Ageing-in-place: the role of neighbourhood outdoor space in urban China

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Long and difficult as the journey may be, sustained actions will take us to the destination. My journey ends here, and starts here.

Declaration

I, the author, confirm that the Thesis is my own work. I am aware of the University's Guidance on the Use of Unfair Means (www.sheffield.ac.uk/ssid/unfair-means). This work has not been previously been presented for an award at this, or any other, university.

Abstract

Due to the increase in life expectancy and the one-child policy, China is experiencing population ageing in line with global trends, characterised by huge and rapid growth in numbers. The ever-changing physiological and psychological status inherent to the ageing process emphasises the importance of helping older people maintain a good and independent life in their own home and community for as long as possible. This is vital for older people's own health and wellbeing, as well as reducing the pressures on health and social care and their cost to the government. Older people are especially sensitive to their social and immediate physical environment. An age-friendly community requires a close person-environment fit to properly address older people's individual needs, physical environmental, and social environmental conditions. A supportive neighbourhood environment can encourage older people to conduct outdoor activities, which are vital to them to keep healthy and maintain social connections. As a part of the neighbourhood environment, neighbourhood outdoor space plays an important role in influencing older people's daily activities and ageing-in-place experiences. The attribute of neighbourhood outdoor space can allow, or indeed prevent, older people from conducting outdoor activities. Therefore, the affordances that fit with older people's characteristics and needs that are offered by the attributes of neighbourhood outdoor spaces have excellent potential to support older people's usage while they are ageing-in-place. The concept of affordance has been applied mostly in relation to children's, rather than older people's, activity environments and thus this study is one of the first to develop the concept in the context of older people's environments. Current Chinese age-friendly environment research is still at a very early stage, just starting to move from a broad planning perspective to relatively more detailed aspects.

This study applies theories of person-environment relationships and affordances in the context of research into age-friendly environments to inform improvements in the planning, design and management of neighbourhoods and communities that support ageing-in-place.

The study uses multi-method research methodologies including interviews with older people living in the two types of residential community (work-unit residential community and

commercial residential community), behavioural observations of older people in outdoor settings, and stakeholder interviews. NVivo was used to analyse interview data to reveal older people's experiences of ageing-in-place, identify the factors that influence their experiences and use of outdoor spaces, as well as stakeholder's perceptions.

The interviews revealed that older people's personal physiological, mobility, mental, and financial status are the premise factors that determine how they use outdoor spaces and whether they can age-in-place independently and well. Their relationships with children, partners, responsibilities for grandchildren's care, as well as relationships with neighbours, wider social engagement, and access to community services constitute the social factors. Older people's attachment to the natural environment and satisfaction with the community's physical environments constitute the physical environment factors. Among the physical factors, community retrofitting in the old residential communities is identified as an opportunity to increase older people's satisfaction, engagement, and attachment to their community. Most importantly, by integrating the analysis of older people's outdoor activities and environmental attributes, personal agency is developed by this study as environment-related agency and social-related agency. Their sense of agency could influences their personal status, social and physical environment, and in turn influenced by those factors. It determines whether older people have positive ageing-in-place experiences rather than feeling stuck in their residential communities.

GIS mapping was used to analyse the observation data to present older people's outdoor activity characteristics. The spatial and temporal analysis of this data revealed a rich diversity of activities and temporal patterns of usage.

By integrating data from these different methods, ten environmental attributes were identified as supportive to older people's environment-related and social-related agency. The attributes are convenience, comfort, safety, multifunctionality, attractiveness, qualities of good maintenance, exercisability, restability, sociability, and identifiability. Overall, this provides a granular and nuanced explanation of how environmental attributes and design elements in different behaviour settings support older people's environment-related and social-related agency. Based on these findings, corresponding policy and practice suggestions

have been made. This research will help researchers and policymakers to understand the factors that influence older people's experiences in their communities and use of outdoor spaces. It presents the complexity and diversity of older people's outdoor activities in their residential communities and neighbourhood outdoor spaces. It provides a framework of factors influencing older people's ageing-in-place from Landscape Architecture to Environmental Gerontology perspectives; explored a way to apply the concept of affordance in age-friendly environment research; identified older people's sense of agency in relation to neighbourhood outdoor space; and made relevant suggestions that can be used to improve Chinese urban neighbourhood outdoor space to ensure it can be more age-friendly in the future and to support older people's ageing-in-place.

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Chapter 1 Introduction

1.1. Research background

1.1.1. Population ageing in the world

Population ageing is both unprecedented and inevitable in all countries and areas worldwide (Figure 1.1) due to declining fertility and increasing longevity (World Health Organisation, 2015; United Nations, Department of Economic and Social Affairs, 2019a). In 1980, there were 382 million people aged 60 years or over worldwide; this number had more than doubled by 2017 to 962 million, which accounted for 12.7 per cent of the world population (United Nations, Department of Economic and Social Affairs, 2017). After 2017, an increasing number of datasets and reports have begun to use the age of 65 and over to report ageing population data. For instance, the United Nations Department of Economic and Social Affairs (2019a) reported that, in 2018, for the first time in human history, people aged 65 and over outnumbered children aged under 5 years old. In the most recent world population data report, people aged 65 years and over numbered 727 million worldwide in 2020, which accounted for 9.3 per cent of the global population (United Nations, Department of Economic and Social Affairs, 2020a). They further predicted that the number of older people globally will more than double and reach 1.5 billion by 2050, which will be around 16 per cent of the world population. By then, there will be one person aged over 65 in every six people globally. More critically, the number of people aged 80 or over is predicted to vastly increase, from 143 million in 2019 to 426 million in 2025, almost tripling in only six years (United Nations, Department of Economic and Social Affairs, 2020b).
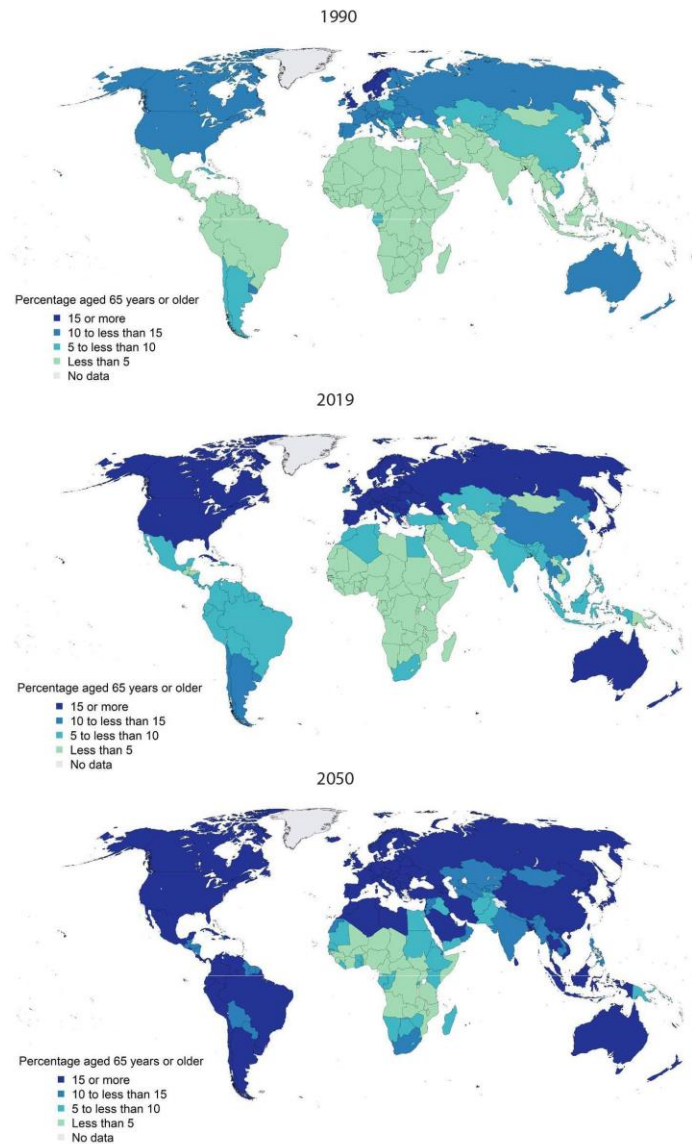
1990

2019

2050

Figure 1.1 Percentage of the world population aged 65 years or over in 1990, 2019, and 2050, according to the medium-variant projection (United Nations, Department of Economic and Social Affairs, 2019a, p19)

Globally, the proportion of ageing population in Northern Africa and Western Asia, Central and Southern Asia, Latin America and the Caribbean, and Eastern and South-Eastern Asia, is predicted to double between 2019 and 2050 (United Nations, Department of Economic and Social Affairs, 2020b). This report further declares that Eastern and South-Eastern Asia had the largest ageing population in 2019, at 261 million, followed by 200.4 million in Europe and Northern America. In Europe, the median age of the European Member States' population will rise 5 years over the next few decades, which means the population is ageing dramatically (European Economy, 2021). In the UK, older people aged 65 years and over had continued to increase to 12.5 million by mid-2020 compared to 10.3 million a decade earlier (United

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Kingdom, Office for National Statistics, 2021). Among the top 10 countries with the highest increases in the proportion of their ageing populations predicted between 2019 and 2050, nine countries are located in Eastern and South-Eastern Asia, with an increase of 23 per cent in the Republic of Korea, 21 per cent in Singapore and China, and 20 per cent in the Taiwan Province of China (United Nations, Department of Economic and Social Affairs, 2020b).

1.1.2. The ageing population in China

In China, '60 years' and '65 years' were defined as the threshold age of older people in the first and second national gerontology and geriatrics symposiums, respectively (Chen, 1993, cited in Yang et al, 2017, p.79). Scholars mentioned that the definition of 'old age' needs to be changed due to changes in life expectancy and health status in line with the development of the economic and social environment and developments in science and technology (Peng and Lu, 2017; Yang et al, 2017; Zhai and Liu, 2019). These developments have significantly changed the way of life and productivity of older people, who now have more opportunities to participate in economic and social activities. This research, defining older people as being aged 60 years and over, follows the current legal definition of older people: the Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly defines older people as being 60 years old and over (China. The Ministry of Civil Affairs of the People's Republic of China, 2019).

China is experiencing rapidly increasing growth in its ageing population (Peng, 2021). It has been over 40 years since China introduced the one-child policy, in 1979. The regulations include restrictions on family size, late marriage, childbearing, and spacing of children in cases where second children are permitted (Hesketh et al., 2005). The decline in family size in the 1970s combined with a sustained decrease in mortality has accelerated the process of population ageing in China (Chen and Liu, 2009). China had just slightly more than 20 years to adapt to a rise from 10 per cent to 20 per cent of its population falling into the aging category, whereas France saw the same proportional change over almost 150 years (World Health Organisation, 2015). Up to 2010, more than 177.6 million people aged 60 or over accounted for 13.26 per cent of China's population (China. National Bureau of Statistics of the People's Republic of China, 2011). In 2017, almost a quarter of the ageing population in the world lived

in China. According to the seventh national census (China. National Bureau of Statistics of the People's Republic of China, 2021), the population aged 60 and above is 264.02 million, accounting for 18.70 per cent. Among them, the population aged 65 and above is 190.64 million, accounting for 13.50 per cent. Compared with 2010, the proportion of people aged 60 and above increased by 5.44 per cent. From 2017 to 2050, the proportion of ageing population is predicted to increase from 16 to 35 per cent in China (United Nations, Department of Economic and Social Affairs, 2017) (Figure 1.2).
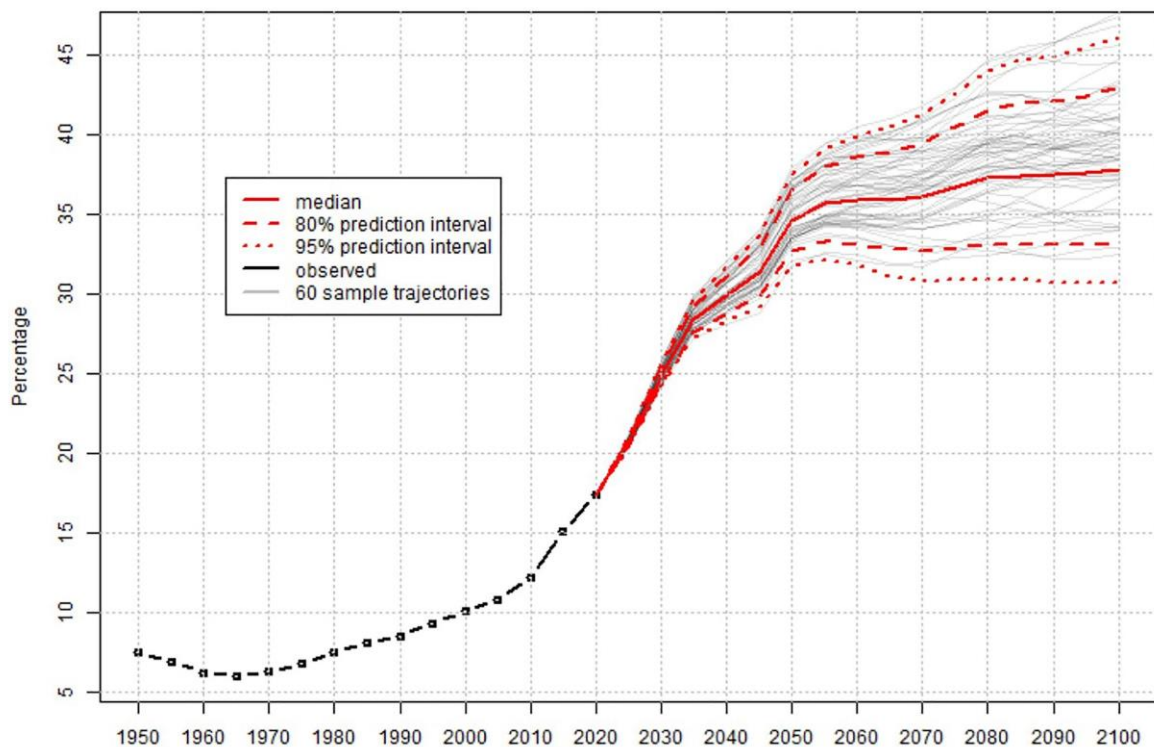
Figure 1.2 China: Percentage of population aged 60 or over (United Nations, Department of Economic and Social Affairs, 2019b).

China conducted its Seventh National Population Census in 2020. According to reports from individual provincial and municipal Bureaux of Statistics, the majority of Chinese provinces and municipalities are facing ageing issues. As clearly shown in Figure 1.3, the areas to the North, Northeast, and within the Yangtze River Basin have proportionately high ageing populations; Liaoning Province, Chongqing, and Sichuan Province have the highest proportions of such, at 17.42 per cent, 17.08 per cent, and 16.93 per cent respectively.

This ageing demographic in China brings certain pressures to the healthcare system (Wang

and Chen, 2014), and pension system (Dong and Wang, 2014). The health and wellbeing of older people determines the pressure of population ageing, and are strongly related to the circumstances in which they age (OECD/World Health Organisation, 2020). According to an analysis of the health and medical status of urban and rural elderly in China (Hu et al, 2018), 37.8 per cent of urban older people's self-assessment of their health status is good, 42.62 per cent is fair, whilst only 31.85 per cent of older people who live alone in the urban area reported a good health status. Almost 80 per cent of older people reported that they have some form of chronic disease. In terms of urban older people's exercising frequency, 31.3 per cent exercised six times or more, 15.1 per cent exercised three to five times, and 35.3 per cent never exercised per week. Chinese older people's health status is worth being concerned about, whilst their frequency of exercising is directly related to their health status and also needs to be improved.
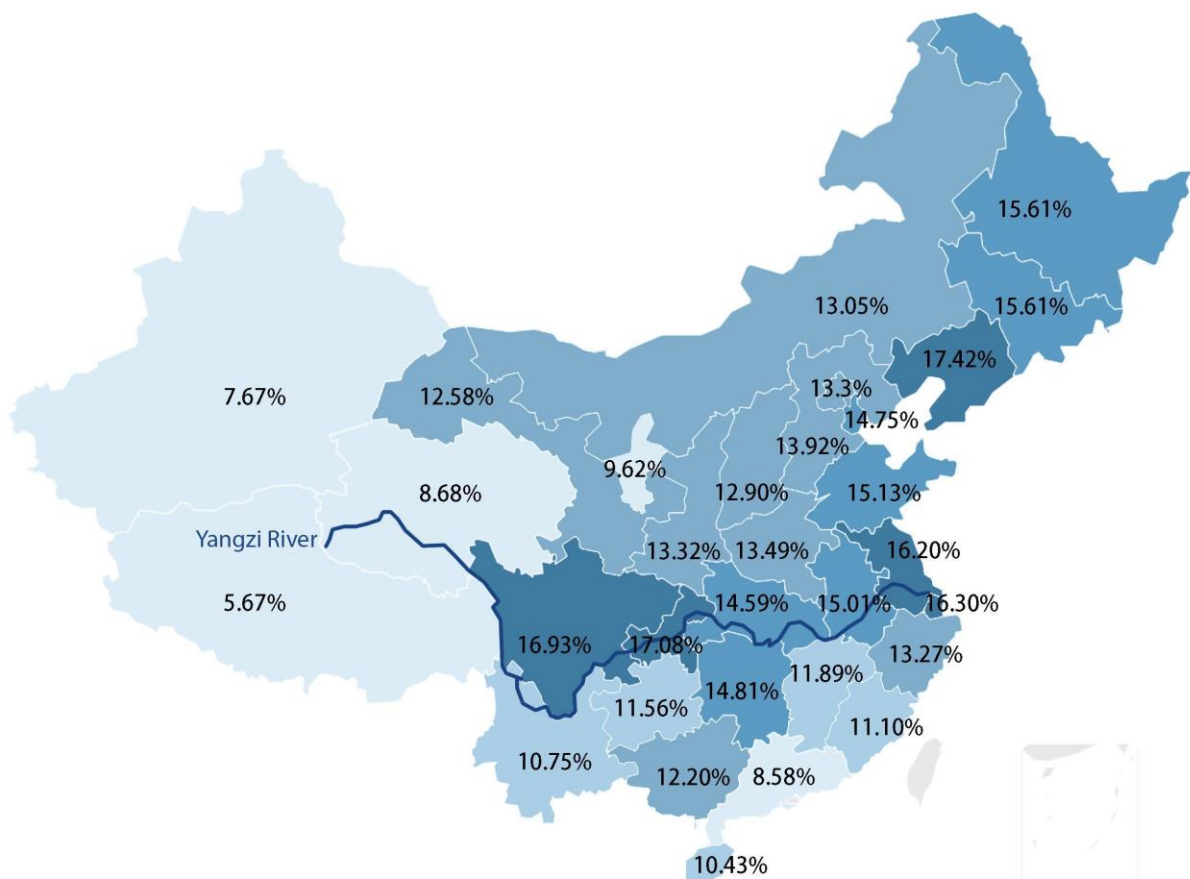
Figure 1.3 Percentage of ageing population (aged 65 or over) in 2021 by Province, autonomous region, and municipality in mainland China (Drawn by author, according to Individual provincial and municipal Bureau of Statistics Seventh National Population Census Data)

1.1.3. Significance of the research and theoretical background

The everchanging psychological and physiological status of older people, together with urbanisation, present this population group with its own particular challenges, especially in today's rapidly urbanising China. Urban environments can cause older people to feel tension and pressure, resulting in changes in their psychological and physiological status and behaviour. Older people can continually contribute to society if they can maintain good health and wellbeing, and vice versa. This population ageing phenomenon is an urgent problem that needs to be addressed. In order to reduce pressures on government and individual families in relation to care for older people, ageing-in-place becomes an economically and socially beneficial choice, which also follows most older people's own wishes. Most older people prefer to remain in a familiar environment to avoid the negative effects of relocation and any drastic transitions. However, ageing-in-place demands that the urban neighbourhood environment is suitable for older people to reside independently and to flourish for as long as possible. To support ageing-in-place, the World Health Organisation proposed an age-friendly cities and communities initiative to build age-friendly environments, an initiative which is followed by 51 countries worldwide (https://extranet.who.int/agefriendlyworld/).

Population ageing phenomena also attract research attention from diverse perspectives, for example, policy (Rémillard-Boilard, 2020), public health (Beard and Bloom, 2015), economics (Marešová et al, 2015), as well as environmental gerontology (Rowles and Bernard, 2013). Environmental gerontology provides solid conceptual and empirical foundations for developing age-friendly societies and promoting healthy ageing (Kendig, 2003). By looking into older people's relationships with the environment, the theory of environmental press model (Lawton and Nahemow, 1973) and the ecological model of active living (Sallis et al, 2006) emphasise the significance of the fit between older people's abilities, capabilities, various personal conditions, and their surrounding physical, social, natural, and policy environments, which will support positive experiences and outcomes. Environmental psychology also develops concepts focused on the environment-behaviour nexus, their relationship, and researching them conjointly. The concept of affordances (Gibson, 1979) highlights that opportunities inherent in the physical environment or affordances can be perceived by people, thereby inviting and supporting people's activities, or indeed preventing

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them if the appropriate opportunities are absent. The affordances of the environment can also be changed, created, and therefore applied in the field of landscape design for specific purposes. Scholars also investigate age-friendly environments with different foci on housing, transportation, outdoor spaces, buildings, and so on. A representative research project in the UK, I-DGO (http://www.idgo.ac.uk), focused on how to improve older people's quality of life by improving outdoor environments to support older people's ability to get outdoors. Two design guidelines for age-friendly streets, parks, and public open spaces were proposed that can be used by government, designers, and practitioners, and also the general public. In China, researchers have explored age-friendly housing and communities (Zhou and Li, 2018; Zhou and Qin, 2018), as well as age-friendly neighbourhood outdoor spaces (Yu and Tian, 2019).

Compared with Western culture, older people's interaction with their living environment is a more passive process in China. It is not only determined by older people's own level of competence and the environment characteristics, but also certain other factors, for example, socioeconomic status, filial piety, and so on (Yu and Rosenberg, 2020). Urban environments in Asia are also different to those in Western countries due to their specific environmental and cultural characteristics, which will lead to different activity patterns (Cerin et al, 2013b). Currently, the Chinese urban environment and the needs of the ageing population are seriously unmatched, given the various qualities of the built environment, extreme lack of activity space, and inconvenient transportation, which cause many problems in the daily lives of older people (Cong and Wang, 2012). This means that older Chinese people may face a lot of environmental pressures that they need to cope with, and further have a lot of unmet needs. More research should also be solidly based on the Chinese context, focus more on detailed aspects, and apply relevant theories. This research is vitally important to address the urgent issue of population ageing in today's rapidly urbanising China. By drawing on the notion of an age-friendly environment, together with application of theories from environmental gerontology and psychology, this study explores age-friendly neighbourhood outdoor spaces in the context of Beijing, China. It is a relatively interdisciplinary subject emerging from the World Health Organisation's age-friendly initiative, focusing on older people's subjective experiences and neighbourhood outdoor environments, combining landscape architecture and sociology perspectives.

1.2. Research aim and questions

This study aims to obtain both subjective and objective data to understand older people's experiences of ageing-in-place and how they perceive and use neighbourhood outdoor spaces. Therefore, to inform improvements in the planning, design, and management of neighbourhoods and communities' outdoor spaces that support ageing-in-place. Three main research questions and corresponding objectives were proposed, starting from understanding experiences, revealing space usage patterns, leading to the identification of environmental affordances that influence older people's usage of outdoor spaces.

- **RQ 1:** *What are older people's experiences of ageing in Chinese urban neighbourhoods?*
  Objective 1: *To identify the multiple factors that influence older people's experiences of ageing-in-place.*

- **RQ 2:** *Where and how do older people use outdoor space in their daily lives?*
  Objective 2: *To reveal older people's usage of outdoor space.*

- **RQ 3:** *How does neighbourhood outdoor space afford older people's activities?*
  Objective 3: *To identify the neighbourhood outdoor spaces' environmental attributes that afford older people's activities.*

- *RQ 4: How to improve outdoor spaces in Chinese urban neighbourhoods to be more age-friendly?*
  Objective 4: To develop policy recommendations and practice guidelines in relation to outdoor space in Chinese urban neighbourhoods to support ageing-in-place.

1.3. Research context

Ageing-in-place is a policy response to the population-ageing phenomenon. In China, more than 85 per cent of urban older people wish to age-in-place (China. National Office of the Elderly Working Committee, 2013). Supporting ageing-in-place in China followed the policy principle that take home care as the foundation, community-based social care as the support,

and care institutions as the supplement (China. The State Council of the People's Republic of China, 2006). Therefore, older people's home and residential communities took on the major responsibility of supporting ageing-in-place. This study thus focuses on the neighbourhood level to explore older people's experiences of ageing-in-place.

The work-unit and commodity housing residential communities accounted for 78.1 per cent of Chinese urban house ownership (China. National Bureau of Statistics of the People's Republic of China, 2011). These two types of residential communities are fundamentally different. The difference most relevant to this study is the outdoor space. Work-unit residential communities have very limited outdoor space for walking and recreation (Yan et al, 2014), whereas commodity housing residential communities are usually set in landscaped gardens (Li et al, 2012). The differences in outdoor spaces may result in differences in old people's outdoor activities.

1.4. Research procedure

To achieve the research aim and objectives and collect comprehensive data, this research used a multi-method qualitative research methodology, combining spatial ethnography strategy and case study, and multi-data collection methods: semi-structured interviews, observations and on-site interviews, and stakeholder interviews. The choice of spatial ethnography research design and multi-method qualitative methodology enabled immersion in the research context and in-depth data to be obtained. The combination of the interview and observation methods have enabled this study to obtain both subjective data from participants about their life experiences in their neighbourhoods and how they perceive environmental affordances and use outdoor spaces, as well as objective data from the observations that reveals their usage patterns in outdoor spaces. The spatial ethnography and case study facilitate social science research and physical spatial analysis, which is helpful to understanding the social, spatial, and material aspects of ageing-in-place. The study had four phases. Each of the research questions was aligned with a specific phase in the study:

1. Phase 1 involved selecting residential communities and conducting semi-structured

interviews with older people from selected sites, as well as stakeholders. This phase identified the factors that influence older people's experiences of ageing-in-place, neighbourhood outdoor spaces that they frequently used, and how they use them.

2. According to the interview data, the neighbourhood outdoor spaces for observation have been identified. Phase 2 involved collecting observation and on-site interview data in selected residential communities and neighbourhood outdoor spaces, revealing older people's usage situations and their perceptions of these outdoor spaces.

3. By triangulating interview, observation, and stakeholders' interview data, phase 3 identified the attributes that influence older people's use of outdoor space at the macro-, meso-, and micro-levels , and further explored how older people's sense of agency has been developed.

4. The findings from the previous phases were used to inform planning, design, and management recommendations in relation to outdoor space in Chinese neighbourhoods to support older people ageing-in-place. The outcomes from this phase achieved the overarching aim of this study.

1.5. Thesis structure

This thesis is structured according to eight chapters, as follows (Figure 1.4):

This chapter (Chapter 1) introduces the research background which highlights the significance and necessity of this research. After explaining the research aim and questions, the research procedure and thesis structure were then introduced to give the reader a clear understanding of how this study and thesis were conducted. The key definitions that are relevant to this research were then explained to help the reader understand the relevant terms, especially related to the Chinese context. Finally, the personal motivation was clarified to demonstrate how the personal life and study experiences inspired this study.

Chapter 2 provides a comprehensive and in-depth literature review regarding the knowledge and theories about the relationship between ageing and environment, ageing-in-place, and

age-friendly environments. Based on this, this chapter emphasises the importance of looking at older people and their residential neighbourhood environments in the Chinese context.

Chapter 3 introduces the research strategy and methodology and the reasons for choosing this approach. A research framework is developed, introducing the research methods (interviews, observations, and stakeholder interviews), their detailed application (e.g., recruiting participants, recording data, and the analysis of the resulting data).

Chapter 4 moves to the detailed research context, involving the relevant Chinese policy and design standard and stakeholder's perspectives, the introduction of the concept of neighbourhood and community in China, the case studies and how they were chosen.

The following chapters, chapters 5, 6, and 7, report the research results according to different research questions and their associated methods. Chapter 5 is based on the interview data, and details the factors that influence older people's experiences in ageing-in-place and use of outdoor space, and identifies the neighbourhood outdoor spaces that they frequently use. By analysing the observation data, Chapter 6 presents older people's activity patterns in both residential communities and neighbourhood outdoor spaces, and illustrates how older people actually use these spaces. Chapter 7 triangulates data from the interviews, observations, and stakeholder interviews, proposing an affordance framework for age-friendly outdoor space which contains affordances at the macro-, meso-, and micro-levels.

Finally, chapter 8 discusses the results and findings from previous chapters, and answers the research questions, and draws conclusions, to achieve the overall research aim.
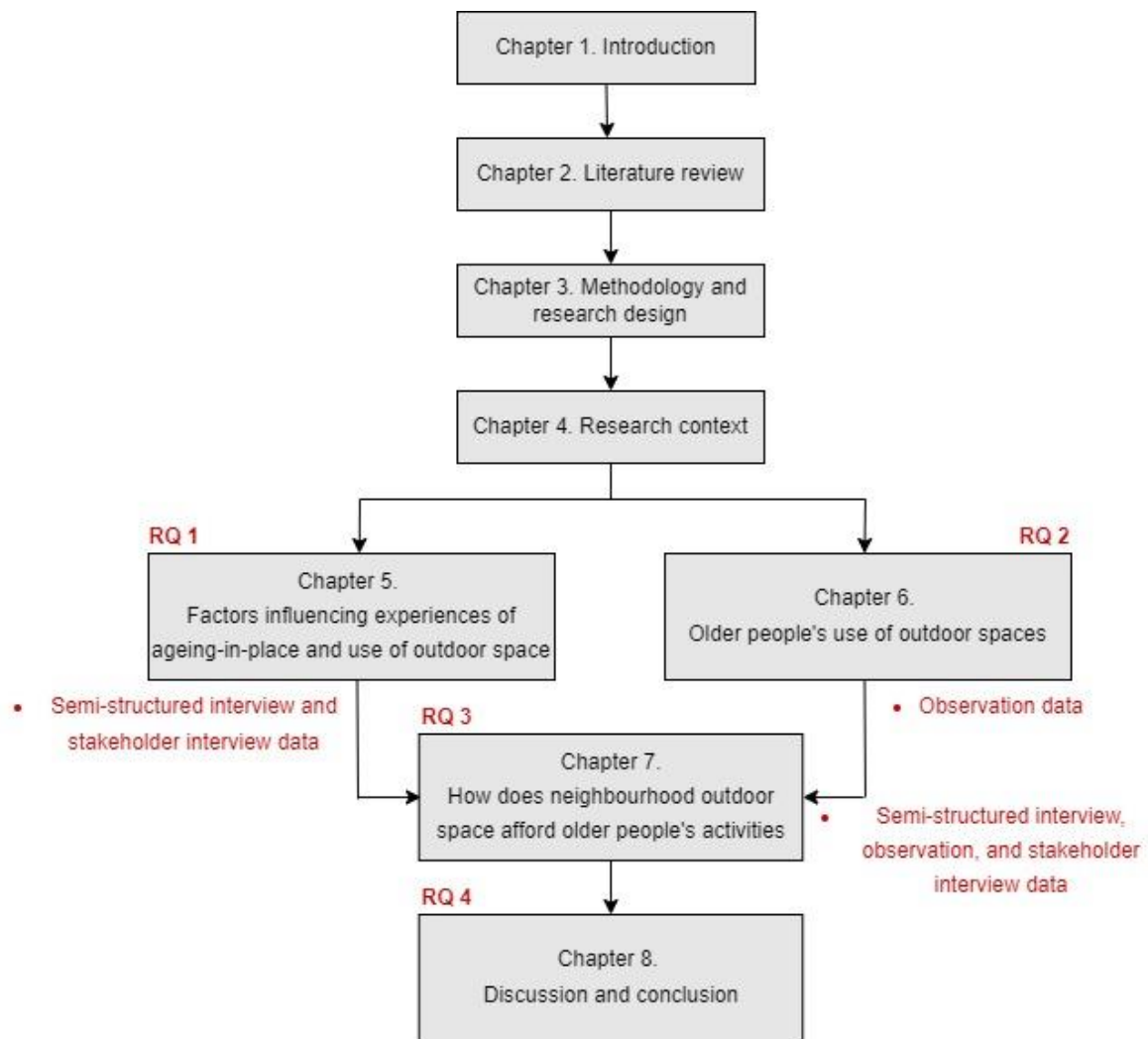
Figure 1.4 Thesis structure (source: author)

1.6. Key definitions

This section provides definitions and relevant Chinese characteristics as well as PinYin translations of key terms used in this thesis, which should help the reader to gain a basic understanding of the terms. Detailed discussions and explanations will be given in related sections of the thesis.

Community / Residential community (住宅小区 Zhu Zhai Xiao Qu)

Composed of several residential buildings and has a clear geographic definition (see Chapter 4.4).

Community committee (社区居委会 She Qu Ju Wei Hui)

The smallest political unit in China. It is a self-governing organisation for residential

community residents' self-management, self-education, and self-service. The duties are to protect residents' lawful rights and interests, mediate residents' conflicts, assist the government and its agencies with work to address residents' interests, and reflect residents' opinions, requirements, and suggestions to the government or its agencies. The committee can also carry out community services and activities that are beneficial to residents and can establish related services business. The jurisdiction of the community committee can cover just a single or several residential communities.

Work-unit residential community (单位型小区 Dan Wei Xing Xiao Qu)

A kind of residential community composed of privatised public housing. Residential buildings are usually medium-rise, multistorey buildings built between 1949 and the 1990s. The residents worked, or are still working, in the same unit.

Commercial residential community (商品房小区 Shang Pin Fang Xiao Qu)

A kind of gated and guarded residential community composed of market housing built after the 1990s and constructed by estate developers. The community consists of high-rise buildings with outdoor space, including landscaped gardens generally designed by landscape architects.

Neighbourhood (邻里 Lin Li)

Neighbourhoods are ultra-local communities of place comprising several residential communities. They are therefore larger than these residential communities in both their physical and social layers. They do not have clear geographic boundaries, but usually comprise a range of land uses to provide living facilities and services for local residents. The neighbourhood is also a local area within which residents engage with people outside their own residential communities. The standard for urban residential areas' planning and design (China. Ministry of Housing and Urban-Rural Construction, 2018) defined neighbourhoods in China as 15-min, 10-min, and 5-min pedestrian-scale neighbourhood living circles, based on the principle that residents can walk for 15, 10, and 5 minutes to places that meet their diverse needs.

Neighbourhood outdoor space (邻里户外空间 Lin li Hu Wai Kong Jian)

Based on the understanding of neighbourhood, neighbourhood outdoor space refers to different types of communal and public outdoor space within 15 minutes walking distance from older people's residential communities. These outdoor spaces are used by older people in their daily lives, and include communal gardens, neighbourhood green spaces, parks, streets, or pavements. This also includes outdoor space in the residential community where old people live as well as outdoor space used by older people outside the immediate community and within local neighbourhoods. Larger areas such as district, metropolitan, and regional green spaces are not included in this study due to time and capacity limitations.

Empty nest (空巢 Kong Chao)

The period in older people's lives after their children have left home.

One-child policy (独生子女政策 Du Sheng Zi Nv Zheng Ce)

The family planning policy introduced in the 1980s aimed at restricting population growth, including limits on family size, late marriage and childbearing, and spacing of children (when such was allowed). The one-child policy promoted only one child per couple, but which ended in 2016.

1.7. Personal motivation

The postgraduate experience in the Department of Landscape Architecture, the University of Sheffield, informed my realisation of the dynamic relationships between people and the environment, and the usually unnoticed power of landscape design to benefit people's health and wellbeing. My Master's degree dissertation explored the intergenerational perceptions of Chinese children's contact with nature and use of urban green spaces. During the data collection process, I noticed that many of the children were supervised by grandparents. This reminded me that I was also taken care of by my grandmother when I was young, and she is now 98 years old. She moved to live with my aunt in a residential building just opposite the

heavily-trafficked main road. Even though they live on the ground floor, my grandmother still finds it difficult to get out of the home to go outside because the outdoor environment is full of barriers and is not age-friendly. She has to spend a lot of time alone staying indoors. This is common for many ageing Chinese populations.

Before I applied for a PhD study, a few Chinese metropolitan cities started to propose age-friendly initiatives, but rarely mentioned outdoor environments. Many other provinces and cities have not even proposed it. There is a long way to go in order to improve the Chinese outdoor environment so that it becomes age-friendly, and all the ageing population are supported in being able to get out of their homes safely and thus live better lives.

Chapter 2 Literature review

2.1. Introduction

This chapter will draw upon worldwide literature concerning a diverse range of relevant issues, including urbanisation and ageing, older people's health and wellbeing, ageing-in-place, theories relating to older people, their environment and activities, and age-friendly environments. The diversity of relevant knowledge and theories helped this study to build a comprehensive theoretical framework in relation to this research topic.

Based on the basic outline of ageing populations both worldwide and in China in Chapter 1, the first section (2.2) links the ageing population and the urbanisation phenomenon. It then goes on to deal with older people's physiological and psychological changes as part of the ageing process, and their living arrangements - both vital aspects of the ageing process - together with different ageing concepts. This section also emphasises the importance of paying attention to this population group. The following section (2.3) looks into the concept of ageing-in-place, and explains why it is important for older people, and why it is necessary to conduct research on this topic, especially in China. The following section (section 2.4) introduces the diverse theories concerning the relationship between older people and their living environments, including the relationship between environment attributes, affordances and older people's outdoor activities, which helps this study to build theoretical knowledge, identify research gaps, and propose research questions. In section 2.5, the review spotlights the key aspect that can support older people ageing-in-place: age-friendly environments, and narrows the focus on age-friendly outdoor space, introducing current Chinese research progress. Finally, based on all the background knowledge and theories, research gaps are identified, followed by the proposed overall research aim and questions.

2.2. Ageing, health and wellbeing

2.2.1. Urbanisation and ageing

Apart from population ageing, rapid urbanisation represents another global phenomenon of

recent decades. The definition of urban or urbanisation varies in different countries and cities. Europe and North America define areas as urban where more than 50 per cent of the surface is built-up, surrounded by areas with 30–50 per cent built land cover, with over 10 people per hectare, whereas other countries use population size, density of economic activity, or governance structure to define urban regions (Elmqvist et al, 2013). The United Nations (2014) uses population size and density, distance between built-up areas, economic activity types, legal or administrative status, and specific urban services to define urban areas. Marsella (1998) concluded that the parameters of urbanisation include population, together with economic, environmental, cultural, and psychosocial lifestyle, as well as there being a political component. As Tisdale (1942) mentioned, using population concentration to define urbanisation seems to be limited, but it is actually the only unambiguous parameter that can be used in this manner. Even though there are different ways to define urban areas, it is generally accepted that urbanisation usually involves population migration from rural to urban areas (McGranahan and Satterthwaite, 2014). The rapid expansion of urban areas is usually achieved at the expense of agricultural land and causes knock-on effects to biodiversity and ecosystem services (Elmqvist et al, 2013).

According to the United Nations, Department of Economic and Social Affairs (2017), the ageing population is growing faster in urban areas than in rural. Globally, between 2000 and 2015, the number of older people increased by 68 per cent in urban and 25 per cent in rural areas, and the proportion of people aged 60 years or over residing in urban areas increased from 51 to 58 per cent. The increasingly concentrated population in urban areas brings sustainability challenges to cities relating to housing, infrastructure, food security, as well as natural resources management (Li et al, 2017). Together with various challenges, cities also have more resources and opportunities (van Hoof et al, 2018). Urbanisation has both advantages and disadvantages regarding human health and wellbeing. Although living in an urban area provides better access to healthcare services and facilities, people may not be able to offset the impacts of the urban environment and lifestyle (Chen and Chen, 2015). Urbanisation creates problems of overcrowding, pollution, social deprivation and stress-related illness (Godfrey and Julien, 2005). These chronic environmental stressors, also including neighbourhood problems, such as crowding, congestion, and noise, have been called "daily hassles", which can cause behavioural, psychological, and physiological reactions

in older people (Phillips et al, 2004). The urban environment can also cause tensions and pressures for older people (Wahl and Oswald, 2010). Changes in neighbourhoods have significant implications for individuals' mental health, especially for urban residents. It is especially dangerous for them when changes in the local environment restrict their daily living activities, cutting off their health and support networks (Phillipson, 2004). Older people's leisure-time physical activities are also influenced by the inconveniences and the safety factors of their local neighbourhood. Many newly developed residential communities in Chinese urban areas lack sufficient facilities and space for older people's sports and exercise (Zhu et al, 2016). Uneven paving, poor seating, steep inclines, and unsafe traffic situations may cause some difficulties for older people moving around their neighbourhood (Burton and Mitchell, 2006; van Hees et al, 2017). Higher population density is negatively related to the sense of neighbourhood safety (Chen and Chen, 2015). Many older people in urban communities experience a growing sense of insecurity about the local environment, feelings of isolation, and loss of community life (Phillipson et al, 2002). In urban areas, attention needs to be paid to the accessible public spaces to enable older people to actively cope with the changes in the contemporary urban area and the ageing process (Galcanova and Sykorova, 2015). Whether the experience of city life is enjoyable and tolerable or not will impact significantly on the future of older people (Phillipson, 2010).

With the development and restructuring of the economy since the 1980s, China is experiencing accelerated urbanisation (Lin, 2007). Gu and Wu (2010, pp. 1-2) defined urbanisation in China as "a complex and multifaceted process involving population migration from rural to urban areas, rural and urban land conversions, spatial reconfiguration of settlements, and changing governance and management". Lin (2007) concluded Chinese urbanisation's features to be city-based and land-centred processes. Based on the data about the elderly population in the fifth and sixth censuses, Zhao et al (2017) found that prefectural-level and above cities in China (including cities under the jurisdiction of a province or autonomous region, leagues, autonomous prefectures, and municipalities) are generally at the middle period of population ageing, which means the ageing population rates are between 10.1 per cent to 15 per cent. Van de Poel et al (2012) found that Chinese urbanisation brings a higher percentage of reporting poor health, and the percentage of poor health is positively related with the degree of urbanisation. They explained the potential

reasons for such, including pollution and unhealthy lifestyles, the latter relating to a high risk of developing cardiovascular disease and cancer.

2.2.2. Health and wellbeing in later life

The process of ageing increases the risk of many health problems. According to the World Health Organisation (World Health Organisation, 2015), the underlying changes as people age include decline in movement, and in sensory, cognitive, and immune functions. Amarya et al (2018) concluded that the process of ageing is accompanied by changes in the musculoskeletal system and physiological function. With age, the joints become less flexible and more susceptible to damage, and the decline in muscle strength also increases stress on certain joints and influences older people's balance control, which may lead to falling (Collins, 2013, Sturnieks et al, 2008). Muscular activities become less responsive and efficient due to a reduction in nerve conduction. The changes in joints and muscles cause a decline in physical mobility and daily activities (Amarya et al, 2018). Even where older people are healthy and functioning well, fear of falling is common in older people due to their musculoskeletal changes, and will reduce their recreational physical activity (Bruce et al, 2002). Many studies have also detailed the physical health issues of older people, which include multiple chronic diseases (Hung et al, 2011; Wolff et al, 2002) and mobility decline (Buckwalter and DiNubile, 1997; Hicks et al, 2011; Rantakokko et al, 2013; Ferrucci et al, 2016). However, residual plasticity still remains to a high degree in the ageing skeletal muscle (Taaffe and Marcus, 2000). Therefore, the practice of exercise is helpful for older people to maintain muscle size and strength, retain proper balance to prevent falls and injuries, and to generally function independently (Gauchard et al, 1999; Collins, 2013). There is a strong relationship between mobility and quality of life (Groessl et al, 2007; Bentley et al, 2013). Improved mobility amongst older people in physical space enables independence, autonomy, and reciprocal social relations with others, and therefore enhanced wellbeing (Ziegler and Schwanen, 2011). However, poor health status (Andresen et al, 1994), and increased prevalence of chronic diseases (Chapman et al, 2005), is related to depression, and is in turn also a risk factor for functional decline, poor health outcomes (Perissinotto et al, 2012), and even suicide (Fiske et al, 2009).

As Amarya et al (2018) noted, physiological changes affect the nervous system, cognition, memory, learning, and intelligence, as well as particular senses. With age, the reduction of brain capacity to transmit signals causes neurological disorders, for example Alzheimer's and Parkinson's disease, which are the most common age-related neurodegenerative diseases (Reeve et al, 2014). These will manifest as cognitive or behavioural function impairments to the ability to acquire and remember new information; reasoning and handling of complex tasks; judgment; visuospatial abilities; language functions; as well as changes in personality, behaviour, or comportment (McKhann et al, 2011). Sensory loss includes vision, hearing, taste acuity, smell, and touch (Amarya et al, 2018). As Salvi et al (2006) stated, the ageing changes in the eye include decreased visual acuity, declining sensitivity of visual field, and decreased contrast sensitivity. Older people are intolerant to glare and find it difficult to adapt to bright light and darkness. The loss of olfactory ability is also very common amongst older people and is related to depression, cognitive performance, and quality of life (QoL) (Seo et al, 2009). The sense of touch, especially on hands and feet, also declines with age, making it more difficult for older people to sense their contact with a surface. To be more specific, Farage et al (2012) explained that older people may find it difficult to sense whether they are fully seated, or whether a button has been depressed. The above changes, forming part of the ageing process, indicate the importance of designing physical environments to meet the specific needs of older people (Farage et al, 2012).

Later in the course of life, changes to people's functional ability and intrinsic capacity can be divided into three periods: maintain high and stable capacity, decline in capacity, and significant loss of capacity (Figure 2.1). Different intervention strategies are suitable for older people at different stages of capacity. To be more specific, when older people are starting to experience declining capacity, the main aim of health services has changed from preventing to reversing or slowing the decline process. Therefore, the role of the environment is to promote older people's capacity-enhancing behaviours to help them overcome the decline of capacity. With further loss of capacity, the emphasis of the environment changes to that of removing barriers and compensating for loss of capacity. Long-term care is also needed at this stage to support older people's basic living and dignity. This framework explains the relationships between older people's changing capacity and supportive environments and care interventions. However, health is not only about the physical aspect.
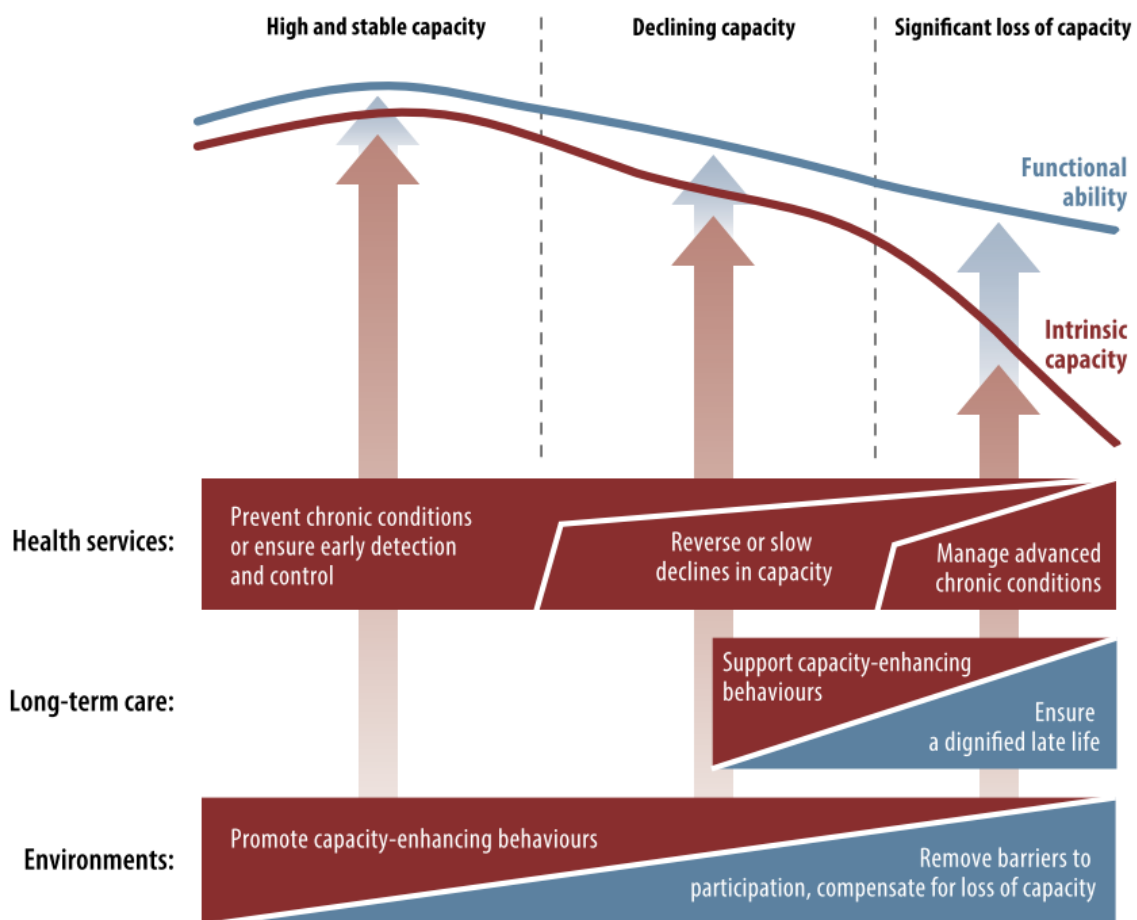
Figure 2.1 A public-health framework for Healthy Ageing: opportunities for public health action throughout the course of life (WHO, 2015)

The process of ageing is also accompanied by emotional and psychological changes. Even though Segal et al (2018) stated that the rates of clinical depression in older people are lower than in other segments of the adult population, Stuart-Hamilton (2012) concluded, based on previous research, that the reason for more frequent isolated depression symptoms is that older people are more likely to be exposed to depressing events. To be more specific, maintaining functional independence is a pressing problem (Mehta et al, 2002). Functional impairment is an important risk factor for depression in older people (Zeiss et al, 1996). Psychosocial adversity including isolation, relocation, caregiving, and bereavement trigger physiological changes and increase the potential for the development of depression (Alexopoulos, 2005). Socially isolated older people, whether subjective (loneliness) or objective (lack social support networks), underline the significant potential for depressed mood (Golden et al, 2009). As one of the susceptibility factors for depression, loneliness is common in older people (Golden et al, 2009). Perissinotto et al (2012) confirmed that

loneliness can result in functional decline and, ultimately, death. Loneliness and social isolation are also associated with physical and mental health, as well as quality of life and wellbeing (Grenade and Boldy, 2008; Luanaigh and Lawlor, 2008; Findlay, 2003; Steptoe et al, 2013). By reviewing related literature, Bryant et al (2008) found that the symptoms of anxiety and anxiety disorders are also common in older people, and often present with depression. From the other perspective, Gale et al (2014) suggested that maintaining better psychological wellbeing may protect older people from physical frailty.

The World Health Organisation (1946, p1) defined health as "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity". In terms of wellbeing, the World Health Organisation (2015, p.231) defined it to include physical, mental, and social aspects that together form the basis for a "good life". Michaelson et al (2012, p.6) defined it as "how people feel and how they function, both on a personal and a social level (e.g., sense of being connected to those around them), and how they evaluate their lives as a whole". Steptoe et al (2014) described wellbeing from the subjective perspective, which has three aspects: evaluative wellbeing (i.e., life satisfaction), hedonic wellbeing (refers to daily emotional feelings), and eudemonic wellbeing (refers to purpose and meaning in life). Hedonic wellbeing refers to the emotional quality of a person's daily experience, the intensity and frequency of experiences of joy, fascination, anxiety, sadness, anger, and affection that make a person's life pleasant or unpleasant (Kahneman and Deaton, 2010). These definitions and research emphasise how wellbeing provides the basis for a "good life"; as Walker (2002) notes, older people can continue to contribute to their family, local community, and society provided that they can sustain their wellbeing, functioning, and levels of physical activity.

Health and wellbeing are closely related, and the link could become more important as people age (Steptoe et al, 2014). Positive wellbeing has a significantly favourable influence on health and longevity (Chida and Steptoe, 2008; Diener and Chan, 2011). There are several other factors that influence older people's wellbeing. Bennett and Soulsby (2014) listed intrapersonal factors comprising morale, identity, and health, and interpersonal factors including social participation, social networks, family, marital status, and social support. Similarly, Litwin and Shiovitz-Ezra (2006) revealed that the number, diversity, frequency, intensity, structural, and interactional characteristics of later life social relationships and the

exchange of social support, combined with the extent to which these are meaningful to the person, can influence older people's wellbeing. De Quadros-Wander et al (2014) emphasised the relationship between the capacity to change the environment to meet individual needs, and the capacity to align individuals' expectations with the environment, and people's wellbeing in later life. Douma et al (2021) gave a different perspective: the potential of their living space to fulfil older people's needs is more important to their wellbeing than its actual size. Quality of life also reflects a broad concept of mental wellbeing including health and happiness status, as well as social indicators (World Health Organisation, South-East Asia Regional Office, 2018). To enable older peoples' ageing well, attention needs to be paid into their physical, mental and social wellbeing related to their specific changes in musculoskeletal, physiological, mental status, and their capacity to adapt to the environment.

2.2.3. Older people's living arrangements

Living arrangements also play an important role in influencing older people's health and wellbeing, even though the research results are complex (Hays, 2002). Older people's living arrangements may differ from their preferred and actual circumstances, due to health status and their, or their partner's, functional ability, the death of a partner, gender, financial status, housing costs and locations, children's need for care of grandchildren, number of children and their marital status, and dominant local cultural norms and traditions (Sereny, 2011; United Nations. Department of Economic and Social Affairs, 2020a).

A number of studies have explored the relationship between living arrangements and older people's health and wellbeing. Zunzunegui et al (2001) found that, for older people in Spain, living with children is associated with good self-rated health and low depressive symptoms. Chen and Short (2008) stated that co-living with children or spouses has positive influences on older people's wellbeing, whereas living alone has a negative impact. Similarly, emotional and mental health were also identified as dramatically low amongst empty nest older people (Lv et al, 2013). As Ji (2018) reported, 29.9 per cent of urban older people in China have a sense of loneliness, with the percentage of 33.7 per cent in women and 25.6 per cent in men. There are 64.3 per cent of urban older people who are living alone who report a sense of loneliness. The period in life after their children have left home is described as an empty nest

(Harkins, 1978). In contrast to the findings reported earlier that 20.2 per cent of the empty nest older people in urban areas reported a sense of loneliness, whereas 29.1 per cent of urban older people who live with their children reported a sense of loneliness (Ji, 2018). This indicates that older people may still feel loneliness if they lack means of communication with family members, even if they are living together. Wu et al (2010) state that loneliness is pervasive among empty nest older people, and indeed may restrict their social relationships. According to the data from the State Council of the People's Republic of China (2017), there are 255 million people aged more than 60, 118 million of who are empty nesters or living alone. The percentage of empty nest older people is predicted to continue growing, because the parents of the first batch of children born after the one-child policy began in the 1980s are about to enter old age (Yu and Tian, 2019). Apart from empty nests, Feng et al (2017) found that living in and moving into a care institution are both correlated with a higher mortality risk in older people.

In East Asia, multigenerational co-residence is considered an ideal living arrangement that benefits filial piety, family solidarity, and collective family interests over individual interests (Xu, 2019). Filial piety (Xiao) plays a vital role in Chinese society as it signifies the important 'rules' of how children should treat and take care of their parents (Yeh, 2003), such as showing respect, being obedient, living with the parent (or staying close if co-residence is not possible), taking care of the parent, and so on (Cheng and Chan, 2006). However, the traditional filial piety has changed with the development of society. Changes in filial piety also bring changes to older Chinese people's living arrangements. The traditional filial piety underlines the responsibility of children for parents, whereas it is now a more reciprocal relationship that includes receiving altruistic help from parents (Chen and Liu, 2012). Between 1990 and 2000, the proportion of older people co-living with their children declined from 70 per cent to 57 per cent in China (United Nations, Department of Economic and Social Affairs, 2017). Nevertheless, an increasing number of grandparents are playing a caregiving role in contemporary Chinese society (Chen et al, 2011). Co-residing grandparents caring for grandchildren is also common in many Chinese families (Chen and Liu, 2011). In 2016, more than 80 per cent of China's migrating older population were younger than 70 years old, with the main reasons being taking care of younger generations (43 per cent), ageing care and employment (23 per cent) (Wang et al, 2017). However, there are different views concerning

the benefits and disadvantages of older people caring for their grandchildren. Yang et al (2021) identified grandchildren's care as a significant reason for reduction in urban older people's life satisfaction. Ku et al (2013) found that older people who provide childcare in multigenerational families (grandparents, their adult children, and their grandchildren) tend to have better self-rated health, fewer depressive conditions, and better life satisfaction. Similarly, Guo et al (2008) found that caregiving and co-residing with grandchildren are beneficial for grandparents' physical and mental status. Older people who are taking care of their grandchildren prefer to choose activity spaces near children's activity spaces to fulfil their desires to be with their grandchildren (Tang, 2016). No matter what their living arrangements, older people may have different needs in relation to their neighbourhood environments.

2.2.4. Ageing well

There are several concepts proposed to relate to ageing well, namely healthy ageing, successful ageing, productive ageing, and competent ageing (Villar, 2012).

The World Health Organisation renamed their programme on the health of the older people to Ageing and Health, and proposed it as a global strategy (Kalache and Kickbusch, 1997). In the World Health Organisation's (2003) Healthy Cities programme, the importance of addressing older people's needs for health, care, active and independent living, quality of life, supportive environments, and access to services to achieve healthy ageing are all highlighted. The well-known definition of healthy ageing was proposed by the World Health Organisation in 2015 (p28) as "The process of developing and maintaining the functional ability that enables wellbeing in older age". The World Health Organisation (2015) also suggested key areas for healthy ageing action. This comprises a person-centred approach that considers the diverse needs of older people (e.g., in long-term care), reducing inequity, enabling the choice that is vital to older people's agency and autonomy (Stephens et al, 2015; Welford et al, 2012), and enabling ageing-in-place. This strategy guided cities worldwide to pay attention to older people's health and wellbeing. Their most recent suggestion is that knowledge from social, biological, economic, and environmental determinants needs to be integrated to address healthy ageing from a life course perspective (World Health Organisation, 2021).

Successful ageing is another strategy to overcoming ageing issues. Early research about successful ageing was conducted by social scientists in the United States from the 1960s to 1970s. Later, psychologists and behavioural scientists turned their attention to successful ageing during the 1980s and 1990s Over the subsequent 20 years, successful ageing also attracted physicians and health services researchers (Phelan and Larson, 2002). By comparing various definitions of successful ageing, Phelan and Larson (2002) identified core factors comprising life satisfaction, longevity, freedom from disability, mastery or growth, active engagement with life, positive adaptation, and high or independent functioning. To be more specific, independent functioning has been defined by Rowe and Kahn (1987) as physical, cognitive, and social functioning.

Productive ageing initially refers to older people participating in production of goods or services, no matter whether they are paid or not (Caro et al, 1993). It was then developed to a wider concept, as Peng and Fei (2013) defined in a Chinese context: "under the premise of their willingness and capabilities, and on the basis of equal opportunities, older adults directly or indirectly participating in activities that are beneficial for personal and social development, in order to achieve the ultimate goal of harmonious development of personal and social values". Unlike successful ageing, productive ageing not only regards ageing as a personally good feeling of old age, but argues more broadly that the whole of society should feel good about the ageing population, and believe that they are contributing to that society and not becoming a burden (Morrow-Howell et al, 2001). As Lin and Lv (2016) mentioned, productive ageing regards older people as supporters for the family, and participants in the social economy.

Another ageing strategy highlighting older people's participation is active ageing, as first proposed by the World Health Organisation (1999) in the International Year of Older Persons to encourage older people's participation in society. In 2002, the World Health Organisation (2002, p.12) defined active ageing as: "the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age". Peng and Fei (2013, p.10) explained the importance of active ageing as it emphasises older people's right to social participation, transferring older people from problem-makers to problem-solvers,

from obstacles to instruments of social development, from consumers to creators of social wealth. Chapman (2009) stated that 'ageing well' has changed in recent years as a process of building a sense of self amid later-life changing. These ageing strategies, with their various concerns, have all been considered as potential approaches to developing an age-friendly society in China.

2.3. Ageing-in-place

2.3.1. Understanding ageing-in-place

Ageing should not be perceived as a liability, as many older people wish to remain active in their communities and maintain relevance to the societies in which they live, and some might feel younger than their chronological age (Farage et al, 2012). Where to live is a major concern for older people as they age. Whilst some older people have no option about their place of residence because they do not have the resources to make choices, an increasing number of older people are able to choose how and where they live (Sokolec, 2015). Davey et al (2004, p.133) defined ageing-in-place as "remaining living in the community, with some level of independence, rather than in residential care". It can also be understood as remaining in an individual's own home or neighbourhood and that individual's fitness to meet changing conditions and needs (Fänge et al, 2012). It shows how older people are part of the neighbourhood, community, and different sociocultural contexts. Concerns with place and ageing focuses on how space and place affect older people's quality of life and the opportunities to age successfully and actively (Andrews and Phillips, 2005). Chapman (2009) mentioned that ageing well in a place can be understood according to certain physical, socio-cultural, and temporal factors, because of people living in physical places and amid social norms. She further suggests that it is necessary to study people who are ageing and the places where they age, to understand ageing well.

Buffel et al (2012) identified several reasons why the neighbourhood plays a significant role in influencing older people's wellbeing and quality of life. First, older people tend to spend the majority of their time in their neighbourhoods. Esther et al (2017) confirmed that older people are more likely to stay in their local area than younger people because they are less

mobile. Attachment to place is another reason because it increases with age and has been defined as "an affective bond or link between people and specific places" (Hidalgo and Hernandez, 2001, p.274). Older people's sense of attachment and connection with place is not only linked to housing but also operates at the neighbourhood and social levels. Both perceived neighbourhood quality and outdoor place attachment explain life satisfaction among older people (Oswald et al, 2010). Enhanced attachment to one's area is related to age and ageing-in-place (Gilleard et al, 2007). Being out of a place or losing one's place can cause a particular anxiety, called "place panic" by Casey (2001). It is reasonable to assume that If older people are forced to leave their attached neighbourhoods, "place panic" could be worse for them than their younger counterparts. The physical place where older people reside is important for them. However, Boyle et al (2015) highlighted the potential of place to support older people's meaningful relationships, for example, the networked social and non-social relationships they developed across different spatial scales and over time, arguing that these relationships are more important than the physical aspects of place for successful ageing-in-place. Maintaining independence and social integration is quite important for older people's ageing-in-place. Local social networks are therefore correspondingly more critical for those more oriented towards their immediate vicinity. As Thomése and Tilburg (2000) identified in the Netherlands, older people's neighbouring social networks accounted for more than 60 per cent of their core social relationships. Older people with a better sense of control, good quality friendships, and fewer depressive symptoms are said to be associated with neighbourhoods with more social cohesion (Stafford et al, 2011). Vanderhorst and McLaren (2005) have similar findings, namely that increasing social support resources for older people help to reduce their symptoms of depression and suicidal ideation. Older people's friendship networks also influence their physical activity and health-promoting behaviours (Watt et al, 2014). By researching older people's social interactions in neighbourhood shops, Stewart et al (2015) proposed another new concept: civic socialising. This concept suggests that accessible local shops enable older people to engage in social activities and maintain their sense of presence, which will help them build their autonomy and continue to be active in the community. They further stated that civic socialising is vital for policy planning and the wellbeing of the increasing number of older populations in the world. If older people are not able to engage in daily social interactions in their communities, many of them might be excluded from mainstream society.

Ageing-in-place is a common policy response to the population ageing phenomenon (World Health Organisation, 2015). Governments and international organisations agree that ageing-in-place, in the community, for as long as possible, is both economically and socially beneficial. By reducing institutional care and supporting home or community-based care, ageing-in-place can provide cost-effective health services for older people (Song and Chen, 2015). The United Kingdom proposed the lifetime neighbourhood policy to respond to population ageing, looking into the built and natural environment, housing, social networks, services and amenities, access to services, and resident empowerment (Bevan and Croucher, 2011). The United States launched the Liveable Communities Policy, which focuses on land use, housing, parks and public spaces, transportation, health services and community support, as well as attaching importance to residents' opinions (see https://www.aarp.org/livable-communities/). In 2000, Japan changed their social care strategy to keeping care-needing older people in their own homes by providing formal care services (Nishino and Nakatani, 2018). Also, the World Health Organisation proposed an initiative that builds age-friendly environments to support ageing-in-place (2015). By reviewing literature related to ageing-in-place from 1980 to 2010, Vasunilashorn et al (2012) found that 36 per cent of the articles focused on the environment, 29 per cent looked at services, 15 per cent concentrated on health and functioning, 7 per cent on technology, and 13 per cent focused on others. In terms of environment, scholars also highlighted that there is a "mismatch" between the physical, social environments and the needs of older people (Iecovich, 2014). Supportive neighbourhood environments facilitating older people's successful ageing-in-place are needed (van Dijk et al, 2015).

2.3.2. The meaning of ageing-in-place

Lawler (2001) identified several reasons for ageing-in-place. It is the most desirable and cost-efficient way of ageing. It also helps older people to maintain a social network and limit the negative effects of relocation and dramatic transitions. These are also identified by Iecovich (2014) as the goal of ageing-in-place from the perspective of older people and their families, which enables older people to have more control over their lives, maintaining their identity and wellbeing. The second goal identified by Iecovich is from a policymaker's perspective,

which is to reduce expenditure by providing care services in the community and older people's homes.

Ekström (1994) explained why older people's homes and neighbourhoods are an essential foundation for their emotions of trust and security. Firstly, the time that people have lived in the same place contributes to the continuity and stability provided by the place, and helps to reflect values and memories from their lives. Wiles et al (2011) also note that ageing-in-place is beneficial to older people's sense of attachment, feeling of security and familiarity, and sense of identity. Secondly, the long-standing home and neighbourhood form a controlled territory and provide certainty and relative independence. Thirdly, the home can be a part of a known, predictable, and dependable neighbourhood which makes older people familiar with the surrounding environment, able to know and trust neighbours, and to be known as well. Old neighbours play significant roles in emotional support for older people (Yu and Rosenberg, 2020). Fourth, older people can confirm their values and ideas with people who are similar to them through socialising and everyday encounters with neighbours. Based on the socioemotional selectivity theory, research in China found that support from family and friends has both positive and negative effects on older people's emotional wellbeing; the positive effects can be enhanced based on older people's personal interests and selectable friend support rather than family support, which is a form of bonded kinship and not selectable (Li et al, 2014). This further highlights the importance of maintaining older people's social network to support them psychologically. Therefore, it is important to keep older people continually living in their familiar environment and with their supportive social connections.

Ageing-in-place in China

Government responses to changes in population structure determined social stability (Yu and Rosenberg, 2020). Ageing-in-place has also been suggested as a suitable way to meet the challenge of population ageing in China; indeed, it is favoured by the government and by older persons themselves. Research and national data demonstrate that the majority of older Chinese people prefer to continue to live at home rather than in care institutions (Liu et al, 2015). More specifically, over 85 per cent of urban older people in China wish to age-in-place (China. National Office of the Elderly Working Committee, 2013). This is also confirmed by

Zhou and Walker (2021), who found that ageing-in-place is preferred even more in urban China. In 2006, the State Council clearly pointed out that to gradually establish and improve the social care for older people it is necessary to take home care as the foundation, community-based social care as the support, and care institutions as the supplement (China. The State Council of the People's Republic of China, 2006). This represents a significant change in Chinese social welfare, from an approach based on the "family" to one based on "home", and expands the responsibility for providing services for older people to include the government, wider society, community, market, and other sectors, not only the government and families alone (Wang, 2013). Yu and Tian (2019) further explained the benefits and shortcomings of three types of ageing models in China: ageing-at-home, ageing-in-community, and ageing-in-care facilities (see Appendix Table 1).

According to these advantages and disadvantages, ageing-in-place, which includes ageing-at-home and in the community, people's independence, and social contacts, is appropriate if they do not require professional health services. However, Yu and Rosenberg (2020) pointed out that Chinese older people who live in modern commercial residential buildings also feel isolated, and feel a strong nostalgia for their previous social environments. Older people might have a sense of powerlessness when they are forced to prioritise other people's needs, prioritise economic status, and forced to live in unfamiliar residential environments. Therefore, attention needs to be paid to strengthening older people's familiarity with the environment and social contacts if they are ageing in a community that they are not familiar with.

Enabling older people's ageing-in-place also places requirements on the living environment. According to a report entitled Housing and Liveable Environment Condition of Urban and Rural Older People in China (Cheng and Hou, 2018), 30 per cent of older people live in housing built in the 1970s and 1980s, 30.1 per cent in housing built in the 1990s, and 33.6 per cent in housing built after 2000. They analysed older people's satisfaction with two aspects of their neighbourhoods, namely neighbours' relationships and satisfaction with neighbourhood facilities (Figure 2.2). Only 29.5 per cent of urban older people said that their neighbours would provide necessary support and only 44.0 per cent thought they would communicate frequently with them. In terms of satisfaction with neighbourhood facilities, 23.6 per cent of

urban older people were satisfied with the public toilets, 40.1 per cent with the fitness space, and 52.2 per cent with the environment's greenery. According to the Urban Green Space Classification Standards (China. Ministry of Housing and Urban-Rural Development, 2017), greenery, which means green spaces rather than just the vegetation, may include residential greenery, road greenery, parks, and so on). The same report found that 13.5 per cent of urban older people had taken a fall in the past year, and most of these falls happened on roads. In terms of the activity spaces in urban areas, Ji (2018) also reported that 61.9 per cent of older people know there are squares near home, 58.7 per cent that there are fitness spaces nearby, and only 47.3 per cent that there are parks nearby. This data reveals that the activity spaces, especially urban parks, were not close to or known by more than half of older people. 70.1 per cent of urban older people use squares, 63.4 per cent parks, and 54.1 per cent exercise sites. These figures highlight that the neighbourhood facilities and activity spaces in China need to be improved to be suitable for the ageing population as they are important for Chinese older people to carry out outdoor activities and build neighbourhood relationships.
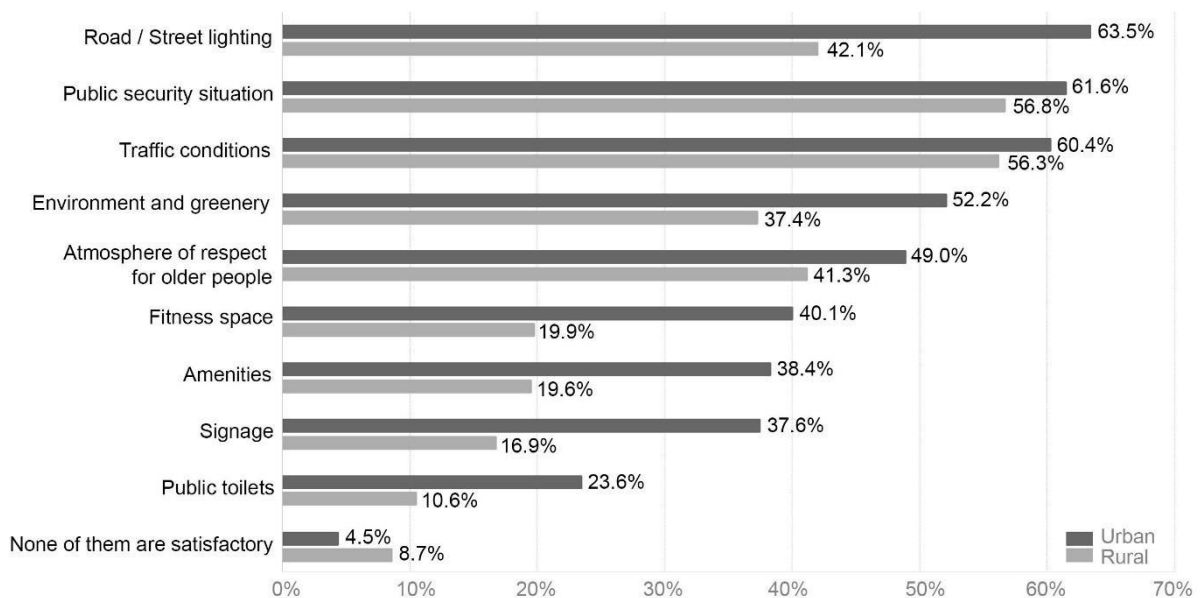
Figure 2.2 Satisfaction with neighbourhood facilities among older people in urban and rural areas (Modified from: Cheng and Hou, 2018, p.257)

2.4. Theories on older people, environment and activities

2.4.1. Environment press and Ecological models

With the development of environmental gerontology, Lawton and Nahemow (1973) conceptualised the relationships between personal competence and environmental demands in their environment press model (Figure 2.3). The vertical axis represents individual competence, for example, physical function, cognitive ability, and social communication ability; the horizontal axis represents the extent of environment press - the degree to which an environment demands a response from the person (Lawton, 1989), which could be related to housing, neighbourhood, and public transport conditions (Peace et al, 2007). They proposed that matching the level of the comfortable individual competence zone and the level of environment press determined individuals adaptive behaviour. That means that for an ageing person, an appropriate combination of their current competence and given environmental circumstances can lead to individuals' highest performance of behaviour and emotional function (Peace et al, 2007). On the contrary, when the degree of environmental press exceeds older people's adaptation level, maladaptive behaviour will result.
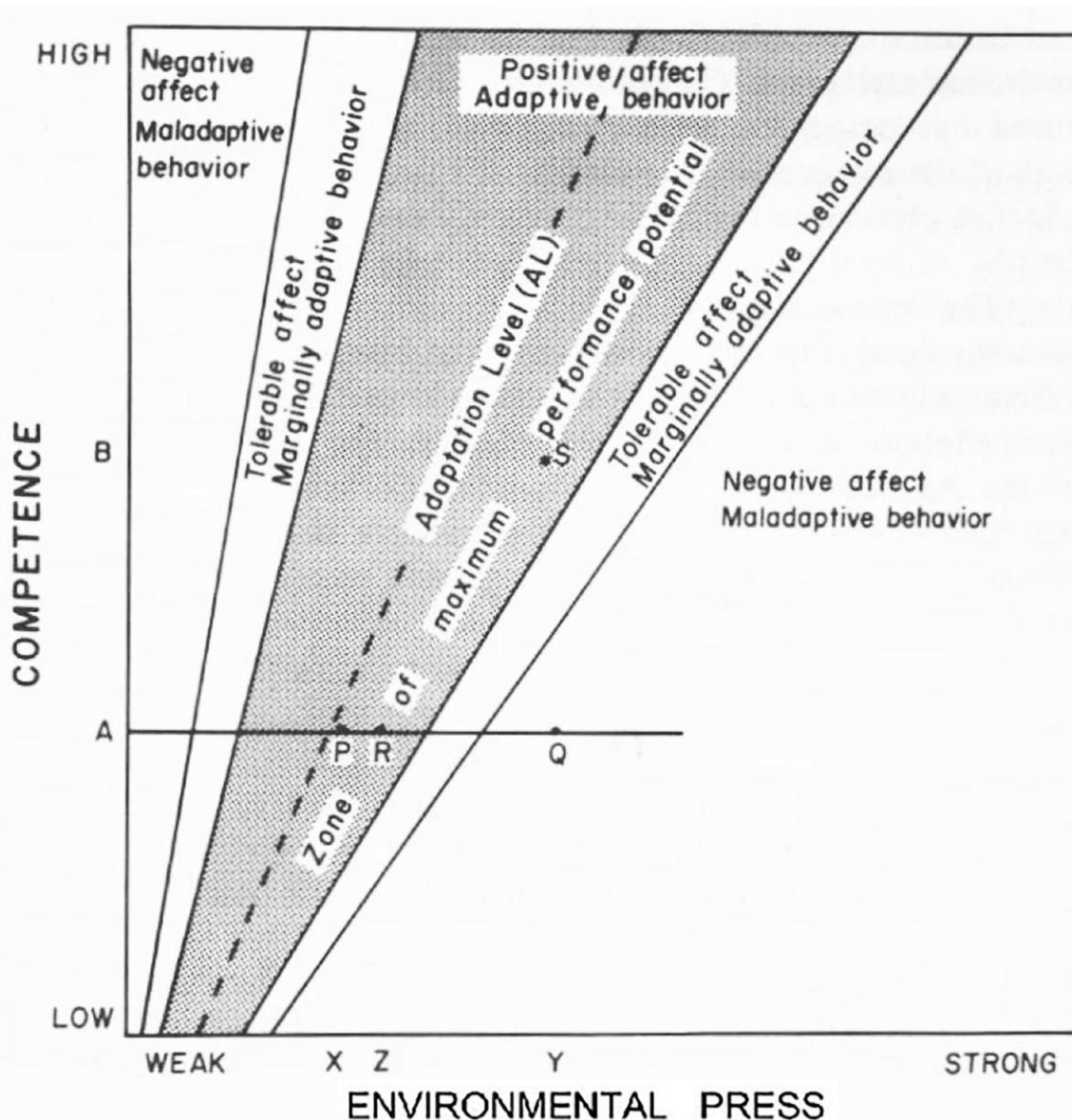
Figure 2.3 Diagrammatic representation of the behavioural and affective outcomes of person-environment transactions. (Environmental press model) (Lawton and Nahemow, 1973)

The early research about individuals' behaviour developed certain theories and models including the Health Belief Model, Social Cognitive Theory, the Theory of Planned Behaviour, and the Transtheoretical Model (Glanz et al, 2008). At this stage, the theories and models about ageing and environment mostly focus on individuals' capabilities, psychological characteristics, and physical environment (Yu and Tian, 2019).

Bronfenbrenner (1979) defined ecology as the process of human development and relationships with its immediate settings, and the larger context in which the settings are embedded. Similarly, Hawley (1950, cited in Stokols, 1992) defined the term ecology as the

interrelationships between organisms and their environments. Bronfenbrenner (1979) developed ecological systems theory and defined four levels of environmental factors: the microsystem, mesosystem, exosystem, and macrosystem. The microsystem refers to the interrelations within the immediate setting, such as among family members or work groups, the mesosystem refers to interrelations between two or more settings, such as physical family, school and work settings; the exosystem refers to the settings which people do not have direct relations with but which nevertheless have impacts on people's development; the macrosystem refers to the cultural and subcultural settings, or ideology and belief systems above the previous levels of systems.

At the same time, Moos et al (1979) determined four categories of environmental factors that influence older people's behaviours in sheltered living settings, comprising physical and architectural features, policies and procedures, human aggregate, and social climate. Human aggregate means the characteristics of residents and staff in the setting. Social climate means the "personalities" of environment settings; some environments can be more supportive than others, just like human beings. This framework draws out the influence of social aspects on behaviour. Later, in 1988, McLeroy et al proposed an ecological model to expand the influential factors of individuals' behaviours to social environments, and organisational, community, and public policy factors. This model supposes that the changes in social environment have the potential to change an individual 's behaviours. Stokols (1992) defined the ecological model as a framework for understanding the nature of people's transactions with their physical and sociocultural environments, which involved sociology, psychology, economics, and public health disciplines. This further changes attention from biological and geographic environments, to social, institutional, and cultural environments of people-environment relationships. However, these theories and models have limited effectiveness in interventions (Sallis et al, 2006).

Based on previous ecological models of physical behaviour, Sallis et al (2006) developed an ecological model of active living (Figure 2.4) explaining the different layers and types of factors that influence human behaviour. In this model, the perceived environmental attributes influential on physical activities were classified as safety, attractiveness, comfort, accessibility and convenience. Physical activity has been divided into active recreation, active

transport, household activities, and occupational activities. These activities were further subdivided into different behaviour settings which include neighbourhood, recreation environment, home environment, transport, workplace environment, and school environment. This model also provided correlative environment elements for different behaviour settings, which can be used to conduct observation in related environments. This model provides guidance to implement interventions in personal aspects, physical environments, social environments, and policy aspects to achieve active living (Sallis et al, 2006).

The ecological perspective underpins research on various aspects of ageing, including, for example, liveable environments and older people's quality of life (Stephens et al, 2019), environmental features and leisure-time physical activity (Cerin et al, 2010), healthy lifestyle (Fitzgerald, 2009), and so on. Jackson (2003) explored the relationships between various aspects of the built environment and population health. Ecological models and theories are especially suitable for researching physical activity that usually occurs in specific settings; research into the characteristics of a place is key to understanding how space supports or prevents physical activity (Sallis et al, 2006). Giles-Corti et al (2005) further suggested that environment-specific and behaviour-specific ecological models are needed to guide future interventions.
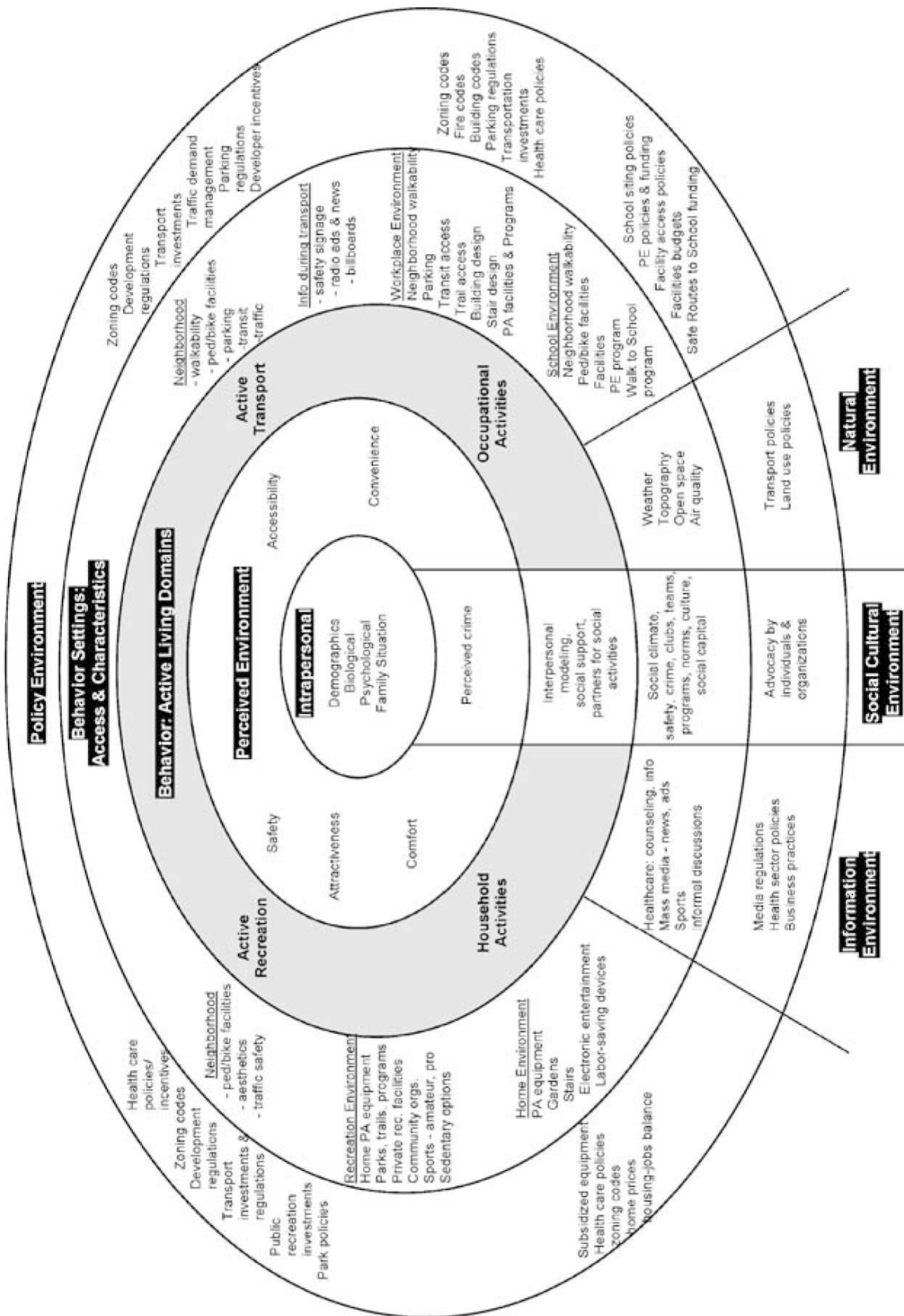
Figure 2.4 Ecological model of the four domains of active living (Sallis et al, 2006, p.301)

2.4.2. Environmental attributes and activity

Aspinall et al (2010) defined environmental attributes as aspects or qualities of the environment which are part of a space setting. Physical environment attributes have close relationships with physical activity (Humpel et al, 2002). Apart from the attributes identified by Sallis et al (2006) in the ecological model, applications of ecological models in physical activity research have also identified diverse attributes. By reviewing 19 quantitative studies, Humpel et al (2002) found that accessibility of facilities, opportunities for activity, and aesthetic attributes had strong relationships with physical activity, whilst weather and safety had less strong associations. The accessibility of facilities includes accessible cycle paths, access to local parks, facilities on frequently travelled routes, density of pay and free facilities, and parks, beaches, and shops within walking distance. Opportunities for activity refers to home equipment, satisfaction with recreational facilities, local clubs and awareness of facilities. Aesthetic attributes include a friendly neighbourhood , pleasant things near home, attractive local area, enjoyable scenery, hills and living environment. The less-influential attributes are weather conditions, safe footpaths, levels of crime in the neighbourhood, and unattended dogs.

Bedimo-Rung et al (2005) developed the conceptual model of park characteristics, physical activity, and public health, and characterised influential park characteristics as Features (Facilities, Programmes, Diversity), Condition (Maintenance, Incivilities), Access (Availability, Equitable, Individual, Within park), Esthetics (sic) (Design, Attractiveness), Safety (Perceived, Objective), and Policies (Management, Budget). McCormack et al (2010) used both qualitative and quantitative methods to identify the associations between park use and the attributes of urban parks, and found that safety, aesthetics, amenities, maintenance, and proximity are important attributes that can promote park use. Furthermore, they also pointed out that people's perceptions of the social environment also have significant influences on physical activity patterns.

In certain research about environment attributes and older people's activities, safety from traffic and safe parks were found to be related to older people's health-related quality of life and self-rated health (Parra et al, 2010). Living in areas with parks, higher connectivity, feeling

safe, and the presence of recreational programmes were positively associated with older people's walking activities (Gómez et al, 2010). Sugiyama et al (2009) identified that the pleasantness and safety of neighbourhood open space were associated with older people's life satisfaction, and the quality of paths to open space were relevant to older people's walking behaviour. Alves et al (2008) identified older people's preferences for local parks attributes, which include an absence of nuisance, cafes and toilets, many trees and plants, light traffic en route, wildlife to watch, and good maintenance.

Su et al (2014) conducted quantitative research in China by recruiting 1440 adult participants, and found that perceived access to physical activity destinations was related to males' leisure time physical activity; perception of aesthetics quality was associated with females' leisure time walking; whereas perception of residential density was inversely related to females' leisure time walking. Similarly, Zhang et al (2013) identified green space attributes relevant to residents' recreational activities, including safety, accessibility, naturalness, coherence, uniqueness, diversified species of plants, configuration of plants, plant density, local old trees, attractive vegetation, seats and shelters, sculptures, rockeries and stones, pools, fountains, hills, lawns, slope, rivers and pools, historicity, pavilions and corridors, exercises facilities, and children's play settings. Cerin et al (2013a) found that influential environment attributes for Chinese older people's activity were safe, aesthetically-pleasing, low-pollution neighbourhoods with easy access to recreational and public facilities.

Identifying environment attributes that promote park use and physical activity has the potential to guide interventions aimed at older people in rapidly urbanising settings (Parra et al, 2010). It is also helpful to decision makers, urban planners, and landscape architects in terms of their ability to improve the environment with consideration for older people, and to support older people's use of the environment (Aspinall et al, 2010, Soma et al, 2017).

2.4.3. Behaviour setting

The development of environmental psychology also contributes to ageing research by emphasising the social aspect (Wahl and Oswald, 2010). The concept of behaviour setting is believed to be a suitable concept to research behaviour in the real milieu, and a cornerstone

of various research disciplines including ecological psychology, behavioural ecology, environment psychology, and sociological social psychology (Popov and Chompalov, 2012). This concept was first introduced by Barker (1968, 1987), and included a behaviour pattern, a physical setting, and the relationship between the behaviour and the setting. Certain physical settings and their socio-cultural contexts can elicit certain behaviours.

People's behaviour can be predicted more precisely according to the environment rather than their individual characteristics (Sallis et al, 2006). The fit between people's behaviour patterns and the features and arrangements of physical elements in a behaviour setting is described as "synomorphy" (Schoggen, 1989). Memmott and Keys (2014) also suggested that people and physical elements in a behaviour setting can support routine activities within place and time boundaries. In earlier periods, Lynch (1984) discussed the fit between environment and behaviour, applying the concept of behaviour setting in a variety of environment contexts. More recently, this concept has been applied widely in diverse contexts. Moore and Cosco (2010) found that children's physical activities in childcare centres vary between different behaviour settings, for example pathways, open areas, and play structures. Even the same type of behaviour setting with different attributes also attracts different physical activities. Smith et al (2016) observed 30 childcare centre outdoor learning environments with 355 behaviour settings and identified that the adjacency and centrality of play settings and manipulable items are important to facilitating children's physical activity. Roe and Aspinall (2011) applied this concept in forest settings and found that boys with extreme behavioural problems experienced restorative benefits. Ganji (2018) used this concept to explore the behaviour of people from diverse ethnic backgrounds in urban public open spaces, and found that the frequency and types of activities varied in different settings. These research efforts applied the concept of behaviour setting as a unit of analysis to facilitate the study of designed landscapes. The physical settings can be decomposed into designed functional areas, for example, pathway, open area, play equipment, and so on. The concept of behaviour setting links the environment and the behaviour, promotes understanding of the impact of design on people's behaviours, and can be used to propose guidelines for design interventions (Moore and Cosco, 2010).

As suggested by Moore and Cosco (2007), the concept of behaviour setting is a valued tool in

park design, which can help the designer to identify the functions of different parts of the park and to arrange these parts within the park appropriately. However, the application of the concept of behaviour has mainly focused on children's activities, as mentioned above. There is still a lack of research applying this concept in studies related to ageing people's activities in outdoor environments. This concept will be used to guide this study's analysis of older people's behaviour in outdoor environments, and the physical and social aspects of the environment that influence older people's activities.

2.4.4. Affordances of the environment

From the ecological perceptual psychology perspective, Gibson (1979) defined affordances as what the environment offers or provides the animal ('human'), either positively or negatively. It also refers to the fit between environment support (both good and bad) and people's capabilities that make possible a given activity (Gibson and Pick, 2000). Heft (1988) and Moore and Cosco (2007) explained that affordances can be understood as the functional significances of environment features related to individual users. Based on Gibson's perceptive, Kyttä (2003) defined p-e (person-environment) fit as a process of the individual and the environment adjusting to each other, using various levels of affordances (potential, perceived, used, and shaped affordance) to describe the levels and characteristics of p-e relationships.

This concept has been applied in various research settings. In Terian's (1988) review of Lang's book, *Creating Architecture Theory: The Role of the Behavioral Sciences in Environmental Design* (1987), Lang applied the theory of affordance to the architecture environment. Kyttä (2003) applied the concept of affordance in child-friendly environment research and notes that "weak" groups, such as children and older people are dependent on the affordances of the vicinal surroundings. McKenzie and Jefferson (2007) identified some housing affordances for women ageing-in-place and mentioned certain outdoor space aspects, for example: street width affords mobility and access to services; parks and gardens afford physical activity, contemplation and socialisation; natural amenities afford physical activity and passive enjoyment or contemplation. Ganji (2018) found sittability as the main affordance of spaces for lingering and visibility, and suggested some spatial structures including benches, ledges,

planting beds, steps, grassed surfaces, and so on. Heft (2010) suggested that in many cases affordances can be considered to be motivating qualities, e.g., open fields afford possibilities for running, and also attract children to run and tumble. In terms of applying affordance in green space research, Hadavi et al (2015) found that people prefer nearby green space that can afford opportunities for both socialising and growing plants. Ganji (2018) identified that free and accessible green spaces within residential neighbourhoods that are suitable for different play and sports afford people the opportunity to engage in informal practices of social activity. Hadavi et al (2015) found that their participants preferred space with playgrounds because they had children. Hadavi et al (2015) further suggested that research should be conducted using wider age ranges with more detailed demographic information to reveal different affordance patterns.

The above studies emphasise the importance of the affordance concept in green space research, and also in landscape research more generally (Hadavi et al, 2015). However, Clark and Uzzel (2006) noted that environment affordances not only relate to the features of the environment, but also individuals' physical characteristics, needs, and intentions. Specific environments "afford" specific types of behaviours, but people's needs, values, and competencies might play a more vital role in supporting or inhibiting behaviours (Land, 1987, citied in Terian, 1998). Chemero (2018) described affordance as a relationship between the feature of an environment and the perceiver's ability, which determines how the environment affordance is perceived. Therefore, identical environment features do not afford the same function for different individuals. As in the example given by Heft (2010), a plaza can be meaningful to thirteen-year-old skateboarders due to the environment features that make certain manoeuvres possible, and also can be meaningful to older people because they can have social encounters with friends on particularly arranged benches in the plaza. This Implies that environmental affordances can vary according to an individual's circumstances.

Rietveld and Kiverstein (2014) argued that in the human case, affordances not only include the action opportunities offered by the material environment, but also the possibilities for action the environment offers in the context of a way of life, and that way of life is sociocultural. That explains why some human abilities are different, because we participate in different sociocultural practices. They further stated that the world can sometimes

motivate people to act in certain ways, because we have been solicited by the specific possibilities for action in our situation. Their arguments linked with Costall's (1995) viewpoint that the concept of affordance proposed by Gibson should be socialised. Gaver (1996) also mentioned that social affordances reveal the possibility that people can offer new affordances to one another, therefore there are possibilities that the physical environment offers opportunities for social interaction. Gaver further noted that affordances for socialising could be a powerful tool for design. As Clark and Uzzell (2006) insisted, it is impossible to conceptualise the environment into separate physical and social aspects, and to separate environmental physical and social affordances is misleading and theoretically and philosophically contestable. The reason they made this contention is that the physical and social aspects of the environment work together and are fused to support behaviour. Therefore, the affordance can relate to both physical and social features of the environment. A space can be especially desirable for users when it affords distinctive engagement experiences (Heft, 2010). Clark and Uzzell (2006) further identified the important socio-environmental affordances of adolescents, for example, to be active, be alone, be in a place where they feel they belong, be in control of the environment, be with close friends, and so on. As well as social affordances, Roe and Aspinall (2011) identified emotional affordances, which refer to restoration effects. However, much of the relevant research did not link the findings to the planning and design process (Hadavi et al, 2015).

Ward Thompson (2013) notes that the concept of environment affordance has influenced a great deal of the research related to landscape and environment preference, as well as environment-behaviour interactions. A favoured environment should afford users the possibility of being able to carry out activities that are important to them that other environments cannot support (Clark and Uzzell, 2006). Withagen et al (2012) further suggested that affordance is not only the possibility of activities, but also can invite activities. This concept provides a new perspective to designers to consider how the physical environment can support different people's activities and experiences. As Heft (2010) said, affordance considerations can lead environmental aesthetics research from assessments of preference to experiencing the environment in the course of action, and that engagement in environment is vital for affective experience.

Affordances of the environment can be created and designed proactively, and regarded as an effort to increase or regulate the p-e fit (Kyttä, 2004). In the field of engineering, Maier and Fadel (2009, p23) defined "Affordance-based design" as follows:

"*Design is the specification of a system structure that does possess certain desired affordances in order to support certain desired behaviours, but does not possess certain undesired affordances in order to avoid certain undesired behaviours*".

Reflecting the field of landscape, affordance-based design is not the specification of a system structure, but rather a kind of theory and logical basis by which to understand people, or specific people's behaviour in relation to environmental features, in order to support and encourage their desired activities. As Maier et al (2009) asserted, affordances can be understood as a conceptual framework to explain the relationship between form, function, and meaning of architectural elements, and humans. It can also be used to improve the design process between people with different backgrounds (e.g., architects and engineers) as a common theoretical basis. In addition, it can be used as an evaluation tool to examine the differences between design intentions and actual usage to prevent design failures.

The concept of affordance and behaviour setting are usually mentioned together in research. The affordances of the settings can influence people's behaviour, therefore contributing to the functioning of the behaviour settings (Ward Thompson, 2013). As Moore and Cosco (2007) suggested, identifying affordances can help designers develop detailed park design features that matter to the users, and to explore the similarities and distinctions between various behaviour settings. For example, the settings may vary in their form, topography, or visual transparency (Moore and Cosco, 2007). The above literature review has provided an overview of how the concept of behaviour setting and affordance has become a useful combination in research about children's outdoor activities and green spaces, which provides a new perspective in exploring the relationship between people's activities and environment attributes. As suggested by Brown and Corry (2011), landscape architecture needs more evidence-based design, not only in the areas that are already based on evidence, for example, transplanting of trees, visual preference, microclimate modification, etc., but also the areas encompassing social, cultural, aesthetic, and human components. However, the majority of

research in this area has no findings to actual designs, and there is still a lack of research applying these concepts to the ageing population as well as neighbourhood outdoor spaces, especially in the Chinese context.

2.4.5. Person-environment relationships in later life

As suggested by Wahl and Oswald (2010), a better understanding of ageing from environmental perspectives is needed in order to understand the relationship between the environment and new lifestyles, and leisure activity patterns. They state that the process of ageing is one of continuous adjustment of people's relationships with the environment that they reside in. They developed an overarching conceptual framework on person-environment (p-e) relationships in older age (Figure 2.5), referring to two key processes: the belonging process, which is relevant to older people's experiences, and the p-e agency process, which is relevant to older people's behaviour.
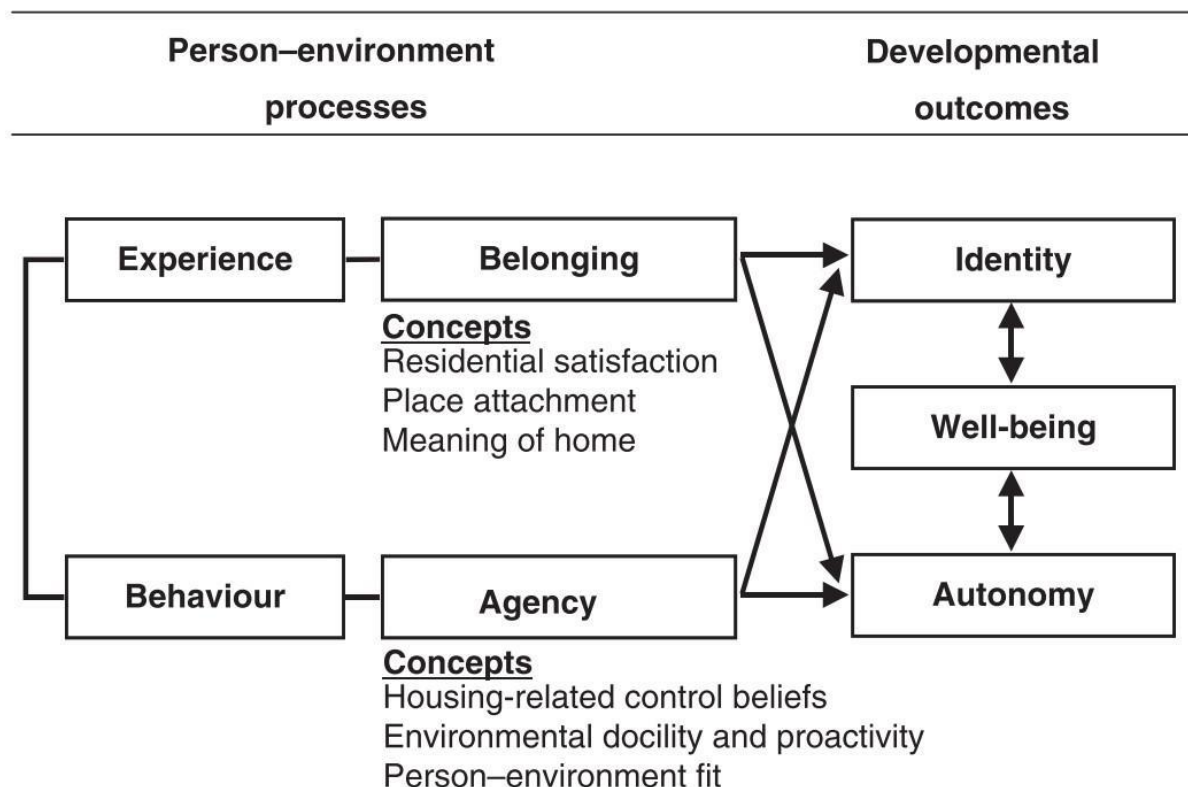
Figure 2.5 Overarching conceptual framework on person-environment relationships in later life (Source: Wahl and Oswald, (2010). The SAGE Handbook of Social Gerontology, P.115.)

Processes of p-e belonging refer to the emotional and cognitive evaluation and representation of physical environments, and also attachment to place which leads to patterns of place meaning. It is based on three concepts and theories: residential satisfaction, place attachment, and meaning of home. According to Amérigo and Aragonés (1997), residential satisfaction is influenced by objective attributes and subjective evaluations of the residential environment. It affects people's behavioural intentions, influences their adaptive behaviour to maintain or increase congruence with the residential environment, and gives an increase in life satisfaction. Another concept, place attachment, is known to be related to identity (Peace et al, 2005), quality of life (Joaquim Araújo de Azevedo et al, 2013), residential satisfaction (Fried, 1982), and wellbeing (Rollero et al, 2010; Wiles et al, 2009). Research related to place attachment that focuses on the neighbourhood scale accounts for a much higher proportion than other place sizes (Lewicka, 2011). Various neighbourhood socio-spatial factors influence the degree of attachment to a place, including but not limited to neighbourhood safety and walkability, satisfaction with parks and recreational facilities, maintenance of streets and open spaces, and availability of trees (Oktay et al, 2009). The third concept within the process of p-e belonging is the meaning of home, as it usually presents in the attachment process. Through reviewing the literature, it appears that the meaning of home can reflect a broader concept, meaning of place, and be used to understanding the relationship between person and environment. Iecovich (2014) explained "place" as consisting of physical (home or neighbourhood), social (connections with others), emotional, and psychological components (sense of belonging and attachment), and cultural dimensions (older people's values, beliefs, symbolic meanings, and ethnicity). Gustafson (2001) proposed a theoretical model-self-others-environment to be used in exploring the meanings of place. Place usually has highly personal meanings via life-path, emotions, activity, and self-identification. In terms of the meanings between self and others, place is usually related to social relationships, the sense of community that is based on these social relationships, being recognised and recognising others, as well as anonymity. The theme 'others' creates meanings via residents' perceived characteristics, traits, and behaviours. Meaning of place also depends on the environment, comprising the physical environment (including natural environment and conditions such as weather and seasons, built environment), symbolic or historical environment, institutional environment, as well as the place localisation, and the nearness or distance to other places. The relationship between environment and self creates

meanings via individuals' formal knowledge (geographical, historical), familiarity with the place in which they live, and whether the place offers opportunities to people to perform activities. Finally, the themes of traditions, festivals, and anniversaries involve self-other-environment poles that contribute to the overall meaning of place.

Processes of p-e agency refer to the perceived controllability of older people's physical environments, the interplay between the physical environment and older people's behavioural, and p-e fit. The interplay refers to the demands of the physical environment conditions ('docility'), and older people's active use, compensation for, adaptation, retrofitting, and creation of places ('proactivity'). The notion of p-e fit refers to the reciprocal and dynamic relationship between individuals and their environments (World Health Organisation, 2015). Kahana et al (2003) point out that the characteristics of the environment, person, and p-e fit are significant to determining older people's life satisfaction. Older people will have unmet needs when they feel that the environment cannot accommodate their intended actions. Unmet needs can be used to investigate the interaction between person and environment (Sugiyama and Ward Thompson, 2007). Oswald et al (2005) stated that age is influential on basic needs, such as necessary daily activities, whereas place plays a more significant role in higher-order and social aspects needs, which refer to more subjective domains including comfort, familiarity, privacy, and favoured activities. They identified that different categories of neighbourhood are associated with the p-e fit, for instance, more pleasant parts of the neighbourhood have higher fit with higher-order needs.

The processes of belonging and agency play an essential role in supporting older people to maintain their identity and autonomy, and are related to wellbeing. As George (1998) commented, self and identity are cornerstones of wellbeing. In the framework of person-environment relationships, the process of belonging, especially place attachment, directly leads to identity. Life experiences and personally valued things in one's life and who you are determine individual attachment to place (Rubinstein and Parmelee, 1992). Just as Peace et al (2005) defined identity as how people see themselves, it also influences how people respond to things and people around them. Personal identity can make a place become meaningful, and in turn the place can shape individual experiences and lead to identity (Rubinstein and Parmelee, 1992). In the framework of person-environment relationships in

later life, the process of agency is connected to older people's autonomy. While considering the ageing process, the World Health Organisation (2002, p.13) defined autonomy as: *The perceived ability to control, cope with and make personal decisions about how one lives on a day-to-day basis, according to one's own rules and preferences.* The ageing process is usually accompanied by a decrease in functional autonomy due to changing functional and cognitive capacity, social relationships, and emotional status, which will also influence psychological wellbeing (Quaglino et al, 2016). Other scholars have verified that perceived environmental barriers will reduce older people's autonomy in participation in outdoor activities (Rantakokko et al, 2017). Familiar environments can support older people's daily activities and their sense of autonomy and control, which contributes to their wellbeing (Gitlin, 2003). Control and autonomy are amongst the factors that can enhance older people's wellbeing (Creech et al, 2013). Arguably, when the environment can fit with older people's behaviour in the process of agency, it will then contribute to their autonomy and wellbeing.

2.4.6. Place attachment

Peace (2007) indicated that the ecology and person-environment relationships theories usually focus on the environment, whereas the concept of place attachment emphasises the process of individual affective, cognitive, and behavioural ties to the surrounding physical environment. The strength of the ties, and different meanings related to different environment settings, for example, home or specific landscapes, reflects the attachment to place. Rubinstein and Parmelee (1992, p.142) explained how a space becomes a place as:

"Personal experience, either direct or vicarious, and social interaction lead the person to attach meaning to a defined space; as a result, within his or her own identity, it becomes a place."

Similarly, de Donder et al (2012) described place attachment as the positive and affective links between individuals and their homes and neighbourhoods. The benefits of place attachment include a better quality of life (Smith and Cartlidge, 2011; Seamon, 2013; Tartaglia, 2013; Marcheschi et al, 2015), meaningful social relationships (Kyle et al, 2005), and psychological benefits including memories, belonging, relaxation, positive emotions, activity support,

comfort-security, personal growth, freedom, entertainment, connection to nature, practical benefits, privacy, and aesthetics (Scannell and Gifford, 2017). By reviewing over 400 papers from the past 40 years (prior to 2010 at the time of writing), Lewicka (2011) also found that many researchers stated place-attached people are more likely to engage in place-related activities.

Smith (2009) identified the factors influencing place attachment, which include length of residency, social support, contacts and integration, perception of area or perceived rewards of living in an area compared with other areas, access to services and amenities, neighbourhood satisfaction, proximity to social encounters, perceived control over the environment, perceived choice in the selection of residence, community participation, public spaces, life history, cultural influences, and location.

Scannell and Gifford (2010) developed a tripartite model of place attachment including three dimensions: Person, Place, and Process (Figure 2.6). Place attachment in the person dimension includes individual and group aspects. From the individual perspective, attachment to a place becomes meaningful because of personal experiences, realisations, and milestones. As Manzo (2005) stated, a meaningful place is not simply important, it is the experience-in-place that creates meaning. There are scholars who debate whether a place's characteristics create meanings. Mannarini et al (2006) identified neighbourhood characteristics related to residents' sense of community and thus their place attachment. Kelly and Hosking (2008) also found that physical spatial characteristics of a place influence the formation of place attachment. Even so, Saar and Palang (2009) strongly argue that place attachment should relate to place meanings rather than quantitatively measurable characteristics. On the group level, attachment to place is built through shared historical experiences and can be religion-based. For example, Shamsuddin and Ujang (2008) found that traditional streets can influence people's degree of attachment by their historical meanings, and the meanings are strongly reflected in the activity and atmosphere on site that people are involved in.

The process dimension refers to the psychological process. Place attachment usually brings positive emotions, for example, happiness, pride, and love. Also, people construct a sense of place attachment through their memory, knowledge, schemas, and meanings of the place. As

Lewicka (2013) said, different types of memory are an enabler of continuity and place attachment. Memory can contribute to people's sense of attachment by linking events happening on site to people (Ratcliffe and Korpela, 2016). Another dimension of the psychological process is behaviour, which means people expressed their attachment through trying to maintain proximity to a place, reconstruction of a place, or relocation to similar places. Riemer (2004) found strong evidence that many people, especially those older people who leave their home and family to pursue things and are adrift, are wishing to look for their roots and hope to return to their homes to be near the important things in their lives. The place dimension is the most important dimension of attachment. Place attachment is different at different scales of the physical environment, for example, worldwide, city, neighbourhood, house, or natural environment. As Williams and Vaske (2003) identified, natural landscapes are not only natural resources but also places containing history, memories, emotional, and symbolic meanings.
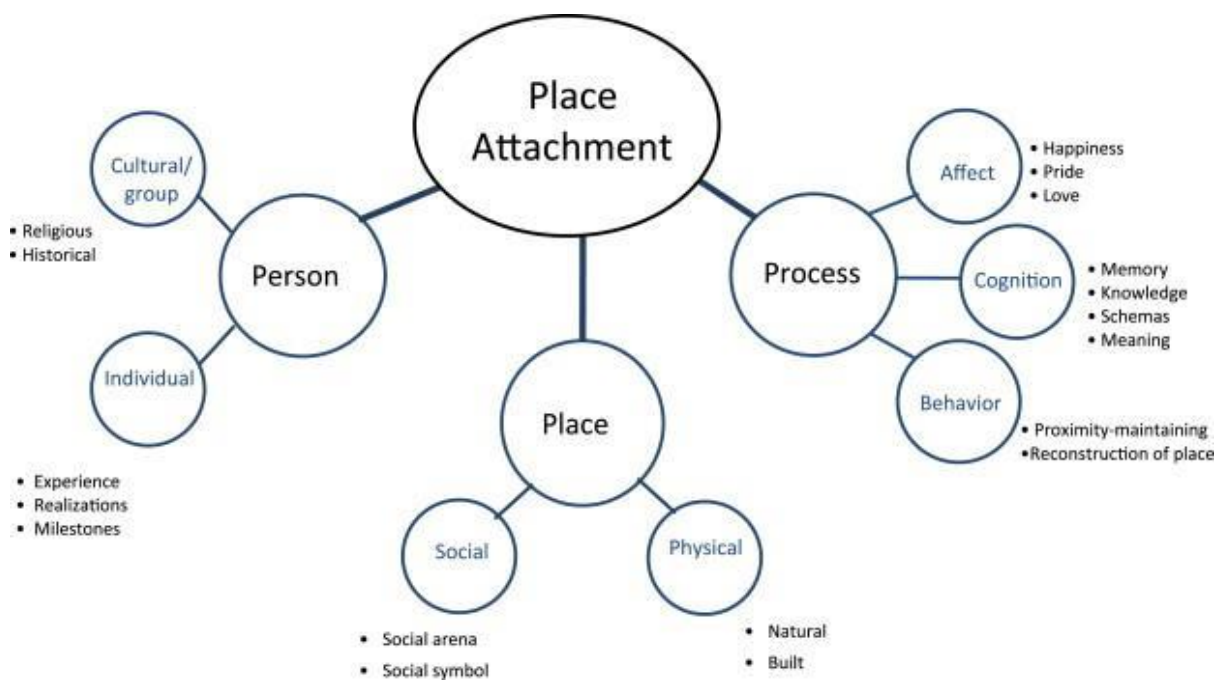
Figure 2.6 The tripartite model of place attachment (Scannell and Gifford, 2010, p.2)

The place dimension also represents social aspects, which can be social interactions that the place affords people, or symbolised social bonds. The social aspect of attachment facilitates social relationships and group identity, and sometimes conflates with a sense of community, as their influencing factors such as emotional bonds, behavioural commitment, affiliation,

satisfaction, and belonging are largely overlapped (Pretty et al, 2003). In this sense, sense of community refers to social bonds in physical places that support social interaction, such as neighbourhoods and shops.

Place attachment is particularly important for older people because they are likely to reside in the same community for a long time (Phillipson, 2007), spend more time in their local environments (Glass and Balfour, 2003), rely on diverse support from neighbours (Nocon and Pearson, 2000), and their sense of identity is also related with place attachment (Rowles, 1983). Place attachment not only motivates ageing-in-place, but also provides older people with a sense of security so they are able to carry out daily activities (Cristoforetti et al, 2011). Apart from this, Rubinstein and Parmelee (1992) also stated that place attachment is especially vital to older people for several reasons. Firstly, attachment to key current or former places helps older people remember their life course, thereby maintaining a sense of continuity, fostering identity, and protecting themselves from deleterious changes. Secondly, attachment to place can act as a buffer to support older people's positive self-image. Finally, attachment to place represents older people's independence and continued competence. McHugh and Mings (1996) suggest that attention should move beyond a unitary conception of home because more and more older people have attachment in multiple places due to the increase in older people's mobility and migration and their changing lifestyles and activities.

In China, Chen et al (2019) identified a relationship of "environmental satisfaction-residential satisfaction-place attachment" that highlights the importance of older people's satisfaction with the environment and their residential community in building their attachment to community. Lu et al (2018) found that residents in China have strong social, symbolic, and functional attachment to their gated community, through knowing their neighbours, participating in neighbourhood activities, having the benefit of privatised services, and being provided with a nice neighbourhood image. However, as mentioned in Chapter 4 (4.4 Understanding community in a Chinese context), Zhu et al (2012) argue that residents in commodity residential communities have strong place attachment but less social interaction. This is congruent with their attachments being related to property ownership and satisfaction with the physical environment. Even though the social environment is an influencing factor,

place attachment in this case is more about neighbours' social status and quality, rather than social interaction.

2.4.7. Environment support: Outdoor space effects on ageing

The influence of outdoor space on older people has been well studied. Sugiyama and Ward Thompson (2007) argue that supportiveness of outdoor environments is beneficial to older people's quality of life and list three modes of how older people benefit from outdoor environments: participation in outdoor physical activity, exposure to outdoor natural environments, and social interaction in outdoor spaces. The three are usually interlaced: for example, contact with nature sometimes involves physical activities, physical activities sometimes involve social interactions.

2.4.7.1.   Participation in outdoor physical activity

There has been an extensive array of research studies on the various benefits from participation in physical activity, such as improved strength, aerobic capacity, flexibility, physical function, cognition, and reduced risk of depression and dementia (Keysor and Jette, 2001; Lü et al, 2016; Ku et al, 2012; Lee et al, 2014, Benedetti et al, 2008). Taking part in various activities also allows older people to enjoy esteem and respect, to exercise their competence, and to maintain caring and supportive relationships (World Health Organisation, 2007a). Most importantly, maintaining outdoor activities could extend older people's high-quality living period and reduce the period during which they need more intensive care (Duggan et al, 2008). However, physical inactivity is a worldwide burden on public health (Lee et al, 2012). By reviewing fifty-three international studies of physical activity in older people, Sun et al (2013) found that the most recommended physical activity level is 150 minutes of moderate or vigorous physical activity per week. They further noticed that older people were less likely to be active than other reference groups, and men were more likely to be regularly active in terms of physical activity, especially leisure time physical activity, than women.

Harris et al (2009) also noticed from objectively measured steps of 280 older people in the United Kingdom that their physical activity level is well below recommended levels. They also found that the factors influencing older people's physical activity level include age, general

health, disability, diabetes, body mass index, exercise self-efficacy, and perceived exercise control. Most research in China also indicates that older people's physical activity does not meet the recommended level. To be more specific, Chen et al (2015) found that older people who live alone in Shanghai have low physical activity levels, and health education interventions are needed to increase these levels. Li et al (2020) reported that physical inactivity is common, even endemic, in Chinese people aged 45 and over, especially those of an older age, who have difficulties in daily living, and not working.

Apart from older people's personal factors, the linkage between built environment and physical activity has been increasingly highlighted. Built environment elements include land-use patterns, large- and small-scale built and natural features, and the transportation system, all shape the opportunities for physical activity (Brownson et al, 2009). The built environment can promote or inhibit older people's physical activities. The elderly can remain independent and active when the environment has supportive features (Kerr et al, 2012), for example, the accessible green and open space (Sugiyama and Ward Thompson, 2008; Moran et al, 2014). Keskinen et al (2018) reported a series of findings indicating that for older people with mobility restrictions, perceiving nature and the presence of water are vital for outdoor physical activity. For older people without walking difficulties, higher habitat diversity within natural areas is relevant to their physical activities.

As Sallis et al (2006) stated, different types of physical activity happening in different settings are affected by different environmental characteristics. Urban environments are culturally and environmentally distinctive in Asian and Western countries and therefore lead to different activity patterns (Cerin et al, 2013b). They found that older people's recreational walking level in Hong Kong was twice to four times higher than in the places studied in relevant Western research. Research in China identified that living near functional spaces (Zhou et al, 2017), and other factors such as mixed land use, sidewalks, aesthetics, and facilities enabled older people to maintain physical activity levels (Day, 2016). Another study in Zhongshan, China, suggested that abundant pavements, density of bus stops, accessible commercial establishments, and sufficient green space could be effective in terms of encouraging walking among older people at different levels. However, they argue that the walkability of compact urban form in the Western context might be so supportive in the

context of Zhongshan (Zhang et al, 2014). Other physical factors identified such as presence of bridges or overpasses connecting to services, proximity of recreational facilities, infrastructure for walking, and indoor places for walking also have a positive impact on recreational walking within the neighbourhood (Cerin et al, 2013b).

In terms of the neighbourhood environment, neighbourhood social factors, such as individual-level social cohesion and participation, and physical factors, are both associated with Chinese older people's leisure-time physical activities (Gao et al, 2015). Most physical activities such as outdoor walking, traditional Chinese exercises, and leisure activities take place in parks, streets, or community open spaces (Li, 2016). Ku et al (2007) confirmed that physical activity contributes to Chinese older people's physical, psychological, developmental, and social elements of subjective wellbeing, and enhances their quality of life. Multilevel physical activity interventions are needed to increase physical activity levels among Chinese older people (Zhu et al, 2016; Li et al, 2020). To be more effective, these physical activity interventions also need to consider the environment.

2.4.7.2.   Exposure to outdoor natural environments

Nature plays an influential role in older people's daily life (Finlay et al, 2015). Numerous studies have documented the various benefits of contact with natural environments. Another concept within environmental psychology that is relevant to how people benefit from the environment is restorative environments, which refers to particular environments and environmental configurations that benefit psychological and/or physiological recovery (Joye and van den Berg, 2018). Joye and van den Berg (2018) further pointed out that natural environments are more restorative than built or urban environments, and exposure to restorative natural environments has the potential to benefit wellbeing and prevent illness.

There is evidence that older people living in neighbourhoods with more green spaces show improvement in frailty status (Yu et al, 2018), and exhibit fewer mental health issues (Wu et al, 2015). Therefore, increasing access to natural environments at the neighbourhood level could be a useful intervention to improve older people's mental health status. Similarly, exposure to urban green space benefits older people's physical health and mental wellbeing (Lau et al, 2021). Based on research by Hawkins et al (2013) and Olsson et al (2013), Orr et al

(2016) list themes of 'being' and 'doing' in natural environments. 'Being' includes activities such as enjoying green views through the window, being outdoor in the fresh air, being peaceful and tranquil outdoors, being outdoors to maintain independence and social contact, and being outdoors as a confirmation of the self. 'Doing' activities include doing something outdoors such as sharing expertise and produce in outdoor gardening. In outdoor gardening activities, older people can feel a sense of achievement and satisfaction from growing things, observing things growing, participating in the process, and sharing skills and expertise with fellow gardeners (Hawkins et al, 2013).

As Day (2008) identified, older people emphasise the importance of natural window views to their health and wellbeing, as they can perceive the changing seasons, and the sequence of leaf burst and blooming of different plants and flowers. The sensory descriptions that underline vision focus more on older people deriving pleasure and joy from appreciation of nature, and the detailed description of plants is a kind of compensation for being less mobile and having fewer opportunities to be outdoors (Orr et al, 2016). Orr et al (2016) also mentioned that being in the fresh air is a multi-sensory experience because the air transmits the sensation of wind, the sounds and smells of nature, and a sense of open space. Numerous studies have shown the importance of being in fresh air for older people (Duggan et al, 2008; Butler and Cohen, 2010; Bengtsson and Carlsson, 2013). Being peaceful and tranquil in the outdoors emphasises that older people need passive engagement with natural environments, which generates therapeutic experiences and effects (Milligan et al, 2004). Nature also enables older people to engage in outdoor activities, but older people in different countries have different preferences. As Alves et al (2006) identified, Hispanic older people prefer natural settings with furnishings to conduct group social activities, whereas Anglo-American older people find authentic natural environments to be more attractive for peaceful activities, for example, quiet reflection. In China, Wang and Rodiek (2019) found that older people strongly prefer colourful flowers in urban parks. Also, Huang et al (2019) reported that older people's better self-rated health correlates with higher residential greenness and proximity to blue and green spaces. These differences are also meaningful to design environments for older people in different countries.

2.4.7.3. Social interaction in outdoor spaces

Lovell et al (2015) reported that exposure to the natural environment and social contact were critical pathways for improving health and wellbeing through activities. As Knox (2005) mentions, place is a setting for social interaction. It structures people's daily routines and life paths, providing a site for the processes of socialisation. Kweon et al (1998) identified some features of sociopetal outdoor spaces, which encourage older people to develop social relationships with neighbours via providing opportunities to have repeated face-to-face contact with them. These features include having access to transient public spaces, clustered elderly housing, outdoor common spaces adjacent to high rise buildings, and other outdoor spaces, e.g., spaces in front of buildings, open spaces, parks. Neighbourhood physical environments play a role in influencing residents' quantity and quality of social contact and therefore affect neighbourhood social ties (Kuo et al, 1998).

Van den Berg et al (2015) confirmed some built environmental factors influencing social interaction. They stated that smaller residential communities tend to have more local social contacts and make residents feel at home in the neighbourhood. Neighbourhood facilities, comprising supermarkets, primary schools, and outdoor sports facilities within 1 km are also identified as positive factors leading to local social interaction. Older people with more integrated social networks also visit parks more frequently (Enssle and Kabisch, 2020). Green spaces allow older people to meet friends and socialise (Esther et al, 2017), contributing to strengthening and maintaining a sense of community and social interaction among older people (Kweon et al, 1998; Kim and Kaplan, 2004). Older people perceive going outdoors as an opportunity to have informal encounters with neighbours or friends, which is a source of social inclusion and identity (Duggan et al, 2008). There are also different levels of engagement in outdoor activities. Bengtsson and Carlsson (2013) identified a range of older people's outdoor social activities, such as people-watching, drinking coffee together, as well as attending larger parties and events. They also highlighted that some older people prefer sitting alone in the garden with views of others.

2.4.8. Outdoor activities

In Gehl's famous book *Life Between Buildings: Using Public Space* (2011), he emphasised the

up-to-date essential principles and quality criteria for public spaces related to people's behaviours. Gehl (2011) identified three types of outdoor activities which have different requirements in relation to the outdoor physical environment: necessary activities, optional activities, and social activities (Figure 2.7).
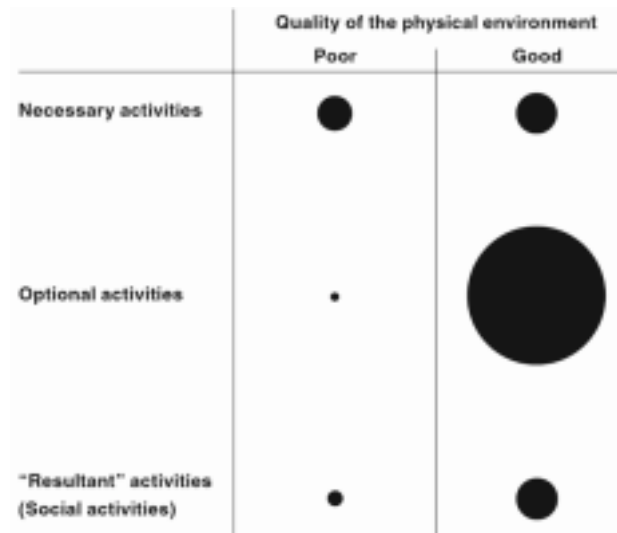
Figure 2.7 Graphic representation of the relationship between the quality of outdoor spaces and the rate of occurrence of outdoor activities (Gehl, 2011, p.11)

Necessary activities include activities essential in daily life (e.g., shopping, waiting for a bus or person). The majority of necessary activities involve walking. Because of the nature of this type of activity, it happens under most conditions and is less influenced by the external environment. Optional activities refer to activities which people may wish to do if time and place make them possible. This type of activity is highly dependent on the outdoor physical conditions. A good environment can make broad spectrum of activities possible. It is reasonable to assume that when the affordances of a physical environment meet older people's needs, optional activities will happen more frequently, and can lead to more social activities because the optional activity provides the essential element of social activity - people. Social activities refer to all activities that depend on others' presence in public spaces. Gehl (2011) further classified social activities into active and passive. Active social activities include various communal activities, greetings, and conversations, whereas passive activities - the most widespread type of social activity - refer to passive contacts with others, such as seeing and hearing other people. Social activity is also referred to as 'resultant' activity because it is usually associated with the other two activity types.

Other scholars studying older people's outdoor activities have also identified diverse types. Shergold (2019) classified older people's activity into solitary, informal, and formal activities. Zhang (2006) listed Chinese older people's outdoor activities according to the frequency of their occurrence, including chatting with old friends, strolling, using exercise facilities, playing chess or cards, resting, exercising through Tai chi, singing and dancing, taking care of children, and ball sports etc. Wu (2015) concluded that Chinese older people's daily activities comprise:

- Daily exercise activities: strolling, using exercise facilities, dancing exercises, jogging, and mountain climbing, which usually happen in pedestrian paths, community squares, parks and green spaces, and outdoor exercise facilities.

- Daily leisure activities: strolling, sitting and chatting, watching TV, reading books or newspapers, and playing cards or chess, which usually occur in community squares, pedestrian paths, activity rooms, parks, and libraries.

According to the Analysis of the Spiritual and Cultural Life of the Elderly in Urban and Rural Areas of China (Ji, 2018), more than 90 per cent of urban older people usually watch TV or listening to broadcasts, 56 per cent of urban older people usually go strolling and jogging, 26.8 per cent of urban older people practise gardening, and about 16.4 per cent of urban older people usually play Mah-jong, cards, or chess. This raises concerns about older people who are less healthy because many outdoor leisure activities require a healthy body and good mobility. Those activities that require less physical exertion, for example strolling and taking care of plants, provide opportunities for older people who are less healthy to maintain physical and mental wellbeing. The traditional Chinese sports and physical activities, such as Tai chi, Qigong, and Yangko, are identified as having health benefits to healthy older people and those with chronic diseases (Guo et al, 2016). Xie et al (2019) found that the most popular neighbourhood outdoor activities for older people in Wuhan, China, are exercising, social activities, shopping, playing chess or cards, and growing vegetables. Li and Zhang (2015) also found that playing cards and Mah-jong are vital social activities for older people, which usually involve four people playing together (Li and Zhang, 2015). Other scholars found that Chinese older people's leisure space and time tend to be constant and fixed, and that they prefer to

participate in group activities and be accompanied by familiar friends (Li et al, 2011). In terms of travel, research in the megacity of Shanghai found that older people's main mode of travel is walking, usually between 10 to 15 minutes a time (Huang and Wu, 2015). By using GPS tracking technology, a space-time behaviour study in Xi'an found that older people's daily travelling distances are usually within 1000 metres (male) and 600 metres (female) (Xu et al, 2019).

It is obvious that Chinese older people's outdoor activities have significant differences compared with older people in other countries. However, there is still a lack of comprehensive research on Chinese older people's outdoor activities and, to the author's knowledge, there have been no studies based on Gehl's (2011) classification of outdoor activities. The affordances of outdoor space will significantly influence the occurrence of optional activities, therefore the presence of people will influence the occurrence of social activities. In order to explore how Chinese neighbourhood outdoor space can support older people's ageing-in-place, it is reasonable to assume that the neighbourhood outdoor space needs to satisfy older people's necessary activity needs to encourage more optional activities, and invite more social activities.

2.4.9. Assemblage thinking

Public space has been developed with over-determined functions and uses since the second half of the 20th century, which prevent spontaneous use of public space and sociability (Sendra, 2015). Assemblage thinking has been used in addressing complex city problems. "Assemblage" is a term understood as the relational process of composition, where the individual elements define the assemblage by their co-functioning, and assemblage thinking is attentive to both the individual elements and the interactive whole (McFarlane, 2011). Kamalipour and Peimani (2015) have suggested that assemblage thinking contributes to addressing complex city problems by encouraging multiscalar thinking. It is beneficial to both theory and practice because it can stimulate integrated ways of landscape architecture (Kamalipour and Peimani, 2015). By reflecting this method of thinking, assemblage theory also enables this landscape study to consider neighbourhood outdoor spaces at different scales, and considers how individual elements work together.

2.5.   Age-friendly environments

Healthy, accessible, and supportive environments enable older people to do the things that are important to them and support their rights regarding ageing-in-place (World Health Assembly, 2016). Therefore, ageing-in-place can be promoted by building age-friendly environments, which can maximise older people's capacity and ability, enable them to be and to do (World Health Organisation, 2015). The development of ageing-in-place policies also emphasise the importance of an "age-friendly community" (Lui et al, 2009). An age-friendly community can moderate the demands of the environment and provide a better fit to older people's strengths and deficits (Alley et al, 2007), and is of crucial importance to older people's wellbeing (Nieboer and Cramm, 2017). Organisations and government entities worldwide have encouraged the development of age-friendly physical and social environments to enhance older people's health, wellbeing, and ability to age-in-place (Lehning et al, 2015). Research in relation to ageing-in-place and environment has identified diverse influencing factors including housing (Bayer and Harper, 2000; Safran-Norton, 2010; Hwang et al, 2011), technology (van Hoof et al, 2011), services (Cutchin, 2003), as well as community and neighbourhood (Wiles et al, 2011; van Dijk et al, 2015). These physical and socio-environmental features should be mutually complementary to help older people to continue to live and participate in the community (Fitzgerald and Caro, 2014). By reviewing 430 sources from Web of Science, Yu and Wang (2018) found that the key research on age-friendly environments focuses on quality of life, ageing-in-place, physical activity, built environment, policy, care facilities, and public participation. The launch of 'Global age-friendly cities: A guide' by the World Health Organisation (2007a) has had a significant effect on global age-friendly research. The World Health Organisation identifies age-friendly features under three themes, physical environment (outdoor spaces and buildings, transportation, housing), social environment (social participation, respect and social inclusion, civic participation and employment, communication and information), and multiple services (community support and health services) (World Health Organisation, 2007a, p.9; World Health Organisation, 2017). However, Wiles et al (2011) noted that research and policy about ageing-in-place usually focus on "home". Actually, features of neighbourhoods also play a role in influencing

people's decision to move or stay, albeit indirectly and in a limited way (Lee et al, 1994).

2.5.1. Age-friendly physical environment

As discussed in Section 2.2.2 Health and wellbeing in later life, the changes to the musculoskeletal system and physiological function in the ageing process combined with the ergonomics of the physical environment present certain challenges to older people. For example, the height of seating might not be suitable for older people's centres of gravity; handles, handrails or counters are needed to help older people maintain their balance whilst doing certain activities (Farage et al, 2012). Based on the theory of person-environment relationships, Yu and Tian (2019) listed the physiological and psychological changes of older people, and their corresponding activity and living needs, as well as the needs of the living environment at housing, neighbourhood, and city levels (see Appendix Table 2).

Following the age-friendly cities initiative proposed by World Health Organisation (2007a), countries worldwide also responded with age-friendly initiatives. To be more specific, Appendix Table 3 lists the public space requirements according to age-friendly initiatives in different countries. These initiatives focus on the transportation environment, walking or street environment, seating, public toilets, and public spaces. Apart from these examples, the I'DGO (see: Inclusive Design for Getting Outdoors (idgo.ac.uk)) project is a good example of using environmental support theories, explaining that older people have the ability to adapt to their environment, and their motivations and needs are important to their quality of life. They collected data via various methods, comprising literature review, focus groups and workshops, questionnaires, interviews, and behavioural observations, in order to explore how to design age-friendly outdoor space to encourage older people to get outdoors, and proposed guidance for age-friendly streets and open spaces, respectively.

Design research has focused on generating evidence-based design recommendations to minimise barriers to movement outdoors and transform disabling environments into supportive ones. Thoughtful design recommendations should allow older people to easily understand, interact with minimal difficulties, and to avoid potential hazards (Farage et al, 2012). Most recently, the research consortium I'DGO have called for the introduction of

certain design features as standard to enable barrier-free movement at all levels (UK Urban Ageing Consortium, 2014). However, as repeatedly mentioned above, attention should not only focus on the place, but also how the place can support older people's social relationships. The next section moves from age-friendly physical environments to social environments, and their relationships.

2.5.2. Age-friendly social environment

Apart from the physical environment, the social environment also contributes to creating living spaces that make it possible for older people to age successfully (Fitzgerald and Caro, 2014). The World Health Organisation (2007a) defines age-friendly social environments as ones in which older people receive respect and feel included by other people's behaviours and messages from the community; older people participate in recreation, social, cultural, educational and spiritual activities; older people have opportunities for civic participation and employment; and older people receive information to avoid social exclusion. Lui et al (2009) identified the key characteristics of social environments based on age-friendly initiatives worldwide. These include social cohesion and sense of place, social inclusion, being valued and respected, encouraging older people to lead community development work, and promoting social and civic engagement. Social engagement means maintaining high levels of social connections and participation in social activities (Butler and Shannon, 2013). Active social environments that provide older people with opportunities to maintain social networks, be active in formal organisations, as well as receive respect are beneficial to older people's quality of life (Alley et al, 2007). By doing voluntary work in political or charity organisations, older people's social capital and society's social cohesion can be promoted (Butler and Shannon, 2013). Wang et al (2002) also found that frequent involvement in mental, social, or productive activities can reduce older people's risk of dementia.

In order to promote age-friendly social environments, recommendations were also proposed by organisations worldwide. Taking Hong Kong as an example, Jockey Club Age-friendly City (2019) suggested that increasing the availability and accessibility of activities and space for activities are necessary to enhance social participation for older people, especially the groups of older people who do not use community centres frequently. An age-friendly project in the

Netherlands aims to run affordable activities in each neighbourhood, organise activities for older people through collaborations between theatres, care, and sports organisations, establish a knowledge centre to stimulate older people's sharing of peer knowledge and skills, set up places for older people to meet neighbours, organise programmes to avoid loneliness, and create exercise facilities in public parks for older people (Van et al, 2018). A project from Poland suggested stimulating older people's involvement in various activities in Senior Activity Centres, for example, dancing events, outdoor and intergenerational activities, to help them receive respect and social inclusion (Van et al, 2018).

The above-mentioned initiatives in relation to age-friendly social environments are usually also relevant to the physical environment, for example, to the accessibility of spaces, and the various activities organised in outdoor space. As Lui et al (2009) stated, the physical and social environment are usually contingent on each other and mutually reinforcing. Current policies in China still lack consideration for creating an engaging social environment for older people in its rapidly ageing society (Yu and Rosenberg, 2020).

2.5.3. Community support and health services

Menec et al (2011) mentioned that community support includes providing various services in older people's homes and health services, including primary care, acute care, long-term care, and even availability of healthcare providers. Availability of sufficient, good quality, and accessible community support and health services is critical for older people to maintain health and independence (World Health Organisation, 2007). Abundant professional health and social services are the key features of an advanced society, and are vital for people's health and wellbeing (Fitzgerald and Caro, 2014). Therefore, community support and health services contribute to delaying or replacing institutionalisation to promote ageing-in-place (Chui, 2008). In the UK, information and communication technologies have been used to develop telecare services to provide care services to older people in their communities (Sixsmith and Sixsmith, 2008). In the USA, a programme for All Inclusive Care for the Elderly was set up to provide long-term care services (Eng et al, 1997). In Canada, a programme of integrated care for vulnerable community-dwelling elderly provided an alternative to 50 per cent of hospital level inpatient stays in the community (Béland et al, 2006). In Italy, integrated

social and medical care, as well as case management programmes, not only improved older people's physical function, but also reduced decline in their cognitive status (Bernabei et al, 1998).

However, due to older people's personal circumstances, including potential multiple chronic conditions, disabilities, and financial issues, combined with potential external factors including cost, information, distance, and transportation, they may have difficulties in accessing health services (Fitzgerald and Caro, 2014). To address this issue, age-friendly initiatives proposed to reduce cost, improve the delivery of information to older people, improve age-friendly transportation, and improve cooperation between organisations, and municipal and regional governments to deliver services (Fitzgerald and Caro, 2014). The importance of accessibility of services, for example, in health centres, poses challenges to urban planning to provide evenly distributed services that older people can access within walking distance (Van et al, 2018).

Due to the rapid population structure transition, together with the problems arising from the one-child policy, family-oriented long-term care is not a sustainable option in China. Therefore, both institutional and community-based health and social care services are needed to supplement family oriented long-term care (Glass et al, 2013). China is in transition from family-oriented to society-oriented ageing care, and this will take a long time (Yu and Tian, 2019). In the deployment of community support and health services, attention needs to be given as to how the physical environment can play a supportive role to help older people receive services.

2.5.4. Age-friendly environment research in China

As Zhang et al (2019) noted, the Chinese focus on the age-friendly environment began after the World Health Organisation's proposal regarding age-friendly cities and communities in 2007. Due to the cultural differences and differences in the translation of "friendly" (You Hao), the China National Committee on Ageing (2009) proposed the concept of age-liveable (Yi Ju) cities and communities, which had the same essence as age-friendly cities and communities proposed by the World Health Organisation. As Yu and Rosenberg (2020) suggested, current

and future urban planning, together with neighbourhood and community design in China, should consider older people's perceptions and needs. The immediate home and community environment can significantly influence older people's daily activities and wellbeing.

Wu and Qu (2016) defined an age-liveable environment as a dwelling and living environment that is suitable for different age groups, including older people. The narrower sense of age-liveable environment means the physical living environment, whereas the broader meaning means the social, economic, and cultural environment. The aims of an age-liveable environment include promoting older people's health, participation opportunities, security, and their quality of life. The building of an age-liveable environment operates at three levels which are region, city, and community. It is the basic and primary factor that enables ageing-in-place. Yu and Rosenberg (2020) pointed out that the development of an age-friendly environment should involve housing and built environment upgrades, and promoting social cohesion through older people's familiar ways of social interaction. In the rapidly changing urban environment, how to reconstruct older people's sense of belonging, support intergenerational interaction, and promote effective community management have become challenging issues for policymakers and urban planners (Yu and Rosenberg, 2020).

In their Graphic book on the construction of age-friendly communities, Zhou and Qin (2018) proposed eight principles including integrity, convenience, safety, applicability, comfort, participation, richness, universality (inclusivity), and fifty key points looking at entrances, parking lots, roads, paths, activity spaces, rest spaces, landscapes, signage systems, and lighting systems. It provides relatively comprehensive recommendations for age-friendly communities, but is more focused on commodity residential communities, which usually have comprehensive support facilities and more plentiful space compared with work-unit residential communities, and does not include other neighbourhood outdoor spaces. This study can add more detailed information about how older people use outdoor spaces in not only commodity residential communities, but also work-unit residential communities, as well as neighbourhood outdoor space. Based on proposals for age-friendly initiatives worldwide and standards for the planning and design of urban residential areas (GB50180-2018), Yu and Tian (2019, p206-207) suggested age-friendly neighbourhood outdoor spaces with corresponding technical measures (Appendix Table 4). These two representative publications

reveal that Chinese age-friendly environment research has started to pay more attention to detailed aspects of outdoor space.

There is other scattered research in China looking at age-friendly outdoor space features. Zhai et al (2018) pointed out that age-friendly outdoor spaces should comprise fitness equipment, wide open areas, proximity to water feature, seating, tranquillity, and beautiful scenery. More specifically, they found that older people prefer sunshine and shade provided by plants, good views that enable them to observe and be observed by others, flat surfaces rather than rockery, and ornamental plants instead of aromatic plants. Zhao et al (2021) outlined older people's requirements for exercise environments in urban parks, suggesting that fundamental requirements are comfort, security, evenness (reasonable distance, free access or access for a reasonable fee), specificity (specific exercise areas for older people), and maintenance. Additional 'expected' requirements include attractiveness and intimacy of the landscape and the accessibility and adequacy of the space, as well as higher level requirements that comprise the characteristics of the landscape and the services of the space. Liu (2021) emphasised the necessity for children's playing facilities and child-friendliness in an age-friendly environment due to the phenomena of older people taking care of their grandchildren. These examples of research into age-friendly community and outdoor spaces in China all have different emphases, and contribute to the progress of age-friendly environment research in China. However, there are still excellent research possibilities in both community and neighbourhood outdoor spaces, focusing on older people's actual usage situation.

2.6.   Research gaps and informing research questions

To support Chinese older people ageing-in-place, it is vital to understand their daily experiences of their process of ageing-in-place, and find out what the personal, physical and social environmental factors that influence their daily lives and use of outdoor spaces actually are. Most research related to ageing-in-place is focused on housing (Hwang et al, 2011), neighbourhood (Van et al, 2015), services (Rantz et al, 2011), and technology (Kim et al, 2017). Explorations of age-friendly initiatives in different countries, for example UK

(https://agefriendlysheffield.org.uk/), Canada (Public Health Agency of Canada, 2012), China (Xie, 2018), follow the guide developed by the World Health Organisation (2007a), which concentrated on the three age-friendly themes, physical environment, social environment, and multiple services. Outdoor space, as one of the important features within the physical environment theme, has not been researched comprehensively. A gap identified by Steels (2015), based on reviewing international literature about the characteristics of age-friendly initiatives, was that the majority of the studies were from the developed, rather than the developing world. It is necessary and important to provide evidence for building age-friendly communities in non-Western contexts (Yu and Rosenberg, 2020). A study carried out by Li (2014) assessed Chinese urban age-friendly neighbourhoods from a planning perspective, but only briefly mentioned neighbourhood open space design. Furthermore, the activities within open spaces in residential communities and wider public outdoor spaces may differ and need to be further explored (Zhang and Lawson, 2009). As noted by Sugiyama and Ward Thompson (2007), another research gap is the lack of research into older people's usage of outdoor space, including where they spend time, what they do, and for what purpose. Baltes and Smith (2003) further pointed out that attention needs to focus on different groups of older people (e.g., young old and oldest old) because they differ both physically and psychologically.

Therefore, It is necessary to focus specifically on neighbourhood-level outdoor space, including outdoor spaces within residential communities and neighbourhoods, to reveal the way in which older people use outdoor space, and to identify the environmental affordances that facilitate or inhibit older people's outdoor activity. Targeted environmental improvement suggestions can then be proposed to support older people's outdoor activity based on their ageing-in-place experiences and outdoor space use patterns, in order to support their ageing-in-place healthily, independently, and actively, both physically and socially.

This study therefore explores Chinese older people's diverse experiences of ageing-in-place, and places of ageing, both of which are key to understanding how neighbourhood outdoor space influences older people's experience of ageing-in-place. The overarching aim of this study is to determine the aspects of outdoor space that influence older people's outdoor activity, and to develop the evidence base necessary to inform practice guidelines in relation to improving outdoor space in Chinese urban neighbourhoods. The research questions are

listed below with their corresponding research objectives.

- **Research question 1:** *What are older people's experiences of ageing in Chinese urban neighbourhoods?*
  Objective1: *To identify the multiple factors that influence older people's experiences of ageing-in-place.*

- **Research question 2:** *Where and how do older people use outdoor space in their daily lives?*
  Objective 2: *To reveal older people's usage of outdoor space.*

- **Research question 3:** *How does neighbourhood outdoor space afford older people's activities?*
  Objective 3: *To identify the neighbourhood outdoor space's environment attributes that afford older people's activities.*

- **Research question 4:** *How to improve outdoor space in Chinese urban neighbourhoods to be more age-friendly?*
- **Objective 4:** *To develop policy recommendations and practice guidelines in relation to outdoor space in Chinese urban neighbourhoods to support ageing-in-place.*

2.7. Summary

By noticing the rapid population ageing phenomenon and older people's ever-changing physiological and psychological status, as well as the way that environmental affordances influence how they perceive and use their living spaces, it is reasonable to speculate that the neighbourhood environment that they reside in can greatly influence how they conduct daily outdoor activities and influence their health and wellbeing in the ageing-in-place process. To develop ways of constructing and improving age-friendly outdoor environments in Chinese urban neighbourhoods, a structured methodology has been developed based on the above knowledge and theories to guide this study, which will be introduced in the following chapter.

Chapter 3 Research methodology and research design

3.1. Introduction

First, in section 3.2, the author sets out this study's philosophical standpoint, approach to theory development, methodological choice, strategy approaches, and the overall research framework that guides data collection in order to understand how older people experience ageing-in-place and use outdoor space in a Chinese urban context.

The chapter presents how the research framework guides this study to achieve the main research aim. The study divides three research questions and objectives into four phases with the application of appropriate research methods and corresponding outcomes.

Next, section 3.3 explains the application of the research methods, which include semi-structured interviews, observations, and stakeholder interviews. This section describes how these methods were selected, applied, and how they worked together, as well as how the collected data was analysed and interpreted.

Finally, the ethical considerations are explained. The chapter concludes with a reflection on the research design and data collection process.

3.2. Research strategy and methodology

3.2.1. Research philosophy and approach to theory development
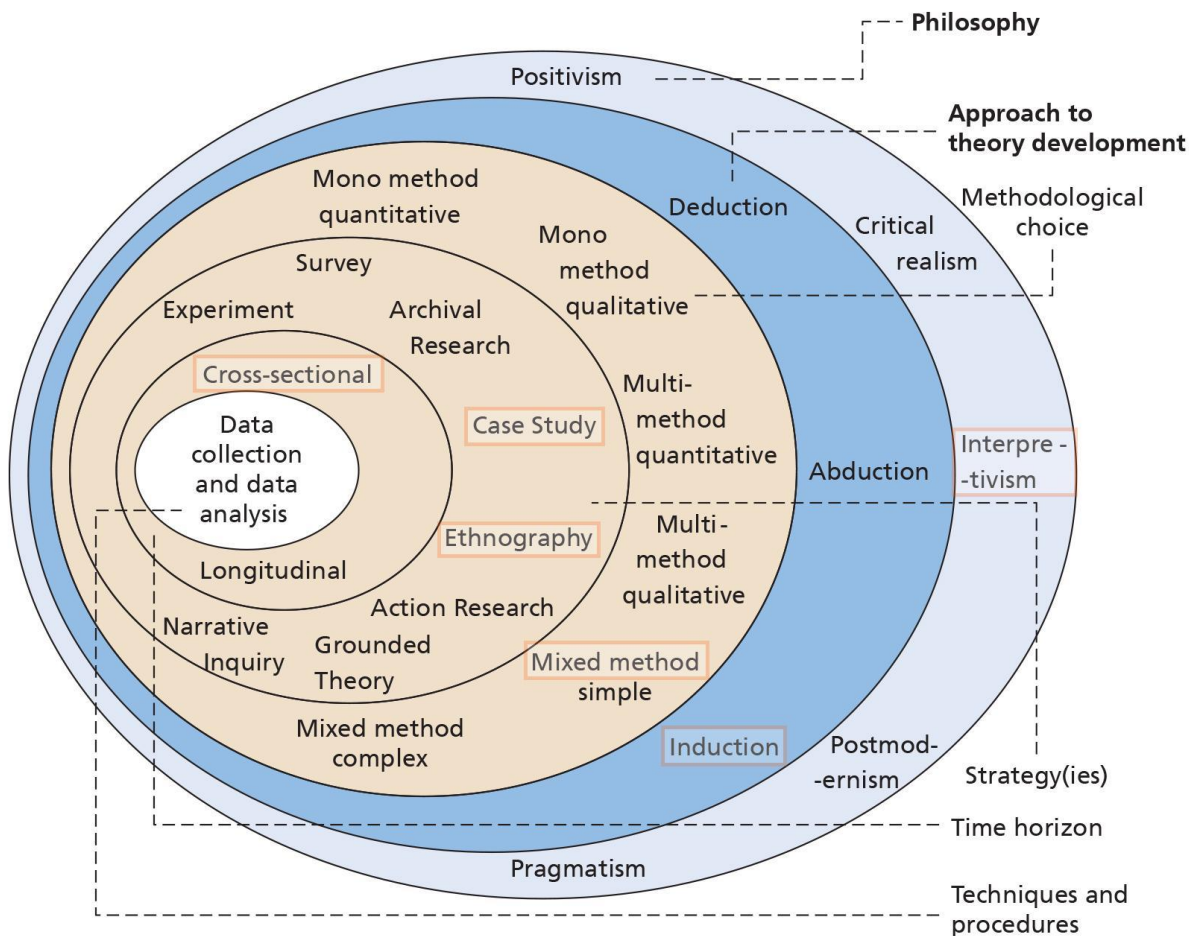
Figure 3.1 The standpoint of this study in the 'research onion'. Modified from: Saunders et al. 2019, p.130

The research onion was developed by Saunders et al (2019) to represent the chosen procedure for data collection and analysis. This study's standpoint is depicted in Figure 3.1. The outer layer, research philosophy, represents the system of beliefs and assumptions within which the researcher solves a problem and develops knowledge in a specific field. This study takes an interpretivism perspective, which argues that knowledge is subjective, culturally and historically situated, and is dependent on people's experiences (Ryan, 2018). It is a dominant research philosophy that supports research in gaining a better understanding of social life by interpreting a world that is inhabited by people (Chowdhury, 2014). Social science research is different from natural sciences as interpretivism insists that the human and social worlds create meaning, therefore they cannot be researched using the same methods used in

studying physical phenomena (Saunders et al, 2019). The processes of interpretation and accounts of social life can be used for sociological investigation to explore the meanings and motivations behind people's behaviour (Whitley, 1984; Chowdhury, 2014). Interpretivist research aims to create new, more abundant explanations of social contexts, and therefore requires the researcher to enter and understand the participants' social world from their perspective (Saunders et al, 2019).

The next layer moves to the approach to developing theory, which is relevant to whether the research is theory-testing or theory-building (Saunders et al, 2019). This study conforms to an inductive approach, because this approach is able to produce reliable results by systematically analysing qualitative data (Thomas, 2006). The inductive approach is most usually followed by interpretive philosophy because of the linkage between this approach and the humanities and its emphasis on subjective explanations (Saunders et al, 2019). The inductive approach utilises rich information collected from the real world and builds theory by exploring, analysing and finding vital patterns in the dataset (Sabherwal and King, 1991). As Saunders et al (2019) suggested, the inductive approach is more concerned with the research context and is suitable for a small sample size, mostly collecting qualitative data using different methods to explore a phenomenon and identifying themes to build a conceptual framework.

3.2.2. Multi-method research

After deciding on the research philosophy and the approach to developing theory, the next step is to determine an appropriate methodology. Multimethod research means the combination of different methods within a qualitative or quantitative approach (Mik-Meyer, 2020). Basically, a multi-method approach to an issue can be adopted using a combination of research methods that can complement each other (Wood et al, 1999). As Brewer and Hunter (1989) explained, a multimethod approach can overcome each individual method's limitations by intentionally using different methods as part of the same research. Compared with a single method, using mixed research methods enables researchers to collect more comprehensive and stronger data, and to address more complicated and broader research questions (Yin, 2018). Multiple individual methods should not have similar weaknesses and biases, and weaknesses in one method should be compensated for by the strengths of

another to guarantee the effectiveness of method triangulation (Amaratunga and Baldry, 2001). Yoo and Kim (2017) commented that qualitative research helps to understand the relationship between the environment and physical activity. Moran et al (2014) suggested the combination of interviews and spatially-oriented methods in research about the physical environment and older people's physical activity can provide insight into how and why this is influenced by the physical environment. The observation method is perceived as a quantitative method that can provide relatively comparable quantifiable data in landscape research (Zeisel, 1984; Lipovská, 2013; Bozkurt, 2016; Bozkurt et al, 2019). The rigour in the quantitative method can make the researcher more self-reflecting concerning their own status as a subjective observer, whilst the qualitative method can promote an understanding of what the phenomena assessed actually mean for the subjects investigated, and enrich the quantitative part (Karpatschof, 2007).

3.2.3. Spatial ethnography

To understand the aspects that influence older people's experience of ageing-in-place, and how they use outdoor spaces, it is vital to understand, from older people's perspectives, how they perceive their neighbourhoods' physical and social environments, and to objectively record how they are actually using the associated spaces. A research methodology that combines social science and spatial analysis methods is suitable for this study. The methodology of spatial ethnography was first developed by Kim (2015) by combining social science research and physical spatial analysis to explore how sidewalks are used and the social processes and meanings of their use. She describes how spatial ethnography informs urban design and planning through talking to local people, doing physical surveys, and participating in the use of space and observing how spaces are actually used. Ethnographic research can provide insights into very detailed design problems (Guenther, 2012). Social science research in the landscape field reveals people's subjective perceptions and personal experiences. For example, Yung et al (2016) conducted focus groups with older residents to explore their social needs and perceptions regarding public open spaces. Walker and Hiller (2007) used an interview method to explore how older women perceive and experience their neighbourhoods to identify the neighbourhood social and physical dimensions that influenced their health. The behaviour studies usually focus on people's behavioural patterns

(McCormack et al, 2014; Cosco et al, 2010), movement patterns (Meijles et al, 2014; D'Antonio et al, 2010), and occupation of space (Bozkurt et al, 2019; Marušić, 2016, Ratti et al, 2006). There is also some landscape research combining social science and behavioural research methods. Zeitler et al (2012) used in-depth interviews and GPS tracking methods to reveal the aspects of suburban environments that influence older people's mobility and their modes of transport. Ja'afar et al (2012) identified the landscape aspects of physical appearance and function that contribute to the character of the traditional street environment by using mixed methods, comprising visual survey, behavioural observation, and interviews. These notable studies informed the choice of spatial ethnography methodology triangulated with multiple case study research sites in this thesis.

3.2.4. The case study approach

By reviewing related literature, Thomas (2011, p.513) defined the case study as:

"Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame—an object—within which the study is conducted and which the case illuminates and explicates."

Case studies have been used in a variety of disciplines, especially in social science research, to obtain an in-depth and comprehensive understanding of a complicated situation in the real world (Crowe et al, 2011). Yin (2018) also states that the case study approach is suitable for investigating contemporary events in depth in a real-world context and requires multiple sources of data and triangulation of various data sources (Yin, 2018). In contrast with experimental research, in which the researcher aims to control the variables and to test hypotheses, the case study is more naturalistic and depends on the real-life situation, and seeks to answer 'how', 'what', and 'why' questions (Crowe et al, 2011).

Groat and Wang (2013) found the case study to be more appropriate to the landscape architecture field as 'an empirical inquiry that investigates a phenomenon or setting'. They

further listed five salient features of the case study approach in the landscape architecture field comprising researching single or multiple cases in real contexts, the ability to interpret causal links, an emphasis on theory development during research design, a reliance on multiple sources and triangulation of data, and the ability to generate theory. The case study has a long history of being employed in landscape research (Francis, 2001), and in being combined with an ethnographic research approach as well (Ganji, 2018). The representative work of Hester (1984), Whyte (1980), Gehl (2011), and Sim (2019) explored people's use of outdoor space. These researchers built and applied theory via studying various cases. It would have been impossible for the researcher to gain a comprehensive picture of how older people in Chinese urban neighbourhoods use outdoor space without considering the contexts in which this occurred.

Groat and Wang (2013) further explained the combination of case studies and other strategies in landscape architecture research. One of the strategies they proposed is a multi-phase research design which, as the name suggests, means designing the case study research in two or more phases. The advantage of a multi-phase research design is that each phase can be fully and distinctly presented. Apart from the multi-phase approach, a multiple case study allows the researcher to find similarities and compare differences between cases (Yin, 2018). This study focused on multiple case studies and used multi-phase data collection to explore the dynamics of older people's experiences of ageing-in-place and use of outdoor space. To investigate the diversity of ageing-in-place experiences and outdoor activities in relation to different social and physical characteristics of urban neighbourhoods, two urban residential communities and three adjacent neighbourhood outdoor spaces in Beijing were selected as case studies to compare the similarities and differences between older people's experiences and uses of outdoor spaces. The detailed case selection process is explained in Chapter 4.

3.2.5. The research framework

In order to respond to the research questions and objectives, a research methodology framework (Figure 3.2) was developed to guide this study. As Abowitz and Toole (2010) suggested, there is no single ideal data collection method; each method has intrinsic advantages and disadvantages. An appropriate mix of each method's strengths and

weaknesses can enhance the validity and reliability of the research. Therefore, this study is structured into four phases with appropriate data collection methods designed to respond to the research questions and objectives.

In phase 1, semi-structured interviews were used to collect data from resident older people in sites 1 and 2 (residential communities) to achieve objective 1. The purpose of these interviews was to explore older people's perceptions of ageing-in-place, their experiences of ageing-in-place, how they perceive neighbourhood outdoor space, and to identify the neighbourhood outdoor spaces important to them. The interviews provided qualitative data to meet the research objectives and identified important neighbourhood outdoor spaces used by older people in which to conduct observations and on-site interviews. Stakeholder interviews were also conducted in order to help understand the factors that influence older people's experiences in ageing-in-place and use of outdoor space from another perspective.

In phase 2, observations were used from all sites (both residential communities and neighbourhood outdoor spaces) to reveal older people's patterns of usage of outdoor spaces (objective 2). On-site interviews were used as a supplemental method to provide further richness in the dataset. The combination of interviews and observations provides information from both researcher's and participants' perspectives, giving a more comprehensive picture of how older people who are ageing in urban neighbourhoods use and perceive outdoor space in their daily lives.

RESEARCH QUESTIONS	What are older people's experiences of ageing in Chinese urban neighbourhoods?	Where and how do older people use outdoor space in their daily lives?	How does neighbourhood outdoor space afford older people's activities?	How to improve outdoor space in Chinese urban neighbourhoods to be more age-friendly?
OBJECTIVES	To identify the multiple factors that influence older people's experiences of ageing-in-place.	To reveal older people's usage of outdoor space.	To identify the neighbourhood outdoor space's environment attributes that afford older people's activities.	To develop policy recommendations and practice guidelines in relation to outdoor space in Chinese urban neighbourhoods to support ageing-in-place.

Phase 1　　　　　Phase 2　　　　　Phase 3　　　　　Phase 4

DATA COLLECTION

Semi-structured interviews

Site 1: Work-unit residential community
Site 2: Commodity residential community

Identify older people's frequently used outdoor spaces

Stakeholder interviews

Observations

On-site interviews

Site 1 and 2
and three neighbourhood outdoor spaces

Identify the attributes at macro, meso, and micro levels that influence older people's use of outdoor space, and further explore how older people's sense of agency has been developed.

Inform improvements in the planning, design and management of neighbourhoods and communities that support ageing-in-place.

OUTPUTS

Factors influencing experiences of ageing-in-place and the use of outdoor space

Older people's outdoor space usage situation.

Figure 3.2 Framework of the research methodology (Drawn by author)

In phase 3, data from interviews with residents and outdoor space users, observations and stakeholder interviews were triangulated to identify the affordances that influence older people's use of outdoor space (objective 3), and to develop an affordance framework of age-friendly neighbourhood outdoor spaces.

Finally, in phase 4, findings concerning older people's experiences of ageing-in-place, use of neighbourhood outdoor spaces, and the identified influential affordances were used to inform planning, design, and management recommendations in relation to outdoor space in Chinese urban neighbourhoods to support older people ageing-in-place. The outcomes from this phase will achieve the overarching aim of this study.

3.3. The selection and design of research methods for this study

3.3.1. The selection criteria for research sites

In this study, the selection of the research sites involved two steps: (a) choosing the urban residential communities, and (b) selecting outdoor spaces near the identified urban residential communities. Due to the limitations of a single case study's generalisability, it is desirable to include more than one case in the research (Meyer, 2001). Flyvbjerg (2006) categorised samples and case selection strategies into random and information-oriented selection (Table 3.1). Quantitative research focuses on the representativeness of cases and selects cases more randomly, whereas qualitative research is concerned with the information-richness of cases and selects cases more purposefully (Kuzel et al., 1999). There are several types of cases in the information-oriented selection, including deviant cases, maximum variation cases, critical cases, and paradigmatic cases (Flyvbjerg, 2006). To maximise the effectiveness of data from small samples, this study relies on information expectations to select multiple research sites.

Yin (2009) suggested that case selection must be representative or typical; however, Crowe et al. (2011) argued that the case is chosen for its interest to the researcher rather than its representativeness. As noted by Crowe et al (2011), accessibility is the central consideration

when selecting a research site. The researcher must know whether they can access the site, recruit proper participants, and obtain sufficient data. Considering the variations between cases, two residential communities were selected as examples of different housing types, and three outdoor spaces were selected as case studies on the basis of their representativeness and accessibility. The strategic selection process can increase case study generalisability (Flyvbjerg, 2006); this will be detailed and illustrated in Section 4.6.

Table 3.1 Strategies for the selection of samples and cases (Flyvbjerg, 2006)

Type of Selection	Purpose
A. Random selection	To avoid systematic biases in the sample. The sample's size is decisive for generalization.
1. Random sample	To achieve a representative sample that allows for generalization for the entire population.
2. Stratified sample	To generalize for specially selected subgroups within the population.
B. Information-oriented selection	To maximize the utility of information from small samples and single cases. Cases are selected on the basis of expectations about their information content.
1. Extreme/deviant cases	To obtain information on unusual cases, which can be especially problematic or especially good in a more closely defined sense.
2. Maximum variation cases	To obtain information about the significance of various circumstances for case process and outcome (e.g., three to four cases that are very different on one dimension: size, form of organization, location, budget).
3. Critical cases	To achieve information that permits logical deductions of the type, "If this is (not) valid for this case, then it applies to all (no) cases."
4. Paradigmatic cases	To develop a metaphor or establish a school for the domain that the case concerns.

3.3.2. Semi-structured interview

In this study, semi-structured interviews were used to directly address research objective 1. The semi-structured interview is a qualitative data collection method in which the researcher can control the topics of the interview but where there is no specific range of answers to each question (Ayres, 2008). It offers participants opportunities to explore issues they feel are important (Longhurst, 2003). It can be used to cover the main themes in a research study and combines the use of prepared questions as well as openness to participants' answers and

incidental stories (Kvale, 2008).

3.3.2.1.   Structuring the interviews

The interviews started with a set of grounding questions designed to obtain information about participants' personal circumstances including their gender, age, occupation status, living arrangements, length of time at their current residence, mobility situation, and mode of daily travel. These grounding questions helped the researcher to gain a general understanding of participants' personal situations, which in turn helped to contextualise the remaining interview themes.

They then moved on to address substantive issues with questions designed to elicit the participants' thoughts and feelings in two thematic areas. The first interview theme explored participants' experiences and perceptions in relation to outdoor space in their neighbourhood. The researcher asked participants about their daily outdoor activities; their usually visited/meaningful/important outdoor spaces; perceptions and experiences of these spaces; factors preventing or facilitating their use of outdoor space; views of outside from home; unmet needs relating to outdoor space; and their ideal outdoor space scenarios. The intention was first to identify the important outdoor spaces for participants, as well as their general usage patterns and perceptions of these spaces, which provided the basis for the next phase of data collection (observation).

The second interview theme related to participants' perceptions of their neighbourhood and their experiences of ageing-in-place. The researcher asked participants to reflect on their satisfaction with, and attachment as residents to their current neighbourhood compared with their previous experiences of living in other neighbourhoods. This was to explore whether or not they have feelings of belonging, and their satisfaction with the neighbourhood, and to elaborate their experiences and perceptions of ageing-in-place, as well as how this relates to outdoor space.

The questions eliciting participants' experiences and perceptions were usually open-ended questions, starting with "Tell me about…" and "How…", and followed up with probing questions which prompted participants to recall their memories and stories, and to clarify or

extend their responses.

3.3.2.2.   Recruiting of participants and conducting interviews

The recruitment of participants for the semi-structured interviews aimed to include older people living in the selected residential communities with diverse living experiences. Between March and May 2019, the researcher conducted 20 interviews on site 1, and 22 interviews on site 2 (Table 3.2). Approximately two in three potential participants approached agreed to be part of the study. Guest et al (2006) suggested that six to twelve interviews have adequate representativeness to explore the general perceptions and experiences among a group of relatively homogeneous individuals. In this study, older people of different gender, age, and mobilities were interviewed to further explore the differences between them. Glaser and Strauss (1967, p.65) first defined data saturation as 'no additional data are being found whereby the sociologist can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated'. Therefore, the researcher decided not to do any further interviews when she found no more new themes emerged from conversations with different types of older people.

Initially, the researcher contacted the community committee hoping to get some help in recruiting participants, but they just told the researcher to talk to residents she could meet within the residential community. The recruitment of participants followed purposeful random sampling and snowballing strategies. The purposeful random sampling strategy is especially appropriate in qualitative research when the potential number of participants within a purposive category is more than can be studied with the available resources and time (Patton, 2015). In this study, the purposive category of participants are people who are aged 60 and over, with the consideration of the heterogeneity in gender, age, mobility level, and household composition. Consequently, the researcher visited the residential community every day and approached older people who seemed not to be in a hurry (e.g., residents who were sitting somewhere or passing slowly by), older people who were using mobility aids, more elderly older people, and those with grandchildren. Some of these older people became the initial participants in this study and introduced other participants to the researcher.

Prior to the interviews, all the participants were provided with an information sheet and

consent form to make sure they understood the purpose of this study and were willing to be audio-recorded. All the interviews were audio-recorded using a mobile phone, and the recordings were uploaded into the researcher's password-protected university Google Drive and backed up on the researcher's personal computer, which is also password protected. All the participants' data were anonymised and given a reference number (e.g., S1_1_M_90: the first participant in the site 1 work-unit residential community, male, age 90).

Table 3.2 Overview of semi-structured interview participants (source: author)

Participants from Site 1: Shuangyushu work-unit residential community					Participants from Site 2: Fangdanyuan commodity residential community				
No.	Gender	Age	Mobility	Household composition	No.	Gender	Age	Mobility	Household composition
S1_1	M	90	So-so	Alone	S2_1	M	82	Good	With partner, child lives in the building next door
S1_2	F	60	Good	With father	S2_2	F	62	Good	With child and grandchild
S1_3	M	87	So-so	With child	S2_3	F	82	Bad	With partner, child lives in the building next door
S1_4	F	87	Bad	With child	S2_4	M	88	So-so	With partner
S1_5	M	77	So-so	With child	S2_5	F	71	Good	With child and grandchild (grandchild aged 19)
S1_6	M	73	Good	With partner	S2_6	F	65	Good	With child and grandchild
S1_7	F	77	Bad	With child and grandchild	S2_7	M	67	Good	With partner, child lives in the same building
S1_8	F	65	Good	With child and grandchild	S2_8	F	77	Good	With child and grandchild
S1_9	F	75	Good	Alone, grandchild comes a few days per week	S2_9	F	80	Bad	With child
S1_10	M	62	Good	With partner	S2_10	M	79	So-so	With partner
S1_11	F	65	Good	With child and grandchild	S2_11	M	72	Good	With child and grandchild
S1_12	M	66	Good	With grandchild	S2_12	F	75	Good	With partner
S1_13	F	83	So-so	Alone	S2_13	M	75	Good	With partner
S1_14	M	83	So-so	With partner (partner is paralysed in bed)	S2_14	F	74	Good	Alone
S1_15	F	87	Bad	Alone	S2_15	M	62	Good	With child and grandchild
S1_16	F	76	Good	With partner	S2_16	F	65	Good	With child and grandchild
S1_17	F	73	Good	With partner (partner in wheelchair)	S2_17	F	67	Good	With child and grandchild
S1_18	M	62	Good	With child and grandchild	S2_18	F	64	Good	With child and grandchild
S1_19	F	63	Good	With child	S2_19	F	60	Good	With child and grandchild
S1_20	F	75	Good	With partner	S2_20	F	60	Good	With child and grandchild
S1_21	F	95	So-so	With child	S2_21	M	62	Good	With partner and grandchild
					S2_22	F	68	Good	With child and grandchild

Table 3.3 Summary of participants' number, gender, mean age, standard deviation, mobility, and household composition (source: author)

	Number of male	Number of female	Mean age and standard deviation	Mobility			Household composition						
				Good	So-so	Bad	Alone	With parent	With partner	With child	With child and grandchild	With grandchild	With partner and grandchild
Site 1	8	12	75.29 (10.46)	12	6	3	4	1	6	5	4	1	0
Site 2	8	14	70.77 (8.16)	18	2	2	1	0	7	1	12	0	1
Total	16	26	72.98 (9.52)	30	6	5	5	1	13	6	16	1	1

The researcher used colloquial language to ask interview questions to ensure the participants

felt more informal and at ease, and to keep the interview process more conversational. The researcher always kept the attributes of a skilled qualitative interviewer in mind: being open-minded, flexible and responsive, patient, observant, and a good listener (Guion et al, 2001). The longest interview time was more than three hours. The researcher played the role of a good listener during the interview process, which not only helped the researcher establish a good relationship with some participants but also gained in-depth data and a network of contacts to approach more participants. The researcher conducted a couple of interviews with some of the participants on different days. With greater familiarity between the researcher and participants, the participants disclosed more detailed stories and experiences in response to the interview questions.

3.3.2.3.   The analysis of data from the semi-structured interviews

The analysis of data from the semi-structured interviews was structured into four steps. The first step was to transcribe the entire interview recordings manually. Roulston (2014) has suggested that transcribing the entire interview corpora, including those sections which deviate from the topics under consideration, can help the researcher to consider how and why these deviations influence the participants' expression of interview topics. Van Nes et al (2010) suggested that keeping to the original language as much as possible helps the researcher to avoid lost meanings when analysing data in another language. Therefore, the researcher decided to analyse data in her native language, Mandarin, and then use English to name the codes and themes for dissemination. To aid precision in the wording of codes and themes, the intended meanings from the raw data were explained and discussed with the researcher's supervisor and another PhD researcher from the School of Architecture, who is also focusing on ageing and environment research in a Chinese context.

The analysis of qualitative interview data includes both a rough review of the dataset as well as detailed analyses including, for example, the identification of structures, the elaboration of categories, and hermeneutic interpretations. It aims to compare different formats of data or data from different cases, and to generate subjective or social meanings from this material (Flick, 2013). In this study, the software program NVivo was used to analyse the qualitative interview data. It reduces the need for a great number of manual tasks and ensures the researcher is working more methodically, thoroughly, and attentively (Bazeley and Jackson,

2013), and provides the researcher with more time to explore and identify themes and derive results (Hilal and Alabri, 2013).

Thematic analysis is a data analysis approach used for identifying, analysing, and reporting themes within data, and describing data in detail (Braun and Clarke, 2006). It does not usually report the frequency counts of themes (Wilkinson, 2000), which means a theme might account for much space or just appear a little within the dataset (Braun and Clarke, 2006). The approach used in this study explored the latent meanings underlying the semantic content to explore Chinese older people's diverse and distinctive experience of ageing-in-place. Whether an identified theme was mentioned by participants more frequently or less frequently, they are all vital to helping this study achieve its research objectives.

The researcher analysed the interview data from two residential communities together but used different letters to distinguish participants from different residential communities. An inductive approach was used to identify themes. According to suggestions concerning the inductive approach to analysing qualitative data developed by Thomas (2006), after inputting data into NVivo, the researcher starts a close reading of the text and consideration of the latent meanings. The initial codes were derived from such a close reading of the dataset. These initial codes were then revised to avoid redundancy and categorised into themes. The themes were discussed as mentioned above and iteratively modified into the final version. These outcomes are discussed in Chapter 5. This qualitative interview analysis also informed the next phase of data collection and analysis: observation.

3.3.3. Observation

Observational research plays a vital role in behavioural sciences, helping the researcher to present convincing evidence for real-world phenomena (Sussman, 2016). Observation has been used in environment-behaviour research (Bechtel and Zeisel, 1987), environmental psychology research (Sussman, 2016), landscape research (Moore and Cosco 2007; Cosco et al, 2010; Marušić, 2011; Ghavampour et al 2017), as well as research about the ageing population (Zhai and Baran, 2017). In environment-behaviour research, behaviour is always linked with an environmental context, which means people's behaviour is not separable from

the environment in which it takes place (Bechtel and Zeisel, 1987). As Lynch and Hack (1984) suggested, the observation of activities is the most reliable form of data to understand how places work when it is consociated with inquiries into experiences. Ward Thompson (2013) assessed Lynch's work, focusing on people's activity on site rather than just design features, linking theory to practice, supporting the concept of affordance, and encouraging designers to think about how places invite various activities. Zeisel (1981) defines observing behaviour as systematically watching people use their environments, including what they do, with whom, their relationships, the context and physical settings. Additional insights may be gained into how people's activities affect one another spatially, and how the physical environment provides opportunities for, and constraints to the behaviours taking place. Observations should be systematically recorded and location-based, by using field notes, maps, precoded checklists, photographs, and videos (Zeisel, 1981; Hanington and Martin, 2012).

The intention of the observation in this study was to address research objective 2. Outdoor spaces that were important to older people who reside in the selected residential communities were identified in the semi-structured interviews. These spaces became the sites used for observing older people's activities in Phase 2. Observation was chosen as one of the primary data collection methods because it provides insights into participants' various interactions with others and with their environment, and provides different and more objective data compared with self-report methods, which rely on participants' abilities to recall their experiences without bias (Liu and Maitlis, 2010; Sussman, 2016). Besides, people may sometimes not be aware of their own behaviours (Ng, 2016), or they tend not to mention some of their activities because they think they are trivial and not worth mentioning (Zeisel, 1984). The combination of observation and interviews in this study was intended to gain a comprehensive set of data because these easily neglected behaviours are vital to this study. It is especially important to gain empirical knowledge from observation when focusing on inclusive design and specific users such as older people, whose real-world responses to a place provide a vital source of information (Marušić and Marušić, 2012).

3.3.3.1.   Procedure and application

Observation was carried out at five sites from August to October in 2019. The detailed site selection process is introduced in Chapter 4. Pre-site visits were organised to gain a basic

understanding of the site and its usage and to measure the site in order to generate the scaled site plan. Field observation also helped the researcher to experience the observation sites features (Carpiano, 2009). Based on the information from the semi-structured interviews with older people regarding the uses to which the observation sites were put, consideration of the schedule of Chinese older people's routine lives, and the scale of the observation sites, and observation time from 6:00 to 19:00 throughout the day was determined (i.e., 13 hours in total). All the observation sites take about 15 to 20 minutes to walk around. Therefore, the duration and frequency of observation was set at 15 to 20 minutes per hour. Three days' observations in total were carried out at each site, including both weekdays and weekends.

The mobile phone was chosen as the recording equipment because it is portable and has capacity to take high-quality photos, live photos, and videos. To identify whether a person was aged 60 or above, the researcher combined her previous experience of knowing and interacting with older people in China, and paid attention to relevant aspects of their appearance, for example, grey hair colour, stooped physique, and facial wrinkles. At each time slot, the researcher walked from the same starting point, along the same paths crossing all parts of the site, and took pictures or videos to capture all the older people's activities occurring on site. The researcher backed up photos onto password-protected personal computers after each day's observation.

Details of the structured observation including the date, weather, and number of photos (including live photos and short videos) are listed in Table 3.4. A total number of 4,282 photos, live photos, and short videos were taken, which were used as the original data for producing GIS behaviour maps and data analysis.

Table 3.4 Observation date, weather, and number of photos at each site (source: author)

Observation sites		Date & Weather	Time	Number of photos	Date & Weather	Time	Number of photos	Date & Weather	Time	Number of photos	Total
	Site 1 — Shuangyushu work-unit residential community	Thu 10/10/19 21℃ / 12℃ Cloudy	06:00	9	Fri 11/10/19 18℃ / 13℃ Cloudy	06:00	10	Sat 19/10/19 20℃ / 10℃ Cloudy	06:00	20	
			07:00	33		07:00	21		07:00	35	
			08:00	31		08:00	22		08:00	33	
			09:00	32		09:00	22		09:00	28	
			10:00	29		10:00	30		10:00	27	
			11:00	26		11:00	27		11:00	33	
			12:00	18		12:00	13		12:00	25	
			13:00	6		13:00	10		13:00	15	
			14:00	14		14:00	20		14:00	20	
			15:00	20		15:00	22		15:00	22	
			16:00	31		16:00	23		16:00	42	
			17:00	21		17:00	37		17:00	21	
			18:00	35		18:00	20		18:00	18	
			19:00	19		19:00	19		19:00	18	
	Total			324			296			357	977
	Site 2 — Fangdanyuan commodity residential community	Wed 28/8/19 31℃ / 20℃ Cloudy / Sunny	06:00	25	Thu 29/8/19 30℃ / 20℃ Cloudy / Sunny	06:00	26	Sat 31/8/19 32℃ / 18℃ Sunny	06:00	22	
			07:00	19		07:00	30		07:00	11	
			08:00	23		08:00	29		08:00	16	
			09:00	21		09:00	20		09:00	28	
			10:00	18		10:00	18		10:00	31	
			11:00	13		11:00	18		11:00	24	
			12:00	11		12:00	16		12:00	13	
			13:00	9		13:00	7		13:00	25	
			14:00	4		14:00	9		14:00	22	
			15:00	8		15:00	10		15:00	11	
			16:00	10		16:00	19		16:00	14	
			17:00	19		17:00	37		17:00	24	
			18:00	16		18:00	27		18:00	19	
			19:00	17		19:00	29		19:00	7	
	Total			213			295			267	775
	Site 3 — University campus's eastern green space	Wed 11/9/19 25℃ / 18℃ Cloudy	06:00	25	Thu 12/9/19 25℃ / 19℃ Cloudy	06:00	31	Sat 14/9/19 29℃ / 17℃ Sunny	06:00	29	
			07:00	28		07:00	28		07:00	29	
			08:00	38		08:00	31		08:00	34	
			09:00	33		09:00	35		09:00	43	
			10:00	29		10:00	34		10:00	36	
			11:00	23		11:00	22		11:00	29	
			12:00	14		12:00	10		12:00	21	
			13:00	7		13:00	7		13:00	13	
			14:00	10		14:00	11		14:00	6	
			15:00	14		15:00	12		15:00	14	
			16:00	25		16:00	31		16:00	25	
			17:00	33		17:00	30		17:00	30	
			18:00	26		18:00	24		18:00	28	
		Raining	19:00	-		19:00	21		19:00	43	
		Tue 24/9/19 25℃ / 18℃ Sunny	19:00	44							
	Total			349			327			380	1056
	Site 4 — University campus's western green space	Wed 18/9/19 25℃ / 14℃ Sunny	06:00	21	Thu 19/9/19 25℃ / 16℃ Cloudy	06:00	23	Sat 21/9/19 27℃ / 16℃ Cloudy / Sunny	06:00	22	
			07:00	23		07:00	21		07:00	21	
			08:00	19		08:00	15		08:00	17	
			09:00	23		09:00	26		09:00	19	
			10:00	18		10:00	19		10:00	22	
			11:00	16		11:00	20		11:00	15	
			12:00	6		12:00	7		12:00	3	
			13:00	4		13:00	4		13:00	4	
			14:00	2		14:00	8		14:00	3	
			15:00	5		15:00	7		15:00	13	
			16:00	24		16:00	18		16:00	12	
			17:00	17		17:00	14		17:00	15	
			18:00	21		18:00	10		18:00	15	
			19:00	7		19:00	10		19:00	16	
	Total			197			206			202	605
	Site 5 — Shuangyushu neighbourhood park	Tue 3/9/19 33℃ / 20℃ Sunny	06:00	16	Wed 4/9/19 32℃ / 19℃ Sunny	06:00	12	Sat 7/9/19 34℃ / 21℃ Sunny	06:00	11	
			07:00	27		07:00	18		07:00	12	
			08:00	30		08:00	24		08:00	17	
			09:00	35		09:00	40		09:00	26	
			10:00	43		10:00	41		10:00	25	
			11:00	21		11:00	20		11:00	17	
			12:00	8		12:00	11		12:00	6	
			13:00	11		13:00	11		13:00	6	
			14:00	17		14:00	14		14:00	15	
			15:00	23		15:00	17		15:00	17	
			16:00	31		16:00	18		16:00	15	
			17:00	25		17:00	20		17:00	19	
			18:00	23		18:00	20		18:00	16	
			19:00	36		19:00	33		19:00	22	
	Total			346			299			224	869
											4282

3.3.3.2.   Position of the observer

Lashley (2018) distinguished observational research into participant observation, nonparticipant observation, covert observation, and online observation. Participant observation is usually fully embedded in the research setting for an extended period of time and develops long-term relationships with the participants. In contrast, nonparticipant observation means the researcher does not, or only occasionally participates in the activities happening on site, therefore the participant does not risk being obtrusive. This approach enables the researcher to conserve more time and energy to focus on recording data and field notes. However, this approach may cause the observed participants discomfort or feelings of strangeness. In order to record the most accurate data and to minimise the discomfort of observed participants, this study followed a nonparticipant approach for the majority of the time, but maintained limited participation in some activities, for example, using the exercising facilities to make the researcher a space user as well, and had conversations with some of the participants both proactively and passively.

3.3.3.3. Alongside the observation

During the observation, the researcher conducted informal on-site interviews with older people at the observation sites. The conversations were mainly focused on the users' perceptions of the space and how they use the space in their daily lives. The researcher approached potential participants while they were doing exercises, walking, or sitting. Sometimes the researcher joined in with their conversations with their companions, or the users themselves started a conversation with the researcher. The researcher recorded the on-site interviews using written notes or audio recorded with participants' consent. Besides observations and on-site interviews, the researcher wrote notes during the observation process to record thoughts whilst observing activities, hearing conversations, and experiencing the sites. After the researcher finished each time slot data collection and prior to the next time slot, she either sat near the older people to converse with them or somewhere at a distance where she could observe the older people's activities and write observation notes.

3.3.3.4. The analysis of data from the observations

GIS has been used in many research studies to record and analyse empirical observation data (Ghavampour et al, 2017; Korpilo et al, 2017; Ostermann, 2010). It can locate different categories and frequencies of behaviour spatially and link with specific design features, providing preliminary data for building design ideas (Bechtel and Zeisel, 1987; Sussman, 2016). The overlay of behaviour maps can demonstrate some of the patterns of how people use the space and changes in terms of different user types and numbers, activities, and times of the day (Marušić and Marušić, 2012).

In this study, the first step to analysing the observation data was familiarisation with the photos to identify the main user groups and behaviours, and to generate code systems for different users and behaviours. The second step was to record users' locations and behaviour on the site map, and use code systems to give each activity a unique code (A1, B1, etc.) and to input data into GIS software to generate behaviour maps. The third step was to analyse behaviours by different themes to reveal aspects of how these sites were used by older people (objective 2). The fourth step was to divide each site into different behaviour settings based on the usage and space features, and then identify the space attributes that afford

older people's outdoor behaviour (objective 3).

In the detailed coding process, every behaviour identified from the dataset was coded in its unique position on the GIS map with three attributes, namely time of occurrence, user type, and behaviour type. Because of Chinese older people's role in taking care of their grandchildren, as well as their mobility levels' influences on their outdoor activity, the user types were classified into six categories which are Male, Female, Male with child, Female with child, Male with wheelchair, and Female with wheelchair. Inspired by Li's (2015) classification of activities in urban squares which includes passing-through and staying-in behaviours, and Ganji's (2018) classification of activities in urban public open spaces including mobile and stationary behaviours, this study categorised older people's behaviours into passing-through activities and on-site activities.

Passing-through activities (coded A1, A2 etc) refer to the activities of moving into, out of and within the site, such as walking, running, or passing through with pram or wheelchair. On-site activities (coded B1, B2, etc) refer to activities happening within a specific range of space within the site, or moving in a small range, such as sitting or standing somewhere, exercising somewhere, playing with children somewhere. On-site activities were further coded under Gehl's (2011) classification of outdoor activities, which included necessary, optional, and social activities. During the data input process, some behaviour codes were redefined in order to identify more specific types of behaviour. For example, behaviours b2 Standing and watching and b3 Sitting and watching were subdivided into behaviour b2 Standing and watching (objects), b3 Sitting and watching (objects), and b21 Standing and watching (people) and b22 Sitting and watching (people). This is because the researcher found that older people watching objects as opposed to watching people represented fundamentally different types of behaviour. Based on Marusic's (2011) experience of generating behaviour maps in GIS, the recorded data were manually inputted into the CAD site plan map in GIS with its unique attributes including user type, activity and locations, transformed into digital symbols (Figure 3.3). Different shaped and coloured symbols were created to represent different users and activities, which is helpful to the presentation of behaviour patterns in overlapped behaviour maps (Table 3.4).
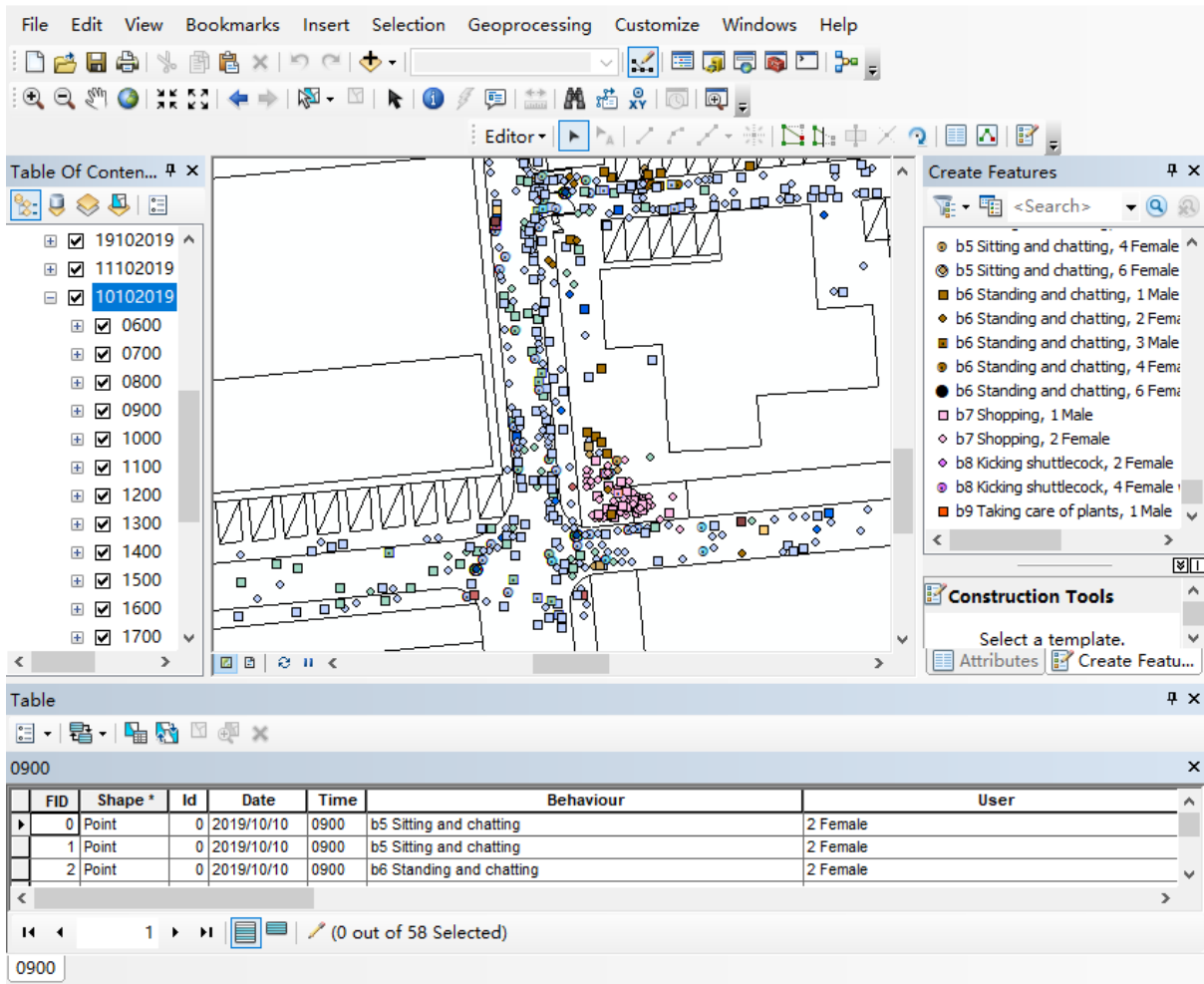
Figure 3.3 Screenshot of the GIS working interface (source: author)

Table 3.5 Examples of symbols (source: author)

Code	Behaviour	Male	Female	Male with child	Female with child	Male with wheelchair	Female with wheelchair
A	Passing-through						
A1	Walking	▫	○	⊡	⊙	▣	◎
A2	Walking with a dog	■	●	■	●	▣	◉
B	On-site						
B1	Doing exercises	▫	○	▫	○	▣	◎
B2	Standing and watching (objects)	▫	○	▫	○	▣	◎

A thematic analysis method was used to analyse the behaviour maps. The theme reveals the key information related to the research question, and shows patterned results within the data (Braun and Clarke, 2006). To be more specific, the analysis of the behaviour maps was undertaken according to two main themes: user and activity features. To present the user features in each site, a pie chart and a line chart were generated for each site with the

assistance of Excel software and BDP online data analysis software (Figure 3.4). These maps help this study to illustrate the proportions of different user types and the number of different users on site at different times. The user density maps and activity spatial distribution maps were produced to show how different users occupied the site and where different activities happened on site (Figure 3.5). Behaviour lists including user numbers and percentages were generated to show behaviours at each site (Table 3.5).
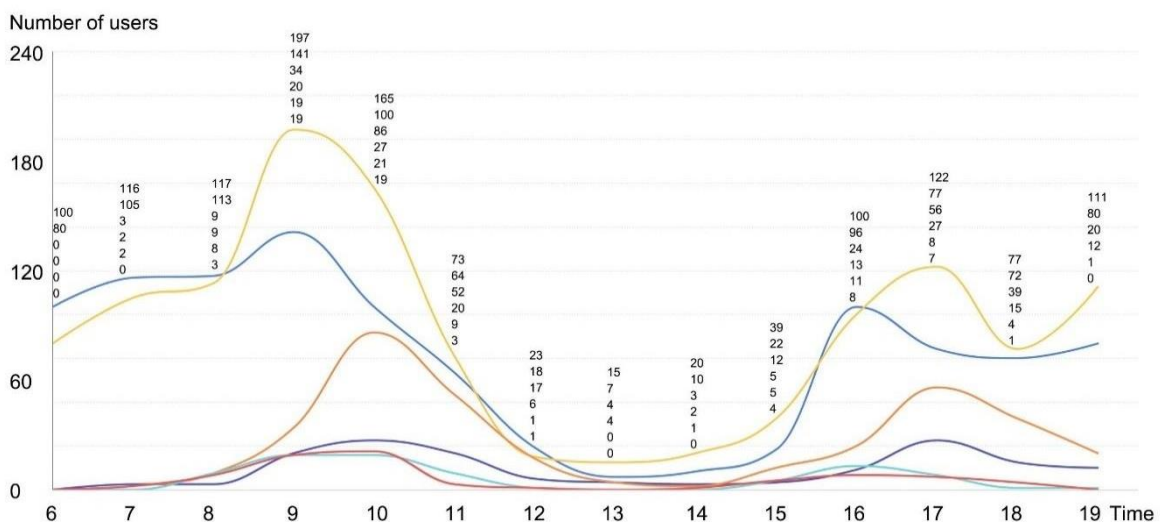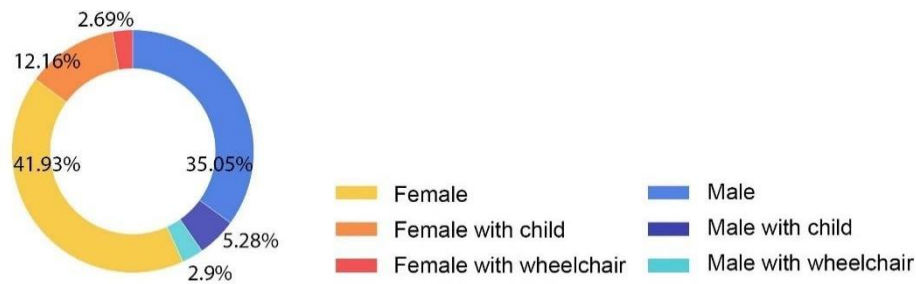
Figure 3.4 Examples of pie chart and line chart to present user features (source: author)

Based on the activity and spatial features in each site, each site was divided into several behaviour settings comprising passing-through space, static activity space, active activity space, nature space, and living and services space. By selecting each of the activities in each site in GIS, the researcher used Microsoft Excel to record each activity's' most concentrated behaviour settings. Then the researcher went back to the observation data, field notes, and on-site interviews to further explore and describe the environmental aspects that support or inhibit older people's activity. After the initial coding, the descriptions for each site's behaviour settings were then summarised and used to generate the spatial affordances. Each

site has a table to document the activity classification, activity, and corresponding behaviour settings, illustration photos, aspects of the space that support and inhibit the activity, and summarised space affordances. Finally, each site's affordances were compared to identify the similarities and differences, and then further distilled and categorised into different levels (macro-, meso-, and micro-scales) according to their features.

Table 3.6 Example of behaviour lists (source: author)

	On-site activities in Site 2	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Necessary Activities	Shopping	9.03%	39	12	26	-	1	-	-
	Collecting parcels	1.85%	8	1	7	-	-	-	-
Optional Activities	Doing exercises	11.34%	49	24	21	1	3	-	-
	Sitting and watching (objects)	6.48%	28	21	7	-	-	-	-
	Airing clothes	2.08%	9	5	4	-	-	-	-
	Standing and watching (objects)	0.69%	3	3	-	-	-	-	-
	Taking care of plants	0.46%	2	2	-	-	-	-	-
	Fixing a chair	0.46%	2	2	-	-	-	-	-
Social Activities	Sitting and chatting	19.68%	85	26	49	4	4	1	1
	Standing and chatting	18.75%	81	24	43	4	10	-	-
	Sitting and watching (people)	12.73%	55	31	21	1	2	-	-
	Playing with children	10.42%	45	-	-	19	26	-	-
	Standing and watching (people)	2.31%	10	5	1	3	1	-	-
	Playing chess (or cards)	2.31%	10	10	-	-	-	-	-
	Playing Tai Chi	1.16%	5	1	4	-	-	-	-
	Playing Badminton	0.23%	1	-	-	-	1	-	-
	Total	100.00%	432	167	183	32	48	1	1
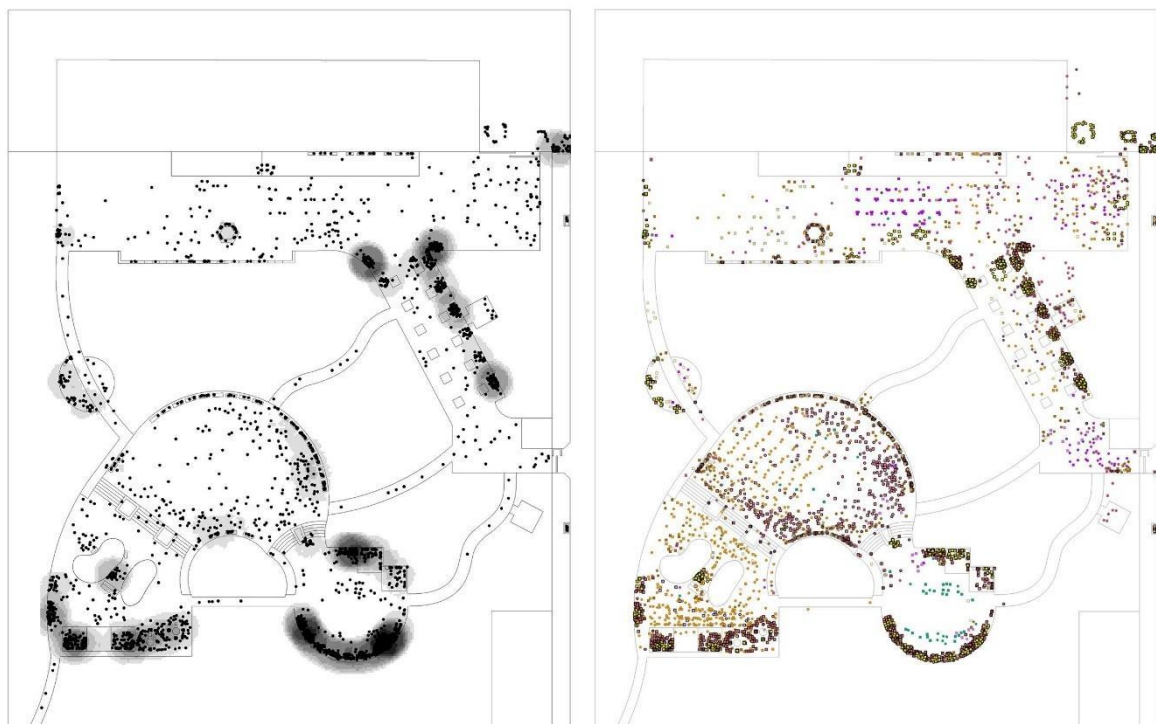
Figure 3.5 Examples of density map (left) and activity spatial distribution map (right) (source: author)

3.3.4. Stakeholder interviews

The aim of the stakeholder interviews was to explore how outdoor space influences older people's ageing-in-place and use of outdoor space, from space designers' and space managers' perspectives, therefore the potential participants needed to have working experience relating to older people, especially in environmental design, and community matters. The strategy for recruitment of stakeholders was convenience sampling (Given, 2018), based on participants' ease of availability. According to the researcher's network and participants' availability, there were six participants from disciplines of architecture, landscape architecture, community committee, and aged-care (Table 3.7). Stakeholder interviews were conducted both face to face and via the phone. The participants were informed and consented to be interviewed prior to doing so, and the interview data were recorded and then transcribed, and imported into NVivo for analysis. The analysis was based on the first and second research questions. The coded themes were then added into Chapter 4, Chapter 5, and Chapter 7 to enrich the results.

Table 3.7 Overview of stakeholder interview participants (source: author)

Stakeholders	Gender	Role
Architect 1	Male	Principal Architect with project experiences of continuing care retirement communities
Architect 2	Male	Principal Architect with project experiences of continuing care retirement communities
Landscape Architect 1	Male	Landscape Architect Director with practice experience of continuing care retirement communities
Landscape Architect 2	Male	Landscape Architect Director with experiences of neighbourhood park age-friendly retrofitting
Community committee staff	Female	Community committee secretary
Aged care providers	Female	Community based aged-care centre staff

3.4. Data collection limitations

Weather is an uncontrollable circumstance within observation research. It was raining whilst the researcher was observing site 2 at 19:00 on September 11st, 2019. The data at this time slot was therefore supplemented by a further observation at 19:00 on September 24th, 2019. Another circumstance caused by the weather is that the temperature turned colder in October whilst the researcher was observing site 1, compared with observations of site 5, which were carried out in warmer weather in August. There were still some older people on site after 19:00, especially at sites 2 and 4. However, the light was diminishing after 19:00 and it was difficult to distinguish people's age range and to capture clear photographs. Therefore, the observational data after 19:00 was not included in the structured observation dataset.

However, the researcher interviewed some older people on site to ask about old people's activities and space usage after this time.

The initial design of the data collection methods included focus groups aimed at facilitating discussions between older people and stakeholders. However, during the process of data collection, the researcher realised that arranging and facilitating such focus groups was too challenging for an individual researcher, especially as there were some potential conflicts between community committees and older residents.

3.5. Data triangulation

Data triangulation has been defined according to four types (Denzin, 1984, cited in Amaratunga and Baldry, 2001): data source triangulation, when the researcher looks for the data to remain the same in different contexts; investigator triangulation, when several investigators examine the same phenomenon; theory triangulation, when investigators with different viewpoints interpret the same results; and methodological triangulation, when one approach is followed by another, to increase confidence in the interpretation. This study triangulated different methodological approaches in the data collection process, and triangulated interview and observation data in the data analysis process. These two forms of triangulation contribute to the integrity of this study.

3.6. Research ethics

This study included the exploration of Chinese older people's daily life experiences, which required the consideration of ethical issues and the position of the researcher. An application detailing all the methods of data collection requiring ethics approval (resident and stakeholder interviews; behavioural observation, mapping, and photography) was approved by the University of Sheffield's Research Ethics Committee devolved to the Department of Landscape Architecture. The main ethical requirements covered:

- Paying attention to participants' safety, especially older people who have less

mobility.

- Being aware of personal safety while doing the observations.

- Fully informing participants to make sure they fully understood the study and obtaining their consent.

- Taking care not to disclose individual identities while recording observation data in public space, as well as while processing and presenting these data. All photography and filming had to be non-obtrusive and carried out at distance so that individual identities were protected, insofar as was possible.

- There was also a requirement to explain the reason for the photography if asked; to request consent from people appearing in the photographs if they requested such information; and to delete the photographs immediately if no consent was given. Any children's faces appearing in the photographs had to be pixelated.

3.7.   Summary

This chapter has explained this study's interpretivist research philosophy, and the reasons for using a multi-method qualitative research methodology comprising spatial ethnography and case study approach. Based on these methodological considerations, the research framework, including four phases and three data collection methods, has been explained. The consociation of semi-structured interviews with older residents, observations, and on-site interviews, as well as stakeholder interviews, was used to draw a comprehensive perspective of older people's ageing-in-place experiences and how they use and perceive outdoor spaces. Each data collection method has been explained in detail, including the participants, data collection procedures, and data analysis methods. These detailed procedures can be used for reference in future relevant research. In the following chapter, Chapter 4, the relevant policy and design standard context, understanding of neighbourhood and community in the Chinese context, research site selection process, and research site contexts will be presented.

Chapter 4 The research context

4.1. Introduction

This thesis moves from theoretical knowledge to the research context in this chapter. First, it introduces the policy, planning, and design standards for China's ageing population, combined with stakeholder's perspectives, which emphasises the need to pay attention to older people. To help the reader understand the research context, the meaning of the neighbourhood living circle is introduced based on the standard for urban residential areas planning and design (GB50180-2018). Then, the meaning of community and its development in a Chinese context are then explained as the primary and most significant stage in the data collection process. The research site selection process is then detailed to explain how each site was selected. Two residential communities and three outdoor spaces were selected for data collection. For clarity, the characteristics and context of each site are also explained in detail and demonstrated with plans and photos.

4.2. Policy, planning, and design standards for China's ageing population

The concept of age-friendly environments was introduced in China in 2007 and became a government priority in 2009 (Xie, 2018). Building an age-friendly environment was raised for the first time in the 2012 revised Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly (the Central People's Government of the People's Republic of China, 2012). The regulation stated that the country should guide and support age-friendly residential development, promote and support older people's barrier-free home modification, and create a barrier-free living environment. Since then, the issues of the ageing population have received attention from various local authorities and have been reflected in policy, e.g., the Shanghai age-friendly city construction guide (Shanghai Civil Affairs Bureau Office, 2013) and the guide to advancing the age-liveable community pilot construction (Shanghai Working Commission on Ageing, 2014). The Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly, which was amended in 2015, highlighted that the country should take steps to promote the construction of an age-friendly

environment to provide older people with a safe, convenient, and comfortable atmosphere. The National Development and Reform Commission (2016) published the *Guiding Opinions on Promoting the Construction of Age-Friendly Environment* (No.73; 2016), proposing five main aspects: age-friendly living environment, transportation environment, health support environment, living services environment, and social and cultural environment.

In China, the published standards mainly focus on facilities for older people in the architectural design field, whereas systematic standards in the urban public environment and community residential environment fields are lacking (Lin, 2015). Only a few standards, such as codes for accessibility design (GB50673-2012), for urban residential areas planning and design (GB50180-2018), and for the planning of urban-rural facilities for the aged (Exposure Draft), mention barrier-free outdoor environments and the allocation of older people's activity space.

After reviewing 66 related policies and standards from 12 representative provinces and municipalities, Yu and Tian (2019) found that metropolises such as Beijing and Shanghai have started to use existing resources to make age-friendly modifications to older people's living environments. The Beijing Municipal Commission of Housing and Urban-Rural Development (2021) published *Guiding Opinions on the Comprehensive Improvement of Old Residential Communities* to implement age-friendly modifications and the construction of a barrier-free environment. This guide suggested age-friendly modifications in areas such as barrier-free movement, public space, home living environment, public services, and home care services. However, Yu and Tian (2019) found that current relevant regulations and standards for age-friendly environments lag behind practice in China, making it difficult to meet the growing ageing-in-place demand for urban and rural older people. As stated by Gadakari et al (2018), building design standards are essential to guiding the design and research process. However, current Chinese design standards need to be more detailed and developed, with a particular focus on older people's health and needs, ergonomics, and supportive technologies, with flexibility and consideration for the differences in climate and lifestyle in northern and southern China.

4.3. Understanding neighbourhood living circle in a Chinese context

The Ministry of Housing and Urban-Rural Construction's (2018) standard for urban residential areas planning and design (GB50180-2018) redefined urban residential areas into 15-min, 10-min and 5-min pedestrian-scale neighbourhood living circles, based on the principle that residents can walk for 15, 10, and 5 minutes to places that meet their diverse needs. The basic neighbourhood unit is the neighbourhood block, which consists of residential housing. These neighbourhood scales are distinguished by the number of residents, residences, boundaries, walking distance, satisfied needs, corresponding facilities and public green spaces (Table 4.1). Street and community committees are two administrative levels that correspond to the 15-min and 5-min pedestrian-scale neighbourhoods, respectively. Neighbourhood facilities within a 5-min pedestrian-scale neighbourhood must have a comprehensive outdoor fitness space with a service radius of 300 metres (including outdoor activity space for older people, such as square dance space and a small ball sports space).

Table 4.1 Graded control scale of the neighbourhood

Scale	15-min pedestrian scale neighbourhood	10-min pedestrian scale neighbourhood	5-min pedestrian scale neighbourhood	Neighbourhood block
Residents	50,000–10,0000	15,000–25,000	5,000–12,000	1,000–3,000
Residences	17,000–32,000	5,000–8,000	1,500–4,000	300–1,000
Boundary	Urban primary roads or land-use boundary	Urban primary and branch roads or land-use boundary	Branch and urban roads or land-use boundary	Urban roads or land-use boundary
Walking distance	800–1,000m	500m	300m	Site area (2hm 4hm)
Satisfied needs	Material and cultural needs	Basic material and cultural needs	Basic living needs	
Facilities	Perfect neighbourhood facility	Complete neighbourhood facility	Complete 5-min neighbourhood facility	Neighbourhood block facility
Per Capita public green space (m²/person)	2	1	1	0.5 / New developed 0.35 / Reconstruction

Source: Standard for urban residential areas planning and design (China – Ministry of Housing and Urban-Rural Construction 2018)

Under this new guidance and in the context of China, Yu (2019) concluded the neighbourhood has three layers of meaning. Firstly, the neighbourhood living circle has distinct geo-spatial

characteristics, which reflect residents daily-life activities, and relevant functional living spaces. Secondly, it has social and economic attributes, acting as a shared unit for residents to participate in social life and access to public services. Thirdly, it also has a neighbourhood boundary, as perceived by the residents, and carries the social networks of specific residents. Based on these understandings, the neighbourhood might not have specific actual boundaries, and may differ from person to person. In this study, the selection of neighbourhood outdoor space is restricted to within 15 mins walking distance, and used by older people in their daily lives. The definition of neighbourhood outdoor space is introduced in Section 1.6.

4.4.   Understanding community in a Chinese context

In English, community refers to 'the people living in one particular area or people who are considered as a unit because of their common interests, social group or nationality' ('community', 2021). In most cases, the term 'community' is translated into Chinese as She Qu. In China, community or She Qu has unique and diverse meanings. Tong Ming (WeChat Media Platform, 2019) established three types of meanings of the word 'community' in a Chinese context in a lecture on whether a community can be planned. The first meaning, on the physicality layer, refers to a neighbourhood unit, which usually covers several or more than a dozen hectares of land, has complete infrastructure and services, and can satisfy residents' daily life needs. The second meaning, on the social layer, may or may not overlap with the physical meaning. In one neighbourhood unit, there may be several communities of people; these community groups may be larger than the neighbourhood unit. The third meaning is about the manageability layer, which relates to the Chinese administrative system. The community committee is China's smallest political unit, with its own organisation to provide both administration and services to community residents (Audin and Throssell, 2015). Residents have the right to participate in the community committee's election and therefore influence the government's policy trend (Tong et al., 2005). A community committee's jurisdiction can include a single residential community or several residential communities.

In this study, the term community is more about the physicality meaning, refers to a residential community, which represents several residential buildings and has a clear

geographic definition.

4.5. Chinese urban residential community development

Since 1949, urban housing has primarily been provided as a form of social welfare and income subsidy within a socialist system (Wang and Murie, 1996). Public-sector institutions and enterprises were responsible for providing accommodation for their employees. After several pilot experiments, the Chinese government initiated the national housing reform implementation plan in 1988 to encourage urban residents to buy their houses and to commercialise and privatise urban housing (Zhang, 2000; Wang and Murie, 1996). During the 1990s, many government-owned enterprises and institutions sold their housing stock to existing tenants or other employees (Wang and Murie, 1996; Wang, 1995). In 1998, the Chinese government (China. The State Council of the People's Republic of China, 1998) announced that public housing would be phased out, and urban housing would be commercialised across the country. Privatised public housing is known as work-unit compounds. Public housing was replaced by commodity housing, purchased by an increasing number of city dwellers (Wang and Murie, 2000). Commodity housing has been proliferating in recent years. In 2010, the urban home ownership rate in China was 89.3 per cent (Table 4.2), with the figure of 11.2 per cent being old/traditional private housing, 38 per cent being commodity housing (new market housing) and 40.1 per cent being work-unit housing (privatised public housing) (Chen et al., 2014; National Bureau of Statistics of the People's Republic of China, 2011).

Work-unit and commodity housing residential communities are therefore the major forms of house ownership in urban China; both are fundamentally different (Huang, 2005). Work-unit residential communities are usually medium-rise buildings (Zhao and Zhao, 2003). Residents of work-unit residential communities typically live there for extended periods and are well-acquainted with one another (Wang and Li, 2004). Their working, living, and social networks all overlap significantly (Li, 2007). According to Ma (2002), work-unit residential communities have intense and strong social interaction and social cohesiveness. However, the outdoor space for walking and recreation in the work-unit residential community is limited, which has

a considerable influence on older people's satisfaction (Yan et al., 2014).

Table 4.2 Tenure distribution of housing in urban China (2011)

Tenure	Home owners			Tenants
	Old/traditional private housing	New market housing	Privatized public housing	
Description	Self-built after 1949 or old housing before 1949	Bought through the market	Bought during the 1980–1990 housing reform	Including both private renting and public renting
Share (%)	11.2	38 89.3	40.1	10.7

Source: National Bureau of Statistics of the People's Republic of China (NBSC, 2011)

Conversely, commodity housing residential communities are typically constructed by estate developers and designed by landscape architects (Wu, 2005), provided with landscaped gardens, high-rise buildings, gated and heavily guarded (Li et al., 2012), and have residents who do not know each other (Wang and Li, 2004). As Li (2007) mentioned, residents in commodity housing residential communities generally work in different domains and have diverse social networks outside the community. Wu (2005) noted that dwellers of commodity residential communities regard their residence as a place to live rather than a site for social interaction; they also have relatively low dependence on their community (Li, 2007). Zhu et al. (2012) confirmed that, when compared to work-unit residential communities, residents of commodity residential communities have weaker neighbourly interactions but intense place attachment due to the pleasant physical environment and less contact with neighbours.

4.6.   The site selection process

As mentioned in Section 3.3.1, this study's case selection is information oriented, but also considered representativeness and accessibility. Therefore, the general strategy behind the selection of residential communities was to focus on areas with significant ageing populations and different residential community types to ensure representation of the population of interest as well as different Chinese main residential community types. The strategy behind the selection of neighbourhood outdoor spaces was based on the interview data, which

helped to identify spaces that were used frequently by older people to ensure they reflected older people's daily outdoor activities.

4.6.1. The selection and context of Beijing

This study was conducted in Beijing, China. Beijing is the capital of China, located in the northern part of the North China Plain, with a total area of 16,410 square kilometres, and seven ring roads. There are 16 districts in Beijing, six of which are in the central urban area (Beijing Municipal Commission of Planning and Natural Resources, 2018), which account for about 1,378 square kilometres (Figure 4.1, Left). In the 2000s, Beijing's built environment grew rapidly, and the central area expanded contiguously (Jian et al., 2016). According to Feng et al. (2019), neighbourhood-level parks are more concentrated in central urban areas, whereas city-level parks are mainly distributed around the fifth ring road (the border of the central urban area). They further pointed out that the distributions of urban parks and urban residents are mismatched. As a highly urbanised metropolitan city in China, Beijing is suitable for researching how older people live in residential communities and use outdoor spaces.

According to the Seventh National Population Census data (Beijing Municipal Bureau of Statistics, 2021), Beijing's resident population was 21.893 million. The population aged 60 and above accounted for 4.299 million or 19.6 per cent, with those aged 65 and over accounting for 2.912 million or 13.3 per cent. Compared to 2010, the proportion of people aged 60 and above increased by 7.1 per cent, with those aged 65 and up increasing by 4.6 per cent. Up to 2019, the Chaoyang and Haidian districts had the most residents aged 60 and over, at 597,000 and 567,000 respectively, among the city's 16 districts. Compared to the previous year's figures, these two districts have experienced the largest growth in the household registered ageing population, at 31,000 and 26,000, respectively (Beijing Municipal Health Commission, 2020). According to the 2010 census data, Beijing's ageing population is concentrated between the second and fifth ring roads, with the remainder dispersed in the outer suburbs (Yi et al., 2014). The large ageing population also made Beijing a meaningful site for conducting a study relating to older people.
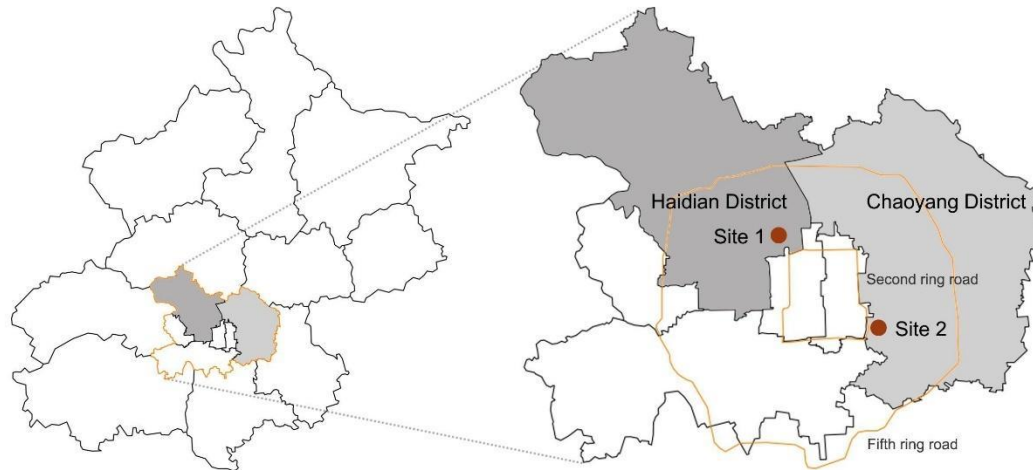
Figure 4.1 Left: 16 districts and Beijing's central urban area; Right: Location of the selected communities in the Chaoyang and Haidian districts (source: author)

As mentioned in Section 4.5 (Chinese urban residential community development), work-unit and commercial communities represent the major residential community types in urban China. To ensure a more focused study with wider applicability, the self-owned housing built before 1949 was excluded from this study as this housing type is increasingly being replaced by commodity housing; it also has a typical layout and local history in Beijing that differs greatly from other areas of China. Therefore, in this study work-unit and commercial communities were selected from the Chaoyang and Haidian districts, which are located between the second and fifth ring roads (Figure 4.1, Right) and have the highest ageing populations in Beijing districts. The following sections will explain why these two specific communities were chosen.

4.6.2. The selection of residential communities

The first residential community (site 1) was selected because it is the pilot community for the construction of an age-liveable community in Beijing (Beijing Haidian District People's Government Office, 2018). The criteria for the government's selection of the age-liveable community pilot site included medium-rise (six floors or less) and high-rise residences built between the 1980s and 1990s, with a proportion of old age residents of at least 10 per cent, space to expand, and transformation experiences that can be rolled-out more widely. Community retrofitting entailed the adaptation of existing housing, provision of community services, and improvement of cultural (attitudes towards older people) and outdoor

environments (e.g., the construction of ramps, stairs, roads, activity squares, walking infrastructure, and additional activity spaces for older people and children). The retrofitting project began in April 2019 and ended in August 2019. This residential community is representative of this residential community type and has an ageing population making it suitable for conducting this study.

The second residential community, built in 2003, is a commodity residential community in Chaoyang district. The district has 24 streets and 19 areas (same administrative level as streets, Figure 4.2). According to Zong Heng Data's report in 2019 (https://mp.weixin.qq.com/s/4ihkgTOwuDDPfIizGA3j1g), the streets in Beijing with the highest density of ageing people are Tuanjiehu and Panjiayuan in Chaoyang district, and Niujie in Xicheng district. Considering that Chaoyang district has the largest ageing population in Beijing, the researcher selected a commodity residential community on Tuanjiehu and Panjiayuan streets. Most of Tuanjiehu street's residential communities are old and consist of work-unit residential communities. There are only a few commodity communities with one to three residential buildings. Panjiayuan street has 12 community committees (Table 4.3), where four commodity residential communities were built after the housing reform in the 1990s.

The researcher chose the newest residential community with the most residential buildings to more potential participants to be approached and have contrasting environmental conditions compared with site 1. Therefore, Panjiayuan street's residential community B from community committee 10 was selected as site 2.
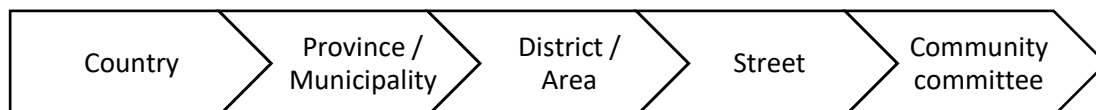
Figure 4.2 Division of administrative levels in China (source: author)

Table 4.3 The selection of residential communities from Panjiayuan street (Source: author)

Panjiayuan Street	Residential communities	Residential buildings	Built time
Community committee1	A	18	1991
Community committee2	A	41	1960s
Community committee3	A	39	1985
Community committee4	A/B/C/D/E/F	35	1990
Community committee5	A	61	1985
Community committee6	A	85	1973
	B	30	1980
	C	12	1980
	D	16	1980
	E	29	1962
Community committee7	A	37	1987
Community committee8	A	21	1984
Community committee9	A	41	1982
Community committee10	A	32	1980
	B	**5**	**2002**
	C	2	2000
Community committee11	A	25	1980
	B	6	1997
Community committee12	A	4	2001
	B	3	2002

4.6.3. The selection of neighbourhood outdoor spaces for observation

Based on interviews with 20 older people at site 1 and 22 older people at site 2 (see Table 3.2), several outdoor spaces were identified as the most used and favoured places for participating older individuals (Table 4.4). Among the site 1 participants, 17 usually do outdoor activities in their communities, while some visit parks (eight go to Shuangyushu neighbourhood park and seven to Zizhuyuan park). Moreover, eight participants from site 1 habitually go to the university near their community without specifying which space on campus they visit (but which may include the green space on campus); five explicitly stated they go to the campus's western green space; while three visit the eastern green space. At site 2, 18 older people said they regularly do outdoor activities in their communities, while 20 highlighted Longtan park.

Among the above-mentioned spaces, Zizhuyuan and Longtan parks are city-level comprehensive parks occupying 47.35 and 49.2 hectares, respectively. It was impossible for the researcher herself to observe these two parks using the same procedure applied in other sites, due to their large size. Therefore, these two city-level comprehensive parks were excluded from this study due to the resource and time constraints inherent to a PhD study.

This study therefore focused on smaller-sized neighbourhood-level outdoor spaces. The university campus as a whole was also ruled out due to its large and diverse area being difficult to subject to the same observation procedure; the western and eastern green spaces on campus were chosen as cases instead.

Table 4.4 Outdoor spaces frequently mentioned by participants (source: author)

Space Name	Number of participants who mentioned these locations
Site 1: Shuangyushu work-unit residential community	17
Shuangyushu neighbourhood park	8
Zizhuyuan park	7
University campus	8
Western green space within university campus	5
Eastern green space within university campus	3
Site 2: Fangdanyuan commodity residential community	18
Longtan park	20

Therefore, apart from the two residential communities, three outdoor spaces were selected for observation: Shuangyushu neighbourhood park, and the western and eastern green spaces on the university campus. These three outdoor areas are distributed within 800 metres of site 1's diameter (Figure 4.3). This section will introduce the context of these outdoor spaces.
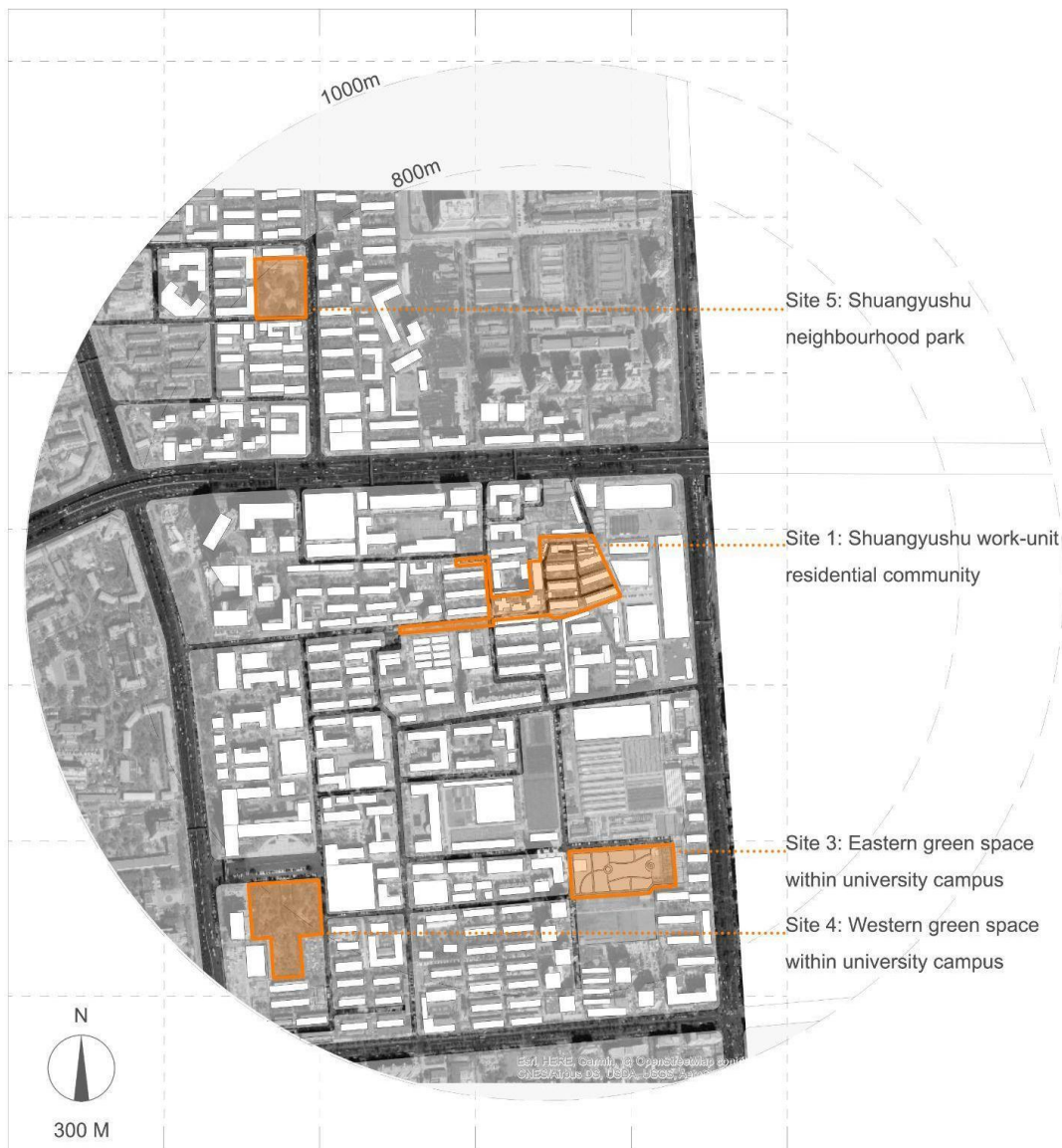
Figure 4.3 Location of sites 1, 3, 4, and 5 (source: author)

4.7. The context of the selected sites

4.7.1. Site 1: Shuangyushu work-unit residential community

Site 1 (Figure 4.4), near the third ring road and a university in the Haidian district, covers 0.64 square kilometres, and was built before the 1983 housing reform. It is not only a work-unit community, but it also includes some relocated households. The total number of registered households is 1,025 with 2,980 residents, 458 of whom are 60 or older and who account for 15.3 per cent of the community's total residents. This residential community is divided into two parts. There are six multistorey residential buildings on the east side of this community with work-unit and relocated residents, only one of which has a lift. On its west side, there

are three high-rise residential buildings with mainly work-unit residents (Figure 4.5).
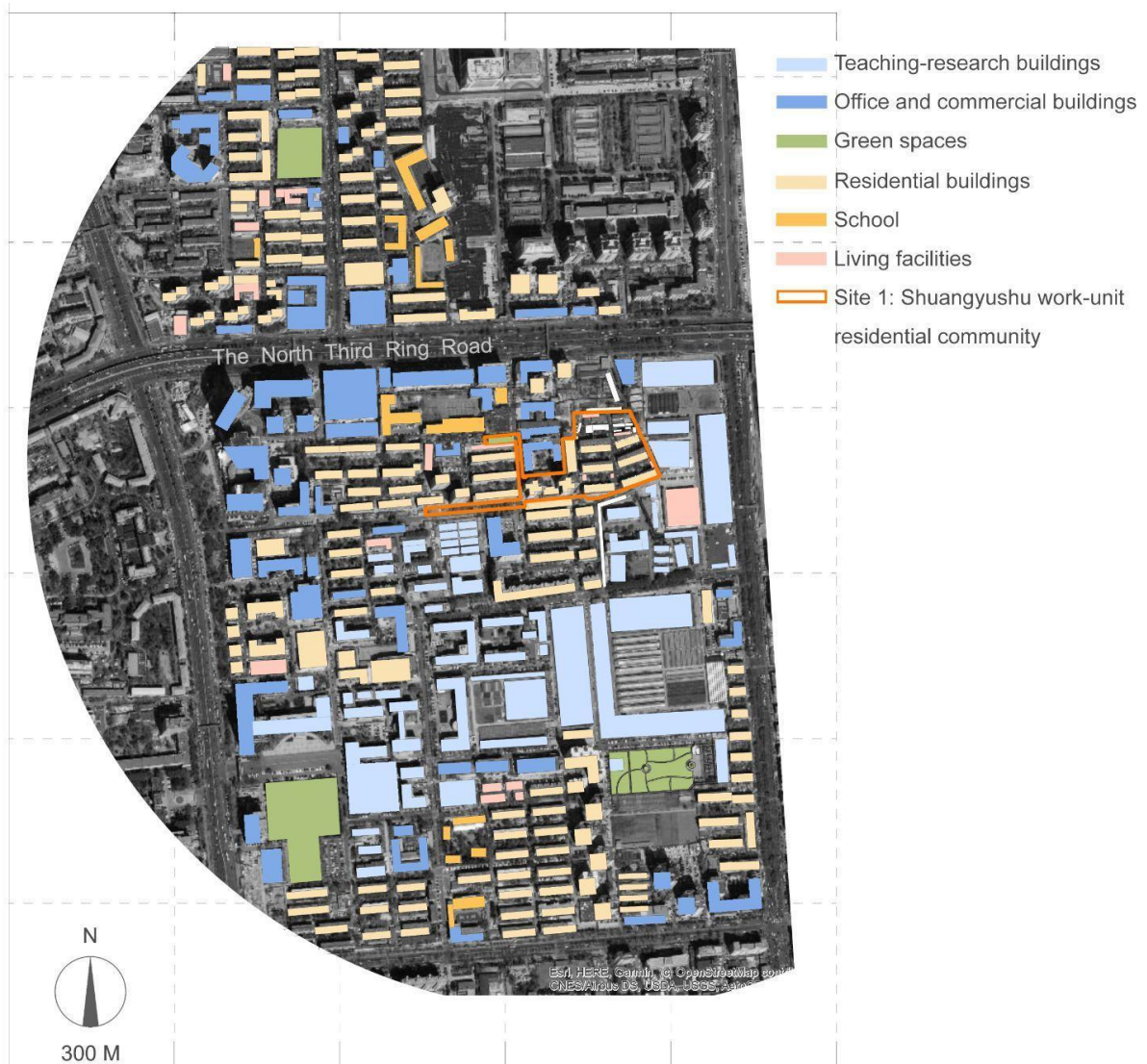
Figure 4.4 Location of site 1 and adjacent urban context (source: author)

No.1 Residential building (Multi-story)
No.2 Residential building (High-rise)
No.3 Community ageing service center
No.4 Community committee
No.5 Grocery store
No.6 Residential community square
No.7 Rest space within the residential community
No.8 Small green space
No.9 Exercise space along the road

Entrance 1
Entrance 2
Entrance 3

N

10 M

Figure 4.5 Master plan of site 1 (source: author)

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● **Residential community entrance**

The community entrances are open and barrier-free, with pedestrian and vehicular roads. The east side's entrances, entrances 1 and 2, are unguarded, whereas the west side's entrance, entrance 3, is guarded.

Figure 4.6 Residential community entrances 1, 2, and 3 at site 1 (source: author)

● **Road and parking**

The road on the east side is split into pedestrian and vehicular lanes by different colours and materials, whereas the west side road is not divided. However, because of the limited parking space, cars occupied the divided pedestrian paths, forcing residents to walk on the vehicular road. Some parts of the road surface are uneven due to underground tree roots. Residents parked their bicycles near the building's entrance.

Figure 4.7 Site 1's pedestrian and vehicular road, as well as its parking space (source: author)

● **Residential building entrance**

With the ramp and handrail installed as part of the community retrofitting, the residential building entrance is now barrier-free. However, one residential building entrance still has stairs, which an older resident required to be kept.

Figure 4.8 Residential building entrance at site 1 (source: author)

● **Activity and rest spaces**

An activity square is located on the east side of the community (No. 6 on Figure 4.5), close to the ageing service centre. Seating is provided along the edge of the square, with billboards to the rear. The rest spaces are in front of the multistorey residential buildings on the east side. Each rest area is unique; some have a pergola with seating, while others have seating without a pergola. Since there are no seating areas along the residential community road, residents bring their chairs or tables to the rest spaces. On the west side of the community, there is only a pavilion with stairs for rest (No. 7 on Figure 4.5).

Figure 4.9 Residential community square, rest space in front of the residential building, and a pavilion at site 1 (source: author)

An exercise area along the road (No. 9 in Figure 4.5) and a small green space (No. 8 in Figure 4.5), outside but close to the residential community (Figure 4.11), have been included in the site 1 research boundary for observation. These spaces are accessible via barrier-free road connections. However, the exercise area is along the main vehicular route with no plants to demarcate it. The small green space (No. 8 in Figure 4.5, Figure 4.12) is a minipark surrounded by several residential communities and a kindergarten. This space has an exercise area, linear benches, benches under a wooden canopy, tree pool with seating and dense trees; however,

there is no specific space for intergenerational use.

Figure 4.10 Exercise area along the road, and a small green space close to the first residential community (source: author)

Figure 4.11 Site 1's small green space plan and illustrative photos (source: author)

● **Landscape**

Some residents create their own 'garden' using the flowerpots for planting in the rest space in front of the residential buildings. Many of the plants in the ground were also planted by locals. However, most of the plants on the east side of the residential community do not show evidence of being designed and maintained. On the west side of the community, there are barely any plants, just some bushes near the pavilion and plants in the small planter.

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Figure 4.12 Landscape in the first residential community (source: author)

● **Signage and lighting system**

This community has a signage system that includes the building number on the wall, the apartment complex number in the residential building entrance, and signposts at the main road crossing. The lighting is only set along the main road via poles, but many areas are not illuminated.

Figure 4.13 Signage and lighting system in the first residential community (source: author)

4.7.2. Site 2: Fangdanyuan commodity residential community

Site 2 is in Chaoyang district, on the outskirts of the east second ring road (Figure 4.14). This residential community is surrounded by other residential communities, close to the Hucheng River and opposite Longtan park, a city-level comprehensive park. According to the Panjiayuan street committee, the total number of residents in site 2 was 980 in 2019, with 260 being from the ageing population, which includes 30 older people whose household registration is not in Beijing. Site 2 was built in 2002, with five high-rise residential buildings, four of which have 24 floors and one has 12 floors (Figure 4.15).
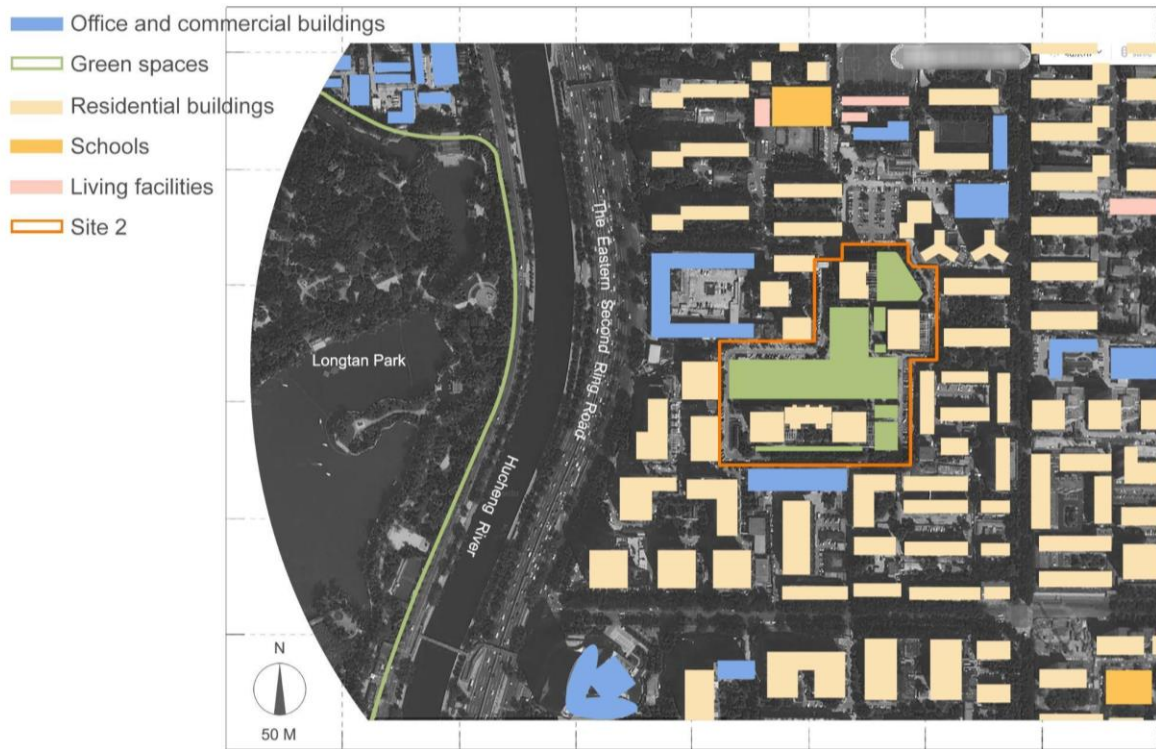
Figure 4.14 Location of site 2 and adjacent urban context (source: author)

Figure 4.15 Master plan of site 2 (source: author)

No.1 Residential building
No.2 Underground parking
No.3 Grocery store
No.4 Rest space
No.5 Children's playground
No.6 Activity space with exercise facilities
No.7 Basketball court

- **Residential community entrance**

This residential community is gated and has only one entrance with a guard, access control, and separate pedestrian and vehicular flow. The strict access control prevents non-residents from easily entering.

Figure 4.16 Residential community entrance at site 2 (source: author)

● **Road and parking**

The road within the residential community is divided into pedestrian and vehicular lanes. Some sections of the road in front of the residential buildings are only accessible to pedestrians, bicycles and electromobiles (mobility scooters). The pedestrian paths are mostly barrier-free with some uneven parts. This residential community has sufficient parking space in the parking lot, underground, and along the road. There are also bicycle and electromobile parking spaces underground and in front of the residential buildings.

Figure 4.17 Site 2's vehicular and pedestrian road, as well as its parking space (source: author)

● **Residential building entrance**

There are two types of residential building entrances. The first has rain-sheltered steps and barrier-free ramps without shelter. The second type also has a rain shelter but has a step height difference between the entrance and the road.

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Figure 4.18 Residential building entrance at site 2 (source: author)

- **Activity and rest spaces**

The areas for activity, exercise and children's playground are all located in the centre of the residential community (Nos. 5 and 6 in Figure 4.15). Outdoor seating is available along the pedestrian paths, by the pond and near the residential building entrance. Two rest pavilions with seating (No. 4 in Figure 4.15, Figure 4.19, Right) are in the southern part of the residential community, behind the residential buildings.

Figure 4.19 Activity space with exercise facilities, children's playground, rest space, and the pavilion at site 2 (source: author)

- **Landscape**

This residential community has a greater variety of plants than site 1. It is also run by a property management company. Though the property's management replants regularly, there is still a lot of bare earth. Nevertheless, residents also grow plants and flowers in front of their residential buildings or in planters in front of their residential building's entrance. In the heart of the residential community, near the main activity space, there is an artificial pond with a bridge that has some fish.

Figure 4.20 Landscape in site 2 (source: author)

● **Signage and lighting system**

This community has a signage system that includes signposts along the road and building numbers on the wall. The lighting is set along the main road, paths, and at the entrances to the residential buildings.

Figure 4.21 Signage and lighting system in site 2 (source: author)

4.7.3. Site 3: Eastern green space within university campus

Site 3 was a university experimental field before it was recently converted into a green space for university students, staff, and nearby residents, surrounded by university residential buildings, teaching buildings, experimental fields, and parking spaces. This site is not restricted to use by university students and staff but is openly accessible to people who wish to use it. Therefore, it is welcomed by nearby residents. This site is widely used by older people, with some middle-aged people and children, but not very often used by university students.

With barrier-free entrances, pedestrians and users with prams and wheelchairs can easily access this location. The main path surrounds the site, while other paths divide it into

different planting areas with a wide variety of plants. Because these plants were newly planted when the site was built, the area is not shady and has clear and wide views. Seating is evenly distributed along the paths and the raised plant bed. The exercise equipment (No. 2 in Figure 4.22) is in the centre of the planting area and is connected by several paths. Users can access this area whether they enter from the north or south entrance. Two pergolas with seating and tables (No. 3 in Figure 4.22) separate the planting and activity areas. The children's activity space (No. 4 in Figure 4.22) is in the north part of the site, between the pergola and basketball court, and is covered by the shelter and surrounded by a low fence. The site's southern section has seating with four tables and a shelter (No. 5 in Figure 4.22), while its eastern part has two basketball courts, which are used by children, adults, and older people (No. 6 in Figure 4.22).

Northern
Entrance

Southern
Entrance

① 1

② 2

③ 3   ④ 4

⑦ 7   ⑥ 6

③ 3

⑤ 5

N

No.1 University building   No.2 Exercise space   No.3 Pergolas with seating   No.4 Children's playground

No.5 Seating with tables and the shelter   No.6 Basketball court   No.7 Activity space

10 M
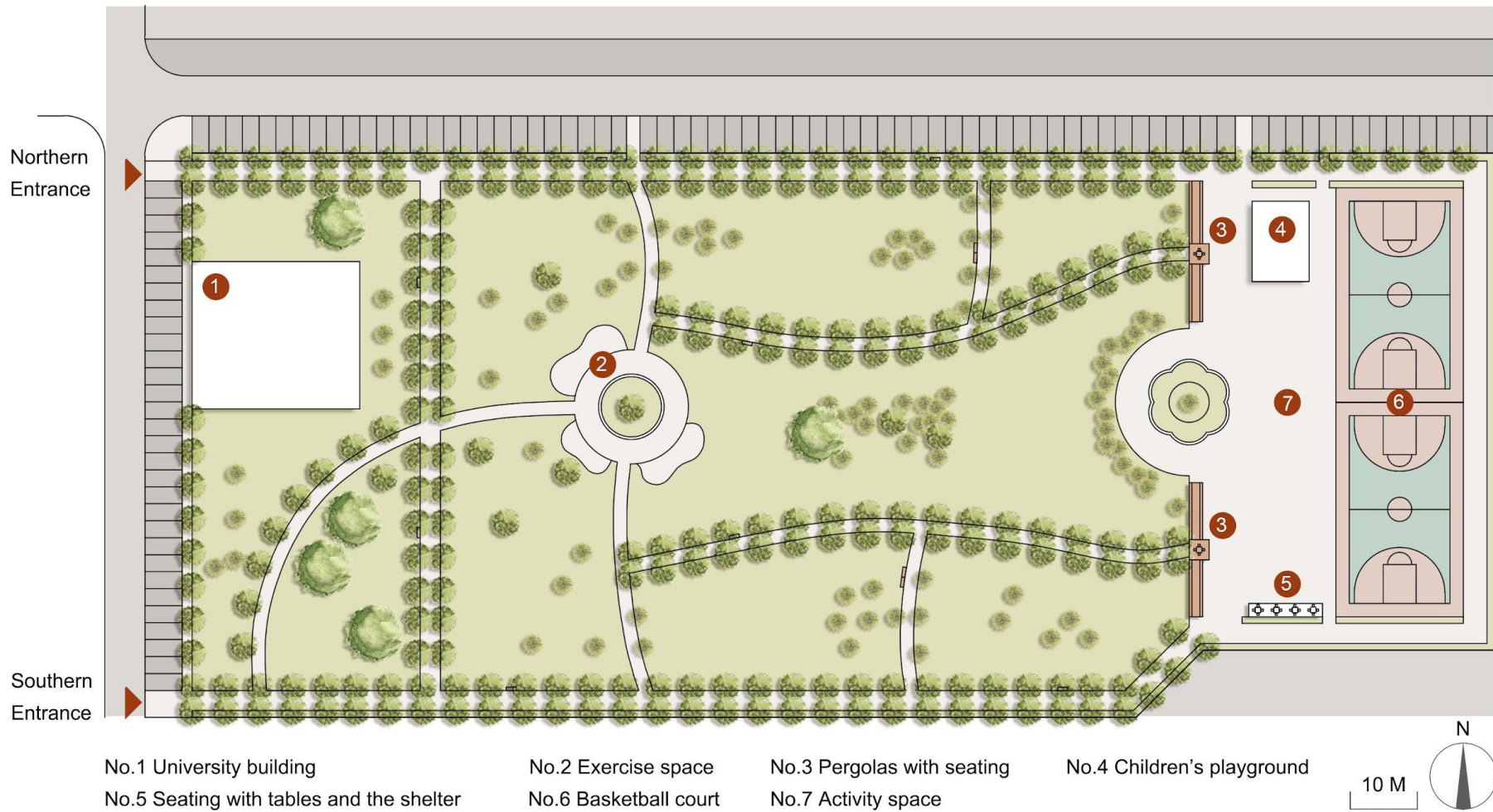
Figure 4.22 Master plan of site 3 (source: author)

Table 4.5 Site 3's illustrative photos (source: author)

No. 2 Exercise space	No. 3 Pergolas with seating
No. 4 Children's playground	No. 5 Seating with tables and the shelter
No. 6 Basketball court	Overview of plants on site 3

4.7.4. Site 4: Western green space within university campus

Site 4 (Figure 4.23) is a green space near the university's main entrance that is mostly surrounded by university teaching and office buildings, as well as a parking space. However, this space has decreased with the development and extension of university buildings over the past decade. The site's winding and narrow paths split it into large planting and small activity spaces. This location has many dense trees with large canopies, making it shady. However, since tall shrubs were also distributed along the paths, these obstructed the views. Seating is likewise reduced and extremely limited because the campus does not wish for non-university people to sleep there. The exercise equipment is distributed on both the west and east sides of the site. Moreover, two table tennis areas are found under tree canopies. There is a large artificial pond with a fountain is in the centre of the northern part, surrounded by some open space. The sound of the fountain combined with the shady trees creates a natural atmosphere. Like site 3, the majority of users of this green space are older people, rather than students.

N

10 M

No.1 Exercise space
No.2 Table tennies table
No.3 Pond with fountain
No.4 University building
No.5 Parking space
No.6 Pergola
▲ Entrance

Figure 4.23 Master plan of site 4 (source: author)

Table 4.6 Site 4's illustrative photos (source: author)

No. 1 Exercise space	No. 2 Table tennis table
No. 3 Pond with fountain	No. 4 University building
No. 5 Parking space	Overview of plants on site 4

4.7.5. Site 5: Shuangyushu neighbourhood park

Site 5 (Figure 4.24) is a typical neighbourhood park that is open to the public and primarily serves residents. It is located along a main road with many residential communities nearby. Most of the site is divided into activity and planting spaces, with a few paths connecting them. This site has different-sized and -shaped activity spaces. Even though there are differences in level between activity spaces, the ramps are designed for barrier-free accessibility. Furthermore, the site's entrances have rails to stop bicycles and electromobiles.

There are numerous seats provided along the margin of these activity spaces, as well as under the trees and shelter. Unlike the other sites, this one does not have any exercise equipment. Two sculptures are surrounded by rails. Most of the plants in this site are dense trees and shrubs. Flowers are only planted in the centre of the southwest activity space.

No.1 Office building   No.2 Activity space   No.3 Rest space
No.4 Trellised pavilion   No.5 Sculpture   No.6 Path with lined trees   ▲ Entrance   10 M

N

① (Office building)

North-east
Entrance

② Activity space in front
of the office building

⑥   ⑤

③

② Central activity space

②

⑤

East
Entrance

④

②

② ③
④

Main road

▲ South Entrance   Main road
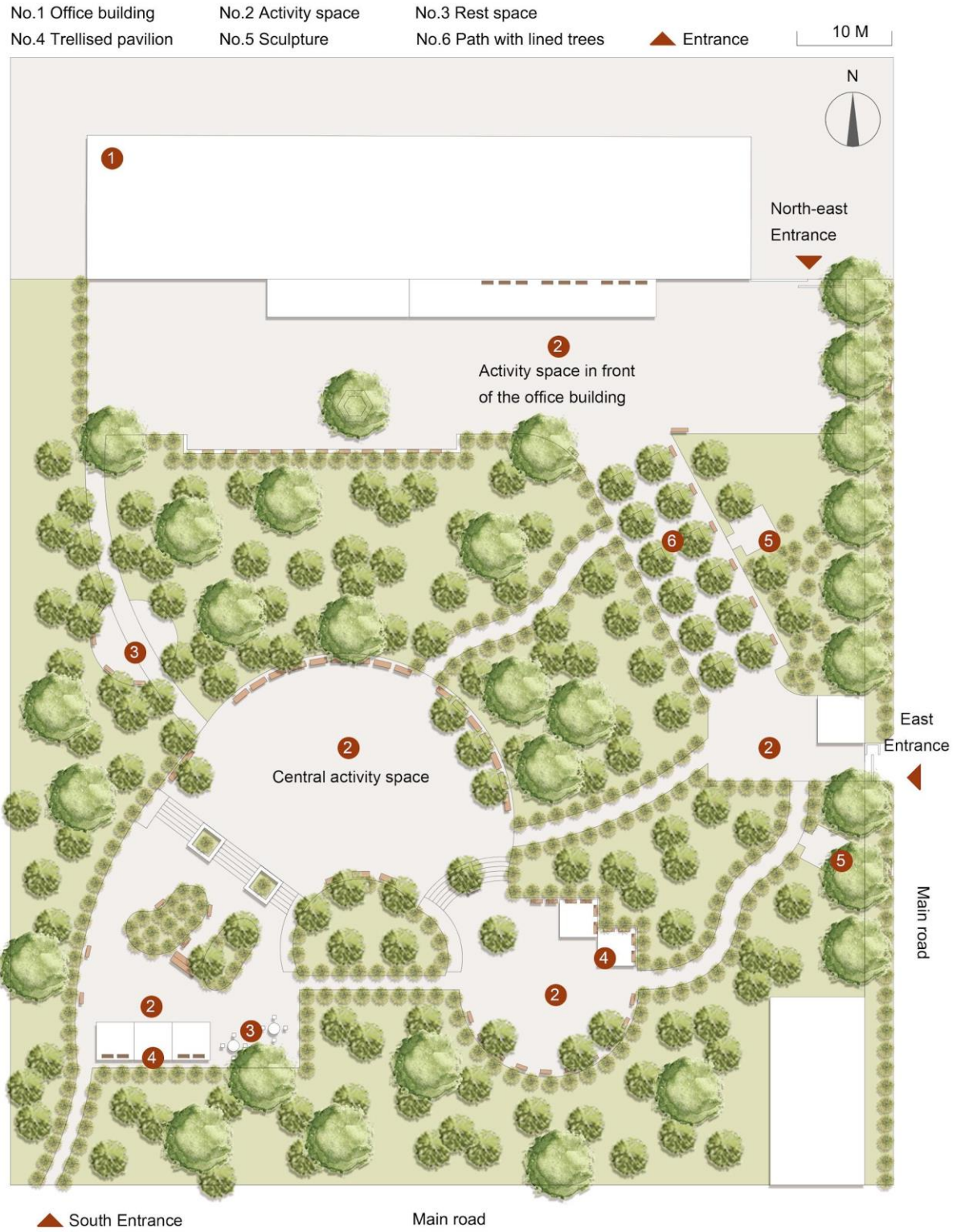
Figure 4.24 Master plan of site 5 (source: author)

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Table 4.7 Site 5's illustrative photos (source: author)

No. 1 Office building	No. 2 Central activity space
No. 3 Rest space	No. 4 Trellised pavilion
No. 5 Sculpture	Overview of plants on site 5

4.8. Summary

This chapter introduced the development of age-friendly initiatives and published standards in China, and highlighted existing gaps, the need to conduct further age-friendly research in China to support the development of current policy and standards. The newly proposed standard for urban residential areas planning and design, which defined the neighbourhood-life circle in a Chinese context, was then introduced to help the reader understand the neighbourhood, and how neighbourhood outdoor space has been defined. The physicality, sociality, and manageability of community in the Chinese context was then explained, and what residential communities mean in this study. The differences between work-unit and commodity housing residential communities, which are the two main residential types in China, were also underscored. The process of selection of Beijing and the two residential communities and three neighbourhood outdoor spaces based on their representativeness, accessibility, and proportion of older residents, was then presented. The selected sites have different environmental characteristics, which have been illustrated with descriptions and photos. The findings from the data gathered from the interviews and observations conducted at the selected sites are set out in the next three chapters.

Chapter 5 Factors influencing experiences of ageing-in-place and use of outdoor space

5.1. Introduction

This chapter moves from the research context to the analysis of data, presenting the findings from the interviews with older people and stakeholders undertaken in Phase 1, with the aim of addressing the first research objective:

To identify the multiple factors that influence older people's experiences of ageing-in-place and use of outdoor space.

The analysis of the Phase 1 interviews provides a better understanding of the personal and environmental factors that influence older people's choices and experiences of ageing-in-place. The data from the interviews with older people from the two communities mentioned in Chapter 4 was thematically analysed using NVivo. 127 nodes were identified and refined into four main themes and some subthemes. The four main themes: Personal Factors, Social Relationships, Physical Environment, and Agency, have been used to structure this chapter according to four sections. The subthemes have been used to structure the subsections and detailed contents.

The first section discusses how older people's personal situations, including their independent living ability, mobility, mental health, and financial conditions, which act as premise factors enabling or limiting their decisions to use outdoor space and their choices of whether or not to opt for ageing-in-place. The second presents older people's social relationships at a family and neighbourhood level, and explains how their interactions with others, participation in community matters, together with the availability of community services, promote or inhibit their use of outdoor space and influence their experiences of ageing-in-place. The third section sets out the experiences that older people have of contact with the physical environment and their perceptions and preferences in relation to it.

Agency as a decisive factor in older people's experiences of ageing-in-place is illustrated by

the fourth section, which syntheses the above factors.

5.2. Personal situations as premise factors

5.2.1. Physiological health

The premise of ageing-in-place is that older people have the ability to take care of their activities of daily living, so they can live an independent life in an environment that they are familiar with, rather than moving to care homes. When participants talked about independent living, their concerns focused on whether they could look after themselves and maintain some level of mobility. Maintaining these daily activities are important for older people to live an independent and good-quality life. This factor is also recognised by some stakeholders who acknowledged that older people's health conditions are a significant factor that will influence their choice of ageing-in-place or moving to care institutions, as well as their use of outdoor spaces.

"Ageing-in-place, to be honest, is children busy with their own things. I can cook by myself, maintain my life. Buy things I want to eat and do things that I wish to do." [S2_12_F_75]

Older people's ability to live independently is determined by their physiological health conditions. A decline in health conditions was seen as associated with the ageing process. Therefore, of the majority of the participants expressed their concerns about their, and sometimes their partners', health conditions as well.

"I'm afraid of being ill and going to the hospital, afraid of being unable to move. These are the things that make me panic...For example, my partner and I, one of us will experience mobility difficulties and lose our ability to look after ourselves one day. It's inevitable in the ageing process. " [S1_20_F_75]

In order to live independently during the ageing-in-place process, being healthy is also one of the main reasons for older people to go outside. Apart from older people who like to go outside for exercise, those older people who do not like to exercise will sometimes force

themselves to go outside to stay healthy and prevent chronic diseases. As one participant mentioned:

"I don't actually like doing exercise. Just exercise a little bit. Force myself to do it, otherwise I will get the Three Highs (High blood pressure, high blood glucose, and high blood lipid levels)." [S2_10_M_79]

Those older people who exercise regularly also have different levels of exercise intensity due to their different health conditions, which is relevant to the following factor, mobility.

5.2.2. Mobility

Health conditions not only determine older people's ability to live independently but also influences their mobility. With the lengthening list of health problems and declining mobilities, participants changed the outdoor spaces they visited habitually. Participants in good health and with good mobility usually go to more distant places, for example, to a city level park by bus, whereas those experiencing health and mobility problems just go walking in the local area or even only within their residential community. Here are two participants who talked about changes to their usually visited outdoor spaces.

"I'm not going to the Summer Palace and the Old Summer Palace anymore. I used to go there two years ago. Sometimes with my partner, sometimes with other neighbours, I just went there by bus. But not now...I cannot walk for a long time." [S1_6_M_73]

"I usually just walk within the community or the other community outside here. Not walking for a long distance anyway. I used to go to the parks previously. But now that I'm aged, mobility has declined relatively. I used to go to Tiantan Park, Longtan Lake Park. I'm old now, my children worry about me if I walk for a long distance and if something happens to me outside." [S2_1_M_82]

Apart from the changes to their usually visited places, their activities also changed according to their different health and mobility levels. Their outdoor activities also transitioned from

being very active to very passive, for example, just sitting outside.

"I had four activities today. I practised dancing before 10 o'clock in the morning, went to Haidian District Women and Child's Activity Centre and watched the Beijing Opera, came back to Nong Ke Yuan at noon and practised singing in order to participate in our street Flower Festival. Then ride back here to play table tennis." [S1_19_F_63]

"I have arthritis in my legs. I usually just sit within the community and enjoy the sunshine, sometimes walking for a while. I used to go to Longtan Lake Park. But I'm not going this year because of arthritis in my legs…I used to walk outside in the evening…" [S2_8_F_77]

Most participants stated that they try to do more activities, or even just try to go outside to maintain their state of health. The interviews reveal that being outside and participating in outdoor activities becomes more important in older people's daily lives. The immediate environment, which can support older people who are less mobile to do outdoor activities, becomes especially vital in their ageing-in-place experiences as people become unable to access locations that are further away. Here a participant described how her partner tries to go outside to maintain mobility.

"He likes to go outside now. He did not go out for more than a year when we lived in Zao Jun Miao. He got sick for years. His legs do not have power. It is very convenient to live here on the first floor. It is very nice we can go out for a walk and chat. He does not want to stay at home anymore, usually wants to go outside." [S1_17_F_73]

5.2.3. Mental Health

Apart from older people's independent living ability and mobility, the state of their mental health also influences their experiences of ageing-in-place. Some negative feelings came from participants' declining state of health. This was first represented by participants' negative judgements of themselves, for example, they regarded themselves as useless, and worried about bringing trouble or becoming a burden to their children.

"I have told my children, if I have a terminal illness, do not give me any treatment. I am aged and useless." [S2_1_M_82]

Here a participant who survived a cerebral infarction and had some associated sequelae described their state of mind:

"It is not easy for them to have me like a burden. People usually say it is good to have older people at home. But I think it is a burden." [S2_9_F_80]

Apart from their worries about their state of health and negative judgments of themselves, some older people also faced other negative emotions, for example, loneliness, sadness, depression, and subjective powerlessness.

"A big problem nowadays is that older people are very withdrawn and the essence of this is that there is no communication with others. There is no communication between the older people. They are mentally monotonous and withdrawn. There is no opportunity to interact or talk to each other. This makes life very monotonous and miserable." [S1_1_M_90]

The interview data revealed some reasons for these feelings of isolation, including lack of communication opportunities, loss of relatives, conflicts with relatives and children, environmental changes, and so on. These were caused by external factors to a great extent, but further underscore the importance of maintaining older people's mental health in ageing-in-place. The stakeholder, who is a landscape designer with experience in designing continuing care retirement communities, also noticed that changes in older people's mental status have the potential to influence their ways of living and use of spaces, which requires designers to take these changes into consideration in the design process.

"The design itself is first of all back to a deeper understanding of the physical functions of the older people themselves, and then the corresponding strategy. The second is to consider the psychological changes of older people. After gradually ageing, the state of all people is actually different from when they were young, you really cannot imagine. You will find that state, the whole physiological and psychological gaps and changes, including with family and

friends...The elderly are a contradiction, they want to be independent, but still need psychological care." [Landscape Architect 1]

5.2.4. Financial conditions

The interview data also revealed interviewees' overwhelming concerns about their financial status with regard to daily living costs, ageing-in-place, or moving to care homes. For example, when older people find it difficult to cook by themselves, they become very concerned about nearby restaurant or canteen prices, revealing that some older people's spending habits are very frugal.

As soon as I came [to this residential community], my son-in-law went to buy me a 200 yuan meal ticket, he said you can go there to eat. Not to mention the taste, the price is too expensive. It costs 18 yuan for lunch...This is completely profitable...If you have to ask them to deliver, it costs three yuan. It is just the distance outside the community walk to here. My legs are not good, I can slowly walk over, I don't want to spend this three yuan, I will go by myself. [S2_09_F_80]

Reflecting on visiting parks that are far from their residential communities, most older people mentioned that they can take buses for free to visit parks, with only one older person saying she would go to the park by taxi. Some municipal parks in Beijing are not free for all to use, but Beijing's policy is to support older people aged 60 and over to visit these parks for free, and to offer free public transportation (China. General Office of Beijing Municipal People's Government, 2018).

Participants' most frequently mentioned concern related to the financial aspects of ageing-in-place is whether they can afford medical care and carers relevant to their health conditions.

"The ageing problem is a noticeable problem. There are three 'not enoughs'. I do not have enough money for a caregiver. Their salary is too high. Not enough beds in care homes. I do not have enough money to hire caregivers in hospitals." [S1_13_F_83]

Some participants do consider moving to care homes. However, their expectations of the care home's environment and the cost did not match. The majority of older people actually wish to have a comfortable but also affordable care home, but usually the environment is unsatisfactory, or the cost unaffordable. The financial consideration has also been noticed by some stakeholders, who are aware that some older people might not be able to afford the expensive care institutions, or continuing care retirement community.

"The care homes now are very expensive, require many deposits, we cannot afford it. Those cheap care homes, it is like waiting for death, very lonely and lifeless. Some people went there for just one month and came back. They cannot bear that environment. Staying at home is better." *[S1_20_F_75]*

"Nowadays, various developers are trying to create a better environment and living environment for the older people. So, when they build these projects, they actually invest quite a lot of money. The service system they bring to the older people is also very good. These bring a problem, the price is very expensive, often hundreds of thousands or even millions." *[Architect]*

This further highlighted the importance of age-friendly residential communities that can support older people ageing-in-place, rather than forcing older people to feel trapped in their communities.

These interviews revealed how older people's personal factors, comprising physiological health, mobility, mental health, and financial status, influence whether they can age-in-place actively and live a quality life. These personal factors determine whether they can balance personal capabilities and external resources and restrictions, such as the supportive or unsupportive residential community and neighbourhood environments. These factors also revealed older people's internal concerns and needs in the process of ageing-in-place. The following sections now go on to present the role of external social and physical factors in influencing older people's use of outdoor space and experiences of ageing-in-place.

5.3.   Social relationships

This section presents older people's social relationships and engagement at the family and neighbourhood level. The family relationships include the extent and diversity of their contact with children, partners, and grandchildren. Their neighbourhood connections comprise how they perceive and build intimate or reserved relationships with neighbours, formalised social engagement in community matters, and community services. This section will explore how various informal casual social interactions could enable older people to receive reciprocal support and companionship from family members or neighbours, which also promote their use of outdoor space. It also details the reasons why formalised social engagement contributes to their sense of inclusion as well as attachment to the community. The section then explores how these informal and formal social contacts work together to influence older people's experiences and wellbeing in the ageing-in-place process.

5.3.1.   Diverse Family Contact

5.3.1.1.   Children

Several different household compositions were identified from the interviews, namely empty-nest (living alone or with a partner), living with their children, or with their children and grandchildren. These different living arrangements determine whether they have close contact with their family members and, therefore, influence the arrangement of their daily lives.

Parent-child relationships dominate Chinese family relationships across different generations. Children providing care for their parents is a traditional behaviour which represents filial piety in Chinese culture (Yeh, 2003). Some participants who live with their children not only receive support and companionship in their daily lives but are also enabled to maintain social contact with the outside world via facilitation of the use of outdoor space. As one participant said, with the help of her children, she could go to a distant park to watch other people's activities, which is an important thing in her life:

"My son takes me to walk around, listen to people singing the song and Beijing opera. I like

sitting there to listen to opera. My son will walk around. He will take me to listen to the other group of people singing the opera until everyone leaves. Then we will come back for lunch. We will go to Zizhuyuan Park every Saturday." [S1_21_F_95]

However, there are also participants who move into their children's homes because they need to take care of their grandchildren or they themselves need care from their children due to illness or infirmity. In these circumstances, even though older people are still living in residential communities, they are uprooted from their own local social networks, with only their relationships with their own children thus remaining.

Some empty nest participants, whether living alone or with a partner, expressed their feelings of loneliness, which indicated that their need to receive emotional support and companionship from their children had not been satisfied. In this case, the interaction with their neighbours becomes an important source of social interaction. In contrast, some participants stated that they chose not to live with their children because of conflicts with them, for example, over different living habits and perspectives. Here a participant talked about the reasons why he chose to live alone:

"Many older people do not live with their children, they choose to live alone. The first reason is the differences in lifestyle, the second reason is the differences in ways of thinking. We cannot live together...I am still isolated even though I have many children. They did not have time to chat with you even when they came back, to talk about how I ate and dried the bran in the past. They do not talk with you. We have barriers in thought." [S1_1_M_90]

5.3.1.2. Partners

Apart from older people's relationships with their children, partners and spouses also played an important role in providing daily living, offering emotional support and companionship to each other. They build living habits and rapport together through years of shared experiences. Numerous participants said they got used to going outdoors with the companionship of their partners. This does not necessarily mean going to the same place together; sometimes they go out together and do different activities in different places.

"I run and she walks around while we go out together in the evening. She just walks on the street. We go to Zizhuyuan Park in the morning together, have a rest in the afternoon, and walk around in the evening. Then the day is finished." [S1_10_M_62]

However, participants explained how the habit of going out together was broken when older people's partners experienced health problems. Partners' health problems will change the fundamentals of their lives and restrict their activities as well. For example, a participant stated that she used to go to city parks with her partner, but now her life revolves around her partner, and they only can go to the neighbourhood park close to their community because of her partner's illness.

"All my thoughts are to take care of my partner. So, I do not have connections with neighbours. I do not even meet with my friends, just chat via Wechat. I go out very rarely, do not have time…I used to go to Zizhuyuan (a city park). It is quite big. But now I cannot go anywhere because of him. Zizhuyuan is much bigger than here (the small green space close to community 1)…I do not have any hobbies now. He took all my hobbies. No pleasure at all. Every day is very depressing. I don't have any other mood. Really depressing…" [S1_17_F_73]

Furthermore, older people experienced the loss of a partner not only in perceived emotional loneliness but also as a reduction in their activities and social interactions, which could lead to social isolation. This theme came up for example in discussions with participants who described changes in their outdoor activities. The loss of partners undermined their motivation to go to parks, maintain their outdoor activities, and wider social connections.

"In terms of the parks, I used to go to the Summer Palace with my partner. But I do not have any interest in going there by myself. It is alright to stay here. So, I just walk within the community. I do not have any interest in other places. All I care about is my health." [S1_3_M_87]

"It was about 10 years ago, my partner was still alive. We went to Longtan Park every day. There are many activities. We exercised together…I could walk at that time. But my partner passed away afterwards. I do not have interests and motivations by myself. They have

partners to go with. I really admire those old partners. It is two people anyway." [S2_9_F_80]

5.3.1.3. Childcare

As some stakeholders mentioned, to design environments for older people requires paying attention to children, family, and older people themselves. Interviews also reflected a recurrent situation, namely that many participants took on childcare duties to look after their grandchildren. The majority of their daily lives are grandchildren centred because their child and daughter/son-in-law are working full time. They spend most of their time doing housework, cooking, taking grandchildren to and from school, etc. This close connection with family members provides sufficient emotional support at the family level. However, a majority of participants stated that taking care of grandchildren occupied their leisure and rest time. Consequently, they do not have time to do their own activities or to go somewhere else, which could in turn influence their wider social connections. Here are two responses from participants who mentioned childcare duties when asked about their daily outdoor activities.

"I do not have many activities, just looking after my grandchild every day. Some older people have many activities, for example, dancing, singing, they are really happy. I am just looking after my grandchild. Their activities are really abundant. My daily life is doing housework, cooking, and picking my grandchild up from school." [S2_20_F_60]

"I do not have many activities now. She (participant's grandchild) is young and pretty troublesome...I used to go to parks very often, every week, any time as I wanted. But now I go out much less since I have a grandchild." [S1_9_F_75]

The interviews revealed that when older people look after their grandchildren, their activities tend to become centred within their communities or spaces that are otherwise very close to their communities. The immediately accessible outdoor space becomes an important space for intergenerational usage. Older people may also play the role of guardian by watching or waiting for their grandchildren when playing outside. These activities also provide opportunities between those older people who look after their grandchildren to have some casual communication as their grandchildren play together:

"I usually went to Tian Tan Park. My grandchild is too young, she cannot go there. Some older children can go to parks. The young children are just staying within the community yard. I haven't gone anywhere recently, just looking after my grandchild." [S2_6_F_65]

When older people relinquish the burden of childcare responsibilities, when their grandchildren do not need their care anymore, they might feel exhausted and experience a loss of mobility and the motivation to do more outdoor activities. For example, several participants mentioned being tired while they talked about childcare. As one interviewee said, she has looked after her grandchild since she retired and she does not have the energy to pursue many activities, even though she now has the time to do so.

"I just became idle last year. Now I am not doing anything. Just staying at home to cook and wash clothes. I retired for 20 years and to help them (participants' children) to look after their child. Now I can finally have a rest. But I cannot walk for a long distance and do not want to go anywhere anymore." [S2_12_F_75]

In contrast, some others who maintain better personal agency and mobility tend to be more active compared with the period in which they took care of grandchildren.

"I just walked around the community when my grandchild was young. Now I'm not strolling here (within the community). I usually play table tennis in Long Tan park." [S2_17_F_67]

Older people who look after their grandchildren spend most of their time in families, play the role of caregiver, and benefit from intimate family relationships. Restricted by their grandchildren, they might not go to distant parks as frequently as they used to, staying in their residential communities instead or going to parks close to their residential communities, which could influence their social networks to some extent. However, they have more opportunity to get familiar with their neighbours, especially those older people who look after grandchildren as well. This further revealed that the immediate outdoor spaces within and around older people's communities are important for older people who are restricted to their communities to have casual communication opportunities and build relationships. After the cessation of their childcare duties, maintaining a good level of health and mobility determines

whether they can resume their activity range. In summary, older people who lack connection or interaction with their family members, for example, children or partners, tend to have greater social needs from their neighbourhood. In contrast, older people may use the outdoor space and build their social networks outside their communities more actively with companionship from their children or partners. On the one hand, looking after grandchildren might limit older people's own social lives; on the other, this also brings opportunities for older people to build social relationships at the neighbourhood level, especially within their communities.

Another theme appearing from the interviews was that in order to receive care from children or help children to take care of grandchildren, some older people moved to live with their children; therefore, they might be uprooted from their familiar social relationships. This relates to older people's neighbourhood relationships, which will be further discussed in the next section.

5.3.2. Neighbourhood connections

This section reveals how participants in both of the communities have divergent relationships with their neighbours - both intimate and reserved - which influence their sense of place attachment, use of outdoor space, and experiences of ageing-in-place. The effect of formalised social engagement and community services in influencing older people's ageing-in-place and activity is also explored in this section.

5.3.2.1.   Intimate relationships with neighbours

A common view amongst interviewees was that intimate relationships with neighbours are reciprocal and mutually supportive. They reported better living experiences, for example, having more chances to communicate and receive emotional support, or even help with each other's family members. The intimate relationships between neighbours even became a motivation for them to go out more frequently. Here, one participant said she enjoyed walking around with her neighbours.

"Here is like a small home anyway. It is nice to have many friends. You will not be happy if you

do not have many friends...This is the environment that I am familiar with. I have lots of friends and know many neighbours. We have good relationships...It is nice to meet with each other. It is delightful to go out because I know lots of people. Sometimes I can meet with someone when I go out and then we can walk together and have some communications with each other. It simply makes me feel happy." [S1_20_F_75]

Many participants described their social needs, for example, seeing and talking to other people, which is important to them in terms of receiving emotional support because these social interactions became a way for them to pass the time and to avoid loneliness.

"We do not have many things to do, we must go out. Only having two older people at home is very boring. We have to go out anyway. Some older people stay together and talk about anything." [S1_6_M_73]

"That older brother (the neighbour living in the same buildings with participants) usually interacts with us. His child is not at home. He likes to talk with peers. Many older people are like this, children are not nearby and willing to talk with peers." [S2_13_M_75]

The need for social connections was also echoed by another participant who stated that she wants to move back to her previous work-unit residential community. She shared the memory that she watched movies with her old neighbours at the so-called 'big pitch' in their residential community. This showcased how the physical environment hosts a social bond. As stated by this participant, the neighbours there satisfied her social needs, for example, talking and companionship.

"I have another idea, but it is unrealised. I just want to go back to my previous work-unit residential community. There is no big difference with this one. That community is also a gated community. The neighbours are all from our units and acquainted with each other. So, we have many things to talk about. We can talk about our past and our children. Our children also know each other, they play together. I really want to go back there, but I can't. The house has been sold." [S2_9_F_80]

Older people's acquaintances within the residential community and in their neighbourhood, also play a role in satisfying older people's social needs. Intimate relationships with acquaintances facilitate older people's use of outdoor space, and in turn emphasised the importance of social profiles in a place. One participant described his impressions of outdoor space:

"There are many old men there. We talk together every day. We sit and chat in the pavilion in Lianhuazi Park." [S1_5_M_77]

Apart from receiving companionship and emotional support from neighbours, mutual support between neighbours was also identified from the interviews. Neighbours play the role of being each other's informal helpers, for instance taking care of each other's family members, helping to carry heavy objects, etc. This instrumental support helps older people to develop their attachment to the place. The comment below from a participant who is living with her father illustrates how they develop relationships with neighbours and attachment to the neighbourhood through mutual support and interactions with neighbours.

"We have good relationships with some of our neighbours. For example, when I need to go on a business trip, a sister neighbour will help me to take care of my father, deliver food sometimes. We still have these interactions. I will share some food with them when I cook something delicious, and they will also share with us. It is a kind of attachment." [S1_2_F_60]

The building of neighbours' intimate relationships is based on residents' familiarity with each other. Familiarity requires time as well as meeting and casual interaction opportunities. Here a participant who usually spends time strolling in the community talked about how he built relationships with his neighbours:

"Did you see the twins over there? There are three twins in our community, they call me grandfather every day. I usually take some chocolate to give to those children when the weather is not too hot. They call me grandfather every day, it has been four generations. How do people develop relationships? For example, I compliment those children, their parents will be happy, they will call me grandfather, and I will give them candy. This is a good relationship.

That is how people communicate." [S1_1_M_90]

These intimate relationships between neighbours seem more common in the first community because these older people have lived in their community for a long time and have established their neighbourhood networks. These relationships contribute to older people's attachment to their neighbourhood and provide an incentive for older people to go out more frequently.

Stakeholders of architects and landscape architects also emphasised the importance of engaging older people in social activities, to avoid older people becoming isolated, and enable them to maintain their social identities. An architect explained how they help older people to build social connections in one of their continuing care retirement community projects:

"In the middle of the community there is a public building, we have designed a lot of different studios and workshops, each of which has a different function, such as piano, chess, calligraphy, painting, food, drink and entertainment, Chinese medicine, etc. Anyway, it's like a role-play for older people, they can go in and fulfil their dreams or realise their social values. It's the equivalent of a small society, which you build up and then let them find their own circle. In this way, older people will naturally form many cliques. Some of them are sports people, some of them like to sing, and so on. A lot of traditional communities nowadays have gaps in their social circles because they don't have complete facilities to offer older people." [Architect]

5.3.2.2.   Remote relationships with neighbours

However, in both communities, participants also reported reserved relationships with their neighbours because they were not acquainted with some of the new residents or rental households. In the first residential community, many old residents choose to move out and rent out, or otherwise sell their houses. The older people sometimes distinguish their own identity as "Older Beijingers", and the new residents as the "New Beijingers". This identity division revealed older people's attachment to their established social networks and exclusion from a sense of social connection with the wider community. Therefore, the unfamiliarity with new residents or rental households diminishes older people's attachment to the community, which can also decrease their social interactions in their communities.

"The old neighbours are becoming fewer and fewer. We have been living here for more than 30 years. The first reason is too many rental households that we are not familiar with. They come today and leave tomorrow. The other reason is some people buy houses here. They are called New Beijingers, we are Old Beijingers." [S1_18_M_62]

This also happened in the second community. The residents have lived there for a relatively shorter time and do not have many collective memories because they did not know each other before living there. Some people who bought houses there and then rented them out, resulting in a high proportion of rental households. Here, a participant explained the reasons why he felt that the neighbours' relationships are distant.

"Just so-so. There are no neighbour's relationship problems anymore. Because everyone is living their own life. Sometimes we nod our heads when we frequently meet someone...People are not familiar with each other. You see...in the building, people are from everywhere and do not have interactions. It is not like in the past, in the work-unit residential buildings, people worked together and knew each other." [S2_21_M_62]

As discussed in Section 5.3.1 (Children), there are some older people who moved in with their children in order to look after their grandchildren. This revealed another reason for reserved relationships with neighbours, which is that these older people are usually non-local and only live with their families for a certain period of time. They are uprooted from their familiar social relationships and might find it difficult to build new social connections in their new community. This sub-theme was reflected in a participant's comment below.

"Many older people in this community are non-local. Few are Beijingers. Many people come here to look after grandchildren for their children. They live here for a period of time and then leave." [S2_14_F_74]

Participants' choices to do outdoor activities within their community or go to some distant place are also influenced by their local social relationships. Some participants chose not to use outdoor space outside their community because they do not have familiar social

relationships there. People's decisions about whether or not to use a space are influenced by who else is using it. This indicates the importance of social relationships in mediating people's choices of spaces to visit. Here, a participant explained why he does not go to the green space very close to his community.

"I'm not used to going there. I do not know anyone there. Usually, people from those residential buildings go to that park. Few residents from this community go to that park. I do not go either." [S1_6_M_73]

At the same time, others considered that they did not have the right people to connect with in their community, and therefore chose to go to other more distant places to build social connections.

"Older people with grandchildren can communicate with each other. Older people who do not have grandchildren have nothing to communicate. Older people who have dogs can talk with each other, the caregivers can chat with each other. There are not many activities in this community. We go outside to find some like-minded friends." [S2_6_F_65]

These cases illustrate that unfamiliarity with community residents is the main reason for reserved relationships with neighbours, which in turn influences older people's socially based attachment to their neighbourhood and their use of outdoor space.

5.3.2.3.   Formalised social engagement

Apart from the informal social support from family members and neighbours, another theme emphasised by participants is the opportunity to participate in community matters. One participant said her previous experiences of working on the community committee determined her decision to age-in-place.

"I had things to do at the community committee at that time, so I'm not leaving here to live with my son. I used to live here so I do not want to move, and [will] stay here." [S1_15_F_87]

This theme particularly emerged from the first community as the community retrofitting was

about to start whilst the interviews were being undertaken (more information will be provided in Section 5.4.4). Participants expressed their concerns about how their community would be changed, and their suggestions regarding the community retrofitting. The older people who voiced their concerns and wished to participate were generally more attached to their communities. Formalised engagement could therefore provide opportunities for older people to feel included as well as generating a sense of attachment to the community. However, it seems that there were some difficulties with the retrofitting process, as many of the participants reported that their voices were not heard. For example, one interviewee said:

"When I saw this news last year, I started to prepare the suggestions. I sent my suggestions letter immediately when they started the retrofitting. It is my own suggestion. I sent a copy to the community secretary and a copy to the community director. No response. Nobody replied to me." [S1_3_M_87]

There was even one participant, who said he felt valued by his community (*"In this community people value me, they ask me to participate in the community committee's meeting." [S1_1_M_90]*), who also reported that his suggestions had not been considered:

"If they want me to agree to their proposal before they apply it, they need to know the residents' opinions. I do not have a place to say, they did not listen to me. I'm glad that you listen to me. Why? Because I can express my opinions. It does not matter if they agree or not. I do not have that ability and responsibility." [S1_1_M_90]

Formalised social engagement has the potential to influence older people's choice and experiences of ageing-in-place through influencing their sense of attachment to the community and inclusion in the community.

5.3.2.4. Community services

Another recurring theme from the interviews is older people's demands for community services. The need for community care was also mentioned by all stakeholders due to their consideration of older people's health needs. Generally speaking, accessible and affordable community care is a common need for older people. They have many expectations from

community services which can support their independence and the choice of ageing-in-place, especially for older people who lack support from their family members:

"I'm not moving, especially at this age. I choose ageing-in-place and don't plan to go to the care home. Ageing-in-place is a nice choice. Now the community nursing services are about to start. They have not actually started their work yet. I think things will get better after they start to provide services." [S1_15_F_87]

"My children have their own home. I [will be] living alone in the future. So, I have many demands. I request [that] the community install sensors in my home, to retrofit my home, and request the community aged care centre provides services. They need to be responsible. Someone has to come to my home immediately if I am calling. The fees need to be reasonable, which means the fees need to consider our salary and the civil servant pension level." [S1_3_M_87]

A surprising sub-theme from the interviews is that many of the participants expressed their need for community-based activities. As people age, their social networks tend to shrink to the neighbourhood level or even to within the community. Therefore, community committees play a role in organising activity programmes which have the potential to provide opportunities for social interactions between residents. A member of staff on the first residential community committee describes how they support residents and older people's activities:

"Generally speaking, the community committee plans and organises the activities, and sets the stage. They (residents) will perform. If they want to participate in a programme, our community will also set up the stage for them, through our streets and community committees, using all these forces and opportunities to create such opportunities for them." [Community committee staff]

This member of staff also mentioned that the community committee organises activities in different seasons, using different themes according to different holidays. However, there are also residents in both residential communities who feel that these do not offer enough

activities. The community committee might need to get more older people to do different activities according to their interests.

"The community does not have many activities. Residents can enhance their social interactions with neighbours If there are many activities in the community. It seems that we do not have many interactions now." [S2_6_F_65]

Thus far, Section 5.3 has attempted to describe older people's social connections at the family and neighbourhood levels. Family members, including children, partners, and grandchildren, play a vital role in providing informal support, facilitating or inhibiting social connections and use of outdoor space, and providing companionship in older people's lives.

Good relationships with neighbours act not only as a source of socially based attachment to their community but also encourages old people to be more active. Opportunities for them to have casual interactions are important as part of the process of familiarisation with neighbours and building social connections. Older people's opportunities for formalised social engagement were identified as another means of contributing to their sense of attachment and inclusion in communities. The community services should provide community care, as well as organised activity programmes, both of which are important ways of supporting older people's independent living and social connections.

The next section moves on to present how older people perceive and use the physical environment, as well as how the physical environment acts as a vital factor in influencing older people's experiences of ageing-in-place and the use of outdoor space.

5.4. Physical environment

Attachment is simultaneously socially and physically based (Scannell and Gifford, 2010). The previous section has explained how social relationships influenced older people's attachment. This section will address how the physical environment plays an important role in influencing older people's attachment and satisfaction, and what older people's preferences are for

environmental attributes. The community retrofitting in the first community as an opportunity to maintain older people's attachment and improve their satisfaction will also be discussed in this section.

5.4.1. Contact and attachment to the natural environment

When older people were asked about their outdoor activities, a common response was that they usually go outdoors to experience nature, for example, to get exposure to sunlight and fresh air, and enjoy the blossoms. Enjoying nature can be relevant to social relationships as well as staying healthy. One interviewee said she usually goes out to get some exposure to sunlight and to walk with her neighbour for exercise. These natural elements can also stand out from social dimensions as independent elements that benefit older people both physically and mentally. Participants reported positive feelings from close or distant visual contact with natural elements. For example, they will go outside to admire the blooms or enjoy the views of nature outside the window. It is reasonable to assume that views of nature outside the window can be more important to older people who are less mobile or bed-ridden, as they might lack opportunities for close contact with natural elements outside their homes.

"At home, I can see the courtyard within the community, and Longtan Lake from the other side, sometimes people are boating. So, I think it is nice." [S2_13_M_75]

Natural elements also play a role in attracting older people to go outside, which is important for them in order to maintain mobility and positive emotions. Participants described how they experience positive emotions through admire flowers in their neighbourhoods:

"Looking at some flowers makes me feel really happy. It is always better than staying at home with your partner and looking at each other...Especially the Peony in Nongkeyuan (the university close to her community). Have a look at the beautiful photos that I took. Look at those Peonies, really beautiful, I really like them." [S1_17_F_73]

"Just strolling and seeing the scene. Looking at some flowers when they are blooming." [S1_6_M_73}

These extracts show how older people's mobility, social interactions, and emotions have been promoted through even just looking at the natural elements in their neighbourhoods. These less participatory connections with natural elements can further develop into a sense of attachment through more involved and participatory activities with natural elements, such as planting and taking care of plants in the residential community. A recurrent theme in the interviews was how older people value their "works", which are the plants they have grown. Their strong sense of attachment is developed through their repetitive care for these natural elements:

"To be honest, they threw away my Chinese Rose when they started the retrofitting. I felt heartbroken. Because I have feelings about them (Chinese Rose). I still think about how to take care of them even though I almost cannot move." [S1_1_M_90]

"These Peonies in the courtyard were from a flowerpot that I retrieved from the dustbin. They were dried up at that time. Then I propagated them into piece in the courtyard. It has been decades. I invested heavily in them at that time. It is like my job. We cannot even sleep thinking about them, about watering and weeding." [S1_6_M_73]

The attachment to plants from these planting and nurturing experiences in communities sometimes also involves developing social relationships with neighbours, therefore promoting attachment to communities. At the time the first community was built, the majority of plants were planted by residents. Some neighbours who grew and looked after plants together over the years to improve and maintain their community environment formed a kind of emotional bond which is vital in promoting people's attachment to the community. As one participant put it:

"It is voluntary labour. I just found a successor for this area (the small green space outside this participant's residential building), he just retired. We water the plants in this area…There are some French Platanus over there. The trunk is very rough. It was bought from Beixiaguan, 15 yuan (RMB) each. I cannot say It was all planted by me, but at least I organised residents to plant them. I handled all of them." [S1_1_M_90]

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However, the departure of old neighbours (as mentioned in Section 5.3.2) and community retrofitting (Section 5.4.4) impacted interviewees' attachment to the community both socially and physically. A similar theme was also identified in the second community. As the residents in commercial residential communities are usually unacquainted with each other, when some older people move in, they might choose to grow some plants to help them adapt to the new environment. As one participant said:

"We grew three trees before, but the property management removed them. This (an orchard within the green space in the community) was grown by us, another two over there, and a pomegranate tree. We have grown them since we moved to live here." [S2_12_F_75]

Taken together, this section presents how older people derive positive feelings, maintain mobility and social relationships through looking at natural elements, and through growing and taking care of plants. Such contact with natural elements contributes to older people's sense of attachment to the community, as well as to that with natural elements. The attachment to natural elements leads to the next theme, which is residents' satisfaction with their communities.

5.4.2. Satisfaction with the physical environment

As well as the attachment to natural elements and community, the physical environment in older people's community and neighbourhood is also associated with their satisfaction. Attachment to community is a multidimensional response relevant to physical and social integration, whereas satisfaction is more predicted by residents' perception of the physical environment and their use of local resources (Ringel and Finkelstein, 1991). Neighbourhood satisfaction is the result of the fit between environment attributes and older people's needs and preferences. Participants expressed a variety of perspectives regarding their neighbourhood satisfaction. When some participants in the first community said they thought the environment was good, they were usually comparing it with previous situations. When the researcher probed one particular participant as to why she thought the community environment gets better and better, she stated that:

"The changes. There is no square there at the very beginning." [S1_7_F_77]

However, more participants in the first community reported less satisfaction, especially towards the environment within their community. Here a participant stated her intense dissatisfaction with the environment, but familiarity with the community relieved her negative feelings.

"It is absolutely not good here. I feel crowded here. It is totally different (compared with her other home)...I only focus on life within the home and do not think much about the outside environment. The greenery and facilities are not good. It is not allowed to grow things. There are not many good impressions, just because we are used to living here...But I do not feel bad back here, because the intimacy here is stronger." [S1_2_F_60]

This the importance of keeping older people's familiarity with the environment in the community retrofitting (Section 5.4.4) process. However, the above participant stated that they would move out of this community. Decreased satisfaction with community environments could push older people into leaving their long-standing communities and result in negative long-term wellbeing outcomes. Surprisingly, most participants in the first community reported better satisfaction with the environment outside their community, for example, some other nearby residential communities and outdoor spaces. This is reflected in older people preferring to go to other places outside their community for activity:

"It is very organised here. The plants are all pruned. I will sit in the pavilion for rest when I get tired of strolling...It is nice here, looks structured. It is not like our community, it is messing up everywhere. I usually stroll here when I feel bored in our community." [S1_6_M_73]

"This small park is quite nice. The management of Nongkeyuan is good. We need to appreciate this environment. A lot of people come here, including people from Zaojunmiao, and many people who live nearby. Because they do not have this environment (within their community). It is impossible to go to a distant park. That is why people all come here." [S1_20_F_75]

In terms of older people from the second community, far more of them stated that they were satisfied with their community, as well as the neighbourhood environment. Some participants described their community as a park with a proud tone. Their satisfaction with the environment brings them pleasure and also encourages them to have contact with the natural elements and activities outside the home:

"The environment of this community is quite nice. It is like a park. The trees, plants, and ground cover are all green. There are few communities nearby that have large spaces like our community. The community over there does not have green space or space for activity." [S2_3_F_82]

"The environment is so tidy. It improves your feelings of pleasure invisibly. It would be disappointing to see dirty things somewhere. It is really enjoyable to see these flowers and grasses." [S2_4_M_88]

Nevertheless, there are also environmental problems in the second community reported by the participants. These problems are relevant to space management, which will be discussed in Section 5.4.3.

Older people's satisfaction with their community and neighbourhood could have the potential to increase their general life satisfaction, as it supports older people's ability to continue to reside in their familiar environment rather than move out or feel stuck in their communities. The attributes that are preferred by older people that can support their satisfaction will be presented in the following section.

5.4.3. Identified environmental barriers and preferences for environmental attributes

It is vital to know what environmental attributes can fit with older people's preferences and needs, thereby promoting their satisfaction and supporting ageing-in-place. The following bullet points extracted from the analysis of interviews represent older people's preferences for environmental attributes reflected by existing barriers in the environment.

● **Convenience**

Older people's activity range shrinks along with their declining mobility. Older people in the first residential community with severe mobility issues may be trapped in their homes, as only one multistorey residential building has a lift. The interviews confirmed that older people found it difficult to climb the stairs, and many of the older householders had moved out from this residential community. The location of local facilities, for example, hospital, park, transport, grocery store, restaurant, and community centre, should be easily accessible to older people. These essential local facilities are the primary important things to satisfy their needs in daily life. Where older people's individually mobility status permits, they find the ring road to be a good connection with surrounding facilities:

"It is very nice to live close to the second ring road. Next to the community is the moat. The park is over there. It's convenient to get around, to the shops and buy something. The food markets were set up recently, very convenient." [S2_10_M_79]

There are also participants who said they no longer go to the park opposite their residential communities because they have to cross the bridge over the ring road, even though other older people said it is very close. In this context, the ring road may act as a barrier for some older people accessing the parks on the far side. This further confirmed that the location of the surrounding facilities and the connectivity of roads influences level of convenience.

Apart from the location of surrounding facilities, the scale of space also influences the convenience of a space. For those older people who are less mobile, or sometimes other older people who do not want to go outside their community, the space within the community becomes a space for walking or strolling. Older people will even count their daily steps, as participants from each residential communities explained:

"I walked around the road in the community, it is about 350 metres, and I usually walk around twice. I have a record of the steps on my mobile phone." [S1_3_M_87]

"It is more than 700 metres or 800 metres to walk around within the community. If walking the whole circle, including the parking area, is about more than 800 metres. I can usually stroll

in the community if I do not go out." [S2_10_M_79]

Another participant recalled her experiences in another residential community in which the exit of residential buildings faces a wall, and the path is very narrow, with no places for strolling in that community. There are also some more mobile participants who said the scale of their communities was too small, and wished that it could be larger, but not too large. In terms of the space outside the residential community, a very mobile participant also mentioned that he prefers to go to a park with a suitable scale:

"It is too big (The Summer Palace). It will be noon when I come back...I like to go to the Zizhuyuan Park most, because it is not too big, suitable for strolling in a circle." [S1_10_M_62]

These comments reveal that the scale of the residential community that is preferred by older people is one that is at least able to support their daily strolling requirements, especially for those less mobile older people. For older people who are more mobile, outdoor space on a walkable scale is also sought out for daily use.

- **Safety**

Older people perceive that community safety is usually related to property management, for example, the presence of a guard, and walking safety which relates to uneven roads and lack of pavements. Below are two examples of older people describing the road in their residential community as unsafe:

"The road is unsafe and uneven. It is very easy to fall if not careful. Some lamps are like ornaments. Some places are not bright. It would be safer if the road is even." [S1_3_M_87]

"There is no pedestrian pavement outside the community main entrance. That side is a restaurant. This side is the stairs." [S1_6_M_73]

The walking safety issue is also related to the paving materials used for the road, as participants from the first residential community mentioned that the road in their residential community and nearby streets was paved with brick, which is not user-friendly to them.

- **Functionality**

A very prominent contradiction in the first residential community is that the limited outdoor space has been used for parking, causing the majority of participants to mention that they do not have sufficient space for activity. As one participant stated:

"Here used to be green space. Now it is for parking. Residents do not have space to stroll. There are too many cars." [S1_15_F_87]

Therefore, older people in the first residential community tend to go outside this community to stroll, exercise, or to conduct other activities. For older people who are less mobile, immediate activity space within the community is vital because they might not be able to go to other spaces used by more mobile older people. This contradiction is less frequently mentioned in the second residential community, as it is designed with much more greenery and activity areas than the first. However, older people are different from each other, they might need to use the space for different purposes, for example strolling, exercising, playing chess, dancing, looking after grandchildren, and so on. Therefore, space that affords a rich variety of activities that can meet older people's diverse physical and social needs is vitally important.

- **Attractiveness**

Participants expressed their preferences for attractive things in different ways, but mostly they talked about natural elements. For example, the natural things to look at while they hang out around the community, and the natural views outside their windows.

"There are many nice flowers. I don't know their names. They grow from spring to summer, very nice to see. Here used to be Chinese roses everywhere, very beautiful. But they disappeared gradually. These are the new ones planted by the property management this year. It's very nice. It is very enjoyable when I go downstairs and see them every day. These round plants (boxwood) are quite cute after they are pruned. It is also nice in winter." [S2_22_F_68]

However, concerns about bare earth were widespread in both residential communities. Bare

earth not only influenced the aesthetic effect, but also the actual usage of the outdoor space. The researcher observed some participants bringing paper or a bag with them to put on the seats before they sat down. As one participant said, bare earth generates a lot of dust. This is also relevant to property management.

"The land is too bare. It is all dust when the wind is blowing. The plants should be diversified." *[S2_19_F_60]*

- **Quality of maintenance**

Cleanliness is the main indicator that a space is well-maintained, which could promote older people's satisfaction. The cleanliness depends on space maintenance, from both management and users. Participants from both residential communities suggested they prefer the outdoor space to be clean, tidy, and without nuisance, e.g., from rubbish, dog mess, catkins, mosquitos, which can act as barriers to their use of the outdoor space. Apart from the cleaning of the space, safety and aesthetics are also influenced by space maintenance. However, many of the participants stated that their communities have not been well maintained. The first community's space maintenance is the responsibility of the community committee. The second community is managed by a property management company. In both communities, the maintenance of plants and clearing of rubbish were identified as the main maintenance problems. One participant in the second community stated that:

"These plants spend residents' money. They die quickly. It is not reasonable. The property management company did not discuss it with us. It is not managed well. I saw other communities, the guard stood outside the community in the morning. We did not even know our property management manager. The garbage station in our community is not suitable. The petrol station is just outside. It is very dangerous. Nobody is cleaning the rubbish on the ground. The person responsible for cleaning our residential building is really good. She cleaned everything. Good is good. Bad is bad. These twigs should be pruned, otherwise, the trees are not growing well." *[S2_14_F_47]*

5.4.4. Community retrofitting as an opportunity

During the first phase of data collection in the first community, the community age-friendly retrofitting was about to start. The researcher asked participants questions about their perceptions of the community retrofitting. Some participants showed certain nostalgic sentiments when talking about community retrofitting, which could also be representative of their attachment to the community. The comment below presented older people's fear of breaking the existing balance between their abilities and the environment.

"I feel uneasy, I do not know how they will retrofit again." [S1_6_M_73]

Older people's ability to accept change in their environment usually decreases as they age. Therefore, they tend to keep things and environments unchanged. As a member of the community committee said, a very old resident who is over 90 years old requires the stairs in front of his residential building entrance to be retained rather than changed to a ramp, because he is used to taking the stairs. However, expectations regarding the retrofitting were also expressed because of dissatisfaction with the existing environment. Concerns regarding how the community retrofitting would be conducted were widespread because it was directly relevant to their ageing-in-place experiences. As mentioned in Section 5.3.2, "Formalised social engagement", some older people submitted their concerns, comments, and suggestions to the community committee. Nonetheless, it seems that there were certain communication issues between older people and the community committee during the retrofitting planning stage. As many participants stated, their suggestions were not accepted, or apparently even listened to:

"Complete satisfaction is impossible. There are always some problems. There are some things that we cannot be concerned about. Our comments do not make any difference." [S1_18_M_62]

"My partner sometimes writes some suggestions about the retrofitting to the community committee. It does not work. He did not have power. The community committee decides whether to accept the suggestions or not." [S1_7_F_77]

As mentioned earlier in Section 5.3.2, formalised social engagement could promote older people's inclusion and attachment to the community. Therefore, it is important to establish good communication between older people and community committees and provide opportunities for older people to participate in community retrofitting matters. Formalised social engagement is important to help older people accept the environmental changes and to maintain their 'fit' with the environment.

Together, these themes provide important insights into how older people developed attachment through direct and indirect contact with natural elements, felt satisfaction with the physical environment, and their preferred physical environment attributes: Convenience, Safety, Functionality, Attractiveness, and Quality of Maintenance. The community retrofitting in the first community was also identified as an opportunity to improve the environment, and to maintain older people's attachment to their community and the fit between older people and the environment.

The opportunities for indirect or direct interaction with the natural environment enhanced older people' sense of attachment. The wider general physical environment is associated with older people's satisfaction through the fit between environmental attributes and older people's needs and preferences. The physical environment stands out as a vital factor that influences older people's activities, attachment, as well as satisfaction, thus determining older people's ageing-in-place experiences and wellbeing.

5.5. Agency as a decisive factor

This section will triangulate the findings from above to illustrate how older people's agency is a determining factor that affects older people's choice and experiences of ageing-in-place. Sense of agency decreases with the ageing process (Moore, 2016). Wahl and Oswald (2010) pointed out that agency is relevant to the perceived controllability of older people's physical environment, and to the interplay and fit between the physical environment and older people's behaviour. In this study, agency is not only about older people's sense of control of

their physical environment and social relationships, but also about their ability to choose to age-in-place positively. As Righi et al (2015) noted, agency means people being able to achieve something for themselves rather than being forced to accept. Participants' levels of agency are influenced by their personal circumstances, their social relationships, as well as the physical environment. The balance between their agency and external resources and restrictions determined their positive or negative experiences of ageing-in-place. Older people who have better agency usually experience higher levels of satisfaction with these three factors, and vice versa.

As mentioned in Section 5.2.1, most participants expressed their awareness that the process of ageing involves the risk of developing various health conditions which may influence their ability to live independently. Maintaining a good ability to live independently determines whether older people feel in control of their home, residential community, and neighbourhood, which also determines their level of agency. In contrast, if environments provide older people with a sense of control, this will support older people's ageing-in-place. Some participants stated that they have experienced a loss of capacity to shape their community environment due to ill-health, which means their agency is limited by their personal health situations.

"We felt we had some autonomy in the past. I'm not sure if this is the right way to say it. We can improve the environment as we want. We could always do something while we had working capacity in the past. If we want to plant something here to improve the environment, we will do it while we can. We also manage here, we have the ability to manage if we can improve it." [S1_6_M_73]

Their financial conditions sometimes also restricted their agency. If older people can live in their own home, and own their own property, this will increase their sense of agency. Participants also mentioned that the cost of care homes and their expectations towards the environment did not match well, and therefore they actually cannot afford and choose to go to care homes. In this sense, some older people may feel trapped in their homes.

"When our generation becomes old, it's better to have our own house, otherwise life will be

very difficult. We cannot afford a good care home. Those bad ones are also overcrowded, you cannot go there even if you want." [S2_5_F_71]

In terms of the links between social relationships and older people's agency, older people who receive support from family, neighbours, as well as community services apparently have a better agency to choose ageing-in-place and have more positive experiences than older people who lack social support. The social interactions enable older people to maintain their social connections, which make older people feel attached to their residential communities. These emotional connections provide older people with the motivation to choose to continue to live in their own residential communities.

"I'm not leaving, staying here. I'm familiar with the neighbours. They come and sit here to chat in the afternoon sometimes...My children's house is very good and has many bedrooms. But I'm not going." [S1_1_M_90]

"It is good to stay at home, especially in this environment. The older people in our community are almost the same. Some of them have a caregiver, or the neighbours will help each other, or have the hourly worker to help them age-in-place. Because the environment is good, the neighbours' relationships are good. Older people do not wish to go somewhere else." [S2_22_F_68]

Older people's personal status, physical environment, social relationships, and their sense of agency are interrelated. The process of ageing usually needs to balance declining personal abilities with the changing environment, and many experience a decline in social connections. A supportive environment which has fewer environmental pressures and more preferred environmental attributes can help older people maintain their fit with the environment. Supportive social connections also provide older people with positive experiences of ageing-in-place. Both of these contribute to their sense of control of their residential community environment, giving them the agency to make a positive choice to age-in-place.

5.6. Summary

This chapter illustrates older people's ageing-in-place experiences from the analysis of interview data in two types of urban communities in Beijing, demonstrating that older people's agency to choose and experience ageing-in-place is affected by their personal situations, social relationships, and their physical environment.

Ageing-in-place for as long as possible was the preferred option of participants in this study. Living an independent life, keeping a good level of mobility for as long as possible and maintaining positive mental health are older people's goals, as well as being influential premises for experiences of ageing-in-place. These personal factors can be supported by receiving reciprocal support from family members, neighbours, social engagement, and community services. These supportive social relationships also contribute to older people's sense of attachment to their community. The physical environment contributes to older people's attachment as well as satisfaction if it fits with their preferences. Community retrofitting is an opportunity to improve the environment, and older people's satisfaction and attachment.

Outdoor space plays an important role in supporting older people in maintaining good health status and social connections. In turn, older people's health conditions and their social relationships also determine how they use outdoor space. The immediate outdoor space is particularly vital for older people who are less mobile and for intergenerational usage. It can provide opportunities for older people to have more social interactions and therefore contribute to their attachment to the community. Not only the immediate outdoor space, outdoor space that is easily accessible at the neighbourhood level is also important to satisfying older people's diverse needs. On the one hand, older people's preferences of outdoor space including Convenience, Safety, Functionality, Attractiveness, and Quality of Maintenance influenced their satisfaction; on the other, the social profile of the outdoor space also plays a role in mediating older people's choice of whether to use a space.

Having discussed the factors that influence older people's choice of ageing-in-place and use of outdoor space, the next chapter addresses the ways older people use outdoor space and

identifies the space attributes that influence their usage.

Chapter 6 Older people's use of outdoor spaces

6.1. Introduction

Based on the understanding of older people's experiences and perceptions of ageing-in-place, as well as insights regarding their usage of outdoor spaces gained from the interviews with residents of the two communities reported in Chapter 5, this chapter moves from subjective perceptions to combine objective data from observations and subjective data from on-site interviews, aiming to address the second research objective:

To reveal older people's use of outdoor spaces.

The results from the observations and onsite interviews for each site will be set out sequentially in this chapter. The observation data combined with the informal interviews provided insights from both researcher and participant perspectives, both visually and verbally, giving a more comprehensive picture of how older people use different outdoor spaces in their daily lives. With the support of the Geographic Information System (GIS), Microsoft Excel, and NVivo, the researcher analysed the user features, including the proportion of each user type, the number of different users at different times, and the density of spatial distribution of different user types, which revealed who was using the space and their preferred time and location for this use. The activities taking place in each site were also analysed, including by distinguishing them into passing-through and on-site activities, as well as assessing the numbers and proportions of different user types participating in each activity. Passing-through activities were defined as transitory and mobile activities, moving into, out of, or within the site, whereas on-site activities were defined as activities performed within a specific area of the site while the researcher was recording the data. Based on Gehl's (2011) classification of outdoor activities, on-site activities were further classified into necessary, optional, and social activities. Interview transcriptions, observation photos, diagrams, tables, and behaviour maps are used to illustrate how people were using these outdoor spaces. The complete list of observed older people's activities at all observation sites and corresponding symbols used in behaviour mappings is attached in Appendix Table 5.

6.2. Site 1: Shuangyushu work-unit residential community

6.2.1. Observation times

06:00 - 19:00, 10th October 2019 - Thursday, 21℃ / 12℃, Cloudy

06:00 - 19:00, 11th October 2019 - Friday, 18℃ / 13℃, Cloudy

06:00 - 19:00, 19th October 2019 - Saturday, 20℃ / 10℃, Cloudy

6.2.2. User characteristics

The overall impression was that this site was used by all types of users including residents in different age ranges, but the majority of users are older people who are occupying some open areas for different activities. The following data describes the older people who were observed. A total number of 1680 users were observed during the three days' observation at site 1. From the analysis of the proportions of different user types at site 1 (Figure 6.1), female older accounted for more than half of the total number of users (51.9 per cent). The proportions of the three types of female users (female, female with child, and female with wheelchair) outnumbered all three types of male users.

Based on the analysis of the three days of data, the number of different types of user on site at different times was determined (Figure 6.2).
- Generally, female users dominated the site throughout the day, except when they fell slightly below the number of male users at 7:00 and 19:00. The peak times for female users were 8:00, 10:00, and 16:00.
- The general pattern of male usage was more stable during the morning from 7:00 to 11:00, dipping at lunchtime, and increasing to the same number seen in the morning from 14:00 to 16:00. These numbers were maintained until 17:00.
- The peak times for female users with children were 7:00, 10:00, and 17:00, and for males with children, 7:00, 11:00, and 18:00. This demonstrated a trend for users with children to use the space later than users without children.
- There were fewer wheelchair users, with low numbers observed between 10:00 to 12:00, and 14:00 to 17:00.

Figure 6.1 Percentages of different user types at site 1 (source: author)
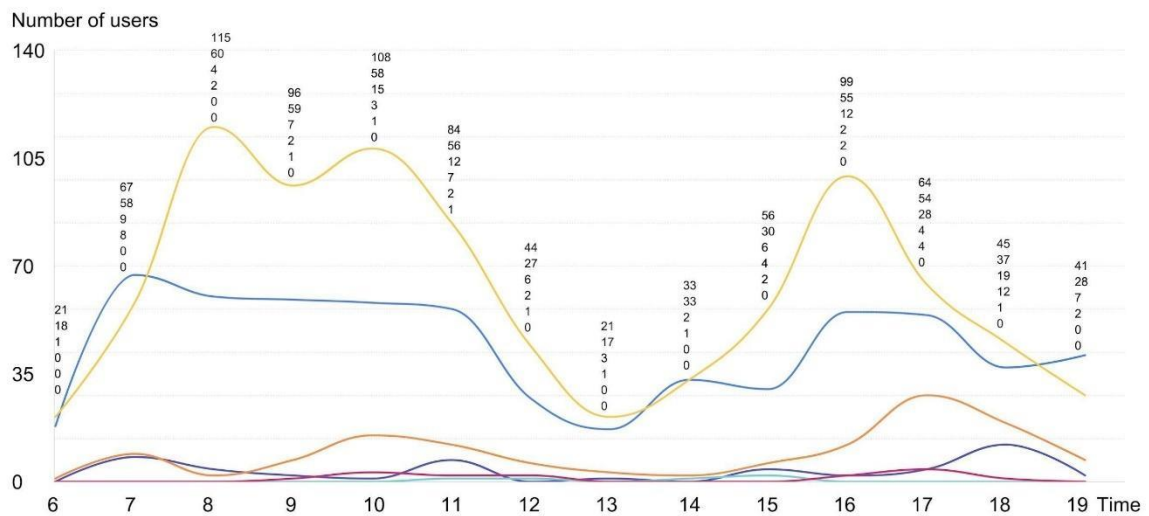
Figure 6.2 Number of different users by different times at site 1 (source: author)

By analysing the spatial distribution density of different users at site 1 (Figures 6.3, 6.4, 6.5, and 6.6), it was found that the occupation of space differed between males, females, users with children, and users with wheelchairs. The 612 male users were relatively well-dispersed along the road, the west side of the small green space, the entrance to the community, the south corner of the community, the exercise area along the road, the immediate space outside the residential building, as well as the square within the community.

The total number of 872 female users were concentrated in the small green space, by the shop along the road and in the south corner of the community. 176 users with children occupied the central area of the small green space and the south part of the road. This might be because that location leads to other green spaces, for example, site 2 and site 3.

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There were only 20 users with wheelchairs, located in the margin of the activity area in the small green space, along the road, and in the square within the community. The low number of users with wheelchairs might be because most of the residential buildings are without lifts, therefore older people with mobility problems are either trapped at home, or choose not to live in this community. The small green space immediately adjacent to the residential units was occupied by all user types and therefore more popular than the spaces within the community.
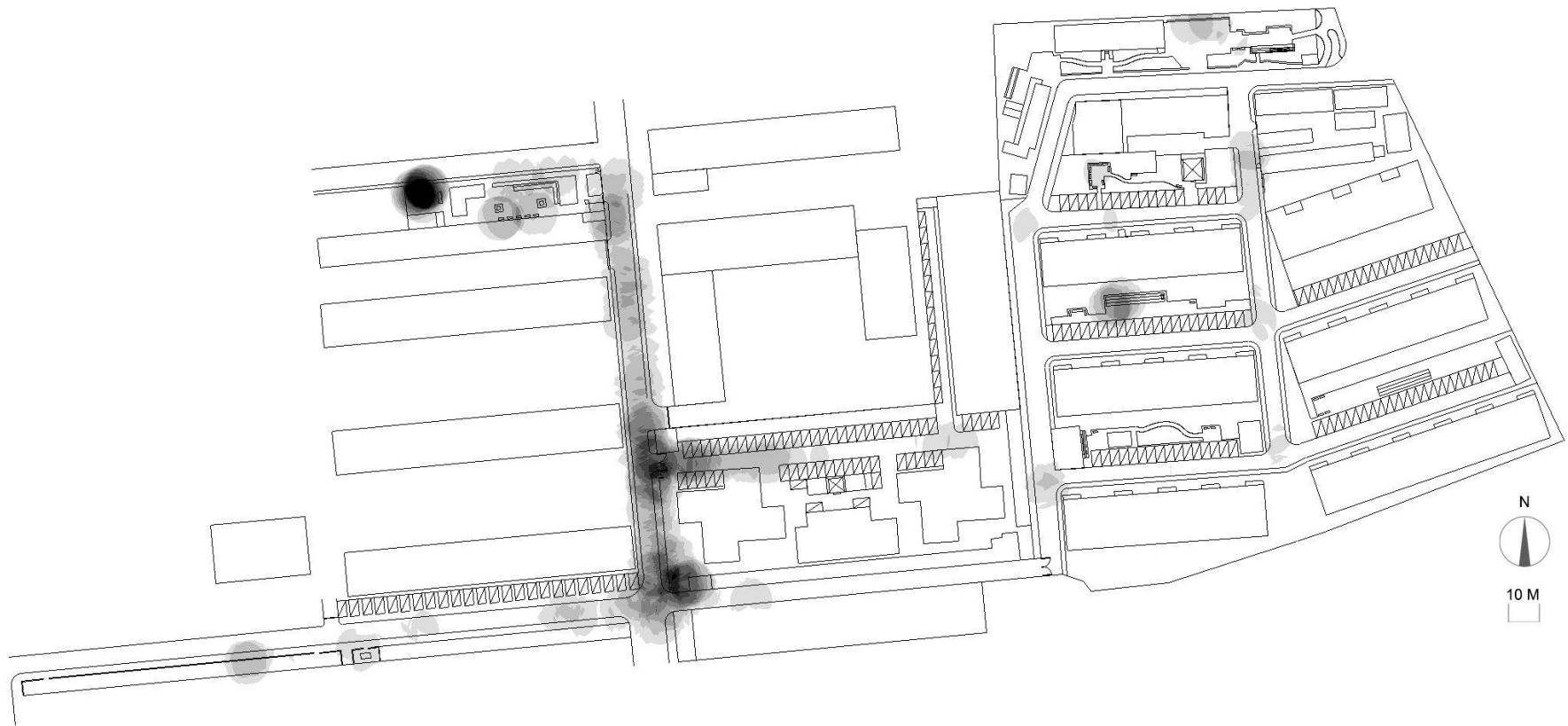
Figure 6.3 Density of male users at site 1 (source: author)
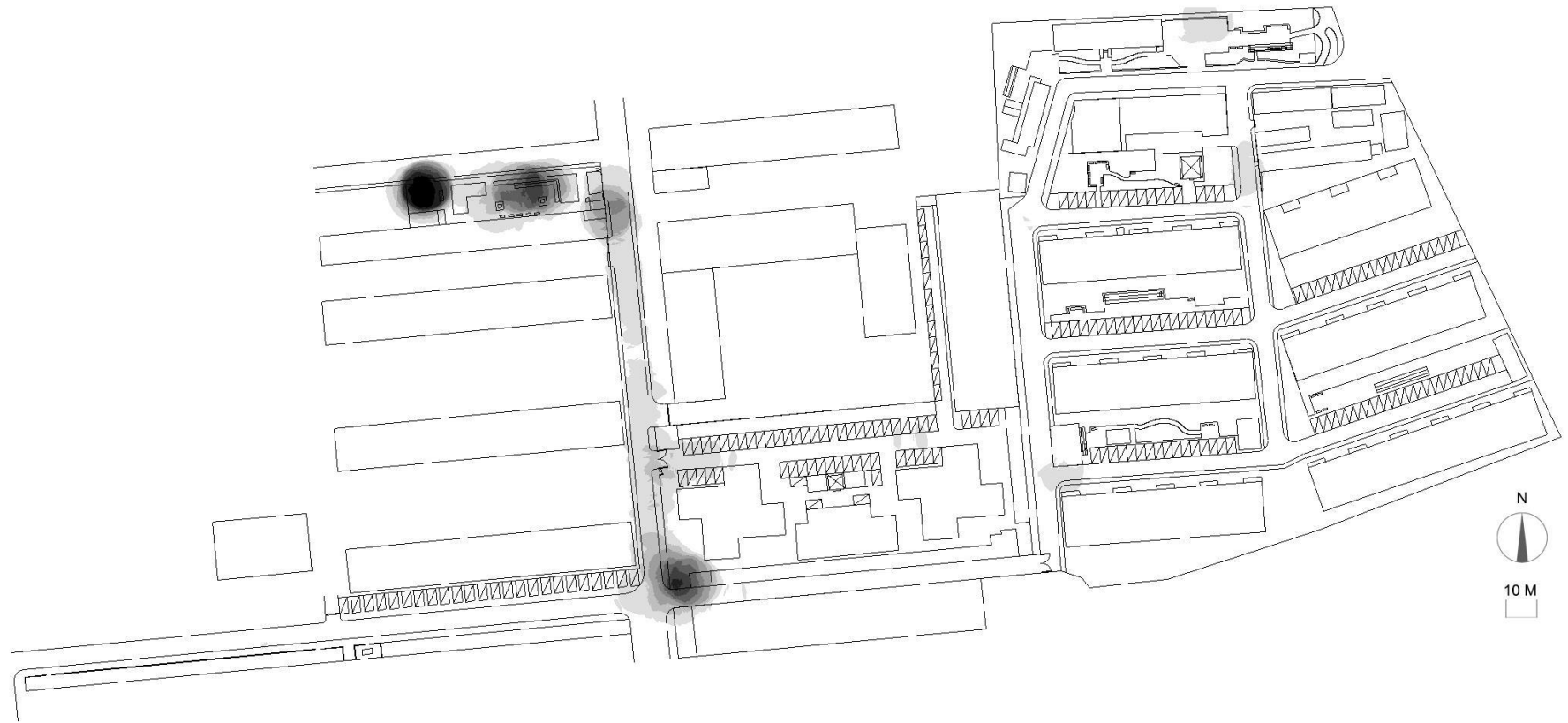
Figure 6.4 Density of female users at site 1 (source: author)
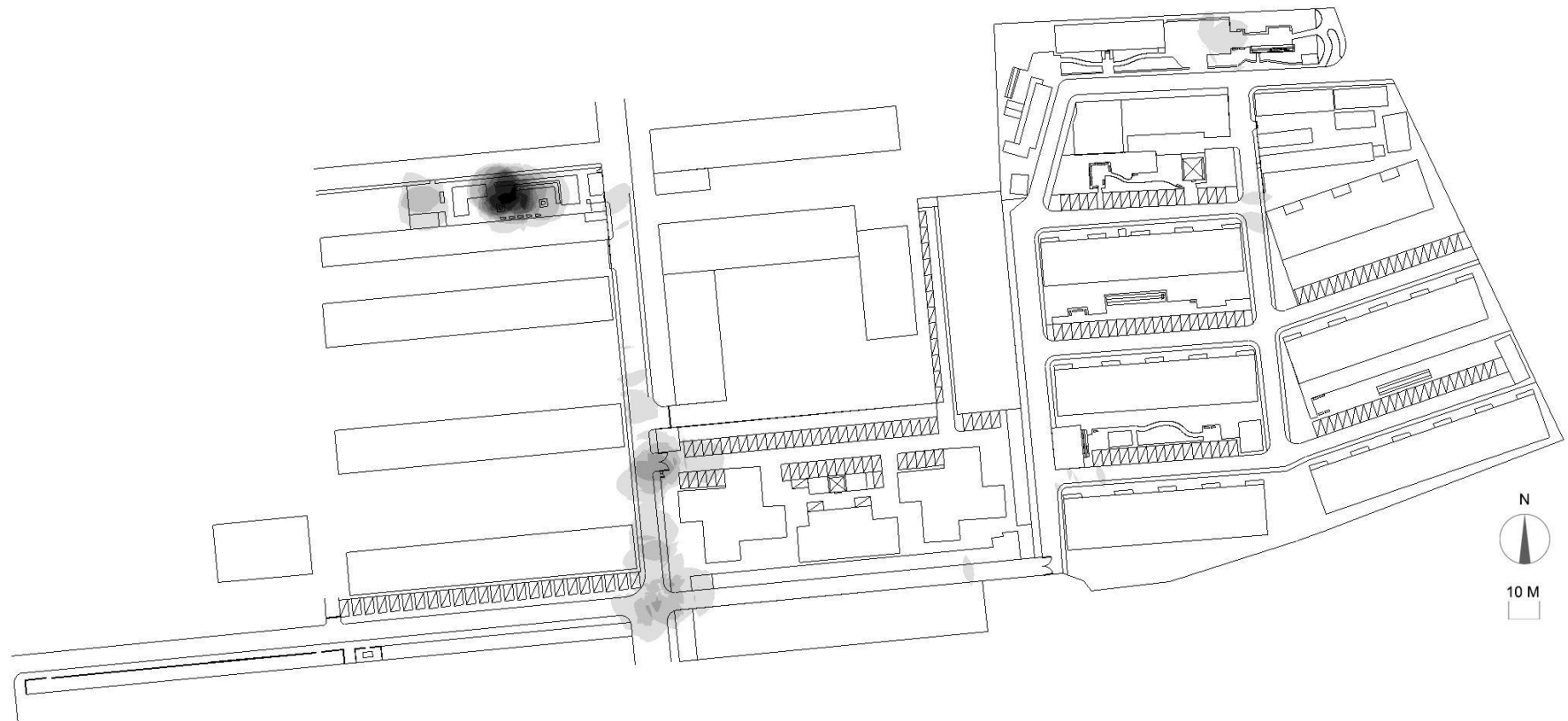
Figure 6.5 Density of users with children at site 1 (source: author)
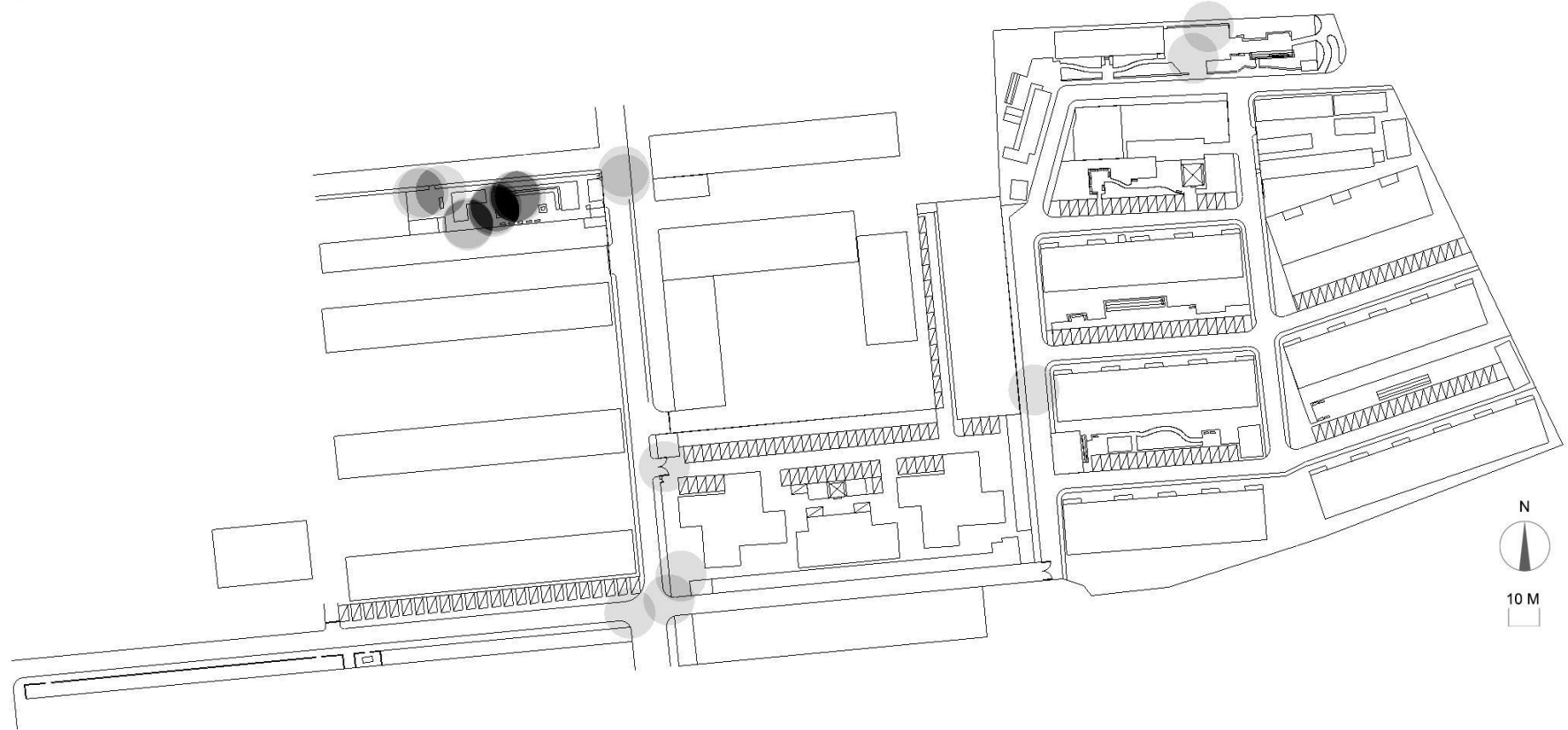
Figure 6.6 Density of users with wheelchairs at site 1 (source: author)

6.2.3. Activities

24 types of activity were observed during the three days' observation at site 1, which included seven passing-through activities (Table 6.1, Figure 6.7), and 17 on-site activities (Table 6.2, Figure 6.8). Walking was the dominant activity, followed by passing through by bicycle (or electromobile). Distinct from walking for necessary purposes, strolling around is also an important activity for older people. As one on-site interview participant described his daily activities:

"I usually stroll within or around the community. I will go to Nongkeyuan if I go out of the community. There is no place to go." [Male, 73]

As shown in Figure 6.5, the density of passing-through activities was obviously higher along the main road, especially the south part of the road, than the paths within the community. The road plays an important role in older people's strolling and connecting with other destinations, for example, shops and green spaces (site 2 and 3).

Table 6.1 Passing-through activities at site 1 (source: author)

Passing-through activities in site 1	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Walking	77.54%	818	322	435	17	43	-	1
Passing through by bicyle (electromobile)	13.74%	145	73	49	12	11	-	-
Walking with a dog	2.84%	30	17	13	-	-	-	-
Walking with mobility aids	2.56%	27	9	18	-	-	-	-
Walking with a pram	2.46%	26	1	-	5	20	-	-
Passing through on wheelchair	0.76%	8	-	-	-	-	4	4
Running	0.09%	1	-	1	-	-	-	-
Total	**100%**	**1055**	422	516	34	74	4	5

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

Table 6.2 On-site activities in site 1 (source: author)

	On-site activities in site 1	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Necessary Activities	Shopping	26.72%	167	56	108	1	1	-	1
Optional Activities	Doing exercises	8.32%	52	15	36	-	1	-	-
	Sitting and watching (objects)	2.56%	16	10	6	-	-	-	-
	Standing and watching (objects)	1.92%	12	10	2	-	-	-	-
	Taking care of plants	0.64%	4	4	-	-	-	-	-
	Sweaping the road	0.16%	1	1	-	-	-	-	-
	Airing clothes	0.16%	1	1	-	-	-	-	-
Social Activities	Standing and chatting	22.24%	139	41	74	1	22	-	1
	Sitting and chatting	16.64%	104	24	69	-	7	1	3
	Sitting and watching (people)	7.36%	46	17	19	2	3	-	5
	Playing with children	4.32%	27	-	-	9	18	-	-
	Dancing	3.84%	24	-	24	-	-	-	-
	Standing and watching (people)	2.08%	13	7	5	-	1	-	-
	Singing	1.28%	8	-	8	-	-	-	-
	Kicking shuttlecock	0.96%	6	-	4	-	2	-	-
	Playing table tennies	0.64%	4	3	1	-	-	-	-
	Practising Tai chi	0.16%	1	1	-	-	-	-	-
	Total	**100.00%**	**625**	190	356	13	55	1	10

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

Figure 6.7 Spatial distribution of passing-through activities at site 1 (source: author)

Figure 6.8 Spatial distribution of on-site activities at site 1 (source: author)

No.1 Residential building (Multi-story)
No.2 Residential building (High-rise)
No.3 Community ageing service center
No.4 Community committee
No.5 Grocery store
No.6 Residential community square
No.7 Rest space within the residential community
No.8 Small green space
No.9 Exercise space along the road

Figure 6.9 Master plan of site 1 (source: author)

Using Gehl's (2011) classification of outdoor activities, the researcher classified the 17 on-site activities at site 1 into necessary activities, optional activities, and social activities (Table 6.2), and analysed the frequency of each. What stands out in the table is that shopping as a necessary activity has the highest frequency. Shopping activity was especially popular on 19th Oct because the temporary food market programme was held on that day. According to the retailer from the temporary food market programme, the market is open from 7:00 to 14:00 every Wednesday and Saturday. Shopping activity was concentrated in the west side of the small green space where the temporary food market programme was held (No. 8 in Figure 6.9), and the south corner within the community where there was a grocery store (No. 5 in Figure 6.9, Figure 6.10, Left and Middle). The number and distribution of older people involved in shopping activity suggests that the necessary stores, or programmes operating close to where older people live and where they are active, are important to their daily lives.

Figure 6.10 Shopping at the temporary food market (Left), grocery store (Middle), and standing and chatting along the path (Right) (source: author)

The most frequent optional activities were doing exercises, sitting and watching objects, and standing and watching objects. This reveals that older people's demands for doing exercises and preferences for things to look at, as mentioned in Section 5.4.3, or information boards to get information. Older people prefer to do exercise by using facilities in the small green space (No. 8 in Figure 6.9, Figure 6.11, Left) rather than in the exercise area along the road (No. 9 in Figure 6.9, Figure 6.11, Middle). Here, a participant explains the reason why the exercise area along the road is not safe:

"There are not many people there. It is close to the road where the cars go and towards."
[Female, 80]

The activity of taking care of plants was also observed in the rest space within the residential community (No. 7 in Figure 6.9), which bore out older people's contact with and attachment to natural elements (as mentioned in Section 5.4.1) (Figure 6.11, Right).

Figure 6.11 Older people exercising in the small green space (Left), in the exercising area along the road (Middle), the plants cared for by older people in the pots and planted in the ground (Right) (source: author)

Standing and chatting, sitting and chatting, in addition to sitting and watching people were the most frequent social activities at site 1. These indicate the importance of opportunities for older people to communicate and observe others. According to Figure 6.8, the activity of standing and chatting is mostly concentrated at the path intersection within the community (Figure 6.10, Right). These crossing points, therefore, could be important spaces to promote the meeting, greeting, and chatting opportunities for older people which are important for them to build intimate relationships with neighbours (as mentioned in Section 5.3.2). The activity of sitting and chatting as well as sitting and watching people was distributed amongst spaces where seats were provided in the rest space (No. 7 in Figure 6.9), the square within the community (No. 6 in Figure 6.9), and within the small green space (No. 8 in Figure 6.9).

Figure 6.12 Older people playing with children (Left), dancing in a group (Middle), and singing after dancing (Right) (source: author)

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Playing with children (Figure 6.12, Left) was also observed in the small green space (No. 8 in Figure 6.9), revealing that some older people use the space for intergenerational interaction. As mentioned earlier in user features (Section 6.2.2), the peak times for users with children and users without children are slightly different. The on-site interviews confirmed that some older people will choose to avoid using the space when there are lots of children present.

"I usually sit here for about one or one and a half hours at 4 pm, then I will go home. Because the kindergarten and primary school is over. A lot of children will be active here. They need to play, and they need space. Firstly, we need to leave space for children. Secondly, It is difficult to blame us or children if they hit us." [Female, 83]

The activities of dancing and singing (Figure 6.12, Middle and Right) were carried out by the same group of older people active at the same place within the small green space (No. 8 in Figure 6.9), but at different times. A participant from this group who lives in this community stated that:

"We usually dance for an hour from 8 am to 9 am, then we will sing for a while afterwards." [Female, 76]

The small green space (No. 8 in Figure 6.9) close to residential communities plays a multifunctional role in satisfying different user's diverse purposes, including shopping, exercising, communicating, dancing, singing, supervising children, and so on. It seems to be even more popular and important than the outdoor spaces immediately adjacent to the residential units within this residential community.

6.3. Site 2: Fangdanyuan Commodity residential community

6.3.1. Observation times

06:00 - 19:00, 28th August 2019 - Wednesday, 31℃ / 20℃, Cloudy / Sunny

06:00 - 19:00, 29th August 2019 - Thursday, 30℃ / 20℃, Cloudy / Sunny

06:00 - 19:00, 31st August 2019 - Saturday, 32℃ / 18℃, Sunny

6.3.2. User characteristics

Mixed age groups of people were also apparent at this site. Most younger users were observed going in and out of this residential community, whereas older people, middle aged people, and children are the main users of the open space at site 2. 1244 older people were observed at site 2 during the three days observation period. The proportions (Figure 6.13) of females and females with children slightly outnumbered males and males with children. Users with wheelchairs were considerably fewer, accounting for no more than 0.48 per cent of males and females, respectively.

Generally, older people were going out at 10:00 and 17:00. What can be clearly seen in Figure 6.11 is the different peak times for male and female users. Male users' peak times were 7:00, 11:00, and 17:00, whereas female users were increasing from 7:00 and peaked at 10:00, then decreasing dramatically and remained at lower numbers until they peaked again at 17:00. The peak times for users with children were similar, namely 10:00, 17:00, and 18:00, though female users with children also peaked at 7:00.
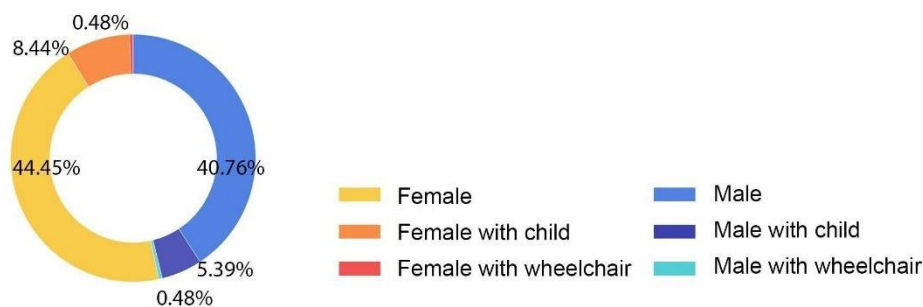
Figure 6.13 Percentages of different user type at site 2 (source: author)

The spatial distributions of males, females, users with children, and users with wheelchairs showed certain distinctions (Figure 6.15, 6.16, 6.17, and 6.18). Male users were more concentrated in front of the residential building entrance, where a desk and seats for chess and poker are provided. In contrast, female users were concentrated by the seats in front of the residential building entrance, and near the activity space. Users with children occupied

the central activity space where the exercise facilities are located (No.6 in Figure 6.19). Surprisingly, these users with children were not concentrated close to the children's playground (No. 5 in Figure 6.19). There were only 12 users with wheelchairs appearing at site 2 during the three days of observation, and these were in any case mainly passing through.
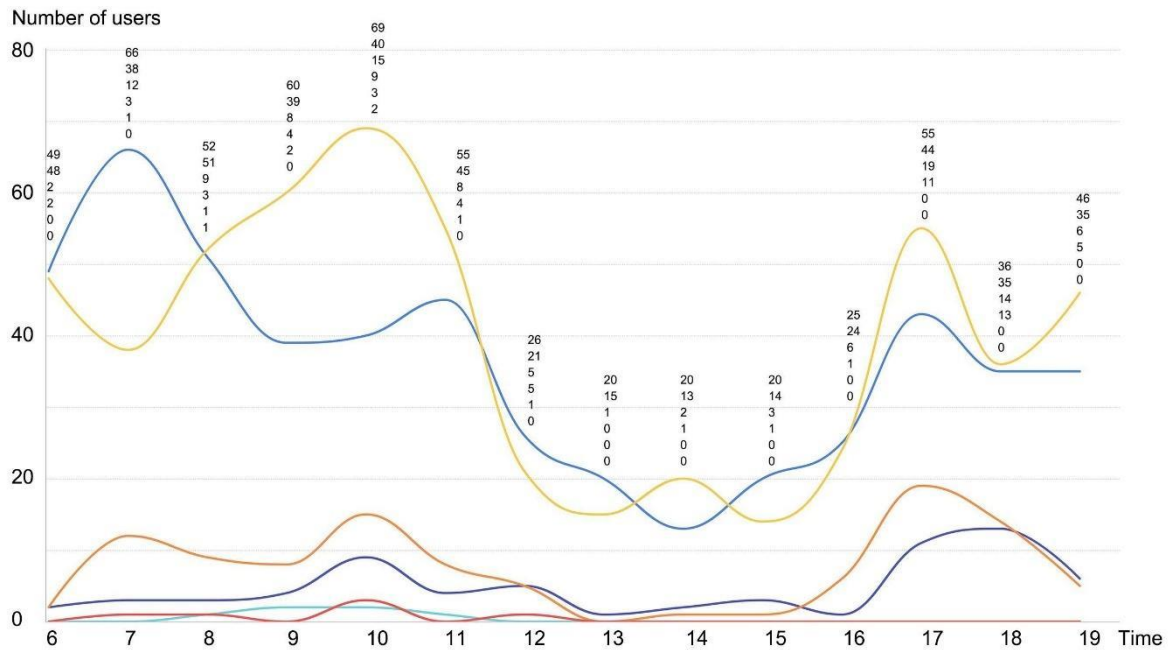
Figure 6.14 Number of different users at different times at site 2 (source: author)
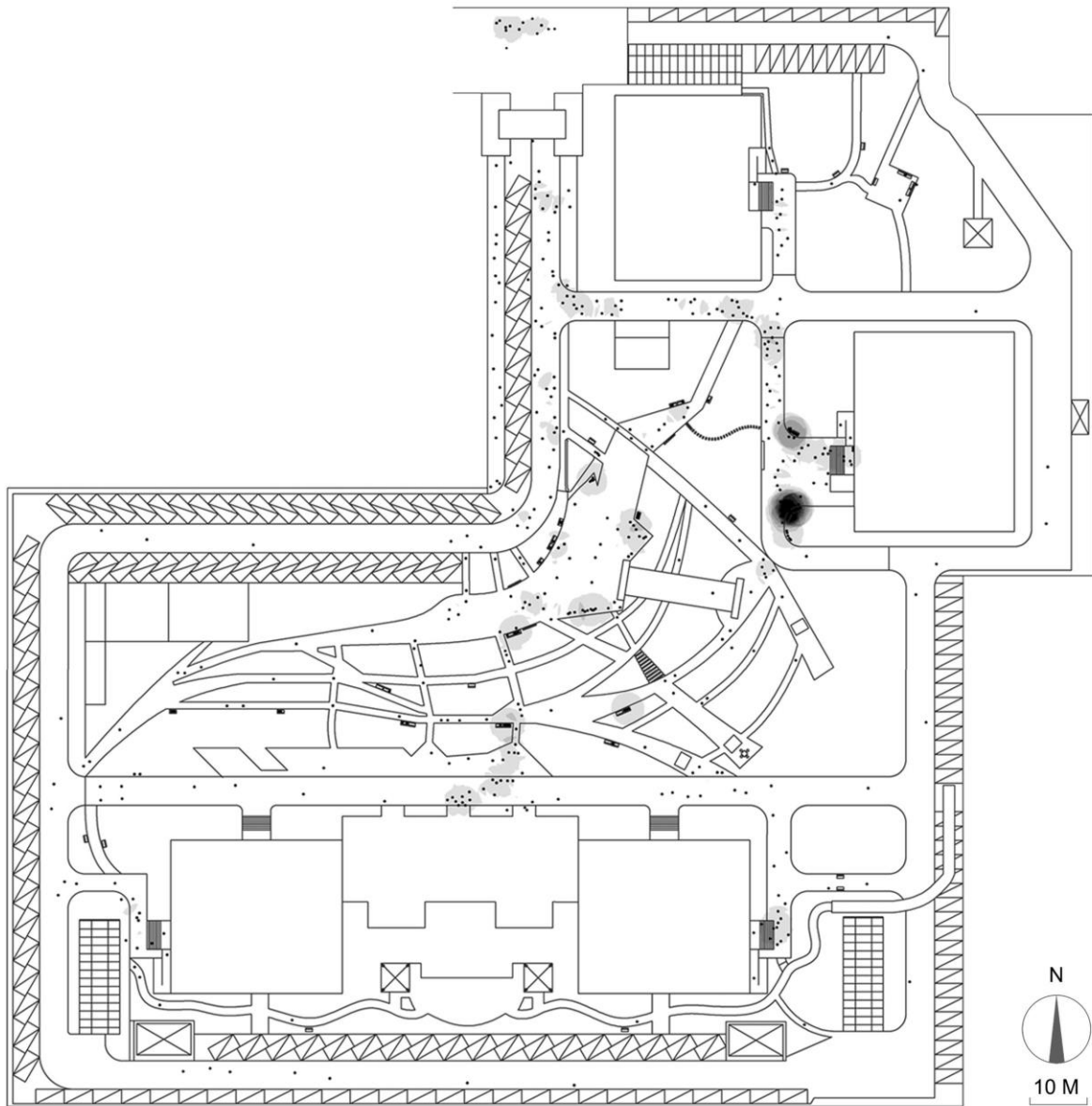
Figure 6.15 Density of male users at site 2 (source: author)
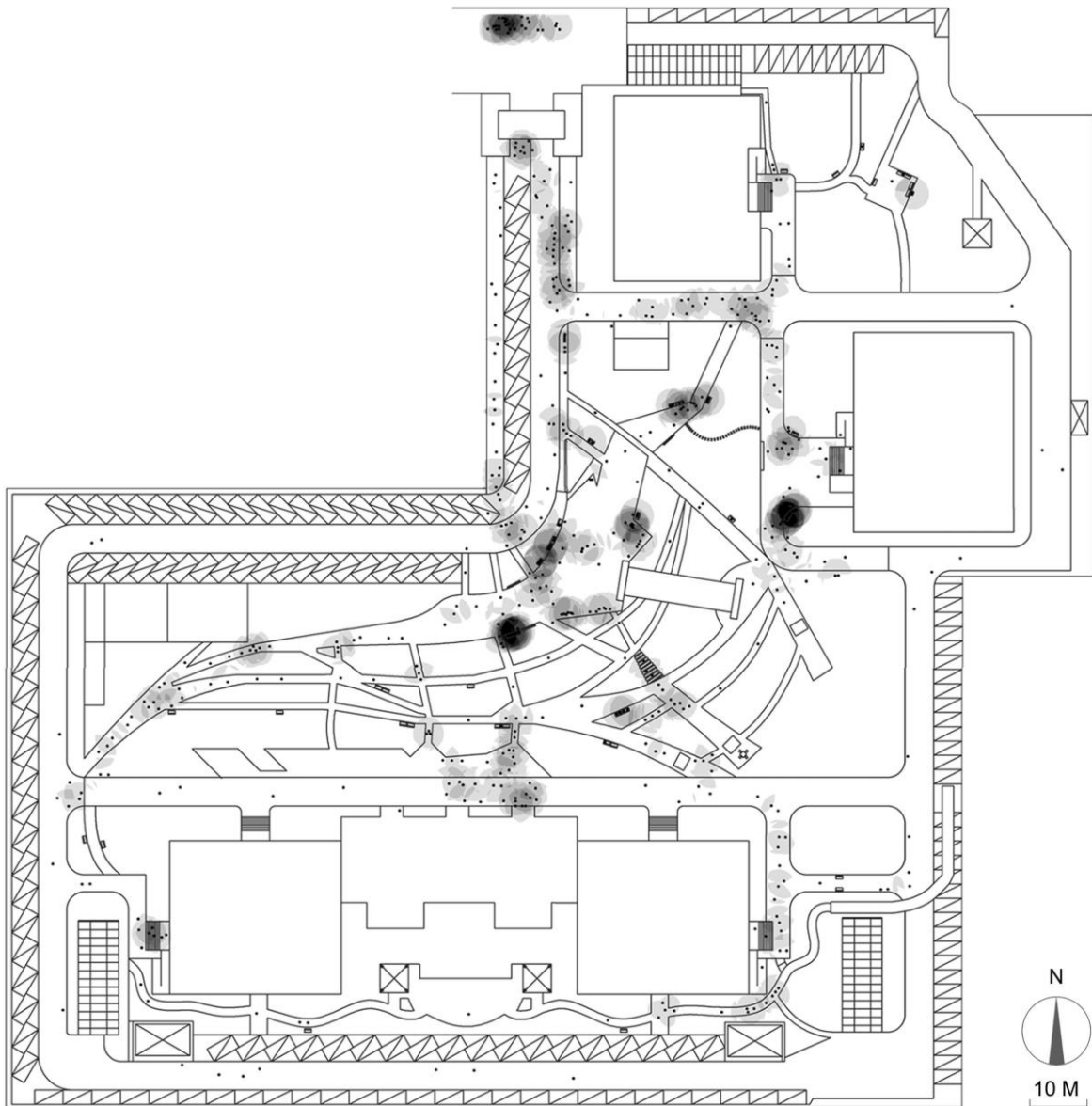
Figure 6.16 Density of female users at site 2 (source: author)
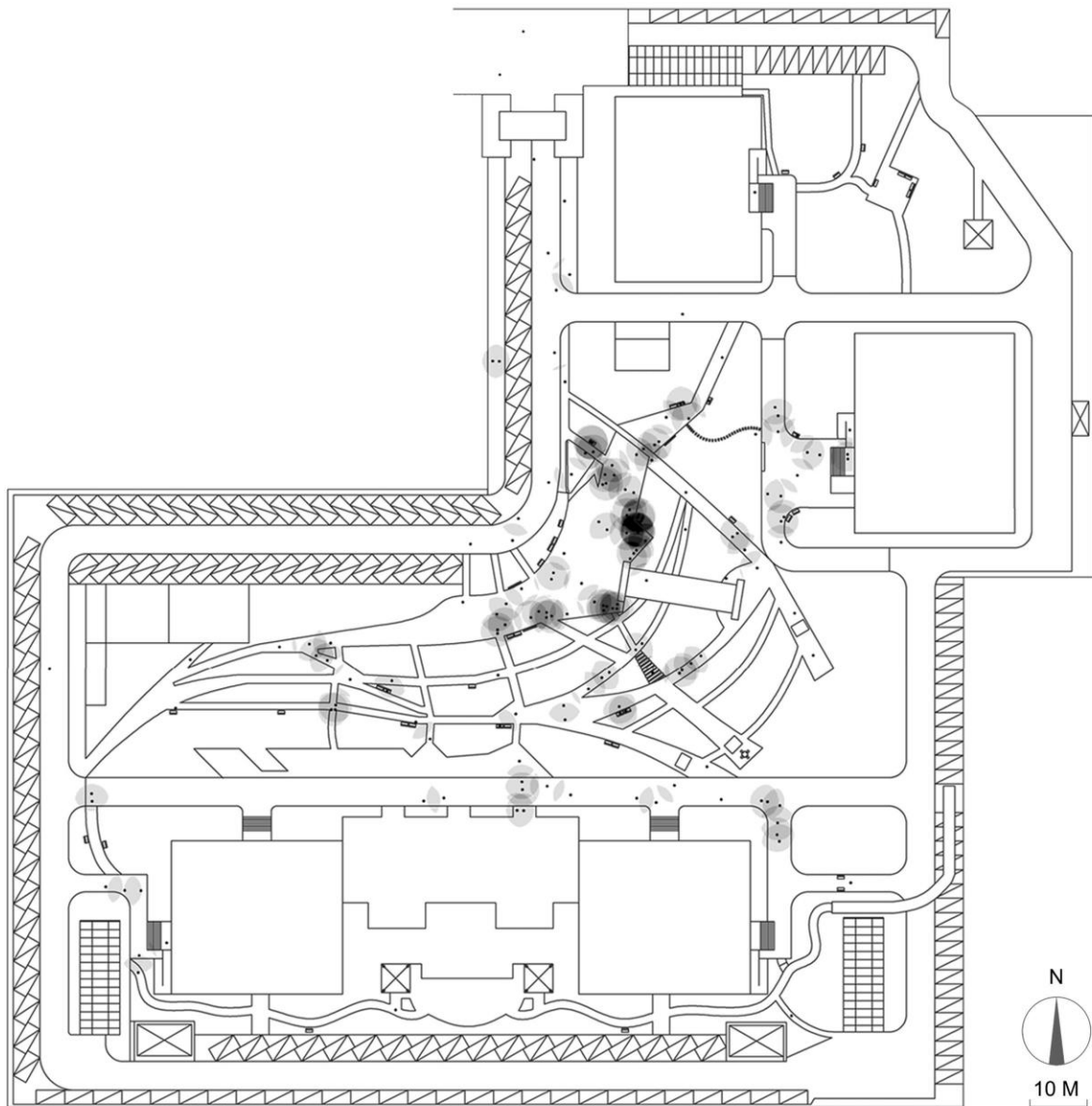
Figure 6.17 Density of users with children at site 2 (source: author)
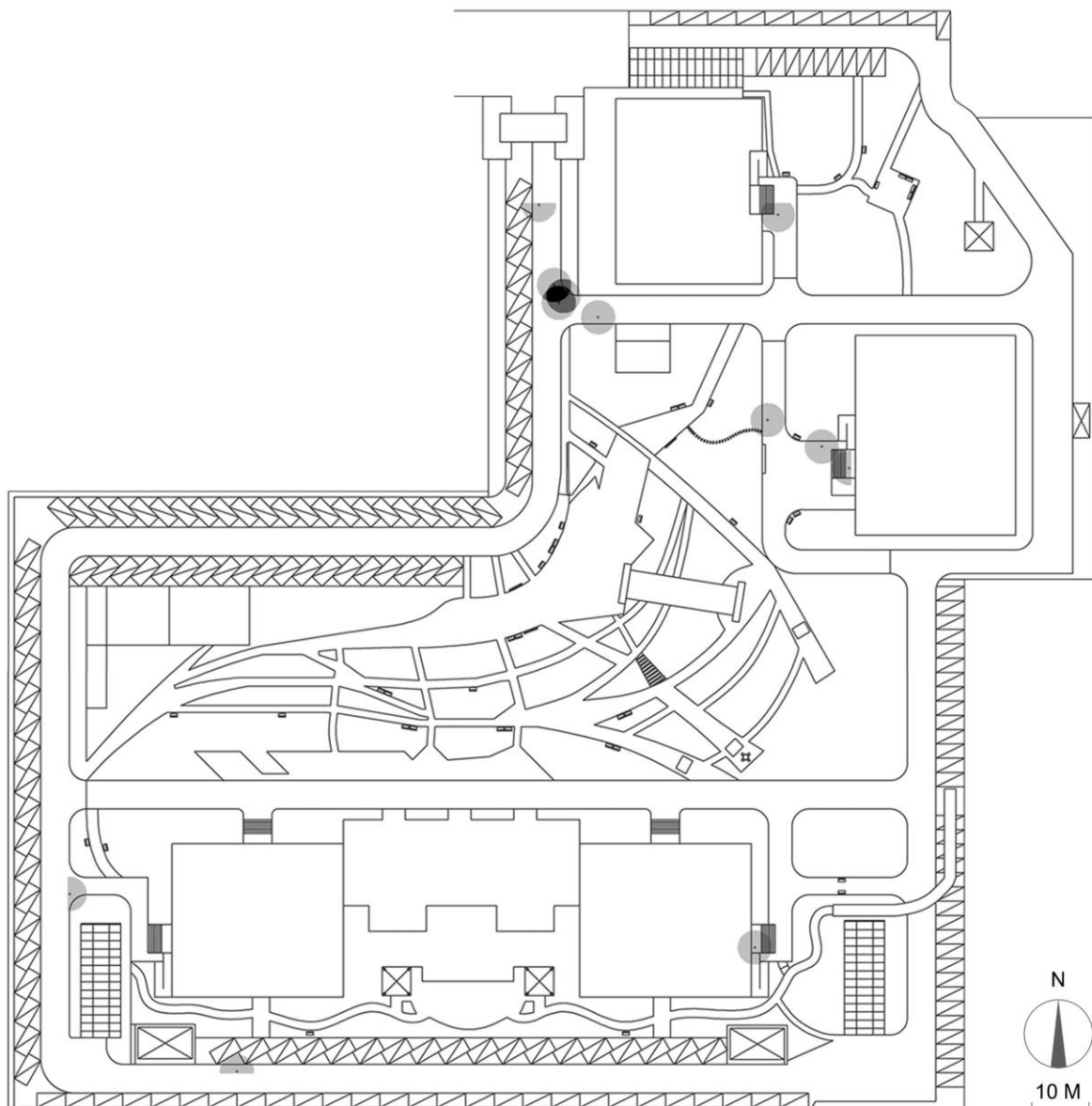
Figure 6.18 Density of users with wheelchairs at site 2 (source: author)

6.3.3. Activities

There were 23 types of outdoor activity observed at site 2, which included seven passing-through (Table 6.3, Figure 6.20), and 16 on-site activities (Table 6.4, Figure 6.21). As at site 1, walking was the dominant passing-through activity, which included going to other destinations, back home, or strolling within the residential community. As one participant mentioned, she usually strolls to keep healthy, and this is also an opportunity to meet neighbours:

"I usually go out for a walk in the morning and afternoon. I have plenty of time. It is not good to sit at home and watch TV all day. Strolling has some benefits. We have some neighbours who usually walk together." [Female, 75]

The activities of walking with a dog and walking with mobility aids accounted for a higher percentage and number of users than at site 1, which may indicate that older people at site 2 prefer to walk their dogs within their residential community. Older people who are less mobile (walking with mobility aids) also usually walk within their residential community.

No.1 Residential building
No.2 Underground parking
No.3 Grocery store
No.4 Rest space
No.5 Children's playground
No.6 Activity space with exercise facilities
No.7 Basketball court

Figure 6.19 Master plan of site 2 (source: author)

Table 6.3 Passing-through activities at site 2 (source: author)

Passing-through activities in Site 2	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Walking	75.25%	611	255	295	23	38	-	-
Passing through by bicyle (electromobile)	10.22%	83	49	30	3	1	-	-
Walking with a dog	5.91%	48	13	33	-	2	-	-
Walking with mobility aids	4.19%	34	22	12	-	-	-	-
Walking with a pram	3.08%	25	-	-	9	16	-	-
Passing through on wheelchair	1.23%	10	-	-	-	-	5	5
Running	0.12%	1	1	-	-	-	-	-
Total	**100.00%**	**812**	**340**	**370**	**35**	**57**	**5**	**5**

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair
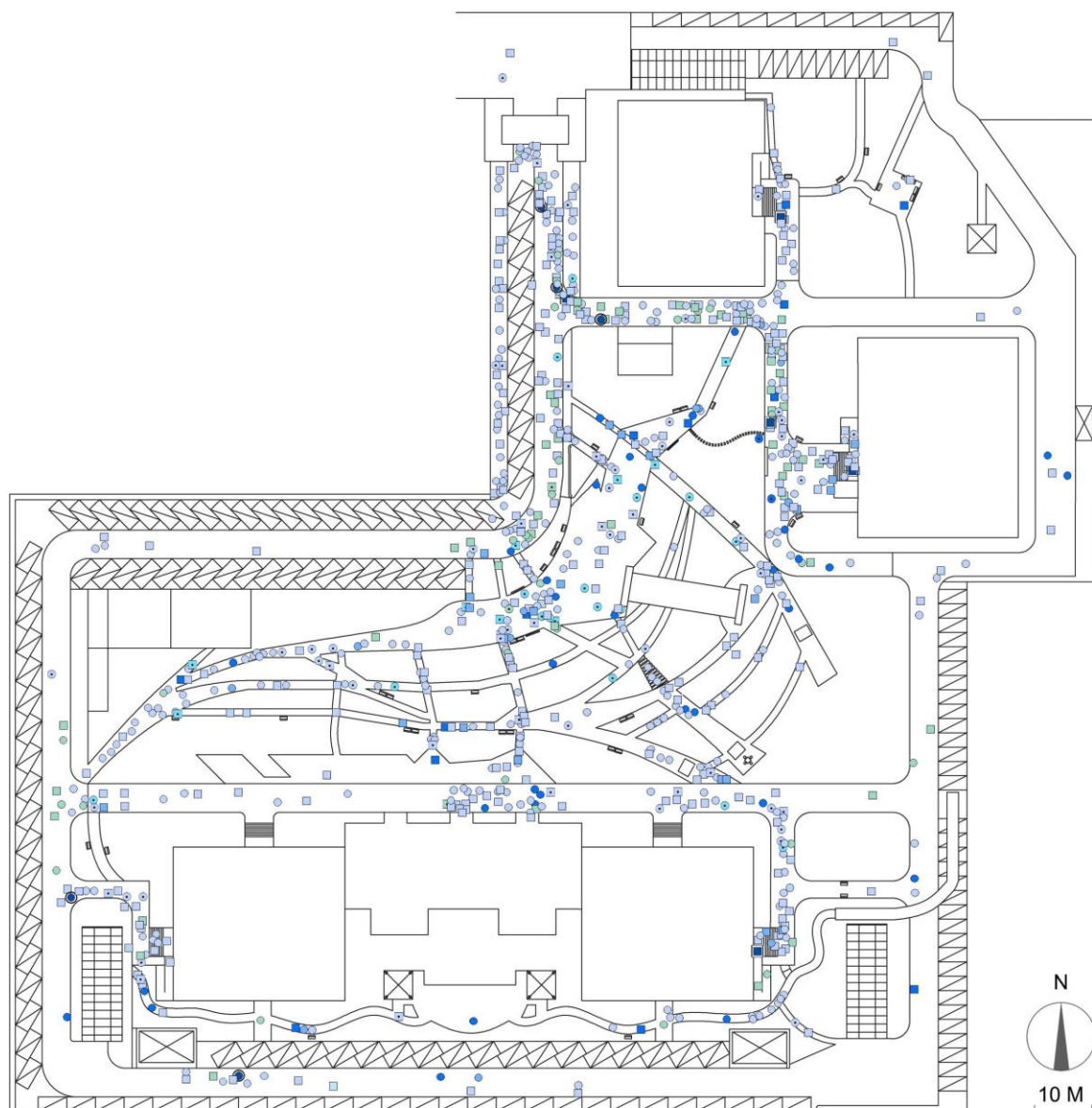
Figure 6.20 Spatial distribution of passing-through activities at site 2 (source: author)
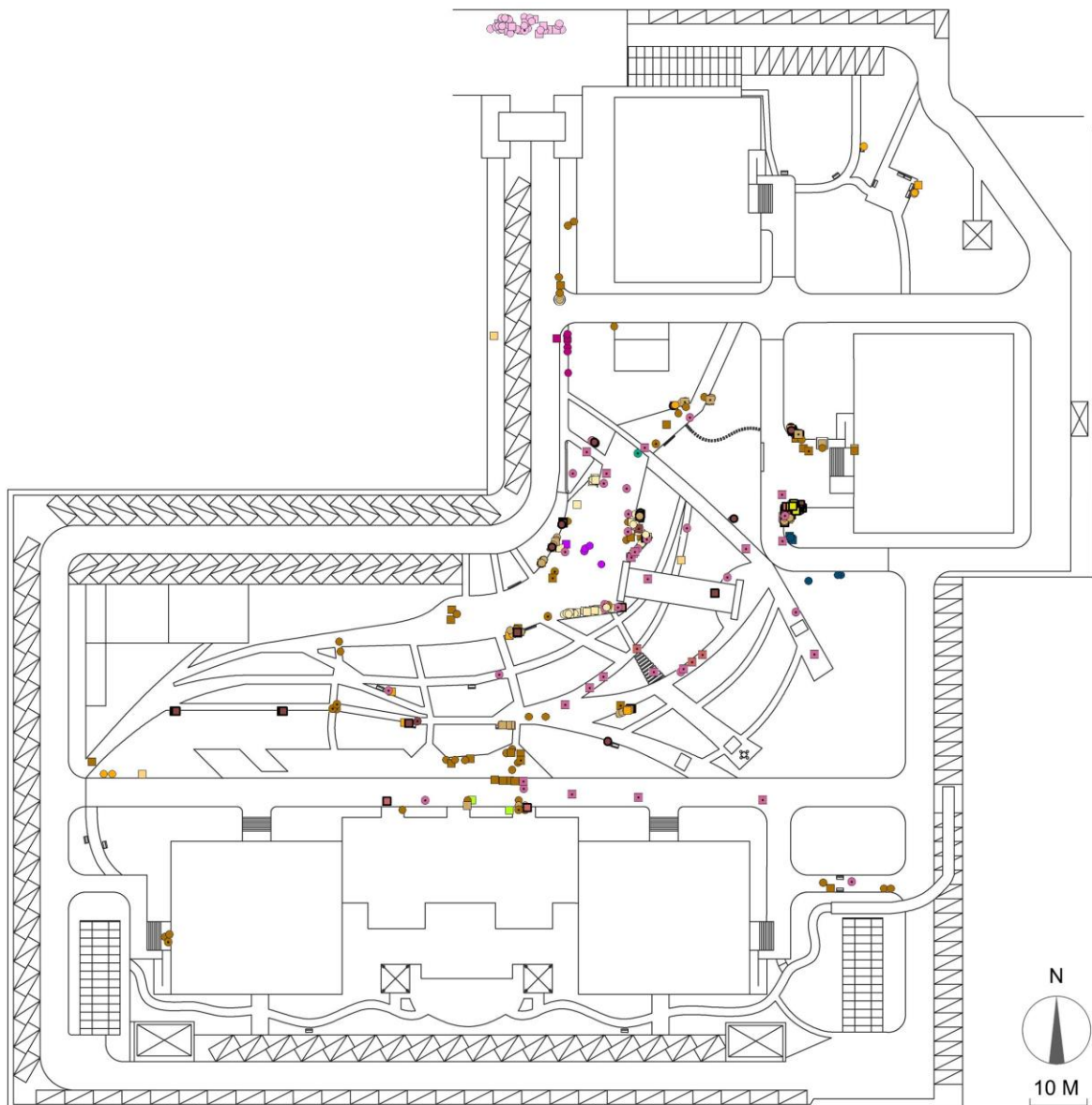
Figure 6.21 Spatial distribution of on-site activities at site 2 (source: author)

Shopping and collecting parcels were classified as necessary on-site activities (Figure 6.22). Similar to site 1, the food market programme was held in front of the residential community main entrance, which attracted 39 older people to buy groceries. The activity of collecting parcels was identified at site 2, indicating that a convenient and accessible parcel collection station is also necessary for some older people.

Figure 6.22 The activities of shopping (Left) and collecting parcels (Right) (source: author)

Table 6.4 On-site activities at site 2 (source: author)

	On-site activities in Site 2	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Necessary Activities	Shopping	9.03%	39	12	26	-	1	-	-
	Collecting parcels	1.85%	8	1	7	-	-	-	-
Optional Activities	Doing exercises	11.34%	49	24	21	1	3	-	-
	Sitting and watching (objects)	6.48%	28	21	7	-	-	-	-
	Airing clothes	2.08%	9	5	4	-	-	-	-
	Standing and watching (objects)	0.69%	3	3	-	-	-	-	-
	Taking care of plants	0.46%	2	2	-	-	-	-	-
	Fixing a chair	0.46%	2	2	-	-	-	-	-
Social Activities	Sitting and chatting	19.68%	85	26	49	4	4	1	1
	Standing and chatting	18.75%	81	24	43	4	10	-	-
	Sitting and watching (people)	12.73%	55	31	21	1	2	-	-
	Playing with children	10.42%	45	-	-	19	26	-	-
	Standing and watching (people)	2.31%	10	5	1	3	1	-	-
	Playing chess (or cards)	2.31%	10	10	-	-	-	-	-
	Practising Tai chi	1.16%	5	1	4	-	-	-	-
	Playing Badminton	0.23%	1	-	-	-	1	-	-
	Total	**100.00%**	**432**	**167**	**183**	**32**	**48**	**1**	**1**

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

There were six optional activities, dominated by doing exercises and sitting and watching (objects). The exercise facilities are located at the edge of the activity space (No. 6 in Figure 6.19), which provides opportunities for older people to do simple exercises within their residential community rather than going out to other places. It is not only used by older people doing exercises, but also by older people while they supervise their grandchildren's play, or who bring their grandchildren to play with the facilities. The activity of sitting and watching (objects) identified at site 2 included older people reading a book or newspaper, looking at their phone, as well as the scenery in their residential community. The popularity of watching activities at site 2 might be attributable to the provision of more seats, which allows older people to do these low-intensity optional activities outside their homes. There are also more laundry racks provided at site 2, which may also explain the reason for the higher proportion of people airing their clothes. However, some older people mentioned that

the laundry racks influenced the aesthetic of the community environment:

"The environment now is a bit worse because residents are hanging their clothes and quilts outside. The community provided many laundry racks based on humanity consideration. The environment was much better when there were no laundry racks." [Female, 68]

The activity of taking care of plants was also observed at site 2, in front of the residential building entrance (Figure 6.23, Left and Middle). This confirmed that the planting area in the residential community offered important opportunities for older people to make contact with nature. Furthermore, it also enhanced the neighbours' interactions. As one participant explained, the plants in front of the residential buildings belong to residents on different floors and he takes care of these plants on a daily basis.

Many chairs are put outside by residents for seating. During the observation, an older person was observed fixing one of the chairs for more than one hour at one entrance of the residential building (Figure 6.23, Right; see also Figure 6.24, Right). It is an unusual activity, but shows older people's efforts to maintain their seating and communication area, as created by themselves.

Figure 6.23 Activity of taking care of plants (Left), plants raised by residents (Middle), and the activity of fixing a chair (Right) (source: author)

The social activities in this site were dominated by chatting, with 19.68 per cent of users sitting and chatting, and 18.75 per cent standing and chatting. Older residents usually did their chatting near the seating provided close to the activity area and near the residential building entrance (Figure 6.24, Left). These two activities revealed that some older people had

opportunities to communicate and build relationships with their neighbours. Similarly, sitting and watching (people) was the third most popular social activity, not only including older people having passive interactions with others, but also including observing children playing. These passive interactions have the potential to develop into more interactive social activities, for example chatting or playing with children. Playing with children at site 2 accounted for 10.42 per cent of users, which was more than double that at site 1. As mentioned earlier, older people were observed supervising their grandchildren playing on the exercise facilities or playing and running around. Site 2 provides more opportunities for children to play and also indicates that supervising children is a common activity for Chinese older people. The immediate outdoor space that supports intergenerational usage is important for both children and older people as their activity range might be less than other populations. Playing chess (or cards) usually happens near one entrance of the residential building, which also attracts people sitting or standing around to communicate (Figure 6.24, Right).

Figure 6.24 Activities of sitting and chatting, standing and chatting, and playing chess (or cards) (source: author)

6.4. Site 3: Eastern green space within university campus

6.4.1. Observation times

06:00 - 18:00, 11th September 2019 - Wednesday, 25℃ / 18℃, Cloudy

19:00, 24th September 2019 - Tuesday, 25℃ / 18℃, Sunny

06:00 - 19:00, 12th September 2019 - Thursday, 25℃ / 19℃, Cloudy

06:00 - 19:00, 14th September 2019 - Saturday, 29℃ / 17℃, Sunny

6.4.2. User characteristics

Even though some younger people, including younger people with children, were seen using site 3, older people are still the main users of this site. The observations of this site recorded 2936 older people during the observation period. Older female users were the largest user group at this site. Users with children were the second-largest group. It is worth noting that the proportion of female users with children was more than double the proportion of male users with children, with percentages of 12.16 per cent and 5.28 per cent, respectively. Proportions of male and female users with wheelchairs are similar, at fewer than 3 per cent in both cases (Figure 6.25), but this green space had the highest proportion of wheelchair users compared with other sites.

As shown in Figure 6.26, the overall peak times for outdoor activities at site 3 were 9:00, 10:00, and 17:00. Numbers of male and female users gently increased from 6:00 to 8:00. Female users then increased sharply and peaked at 9:00. They then decreased gradually and remained at a stable low until starting to increase again between 15:00 and 16:00. Male user numbers tended to fluctuate less, peaking at 9:00 and 16:00. Users with children appear to have a similar trend that peaked at 10:00 and 17:00.

Figure 6.25 Percentages of different user type at site 3 (source: author)

According to the density maps of male and female users at site 3 (Figure 6.27, 6.28), the distributions of male and female users show a similar trend, with both groups dispersed across the site. However, the density of users with children and users with wheelchairs (Figures 6.29, and 6.30) presents an entirely different situation. The users with children were crowded in the northern part of the activity space, where children's play facilities are provided (No. 4 in Figure 6.31), and around the pergola (No. 3 in Figure 6.31), and the planter area with

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seating. In contrast, the users with wheelchairs were concentrated in the southern part of the activity space, under the pergola and pavilion (No. 3 in Figure 6.31). This indicates that these two types of users have different needs and use outdoor space to do different types of outdoor activities.
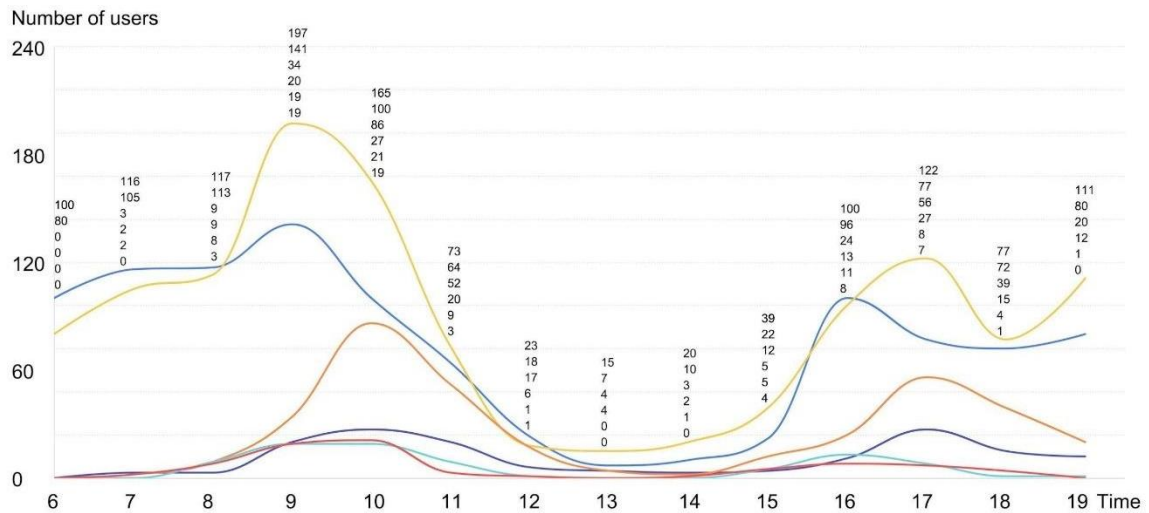
Figure 6.26 Number of different users at different times at site 3 (source: author)
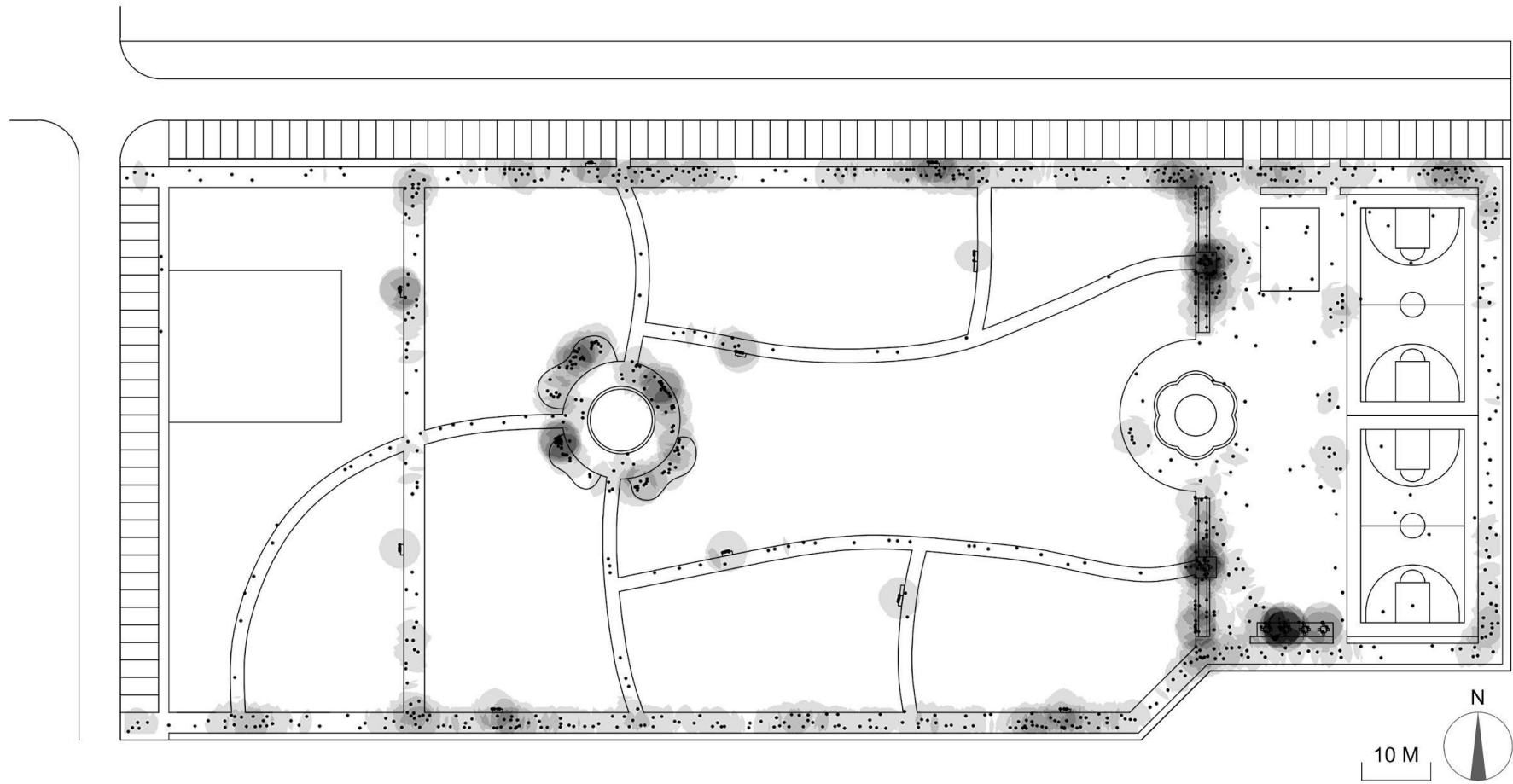
Figure 6.27 Density of male users at site 3 (source: author)
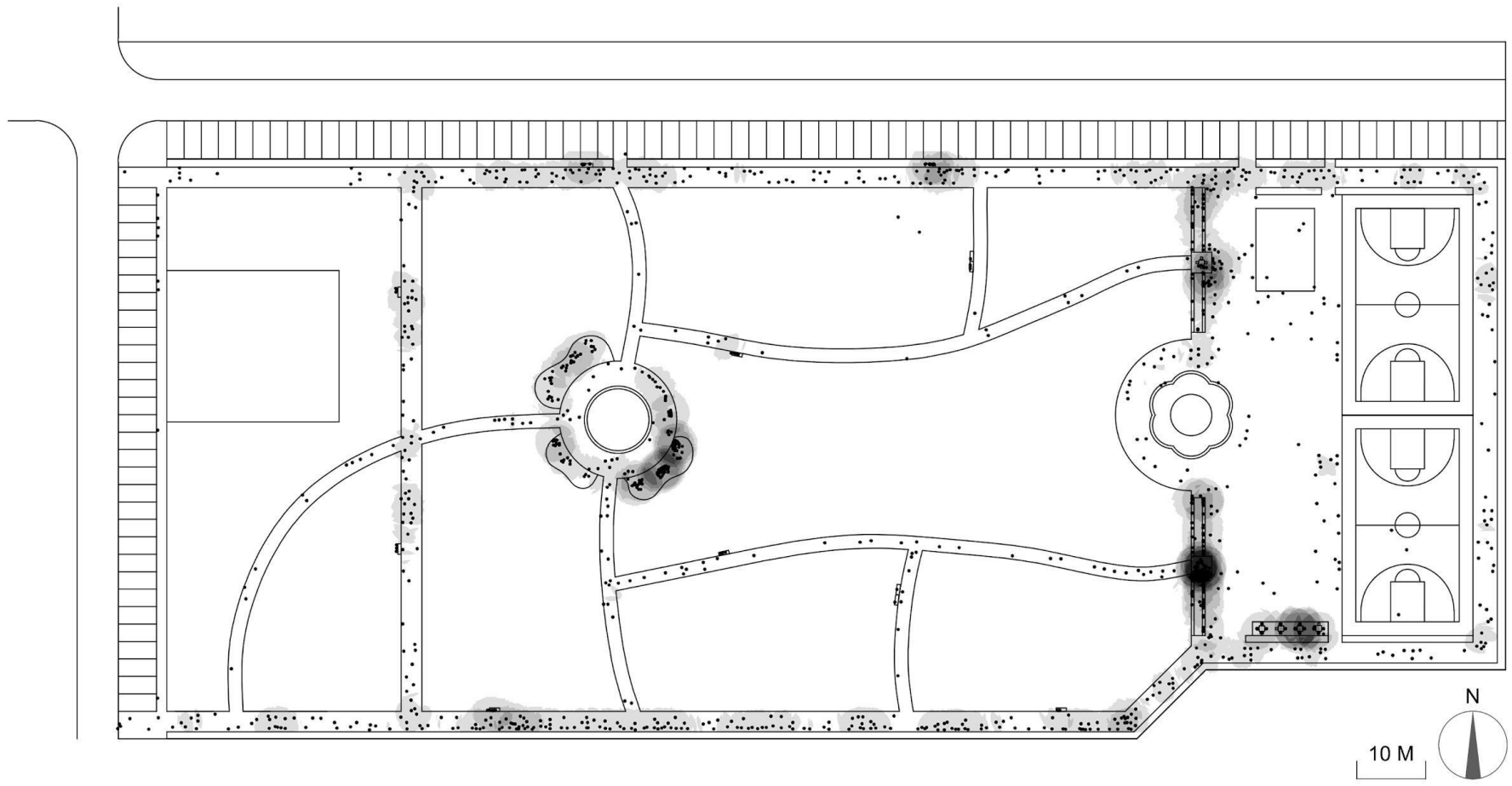
Figure 6.28 Density of female users at site 3 (source: author)
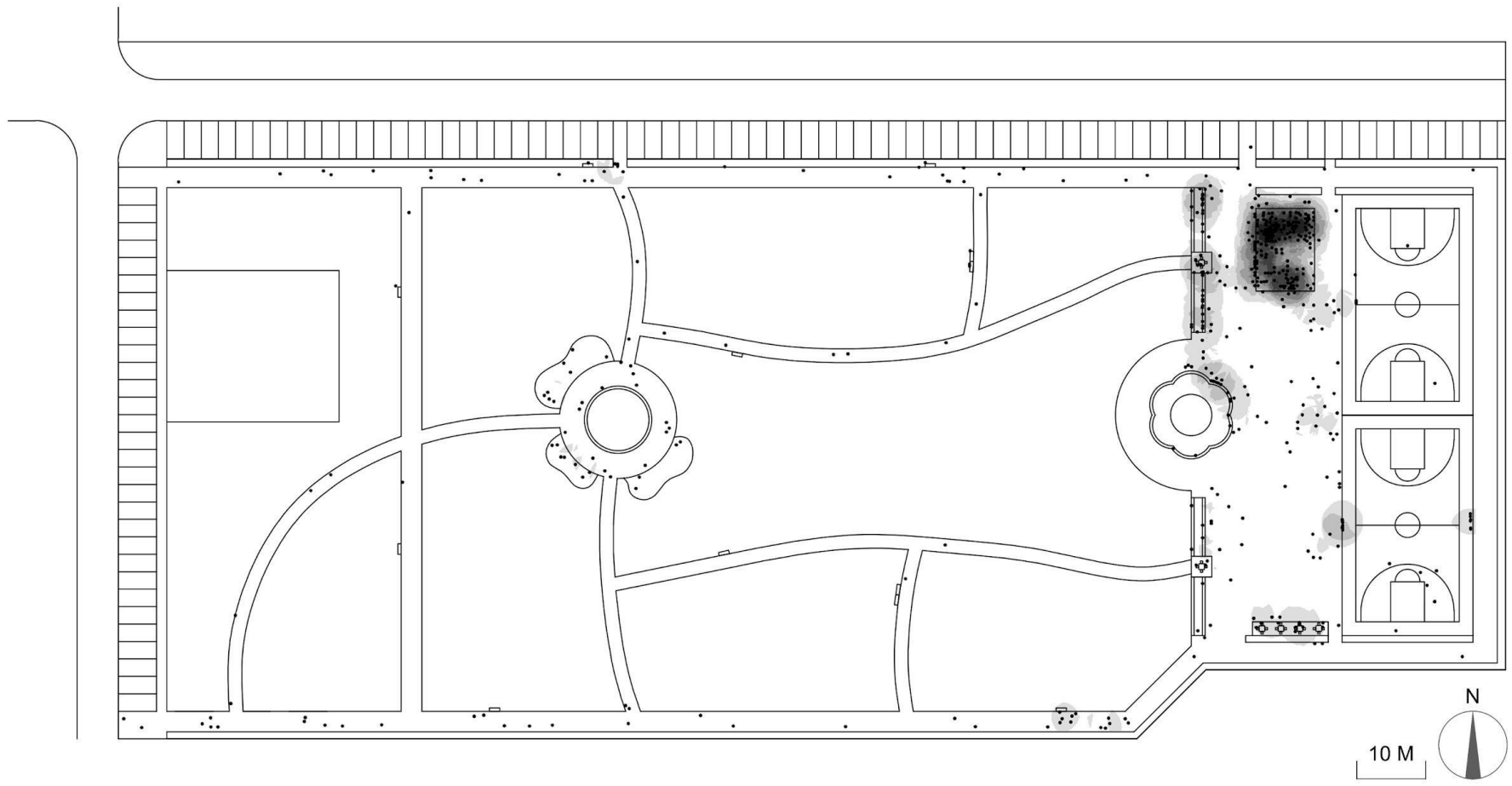
Figure 6.29 Density of users with children at site 3 (source: author)
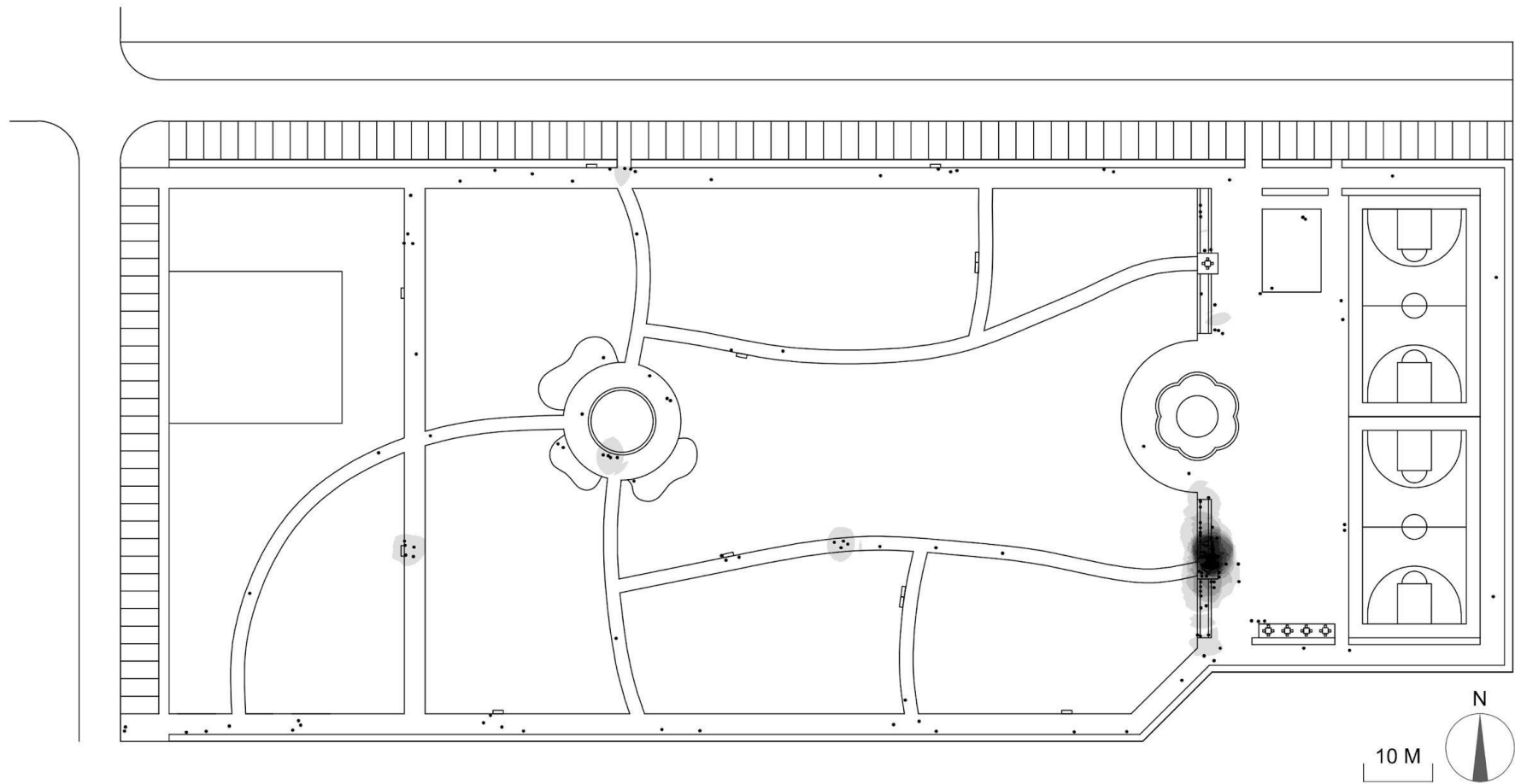
Figure 6.30 Density of users with wheelchairs at site 3 (source: author)

No.1 University building   No.2 Exercise space   No.3 Pergolas with seating   No.4 Children's playground

No.5 Seating with tables and the shelter   No.6 Basketball court   No.7 Activity space
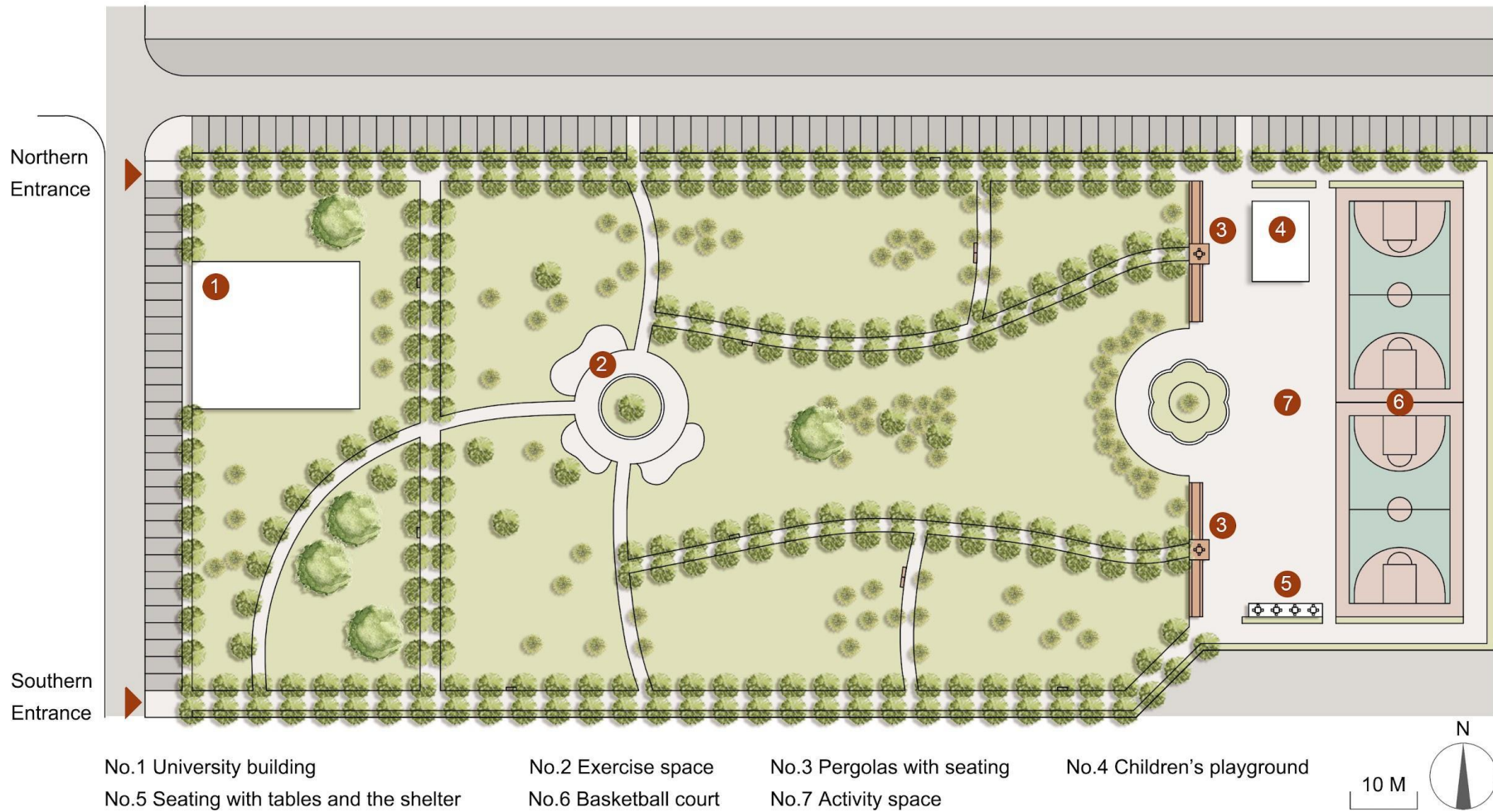
Figure 6.31 Master plan of site 3 (source: author)

6.4.3. Activities

A total of 27 activities were observed, which included seven passing-through activities (Table 6.5) and 20 on-site activities (Table 6.6). Because of the nature of this site, the purpose of passing-through activity was different from previous sites, which included going to other destinations and strolling (the latter can be understood as mobile activities within the site). Most older people were using this site for exercise purposes. There were 1331 older people walking on the site, which accounted for 84.4 per cent of the total passing-through activities. During the observation, many older people were observed strolling along the main path around the site for more than one circuit. This site plays an important role in supporting older people's daily outdoor strolling, which is older people's most important outdoor activity. One participant explained how strolling around is her daily outdoor activity:

"Walking, walking along the path. I walk every day, and for a few laps." [Female, 75]

As mentioned earlier, the users with wheelchairs accounted for a higher proportion of users overall than in the other sites. These wheelchair users were more likely to be engaged in passing-through activity compared with wheelchair users at other sites. This might be because this site has better accessibility for wheelchair users. These users were not only observed moving towards the area where wheelchair users congregated, but also moving along the path for a few laps as well. This was also observed in the case of older people walking with mobility aids, which also proved that this site is attractive to older people with different levels of mobility going outside to stroll.

Table 6.5 Passing-through activities at site 3 (source: author)

Passing-through activities in site 3	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Walking	84.40%	1331	591	670	23	47	-	-
Passing through on wheelchair	4.12%	65	-	-	-	-	30	35
Walking with mobility aids	3.74%	59	25	34	-	-	-	-
Walking with a pram	3.42%	54	-	-	12	42	-	-
Passing through by bicycle (electromobile)	2.03%	32	16	9	3	4	-	-
Walking with a dog	1.52%	24	10	14	-	-	-	-
Running	0.76%	12	10	2	-	-	-	-
Total	100.00%	1577	652	729	38	93	30	35

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

What stands out from the table is that this site has a very low proportion of users passing

through by bicycle (or electromobile) and walking with dogs. Older people can hence walk more safely without worrying about passing bicycles or electromobiles. Walking with dogs is permitted at this site but with some restrictions, including the dog needing a certificate, walking the dog on a lead, and cleaning up any dog fouling. However, there were still participants who mentioned that:

"Dogs are fouling everywhere, and you cannot say anything. Dog owners should clean up the fouling themselves. It is not managed well. It is so dirty. I have to look down and pay attention while strolling." [Female, 75]

Even though the activity of running accounted for the lowest proportion of passing-through activities, this site still had greater numbers of older people running than other sites. This again confirmed that this site has better path conditions and a spatial layout that supports older people's ability to stroll and run for exercise.

It is apparent from the spatial distribution of passing-through activities (Figure 6.32) that the southern entrance and the outer circle path have more users than the northern entrance and the inner path. During the observation, more older people were observed entering this site from the southern entrance and walking in an anti-clockwise direction. This is because the southern entrance is closer to residential areas. As mentioned earlier, older people's main passing-through activity included walking along the path for exercise. The outer circle path provides a longer distance for older people to walk.
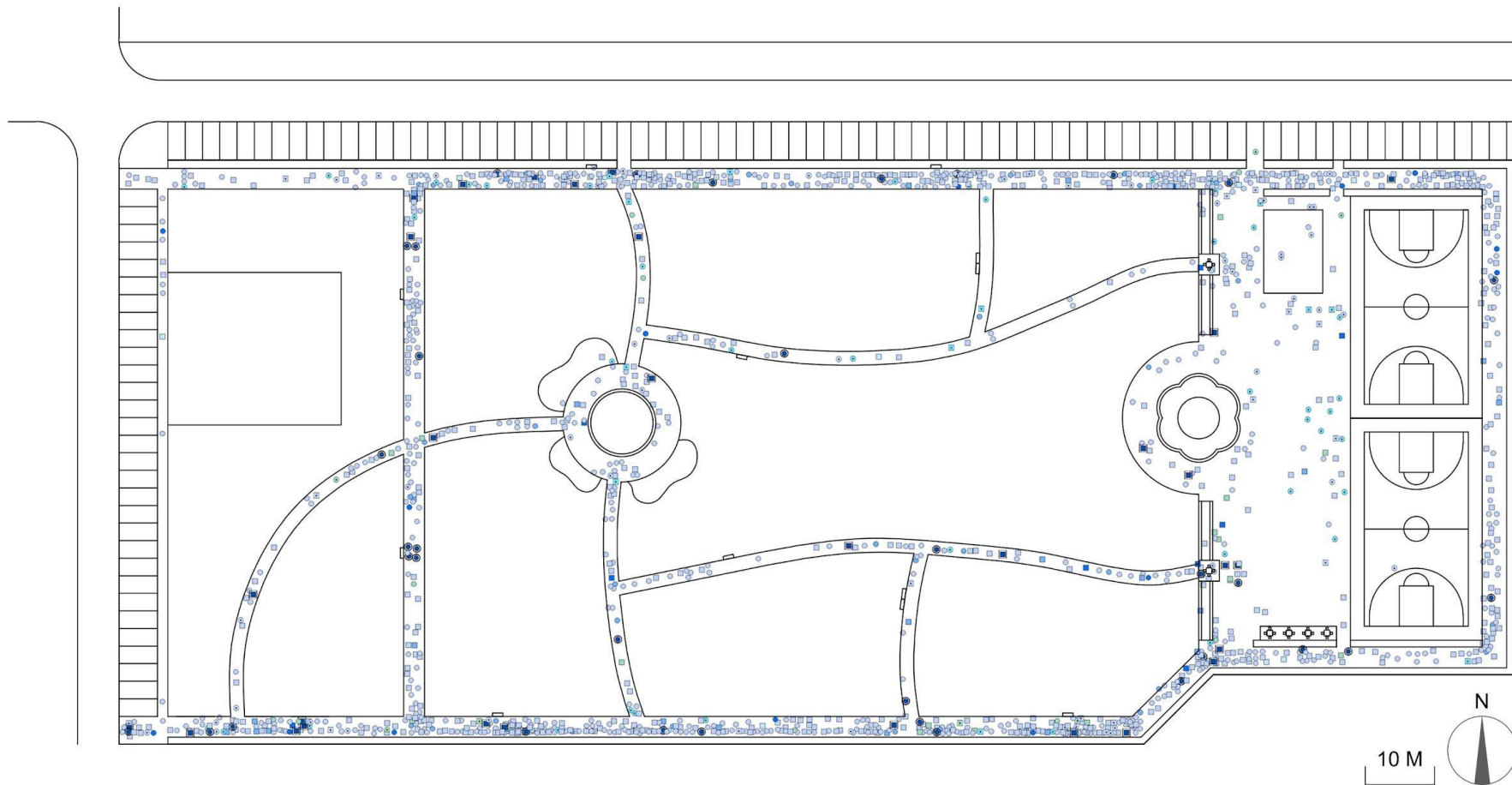
Figure 6.32 Spatial distribution of passing-through activities at site 3 (source: author)

10 M

N
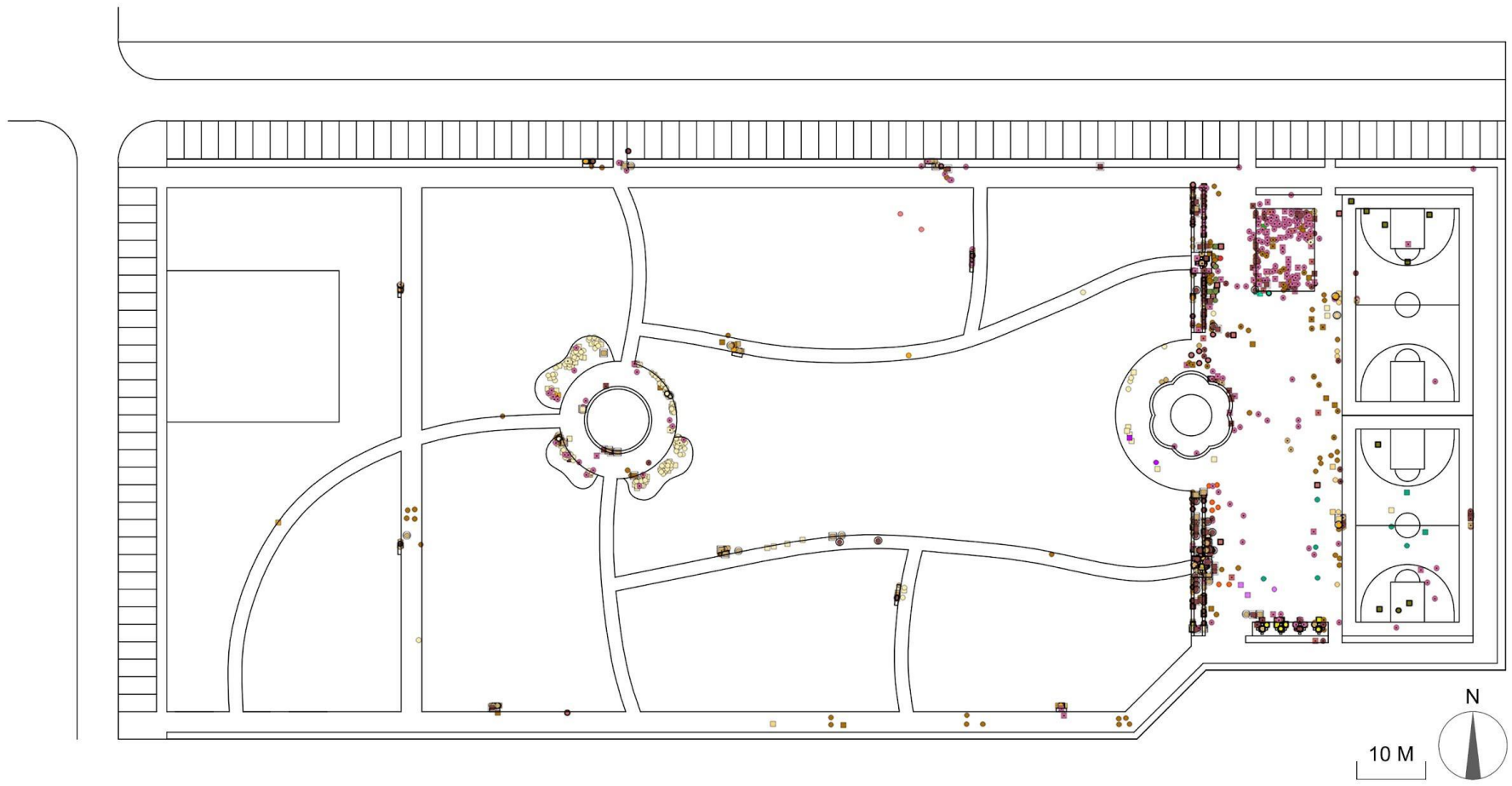
Figure 6.33 Spatial distribution of on-site activities at site 3 (source: author)

10 M

N

In terms of on-site activities, there was no activity identified as a necessary activity because of the nature of this site, which is designed for people to exercise and socialise. There were 20 types of on-site activities that can be subdivided into six optional activities and 14 social activities (Table 6.6). Doing exercises constituted the most frequent optional activity. This activity occurred in the central exercise area where exercise facilities were provided, along the inner path, and the path close to the planting area with seating at the eastern part of the site. It was observed that older people who exercised along the path usually faced the scenery to enjoy the views of nature (Figure 6.35, Left). The activities of sitting and watching objects and standing and watching objects at this site include reading newspapers, looking at mobile phones, the natural scenery, and the exhibition. In contrast to other sites, the exhibition at this site attracts large numbers of older people to stop and view the exhibits (Figure 6.34), which also creates opportunities for older people to communicate with each other.

Table 6.6 On-site activities at site 3 (source: author)

	On-site activities in site 3	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Optional activities	Doing exercises	19.43%	264	111	142	2	2	3	4
	Sitting and watching (objects)	2.65%	36	21	13	-	-	-	2
	Getting haircut	1.10%	15	7	8	-	-	-	-
	Standing and watching (objects)	0.96%	13	5	6	-	-	1	1
	Flying kite	0.29%	4	3	1	-	-	-	-
	Picking fruit	0.15%	2	-	2	-	-	-	-
Social activities	Sitting and watching (people)	18.91%	257	73	64	28	35	32	25
	Playing with children	17.51%	238	-	-	67	171	-	-
	Sitting and chatting	15.31%	208	52	106	4	16	18	12
	Standing and chatting	9.42%	128	25	74	6	22	1	-
	Playing chess (or cards)	7.43%	101	47	53	-	1	-	-
	Standing and watching (people)	4.49%	61	18	16	10	17	-	-
	Playing basketball	0.66%	9	8	1	-	-	-	-
	Playing badminton	0.59%	8	2	6	-	-	-	-
	Dancing	0.52%	7	-	7	-	-	-	-
	Kicking shuttlecock	0.22%	3	2	1	-	-	-	-
	Practising Tai chi	0.15%	2	1	1	-	-	-	-
	Playing the instrument	0.07%	1	1	-	-	-	-	-
	Practising Tai chi Roliball	0.07%	1	-	1	-	-	-	-
	Playing Diabolo	0.07%	1	1	-	-	-	-	-
	Total	**100.00%**	**1359**	377	502	117	264	55	44

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

*Figure 6.34 Older people viewing the exhibition at site 3 (source: author)*

An interesting optional activity observed at this site was getting a haircut (Figure 6.35, Middle). This activity was organised by one of the nearby community committees, which invited some barbers to cut older people's hair for free. This activity not only provides essential services for older people, which attracts older people to participate, but also draws in more older people, who stand around and chat with others. This revealed that this site can be used by community committees to organise activities and provide services, which has the potential to encourage older people to get outside, promoting their satisfaction with their neighbourhoods, and extending their social connections.

Kite flying was also observed on the activity area of this site, which reflected this site's characteristics of openness, without too many overhanging trees. Even though the activity of picking fruit was only observed twice, it is also worth noting that older people are interested in making contact with nature or reconnecting with the productive landscapes of their youth (Figure 6.35, Right).

Figure 6.35 Older people exercising along the path (Left), getting their hair cut (Middle), and picking fruit (Right) at site 3 (source: author)

The activities of sitting and watching (people), playing with children, and sitting and chatting

accounted for the most frequent social activities at site 3. In contrast to other sites, sitting and watching was the most popular social activity for all user types. For older people with children, this activity included not only observing others but also observing their children playing on site. Most older people were sitting on the north pergola (No. 3 in Figure 6.31), or sitting on the fence around the children's play facilities (Figure 6.36, Left). Apart from that, users with children's most obvious activity was playing with children, which was the second-most frequent social activity. One participant stated that:

"There are many children playing here. The children will come here after school. " [Female, 90]

For users with wheelchairs, sitting and watching and sitting and chatting were the leading activities. As mentioned in Section 6.4.2, "User features", the users with wheelchairs were concentrated in the southern part of the activity space (No. 3 in Figure 6.31), which is also where they spent time observing others and chatting (Figure 6.36, Middle). These activities are essential and meaningful for less mobile older people. The following participant highlighted why this site is important to their lives:

"Our main activities are here. We cannot walk for a long time and take the bus. So, we prefer staying here to watch these children playing basketball, playing here. It is nice to just sit here and watch." [Older people at site 3]

Figure 6.36 Older people sitting on the fence while observing children playing (Left), Older people with wheelchairs sitting on the southern part of the activity space (Middle), Older people playing chess (or cards) (Right) on site 3 (source: author)

Playing chess (or cards) was also a frequent social activity for both male and female users at

site 3, which occurred where chess tables were provided in the pergolas (No. 3 in Figure 6.31) and seating with tables and the shelter along the south part of the activity space (No. 5 in Figure 6.31, Figure 6.36, Right).

The activities of playing basketball and badminton were physically high-intensive activities, which occurred more frequently at this site than within the communities. However, there was no large group dancing exercise observed at site 3, except for a few female users. Their dancing exercise was not organised and did not occur regularly, as at other sites. The rest of the social activities, including kicking shuttlecock, practising Tai chi, playing instruments, practising Roliball and Diabolo, showing that this site has the potential to invite older people to do various activities and get connected with wider networks.

In terms of older people's use of space, It seems that there is no conflict with other users. A group of young males playing basketball were seen in the early morning (during the 6:00 to 8:00 observation period), whereas older people were mainly strolling or exercising at that time. Some other young adults, and young adults with children, were also using the site alongside older people. The group of children taking basketball lessons at the basketball court in the afternoons became an attractive event for older people to observe.

6.5. Site 4: Western green space within the university campus

6.5.1. Observation times

06:00 - 19:00, 18th September 2019 - Wednesday, 25℃ / 14℃, Sunny

06:00 - 19:00, 19th September 2019 - Thursday, 25℃ / 16℃, Cloudy

06:00 - 19:00, 21st September 2019 - Saturday, 27℃ / 16℃, Sunny

6.5.2. User characteristics

Site 4 is mainly occupied by older people, with a few young adults and middle-aged people seen using this site together with them. The observations recorded 1402 older users at site 4

during the three days of observation time. According to Figure 6.26, female users slightly outnumbered male users, accounting for 45.08 per cent and 42.8 per cent, respectively. The proportion of female users with children was 7.06 per cent higher than male users with children, the latter with a proportion of 2.92 per cent. Female users with wheelchairs and male users with wheelchairs had the lowest proportions at only 2 per cent and 0.14 per cent, respectively.

Figure 6.37 Percentage of different user type in site 4 (source: author)
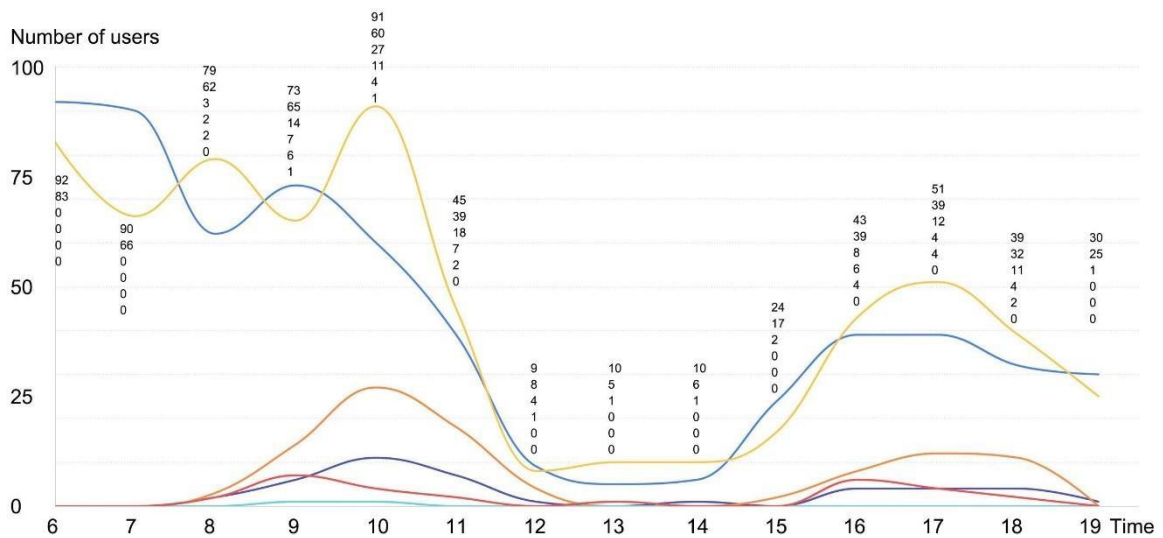
Figure 6.38 Number of different users at different times at site 4 (source: author)

Older people tend to use this site in the morning because the number of all user types was higher in the morning than in the afternoon (Figure 6.38). Unlike other sites, where there were lower numbers of male and female users from 6:00 to 7:00, male and female user numbers at this site were higher from 6:00 to 7:00. What is interesting in Figure 6.38 is the difference between male and female users. The number of male users decreased with a fluctuating tendency from 6:00 to 12:00, and remained low until it started to increase, when it remained at a relatively higher number from 15:00 to 18:00. The number of female users

presented a fluctuating increasing trend in the morning and reached a peak at 10:00. The number of female users exceeded male users at 16:00 and peaked at 17:00. The male and female users with children presented a similar trend, which peaked at 10:00 and was distributed evenly from 16:00 to 18:00. The small number of wheelchair users were concentrated at 9:00 and 16:00.

The distribution of male and female users (Figure 6.39, 6,40) had a similar pattern that was distributed fairly evenly across the site and clustered where exercise facilities are provided (No. 1 in Figure 6.43). There were some small female groups occupying the space near and under the pergola at the north-eastern and north-western parts of the site (No. 6 Figure 6.43), as well as the parking space outside the site (No. 5 Figure 6.43), and the open space near the university building (No. 4 in Figure 6.43). It is obvious that the users with children were concentrated around the pond (No. 3 in Figure 6.43) and the exercise area on the south-west corner of the site (No. 1 in Figure 6.43). This might be because children prefer playing near the water or playing with the exercise equipment. The distribution of users with wheelchairs was relatively dispersed. Except for passing-through on a wheelchair, their main activities were doing exercises, sitting and chatting, and sitting and watching others.
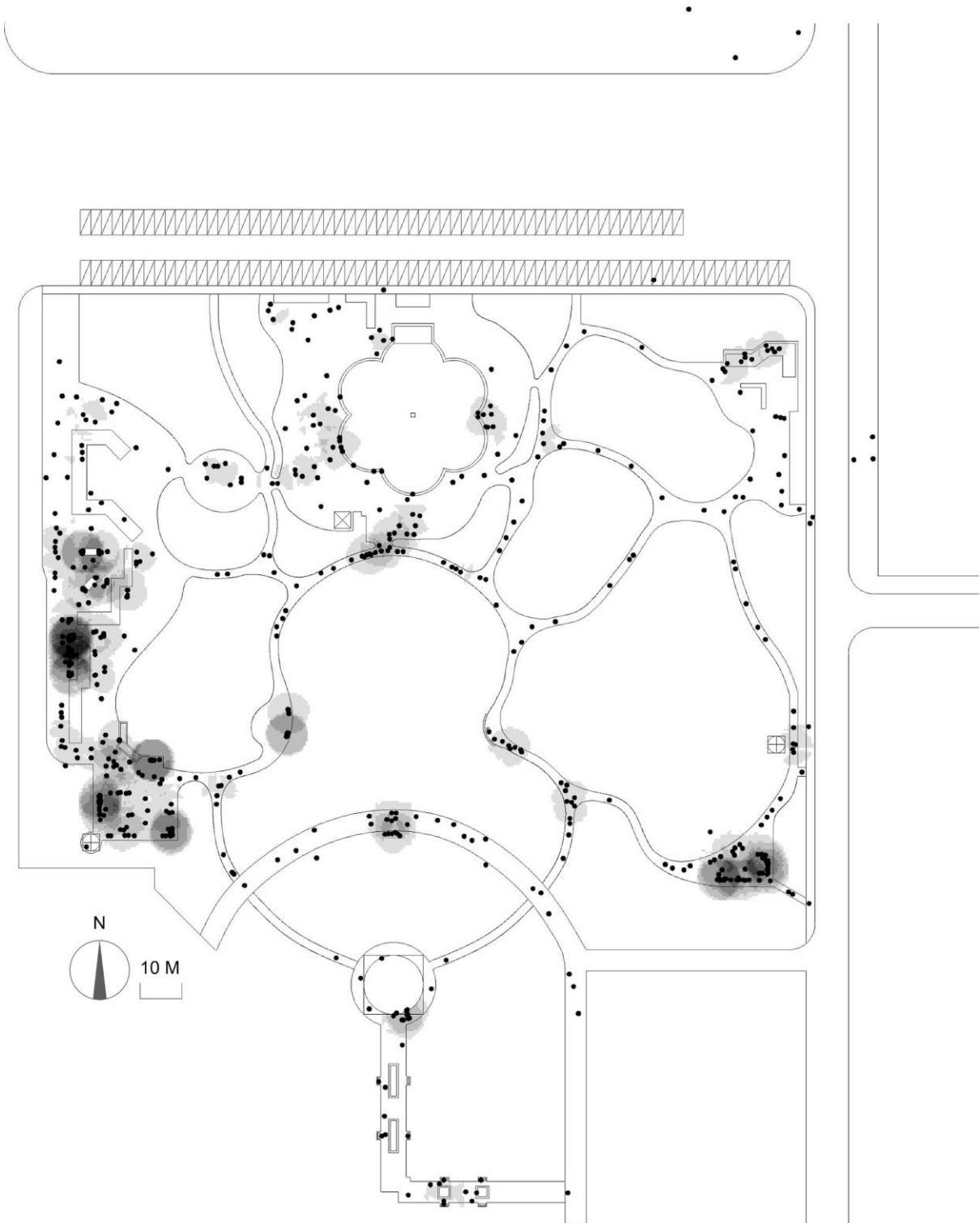
Figure 6.39 Density of males at site 4 (source: author)
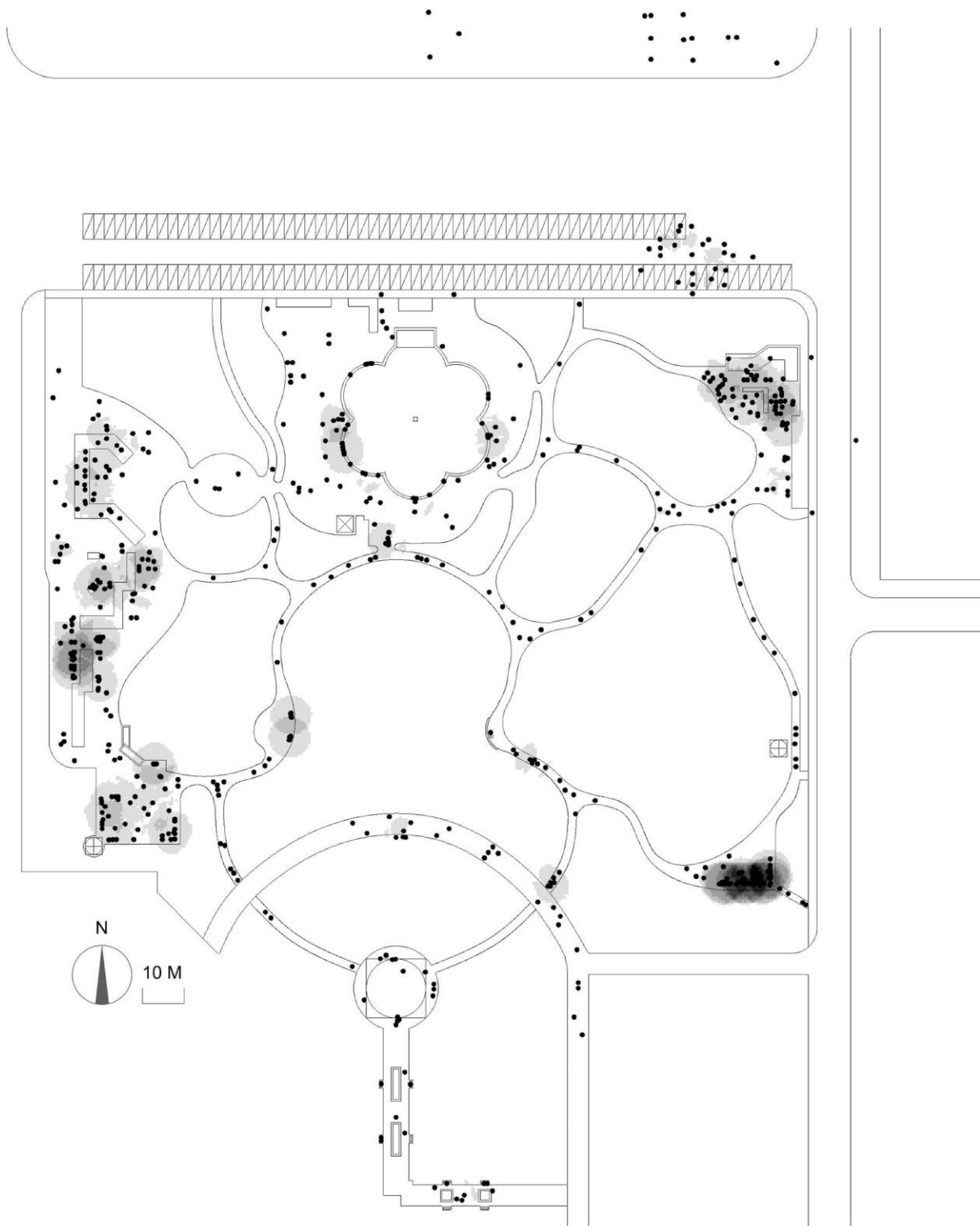
Figure 6.40 Density of females at site 4 (source: author)
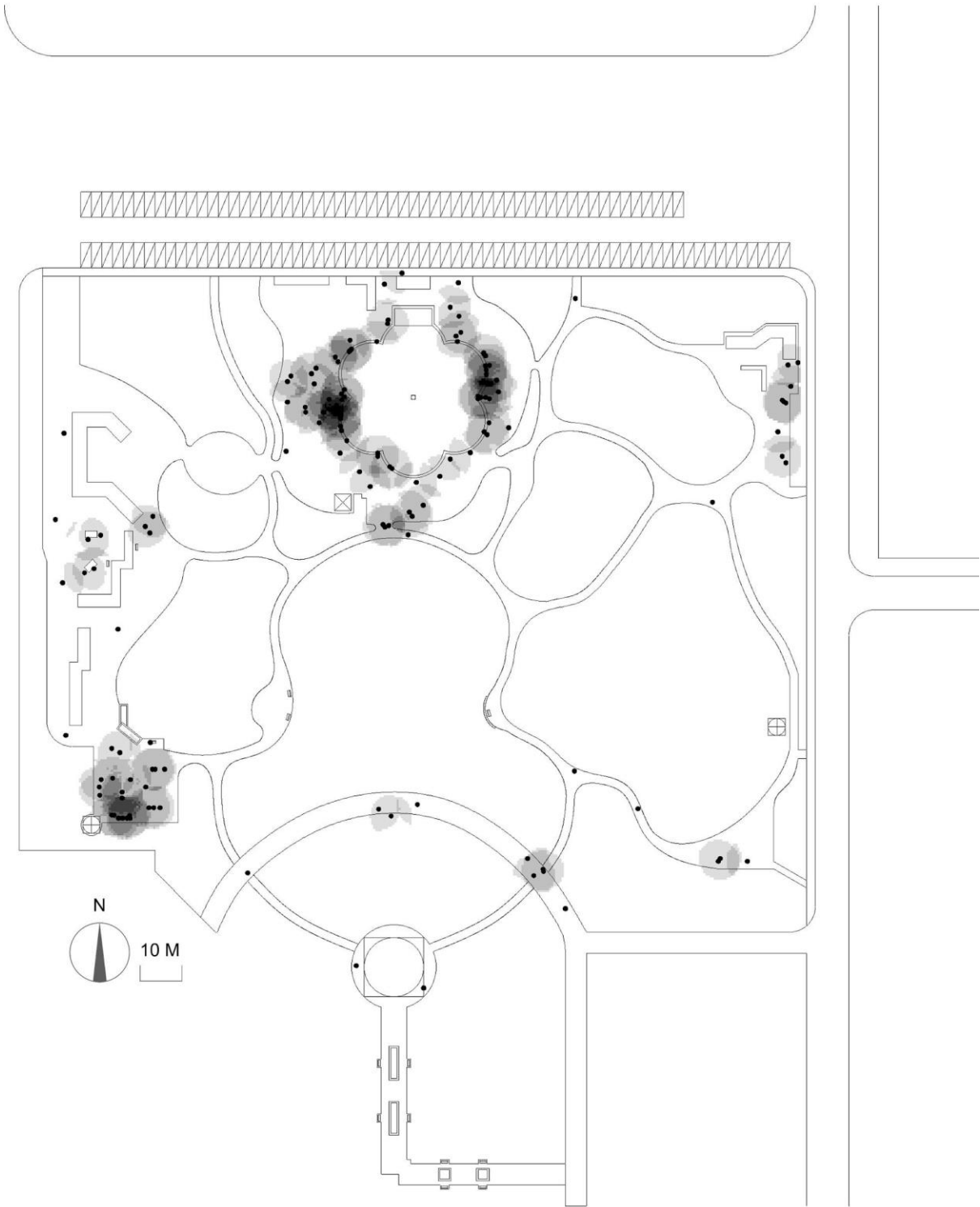
Figure 6.41 Density of users with children at site 4 (source: author)
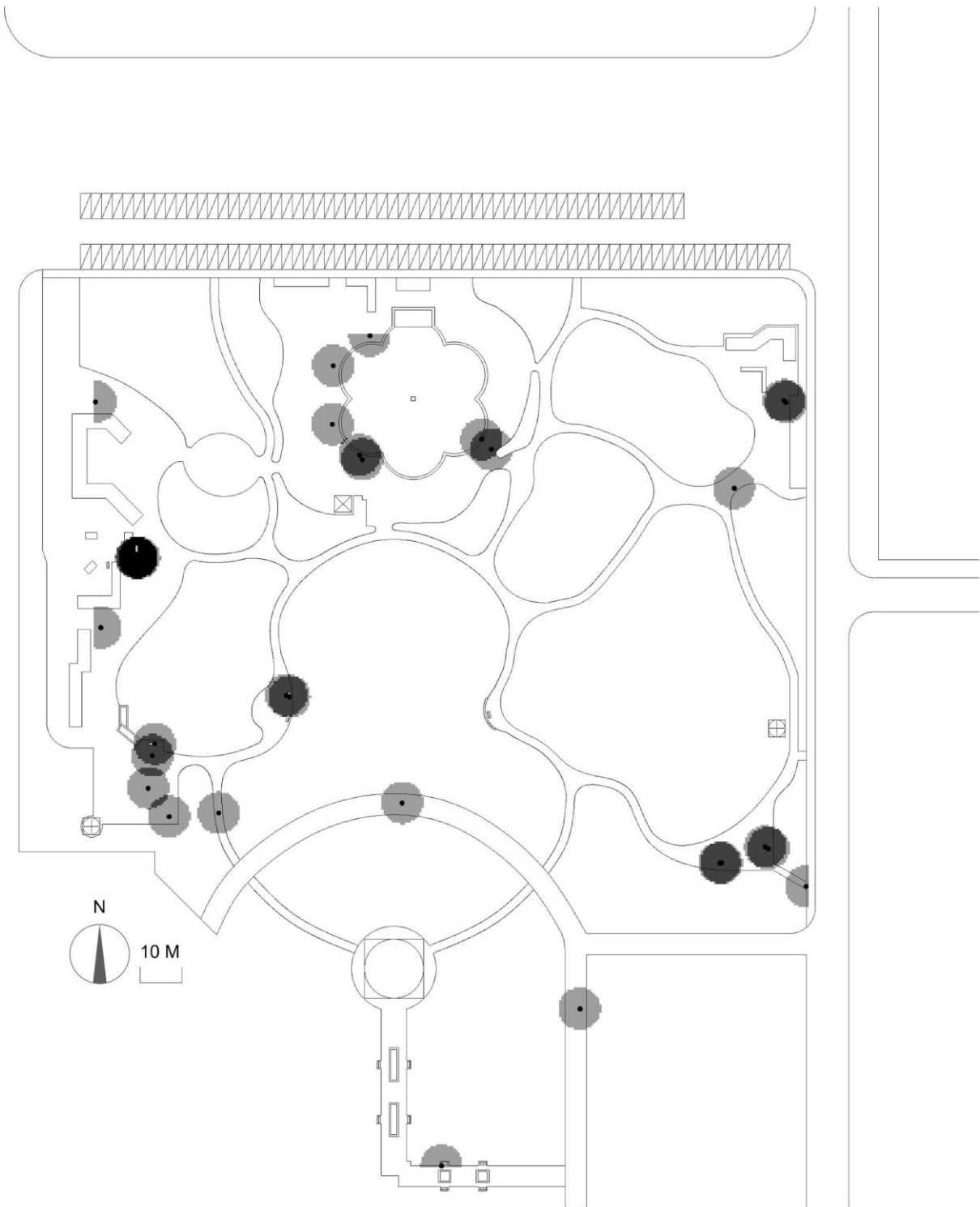
Figure 6.42 Density of users with wheelchairs at site 4 (source: author)

Figure 6.43 Master plan of site 4 (source: author)

6.5.3. Activities

A total number of 24 types of activities were observed on site 4, which included seven passing-through activities (Table 6.7, Figure 6.44), and 17 on-site activities (Table 6.8, Figure 6.45).

The activity of walking accounted for the highest proportion of passing-through activities, not only at this site but also at other sites as well. The reason for this might be that some older people not only like to stroll here, but also choose to walk through this site to reach other destinations rather than using the main road near this site. This site provides alternative, greener walking spaces for people to cross compared with the main road. A participant explained why they prefer strolling at this site:

"We usually come here in the summer. There are more trees and better fresh air. But the circle here is smaller and has less sunshine." [Female, 75]

Even though the activity of passing through by bicycle (or electromobile) accounted for the second-highest percentage of passing-through activity on this site, it was still not frequently observed. This activity usually happened along the path, and near the most popular activity space in the south-western corner, which indicated that it might represent older people passing through this site on their way to other destinations, or travelling to this site by bicycle or electromobile, and then dismounting to use the site on foot. The next most common activity was walking with a pram; this was usually observed near the pond, which is a popular area for older people with children. A limited number of older people were observed walking with prams and passing through on wheelchairs, which might reveal that this site was not preferred by older people with less mobility to strolling. Unlike at other sites, walking with dogs was only observed once due to the location of this site, which is close to the university offices and educational buildings.

Table 6.7 Passing-through activities at site 4 (source: author)

Passing-through activities in site 4	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Walking	87.76%	466	242	203	7	14	-	-
Passing through by bicycle (electromobile)	5.08%	27	17	9	1	0	-	-
Walking with a pram	3.20%	17	0	0	6	11	-	-
Walking with mobility aids	1.88%	10	3	7	-	-	-	-
Passing through on wheelchair	1.13%	6	-	-	-	-	1	5
Running	0.75%	4	4	-	-	-	-	-
Walking with a dog	0.19%	1	0	1	-	-	-	-
Total	100%	531	266	220	14	25	1	5

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair
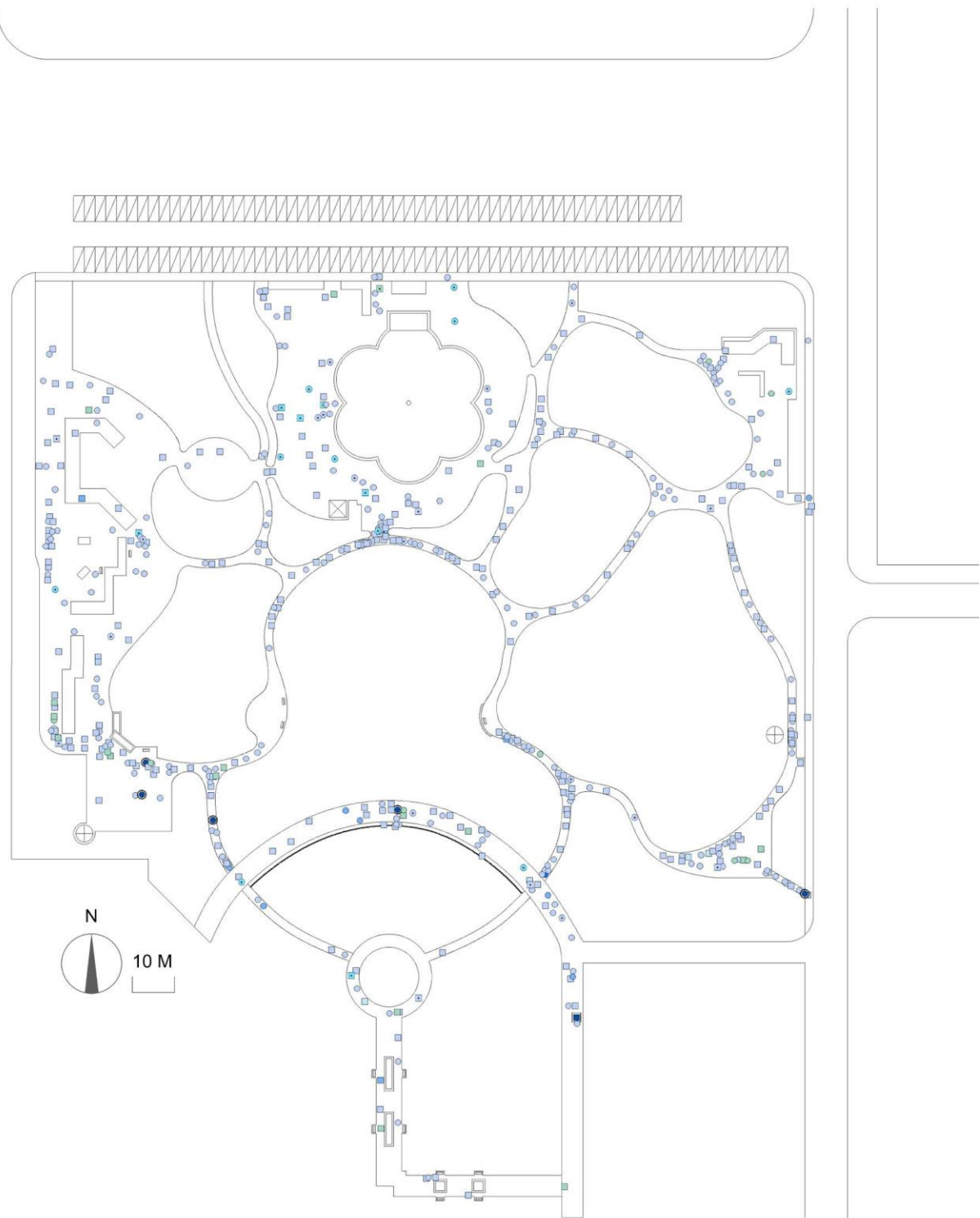
Figure 6.44 Spatial distribution of passing-through activities at site 4 (source: author)
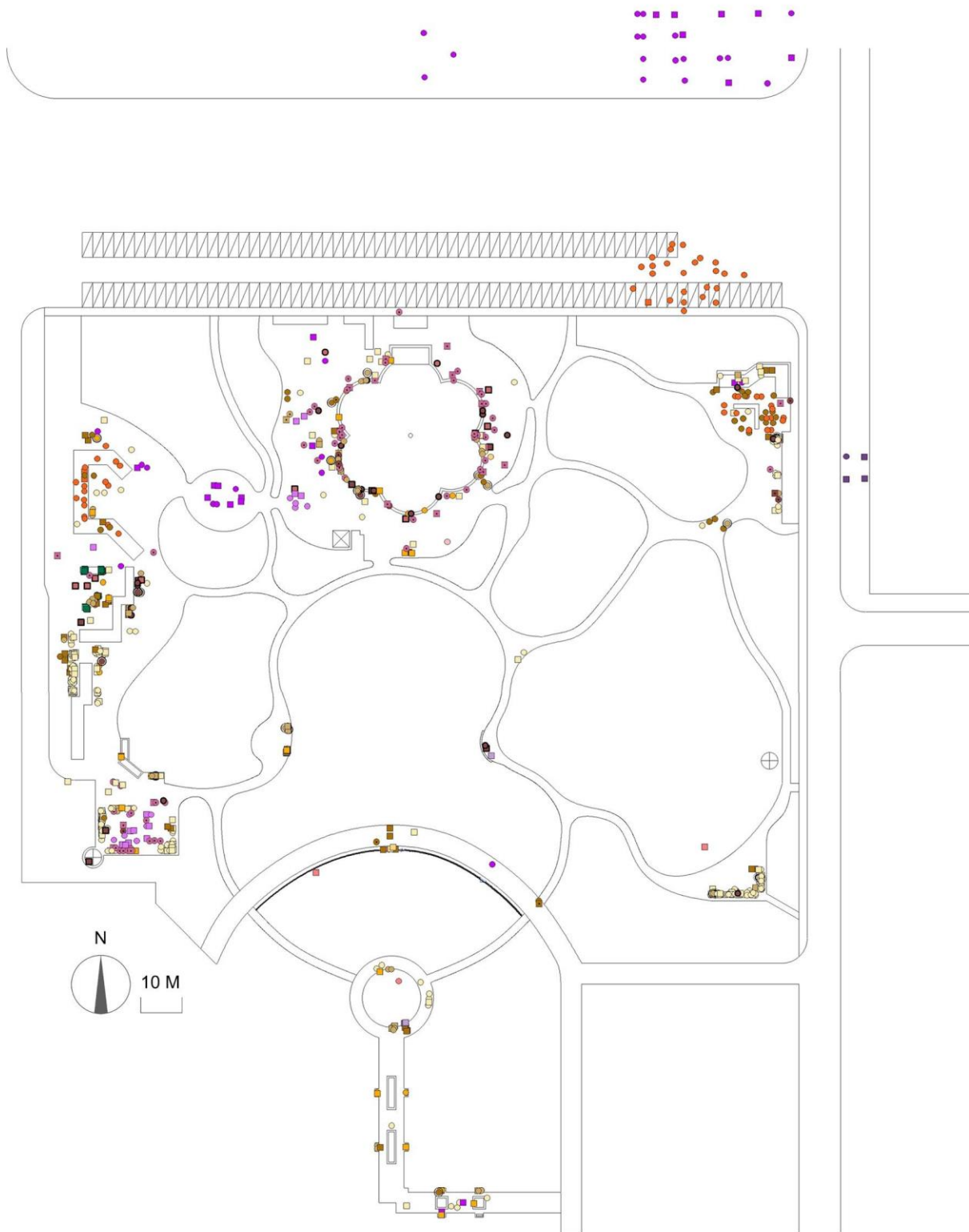
Figure 6.45 Spatial distribution of on-site activities at site 4 (source: author)

Table 6.8 On-site activities at site 4 (source: author)

	On-site activities in site 4	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Optional Activities	Doing exercises	36.62%	319	148	165	1	-	1	4
	Sitting and watching (objects)	5.97%	52	33	17	-	-	-	2
	Standing and watching (objects)	0.34%	3	2	1	-	-	-	-
	Picking fruit	0.34%	3	2	1	-	-	-	-
	Practising Yoga	0.11%	1	0	1	-	-	-	-
Social Activities	Sitting and chatting	12.86%	112	33	64	2	3	-	10
	Standing and chatting	9.07%	79	33	38	1	5	-	2
	Playing with children	8.96%	78	-	-	20	58	-	-
	Dancing	7.00%	61	3	58	-	-	-	-
	Practising Tai chi	5.51%	48	19	29	-	-	-	-
	Sitting and watching (people)	5.17%	45	12	20	2	6	-	5
	Playing table tennis	2.76%	24	17	5	2	-	-	-
	Kicking shuttlecock	2.64%	23	13	10	-	-	-	-
	Standing and watching (people)	1.49%	13	9	2	-	2	-	-
	Playing the instrument	0.46%	4	4	-	-	-	-	-
	Practising Tai chi Roliball	0.46%	4	3	1	-	-	-	-
	Playing badminton	0.23%	2	2	-	-	-	-	-
	Total	**100%**	**871**	**333**	**412**	**28**	**74**	**1**	**23**

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

A total number of 17 on-site activities could be subdivided into five optional activities and 12 social activities. Doing exercises made up the highest proportion and number of optional activities across all sites. This also explains the reason why there were far more older people observed here in the early morning than at other sites, because this site attracts more older people to do exercise (usually an early morning activity). Sitting and watching (objects) was the next most frequent optional activity, with the highest number of older people observed doing this here compared with other sites. As well as looking at their phones, many were observed reading a book (Figure 6.46 Left). This might reflect that this site is suitable for static activity. Picking fruit was also observed because there are orchards at this site (Figure 6.46 Middle). Even though they are surrounded by hedges, older people are still interested in gaining the opportunity to connect more closely with productive landscapes. Practising yoga was only observed at this site, which took place under a landmark tree (Figure 6.46 Right). This also confirmed that this site's characteristics are suitable for tranquil and peaceful activities.

Figure 6.46 Older people reading a book (Left), picking fruit (Middle), and practising yoga (Right) at site 4

(source: author)

In terms of social activities, sitting and chatting, and standing and chatting were the preferred social activities for both male and female users, as well as users with wheelchairs. Older people were usually observed sitting and chatting alongside the pond (No.3 in Figure 6.43), and where seating was provided, standing and chatting near the pond, and close to the exercise facilities (No.1 in Figure 6.43). As with other sites, playing with children was also a common social activity at this site; this usually happened near the pond (No. 3 in Figure 6.43) and the exercise space (No. 1 in Figure 6.43) at the south-western corner of the site - as mentioned earlier in the user analysis - which are the preferred spaces for users with children. Three small groups of older people were observed dancing for exercise in the early morning at the parking area near the site (No. 5 in Figure 6.43, Figure 6.47, Left), exercise space on the north-eastern corner, and the pergola (No.6 in Figure 6.43). Practising Tai chi was also observed in small groups of older people, which indicated that this site enabled older people to organise various group activities. The next most frequent social activity was sitting and watching (people), which was also popular amongst users with wheelchairs. Playing table tennis was also a popular social activity at this site, as there are two table tennis tables provided (No. 2 in Figure 6.43, Figure 6.47, Middle). A participant from site 1 also mentioned that she usually comes here to play table tennis:

"We have a lot of activities. I usually go to the south entrance of the University, near the fountain, to play table tennis." [Female, 63]

A number of older people were also observed kicking shuttlecocks in several small groups at the exercise space at the south-western corner (No. 1 in Figure 6.43) of the site and the space

close to the pond (No. 3 in Figure 6.43, Figure 6.47, Right). The south-western corner of the site and the space around the pond are popular areas for different users and activities. The activities of playing an instrument, practising Tai chi Roliball, and playing badminton were also observed, which enriched the types of social activity pursued at this site.

Figure 6.47 Older people dancing in group at the car park (Left), playing table tennis (Middle), and kicking a shuttlecock (Right) at site 4 (source: author)

6.6. Site 5: Shuangyushu neighbourhood park

6.6.1. Observation times

06:00 - 19:00, 3rd September 2019 - Tuesday 33℃ / 20℃, Sunny

06:00 - 19:00, 4th September 2019 - Wednesday, 32℃ / 19℃, Sunny

06:00 - 19:00, 7th September 2019 - Saturday, 34℃ / 21℃, Sunny

6.6.2. User characteristics

Among all the age groups using site 5, older people are the dominant user type, though with some other user types including middle-aged adults and adults, both with and without children. A total number of 5069 older people were observed during the observation times, which was much higher than at other sites. Unlike the other sites (Figure 6.48), the proportion of male users was significantly higher than that of female users, accounting for 51.92 per cent (2632 male users) and 37.15 per cent (1883 female users), respectively. However, the unaltered trend was for the percentage of females with children (6.08 per cent) to remain much higher than for males with children (2.43 Per cent). Male and female users with wheelchairs did not account for a high proportion because of the large total user number, but

the number of users with wheelchairs was not lower than at other sites, with 65 males (1.28 per cent) and 58 females with wheelchairs (1.14 per cent).

Figure 6.48 Percentages of different user types at site 5 (source: author)
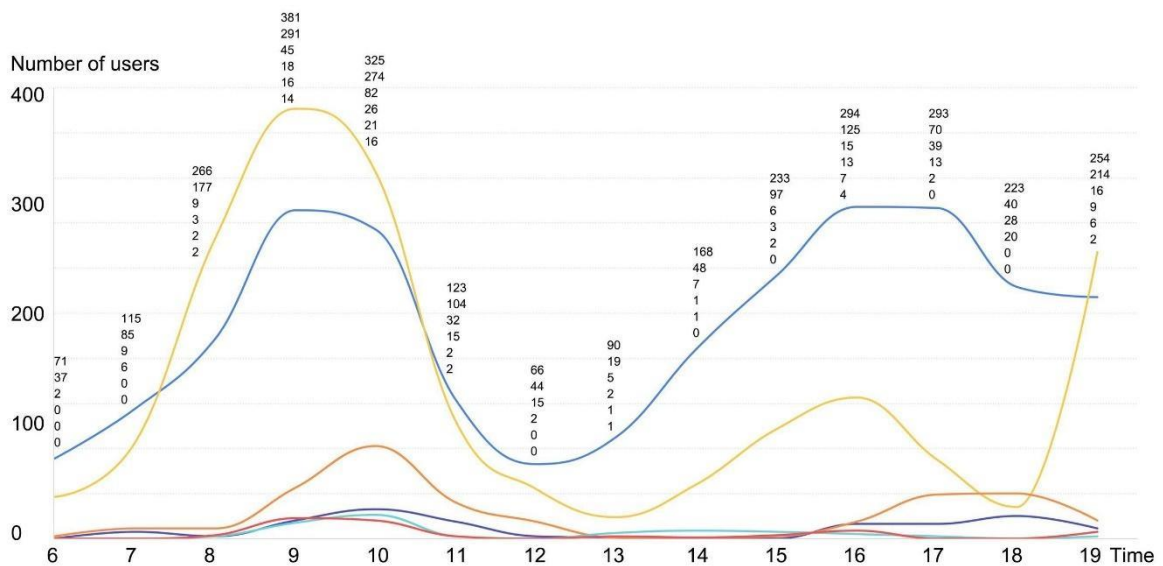
Figure 6.49 Number of different users at different times at site 5 (source: author)

The difference between the peak times for male and female users is that the male users peaked both in the morning, from 9:00 to 10:00, and in the afternoon, increased gradually from 13:00, and peaked between 16:00 and 17:00. In contrast, female users' peak time in the morning was also between 9:00 and 10:00, but the number of female users during this time exceeded male users. Even though the number of female users also increased slightly in the afternoon, it was dramatically lower than male users. However, the number of female users increased sharply at 19:00, possibly because their preferred activities were happening at that time. As can be seen from the line graph trend (Figure 6.49), there were still a large number of older people on site after 19:00. Due to the difficulty in identifying people's ages from photos taken at night, and the observation times at other sites, the researcher did not record

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data after 19:00. However, the researcher remained on site until 21:00 to speak with some older people and learned that this site is still used by many older people, even up to 22:00. Therefore, there were more older people using this site than the observed number of older people.

As shown in Figure 6.50, it was obvious that there was a trend for male users to concentrate where chairs were provided, as their popular activity is playing chess or cards. The female users (Figure 6.51) also followed this trend but were, in addition, distributed throughout the central activity space (No. 2 in Figure 6.54), the activity space in front of the building, near the north-east entrance, and the path with lined trees (No. 6 in Figure 6.54), as they used these spaces to dance and to practise Tai chi in groups. The users with children (Figure 6.52) occupied the spaces where the seats were provided near the row of trees (No. 6 in Figure 6.54), the seating under the landmark tree in front of the building, the rest area close to the trellised pavilion (No.6 in Figure 6.54), the area near the north-east and the east entrance (No. 2 in Figure 6.54), as well as the edges of the central activity area (No. 2 in Figure 6.54). There are some overlaps between users with children and wheelchair users. However, these wheelchair users were more concentrated (Figure 6.53), sitting close to the bench provided in the central activity area (No. 2 in Figure 6.54). The seating provided along the central activity area provided the opportunity for different users to observe the various activities happening there.
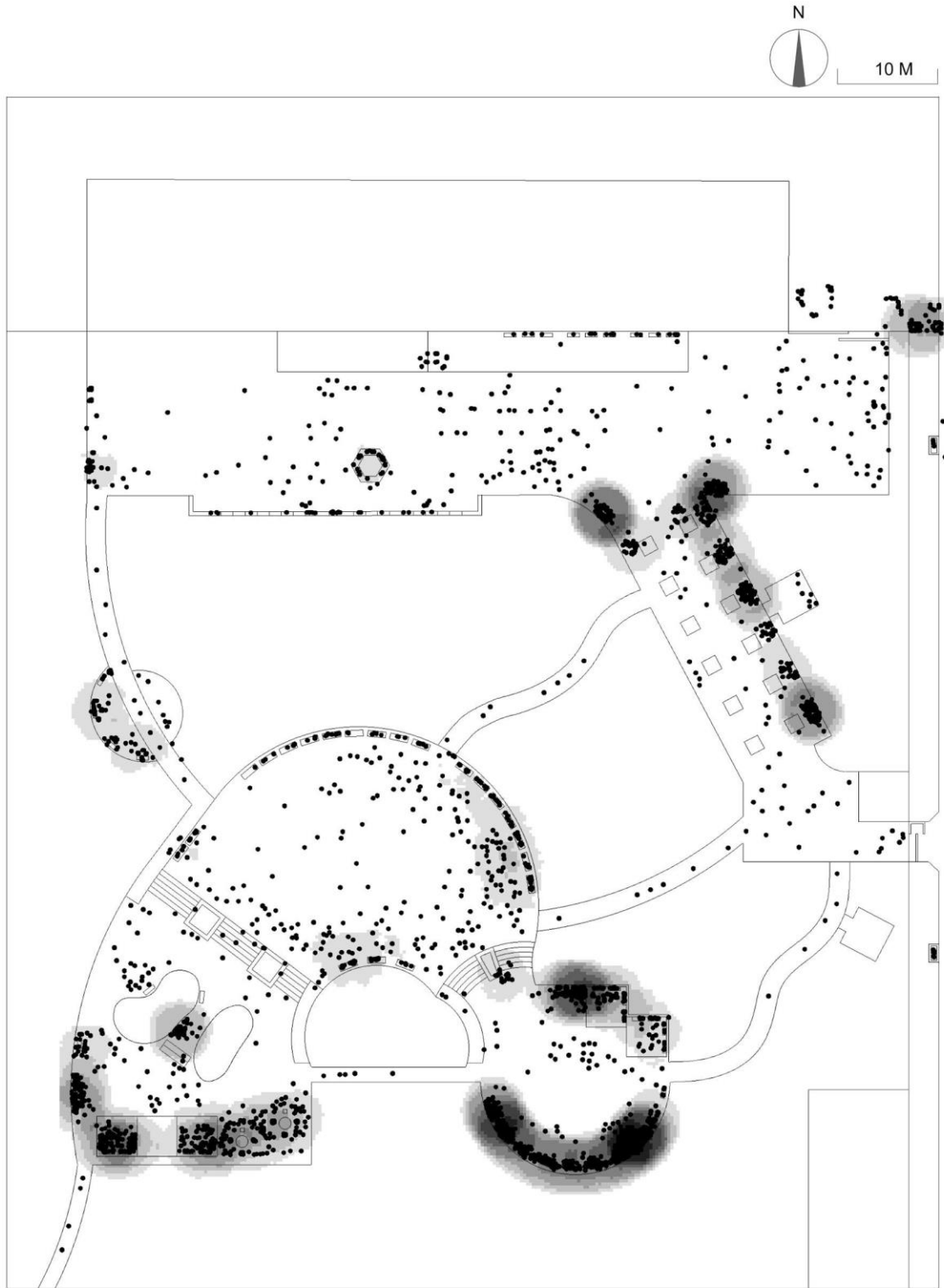
Figure 6.50 Density of males at site 5 (source: author)
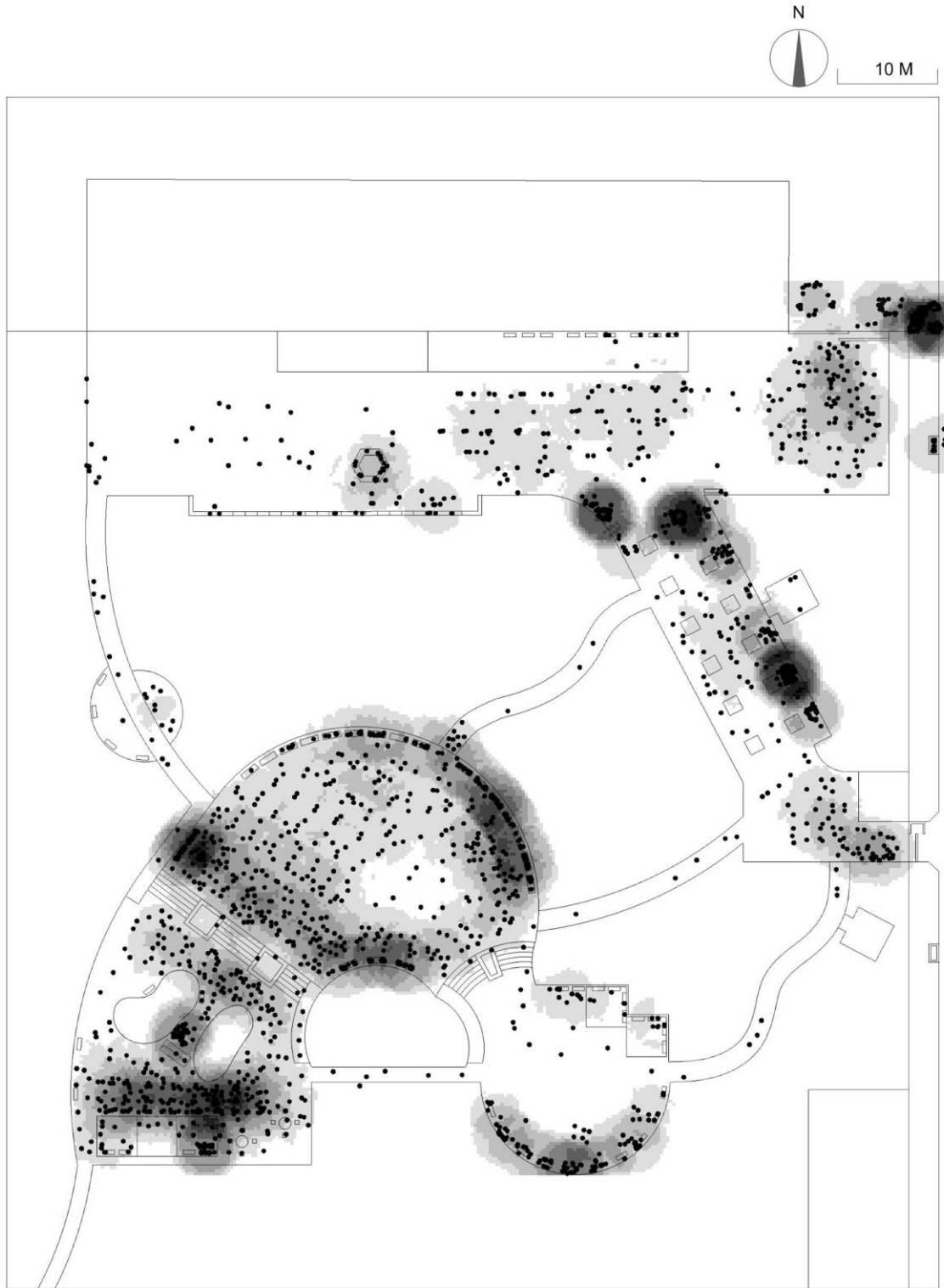
Figure 6.51 Density of females at site 5 (source: author)
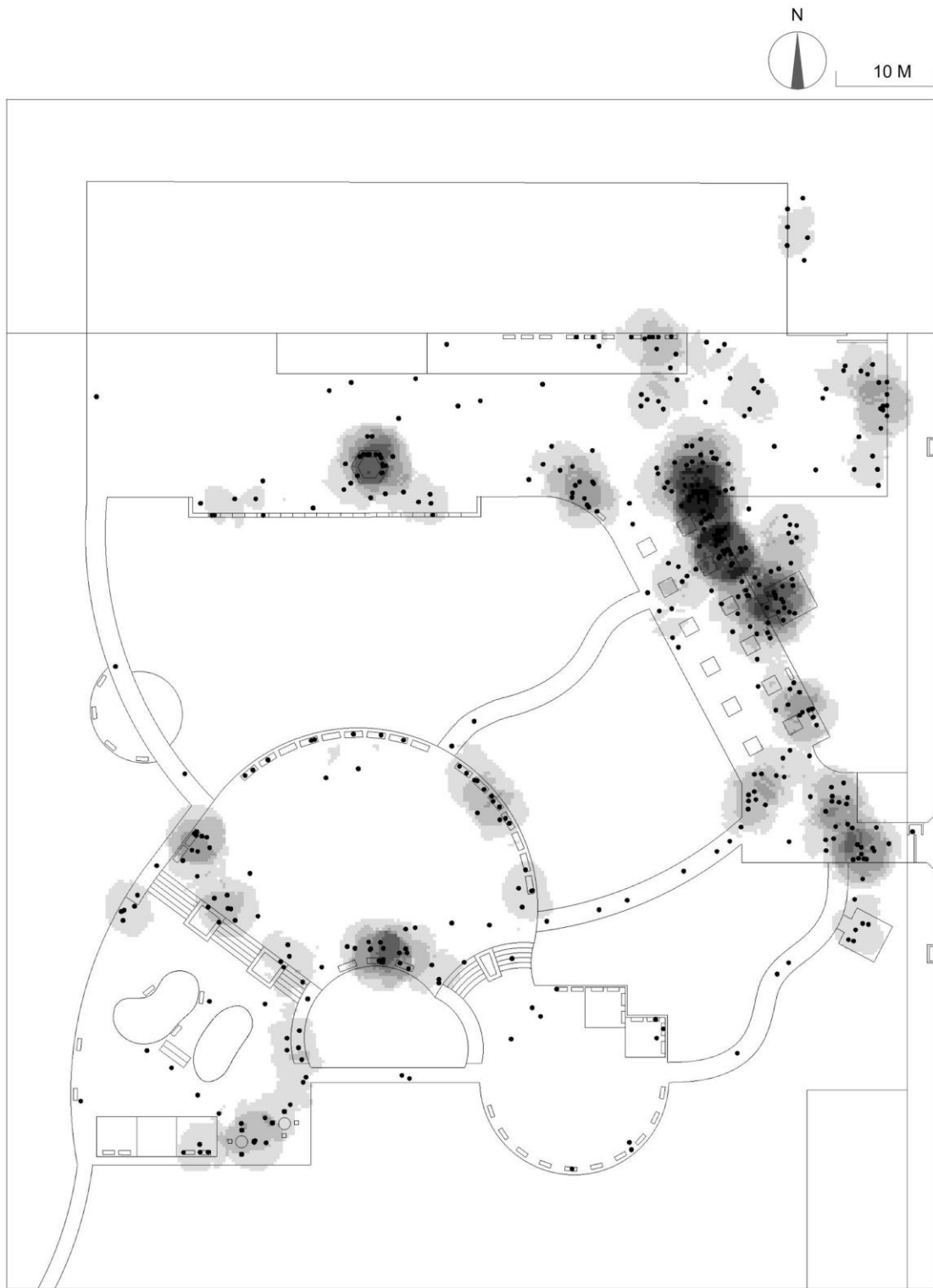
Figure 6.52 Density of users with children at site 5 (source: author)

Figure 6.53 Density of users with wheelchairs at site 5 (source: author)

No.1 Office building	No.2 Activity space	No.3 Rest space
No.4 Trellised pavilion	No.5 Sculpture	No.6 Path with lined trees	▲ Entrance

10 M

N

North-east
Entrance

2
Activity space in front
of the office building

6	5

East
Entrance

Central activity space

Main road

South Entrance	Main road
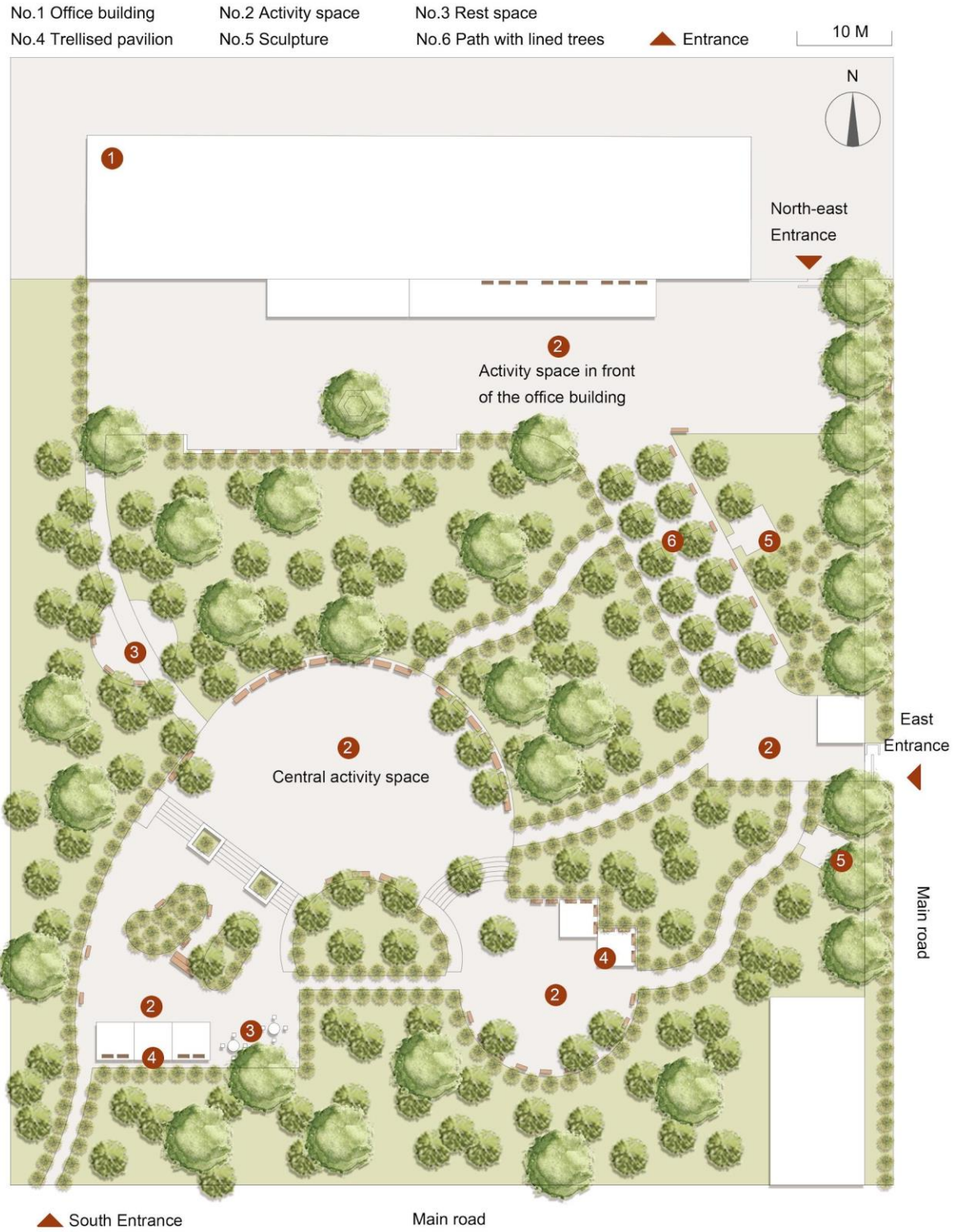
Figure 6.54 Master plan of site 5 (source: author)

6.6.3. Activities

There were 30 types of activities observed, which included seven passing-through (Table 6.9, Figure 6.55) and 23 on-site activities (Table 6.10, Figure 6.56). The number of passing-through activities was significantly lower than on-site activities: only 370 in total. Among the passing-through activities, walking still accounted for the most frequent, with a proportion of 84.64 per cent. A greater number of walking activities were observed entering, exiting, and moving through the paths. The next most frequent passing-through activity was walking with a pram, which was concentrated at the east entrance and along the path lined with trees. Only a few older people were observed passing through on wheelchairs and walking with mobility aids. This might indicate that older people with less mobility prefer to stay within this site rather than moving through. Similarly, passing through by bicycle (or electromobile), walking with a dog, and running was only observed once or twice, which also might be because this site is generally too busy for these passing-through activities.

Table 6.9 Passing-through activities at site 5 (source: author)

Passing-through activities in site 5	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Walking	84.86%	314	144	114	18	37	-	1
Walking with a pram	10.27%	38	-	-	19	19	-	-
Passing through on wheelchair	2.16%	8	-	-	-	-	4	4
Walking with mobility aids	1.62%	6	1	5	-	-	-	-
Passing through by bicycle (electromobile)	0.54%	2	2	-	-	-	-	-
Walking with a dog	0.27%	1	1	-	-	-	-	-
Running	0.27%	1	1	-	-	-	-	-
Total	**100.00%**	**370**	**149**	**119**	**37**	**56**	**4**	**5**

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair
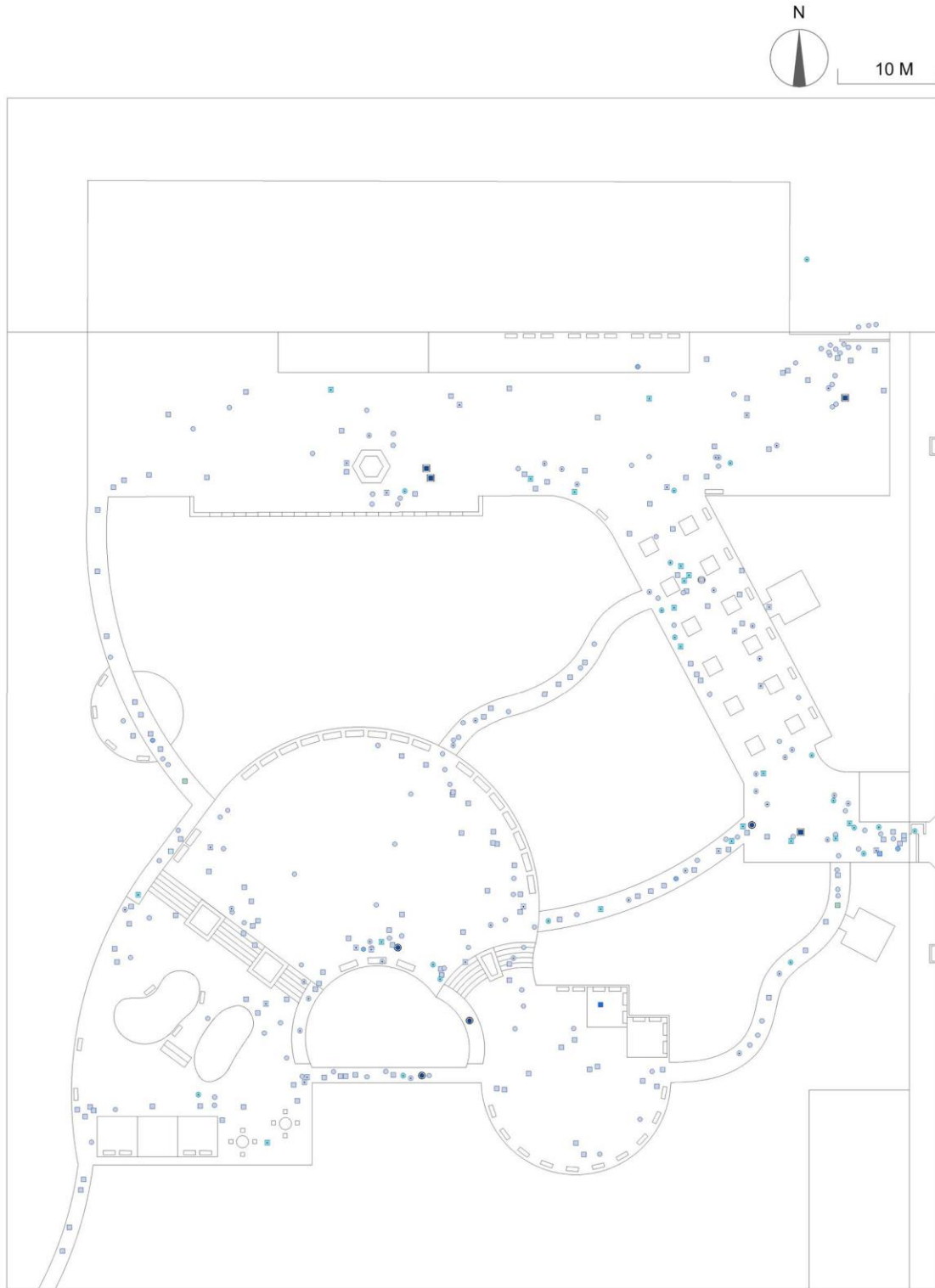
Figure 6.55 Spatial distribution of passing-through activities at site 5 (source: author)
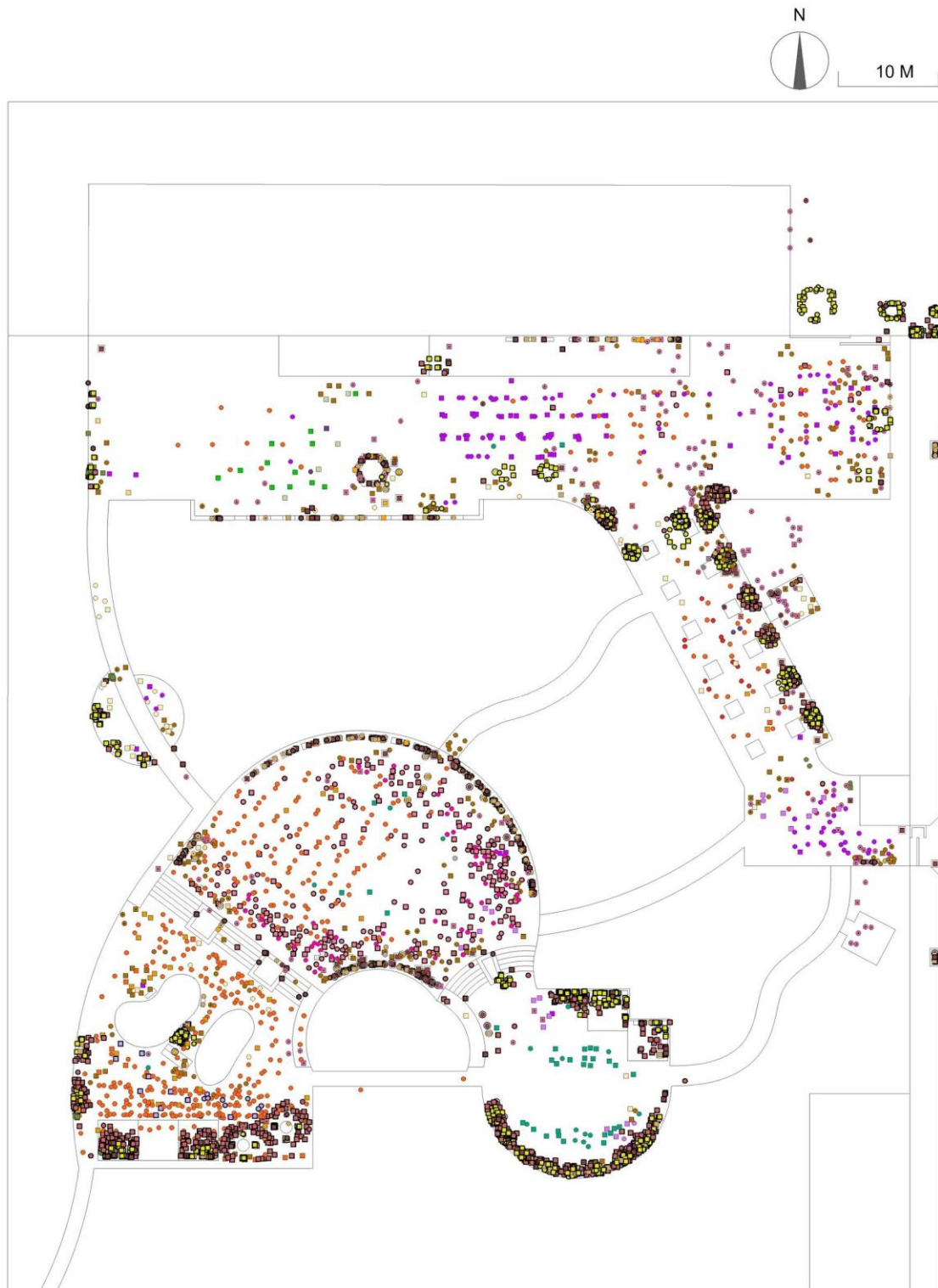
Figure 6.56 Spatial distribution of on-site activities at site 5 (source: author)

Among the 23 types of on-site activities, there were seven types of optional activity and 16 types of social activity. Even though doing exercises was the most frequent optional activity, it only accounted for 1.21 per cent, or 57, older people. The reasons for the lower number of

older people doing exercises might be that there are no exercise facilities provided and many of the older people were exercising in other ways, for example, dancing, ballroom dancing, and practising Tai chi. The next most common optional activity was sitting and watching (objects), mostly taking the form of older people looking at their phones or viewing broadcasts.

Figure 6.57 Older people having haircuts (Left), fixing a chair (Middle), and the locked chairs at site 5 (source: author)

The stand-out difference with other sites is that getting haircuts was a popular optional activity (Figure 6.57, Left), especially for males. At this site, this activity not only refers to older people getting haircuts, but also includes older people doing the haircutting. This activity occurred near the eastern and southern entrances, the west side of the activity space in front of the office building (No. 2 in Figure 6.54), and the rest space at the western side of the site (No. 3 in Figure 6.54). These areas are easily accessible or not very busy. Many of the older people bring their own chairs, including portable chairs or wooden stools to this site to seat themselves. Therefore, it is unsurprising that locking was observed at this site. Some older people also leave their chairs securely locked on-site so they do not need to bring them from home every time they visit (Figure 6.57, Middle and Right). Blading was only observed at this site, and took place in the central activity space (No. 2 in Figure 6.54). It not only bears out that this site supports this activity, which requires a level floor, but also indicates that activities at this site tend to be more active than at others. Practising calligraphy (Figure 6.58, Left) is a Chinese cultural activity, which refers to older people using a writing brush dipped in water and writing on the floor. This activity was also observed in the central activity area at noon when it is not busy (No. 2 in Figure 6.54). While the researcher was talking with the older person who practised calligraphy, he said he used to practise in another park when he

lived in another neighbourhood.

Table 6.10 On-site activities at site 5 (source: author)

	On-site activities in site 5	Percentage	Total	Male	Female	Male C	Female C	Male W	Female W
Optional activities	Doing exercises	1.21%	57	36	21	-	-	-	-
	Sitting and watching (objects)	1.04%	49	31	13	2	-	1	2
	Getting haircut	0.72%	34	28	6	-	-	-	-
	Standing and watching (objects)	0.15%	7	3	1	-	3	-	-
	Fixing a chair	0.04%	2	1	1	-	-	-	-
	Roller skating	0.04%	2	-	2	-	-	-	-
	Practising calligraphy	0.04%	2	2	-	-	-	-	-
Social activities	Playing chess (or cards)	26.32%	1237	853	380	-	-	3	1
	Standing and watching (people)	14.05%	660	576	66	9	9		
	Sitting and watching (people)	13.43%	631	351	152	13	28	54	33
	Dancing	11.36%	534	48	483	-	-	-	3
	Sitting and chatting	8.07%	379	150	182	4	27	3	13
	Ballroom dancing	6.28%	295	121	174	-	-	-	-
	Standing and chatting	6.24%	293	114	125	12	42	-	-
	Playing with children	4.04%	190	-	-	46	143	-	1
	Practising Tai chi	3.23%	152	56	96	-	-	-	-
	Playing badminton	1.04%	49	32	17	-	-	-	-
	Playing the instrument	0.64%	30	30	-	-	-	-	-
	Kicking shuttlecock	0.51%	24	21	3	-	-	-	-
	Practising Tai chi Roliball	0.51%	24	1	23	-	-	-	-
	Practising Tai chi Sword	0.43%	20	11	9	-	-	-	-
	Playing Diabolo	0.36%	17	17	-	-	-	-	-
	Singing	0.23%	11	1	10	-	-	-	-
	Total	**100.00%**	**4699**	**2483**	**1764**	**86**	**252**	**61**	**53**

Male C = Male with Child, Female C = Female with Child

Male W = Male with Wheelchair, Female W = Female with Wheelchair

*Figure 6.58 Older people practising calligraphy (Left), playing chess or cards under tree shadows (Middle), and near the north-east entrance (Right) at site 5 (source: author)*

Social activities accounted for the majority of all types of activities observed at this site. Among a large number of on-site activities, playing chess (or cards) was the most popular social activity, occupying 26.32 per cent, or 1237, older people. This activity is the most popular activity amongst male users, but also attracts users with wheelchairs. Older people were observed playing chess (or cards) in every observation slot from 9:00 to 19:00, which indicated that this activity might not happen only at specific times. It can clearly be seen that

this activity mostly happened where chairs are provided, under the shade of the trees (Figure 6.58, Middle), and also near the north-east entrance, (Figure 6.58, Right) where older people sit on the edge of the planting area or on their own chairs. This activity also attracts many older people who gather around to watch, coded as standing and watching (people), and sitting and watching (people), which were also the next most popular social activities with proportions of 14.05 per cent (660 older people) and 13.43 per cent (631), respectively. These two activities are also popular amongst male users, which indicates that playing chess (or cards) attracts more male users to participate and to watch. Sitting and watching is also a popular activity for female users, and is the most frequent activity for users with wheelchairs, and not only includes watching others playing chess (or cards), but also watching people dancing, ballroom dancing, and children playing around (Figure 6.59, Left). The next most preferred activity is dancing, usually in groups (Figure 6.59, Middle). It also attracts female wheelchair users to participate (Figure 6.59, Right). These results indicate that this site provides various opportunities for older people at different mobility levels to be included. As an old lady sitting on a bench watching people dancing said:

"I used to dance here as well. Dancing is a very good activity, good for your body and mood. Even though I cannot dance now, I still like to watch them dancing." [Female, 84]

Figure 6.59 Older people with wheelchairs watching others (Left), older people dancing for exercise (Middle), an older female with a wheelchair dancing (Right) at site 5 (source: author)

Dancing in groups not only provides older people with exercise, but also enables them to feel involved in a group activity, and be seen by other people. It is also very attractive to observers. Another female user seemed to enjoy being watched while she was doing ballroom dancing, as she laughed and said to her friend:

"This girl (The researcher) is watching us dancing."

These quotes lead to the next most popular social activities, dancing and ballroom dancing. Dancing is the most popular activity for female users, and there were several different groups of older people observed dancing different dances at different times and at different areas of the site, for example, in the south-western part of the activity space in the morning, in the central activity space (No. 2 in Figure 6.54), and the path lined with trees (No. 6 in Figure 6.54) in the late afternoon. The dancing activities at this site are very organised and some are done in large groups, with an instructor, lead dancer, and uniform clothing. Ballroom dancing was a very popular social activity for both male and female users, and was only observed at this site (Figure 6.60, Left). The people who were ballroom dancing included some caregivers who bring older people in wheelchairs to this site to watch people dancing and then dance there themselves. Ballroom dancing was mainly observed from 7:00 to 10:00 in the central activity space (No. 2 in Figure 6.54), and at 19:00 at the space near the north-eastern entrance. As a female who was on site said:

"I come here for ballroom dancing every day. An old man will bring the equipment to play the music from around 8:00 until 10:30 every day." [Female, 60s]

However, the researcher noticed that some of the older people were wearing sunglasses while they were dancing. The smooth paving might be too reflective, thereby resulting in dazzling light. Another group of people was observed ballroom dancing at 19:00, which lasted until 22:00. The researcher spoke with two instructors for this ballroom dance group who organise ballroom dancing training classes there from 20:00 to 22:00, and charge 300 Yuan (about £33) per year. The social activities at this site are more varied and organised in nature, typically involving larger numbers of participants.

Sitting and chatting, and standing and chatting, are also very popular social activities at this site, which accounted for 8.07 per cent (379 older people), and 6.24 per cent (293 older people), respectively. As mentioned above, the social activities happening on site attract many older people to watch, and also might trigger conversations between older people,

which are coded as sitting or standing and chatting. These activities together created a busy and lively atmosphere at this site.

Figure 6.60 Older people ballroom dancing (Left), older people practising Tai chi (Middle), and older people playing instruments and singing (Right) at site 5 (source: author)

As at other sites, playing with children is the primary activity for users with children, especially for females with children. An older person with a wheelchair was observed taking part in this activity. It could be beneficial for her to experience the active nature of children. Practising Tai chi at this site is usually in large organised groups, accounting for 3.23 per cent (152 older people) of on-site activities (Figure 6.60, Middle). These groups were usually observed in the activity space in front of the office building, and the activity space near the east entrance (No. 2 in Figure 6.54), the exception being a small group in the rest space on the western side of the site (No. 3 in Figure 6.54). This activity once again verified that the on-site activities in this site are organised, with large numbers of participants.

Several pairs of older people were observed playing badminton in the central activity area at 6:00 (No. 2 in Figure 6.54), because this area will become the space for ballroom dancing after 7:00.

Figure 6.61 Older people kicking a shuttlecock (Left), practising Tai chi Sword (Middle), and playing Diabolo (Right) at site 5 (source: author)

Even though the remainder of the social activities accounted for less than 1 per cent overall, they still present unique opportunities for older people. People playing instruments were observed both individually and in groups. A male was observed playing the accordion on every observation day and in the same place at 6:00 when this site is relatively quiet. A group of males formed a band, observed playing erhu together accompanied by some females singing on every observation day in the same place as well, but at noon when the site is also less busy and noisy (Figure 6.60, Right). By playing their instruments, these older people not only practised their hobbies, and attracted others' attention, but also joined in group activities and made friends outside their own residential communities. The activity of kicking shuttlecocks was usually observed in small and younger groups (Figure 6.61, Left). In contrast, older people who practise Tai chi Sword are usually older (Figure 6.61, Middle). They were observed practising at 7:00 every observation day on the activity space near the south entrance (No.2 in Figure 6.54), after which this area would then be occupied by the dancing group. Practising Tai chi Roliball were another group of older people who were usually active at 9:00 on the path lined with trees (No. 6 in Figure 6.54). Playing Diabolo was only observed for small numbers of male users (Figure 6.61, Right). From the conversation with users who were playing Diabolo, the researcher learned that they have regularly played for years. This activity also makes sounds which attract people.

The number of users observed, and the diverse types of activities, indicate that this site is fully utilised. Furthermore, the users in this site seem to have formed a tacit agreement that different activities involving different-sized groups are arranged at different times and areas of the site. Regarding other users at this site, middle-aged people with and without children presented a similar activity range and characteristics to the older people. Male adults playing chess and cards were more evident in the afternoon, at which time some adults with children also appeared in the open area, both mixed in with older people playing chess or cards, and older people who were also together with children.

6.7. User, activity characteristics, and space attributes

The observation results from this chapter presents a staggering array of activities in each site

that, together, give a vivid impression of how older people living in work-unit and commodity residential communities use the outdoor spaces within and near their neighbourhoods. This analysis of the site and user characteristics and the diverse activities at each site suggests that the attributes and affordances of the sites significantly influence who uses them, and how they will use them. The next section compares the number of users and activities at each site and tries to draw out and explain some of their influential attributes and affordances based on the results from the previous sections, with the aim of giving some initial explanations to form the basis for the following chapter about how space attributes and affordances influence older people's usage.

6.7.1. User types and activities

By comparing the number of different users' different on-site activities, some similarities and differences emerge. The most common on-site activities for male and female older people in residential communities (site 1 and 2) are shopping, standing and chatting, sitting and chatting, as well as exercising (Table 6.11). Only female users participate in the activity of dancing, singing, and kicking shuttlecock. Only male users are observed taking care of plants.

Table 6.11 The number of male and female users' different on-site activities at sites 1 and 2 (source: author)

Male	The number of activities in site 1 and 2	Female	The number of activities in site 1 and 2
Shopping	68	Shopping	134
Standing and chatting	65	Standing and chatting	117
Sitting and chatting	50	Sitting and chatting	118
Sitting and watching (people)	48	Doing exercises	57
Doing exercises	39	Dancing	24
Sitting and watching (objects)	31	Sitting and watching (people)	40
Standing and watching (objects)	13	Sitting and watching (objects)	13
Standing and watching (people)	12	Singing	8
Playing chess (or cards)	10	Collecting parcels	7
Taking care of plants	6	Standing and watching (people)	6
Airing clothes	6	Kicking shuttlecock	4
Playing table tennis	3	Airing clothes	4
Fixing a chair	2	Practising Tai chi	4
Practising Tai chi	2	Standing and watching (objects)	2
Sweeping the road	1	Playing table tennis	1
Collecting parcels	1		

Male and female older people's popular activities in neighbourhood outdoor spaces (sites 3, 4, and 5) show more differences (Table 6.12). Playing chess (or cards) is a frequent activity

amongst older people, but attracts more male users to participate, as well as many male observers, which also increases the number of male older people standing or sitting and watching people. Popular male user activities also include exercising and chatting. Female users' most frequent activities are dancing, playing chess (or cards), exercising, and chatting (both standing and sitting). Ballroom dancing and practising Tai chi are also popular amongst both males and females. There are some activities only observed amongst male users, which include playing instruments, playing Diabolo, and practising calligraphy; on the other hand, blading and practising yoga were only observed amongst female users.

Table 6.12 The number of male and female users' different on-site activities at sites 3, 4, and 5 (source: author)

Male	The number of activities in site 3, 4 and 5	Female	The number of activities in site 3, 4 and 5
Playing chess (or cards)	900	Dancing	548
Standing and watching (people)	603	Playing chess (or cards)	433
Sitting and watching (people)	436	Sitting and chatting	352
Doing exercises	295	Doing exercises	328
Sitting and chatting	235	Standing and chatting	237
Standing and chatting	172	Sitting and watching (people)	236
Ballroom dancing	121	Ballroom dancing	174
Sitting and watching (objects)	85	Practicing Tai Chi	126
Practicing Tai Chi	76	Standing and watching (people)	84
Dancing	51	Sitting and watching (objects)	43
Playing badminton	36	Practicing Tai chi Roliball	24
Kicking shuttlecock	36	Playing badminton	23
Getting haircut	35	Kicking shuttlecock	14
Playing the instrument	35	Getting haircut	14
Standing and watching (objects)	10	Singing	10
Playing Diabolo	18	Practising Tai chi Sword	9
Playing table tennis	17	Standing and watching (objects)	8
Practising Tai chi Sword	11	Playing table tennis	5
Playing basketball	8	Picking fruit	2
Practising Tai chi Roliball	4	Roller skating	2
Flying kite	3	Flying kite	1
Picking fruit	2	Playing basketball	1
Practising calligraphy	2	Picking fruit	1
Fixing a chair	1	Practising Yoga	1
Singing	1	Practising Tai chi Roliball	1
		Fixing a chair	1

Apart from playing with children, older people with children in residential communities engage in more chatting activities between neighbours, as well as observing and exercising, whereas in neighbourhood outdoor spaces, more older people with children are observing other people or their grandchildren playing, followed by chatting and exercising (Table 6.13).

Older people with children	The number of activities in site 1 and 2	Older people with children	The number of activities in site 3, 4 and 5
Playing with children	72	Playing with children	505
Standing and chatting	37	Sitting and watching (people)	112
Sitting and chatting	15	Standing and watching (people)	47
Sitting and watching (people)	8	Standing and chatting	88
Standing and watching (people)	5	Sitting and chatting	56
Doing exercises	5	Doing exercises	5
Shopping	3	Standing and watching (objects)	3
Kicking shuttlecock	2	Playing table tennis	2
Playing Badminton	1	Sitting and watching (objects)	2
		Playing chess (or cards)	1

Older people in wheelchairs in both residential communities and in the neighbourhood outdoor spaces are usually observing others and chatting (Table 6.14). In neighbourhood outdoor space, the exercise facilities enable more older people with wheelchairs to do exercises, and the dancing activity on-site also attracts them to join in, while they are sitting in their wheelchairs.

Table 6.14 The number of older people with wheelchair's different on-site activities at different sites (source: author)

Older people with wheelchair	The number of activities in site 1 and 2	Older people with wheelchair	The number of activities in site 3, 4 and 5
Sitting and chatting	6	Sitting and watching (people)	149
Sitting and watching (people)	5	Sitting and chatting	56
Shopping	1	Doing exercises	12
Standing and chatting	1	Sitting and watching (objects)	7
		Playing chess (or cards)	4
		Standing and chatting	3
		Dancing	3
		Standing and watching (objects)	2
		Playing with children	1

6.7.2. User characteristics and space attributes

Comparing the numbers of different users in each site (Figure 6.62) gives a clear indication that site 5 (Shuangyushu neighbourhood park) and site 3 (Eastern green space within university campus), are the most popular spaces for all user types. Site 2 (Fangdanyuan commodity residential community) has the lowest number of older users. Site 2 is a gated

community with a green space from which people who are not residents are therefore excluded. Even though this residential community is surrounded by other such communities, other residents are not able to access and are turned away from the outdoor spaces in this residential community. The gated status of Site 2 likely prevents older residents from connecting with their peer groups adjacent to the community.

Site 5 Shuangyushu neighbourhood park is surrounded by work-unit residential communities and provides open access to all members of the public without restriction. This park is also located along the main road linked to the road by a pedestrian route which has excellent connectivity with its surroundings. Local residents, especially those who do not have activity space in their own residential communities, can access this neighbourhood park conveniently within walking distance. Site 3, the Eastern green space within the university campus, has a similar feature in the sense that it is located opposite to the residential communities and open to the public. The numbers of wheelchair users at these two sites are higher than in other sites. These public green spaces attract more users and enable older people with different mobility levels to move around conveniently and safely by providing barrier-free access and paths across all parts of the sites. The above explanations indicate that accessibility is critical to facilitating access by diverse user groups and social mingling among older people; this includes both the public and openly accessible status of green spaces, as well as physical accessibility for people with different levels of mobility.
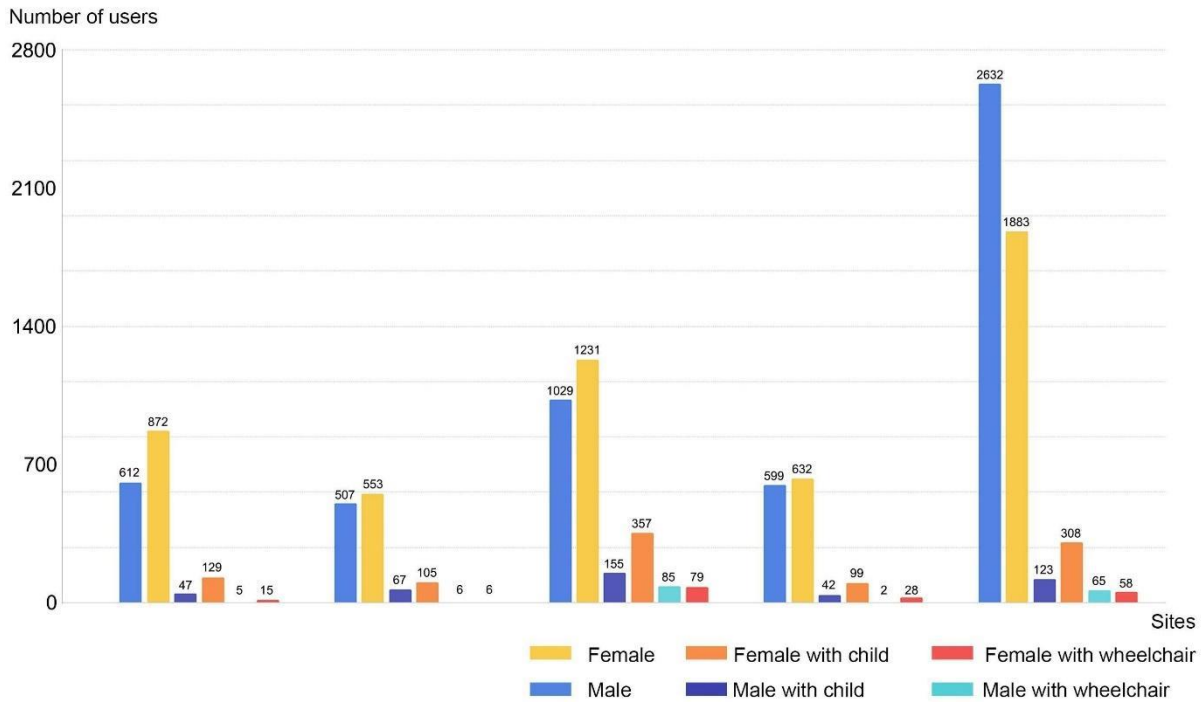
Figure 6.62 Number of different users at each site (source: author)

(From left to right: Site 1 Shuangyushu work-unit residential community, Site 2 Fangdanyuan commodity residential community, Site 3 Eastern green space within university campus, Site 4 Western green space within university campus, Site 5 Shuangyushu neighbourhood park)

For all sites, the number of females with children was higher than males with children. Sites 3 and 5 were also most popular in older people with children, which reveals the importance of spaces that can support intergenerational usage. These sites seem to cater for grandchildren in different age groups. The difference between these two sites is that the site 3 Eastern green space has a children's playground, which attracts more older people to supervise their grandchildren playing there, whereas the Shuangyushu neighbourhood park invites more older people with younger grandchildren, who hang out together in the main site activity space.

There were fewer users at site 4, the western green space within the university campus, compared with the other sites, and especially compared with the other neighbourhood green spaces: the site 3 eastern green space and site 5 neighbourhood park. The potential reasons are that the whole of site 4 is filled with dense trees which prevent sunlight reaching the ground; there is insufficient lighting when it is getting dark, as well as a limited number of

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seats for older people to rest on. The paths are curved and paved with stone pavers, which are not suitable for older people with walking difficulties. This may also confirm that the quality of the walking environment may influence older people's use of space, deterring them from visiting spaces where the walking conditions are sub-optimal. This site is located within the university campus, close to the campus entrance, and opposite the university office buildings. The surrounding environments create a formal and solemn atmosphere which seems to decrease the vibrancy and liveliness of this site, and appears to reduce user numbers. In contrast, the popularity of site 5 neighbourhood park creates an active and dynamic atmosphere which attracts more users and diverse activities.

6.7.3. Activity characteristics and space attributes

The numbers of passing-through activities and on-site activities at each site also show noticeable differences (Figure 6.63). Both of the residential communities (site 1 and 2), as well as site 3, have more passing-through activities than on-site activities. It is reasonable to expect this in the residential communities because these sites must accommodate residents' daily travel activities. The reason for site 3 Eastern green space within the university campus having more passing-through activities, which refers to mobile activities within the site, than on-site activities is that it provides ideal walking environments, which attract large numbers of older people strolling. This again revealed the importance of enabling older people to access sites conveniently and move around easily and safely within them. At site 3, the path surrounding the site plays an important role for people moving back and forth for exercise and leisure purposes. The lengths of the paths are suitable for older people to achieve their daily exercise goals within their physical capacity, and they can have a rest on the seating provided along these routes.
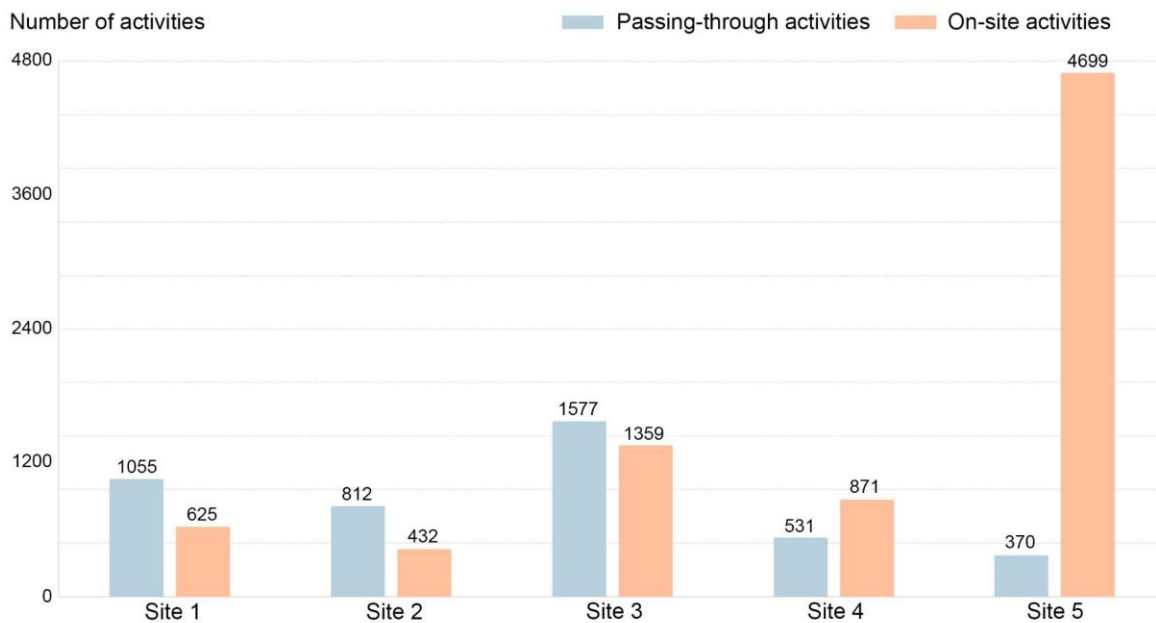
Figure 6.63 Number of passing-through activities and on-site activities at each site (source: author)

As mentioned in Chapter 5 (Section 5.4.3 Preferences for environmental attributes), older residents have a strong need for adequate activity space. As reflected in the observation data, both of the residential communities have a lower number of on-site activities. This further emphasises the importance of providing a variety of activity spaces for older people within residential communities. Even though the activity space in site 1 is somewhat limited, the number of on-site activities at site 1 is still slightly higher than at site 2. These on-site activities are concentrated at the small green space near the residential community, which plays an important role in supporting older people's outdoor activity, especially when there is limited activity space within the residential community. The number of on-site activities at site 5 Shuangyushu neighbourhood park is the greatest among all the research sites, followed by site 3 Eastern green space within the university campus. Both of these sites offered adequate activity space for different on-site activities. This was especially evident for site 5, which has the most diverse on-site activities, and the most on-site activities happening in different sized groups. From Figures 6.50 and 6.51, it is apparent that the number of male users was highest at site 5. This is because most of the male users at site 5 play chess or cards. Playing chess or cards is an activity that clearly attracts male users to go outside. Paying attention to such factors should be borne in mind in future outdoor space design if the aim is to attract more older males to use green spaces.

6.8. Summary

This chapter provides detailed data analysis how older people use their residential communities and neighbourhood outdoor spaces. By analysing the user and activity characteristics for each site, the chapter highlights the differing temporal patterns of usage of the user types: males, females, males with children, females with children, males with wheelchairs, and females with wheelchairs. Older people's outdoor activities at each site also show variations. The on-site activities in residential communities are more relevant to necessary activities, such as shopping, and optional activities, such as exercising. Social activities are limited in types, such as chatting and observing others, playing with children. The on-site activities at neighbourhood outdoor spaces not only include those frequent optional and social activities in residential communities, but also a more diverse and greater range of social activities, such as getting haircuts, playing chess (or cards), ballroom dancing, and different sports activities. By comparing user and activity characteristics across all sites, certain environmental attributes start to emerge related to the convenience, safety, and richness of activity space.

The more comprehensive space attributes and affordances that influence the fit between older people and outdoor space will be presented in the next chapter. What are the space affordances that influence older people's use of these outdoor spaces, and how do they do this? These questions need in-depth investigation and triangulation of the data from the residents interviews, observations, and stakeholder interviews. The following chapter will focus on the third research objective to identify the influential space affordances.

Chapter 7 How does neighbourhood outdoor space afford older people's activities

7.1. Introduction

The analysis of older people's activities from the observation data in Chapter 6 gave the researcher a clear understanding of how they actually use and perceive the outdoor spaces in their residential communities and neighbourhoods, and allowed some initial environmental attributes to be drawn. Beyond older people's description of their perceptions and the observation of older people's activities, Chapter 7 integrates insights from the onsite and stakeholder interviews, and shifts the focus to the neighbourhood outdoor space itself. From the perspective of landscape architecture, using the analytical frameworks of the ecological model (Sallis et al, 2006), behaviour settings (Barker, 1987), and affordance (Gibson, 1979), this chapter explains how neighbourhood outdoor space affords older people's outdoor activities and supports their sense of agency (objective 3), which are both important to supporting older people's ageing-in-place in a healthy and independent manner.

By integrating different data, this chapter further identifies the macro-environment attributes and behaviour settings with relevant design elements, using the concept of affordance to illustrate how the neighbourhood outdoor space affords older people's activities (objective 3).

As suggested by Kamalipour and Peimani (2015), assemblage thinking is necessary to explore urban environments and understand urban issues. For example, attention needs to be given to the boundary effect and how macro-, meso-, and micro-scales correlate to address the access network in an area. Inspired by the ecological model's scale classification (Sallis et al, 2006), and Ganji's (2018) application of assemblage thinking and her explanation of different scales of space, it is also important to examine the space itself as a unit and at different scales in this landscape study. The ecological model (Sallis et al, 2006) divides the influential factors that affect human behaviour into the intrapersonal, perceived environment, behaviour

settings, policy environment, information environment, social cultural environment, and natural environment. With the specific focus on neighbourhood outdoor space, and from a landscape perspective, this study applied and developed the classification of influential factors from the ecological model into the three layers of perceived environment, behaviour settings, and more detailed design elements. This scalar approach was combined with the concept of affordance to explore how these different layers of environmental factors afford, disafford, or have been adapted by older people to afford their outdoor activities.

In this study, attributes at the macro scale can be understood as older people perceiving or identifying influential environmental attributes at the whole site scale, as well as specific behaviour settings that can influence their use of outdoor spaces. Macro-scale attributes can include an outdoor space's ease of access, or a rest area that is comfortable with attractive views. Attributes at the meso-scale refer to the environmental and social characteristics in "behaviour settings" (Barker, 1987) that support recurrent patterns of activities in those settings, e.g., shady strolling paths, intergenerational areas. Attributes at the micro-scale are more relevant to the detailed design elements and facilities aspects, which make behaviour settings work to afford older people's activities, for example, the stone seats that can be moved short distances by older people to form the settings to play chess or cards.

Based on the types of activity and their distribution identified in the previous chapter, each observed activity was reviewed on the GIS maps at each site to identify areas where this activity was concentrated. These hotspots were then named, and descriptions added with their physical characteristics and the recurring activities in Excel tables to create the initial version of the behaviour settings. These initial classifications of behaviour settings were then compared within the residential community outdoor space cluster (site 1 and 2), and within the neighbourhood outdoor space cluster (sites 3, 4, and 5) to identify recurring settings and merge duplicates. These recategorised behaviour settings were allocated into five main types, passing-through space, static activity space, active activity space, nature space, and services space, to provide a clear structure to the thesis. The design elements that make behaviour settings work to afford the activities for certain older people were then distinguished from the behaviour settings for each site. During the process of identifying the behaviour settings and design elements, some perceived macro-scale environmental attributes were found to

recur in different settings. For example, different paths, rest settings, and exercise settings were identified as comfortable, attracting older people to use the settings, therefore the comfort attributes were identified as macro-scale environment attributes. Combined with the previous findings from Chapter 5 and analysis of on-site and stakeholders' interviews, ten macro-environmental attributes were developed.

In this Chapter, macro-attributes are introduced first, followed by the behaviour settings and design elements in the community outdoor space cluster (site 1 and 2), and the neighbourhood outdoor space cluster (site 3, 4, and 5) respectively. The ways in which older people's sense of agency can be supported by these attributes, settings, and elements are also illustrated in this chapter. This shows how environment attributes at different levels influence older people's choices to use - or not use - a space, and how older people change the micro-design elements to form their desired meso-behaviour settings, thereby reinforcing the macro-environment attributes that matter to them.

7.2. Macro-environmental attributes

This study has identified ten overall environmental attributes that are influential to older people's outdoor activities: Convenience, Comfort, Safety, Multifunctionality, Attractiveness, Quality of maintenance, Exercisability, Restability, Sociability, and Identifiability. This thesis uses relevant adjectives and nouns interchangeably to make the description of attributes more precise.

These individual environmental attributes are usually interrelated rather than only acting individually in the behaviour settings. Convenience, for example, is not only about connecting older people to other important destinations, but also relies on a safe and comfortable walking environment. By the same logic, a comfortable environment usually requires attractive natural features to provide views, and shade; and a sociable environment depends on the presence of other people and needs to be restable to enable people to sit together, or multifunctional to attract more people with diverse interests to visit. To continually satisfy older people's expectations and requirements in relation to outdoor spaces, maintenance is

a more long-term attribute that enables other attributes. In the following section, each of these attributes is explained, and their relationships with other attributes will be discussed.

7.2.1. Convenience

From older people's subjective perspective, convenience was identified as a supportive environmental attribute in Chapter 5. From the observation data, it was seen that older people can walk from their communities to other important destinations, and outdoor spaces connected by walkable routes, which provide older people with convenient access, are important attributes to encourage older people to go out to use outdoor spaces. Taking site 1 (work-unit residential community) as an example, the main traffic roads outside the residential community show a clear sign that the southern parts are busier because that direction connects to green spaces and university campuses which are the favourite spaces older people usually visit (see Figure 6.3). Taking site 5 (Shuangyushu neighbourhood park) as an example, this green space has the largest number of users amongst all the observed sites. One of the reasons for this is likely to be its location along the main road, which connects many nearby residential communities. Older users also observed that the neighbourhood green space should be conveniently accessible from their homes, especially if there are no activity spaces in their residential communities:

"The surrounding parks are very important because sometimes you have to think about taking care of your family, playing for a while and then going back to buy food and cook, so if you are going to a big park, it basically costs most of the day. So, it is necessary to strengthen the building of surrounding parks. There is no space in the community, and there is no organising of activities." [Older people in site 5]

Apart from nearby green space, observation data also reveals that the necessary facilities, for example, local shops and parcel stations, should also be conveniently accessible. However, it is worth considering whether the main road linking the residential communities, neighbourhood outdoor space, and other facilities are perceived as safe by older people. More older people were observed walking in or out their residential communities and neighbourhood outdoor spaces on foot rather than cycling. Ensuring the safety and

convenience of roads is necessary to prevent them from becoming an obstacle.

Being barrier-free is another vital aspect of making spaces convenient for older people to use. It is not only for older people who have a lower level of mobility, or who walk with mobility aids, but also for older people who push prams or shopping trolleys. As mentioned in Section 5.3.1, many older people take responsibility for the care of their grandchildren, and were therefore observed walking with prams. Shopping is also the most frequent necessary activity, and many older people were observed walking with a small shopping trolley to help them carry their groceries. This came out from the observations, but a stakeholder also mentioned that:

"Some old residential communities are even not fully barrier-free. My residential community's accessibility ramp was retrofitted later. The place with steps will be provided with a board. It is because some older people need to go out shopping, they will pull a shopping cart to load things. Some steps are more than a metre. Finally, you will find a particularly interesting phenomenon, they will spontaneously lay a board on the steps, and then pull up their shopping cart." [Landscape Architect 2]

Stakeholder interviews also suggest that the footpaths within residential communities need to flow and be organised smoothly. The passing-through activity at site 3 has a clear pattern (see Figure 6.26), with older people moving along the main paths within the site. This also illustrates the importance of the convenience of internal circulation. Therefore, barrier-free connective routes between residential communities, local services, facilities, and green spaces, as well as within each type of space, which enable older people to walk safely to visit different destinations and move within site conveniently, are important affordances to support older people's outdoor activities.

7.2.2. Comfort

Comfort is also a significant attribute that can support older people's outdoor activity. From the observation data, the attribute of comfort refers more to comfortable micro-environments, for example, comfortable exercising spaces, paths, seating etc. The common

feature of a comfortable setting is its reliance on attractive natural features, e.g., surrounding plants, which provide shade or natural views, and create a sense of being away from heavy traffic. The presence of natural elements enables older people to experience outdoor natural environments, avoid prolonged direct sunlight in hot weather, and be separated from traffic to provide a sense of safety. To activate the comfort attribute, comfortable microclimates within different settings are vital to supporting older people's ability to spend a longer time outside.

7.2.3. Safety

Safety is undoubtedly a vital and fundamental attribute to support older people's use of outdoor spaces, especially for the passing-through settings. As mentioned in Chapter 5, safety refers to enabling older people to walk safely, and to feel that their community is safe. The observation data also reflect these two layers of meaning in the safety attribute. For example, many older people were observed walking or standing and chatting in the middle of the main road within site 1 due to the limited width of the road and the vehicles parked along it. Whilst not ideal, paradoxically these factors acted to reduce the speed of vehicles and increased older people's safety while they were walking in the road. At site 2, however, which has pedestrian paths, older people were more likely to walk on the pedestrian path rather than the vehicle road. At site 3, there is a clear trend of walking activity surrounding the whole site, where a flat path without barriers enables older people with different mobility levels to walk and move safely. The importance of safety is also obvious when comparing sites 4 and 5. Site 4 has a very small number of users when getting towards darkness as it does not have sufficient lighting after dark, which may result in older people stumbling and falling, and leave them in fear of crime. In marked contrast, site 5 still has a large number of users after dark (after 19:00), and even shows a trend of increasing numbers of users at this time due to having sufficient lighting and barrier-free paths, which ensure walking safety. The presence of large numbers of other older people after dark also gives individual older users a sense of safety. The importance of safety is also reflected in the exercising area along the road at site 1 (Figure 6.8, Middle), which older people were not often observed using. Even though there are a variety of exercise facilities, the traffic close to it causes a sense of insecurity amongst older people. Therefore, older people need residential communities and other outdoor spaces that

enable them to walk safely outside, and spaces that feel safe and supportive for their outdoor activities.

7.2.4. Multifunctionality

In Chapter 5, the need for a space's functionality to support multiple and diverse activities was identified from the interviews. This needs and actual usage were also extracted from the observation data and described as the attribute of multifunctionality, because many behaviour settings were used for multiple purposes, not only for older people's spontaneous activities and intergenerational interactions but also for community committees' organised services and events. To be more specific, older people may use or adapt a behaviour setting for diverse activities, for example, they may exercise on a path, dance under a pergola, set up their chess tables under a pavilion, carry out different leisure or sport activities in an open area, and use different settings to play with their grandchildren. Some spaces in the residential communities were used by the community committee to organise shopping programmes, whilst those in neighbourhood parks were used to organise cultural activities and provide services. Multifunctional settings have an added richness derived from their ability to attract more people to use and adapt them to more diverse activities, promoting older people's sense of agency in using the space. The attribute of multifunctionality was also suggested by landscape designers, as one stakeholder said:

"It is important to set up multifunctional possibilities for the space, for festivals and events and so on, so that the space has an extensibility." [Landscape Architect 1]

Even though activities organised by the community committee within the residential communities were not recorded in the observation data, the researcher did witness them at site 1, when conducting pre-observation site visits. The community committee organised a presentation meeting in the community square to share their age-friendly retrofitting plan with community residents. From interviewing the community committee staff, it was clear that it organises a variety of community activities. These include series of lectures about health and safety, a summer evening party, and cultural festivals at holidays. This further suggests that community spaces should be able to support such special local community activities to address the multifunctional attribute.

7.2.5. Attractiveness

Older people expressed their preferences for attractive things to look at, especially natural elements, as well as their concerns about the dust caused by the ugly bare earth in their communities, as reported in Chapter 5. The observations also recorded relevant activities, such as older people facing the planting area with its diverse plants and flowers to do their exercise, or practising yoga under an attractive tree, sitting in a nook area facing the planting, stopping for a moment as they walk through a little garden along a path, and gardening in their communities. Space that can encourage older people's participation in gardening or nature-related work or activities are attractive to them. Other attractive features also include water features, for example, fountains and ponds, where it was observed that older people gathered. All these attractive attributes provide older people with opportunities to connect with natural elements and listen to natural sounds while they go outside, which could significantly improve older people's outdoor experiences. To some extent, the attractive attribute will be influenced by the quality of maintenance, because those natural elements, green ground cover, and artificial water features need to be maintained regularly.

7.2.6. Quality of maintenance

Maintenance was identified in the interviews as an influencing factor with regard to older people's perceptions and use of outdoor spaces. As mentioned in Section 5.4.3, maintenance problems include the management of plants and clearing of rubbish. Even though many older people mentioned their dissatisfaction with the residential community's environmental maintenance, the observation data recorded older people sweeping the road in the residential community, revealing that they regard their residential community as "home", and are therefore prepared to conduct community maintenance activities voluntarily and to actively maintain their residential community in a preferred condition. Their activities of managing and cleaning their residential communities illustrate their sense of agency in participating in improving the environment, and their participation in residential maintenance and efforts to change the environment could be beneficial to their satisfaction with, and attachment to their community.

During the observations, the maintenance of green spaces by park staff was also observed (and recorded in the observation notes), for example, pruning branches and leaves, sweeping the road. One of the older people was observed taking some pruned roses from the maintenance staff (at site 3), whilst some others expressed different opinions about the space maintenance. For example, in the very busy Shuangyushu neighbourhood park (site 5), one participant implied in the on-site interview that the cleaning work influenced their use of parks.

"This park is just average, and poorly managed. It should be cleaned at 6.30 am, or before 7 am at the latest. Now they're cleaning here while we're playing, it's all dust. Small parks are poorly managed." [Older female in site 5]

The presence of maintenance workers has the potential to encourage older people to make more use of the space, but can also cause nuisance such as dust, which will significantly detract from their experience of using the space. A good level of maintenance, including pruning plants, maintaining green ground cover (mentioned in 5.4.3 Attractiveness), and regular rubbish removal, will produce a tidy environment and an enjoyable landscape that enhances older people's use of outdoor spaces. Even if the level of maintenance in residential communities is not considered satisfactory by older people, the encouragement to participate in space maintenance, for example street sweeping and plant management, have the possibility of increasing older residents' satisfaction and attachment to their residential communities, and to increase their own sense of agency.

7.2.7. Exercisability

Many of the observed optional and social activities in both the residential communities and neighbourhood outdoor spaces are related to exercise. That is consistent with interview data which revealed that many older people's aim is to go outside to exercise and keep healthy (Section 5.2.1). An exercisable outdoor space should be able to support different types of exercise, for example, mobile activities (e.g., strolling, running), ball games (e.g., badminton, table tennis), activities involving specialist equipment, different intensities of exercise, and different numbers of people (individuals, and small and large groups), and therefore to satisfy

the most important aim of older people's exercise, which is to keep healthy.

In the stakeholder interviews, the designers also noted the importance of the exercisable attribute of a space, and they even considered the special needs of some older people, and applied this in their designs by providing restorative exercising spaces and equipment, including fitness and flexibility equipment, to meet older people's specific exercise needs. Even though their practice focuses on Continuing Care Retirement Communities, the principle that the exercisable affordance needs to consider older people's special needs can also be reflected in the design of normal residential communities.

Identified exercisable settings include diverse types of behaviour settings, for example, paved open area within residential communities, tree-lined strolling path, rest nook seating areas along the strolling path, centripetal layout exercise area, exercising nook areas, basketball court, attractive fountain with waterside seating, and so on. Exercisable settings have common and diverse features that afford possibilities for different exercises. Being surrounded by plants, which create attractive and comfortable micro-environments, is one of the most common features of favoured exercise settings. To be more specific, plants around the exercise settings provide shade, fresher air, and natural views, allowing older people to relax and exercise comfortably. Other diverse features, for example, the layout and location of exercising facilities, are illustrated in detail in later sections. While a space encourages older people to exercise frequently, it will also contribute to the sociable attribute, as the process of frequently exercising will increase the familiarities between users and trigger more social interactions between them.

7.2.8. Restability

Older people mentioned in the interviews that their declining mobility reduced their activity range (Section 5.2.2), so that some older people are only active within their residential communities, whilst some still go to other outdoor spaces. Based on the observations, restability was identified as an important attribute to support older people's outdoor activity, both within the residential communities and neighbourhood outdoor spaces. As a stakeholder indicated:

"Because the older people will get tired after walking for a while, so it is generally necessary to set up seats for them at a certain distance, including these entrances, but at the same time these seats are actually contributing to the possibility of communication between neighbours." *[Landscape Architect 1]*

Older people have diverse mobility levels. Even older people who only walk within their residential communities also need seating because they could feel tired at any time. Examples of older people resting in the parking area and at the edge of the main vehicle road in the residential community confirm the need for seating and restability, even in the most everyday and mundane situations (Figure 7.1).

Figure 7.1 Older people sitting at their residential communities (source: author)

Observations in other neighbourhood outdoor spaces also indicated the importance of restability in outdoor environments. Older people were observed sitting in different behaviour settings, for instance, on shady strolling paths which have rest seating at intervals, open paved areas with rest settings, self-made resting areas, pergola rest areas, tree-pool seating, and so on. When older people can get rest outside, they can spend more time outside. The attribute of restability enables older people to rest while they walk or after exercise, to enjoy views of nature, observe others, and supervise their grandchildren. As the above stakeholder mentioned, restability also contributes to the sociable attribute as it offers possibilities for both passive and active social interaction.

7.2.9. Sociability

Another important attribute is sociability. As the interviews and site-based data collection activities have repeatedly demonstrated older people's need for social interaction, and their

diverse social activities. As mentioned in Section 5.3.2, positive social interactions can encourage older people to go outside and increase their sense of attachment. The observation data indicated that social activities accounted for a considerable proportion of on-site activities across all sites: 59.52 per cent, 67.61 per cent, 75.42 per cent, 56.61 per cent, and 96.76 per cent from site 1 to site 5, respectively. Older people's social activities also vary from passive interaction, for instance observing others, to more active interaction, including supervising their grandchildren, chatting with others, and participating in group leisure or sport activities. As Gehl (2011) stated, social activities to some extent depend on the presence of other people. Therefore, an outdoor space with attributes that fits older people's preferences and needs, and attracts diverse activities, will contribute to the sociability attribute. At times, older people themselves create the sociability attribute of a site or setting. For example, they bring their own chairs to form a social setting to play chess or cards, making use of the tree shade on the path, which provides a comfortable micro-environment. This reflects older people's sense of agency in changing the path's affordance, from affording older people to go through, to affording sitting and socialising. Another example was observed at site 5, where several open areas are used by different groups of older people in an established order at different times of the day; this collective action also reflected different groups of people working together to maximise the capacity of a site, a form of collective agency (Bandura, 2006).

Another important factor influencing the sociability of a space is social familiarity, which depends on who is using the site. As mentioned earlier in Section 5.3.2 (Intimate relationships with neighbours), companionship with neighbours can promote older people's use of community outdoor space. In contrast, Section 5.3.2 (Remote relationships with neighbours) also mentions that if older people do not have any acquaintances in an outdoor space, there is the possibility that they may not use it. Therefore, for both residential community and neighbourhood outdoor spaces, building familiarity between people is quite important to encourage them to use outdoor space.

Older people's grandchildren can act as social bridges to establish familiarity between older people who are supervising their grandchildren. Sociability provides older people opportunities to become involved in incidental or frequent social activities with other people,

which can strengthen and expand their social networks, enable their participation in active or passive social interactions, and have the potential to prevent social isolation. As an architect expressed, a good environment that enables older people to socialise is important to older people's ageing-in-place.

"Why would the older people choose to go to the city park to sing and dance and do these things? This means that they do not have the space in their own community, or even if they do, they do not have a social circle. Therefore, I think that the ageing, one aspect is the environment, and another aspect is the social circle. Older people themselves may have neighbours in their own residential communities, but they may not know many of them, and their social circles are relatively small, so they don't like to walk downstairs in their own residential communities very often, and they would rather walk a little farther to meet more people in the park. The other thing is that not all residential communities have a very good environment, there may be some old residential communities that have no green space, only all the parking space. I think the reason why we are designing these senior housing developments is to create an environment for the older people, and the second reason is to bring them a social circle." [Architect]

7.2.10. Identifiability

The attribute of identifiability was clearly highlighted in the stakeholder interviews. It is vital to supporting older people being outside, especially for those who are experiencing decline of nervous function, for example, due to Alzheimer's disease. Alzheimer's disease's clinical hallmarks comprise developing impairment in orientation to physical surroundings, memory, decision making, and language (Nussbaum and Ellis, 2003). In such cases, an identifiable environment can afford older people signals to distinguish direction and location, and help older people's wayfinding. As a landscape architect said:

"We will make a distinction in the design, for example, the east side and the west side, one is on the streamline, natural type, and the other side is on the regular type, so that the older people will know that my home is in a square area, or my home side has a red chair. In fact, it is to provide a variety of identifiable and memorable features for older people." [Landscape

Architect 1]

Linking back to the interview data, an older person with Parkinson's disease, who had just moved from another residential community to live with his children, mentioned that he was afraid of going out, reflecting the importance of the affordance of identifiability. For older people who are uprooted from their own residential communities and move to live with their children (5.3.1), identifiability might also act as a positive affordance to encourage older people to become familiar with the environment quickly.

"I dare not go outside alone here, I am unfamiliar with this area. I will not know where I am if I go far away. So, I just strolled within the residential community...I am not well, I have Parkinson's disease." [S1_5_M_77]

7.3. The behaviour settings and design elements in residential communities

The following sections will introduce the behaviour settings and design elements in residential communities and neighbourhood outdoor spaces. In order to present different behaviour settings more systematically, they have been organised into different categories according to their main environment and activity features. The passing-through space setting refers to the roads and paths that afford older people the opportunity to move around to different destinations. The active activity space indicates different-sized and -shaped open areas that afford diverse active activities or group activities. The static activity space represents different-sized and -shaped rest areas that afford rest and socialising. Living and services spaces are settings that mainly provide older people's services. Nature space represents green and vegetated areas that support older people's ability to pursue nature-related activities or activities that rely on natural elements.

7.3.1. Passing-through space

- **Tree-lined vehicle roads**

Tree-lined vehicle roads that cross all parts of the residential community afford older people with different mobility levels the opportunity to walk and cycle, both conveniently and safely.

	The **parking space at the side** narrows the space for vehicles to pass through, but it also slows down the vehicle speed which enables older people to feel safer with regard to walking, resting, and talking to neighbours on the road. The **information board** is located at the side of the road near the entrance to the residential community, and provides some community news which affords older people opportunities to learn about and involve themselves in community matters.

- **Pedestrian paths with a parcel collection station**

Pedestrian paths that are separate from vehicle roads afford older people a safe walking and strolling environment. They link different areas of residential communities, and with a parcel collection station near the entrance to the residential community, provide additional services. A potential issue with the parcel collection station was observed during the observations. An older person was seen struggling to use the machine, which suggests that the design of similar technological facilities should take older people's abilities into consideration, or give them simple and clear instructions.

Table 7.2 Example and design elements of pedestrian paths with a parcel collection station at site 2 (source: author)

	Separate the pedestrian paths from vehicle roads, by using **different paving or levels**, and use **bollards** to block off part of the vehicle road for pedestrians to use. The **parcel collection station** is set alongside the pedestrian paths, enabling older people to collect their parcels conveniently whilst they walk home.

- **Shady strolling paths**

Strolling paths lined with trees provide shade, with benches at regular intervals, linked to different areas of residential communities, e.g., residential building entrances, pavilions, artificial ponds, and activity spaces, which afford older people opportunities to enjoy changing views whilst they walk to different places.

Table 7.3 Examples and design elements of shady strolling paths of site 2 (source: author)

	The **paths and their linkages** are barrier-free so that older people with different levels of mobility, with prams, shopping trollies, or wheelchairs, can move around safely. The **trees and green areas** along the paths provide shade and changing natural views for older people while they move through or sit somewhere.
	The **seating** is located along strolling paths interspersed with diverse views for older people to sit and enjoy the natural views or chat with acquaintances. Some are situated away from, but facing onto, the active activity space, or face artificial ponds, affording older people peaceful seating but allowing them to maintain visual connection with activities happening in the active activity space.

7.3.2. Active activity space

- **Nearby paved open area with exercise facilities**

This setting is immediately adjacent to residential communities without exercise facilities, enabling nearby older people to exercise, rest on the facilities, and chat whilst they exercise. The open area's proximity to residential communities determines the flow of potential users, and the size of this area is suitable for vending and other similar activities. It also acts as a setting for community committees to organise activity programmes to deliver services to older people, e.g., shop programmes, that provide groceries for older people to buy, and local cultural or community activities. Therefore, it is a setting where older people can exercise,

meet up with neighbours, and do grocery shopping while passing by or doing other activities on-site, putting together the attributes of exercisability, sociability, restability, and multifunctionality.

Table 7.4 Examples and design elements of the small paved open area at site 1 (source: author)

	A set of exercise facilities at the edge of a small paved open area, enable older people to exercise and sit. The **surrounding shrubs and trees** provide a sense of enclosure which separates older people from vehicle roads.

● **Nearby open paved area with rest settings**

This open area adjacent to residential communities, with surrounding benches under a pergola, contains individuated benches, as well as tree-pool seating near the centre, affording older people a setting in which to dance and sing in groups, stimulating a chain of social interactions.

Table 7.5 Examples and design elements of the nearby open paved area with rest settings at site 1 (source: author)

	The **benches under a pergola** surrounding the front and side of the open area enable older people to leave personal belongings while they dance or sing, and other older people to rest, observe, or chat with others.
	Individual benches at the other side of the open area also enable older people to rest, observe, and chat. The trees near the centre provide some shade within the open area, with **tree-pool seating** that enables older people to sit facing

	different directions for observing or chatting.

- **Paved open area within residential communities**

The paved open areas within residential communities are necessary for older people to exercise, rest, and socialise, and for community committees to organise community activities. This setting is especially vital for older people with mobility issues to have a place to stay outside to rest, observe, and socialise with neighbours, so that they do not have to leave their residential communities. Taking site 1 as an example, the paved open area is near the Community Aged Care Centres, enabling community committees to organise community activities (e.g., set up projection cloth for movie display activities, display posters for community matters and health promotion). The paved open area at site 2, located at the centre of the residential community, linked by several strolling paths from different directions, becomes a gathering area for residents.

Table 7.6 Examples and design elements of paved open area within residential communities (source: author)

	The **linear seating** at the side of the open area at site 1 becomes a rest and chat area for older people; those who are less mobile were observed sitting and chatting here on different observation days. The **information board** at the back of the linear seating also provides information about community matters, attracting older people to look and chat.
	The paved open area at site 2 is **semi-encircled by exercising facilities and trees**, with some **benches** at the other side. The open area enables older people to do exercises that do not need facilities, whereas the exercise facilities encourage older people to exercise or observe their children playing, and the benches afford sitting opportunities suitable for observing and chatting.

- **Intergenerational area**

The children's playing facility, in the sandy area with a nearby bench under tree shade facing the facility, formed the setting for the intergenerational area. The gathering of children acts

as a social bridge between the people who supervise them, who are usually from the same residential community, creating social interaction opportunities and increasing social familiarity between neighbours. As it is located at the edge of open space in the residential community, with exercise facilities, older people can also exercise while they wait.

Table 7.7 Example and design elements of the Intergenerational area at site 2 (source: author)

The **nearby bench** enables older people to rest while they are waiting, which can extend their time spent outside.

An issue noted whilst observing at site 2 is that the playgrounds have **sandy floors**. This can be considered a play material for children, but the sand tends to spread to nearby areas and paths. Considering the windy weather in Beijing, the scattered sand could make the environment untidy, and become dangerous for older people when they walk through. Alternative materials or more frequent maintenance might be needed.

- **Roadside exercise area**

Whether it is in order to increase the exercise equipment around the residential communities or making the most of the street, roadside exercise areas can potentially provide an exercise option for older people who do not wish to go far from their residential communities, or for older people on their way to other destinations. However, this particular setting is an example of an unsafe and uncomfortable setting that is not matched to older people's comfortable competence zone. Older people seemed reluctant to use this setting, which was only infrequently in use during the observations, even though there are plenty of exercise facilities. Ensuring a sense of safety is the primary issue that needs to be resolved when designing a roadside exercise area. Apart from this, the presence of plants on roadside exercise areas is also vital to making the micro-environment more comfortable, and to separate it from vehicular traffic and exhaust.

Table 7.8 Example and design elements of the roadside exercise area at site 1 (source: author)

	The **very low marble fence** (approximate seat height) cannot provide older people with a sense of safety and enclosure, protection from cars, and there is **no shade provided by trees.**
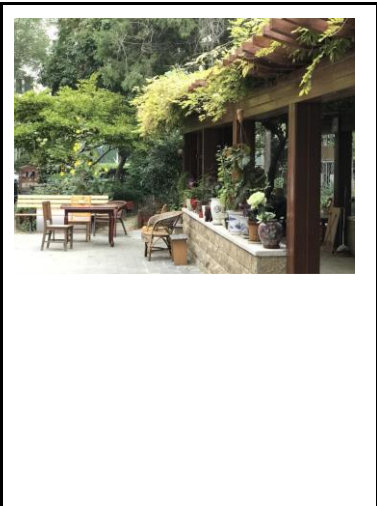
7.3.3. Static activity space

● **Self-made resting area**

Resting areas near the residential community green area or residential building entrance are formed by designed benches or pergolas, and furniture brought by residents. This type of rest and social setting is mostly maintained by older people themselves, who bring their own tables, chairs, planting pots, gardening equipment, etc., forming a flexible setting according to their resting, socialising, and planting needs. It was apparent from the observation data that this setting afforded older people the opportunity to sit and chat with neighbours, and garden in the nearby green area or in pots.

This setting enables older people to adapt the space according to their needs and preferences, extending their sense of control from their own homes to their residential communities, developing their sense of agency in the setting, and thus potentially increasing their satisfaction and sense of attachment to their residential communities.

Table 7.9 Examples and design elements of self-made resting areas at sites 1 and 2 (source: author)

	The **washing lines** are also located nearby for older people to dry quilts and other large items and this area can therefore also support some older people's living requirements. However, older people also mentioned in the interviews that the community environment deteriorated somewhat after the washing lines were installed as they make it feel untidy. This reveals that in providing facilities, e.g., washing lines, both usefulness and environmental attractiveness need to be considered to allow some older people to use them without affecting the community's overall attractiveness.

● **Rest area with nature views**

An example of combining the comfortable and attractive attributes is this setting, with benches facing both directions within a small paved area surrounded by dense trees and a green area, and very close to residential building entrances. This rest setting affords older people a quiet atmosphere to sit and enjoy natural views, be alone, or chat with familiar neighbours.

Table 7.10 Example and design elements of the rest area with nature views at site 1 (source: author)

	Dense trees and shrubs offer an enclosed feeling and provide natural views for older people to enjoy when they rest here. The **benches** enable older people to sit and chat with neighbours.

7.3.4. Nature space

● **Plantable and maintainable area**

In both of the residential communities, older people were observed planting and managing diverse plants and flowers in the green area in front of the residential buildings. They developed their sense of agency by making changes and maintaining the area by themselves, and this process also helped to develop older people's sense of attachment to their residential community.

Table 7.11 Example and design elements of the plantable and maintainable area at site 1 (source: author)

	These planting opportunities are afforded by the **flowerbeds**, but these areas are not strictly restricted, and not specifically designated by the community committee or property management company for residents or older people to plant and put out plant pots.

The observed planting and maintenance activities, growing diverse plants, and the ways in which older people talked about their attachment to plants in their residential community (see Section 5.4.1) provide strong evidence that allocating areas near residential buildings for older people's gardening activity is vital to facilitating their interest in gardening. It is also beneficial for older people's sense of attachment to their community, and increases the opportunities for older people to go outside, meet neighbours, and enhance neighbourly interaction. Stakeholders also emphasised the importance of providing older people opportunities to plant:

"The older people contact nature through the gardening activities of flowers, fruits and vegetable cultivation, can witness the change of seasons, relieve stress and be restored." [Landscape Architect 1]

As Han and Bao (2016) mentioned, this generation usually grew up in rural areas, and have experience in agricultural activities, therefore it is common for them to have unique emotional bonds with the earth and planting. They further suggested that community farming activity can enrich older people's lives, provide favourable environments for aged care, encourage social interaction, and could be a suitable proposal for sustainable community renovation to address ageing issues. The potential issues of setting up plantable and maintainable sites within residential communities are that they need to be approved by community residents, and be organised, supervised, and co-ordinated by the community committee or even partnerships of local organisations.

7.3.5. Services space

● **Easily accessible shops**

Doing housework and cooking are identified as daily activities of older people, as some of them take on grandchild-care duties (Section 5.3.1), and some have the independent living ability to live alone or with their partners (Section 5.2.1). Housework and cooking are directly related to a frequently observed outdoor activity, namely shopping. There are two shops and a shop programme at site 1. One shop is within the residential community, whilst the other is just opposite the residential community, and the shop programmes are held in the small green space near the residential community. Site 2 has a shop within the residential community and a shop programme organised in front of the community entrance, which are all conveniently accessible for older people. The regularly organised shopping programmes in/near residential communities need to be easily accessible, close to where older people reside, providing groceries for older people to buy, as it is especially important for those older people who are not able to walk long distances. By satisfying older people's shopping needs, the convenient service spaces also have the potential to promote older people's physical activity, create social interaction opportunities, and promote familiarity between neighbours.

7.4. The behaviour settings and design elements in neighbourhood outdoor space

7.4.1. Passing-through space

● **Tree-lined strolling path**

The barrier-free path that surrounds the site, with sub-paths that connect different areas of the space, and benches to one side at regular intervals, encourages a constant through flow of people. This setting affords older people with good mobility levels the possibility to stroll or run for exercise. Older people with poorer mobility levels can walk safely or move easily using their wheelchairs, and rest when they feel tired whilst socialising with companions or passers-by.

Table 7.12 Examples and design elements of the tree-lined strolling path at site 3 (source: author)

	The **trees lining the path** provide older people with shade and views of nature while they are moving along the path, standing somewhere, or sitting in the benches to observe and chat.
	Side benches with backrests that are distributed at intervals at the side of the path, with good views of nature and a sense of enclosure provided by the surrounding hedging and trees, enable older people to sit, to observe, and gather to chat.

Stakeholders also considered using the space near a fixed bench for older people's social possibilities, as mentioned here:

"Next to a fixed bench, we have to reserve space for wheelchair pushers or other people, who will have various activities between them at will, and it will be natural. We have to consider as much as possible some activities that will happen between older people, and trigger various possibilities between them from the design we are doing." [Landscape Architect 1]

As the observations noted a considerable number of sitting and watching, and sitting and chatting activities, the restable and sociable attributes, combined with attractive natural elements, would be a forceful combination to support older people's outdoor walking and social interaction.

- **Shady strolling path lined with hedging and trees**

The strolling path lined with tall or waist-high hedging, under the shade of the dense trees, and curved to cross different parts of the space, with several rest nooks in between, and a garden viewing point, provides older people with a quiet, peaceful, and shady path for strolling. Considerations should be made to provide sufficient lighting to ensure older people's sense of safety, especially after dark.

	The **dense trees** provide shade that covers most of the strolling path, which is lined with **hedging** at different heights, creating a cooling and natural walking environment in summertime.
	The **garden** with diverse ornamental plants alongside the avenue trees or lining shrubs afford older people aesthetically pleasing views while they stroll, becoming an attractive viewpoint for older people inviting them to stroll along the path.
	Benches set along the strolling path, away from the activity area, enclosed by tall hedging can create a peaceful area for older people to rest by themselves or chat with companions.

● **Pergola path**

The wooden pergola, covered with climbers but without seating, provides an alternative dancing and exercise area for older people, shows how a passing-through setting was used in a multifunctional way.

Table 7.14 Example and design elements of pergola path at site 4 (source: author)

	The **curved pergola** enables older people to stand in a staggered row, with good views of the dance leader for all. The **barrier-free paving and links with surrounding grounds** enable older people to dance and walk safely.

● **Rest nook seating areas along the strolling path**

The rest areas with seating that project from the strolling path afford older people a rest nook when they pass by. The enlarged areas in front of the rest nook seats become alternative

exercise areas (often in the morning), or parking areas for bicycles while users play chess or card there (often in the afternoon).

Table 7.15 Examples and design elements of the rest nook seating areas at sites 4 and 5 (source: author)

	The **benches** are backed with hedging and with natural views in front, under the tree shade or under the sunlight, enabling older people to step aside from the strolling path and rest there to enjoy the peaceful views of nature, and have conversations with their companions.
	The stone seats at the side are moved by older people according to their needs (e.g., playing chess or cards, getting haircuts).

● **Path with double row of trees**

The wide passing area with a double row of trees, and seating at one side is highly multifunctional, not only acting as a passing-through path, but also providing places to do individual or small group exercise activities, play with children, or play chess (or cards), illustrating the multifunctionality attribute.

Table 7.16 Examples and design elements of the path with a double row of trees (source: author)

	The **barrier-free paving** allows older people to pass through or dance here. The **double row of trees** can provide some shade for this area, and also attracts older people to set out their own chairs and tables to form chess tables and to play chess or cards. This represents how the setting supports older people in exercising their own agency, allowing them to gather together and bring their own chairs to form a social setting, compatible with the site's comfortable micro- and social environment.

● **Connecting path**

Sub-paths that connect different areas of the space, and cross planting areas, with fewer pedestrians, allow ease of movement for people with mobility issues. They enable older people to choose how far they want to walk, to stop by to do some exercises and enjoy the views of nature, or access linked activity spaces, increasing the opportunities for older people to observe and participate in the activities going on in these spaces.

7.4.2. Active activity space

● **Centripetal layout exercise area**

A paved area containing diverse exercise equipment, with decorative and attractive planting at the centre and perimeter, sub-paths from different directions, combined with visibility in different directions, encourages users to exercise in a sociable setting with natural elements.

Table 7.17 Example and design elements of the centripetal layout exercise area (source: author)

	The **exercise facilities** become a restful setting for older people and a playful setting for children. The **decorative planting** affords older people the opportunity to enjoy natural views while they exercise, representing the attractiveness attribute.

● **Exercising nook areas**

The areas with or without exercise facilities, located at the edges of the site or path side, created several exercise nooks, as linked by strolling paths and surrounded by dense trees and shrubs. These exercising nooks enable older people to stop by and exercise, gather to chat, spend time with their grandchildren, or carry out small group activities, e.g., kicking shuttlecock.

	Table tennis tables and **diverse exercise facilities** enable older people to exercise, children to play, creating opportunities for socialising. The **dense trees and shrubs** provide shade and fresh air, forming a comfortable micro-environment. They can also divide exercise areas, providing a sense of separation from the strolling path, but the gaps in the shrubs maintain these areas' accessibility, allowing older people to move between these areas and the paths.

- **Intergenerational area**

Children's play facilities located at the large open activity area near a pergola, enable older people to spend time with their grandchildren and can encourage them to socialise with other users who are also supervising grandchildren, because they might have more topics in common to start a conversation with. Seating arrangements that allow older people to rest but also keep watch over their grandchildren is necessary, as children were often observed playing at the facilities for long periods.

Table 7.19 Example and design elements of the intergenerational area (source: author)

	The **canopy** provides shade for users at different times of day. The **low fence** surrounding the play facilities provides a supplementary sitting area for older people to rest while they are supervising children's play. However, the structure of the fence needs to be further considered so that older people can sit more comfortably.

- **Basketball court**

The basketball court provides a specific sport site for people to play basketball, and affords an alternative setting for badminton, doing exercises, and playing with children.

Table 7.20 Examples and design elements of the basketball court (source: author)

	The **high fence** can be used to display objects, and is used by the community committee to hang paintings, calligraphy, and banners as part of cultural activities that attract older people to gather, to view exhibits and communicate.
	The **benches with backrests** at both sides of the basketball court offer older people places to sit, allowing them to observe or chat with others.

- **Open areas near the site**

Where there is no or not enough open space suitable for carrying out group activities, activities with a larger range of movement, playing cards, or playing with children, the nearby open areas, e.g., parking lot, incidental space at the front of buildings, become the supplemental areas of choice for older people. The open areas are often without busy traffic so that older people can occupy the areas for dancing, exercising, playing chess (or cards), and playing with children.

- **Paved open area with rest settings nearby**

The open space and barrier-free paving enables multiple leisure and sports activities in different groups. Its openness and the nearby rest settings also enable older people to see other users and activities happening on-site, which promotes passive or incidental social interaction. If there are multiple open leisure or sport areas in one site, they should be close to each other and linked by accessible paths to support older people to transit conveniently in between.

Table 7.21 Examples and design elements of the paved open area with rest settings nearby (source: author)

	The **smooth paving** enables older people to do activities that require less friction, such as ballroom dancing and roller skating.
	Centripetal layout seating is located at the edge of the open area, facing the central activity space, with trees at the back or in between. The centripetal layout creates the sense of being in an audience, encouraging older people to sit and watch other people and activities happening on site, and also increasing the opportunities for conversation.
	The **tree branches and shrubs** act as hangers to allow older people to store equipment or hang their bags up.

- **Service points at the edge**

Spontaneous haircut activities were observed located near the site entrance and the junction of the path and activity space, where it is not crowded but with a flow of people, which become service points for older people to receive services whilst they go to the park. The service points add a layer of functionality to the site and give extra reasons for some older people to come to the site, creating social interaction opportunities in the process. The service points are spontaneously created by older people by bringing their own chairs and tools, allowing them to exercise their agency in providing or accessing services they need in the space.

Table 7.22 Example and design elements of the service points at the edge (source: author)

	The nearby **decorative stones**, and **seats** afford older people a platform on which to place their tools.

● **Sculpture nooks**

The sculpture nooks, enclosed by a fence, with one side entrance, contain a sculpture, allowing children to play there whilst older people observe them, and also allow some older people to exercise.

Table 7.23 Example and design elements of the sculpture nooks (source: author)

	The **sculpture** is climbable for children, and acts as a support point or platform for older people to stretch their legs as a form of exercise.

7.4.3. Static activity space

● **Shady trees with moveable stone seats**

The stone seats under shady trees form a rest and social setting, attracting older people to play chess or cards.

Table 7.24 Example and design elements of the shady trees with moveable stone seats (source: author)

	Rectangular and square-shaped stone seats are located at the side of the wide path or near open areas. The rectangular stone seats are not only used by older people to sit, but also used as 'chess tables'. The square-shaped stone seats are too heavy to take away but easy to move small distances on-site. It enables older people's sense of control in the sense that they can move the stone seats according to their needs to maximise this area's capacity, e.g., move the stools to a suitable position to play chess or cards.

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● **Pergola rest area**

The wooden pergolas with benches, tables, and plants, are situated at the side of the open area and intergenerational area, forming a comfortable rest setting. They afford older people the opportunity to rest, chat, observe what is going on around them, play chess or cards, and use the services organised by the community committee. This is an example of how the space has been used in a multifunctional way.

Table 7.25 Examples and design elements of the pergola rest area (source: author)

	The **double-sided benches** can enable older people to choose which way they face while they sit - face to face with other people to chat, or facing the open, intergenerational area, to observe other people. The **chess table surrounded by four seats** at the centre of the pergola attracts older people to play chess or cards, or to chat. The **climber** covers the back and top of the pergola, providing a sense of enclosure and shade for older people to rest comfortably. The **pergola's structure** can be used by the community committee to hang banners, and they add extra chairs in front of the pergola to form a setting for providing services for older people.

● **Gathering chess tables under canopy**

Tables with seats under a canopy or the shade of a tree enable older people to play chess or poker games, and attract onlookers to gather to observe.
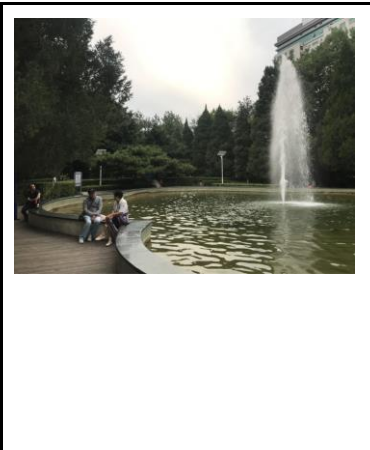
Table 7.26 Example and design elements of gathering chess tables (source: author)

The **chess tables with a set of seats** enable older people to play chess or poker games in small groups.

The **canopy** or nearby **trees** provide shade for the older people who are using the tables and their onlookers.

● **Attractive fountain with waterside seating**

The artificial fountain with its large pool and waterside seating forms an attractive viewpoint and provides restorative water sounds, attracting older people to exercise near the fountain, play with children, and sit and chat with companions.

Table 7.27 Example and design elements of the attractive fountain with waterside seating (source: author)

Nearby dense trees create a patch of shade for people to pause to watch and listen to the fountain, hold some occasional conversation, or observe the activities and people near the fountain.

The **angular form of the edge of the fountain pool** affords different seating possibilities, enabling older people to sit close to the water, enjoy the views of nature, chat with companions, or play with children.

● **Trellised pavilion area**

The trellis with canopy and seating forms a resting place, used by older people to play chess or poker games, by bringing their own chairs to establish their chess tables.

Table 7.28 Example and design elements of the trellised pavilion area (source: author)

The **canopy** intercepts the rain, and the **structure of the pavilion** provides a sense of enclosure, also enabling older people to use chain locks to lock their chairs so that they do not need to carry their chair to the site every time they visit.

● **Linear rest area**

The linear set of benches is located at the side of an open area, with trees and shrubs at the back. This rest setting affords older people the possibility to sit and gather to chat.

Table 7.29 Example and design elements of the linear rest area (source: author)

	The **linear bench** marks the transition between different atmospheres, i.e., between an active and crowded area and a more tranquil area. It provides older people opportunities to choose whether they want to watch the activities and chat with others, or get away from people.
	The **trees** at the back provide shade for this area.

● **Landmark tree with tree-pool seating**

The landmark tree with tree-pool seating located in the central activity space, away from crowded areas and flows of pedestrians, affords older people a chance to choose between sitting facing different directions for different purposes, for example, older people were observed facing the open area to observe or chat with others, or facing more natural views with a few people choosing to play their musical instruments.

Table 7.30 Examples and design elements of the landmark tree with tree-pool seating (source: author)
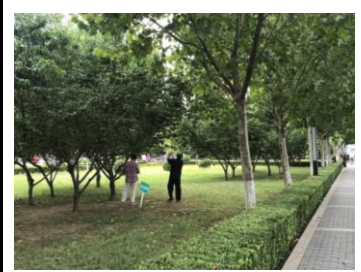
	The **landmark tree** acts as a viewing point, and provides shade for the tree-pool seating.
	The **benches surrounding the landmark tree**, or the **sittable edge of the tree pool,** provide an all-round viewpoint and afford older people the opportunity to choose the direction they prefer to face.

7.4.4. Nature space

● **Pickable orchard**

A few orchard trees planted on site attract older people to pick fruit, even though the space is not specifically designed for users to pick fruit. Supervision or organisation of fruit picking might be needed to conform to local norms.
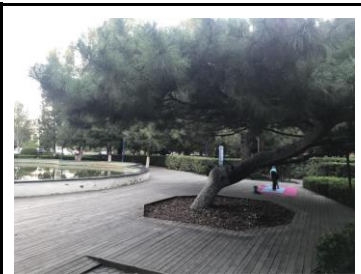
Table 7.31 Example and design element of the pickable orchard (source: author)

	Orchard trees attract people to have closer contact with nature and to feel the change of the seasons.

● **Attractive tree**

The uniquely shaped tree is set within a wooden deck that afford older people a setting to practise yoga in a natural environment.

Table 7.32 Example and design elements of the attractive tree (source: author)

	The **tree's unique shape** is attractive and provides shade. The **wooden deck** provides warm, smooth tactility, and enables the laying of yoga mats.

● **Green area**

Site 5 does not have specific children's play facilities. The green area planted with trees and surrounded by a low fence is not specifically designed for people to use, but it attracts children to play inside of the green area, therefore observed by older people who are supervising their grandchildren.

	The **trees and soil provide a** playful environment for children. The **low fence** deters others from accessing the area which gives this green area a sense of being reserved for children to play, therefore also inviting older people who are supervising grandchildren to come into this area.

7.5. Summary

Using the analytical framework derived from the ecological model of active living, and the concept of affordance, this chapter explains how the environment attributes at different levels afford the older people's activities that are observed in Chapter 6. The attributes have been divided into the macro-, meso-, and micro-levels. Combined analysis of interview and observation data generated ten macro-environment attributes that work for older people at the whole site and behaviour setting levels. The concept of behaviour settings was applied in this chapter at the meso-level to classify neighbourhood outdoor environments into passing-through, static activity, active activity, nature, service space types, with more detailed classification under these types. These categories of behaviour settings reflect single or multi-macro attributes, and represent how older people's activities occurred recurrently within a setting with some specific environment features. The more detailed micro-design elements (e.g., trees and shrubs, seats, paving, location, pergola, canopy, fence, and facilities such as information board and parcel collection station) provide different functions in different behaviour settings.

This chapter also explained how neighbourhood outdoor space enables older people's agency, emphasising the important role of neighbourhood outdoor space in supporting older people's ageing-in-place. Convenient and safe walking environments, and comfortable exercise settings, provide older people who are less mobile with a feeling of support and activate their sense of agency to decide to use these spaces, even though they have lower levels of competence in relation to the surrounding environment. Some of the older people were

observed using and changing the outdoor space proactively by changing the design elements on-site according to their needs, bringing their own items to form a social setting, using a space in a different way at different times. These proactive behaviours also reflect Chinese older people's sense of agency in using neighbourhood outdoor spaces, which can support their sense of control in life, therefore ageing-in-place healthily and independently. This chapter provides a solid foundation to provide suggestions for developing age-friendly outdoor spaces that can support older people's ageing-in-place, as will be discussed further in the next chapter.

Chapter 8 Discussion and Conclusion

8.1. Introduction

This chapter systematically discusses the findings derived from different methods of data collection set out in previous results chapters in relation to relevant pre-existing research, and assesses the study's achievements against its overall aim. Sections 8.2 to 8.5 discuss the findings from Chapters 5 to 7 in relation to objectives 1 to 3. The implications for policymakers and practitioners with regard to the research findings are then introduced to emphasise the implications of this study. Finally, the research contribution, limitations, and future research possibilities are presented.

8.2. Experiences of ageing in Chinese urban neighbourhoods

8.2.1. Personal aspects

In the first phase of this study, the researcher used semi-structured interviews to obtain perspectives from both older people and stakeholders, revealing older people's detailed and lived experiences of their daily lives in residential communities. As people age, they will experience physiological health issues, a decline in mobility, face isolation and depression, and concerns about whether their financial resources can support them in their twilight years. These factors influence older people's daily lives and use of outdoor spaces, and provide key points for researchers and stakeholders to consider supporting older people's ageing-in-place.

This study identified that older people are very concerned about their own and their partners' health status, which fundamentally determines whether they can live a high-quality and independent life in their residential community. Older people frequently have several chronic diseases, or comorbidity, which will limit the extent of activities, lead to disability, and impact independence (Verbrugge et al, 1989; Beswick et al, 2010). Van Dijk et al (2015) also highlighted the importance of maintaining independence whilst ageing-in-place. Older people's mobility levels, which are influenced by their health status, also play a vital role in delimiting the area in which their outdoor activities take place. A reduced mobility level

significantly reduces older people's activity range and the dynamic level of activity. No matter what their health and mobility status, participants in van Dijk et al's (2015) study emphasised their efforts to conduct outdoor activities to keep healthy. As suggested by Nusselder et al (2008), moderate physical activity helps older people to prevent disabilities. These studies emphasise the importance of encouraging older people to go outside their homes and keep active outside. The findings from the interview data in the current study also demonstrate that the immediate outdoor environment in residential communities is more important to support older people with lower mobility levels. Supportive environments can encourage older people, even if they are experiencing a decline in their mobility status, to go outside, and indeed have the potential to help reverse or at least delay such decline. The findings are in line with previous empirical research that the prerequisite for older people to reside independently in the residential community is to maintain outdoor mobility, by reducing barriers in the outdoor environment (Rantakokko, 2011).

Older people's strong concerns about their health status could become a mental burden, as some participants in the current study expressed negative judgments of themselves because of their health issues. Such negative self-images, as perceived by older people themselves, are detrimental to their physical, mental, behavioural, and social functioning (Bai, 2014). Similar findings have been emphasised by Pan et al (2019) in China: enabling older people to experience functional independence and physical health is beneficial for a more positive self-image. Apart from the negative self-image caused by disease, participants in this study also experience loneliness, sadness, and subjective powerlessness due to environmental changes, loss of relatives, conflicts with relatives and children, as well as lack of social interaction. As Shankar et al (2013) noted, loneliness and isolation are detrimental to older people's cognitive function. Furthermore, older people's low health literacy and high social isolation are high risk factors for mortality (Smith et al, 2018). Therefore, attention should be paid not only to older people's physical health, but also mental health, to avoid their negative self-image and feelings, which will significantly influence their experiences of ageing-in-place.

Another factor that will influence older people's choice of ageing-in-place is their financial status. Current continuing care retirement communities in China are focused on providing services to wealthy older people rather than the general public. Some older people have to

stay in their own residential communities because they cannot afford continuing care retirement communities. The environment and services in their residential communities therefore determine whether older people perceive that they are trapped or thriving in these communities, which emphasises the importance of age-friendly residential communities across a wider socio-economic spectrum. The factor of financial status can further apply to future residential community retrofitting, which may involve the retrofitting of older people's homes. As Addae-Dapaah and Wong (2001) found in Singapore, older people's lack of finance may affect the suitability and feasibility of home modifications, and fail to meet their preferences and needs.

8.2.2. Social aspects

Older people's relationships with their family members, including children, partners, and grandchildren, as well as neighbours, determine the arrangement of their daily lives. Whether these relationships are supportive is key to encouraging older people to go outdoors and perceive this as a positive experience.

The current study identified that lack of companionship from their children, partner, or neighbours has the potential to prevent older people from going outdoors. The illness or death of a partner can suddenly break their daily routine, and they might feel a lack of interest generally and find it difficult to go outdoors again. As Duggan et al (2008) mentioned, some older people may rarely go out or prefer to go out with family members only because of their health problems or lack of confidence. However, this study found that older people's neighbours also act in a companion role to encourage them to go outdoors. The current study suggests that having a person, whether a child, grandchild, partner, or neighbour, that can accompany them to go outside is vital to helping them conquer the fear of going further afield, maintain their interest in the outdoors, and in experiencing the benefits of going outside.

Noon and Ayalon (2018) reported their observation of older people in public open spaces in Israel, noting that Intergenerational contact was almost absent and older people were mostly sedentary. In China, as identified in the current study, it is a common phenomenon that older people play a vital role in taking care of grandchildren, which could occupy most of their daily

lives; their lives are "grandchild-centred". Care for grandchildren could encourage older people to use nearby outdoor space more frequently, as they need to bring their grandchildren outdoors to play. This in turn prevents some older people from going to other distant outdoor spaces for activity, as they might have to take their grandchildren with them at any time. As Fu and Chen (2021) identified, strong family ties also have the potential to reduce the activity ranges of older people. From another perspective, Chen and Liu (2012) stated that grandchildren's care has no general beneficial or detrimental effect on older people's health, but depends on the method and level of caregiving, and individual characteristics. The current study finds that the immediate vicinity should be supportive to older people with grandchildren to conduct intergenerational interaction, and bring opportunities for older people to build social relationships at the neighbourhood level, especially within their communities.

However, some older people in the current study have had to move into their children's homes in order to take care of grandchildren. In this situation, older people are uprooted from their familiar physical and social environment. As Yu and Rosenberg (2020) highlighted, when older people are forced to move to an unfamiliar residential community, due to economic reasons and considering the needs of other people, they may feel powerless and have a sense of insecurity, which also threatens their social relationships (Yu and Rosenberg, 2020). The current study notes that how to help these older people to quickly familiarise themselves with the physical environment and get social connections are also important aspects to consider.

This thesis identified that neighbouring relationships also act as key aspects influencing older people's experiences of ageing-in-place and use of outdoor space. Neighbours can be reciprocal and mutually supportive. Some participants in this study received daily help from their neighbours. These positive processes of giving and receiving support between neighbours are vitally important for older people as they spend more time in their neighbourhood and may live alone (Perren et al, 2014). The current study also identified that the companionship between neighbours acts as a facilitator to promote older people going outdoors, getting involved in outdoor physical activities and social interactions, and avoiding loneliness. This is similar to the findings of Xiong et al (2021), who identified that companionship in public open space in China is beneficial to mental health, and beneficial to

physical health through physical activities. Supportive social networks and sense of companionship play a significant role in promoting older people's life satisfaction (Pan et al, 2019). This thesis also identified that social connection could act as a stronger factor than physical environment in influencing older people's life satisfaction or attachment to place. As Yu and Rosenberg (2020) identified in China, older people's sense of isolation is not necessarily related to neighbourhood deprivation, because those older people who live in commodity residential communities also have a sense of isolation and a strong nostalgia for their old social connections. Referring back to Section 2.4.6 (Place attachment), meaningful social relationships are beneficial to people's sense of attachment to a place. It is reasonable to assume that older people who perceive more supportive neighbourly relationships might have a stronger sense of attachment to their residential community, and thus go outdoors more often.

However, older people in this study also reported weaker neighbourly relationships due to the continual moving out of older residents and arrival of new residents or rental households, those older people moving in with their children in order to take care of grandchildren. Unfamiliarity with neighbours will affect older people's social interactions. Older people may not use a space because there are no familiar people there, or choose to use more remote space to build their social connections outside their residential community. Many other studies identified that the physical environment could influence social interactions (Huang, 2006; Can and Heath, 2016; Zhang et al, 2018). Combining this knowledge base with the findings from the current study suggests an interactive relationship between the physical environment and social familiarities.

Apart from social interaction with family members and neighbours, this study also identified formalised social engagement and community services as factors that can affect older people's decisions regarding ageing-in-place. In this study, the community retrofitting in the old residential community is a particular opportunity that could enable older people to engage in community development work. It is a key aspect of an age-friendly social environment: promoting social and civic engagement (Lui et al, 2009). This study's results also suggest that enabling older people to express their preferences and participate in community retrofitting works, which can provide older people with a sense of control and greater

satisfaction with their residential community.

Affordable and accessible community services can support older people with receiving necessary health care, which is essential during the ageing-in-place process, especially for older people who are living alone. In addition, community committees can promote older people's participation in outdoor activities by organising various activities. However, the basis for realising community activities is that the community environment should be able to support those activities.

8.2.3. Attachment and satisfaction with the physical environment

Older people's mobility, social interaction, and emotions can be improved through viewing natural elements in their neighbourhoods. In order to get exposure to sunlight, fresh air, and to enjoy the blossoms, older people will go outdoors and therefore get more exercise and social interaction opportunities, receiving both physical and emotional benefits. These findings are in line with the conclusions given by Sugiyama and Ward Thompson (2007), namely that older people's quality of life can benefit from outdoor environments: participation in outdoor physical activity, exposure to outdoor natural environments, and social interaction in outdoor spaces. Additionally, this study further identified that planting and taking care of plants within older people's residential communities represent opportunities for enhancing their attachment to these communities. This is similar to findings from Comstock et al (2010) that gardening activities in home or community environments enhance residents' sense of attachment. Research and practice in China also found that community gardens can enthuse residents to participate in community public affairs, and benefit community cohesion (Liu and Kou, 2019). Therefore, organising community gardens or enabling older people to conduct planting activities could become ways to encourage older people to be more active and social, giving them a stronger sense of control and attachment, and a better quality of life.

If older people find their neighbourhood environment satisfying, they might have better overall life satisfaction. The satisfaction with their neighbourhood depends on the fit between environmental attributes and older people's needs and preferences. If the neighbourhood

environment, for example, its greenery, facilities, gardening opportunities, and standard of maintenance, fit with older people's preferences, they may feel satisfied and prefer to live there rather than moving elsewhere. Han and Kim (2017) also found that people would not move from their current neighbourhood if they were satisfied and had a sense of attachment to that neighbourhood. From another perspective, Perez et al (2001) argue that residential satisfaction is not an isolated factor, but is also influenced by other factors such as their home, neighbourhood, and the building in which their home is located. Even the satisfaction and attachment to neighbourhoods are not decisive factors that support older people's ageing-in-place, but that rather determine older people's experiences of ageing-in-place.

8.2.4. Agency

Following the discussions about older people's agency in Chapters 5 and 7, this study distinguishes agency as environment-related or social-related. They are interrelated with each other, influencing and influenced by older people's personal situations, their use of neighbourhood physical environment, and their social relationships.

Older people's environment-related agency manifests in this study in diverse ways, such as exercising their agency to make the decision to go outside and use neighbourhood outdoor space, changing the physical environmental affordance (e.g., moving stone seats to form chess tables, bring their own chairs to outdoor space), and maintaining their community environment (e.g., planting in their residential community and taking care of those plants, sweeping the road). Johansson et al (2009) suggested that practice and policy with regard to older people's home modification needs to consider older people's experiences of constrained and disempowering situations, and value older people's efforts at problem-solving, thereby supporting older people's agency.

Their social-related agency represents their ability to engage in social interactions, change or form the environmental social affordance, and participate in community matters. Engaging in social interactions enables older people to establish and socialise with their networks, build relationships of mutual companionship through going outdoors together, and join group activities regularly. Stanley et al (2010) also stated that older people have a sense of agency,

manifesting as continuing to be active in adapting and negotiating the challenges that come with ageing and loneliness. They suggested that the services for older people need to be provided in an empowering and enabling way, to maximise their ability to exert their own agency, and avoid the creation of dependency. Combined with the findings from this study, it is reasonable to assume that supportive neighbourhood outdoor environments that can empower older people and enable them to carry out diverse activities, is a way to support older people's ageing-in-place.

Older people's sense of agency is also represented in this study as changing or forming the environmental social affordance in a place, which can provide them with a sense of control about how to use the place, as well as a sense of attachment and belonging to a group of people. For example, they may carry out regular activities that attract others to observe and become immersed in, or different groups of older people may establish the order of different activities that are carried out in one area. That connectedness generated through the group is also identified by other scholars as a way of maintaining older people's participation in group activities (Dare et al, 2018). Noon and Ayalon (2018) also described the scenes in which older people created unique places that meet their needs by presence in large numbers.

Another type of social-related agency is engaging in community matters, represented in this study as older people having the opportunity to perform their civic role, and express their concerns and suggestions regarding community retrofitting. Older people themselves know what they want from retrofitting their residential community, and their voice being heard is thus key to ensuring the retrofitting results are age-friendly. To encourage civic participation and empowerment of older people is a key aspect of age-friendly neighbourhoods (Chan and Cao, 2015), and also a key social environment aspect of age-friendly cities suggested by the World Health Organisation (2007a). Keeping busy and engaged in meaningful activities offers older people a sense of being needed, and a feeling that they can still contribute even though with decreased functional abilities (Stanley et al, 2010).

Cutchin (2003) defined ageing-in-place as an ongoing process of place integration. Johansson et al (2009) further explained the process as a spiral of transactions into new environments, rather than a circular or linear process with predictable and repeated situations. Therefore,

agency means the active relation that interconnects the person and environment over time. This study identified that when the older people's neighbourhood physical environment and their social relationships are supportive, they have a better sense of environment-related and social-related agency. This sense of agency can lead older people to be more physically and socially active, strengthen their sense of attachment and satisfaction with their residential community, thereby supporting older people's ageing-in-place by ensuring good personal situations. Malhotra et al (2021) identified that lonely older people had a shorter life and fewer healthy or active life years than those who were not lonely. Therefore, where the physical environment and social relationships are not supportive, this has a negative effect leading to physical and social inactivity, isolation, loneliness, disempowerment, and ultimately a decline in health and wellbeing.

8.3. Older people's usage of outdoor spaces

8.3.1. Users' characteristics

The observation in two residential communities and three neighbourhood outdoor spaces reveals different user and activity characteristics. In residential communities (site 1 and 2), females are the main users of outdoor spaces. They are most active outside from 8:00 to 10:00, and 16:00 to 17:00. Male users, as the next largest group, are most active outside at 7:00 to 11:00, and 16:00 to 17:00. Older people with children are also common as a type of user observed in the Chinese context, usually active in residential communities at 7:00, 10:00, and 17:00. There are usually more female older people taking care of their grandchildren outside. Older people using wheelchairs in residential communities are infrequently present.

In neighbourhood outdoor spaces (sites 3, 4, and 5), the proportion of male and female users varies widely. Sites 3 and 4 show a similar pattern to residential communities, in that the female users outnumbered male users, whereas site 5 had a greater number of male users than female users. This is because site 5 attracts a large number of male users to play chess or cards. Another similarity is that there are more female users with children in all neighbourhood outdoor spaces. Users with wheelchairs were more common at site 3 and 5, rather than site 4. The users in neighbourhood outdoor spaces are also active at different

times. In general, female and male users are active from 6:00 to 11:00, and 16:00 to 19:00. Users with children are most active at 10:00, 17:00, and 18:00. Wheelchair users usually appear in neighbourhood outdoor spaces at 9:00, 10:00, and 16:00.

Generally, older people are active in their residential communities from 7:00 to 11:00, and 16:00 to 17:00. The peak times for older people's activities in neighbourhood outdoor spaces is 6:00 to 11:00, and 16:00 to 19:00, which is a wider time range than older people in residential communities. There is a common trend for older people to be more active outside in the morning than afternoon. As mentioned earlier, except for site 5, all other sites have a higher proportion of female users than male users. This suggests that female older people might be more likely to go outside compared to males. Older people with children are usually active outside at 10:00 and 16:00, both in residential communities and neighbourhood outdoor spaces. However, older people with children have also been observed at 7:00 in residential communities, which might be due to some older people getting their grandchildren to school, or pushing prams to get some sunshine and fresh air. Females take more responsibility in terms of taking care of grandchildren because the proportion of females with children is obviously higher than males with children across all sites. The proportions of wheelchair users are extremely low in both residential communities (site 1 and 2), suggesting that residential community environments have a long way to go to becoming barrier-free.

Even though this study did not systematically record the age groups of other users by taking photos, through the researcher's observations during the observation period, it is obvious that older users are the dominant user group in neighbourhood outdoor spaces. This is confirmed by other observational studies in China, which found that older adults are the main users in parks and in community green spaces, at 53.5 per cent (Tu et al, 2015), and 61.3 per cent (Pleson et al, 2014) of all user age groups. This is different from non-Asian countries' findings, namely that older people are the minority users such as in the US (Park and Ewing, 2017), Australia (Cranney et al, 2016), and Belgium (van Dyck et al, 2013). These natural environments have excellent potential to support older people's physical activity, social interaction, and connection with nature, which are beneficial to their quality of life (Sugiyama and Ward Thompson, 2007). The dominance of older people in parks and community green

spaces in China is an example of exemplifying best practice in ageing-in-place approaches in a global context.

8.3.2. Older people's activity characteristics

A total of 40 types of outdoor activity were observed in this study: seven types of passing-through activity, and 33 on-site activities. Among these 40 types, 21 were recorded in the two residential communities, and 29 in the three neighbourhood outdoor spaces. The passing-through activities observed in residential communities show the same proportion trends, with a greater proportion of walking, followed by passing through by bicycle, walking with a dog, walking with mobility aids, and walking with a pram. Only a few older people were observed either passing-through in wheelchairs or running in their residential communities. This indicated that the passing-through spaces in residential communities should be designed to ensure that older people can move safely and confidently, whether they are walking unaided or with some form of mobility aid, riding a bicycle, pushing a pram, and especially using a wheelchair. Attention should be paid not only to the paths and pavements, but also to the connection between the entrance to residential buildings and the paths. Compared with passing-through activities in residential communities, the passing-through activities recorded in neighbourhood outdoor spaces show different trends. Walking was the most popular activity in all the neighbourhood outdoor spaces. The activities of passing-through in a wheelchair and walking with a pram were also more common in neighbourhood outdoor spaces than in residential communities. These neighbourhood outdoor spaces should also be designed to enable users with prams and wheelchairs to move around and park their vehicles.

In terms of on-site activities, outdoor spaces in residential communities and in nearby neighbourhoods presented differently. Necessary activities were only observed in the residential communities, and consisted of shopping and collecting parcels. Doing exercises was the most popular optional activity across all sites, representing Chinese older people's concern towards their health status and efforts in maintaining it. This is different from a study in Australia where few older people exercise outdoors other than walking (Levinger et al, 2018). The following optional activity is sitting and watching (objects): looking at information boards, phones, and reading a book or newspaper.

Airing clothes and taking care of plants were the optional activities exclusive to both of the residential communities. It is very rare to have private gardens in high-density urban areas in China, and doing gardening in their residential communities is therefore an important opportunity for older people to connect with nature. The optional activities of getting haircuts, flying a kite, picking fruit, practising yoga, roller skating, and practising calligraphy were all observed in neighbourhood outdoor spaces. Haircutting is a spontaneous informal small business taking place in neighbourhood outdoor space, which therefore adds a layer of service function for older people who visit. Sun (2022) explored how street vendors support different pedestrians' everyday needs in a real, detailed, and specific way. It is reasonable to assume that the dominance of older people in parks in China stimulates the haircut business in them, which may in turn attract more older people to visit such spaces.

With regard to social activities, social activities in outdoor spaces within communities are less varied and more static, for example, sitting or standing and chatting, sitting and watching people, playing with children. On the other hand, neighbourhood outdoor spaces not only include the occurrence of such social activities in residential communities, but also support more dynamic, active, and group outdoor social activities. For instance, in these spaces, more people were found playing chess (or cards), doing various sport or exercise activities, such as playing basketball, Tai chi Roliball, Diabolo, dancing and ballroom dancing, practising Tai chi Sword, and so on. The intensity of social activities observed in this study is quite different from Noon and Ayalon's (2018) observations in Israel that many older people outdoors remain alone and without any social contact. In this study, the observed dancing and ballroom dancing were mentioned in other studies as guangchang wu (public square dance) (Wang, 2015; Seetoo and Zou, 2016; Martin and Chen, 2020). The socio-cultural origin of the public square dance phenomenon in China is an inheritance from the yangge (Martin and Chen, 2020), the Loyalty Dance, and the lifting of the ban on Ballroom Dancing (Tao, 2020). It represents individual historical memory and subjective expression, and is the co-result of emotional needs of people, promotion of grass-roots autonomy, and the guidance of the government (Tao, 2020). Yao et al (2019) identified that the public square dance has the function of recreating socialist collective life and relationships for local people, and a space where they dance as a unitary community. Square dance also helps immigrants to rebuild

social networks broken by migration, and the square has a function similar to that of a village community. These unitary and village-like communities support older people's local identity (Yao et al, 2019).

The residential community plays a more important role in supporting older people's necessary activities, whereas neighbourhood outdoor spaces can provide opportunities for more diverse optional and social activities, which support older people's exercise and social needs. The future development of neighbourhood outdoor space in China needs to consider the diversity of older people's activities and the conflicts this may cause with other users, e.g., rights of dancers and those seeking peace and quiet, disputes over the use of spaces (Wang, 2015), etc.

8.4. Key age-friendly outdoor space attributes

This section moves to attributes that influence older people's use of outdoor space. Attributes at the macro-scale can be understood as older people perceiving or identifying influential environmental attributes at the whole site scale, or as well as specific behaviour settings that can influence their use of outdoor spaces. Attributes at the meso-scale refer to "behaviour settings" (Barker, 1987) that include the environmental and social characteristics that support recurrent patterns of activities in those settings. Attributes at the micro-scale are more relevant to the detailed design elements and facilities aspects, which make behaviour settings work to afford the older people's activities. This section focuses on the main macro-attributes, and discusses how the macro-, meso- and micro-scales of attributes were related.

- **Convenience**

This study identified convenience as having two layers of meaning. The first refers to the barrier-free connective roads between residential communities, necessary living facilities, services, and green spaces, which should all enable older people to access different destinations without accessibility or safety issues. A pleasant neighbourhood with good access to shops contributes to residents' physical activity levels (Sigmundová et al, 2011). Zhang and Lawson (2009) claimed that facilities such as an ATM or grocery store can attract

people to go out from home but not encourage them to stay. Focusing on the ageing population, this current study came to a different conclusion: living facilities, especially local shops and nearby green spaces, not only attract older people to leave their homes, but also encourage them to have social interactions whilst they are shopping or using the green space. An urban park that has good connections with nearby communities, subway, school, market, and restaurant are also identified as age-friendly features in China.

By conducting research with people with dementia, Brorsson et al (2020) identified certain features that detract from the accessibility of the grocery shop, comprising illogical arrangement, overload of products, information, and people, and visual illusions and intrusive auditory stimuli. This is relevant to the second layer meaning of convenience identified in this study: the layout within different settings should enable older people to move between different areas of a setting. Convenience in this study is similar to the quality of accessibility that was identified in other studies. For example, Burton and Mitchell (2006) identified accessibility as a vital attribute for age-friendly street environments, in which accessibility has been described as the street supporting older people to reach, enter, use, and walk to those areas they wish to, no matter whether they have any mental, sensory, or physical impairment. An accessible street has wide and level pavements, ground-level signal-controlled pedestrian crossings, and is linked to local services and facilities.

● **Comfort**

Carmona et al (2010) emphasised that the prerequisite for a successful public space is comfort, where the length of time that people stay is an indicator of whether a space is comfortable. Aspects of comfort that people respond to comprise environmental aspects (e.g., relief from sun and wind), physical aspects, (e.g., comfortable and sufficient seating), and social as well as psychological aspects, referring to the space's atmosphere and character. Comfort in this study means comfortable micro-environments, and which are often reliant on attractive natural features that provide older people with shade, natural views, and separate the space from vehicular traffic. Burton and Mitchell (2006) explained a comfortable street from older people's perspective, which is a street that supports older people's ability to visit places they wish to enjoy without feeling physically or mentally uncomfortable while they are outdoors. They introduced further qualities of comfortable streets, which include being welcoming,

calm, pedestrian-friendly, and especially providing older people with incapacities appropriate services and facilities.

● **Safety**

Walking safety and enabling older people to have a sense of safety in their residential communities and other neighbourhood outdoor spaces are identified as two layers of meaning of the environmental attribute of safety in this study. Safety is also identified by Bhuyan et al (2020) in Singapore as a key theme of age-friendly neighbourhoods, which includes safety from falls, traffic, and crime. Burton and Mitchell (2006) suggested that streets should be safe to enable older people to feel enjoyment in using them and in walking outdoors, and avoid apprehension due to possible harm such as tripping, falling, being run over, or being attacked. The basic features of safe streets are wide, flat level footways with well-lit and separate bicycle lanes. Safety and convenience are especially important factors that reduce barriers to older people's ability to go outdoors and support capacity-enhancing behaviours (see Figure 2.1). Reduced traffic speed in residential communities, exercise facilities away from traffic, barrier-free pavements, sufficient light at night, and the presence of people, are potential aspects identified in the current study to enable older people to walk safely and have a sense of safety.

● **Multifunctionality**

Whether part of the residential community or neighbourhood outdoor spaces, the environment should enable older people to conduct diverse activities, intergenerational interactions, and take part in activities and services organised by community committees. This attribute also includes the adaptivity that allows older people some degree of agency, so that they can change the environment to suit the activities that they wish to conduct.

Chinese older people particularly value intergenerational interactions, therefore, facilities that can support them in spending time with their grandchildren are highly preferred (Chan et al, 2016). It is vital that outdoor space should at least enable intergenerational interactions even though it does not have specific children's play facilities. This applies especially to the outdoor space in residential communities, as this is the main activity zone for older people caring for grandchildren. Also, as mentioned earlier, community committee organising

activities can facilitate older people's participation in outdoor activities. Outdoor spaces that can support diverse cultural and living services activities, such as exhibitions, cultural festivals, shop programmes, and haircutting services organised by the community committee are vital to enabling and encouraging older people to participate.

● **Attractiveness**

Zhang and Lawson (2009) suggest that the importance of outdoor spaces in residential communities is to attract more local people to leave their homes, stay outside for longer, and to meet local people to engage in social interaction. In this study, the attractiveness of outdoor spaces, within both residential communities and neighbourhoods, is a key attribute that invites older people to go outside and find enjoyment in outdoor spaces. The attractive features of outdoor spaces include diverse plants, water features, and green ground cover, which provide older people with views of nature. These features support the 'being' in natural environments that was proposed by Orr et al (2016). Zhai et al (2018) pointed out similar findings in China, namely that age-friendly outdoor spaces should include beautiful scenery and proximity to water features. Apart from 'being' in natural environments, Orr et al (2016) also concluded 'doing' activities, such as sharing expertise and produce in outdoor gardening. The current study also identified that outdoor spaces that enable older people to conduct activities such as caring for plants are also attractive, giving older people 'doing' opportunities in outdoor spaces.

● **Quality of maintenance**

By reviewing 44 peer-reviewed articles, Wen et al (2018) categorised maintenance as one of older people's landscape preferences. In their study, maintenance comprised cleanliness (such as clean pavements), well-maintained facilities, security (such as good visibility and under supervision), avoidance of nuisance, crime, and free-running dogs, and good lighting. In this thesis, quality of maintenance refers to the regular management of plants and removal of rubbish.

Older people prefer outdoor spaces to be clean and tidy, for there to be green ground cover rather than bare earth, and well-maintained plants. Encouraging older people to participate in managing their residential community could increase their satisfaction and attachment to

their residential communities, and increase their agency. Ground cover plants rather than bare land with a sparse vegetative cover was also identified as a strongly preferred feature alongside the pathways in Chinese urban parks (Wang and Rodiek, 2019).

● **Exercisability**

By reviewing nine relevant studies, both qualitative and quantitative, Lee et al (2018) found that adults and older people are the main users of outdoor gyms, and health is the main goal of the user's experiences. Motivations include rehabilitation, physical health, mental health, fitness, gaining strength, improving mood, pursuit of health, weight-gain prevention, and weight reduction. Chow (2013) also identified that older people can perceive physical, social, and psychological benefits from using outdoor fitness equipment, even though this is not their main aim in going to parks. In this study, many of the observed older people's outdoor activities involved exercise. A lot of older people also mentioned that they go out for the purposes of exercise in order to maintain their health status and independent living ability, which represents their physical-related agency. There were a variety of exercise activities, such as, ball activities, equipment activities, different intensities of exercise, with different numbers of people involved in each. The outdoor space needs to accommodate such diverse exercise activities, supporting older people's physical-related agency, and thereby encouraging older people to be more active and experience more physical, social, and emotional benefits. Levinger et al (2021) also identified that the suitability and age-friendliness of outdoor exercise facility features, locations, and settings can promote older people's participation in physical and social activity. The current study identified that older people preferred exercise environments including surrounding natural elements, a comfortable micro-environment, with different layouts and locations of exercising facilities.

● **Restability**

Restability is an important aspect that enables older people to stay outside for a longer time or go to more distant destinations. This attribute is also reflected in Moran et al's (2014) review of 31 articles, which found that rest areas are especially relevant environmental features for older people. Van Cauwenberg et al (2016) also indicated that the presence of benches can encourage older people to walk, especially those who are functionally limited, as they need places to sit and rest during the walk. Wang and Rodiek (2019) also found in

China that seating arrangements in urban parks are supportive of older people's walking activities, and the need for seating increases with age. However, they further noticed that current seating in urban parks does not meet older people's preferences due to placement in inappropriate locations and uncomfortable seating without backs and arms. In this study, the attribute of restability should not only offer older people places to rest, but also enable them to enjoy natural views, observe others, and supervise their grandchildren, all in a comfortable micro-environment. Examples of rest settings in this study included self-made resting areas, rest nook seating areas along strolling paths, moveable stone seats, pergola rest areas, gathering chess tables under canopy, waterside seating, trellised pavilion areas, linear rest areas, and tree-pool seating.

- **Sociability**

Interview data emphasised that positive social interactions could encourage older people to go outside and increase their sense of attachment. Similar findings confirm that public spaces that enable daily interactions, for example, observing and greeting neighbours, are vital in building people's place attachment (van Hees et al, 2017). The observation data further identified that older people may create the sociability of a site by forming the setting to play chess or cards, or establishing the order of different groups of people using the same site. Therefore, outdoor spaces that enable older people to get familiar with their local social networks and encourage them to participate in diverse passive and active social activities are supportive of older people's social-related agency, and ageing-in-place. The attribute of sociability depends on other attributes that invite older people to use the outdoor space and carry on diverse activities, creating opportunities for more social activities to happen. Ronzi et al (2020) concluded that the combination of sociability, accessibility, and affordability of physical environments can facilitate older people's sense of connection and independence, feelings of inclusion, and mental wellbeing.

- **Identifiability**

The current study suggests that the identifiability of an environment can encourage older people to go outdoors and explore the environments that they are not familiar with by providing visible signals, clear colour, or layout distinctions and landmarks, which can help them to identify specific locations and distinguish directions. Phillips et al (2013) suggested

retaining landmarks and familiar cues when designing and redeveloping a physical environment to support older people's familiarity with it. The identifiability of outdoor space is highlighted in this thesis as especially important for older people experiencing a decline in cognition, or moving to live with their children in an unfamiliar environment.

- **Behaviour settings and design elements**

This study also developed a series of behaviour settings and corresponding design elements that can be utilised in future age-friendly environments design. The behaviour settings often represent a combination of different macro-attributes.

For the passing-through space, behaviour settings, for example, tree-lined vehicle roads, shady strolling paths, and reset nook seating areas along the strolling path, often combined the attributes of safety, convenience, restability, and comfort. Services space's behaviour setting in this study is easily accessible shops, whereas similar space or facilities were suggested in the UK as cafes (Inclusive Design for Getting Outdoors, 2007).

Behaviour settings for activity space, for example open areas with exercise facilities or rest settings, intergenerational areas, and exercise areas, usually combine the attributes of multifunctionality, exercisability, restability, and sociability. To maximise the usage of exercise facilities, equipment should be installed in easily accessible areas that are close to a large target population (Levinger et al, 2021), which is also relevant to convenience attributes. Zhou (2018) suggested that the diversity of activity space in Chinese residential communities should include ball game courts, exercise and dance areas, fitness activity spaces, casual social spaces, intergenerational activity spaces, and gardening spaces. However, this study noticed that for residential community or neighbourhood outdoor spaces that do not have sufficient space for all the above types of spaces, actually making the space more multifunctional is of vital importance.

Findings from the Inclusive Design for Getting Outdoors project (2007) pointed out some seats in the open space, giving the example that the path can act as sitting place, playground sitting, and a crescent of seats for older people to relax and rest. Based on the findings from the Chinese context in this study, self-made rest areas, pergola rest areas, and shady trees with

moveable stone seats are amongst the examples of behaviour settings for static activity spaces, presenting a little of older people's efforts to change these settings, and are used for their social activities. These settings are more relevant to the attributes of restability, sociability, comfort, and attractiveness.

For more detailed design elements, planting elements (e.g., trees and shrubs) provide shade, natural views, a sense of enclosure, and separate the traffic and paths, or act as hangers, whereas the flowerbeds invite older people to plant and manage. The hangers or other elements that can act as hangers are necessary in considering the intense use of outdoor space. The adjustable facilities, e.g., moveable stones, provided opportunities for older people to change the settings according to their particular needs at a given time.

8.5. Summary of key findings

The ultimate research outcome of this thesis is to explain the factors that influence older people's experience of ageing-in-place and how neighbourhood outdoor spaces support their ageing-in-place. Based on the understanding of older people's experiences and the factors influencing their ageing-in-place (Research question 1), older people's outdoor activities (Research question 2), and identifying influential environmental attributes that afford their activities (Research question 3), policy recommendations and practice guidelines were produced (Research question 4).

Research question 1: What are older people's experiences of ageing in Chinese urban neighbourhoods?

This research question was addressed through interviews with older people who live in the two selected residential communities, and stakeholders who have experiences in the design and management of residential communities in relation to older people. The summary of key findings for this research question is:

- Older people's personal situations, comprising their physiological health, mobility, mental health, and financial status are the premises that determine whether they have a positive experience of ageing-in-place, and determine their ability to go outdoors for activities. The immediate residential community outdoor spaces are more important for older people who experience health and mobility difficulties.

- Older people's relationships with their children, partners, responsibility for grandchildren's care, as well as their relationships with neighbours, wider social engagement, and access to community services form the social factors that influence their daily experiences of ageing-in-place, and use of outdoor spaces.

- Older people's attachment to the natural environment and satisfaction with the community's physical environments are the physical environment factors. Community retrofitting in the old residential communities is an opportunity to increase older people's satisfaction, engagement, and attachment to their residential communities.

- Personal agency, including environment-related agency and social-related agency, is a decisive factor that is influenced by personal status, as well as social and physical environment. The environment-related agency determines how older people use their neighbourhood outdoor space, change or form the physical affordance to afford their activities, and how they maintain their community environment. The social-related agency represents older people's engagement in social interactions, their ability to change or form the social affordance of a site, and their engagement in community matters. While the physical environment and social relationships are supportive, older people may have a better sense of agency, becoming more proactive in their physical and social activities, both of which are beneficial to their personal situations, therefore supporting their ageing-in-place in a healthy and independent manner (Figure 8.1).
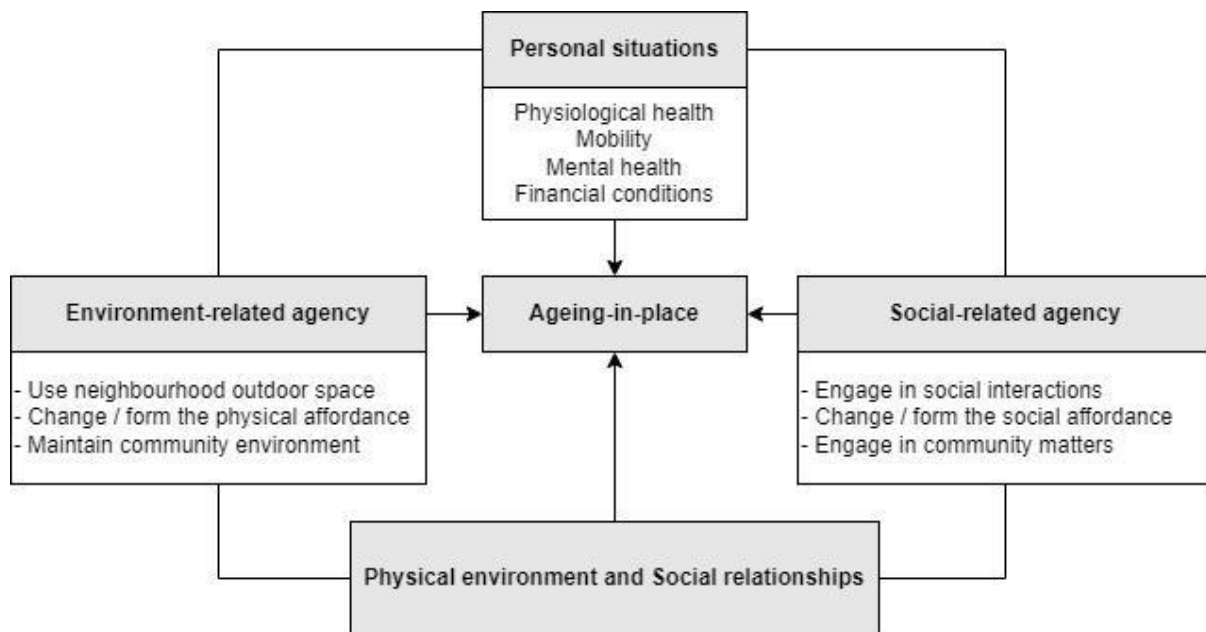
Figure 8.1 Factors influencing older people ageing-in-place (source: author)

Researchers, practitioners, and policymakers need to pay particular attention to the above personal, physical and social environment factors to facilitate older people's agency in order to encourage them to go outdoors and foster more positive experiences of ageing-in-place.

Research question 2: Where and how do older people use outdoor space in their daily lives?

By conducting observations and on-site interviews in the selected two residential communities and three neighbourhood outdoor spaces, diverse older people's activities were identified, giving a detailed dataset that addresses this question. The spatial and temporal analysis of observational data in GIS revealed a rich diversity of activities and temporal patterns of usage. The key findings for this research question can be summarised as follows:

- Residential community outdoor spaces play a more important role in undertaking older people's necessary activities (e.g., shopping, and collecting parcels); support limited types of optional activities (e.g., doing exercises, sitting or standing and watching objects, and taking care of plants); and limited types of social activities (e.g., sitting or standing and chatting, sitting and watching people, playing with children).

- Neighbourhood outdoor spaces provide a setting for a greater variety of optional activities (e.g., doing exercises, sitting or standing and watching objects, getting haircuts). Older people's social activities in neighbourhood outdoor spaces not only included those observed in residential communities, but also more diverse and active

social activities, especially in groups (e.g., playing chess or cards, ballroom dancing, practising instruments, Tai chi Roliball, Tai chi Sword).

By performing these diverse physical exercise activities, engaging in social and collective activities, and interacting with the natural environment, older people can maintain or develop their environment-related and social-related agency, and experience health and wellbeing benefits that support their ageing-in-place.

Research question 3: How does neighbourhood outdoor space afford older people's activities?

This research question was addressed by integrating the interview data with older people and stakeholders with the observation data, combining subjective and objective perspectives. The summary of key findings for this research question is:

- The overall environmental attributes are identified as convenience, comfort, safety, multifunctionality, attractiveness and the qualities of good maintenance, exercisability, restability, sociability, and identifiability. These attributes are interrelated with each other, and can support older people's physical- and social-related agency. They therefore enable older people to receive physical, social, and mental benefits from participating in physical and social activities in neighbourhood outdoor space.
- The different behaviour settings that can be used to apply the above environmental affordances are passing-through spaces, static activity space, active activity space, nature space, and living and services space.

Research question 4: How to improve outdoor space in Chinese urban neighbourhoods to be more age-friendly?

Stakeholder participants in the interviews in this study also shared their perceptions of Chinese planning and design standards. The main issue they mentioned is the rationale for current standards. For security reasons, current standards might lack agility and flexibility. The required width of the road causes difficulties in design and sometimes it may be too wide for older people to use. They also made certain recommendations towards future design standards: that the rules in the design standards can be more detailed and can be illustrated

by diagrams. As a professional design team, they have internal principles, but they can only make adjustments according to their own sense or feeling rather than guidance. The relative regulations and design standards in China need to be more flexible to adjust to circumstances, and to be more detailed according to older people's physiological and psychological changes.

This study analyses the experiences that older people may have while they age and the neighbourhood outdoor space based on interviews and observations, but also highlights the diversity of older people, and the need for a more nuanced understanding to design age-friendly environments. There are no generic design principles for age-friendly environments: the fundamental requirement for designing a successful age-friendly outdoor space is to understand older people's needs, and how they use and perceive the space. After exploring older people's personal status, their social relationships, and perceptions and uses of the physical environment, this study provides novel insights into the types of planning, design, and management interventions that can support older people's agency and provide them with a better experience of ageing-in-place. The suggestions for stakeholders for making age-friendly residential communities' outdoor space and neighbourhood outdoor space to support ageing-in-place are set out.

According to the public-health framework for healthy ageing, opportunities for public health action across the life course (WHO, 2015), environments need to be more supportive in line with older people's declining capacity, to remove barriers to participation, and compensate for loss of capacity. This study illustrates the qualities that environments need to demonstrate to support older people in this way in the context of urban China. Safety, restability, and convenience are the most relevant attributes that can promote older people's use of neighbourhood outdoor spaces, whilst attractiveness and quality of maintenance can add another dimension of factors that can invite older people to use outdoor spaces.

Promote the use of residential community outdoor space:
- **Safety and Restability** - Residential communities' roads need to have pedestrian paths with barrier-free connection and paving and seating at regular intervals.
- **Convenience** - Essential services (e.g., grocery shops or programmes) need to be adjacent to residential communities to enable older people to buy groceries

conveniently.

- **Convenience and Safety** - Residential communities need to have good road connections with nearby green spaces, open spaces, exercise areas, and care services to enable older people with different mobility abilities to access these places conveniently and safely.

- **Attractiveness** - Dedicated planting areas should be provided for older people to do gardening.

- **Attractiveness and Quality of maintenance** - Residential communities' planting should include diverse well-maintained ornamental plants and the planting areas should be covered by plants to avoid dust.

Promote the use of neighbourhood outdoor spaces:

- **Convenience** - The entrances and different areas need to be accessible for wheelchair users and users pushing strollers.

- **Convenience** - Supporting and providing space for informal spontaneous business activities may be an opportunity to provide services and attract older people to visit.

- **Attractiveness** - Orchard trees and ornamental plants that fit with older people's preferences can encourage their connections with nature.

- **Quality of maintenance** - Maintenance work, especially cleaning work, should avoid busy times, preferably taking place in the early morning when older users have not yet gathered.

- **Safety** - Sufficient lighting is essential for older people to walk and carry out activities safely after dark.

- **Identifiability** - Visible cues, such as clear colour coding or layouts, which can help older people to identify their locations and distinguish directions are needed.

While older people have high and stable capacity, the role of environments is to promote or support capacity-enhancing behaviours (WHO, 2015). Linking with this study's findings about older people's environment-related and social-related agency, the recommendations are listed below.

Enabling physical activities in residential community:

- **Exercisability and Safety** - Where residential communities do not have sufficient exercise space, nearby streets, or open areas that could be utilised for the placement of exercise facilities. Vegetation is needed to create a sense of separation from vehicular traffic, enabling older people to exercise safely.

Enabling social interactions in residential community:

- **Multifunctionality and sociability** - The residential communities' open spaces need to be able to afford small scale group activities (e.g., community committee-organised activities or services). Accessible nearby open space can act as an alternative choice if high-density residential communities do not have sufficient open space.
- **Restability, Sociability, and Comfort** - The residential building's entrance needs to have rest settings. These can be simply a few benches and movable stone seats or designed rest areas with plants and seating.
- **Exercisability, Restability and Sociability** - Exercising facilities and an intergenerational area with nearby observation seating are essential for older residents to do daily exercise and supervise their grandchildren.
- **Engage in community matters** - The community retrofitting process needs to ensure the participation of older residents, whose opinions should be considered by the community committee and the built environment design sector.

Enabling physical activities in neighbourhood outdoor spaces:

- **Restability and Comfort** - Rest areas and exercise areas need to be combined with plants to create a comfortable micro-environment.
- **Design elements** - Where necessary, electric sockets should be provided for older people to charge their audio equipment, together with hangers for their bags and audio equipment.
- **Design elements** - Appropriate paving materials need to be selected based on potential activities, e.g., smooth paving enables older people to do ballroom dancing, but excessively reflective paving material should be avoided as dazzling reflections may cause discomfort for older people.

Enabling social interactions in neighbourhood outdoor spaces:

- **Multifunctionality** - Open areas at different parts of a site are needed for different groups of older people doing different activities at the same time.

- **Restability and Sociability** - Observation seating is needed at open areas for older people to rest and observe others.

- **Restability and Design elements** - Observation seating or sittable fences, space for strollers, and hangers for belongings are needed at children's play areas.

- **Design elements** - Adjustable facilities such as moveable stone seats can support older people's ability to adapt the settings according to their particular needs.

Some of the key attributes have the potential to be applied to other countries, but the more detailed recommendations based on those attributes need to be further developed under specific environmental and cultural contexts. The intensity of Chinese's older people's social life in this study stands out as an example for other countries to illustrate the great potential diversity that older people's lives can have, and how the physical environment can support that intensity.

8.6. Research contributions

In general, this study contributes to the field of age-friendly environment research, deepening the understanding of age-friendly physical environments in the context of the World Health Organisation's initiative of global age-friendly cities (World Health Organisation, 2007a). Whereas other studies emphasise the key factors in the home environment (Sixsmith and Sixsimth, 2008; Hillcoat-Nallétamby and Ogg, 2014), and neighbourhood characteristics (John and Gunter, 2016; Cramm et al, 2018), this study highlights the close connections between Chinese older people and neighbourhood outdoor space, and the enormous potential of neighbourhood outdoor space to support older people's ageing-in-place. This study also provides evidence for building age-friendly neighbourhood outdoor spaces in the Chinese context, and scope to be generalised to non-Western contexts. The detailed contributions to knowledge and practice from different data and methods are explained in the following sections.

This study provided first-hand and rich interview data which revealed the issues that older people may experience while ageing-in-place, focusing especially on the role of neighbourhood outdoor space. The findings enrich the understanding of older people's needs and concerns while they are ageing-in-place, their sense of attachment to their neighbourhood, and explores the fundamental mechanism of how neighbourhood outdoor space has the potential to support older people's ageing-in-place. These findings have prepared the groundwork for future relevant research and design, helping researchers, practitioners, and policymakers to understand the factors that need to be considered whilst studying, designing, and managing an ageing-friendly environment.

Based on Gehl's (2011) classification of outdoor activities, the observation data in this study constitutes an elaborate dataset of older people's activities in both residential communities and neighbourhood outdoor spaces, showing the complexity of older people's outdoor activity in the Chinese context. The findings fill the gap identified previously (see Section 2.6), presenting older people's usage of outdoor space, what they do, and for what purposes. These older people's activity patterns also provide detailed information and a foundation that can help practitioners, policymakers, and managers to understand how space is used by older people, with potential support for future design, study, and research.

This study is one of the first to apply the concept of affordances (Gibson, 1979) and behaviour settings (Baker, 1968, 1987) to understand the environment and older people's outdoor activities. The combination of affordances and behaviour settings as defined in this thesis provide useful conceptual tools for understanding neighbourhood outdoor spaces in urban China, with huge potential for improving older people's experiences of ageing-in-place. Inspired by Sallis et al's (2006) classification of different layers of domains in active living, this study also distinguishes the influential environmental factors into perceived environment attributes (macro-level), behaviour settings (meso-level), and more detailed design elements (micro-level). Based on the overarching conceptual framework on person-environment relationships in later life (Wahl and Oswald, 2010), this study further distinguished older people's sense of agency to environment-related and social-related agency, and the ways in which they are interrelated and work together to enable older people to be more physically and socially active, while the physical and social environment are supportive. The

development of older people's sense of agency provides a new perspective to understanding how to support older people's ageing-in-place, especially from a Landscape Architecture perspective.

In conclusion, the totality of data builds up a rich and detailed picture of the complex interrelationship between older people and their outdoor living environments and the potential for that relationship to be strengthened as a key means of supporting older people's ageing-in-place. This study proposes a theoretical framework for supporting older people's ageing-in-place through age-friendly neighbourhood outdoor space (Figure 8.1). This framework not only fills the gaps in existing Chinese research, policies, and practice guidance that are relevant to age-friendly environments, but also forms a foundation for understanding the role of neighbourhood outdoor spaces in supporting older people's ageing-in-place.

8.7.   Research limitations

This research has certain methods and outcomes limitations. First, the observation sites only included residential communities and nearby neighbourhood outdoor spaces, and excluded large comprehensive city parks. As noted from the older people's interviews, large parks are also favoured places to visit. It is reasonable to assume that older people's outdoor activities in large parks could be also different from those in residential communities and neighbourhood-level parks. It is a great pity that this type of space is excluded from this research due to time limitations, and the resource constraints inherent to PhD research in general.

Second, the observation data only recorded older people's activities, the missed data regarding other users' activities might have been a potential opportunity to reveal space usage situations in general, the proportion of older people among total users, and how older people may be influenced by other users.

Although this research distinguished different residential community types, and selected relatively representative sites, the two residential communities selected might still not be

able to represent all the situations in Chinese urban residential communities. There are communities in China that are even older and more crowded, or even built more recently, which may have different outdoor spaces and design considerations.

Another limitation of this research is the limited observation time. Due to limited research time and the researcher's own capacity, the observations were only conducted for three days at each site, and between 7 am and 7 pm. This relatively short duration of the observations had the potential to introduce data bias due to limited sample size, change of weather conditions, and unrecorded data after 7 pm (see Section 3.4). The other potential biases are the data recording and processing bias. For example, the researcher was unable to capture every single older user at the extremely busy periods at site 5, resorting to recording short videos of the sub-areas from different angles to capture as much data as possible. While processing data recorded at the site's busiest times, it was sometimes impossible to identify whether users were older people. It was also impossible to accurately determine the number of users due to the large numbers of people moving about at the same time and limited image or video clarity. The researcher considered the importance of older people's lived experiences while they were using the outdoor spaces, and conducted on-site interviews. However, due to the demands of regularly recording observation data and notes, the on-site interview data, which represent users' subjective experiences, is limited.

Finally, as mentioned in Section 3.4, stakeholder interviews were used instead of focus groups due to difficulties in arranging meetings between stakeholders. There is a limitation based on the low number of participating stakeholders. The result from this stakeholder research has not been validated or further tested.

8.8. Future research possibilities

There are certain future research possibilities that can be based on or inspired by this study, and that can learn from the limitations to this study. Firstly, the observation data in this research only included three days at each of five sites in Beijing. Future research could use a longer observation period, in different seasons, and different areas of China. This could

increase the reliability of data, and present clearer and more comprehensive characteristics of the users, activities, and activity distribution. Due to the time-consuming nature of observation data collection and analysis, future research could also consider the use of technology to automatically recognise target participants, to reduce the time taken, especially in the process of data input.

Secondly, the observational research method can be combined with other research methods, for instance, on-site interviews, questionnaires, and eye-tracking, to explore walking-friendly environments, and socially beneficial environments. The method of using GIS to analyse observation data, and the application of the affordance concept, can also be used in future research for different population groups, for example, children and people from different ethnic backgrounds, as well as in diverse environmental settings, for instance, schools, age-care centres, streets, squares, comprehensive parks, and before and after comparisons of community retrofitting.

Thirdly, the affordance framework for age-friendly neighbourhood outdoor space can be used in future research to evaluate whether the current community or neighbourhood outdoor spaces are age-friendly or otherwise to guide residential community retrofitting, or the improvement of outdoor spaces. Furthermore, this framework can be further improved by collecting more data in different settings, areas of China, and involving more stakeholders. With the proposal of the Guiding Opinions on Comprehensively Promoting the Retrofitting of Older Urban Residential Communities (China. General Office of the State Council, 2020), residential community age-friendly retrofitting is also another research hotspot that has great relevance.

Fourthly, as shown in Figure 2.2, rural older people's satisfaction with neighbourhood facilities is even lower than urban older people. Therefore, future attention is also urgently needed in the construction of age-friendly environments in rural areas, especially in terms of their amenities, fitness spaces, greenery, lighting, and provision of facilities, such as public toilets, to support older people in rural areas to also live independent, healthy, and active lives for as long as possible.

It is vital to understand Chinese older people's preferences for the features of urban parks to develop design recommendations (Wang and Rodiek, 2019). Therefore, the fifth possibility is for future studies to explore Chinese older people's preferences of park features and their planting. As identified in this study, some older people mentioned that they prefer plants to be tidy. This might be different from other population groups, or older people from different countries, which is worth studying and applying in the context of planting design in age-friendly environments.

Finally, the unexpected Covid-19 pandemic and closure of green spaces, parks, and amenities have reduced people's healthy outdoor activities and put people in more congested spaces (Freeman and Eykelbosh, 2020), which will lead to serious negative outcomes, especially for susceptible older people. As identified in this study, planting is amongst older people's activities in their daily lives. The potential of indoor plants to mediate the negative impacts of being trapped at home are yet to be clearly identified. Other important questions include whether Covid-19 changes people's perception of outdoor spaces and green spaces and how they use these spaces, and how immediate outdoor space can be designed to adapt to public health emergency situations. These questions are yet to be studied.

Overall, this study expands the understanding of the dynamic relationships between outdoor environments and older people, emphasises the power of landscape design to benefit older people's health and wellbeing, and provides useful conceptual and methodological sources for future studies.

References

Abowitz, D.A. and Toole, T.M. (2010) 'Mixed method research: Fundamental issues of design, validity, and reliability in construction research', *Journal of construction engineering and management*, 136(1), pp.108-116.

Addae-Dapaah, K. and Wong, G.K.M. (2001) 'Housing and the elderly in Singapore–financial and quality of life implications of ageing in place', *Journal of Housing and the Built Environment*, *16*(2), pp.153-178.

Ayres, L. (2008) 'Semi-Structured Interview', In: L. Given, ed., *The SAGE Encyclopedia of Qualitative Research Methods.* Thousand Oaks: SAGE Publications Inc, pp.811-813.

Alexopoulos, G.S. (2005) 'Depression in the elderly', *The lancet*, *365*(9475), pp.1961-1970.

Alley, D., Liebig, P., Pynoos, J., Banerjee, T. and Choi, I.H. (2007) 'Creating elder-friendly communities: Preparations for an aging society', *Journal of Gerontological Social Work*, *49*(1-2), pp.1-18.

Alves, S., Aspinall, P.A., Ward Thompson, C., Sugiyama, T., Brice, R. and Vickers, A. (2008) 'Preferences of older people for environmental attributes of local parks: The use of choice-based conjoint analysis', *Facilities.*

Alves, S.M., Gulwadi, G.B. and Cohen, U. (2006) Accommodating culturally meaningful activities in outdoor settings for older adults. *Journal of Housing for the Elderly*, *19*(3-4), pp.109-140.

Amaratunga, D. and Baldry, D. (2001) 'Case study methodology as a means of theory building: performance measurement in facilities management organisations', *Work study*.

Amarya, S., Singh, K. and Sabharwal, M. (2018)' Ageing process and physiological changes', In *Gerontology*. IntechOpen.

Amérigo, M. and Aragonés, J. (1997) 'A theoretical and methodological approach to the study of residential satisfaction', *Journal of Environmental Psychology*, 17(1), pp.47-57.

Andresen, E., Malmgren, J., Carter, W. and Patrick, D. (1994) 'Screening for Depression in

Well Older Adults: Evaluation of a Short Form of the CES-D', American Journal of Preventive Medicine, 10(2), pp.77-84.

Andrews, G. J. & Phillips, D. R. (2005) 'Introduction' In: Andrews, G. J. & Phillips, D. R. (eds.) *Ageing and Place: Perspectives, Policy, Practice*. London and New York: Routledge.

Aspinall, P.A., Ward Thompson, C., Alves, S., Sugiyama, T., Brice, R. and Vickers, A. (2010) 'Preference and relative importance for environmental attributes of neighbourhood open space in older people', *Environment and Planning B: Planning and design*, *37*(6), pp.1022-1039.

Audin, J. and Throssell, K. (2015) 'Governing through the neighbourhood community (shequ) in China', *Revue française de science politique*, vol. 65, no. 1, pp.85-110.

Bai, X. (2014) 'Images of ageing in society: A literature review', *Journal of Population Ageing*, *7*(3), pp.231-253.

Baltes, P.B. and Smith, J. (2003) 'New frontiers in the future of aging: From successful aging of the young old to the dilemmas of the fourth age', *Gerontology*, *49*(2), pp.123-135.

Bandura, A., 2006. Toward a psychology of human agency. *Perspectives on psychological science*, *1*(2), pp.164-180.

Barker, R. (1968) *Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behaviour*. Standford, CA: Stanford University Press.

Barker, R. (1987) 'Prospecting in Environmental Psychology: Oskoloosa Revisited', in: Stokols, D. and Altman, I. (Eds.), *Handbook of environmental psychology (vol.II)*. New York: Wiley.

Bayer, A. H., and Harper, L.. (2000) '*Fixing to stay: A National Survey of Housing and Home Modification Issues',* Washington, DC: AARP.

Bazeley, P. and Jackson, K. eds. (2013) *Qualitative data analysis with NVivo*. SAGE publications limited.

Beard, H.P.J.R. and Bloom, D.E. (2015) 'Towards a comprehensive public health response to population ageing', *Lancet (London, England)*, *385*(9968), p.658.

Bechtel, R.B., Zeisel, J. (1987) Observation: The world under a glass. In Bechtel, R.B., Marans,

R.W. and Michelson, W.E. (1987) *Methods in environmental and behavioral research*. Van Nostrand Reinhold Co.

Bedimo-Rung, A.L., Mowen, A.J. and Cohen, D.A. (2005) 'The significance of parks to physical activity and public health: a conceptual model', *American journal of preventive medicine*, *28*(2), pp.159-168.

Beijing Haidian District People's Government Office (2018) *Implementation Plan for the Pilot Community of the Age-Liveable Environment Construction in Haidian District in 2018*. Available at: http://www.bjhd.gov.cn/zfxxgk/auto4487_51783/auto4487_52083/201810/t20181003_3520318.shtml (Accessed 07 December 2018).

Beijing Municipal Bureau of Statistics Survey (2021) *Main Data of the Seventh National Census in Beijing*. Available at: http://tjj.beijing.gov.cn/zxfbu/202105/t20210519_2392526.html (Accessed: 20 July 2021).

Beijing Municipal Commission of Housing and Urban-rural Development (2021) *Guiding Opinions on the Comprehensive Improvement of Old Residential Communities to Implement Age-Friendly Modification and the Construction of Barrier-Free Environment*. Available at: www.beijing.gov.cn/zhengce/zhengcefagui/202105/t20210526_2398635.html (Accessed: 28 July 2021).

Beijing Municipal Commission of Planning and Natural Resources, 2018. *Beijing Urban Master Plan (2016-2035)*. Available at *http://ghzrzyw.beijing.gov.cn/zhengwuxinxi/zxzt/bjcsztgh20162035/202001/t20200102_1554600.html* (Accessed: 28 July 2021).

Beijing Municipal Health Commission (2020) *Report on the Development of Beijing Ageing Cause 2019*. Available at wjw.beijing.gov.cn/zwgk_20040/tzgg/202010/t20201023_2119958.html (Accessed 28 July 2021).

Béland, F., Bergman, H., Lebel, P., Clarfield, A.M., Tousignant, P., Contandriopoulos, A.P. and Dallaire, L. (2006) 'A system of integrated care for older persons with disabilities in

Canada: results from a randomized controlled trial', *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *61*(4), pp.367-373.

Bennett, K.M. and Soulsby, L.K. (2014) 'Psychological wellbeing in later life', *Wellbeing: A Complete Reference Guide*, pp.1-21.

Benedetti, T.R.B., Borges, L.J., Petroski, E.L. and Gonçalves, L.H.T. (2008) 'Physical activity and mental health status among elderly people', *Revista de Saúde Pública*, *42*, pp.302-307.

Bengtsson, A. and Carlsson, G. (2013) 'Outdoor environments at three nursing homes-qualitative interviews with residents and next of kin' *Urban Forestry & Urban Greening*, *12*(3), pp.393-400.

Bentley, J.P., Brown, C.J., McGwin, G., Sawyer, P., Allman, R.M. and Roth, D.L. (2013) 'Functional status, life-space mobility, and quality of life: a longitudinal mediation analysis', *Quality of Life Research*, *22*(7), pp.1621-1632.

Bernabei, R., Landi, F., Gambassi, G., Sgadari, A., Zuccala, G., Mor, V., Rubenstein, L.Z. and Carbonin, P. (1998) 'Randomised trial of impact of model of integrated care and case management for older people living in the community', *Bmj*, *316*(7141), p.1348.

Beswick, A.D., Gooberman-Hill, R., Smith, A., Wylde, V. and Ebrahim, S. (2010) 'Maintaining independence in older people', *Reviews in Clinical Gerontology*, *20*(2), pp.128-153.

Bevan, M., Croucher, K. (2011) Lifetime Neighbourhoods. London: Department of Communities and Local Government. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6248/2044122.pdf (Accessed: 11 June 2021).

Bhuyan, M.R., Lane, A.P., Moogoor, A., Močnik, Š. and Yuen, B. (2020) 'Meaning of age-friendly neighbourhood: an exploratory study with older adults and key informants in Singapore', *Cities*, *107*, p.102940.

Boyle, A., Wiles, J.L. and Kearns, R.A. (2015) 'Rethinking ageing in place: The 'people' and 'place' nexus', *Progress in Geography (China)*, *34*(12), pp.1495-1511.

Bozkurt, M. (2016) Digital age for observations: The use of gis for analysing observations and behaviour mapping. *J Digital Landsc Archit*.

Bozkurt, M., Woolley, H. and Dempsey, N. (2019) 'Children's interactions with water in city centres: a case study from Sheffield, UK', *Landscape Research*, *44*(6), pp.671-687.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', Qualitative research in psychology, 3(2), pp.77-101.

Brewer, J. and Hunter, A. (1989) *Multimethod research: A synthesis of styles*. Sage Publications, Inc.

Bronfenbrenner, U. (1979) *The ecology of human development: Experiments by nature and design*. Harvard university press.

Brorsson, A., Öhman, A., Lundberg, S., Cutchin, M.P. and Nygård, L. (2020) 'How accessible are grocery shops for people with dementia? A qualitative study using photo documentation and focus group interviews', *Dementia*, *19*(6), pp.1872-1888.

Brown, R.D. and Corry, R.C. (2011) 'Evidence-based landscape architecture: The maturing of a profession', *Landscape and urban planning*, *100*(4), pp.327-329.

Brownson, R.C., Hoehner, C.M., Day, K., Forsyth, A. and Sallis, J.F. (2009) 'Measuring the built environment for physical activity: state of the science', *American journal of preventive medicine*, *36*(4), pp.S99-S123.

Bruce, D.G., Devine, A. and Prince, R.L. (2002) 'Recreational physical activity levels in healthy older women: the importance of fear of falling', *Journal of the American Geriatrics Society*, *50*(1), pp.84-89.

Bryant, C., Jackson, H. and Ames, D. (2008) 'The prevalence of anxiety in older adults: methodological issues and a review of the literature', *Journal of affective disorders*, *109*(3), pp.233-250.

Buckwalter, J. and DiNubile, N. (1997) 'Decreased Mobility in the Elderly', The Physician and Sports medicine, 25(9), pp.126-133.

Buffel, T., Verté, D., De Donder, L., De Witte, N., Dury, S., Vanwing, T. and Bolsenbroek, A. (2012) 'Theorising the relationship between older people and their immediate social living environment', *International Journal of Lifelong Education*, 31(1), pp.13-32.

Burton, E. and Mitchell, Lynne. (2006) *Inclusive urban design : Streets for Life*. Oxford: Architectural Press, Elsevier.

Butler, B. and Shannon, S. (2013) *Age-friendly Communities: The Irish Experience*. Ageing Well Network.

Butler, S.S. and Cohen, A.L. (2010) 'The importance of nature in the well-being of rural elders', *Nature and culture*, *5*(2), pp.150-174.

Can, I. and Heath, T. (2016) 'In-between spaces and social interaction: a morphological analysis of Izmir using space syntax', *Journal of Housing and the Built Environment*, *31*(1), pp.31-49.

Carmona, M., Tiesdell, S., Heath, T., Oc, T. (2010) *Public places - urban spaces: the dimensions of urban design*. 2nd ed. London: Routledge Press.

Caro, F.G., Bass, S.A. and Chen, Y.P. (1993) 'Introduction: achieving a productive ageing society' in Achieving a Productive Ageing Society.

Carpiano, R. (2009) 'Come take a walk with me: The "Go-Along" interview as a novel method for studying the implications of place for health and well-being', *Health & Place*, 15(1), pp.263-272.

Casey, E.S. (2001) 'On habitus and place: responding to my critics', *Annals of the Association of American Geographers*, Vol. 91 No. 4, pp. 716-23.

Cerin, E., Leslie, E., Sugiyama, T. and Owen, N. (2010) 'Perceived barriers to leisure-time physical activity in adults: an ecological perspective', *Journal of physical activity and health*, *7*(4), pp.451-459.

Cerin, E., Lee, K.Y., Barnett, A., Sit, C.H., Cheung, M.C. and Chan, W.M. (2013a) 'Objectively-measured neighborhood environments and leisure-time physical activity in Chinese urban elders', *Preventive medicine*, *56*(1), pp.86-89.

Cerin, E., Sit, C.H., Barnett, A., Cheung, M.C. and Chan, W.M. (2013b) 'Walking for recreation and perceptions of the neighborhood environment in older Chinese urban dwellers', *Journal of urban health*, *90*(1), pp.56-66.

Chan, A.C.M. and Cao, T. (2015) Age-friendly neighbourhoods as civic participation: Implementation of an active ageing policy in Hong Kong. *Journal of Social Work Practice*, *29*(1), pp.53-68.

Chan, A.W., Chan, H.Y., Chan, I.K., Cheung, B.Y. and Lee, D.T. (2016) 'An age-friendly living

environment as seen by Chinese older adults: a "photovoice" study', *International Journal of Environmental Research and Public Health*, *13*(9), p.913.

Chapman, D.P., Perry, G.S. and Strine, T.W. (2005) 'Peer reviewed: the vital link between chronic disease and depressive disorders', *Preventing chronic disease*, *2*(1).

Chapman, S.A. (2009) 'Ageing well: emplaced over time' *International journal of sociology and social policy*.

Chemero, A. (2018) An outline of a theory of affordances. In *How Shall Affordances be Refined? Four Perspectives* (pp. 181-195). Routledge.

Chen, F. and Liu, G. (2009). 'Population Aging in China' *International Handbook of Population Aging*, pp.157-172.

Chen, F. and Liu, G. (2012) 'The health implications of grandparents caring for grandchildren in China', *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *67*(1), pp.99-112.

Chen, F., Liu, G. and Mair, C.A. (2011) 'Intergenerational ties in context: Grandparents caring for grandchildren in China', *Social forces*, *90*(2), pp.571-594.

Chen, F. and Liu, G. (2012) 'The health implications of grandparents caring for grandchildren in China', *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *67*(1), pp.99-112.

Chen, F. and Short, S.E. (2008) 'Household context and subjective well-being among the oldest old in China', *Journal of family issues*, *29*(10), pp.1379-1403.

Chen, J. and Chen, S. (2015). 'Mental health effects of perceived living environment and neighborhood safety in urbanizing China', Habitat International, 46, pp.101-110.

Chen, J., Yang, Z. and Wang, Y. P. (2014) 'The New Chinese Model of Public Housing: A Step Forward or Backward?', *Housing Studies*, vol. 29, no. 4, pp. 534–550.

Chen, N.C., Hall, C.M., Yu, K. and Qian, C. (2019) 'Environmental satisfaction, residential satisfaction, and place attachment: The cases of long-term residents in rural and urban areas in China', *Sustainability*, *11*(22), p.6439.

Chen, Y., While, A.E. and Hicks, A. (2015) 'Physical activity among older people living alone in

Shanghai, China', *Health Education Journal*, *74*(2), pp.156-167.

Cheng, H., Hou, X. (2018) Housing and livable environment condition of urban and rural older people in China, in: Dang, J., Wu, Y. and Liu, N., (Eds), *Survey report on the living conditions of China's urban and rural older persons*. Social Sciences Academic Press: Beijing, China, pp.21-96.

Cheng, S.T. and Chan, A.C. (2006) 'Filial piety and psychological well-being in well older Chinese', *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *61*(5), pp.P262-P269.

Chida, Y. and Steptoe, A. (2008). 'Positive Psychological Well-Being and Mortality: A Quantitative Review of Prospective Observational Studies', *Psychosomatic Medicine,* 70(7), pp.741-756.

China. China National Committee on Ageing. (2009) *Announcement of the Office of the National Working Committee on Ageing.* Available at: <http://www.cncaprc.gov.cn/llxw/79.jhtml> (Accessed 9 March 2021).

China. General Office of Beijing Municipal People's Government (2018) Opinions on the implementation of strengthening elderly care services to improve the elderly system. Available at: http://www.gov.cn/xinwen/2018-11/05/content_5337645.htm (Accessed 22 August 2022)

China. General Office of the State Council. (2020) *Guiding Opinions of the General Office of the State Council on Comprehensively Promoting the Renovation of Older Urban Areas.* Available at: <http://www.gov.cn/zhengce/content/2020-07/20/content_5528320.htm> (Accessed 9 November 2021).

China. The State Council of the People's Republic of China (1998) *Notice of the State Council on Further Urban Housing Reform and Accelerating Housing Construction*. Available at https://www.shui5.cn/article/4e/27749.html (Accessed 20 June 2021).

China. The State Council of the People's Republic of China. (2006) *Notice of the General Office of the State Council on Forwarding the Opinions of the Office of the National Committee on Aging and the Development and Reform Commission on Accelerating the Development of the Aged Care Service Industry.* Available at:

<http://www.gov.cn/zhengce/content/2008-03/28/content_6372.htm> (Accessed 31 August 2021).

China. The State Council of the People's Republic of China. (2017) *The 13th Five-Year Plan for the Development of the National Ageing Career and the Construction of the Elderly Care System.* Available at: http://www.gov.cn/zhengce/content/2017-03/06/content_5173930.htm (Accessed 31 August 2021).

China. Ministry of Civil Affairs of the People's Republic of China (2019) Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly. Available at https://www.mca.gov.cn/article/gk/fg/ylfw/202002/20200200024078.shtml (Accessed 06 August 2022).

China. Ministry of Housing and Urban-Rural Development (2017) Urban Green Space Classification Standards. Available at http://cdbpw.chengdu.gov.cn/cdslyj/c110455/2019-02/14/c8789a9af958477d8e814b3fce93f4b9/files/9a5c3ecdf38748a48e1bfa825edaefb7.pdf (Accessed 14 August 2022).

China. Ministry of Housing and Urban-Rural Construction (2018) *Standard for Urban Residential Areas Planning and Design (GB50180-2018)*. Available at http://www.mohurd.gov.cn/wjfb/201811/W020181130044801.pdf (Accessed 1 December 2018).

China. National Bureau of Statistics of the People's Republic of China (2011) *The Ninth Report of the 'Eleventh Five-Year Plan' Series of Economic and Social Development Achievements*. Available at http://www.stats.gov.cn/ztjc/ztfx/sywcj/201103/t20110307_71321.html (Accessed 23 April 2018).

China. National Bureau of Statistics of the People's Republic of China (2021) Main data of the seventh national census. *National Bureau of Statistics*. Available from: http://www.stats.gov.cn/tjsj/zxfb/202105/t20210510_1817176.html(Accessed 31 August 2021).

China. National Development and Reform Commission (2016) *Notice on Printing and*

Distributing the Guiding Opinions on Promoting the Construction of Liveable Environment for the Elderly. Available at: http://www.gov.cn/xinwen/2016-11/25/content_5137617.htm (Accessed 20 June 2021).

China. National Office of the Elderly Working Committee (2013). Population ageing has spawned an old-age crisis. 85% of urban elderly want to ageing in place. Cncaprc.gov.cn. Available at: http://www.cncaprc.gov.cn/contents/23/13418.html (Accessed 22 November 2018).

Chowdhury, M.F. (2014) 'Interpretivism in aiding our understanding of the contemporary social world', *Open Journal of Philosophy*, *4(3)*.

Chow, H.W. (2013) 'Outdoor fitness equipment in parks: a qualitative study from older adults' perceptions', *BMC public health*, 13(1), pp.1-9.

Chui, E. (2008) 'Ageing in place in Hong Kong—Challenges and opportunities in a capitalist Chinese city', *Ageing international*, *32*(3), pp.167-182.

Clark, C. and Uzzell, D.L. (2006) The socio-environmental affordances of adolescents' environments. In C. Spencer and M. Blades (ed.) *Children and their environments: Learning, using and designing spaces*, pp.176.

Collins, J. (2013) 'Letter from the editor: effects of aging on the musculoskeletal system', In *Seminars in roentgenology*, Vol. 2, No. 48, pp. 105-106.

'Community' (2021) Cambridge Dictionary. Available at https://dictionary.cambridge.org/dictionary/english/community (Accessed 3 March 2021).

Comstock, N., Dickinson, L.M., Marshall, J.A., Soobader, M.J., Turbin, M.S., Buchenau, M. and Litt, J.S. (2010) 'Neighborhood attachment and its correlates: Exploring neighborhood conditions, collective efficacy, and gardening', *Journal of environmental psychology*, *30*(4), pp.435-442.

Cong, X.J., Wang, X.P. (2012) *Shi Lao Xing Cheng Shi Jian She Yan Jiu——Da Du Shi Shi Lao Xing Zheng Ti Gui Hua Ying Dui Yan Jiu——Yi Wuhan Wei Li* [A Study on the Response to Old-Appropriate Overall Environment Planning of Metropolitan——A Case Study of Wuhan]. Modern Urban Research, 27(8), pp.4-12

Cosco, N., Moore, R. and Islam, M. (2010), 'Behavior Mapping: A Method for Linking Preschool Physical Activity and Outdoor Design', *Medicine & Science in Sports & Exercise, 4*2(3), pp.513-519.

Costall, A. (1995) 'Socializing affordances', *Theory & Psychology*, *5*(4), pp.467-481.

Cramm, J.M., van Dijk, H.M. and Nieboer, A.P., 2018. The creation of age-friendly environments is especially important to frail older people. *Ageing & Society*, *38*(4), pp.700-720.

Cranney, L., Phongsavan, P., Kariuki, M., Stride, V., Scott, A., Hua, M. and Bauman, A. (2016) Impact of an outdoor gym on park users' physical activity: A natural experiment. *Health & place*, *37*, pp.26-34.

Creech, A., Hallam, S., Varvarigou, M., McQueen, H. and Gaunt, H. (2013) 'Active music making: a route to enhanced subjective well-being among older people', *Perspectives in Public health*, *133*(1), pp.36-43.

Cristoforetti, A., Gennai, F. and Rodeschini, G. (2011) 'Home sweet home: The emotional construction of places', *Journal of Aging studies*, *25*(3), pp.225-232.

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A. and Sheikh, A. (2011) 'The Case Study Approach', *BMC Medical Research Methodology*, vol. 11, no. 1, pp. 1–9.

Cutchin, M.P. (2003) 'The process of mediated aging-in-place: A theoretically and empirically based model', *Social science & medicine*, *57*(6), pp.1077-1090.

Dare, J., Wilkinson, C., Marquis, R. and Donovan, R.J. (2018) "The people make it fun, the activities we do just make sure we turn up on time." Factors influencing older adults' participation in community-Based group programmes in Perth, Western Australia. *Health & Social Care in the Community*, *26*(6), pp.871-881.

Day, K. (2016) 'Built environmental correlates of physical activity in China: A review', *Preventive medicine reports*, *3*, pp.303-316.

Day, R. (2008) 'Local environments and older people's health: dimensions from a comparative qualitative study in Scotland', *Health & place*, *14*(2), pp.299-312.

Davey, J., Nana, G., de Joux, V., & Arcus, M. (2004) 'Accommodation options for older people in Aotearoa/New Zealand', *Wellington, New Zealand: NZ Institute for*

Research on Ageing/Business & Economic Research Ltd, for Centre for Housing Research Aotearoa/New Zealand.

de Donder, L., De Witte, N., Buffel, T., Dury, S. and Verté, D. (2012) 'Social capital and feelings of unsafety in later life: A study on the influence of social networks, place attachment, and civic participation on perceived safety in Belgium', *Research on Aging*, *34*(4), pp.425-448.

De Quadros-Wander, S., McGillivray, J. and Broadbent, J. (2014) 'The influence of perceived control on subjective wellbeing in later life', *Social Indicators Research*, *115*(3), pp.999-1010.

Diener, E. and Chan, M. (2011) 'Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity', Applied Psychology: Health and Well-Being, 3(1), pp.1-43.

Dong, K. and Wang, G., 2014. 'China's pension challenge: adaptive strategy for success', *Public Administration and Development*, *34*(4), pp.265-280.

Douma, L., Steverink, N. and Meijering, L. (2021) 'Geographical life-space and subjective wellbeing in later life', Health & place, 70, pp. 102608–102608. doi:10.1016/j.healthplace.2021.102608.

Duggan, S., Blackman, T., Martyr, A. and Van Schaik, P. (2008) 'The impact of early dementia on outdoor life: Ashrinking world'?', *Dementia*, *7*(2), pp.191-204.

D'Antonio, A., Monz, C., Lawson, S., Newman, P., Pettebone, D. and Courtemanch, A. (2010) 'GPS-based measurements of backcountry visitors in parks and protected areas: Examples of methods and applications from three case studies', *Journal of Park and Recreation Administration*, *28*(3).

Ekström, M. (1994) 'Elderly people's experiences of housing renewal and forced relocation: Social theories and contextual analysis in explanations of emotional experiences', *Housing studies*, *9*(3), pp.369-391.

Elmqvist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P.J., McDonald, R.I., Parnell, S., Schewenius, M., Sendstad, M., Seto, K.C. and Wilkinson, C. (2013) '*Urbanization, biodiversity and ecosystem services: challenges and opportunities: a*

global assessment (p. 755)', Springer Nature.

Eng, C., Pedulla, J., Eleazer, G.P., McCann, R. and Fox, N. (1997) 'Program of All-inclusive Care for the Elderly (PACE): an innovative model of integrated geriatric care and financing', *Journal of the American Geriatrics Society*, *45*(2), pp.223-232.

Enssle, F. and Kabisch, N. (2020) 'Urban green spaces for the social interaction, health and well-being of older people—An integrated view of urban ecosystem services and socio-environmental justice', *Environmental science & policy*, *109*, pp.36-44.

Esther, Y.H.K., Winky, H.K.O. and Edwin, C.H.W. (2017) 'Elderly satisfaction with planning and design of public parks in high density old districts: An ordered logit model', *Landscape and urban planning*, 165, pp. 39–53. doi:10.1016/j.landurbplan.2017.05.006.

European Economy (2021) The 2021 Ageing Report: Economic and Budgetary Projections for the EU Member States (2019-2070). Available at: <https://ec.europa.eu/info/sites/default/files/economy-finance/ip148_en.pdf> (Accessed 13 Oct 2021).

Farage, M.A. et al. (2012) 'Design principles to accommodate older adults', Global journal of health science, 4(2), pp. 2–25. doi:10.5539/gjhs.v4n2p2.

Fänge, A., Oswald, F. and Clemson, L. (2012) 'Aging in Place in Late Life: Theory, Methodology, and Intervention', *Journal of Aging Research*, 2012, pp.1-2.

Feng, S., Chen, L., Sun, R., Feng, Z., Li, J., Khan, M. S. and Jing, Y. (2019) 'The Distribution and Accessibility of Urban Parks in Beijing, China: Implications of Social Equity', *International Journal of Environmental Research and Public Health*, 16(24), p. 4894. doi:10.3390/ijerph16244894.

Feng, Z., Falkingham, J., Liu, X. and Vlachantoni, A. (2017) 'Changes in living arrangements and mortality among older people in China', *SSM-population health*, *3*, pp.9-19.

Ferrucci, L., Cooper, R., Shardell, M., Simonsick, E., Schrack, J. and Kuh, D. (2016) 'Age-Related Change in Mobility: Perspectives From Life Course Epidemiology and geroscience', Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences, 71(9), pp.1184-1194.

Flick, U. (2013) The SAGE Handbook of Qualitative Data Analysis, The SAGE Handbook of Qualitative Data Analysis. London: SAGE Publications. doi:10.4135/9781446282243.

Flyvbjerg, B. (2006) 'Five Misunderstandings About Case-Study Research', *Qualitative Inquiry*, vol. 12, no. 2, pp. 219–245.

Francis, M. (2001) 'A Case Study Method For Landscape Architecture', Landscape journal, 20(1), pp. 15–29. doi:10.3368/lj.20.1.15.

Freeman, S. and Eykelbosh, A. (2020) 'COVID-19 and outdoor safety: Considerations for use of outdoor recreational spaces', *National Collaborating Centre for Environmental Health*, *829*.

Fried, M. (1982) 'Residential attachment: Sources of residential and community satisfaction', *Journal of social issues*, *38*(3), pp.107-119.

Fiske, A., Wetherell, J.L. and Gatz, M. (2009) 'Depression in older adults', Annual review of clinical psychology, 5, pp.363-389.

Findlay, R. (2003) 'Interventions to reduce social isolation amongst older people: where is the evidence?', Ageing and Society, 23(05), pp.647-658.

Fitzgerald, K.G. and Caro, F.G. (2014) 'An overview of age-friendly cities and communities around the world', *Journal of Aging & Social Policy*, *26*(1-2), pp.1-18.

Fitzgerald, N. and Spaccarotella, K. (2009) 'Barriers to a healthy lifestyle: from individuals to public policy—an ecological perspective', *Journal of extension*, *47*(1), pp.1-8.

Finlay, J., Franke, T., McKay, H. and Sims-Gould, J. (2015) 'Therapeutic landscapes and wellbeing in later life: Impacts of blue and green spaces for older adults', *Health & Place*, 34, pp.97-106.

Fu, Y. and Chen, M. (2021) 'Intergenerational relationship quality and activity profiles among older adults in China', *Health & social care in the community*.

Gadakari, T., Wang, J., Hadjri, K. and Huang, J. (2018) 'Designing Residential Buildings for Older People in China to Promote Ageing-in-Place', *Asian Journal of Quality of Life*, vol. 3, no. 13, pp. 18–28.

Galcanova, L. and Sykorova, D. (2015) 'Socio-spatial aspects of ageing in an urban context:

an example from three Czech Republic cities', *Ageing & Society*, *35*(6), pp.1200-1220.

Gale, C.R., Cooper, C., Deary, I.J. and Sayer, A.A. (2014) 'Psychological wellbeing and incident frailty in men and women: The English Longitudinal Study of Ageing', *Psychological medicine*, 44(4), p.697.

Ganji, F. (2018) *Everyday Interculturalism in Urban Public Open Spaces: A Socio-spatial Inquiry in Bradford City.* PhD Thesis. University of Sheffield.

Gao, J., Fu, H., Li, J. and Jia, Y. (2015) 'Association between social and built environments and leisure-time physical activity among Chinese older adults-a multilevel analysis', BMC public health, 15(1).

Gauchard, G.C., Jeandel, C., Tessier, A. and Perrin, P.P. (1999) 'Beneficial effect of proprioceptive physical activities on balance control in elderly human subjects', *Neuroscience letters*, *273*(2), pp.81-84.

Gaver, W.W. (1996) 'Situating action II: Affordances for interaction: The social is material for design', *Ecological Psychology*, *8*(2), pp.111-129.

Gehl, J. (2011) *Life between buildings : using public space*, Washington, DC: Island Press.

George, L.K. (1998) 'Self and identity in later life: Protecting and enhancing the self', *Journal of Aging and identity*, *3*(3), pp.133-152.

Ghavampour, E., Del Aguila, M. and Vale, B. (2017) 'GIS mapping and analysis of behaviour in small urban public spaces', Area, 49(3), pp.349-358.

Glass, A.P., Gao, Y. and Luo, J. (2013) 'China: facing a long-term care challenge on an unprecedented scale', *Global Public Health*, *8*(6), pp.725-738.

Gibson, J.J. (1979) *The ecological approach to visual perception.* Houghton, Mifflin and Company.

Gibson, E. and Pick, A. (2000) *An ecological approach to perceptual learning and development*. Oxford: Oxford University Press.

Giles-Corti, B., Timperio, A., Bull, F. and Pikora, T. (2005) 'Understanding physical activity environmental correlates: increased specificity for ecological models', *Exercise and sport sciences reviews*, *33*(4), pp.175-181.

Gilleard, C., Hyde, M. and Higgs, P. (2007) 'The Impact of Age, Place, Aging in Place, and Attachment to Place on the Well-Being of the Over 50s in England', *Research on Aging*, 29(6), pp.590-605.

Gitlin, L.N. (2003) 'Conducting research on home environments: Lessons learned and new directions', *The Gerontologist*, *43*(5), pp.628-637.

Given, L.M. (2008) The Sage encyclopedia of qualitative research methods [electronic resource]. Los Angeles, [Calif.] ; London: SAGE.

Glanz, K., Rimer, B.K. and Viswanath, K. (2008) *Health behavior and health education: theory, research, and practice*. John Wiley & Sons.

Glaser, B.G., and Strauss, A.L. (1967) *The discovery of grounded theory : strategies for qualitative research*. New York: Aldine de Gruyter.

Glass, T.A. and Balfour, J.L. (2003) 'Neighborhoods, aging, and functional limitations', *Neighborhoods and health*, *1*, pp.303-34.

Godfrey, R. and Julien, M. (2005). 'Urbanisation and health', Clinical Medicine, 5(2), pp.137-141.

Golden, J., Conroy, R.M., Bruce, I., Denihan, A., Greene, E., Kirby, M. and Lawlor, B.A. (2009) 'Loneliness, social support networks, mood and wellbeing in community-dwelling elderly', *International Journal of Geriatric Psychiatry: A journal of the psychiatry of late life and allied sciences*, *24*(7), pp.694-700.

Gómez, L.F., Parra, D.C., Buchner, D., Brownson, R.C., Sarmiento, O.L., Pinzón, J.D., Ardila, M., Moreno, J., Serrato, M. and Lobelo, F. (2010) 'Built environment attributes and walking patterns among the elderly population in Bogotá', *American journal of preventive medicine*, *38*(6), pp.592-599.

Grenade, L. and Boldy, D. (2008) 'Social isolation and loneliness among older people: issues and future challenges in community and residential settings', Australian Health Review, 32(3), p.468.

Groessl, E., Kaplan, R., Rejeski, W., Katula, J., King, A., Frierson, G., Glynn, N., Hsu, F., Walkup, M. and Pahor, M. (2007) 'Health-Related Quality of Life in Older Adults at Risk for Disability', American Journal of Preventive Medicine, 33(3), pp.214-218.

Groat, L.N. and Wang, D. (2013) *Architectural research methods*. John Wiley & Sons.

Gu, C. and Wu, F. (2010) 'Urbanization in China: Processes and policies', *China Review*, *10*(1), pp.1-9.

Guenther, M. (2012) *Intersection: How enterprise design bridges the gap between business, technology, and people*. Newnes.

Guest, G., Bunce, A. and Johnson, L. (2006) 'How many interviews are enough? An experiment with data saturation and variability', *Field methods*, *18*(1), pp.59-82.

Guion, L.A., Diehl, D.C. and McDonald, D. (2001) 'Conducting an in-depth interview. McCarty Hall, FL: University of Florida Cooperative Extension Service', Institute of Food and Agricultural Sciences, EDIS.

Guo, B., Pickard, J. and Huang, J. (2008) 'A cultural perspective on health outcomes of caregiving grandparents: Evidence from China', *Journal of Intergenerational Relationships*, *5*(4), pp.25-40.

Guo, Y., Shi, H., Yu, D. and Qiu, P. (2016) 'Health benefits of traditional Chinese sports and physical activity for older adults: a systematic review of evidence', *Journal of Sport and Health Science*, *5*(3), pp.270-280.

Gustafson, P. (2001) 'Meanings of place: Everyday experience and theoretical conceptualizations', *Journal of environmental psychology*, *21*(1), pp.5-16.

Hadavi, S., Kaplan, R. and Hunter, M.C.R. (2015) 'Environmental affordances: A practical approach for design of nearby outdoor settings in urban residential areas', *Landscape and urban planning*, *134*, pp.19-32.

Hamilton Council On Aging (2021) Hamilton's Plan for an Age-Friendly Community 2021-2026. Available from: https://www.hamilton.ca/sites/default/files/media/browser/2021-04-15/age-friendly-report-2021_2026-coh.pdf (Accessed 27 Dec 2021).

Hanington, B. and Martin, B. (2012) 'Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design *effective solutions', Rockport Publishers.*

Han, J.H. and Kim, J.H. (2017) 'Variations in ageing in home and ageing in neighbourhood',

Australian Geographer, *48*(2), pp.255-272.

Han, Y.C. and Bao, L., (2016) 'Residential Farming: A Strategy on the Regeneration of Existing Chinese Residential Area Concerning Aged Caring Issue', *The Asian Conference on Sustainability, Energy & the Environment 2016*. Kobe, June 9–12, pp.495-511. Available at: http://papers.iafor.org/wp-content/uploads/papers/acsee2016/ACSEE2016_27140.pdf (Accessed: 14 September 2021).

Harkins, E. (1978). 'Effects of Empty Nest Transition on Self-Report of Psychological and Physical Well-Being', Journal of Marriage and the Family, 40(3), p.549-556.

Harris, T.J., Owen, C.G., Victor, C.R., Adams, R. and Cook, D.G. (2009) 'What factors are associated with physical activity in older people, assessed objectively by accelerometry?', *British journal of sports medicine*, *43*(6), pp.442-450.

Hawkins, J.L., Mercer, J., Thirlaway, K.J. and Clayton, D.A. (2013) '"Doing" gardening and "being" at the allotment site: exploring the benefits of allotment gardening for stress reduction and healthy aging', *Ecopsychology*, *5*(2), pp.110-125.

Hays, J.C. (2002) 'Living arrangements and health status in later life: A review of recent literature', *Public Health Nursing*, *19*(2), pp.136-151.

Heft, H. (1988) 'Affordances of children's environments: A functional approach to environmental description', *Children's environments quarterly*, pp.29-37.

Heft, H. (2010) Affordances and the perception of landscape. *Innovative approaches to researching landscape and health*, pp.9-32.

Hesketh, T., Lu, L. and Xing, Z.W. (2005) 'The effect of China's one-child family policy after 25 years', *New Engl J Med*, *353*(11), pp.1171-1176.

Hester, R.T. (1984) *Planning neighborhood space with people* (Vol. 3). Van Nostrand Reinhold.

Hicks, G., Shardell, M., Alley, D., Miller, R., Bandinelli, S., Guralnik, J., Lauretani, F., Simonsick, E. and Ferrucci, L.. (2011) 'Absolute Strength and Loss of Strength as Predictors of Mobility Decline in Older Adults: The InCHIANTI Study', The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 67A(1), pp.66-73.

Hidalgo, M. and Hernandez, B. (2001) 'Place attachment: Conceptual and empirical questions', *Journal of Environmental Psychology*, 21(3), pp.273-281.

Hilal, A.H. and Alabri, S.S. (2013) 'Using NVivo for data analysis in qualitative research', *International interdisciplinary journal of education*, *2*(2), pp.181-186.

Hillcoat-Nallétamby, S. and Ogg, J.I.M. (2014) Moving beyond 'ageing in place': older people's dislikes about their home and neighbourhood environments as a motive for wishing to move. *Ageing & Society*, *34*(10), pp.1771-1796.

Hu, H., Yuan, Shui., Zheng, P. (2018) Zhong Guo Cheng Xiang Lao Nian Ren Jian Kang Ji Yi Liao Wei Sheng Zhuang Kuang Fen Xi [Analysis of health and medical status of urban and rural elderly in China]. In: Zhong Guo Cheng Xiang Lao Nian Ren Sheng Huo Zhuang Kuang Diao Cha Bao Gao [*Survey report on the living conditions of China's urban and rural older persons (2018)*]. Beijing: Social sciences academic press (China).

Huang, B., Liu, Y., Feng, Z., Pearce, J.R., Wang, R., Zhang, Y. and Chen, J. (2019) 'Residential exposure to natural outdoor environments and general health among older adults in Shanghai, China', *International journal for equity in health*, *18*(1), pp.1-11.

Huang, J., Wu, M. (2015) Te Da Cheng Shi Lao Nian Ren Chu Xing Te Zheng Ji Xiang Guan Yin Su Fen Xi, Yi Shang Hai Zhong Xin CHeng Wei Li [*Analysis on the travel characteristics and related factors of the elderly in megacities, taking the central city of Shanghai as an example*], Shanghai: Urban Planning Forum, pp.93-101.

Huang, S.C.L. (2006) 'A study of outdoor interactional spaces in high-rise housing', *Landscape and urban planning*, *78*(3), pp.193-204.

Huang, Y. (2005) 'From Work-Unit Compounds to Gated Communities: Housing Inequality and Residential Segregation in Transitional Beijing', in Ma, L. J. C. and Wu, F. (eds) *Restructuring the Chinese City: Changing Society, Economy and Space,* Oxon, Routledge, pp. 172–198.

Humpel, N., Owen, N. and Leslie, E. (2002) 'Environmental factors associated with adults' participation in physical activity: a review', *American journal of preventive medicine*, *22*(3), pp.188-199.

Hung, W., Ross, J., Boockvar, K. and Siu, A. (2011) 'Recent trends in chronic disease,

impairment and disability among older adults in the United States', *BMC Geriatrics*, 11(1).

Hwang, E., Cummings, L., Sixsmith, A. and Sixsmith, J. (2011) 'Impacts of home modifications on aging-in-place', *Journal of Housing for the Elderly*, *25*(3), pp.246-257.

Iecovich, E. (2014) Aging in place: From theory to practice. *Anthropological notebooks*, *20*(1).

Inclusive Design for Getting Outdoors (2007). Available at: http://www.idgo.ac.uk/design_guidance/open_spaces.htm (Accessed: 26 September 2022).

Ja'afar, N.H., Sulaiman, A.B. and Shamsuddin, S. (2012) 'The contribution of landscape features on traditional streets in Malaysia', *Procedia-Social and Behavioral Sciences*, *50*, pp.643-656.

Jackson, R.J. (2003) 'The impact of the built environment on health: an emerging field', *American journal of public health*, *93*(9), pp.1382-1384.

Ji, Y. (2018) Zhong Guo Cheng Xiang Lao Nian Ren Jing Shen Wen Hua Sheng Huo Zhuang Kuang Fen Xi [Analysis of the spiritual and cultural life of the elderly in urban and rural areas of China]. In: Zhong Guo Cheng Xiang Lao Nian Ren Sheng Huo Zhuang Kuang Diao Cha Bao Gao [*Survey report on the living conditions of China's urban and rural older persons (2018)*]. Beijing: Social sciences academic press (China).

Jian, P., Yanxu, L., Hong, S., Pan, X., Xiaoxu, H. U. and Yanglin, W. (2016) 'Using Impervious Surfaces to Detect Urban Expansion in Beijing of China in the 2000s', *Chinese Geographical Science*, vol. 26, no. 2, pp. 229–243.

Joaquim Araújo de Azevedo, A., João Ferreira Custódio, M. and Pereira Antunes Perna, F. (2013) '"Are you happy here?": the relationship between quality of life and place attachment', *Journal of Place Management and Development*, *6*(2), pp.102-119.

Jockey Club Age-friendly City. (2019) Cross-district Report of Baseline Assessment on Age-friendliness (18 Districts). Available from: https://www.jcafc.hk/en/Resources-Centre/Publications/Cross-District-Report-On-Baseline-Assessment.html (Accessed 27 Jun 2021).

Johansson, K., Josephsson, S. and Lilja, M. (2009) 'Creating possibilities for action in the presence of environmental barriers in the process of 'ageing in place'', *Ageing & Society*, *29*(1), pp.49-70.

John, D.H. and Gunter, K. (2016) engAGE in community: Using mixed methods to mobilize older people to elucidate the age-friendly attributes of urban and rural places. *Journal of Applied Gerontology*, *35*(10), pp.1095-1120.

Joye, Y. and van den Berg, A.E. (2018) Restorative environments. *Environmental psychology: An introduction*, pp.65-75.

Kahana, E., Lovegreen, L., Kahana, B. and Kahana, M. (2003) 'Person, Environment, and Person-Environment Fit as Influences on Residential Satisfaction of Elders', *Environment and Behavior*, 35(3), pp.434-453.

Kahneman, D. and Deaton, A. (2010) 'High income improves evaluation of life but not emotional well-being', *Proceedings of the national academy of sciences*, *107*(38), pp.16489-16493.

Kalache, A. and Kickbusch, I. (1997) 'A global strategy for healthy ageing', *World health*, *50*(4), pp.4-5.

Kamalipour, H. and Peimani, N. (2015) 'Assemblage thinking and the city: Implications for urban studies', *Current Urban Studies*, *3*(4), pp.402-408.

Karpatschof, B. (2007) Bringing quality and meaning to quantitative data–Bringing quantitative evidence to qualitative observation. *Nordic Psychology*, *59*(3), pp.191-209.

Kelly, G. and Hosking, K. (2008) 'Nonpermanent residents, place attachment, and "sea change" communities', *Environment and Behavior*, *40*(4), pp.575-594.

Kendig, H. (2003) 'Directions in environmental gerontology: A multidisciplinary field', *The Gerontologist*, *43*(5), pp.611-614.

Kerr, J., Rosenberg, D. and Frank, L. (2012) ,The Role of the Built Environment in Healthy Aging', *Journal of Planning Literature*, 27(1), pp.43-60.

Keskinen, K.E., Rantakokko, M., Suomi, K., Rantanen, T. and Portegijs, E. (2018) 'Nature as a facilitator for physical activity: Defining relationships between the objective and

perceived environment and physical activity among community-dwelling older people', *Health & place*, *49*, pp.111-119.

Keysor, J. and Jette, A. (2001) 'Have We Oversold the Benefit of Late-Life Exercise?', *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 56(7), pp.M412-M423.

Kim, A.M. (2015) *Sidewalk city*. University of Chicago Press.

Kim, K.I., Gollamudi, S.S. and Steinhubl, S. (2017) 'Digital technology to enable aging in place', *Experimental gerontology*, *88*, pp.25-31.

Kim, J. and Kaplan, R. (2004) 'Physical and Psychological Factors in Sense of Community', *Environment and Behavior*, 36(3), pp.313-340.

Knox, P. (2005) 'Creating Ordinary Places: Slow Cities in a Fast World', *Journal of Urban Design*, 10(1), pp.1-11.

Korpilo, S., Virtanen, T. and Lehvävirta, S. (2017) 'Smartphone GPS tracking—Inexpensive and efficient data collection on recreational movement', *Landscape and Urban Planning*, *157*, pp.608-617.

Kweon, B., Sullivan, W. and Wiley, A. (1998) 'Green Common Spaces and the Social Integration of Inner-City Older Adults', *Environment and Behavior*, 30(6), pp.832-858.

Kyle, G., Graefe, A. and Manning, R. (2005) 'Testing the dimensionality of place attachment in recreational settings', *Environment and behavior*, *37*(2), pp.153-177.

Kyttä, M. (2003) *Children in outdoor contexts: affordances and independent mobility in the assessment of environmental child friendliness*. Helsinki University of Technology.

Kyttä, M., Kaaja, M. and Horelli, L. (2004) 'An Internet-Based Design Game as a Mediator of Children's Environmental Visions', *Environment and Behavior*, 36(1), pp.127-151.

Ku, L.J.E., Stearns, S.C., Van Houtven, C.H., Lee, S.Y.D., Dilworth-Anderson, P. and Konrad, T.R. (2013) 'Impact of caring for grandchildren on the health of grandparents in Taiwan', *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *68*(6), pp.1009-1021.

Ku, P.W., Fox, K.R., Chen, L.J. and Chou, P. (2012) 'Physical activity and depressive symptoms

in older adults: 11-year follow-up', *American journal of preventive medicine*, *42*(4), pp.355-362.

Ku, P.W., McKenna, J. and Fox, K.R. (2007) 'Dimensions of subjective well-being and effects of physical activity in Chinese older adults', *Journal of aging and physical activity*, *15*(4), pp.382-397.

Kuo, F., Sullivan, W., Coley, R. and Brunson, L. (1998) 'Fertile Ground for Community: Inner-City Neighborhood Common Spaces', *American Journal of Community Psychology*, 26(6), pp.823-851.

Kuzel, A. J. (1999) 'Sampling in qualitative inquiry', in Crabtree, B. F. and Miller, W. L. (eds) *Doing Qualitative Research,* Thousand Oaks, CA, Sage Publications, pp. 31–44.

Kvale, S. (2008) *Doing interviews*. London: SAGE.

Lashley, M. (2018) Observational Research Methods. In: M. Allen, ed., *The SAGE Encyclopedia of Communication Research Methods*. Thousand Oaks: SAGE Publications, Inc.

Lau, K.K.L., Yung, C.C.Y. and Tan, Z. (2021) 'Usage and perception of urban green space of older adults in the high-density city of Hong Kong', *Urban Forestry & Urban Greening*, *64*, p.127251. doi:10.1016/j.ufug.2021.127251.

Lawler, K. (2001) '*Aging in place: Coordinating housing and health care provision for America's growing elderly population',* Washington, DC: Joint Center for Housing Studies of Harvard University & Neighbourhood Reinvestment Corporation.

Lawton, M.P. (1989) Behavior-relevant ecological factors. *Social structure and aging: Psychological processes*, *57*, p.78.

Lawton, M. P., & Nahemow, L. (1973) Ecology and the aging process. In C. Eisdorfer & M. P. Lawton (Eds.), *The psychology of adult development and aging* (pp. 619–674). American Psychological Association.

Lee, B., Oropesa, R. and Kanan, J. (1994) 'Neighborhood Context and Residential Mobility', *Demography*, 31(2), pp.249-270.

Lee, H., Lee, J.A., Brar, J.S., Rush, E.B. and Jolley, C.J. (2014) 'Physical activity and depressive symptoms in older adults', *Geriatric nursing*, *35*(1), pp.37-41.

Lee, I.M., Shiroma, E.J., Lobelo, F., Puska, P., Blair, S.N., Katzmarzyk, P.T. and Lancet Physical Activity Series Working Group. (2012) 'Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy', *The lancet*, *380*(9838), pp.219-229.

Lee, J.L.C., Lo, T.L.T. and Ho, R.T.H. (2018) 'Understanding outdoor gyms in public open spaces: a systematic review and integrative synthesis of qualitative and quantitative evidence', *International journal of environmental research and public health*, 15(4), p.590.

Lehning, A.J., Smith, R.J. and Dunkle, R.E. (2015) 'Do age-friendly characteristics influence the expectation to age in place? A comparison of low-income and higher income Detroit elders', *Journal of applied gerontology*, *34*(2), pp.158-180.

Levinger, P., Panisset, M., Parker, H., Batchelor, F., Tye, M. and Hill, K.D. (2021) 'Guidance about age-friendly outdoor exercise equipment and associated strategies to maximise usability for older people', *Health Promotion Journal of Australia*, *32*(3), pp.475-482.

Levinger, P., Sales, M., Polman, R., Haines, T., Dow, B., Biddle, S.J., Duque, G. and Hill, K.D. (2018) Outdoor physical activity for older people—The senior exercise park: Current research, challenges and future directions. *Health Promotion Journal of Australia*, *29*(3), pp.353-359.

Lewicka, M. (2011) 'Place attachment: How far have we come in the last 40 years?', *Journal of environmental psychology*, *31*(3), pp.207-230.

Lewicka, M. (2013) In search of roots. *Place attachment: Advances in theory, methods and applications*, pp.49-60.

Li, D. (2015) *The Development of a Conceptual Framework for Delivering Socially Beneficial Urban Squares in Guangzhou, China*. PhD Thesis. University of Sheffield.

Li, F. (2016) 'Physical activity and health in the presence of China's economic growth: Meeting the public health challenges of the aging population', *Journal of Sport and Health Science*, 5(3), pp.258-269.

Li, G. (2007) 'Types of Community and Relationship of Neighbours: Taking Beijing as an

Example', *Journal of Jiangsu Administration Institute*, vol. 2007, no. 2, pp. 59–65.

Li, H., Ji, Y. and Chen, T. (2014) 'The roles of different sources of social support on emotional well-being among Chinese elderly', *PloS one*, *9*(3), p.e90051.

Li, H., Peng, J., Yanxu, L. and Yi'na, H. (2017) 'Urbanization impact on landscape patterns in Beijing City, China: A spatial heterogeneity perspective', *Ecological Indicators*, *82*, pp.50-60.

Li, M.Y., Li, M.Y., Zhang, M.Y, Xie, Y., Bian, Y.H., Zhang, M.Y., Yang, Z.H. (2011) Beijing Shi Lao Nian Ren Yu Le Fang Shi Dui Qi Zhu Guan Xing Fu Gan De Ying Xiang [The effect of elderly entertainment styles on their subjective well-being in Beijing]. In: Zhong Guo Lao Nian Xue Za Zhi [Chinese Journal of Gerontology], 31(4): 675-677.

Li, S. M., Zhu, Y. and Li, L. (2012) 'Neighbourhood Type, Gatedness and Residential Experiences in Chinese Cities: A Study of Guangzhou', *Urban Geography*, vol. 33, no. 2, pp. 237–255.

Li, T. and Zhang, Y. (2015) 'Social network types and the health of older adults: Exploring reciprocal associations', Social Science & Medicine, 130, pp.59-68.

Li, X., Zhang, W., Zhang, W., Tao, K., Ni, W., Wang, K., Li, Z., Liu, Q. and Lin, J. (2020) ,Level of physical activity among middle-aged and older Chinese people: evidence from the China health and retirement longitudinal study', *BMC Public Health*, *20*(1), pp.1-13.

Li, X.Y. (2014) Cheng Shi Lao Nian You Hao She Qu Gui Hua Ce Lve Yan Jiu [Urban age-friendly community planning strategy research]. Beijing, China: Zhong Guo Jian Zhu Gong Ye Chu Ban She.

Lin, G.C. (2007) 'Reproducing spaces of Chinese urbanisation: new city-based and land-centred urban transformation', *Urban Studies*, *44*(9), pp.1827-1855.

Lin, J. Y. (2015) Lao Nian Yi Ju Xiang Guan Biao Zhun Gui Fan De Xian Zhuang, Wen Ti Yu Fa Zhan Jian Yi (The Current Situation, Problem and Development Suggestion of Standards Related to Liveable Environment for the Elderly), in Dang, J. W. and Zhou, Y. M. (eds) *China Report of the Development on Liveable Environment for the Elderly 2015*, Beijing, Social Science Literature, pp. 174–189.

Lin, K., and Lv, H.R. (2016) Si Zhong Lao Ling Hua Li Nian Ji Qi Zheng Ce Yun Yi [Four Ideas of

Aging Strategies and Their Policy Implications]. Journal of Zhejiang University (Humanities and Social Sciences), 46(4), pp.136-143.

Lipovská, B. (2013) Assessing observation methods for landscape planning practice in rural villages. *Current Urban Studies*, *1*(04), p.102.

Litwin, H. and Shiovitz-Ezra, S. (2006) 'The association between activity and wellbeing in later life: what really matters?', *Ageing & Society*, *26*(2), pp.225-242.

Liu, C. (2021) 'Research on age-friendly garden design in China based on the case study of WANSHOU Park', In *E3S Web of Conferences* (Vol. 283). EDP Sciences.

Liu, F. and Maitlis, S. (2010) 'Nonparticipant observation', Encyclopedia of case study research, 2, pp.610-612.

Liu, J.E., Tian, J.Y., Yue, P., Wang, Y.L., Du, X.P. and Chen, S.Q. (2015) 'Living experience and care needs of Chinese empty-nest elderly people in urban communities in Beijing, China: A qualitative study', *International Journal of Nursing Sciences*, 2(1), pp.15-22.

Liu, Y.L., and Kou, H.Y. (2019) Shanghai She Qu Hua Yuan Can Yu Shi Kong Jian Wei Geng Xin Wei Zhi Li Ce Lve Yan Jiu [Study on the Strategy of Micro-renewal and Micro-governance by Public Participatory of Shanghai Community Garden]. Chinese Landscape Architecture, 35(12), pp.5-11.

Longhurst, R. (2003) 'Semi-structured interviews and focus groups', Key methods in geography, pp.117-132.

Lovell, R., Husk, K., Cooper, C., Stahl-Timmins, W. and Garside, R. (2015) 'Understanding how environmental enhancement and conservation activities may benefit health and wellbeing: a systematic review', *BMC Public Health*, 15(1).

Lü, J., Fu, W. and Liu, Y. (2016) 'Physical activity and cognitive function among older adults in China: a systematic review', *Journal of sport and health science*, *5*(3), pp.287-296.

Lu, T., Zhang, F. and Wu, F., 2018. Place attachment in gated neighbourhoods in China: Evidence from Wenzhou. *Geoforum*, *92*, pp.144-151.

Luanaigh, C. and Lawlor, B. (2008) 'Loneliness and the health of older people', International Journal of Geriatric Psychiatry, 23(12), pp.1213-1221.

Lui, C.W., Everingham, J.A., Warburton, J., Cuthill, M. and Bartlett, H. (2009) 'What makes a community age-friendly: A review of international literature', *Australasian journal on ageing*, *28*(3), pp.116-121.

Lv, X., Jiang, Y., Sun, Y., Ren, C., Sun, C., Sun, L., Wu, Z. and Zhao, X. (2013) 'Short Form 36-Item Health Survey test result on the empty nest elderly in China: A meta-analysis', Archives of Gerontology and Geriatrics, 56(2), pp.291-297.

Lynch, K. (1984) Good city form. Cambridge, Mass.: MIT Press.

Lynch, K. and Hack, G. (1984) *Site Planning*. 3rd ed. Cambridge, Mass.: MIT Press.

Ma, L. (2002) 'Urban Transformation in China, 1949–2000: A Review and Research Agenda', *Environment and Planning A*, vol. 34, no. 9, pp. 1545–1569.

Malhotra, R., Tareque, M.I., Saito, Y., Ma, S., Chiu, C.T. and Chan, A. (2021) Loneliness and health expectancy among older adults: A longitudinal population-based study. *Journal of the American Geriatrics Society*, *69*(11), pp.3092-3102.

Maier, J.R. and Fadel, G.M. (2009) 'Affordance based design: a relational theory for design', *Research in Engineering Design*, *20*(1), pp.13-27.

Maier, J.R., Fadel, G.M. and Battisto, D.G. (2009) 'An affordance-based approach to architectural theory, design, and practice', *Design Studies*, *30*(4), pp.393-414.

Marcheschi, E., Laike, T., Brunt, D., Hansson, L. and Johansson, M. (2015) 'Quality of life and place attachment among people with severe mental illness', *Journal of Environmental Psychology*, *41*, pp.145-154.

Marešová, P., Mohelská, H. and Kuča, K. (2015) 'Economics aspects of ageing population', *Procedia economics and finance*, *23*, pp.534-538.

Marsella, A.J. (1998) 'Urbanization, mental health, and social deviancy: A review of issues and research', *American Psychologist*, *53*(6), p.624.

Martin, R. and Chen, R. (2020) From Folk to on Mass Dance Practices: The Emergence of Guangchang Wu. In *The People's Dance* (pp. 21-32). Palgrave Macmillan, Singapore.

Marušić, B.G. (2011) 'Analysis of patterns of spatial occupancy in urban open space using behaviour maps and GIS', *Urban design international*, *16*(1), pp.36-50.

Marušić, B.G. (2016) 'Discrepancy between likely and actual occupancies of urban outdoor places', *Urban Forestry & Urban Greening*, *18*, pp.151-162.

Marušić, B.G. and Marušić, D. (2012) 'Behavioural maps and GIS in place evaluation and design', *Application of geographic information systems*, pp.115-138.

Mannarini, T., Tartaglia, S., Fedi, A. and Greganti, K. (2006) 'Image of neighborhood, self-image and sense of community', *Journal of environmental psychology*, *26*(3), pp.202-214.

Manzo, L.C. (2005) For better or worse: Exploring multiple dimensions of place meaning. *Journal of environmental psychology*, *25*(1), pp.67-86.

McCormack, G.R., Rock, M., Swanson, K., Burton, L. and Massolo, A. (2014) 'Physical activity patterns in urban neighbourhood parks: insights from a multiple case study', *BMC Public Health*, *14*(1), pp.1-13.

McFarlane, C. (2011) 'Assemblage and critical urbanism', *City*, *15*(2), pp.204-224.

McHugh, K.E. and Mings, R.C. (1996) 'The circle of migration: Attachment to place in aging', *Annals of the Association of American Geographers*, *86*(3), pp.530-550.

McKhann, G.M., Knopman, D.S., Chertkow, H., Hyman, B.T., Jack Jr, C.R., Kawas, C.H., Klunk, W.E., Koroshetz, W.J., Manly, J.J., Mayeux, R. and Mohs, R.C. (2011) 'The diagnosis of dementia due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease', *Alzheimer's & dementia*, *7*(3), pp.263-269.

McCormack, G.R., Rock, M., Toohey, A.M. and Hignell, D. (2010) 'Characteristics of urban parks associated with park use and physical activity: A review of qualitative research', *Health & place*, *16*(4), pp.712-726.

McGranahan, G. and Satterthwaite, D. (2014) *Urbanisation concepts and trends* (Vol. 220), International Institute for Environment and Development.

McKenzie, F.H. and Jefferson, T. (2007) The relevance of affordance for women" ageing in place". In Changes. Challenges. Choices. Conference proceedings from the inaugural international women and leadership conference (pp. 197-210). Women in Social and Economic Research.

McLeroy, K.R., Bibeau, D., Steckler, A. and Glanz, K. (1988) ,An ecological perspective on health promotion programs', *Health education quarterly*, *15*(4), pp.351-377.

Mehta, K.M., Yaffe, K. and Covinsky, K.E. (2002) 'Cognitive impairment, depressive symptoms, and functional decline in older people', *Journal of the American Geriatrics Society*, *50*(6), pp.1045-1050.

Meijles, E.W., De Bakker, M., Groote, P.D. and Barske, R. (2014) 'Analysing hiker movement patterns using GPS data: Implications for park management', *Computers, Environment and Urban Systems*, *47*, pp.44-57.

Memmott, P. and Keys, C. (2014) Translating the design of behaviour settings for Aboriginal well-being. Society of Architectural Historians, Australia and New Zealand (SAHANZ) Annual Conference, Auckland, New Zealand, 2-5 July 2014. Gold Coast, QLD, Australia: SAHANZ.

Menec, V.H., Means, R., Keating, N., Parkhurst, G. and Eales, J. (2011) 'Conceptualizing age-friendly communities', *Canadian Journal on Aging/La revue canadienne du vieillissement*, *30*(3), pp.479-493.

Michaelson, J., Mahony, S. and Schifferes, J. (2012) Measuring Well-being: A guide for practitioners. New Economics Foundation.

Meyer, C. B. (2001) 'A Case in Case Study Methodology', *Field Methods*, vol. 13, no. 4, pp. 329–352.

Miami-Dade County. (2015) Miami-Dade Age-friendly parks toolkit. Available at: https://agefriendlymiami.org/wp-content/uploads/2015/10/Age-Friendly-Parks-Toolkit.pdf (Accessed: 27 December 2021).

Mik-Meyer, N. (2020) Multimethod Qualitative Research. In *Qualitative Research* (pp. 357-374). SAGE Publications.

Milligan, C., Gatrell, A. and Bingley, A. (2004) ''Cultivating health': therapeutic landscapes and older people in northern England', *Social science & medicine*, *58*(9), pp.1781-1793.

Moore, J.W. (2016) 'What is the sense of agency and why does it matter?', Frontiers in psychology, 7, pp. 1272–1272. doi:10.3389/fpsyg.2016.01272.

Moore, R.C. and Cosco, N.G. (2007) 'What makes a park inclusive and universally designed?: a multi-method approach', In *Open space: People space* (pp. 105-130). Taylor & Francis.

Moore, R.C. and Cosco, N.G. (2010) 'Using behavior mapping to investigate healthy outdoor environments for children and families', Innovative Approaches to Research Excellence in Landscape and Health. New York: Routledge, pp.33-72.

Moos, R.H., Gauvain, M., Lemke, S., Max, W. and Mehren, B. (1979) 'Assessing the social environments of sheltered care settings', *The Gerontologist*, *19*(1), pp.74-82.

Moore, R. and Cosco, N. (2007) What makes a park inclusive and universally designed? A multi- method approach. in C. Ward Thompson and P. Travlou (eds), Open Space: People Space, 85–110, London: Taylor & Francis.

Moran, M., Van Cauwenberg, J., Hercky-Linnewiel, R., Cerin, E., Deforche, B. and Plaut, P. (2014) 'Understanding the relationships between the physical environment and physical activity in older adults: a systematic review of qualitative studies', *International journal of behavioral nutrition and physical activity*, *11*(1), pp.1-12.

Morrow-Howell, N., Hinterlong, J. and Sherraden, M. eds. (2001) '*Productive aging: Concepts and challenges*', Johns Hopkins University Press.

Ng, C.F. (2016) Behavioral mapping and tracking. In: R. Gifford, ed., Research Methods for Environmental Psychology. Chichester: John Wiley & Sons.

Nieboer, A. and Cramm, J. (2017) 'Age-Friendly Communities Matter for Older People's Well-Being', *Journal of Happiness Studies*, *19*(8), pp.2405-2420.

Nishino, T. and Nakatani, S. (2018) 'Model of a community-based care environmental system for "aging in place"–A case study from a historical port town in Japan', *Japan Architectural Review*, *1*(4), pp.504-518.

Nocon, A. and Pearson, M. (2000) 'The roles of friends and neighbors in providing support for older people', *Ageing and Society*, *20*, p.341.

Noon, R.B. and Ayalon, L., 2018. Older adults in public open spaces: Age and gender segregation. *The Gerontologist*, *58*(1), pp.149-158.

Nussbaum, R.L. and Ellis, C.E. (2003) 'Alzheimer's disease and Parkinson's disease', *New*

england journal of medicine, 348(14), pp.1356-1364.

Nusselder, W.J., Looman, C.W.N., Franco, O.H., Peeters, A., Slingerland, A.S. and Mackenbach, J.P. (2008) 'The relation between non-occupational physical activity and years lived with and without disability', *Journal of Epidemiology & Community Health*, *62*(9), pp.823-828.

OECD/World Health Organization (2020) "Ageing", in Health at a Glance: Asia/Pacific 2020: Measuring Progress Towards Universal Health Coverage, OECD Publishing, Paris.

Oktay, D., Rüstemli, A. and Marans, R.W. (2009) 'Neighborhood satisfaction, sense of community, and attachment: Initial findings from Famagusta quality of urban life study', *ITU A/Z Journal*, *6*(1), pp.6-20.

Olsson, A., Lampic, C., Skovdahl, K. and Engström, M. (2013) 'Persons with early-stage dementia reflect on being outdoors: a repeated interview study', *Aging & Mental Health*, *17*(7), pp.793-800.

Orr, N., Wagstaffe, A., Briscoe, S. and Garside, R. (2016) 'How do older people describe their sensory experiences of the natural world? A systematic review of the qualitative evidence', *BMC geriatrics*, *16*(1), pp.1-16.

Ostermann, F.O. (2010) 'Digital representation of park use and visual analysis of visitor activities', *Computers, environment and urban systems*, *34*(6), pp.452-464.

Oswald, F., Hieber, A., Wahl, H. and Mollenkopf, H. (2005) 'Ageing and person–environment fit in different urban neighbourhoods', European Journal of Ageing, 2(2), pp.88-97.

Oswald, F., Jopp, D., Rott, C. and Wahl, H. (2010) 'Is Aging in Place a Resource for or Risk to Life Satisfaction?', *The Gerontologist*, 51(2), pp.238-250.

Pan, Y., Chan, S.H., Xu, Y. and Yeung, K.C. (2019) 'Determinants of life satisfaction and self-perception of ageing among elderly people in China: An exploratory study in comparison between physical and social functioning', *Archives of gerontology and geriatrics*, *84*, p.103910.

Park, K. and Ewing, R. (2017) The usability of unmanned aerial vehicles (UAVs) for measuring park-based physical activity. *Landscape and Urban Planning*, *167*, pp.157-164.

Parra, D.C., Gomez, L.F., Sarmiento, O.L., Buchner, D., Brownson, R., Schimd, T., Gomez, V.

and Lobelo, F. (2010) 'Perceived and objective neighborhood environment attributes and health related quality of life among the elderly in Bogota, Colombia', *Social Science & Medicine*, *70*(7), pp.1070-1076.

Patton, M.Q. (2015) *Qualitative research & evaluation methods : integrating theory and practice*. Fourth edition. Thousand Oaks, California: SAGE.

Peace, S., Kellaher, L. and Holland, C. (2005) *Environment and identity in later life*. McGraw-Hill Education (UK).

Peace, S., Wahl, H.W., Mollenkopf, H. and Oswald, F. (2007) 'Environment and ageing', *Ageing in society*, pp.209-234.

Peng, D. and Fei, W. (2013) 'Productive ageing in China: development of concepts and policy practice', *Ageing International*, *38*(1), pp.4-14.

Peng, X. (2021) 'Coping with population ageing in mainland China', *Asian Population Studies*, *17*(1), pp.1-6.

Peng, X.Z., Lu, M. (2017) Lao Nian Ren Kou Si Wang Gai Lv Shi Dai Bian Qian Yu Lao Nian Ding Yi De Chong Xin Si Kao [The Changes of the Aging Population's Death Probability over Time and Rethinking of the Definition of Age]. *POPULATION & ECONOMICS*. (2), pp. 1-10.

Perez, F.R., Fernandez, G.F.M., Rivera, E.P. and Abuin, J.M.R. (2001) 'Ageing in place: Predictors of the residential satisfaction of elderly', *Social Indicators Research*, *54*(2), pp.173-208.

Perissinotto, C.M., Cenzer, I.S. and Covinsky, K.E. (2012) 'Loneliness in older persons: a predictor of functional decline and death', *Archives of internal medicine*, *172*(14), pp.1078-1084.

Perren, K., Arber, S. and Davidson, K. (2004) ,Neighbouring in later life: The influence of socio-economic resources, gender and household composition on neighbourly relationships', *Sociology*, *38*(5), pp.965-984.

Phelan, E.A. and Larson, E.B. (2002) '"Successful aging"—where next?', *Journal of the American Geriatrics Society*, *50*(7), pp.1306-1308.

Phillips, D.R., Siu, O.L., Anthony, G.O.Y. and Cheng, K.H. (2004) 'Ageing and the urban

environment', In *Ageing and place* (pp. 163-179). Routledge.

Phillips, J., Walford, N., Hockey, A., Foreman, N. and Lewis, M. (2013) 'Older people and outdoor environments: Pedestrian anxieties and barriers in the use of familiar and unfamiliar spaces', *Geoforum*, *47*, pp.113-124.

Phillipson, C. (2004) 'Urbanisation and ageing: Towards a new environmental gerontology', Ageing and Society, 24(06), pp.963-972.

Phillipson, C. (2007) 'The 'elected' and the 'excluded': sociological perspectives on the experience of place and community in old age', *Ageing and society*, *27*(3), pp.321-342.

Phillipson, C. (2010) Ageing and Urban Society: Growing Old in the 'Century of the City'. In: D. Dannefer and C. Phillipson, ed., The SAGE Handbook of Social Gerontology. London: SAGE Publication Ltd, pp.597-606.

Phillipson, C., Bernard, M., Phillips, J. and Routledge, J. (2002) 'The Family and Community Life of Older People: Social Networks and Social Support in Three Urban Areas', Health & Social Care in the Community, 10(1), pp.60-61.

Pleson, E., Nieuwendyk, L.M., Lee, K.K., Chaddah, A., Nykiforuk, C.I. and Schopflocher, D. (2014) Understanding older adults' usage of community green spaces in Taipei, Taiwan. *International journal of environmental research and public health*, *11*(2), pp.1444-1464.

Popov, L. and Chompalov, I. (2012) 'Crossing over: The interdisciplinary meaning of behavior setting theory', International Journal of Humanities and Social Science, 2(19), pp.18-27.

Pretty, G.H., Chipuer, H.M. and Bramston, P. (2003) 'Sense of place amongst adolescents and adults in two rural Australian towns: The discriminating features of place attachment, sense of community and place dependence in relation to place identity', *Journal of environmental psychology*, *23*(3), pp.273-287.

Public Health Agency of Canada (2012) *Age-Friendly Communities In Canada : Community Implementation Guide*.

Quaglino, V., Gounden, Y., Lacot, E., Couvillers, F., Lions, A. and Hainselin, M. (2016) Talk the

talk and walk the walk. Evaluation of autonomy in aging and Alzheimer disease by simulating instrumental activities of daily living: the S-IADL. *PeerJ*, *4*, p.e2351.

Rantakokko, M., Portegijs, E., Viljanen, A., Iwarsson, S., Kauppinen, M. and Rantanen, T. (2017) 'Perceived environmental barriers to outdoor mobility and changes in sense of autonomy in participation outdoors among older people: a prospective two-year cohort study', *Aging & mental health*, *21*(8), pp.805-809.

Rantz, M.J., Phillips, L., Aud, M., Popejoy, L., Marek, K.D., Hicks, L.L., Zaniletti, I. and Miller, S.J. (2011) 'Evaluation of aging in place model with home care services and registered nurse care coordination in senior housing', Nursing Outlook, 59(1), pp.37-46.

Ratcliffe, E. and Korpela, K.M. (2016) 'Memory and place attachment as predictors of imagined restorative perceptions of favourite places', *Journal of Environmental Psychology*, *48*, pp.120-130.

Ratti, C., Frenchman, D., Pulselli, R.M. and Williams, S. (2006) 'Mobile landscapes: using location data from cell phones for urban analysis', *Environment and planning B: Planning and design*, *33*(5), pp.727-748.

Reeve, A., Simcox, E. and Turnbull, D. (2014) 'Ageing and Parkinson's disease: why is advancing age the biggest risk factor?', *Ageing research reviews*, *14*, pp.19-30.

Rantakokko, M. (2011) *Outdoor environment, mobility decline and quality of life among older people* (No. 168). University of Jyväskylä.

Rémillard-Boilard, S. (2020) *Developing age-friendly cities: a public policy perspective*. PhD Thesis. The University of Manchester.

Riemer, J. W. (2004) 'Job relocation, sources of stress, and sense of home', Community, Work & Family, 2, pp.205–217

Rietveld, E. and Kiverstein, J. (2014) A rich landscape of affordances. *Ecological psychology*, *26*(4), pp.325-352.

Righi, V., Sayago, S. and Blat, J. (2015) Urban ageing: technology, agency and community in smarter cities for older people. In *Proceedings of the 7th International Conference on Communities and Technologies*, pp. 119-128.

Ringel, N.B. and Finkelstein, J.C. (1991) 'Differentiating neighborhood satisfaction and neighborhood attachment among urban residents', *Basic and applied social psychology*, *12*(2), pp.177-193.

Roe, J. and Aspinall, P. (2011) 'The emotional affordances of forest settings: an investigation in boys with extreme behavioural problems', *Landscape Research*, *36*(5), pp.535-552.

Rollero, C. and De Piccoli, N. (2010) 'Does place attachment affect social well-being?', *Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology*, *60*(4), pp.233-238.

Ronzi, S., Orton, L., Buckner, S., Bruce, N. and Pope, D. (2020) 'How is respect and social inclusion conceptualised by older adults in an aspiring age-friendly city? A photovoice study in the North-West of England', *International Journal of Environmental Research and Public Health*, *17*(24), p.9246.

Rowe, J.W. and Kahn, R.L. (1987) 'Human aging: usual and successful', *Science*, *237*(4811), pp.143-149.

Rowles, G.D. (1983) 'Place and personal identity in old age: Observations from Appalachia', *Journal of environmental psychology*, *3*(4), pp.299-313.

Rowles, G.D. and Bernard, M.A. (2013) *Environmental gerontology: Making meaningful places in old age*. Springer Publishing Company.

Rubinstein, R.I. and Parmelee, P.A. (1992) Attachment to place and the representation of the life course by the elderly. In Altman I., Low S.M. (eds) *Place Attachment. Human Behavior and Environment (Advances in Theory and Research)*, vol 12. Springer, Boston, MA. *Place attachment* (pp. 139-163). Springer, Boston, MA.

Ryan, G. (2018) 'Introduction to positivism, interpretivism and critical theory', Nurse researcher, 25(4), pp.41-49.

Saar, M. and Palang, H. (2009) 'The dimensions of place meanings', *Living reviews in landscape research*, *3*(3), pp.5-24.

Sabherwal, R. and King, W.R. (1991) 'Towards a theory of strategic use of information resources: an inductive approach', *Information & Management*, *20*(3), pp.191-212.

Safran-Norton, C. (2010) 'Physical Home Environment as a Determinant of Aging in Place for

Different Types of Elderly Households', *Journal of Housing For the Elderly*, 24(2), pp.208-231.

Sallis, J.F., Cervero, R.B., Ascher, W., Henderson, K.A., Kraft, M.K. and Kerr, J. (2006) 'An ecological approach to creating active living communities', Annu. Rev. Public Health, 27, pp.297-322.

Salvi, S.M., Akhtar, S. and Currie, Z. (2006) 'Ageing changes in the eye', *Postgraduate medical journal*, *82*(971), pp.581-587.

Saunders, M., Lewis, P. and Thornhill, A. (2019) Research Methods For Business Students. 8th ed. Harlow: Pearson.

Scannell, L. and Gifford, R. (2010) 'Defining place attachment: A tripartite organizing framework', Journal of environmental psychology, 30(1), pp.1-10.

Scannell, L. and Gifford, R. (2017) 'The experienced psychological benefits of place attachment', *Journal of Environmental Psychology*, *51*, pp.256-269.

Schoggen, P. (1989) *Behavior settings: A revision and extension of Roger G. Barker's ecological psychology*. Stanford University Press.

Seamon, D. (2013) Place attachment and phenomenology. *Place attachment: Advances in theory, methods and applications*, pp.12-22.

Seetoo, C. and Zou, H. (2016) China's guangchang wu: The emergence, choreography, and management of dancing in public squares. *TDR/the drama review*, *60*(4), pp.22-49.

Segal, D.L., Qualls, S.H. and Smyer, M.A. (2018) *Aging and mental health*. John Wiley & Sons.

Sendra, P. (2015) 'Rethinking urban public space: assemblage thinking and the uses of disorder', *City*, *19*(6), pp.820-836.

Seo, H.S., Jeon, K.J., Hummel, T. and Min, B.C. (2009) 'Influences of olfactory impairment on depression, cognitive performance, and quality of life in Korean elderly', *European archives of oto-rhino-laryngology*, *266*(11), pp.1739-1745.

Sereny, M. (2011) 'Living arrangements of older adults in China: The interplay among preferences, realities, and health', *Research on Aging*, *33*(2), pp.172-204.

Shamsuddin, S. and Ujang, N. (2008) 'Making places: The role of attachment in creating the

sense of place for traditional streets in Malaysia', *Habitat international*, *32*(3), pp.399-409.

Shanghai Civil Affairs Bureau Office (2013) *The Shanghai Age-Friendly City Construction Guide*. Available at: https://max.book118.com/html/2018/0419/162093725.shtm (Accessed: 2 July 2017).

Shanghai Working Commission on Ageing (2014) *The Guide of Advancing the Age-Liveable Community Pilot Construction*. Available at: http://www.shmzj.gov.cn/gb/shmzj/node8/node15/node55/node231/node279/u1ai 38334.html (Accessed: 2 July 2018).

Shankar, A., Hamer, M., McMunn, A. and Steptoe, A. (2013) 'Social isolation and loneliness: relationships with cognitive function during 4 years of follow-up in the English Longitudinal Study of Ageing', *Psychosomatic medicine*, *75*(2), pp.161-170.

Shergold, I. (2019) 'Taking part in activities, an exploration of the role of discretionary travel in older people's wellbeing', Journal of Transport & Health, 12, pp.195-205.

Sigmundová, D., El Ansari, W. and Sigmund, E. (2011) 'Neighbourhood environment correlates of physical activity: a study of eight Czech regional towns', *International journal of environmental research and public health*, *8*(2), pp.341-357.

Sim, D. (2019) *Soft City: Building Density for Everyday Life*. Island Press.

Sixsmith, A. and Sixsmith, J. (2008) 'Ageing in place in the United Kingdom', *Ageing International*, *32*(3), pp.219-235.

Smith, A.E. (2009) *Ageing in urban neighbourhoods: Place attachment and social exclusion*. Policy press.

Smith, J.S. and Cartlidge, M.R. (2011) 'Place attachment among retirees in Greensburg, Kansas', *Geographical review*, *101*(4), pp.536-555.

Smith, S.G., Jackson, S.E., Kobayashi, L.C. and Steptoe, A. (2018) 'Social isolation, health literacy, and mortality risk: Findings from the English Longitudinal Study of Ageing', *Health Psychology*, *37*(2), p.160.

Smith, W.R., Moore, R., Cosco, N., Wesoloski, J., Danninger, T., Ward, D.S., Trost, S.G. and Ries, N. (2016) 'Increasing physical activity in childcare outdoor learning

environments: the effect of setting adjacency relative to other built environment and social factors', *Environment and behavior*, *48*(4), pp.550-578.

Sokolec, J. (2015) 'The Meaning of "Place" to Older Adults', *Clinical Social Work Journal*, 44(2), pp.160-169.

Soma, Y., Tsunoda, K., Kitano, N., Jindo, T., Tsuji, T., Saghazadeh, M. and Okura, T. (2017) 'Relationship between built environment attributes and physical function in Japanese community-dwelling older adults', *Geriatrics & gerontology international*, *17*(3), pp.382-390.

Song, P. and Chen, Y. (2015) 'Public policy response, aging in place, and big data platforms: Creating an effective collaborative system to cope with aging of the population', *Bioscience trends*, *9*(1), pp.1-6.

Stafford, M.A.I., Mcmunn, A. and De Vogli, R. (2011) 'Neighbourhood social environment and depressive symptoms in mid-life and beyond', *Ageing & Society*, *31*(6), pp.893-910.

Stanley, M., Moyle, W., Ballantyne, A., Jaworski, K., Corlis, M., Oxlade, D., Stoll, A. and Young, B. (2010) 'Nowadays you don't even see your neighbours': loneliness in the everyday lives of older Australians. *Health & social care in the community*, *18*(4), pp.407-414.

Steels, S. (2015) 'Key characteristics of age-friendly cities and communities: A review', Cities, 47, pp.45-52.

Stephens, C., Szabó, Á., Allen, J. and Alpass, F. (2019) 'Livable environments and the quality of life of older people: An ecological perspective', *The Gerontologist*, *59*(4), pp.675-685.

Stephens, C., Breheny, M. and Mansvelt, J. (2015) 'Healthy ageing from the perspective of older people: A capability approach to resilience', *Psychology & health*, *30*(6), pp.715-731.

Steptoe, A., Deaton, A. and Stone, A. (2014) Subjective wellbeing, health, and ageing. The lancet. Available at: http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(13)61489-0.pdf (Accessed: 17 April. 2018).

Steptoe, A., Shankar, A., Demakakos, P. and Wardle, J. (2013) 'Social isolation, loneliness, and all-cause mortality in older men and women', Proceedings of the National Academy of Sciences, 110(15), pp.5797-5801.

Stewart, J., Browning, C. and Sims, J. (2015) 'Civic Socialising: a revealing new theory about older people's social relationships', *Ageing & Society*, *35*(4), pp.750-764.

Stokols, D. (1992) 'Establishing and maintaining healthy environments: toward a social ecology of health promotion', *American psychologist*, *47*(1), p.6.

Stuart-Hamilton, I. (2012) '*The psychology of ageing: An introduction*', Jessica Kingsley Publishers.

Sturnieks, D.L., St George, R. and Lord, S.R. (2008) 'Balance disorders in the elderly', *Neurophysiologie Clinique/Clinical Neurophysiology*, *38*(6), pp.467-478.

Su, M., Tan, Y.Y., Liu, Q.M., Ren, Y.J., Kawachi, I., Li, L.M. and Lv, J. (2014) 'Association between perceived urban built environment attributes and leisure-time physical activity among adults in Hangzhou, China', *Preventive medicine*, *66*, pp.60-64.

Sugiyama, T. and Ward Thompson, C. (2007) 'Outdoor environments, activity and the well-being of older people: conceptualising environmental support', *Environment and Planning A*, *39*(8), pp.1943-1960.

Sugiyama, T. and Ward Thompson, C. (2008) 'Associations between characteristics of neighbourhood open space and older people's walking', *Urban Forestry & Urban Greening*, 7(1), pp.41-51.

Sugiyama, T., Ward Thompson, C. and Alves, S. (2009) 'Associations between neighborhood open space attributes and quality of life for older people in Britain', *Environment and behavior*, *41*(1), pp.3-21.

Sun, F., Norman, I.J. and While, A.E. (2013) 'Physical activity in older people: a systematic review', *BMC public health*, *13*(1), pp.1-17.

Sun, Z. (2022) A rhythmanalysis approach to understanding the vending-walking forms and everyday use of urban street space in Yuncheng, China. *Urban Studies*, *59*(5), pp.995-1010.

Sussman, R. (2016) Observational Methods. In: R. Gifford, ed., Research methods for

environmental psychology. Chichester: John Wiley & Sons.

Taaffe, D.R. and Marcus, R. (2000) 'Musculoskeletal health and the older adult', *Journal of rehabilitation research and development*, *37*(2), pp.245-254.

Tang, D.W. (2016) Lao Nian Yi Ju Cheng Shi Xu Xian Kong Jian Jian She De Wen Ti Ji Dui Ce [Problems and countermeasures for construct leisure space of elderly livable cities]. In: Dang, J.W., Zhou, Y.M., ed. *China report of the development on livable environment for the elderly (2015)*. Beijing: Social science literature. Pp.97-112.

Tao, C.W. (2020) Guangchang Wu Xian Xiang Yan Jiu [Research on square dance phenomenon]. PhD Thesis. Hunan Normal University.

Tartaglia, S. (2013) 'Different predictors of quality of life in urban environment', *Social Indicators Research*, *113*(3), pp.1045-1053.

Terian, S.K. (1988) 'Creating Architectural Theory: The Role of the Behavioral Sciences in Environmental Design', Journal of Architectural Education: Urban History in the 1980s. Taylor & Francis, pp. 60–61. doi:10.1080/10464883.1988.10758493.

The Central People's Government of the People's Republic of China (2012) Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly. Available at: http://www.gov.cn/flfg/201212/28/content_2305570.htm (Accessed: 20 June 2021).

The Council of the City of New York City Hall. (2009) Age-friendly NYC enhancing our city's livability for older New Yokers. New York. Available at: https://media.nyam.org/filer_public/67/20/67204ef9-a18e-4b3f-b561-34de0fa6b341/nyc_age_friendly_reportenhancing-livability.pdf (Accessed: 14 Jun 2021).

Thomas, D.R. (2006) 'A general inductive approach for analyzing qualitative evaluation data', *American journal of evaluation*, *27*(2), pp.237-246.

Thomas, G. (2011) 'A typology for the case study in social science following a review of definition, discourse, and structure', *Qualitative inquiry*, *17*(6), pp.511-521.

Thomése, F. and Van Tilburg, T. (2000) 'Neighbouring networks and environmental dependency. Differential effects of neighbourhood characteristics on the relative size

and composition of neighbouring networks of older adults in The Netherlands', *Ageing & Society*, *20*(1), pp.55-78.

Tisdale, H. (1942) 'The process of urbanization', *Social Forces.*, *20(3)*, p.311.

Tong, M., Dai, X., Li, Q. and Tian, B. (2005) She Qu De Kong Jian Jie Gou Yu Zhi Neng Zu Zhi – Yi Shang Hai Shi Jiang Ning Lu Jie Dao She Qu Gui Hua Wei Li (A Study on the Spatial and Functional Structure of the Community – A Case Study in Community Planning of Jiangning Street, Shanghai). *Cheng Shi Gui Hua Xue Kan*, vol. 4, no. #, pp. 60–66.

Tu, H., Liao, X., Schuller, K., Cook, A., Fan, S., Lan, G., Lu, Y., Yuan, Z., Moore, J.B. and Maddock, J.E. (2015) Insights from an observational assessment of park-based physical activity in Nanchang, China. *Preventive medicine reports*, *2*, pp.930-934.

United Kingdom, Office for National Statistics. (2021) Population estimates for the UK, England and Wales, Scotland and Northern Ireland: mid-2020. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/ populationestimates/bulletins/annualmidyearpopulationestimates/mid2020#age-structure-of-the-uk-population (Accessed: 13 October 2021).

UK Urban Ageing Consortium. (2014) A Research & Evaluation Framework for Age-friendly Cities. Available at: https://hummedia.manchester.ac.uk/institutes/micra/A%20Research%20and%20Ev aluation%20Framework%20for%20Age-friendly%20Cities_web%20version.pdf (Accesed 14 June 2021).

United Nations, Department of Economic and Social Affairs. (2014) Demographic Yearbook 2014: Table 6. Statistics Division. Available at: http://unstats.un.org/unsd/demographic/products/dyb/dyb2014.htm. (Accessed: 12 Aug 2021).

United Nations. Department of Economic and Social Affairs. (2017) *World Population Ageing: 2017 Highlights*. UN. *Population Division.*

United Nations, Department of Economic and Social Affairs. (2019a) World population prospects 2019: highlights (ST/ESA/SER.A/423). *Population Division.*

United Nations, Department of Economic and Social Affairs. (2019b) *Population Division*

World population prospects 2019 Graphs / Profiles. Available at:
https://population.un.org/wpp/Graphs/Probabilistic/PopPerc/60plus/156 (Accessed:
2 September 2021).

United Nations, Department of Economic and Social Affairs. (2020a) *Population Division*
World Population Ageing 2020 Highlights: Living arrangements of older persons
(ST/ESA/SER.A/451).

United Nations, Department of Economic and Social Affairs. (2020b) Population Division
World Population Ageing 2019 (ST/ESA/SER.A/444).

Van Cauwenberg, J., De Bourdeaudhuij, I., Clarys, P., Nasar, J., Salmon, J., Goubert, L. and
Deforche, B. (2016) 'Street characteristics preferred for transportation walking
among older adults: a choice-based conjoint analysis with manipulated
photographs', *International journal of behavioral nutrition and physical activity*,
13(1), pp.1-17.

Vanderhorst, R.K. and McLaren, S. (2005) 'Social relationships as predictors of depression
and suicidal ideation in older adults', *Aging & mental health*, *9*(6), pp.517-525.

Van de Poel, E., O'Donnell, O. and Van Doorslaer, E. (2012) 'Is there a health penalty of
China's rapid urbanization?', *Health economics*, *21*(4), pp.367-385.

van den Berg, P., Arentze, T. and Timmermans, H. (2015) 'A multilevel analysis of factors
influencing local social interaction', *Transportation*, *42*(5), pp.807-826.

van Dijk, H.M., Cramm, J.M., Van Exel, J.O.B. and Nieboer, A.P. (2015) 'The ideal
neighbourhood for ageing in place as perceived by frail and non-frail community-
dwelling older people', *Ageing & Society*, *35*(8), pp.1771-1795.

van Dyck, D., Sallis, J.F., Cardon, G., Deforche, B., Adams, M.A., Geremia, C. and De
Bourdeaudhuij, I. (2013) Associations of neighborhood characteristics with active
park use: an observational study in two cities in the USA and Belgium. *International*
journal of health geographics, *12*(1), pp.1-9.

van Hees, S., Horstman, K., Jansen, M. and Ruwaard, D. (2017) 'Photovoicing the
neighbourhood: Understanding the situated meaning of intangible places for ageing-
in-place', *Health & place*, 48, pp.11-19.

van Hoof, J., Kazak, J.K., Perek-Białas, J.M. and Peek, S. (2018) 'The challenges of urban ageing: Making cities age-friendly in Europe', *International Journal of Environmental Research and Public Health*, *15*(11), p.2473.

van Hoof, J., Kort, H., Rutten, P. and Duijnstee, M. (2011) 'Ageing-in-place with the use of ambient intelligence technology: Perspectives of older users', *International Journal of Medical Informatics*, 80(5), pp.310-331.

Van Nes, F., Abma, T., Jonsson, H. and Deeg, D. (2010) 'Language differences in qualitative research: is meaning lost in translation?', *European journal of ageing*, *7*(4), pp.313-316.

Vasunilashorn, S., Steinman, B.A., Liebig, P.S. and Pynoos, J. (2012) 'Aging in place: Evolution of a research topic whose time has come', *Journal of Aging Research*, *2012*.

Verbrugge, L.M., Lepkowski, J.M. and Imanaka, Y. (1989) 'Comorbidity and its impact on disability', *The Milbank Quarterly*, pp.450-484.

Villar, F. (2012) 'Successful ageing and development: The contribution of generativity in older age', *Ageing & Society*, *32*(7), pp.1087-1105.

Walker, A. (2002) 'A strategy for active ageing', International social security review, 55(1), 121-139.

Walker, R.B. and Hiller, J.E. (2007) 'Places and health: A qualitative study to explore how older women living alone perceive the social and physical dimensions of their neighbourhoods', *Social Science & Medicine*, *65*(6), pp.1154-1165.

Watt, R.G., Heilmann, A., Sabbah, W., Newton, T., Chandola, T., Aida, J., Sheiham, A., Marmot, M., Kawachi, I. and Tsakos, G. (2014) 'Social relationships and health related behaviors among older US adults', *BMC public health*, *14*(1), pp.1-11.

Wang, D. and Li, S. (2004) 'Housing Preferences in a Transitional Housing System: The Case of Beijing, China', *Environment and Planning A*, vol. 36, no. 1, pp. 69–87.

Wang, H.X., Karp, A., Winblad, B. and Fratiglioni, L. (2002) 'Late-life engagement in social and leisure activities is associated with a decreased risk of dementia: a longitudinal study from the Kungsholmen project', American journal of epidemiology, 155(12), pp.1081-1087.

Wang, L.C., Wu, R.W., and Li, W. (2017) *Zhong Guo Cheng Shi Qun Ren Kou Lao Ling Hua Shi Kong Ge Ju* [Spatial and Temporal Patterns of Population Ageing in China's Urban Agglomerations]. ACTA GEOGRAPHICA SINICA, 72(6), pp. 1001-1016.

Wang, L.L. (2013) *Zhong Guo Ju Jia Yang Lao Zheng Ce Fa Zhan Li Cheng Fen Xi* [Study on the Development of China's Aging-in-place Policy]. Northwest population, 34(2), pp. 66-72.

Wang, Q. (2015) Guangchang Wu: An ethnographic study of dance in public spaces. *MPhil Thesis. Chinese University of Hong Kong*.

Wang, X. and Rodiek, S. (2019) 'Older adults' preference for landscape features along urban park walkways in Nanjing, China', *International journal of environmental research and public health*, *16*(20), p.3808.

Wang, X.Q. and Chen, P.J. (2014) 'Population ageing challenges health care in China',*The lancet*, *383*(9920), p.870.

Wang, Y. P. (1995) 'Public Sector Housing in Urban China 1949–1988: The Case of Xian', *Housing Studies*, vol. 10, no. 1, pp. 57–82.

Wang, Y. P. and Murie, A. (1996) 'The Process of Commercialisation of Urban Housing in China', *Urban Studies*, vol. 33, no. 6, pp. 971–989.

Wang, Y. P. and Murie, A. (2000) 'Social and Spatial Implications of Housing Reform in China', *International Journal of Urban and Regional Research*, vol. 24, no. 2, pp. 397–417.

Wahl, H. and Oswald, F. (2010) Environmental Perspectives on Ageing. In: D. Dannefer and C. Phillipson, ed., *The SAGE Handbook of Social Gerontology.* London: SAGE Publications Ltd, pp.111-124.

Ward Thompson, C. (2013) 'Activity, exercise and the planning and design of outdoor spaces', *Journal of Environmental Psychology*, *34*, pp.79-96.

WeChat Media Platform (2019) *Tong Ming's Lecture: Can the Community be Planned?*. Available at https://mp.weixin.qq.com/s/W75v8wABkC21iZhmJoTTJg (Accessed: 3 March 2021).

Welford, C., Murphy, K., Rodgers, V. and Frauenlob, T. (2012) 'Autonomy for older people in

residential care: a selective literature review', *International Journal of Older People Nursing*, *7*(1), pp.65-69.

Wen, C., Albert, C. and Von Haaren, C. (2018) ,The elderly in green spaces: Exploring requirements and preferences concerning nature-based recreation', *Sustainable cities and society*, *38*, pp.582-593.

Whitley, R. (1984) 'The scientific status of management research as a practically-oriented social science', *Journal of management studies*, *21*(4), pp.369-390.

Whyte, W.H. (1980) *The social life of small urban spaces*. New York: Project for Public Spaces.

Wiles, J.L., Allen, R.E., Palmer, A.J., Hayman, K.J., Keeling, S. and Kerse, N. (2009) 'Older people and their social spaces: A study of well-being and attachment to place in Aotearoa New Zealand', *Social Science & Medicine*, *68*(4), pp.664-671.

Wiles, J., Leibing, A., Guberman, N., Reeve, J. and Allen, R. (2011). 'The Meaning of "Aging in Place" to Older People', *The Gerontologist*, 52(3), pp.357-366.

Wilkinson, S. (2000) 'Women with breast cancer talking causes: Comparing content, biographical and discursive analyses', *Feminism & Psychology*, *10*(4), pp.431-460.

Williams, D.R. and Vaske, J.J. (2003) 'The measurement of place attachment: Validity and generalizability of a psychometric approach', *Forest science*, *49*(6), pp.830-840.

Withagen, R., De Poel, H.J., Araújo, D. and Pepping, G.J. (2012) 'Affordances can invite behavior: Reconsidering the relationship between affordances and agency', *New Ideas in Psychology*, *30*(2), pp.250-258.

Wolff, J., Starfield, B. and Anderson, G. (2002) 'Prevalence, Expenditures, and Complications of Multiple Chronic Conditions in the Elderly', *Archives of Internal Medicine*, 162(20), pp.2269.

Wood, M., Daly, J., Miller, J. and Roper, M. (1999) 'Multi-method research: An empirical investigation of object-oriented technology', Journal of Systems and Software, 48(1), pp.13-26.

World Health Assembly, 69. (2016) The Global strategy and action plan on ageing and health 2016–2020: towards a world in which everyone can live a long and healthy life.

World Health Organization. https://apps.who.int/iris/handle/10665/252783

World Health Organization. (1946) *Preamble to the Constitution of the World Health Organization as Adopted by the International Health Conference, New York, 19–22 June 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.* Available at: https://hero.epa.gov/hero/index.cfm/reference/details/reference_id/80385 [Accessed: 02 September 2021].

World Health Organization. (1999) *Ageing: Exploding the myths* (No. WHO/HSC/AHE/99.1). World Health Organization.

World Health Organization. (2002) *Active ageing: A policy framework* (No. WHO/NMH/NPH/02.8). World Health Organization.

World Health Organization, Regional Office for Europe & Centre for Urban Health. (2003) Phase IV (2003-2007) of the WHO Healthy Cities Network in Europe: goals and requirements. Copenhagen. https://apps.who.int/iris/handle/10665/107539

World Health Organization. (2007a) *Global age-friendly cities: A guide*. World Health Organization.

World Health Organization. (2007b) Checklist of essential features of age-friendly cities. *World Health Organization*.

World Health Organization. (2015) World report on ageing and health. Geneva: WHO Press. Available at: http://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf?sequence=1 (Accessed: 16 April 2018).

World Health Organization. (2017) *Age-friendly environments in Europe A handbook of domains for policy action*. Copenhagen: WHO Regional Office for Europe. Available at: http://www.euro.who.int/__data/assets/pdf_file/0011/359543/AFEE-handbook.PDF?ua=1 (Accessed: 13 November 2018).

World Health Organization. (2021) Decade of healthy ageing: baseline report: summary.

World Health Organization, South-East Asia Regional Office. (2018) Promotion of mental

well-being. Available at:
http://www.searo.who.int/entity/mental_health/promotion-of-mental-well-being/en/ (Accessed: 5 December 2018).

Wu, F. (2005) 'Rediscovering the "Gate" Under Market Transition: From Work-Unit Compounds to Commodity Housing Enclaves', *Housing Studies*, vol. 20, no. 2, pp. 235–254.

Wu, X.L., Qu, J.Y. (2015) Zhong Guo Lao Nian Yi Ju Huan Jing Jian She Zou Xiang Shi Dai Qiang Yin [Building a livable environment for the elderly in China plays a strong voice of the times] In Dang, J.W., Zhou, Y.M.,. (Eds.), *China report of the development on livable environment for the elderly (2015)* (pp. 001–028). Social sciences academic press (China).

Wu, Y. (2015) *The research on adaptability of daily space and environment for the aged in Chongqing city communities.* PhD thesis. Chongqing University. (Accessed 03 December 2018). Available at:
http://www.wanfangdata.com.cn/details/detail.do?_type=degree&id=D804771

Wu, Y.T., Prina, A.M., Jones, A., Matthews, F.E., Brayne, C. and CFAS, M. (2015) 'Older people, the natural environment and common mental disorders: cross-sectional results from the Cognitive Function and Ageing Study', *BMJ open*, *5*(9), p.e007936.

Wu, Z., Sun, L., Sun, Y., Zhang, X., Tao, F. and Cui, G. (2010) 'Correlation between loneliness and social relationship among empty nest elderly in Anhui rural area, China', Aging & Mental Health, 14(1), pp.108-112.

Xie, B., Zheng Y., Li Z., An Z. (2019) ,Planning Model for the Elderly Outdoor Space from the Perspective of Behavior Activities: A Case in Wuhan', *Modern Urban Research,* p.30-37.

Xie, L. (2018) 'Age-Friendly Communities and Life Satisfaction Among the Elderly in Urban China', *Research on Ageing*, vol. 40, no. 9, pp. 1–23.

Xiong, X., Liu, L., Peng, Z. and Wu, H. (2021) 'Physical Activities in Public Squares: The Impact of Companionship on Chinese Residents' Health', *Land*, *10*(7), p.720.

Xu, H. (2019) 'Physical and mental health of Chinese grandparents caring for grandchildren

and great-grandparents', *Social Science & Medicine*, *229*, pp.106-116.

Xu, Y., Zhou, D., Liu, K. (2019) Lao Nian Ren Shi Kong Jian Xing Wei Ke Shi Hua Yu She Qu Jian Kang Yi Ju Huan Jing [Research on the elderly space-time behavior visualization and community healthy livable environment]. Beijing: Architectural Journal, pp. 90-95.

Yan, B., Gao, X. and Lyon, M. (2014) 'Modelling Satisfaction Amongst the Elderly in Different Chinese Urban Neighbourhoods', *Social Science & Medicine*, vol. 118, no. #, pp. 127–134.

Yang, S.H., Zhao, Y., Lin, J. (2017) Guan Yu Wo Guo Lao Nian Ren Kou Jie Ding Biao Zhun De Yi Dian Si Kao [A little reflection on the criteria for defining the elderly population in China]. *Northwest Population,* 38(5), pp.77-83.

Yang, Y., Evandrou, M. and Vlachantoni, A. (2021) 'The impact of living arrangements and intergenerational support on the health status of older people in China: are rural residents disadvantaged compared to urban residents?', *Ageing & Society*, pp.1-26.

Yao, H.S., Zhou, C.S., Huang, G.Z., Chen, K.L., Shao, X.W. (2019) Kong Jian De Li Liang: Guang Chang Wu De She Hui Wen Hua Yi Yi Yu Di Fang Ren Tong Xiao Ying [The power of space: Socio-cultural implication of square dancing and its effects of place identity]. GEOGRAPHICAL RESEARCH, 38(5).

Yeh, K.H. (2003) 'The beneficial and harmful effects of filial piety: An integrative analysis', *Progress in Asian Social Psychology: Conceptual and Empirical Contributions: Conceptual and Empirical Contributions*, *42*, pp.67-82.

Yi, C. D., Zhang, C., Wu, S. P., Gao, M. and Liang, H. (2014) 2000–2010 Nian Bei Jing Shi Lao Nian Ren Kou Kong Jian Fen Bu Ji Qi Bian Dong Yan Jiu (Study on Spatial Distribution and Changes of the Elderly Population in Beijing from 2000 to 2010). *Urban Development Studies*, vol. 21, no. 2, pp. 66–71.

Yin, R. (2018) *Case Study Research And Applications: Design And Methods*. 6th ed. Los Angeles: SAGE.

Yin, R. K. (2009) *Case Study Research: Design and Methods*, 4th edn, Thousand Oaks, CA, SAGE.

Yu, Y.F. (2019) *Cong Chuan Tong Ju Zhu Qu Gui Hua Dao She Qu Sheng Huo Quan Gui Hua*

(From traditional residential area planning to neighbourhood life circle planning), City Planning Review 43(5), pp. 17-22

Yoo, S. and Kim, D.H. (2017) 'Perceived urban neighborhood environment for physical activity of older adults in Seoul, Korea: a multimethod qualitative study', *Preventive medicine*, *103*, pp.S90-S98.

Yu, J. and Rosenberg, M.W. (2020) 'Aging and the changing urban environment: The relationship between older people and the living environment in post-reform Beijing, China', *Urban Geography*, *41*(1), pp.162-181.

Yu, R., Wang, D., Leung, J., Lau, K., Kwok, T. and Woo, J. (2018) 'Is Neighborhood Green Space Associated With Less Frailty? Evidence From the Mr. and Ms. Os (Hong Kong) Study', *Journal of the American Medical Directors Association*, 19(6), pp.528-534.

Yu, Y., and Tian, F. (2019) *Mian Xiang Lao Ling Hua She Hui De Cheng Shi Ying Dui (Urban Countermeasures for an Ageing Society)*, Beijing, Science Press.

Yu, Y. and Wang, Q. (2018) *Jian Kang Dao Xiang Xia de Lao Nian Yi Ju Huan Jing JIan She* [International literature review of old-age-friendly living environment and its enlightenment]. Urbanism and Architecture, p.14-19.

Yung, E.H., Conejos, S. and Chan, E.H. (2016) 'Social needs of the elderly and active aging in public open spaces in urban renewal', *Cities*, *52*, pp.114-122.

Zeisel, J. (1981) '*Inquiry by design - tools for environment behaviour', Cambridge: Cambridge UP.*

Zeisel, J. (1984) *Inquiry by design: Tools for environment-behaviour research* (No. 5). CUP archive.

Zeiss, A.M., Lewinsohn, P.M., Rohde, P. and Seeley, J.R. (1996) 'Relationship of physical disease and functional impairment to depression in older people', *Psychology and Aging*, *11*(4), p.572.

Zeitler, E., Buys, L., Aird, R. and Miller, E. (2012) 'Mobility and active ageing in suburban environments: Findings from in-depth interviews and person-based GPS tracking', *Current gerontology and geriatrics research*, *2012*.

Zhai, Y. and Baran, P.K. (2017) 'Urban park pathway design characteristics and senior

walking behavior', *Urban forestry & urban greening*, 21, pp.60-73.

Zhai, Y., Li, K. and Liu, J. (2018) 'A conceptual guideline to age-friendly outdoor space development in China: How do Chinese seniors use the urban comprehensive park? A focus on time, place, and activities', *Sustainability*, *10*(10), p.3678.

Zhai, Z.W., Liu, W.L. (2019) Cong Gong Neng Fa Hui De Jiao Du Ding Yi Lao Nian: Dui Lao Nian Ding Yi Yu Jian Kang Ce Liang De Fan Si Yu Tan Tao [The Discussion on the Definition of"Elderly"and the Health Measurement:From the Perspective of Functional Ability]. *CHINA SPORT SCIENCE AND TECHNOLOGY*, 55(10), pp.3-9.

Zhang, H., Chen, B., Sun, Z. and Bao, Z. (2013) 'Landscape perception and recreation needs in urban green space in Fuyang, Hangzhou, China', *Urban Forestry & Urban Greening*, *12*(1), pp.44-52.

Zhang, H., Matsuoka, R.H. and Huang, Y.J. (2018) 'How do community planning features affect the place relationship of residents? An investigation of place attachment, social interaction, and community participation', *Sustainability*, *10*(8), p.2726.

Zhang, J. (2006) Lao Nian Ren She Qu Hu Wai Kong Jian Shi Ying Xing Yan Jiu [Study on compatibility of senior citizen in outdoor space of community]. MA Dissertation, Beijing Forestry University.

Zhang, P., Ji, J. and Guan, T. (2019) Jian Kang Shi Jiao Xia Dui Lao Nian Yi Ju Huan Jing Jian She Xian Zhuang De Si Kao [Thoughs on the current age-livable environment construction situation from the health perspective]. In: Zhong Guo Lao Nian Jian Kang Yan Jiu Bao Gao (2018) [*Annual report on elderly health in China (2018)*]. Beijing: Social sciences academic press (China).

Zhang, Y., Li, Y., Liu, Q. and Li, C. (2014) 'The built environment and walking activity of the elderly: an empirical analysis in the Zhongshan metropolitan area, China', *Sustainability*, *6*(2), pp.1076-1092.

Zhang, W. and Lawson, G. (2009) 'Meeting and greeting: Activities in public outdoor spaces outside high-density urban residential communities', *Urban Design International*, *14*(4), pp.207-214.

Zhang, X. Q. (2000) 'Housing Reform and the New Governance of Housing in Urban China',

International Journal of Public Sector Management, vol. 13, no. 6, pp. 519–525.

Zhao, D.X., Han, Z.L., and Wang, L. (2017) Zhong Guo Lao Nian Ren Kou Fen Bu De Ji Shu Ge Ju Ji Qi Xing Cheng Ji Zhi [Distribution pattern and formation mechanism of the elderly population in China]. Beijing: Acta Geographica Sinica, *72*(10), pp.1762-1775.

Zhao, M. and Zhao, W. (2003) *She Qu Fa Zhan Gui Hua, Li Lun Yu Shi Jian (Community Development and Planning, Theory and Practice)*, Beijing, Zhong Guo Jian Zhu Gong Ye Chu Ban She.

Zhao, W.M., LI, C.D., You, J.Y. (2021) Cheng Shi Gong Yuan Shi Lao Yun Dong Huan Jing Ying Xiang Yao Su Ju Lei Yan Jiu [Clustering Study on the Influencing Factors of Elderly-oriented Sports Environment in Urban Parks]. Beijing: Chinese Landscape Architecture,37(05), pp.50-55.

Zhou, Y.M., Li, G.L. (2018) Shi Lao Jia Zhuang Tu Ji, Cong 9 Ge Yuan Ze Dao 60 Tiao Yao Dian [Graphical Book for Age-friendly Housing, From 9 principles to 60 essentials]. Beijing: China Architecture & Building Press.

Zhou, Y.M., Qin, L. (2018) Shi Lao She Qu Huan Jing Ying Jian Tu Ji, Cong 8 Ge Yuan Ze Dao 50 Tiao Yao Dian [Graphical Book for Age-friendly Community, From 8 principles to 50 essentials]. Beijing: China Architecture & Building Press.

Zhou, J. and Walker, A. (2021) The impact of community care services on the preference for ageing in place in urban China. *Health & Social Care in the Community*, *29*(4), pp.1041-1050.

Zhou, P., Grady, S.C. and Chen, G. (2017) How the built environment affects change in older people's physical activity: A mixed-methods approach using longitudinal health survey data in urban China. *Social Science & Medicine*, *192*, pp.74-84.

Ziegler, F. and Schwanen, T. (2011) ,'I like to go out to be energised by different people': an exploratory analysis of mobility and wellbeing in later life', Ageing and Society, 31(05),pp.758-781.

Zhu, W., Chi, A. and Sun, Y. (2016). 'Physical activity among older Chinese adults living in urban and rural areas: A review', Journal of Sport and Health Science, 5(3), pp.281-286.

Zhu, Y., Breitung, W. and Li, S. (2012) 'The Changing Meaning of Neighbourhood Attachment in Chinese Commodity Housing Estates: Evidence from Guangzhou', *Urban Studies*, vol. 49, no. 11, pp. 2439–2457.

Zunzunegui, M.V., Beland, F. and Otero, A. (2001) 'Support from children, living arrangements, self-rated health and depressive symptoms of older people in Spain', *International Journal of Epidemiology*, *30*(5), pp.1090-1099.

Appendix

Appendix Table 1

Appendix Table 1 The comparison between three types of ageing models

(Translate from Yu and Tian, 2019, p.75)

Ageing model types	Benefits	Shortcomings
Ageing-at-home	Older people stay in their familiar living environment and social relations, get family care and spiritual consolation, can arrange their lives according to their own wishes, and can maximize their privacy and independence.	Lack of professional aged care and medical services. Difficult to cope with the decline of self-care ability, causing a burden on family members.
Ageing-in-community	Can save social and economic capital, make full use of community management, volunteer service and family support, make full use of community culture, sports, education and care facilities, have abundant opportunities for social participation, and convenient access to diversified services.	Difficult to achieve high-quality and equal services at this stage, due to limited manpower, material and financial resources. A clear system and corresponding technical specifications have not yet been formed, and it is still difficult to integrate service resources, lacking a stable source of funds, and lacking standardization of service quality.
Ageing-in-care facilities	It is convenient to obtain professional medical, nursing and rehabilitation services, and provide all-around life care to reduce the burden on family members.	High construction cost and other infrastructure investment, Older people are separated from their original social network, the freedom and privacy of daily life are reduced, and mental health issues are common.

Appendix Table 2

Appendix Table 2 The needs for the living environment caused by the decline of the ability level of older people

(Translate from Yu and Tian, 2019, p.164)

The physiological and psychological changes of older people	Activity and living needs	The needs for the living environment		
The decline of various ability levels	Safe, Health, Convenience, Comfort	Barrier-free, Inclusive		
		Housing	**Neighbourhood**	**City**
Limbs are stiff and deline in coordination ability	1. Safe activities to avoid falling injuries 2. Can live independently, or need to use assistant facilities or other people's help 3. Daily operation can be performed in standing or sitting position	1. Handrails are designed for passing and activity spaces 2. Use non-slip, non-hard, non-breakable materials		
		3. Reduce ground height difference or use ramp 4. The size and location of functional space, furniture and facilities are also suitable for mobility aids and wheelchair users		
Slow movement and decline in physical capacity	1. Active in small areas 2. Can active conveniently and with less energy 3. Have sufficient reaction time	1. Low stories or have lift or elevator to help go upstairs or downstairs	2. Arrange service facilities centralised and provides door-to-door services	3. Good accessibility of city service facilities and activity spaces
			4. Road and transportation facilities are suitable for older people walking and use safely	
Decline in sensory function	1. Make environmental compensation and protection for the decline of vision, hearing and smell 2. Somatosensory temperature remains comfortable and stable	1. Dangerous equipment has safety monitoring		
		2. Ensure sufficient natural light or artificial lighting indoors and outdoors 3. Various indications, alarms and switches use various obvious sensing methods 4. Maintain comfortable sound, light and thermal environment through layout selection or use equipment		
Memory loss and slow response	1. Able to identify and remember active paths and spaces 2. Various operations are easy to learn 3. Appropriate stimulation of external environment changes		1. The community or the activity space for older people has obvious directionality and identification	
		2. Indoor, urban furniture, equipment or service facilities are easy to use 3. Use electronic devices or landscapes to create an abundant environment		
Psychological stress and poor spirit states	1. Pleasant and harmonious living atmosphere 2. Able to carry out activities and relax in a comfortable environment 3. Have the opportunity to communicate with the outside world and relieve emotions	1. The living room has a good orientation and soft environment color		
			2. Neighbourhood and city have abundant parks and green spaces	
		3. Provide various rest and activity spaces and facilities		

Appendix Table 3

Appendix Table 3 The public space aspect within the age-friendly initiatives in different countries

Proposers	Age-friendly initiatives related to public/outdoor spaces
WHO (2007b)	· Public areas are clean and pleasant. · Green spaces and outdoor seating are sufficient in number, well-maintained and safe. · Pavements are well-maintained, free of obstructions and reserved for pedestrians. · Pavements are non-slip, are wide enough for wheelchairs and have dropped curbs to road level. · Pedestrian crossings are sufficient in number and safe for people with diff erent levels and types of disability, with nonslip markings, visual and audio cues and adequate crossing times. · Drivers give way to pedestrians at intersections and pedestrian crossings. · Cycle paths are separate from pavements and other pedestrian walkways. · Outdoor safety is promoted by good street lighting, police patrols and community education. · Services are situated together and are accessible. · Special customer service arrangements are provided, such as separate queues or service counters for older people. · Buildings are well-signed outside and inside, with sufficient seating and toilets, accessible elevators, ramps, railings and stairs, and non-slip floors. · Public toilets outdoors and indoors are sufficient in number, clean, well-maintained and accessible.
The Council of the City of New York City Hall (2009)	**Safe & Age-Friendly Public Spaces** · Increase seating in bus shelters. · Install public restrooms at key locations citywide. · Create new, pedestrian friendly public spaces while calming traffic. · Redesign street intersections at key locations citywide to improve safety for older New Yorkers. · Identify age-friendly parks and encourage older adults to utilize them.
Miami-Dade County (2015)	**Area surrounding the park (1/4'mile'radius)** · Signs indicating the park location. · Number of entrances. · Number of public transit stops are there in front or in close proximity to the park. · Parking. · Sidewalks on the roads within 1⁄4 mile radius surrounding the park. · Sidewalks free of obstructions, wide enough and with curb cuts adequate for wheelchair users. · Crosswalks on roads surrounding the park. · Shaded areas within a 1⁄4 mile radius surrounding the park. · Outdoor seating areas with hand rests within a 1⁄4 mile radius of the park.
Hamilton Council On Aging (2021)	· Provide sufficient seating and shelters. · Provide directional signage and space use guidelines that have large graphics and symbols in clear colour contrast to the background, are easy to read and situated in high visibility areas. · Ensure that sidewalks, bicycle paths and trails are accessible for individuals with mobility challenges. · Provide safe, clean, accessible and well-maintained public washrooms, including gender-neutral washrooms.

Appendix Table 4

Appendix Table 4 The system of age-friendly neighbourhood outdoor space' factors

(Translate from Yu and Tian, 2019, p206-207)

Type	Age-friendly environmental factors	Technical measures
Activity space	Public activity space	The activity space within neighbourhood parks, pleasant gardens and concentrated green spaces should not be less than 10% of the total coverage area.
	Older people's outdoor exercise space	The construction area should not be less than 150 square meters. The service radius should be smaller than 300 meters.
	Older people's exercise facilities	Including outdoor exercise facilities, croquet court, exercise path, jogging path, message path, etc.
Road and traffic environment	Road system	Encouraging to separate the pedestrian and vehicle, and separate the fast and slow path at the entrance.
	Static traffic facilities	The vehicle parking rate should not be less than 0.5. Ground parking should not exceed 30%.
	Pedestrian environment	Pedestrian width should be wider than 1.5 meters, advisable to reach 2 meters. The slope should be controlled below 2.5%, and no larger than 5%.
Green and blue space	Green system	The ratio of green space in new residential communities should be no less than 35%. Form a green space system in various levels of living circles.
	Residential green space	Give consideration to the principle of functionality and appreciation, which can be combined with activity space.
	Water environment	Approachable water depth should not exceed 0.6 meters, preferably 0.3 meters. Non-slip materials and corresponding handrails should be used at the edge of the water body.
	Road green space	Mainly used for separation and protection in a suitable height. Do not limit visibility, and avoid forming blind areas with danger.
	Plant configuration	Reflect the beautify, ecological, and healthy principle.
Environmental facilities	Signage system	Have clear directionality and identifiability, located in a position easily seen by older people. Combined with the layout of the community, and forms signages of public space and residential buildings that are easy to remember and identify.
	Shelter facilities	Improve the climate adaptability of the site by using shelter facilities such as wind and rain corridor, pavilion and film.
	Rest facilities	Benches or other rest facilities should be set up every 100 meters on the pedestrian path. The activity space is recommended to use the centripetal layout for the convenience of the communications between older people.
	Public toilet	A public toilet should be set up within a 5-minute walking distance, which can be combined with public activity space or public service facilities.
	Lighting facilities	Reflect safety as the first priority, take into account the principle of comfort or gentleness, and have sufficient lighting at night.
	Drinking water facility	Residential communities with possibilities should set drinking water facilities around the central activity space.
Barrier-free facilities	Disabled ramp	Activity space, pedestrian paths, indoor and outdoor entrances that have different heights should set up ramps, or set up barrier-free by the side of stairs.
	Site and road surface	Keep the surface as flat as possible, and choose non-slip and non-reflective pavement. Materials and colors can be used to distinguish sites.
	Handrails	Set up at least one handrail in the place where there is a height difference, in activity space and near water. The height of the handrail should be consistent with the habits of elderly people who are walking or using wheelchairs.
Physical environment	Sound environment	The noise of the outdoor environment in residential areas should be ≤ 55 dB (A) in the daytime, ≤ 45 dB(A) at night.
	Sunlight environment	At least one-third of the activity area should be outside the building sunshine shadow line.
	Wind environment	Follow the principle of benefiting natural ventilation in summer and keeping out cold wind in winter.

Appendix Table 5

The complete list of observed older people's activities in all observation sites and corresponding symbols in behaviour mappings (Source: Author)

Code	Behaviour	Male	Female	Male with child	Female with child	Male with wheelchair	Female with wheelchair
A	Passing-through						
A1	Walking	□	○	▫	⊙	▣	◎
A2	Walking with a dog	■	●	■	●	■	●
A3	Passing through by bicycle (electromobile)	▫	○	▫	⊙	▣	◎
A4	Running	□	○				
A5	Walking with mobility aids	□	○				
A6	Walking with a pram	□		▫	○		
A7	Passing through on wheelchair					■	●
B	On-site						
B1	Doing exercises	□	○	▫	○	▣	◎
B2	Standing and watching (objects)	□	○	□	○	▣	◎
B3	Sitting and watching (objects)	■	●	■	●	■	◉
B4	Dancing	■	●				
B5	Sitting and chatting	■	●	■	●	■	◎
B6	Standing and chatting	■	●	■	●	■	●
B7	Shopping	□	○	▫	⊙		◎
B8	Kicking shuttlecock	■	○		○		
B9	Taking care of plants	■					
B10	Playing with children			■	●		◉
B11	Practising Tai chi	■	●				
B12	Singing	■	●				
B13	Sweaping the road	■					
B14	Airing clothes	■	●				
B15	Playing table tennis	■	●	■			
B16	Playing badminton	■	●		●		
B17	Flying kite	■	●				
B18	Playing basketball	■					
B19	Playing chess (or cards)	□	○		○	▣	◎
B20	Picking fruit	■	●				
B21	Standing and watching (people)	■	●	■	●		
B22	Sitting and watching (people)	■	●	■	●	■	◉
B23	Playing the instrument	■					
B24	Practising Tai chi Roliball	■	●				
B25	Getting haircut	■	●				
B26	Playing Diabolo	■					
B27	Collecting parcels	■	●				
B28	Fixing a chair	■	●				
B29	Practising Yoga		○				
B30	Practising Tai chi Sword	■	●				
B31	Ballroom dancing	■	●				
B32	Roller skating		●				
B33	Practising calligraphy	□					

Appendix: Ethical Approval letter

Yichao He
Registration number: 170267117
Landscape
Programme: Landscape (PhD/Landscape FT) - LSCR131

Dear Yichao

PROJECT TITLE: Supporting ageing-in-place: the role of outdoor space in Chinese urban neighbourhoods
APPLICATION: Reference Number 024542

On behalf of the University ethics reviewers who reviewed your project, I am pleased to inform you that on 10/04/2019 the above-named project was **approved** on ethics grounds, on the basis that you will adhere to the following documentation that you submitted for ethics review:

- University research ethics application form 024542 (form submission date: 10/04/2019); (expected project end date: 31/12/2021).
- Participant information sheet 1057798 version 2 (10/04/2019).
- Participant information sheet 1059902 version 1 (10/04/2019).
- Participant consent form 1057799 version 2 (10/04/2019).

The following optional amendments were suggested:

Generally good responses to the previou scomments from the reviewers. Suggest that you clarify about whether the data will be used in future research. This needs clarifying in both the information sheets and consent form. You seem to say the data might be used for future research by the researcher. Will this mean it is available for other researchers? If so you need to say where it will be stored after the end of your research. The usual depository for PhD students is the University's depossitory which is called ORDA. If you are going to destroy the data and not allow it to be used in future research that is fine. But please be clear in all the documents and make sure they all say the same thing.

If during the course of the project you need to deviate significantly from the above-approved documentation please inform me since written approval will be required.

Your responsibilities in delivering this research project are set out at the end of this letter.

Yours sincerely

Helen Woolley
Ethics Administrator
Landscape

Please note the following responsibilities of the researcher in delivering the research project:

- The project must abide by the University's Research Ethics Policy:
  https://www.sheffield.ac.uk/rs/ethicsandintegrity/ethicspolicy/approval-procedure
- The project must abide by the University's Good Research & Innovation Practices Policy:
  https://www.sheffield.ac.uk/polopoly_fs/1.671066!/file/GRIPPolicy.pdf
- The researcher must inform their supervisor (in the case of a student) or Ethics Administrator (in the case of a member of staff) of any significant changes to the project or the approved documentation.
- The researcher must comply with the requirements of the law and relevant guidelines relating to security and confidentiality of personal data.
- The researcher is responsible for effectively managing the data collected both during and after the end of the project in line with best practice, and any relevant legislative, regulatory or contractual requirements.

Appendix: Participant Consent Form

Participant Consent Form

Title of research project:
Supporting ageing-in-place: the role of outdoor space in Chinese urban neighbourhoods

Please tick the appropriate boxes	Yes	No
I confirm that I have read and understand the information sheet dated (___/___/_____) or the project has been fully explained to me. I have been given the opportunity to ask questions about the project and have had satisfactory answers. (If you answer No to this question please do not proceed with this consent form until you are fully aware of what your participation in the project will mean.)	☐	☐
I agree to take part in the project. I understand that by taking part in the project I will be interviewed.	☐	☐
I agree to be audio recorded during the interview. (If you answer No to this question then hand written notes will be used.)	☐	☐
I understand that my taking part is voluntary and that I can withdraw from the study at any time; i do not have to give any reasons for why I no longer want to take part and there will be no adverse consequences if I choose to withdraw.	☐	☐
I understand that my personal data will be kept strictly confidential and my responses will be anonymised. I understand that my personal information (e.g. name, address, telephone number, occupation etc.) will be stored digitally (e.g. researcher's laptop, University Google drive, and personal hard disk) and encrypted or in a locked space accessible only by the researcher herself, and, will be destroyed after the research has finished.	☐	☐
I understand and agree that my words may be quoted in theses, publications, reports, webpages, conferences, lectures, seminars, and other research outputs. I understand that I will not be named in these outputs unless I specifically request this.	☐	☐
I understand and agree that other authorised researchers will have access to anonymised data which may be used in publications, reports, webpages, conferences, teaching, seminars, and other research outputs. I will not be identified or identifiable in any materials from the research.	☐	☐
I understand and agree that anonymised data be retained safely (e.g. in a encrypted form or device) by the researcher for future research.	☐	☐
I understand that it will not be possible to with withdraw my data from the study after final analysis has been undertaken.	☐	☐
I agree to assign the copyright I hold in any materials generated as part of this project to The University of Sheffield.	☐	☐

_____   _____   _____
Name of Participant   Date   Signature

Yichao He
_____   _____   _____
Name of Researcher   Date   Signature

Project contact details for further information:
Yichao He, Department of Landscape Architecture, The University of Sheffield, Arts Tower, Western Bank. Sheffield S10 2TN, Email: yhe28@sheffield.ac.uk

Appendix: Information Sheet for older people

Participant Information Sheet

Research project title:
Supporting ageing-in-place: the role of outdoor space in Chinese urban neighbourhoods.

Invitation to take part in this study:
You are being invited to take part in a research project. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear. Take time to decide whether or not you wish to take part.

1. What is the project's purpose?
This research aims to explore older people's relationships with different types of outdoor space in Chinese urban neighbourhoods and to improve outdoor space to meet their needs, and support them in ageing-in-place. In this phase, the project aims to identify different types of outdoor space used and perceived by older people who are ageing-in-place.

2. Why have I been chosen?
As part of the research, we would like to interview older people (aged 60 and above) who live in the selected neighbourhoods in urban China, to explore how older people living in their neighbourhoods use and perceive outdoor space, as well as their perceptions about ageing-in-place. Around 36 participants will be involved in semi-structured interviews, and 24 participants in go-along interviews.

3. Do I have to take part?
It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time without any reasons. You can chose to participate in semi-structured interviews only or both semi-structured and go-along interviews. It will not be possible to remove data from the study once the final analysis has been undertaken.

4. What will happen to me if I take part?
For semi-structured interviews: You will be interviewed for about 30-45 minutes. The interview will be audio recorded for transcription, and all information used will be anonymised. If audio recording is not acceptable to you, then hand-written notes will be made. Interview questions will explore your personal experiences, usage of outdoor spaces and your perceptions about ageing-in-place.

For go-along interviews: You will need to lead the researcher to walk around your neighbourhood to show how you use outdoor spaces and explain your thoughts and feelings about them. You can choose the time and route that can reflect your daily use for the go-along interview. The researcher will take photos or films during the walk to record locations, environment elements and activities happening in the spaces mentioned by you (not take photos of you). These photos/films will provide a useful way of explaining the situation to the reader of the research publications in the future.

5. What are the possible disadvantages and risks of take part?
Semi-structured interviews does not include any possible disadvantages and risks to participants There are usual risks of moving around urban places during the go-along interviews, e.g. risk of falling, traffic accident. Please chose the route that you familiar with and provide a emergency contact to the researcher for your safety.

6. What are the possible benefits of take part?

Whilst there are no immediate benefits for those people participating in the project, you will be able to help me by sharing your experience of using outdoor spaces and opinions about ageing-in-place.

7. Will my taking part in this project be kept confidential?

We will be collecting some personal information from you including your name and the name of the neighbourhood you live in, and, if you wish to participate in the go-along interviews, contact information and your personal mobility requirements. All the personal information that we collect about you during the course of the research will be kept strictly confidential and will only be accessible to the researcher herself.

8. What is the legal basis for processing my personal data?

According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest' (Article 6(1)(e)). Further information can be found in the University's Privacy Notice https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

9. What will happen to the data collected, and the results of the research project?

The original data including personal information will be stored digitally (e.g. researcher's laptop, University Google drive, and personal hard disk) and encrypted or in a locked space accessible only by the researcher herself, and, will be destroyed after the research has finished. The transcriptions of the interviews will be anonymised and will be retained safely by the researcher for future research. The fully anonymised data collected and results of the research may be used widely at research seminars, conferences, teachings, published in journals and any other forms, and in further research. You will not be identified or identifiable in any of these publications, unless you have given your explicit consent for this.

10. Will I be recorded, and how will the recorded media be used?

The interview will be audio recorded. The audio recordings of the interview made during this research will be used by the researcher for transcription and analysis. All the records will be stored in a form protected by passwords or in a locked space, and will be destroyed after the research has finished.

11. Who is organising and funding the research?

This research is self-funded by the individual researcher Yichao He.

12. Who is the Data Controller?

The University of Sheffield will act as the Data Controller for this study. This means that the University is responsible for looking after your information and using it properly.

13. Who has ethically reviewed the project?

This research has been ethically approved (Application No.024542) via The University of Sheffield's Ethics Review Procedure, as administered by the Department of Landscape.

If you have questions about this study and the interview, please contact:
Researcher: Yichao He (yhe28@sheffield.ac.uk).
Supervisor of this research: Anna Jorgensen (a.jorgensen@sheffield.ac.uk).
Address: The Department of Landscape Architecture, The University of Sheffield, Arts Tower, Western Bank, Sheffield, S10 2TN, UK.
You can make complains about handling personal data via:
https://www.sheffield.ac.uk/govern/data-protection/privacy/general

Thanks for taking part in this project.

Appendix: List of interview questions for older people

THEME 1: BASIC INFORMATION
1. **Gender of participant** *(Interviewer observed, Male or Female)*

2. **What is your age?** *(60+, 70+, 80+)*

3. **What is your occupation status?**
   [Working, Retired, Volunteer, Unemployed]

4. **What is your living arrangement?**
   [Living alone, living with spouse only, living with relatives (spouse, children, grandchildren...)]

5. **Which floor do you live on?**

6. **How long have you lived at your current address? What kind of neighbourhood you did live in previously?**

7. **How would you describe your mobility status outside home?**
   Probe for: do they have any mobility issues or use mobility aids, how long can they comfortably walk, can they walk up and down stairs comfortably

8. **What is your main travel mode?**
   [Bus, Metro, Car, Bike, Electric car, Taxi, Motorcycle (Tricycle), Foot, Wheelchair]

THEME 2: EXPERIENCE AND PERCEPTIONS ABOUT OUTDOOR SPACE
Outdoor activity is defined as "being outdoors." It encompasses both passive and active activities.

9. **First, could you tell me about your daily outdoor activities?**
   Probe for: why did they do these activities, any activities related to childcare?

10. **Thinking about your daily outdoor activities, could you tell me which outdoor spaces you usually use/visit?**
    Probe for: how and when they went, how long they spent, who they went/did it with/met

11. **How do you feel about these outdoor spaces?**
    Probe for: Do these spaces make it difficult/easy to do your daily outdoor activities. Feelings of these different spaces.

12. **Tell me about an experience in an outdoor space in which you feel good.**
    Probe for: Where, what happened, how they feel, why

13. **Tell me about some outdoor spaces that are especially important and meaningful to you.**
    Probe for: Places you feel attached, why it is important and meaningful, what they can remember about that space(s), what happened there, how they feel, how often they usually go there, has the important and meaningful spaces changed over time? Why?

14. **What prevents you from using outdoor space?**
    Probe for: personal reasons, lifestyle, other people, physical environmental factors, social environments, services etc.

15. **What makes it possible for you to use outdoor space?**
    Probe for: personal reasons, lifestyle, other people, physical environmental factors, social environments, services etc.

16. **Tell me about the views from your home and how you feel about them?**

17. **Do you have any unmet needs from outdoor spaces?**

Probe for: activity needs, social needs, psychological needs, space typology, distance, quality etc.

18. **Please describe your ideal outdoor space that can support your needs would look like.**
Probe for: Why? Are there any previous personal experiences factors?
[Distance to park, pavement existence, pavement quality, trees along footpath, seats en route, volume of road traffic, trees/plants, facilities (café, toilets, etc), seats in the park, things to watch, maintenance, nuisances (dog fouling, youths hanging about, etc), water feature, public transport, and car park.]

THEME 3: PERCEPTIONS ABOUT NEIGHBOURHOOD AND AGEING-IN-PLACE
Neighbourhood will be translated into "Shequ" in Chinese. In the context of China, the administrative boundaries of the neighbourhood refer to the administrative region of the community committee. The subjective boundaries of the neighbourhood will be explained to participants as: the area you live in and are familiar with, including the people in this area you perceived as belonging together, and the area that satisfies your daily living needs.

19. **Can you tell me the boundaries of the neighbourhood which you perceive as yours?**
(Provide map to draw the boundaries if older people are able to identify from the map, or probe for distance, from where to where, representative places…)

20. **How do you think about your life in your neighbourhood?**
Probe for: general satisfaction, compared with previous experiences in other neighbourhoods

21. **Do you feel you belong to your neighbourhood?**
Probe for: Why? (self, others, environment), Any specific outdoor space makes you feel attached? How do you think about your neighbourly relationship (know each other, supported and connected, neighbourly activities)?

22. **Do you think outdoor spaces in your neighbourhood will influence your wellbeing? Why and how (if yes)?**

23. **What do you think of ageing-in-place?**
Probe for: subjective definition, meanings, perceptions, advantages and disadvantages

24. **Do you want to continue to live in here or move somewhere else?**

25. **Do you think outdoor space in your neighbourhood will influence your decision of ageing-in-place or moving out? Why?**

Appendix: Information Sheet for stakeholders

Participant Information Sheet

Research project title:
Supporting ageing-in-place: the role of outdoor space in Chinese urban neighbourhoods.

Invitation to take part in this study:
You are being invited to take part in a research project. Before you decide whether to take part it is important for you to understand why the research is being done and what it will involve. Please take time to read the information carefully and discuss it with others if you wish. Ask me if there is anything that is not clear. Take time to decide whether or not you wish to take part.

1. What is the project's purpose?
This research aims to explore older people's relationships with different types of outdoor space in Chinese urban neighbourhoods and to improve outdoor space to meet their needs, and support them in ageing-in-place. In this phase, the project aims to develop suggestions for policy and practice in relation to improving outdoor space in Chinese urban neighbourhoods to support ageing-in-place.

2. Why have I been chosen?
As part of this research, we would like to have interviews with stakeholders to explore the difficulties and possibilities of how outdoor space in Chinese urban neighbourhoods could be improved, and to develop suggestions for related policies and design standards. Potential stakeholders include: Landscape designers, urban planners, related researchers, policy makers and older people.

3. Do I have to take part?
It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time without any reasons. It will not be possible to remove data from the study once the final analysis has been undertaken.

4. What will happen to me if I take part?
You will be interviewed for no more than 1 hour to discuss how to improve outdoor space in Chinese urban neighbourhoods to support ageing-in-place.

5. What are the possible disadvantages and risks of take part?
The research does not include any possible disadvantages and risks to participants. Participating in the project is not anticipated to cause you any disadvantages or discomfort.

6. What are the possible benefits of take part?
Whilst there are no immediate benefits for those people participating in the project, you will be able to help me by sharing your opinions about how to making better places for older people.

7. Will my taking part in this project be kept confidential?
We will be collecting some personal information from you including your name, occupation, and contact information. All the personal information that we collect about you during the course of the research will be kept strictly confidential and will only be accessible to the researcher herself.

8. What is the legal basis for processing my personal data?
According to data protection legislation, we are required to inform you that the legal basis we are applying in order to process your personal data is that 'processing is necessary for the performance of a task carried out in the public interest' (Article 6(1)(e)). Further information can be found in the University's Privacy Notice https://www.sheffield.ac.uk/govern/data-protection/privacy/general.

9. What will happen to the data collected, and the results of the research project?

The original data including personal information will be stored digitally (e.g. researcher's laptop, University Google drive, and personal hard disk) and encrypted or in a locked space accessible only by the researcher herself, and, will be destroyed after the research has finished. The fully anonymised transcriptions of the interviews will be retained safely by the researcher for future research. The fully anonymised data collected and results of the research may be used widely at research seminars, conferences, teachings, published in journals and any other forms, and in further research. You will not be identified or identifiable in any of these publications, unless you have given your explicit consent for this.

10. Will I be recorded, and how will the recorded media be used?

With your permission the interview will be audio recorded. The audio recordings of the interview made during this research will be used by the researcher for transcription and analysis. All the records will be stored in a form protected by passwords or in a locked space, and will be destroyed after the research has finished.

11. Who is organising and funding the research?

This research is self-funded by the individual researcher Yichao He.

12. Who is the Data Controller?

The University of Sheffield will act as the Data Controller for this study. This means that the University is responsible for looking after your information and using it properly.

13. Who has ethically reviewed the project?

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If you have questions about this study and the interview, please contact:
Researcher: Yichao He (yhe28@sheffield.ac.uk).
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Thanks for taking part in this project.

Appendix: List of interview questions for stakeholders

Position:_____
Working experiences in relation to older people, ageing-in-place, and outdoor space:

_____

1. **Have you heard of ageing-in-place? What do you understand by ageing in place?**
   Probe for: subjective definition, meanings, perceptions, advantages and disadvantages

2. **What are the challenges of ageing-in-place that Chinese urban older people face?**
   Probe for: different living arrangements, different residential communities, different mobility states

3. **According to your working experiences** (design, planning, residential development or transformation, outdoor space management, policy-making, research)**, what are the main points that need to be considered to support older people ageing-in-place?**

4. **What do you think the role of outdoor space is in supporting older people ageing-in-place?**

For landscape designers:
How to design age-friendly outdoor space?
Probe for: community outdoor space, neighbourhood green space, urban park…

For urban planners:
How to design and plan an age-friendly urban neighbourhood?

For residential transformation practitioners:
What are the aims of the outdoor transformation?
What are the difficulties and challenges you face during the outdoor space transformation process?
Do you think it's important for residents to be involved in the process?

For residential developers:
What is your opinion about the age-friendly community concept?
How do you consider older people's needs in the process of developing an age-friendly community?

For outdoor space managers (grounds maintenance staff):
What are the difficulties and challenges in managing outdoor space suitable for older people to use?

For all:
Are you aware of any related standards and guidelines (e.g. ...)?
Do you think they are important? How do they influence your working process/outcomes?

Do you have any suggestions or recommendations for related standards or guidelines?