

## Public Policy Research Funding Scheme

### 公共政策研究資助計劃

|  |  |
|--|--|
| Project Number :<br>項目編號 :             | 2017.A6.102.18B  |
| Project Title :<br>項目名稱 :              | An Analytical Study on Preferences of the Elderly in Visiting Public Open Spaces<br>分析長者使用公共開放空間的喜好的研究 |
| Principal Investigator :<br>首席研究員 :    | Dr YUNG Hiu Kwan, Esther<br>容曉君博士  |
| Institution/Think Tank :<br>院校 / 智庫 :  | The Hong Kong Polytechnic University<br>香港理工大學   |
| Project Duration (Month):<br>推行期 (月) : | 15   |
| Funding (HK\$) :<br>總金額 (HK\$) :       | 380,944.00   |

This research report is uploaded onto the webpage of the Public Policy Research Funding Scheme and Strategic Public Policy Research Funding Scheme for public reference. The views expressed in this report are those of the Research Team of this project and do not represent the views of the Government and/or the Assessment Panel. The Government and/or the Assessment Panel do not guarantee the accuracy of the data included in this report.

Please observe the “Intellectual Property Rights & Use of Project Data” as stipulated in the Guidance Notes of the Public Policy Research Funding Scheme and Strategic Public Policy Research Funding Scheme.

A suitable acknowledgement of the funding from the Government should be included in any publication/publicity arising from the work done on a research project funded in whole or in part by the Government.

The English version shall prevail whenever there is any discrepancy between the English and Chinese versions.

此研究報告已上載至公共政策研究資助計劃及策略性公共政策研究資助計劃的網頁，供公眾查閱。報告內所表達的意見純屬本項目研究團隊的意見，並不代表政府及／或評審委員會的意見。政府及／或評審委員會不保證報告所載的資料準確無誤。

請遵守公共政策研究資助計劃及策略性公共政策研究資助計劃申請須知內關於「知識產權及項目數據的使用」的規定。

接受政府全數或部分資助的研究項目如因研究工作須出版任何刊物／作任何宣傳，均須在其中加入適當鳴謝，註明獲政府資助。

中英文版本如有任何歧異，概以英文版本為準。

Public Policy Research Funding Scheme  
Policy Innovation and Co-ordination Office  
The Government of the Hong Kong Special Administrative Region

**An Analytical Study on Preferences of the Elderly in  
Visiting Public Open Spaces**

分析長者使用公共開放空間的喜好的研究

Project Number: 2017.A6.102.18B

**Final Report**

Dr. Esther Hiu Kwan YUNG

(Principal Investigator)

Department of Building and Real Estate

The Hong Kong Polytechnic University

## **Research Team**

Principal Investigator    Dr. Esther Hiu Kwan YUNG

Co- Investigator         Prof. Edwin Hon Wan CHAN

Research Associate       Mr. Siqiang WANG

## **Acknowledgements**

This research project (Project Number: 2017.A6.102.18B) is funded by the Public Policy Research Funding Scheme from the Policy Innovation and Co-ordination Office of The Government of the Hong Kong Special Administrative Region.

The research team would like to thank for the strong support from the elderly centres participating in this study, and also the experts participating in interviews and validation focus group meetings. We would also like to thank the elderly respondents involved in the focus group meetings, and those who responded to the questionnaire survey. Special thanks to the research assistant, Ms Irene Liu, Dr. Zhang Qi, Mr. Davy Yuen and the student helpers for conducting the focus group meetings and the interviews with experts.

## Table of Content

|   |      |
|---|------|
| <b>Research Team</b> .....  | ii   |
| <b>Acknowledgements</b> .....   | iii  |
| <b>Table of Content</b> .....   | iv   |
| <b>List of Tables</b> .....   | viii |
| <b>List of Figures</b> .....  | ix   |
| <b>Executive summary</b> .....  | x    |
| <b>Chapter 1. Introduction</b> .....  | 1    |
| 1.1 Background.....   | 1    |
| 1.1.1 Aging in Hong Kong.....   | 1    |
| 1.1.2 Public Open spaces in Hong Kong .....                                       | 2    |
| 1.2 Problem Statement .....   | 4    |
| 1.3 Project Objectives .....  | 4    |
| 1.4 Research Significance.....  | 5    |
| 1.5 Report Structure .....  | 5    |
| <b>Chapter 2. Literature review</b> .....   | 6    |
| 2.1 Active aging and aging in place.....  | 6    |
| 2.2 Age-friendly community and the importance of public open spaces .....         | 7    |
| 2.3 Multidimensional considerations affecting the use of public open spaces ..... | 8    |
| 2.3.1 Surrounding environment .....   | 13   |
| 2.3.2 Open space design.....  | 15   |
| 2.3.3 Transport .....   | 17   |
| 2.3.4 Management.....   | 18   |
| 2.3.5 Social.....   | 19   |
| 2.3.6 Personal.....   | 20   |
| <b>Chapter 3. Methodology</b> .....   | 24   |
| 3.1 Data Collection .....   | 24   |
| 3.1.1 Selected study districts.....   | 24   |
| 3.1.1.1 Study districts.....  | 24   |
| 3.1.1.2 Selected study open spaces .....  | 26   |
| 3.1.2 Focus group meetings .....  | 28   |
| 3.1.3 Interviews with Practitioner Experts.....                                   | 30   |
| 3.1.4 Questionnaire surveys .....   | 30   |
| 3.1.4.1 Sampling of questionnaire .....   | 30   |
| 3.1.4.2 Design of questionnaire .....   | 30   |
| 3.1.5 Spatial analysis.....   | 32   |
| 3.1.5.1 Spatial data source .....   | 32   |
| 3.1.5.2 Spatial distribution of open space .....                                  | 33   |
| 3.1.5.3 Amenities number around open space .....                                  | 37   |
| 3.1.5.4 POS integration.....  | 41   |
| 3.1.6 Field observation.....  | 44   |
| 3.2 Data Analysis Techniques.....   | 45   |

|   |           |
|---|-----------|
| 3.2.1 Qualitative analysis .....  | 45        |
| 3.2.2 Mean score ranking and Mann-Whitney U test .....  | 45        |
| 3.2.3 Principle Components Analysis (PCA) .....   | 46        |
| 3.2.4 Ordered logit model .....   | 46        |
| 3.2.5 Correlation analysis .....  | 47        |
| 3.3 Validation by Experts .....   | 47        |
| <b>Chapter 4. Results</b> .....   | <b>48</b> |
| 4.1 Focus group meetings .....  | 48        |
| 4.1.1 NVivo analysis on factors affecting preferences of the elderly in<br>visiting public open spaces .....  | 48        |
| 4.2 Interviews with Experts .....   | 51        |
| 4.2.1 Key factors affecting elderly visits to POS .....   | 52        |
| 4.2.2 Differences between renewal old district and new town .....   | 53        |
| 4.2.3 Relevance to design or planning practice .....  | 54        |
| 4.2.4 Policy implication and implementation .....   | 54        |
| 4.2.5 Framework and methods suggestions .....   | 55        |
| 4.2.6 Comparison of expert opinions and the significant factors identified<br>from regression models .....  | 56        |
| 4.3 Questionnaire surveys .....   | 56        |
| 4.3.1 Characteristics of respondents .....  | 56        |
| 4.3.2 Elderly's use pattern of public open space .....  | 57        |
| 4.3.3 Key factors affecting elderly's visits to public open space – factor<br>analysis .....  | 59        |
| 4.3.4 Factors associated with elderly use patterns in public open space .....   | 61        |
| 4.3.5 Factors associated with use patterns of the elderly in urban old<br>districts and new towns .....   | 62        |
| 4.3.6 Factors associated with use patterns of the elderly living in public and<br>private housing estates .....                                       | 63        |
| 4.3.7 Factors associated with use patterns of the elderly of different genders<br>.....   | 65        |
| 4.3.8 Factors associated with satisfaction level and use patterns of the<br>elderly of different age group .....                                      | 66        |
| 4.4 Spatial analysis and field observation .....  | 67        |
| 4.4.1 Quality of selected public open spaces .....  | 67        |
| 4.4.2 Spatial factors and park quality attributes associated with elderly<br>satisfaction level of parks for all selected districts .....             | 69        |
| 4.4.3 Spatial factors and park quality attributes associated with elderly<br>satisfaction level of parks in urban old districts and new towns .....   | 69        |
| 4.4.4 Spatial factors and park quality attributes associated with satisfaction<br>level of elderly living in public and private housing estates ..... | 70        |
| 4.4.5 Spatial factors and park quality attributes associated with satisfaction<br>level of elderly of different gender groups .....                   | 71        |

|   |            |
|---|------------|
| 4.4.6 Spatial factors and park quality attributes affecting satisfaction level of elderly of different age groups .....                 | 72         |
| 4.5 Relative importance of the factors associated with elderly’s visits to public open space .....                                      | 72         |
| 4.5.1 Relative importance of the factors associated with elderly’s visits to public open space in urban old district and new town ..... | 73         |
| 4.5.2 Relative importance of the factors in affecting users and less frequent user visits to public open space.....                     | 73         |
| 4.5.3 Relative importance of key planning consideration of open space.....  | 73         |
| <b>Chapter 5. Discussion and Validation .....</b>   | <b>75</b>  |
| 5.1 Preferences of the elderly in visiting public open spaces .....   | 75         |
| 5.2 Discrepancies between preferences of the elderly in visiting public open spaces in urban old district and new town .....            | 81         |
| 5.3 Discrepancies between preferences of the different groups of elderly in visiting public open spaces .....                           | 86         |
| 5.3.1 Frequent users and less frequent users.....   | 86         |
| 5.3.2 Type of housing .....   | 86         |
| 5.3.3 Gender.....   | 89         |
| 5.3.4 Age group.....  | 90         |
| 5.4 Validations by experts focus group meetings .....   | 92         |
| 5.4.1 The interpretation and discussion of key identified factors .....   | 94         |
| 5.4.1.1 The importance and diversity of intention to visit POS.....   | 94         |
| 5.4.1.2 The safe, short and elderly friendly trip from home to POS....  | 95         |
| 5.4.1.3 Attractions inside POS to different elderly groups .....  | 96         |
| 5.4.2 The comparison of different factors between urban renewal old districts and new towns.....  | 98         |
| 5.4.3 The policy implications to the planning and design of POS.....  | 98         |
| 5.4.3.1 The site selection, size and facility allocation of POS.....  | 98         |
| 5.4.3.2 The flexible space management and usage .....   | 99         |
| <b>Chapter 6. Conclusions: Policy Implications and Recommendations.....</b>   | <b>101</b> |
| 6.1 Implications for spatial planning of open space and the surrounding environment .....   | 103        |
| 6.2 Implications for design of open space .....   | 104        |
| 6.3 Implications for management of open space .....   | 105        |
| 6.4 Difference between urban old districts and new towns .....  | 106        |
| 6.5 General aspects of ageing policy .....  | 107        |
| <b>References .....</b>   | <b>108</b> |
| <b>Appendix.....</b>  | <b>120</b> |
| Appendix A. Questions for Interviews with Experts .....   | 120        |
| Appendix B. Questionnaire for Open Space User in Chinese .....  | 121        |
| Appendix C. Questionnaire for Less Frequent User in Chinese .....   | 125        |
| Appendix D. Park Observation Form .....   | 129        |

|  |     |
|--|-----|
| Appendix E. Representative statements from the focus groups and the corresponding criteria for public open space from the literature ..... | 133 |
| Appendix F. The comparison of regression model result and previous experts' views .....  | 139 |
| Appendix G Results of ordered logit regression estimates for use pattern in open spaces. ....  | 142 |
| Appendix G.1 All selected districts .....  | 142 |
| Appendix G.2 Urban old district.....   | 144 |
| Appendix G.3 New town .....  | 146 |
| Appendix G.4 Public housing .....  | 148 |
| Appendix G.5 Private housing .....   | 150 |
| Appendix G.6 Male elderly.....   | 152 |
| Appendix G.7 Female elderly .....  | 153 |
| Appendix G.8 Younger elderly.....  | 154 |
| Appendix G.9 Older elderly.....  | 156 |
| Appendix H Results of Correlation Analysis for satisfaction level with open space.....   | 158 |
| Appendix H.1 All selected districts .....  | 158 |
| Appendix H.2 Urban old districts and new towns .....   | 159 |
| Appendix H.3 Association between facility type and satisfaction level with open space .....  | 160 |
| Appendix H.4 Public housing and Private housing .....  | 161 |
| Appendix H.5 Male elderly and Female elderly .....   | 162 |
| Appendix H.6 Younger elderly and Older elderly.....  | 163 |
| Appendix I Relative importance of the factors associated with elderly's visits to public open space .....                                  | 164 |
| Appendix I.1 Urban old district and New town.....  | 164 |
| Appendix I.2 Open space user and Less frequent user .....  | 167 |
| Appendix I.3 Results of ANCOVA models predicting satisfaction level with open space using key planning parameters.....                     | 170 |
| Appendix J Dissemination of project results .....  | 171 |

## List of Tables

|   |    |
|---|----|
| Table 1 List of criteria associated with elderly's visit to public open space .....                     | 9  |
| Table 2 Characteristics of three selected districts .....   | 26 |
| Table 3 Characteristics of selected open spaces .....   | 26 |
| Table 4 Profile of elderly that attend focus group meetings .....                                       | 29 |
| Table 5 List of variables calculated by spatial analysis .....  | 32 |
| Table 6 Facility type and description (amenities, transport station, open space) ....                   | 37 |
| Table 7 List of variables collected by field observation .....  | 44 |
| Table 8 The name and affiliation of expert attendees in the interview .....                             | 51 |
| Table 10 Profiles of respondents.....   | 56 |
| Table 11 Elderly's use pattern of public open space .....   | 58 |
| Table 12 Factor analysis result of key factors affecting elderly's visits to public<br>open space ..... | 59 |
| Table 12 Descriptive statistics of assessment of quality of selected public open<br>spaces .....        | 67 |
| Table 13 The name and affiliation of expert attendees in the focus group 1 .....                        | 93 |
| Table 14 The name and affiliation of expert attendees in the focus group 2 .....                        | 93 |

## List of Figures

|  |    |
|--|----|
| Figure 1 Number and Proportion of older persons, 1961-2011 .....   | 1  |
| Figure 2 Proportion of older persons by age groups, 2001, 2006 and 2011 .....  | 2  |
| Figure 3 Comprehensive framework of factors that affect elderly's visit to public<br>open space .....                                | 23 |
| Figure 4 Flow of methodology to achieve the research objectives.....   | 25 |
| Figure 5 Framework of elderly's preference of visiting open space .....  | 32 |
| Figure 6 Spatial distribution of open space, road network, amenities and<br>transport station in Wong Tai Sin district. ....         | 34 |
| Figure 7 Spatial distribution of open space, road network, amenities and<br>transport station in Tsing Yi new town.....              | 35 |
| Figure 8 Spatial distribution of open space, road network, amenities and<br>transport station in Tseung Kwan O new town.....         | 36 |
| Figure 9 Amenities number around each open space in Wong Tai Sin district.....   | 38 |
| Figure 10 Amenities number around each open space in Tsing Yi new town. ....   | 39 |
| Figure 11 Amenities number around each open space in Tseung Kwan O new<br>town.....  | 40 |
| Figure 12 Integration score of each open space in Wong Tai Sin district. ....  | 41 |
| Figure 13 Integration score of each open space in Tsing Yi new town. ....  | 42 |
| Figure 14 Integration score of each open space in Tseung Kwan O new town.....  | 43 |
| Figure 15 the frequency of each factor mentioned by older people in the focus<br>group .....   | 49 |
| Figure 16 Multidimensional model of the preferences of the elderly in visiting<br>public open space .....                            | 75 |
| Figure 17 Multidimensional model of the preferences of the elderly in visiting<br>public open space (old district and new town)..... | 82 |
| Figure 18 Multidimensional model of the preferences of the elderly in visiting<br>public open space (type of housing) .....          | 87 |
| Figure 19 Multidimensional model of the preferences of the elderly in visiting<br>public open space (gender) .....                   | 89 |
| Figure 20 Multidimensional model of the preferences of the elderly in visiting<br>public open space (age).....                       | 91 |

## **Executive summary**

### **1. Abstract**

Owing to the rapid increase of its aging population, Hong Kong society faces an immense challenge to provide an inclusive built environment to cater for the needs of all ages. One of the key strategies of the World Health Organisation's (WHO) Age-friendly community is to promote age-friendly outdoor spaces and buildings. Public open space (POS) is recognized as an important outdoor environment that can benefit the physical health and social well-being of the elderly. However, the needs of this elderly population have evolved due to social, economic, environmental changes. Current research and policy mainly focus on the concept of universal design and the provision of basic facilities, and yet there is still a lack of comprehensive study to examine the multi-facet factors that affect the elderly's preference for visiting public open spaces. In addition, old urban districts in Hong Kong, which are undergoing a process of urban renewal, usually have distinct socio-economic characteristics, urban forms and redevelopment plans compared to those in new towns. As a result, this may have an influence on the elderly's preference for visiting open space in the two different areas. Hence, it is also meaningful to investigate the differences in the use pattern of public open space by the elderly people living in urban old districts and new towns.

The following are the objectives of this research study, all of which have been fulfilled:

- 1) To identify the underlying factors affecting the perceptions and preferences of elderly people in visiting public open spaces
- 2) To identify the relative importance of the different factors in affecting visits to public open space by the elderly in newly town and old districts
- 3) To formulate a multidimensional model of the preferences of the elderly in visiting public open space
- 4) To provide a policy framework for the planning of public open space which aims to enhance age-friendly environments in new town and old districts

This study employs a mix of qualitative and quantitative research methods to achieve the research objectives. Firstly, a comprehensive literature review of previous studies was conducted to identify the impact factors that affect elderly's preference of visiting open space. Then, a series of focus group meetings with the elderly was used to refine the list of factors affecting their use of public open space. Interviews with expert practitioners were also conducted after the focus groups to validate the factors extracted

from the data collected. The research framework was revised based on the findings from focus group and expert interviews. The second stage of this study, mainly included a questionnaire survey, spatial analysis and field observation. The questionnaire survey aimed to collect the elderly's perception to the impact factors of their preference of visiting open space. Spatial analysis was used to analyze the spatial distribution and surrounding environment of open space. Field observations were conducted to evaluate the quality of open space, focused on its design and management. Finally, the focus group meetings with experts from different background were utilized to validate the preliminary findings of the study and discuss the policy implications based on the findings. In this study, 30 public parks managed by the Leisure and Cultural Service Department (LCSD) were selected from three locations: urban old district, Wong Tai Sin and two new towns, Tsing Yi and Tseung Kwan O. Totally 647 valid questionnaires were collected, 537 from open space users and 110 from less frequent users of public open spaces.

## **Major Research Findings**

### Patterns of use of public open space by the elderly

This study found that 94.6% of the elderly respondents chose to visit public open spaces by walking, and elderly people tend to visit public open space not far from their home. The cost time from home to public open space for most elderly respondents is less than 20 minutes. It is indicated that the intention to visit public open spaces by elderly people are mainly doing physical exercises or chatting with friends, which account for 75.4% and 36.1% of the respondents respectively.

The factors which influence the elderly when they visit public open space are grouped into three stages according to the sequence of visits to open space, namely 'Departure decision from home', 'Way to open space' and 'Inside open space'.

### Departure decision from home

Departure decision from home mainly includes factors that encourage elderly people to leave home to visit public open spaces. This research found that 'Available leisure time and Security' affects elderly's preference of visiting public open space. 'Personal Consideration' in regard to health status, active lifestyle or attractive activities in the public open space also influence elderly's visit to public open space. Besides, the purpose of visiting public open space is also an important factor. The results reveal that elderly people visit public open space more frequently than others if they do physical exercises or accompany friends or family members to public open spaces.

Furthermore, the factor ‘Living condition’ is associated with preference of visiting public open space of elderly living in private housing. It includes size of living space, comfort status at home and residential density of the neighbourhood. It was found that elderly people living in private housing spend more time on having activities in public open space if their purpose of visiting public open space is chatting with friends. In addition, the results show that male elderly visit public open space more frequently if they engage in group activities in public open spaces.

#### Way to open space

Way to open space considers the surrounding environment of the open spaces. The results show that the factor ‘Availability and Proximity’ has an impact on the elderly’s preference of visiting public open space, which contains availability of public open space, proximity to home, proximity to amenities and travel time. It means that elderly people are sensitive to the provision of public open space and distance to the public open space. Factors ‘POS number’ and ‘POS Integration/Street connectivity’ are also significant factors identified in this study. It is revealed that elderly people are more satisfied with the open space located in the street with lower street connectivity or with less other public open spaces surrounding.

It is also illustrated that elderly people living in private housing were more sensitive to the residential density and socio-economic status of the neighbourhood where public open space is located. They prefer to visit public open spaces located in the neighbourhoods with higher socio-economic status or higher residential density. In addition, the preferences of elderly people living in private housing or those younger elderly are associated with the ‘Perceived Walking Environment’. It shows that they pay more attention to walkability of the street, the terrain on the way and pedestrian safety/traffic speed on their way to public open space. Interestingly, older elderly people who are aged 75 or above are more sensitive to the actual pedestrian environment of the surrounding environment of the public open space.

#### Inside open space

Factors under inside open space category are those related to the design and management quality inside the public open space. Several elements related to the quality of public open space are correlated with elderly’s preference of visiting public open space, which include size, facility type, facility quality, urban furniture, landscape, maintenance, crowdedness and quietness. It is clear that elderly people are more satisfied with the public open space with larger size, variety of facilities, good quality of facilities, well designed urban furniture and landscape, well-maintained status, less crowded and less noisy.

‘Social consideration and management’ is the only factor that is associated with male or younger elderly group’s preference of visiting public open spaces. It shows that male elderly or younger elderly have higher level of social needs of using public open space and they are also more concerned about the management of public open space.

#### Difference between urban old districts and new towns

Some differences in elderly people’s use pattern of public open space between urban old district and new town are identified. The factor ‘Personal Consideration’ including health status, active lifestyle and attractive activities have higher impact on elderly people’s preference of visiting public open space in new towns.

The results also reveal that the factor ‘Public transport and street design’ is associated with elderly people’s preference of visiting open space in urban old districts. It means that public transport services and street network planning and road design are important in influencing elderly people to use public open spaces. In contrast, elderly people in new towns pay more attention to the socio-economic status of the neighbourhood where the public open space is located.

Last but not least, elderly people in urban old districts have higher requirements for the design and management quality of public open space. The factor ‘Inside open space’ including Social consideration and management, Maintenance, Crowdedness, Terrain and Quietness are correlated with the elderly’s preference of visiting public open space in urban old districts.

## **2. Layman’s summary on policy implications and recommendations**

In response to the key findings listed above, a number of corresponding policy implications are formulated. In turn, these led to some recommendations for the HKSAR government’s consideration.

The following are key planning and design principles for future policy formulation for the provision and design of public open space to better cater for the special and diverse needs of the older people.

#### For spatial planning of open space and the surrounding built environment

It is better to provide large public open space with good quality to elderly people rather than to provide open space which are near to their housing. Elderly people are more satisfied with district or regional open space than local open space. Thus, providing district or regional level open space is better than providing local level open space. In particular, in urban old districts, there are opportunities and need to combine several small open spaces into a large one. It is also revealed that elderly prefer a walking

distance to open space to be within 20 minutes. Besides, open space should be located in close proximity to other amenities that are important to elderly's daily life, for example, community facilities, restaurants and shops. As indirect and unphysical form of social interaction can also benefit elderly, thus, pocket parks should not be physically enclosed and isolated, instead they could be linked to shopping mall space or pedestrian linkage.

It is important to note that the walking environment around public open space is important as the majority of elderly walk to public open space. Thus, walkability, terrain and pedestrian safety are important planning considerations. Safe and barrier-free paths connecting public transport system and public open space are extremely important for elderly. It is highlighted that street connectivity and street networks are crucial for elderly people. It is better to locate open space in the street with fewer street intersections because it would normally be a less busy, less polluted and less noisy pedestrian environment.

In regard to strategic policy framework, it is suggested to find out the adequate number of large-size POS within a dense urban area with consideration of elderly mobility constraint. Given the limited supply of land resource, efficient allocation of land to public open space is essential.

#### For design within open space

The results reveal that the design considerations inside open space are more important than the surrounding spatial factors in both urban old districts and new towns. Thus, more detailed and thoughtful consideration should be given to the internal facilities, urban furniture and spatial design in order to enhance elderly's satisfaction with the open space.

The majority of elderly's intention to visit public open spaces is mainly doing physical exercises or chatting with friends. Thus, public open space should provide sufficient physical fitness equipment and quality space for social interaction. In particular, safety and elderly-friendly should be the key consideration in the design and selection of the physical fitness equipment. In regard to space for social interaction, more sub-spaces can be designed to cater the need of different social activities including space for chatting, small group gathering and different hobbies. Promotion of intergenerational activities can be enhanced, for example by thoughtful allocation of the fitness facilities and children playground.

In order to enhance the attractiveness of public open space, it is important to provide a variety of facilities to meet different needs of different age groups, such as commercial facilities, rain and wind protection and sun-shading devices, washroom facilities,

drinking water fountain and boundary treatments for different spaces and seating. Moreover, open space should be provided with a variety of urban furniture with good quality, pleasant landscape design, clear directional sign and sculptures, all of which can encourage elderly to visit open space and enhance their satisfaction level derived from using it.

The similarity and differences of preferences between genders should be taken into account when designing POS in order to address the issue of gender isolation in POS usage. Providing cultural and fitness facilities could encourage the inter-gender interaction. In addition, the age difference within elderly people should also be considered. For instance, the pedestrian environment is particularly important to older elderly in visiting open space, because of their lower mobility. In response, adequate pedestrian facilities, clear signage and wayfinding facilities, convenient pedestrian links, elderly friendly passageway, good traffic management and pleasant and attractive greening not only within the open space but also the route to the open space from major transport station are fundamental.

#### For management of open space

The management staff of public open space should ensure facilities in the open space are clean and in good condition by adopting a regular checking and maintenance schedule plan. It is revealed that crowdedness and conflict of use influence elderly's use of open space. Management action plan should be used to avoid conflict of use and crowdedness in different areas of the parks during different times of the day and the week. Sensors can be installed to measure noise levels in open space and effective actions to decrease noise levels can be formulated. Moreover, elderly people are concerned about the security and safety in the park. Thus, the LCSD should ensure that every park has at least one security guard, or one that can be shared among several small open spaces in the vicinity. It is important to make elderly users feel safe. Information about the location and quality of the open space is also important to enhance elderly's visits to open space.

Besides, space management should be flexible to accommodate diverse functions for meeting different user groups' needs. Regulations of the use of spaces and facilities should be flexible. It is suggested that more collaboration with NGOs in organizing different events can help to make public open space more attractive to the elderly people.

#### Difference between urban old districts and new towns

Similar design principles apply to the design of the internal area of open space. The core design elements include size, facility type, facility quality, urban furniture, landscape features and pollution. All are important to influence elderly's preference in

visiting public open space. However, there are also some specific consideration for urban old district and new town.

In urban old districts, street connectivity and network and public transport services are important. Thus, planning of open space should be located near public transport stations and should also ensure pedestrian safety by providing effective wayfinding systems and barrier free design. In management of open space, social considerations and management, maintenance, control of crowdedness, terrain, and quietness are important in old districts. Since it is normal that physical conditions of open space in old districts is relatively poor and dilapidated, a programme of more frequent maintenance would be needed. As urban old districts are relatively small in size and have a higher population density, noise could be a problem. Thus, a special management plan should be designed in accordance with the specific condition of the use of public open space. Given the size of POS in old districts is often small and it cannot accommodate additional facilities, sharing facilities with several nearby POS could be a feasible solution to enlarge the service circle of facilities and enhance accessibility of POS to the elderly users. For instance, sharing of a public toilet for a cluster of small POS is desirable. It is also highlighted that elderly people living in old districts tend to have developed a strong social networks, they would require more space and opportunities for social interaction and maintaining a sense of social cohesion.

In new towns, the government could promote more active and healthy lifestyle programmes and attractive activities to increase elderly's willingness to visit open spaces in new towns because health status, active lifestyle and attractive activities are found to affect the elderly's desire to visit open space. Overall, new towns are relatively new and usually provide better overall planning and design of open space. Thus, elderly people are quite satisfied with the open space. In this sense, the findings of the study would be of particular value to planners and urban designers to improve the design and management of POS in urban renewal old districts. Renovation of open space in old districts would be more possible because of its lower cost and easy to carry out.

## 執行摘要

### 1. 研究摘要

由於老齡人口的快速增長，香港社會正面臨著嚴峻的老齡化挑戰以及建設包容性的建成環境以滿足所有年齡群體的需求。其中一個重要策略就是推廣長者友善的公共開放空間。公共開放空間對於促進長者的身體健康和社會福祉是一個重要的元素。然而，長者的需求隨著社會、經濟與環境的變化而變化。現時的研究通常關注通用設計和基礎設施，其他影響長者使用公共空間的因素仍然缺乏綜合研究。同時在香港，與新市鎮相比，正在

经历城市更新过程的舊區具有獨特的社會經濟特徵，城市形態和重建計畫，這也會影響長者使用公共開放空間的喜好。因此，研究長者在舊區和新市鎮的公共開放空間的使用模式的不同對制定公共政策具有重要意義。

本研究旨在達成以下目的：

- 1) 探索影響長者使用公共開放空間的觀念和喜好的潛在因素；
- 2) 探索影響新市鎮和舊區長者訪問公共開放空間的不同因素的相對重要性；
- 3) 建立長者對公共開放空間的偏好的多維模型；
- 4) 為公共開放空間用地的規劃提供政策框架，以改善新市鎮和舊區的長者友善環境

本研究綜合使用了定性和定量的研究方法以達成研究目的。首先，通過文獻閱讀法提出了一個包含多種類因素的長者對公共開放空間的偏好的多維模型。其次，通過焦點小組訪談和專家訪談對多維模型和研究框架進行初步的改善。在研究的第二階段，資料收集主要使用了問卷調查、空間分析和實地調查。問卷調查主要用於收集長者對影響使用公共開放空間的不同因素的感知。空間分析主要用於對公共開放空間的分佈及其周邊環境的分析。實地調查法主要用於對公共開放空間的設計和管理品質進行評估。最後，由不同領域的專家組成的專家小組對本研究的結果進行了論證並對可行的政策建議進行了討論。本研究選擇了從黃大仙區（舊區）和青衣及將軍澳新市鎮中選擇了 30 個公共開放空間作為研究場地，共收集了 647 份有效的調查問卷，其中 537 份來自經常使用公共開放空間的長者，110 份來自很少使用公共開放空間的長者。

## 主要研究結果

### 長者使用公共開放空間的模式

本研究發現 94.6%的長者選擇步行去公共開放空間。同時步行時間亦是重要考量，大部分的長者傾向於使用离家近的公共开放空间，步行时间不多于 20 分钟。長者使用公共開放空間的目的反映了他們的物理和社會需求，75.4%的長者主要在公共開放空間做運動，同時 36.1%會在公園中與朋友會面交談。

影响长者使用公共开放空间的因素根据使用公共开放空间的顺序被归类为三个类别：決定從家中出發類別、去公共開放空間的途中類別和在公共開放空間中類別。

### 決定從家中出發

決定從家中出發的類別主要包含了能夠鼓勵長者離開家去使用公共開放空間的因素。在這其中，空餘休閒時間和保安因素以及個人考量因素（身體健康、積極的生活方式和有吸引力的活動）是影響長者使用公共開放空間喜好的重要因素。同時，研究也發現長者

使用公共開放空間的目的（做運動、有他人陪伴）會使得長者更傾向於使用公共開放空間。

同時，有一些因素被發現只會影響特定長者群體的使用公共開放空間的偏好。居住條件因素以及使用公共開放空間的目的（與朋友交談）被認為只會影響居住在私人屋苑中的長者的使用偏好。與此同時，使用公共開放空間的目的（群體活動）被認為只會影響男性長者群體的使用偏好。

### 去公共開放空間的途中

去公共開放空間的途中類別主要指公共開放空間的周邊環境因素。本研究發現公共開放空間的可用和鄰近距離因素是本類別中的影響長者使用偏好的重要因素。除此之外，公共開放空間周邊的公共開放空間數量和街道網路的集成度亦會影響長者使用公共開放空間的喜好。

同時，公共開放空間所處社區的社會經濟狀況和居住密度被發現僅會影響居住在私人屋苑中的長者的使用偏好。感知的不行環境被認為會同時影響居住在私人屋苑的長者和較年輕的長者的使用偏好。與此相反，較年長的長者對真實的行人環境的更為敏感。

### 在公共開放空間中

在公共開放空間中類別關注公共開放空間的品質，主要包含公共開放空間的設計和管理。一系列相關的重要指標被發現會對長者使用公共開放空間的喜好產生重要影響，其中包括面積、設施種類、設施品質、城市傢俱、景觀、維護、擁擠以及安靜程度。長者被認為會更傾向於使用那些有更大面積、豐富的設施種類及良好的設施品質、精心設計的城市傢俱和景觀、良好的維護、不擁擠以及安靜的公共開放空間。

與此同時，社會考量和管理因素被發現會對男性長者或較年輕長者的使用偏好產生影響。這說明這些長者群體對公共開放空間有著更高的社會需求和管理需求。

### 城市舊區和新市鎮的不同之處

除了以上一些因素，本研究亦發現長者使用公共開放空間的喜好在舊區和新市鎮中有所區別。在決定從家中出發的類別中，新市鎮的長者被發現更關注個人考量的因素，包括身體健康狀況、積極的生活態度和活動的吸引程度。在去公共開放空間的途中類別中，舊區的長者更關注公共開放空間的公共交通配套和公共開放空間的管理因素，與此同時，新市鎮的長者更關注公共開放空間所處社區的社會經濟狀況。同時，在公共開放空間中類別中，舊區中的長者被發現相對於新市鎮中的長者對公共開放空間的品質普遍有著更高的要去，包括公共開放空間的維護、擁擠程度、平坦、安靜程度以及社會考量和管理因素。

## **2. 對政策的影響和建議**

為了回應以上所列的主要研究結果，如下相關的政策建議被提出以供香港特別行政區政府考慮。

以下是未來政策重要的規劃與設計準則：

#### 在公共開放空間的空間規劃和周邊建成環境方面

通常，規劃應考慮提供面積更大以及高質量的公共開放空間而不是提供離長者家最近的公共開放空間。相比鄰捨級別的公共開放空間，長者通常更滿意區域或地區級別的公共開放空間。因此，規劃應提供更多區域或地區級別的公共開放空間。特別在舊區中，有機會將幾個小的公共開放空間合併為一個大的公共開放空間。研究亦發現長者更傾向於低於 20 分鐘的步行距離。此外，公共開放空間的位置也應該與其他對長者日常生活較為重要的設施較近，例如公共設施，餐廳及零售店。由於社會交往的間接形式和非物質形式也有利於長者，因此，袖珍公園不應在物理上被封閉和孤立，而應與購物中心的空間或行人聯繫起來。

由於大部分的長者步行去達公共開放空間，因此公共空間周邊的步行環境至關重要。因此，可步行性、地形和行人安全是非常重要的規劃考量。連接公共交通系統和公共開放空間的安全和無障礙的通道對長者十分重要。對於長者，街道的連接和網絡也十分重要。規劃應考慮將公共開放空間佈局在有更少交叉口的街道上，因為通常這樣的街道會提供較少車流、空氣污染和噪音的步行環境。

就策略政策框架而言，建議在考慮到長者出行限制的情況下，探索在高密度的城市地區提供足夠數量的大型公共開放空間。考慮到土地資源的局限，有效的公共開放空間佈局至關重要。

#### 在公共開放空間設計方面

此研究發現在城市舊區和新市鎮，公共開放空間內部設計因素都比周邊空間環境因素更重要。因此，應該對內部設施，城市傢具和空間設計進行更詳細和周到的考量，以提高長者對公共開放空間的滿意度。

大部分長者使用公共開放空間的目的是做運動或與朋友交談。因此，公共開放空間需要提供足夠的長者健身設施和空間供社交活動。特別是安全和長者友善是在設計和選擇健身設施上需要重點考量的，更可以促進和加強跨代活動，例如仔細考慮健身設施和兒童遊樂場的配置。對於供社交活動的空間而言，可以設計更多的子空間來滿足不同社交活動的需求，諸如聊天空間，小組聚會和不同的愛好。

為了提高公共開放空間的吸引力，提供多種類的設施來滿足不同年齡群體的需求十分重要，諸如商業設施、防雨、防風和遮陽設備、公共廁所、飲用水以及針對不同空間和座位的邊界處理。此外，公共開放空間亦應提供不同種類的高質量的城市傢具，宜人的景觀設計，清晰的指引系統和景觀雕塑來鼓勵長者只用公共開放空間以及提高他們對公共開放空間的滿意度。

## 在公共開放空間管理方面

公共開放空間的管理職員需要通過定期的檢查和維護計劃確保公共開放空間內的設施清潔以及狀態良好。研究結果發現擁擠程度和使用上的衝突會影響長者使用公共開放空間，可使用管理行動方案以避免在一周或一天中的不同時間在公共開放空間的不同區域擁擠和使用衝突。可以安裝傳感器以收集公共開放空間中的噪聲水平，以此制定降低噪聲水平的有效措施。此外，長者擔心公園的安保問題。因此，康文署應確保每個公共開放空間內至少有一名保安，或有鄰近的幾個小型公共開放空間共用，使長者感到安全十分重要。

此外，空間管理應該靈活以提供多種功能，以滿足不同用戶群體的需求。有關使用空間和設施的規定應更靈活。建議可與非政府組織加強合作，組織各種活動，使公共開放空間對長者更具吸引力。

在設計公共開放空間時，應考慮性別偏好的異同，以解決公共開放空間使用中性別隔離的問題。提供文化和健身設施可以鼓勵跨性別的互動。此外，還應考慮長者的年齡差異。例如，由於年長的長者的活動能力較低，行人環境對他們而言在使用公共開放空間時尤其重要。因此，不僅在公共開放空間內部，而且從主要的公共交通站點到公共開放空間的路線都必須具備足夠的行人設施，清晰的路標和指引設施，便利的人行通道，長者友善的通道，良好的交通管理以及宜人的綠化環境。

## 城市舊區和新市鎮的不同

對於城市舊區和新市鎮，相似的設計原則適用於公共開放空間內部區域的設計。核心設計元素包括面積，設施類型，設施質量，城市傢具，景觀特徵和空氣質量，這對於影響老長者訪問公共開放空間的偏好至關重要。但是，對於城市舊區和新市鎮也有一些特殊的考量。

在城市舊區，街道連接和網絡以及公共交通服務至關重要。因此，公共開放空間的規劃應位於公共交通站點附近，並且還應通過提供有效的指引系統和無障礙設計來確保行人安全。在公共開放空間的管理中，舊區的社會考量和管理因素，維護，擁擠的控制，地形和安靜十分重要。由於正常情況下舊區公共開放空間的物理條件相對較差且殘舊，因此需要更頻繁的維護保養。由於城市舊區面積相對較小，人口密度較高，因此噪音可能成為問題。因此，應根據使用公共開放空間的具體情況制定特殊的管理計劃。鑒於舊區的公共開放空間規模通常很小，並且無法容納額外的設施，因此與鄰近的公共開放空間共享設施可能是擴大設施服務範圍並增強公共開放空間對長者的可達性的可行解決方案。例如，為一群小型公共開放空間共享一個公共廁所。還需要強調的是，居住在舊區的長者往往建立了強大的社交網絡，他們需要更多的空間和機會進行社交活動並保持社會凝聚力。

在新市鎮中，考慮到身體健康、積極的生活方式和有吸引力的活動會影響長者使用公共開放空間的意願，政府可推廣更多的促進健康和積極生活方式的項目以及有吸引力的活動來提高長者使用公共開放空間的意願。總體而言，新市鎮相對較新，通常可以提供更好的總體規劃和公共開放空間設計。因此，長者對公共開放空間較為滿意。以此而言，

此研究的結果對城市規劃師和城市設計師來說，對於改善城市舊區的公共開放空間的設計和管理具有重要的價值。由於成本較低且易於實施，舊區的公共開放空間的翻新更具可能性。

## Chapter 1. Introduction

### 1.1 Background

#### 1.1.1 Aging in Hong Kong

As with other developed cities all over the world, Hong Kong, faces the significant trend of rapid growth of the population of elderly people in the past years. Based on the result of 2011 Population Census of Hong Kong (Census and Statistics Department, 2013), life expectancy had a substantial increase compared to 2001, which are 80.5 years and 80.67 years respectively of male and female in 2011. Similarly, the proportion of elderly people rose from 2.8% in 1961 to 13.3% in 2011 (Figure 1), which the annual average growth rate was 4.8% in these five decades. Another important issue that should be highlighted is that elderly people themselves also showed an aging trend. The proportion of elderly people aged 65-69 years decreased from 33.3% in 2001 to 24.9% in 2011, in contrast, the proportion of people over 80 years grew rapidly from 19.6% in 2001 to 28.8% in 2011 (Figure 2). These changes highlight the fact that Hong Kong has gradually become an aging city in the past decades.

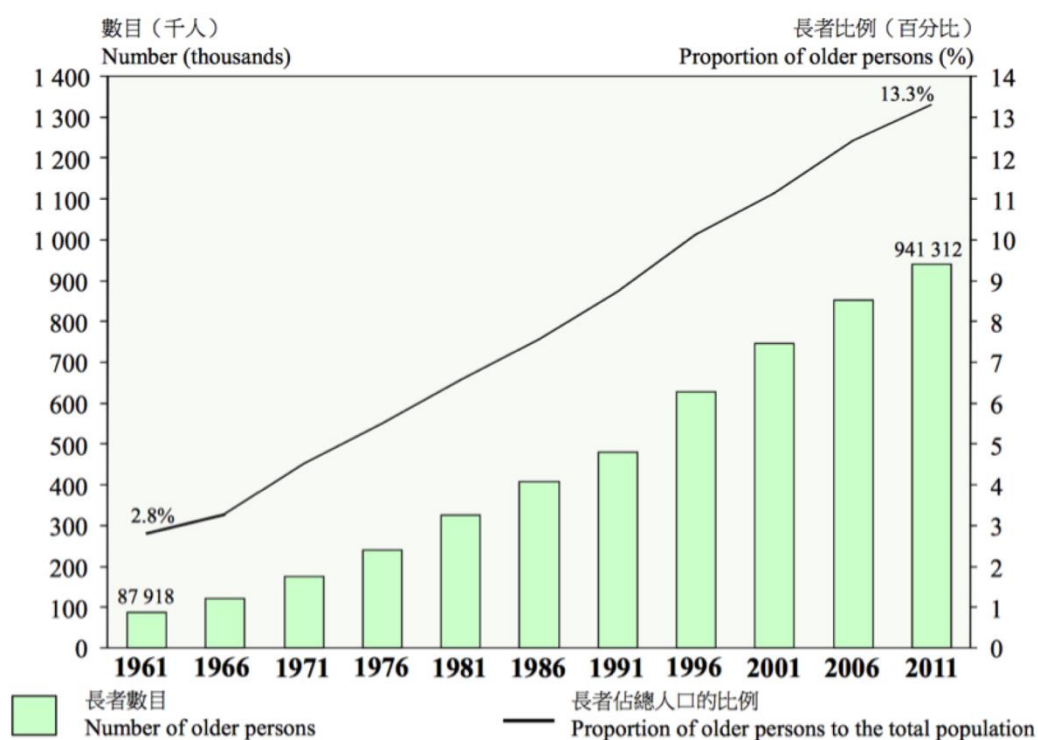


Figure 1 Number and Proportion of older persons, 1961-2011

Source: 2011 Population Census Office, Census and Statistics Department, HKSAR

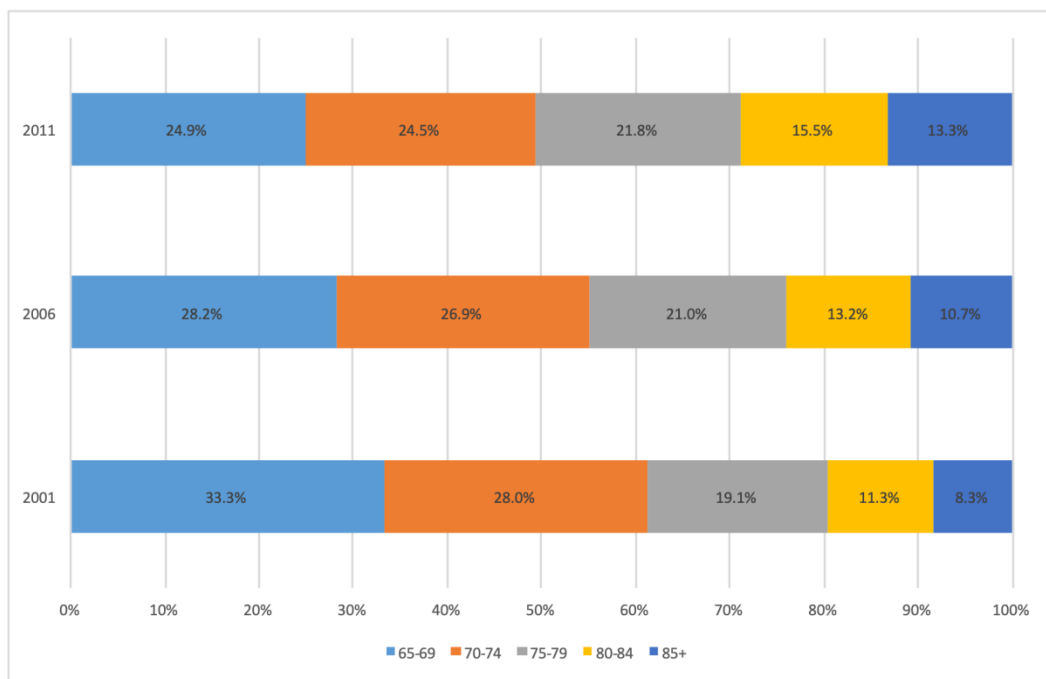


Figure 2 Proportion of older persons by age groups, 2001, 2006 and 2011

Source: 2011 Population Census Office, Census and Statistics Department, HKSAR

According to the population projections by Census and Statistics Department (Census and Statistics Department, 2017), the trend of aging will be much obvious in next 50 years. The forecast illustrates that the proportion of elderly people aged over 65 years would increase from 15.9% in 2016 to 33.7% in 2066 and the life expectancy would increase nearly 5.8 years for both male and female, reaching 87.1 years and 93.1 years respectively in 2066. Compared to other developed economies, such as Japan, Sweden, Australia, U.K. and U.S.A., the life expectancy of Hong Kong is longer than the others, especially for female, which means that in the following five decades, Hong Kong will face a more serious aging problem, and the transformation of population structure will also be much apparent as the group of people at the top of the age pyramid will expand year by year.

### 1.1.2 Public Open spaces in Hong Kong

According to the Hong Kong Planning Standards and Guidelines (Hong Kong Planning Department, 2014), open space refers to those public and private outdoor open-air spaces mainly used for active and/or passive recreation for the enjoyment of the general public provided both at ground and podium levels. The Hong Kong Planning Standards and Guidelines list three types of open space, namely regional, district and local (Hong Kong Planning Department, 2014). Due to the intense development pressure in Hong Kong, it is common for open spaces to be sacrificed for commercial development or other uses. The planning standards for open space, approved by the government authority in 1981, were 15 ha and 20 ha per 100,000 persons in the Metro Area and the New Territories respectively. The Hong Kong Planning Standards and Guidelines

regarded these provisions as not sufficient. Apart from the quantity, the quality of the open space provision is also not satisfactory. Thus, it is not uncommon to see that some public open spaces have very few visitors. The Chief Executive of Hong Kong (Office of the Chief Executive, 2011) highlighted his commitment to ensuring that all residents can enjoy quality city living by rejuvenating old quarters of the city.

Yung et al. (2016b) shows that the social preferences of the elderly in using public open spaces are different in the case of older districts in Hong Kong. As such, the broad planning and standard guidelines, which are more relevant to newly-planned districts, may not be completely applicable to the planning of public open spaces in the old districts. The Urban Renewal Authority claims that redevelopment sites will be “replanned and rebuilt to achieve clear environmental and social benefits such as the provision of open space and community facilities...” (URA, 2011). However, clear consideration of elderly people’s needs in the planning of open spaces is lacking. In new development areas in the New Territories with a lower living density, much more generous recreation spaces and amenities could be provided than in the urban areas. The planning of new towns is important in catering for the increasing population, especially for an ageing population.

### 1.1.3 Urban old districts and new towns in Hong Kong

There are 18 districts in Hong Kong and some of them have a long development history compared to those in the new towns. In most of these old districts, the buildings and facilities are old and dilapidated and the living condition is not good for residents, especially elderly people. Thus, the government established the Urban Renewal Authority 2001 to facilitate urban redevelopment projects to improve the built environment of local communities. As there is no clear definition of urban old district, in this study, urban old district is defined as the districts with undergoing or finished urban renewal projects. This finding is based on the information provided by Urban Renewal Authority, Central & Western district, Kwun Tong district, Kowloon City district, Sham Shui Po district, Eastern district, Yau Tsim Mong district, Wan Chai district and Wong Tai Sin district.

The development of new towns aims to provide housing for the increasing population, and the programme was released in 1973. Up to now, 9 new towns have been built and around 3.47 millions of residents live in new towns (Civil Engineering and Development Department, 2016). The 9 new towns could be divided into three generations. The first generation contains three new towns named Tsuen Wan, Sha Tin and Tuen Mun. Tsuen Wan New Town covers Tsuen Wan, Kwai Chung and Tsing Yi Island. The second generation of programme was mainly built in late 1970s, which includes Tai Po, Fanling/Sheung Shui and Yuen Long. The most recent new towns, which are Tseung Kwan O, Tin Shui Wai and Tung Chung, are mainly built in the 1980s and 1990s. As the population in new towns is expected to increase to 3.63 million,

it is meaningful to provide better planning and design of open spaces to meet residents' needs.

## 1.2 Problem Statement

As illustration in chapter 1.1, the elderly population in Hong Kong has a rapid growth trend and open space has been found that is important to the elderly's health and social well-being. However, the quality and provision of urban open space has long been criticized as unsatisfactory. It is well observed that the elderly population, especially those with less financial resources, often spend most of their day in public open spaces, due to the very small living spaces and poor living conditions in Hong Kong (Kwok and Tsang, 2012; Kwok, 2013). A detailed understanding of the diverse preferences of the elderly in using public open space has yet to be fully provided.

In addition, urban old districts and new towns have quite different geographical features, and elderly people living in these districts also have different preferences of using open space. However, the recent planning and management policy did not address this particular difference sufficiently. There is still a lack of understanding of the difference of the elderly's preference of visiting open space in urban old districts and new towns. Thus, it is useful to explore the different use pattern of open space by people in urban old districts and new towns, which could be a benefit to policy-making.

## 1.3 Project Objectives

Objectives of the study are listed below:

- 1) To identify the underlying factors affecting the perceptions and preferences of elderly people in visiting public open spaces;
- 2) To identify the relative importance of the different factors in affecting visits to public open space by the elderly in new towns and old districts;
- 3) To formulate a multidimensional model of the preferences of the elderly in visiting public open space; and
- 4) To provide a policy framework for the planning of public open space which aims to enhance age-friendly environments in new town and old districts.

#### 1.4 Research Significance

This research aims to formulate a framework which examines these underlying factors in the case of a dense urban city. This research will focus both on studying old districts and new development areas because the elderly population is found to be concentrated in these areas due to the relatively affordable housing. It is also argued that the use of a uniform set of principles and guidelines for planning public open spaces in both urban renewal and newly-developed districts with different existing urban form and land use planning is questionable.

Thus, this research study will formulate a comprehensive framework for the understanding of the preferences of the elderly in visiting public open space. Hence, the diverse needs of the ageing population should be incorporated into the planning of public open space in the different types of areas. The list of factors and their relative importance in affecting preferences of the elderly in visiting public open space can provide useful insights and guidelines enabling urban planners and designers to improve the planning and design of public open spaces to promote age-friendly built environment and enhance active ageing. In addition, this study will inform planners on the utilization and distribution of public open spaces for better relocation of and utilization of land resources in Hong Kong.

#### 1.5 Report Structure

Chapter 1 introduces the research background, research problem and objectives as well as the significance of the research.

Chapter 2 presents a comprehensive literature review of the key concepts of this research as well as multidimensional considerations affecting the use of public open spaces.

Chapter 3 explains the research methodology used in this research, which involves both qualitative and quantitative research methods.

Chapter 4 contains the results of focus group meetings, expert interviews, questionnaire surveys and spatial analysis.

Chapter 5 discusses the findings of the elderly's preferences in visiting open space.

Chapter 6 provides the conclusions, policy implications and key recommendations to improve the planning, design and management of public open space.

## **Chapter 2. Literature review**

### **2.1 Active aging and aging in place**

Nowadays, due to the development of medical technology and life quality, people are expected to live much longer than ever before. The statistics show a new trend in population structure that the proportion of elderly people aged over 60 years increases at a high rate. According to the report by the United Nations Department of Economic and Social Affairs (2017), it is predicted that the number of people who are aged over 60 will double from 962 million in 2017 to nearly 2.1 billion in 2050, while the proportion of elderly will rise from one in eight people in 2017 to one in five people by the middle of the twenty-first century.

To face the global challenges of the aging process, the World Health Organization has proposed the concept of active aging. Active ageing is “the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age” (WHO, 2002). Another important concept is aging in place, which was defined as “the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level”. (U.S. Centers for Disease Control and Prevention, 2009).

Active aging encourages elderly people to keep participating in a diversity of activities and affairs, such as physical, social, economic and cultural activities. The success of active aging depended on variety of determinants, such as culture and gender, health and social services, behavioural, personal factors, physical and social environment, and economic determinants (WHO, 2002). Thus, physical activity is one of the key elements of active aging. Aging in place also requires elderly to be actively engage in physical activity. Barnett et al. (2016) also found that providing a suitable neighbourhood environment that could help the elderly to continue participating in physical activity and maintain independent community living was important for their aging in place.

Active aging and aging in place both require the elderly to integrate the physical activity into their daily routines. It is indicated that physical activity could benefit the elderly’s physical, social and emotional well-being, which could also promote active aging and aging in place for elderly people (Jancey et al., 2009; Lyons & Dionigi, 2007). Elderly people who are physically active have ability to have more opportunities to socialize with others, which could promote their social and psychological health. Physical health has been found that has a significantly larger impact on the elderly’s social participation than young adults (Van Willigen, 2000; Li & Ferraro, 2006). Lyons and Dionigi (2007) also found that in Australia, the elderly’s social interaction and sense of community could be enhanced by participating in sports competitions or activities. Furthermore, social participation and social support also play important role in the elderly’s physical health, active aging and aging in place. Cornwell and Waite (2009) encouraged elderly people to take part in voluntary associations as it could help the elderly to keep

physically active and develop their own social support network. Some related studies also demonstrated that social support from families and friends plays an important role in promoting the elderly's involvement in leisure and recreational physical activities (Sasidharan et al., 2006; Orsega-Smith et al., 2007).

To achieve active aging and aging in place, a suitable built environment for the elderly to have physical activity on a daily basis is an essential element that affects both their physical health (Sheffield & Peek, 2009) and social benefits (Gallacher, 2005). Thus, it is important to improve the built environment and develop an age-friendly community, particularly open spaces, to increase the elderly's daily physical activities, and promote active aging and aging in place.

## 2.2 Age-friendly community and the importance of public open spaces

The initiative of age-friendly cities and communities intends to create inclusive and accessible urban environments to benefit the ageing population. The physical and social environment of the community is important to make the community age-friendly. In regard to the physical environment, public transport and a walkable environment are important for age-friendly community. Loo and Lam (2012) found that in Hong Kong public transport and walking are the two most frequent transportation modes that elderly people take to visit health-care facilities. Loo et al. (2017) also believed that the design of neighbourhood should enhance the elderly's walkability which can directly increase their physical health and encourage an active lifestyle. Thus, promoting a walkable environment should be priority in age-friendly community development. The accessible and affordable public transport could be helpful for the elderly to engage in community life and keep mobile and independent (Zeitler et al., 2012; Coronini-Cronberg et al., 2012).

Social environment plays an important role in achieving age-friendly community. It has been proven that a positive social environment could promote social capital and social inclusion, maintenance of social networks and relationships (Scharlach & Lehning, 2013) which could increase the elderly's subjective well-being (Wang, 2016). It is also indicated that social integration and interaction among older and younger persons could help the elderly to maintain the connection with local community, which should be considered in establishing the age-friendly community (Emlet & Mocerri, 2012). Social inclusion is also a key theme for elderly's well-being. Thus, it is indicated that building an age-friendly social environment should be given the same priority as the physical environment in achieving age-friendly community (Liu et al., 2009).

In particular, open space is a vital factor that enhance elderly's active aging and the building of an age-friendly community (Pasaogullari & Doratli, 2004; Kwok & Ng, 2008; Sugiyama & Thompson, 2007). The provision and design of 'outdoor space and

buildings' is one of the eight themes to assess the extent to which a city is age-friendly (WHO, 2007). It is stated that an age-friendly city positively affects personal mobility, security, safety, health behaviour and social participation (WHO, 2007). Like many other cities, the population is aging rapidly in Hong Kong. Thus, it is fundamental to improve existing community facilities to cater for the evolving needs of the elderly population in an extremely dense urban environment.

It is well documented that open spaces can enhance the elderly's physical activity and physical health. It was found in Bristol, UK that people who lived close to the open space had a higher possibility to reach the physical activity recommendation and had less possibility to be overweight or obese (Coombes et al., 2010). It is also proven that open space, with big size and high quality within walking distance from home, can enhance adequate walking activities (Sugiyama et al., 2010). A longitudinal study in Japan found that elderly people who live in a community with walkable green space have a five-year higher survival percentage than those who live without walkable green space (Takano et al., 2002). Cerin et al. (2013) indicated that the availability of parks has a positive impact on elderly people's recreational walking activity. In addition, Giles-Corti et al. (2005) found that in Perth, Australia, public open spaces which are large, attractive and easy to access could increase the level of walking activity.

Previous research also commonly highlighted that open space could foster social networks and social interaction through providing space for face-to-face contacts with other people (Sugiyama & Thompson, 2008; Kweon et al., 1998). It is suggested by Turel et al. (2007) that using public open space with other people could enhance elderly's social relations and communications with other citizens in cities. Coley et al. (1997) found that park-like natural elements can increase the opportunities for the elderly to engage in social interaction in poor communities. It is also found that the use of parks could help to enhance elderly's social connection and sense of community (Kweon et al., 1998). Furthermore, it is indicated that the presence of other people in open space was an essential element of users' experience in open space, and active engagement can enhance their well-being (Dinnie et al., 2013).

It is stated that physically active lifestyles, social integration and mobility are factors that contribute to successful ageing (Labus, 2012; Rowe & Kahn, 1998). The dramatic ageing population trend makes for important social, cultural, economic and political change that has consequences on our way of understanding the needs of different age groups, forcing reconsideration of city and urban planning.

### 2.3 Multidimensional considerations affecting the use of public open spaces

Many studies have separately examined many different criteria that can enhance the design of public open space. These include physical factors with regard to urban design

and spatial aspects, and environmental, social, psychological, and individual factors. However, a comprehensive framework is lacking to support investigation into the multidimensional factors seen as a whole, a continuum affecting the preferences of the elderly in visiting public open spaces.

To capture the existing research on which factors affect the use of public open spaces, a comprehensive literature search has been conducted on the main full-text academic databases, including Web of Science, Science Direct, EBSCO, ProQuest, Scopus, Google Scholar and University Library OneSearch (including HKALL). The aim of the search was to find out the variety of variables that have influence or relationship with people’s decision to visit open space. The following keywords were used for searching work: “open space”, “park”, “green space” combined with “access”, “visit”, “use”, “attract”. In addition, “elderly”, “older” and “senior citizens” are also used to identify the research focus on the elderly people. Overall, 113 academic journal papers, 6 government public policy documents or planning guidelines and 6 institutional research files have been included in the study based on deep reading of the abstracts. After deep reviewing the paper and documents, six main areas (surrounding environment, open space design, transport, management, social and personal) were identified and 39 factors are included in the study, which is presented in Table 1.

Table 1 List of criteria associated with elderly’s visits to public open space

| Factor                         | Description  | Reference  |
|--------------------------------|--|--|
| <b>Surrounding environment</b> |  |  |
| Walkability                    | Easily walk to the park and the walk to the park is pleasant   | Frank et al., 2005; Goličnik and Thompson, 2010; Wang et al., 2015a; Wang et al., 2015b                    |
| Proximity to home              | Distance from home to open space   | Giles-Corti et al., 2005; Koosari et al., 2013; Wang et al., 2015; Arnberger et al., 2017                  |
| Proximity to amenities         | Distance from open space to community facilities/ number of amenities around open space                    | Bauman et al., 1996; Pasaogullari and Doratli, 2004; Michael et al., 2006; Temelová & Dvořáková, 2012      |
| Proximity to public transport  | Distance from open space to public transport station/ number of public transport station around open space | Borges, 2007; Turel et al., 2007; Day, 2008; Clarke & Nieuwenhuijsen, 2009; McCormack et al., 2010; Labus, |

|                                   |   |   |
|-----------------------------------|---|---|
|                                   |   | 2013; Holle et al., 2015  |
| Street connectivity               | Directness and availability of alternative routes through the network     | Handy et al., 2002; Kaczynski, 2010; Kaczynski et al., 2014   |
| Pedestrian safety / traffic speed | Safety situation along the way to the open space, caused by traffic speed | Morrison et al., 2004; Kaczynski et al., 2014; Loukaitou-Sideris et al., 2016   |
| Availability                      | There are a sufficient number of parks in the neighbourhood               | Koohsari et al., 2013; Gong et al., 2014; Wang et al., 2015a  |
| Residential density               | Residential density reflects the number of residents of the neighbourhood | Saelens et al. 2003a; Saelens et al. 2003b; Frank et al., 2005  |
| Noise                             | The noise around the open space, mainly traffic noise                     | Rantakokko et al., 2012; Arnberger et al., 2017   |
| Pollution                         | The pollution around the open space, air quality                          | Fermino et al., 2013; Wen et al., 2018  |
| <b>Open space design</b>          |   |   |
| Size                              | Size of open space which provide adequate space for activity              | Giles-Corti et al., 2005; Rantakokko et al., 2012; Loukaitou-Sideris et al., 2016   |
| Terrain                           | Height difference within open space                                       | Rigolon, 2016   |
| Landscape                         | Natural or cultural landscape design                                      | Zhang et al., 2013; Wan & Shen, 2015; Chen et al., 2016; Arnberger et al., 2017; Wen et al., 2018                                     |
| Facilities/amenities              | Recreation, commercial or other facilities for uses                       | Kaczynski et al., 2010; Wendel et al., 2012; Chen et al., 2016; Singapore Building and Construction Authority, 2016; Wen et al., 2018 |
| Urban Furniture                   | Seating area for rest, communal spaces, special seating, talking spaces   | Thompson et al., 2012; Chen et al., 2016; Yung et al., 2017   |

|                                  |   |   |
|----------------------------------|---|---|
| Barrier free design              | Universal design for people with disability   | Clarke & Nieuwenhuijsen, 2009; Wan & Shen, 2015; Zhu et al., 2017                                       |
| Design for all weather condition | Design for people to use open space in different weather conditions   | Zhang et al., 2013; Wan & Shen, 2015; Zhai & Baran, 2017  |
| Wayfinding system                | how easily people can find their way in an existing environment   | Loukaitou-Sideris et al., 2014; Singapore Building and Construction Authority, 2016                     |
| <b>Transport</b>                 |   |   |
| Cost                             | affordable public transport   | WHO, 2007; Olawole & Aloba, 2014  |
| Availability of public transport | Adequate public transport around open space and can easily access   | Dony et al., 2015; Wan & Shen, 2015; Fan et al., 2017   |
| Car ownership                    | Visitors who have cars  | Hillsdon et al., 2006; Gong et al., 2014; Boyd et al., 2018   |
| Travel time                      | Acceptable time to visit open space by public transport   | Erkip, 1997; Levinson, 1998; Pasaogullari & Doratli, 2004; Wang et al., 2015a<br>Arnberger et al., 2017 |
| <b>Management</b>                |   |   |
| Conflict of use                  | Different uses of space by different age groups or cultural groups per day and time of day which need better management | Turel et al. 2007; Wang et al., 2015a; Wang et al., 2015b; Arnberger et al., 2017                       |
| Maintenance                      | the facility/amenities are in good condition to use   | Aspinall et al., 2010; Chow, 2013; Eronen et al., 2014; Sang et al., 2016; Wen et al., 2018             |
| Cleanliness                      | Clean, no rubbish outside trash can   | Pasaogullari and Doratli, 2004; Eronen et al., 2014; Hecke et al., 2016                                 |
| Crowdedness                      | Enough space provided for activity  | Yuen, 1996; Wong, 2009; Brander & Koetse, 2011  |

|                                  |  |   |
|----------------------------------|--|---|
| Open hours                       | The opening hours of the urban green spaces are convenient   | Wan & Shen, 2015  |
| <b>Social</b>                    |  |   |
| Social interaction               | Interact with other social/cultural groups   | Pasaogullari and Doratli, 2004; Loukaitou-Sideris et al., 2016; Yung et al., 2016a; Wen et al., 2018    |
| Safety                           | Perceived safety, access to protection   | Loukaitou-Sideris et al., 2014; Loukaitou-Sideris et al., 2016; Sang et al., 2016                       |
| Attractiveness                   | The quality that causes interests, desire in, or gravitation to open space   | Giles-Corti et al., 2005; Sugiyama & Thompson, 2007; Kwok & Ng, 2008; Zhai & Baran, 2017                |
| Social cohesion                  | The extent to which a geographical place achieves 'community' in the sense of shared values, cooperation and interaction | Beckley, 1994; Forrest & Kearns, 2001; Cattell et al., 2006; Peters et al., 2010; de Vries et al., 2013 |
| Social participation             | Sense of community ownership and involvement in site planning and management, social activities                          | Chiesura, 2004; Fadda et al., 2010; Andersson, 2011; Yung et al., 2016a                                 |
| <b>Personal</b>                  |  |   |
| Available leisure time           | Visiting open space requires available leisure time which may influence the decision to visit open space                 | Neuvonen et al., 2007; Reichert et al., 2007; Wang et al., 2015a  |
| Comfort at home                  | Feeling comfort staying at home  | Beng-Huat, 2002   |
| Active lifestyle                 | Willing to active engaged in physical and social activity  | Neuvonen et al., 2007; Sugiyama & Thompson, 2008; Wang et al., 2015a                                    |
| Means to go to public open space | The way people take to open space  | Tinsley et al., 2002; Duan et al., 2018   |

|                               |  |   |
|-------------------------------|--|---|
| Health status                 | Health status that affect elderly's ability to move around, see clearly and hear clearly, etc. | Jorgensen & Anthopoulou, 2007; Turel et al., 2007; Aspinall et al., 2010; Sarkissian & Stenberg, 2013; Sajadzadeh et al., 2015; Aspinall et al., 2010 |
| Intention to visit open space | Why the elderly visit open space   | Kweon et al., 1998; Sugiyama & Thompson, 2008; Kemperman & Timmermans, 2014; Gibson, 2018   |
| Size of Living space          | Size of house  | Tu et al., 2016   |

### 2.3.1 Surrounding environment

With reference to Table 1, the walkability of the surrounding environment is one important factor, as the elderly mostly engage in walking as part of their daily lives and it would affect the elderly's experience in walking to the open space. It is indicated that pleasant walk plays important role in people's perceived accessibility to open space and the higher walkability to the open space could make people feel easier to access to open space for both high SES and low SES suburbs (Wang et al., 2015a). Wang et al. (2015b) also pointed out that having pleasant walking experience was much more important to Chinese people than to people living in Western countries, and it was one of the strongest predictors of perceived accessibility. A walkability index which consists of several urban form variables was used to explain the daily physical activity level in Atlanta and found that it was significantly related to people's number of minutes of moderate daily activity (Frank et al., 2005). Goličnik and Thompson (2010) found that a footpath with trees and seats could promote the walking experience and this had a significant impact on the use of open space.

Proximity to open space has been well documented that has vital impact on people's decision to visit open space. Giles-Corti et al. (2005) found that public open space with good access to and was proximate could increase people's walking level. Koosari et al. (2013) indicated that attention should be paid to proximity during the urban design process to distribute the public open space in the community to promote walking activity. The geographical proximity from open space to people's homes could improve people's perceived accessibility to urban parks (Wang et al., 2015). The study in Vienna

also found that the distance to open space had a close relationship with senior citizen's use of open space, and preference was given to the short access time (Arnberger et al., 2017).

Ease of access to community amenities around open space have also been found to affect people's use of open space. Proximity to popular amenities can also help encourage the use of open space. A study in Famagusta found the public amenities around the park and located close to the residential units could increase the use of the open space (Pasaogullari and Doratli, 2004). Bauman et al. (1996) indicated that proximity of facilities, including shops, is the most important environmental factor that affects physical activities. Thus, it is vital to consider the location of open space in the community during the planning and design process. It was also found in Portland that local shopping and services were important to the elderly's activity, and these need to be considered in land use planning to build an age-friendly community (Michael et al., 2006). It could also affect elderly's neighbourhood satisfaction levels and promote their walking activity level in city centres (Temelová & Dvořáková, 2012).

Proximity to public transport is also an important factor, as public transport is one of the frequently used methods to visit open space by elderly. Access to public transport has been identified as one of the main factors that could promote active aging in the "Age-Friendly Cities" programme by WHO (Labus, 2013). Easy access to public transportation has been found to have an essential impact on the elderly (McCormack et al., 2010; Holle et al., 2015), as it could help them to easily reach their preferred places and increased their physical activity level (Day, 2008). Poor accessible public transportation has been seen as environmental barriers for senior citizens to achieve healthy aging (Clarke & Nieuwenhuijsen, 2009). Previous studies suggest that accessibility of public transport contains the choice, frequency and ease (Borges, 2007; Turel et al., 2007), thus, accessible public transport can increase the frequent use of public open spaces by the elderly.

Street connectivity is the most common factor in community planning and design to examine the effect and quality of the pathway. Kaczynski et al. (2014) found that a higher intersection density of the street network could increase the possibility for people to visit open space. In addition, it could also encourage people to take part in the weekly park-based physical activity. Kaczynski (2010) also believed that street connectivity could be helpful to encourage transportation-related neighbourhood physical activity. Handy et al. (2002) suggested that urban planners should make efforts to improve the street network, which can increase the feasibility and the attractiveness of walking activities.

Pedestrian safety or traffic speed along the road to visit open space should also be considered. It is indicated that if people need to cross or walk on a highspeed road to visit the closest park, the possibility for them to visit open space will be much lower than those who only need to walk along slower traffic routes (Kaczynski et al., 2014).

The study in Los Angeles found that elderly people prefer a park that is easily accessible, safely, with ease, and without impediment, and it could increase the possibility for them to visit such open space (Loukaitou-Sideris et al., 2016). It is also found that if the government introduced the traffic calming scheme to the community, which tends to protect the pedestrians' safety, the pedestrians would be more willing to have pedestrian activity in that area (Morrison et al., 2004).

Availability of the open space in the neighbourhood or around the open space could also affect elderly's visit to open space. Wang et al. (2015a) found that providing sufficient open spaces in the neighbourhood could significantly decline the perceived physical access to parks by residents. It is also indicated that if there were a lot of open spaces within the 1km of one open space, it could decrease the possibility of people to visit this open space as well as the walking activity to the open space (Koohsari et al., 2013). In the UK, a study in Wales pointed out that the amount of neighbourhood open space had a positive relationship with regular physical level, even with adjusting for individual factors, which showed that large amount of open space could encourage the use of open space and the activity level (Gong et al., 2014).

It is commonly agreed that neighbourhoods with relatively high densities of development are walkable. It is found that residential density was an important factor that correlated with walking activities, as residents from high-density communities had a higher walking activity level for utilitarian purposes than those from low-density communities (Saelens et al. 2003a). Saelens et al. (2003b) also indicated that people who live in a higher density development area usually spent more time on participating in walking activities than those in living in a low-density community. Such findings had also been proved by Frank et al. (2005) that residential density had positive effect on people's daily moderate physical activity level.

Noise and pollution are two environment factor which are reported to have impact on elderly's usage of open space. Noisy traffic had been seen as barriers in outdoor environment that could make walking activity difficult for elderly people (Rantakokko et al., 2012). It is also found that older adults prefer a no-traffic-noise environment that would have positive impact on their using open space (Arnberger et al., 2017). In addition, it is demonstrated that traffic pollution along the road could make the walking activity unpleasant and decrease people's walking activity level (Fermino et al., 2013). Wen et al. (2018) also indicated that elderly people were sensitive to the noise and pollution in neighbourhood open space.

### 2.3.2 Open space design

Size and terrain are found to be determining factors of the elderly's visits to open space. Giles-Corti et al. (2005) found that large public open space resulted in higher levels of walking and promoted people's activity level. It is also indicated that the size of the open space which was suitable could make the park become comfortable and friendly

for elderly people to use (Loukaitou-Sideris et al., 2016). It has been found that there were striking inequities of park acreage (the number or size of parks) and quality between different social-economic status groups, which affect their access to open space (Rigolon, 2016). Terrain has also been seen as barriers to outdoor mobility for people to visit open space as it could make the walking activity difficulty for them and decrease their willingness to engage in walking (Rantakokko et al., 2012).

Landscape is the core element of open space design, which makes the open space attractive to citizens. The study in Hangzhou, China found that the effect of different elements of landscape design varied among different parks. The attributes of naturalness, particularly coherence, vegetation, garden ornaments, uniqueness coherence, history and coherence play important roles in perceived appropriateness and suitability for recreation activities in three urban green space (Zhang et al., 2013). Chen et al. (2016) indicated that water, green vegetation, sculptures, and landscape accessories should be added in open space design as these characteristics could increase the use of open space as well as residents' outdoor activity levels. With the increase of natural elements in open space, perceptions of usefulness and quality will also increase, and it makes people more willing to visit the open spaces (Wan and Shen, 2015). It is demonstrated that open space without trees and water characteristics would decrease the satisfaction level of open space by the elderly, and they prefer the combination of trees with a high canopy cover and water surfaces in open space (Arnberger et al., 2017). Furthermore, it should be pointed out that people would have diverse expectations and requirements for landscape design when they were participating in different activities in open space (Wen et al., 2018).

Facilities and amenities is another core factor in landscape design of open space. Singapore Building and Construction Authority (2016) identified that the outdoor facilities, which include playgrounds, fitness areas, resting areas, planting areas, shelters, viewing areas, and toilets, were important to elderly people's use of open space. While Wen et al. (2018) also suggested that elderly people prefer the infrastructure and facilities, which consists of trails, intersections, seating, recreational facilities, business settings and toilets, in the open space, and it could increase their recreation activities. The study in Canadian cities indicated that if the parks had more facilities, it could promote the physical activity levels of senior citizens in the open space (Kaczynski et al., 2010). Chen et al. (2016) demonstrated that commercial facilities could encourage people to use open space frequently and recommended that designers should pay attention to create user-oriented spaces with facilities. Wendel et al. (2012) also suggested that the design of amenities and atmosphere of open space should meet the needs of all user groups, which could increase the use of open space by different groups of people.

Public parks with varieties of outdoor urban furniture can support a wider range of users. The different kinds of special outdoor urban furniture in different locations of parks can help people recognize their location and improve the way-finding information. In

addition, having relaxation in green space could make a contribution to the decrease of users' stress and improve their psychological health (Thompson et al., 2012). Yung et al. (2017) also indicated that open space should provide sufficient urban furniture which was comfortable and easy for elderly to use, and it could increase the satisfaction level of the elderly when using the open space. It is also believed that seats in the open space could attract people to visit open space (Chen et al., 2016).

Barrier free design could encourage elderly with disability to use the open space more frequently. Barrier-free sidewalks had been seen as part of the mobility to impact on the use of open space by elderly people (Zhu et al., 2017). A barrier-free environment played an important role in older adults' healthy aging, especially those who have problems in disability and poor health condition (Clarke & Nieuwenhuijsen, 2009). Wan and Shen (2015) also identified barrier-free facilities for elderly as one important factor that make contribution to the use of open space in high density cities.

A way-finding system usually could help elderly people to recognize their location and way in the open space. Loukaitou-Sideris et al. (2014) indicated that way-finding could help elderly people to control themselves in the open space and a perfect way-finding system is a necessary element to build senior-friendly parks. It is also proposed by Singapore Building and Construction Authority (2016) that design of open space should include way-finding information which could help them to assess and prepare for potential challenges and make their own choices.

Design for all weather condition is useful to encourage elderly to use the open space in different weather conditions. Wan and Shen (2015) defined facilities under various weather conditions as one important factor that affect use of open space in Hong Kong as it could make users believe that the park provide different types of facilities to adopt to different weather conditions. The study in Hangzhou, China also suggested that the park should provide shelters for people to protect them from sunshine and rain so that it could encourage them to use open space even in bad weather conditions (Zhang et al., 2013). It is also indicated that trees, which could decrease the temperature of the open space and made it lower than the temperature in the home, would made elderly more willing to visit open space (Zhai & Baran, 2017).

### 2.3.3 Transport

Cost of the public transportation is the factor that impact on elderly' decision to visit open space by public transportation. WHO (2007) pointed out that cost of public transportation was significantly important to elderly's use of the public transportation system and suggested to provide free or subsidized transport to older adults. The study in Southwestern Nigeria also suggested that government should provide affordable public transport to elderly people as it could increase their satisfaction level of transport services and encourage them to use (Olawole & Aloba, 2014).

Availability of public transport is well documented that has impact on elderly's use of open space. Dony et al. (2015) indicated that transportation facilities and its location have significant effect on the accessibility to open space, which could encourage people to use the open space that exceeds their walking distance. Wan and Shen (2015) also identified access to open space through public transport as an important factor of the features that affect people's use of parks in high density city. In addition, it is suggested that public transportation should be given a high weight to measure the accessibility to open space as it is one of the important methods (Fan et al., 2017).

Car ownership mainly impacted on the elderly's traveling distance and it could also affect their decision to visit open space. It is indicated that car ownership had significant effect on people's regular physical activity level (Gong et al., 2014). It is also reported that people who had a car were less likely to visit the open space frequently, which means car ownership could decrease their visits to open space (Boyd et al., 2018). It is also demonstrated that car ownership had a significant positive relationship to recreation physical activity level (Hillsdon et al., 2006).

Travel time also plays important role in elderly's access to open space. Travel time has been found as one of the most important explanatory variables in Brisbane as it had a positive relationship with the perceived accessibility (Wang et al., 2015a). Similar findings have also been found in Famagusta that travel time had direct impact on accessibility to open space (Pasaogullari & Doratli, 2004). It is common that people prefer a short travel time and sometimes the access to open space may rely on the travel time (Erkip, 1997; Levinson, 1998; Arnberger et al., 2017).

#### 2.3.4 Management

Elderly people may be affected by other user groups in the open space, thus conflict of use could also impact on elderly's use of open space. It is reported that elderly's use of open space could be affected by the dogs in the park, and they can accept a single dog on a lead, which means more dogs in open space was a barrier for them to use open space (Arnberger et al., 2017). Wang et al. (2015a) pointed out a cultural group variable was a significant factor that related to people's visit open space in both high and low SES suburbs and people prefer to use the open space with similar cultural groups which can increase their perceived park accessibility. The findings have also been proven by Wang et al. (2015b) that using the park with similar cultural groups was the second important variable among socio-personal predictor variables of perceived accessibility. It is also mentioned that inappropriate behaviour by other users could also affect the pleasantness in using open space (Turel et al. 2007).

Maintenance level is a common preference identified by different user groups. It is indicated that maintenance of the infrastructure and facilities in the open space was the common requirement for elderly people to use the open space across different contexts (Wen et al., 2018). Chow (2013) also found that respondents mentioned that

maintenance of outdoor fitness equipment in open space was an essential factor that should be addressed. Aspinall et al. (2010) demonstrated that good maintenance was one of the attractive factors for elderly people to visit open space. It also has been proved that maintenance could increase the pleasantness and attractiveness of the open space, and also made the open space safe for people to use (Eronen et al., 2014). It is suggested by Sang et al. (2016) that well-ordered and maintained open space could improve visitors' perceptual experience and attracts them to visit open space.

Cleanliness of the open space is an important factor to decide whether the open space is well-maintained. It is found that lack of cleanliness was the most important factor that made people feel dissatisfaction with using the public open space and decrease their willingness to visit open space (Pasaogullari and Doratli, 2004). The cleanliness of the open space could encourage the people to visit open space frequently and promote their physical activity level as well (Van Hecke et al., 2016). It is also suggested that keeping the streets clean could not only make the open space pleasant and attractive for users, but also can keep them feel safe when using the open space (Eronen et al., 2014).

Crowdedness is used to describe whether the open space provides enough space for elderly people to use. It is indicated that crowdedness could increase the value of the open space, which could also encourage people to use the open space (Brander & Koetse, 2011). Wong (2009) also found that residents living in Hong Kong mentioned that crowdedness was one of the problems when they used parks, which may decrease their satisfaction level of using the park. The study in Singapore also identified that crowdedness of the open space was related to users' perceptions and recreation activities (Yuen, 1996). In addition, open hours also limited the use of open space by residents. Wan and Shen (2015) suggested that the government should set a convenient open hour for citizens to use and meet different user groups' requirements.

### 2.3.5 Social

Social interaction allows elderly to talk or have activities with others when using open space. In regard to the social factors affecting use of public open spaces, social interaction and enhancing people's sense of community are important (Pasaogullari and Doratli, 2004). Wen et al. (2018) found that social interaction had an impact on the people's attitudes towards the relative importance levels of the preferences and landscape characteristics. In addition, social interaction with other elderly people in the open space could help them to be independent and confident in their daily life (Yung et al., 2016a). Thus, Loukaitou-Sideris et al. (2016) suggested that open spaces should provide elderly people opportunities for social interaction, which could enhance active aging and aging in place.

Safety is an important psychological issue that attracts elderly to use open space. It is indicated that lack of safety and security would protect elderly people from visiting

parks, and crime was also related factor that affect their decision to using open space (Loukaitou-Sideris et al., 2016). Sang et al. (2016) also found that safety in the park could make contributions to people's high perceived naturalness and encourage them to use the open space. Loukaitou-Sideris et al. (2014) also identified safety and security as one important factor to enhance elderly's use experience in open space in their guideline for senior-friendly parks.

Attractiveness has direct influence on the elderly's decision to visit open space. Zhai and Baran (2017) identified that design and access to open space would affect park's attractiveness during heat periods. Previous studies state that open spaces which enable the elderly to breathe and be connected with nature, showed high attractiveness to the residents, and could provide physiological and psychological benefits to users (Kwok & Ng, 2008; Sugiyama & Thompson, 2007). It is also indicated that the open space with higher attractiveness could increase levels of walking and promote using of the open space (Giles-Corti et al., 2005).

Social cohesion is the concept that people could share values, cooperation and interaction in the place or community (Beckley, 1994). It is found that open space can enhance social cohesion by providing space for social interaction (Cattell et al., 2006) and place attachment (Forrest & Kearns, 2001). It is also revealed that well-designed open space that meets different cultural needs and encourage social interaction, could enhance social cohesion when using the open space (Peters et al., 2010). In addition, it is indicated that open space could increase the possibility to have activities, and promote users' physical health status (de Vries et al., 2013).

Social participation shows the ability for elderly to engage in social activity in their daily life. It is indicated that open space was one of the fundamental variables that could enhance people's participation in social activities (Andersson, 2011). Yung et al. (2016a) found that 'social participation' was one of the most important reason that elderly people choose to visit open space, and elderly prefer to seek for opportunity to participate in variety social activities to enrich their daily life. It is showed that engaging in social relations by the users could help to improve their experience of using open space (Chiesura, 2004). Fadda et al. (2010) also recommended to promote the elderly's social participation when planning and designing urban open spaces in Valparaiso.

### 2.3.6 Personal

Available leisure time is the factor that determines whether elderly people are free to visit open space. The people who had little available leisure time were found to have a higher possibility to be inactive in physical activity and less engaged in leisure-time physical activity (Reichert et al., 2007). It is found that available leisure time had significant relationship with perceived accessibility of open space, especially in low SES suburbs (Wang et al., 2015a). The study in Helsinki also showed that available

leisure time, especially those who were employed, would decrease the number of visits in open space (Neuvonen et al., 2007).

Comfort at home and size of living space are the factors that describe the home situation of people. It is indicated that if people felt comfort at home, it would reduce their willingness to go outside, which means they preferred stay at home rather than having outdoor activities (Beng-Huat, 2002). It is also found that size of living space could increase the comfort level of home, which would decrease possibility for people to visit open space (Tu et al., 2016).

An active lifestyle shows whether people are active to engage in physical and social activities, which will affect their willingness to visit open space. It is indicated that group activity in the open space could promote the active lifestyle of users and increase their perceived accessibility of park (Wang et al., 2015a). Sugiyama and Thompson (2008) found that older adults could have a more active lifestyle through informal social engagement and interaction with children in suitable outdoor open space. It is also indicated that open space could provide recreation opportunities for residents to take part in outdoor recreation activities and promote an active lifestyle to encourage them to use open space (Neuvonen et al., 2007).

Means to go to public open space could also affect elderly's choice to visit open space. It is indicated that a high proportion of elderly people chose to visit open space through walking in Hong Kong, and it was also one of the common physical activities in urban parks (Duan et al., 2018). It is also reported that older Caucasians were more willing to walk to the park, rather than driving cars (Tinsley et al., 2002).

Health status reflects the physical health status and ability of elderly to having outdoor activities, which mainly consists of mobility, eye sight and hearing. It is indicated that the degree of mobility would influence elderly people's attitudes towards environment attributes, which could affect their decision to visit open space (Aspinall et al., 2010). Jorgensen and Anthopoulou (2007) also mentioned that elderly people were concerned with a lack of mobility when enjoy the urban woodlands. Turel et al. (2007) suggested that mobility should be carefully considered when designing outdoor open space to encourage use of open space by elderly people. Eye sight and hearing are other two variables that reflect the physical health status of elderly. It is indicated that many elderly people had problems in eyesight, which might make them feel vulnerable when using open space (Sarkissian & Stenberg, 2013). It is also proven that some elderly people might suffer from eyesight problem, and it could cause injures when using the open space if the design of open space did not meet their needs and provide suitable spaces (Sajadzadeh et al., 2015). Hearing disabilities of elderly was also identified as barrier to having outdoor activities because it could also cause injures if the open space was not well-designed for those elderly people (Aspinall et al., 2010).

Intention to visit open space shows the motivation of elderly to visit open space, which would affect their expectation of open space. The previous studies indicated that people would visit open space due to a variety of reasons, such as meeting friend (Kweon et al., 1998), participating in physical exercises (Sugiyama & Thompson, 2008) and enjoying the design and natural environment of open space (Kemperman & Timmermans, 2014). It is found that elderly people have different motivations of visiting open space, compared with young adults, and they hope to fulfil their autonomy needs through using open space. Thus it is important to design open space to meet elderly's needs and encourage their visitation to open space (Gibson, 2018).

Given the many diverse factors that affect visits to and the use of public open space, the comprehensive framework (Figure 3) is needed to provide a better understanding of the relative importance of the different factors affecting the use of public open space by the elderly.

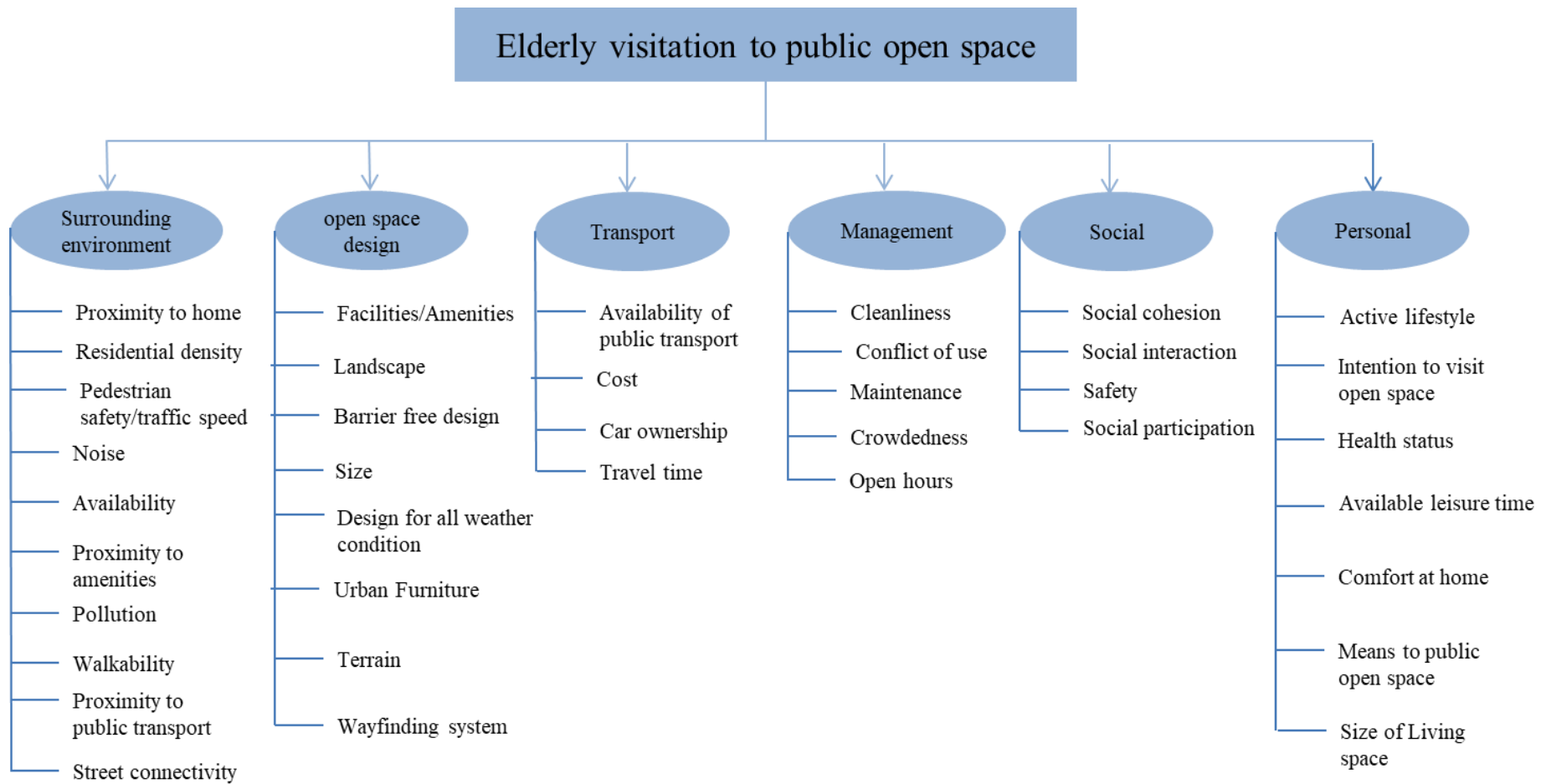


Figure 3 Comprehensive framework of factors that affect the elderly's visits to public open space

## Chapter 3. Methodology

This study adopts a mixed methods collection of subjective perception data and objective spatial data and field observations. Figure 4 presents the methodology flow of this study.

### 3.1 Data Collection

#### 3.1.1 Selected study districts

##### 3.1.1.1 Study districts

This research selects Wong Tai Sin as representative of an urban old district, as it is listed as one of the urban renewal districts by the URA. Tseung Kwan O and Tsing Yi are selected as representative of new town area because Tsuen Wan New Town covers Tsuen Wan, Kwai Chung and Tsing Yi Island. In this study, urban old district refers to the old and decayed area which has completed or is undergoing urban renewal projects. The selection of study districts is mainly based on the elderly population and density, and socio-economic profiles of district council districts or new town. The detailed reasons for selection of the three districts are as follows, and the characteristics of three selected districts were given in Table 2:

Wong Tai Sin district ranked first in terms of its elderly proportion among 18 districts based on the 2011 population census data and it also has a high elderly population. In addition, it is one of the urban old districts in Hong Kong that has been undergoing urban renewal carried out by the Urban Renewal Authority.

Kwai Tsing district is one of the first three participating District Council districts in Hong Kong that joined the WHO Global Network of Age-friendly Cities and Communities. Tsing Yi is one of the new towns in Tsuen Wan which had a higher Median Monthly Domestic Household Income (HK\$26,250) than Kwai Chung (HK\$20,000) in 2016.

Tseung Kwan O is one of the latest developed new towns in Hong Kong and ranked 2nd in terms of Median Monthly Domestic Household Income among 12 New towns in 2016, which has comparatively higher socio-economic status than Tsing Yi.

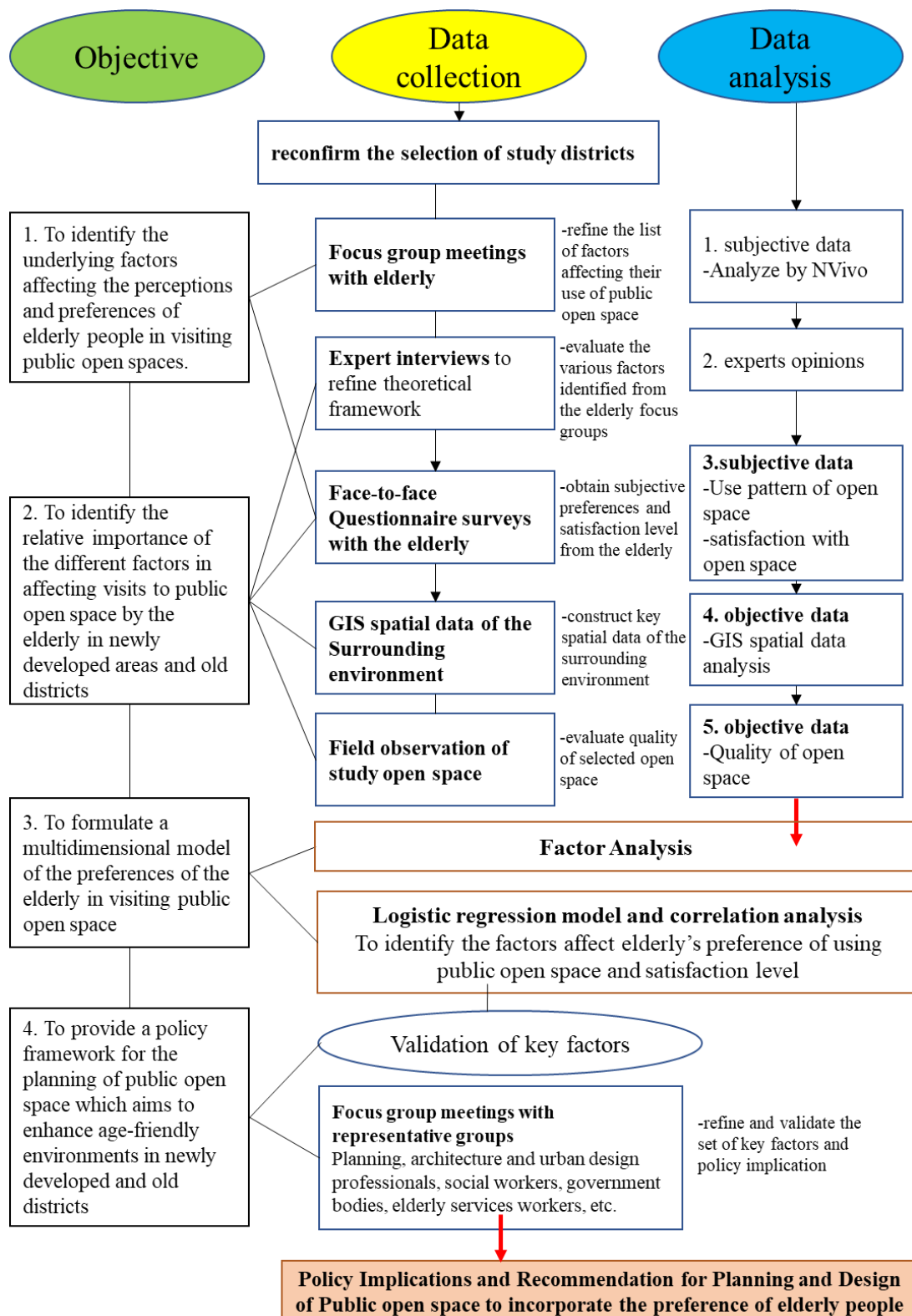


Figure 4 Flow of methodology to achieve the research objectives

Table 2 Characteristics of three selected districts

|   | <b>Wong Tai Sin</b> | <b>Tsing Yi</b>   | <b>Tseung Kwan O</b> |
|---|---------------------|-------------------|----------------------|
| <b>Elderly population</b>                       | 74036<br>(2011)     | 22095<br>(2011)   | 33742<br>(2011)      |
| <b>Elderly proportion</b>                       | 17.6%<br>(2011)     | 11.5%<br>(2011)   | 9.1%<br>(2011)       |
| <b>Elderly density per km<sup>2</sup></b>       | 7909.83<br>(2011)   | 2066.88<br>(2011) | 3357.41<br>(2011)    |
| <b>Median Monthly Domestic Household Income</b> | 22000<br>(2016)     | 26250<br>(2016)   | 32000<br>(2016)      |

### 3.1.1.2 Selected study open spaces

This research focuses on the outdoor open-air space in urban areas developed by the public sector and is counted towards the open space standard of provision. Thus, those open spaces in rural areas, or developed by private sector, are out of the research scope. Only those public open spaces managed by the Leisure and Cultural Services Department are selected as study open spaces. The selection of study open spaces mainly considers the variation of size, facility types, socio-economic status of the neighbourhood, residential density of neighbourhood and types of open space. The characteristics of 30 selected open space are shown in Table 3.

Table 3 Characteristics of selected open spaces

| <b>English Name</b>              | <b>Chinese Name</b> | <b>District</b> | <b>TPU</b> | <b>Residential density</b> | <b>SES</b> | <b>Size (m<sup>2</sup>)</b> |
|----------------------------------|---------------------|-----------------|------------|----------------------------|------------|-----------------------------|
| Choi Hung Road Playground        | 彩虹道遊樂場              | Wong Tai Sin    | 284        | 15052                      | 19000      | 39843.98                    |
| Fung Tak Park                    | 鳳德公園                | Wong Tai Sin    | 281        | 201811                     | 17660      | 10873.51                    |
| Hammer Hill Park                 | 斧山公園                | Wong Tai Sin    | 281        | 201811                     | 17660      | 7077.56                     |
| Heng Lam Street Sitting-out Area | 杏林街休憩處              | Wong Tai Sin    | 283        | 60909                      | 13960      | 796.76                      |

|  |            |              |     |        |       |           |
|--|------------|--------------|-----|--------|-------|-----------|
| Hong Keung Street Rest Garden                | 康強街休憩花園    | Wong Tai Sin | 284 | 15052  | 19000 | 889.12    |
| King Fuk Street Sitting Out Area             | 景福街休憩處     | Wong Tai Sin | 284 | 15052  | 19000 | 1027.87   |
| Lion Rock Park                               | 獅子山公園      | Wong Tai Sin | 282 | 57946  | 19500 | 63668.91  |
| Lok Fu Recreation Ground                     | 樂富遊樂場      | Wong Tai Sin | 282 | 57946  | 19500 | 28105.50  |
| Lok Sin Road/Choi Hung Road Sitting-out Area | 樂善道/彩虹道休憩處 | Wong Tai Sin | 283 | 60909  | 13960 | 907.23    |
| Morese Park                                  | 摩士公園       | Wong Tai Sin | 283 | 60909  | 13960 | 142471.90 |
| Ngau Chi Wan Park                            | 牛池灣公園      | Wong Tai Sin | 288 | 65789  | 20000 | 73709.48  |
| Ngau Chi Wan Village Sitting-Out Area        | 牛池灣村休憩處    | Wong Tai Sin | 288 | 65789  | 20000 | 1186.39   |
| Po Kong Village Road Park                    | 蒲崗村道公園     | Wong Tai Sin | 281 | 201811 | 17660 | 94526.31  |
| Tsz Wan Shan Estate Central Playground       | 慈雲山邨中央遊樂場  | Wong Tai Sin | 281 | 201811 | 17660 | 22875.82  |
| Wing Ting Road Sitting-out Area              | 永定道休憩處     | Wong Tai Sin | 288 | 65789  | 20000 | 248.49    |
| Liu To Road Garden                           | 寮肚路花園      | Tsing Yi     | 351 | 82749  | 19040 | 2300.46   |
| Liu To Road Playground                       | 寮肚路遊樂場     | Tsing Yi     | 351 | 82749  | 19040 | 2158.08   |

|                                   |         |               |     |        |       |          |
|-----------------------------------|---------|---------------|-----|--------|-------|----------|
| Mei King Playground               | 美景遊樂場   | Tsing Yi      | 350 | 108990 | 21200 | 8109.70  |
| Nga Ying Chau Garden              | 牙鷹洲花園   | Tsing Yi      | 351 | 82749  | 19040 | 5895.15  |
| Tsing Yi Northeast Park           | 青衣東北公園  | Tsing Yi      | 351 | 82749  | 19040 | 58062.85 |
| Tsing Yi Park                     | 青衣公園    | Tsing Yi      | 350 | 108990 | 21200 | 71192.49 |
| Tsing Yi Promenade                | 青衣海濱公園  | Tsing Yi      | 350 | 108990 | 21200 | 61188.47 |
| Chui Ling Lane Playground         | 翠嶺里遊樂場  | Tseung Kwan O | 833 | 64801  | 23000 | 3840.43  |
| Hang Hau Garden                   | 坑口花園    | Tseung Kwan O | 837 | 81842  | 26000 | 1709.82  |
| Hong Kong Velodrome Park          | 香港單車館公園 | Tseung Kwan O | 838 | 96063  | 27630 | 65538.48 |
| Po Hong Park                      | 寶康公園    | Tseung Kwan O | 836 | 91645  | 25800 | 41466.23 |
| Po Tsui Park                      | 寶翠公園    | Tseung Kwan O | 836 | 91645  | 25800 | 45063.61 |
| Pui Shing Garden                  | 培成花園    | Tseung Kwan O | 837 | 81842  | 26000 | 5919.87  |
| Sheung Ning Playground            | 常寧遊樂場   | Tseung Kwan O | 837 | 81842  | 26000 | 31780.32 |
| Tong Ming Street Sitting-out Area | 唐明街休憩處  | Tseung Kwan O | 838 | 96063  | 27630 | 2164.36  |

### 3.1.2 Focus group meetings

Focus groups were conducted in two urban districts in Hong Kong, Wong Tai Sin and Kwai Tsing districts, which are representative of old districts and new town area respectively. The reason to select the two districts is they have the highest proportion of elderly aged over 65 among old districts and new towns in Hong Kong, which are 17.6% and 14.7%, respectively (Census and Statistics Department, 2013). The focus

groups were organized and conducted in community centres in two districts and elderly people who live in the districts and frequently go to the community centres were invited as participants. One experienced researcher acted as moderator and two to three students would record the elderly's opinions. The open-ended questions were employed to guide the focus group discussions and encourage elderly people to express their experiences of using open space. Each focus group session lasted for around 45 minutes and the following four questions were asked:

- 1) Which type of open spaces you visited most frequently?
- 2) What are the activities you would like to take part in public open spaces?
- 3) What factors will make open spaces most satisfied for you?
- 4) What are the factors that prevent you from visiting open spaces?

Nine focus groups were conducted in the Wong Tai Sin and Kwai Tsing between September to November 2018, such that four focus groups were conducted in Wong Tai Sin districts and five were conducted in Kwai Tsing. Totally 66 participants were investigated, 29 lived in Wong Tai Sin and 37 lived in Kwai Tsing, respectively. After a review of focus group records, 1 participant from Kwai Tsing was excluded in the final analysis because he/she cannot express valid answers. Table 4 illustrates the characteristics of the focus group participants.

Table 4 Profile of elderly that attended focus group meetings

| Description | Wong Tai Sin | Kwai Tsing |
|-------------|--------------|------------|
| Gender      |              |            |
| Male        | 9 (31.0%)    | 10 (27.0%) |
| Female      | 20 (69.0%)   | 27 (73.0%) |
| Age         |              |            |
| 60-70       | 4 (13.8%)    | 17 (45.9%) |
| 71-80       | 14 (48.3%)   | 15 (40.5%) |
| 81-90       | 11 (37.9%)   | 5 (13.5%)  |
| Total       | 29           | 37         |

### 3.1.3 Interviews with Practitioner Experts

Interviews with experts aimed to validate the results from focus groups and help to refine the research framework. Twelve experts were interviewed during December 2018 to January 2019 to discuss the various factors identified from the elderly focus groups, together with their implications and applicability to the planning of public open space in the Hong Kong dense urban environment. The experts invited were with diverse background, such as planning, architecture, urban design, social work, government bodies, NGOs, and elderly services workers.. During the interviews, they were also asked to present their comments or suggestions for the research framework or the subsequent research steps. The outline of expert interviews is given in Appendix A.

### 3.1.4 Questionnaire surveys

#### 3.1.4.1 Sampling of questionnaire

The primary objective of questionnaire survey was to obtain the elderly's subjective evaluation of factors that affect their preference of visiting open space. The subjects of the questionnaire survey were elderly people aged 60 or above who were using public open spaces and were willing and competent to take part in the survey. The stratified random sampling technique was adopted to conduct the face to face questionnaire surveys. Elderly people in public open space who are aged over 60 were invited to participate in the questionnaire survey. This study uses 60 years old as definition of elderly people is because 60 is a common retirement age and those retired elderly people usually have more available leisure time to use public open space.

The questionnaire survey was conducted from February 27, 2019 to May 6, 2019 in 30 selected open spaces in three districts. A total number of 647 valid questionnaires were collected, among which 537 from users in public open spaces and 110 from less frequent users out of public open spaces and 271 public open space users are in urban old districts and 266 public open spaces users are in new towns. According to Bartlett, Kotrlik, and Higgins (2001), an appropriate sample size for a categorical data model is 264, thus, the sample size of whole public open space user samples and samples in urban old district and new town meets the basic statistical requirement.

#### 3.1.4.2 Design of questionnaire

The questionnaire contains of five parts. The first part collects elderly people's degree of liking to visit open space and the related reason. The second to fourth parts ask elderly people to make subjective evaluation of each factors that may affect their preference of visiting open space by using a five-point Likert scale (1 = lowest importance...3 = neutral...5 = highest importance). Following the suggestion in the interviews with experts, the factors were grouped into three categories, which are

‘Departure decision from home’, ‘Way to open space’ and ‘Inside open space’ (Figure 3). This contains the entire procedure of elderly people from deciding to visit open space to having activities inside open space.

The second part contains 8 factors related to ‘Departure decision from home’. The third part of questionnaire involves 14 factors under ‘Way to open space’ stage, which are related to the transport and surrounding built environment of the open space. The fourth part consists of 20 factors that under the heading of ‘Inside open space’ category, which are related to the design and management issue of the open space. The detailed variables of these three parts are presented in Figure 3. The fifth part of the questionnaire asked for the elderly’s personal information, and pattern of use of open space, including age, gender, education, frequency of visiting open space, length of staying open space, means to visit open space, cost time to visit open space, house size, living district, house type, monthly expenditure, purpose to visit open space, self-reported health status and time period of visiting open space. Finally, elderly respondents were asked to evaluate their overall satisfaction level with using a particular open space by giving a score on a five-point Likert scale (1 = most dissatisfied...3 = neutral...5 = most satisfied).

A slightly different questionnaire version for less frequent users is used, only some irrelevant questions are removed, such as length of staying open space, means to visit open space, cost time to visit open space, purpose to visit open space and overall satisfaction level with using the open space. The less frequent user is defined as elderly people who visit open space less than once per month. The elderly people who were sitting in the fast food restaurant or shopping malls were invited to participate in the survey and their frequency of visiting open space were asked before the survey to make sure they meet the requirement.

The two versions of questionnaires are presented in Appendices B and C.

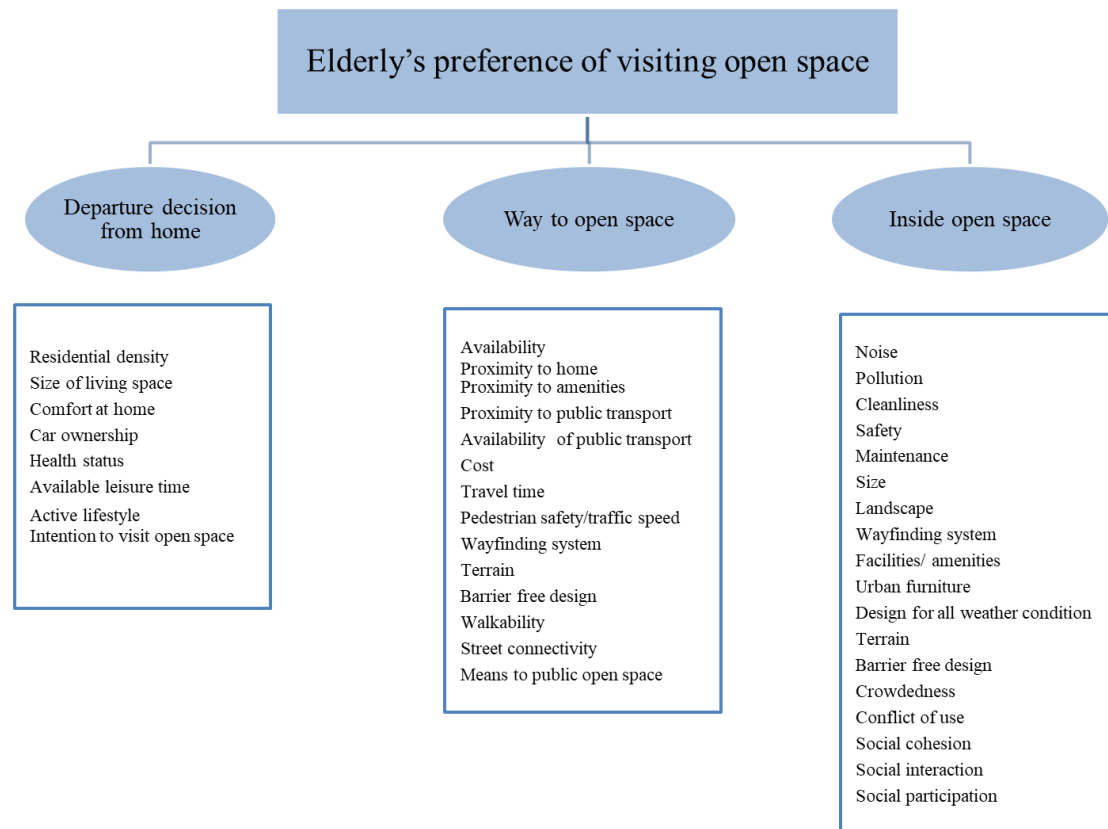


Figure 5 Framework of elderly's preference of visiting open space

### 3.1.5 Spatial analysis

Spatial analysis method aims to evaluate the spatial distribution and surrounding environment of public open space. GIS and space syntax methods were involved in spatial analysis process.

#### 3.1.5.1 Spatial data source

The data of digital map and community services was gained from the Survey & Mapping Office of Lands Department as of March 2019. In addition, the 2011 Tertiary Planning Unit (TPU) boundary data was collected from the Planning Department. TPU is the smallest planning unit, as defined by the Planning Department, in the territory of Hong Kong (Yao and Loo, 2016) and is matched with the 2011 Hong Kong Population Census data. Thus, it is used to define the neighbourhood in this study. Table 5 presents the list of variables analysed by using spatial analysis.

Table 5 List of variables calculated by spatial analysis

| <b>Variables</b> | <b>Items</b>       | <b>Scale</b>   | <b>Measurement</b>      |
|------------------|--------------------|----------------|-------------------------|
| <b>Size</b>      | Size of open space | m <sup>2</sup> | Calculated by using GIS |

|  |   |                             |  |
|--|---|-----------------------------|--|
| <b>Residential density</b>                 | Residential density of TPU that open space is located                               | person/m <sup>2</sup>       | 2011 Hong Kong Population Census               |
| <b>Socio-economic status (SES)</b>         | Median Monthly Domestic Household Income of TPU that open space is located          | HK\$                        | 2011 Hong Kong Population Census               |
| <b>Amenities around open space</b>         | Commercial facility, Cultural facility, Municipal Facility, Fast food               | Number of amenities         | Network analysis by using ArcGIS               |
| <b>Transport station around open space</b> | Bus Terminus, Green Minibus Terminus, Railway station Access                        | Number of transport station | Network analysis by using ArcGIS               |
| <b>POS number</b>                          | Number of surrounding open spaces within 500m service area of particular open space | Number of open space        | Network analysis by using ArcGIS               |
| <b>POS Integration</b>                     | Street connectivity - Integration score of open space                               | Numerical score             | Convert and calculate using DepthmapX software |

The variables ‘Size’, ‘Residential density’ and ‘Socio-economic status’ can be calculated or read directly from Hong Kong digital map data and 2011 Hong Kong Population Census by using ArcGIS software.

### 3.1.5.2 Spatial distribution of open space

Figures 6, 7 and 8 show the spatial distribution of selected open spaces and their surrounding environment in three selected districts.

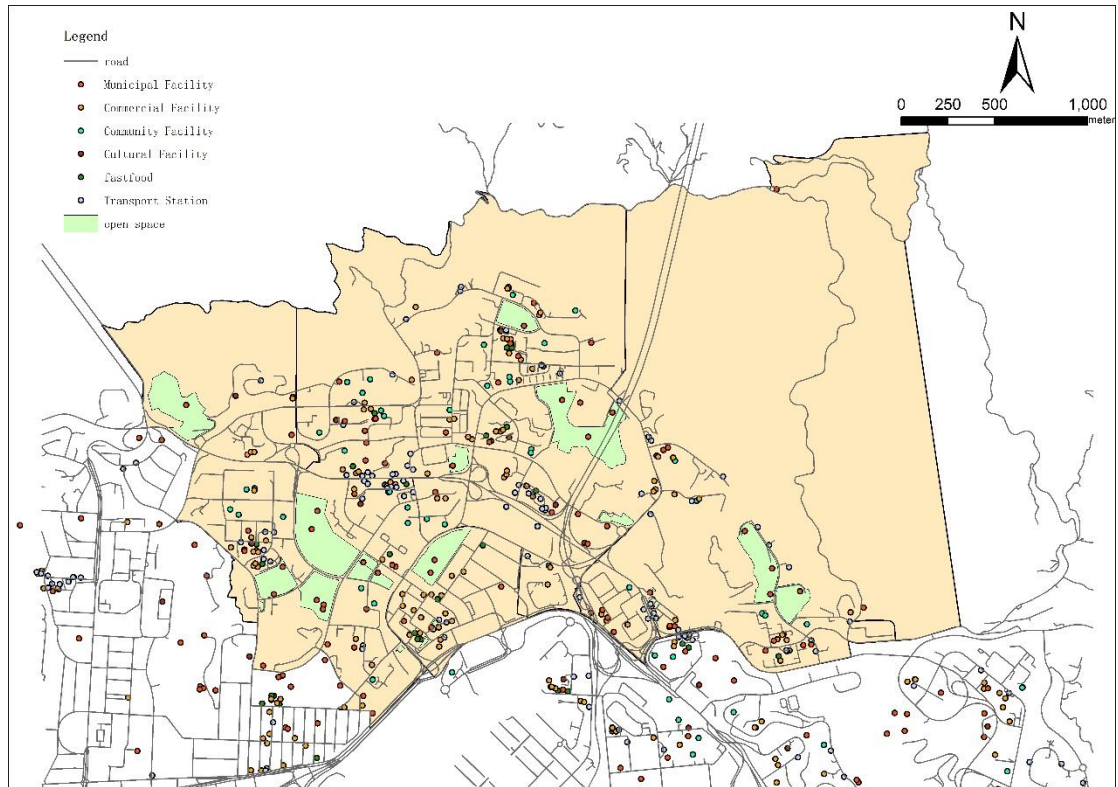


Figure 6 Spatial distribution of open space, road network, amenities and transport station in Wong Tai Sin district.

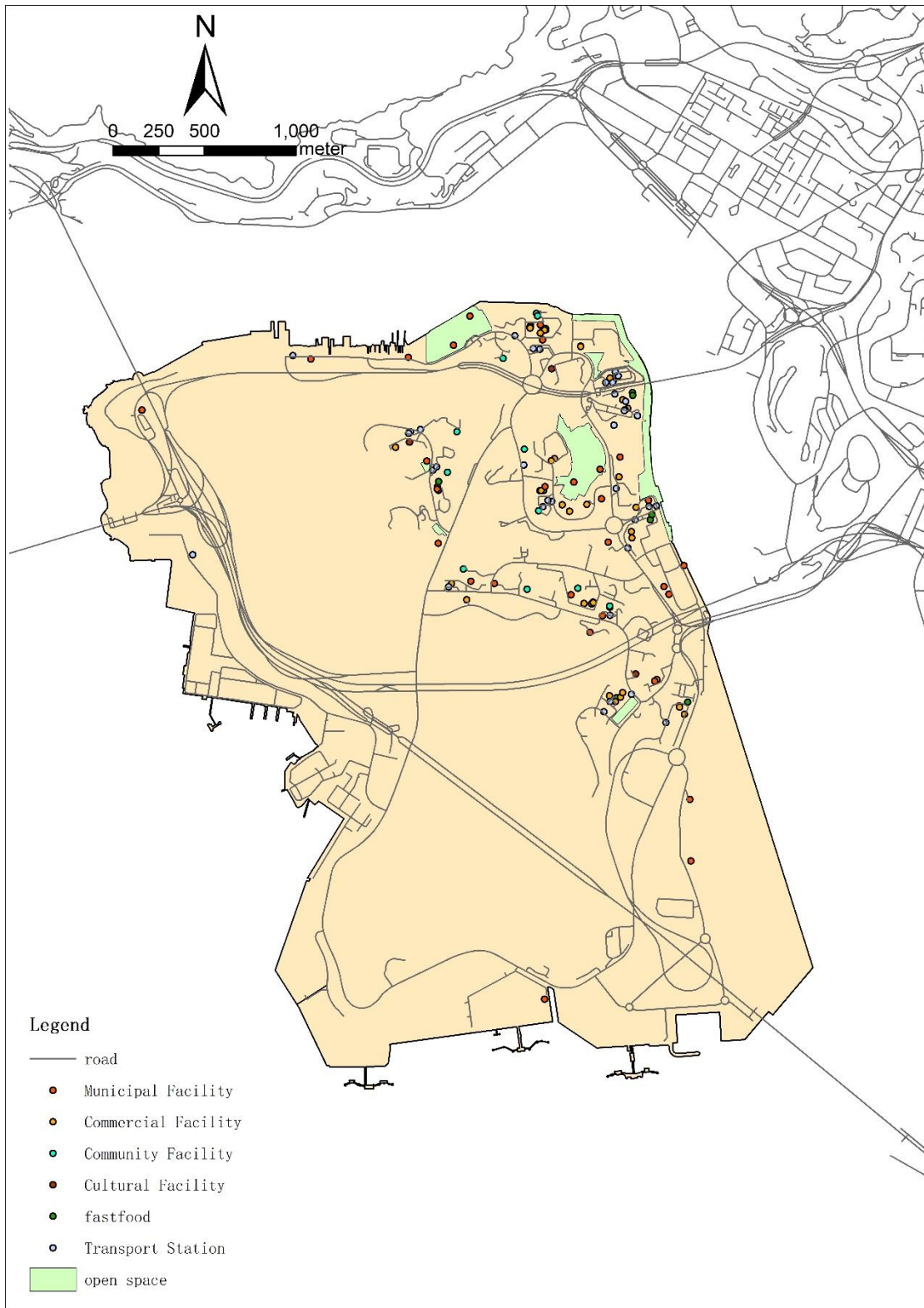


Figure 7 Spatial distribution of open space, road network, amenities and transport station in Tsing Yi new town.

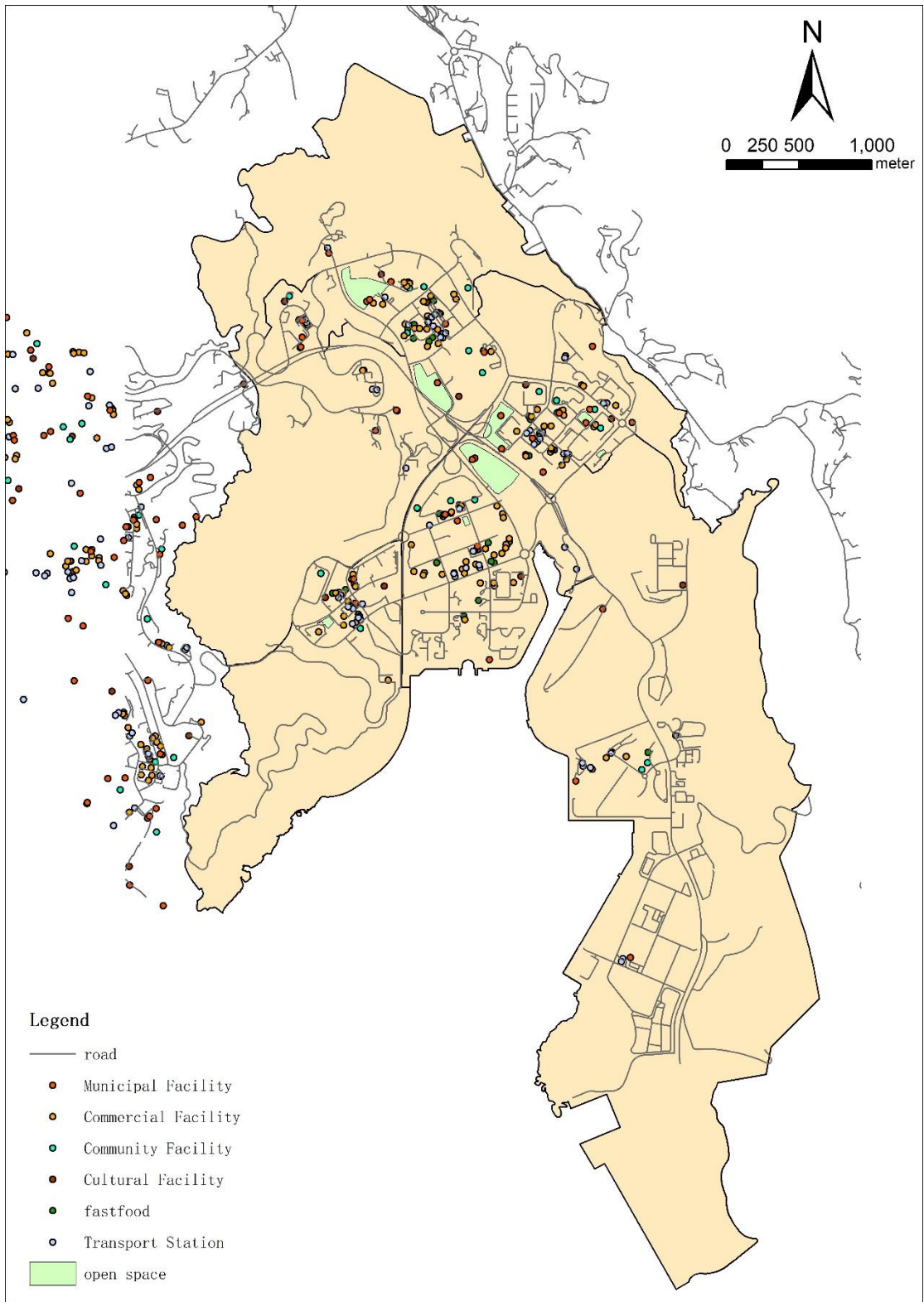


Figure 8 Spatial distribution of open space, road network, amenities and transport station in Tseung Kwan O new town.

### 3.1.5.3 Amenities number around open space

A network analysis approach was used to calculate the amenities around open space, transport station around open space and POS number variables. Compared with the traditional distance measurement, such as buffer zone, the network analysis method is more accurate and suitable for measurement of accessibility to amenities/services (Comber, Brunson, & Green, 2008; Kaczynski et al., 2014). The road line data is extracted from Hong Kong digital map data, the location of entrance of amenities, transport stations and open space are from on-site survey data. The 500 metres was set as the radius of the service area, which was commonly used in previous studies as service area boundary for elderly people (Cerin et al., 2017; Browning & Lee, 2017). The number of amenities, transport station and open space within the 500-metre services area had been given to the related variables as the value of each variable (Figure 9, 10, 11). The data of location of these facilities was extracted from the GeoCommunity Database developed by the Lands Department and the list of the facilities included in this study is presented in Table 6.

Table 6 Facility type and description (amenities, transport station, open space)

| <b>Facility type</b>               | <b>Description</b>  |
|------------------------------------|---|
| <b>Amenities around open space</b> |   |
| Commercial Facility (CMF)          | Convenient store (CVS)<br>Mall/ Shopping Centre/ Commercial Complex (MAL)<br>Department Store/ Retail Outlet of Interest (ROI)<br>Supermarket (SMK) |
| Community Facility (COM)           | Community Centre/ Community Hall/ Youth Centre/<br>Welfare Centre (CMC )<br>Family Service Centre (FSC)   |
| Cultural Facility (CUF)            | City Hall/ Town Hall/ Civic Centre (CHL)<br>Exhibition Venue (EXB)<br>Library (LIB)<br>Cinema (TNC)   |
| Municipal Facility (MUF)           | Cooked Food Stall (CFS)<br>Municipal Complex (CSC)<br>Market (MKT)<br>Toilet (TOI)  |
| Fast food                          | Maxim<br>Cafe De Coral<br>Fairwood Fast Food<br>KFC<br>McDonald's   |

|  |   |
|--|---|
| <b>Transport station around open space</b> |   |
| Bus Stop (BUS)                             | Bus Terminus (BUS)<br>Green Minibus Terminus (MIN)  |
| Transportation (TRS)                       | Railway Station Access (MTA)  |
| <b>POS number</b>                          |   |
| Leisure Facility (RSF)                     | Park (PAR)<br>Playground (PLG)<br>Minor Open Space (Passive) (RGD)<br>Sports Ground/ Football Field (SGD) |

Note: The codes in parentheses are the codes used in the GeoCommunity Database. The data of fast food is extracted from OpenRice by authors.

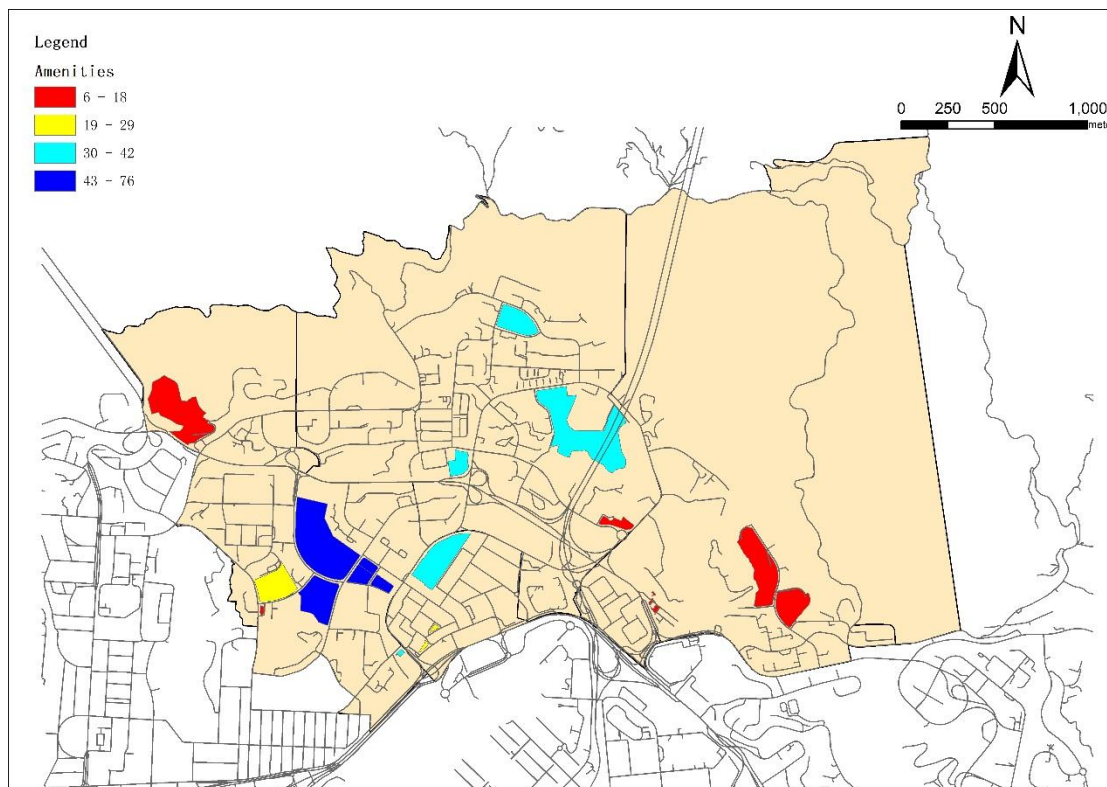


Figure 9 Amenities number around each open space in Wong Tai Sin district.

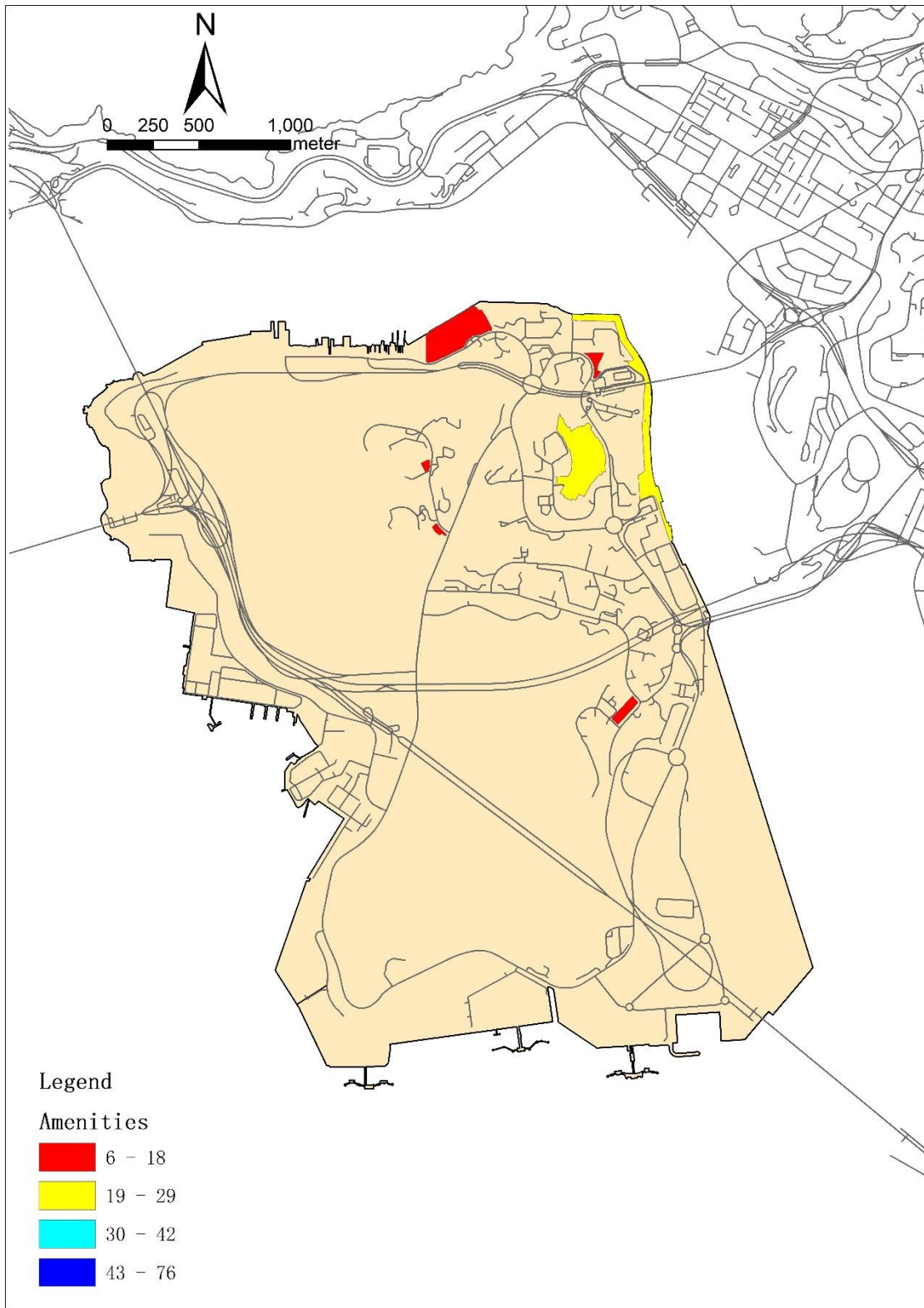


Figure 10 Amenities number around each open space in Tsing Yi new town.

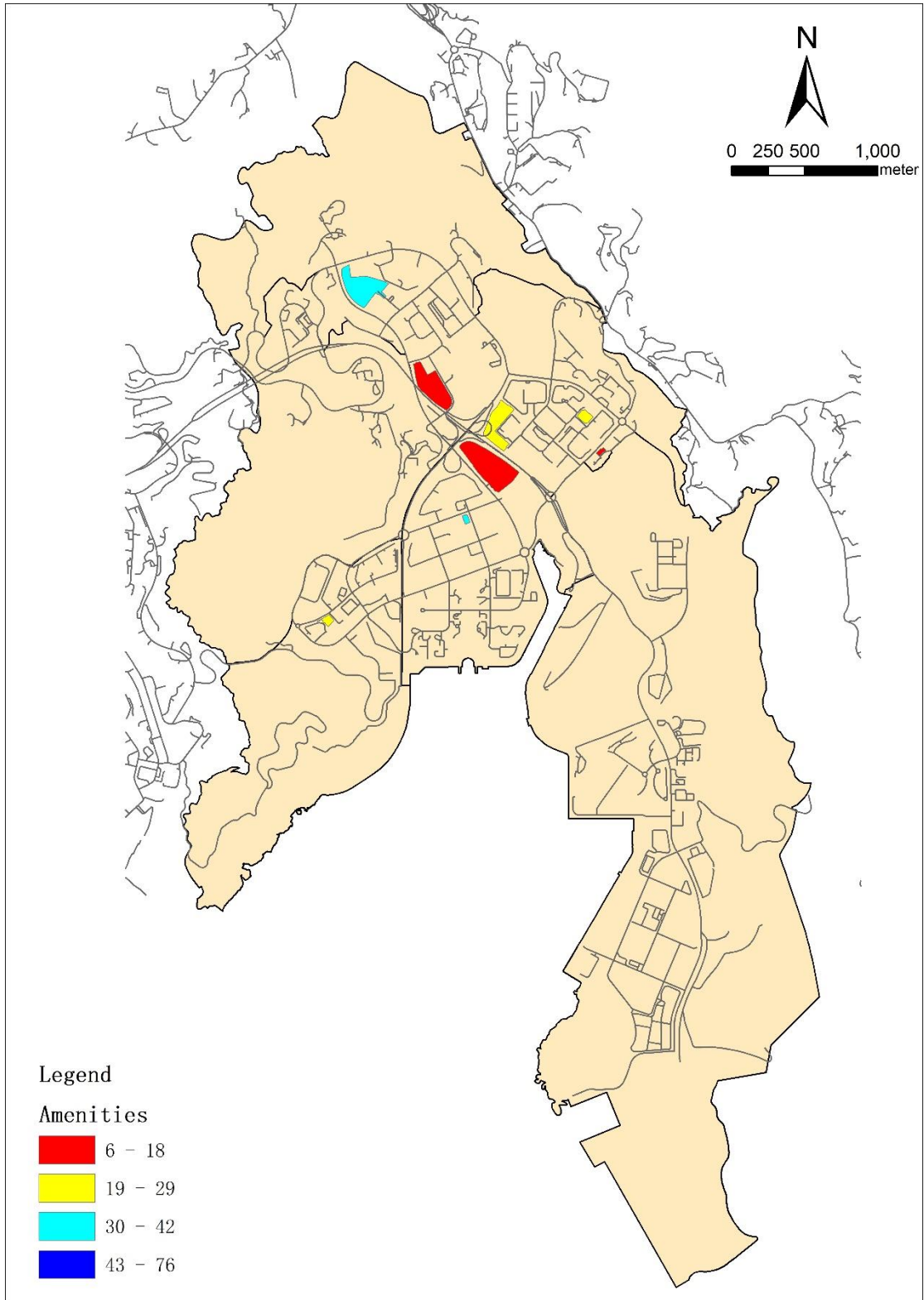


Figure 11 Amenities number around each open space in Tseung Kwan O new town.

### 3.1.5.4 POS integration

The value of POS Integration was calculated by using space syntax theory, which was confirmed as a useful tool to analyse the street network (Koohsari et al., 2013; Chiang & Li, 2019). First of all, the street network data was input into DepthMap X software which was developed by The Bartlett School of Architecture, University College London and the integration score of each street was calculated based on space syntax theory. Secondly, the integration score of the street where the entrance of open space located in was assigned to the particular open space as the value of POS integration (Figure 12, 13, 14). In case open space have several entrances, the highest integration score was given to the open space. A high integration score indicates that the street or open space is easy to reach.

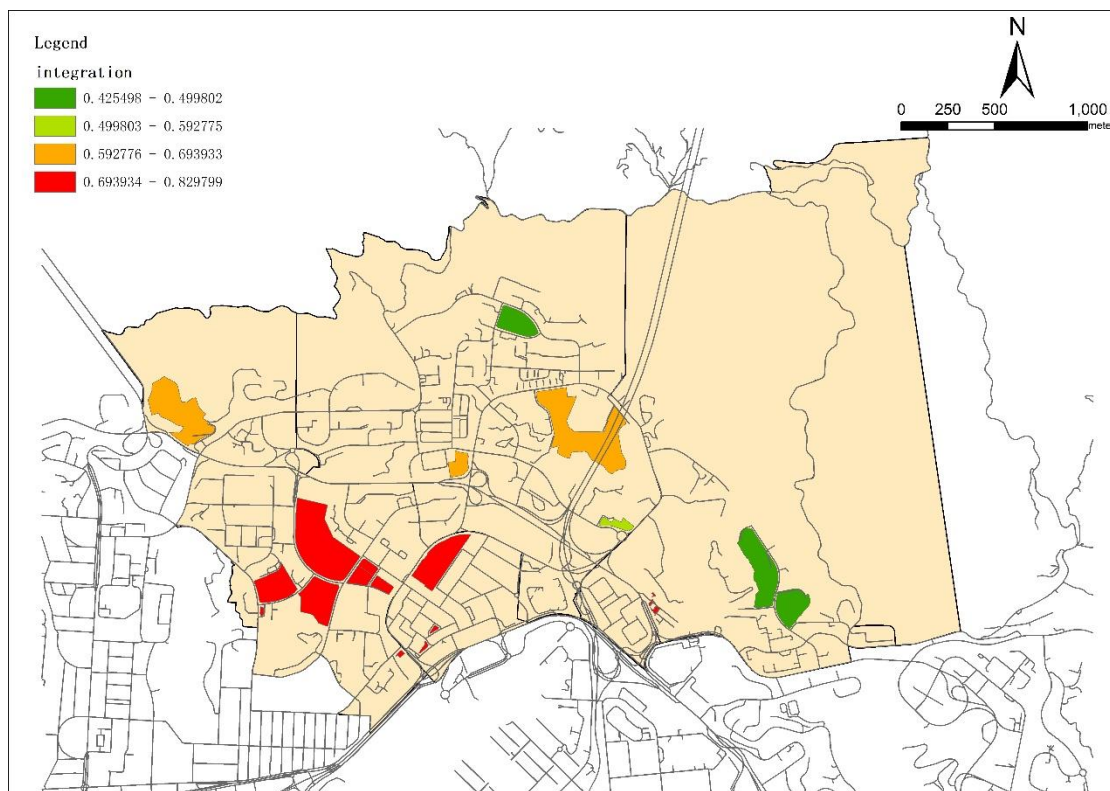


Figure 12 Integration score of each open space in Wong Tai Sin district.

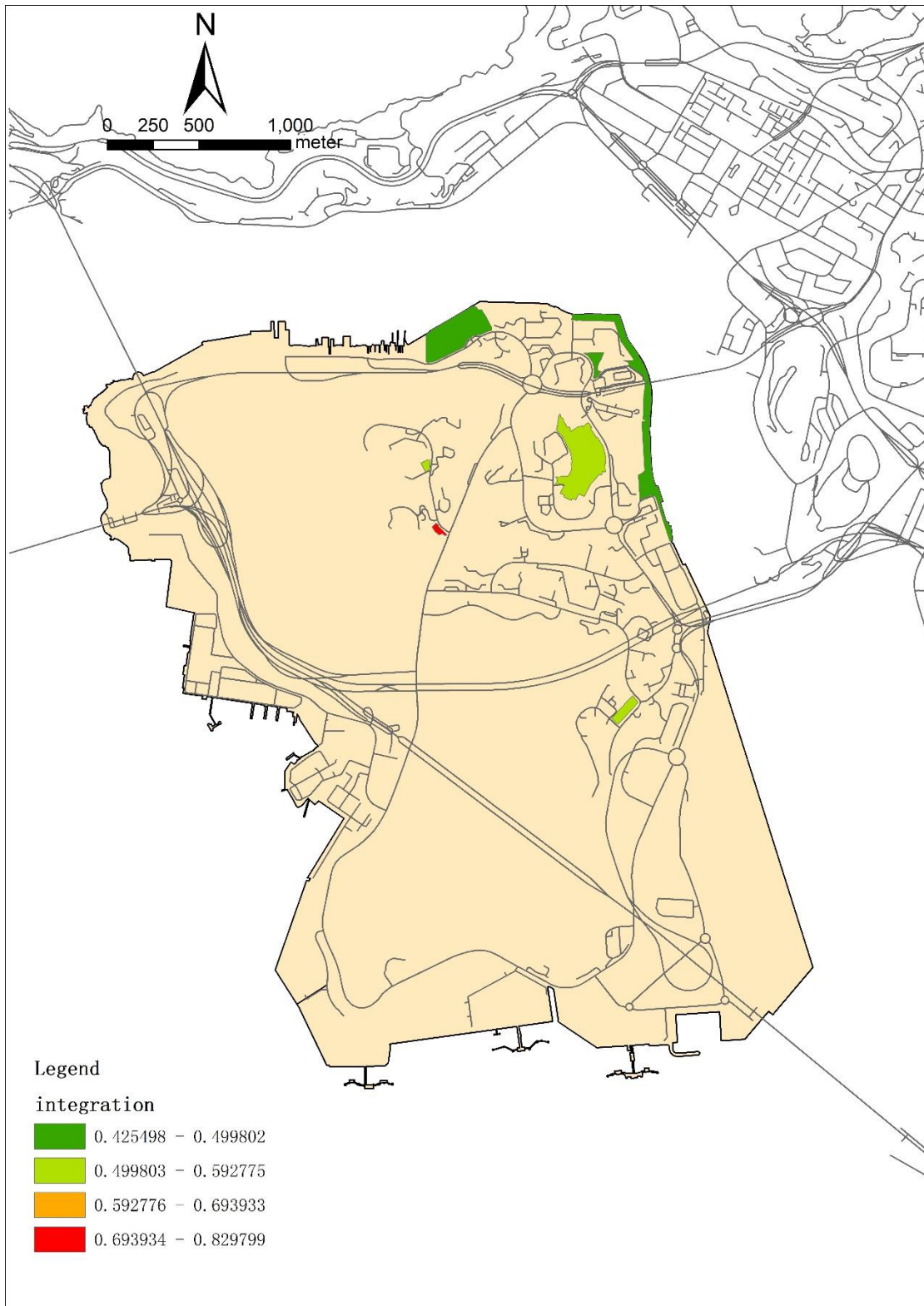


Figure 13 Integration score of each open space in Tsing Yi new town.

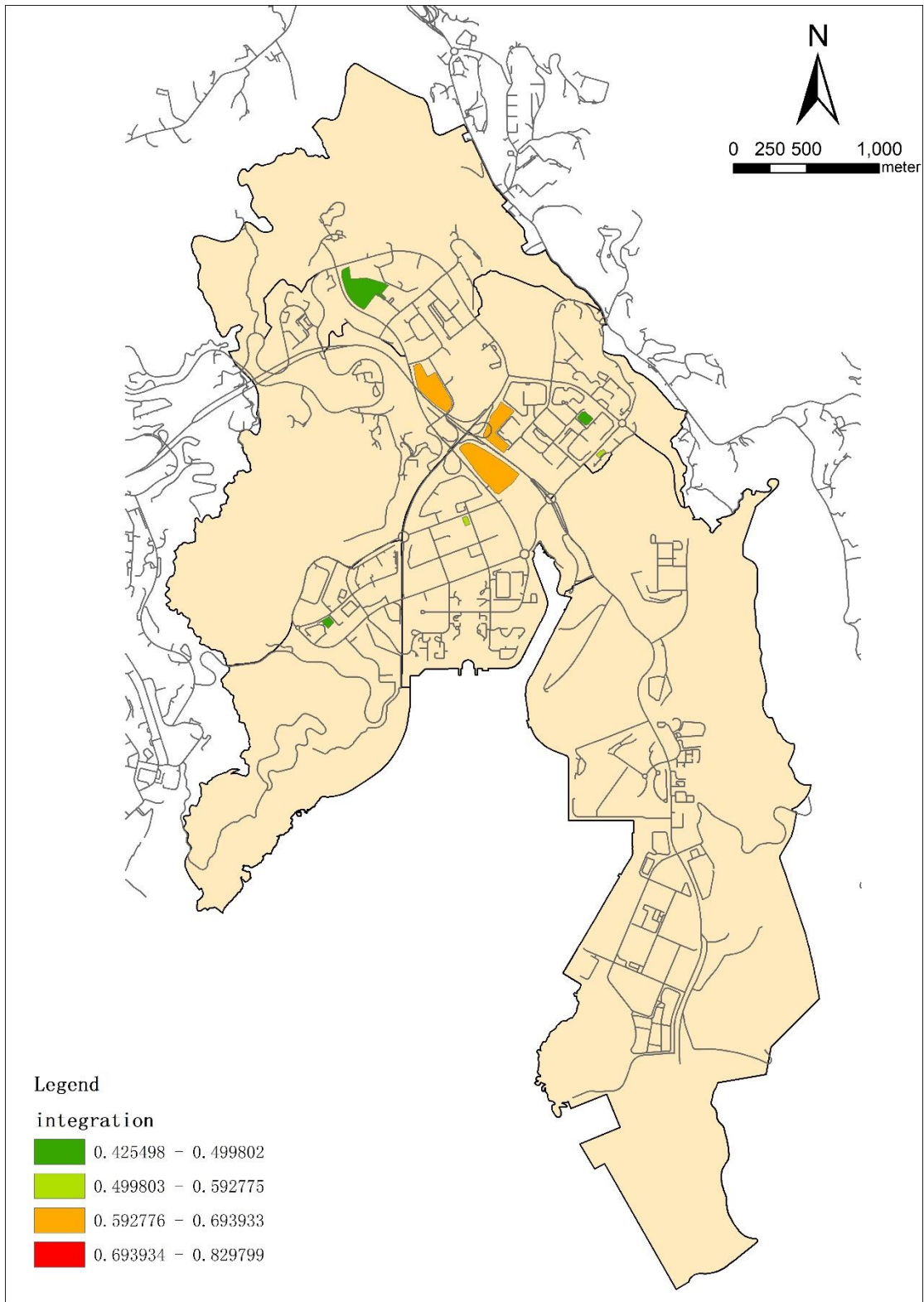


Figure 14 Integration score of each open space in Tseung Kwan O new town.

### 3.1.6 Field observation

The field observation aims to evaluate the quality of open space and its surrounding built environment. In this study, an observation survey was conducted from May 20, 2019 to May 23, 2019. Two to three trained observers were employed to investigate and record the required information of quality of open space and its surrounding environment. A mock-up site visit was held to ensure that the observers have reasonable agreement on the quality of different open space features. The evaluation score of each feature of open space quality was the average score of all observers' evaluation score to decrease the impact of personal bias. The descriptions of each of the variables that were collected in field observation and its related items, scale and measurement is presented in Table 7, and the sample of observation form used in this study is also included in Appendix D.

Table 7 List of variables collected by field observation

| <b>Variables</b> | <b>Items</b>  | <b>Scale</b>                                | <b>Measurement</b>                                      |
|------------------|---|---|---|
| Facility type    | Fitness/ Entertainment facilities, Commercial facilities, Rain and sun-shading devices, Washroom facilities, Drinking water fountain, Boundary treatments and furniture | No/Yes (0, 1)                               | Number of facility type                                 |
| Facility quality |   | Worst/Poor/Fair/Good/Best (1/2/3/4/5)       | Average score of all facilities presented in open space |
| Urban furniture  | Seats/ benches, Directional sign, Lighting facilities, Sculpture, Trash cans  | Non/Worst/Poor/Fair/Good/Best (0/1/2/3/4/5) | Average score of all urban furniture                    |
| Landscape        | Greenery feature, Water feature, Plaza for group gathering, Pavilion, Walking/jogging track   | Non/Worst/Poor/Fair/Good/Best (0/1/2/3/4/5) | Average score of all landscape item                     |
| Maintenance      | Security guard around the space (include park office) (No/Yes (0, 1)), Lawn condition, Extent and upkeep of vegetation, Cleanliness                                     | Worst/Poor/Fair/Good/Best (1/2/3/4/5)       | Average score of all maintenance item                   |

|                        |  |  |  |
|------------------------|--|--|--|
| Crowdedness            |  | Worst/Poor/Fair/Good/Best<br>(1/2/3/4/5) | Score of crowdedness                             |
| Terrain                |  | Worst/Poor/Fair/Good/Best<br>(1/2/3/4/5) | Score of terrain                                 |
| Quietness              |  | Worst/Poor/Fair/Good/Best<br>(1/2/3/4/5) | Score of quietness                               |
| Pollution              |  | Worst/Poor/Fair/Good/Best<br>(1/2/3/4/5) | Score of pollution                               |
| Pedestrian environment | Pedestrian facilities, Signages and wayfinding facilities, Pedestrian links, Design of passageway, Traffic management, Greening and attractiveness | Worst/Poor/Fair/Good/Best<br>(1/2/3/4/5) | Average score of all pedestrian environment item |

### 3.2 Data Analysis Techniques

#### 3.2.1 Qualitative analysis

One of the main research methods involved in this study is qualitative analysis, including literature review and focus groups. NVivo 11 pro software was used to manage and organize the focus group data and help to analyse and find pattern of results. It has been shown that this software is a useful tool for qualitative analysis (Welsh, 2002).

#### 3.2.2 Mean score ranking and Mann-Whitney U test

Mean score ranking is a commonly used approach to identify the relative importance of individual variables and to identify the key variables. This method is widely used in several previous studies (Chau et al., 2006; Mulliner & Algnas, 2018), which show that this method is reliable. This study uses the mean score ranking method to identify the relative importance of the variables that affect the elderly's preference for visiting open space for different user groups. The mean scores were calculated by using the following formula:

$$\text{Mean score} = \frac{1n_1 + 2n_2 + 3n_3 + 4n_4 + 5n_5}{N}$$

in which, n means respondents' scores based on 5-point scales (From 1 to 5), and N is the total number of respondents.

The Mann-Whitney U test is one of the non-parametric tests that could examine whether there is significant difference between groups. This method is also a common method that used by previous studies (Naderi, Sharbatoghlie & Vafaeimehr, 2012; Mulliner & Algrnas, 2018). In this study, the Kolmogorov-Smirnov test was employed to examine whether the scores of variables meet the requirement of normal distribution. As the significance value for each variable is smaller than 0.05, which means that the score of these variables were not normal distributed, the Mann-Whitney U test is suitable in this study. This method is mainly used to test whether there is statistically significant difference of scores of each variable between open space users and less frequent users or elderly in urban old districts and new town.

### 3.2.3 Principle Components Analysis (PCA)

Principal component analysis (PCA) is a type of statistical factor analysis, that was used to identify underlying factors affecting visits to public open spaces by the elderly, based on evaluations of the elderly obtained from the questionnaires. In the questionnaire, there were three categories of questions, with totally 42 variables. With a view to carrying out quantitative analysis, we need to combine some variables into one factor so as to construct independent variables. The main purpose of PCA is to explore the pattern of data and reduce the dimensions of the dataset with minimal loss of information (Pearson, 1901). In this study, 41 variables were used to conduct PCA, except car ownership which has a lower mean score when compared to other variables.

### 3.2.4 Ordered logit model

After constructing the independent variables, the ordered logit model was used to estimate how the independent variables can affect a dependent variable. As the dependent variable is an ordinal variable, this statistical analysis method is suitable in this study, and the Pseudo r-square was employed to examine the strength of the association between dependent and independent variables. In the current study, the dependent variables are degree of liking to visit open space, frequency of visiting open space and length of staying in open space. These variables describe the elderly's general preference of visiting open space. Independent variables include elderly's perception extracted from PCA and personal factors collected from the fifth part of questionnaire survey. The equation of the ordered logit model is formulated as following:

$$\ln = \left[ \frac{P(Y \leq j)}{1 - P(Y \leq j)} \right] = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_m x_m$$

### 3.2.5 Correlation analysis

This study only involves 30 open spaces, which is a limited sample size, thus, the order logit model is not applicable to examine relationship between the elderly's overall satisfaction and surrounding environment of open space and quality of open space. Hence, the correlation analysis was used in this study to estimate the relationship between elderly's overall satisfaction level with particular open space and surrounding environment variables calculated from spatial analysis and quality of open space variables collected from field observation. All the above statistical analyses were conducted by using SPSS 24.0 software.

### 3.3 Validation by Experts

The findings on those factors which affect the visits to public open spaces by the elderly will be presented and discussed to the experts in the focus groups meetings. The key findings will be validated through a structured discussion with two panels of experts (6-8 members) consisting of: 1) experts in the field of planning, architecture and urban design; 2) professionals from related fields such as social workers, sociologists, physicians specializing in elderly care; 3) caregivers and workers in services for the elderly, and representatives of NGOs related to such services; and 4) government bodies such as the Architectural Services Department, Leisure and Culture Service Department.

Criticism, comments and recommendations were reviewed and incorporated into a final list of factors which affect the occurrence of visits to public open space by the elderly. Most importantly, valuable policy implications of the study results were formulated for the planning of public open spaces that can better meet the diverse needs of the elderly population and enhance an age-friendly community.

## Chapter 4. Results

### 4.1 Focus group meetings

#### 4.1.1 NVivo analysis on factors affecting preferences of the elderly in visiting public open spaces

The focus group results indicate that all six dimensions as identified in the literature are important in influencing elderly people to visit open space. Figure 15 shows the frequency of each factor mentioned by older people in the nine focus group meetings. The results to the open-ended questions also highlight the importance of ‘Facilities or amenities’ in planning and design of open space, as it is mentioned most frequently by elderly people. The second and third frequently mentioned factors are ‘Active lifestyle’ and ‘Intention to visit open space’ respectively. Appendix E reports the representative statements from the focus groups and the corresponding criteria for public open space from the literature.

For **surrounding environment criteria**, seven of 10 factors are more concerned by elderly people, which are ‘Proximity to home’, ‘Residential density’, ‘Pedestrian safety or traffic speed’, ‘Noise’, ‘Availability’, ‘Proximity to amenities’ and ‘Pollution’. It is indicated that proximity from home to open space is the main consideration for elderly people to visit open space as most of them prefer to visit open space near their home. The geographical proximity from open space to people’s home has been found that could improve people’s perceived accessibility to urban parks (Wang et al., 2015) and it is also believed that for elderly people, preference will be given to open space with short access time (Arnberger et al., 2017). Elderly people also focus on the number of open spaces and density of people living in the neighbourhoods. With the increase of number of local residents, especially elderly people, the number of open spaces in the neighbourhoods is not adequate and more open spaces should be provided to meet the growing needs. In addition, the environment of the way to open space is important to elderly people. Pedestrian safety, proximity to amenities, noise and pollution are mentioned by elderly people which are related to their perceived aesthetics of the environment along the way to open space, all of which are in line with previous studies (Kaczynski et al., 2014; Pasaogullari & Doratli, 2004; Wen et al., 2018).

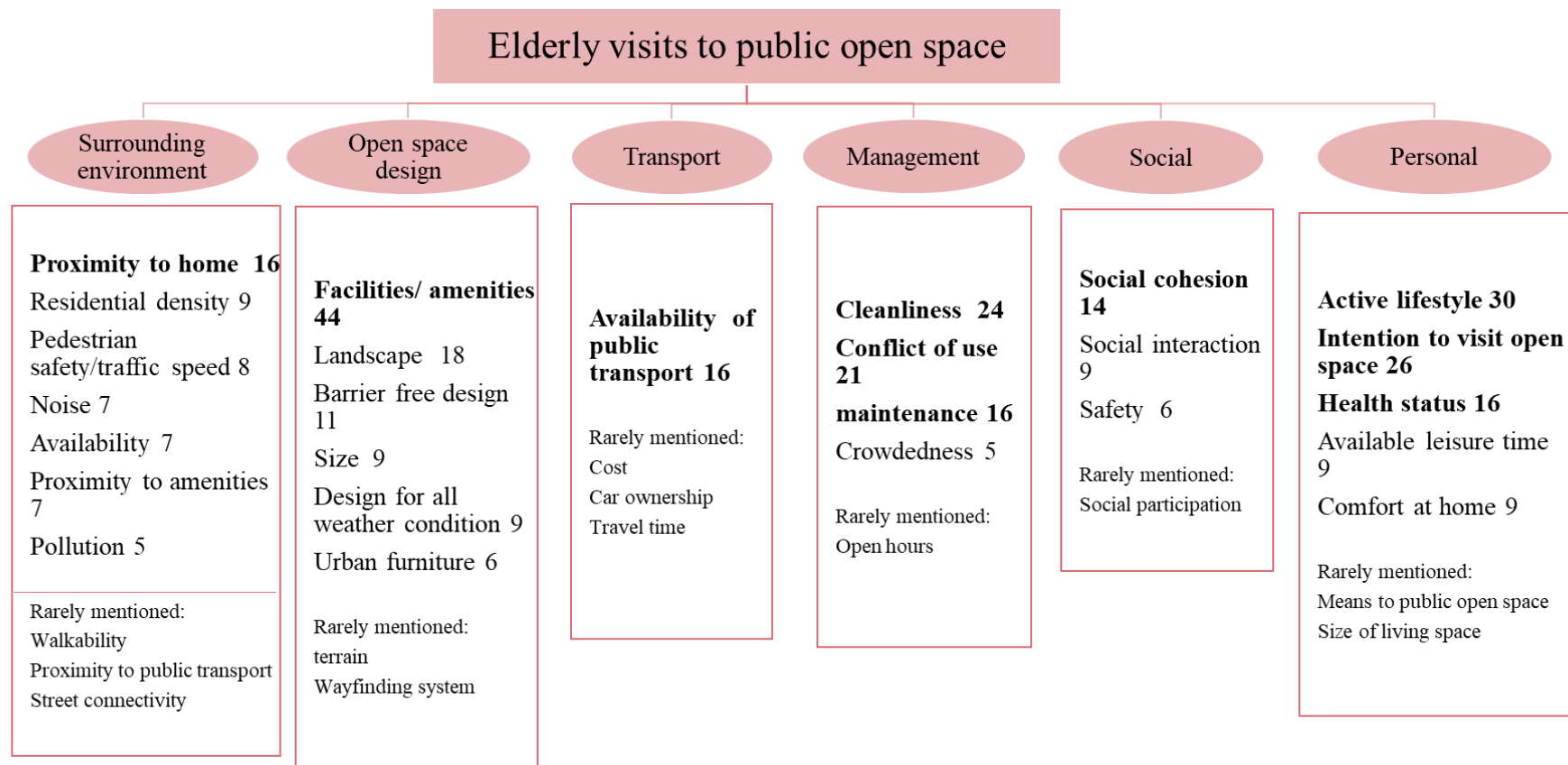


Figure 15 the frequency of each factor mentioned by older people in the focus group

Note: Numbers: represent the frequency with which older people mention this factor in the focus groups

Among **open space design** criteria, six of 8 factors are more frequently mentioned by elderly people, which are 'Facilities or amenities', 'Landscape', 'Barrier free design', 'Size', 'Design for all weather condition' and 'Urban furniture'. Facilities or amenities is the factor that is mentioned most frequently in both two districts, which shows that the most common requirement of elderly people is still using the facilities provided by open space, such as elderly fitness area, resting area, commercial facilities and toilets. Those facilities could sufficiently increase the use and recreation activities of elderly people in open spaces (Wen et al., 2018). Size is another vital factor which has close relationship with facilities or amenities. Elderly people require large open space because enough space could usually provide adequate facilities or amenities. For landscape design of open space, elderly people prefer the natural elements in open spaces such as trees and flowers and these elements could also increase use of open spaces (Chen et al., 2016). Barrier free design is also a concern expressed by the elderly, especially those with disability.

For **transport** criteria, only one factor 'Availability of public transport' is frequently a concern by elderly people to visit open space. Public transport is still an important mode for elderly people to visit open space. A well-designed public transport station and system could encourage elderly people to use open space more frequently, especially those open spaces exceed their walking distance (Dony et al., 2015). For remaining factors, cost is not so important. It may be because Hong Kong government provides the \$2 public transport fare concession to elderly people so the cost is acceptable to them and would not affect their visitation to open spaces. In addition, as most elderly people usually have enough leisure time, so that travel time may not be the main consideration for them to visit open spaces.

For **management** criteria, 'Cleanliness', 'Conflict of use', 'Maintenance' and 'Crowdedness' are concerns of elderly people. Most elderly people agreed that open space should be clean and well-maintained. Open spaces which are dirty and in broken condition would not attract elderly people to use. Keeping open space clean and well-maintained has been proven to attract visitors and enhance visitors' perceptual experience (Eronen et al., 2014; Sang et al., 2016). Conflict of use also prevents elderly people from using open spaces. Elderly people complained that their use of open spaces is easily disturbed by other age or cultural groups and it would decrease their willingness to use the open space. Furthermore, elderly people were also concerned about the crowdedness of open space, which would also decrease the pleasantness of using open spaces.

For **social** criteria, 'Social cohesion', 'Social interaction' and 'Safety' are identified as important factors affecting elderly's use of open space. It is indicated that social issues are a vital aspect that is related to elderly's use of open space. One of the reasons for elderly people to visit open space is to participate in group activities, which contributes to social cohesion. Such group activities and social networks could encourage elderly people to visit open space more frequently. In addition, social interaction is also one of

the important factors that affect elderly’s visit to open space. Social interaction has close relationship with people’s attitudes towards relative importance levels of the preferences and landscape characteristics (Wen et al., 2018). In addition, social interaction with other elderly people in the open space could also help them to be independent and confident in their daily life (Yung et al., 2016a).

Among **personal** criteria, five of 7 factors are more frequently mentioned by elderly people, which are ‘Active lifestyle’, ‘Intention to visit open space’, ‘Health status’, ‘Available leisure time’ and ‘Comfort at home’. Actively lifestyle, which shows that elderly people prefer to go outside and engage in outdoor activities, could promote using of open space as it could be part of their daily lives. In addition, it is indicated that elderly people visit open space for different purposes, which could have different perceived accessibility to open space. Health status is a physical factor that affect their mobility and ability to visit to open space (Jorgensen & Anthopoulou, 2007). Elderly people who do not have available leisure time would have less possibility to visit open space (Neuvonen et al., 2007). Some elderly people prefer an indoor environment and feel comfortable at home, and so this would decrease the possibility to visit open space (Tu et al., 2016).

#### 4.2 Interviews with Experts

A total of 12 experts were separately interviewed during Dec. 2018 to Jan. 2019. Their names and affiliations are shown in the Table 8. The background of experts spans from urban planning, urban design, architecture, social science, public space management, gerontology to other related fields. Each of them was asked whether he or she agreed with the factors that affect elderly visits to POS identified from literature review, ranking of factors by the frequency of being mentioned in the previous nine focus groups. They were also asked to discuss about the difference between urban renewal district and new town as well as possible policy implications of the important factors in relation to the planning and design of POS. Each interview lasted for about one hour. All the expert interviews were audio-taped, transcribed for data analysis.

Table 8 The name and affiliation of expert attendees in the interview

|   | Interviewee             | Affiliation  |
|---|-------------------------|--|
| 1 | Prof. Alex LUI          | Former Professor of Architecture, the Chinese University     |
| 2 | Dr. JIANG Bin           | Landscape Architecture, HKU                                  |
| 3 | Prof. Daniel LAI        | APSS, Institute of Active Ageing, Poly U                     |
| 4 | Prof. MOK Ka Ho, Joshua | Asia-Pacific Institute of Ageing Studies, Lingnan University |

|    |                           |   |
|----|---------------------------|---|
| 5  | Dr. Cheryl CHUI           | Sau Po Centre on ageing, HKU                        |
| 6  | Ms. Alice YEUNG Lai-fong, | Architectural Services Department, HKSAR Government |
| 7  | Mr. Robert WONG           | Hong Kong Sheng Kung Hui Welfare Council            |
| 8  | Ms. Betty HO              | Plan Arch Consultants Ltd.                          |
| 9  | Ms. Sunnie LAU            | SOS Architecture urban design                       |
| 10 | Mr Alan LEE               | District Councillor in Tsing Yi                     |
| 11 | Mr. Paul Zimmerman        | Designing Hong Kong                                 |
| 12 | Mr. Louis LOR             | Architect and Author                                |

#### 4.2.1 Key factors affecting elderly visits to POS

Generally, most interviewees were affirmative that the identified factors related to elderly preferences in using public open space. They largely agreed that the rankings based on frequency mentioned by the elderly are reasonable. For instance, proximity to home is critical as most elderly prefer going to the POS near their home due to their low mobility level. Accessibility is important since elderly are vulnerable to those hard-to-cross intersections, slopes or footbridges. For instance, Kowloon Park is not accessible to some people because they have to climb up the stairs at some of the entrances. Cleanliness and safety are important. A dirty or unsafe space will become worse if timely cleaning or assessment cannot be taken.

From the perspective of elderly needs, some experts mentioned elderly need of social interaction when they go to the public open space. The elderly are similar to the youngsters. They also like participating in interesting and vibrant activities. The elderly prefer meeting friends rather than just sitting alone. So the POS is a common place for them to meet each other. Other than the social ‘strong ties’, they also highlighted the importance of social ‘weak ties’ between elderly and the external environment. They suggested that designers, managers or corresponding government departments should recognize the elderly’s indirect or unphysical form of social interaction, such as observation, appreciation of vibrant vibe and beautiful things. Thus, for example, the pocket park where elderly usually sit in should be somehow linked with the external environment, such as shopping mall square or pedestrian linkage lanes, rather than very physically enclosed and isolated. Besides, they highlighted the role of intergenerational activity and demand in affecting elderly visits to public open space. Given the elderly’s preference in getting close to children, the allocation of the fitness facilities and children playground should be carefully designed. This spatial arrangement can attract elderly to visit public open space by promoting the intergenerational activities.

Regarding the less-frequently-mentioned factors, the experts further explained and interpreted them. Some experts explained that the elderly may not understand and use the terms: walkability and street connectivity. But they denied they are not important. Instead, those less-frequently-mentioned factors, such as wayfinding, terrain and walkability, are still regarded as influential and should be retained in the study. In contrast, several experts interpreted that some less-mentioned factors are not important. For instance, the availability of public transport, available leisure time, opening hours are suggested not important in affecting their visits. Cost of transport, car ownership is not important neither as the two-dollar plan has been widely implemented for enhancing elderly mobility by providing affordable transport. After consolidating the experts' suggestions, most factors which were rarely mentioned by elderly in the focus group meetings were still retained in the subsequent questionnaire survey design for further exploration.

The experts supplemented some important factors which were not mentioned in the focus group meetings. Kiosk and other commercial facilities are able to attract more elderly users. The foreign cases showed that elderly like taking a rest and chat with friends in the kiosk. Next, promoting the inter-gender interaction is important to prevent gender-exclusive space and attract more elderly users. The role of family structure in affecting elderly's visits to POS was mentioned. It is common that the elderly may not know much information about the location and quality of the open space if they live alone. Normally, they would be more active in going to POS if they live together with their family members. Besides, security staff and lighting provision duration was considered as important. It was also demonstrated that organizing events and activities is meaningful to prevent elderly getting bored and can attract them to visit open space. Additionally, the experts also highlighted the issue of gender difference which leads to activity separation between male and female elderly users in the POS

Lastly, for elderly friendly built environment, it was suggested to avoid using slippery material for pavements which may increase the risk of falling. Shelter and shade as well as a wider path are important. To deal with the strong sunshine and frequent rain, more shade and shelters not only inside the POS but also at the bus station or stops surrounding POS are required. Sometimes elderly went out by using wheelchair, thus it would be inconvenient if the width of the d/sidewalk is not enough.

#### 4.2.2 Differences between renewal old district and new town

The experts commented on the difference of POS between renewal old districts and new towns. Most of them agreed that provision of open space in old renewal districts is facing more challenges in old districts than in new town. Lacking land resource is one of the major challenges in Wanchai, Yau Tsim Mong, etc. The geomorphology of some old districts of Hong Kong island is unique. For example, the slope of the townscape is difficult for elderly to climb up and down. This objective element affects

their mobility and preferences of visiting open space. In this regard, the old districts are different from the new ones, such as Sha Tin.

It was suggested to incorporate open space expansion plan into comprehensive development strategy of renewal of old districts. In the old district, they suggested to identify where there is a need and opportunity to expand open space by combining different spaces where there is any comprehensive redevelopment nearby. In contrast, the quality of POS in new towns is relatively good, which can be referred to as standards to compare with for rehabilitation projects taking place in old districts.

Then experts also commented on the differences of surrounding connectivity between old and new districts. It was believed that POS in old districts are well connected with facilities in the surrounding neighbourhoods while those in new towns are relatively separated due to spatial distance and management requirements. In addition, some open spaces within private estates in new towns are legally open to the public but, in fact, the actual accessibility is restricted.

#### 4.2.3 Relevance to design or planning practice

The relationship between POS and daily-use shops was pointed out. For example, the restaurant is suggested to be allocated around the POS. More elderly prefer going to those POS with surrounding restaurants or shops in the surrounding area. Thus, providing shops or grocery just outside the POS can be considered in master planning.

It was also suggested that locating community centres within or near the POS would be desirable as it could encourage elderly people to use open space more frequently. It is good to have a connection between different community facilities and services

For the land resource of public open space in old districts, the usage of space under the overpass and the roof in the old-style housing estate can be explored to provide additional land for open space. Now these spaces are largely neglected and underused. Many rooftops are closed and authorities will not allow people to go because of safety and security reasons. Given that it is very difficult, if not impossible to develop more land in old areas, vertical consideration can be another option.

It was also suggested to integrate the POS allocation and urban renewal project in old districts. It can maximize the benefit of POS not only physically but also socially. POS can be a place which recall the district history and memories of surrounding residents and create a strong sense of place.

#### 4.2.4 Policy implication and implementation

It was argued by some experts that there is no need to distinguish the design principles between new towns and old districts. Comprehensive and strategic development is

needed for both old and new districts. It was reported that safety, support, cognition, well-being are four universal principles that HK government are going to propose as elderly design guidelines soon. However, they thought the findings of this study may bring great value to improve the design and operation of POS in new town in the future. Meanwhile, it also provides valuable suggestion in the renovation of open space which is more feasible in old town because of its lower cost and feasibility.

Policy suggestions of management and public participation were also proposed by many experts. It was recognized that generally the management of POS is good. However, regulations should be reviewed to maximize the utilization of public open space. Compared with foreign countries, the restrictions of POS are too rigid to promote the intergenerational activities. For instance, playing football and scooter is prohibited in many open spaces. Besides, some experts thought that the elderly, as the major user group of POS, preference was inadequately considered in the planning and design and stage of POS. Although public consultation has always been conducted, the elderly behavioural pattern, including what they are going to POS for and how they interact with others, has not been well understood by the managers, designers nor planners. Basically, elderly preferences and needs should be investigated, understood and incorporated into the actual planning and design by landscape architects or planners whose role is to realize these considerations. In this sense, each park should have a user group or consultant group providing input during the design stage.

#### 4.2.5 Framework of factors and methods suggestions

Experts' supplements provided valuable advice for reframing the conceptual framework and exploring the implications of factors influencing elderly visits to POS. For instance, one expert suggested the framework of factors can be categorized into three different aspects: before departure at home, on the way to the POS and within the POS itself. This helped the researchers to organize the identified factors into a sequence that resembles the elderly preference and behaviour, and this has guided the organization of the questionnaire survey.

Regarding the sampling group, several experts gave their suggestions to help achieving the project objectives. A professor suggested that the research team should also approach those 'hidden elderly' who seldom go to POS and investigate the reasons. It is important to understand their views towards visiting POS, although the sampling size of this group may not be large due to difficulty in approaching this subset of the elderly. Similarly, another expert emphasized that the reasons some elderly did not go to the POS are important to the understanding of their preferences. The reasons can be health issue, age or available time, etc. Therefore, involving those inactive elderly users as one of the target groups for the questionnaire surveys was also considered.

#### 4.2.6 Comparison of expert opinions and the significant factors identified from regression models

The expert opinions which are related to the significant factors identified from the multiple regressions modelling are shown in the Appendix F. The experts' views on the similar aspects and factors are mostly consistent, but there are also several differences among the results from these two sources of data, including wayfinding, directional sign and size of POS. The views experts regarding the identified factors are included in the table for further explanation and interpretation of the regression modelling results.

### 4.3 Questionnaire surveys

#### 4.3.1 Characteristics of respondents

Table 9 shows the characteristics of respondents, and the sample contains a broad spectrum of both users and less frequent users of public open spaces. In this study, a total number of 647 questionnaires were collected; 537 from users in public open spaces; and 110 from less frequent users out of public open spaces. Among 537 respondents in public open spaces, 271 are in urban old districts and 266 are in new towns. More than half of the elderly respondents are aged between 65 to 84. Gender distribution was quite even, with slightly more than half of the respondents are female. In terms of education level, the largest group of elderly reported having primary level education, representing 42.3% and 41.8% of users and less frequent uses respectively. Most of the respondents indicated their health status as fair or good. Regarding the housing condition, more than half of respondents lived in public housing estates and the dwelling size is between 100-500 sq. ft.

Table 9 Profiles of respondents

|               | <b>Users</b><br>(N=537) | <b>Urban old district</b><br>(N=271) | <b>New town</b><br>(N=266) | <b>Less frequent users</b><br>(N=110) |
|---------------|-------------------------|--------------------------------------|----------------------------|---------------------------------------|
| <b>Gender</b> |                         |                                      |                            |                                       |
| Female        | 297(55.3%)              | 139(51.3%)                           | 158(59.4%)                 | 65 (59.1%)                            |
| Male          | 240(44.7%)              | 132(48.7%)                           | 108(40.6%)                 | 45 (40.9%)                            |
| <b>Age</b>    |                         |                                      |                            |                                       |
| <60           | 35(6.5%)                | 14(5.2%)                             | 21(7.9%)                   | 5 (4.5%)                              |
| 60-64         | 111(20.7%)              | 61(22.5%)                            | 50(18.8%)                  | 13 (11.8%)                            |
| 65-74         | 186(34.6%)              | 93(34.3%)                            | 93(35.0%)                  | 41 (37.3%)                            |
| 75-84         | 149(27.7%)              | 75(27.7%)                            | 74(27.8%)                  | 34 (30.9%)                            |
| >=85          | 56(10.4%)               | 28(10.3%)                            | 28(10.5%)                  | 17 (15.5%)                            |

| <b>Education level</b> |             |             |             |            |
|------------------------|-------------|-------------|-------------|------------|
| None                   | 110(20.5%)  | 53(19.6%)   | 57(21.4%)   | 26 (23.6%) |
| Primary                | 227(42.3%)  | 115(42.4%)  | 112(42.1%)  | 46 (41.8%) |
| Secondary              | 152(28.3%)  | 77(28.4%)   | 75(28.2%)   | 31 (28.2%) |
| Post-secondary         | 48(8.9%)    | 26(9.6%)    | 22(8.2%)    | 7 (6.3%)   |
| <b>Health</b>          |             |             |             |            |
| Poor                   | 49 (9.1%)   | 21 (7.7%)   | 28 (10.5%)  | 15 (13.6%) |
| Fair                   | 230 (42.8%) | 110 (40.6%) | 120 (45.1%) | 42(38.2%)  |
| Good                   | 196 (36.5%) | 114 (42.1%) | 82 (30.8%)  | 48 (43.6%) |
| Very good              | 50 (9.3%)   | 19 (7.0%)   | 31 (11.7%)  | 5 (4.5%)   |
| Excellent              | 12 (2.2%)   | 7 (2.6%)    | 5 (1.9%)    | 0 (0.0%)   |
| <b>House size</b>      |             |             |             |            |
| <100 sq. ft            | 19 (3.5%)   | 12 (4.4%)   | 7 (2.6%)    | 1 (0.9%)   |
| 100-500 sq. ft         | 366 (68.2%) | 187 (69.0%) | 179 (67.3%) | 76 (69.1%) |
| 500-1000 sq. ft        | 145 (27.0%) | 68 (25.1%)  | 77 (28.9%)  | 33 (30.0%) |
| >1000 sq. ft           | 7 (1.3%)    | 4 (1.5%)    | 3 (1.1%)    | 0 (0.0%)   |
| <b>Type of house</b>   |             |             |             |            |
| Public housing estate  | 365 (68.0%) | 195 (72.0%) | 170 (63.9%) | 80 (72.7%) |
| Private housing estate | 123 (22.9%) | 67 (24.7%)  | 56 (21.1%)  | 20 (18.2%) |
| others                 | 30 (5.6%)   | 0 (0.0%)    | 30 (11.3%)  | 10 (9.1%)  |
| missing                | 19 (3.5%)   | 9 (3.3%)    | 10 (3.8%)   | 0 (0.0%)   |

#### 4.3.2 Elderly's use pattern of public open space

Table 10 demonstrates the elderly's pattern of use of public open spaces. It is indicated that half of the elderly respondents visit open spaces 6 to 7 times per week. The highest group of usual visit time period to open space is 6:00-9:00am, followed by time period of 9:00am-12:00pm. Regarding the transportation to public open spaces, 94.6% of respondents chose to visit public open spaces by walking, and cost time from home to public open space for most elderly respondents is less than 10 minutes or 10 to 20 minutes, which the percentages are 46.0% and 46.7% respectively. In addition, nearly 80% of elderly respondents indicated that they like to visit public open space, and the intention to visit public open spaces are mainly doing physical exercises or chatting with friends, which account for 75.4% and 36.1% respectively. In terms of using public open spaces, 52.0% of respondents would stay in public open spaces for more than one

hour, and 73.6% of elderly people are satisfied or very satisfied with using public open spaces.

Table 10 Elderly's pattern of use of public open space

|  | <b>Users</b><br>(N=537) | <b>Urban old district</b><br>(N=271) | <b>New town</b><br>(N=266) |
|--|-------------------------|--------------------------------------|----------------------------|
| <b>Times visiting each week</b>  |                         |                                      |                            |
| 0  | 9(1.7%)                 | 7(2.6%)                              | 2(0.8%)                    |
| 1-2 times  | 75(14.0%)               | 40(14.8%)                            | 35(13.2%)                  |
| 3-5 times  | 144(26.8%)              | 71(26.2%)                            | 73(27.4%)                  |
| 6-7 times  | 272(50.7%)              | 141(52.0%)                           | 131(49.2%)                 |
| >7 times   | 37(6.9%)                | 12(4.4%)                             | 25(9.4%)                   |
| <b>Visit time to public open space</b>                                 |                         |                                      |                            |
| Before 6:00 am   | 8 (1.5%)                | 4 (1.5%)                             | 4 (1.5%)                   |
| 6:00 am -9:00am  | 268 (49.9%)             | 130 (48.0%)                          | 138 (51.9%)                |
| 9:00 am-12:00 pm   | 191 (35.6%)             | 93 (34.3%)                           | 98 (36.8%)                 |
| 1:00pm-6:00pm  | 95 (17.7%)              | 42 (15.5%)                           | 53 (19.9%)                 |
| After 6:00pm   | 40 (7.4%)               | 21 (7.7%)                            | 19 (7.1%)                  |
| <b>Transportation</b>  |                         |                                      |                            |
| Public transport   | 23 (4.3%)               | 18 (6.6%)                            | 5 (1.9%)                   |
| Walking  | 508 (94.6%)             | 250 (92.3%)                          | 258 (97.0%)                |
| Cars   | 5 (0.9%)                | 5 (1.8%)                             | 0 (0.0%)                   |
| <b>Cost time from home to public open space</b>                        |                         |                                      |                            |
| <10 min  | 247 (46.0%)             | 101 (37.3%)                          | 146 (54.9%)                |
| 10-20 min  | 251 (46.7%)             | 140 (51.7%)                          | 111 (41.7%)                |
| >20 min  | 39 (7.3%)               | 30 (11.1%)                           | 9 (3.4%)                   |
| <b>Degree of liking</b>  |                         |                                      |                            |
| Very much dislike  | 3 (0.6%)                | 0 (0.0%)                             | 3 (1.1%)                   |
| Dislike  | 2 (0.4%)                | 0 (0.0%)                             | 2 (0.8%)                   |
| Fair   | 66 (12.3%)              | 42 (15.5%)                           | 24 (9.0%)                  |
| Like   | 424 (79.0%)             | 220 (81.2%)                          | 204 (76.7%)                |
| Very much like   | 42 (7.8%)               | 9 (3.3%)                             | 33 (12.4%)                 |
| <b>Intention (Reason) to visit public open space (multiple choice)</b> |                         |                                      |                            |
| Chat with friends  | 194 (36.1%)             | 81 (29.9%)                           | 113 (42.5%)                |
| Physical exercises   | 405 (75.4%)             | 210 (77.5%)                          | 195 (73.3%)                |
| Group activity   | 57 (10.6%)              | 21 (7.7%)                            | 36 (13.5%)                 |
| Landscape  | 81 (15.1%)              | 48 (17.7%)                           | 33 (12.4%)                 |
| Facilities   | 94 (17.5%)              | 37 (13.7%)                           | 57 (21.4%)                 |

|                           |             |             |             |
|---------------------------|-------------|-------------|-------------|
| Rest                      | 38 (7.1%)   | 22 (8.1%)   | 16 (6.0%)   |
| Accompany                 | 4 (0.7%)    | 2 (0.7%)    | 2 (0.8%)    |
| <b>Length of stay</b>     |             |             |             |
| <15min                    | 14 (2.6%)   | 9 (3.3%)    | 5 (1.9%)    |
| 15-30min                  | 56 (10.4%)  | 23 (8.5%)   | 33 (12.4%)  |
| 30-60min                  | 188 (35.0%) | 88 (32.5%)  | 100 (37.6%) |
| >60min                    | 279 (52.0%) | 151 (55.7%) | 128 (48.1%) |
| <b>Satisfaction level</b> |             |             |             |
| Very dissatisfied         | 7(1.3%)     | 7(2.6%)     | 0(0%)       |
| Dissatisfied              | 22(4.1%)    | 12(4.4%)    | 10(3.8%)    |
| Neutral                   | 113(21.0%)  | 60(22.1%)   | 53(19.9%)   |
| Satisfied                 | 337(62.8%)  | 174(64.2%)  | 163(61.3%)  |
| Very satisfied            | 58(10.8%)   | 18(6.6%)    | 40(15.0%)   |

#### 4.3.3 Key factors affecting elderly's visits to public open space – factor analysis

The Kaiser-Meyer-Olkin Test (KMO) and Bartlett's Test of Sphericity were performed to test whether the data set is suitable for conducting statistical factor analysis. The result shows that the Kaiser-Meyer-Olkin Test (KMO) measure of sampling adequacy is 0.895, which is 'Meritorious' according to Kaiser (1974). In addition, the value of Bartlett's Test of Sphericity is 9334.704 and the significance level is 0.000, which means the variables are related and suitable for structure detection. The above statistical results indicate that the factor analysis is suitable to be used based on data set of this study.

Table 11 presents the results of factor analysis method. According to their Eigenvalues greater than 1.0, overall, 9 underlying factors are extracted from 41 variables that may affect elderly's preference in visiting public open spaces. The 9 underlying factors would be used in the following regression analysis. The variable 'car ownership' is not included in factor analysis because most elderly people indicated it as not important and the mean value is only 1.65, which is much lower than other variables.

Table 11 Factor analysis result of key factors affecting elderly's visits to public open space

| Variables  | Factor loading | % of Variance explained | Cumulative % of variance |
|--|----------------|-------------------------|--------------------------|
| <b>Factor 1 Public Transport and Street Design</b> |                |                         |                          |
| B5 Proximity to public transport                   | 0.899          | 23.031                  | 23.031                   |
| B4 Availability of public transport                | 0.887          |                         |                          |
| B6 Cost  | 0.847          |                         |                          |

|   |       |        |        |
|---|-------|--------|--------|
| B14 Means to public open space                      | 0.773 |        |        |
| B9 Wayfinding system (on the way)                   | 0.560 |        |        |
| B11 Barrier free design (on the way)                | 0.506 |        |        |
| B13 Street connectivity                             | 0.477 |        |        |
| <b>Factor 2 Quality of Open Space</b>               |       |        |        |
| C2 Pollution  | 0.767 | 11.021 | 34.052 |
| C3 Cleanliness                                      | 0.756 |        |        |
| C4 Safety   | 0.693 |        |        |
| C5 Maintenance                                      | 0.654 |        |        |
| C1 Noise  | 0.651 |        |        |
| C7 Landscape  | 0.615 |        |        |
| C6 Size   | 0.461 |        |        |
| C12 Terrain (in open space)                         | 0.404 |        |        |
| <b>Factor 3 Social Consideration and Management</b> |       |        |        |
| C18 Social interaction                              | 0.656 | 5.119  | 39.171 |
| C17 Social cohesion                                 | 0.607 |        |        |
| C19 Physical Activity                               | 0.599 |        |        |
| C15 Conflict of use                                 | 0.583 |        |        |
| C20 Social participation                            | 0.578 |        |        |
| C14 Crowdedness                                     | 0.518 |        |        |
| <b>Factor 4 Facilities of Open Space</b>            |       |        |        |
| C10 Urban furniture                                 | 0.693 | 4.610  | 43.782 |
| C13 Barrier free design (in open space)             | 0.636 |        |        |
| C9 Wayfinding system (in open space)                | 0.635 |        |        |
| C8 Facilities/ amenities                            | 0.455 |        |        |
| C11 Design for all weather condition                | 0.356 |        |        |
| <b>Factor 5 Walking Environment</b>                 |       |        |        |
| B12 Walkability                                     | 0.718 | 3.747  | 47.528 |
| B10 Terrain (on the way)                            | 0.714 |        |        |
| B8 Pedestrian safety/traffic speed                  | 0.493 |        |        |
| <b>Factor 6 Living Condition</b>                    |       |        |        |
| A2 Size of living space                             | 0.823 | 3.612  | 51.140 |
| A3 Comfort at home                                  | 0.784 |        |        |
| A1 Residential density                              | 0.640 |        |        |

| <b>Factor 7 Availability and Proximity</b>          |       |       |        |
|---|-------|-------|--------|
| B2 Proximity to home                                | 0.741 | 2.954 | 54.090 |
| B1 Availability                                     | 0.620 |       |        |
| B7 Travel time                                      | 0.481 |       |        |
| B3 Proximity to amenities                           | 0.330 |       |        |
| <b>Factor 8 Personal Considerations</b>             |       |       |        |
| A6 Health status                                    | 0.768 | 2.638 | 56.732 |
| A8 Active lifestyle                                 | 0.733 |       |        |
| A7 Attractive activities                            | 0.481 |       |        |
| <b>Factor 9 Available leisure time and security</b> |       |       |        |
| A5 Available leisure time                           | 0.536 | 2.560 | 59.292 |
| C16 Security  | 0.361 |       |        |

#### 4.3.4 Factors associated with elderly use patterns in public open space

##### All selected districts

Appendix G.1 illustrates the results of the ordered logit model of factors affecting preferences of the elderly in visiting public open spaces. It shows that the factor 'Personal Consideration' (Estimate=0.273,  $p<0.05$ ) is positively associated with the elderly's degree of liking to visit public open space, which means elderly people who believe personal consideration factor is important are more likely to visit public open spaces. Factor 'Availability and Proximity' (Estimate=0.215,  $p<0.05$ ) is also significantly associated with elderly's degree of liking to visit public open space in a positive direction. In addition, factor 'Available leisure time and security' (Estimate=0.290,  $p<0.01$ ) is positively associated with elderly's frequency to visit public open spaces, elderly who believe available leisure time and security factor is important would visit public open spaces more frequently.

In terms of personal factor, elderly people who visit public open space for reasons to accompany others, such as playing with family, are more likely to visit public open spaces (Estimate=2.513,  $p<0.05$ ). The results also show that elderly people who visit public open spaces for doing physical exercises tend to stay longer in public open spaces (Estimate=0.967,  $p<0.01$ ). Age is an important factor that affect elderly's preference in visiting public open spaces. It is indicated that with the increase of age, elderly people are more possible to visit public open spaces more frequently (Estimate=0.618,  $p<0.01$ ) and stay longer in public open spaces (Estimate=0.293,  $p<0.01$ ). In addition, education level is also a statistically significant factor that affect elderly's degree of liking (Estimate=-0.300,  $p<0.05$ ) and frequency (Estimate=-0.275,

$p < 0.05$ ) to visit public open spaces in a negative direction, which means elderly people who have lower education level tend to like to visit public open spaces and visit public open spaces more frequently.

#### 4.3.5 Factors associated with use patterns of the elderly in urban old districts and new towns

##### Urban old districts

Appendix G.2 presents the ordered logit model results of factors affecting preferences of the elderly in visiting public open spaces in urban old districts. It is indicated that factor 'Public Transport and Street Design' (Estimate=0.768,  $p < 0.05$ ) is positively associated with elderly's degree of liking to visit public open spaces, which shows that elderly people who believe public transport and street design factor is important are more likely to visit public open spaces. In addition, factor 'Available leisure time and security' (Estimate=0.396,  $p < 0.05$ ) is a statistically significant factor that associated with elderly's frequency to visit public open spaces in a positive direction, which means elderly people who believe available leisure time and security time is important would visit public open spaces more frequently. Factor 'Social Consideration and Management' (Estimate=0.518,  $p < 0.01$ ) has been found that significantly associated with elderly's length of stay in public open spaces. Elderly people who believe social consideration and management factor is important may have a higher possibility to stay longer in public open spaces.

In terms of personal factors, elderly people who visit public open spaces for doing exercises (Estimate=1.175,  $p < 0.05$ ) may have a higher degree of liking to visit public open spaces. Furthermore, age (Estimate=0.729,  $p < 0.01$ ) is also a statistically significant factor that associated with elderly's frequency to visit public open spaces, which means with increase of age, elderly people may visit public open spaces more frequently.

##### New towns

Appendix G.3 shows the ordered logit model results of factors affecting preferences of the elderly in visiting public open spaces in new towns. Regarding elderly's perception, the factor 'Personal Consideration' is an important factor that affect elderly's degree of liking (Estimate=0.426,  $p < 0.01$ ) and frequency (Estimate=0.283,  $p < 0.05$ ) to visit public open spaces in a positive direction. It means that elderly people who believe personal consideration factor is important are more likely to visit public open spaces and visit more frequently in new towns. In addition, factor 'Available leisure time and security' is also positively (Estimate=0.241,  $p < 0.05$ ) associated with elderly's frequency to visit public open spaces, which means that elderly people who believe available leisure time and security factor is important would visit public open spaces more frequently in new towns.

In terms of personal factors, intention to visit public open space and age are two major aspects. The results present that elderly people who visit public open spaces for doing physical exercises may visit public open spaces more frequently and stay longer in public open spaces as the factor 'intention to visit open space for physical exercise' is positively associated with elderly's frequency (Estimate=0.715,  $p<0.05$ ) and length of stay (Estimate=1.167,  $p<0.01$ ) in new towns. In addition, the factor 'intention to visit open space for accompany' is also a statistically significant factor (Estimate=3.931,  $p<0.05$ ) that positively associated with elderly's degree of liking to visit public open spaces. It shows that elderly people who visit public open spaces due to accompanying reasons, such as playing with family or other generations, are more possible to like to visit public open spaces. Age is an essential variable that positively associated with elderly's frequency (Estimate=0.586,  $p<0.01$ ) and length of stay (Estimate=0.520,  $p<0.01$ ) in public open spaces in new town. It seems that older elderly tend to be more likely to visit public open spaces more frequently and stay longer than younger elderly in new town. Another interesting finding is that gender (Estimate=0.660,  $p<0.05$ ) is also a statistically significant factor that affect elderly's length of stay in public open spaces. Comparing with female elderly, male elderly tend to using public open spaces for a longer time period.

#### 4.3.6 Factors associated with use patterns of the elderly living in public and private housing estates

##### Public housing

Appendix G.4 presents the ordered logit model results of factors affecting preferences of the elderly in visiting public open spaces who live in public housing estates. It is indicated among the factors of elderly's perception, the only factor 'Available leisure time and security' (Estimate=0.332,  $p<0.01$ ) is a statistically significant factor in a positive direction that associated with elderly's frequency to visit public open spaces. It means that for elderly people living in public housing estates, those who believe available leisure time and security issue is important may visit public open spaces more frequently.

It is also found that elderly people who visit for doing exercises (Estimate=1.186,  $p<0.01$ ) may have a higher possibility to stay longer in public open spaces, as this factor is positively associated with elderly's length of stay in public open spaces. Elderly people who visit to accompany family members or other generations (Estimate=3.039,  $p<0.05$ ) were also found that have a higher degree of liking to visit public open spaces. In addition, age was found to be significantly positively (Estimate=0.716,  $p<0.01$ ) associated with elderly's frequency to visit public open spaces. With the increase of age, elderly people living in public housing estates may visit public open spaces more frequently.

## Private housing

Appendix G.5 shows the ordered logit model results of factors affecting preferences of the elderly in visiting public open spaces who live in private housing estates. For elderly's perception, factors 'Walking Environment' (Estimate=0.816,  $p<0.01$ ), 'Living Condition' (Estimate=0.943,  $p<0.05$ ) and 'Availability and Proximity' (Estimate=1.694,  $p<0.01$ ) are significant positively associated with elderly's degree of liking to visit open spaces, which means that elderly people living in private housing estates who believe these factors are important may have a higher degree of liking to visit public open spaces. It is also found that factor 'Availability and Proximity' (Estimate=0.696,  $p<0.01$ ) is significantly associated with elderly's frequency to visit public open spaces in a positive direction. Elderly people living in private housing estates who believe availability and proximity issue is important may visit public open spaces more frequently. Factor 'Living Condition' (Estimate=0.515,  $p<0.05$ ) is also a statistically significant factor that affect elderly's length of stay in a positive direction, which means elderly people believing this factor is important may stay in public open spaces for longer time period.

In terms of personal factors, the results indicate that intention to visit open space for physical exercise (Estimate=2.988,  $p<0.01$ ) is positively associated with elderly's degree of liking to visit public open spaces, which means that elderly people living in private housing estates who come to public open spaces for doing physical exercises or having rest could have a higher degree of liking to visit public open spaces. In addition, elderly people who visit public open spaces for chatting with friends (Estimate=0.992,  $p<0.05$ ) is also positively associated with elderly's length of stay in public open spaces, which means that elderly people living in private housing estates who visit public open spaces for chatting with friends may stay longer in public open spaces.

The results also found that age (Estimate=0.624,  $p<0.01$ ) is a statistically significant factor that affect elderly's frequency in a positive direction. It is demonstrated that elderly people living in private housing estates may visit public open spaces more frequently with the increase of age. Education level is an important factor that affect elderly's preference in visiting public open spaces who live in private housing estates. It is indicated that education level is significantly associated with elderly's degree of liking (Estimate=-0.854,  $p<0.05$ ), frequency (Estimate=-0.969,  $p<0.01$ ) and length of stay (Estimate=0.648,  $p<0.05$ ) in public open spaces. It shows that elderly people who have lower education level and living in private housing estates may have higher degree of liking it visit public open spaces and visit more frequently but stay for less time period in public open spaces. Some more interesting points are health (Estimate=0.579,  $p<0.05$ ) is found that positively associated with elderly's frequency to visit public open spaces, which means elderly people who have better health status may willing to visit public open spaces more frequently. Gender (Estimate=0.935,  $p<0.05$ ) is another significant factor that positively associated with elderly's length of stay in public open

spaces, which shows that compare to female elderly, male elderly living in private housing estates tend to stay in public open spaces for longer time period.

#### 4.3.7 Factors associated with use patterns of the elderly of different genders

##### Male elderly

Appendix G.6 presents the ordered logit model results of factors affecting preferences of the male elderly in visiting public open spaces. It is indicated that the factor ‘Social Consideration and Management’ (Estimate=0.285,  $p<0.05$ ) is a significant factor that is associated with male elderly’s frequency to visit public open spaces in a positive direction, which means that male elderly who believe this factor is important may visit public open spaces more frequently. Factor ‘Availability and Proximity’ is also an important factor that is associated with male elderly’s degree of liking (Estimate=0.451,  $p<0.01$ ) and frequency (Estimate=0.291,  $p<0.05$ ) to visit public open spaces, which shows that male elderly who believe availability and proximity factor is important would have a higher possibility to like to visit public open spaces and visit more frequently. Factor ‘Available leisure time and security’ (Estimate=0.389,  $p<0.05$ ) has also been found to be positively associated with elderly’s frequency. Male elderly who indicate this factor as important may visit public open spaces more frequently. In addition, factor ‘Personal Consideration’ (Estimate=0.285,  $p<0.05$ ) is significantly associated with the elderly’s length of stay in public open spaces in a positive direction, which means that male elderly who believe personal consideration factor is important may stay in public open spaces for a longer time period.

In terms of personal factors, it is indicated that intention to visit public open spaces for physical exercises (Estimate=0.773,  $p<0.05$ ), group activity (Estimate=1.544,  $p<0.01$ ) and age (Estimate=0.661,  $p<0.01$ ) are significantly associated with male elderly’s frequency to visit public open spaces in a positive direction, which shows that male elderly visit public open spaces for doing physical exercises or group activities, or with the increase of age, may visit public open spaces more frequently. Furthermore, intention to visit public open spaces for physical exercises (Estimate=0.779,  $p<0.05$ ), house size (Estimate=0.652,  $p<0.05$ ), age (Estimate=0.464,  $p<0.01$ ) and education level (Estimate=0.358,  $p<0.05$ ) are also found positively associated with male elderly’s length of stay in public open spaces. With the increase of age, education level or living house size, or visit public open spaces for doing physical exercise, male elderly people may stay in public open spaces for longer time period.

##### Female elderly

Appendix G.7 shows the ordered logit model results of factors affecting preferences of the female elderly in visiting public open spaces. In terms of female elderly’s perception, factor ‘Personal Consideration’ (Estimate=0.348,  $p<0.05$ ) is positively associated with their degree of liking and factor ‘Available leisure time and security’ (Estimate=0.268,

$p < 0.05$ ) is a significant factor that affect female elderly's preferences of the female elderly in visiting public open spaces in a positive direction. It shows that female elderly who indicated that personal consideration factor is important may have a higher degree of liking to visit public open spaces. In addition, female elderly who believe available leisure time and security factor is important would visit public open spaces more frequently.

Considering personal aspects, intention to visit public open space for physical exercises (Estimate=1.154,  $p < 0.01$ ) is significantly associated with female elderly's length of stay in public open spaces in a positive direction, which means female elderly who visit public open spaces for doing physical exercised tend to stay a longer time period in public open spaces. Intention to visit public open space for accompany reason (Estimate=2.907,  $p < 0.05$ ) is also a significant factor that is positively associated with female elderly's degree of liking, which shows that female elderly who visit public open spaces to play with family members or other generations may have a higher degree of liking to visit public open spaces. In addition, age (Estimate=0.600,  $p < 0.01$ ) and education (Estimate=-0.439,  $p < 0.05$ ) have been found to be significantly associated with female elderly's frequency to visit public open space. With the increase of age, or decrease of education level, female elderly may visit public open spaces more frequently.

#### 4.3.8 Factors associated with satisfaction level and use patterns of the elderly of different age group

##### Younger elderly

Appendix G.8 shows the ordered logit model results of factors affecting preferences of the younger elderly (age < 75) in visiting public open spaces. It is indicated that factor 'Walking Environment' (Estimate=0.326,  $p < 0.05$ ), 'Availability and Proximity' (Estimate=0.290,  $p < 0.05$ ) and 'Personal Consideration' (Estimate=0.316,  $p < 0.05$ ) are positively associated with younger elderly's degree of liking, which means that younger elderly who believe these factors are important would be more likely to visit public open spaces. In addition, two factors 'Social Consideration and Management' (Estimate=0.241,  $p < 0.05$ ) and 'Available leisure time and security' (Estimate=0.377,  $p < 0.01$ ) are found to be significantly associated with younger elderly's frequency of visits. Younger elderly who indicate the two factors as important factors may visit public open spaces more frequently. Factor 'Personal Consideration' (Estimate=0.268,  $p < 0.05$ ) is also a significant factor that associate with younger elderly's length of stay in public open space in a positive direction, which shows that younger elderly who believe personal consideration factor is important factor tend to stay for longer time period in public open spaces.

In terms of personal aspects, intention to visit public open space for accompanying others (Estimate=2.839,  $p < 0.05$ ) or physical exercises (Estimate=0.796,  $p < 0.05$ ) are

found to be positively associated with younger elderly’s degree of liking and length of stay respectively. It is illustrated that younger elderly who visit public open space to play with family members or other generations would have higher degree of liking to visit public open spaces and younger elderly visit public open space for doing physical exercised may stay for longer time period in public open spaces. Furthermore, education is also an important factor that negatively associated with younger elderly’s degree of liking (Estimate=-0.444,  $p<0.05$ ) and frequency (Estimate=-0.445,  $p<0.01$ ), which means that younger elderly with lower education level may have higher degree of liking to visit public open spaces and visit more frequently.

### Older elderly

Appendix G.9 presents the ordered logit model results of factors affecting preferences of the older elderly (age $\geq$ 75) in visiting public open spaces. For elderly’s perception aspect, only factor ‘Availability and Proximity’ (Estimate=0.574,  $p<0.01$ ) is found that positively associated with older elderly’s frequency to visit public open space, which shows that elderly people who believe availability and proximity factors are important may visit public open space more frequently.

Among personal factors, intention to visit public open space for doing physical exercises (Estimate=1.473,  $p<0.01$ ) is significantly associated with older elderly’s length of stay in public open spaces in a positive direction, which demonstrates that older elderly who visit public open spaces for doing physical exercises may stay in public open space for a longer time period. In addition, education is also negatively associated with older elderly’s degree of liking to visit public open spaces. Older elderly people with lower education level tend to have a higher degree of liking to visit public open spaces than those with higher education level.

## 4.4 Spatial analysis and field observation

### 4.4.1 Quality of selected public open spaces

Table 12 demonstrates the descriptive statistics of quality of selected public open spaces. It is indicated that ‘Sculpture’ and ‘Water feature’ have relatively poor quality, and ‘Boundary treatments and furniture’ and ‘Crowdedness’ have relatively high quality.

Table 12 Descriptive statistics of assessment of quality of selected public open spaces

| <b>Factors</b>                          | <b>Mean</b> | <b>Std.</b> |
|---|-------------|-------------|
| <b>Number of facility types</b>         | 3.70        | 1.765       |
| <b>Facility quality</b>                 | 3.75        | 0.632       |
| <i>Fitness/entertainment facilities</i> | 3.90        | 0.775       |

|   |      |       |
|---|------|-------|
| <i>Commercial facilities</i>              | 3.36 | 0.929 |
| <i>Rain and sun-shading devices</i>       | 3.76 | 0.777 |
| <i>Washroom facilities</i>                | 3.78 | 0.878 |
| <i>Drinking water fountain</i>            | 3.67 | 0.888 |
| <i>Boundary treatments and furniture</i>  | 4.13 | 0.500 |
| <b>Urban furniture</b>                    | 2.99 | 0.793 |
| <i>Seats/ benches</i>                     | 3.58 | 0.831 |
| <i>Directional sign</i>                   | 2.30 | 1.489 |
| <i>Lighting facilities</i>                | 3.87 | 0.681 |
| <i>Sculpture</i>                          | 1.82 | 2.028 |
| <i>Trash cans</i>                         | 3.40 | 1.037 |
| <b>Landscape</b>                          | 2.54 | 1.236 |
| <i>Greenery feature</i>                   | 3.93 | 0.691 |
| <i>Water feature</i>                      | 1.20 | 2.041 |
| <i>Plaza for group gathering</i>          | 2.57 | 1.960 |
| <i>Pavilion</i>                           | 2.33 | 2.139 |
| <i>Walking/jogging track</i>              | 2.67 | 1.988 |
| <b>Maintenance</b>                        | 2.78 | 0.564 |
| <i>Security guard around the space</i>    | 0.67 | 0.479 |
| <i>Lawn condition</i>                     | 3.20 | 1.064 |
| <i>Extent and upkeep of vegetation</i>    | 3.83 | 0.648 |
| <i>Cleanliness</i>                        | 3.43 | 0.898 |
| <b>Crowdedness</b>                        | 4.07 | 0.521 |
| <b>Terrain</b>                            | 3.67 | 0.994 |
| <b>Quietness</b>                          | 3.00 | 0.871 |
| <b>Pollution</b>                          | 3.77 | 0.568 |
| <b>Surrounding pedestrian environment</b> | 3.49 | 0.427 |
| <i>Pedestrian facilities</i>              | 3.60 | 0.563 |
| <i>Signage and wayfinding facilities</i>  | 2.67 | 0.758 |
| <i>Pedestrian links</i>                   | 3.63 | 0.669 |
| <i>Design of passageway</i>               | 3.67 | 0.547 |
| <i>Traffic management</i>                 | 3.63 | 0.556 |

|                                    |      |       |
|------------------------------------|------|-------|
| <i>Greening and attractiveness</i> | 3.75 | 0.653 |
|------------------------------------|------|-------|

Note: The assessment scale for urban furniture and landscape is 0–3 (no/poor/fair/good) and the scale of ‘Security guard around the space’ is 0 and 1 (no/yes), whereas that for other items is 1–3 (poor/fair/good).

#### 4.4.2 Spatial factors and park quality attributes associated with elderly satisfaction level of parks for all selected districts

Appendix H.1 presents the correlation analysis results of surrounding environment and open space quality factors with elderly’s satisfaction level with public open spaces. Regarding to the surrounding environment aspect, POS number (coefficient=-0.127,  $p<0.01$ ) and POS integration (coefficient=-0.143,  $p<0.01$ ) are negatively correlated with elderly’s satisfaction level with public open spaces. It shows that elderly people are more satisfied with public open space that is located at less integrated street or less other public open spaces within 500m radius of a particular public open space.

Open space quality aspect is an important aspect because size (coefficient=0.244,  $p<0.01$ ), facility type (coefficient=0.338,  $p<0.01$ ), facility quality (coefficient=0.145,  $p<0.01$ ), urban furniture (coefficient=0.212,  $p<0.01$ ), landscape (coefficient=0.344,  $p<0.01$ ), maintenance (coefficient=0.113,  $p<0.01$ ), crowdedness (coefficient=0.204,  $p<0.01$ ) and quietness (coefficient=0.221,  $p<0.01$ ) are all found significantly correlated with elderly’s satisfaction level with public open spaces. It is indicated that elderly people would be more satisfied with the public open spaces with a large size, variety facility type, good facility quality, urban furniture or landscape, well-maintained condition, less crowded or quiet.

According to Profillidis and Botzoris (2018, p.187), the variables ‘Facility type’ and ‘Landscape’ have moderate positive correlation with elderly’s satisfaction level with public open spaces as Pearson correlation coefficient of the two variables are larger than 0.3. Other significant variables have weak correlation with elderly’s satisfaction level with public open spaces due to the small Pearson correlation coefficient.

#### 4.4.3 Spatial factors and park quality attributes associated with elderly satisfaction level of parks in urban old districts and new towns

Appendix H.2 compares the difference of correlation of the elderly’s satisfaction level with spatial factors and park quality between urban old districts and new towns. In terms of surrounding environment, only SES factor (coefficient=-0.132,  $p<0.05$ ) is significantly negatively correlated with elderly’s satisfaction level in new towns, which

means that elderly people are more satisfied with public open spaces located in low-SES neighbourhoods in new towns.

Regarding open spaces quality, factor size, facility type, facility quality, urban furniture and landscape are positively correlated with elderly's satisfaction level in both urban old districts and new towns. Pollution factor is also significantly correlated with elderly's satisfaction level in both districts but in the opposite direction. In addition, maintenance (coefficient=0.338,  $p<0.01$ ), crowdedness (coefficient=0.351,  $p<0.01$ ) and quietness (coefficient=0.321,  $p<0.01$ ) variables are only positively correlated with elderly's satisfaction level in urban old districts, and the terrain (coefficient=-0.262,  $p<0.01$ ) variable is negatively correlated with elderly's satisfaction level in urban old districts.

In urban old districts, factor size, facility type, facility quality, urban furniture, landscape, maintenance, crowdedness and quietness are found that have moderate correlation with elderly's satisfaction level with public open spaces, while in new towns, only facility type variable has moderate correlation with elderly's satisfaction level.

To further understand which specific facility or urban furniture impact on elderly's preference would have using public open spaces, correlation analysis was conducted between elderly's satisfaction level and each facility type and urban furniture, which is shown in Appendix H.3. It is demonstrated that all the facility types, excluding fitness/entertainment facilities, are significantly correlated with elderly's satisfaction level in a positive direction in all three models. Fitness/Entertainment facility is only significantly correlated with elderly's satisfaction level in new towns.

In terms of urban furniture, only directional signs and sculptures have been found that are positively correlated with elderly's satisfaction level in all three models. Seats/benches and lighting facilities are only found significantly correlated with elderly's satisfaction level in a positive direction in urban old districts. Trash cans have a significant correlation with elderly's satisfaction level in both urban old districts and new towns, but in the opposite direction.

#### 4.4.4 Spatial factors and park quality attributes associated with satisfaction level of elderly living in public and private housing estates

Appendix H.4 presents the results of correlation analysis results of the surrounding environment and open space quality factors with satisfaction level with public open spaces of elderly people living in public housing estates and private housing estates. It is indicated that among surrounding environment variables, POS number and POS integration factors are significantly correlated with satisfaction levels of elderly living in both public and private housing estates in a negative direction. Furthermore,

residential density (coefficient=0.228,  $p<0.01$ ) and SES (coefficient=0.254,  $p<0.01$ ) factors are only significantly correlated with satisfaction levels of elderly people living in private housing estates in a positive direction.

Regarding the open space quality variables, significant factors are the same between elderly people living in public and private housing estates, which are size, facility type, urban furniture, landscape, crowdedness and quietness. Nevertheless, significant factors seem have a stronger correlation with elderly's satisfaction level who are living in private housing estates than those living in public housing estates, especially factors size, facility type, landscape and quietness. It is indicated that size (coefficient=0.315,  $p<0.01$ ), facility type (coefficient=0.490,  $p<0.01$ ), landscape (coefficient=0.393,  $p<0.01$ ) and quietness (coefficient=0.305,  $p<0.01$ ) have moderate positive correlation with satisfaction level of elderly people living in private housing estates, while the effect of these factors can only be seen as weak positive correlation for elderly people living in public housing estates.

#### 4.4.5 Spatial factors and park quality attributes associated with satisfaction level of elderly of different gender groups

Appendix H.5 demonstrates the results of correlation analysis of surrounding environment and open space quality factors with satisfaction levels with public open spaces of elderly people in different gender groups. In terms of the surrounding environment, POS integration is found to be negatively correlated with both male (coefficient=-0.135,  $p<0.05$ ) and female (coefficient=-0.143,  $p<0.05$ ) elderly's satisfaction level with public open space, which shows that both male and female elderly are more satisfied with public open space located in less integrated streets. In addition, the number of POSs (coefficient=-0.150,  $p<0.05$ ) is only negatively correlated with male elderly's satisfaction level with public open space, which means that male elderly are more satisfied with public open spaces that are with less other public open spaces within 500m radius around it.

For open space quality aspect, it is indicated that size, facility type, urban furniture, landscape, crowdedness and quietness are found significantly associated with satisfaction levels with public open space for both male and female elderly in a positive direction. With the improvement of these condition inside public open space, both male and female elderly will become more satisfied with the public open space. Furthermore, facility quality (coefficient=0.167,  $p<0.01$ ) is only positively correlated with female elderly's satisfaction level, which means that female elderly are more satisfied with public open spaces that have good facility quality. Maintenance (coefficient=0.156,  $p<0.05$ ) is also found to be only positively correlated with male elderly's satisfaction level with public open space, which reflects that male elderly are more satisfied with well-maintained public open spaces.

#### 4.4.6 Spatial factors and park quality attributes affecting satisfaction level of elderly of different age groups

Appendix H.6 compares the difference of correlation of the elderly's satisfaction level with spatial factors and park quality between younger elderly (age<75) and older elderly (age≥75). It is indicated that among surrounding environment factors, POS number (coefficient=-0.133, p<0.05) and POS integration (coefficient=-0.151, p<0.01) are only significantly correlated with younger elderly's satisfaction level in a negative position, while there is no significant factor found that is significantly correlated with older elderly's satisfaction level. It shows that younger elderly are more satisfied with public open space that is located at less integrated street or less other public open spaces within 500m radius of particular public open space. On the contrary, older elderly are sensitive with the surrounding environment of public open spaces.

In terms of open space quality, size, facility type, facility quality, urban furniture, landscape and quietness are significantly correlated with both younger and older elderly's satisfaction level with public open spaces in a positive direction. It is illustrated that if these variables have been improved, both younger and older elderly would be more satisfied with the public open space. Maintenance (coefficient=0.178, p<0.01) and crowdedness (coefficient=0.258, p<0.01) are only positively correlated with younger elderly's satisfaction level, which means that younger elderly prefer public open space which is well-maintained, or is not crowded. In addition, the pedestrian environment (coefficient=0.177, p<0.05) is only found to be significantly correlated with older elderly's satisfaction level with public open space, which shows that older elderly people are more satisfied with public open space with a good pedestrian environment around it.

#### 4.5 Relative importance of the factors associated with elderly's visits to public open space

Appendix I presents the mean rating of importance for each variable that affect elderly's preference in visiting public open spaces, which are given by elderly people in urban old districts and new towns, or frequent users and less frequent users of public open spaces. The scale of importance rating uses a 5-point Likert-scale, where the lowest score 1 means least important and the highest score 5 means most important. The variables affecting elderly people living in urban old districts and frequent users are ordered in accordance with the rating importance, while elderly people in new town and less frequent users' rating are shown as a comparison and not ordered. The mean figure and coloured rank order could help to compare the difference and similarity of the importance of variables affecting elderly's preference in visiting public open space.

#### 4.5.1 Relative importance of the factors associated with elderly's visits to public open space in urban old district and new town

Appendix I.1 compares the relative of importance of variables between elderly people in urban old districts and new towns. It is indicated based on Mann-Whitney U test results, elderly people in urban old districts and new towns have different opinions of importance in the 25 factors. Elderly people in urban old districts believe variables 'Available leisure time', 'Terrain (on the way)', 'Urban furniture', 'Availability', 'Barrier free design (on the way)', 'Wayfinding system (inside open space)', 'Wayfinding system (on the way)', 'Means to public open space', 'Residential density', 'Cost', 'Proximity to public transport', 'Availability of public transport', 'Size of living space' and 'Social participation' are more important to elderly's preference in visiting public open spaces than elderly people living in new towns.

In contrast, elderly people living in new towns indicated higher importance of variables 'Cleanliness', 'Pollution', 'Maintenance', 'Safety', 'Landscape', 'Security', 'Physical activity', 'Proximity to home', 'Size', 'Facilities/ amenities' and 'Travel time' than elderly people living in urban old districts.

#### 4.5.2 Relative importance of the factors in affecting users and less frequent user visits to public open space

Appendix I.2 compares the different relative importance of variables between frequent users and less frequent users of public open spaces. Apparently, the result tells us that there is a significant difference between all of the variables, excluding car ownership, between frequent users and less frequent users of public open spaces. It is indicated that frequent users believe all these variables are important to their preference in visiting public open spaces than less frequent users. It seems that compared to the frequent users, those less frequent users are less sensitive to these variables. Furthermore, for both open space users and less frequent users, the variables that fall under the 'Inside open space' category were the important variables and ranked higher than the other two categories.

#### 4.5.3 Relative importance of key planning consideration of open space

To understand the elderly's preference and how varying levels of proximity, size and quality of public open spaces were associated with satisfaction level, the Analysis of Covariance (ANCOVA) was conducted, and the result is shown in Appendix I.3. It is indicated that factor 'Size' and the combined factor 'Size \* Facility quality' are significantly associated with elderly's satisfaction level, which shows that size is the most important factor among three key planning elements, and facility quality with size could also affect elderly's satisfaction level. Thus, it shows that elderly people prefer to visit open space with a larger size, and the better facility quality could be supplement. In addition, proximity seems not important based on this finding.

The Kruskal-Wallis Test result (Kruskal-Wallis  $H=46.512$ ,  $p=0.000$ ) indicates that there is significant difference of elderly's satisfaction level among different types of public open spaces. Further pairwise comparisons show that the significant differences of elderly's satisfaction level exist between local open space and district open space (Test Statistic=-93.477,  $p=0.000$ ), as well as local open space and regional open space (Test Statistic=-83.640,  $p=0.000$ ), but is not found between district open space and regional open space (Test Statistic=9.837,  $p=0.486$ ). It seems that elderly's satisfaction level of local open space (Mean=3.39, Std.=0.904) is lower than district open space (Mean=3.95, Std.=0.669) and regional open space (Mean=3.91, Std.=0.572).

## Chapter 5. Discussion and Validation

### 5.1 Preferences of the elderly in visiting public open spaces

Figure 16 presents the multidimensional model of the preferences of the elderly in visiting public open space. The factors that affect elderly's preferences have been grouped into three categories/stages based on when each factor influences the elderly: (1) 'Departure decision from home', (2) 'Way to open space', and (3) 'Inside open space'. The said grouping into three categories can help to understand elderly's behaviour pattern from leaving home to using public open spaces.

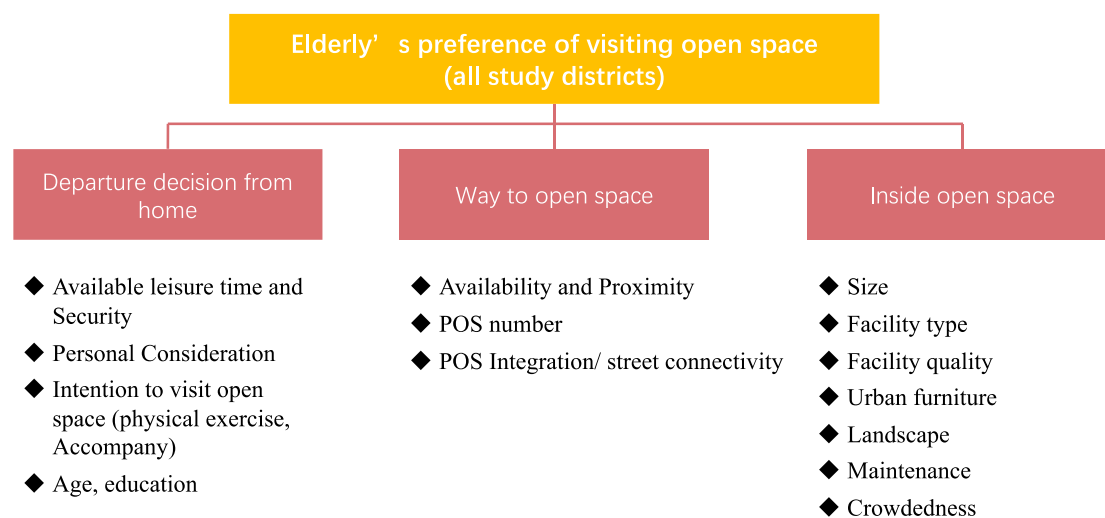


Figure 16 Multidimensional model of the preferences of the elderly in visiting public open space

#### Departure decision from home

When elderly make their decision to depart from home, there are four factors that would affect their decision:-'Available leisure time and Security', 'Personal Consideration', 'Intention to visit open space (physical exercise)' and 'Intention to visit open space (Accompany)'. 'Age and education level', as personal factors, have also been found that affect elderly's preference in visiting public open space.

'Available leisure time and Security' contains two variables: available leisure time and security. Available leisure time is an important variable that affects the elderly's preference in visiting public open space, and it influences whether elderly people have spare leisure time to visit public open space. The importance of available leisure time was also mentioned by elderly people in the focus group interviews as "*I don't have much spare time. I often do housework at home. I spend a lot of time in the day, and I rarely go to public space.*" The common reasons raised in focus group interviews are

employment or volunteer work, housework and taking care of grandchildren. Thus, it shows that these activities keep elderly people busy and make visits public open space less frequent. Security means that there are security staff in the public open space, which is a key issue of maintenance of public open space. Security guards in public open space could effectively decrease crimes and increase the elderly's perceived safety level. Yung et al. (2016a) also found that elderly people in Hong Kong would like to have CCTV and extra security guards inside open space to enhance security level of public areas.

Personal considerations involve health status, active lifestyle and attractive activities. Health status is a common constraint that prevents the elderly from visiting public open spaces, especially those with long distance from their home. Mobility is the main health problem mentioned by elderly people that may affect their walking to public open spaces. Elderly people in focus group interviews told that *"I often went to Tsing Yi Park and waterfront promenade before. But now, I go there less frequently because of my deteriorated health condition"*. In addition, elderly people's health status may also be a concern of their family members and it may prevent elderly from walking outside. One of the elderly people told in focus group interviews that *"I suffered a stroke, so it was not convenient to walk. And I am not allowed to go far to places by my family."*

Active lifestyle means that elderly people have a habit to actively engage in activities in outdoor spaces. Elderly people who have an active lifestyle may visit public open spaces frequently to do physical or social activities, such as elderly people told during interview with experts *"I go outside at 5:30 every morning. I started playing Tai Chi at 7:00 am in the morning. I often run and stretch the legs"*. Public open spaces provide a free space for those elderly people who do physical exercises every day. On the other hand, public open space could also promote an active lifestyle. Wang et al. (2015a) pointed out that open space could provide space for doing group activities, which could promote users' active lifestyle and increase their perceived accessibility of open space. Engaging in attractive activities could be promotion/encouragement for other elderly people to visit public open spaces. This finding is in line with the elderly's comment in focus group interview *"In contrast, there are many citizens singing and dancing in MEI FOO Park. This adds vibrancy to the park"*.

Intention to visit public open space is an important factor that affect the elderly's preference in visiting public open spaces, as it is the motivation of elderly to visit public open space and could affect their expectation of open space. It is indicated that there is big difference of motivations of visiting open space between elderly people and young adults, and using open space is important for elderly people to fulfil their autonomy needs. Thus, it is essential to consider the elderly's needs and motivations during planning and design of open space, which could encourage their visits to open space (Gibson, 2018). Physical exercises and accompany are two significant intentions that affect preference of elderly people in visiting public open space. Physical exercise is the most common reason for elderly to visit public open space, elicited in this study, as

75.4% of respondents indicated that they visit public open space for doing physical exercises. As public open spaces usually provide free fitness facilities for elderly people, it would be a common choice for elderly people who want to do physical exercise to visit public open spaces. Elderly people's comments in focus group interviews also proved it such as *"In the morning, I do some exercise in the park and go to the centre after having breakfast."*

Accompanying family members or playing with other generations is also a significant issue, although it is not a top reason in this study. It may be because the questionnaire surveys are most conducted in the weekday mornings, and during this time period, other family members may not have free time. Accompanying family members or playing with other generations is an important social issue that benefits elderly's social/psychological health. Public open space provides enough space and variety facilities that allow family members of different age groups to engage in outdoor activities in the same place. Sometimes, it is the only reason that attract some elderly people to visit public open space, as told by elderly in focus group interviews: *"Seldom. I go there once a month or during the holiday, to play with my grandson."*

Age and education level are two personal factors that affect elderly's preference in visiting public open space. It is found that with the increase of age, elderly people would visit public open space more frequently and tend to stay longer. It may be because the mobility of elderly people would be decreased as their ages increase, so it would limit the range of their walking activities. Thus, they may spend more time in public open spaces near their home for recreational activities rather than looking for other recreational opportunities. In addition, compared with elderly people with higher education level background, it is found that elderly people with lower education level background visit public open space more frequently and show a higher degree of liking to visit public open space. The possible explanation is that elderly people with lower education background may have less recreation choices, and so to visit public open space, which is free and convenient, may be one of the best choices for them to do recreational activities.

#### Way to open space

The three factors that would affect elderly's way to public open space are 'Availability and Proximity', 'POS number' and 'POS Integration'.

'Availability and proximity' involves proximity to home, availability, travel time, and proximity to amenities. Proximity to home refers to the distance from home to public open space, which is a key issue that affect elderly's preference in visiting public open space, especially for those with mobility impairment. It is common that elderly people usually visit public open space near their home as told in focus group interviews *"I like to visit the Kowloon Walled City Park, because I live nearby the park."*

Availability of public open space could also affect elderly's preference in visiting public open space by providing enough public open space. It is indicated that the perceived accessibility of public open space could be improved by providing sufficient public open space in the neighbourhood. In addition, the availability of public open space is also based on the population of the neighbourhood. Elderly people in focus groups mentioned that *"In fact, those open spaces you mentioned before are not enough. The total number of parks in Tsing Yi, in proportion is not enough."*

Compare with proximity to home, travel time is more concerned about an individual's condition, as each elderly's travel mode or walking speed is different. In this study, elderly people indicate that 92.7% of them travel to public open space within 20 minutes, and among them 46.0% are within 10 minutes. It shows that 20 minutes may be an acceptable travel time for elderly to decide which public open space to visit.

Proximity to amenities is mainly related to the planning of the neighbourhood, to connect the visitation to public open space with elderly's other daily activities. It is also very common in Hong Kong that elderly people would visit other public amenities before or after visiting public open spaces. One of the participants mentioned that *"I usually go to the big garden which is located near the public market, then I buy some ingredients and food from the public market for cooking and watch TV afterwards."* It shows that it is important to improve the accessibility from public open space to other community facilities/amenities.

The number of POSs as a factor has been found to exert a negative influence on the elderly's preference in visiting public open space. This shows that elderly people, when they have little or no choice of other public open spaces around it within 500m radius, they prefer to visit whatever public open space is available. It was reported by Koohsari et al. (2013) that if one open space is surrounded by a lot of other open spaces, people may become less likely to visit one particular open space and the walking activity level will also drop down. This phenomenon may be explained that when public open spaces are too proximate to each other, which may increase elderly people's awareness of the quality of public open space and comparing with others, it could increase their expectation of good quality of open space and may decrease their satisfaction level of one particular open space. It seems there is a distance threshold in distributing public open space that could encourage the use and physical activity. Thus, it is not good to build a lot of small and unattractive public open spaces in a very close proximity.

The POS integration factor is also found to be negatively associated with the elderly's preference in visiting public open spaces, which means that elderly people prefer public open space located in a less integrated street. A common understanding of integration score is that a high integration score of a street means high accessibility and one that could attract more people. It is opposite to our findings, perhaps because those highly integrated streets in Hong Kong are main streets with a large number of vehicles (Leck, 2006). It is quite difficult and dangerous for elderly people, especially those with

mobility impairments, to cross the streets or intersections to reach the public open space. The traffic safety concern could be a barrier to discourage elderly people to visit public open spaces located in those highly integrated streets (Kaczynski et al., 2014). A similar finding is also reported in the previous study by Koohsari et al. (2013).

One further factor is the noise caused by traffic flow. This could also be a possible reason that prevents elderly people from visiting public open space located in highly integrated streets. High noise levels caused by traffic could also make the elderly's outdoor walking activity difficult (Rantakokko et al., 2012). In addition, a noisy traffic environment would also affect the elderly's use of public open space in a negative way (Arnberger et al., 2017).

### Inside open space

The seven factors that would influence the elderly's use inside public open space are 'Size', 'Facility type', 'Facility quality', 'Urban furniture', 'Landscape', 'Maintenance' and 'Crowdedness'. These are explained in the paragraphs below.

Size is an important consideration for elderly people to decide which public open space to visit. Public open space with larger size usually could provide more and a variety of facilities, and it could also provide enough space for group activities and decrease crowdedness inside public open space. Public open space with small size may contain less number and types of facilities, which would discourage elderly people to use it. As elderly people complained in the focus group interview "*The open space downstairs is too small and there are few facilities*", which shows that small size and inadequate facilities would decrease elderly user satisfaction level. In addition, crowdedness caused by the small size of public open space may also be a barrier for elderly people to visit the open space.

Facility type and facility quality are two factors that measure the facility or amenities provided by the public open space. Using facilities or amenities, especially fitness facilities, are one of the main reasons for elderly people to visit public open space. Over 75.4% of elderly indicated that their purpose to visit public open space is doing physical exercises in this study. It is also the factor that highest frequently mentioned (67.69%) by elderly participants in focus group interviews.

Among six types of facilities identified in this study, five types of facilities, which are commercial facilities, rain and sun-shading devices, washroom facilities, drinking water fountain and boundary treatments and furniture, have been significantly correlated to elderly's satisfaction level with using public open space. These facilities are also mentioned in focus group interviews. For example, some elderly people told that "*The washroom is too important to elderly people. Many elder people go outside and do exercises in the morning. And we often drink water before leave home. If there is no washroom in the open space, should I need to find a place which has a washroom*

*and do exercises in front of the washroom?”* The fitness facilities have not been found to be a significant relationship in this study. It may be because it is provided by most of public open space in Hong Kong, and yet it is still important, especially its number, as elderly people told in focus group *“I am quite dissatisfied with the urban design of this district. There should be more recreational fitness facilities in the parks, as many elderly people queue up for the facilities. On top of this, cycling equipment should be included in the fitness stations in the parks.”*

Attention should also be paid to the facility quality, as poor quality of facilities would decrease elderly’s satisfaction level with using public open space. Elderly people in focus group interviews complained that *“The condition of the fitness equipment should also be monitored. For example, the upper limb stretchers are not up to quality that they cannot train my muscle strength.”* It shows that poor quality of fitness facilities could not meet elderly’s needs and would discourage their use of public open spaces.

Urban furniture is also a core variable that significantly correlated with elderly’s preference in visiting public open space. It seems the poor quality of chairs and other urban furniture could discourage elderly to use public open space, which was mentioned by elderly people in focus group interview *“I think the public chairs should be renewed year by year. But the chairs are never been painted. They are very dirty, and I suppose that should be improved.”* In addition, outdoor urban furniture could be part of wayfinding system in public open space and help elderly to recognize their location. In this study, among five types of urban furniture, only directional signs and sculptures are significantly correlated with elderly’s satisfaction level with using public open space. It shows that directional sign, or wayfinding system is quite important to elderly’s use of open space and should be considered during planning and design of public open space. Sculptures, especially those that present the history of local district, is an interesting type of urban furniture that could increase the cultural value of public open space and encourage elderly people to visit.

Landscape plays important role in elderly’s preference in visiting public open space and could increase the attractiveness of public open space. Different kinds of landscape elements, such as naturalness, particularly coherence, vegetation, water and landscape accessories, could encourage the use of public open space, and improve users’ perceived appropriateness and increase their outdoor activity level (Zhang et al., 2013; Chen et al., 2016). A similar requirement is also found in focus group interviews *“In the nearby park, I prefer more flowers and trees, or build some koi ponds for children to feed the goldfish.”*

Maintenance would impact on the quality of public open space, including facilities, urban furniture or landscape, like elderly people mentioned *“Management is also important for things like public facilities.”* In addition, repair of damage facilities in time is also important to elderly people, as complained in focus group *“There are some*

*sport facilities. But once it is broken, it will not be repaired for a long time.*” It could discourage the use of public open space by elderly people.

Crowdedness has close relationship with size of public open space, as large size of public open space could provide more flexible space and decrease the crowdedness of public open space. Some elderly people need flexible space that is not occupied by a lot of other people as they told in focus group interviews *“I only need some empty and comfortable place.”*, and crowdedness would decrease their willingness to use public open space. In addition, another kind of crowdedness is that elderly people need to wait for long time to use facilities, and it would also decrease their satisfaction level of using public open space. In the focus group interview, elderly people complained about this problem *“Some people find it hard to wait. There are too many people, but too few facilities to play with.”* and *“The numbers of equipment is not enough, because many people go outside at the same time. It’s hard to satisfy so many people at the same time.”* The problem of crowdedness is not only about space but also the inadequate facilities and large number of users.

## 5.2 Discrepancies between preferences of the elderly in visiting public open spaces in urban old district and new town

Figure 17 shows the difference of multidimensional model of the preferences of the elderly in visiting public open space between urban old districts and new towns.

### Departure decision from home

Among factors under ‘Departure decision from home’ stage, ‘Available leisure time and security’, ‘Intention to visit open space (physical exercise)’ and ‘Age’ have exerted an influence on elderly’s preference in visiting public open space in both old districts and new towns. The factor ‘Personal consideration’, ‘Intention to visit open space (Accompany)’ and ‘gender’ are associated with elderly’s preference in visiting public open space in new towns.

Elderly people living in new towns are concerned about ‘Personal Consideration’. This shows that those elderly people have higher needs of health status and active lifestyle, which makes them prefer to visit public open space. It may be because those elderly people, after moving to a new town, commonly lose their social networks in their previous community. Thus they may pay more attention to their own personal consideration, such as health status or lifestyle, which would impact on their decision to visit public open space. In addition, accompanying their family members becomes their important social motivation to visit public open spaces as they may not have built their new social networks in the new community. Thus, the factor ‘Personal

consideration’ and ‘Intention to visit open space (accompany)’ is found to be associated with elderly’s preference in visiting public open space in new town.

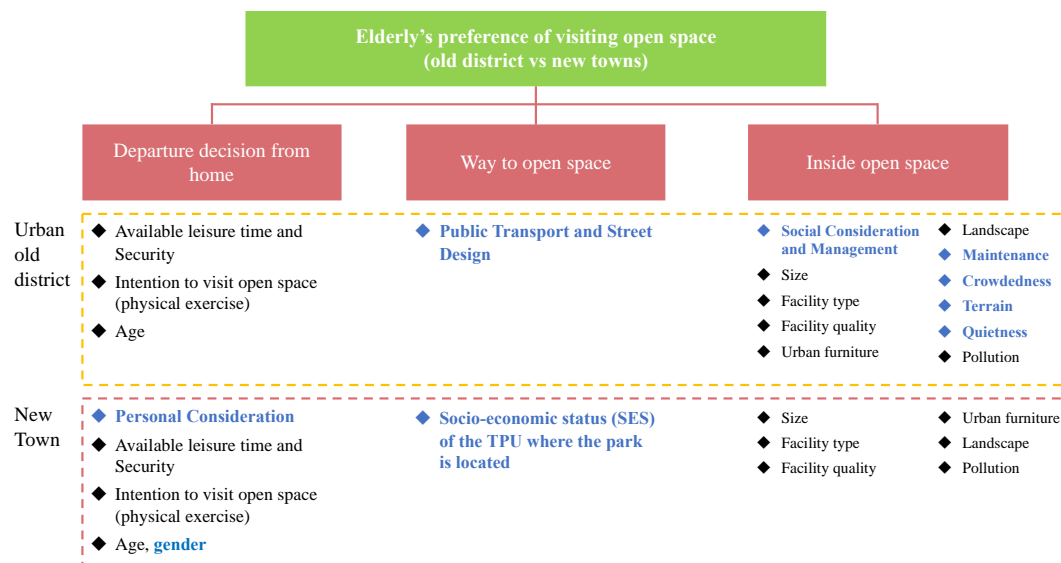


Figure 17 Multidimensional model of the preferences of the elderly in visiting public open space (old districts and new towns)

### Way to open space

In terms of ‘Way to open space’ stage, it is shown that ‘Public transport and street design’ is the only factor associated with elderly’s preference in visiting public open space in urban old districts, while SES factor is only associated with elderly’s preference in visiting public open space in new towns. It means that elderly people in urban old districts more focus on public transport and street design condition around public open space. Whereas elderly people in new towns pay attention to the socio-economic status of the neighbourhood where the public open space is located.

Factor ‘Public Transport and Street Design’ involves seven variables ‘Proximity to public transport’, ‘Availability of public transport’, ‘Cost’, ‘Means to public open space’, ‘Wayfinding system (on the way)’, ‘Barrier free design (on the way)’ and ‘Street connectivity’. Proximity to public transport, availability of public transport and cost are three variables that related to public transport services provided around public open spaces. The importance of availability and proximity to public transport has been recognized by elderly people in focus group interviews ‘*There is also a very important topic, taking the bus to enjoy facilities.... I agree. We have more opportunities to go to the streets.*’ and ‘*An ideal public open space should be accessible, where it can be arrived at by public transportation.*’

Cost of public transport services affect elderly’s use of public open space by exerting an influence on elderly’s affordability of using public transport services. It is suggested

by WHO (2007) that government should provide free or subsidized transport to older adults to encourage them to use public transport. Elderly people in focus group interview are full of praise for the \$2 Concessionary Fare Scheme provided by Hong Kong government as *‘There is public transportation to go there, it only cost 2 dollars.’*

Means to public open space shows that there should be several options for elderly people to reach public open space, such as walking, public transport, car, etc. This study found that in Hong Kong, 94.6% of elderly respondents choose to visit public open space by walking. Thus, street design is important to the elderly walking to public open space, which should be friendly to elderly pedestrians. Wayfinding system (on the way), barrier free design (on the way) and street connectivity are three variables that are related to street design condition.

Wayfinding system (on the way) could help elderly people to recognize their location and easily reach the public open space. It is important to elderly people, especially those who are not familiar with the community, to find their way to public open space. Street design without wayfinding information could be not friendly to elderly people and discourage them to go outside from home.

Barrier-free design (on the way) is also significant important to elderly people to walk to public open space, especially those with disability of mobility. Not sufficient barrier-free design could be seen as barrier that prevent elderly from visiting public open space, which was also complained by elderly during focus group interview as *“In addition, there is a staircase from Kwai Chung Estate to Kwong Fai Circuit near the Kwai Chung San Kui Park. It consists of more than one hundred steps. It is difficult for elderly to climb the staircase.”*

Street connectivity is an important factor that is used to examine the quality of pedestrian pathway. It is found that a well-designed street network which contains higher density of street intersections would encourage elderly people to visit public open space (Kaczynski et al., 2014). It could also promote elderly’s physical activity and increase the feasibility and the attractiveness of walking activities (Handy et al., 2002).

The reason why factor ‘Public transport and street design’ is only significantly associated with elderly’s preference in visiting public open space in urban old districts could be that planning in new towns already consider the proximity from home to public open space. Thus elderly people can walk closely to the nearest public open space without taking public transport, but in urban old districts, the proximity and quality of public open space may not well considered in the planning in those days, which makes elderly people have to take public transport to their preferred public open space. This study found that the percentage of elderly people who go to public open space by public transport is 6.6% in urban old districts, while the percentage is only 1.9% in new towns. It shows that although the percentage is not high, the proportion of elderly taking public

transport in urban old district is a bit higher than elderly in new towns. It could partly attest to the explanation that elderly people in urban old district pay more attention to public transport and street design that affect their preference in visiting public open space.

It is also indicated that factor socio-economic status only exerts an impact on elderly's preference in visiting public open space in new town. Elderly people are more satisfied with public open space located in a low-SES neighbourhood. It may be because that elderly people in a low-SES neighbourhood have less alternative recreational options and their requirement of public open space is not as high as elderly people in high-SES neighbourhoods. In addition, the median monthly domestic household income of neighbourhoods located in urban old districts (Wong Tai Sin - HK\$22,000 in 2016) is lower than neighbourhoods located in new towns (Tseung Kwan O - HK\$32,000 in 2016; Tsing Yi - HK\$26,250 in 2016). Elderly people in high-SES neighbourhood, i.e. new town, are more likely to pay attention to the surrounding environment and socio-economic status of the neighbourhood where public open space is located. The difference of median monthly domestic household income between each neighbourhood in urban old districts is also smaller than the difference in new towns (Table 3). Thus, it may make elderly people in urban old districts not as sensitive to the socio-economic status of neighbourhoods where public open space is located as elderly people in new towns.

#### Inside open space

Considering the factors under 'Inside open space', 'Size', 'Facility type', 'Facility quality', 'Urban furniture', 'Landscape' and 'Pollution' are significantly associated with elderly's preference in visiting public open space in both urban old district and new town, which shows that these factors are the core elements that should be considered during design and management of public open space to encourage the use of public open space by elderly people. Furthermore, factors 'Social Consideration and Management', 'Maintenance', 'Crowdedness', 'Terrain' and 'Quietness' that impact on elderly's preference in visiting public open space are only found in urban old districts.

Factor 'Social Consideration and Management' contains six variables 'Social interaction', 'Social cohesion', 'Physical Activity', 'Conflict of use', 'Social participation' and 'Crowdedness'. Among these factors, social interaction, social cohesion, physical activity and social participation are related to elderly's social consideration when using public open space. Conflict of use and crowdedness are related to management of public open space. Social interaction or social cohesion is one of the main purposes of elderly people to visit public open space, such as elderly people told in focus group meeting "*I aim to chat with some people and listen to some information.*" and "*I play Taiji with a crowd of people on the podium of the Tai Wo Hau Estate.*" The importance of social interaction and social cohesion was also mentioned

in focus group interviews by elderly participants “*Many elderly people want to go out for activities with friends.*” and “*Some elders would join activities if they see many people stay together. If there is a host, it will be more easy to build a group. Actually, some parks are very big, such as the Morse Park. It is easy to organize some small groups there.*”

Social participation is also an important variable reported in previous studies that would impact on elderly’s use of open space and encourage them to engage in social activities (Andersson, 2011; Yung et al., 2016a). It is also recommended by Fadda et al. (2010) that elderly people should be encouraged to take part in social participation during planning and design process of open space. However, this variable was not mentioned in focus group meetings and the relative importance is quiet low. This finding is in line with a previous study (Yung et al., 2017) that Social Participation and Social Inclusion is not a significant planning-related factor that affect elderly’s satisfaction level with using open space in Hong Kong. It may because there is no clear culture of actively taking part in social participation activities in public open space by elderly people in Hong Kong.

Conflict of use and crowdedness are two variables that are related to the management issue in public open space. Some elderly participants in focus group interviews complained “*I think that the most important thing of public open space is management. Some people carry their pillow and bed and sleep in the public space. It must be managed. They must leave at night. They can sit but not lay down during the daytime. If many people are lying there, less and less people will go there. The places will be wasted. These phenomena need to be managed by some public organization.*” Crowdedness means that public open space could not provide enough space for users at the same time. It has been found that would decrease user satisfaction levels of using open space in Hong Kong (Wong, 2009).

The reason why factor ‘Social Consideration and Management’ is only significant associated with elderly’s preference in visiting public open space in urban old districts may be elderly people in urban old districts hope to maintain their existing social network so that they are more willing to actively participate in those social activities with their family or friends. By contrast, elderly people moving to new towns may lose their social network in community so that those social activities such as social interaction and social cohesion are not attractive to them. In addition, population density in urban old districts (Wong Tai Sin – 45181/km<sup>2</sup> in 2011) is quite higher than population density in new towns (Tseung Kwan O – 21708/km<sup>2</sup> in 2011; Tsing Yi - 17929/km<sup>2</sup> in 2011), it would make the problem of conflict of use and crowdedness more apparent in urban old district as there are more potential users of public open space. Thus, it may make social consideration and management issue only significant to elderly people and public open space in urban old districts.

The other factors, maintenance, crowdedness, terrain and quietness, are design or management related factors. These factors have also been found that affect elderly's preference in visiting public open space only in urban old districts. It may be because public open space in urban old districts is older than those in new towns. Thus the facilities and amenities in public open space may seem not in good condition, which will impact on the maintenance level of public open space. Due to the high population density in urban old districts and high-density development, public open space is usually located near heavy traffic roads, which would cause uncomfortable noisy and decrease quietness in public open space.

### 5.3 Discrepancies between preferences of the different groups of elderly in visiting public open spaces

#### 5.3.1 Frequent users and less frequent users

Appendix I.2 compares the difference of importance level that elderly people indicated for each variable between frequent users and less frequent users of public open space. Overall, it is indicated that for all variables except 'Car ownership', elderly frequent users indicate significant higher importance level than less frequent users. It seems that less frequent users are not sensitive to these variables, since even if these variables are improved, it may not attract these less frequent users to visit public open space. Table x shows the reason that less frequent users responded during questionnaire survey. The most frequently mentioned reasons from the questionnaire survey are no available leisure time (19.09%), which may not relate to planning and design variables of public open space. The other reasons are dirty or mosquito (13.64%) and hot or sunny (10.0%) which could be mitigated by thoughtful design and management policy.

#### 5.3.2 Type of housing

Figure 18 presents the difference of multidimensional model of the elderly's preferences in visiting public open space who live in public housing estates or private housing estates.

##### Departure decision from home

Among the factors under 'Departure decision from home', factor 'Intention to visit open space (physical exercise)' was found to be associated with preference of visiting open space for both elderly people living in public housing and private housing estates, which means that doing physical exercise is a common needs for both elderly people

living in public and private housing estates and would encourage them to visit public open space.

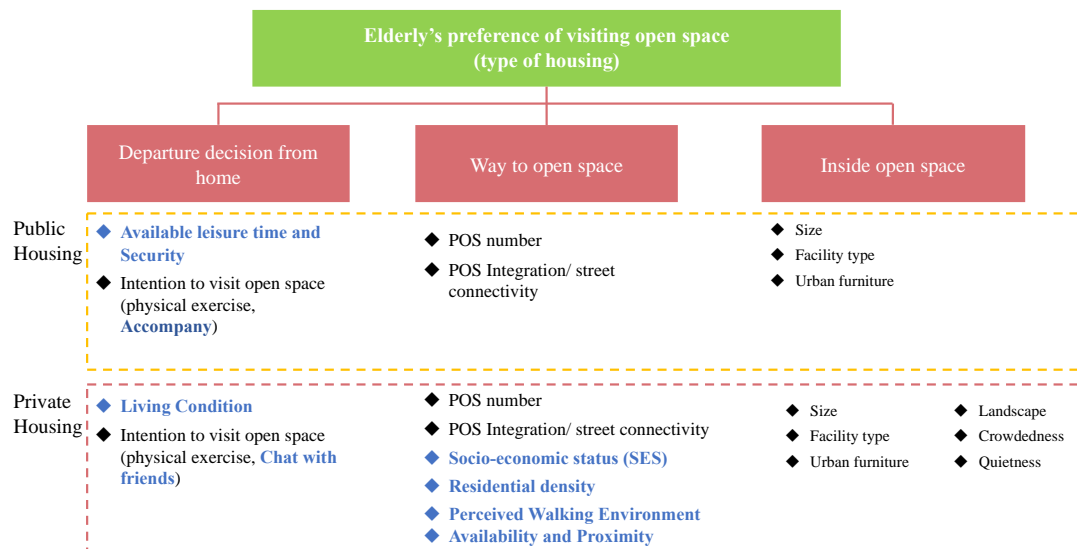


Figure 18 Multidimensional model of the preferences of the elderly in visiting public open space (type of housing)

For elderly people living in public housing estates, factors ‘Available leisure time and Security’ and ‘Intention to visit open space (Accompany)’ have been found that are significantly associated with elderly’s preference in visiting public open space. One possible reason is that generally elderly people living in public housing have relatively lower economic conditions and may have to work for their living expenses or doing housework to decrease their monthly expenditure. Thus they do not have enough available leisure time to visit public open space for recreation. While elderly people living in private housing do not need to keep working after retirement, they may be able to afford the expenses for recruiting domestic helper. Thus, they would have more available leisure time to visit public open space.

In addition, based on 2011 population census result (Census and Statistics Department, 2013), it is indicated that among elderly people living alone, 52.1% of elderly people are living in public housing, while only 37.0% of elderly people are living in private housing. Thus, elderly people living in public housing may have higher needs to accompany family members because they live alone.

For elderly people living in private housing, factors ‘Living condition’ and ‘Intention to visit open space (Chat with friends)’ are found to be associated with elderly’s preference in visiting public open space in a positive way. Living condition factor, which contains size of living space, comfort at home and residential density variables, describe the elderly’s opinion to what extent an uncomfortable home will affect their choice to visit public open space. It is indicated that elderly people living in private

house are more sensitive to their living environments, and if they feel not comfortable at home, they would be more possible to visit public open space than those living in public housing. It may be because elderly people living in public housing have lower socio-economic level which results in their higher tolerance to their living condition. In addition, elderly people living in private housing who go to open space to chat with friends would encourage them to use public open space more frequently. It shows that they have higher needs of social interaction with their friends.

#### Way to open space

In terms of 'Way to open space' stage, factors 'POS number' and 'POS integration/street connectivity' are significantly associated with both elderly preference of visiting open space for both elderly people living in public housing and private housing estates, which highlight the importance of planning of open space and street network around public open space.

Except the above two factors, factors 'Availability and Proximity', 'Socio-economic status (SES)', 'Residential density' and 'Perceived walking environment' were found that only have statistically significant impact on preference of visiting open space for elderly people living in private housing. It may be because elderly people living in private housing usually have higher economic ability which could result in their higher requirement of the built environment and facilities. Thus, they may be more sensitive to the perceived walking environment around open space as well as the availability and proximity to open space.

In addition, as those elderly people have higher socio-economic status, they may be more satisfied with the open space located in neighbourhood with higher socio-economic status, which may have better neighbourhood environment. Furthermore, residential density would also affect neighbourhood environment. If the open space is located in the neighbourhood with higher residential density, it could be a better space for residents to breathe fresh air.

#### Inside open space

For 'Inside open space' category, factors 'Size', 'Facility type', 'Urban furniture', 'Landscape', 'Crowdedness' and 'Quietness' were found to have significant association with preference of visiting public open space for both elderly people living in public and private housing. It shows that both elderly people living in public and private housing believe that factors under 'Inside open space category' are important and they would visit open space with better design and management more frequently.

### 5.3.3 Gender

Figure 19 illustrates the difference of multidimensional model of male and female elderly’s preferences in visiting public open space.

#### Departure decision from home

In terms of the factors under ‘Departure decision from home’, factors ‘Available leisure time and Security’, ‘Personal Consideration’, ‘Intention to visit open space (physical exercise)’, ‘age’ and ‘education’ were statistically significant associated with both male and female elderly’s preference of visiting open space. It shows that both male and female elderly believed that these factors were important to their visiting of open space, which should be highlighted in the planning and design of open space.

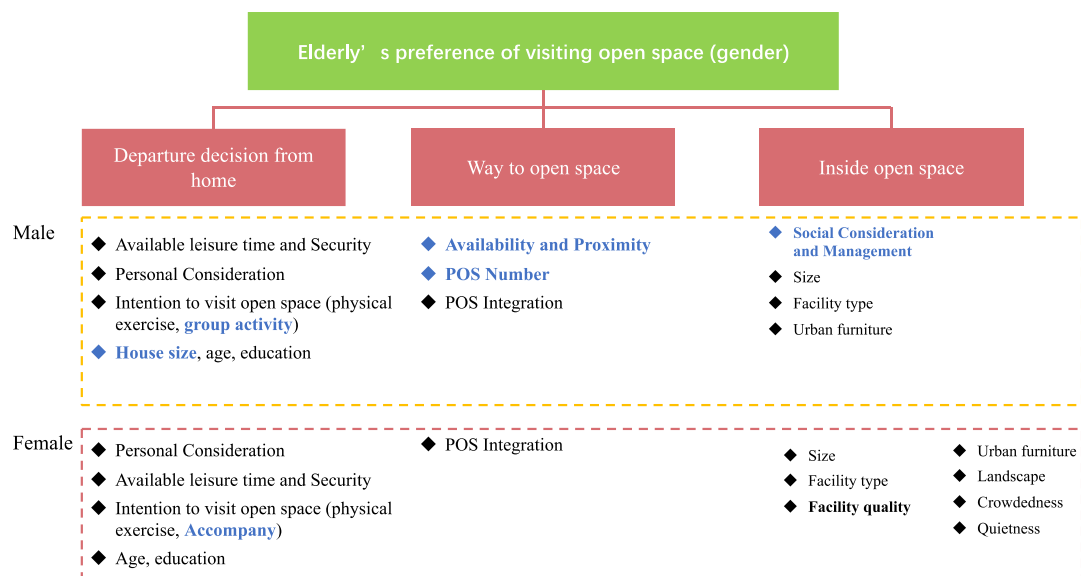


Figure 19 Multidimensional model of the preferences of the elderly in visiting public open space (gender)

Factor ‘Intention to visit open space (group activity)’ and ‘House size’ were found that are significantly associated with male elderly’s preference of visiting open space, while factor ‘Intention to visit open space (Accompany)’ was found only to have significant association with female elderly’s preference of visiting open space. It means that male elderly would be more willing to visit public open space if there are group activities inside open space. This shows the social cohesion needs of male elderly to be the member of groups in the community. In contrast, female elderly shows higher social needs of accompanying with family or friends to visit open space frequently. In Hong Kong context, females prefer to visit open space with family members or friends while male elderly people usually visit open space alone.

### Way to open space

Among factors under 'Way to open space' stage, POS integration factor was found that has significant impact on both male and female elderly's preference of visiting open space, which shows that the street network is quite important to elderly's visiting open space as it would affect the walking environment. In addition, factors 'Availability and Proximity' and 'POS number' were found to be significantly associated only with male elderly's preference of visiting open space. It means that male elderly have higher requirement of the provision of open space in the community and they prefer the open space that can be easily accessed.

### Inside open space

For 'Inside open space' category, most of the factors, i.e. size, facility type, urban furniture, landscape, crowdedness and quietness, are significantly correlated with both male and female elderly's preference of visiting open space, which shows the importance of design and management of open space. Furthermore, factor 'Social Consideration and Management' and 'Maintenance' were only significantly associated with male elderly's preference while factor 'Facility quality' was only significantly associated with female elderly's preference of visiting open space. As female elderly usually visit open space with friends or family members, they may have less social needs of social interaction or social cohesion, and male elderly usually visit open space alone, which may result in their higher needs of social consideration and management issue. In addition, male and female elderly have different needs of open space quality. In this study, male elderly paid more attention to management and maintenance while female elderly prefer the better facility quality.

### 5.3.4 Age group

Figure 20 demonstrates the difference of multidimensional model of younger and older elderly's preferences in visiting public open space.

### Departure decision from home

Among factors under 'Departure decision from home' stage, factors 'Intention to visit open space (physical exercise)' and 'Education' were significantly correlated with both younger and older elderly's preference in visiting open space. It is illustrated that for both younger and older elderly, doing physical exercise is the main purpose to visit open space and this activity would encourage them to use open space more frequently.

Furthermore, factors 'Available leisure time and Security', 'Personal Consideration' and 'Intention to visit open space (Accompany)' have also been found that significantly

associated with younger elderly’s preference in visiting open space. As younger elderly still have high mobility or working ability, they may still need to work, which would decrease their available leisure time and make them have less opportunity to visit open space. In addition, younger elderly usually have better health status and active lifestyle than older elderly due to their higher mobility, thus, they are more sensitive to personal consideration issue, which contains health status, active lifestyle and attractive activities. Younger elderly are also found to be more willing to visit open space with their friends or family members.

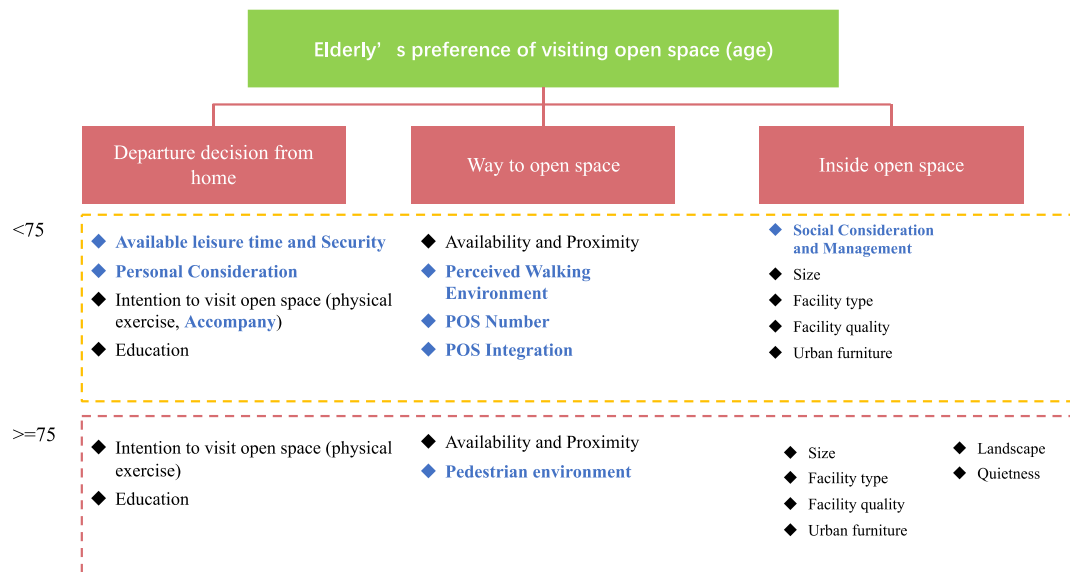


Figure 20 Multidimensional model of the preferences of the elderly in visiting public open space (age)

### Way to open space

In terms of ‘Way to open space’ stage, factor ‘Availability and Proximity’ was found to be significantly associated with both younger and older elderly’s preference of visiting open space, which shows that both of younger and older elderly are sensitive to the provision of open space and proximity to open space by different transportation mode. In addition, factors ‘Perceived walking environment’, ‘POS number’ and POS integration’ were only found to be significantly associated with younger elderly’s preference of visiting open space, and factor ‘Pedestrian environment’ was only significantly correlated with older elderly’s preference of visiting open space. One possible reason is that older elderly usually have lower mobility due to their health condition, thus they have a higher requirement of actual pedestrian environment, which would affect their ability to walk to open space directly. In addition, as younger elderly still have ability to use alternative services rather than open space for recreation, they may have higher requirement of surrounding environment of open space, such as street network, perceived walking environment and open space provision.

### Inside open space

For ‘Inside open space’ category, most of the factors, which are size, facility type, facility quality, urban furniture, landscape and quietness, are significantly associated with both younger and older elderly’s preference of visiting open space. Only three factors, ‘Social Consideration and Management’, ‘Maintenance’ and ‘crowdedness’ have been found to be correlated with younger elderly’s preference of visiting open space only. It may be because younger elderly are still actively engaged in their social network, which may increase their social needs of open space. Furthermore, as they still have the ability to look for alternative recreation services, they have higher requirement of the quality and management of open space, which would affect their satisfaction with using the open space.

#### 5.4 Validations by experts focus group meetings

Based on the results and discussion, we conducted two focus groups on 15th July and 2nd August respectively to validate and refine the results and findings of this study. Overall, 14 invited experts attended the focus group meetings. All the attendees had worked in elderly aging or public open space works and researches for a long time, including academics, governors, NGO representatives, social workers, professional landscape architects or planners etc. The name, position and affiliations of the experts in the two focus group meetings are shown in Tables 13 and 14.

| Name                     | Position  |
|--------------------------|---|
| Dr. King Chung, SIU      | Associate Dean (Academic Programmes), Associate Professor, School of Design, Poly U   |
| Prof. Jean WOO           | Emeritus Professor of Medicine<br>Henry G Leong Research Professor of Gerontology and Geriatrics<br>Faculty of Medicine<br>Director, CUHK Jockey Club Institute of Ageing<br>Director, SH Ho Centre for Gerontology and Geriatrics<br>Director, Centre for Nutritional Studies<br>The Chinese University of Hong Kong<br>Honorary Consultant Geriatrician, Hospital Authority |
| Ms Lai-fong, Alice YEUNG | Assistant Director(A) (Architectural Branch), Architectural Services Department   |
| Ms Karrie, Chung Ho CHAN | Deputy Director (Elderly, Rehabilitation & Community), Hong Kong Christian Service  |

|                   |   |
|-------------------|---|
| Mr. KK LING       | Director, Jockey Club Design Institute for Social Innovation, Poly U  |
| Dr. Calvin LUK    | Project Manager, Jockey Club Design Institute for Social Innovation, Poly U   |
| Ms. Catherine WAN | Assistant General Manager (Elderly Services), Hong Kong Housing Society<br>(Catherine is a registered social worker over 30 years and involves in the elderly sector for over 26 years; and she is now leading our Senior Citizen Residence Scheme) |

Table 13 The name and affiliation of expert attendees in the focus group meeting 1

| Name                 | Position  |
|----------------------|---|
| Prof. Daniel LAI     | Chair Professor of Social Work and Gerontology & Head; Director, Institute of Active Ageing, APSS, Poly U |
| Mr. CHEUNG Wan-ching | Chief Leisure Manager (Development), Leisure and Cultural Services Department                             |
| Ms. Karen LEE        | Assistant Project Manager, Jockey Club Design Institute for Social Innovation, Poly U                     |
| Ms. Selina LO        | Senior Manager (Elderly Services), Hong Kong Housing Society  |
| Mr. Alfie CHUNG      | Project Associate, Jockey Club Design Institute for Social Innovation, Poly U                             |
| Dr. Brian LEE        | Assistant Professor, Leader of Asian Lifestyle Design Lab, School of Design, Poly U.                      |
| Mr. Micki LAU        | Project Assistant, Jockey Club Design Institute for Social Innovation, Poly U                             |

Table 14 The name and affiliation of expert attendees in the focus group meeting 2

These two expert meetings aim to obtain feedback on the results and analysis from the experts. This is a necessary and crucial step before finalizing the findings and making recommendations for policy implications. During the focus group meetings some constructive and stimulating questions also led to further analysis and elaborations.

The validation was conducted in the form of roundtable discussion. Firstly, the project principle investigator briefed the overall flow of the meeting and results of the study. It was clarified to the experts that the ‘public open space’ used in the study mainly refer to urban public parks, sitting-out area as well as promenade etc., excluding those public space within private housing or country parks. Secondly, the experts were asked to give their own comments or suggestions towards the findings of the study, particularly, policy implications of the results.

The experts were asked the following questions:

- 1) How do you interpret the identified factors affecting preferences of the elderly in visiting public open space;
- 2) How do you opine on the difference between the significant factors affecting elderly visits to public open spaces in urban old districts and new towns;
- 3) What are the policy implications of the key research findings to the planning and design of public open space in Hong Kong?

#### 5.4.1 The interpretation and discussion of key identified factors

##### 5.4.1.1 The importance and diversity of intention to visit POS

The experts firstly commented and interpreted the identified significant factors. They highlighted the importance of ‘intention to visit POS’. They thought it is reasonable that ‘the physical exercises’ and ‘accompany’ are two significant intentions affecting elderly preferences in visiting POS. This is because these are two major ways to improve physical and psychological wellbeing.

Meanwhile, they further emphasized that the role and importance of POS to elderly would be different if their intention of visit is different. Thus, the study should explore their intention to visit POS. One expert doubted that visiting the parks is not the only way for doing exercise. It is not always the case that elderly would go to LCSD’s parks for doing exercise. They would rather go downstairs to street or promenade for jogging. In this sense, for those elderly who intentionally visit POS for doing exercise, the sport facilities design is important. If their intention is just to relax, then there are many other choices, like taking a bus tour or going to Macdonald than going to POS. If their intention is to gather with their friends, POS is a familiar and suitable place for meeting up and chatting with people. They may even delay their scheduled housework for leaving time for gathering with friends. If the elderly health status is poor, their intention to visiting POS would be weak. Many elderly are suffering from diverse pains so that they are not able to go POS independently. In addition, if the elderly has family members passed away, their motivation of going outside is weak and they may feel even isolated from the society. In fact, going out is important to their well-being.

Some experts shared a personal story to review the relationship between active lifestyle and visiting POS. His mother is around 65 to 70 years old and he had never heard that she once went to parks. His mom likes playing Guzheng, planting etc. She has an active lifestyle but had never been to parks. Given she only received primary school education, the expert did not exactly understand why she can develop so many personal interests. In this sense, he thought it is important to better define what does ‘active’ and ‘inactive’ mean in visiting POS, which was related to personal characteristics. On the contrary,

some POS elderly users, who look ‘active’, but may not well develop their personal interests so that they only want to go and stay in POS. This may be because they want to use specific facilities or doing special activities. For this group of elderly, enhancing the facilities is helpful in attracting them.

Generally, the experts opined that intention of visiting POS is very important in affecting elderly preference but it is also personal and complex. Understanding the differences of intention, motivation and needs among different elderly is vital to attracting more elderly to go outside and visit POS. They suggested providing a variety of quality and elderly friendly facilities may attract more active elderly users. Besides, promoting intergenerational activities is another method to motivate more elderly to visit POS with family members. Additionally, experts suggested paying attention to the maids’ concern when they are pushing elderly wheelchair to POS for leisure. The more interested the maid can get in visiting POS, the more likely they want to go out with the elderly. This could be regarded as a method to attract those physically inactive and ‘hidden’ elderly.

#### 5.4.1.2 The safe, short and elderly friendly trip from home to POS

The experts felt interested and surprised that although most elderly went to the POS by walking, the walkability is not a significant factor. One possible reason is that walkability of the surrounding roads in Hong Kong are generally good so that most elderly took it for granted. Another reason is elderly may not understand what walkability means. Unless you asked them specifically whether the slope or road quality is good etc., they may think walkability is not important since they normally walk there every day.

Some experts argued letting elderly feel safe and convenient on the way to POS is crucial. They said it would be better if there are more benches that she can rest every now and then on the way. The benches may not need to be very high-standard but basic sitting design would be good enough. The elderly may feel more comfortable and secured if there is a sitting place within every 5 minute’s walking distance. After all, 20 minutes walking distance, as revealed from the questionnaire results, is still too long for some weak elderly and their intention of visiting POS may be affected. In this sense, safe and barrier-free connective roads are very important to making POS accessible to elderly. Also providing more armed benches and reducing slanting roads are important in creating an age-friendly environment.

As age grows, the elderly should become more sensitive to the proximity of the POS. This is consistent with the analysis result of different age group’s factors. This provides a basis for reviewing the POS quality from the different age groups’ perspective in the study area. A few experts also highlighted the importance of safe and barrier-free paths connecting public transport station and POS. They thought, compared with the old-old, the young-old group are still capable in taking public transport to a remote POS. In

other words, young old do not limit their daily activities within the immediate surrounding area. Therefore, regarding the elderly friendly transport, it is not only about whether elderly can get to the parks by taking public transport, but also about whether the path connecting public transport and POS is walkable and accessible to elderly.

Other than safety and convenience, proximity to POS was also regarded as very important in affecting elderly visits to POS. An expert demonstrated the importance of short distance between home and POS by using the example of her grandma: 'She lives alone at private estate. Her life circle is within around 10 minutes' walking distance. She hopes she can meet all the daily use or other services nearby.' This is consistent with the analysis result that 'Availability and Proximity' (Estimate=1.694,  $p<0.01$ ) are significant and positively associated with elderly's degree of liking to visit open spaces if the elderly are living in a private housing. It was argued that many elderly prefer using the POS downstairs within the housing estate rather than going to the public park elsewhere.

The experts also thought we should not only focus on the specific age group but also consider the change of elderly needs during the aging procedure. Take a normal retired person as an example. When he was at young old, he may go to everywhere by using the transport. As in 60 to 75, elderly mobility is still good. However if he is getting older and older, he will become weak to go far away. In this regard, he may look for alternative places which can meet his needs nearby.

In other words, the young-old do not have many problems in travelling. Young-old do not limit their daily activities at surrounding area. They may take public transport to other places. But their travelling interests may decrease as age increases. For those elderly who are older than 75, they largely rely on the surrounding community in the daily routine. Consequently, their daily life circle became smaller and smaller. For this old-old elderly, how to satisfy their needs by providing nearby facilities is important.

An expert explored the 'distance' issue by asking its relationship with 'size'. He demonstrated this problem by giving the example of POS in Yau Ma Tei. According to his own database, most of the POS in YMT are smaller than 500 square metres and are accessible. There is only one district park in YMT. The walking distance to the park is longer than 10 or 15 minutes. Thus, it poses the questions among 'size' and 'walking distance', which one is more important? Do elderly prefer that are very near to their home or larger size parks within walkable distance?

#### 5.4.1.3 Attractions inside POS to different elderly groups

The experts agreed with the significance of space and facilities. They raised the point that although doing some exercise does not necessarily require specific facilities, a space is needed, like playing Tai Chi. Common needs frequently mentioned by the elderly include providing more benches, toilets and drinking water fountains. A sitting

area was also regarded as fundamental for the elderly to enjoy the POS. The toilet provision and quality is very important as elderly hope that they can access to the toilets as soon as possible. Drinking water fountain may help extending their time length of stay in the POS. The characteristics of fitness facilities are important. The elderly prefers elderly-friendly and safe facilities.

Regarding the safety issue, one expert clarified that it is not only about physical security but also related to the psychological security. For example, she felt scared with seeing the homeless people lying on the benches in the POS and meanwhile felt happy to see many children playing at the playground region.

Besides, organizing thematic events or festival activities inside the POS are important in attracting elderly to visit open space. These cultural activities can make the elderly feel connected with the society and get the warmly regards from the communities. For instance, mid-autumn or food festival. By attending these activities, the elderly also can chat with their neighbours. However, this requires space and flexible regulations.

From the perspective of elderly user groups, the gender difference in affecting use of open space was also mentioned by one of the experts. She recommended that the design consideration should recognize the similarity and differences of preferences between male and female. If there are obvious differences, specific method should be taken separately to promote their visits to POS. The results of this study showed 'Available leisure time and security' and 'Personal Consideration' were significant for both male and female elderly's visit to POS. However, 'Social Consideration and Management' and 'Availability and Proximity' are only significant in affecting male elderly preferences. This contradicted with the experts' perception which female elderly prefer group and social activities more than male. On the contrary, male elderly preference is more social-related than female elderly. To prevent the gender isolation in POS usage, these identified factors should be considered in providing cultural and fitness facility and toilet design for encouraging the inter-gender interaction. Promoting elderly couples visiting POS together would be a desirable initiative.

Additionally, some experts highlighted the difference between young-old and old-old elderly users. According to their previous experience of conducting focus group meetings, the young-old who are just retired resisted of being called 'elderly'. They are afraid of being grouped into the old people who seem like unable to do and enjoy some facilities, like playgroup, water pool. In fact, some young-old are even performing better than youngsters in doing exercise, such as being skilful in playing on parallel bars.

#### 5.4.2 The comparison of different factors between urban renewal old districts and new towns.

The experts provided their views towards the comparison of POS in urban renewal old districts and new towns. They agreed that the condition and user background of POS in new and old districts are different. The POS in renewal old districts were built earlier with a relatively lower standard while those in new towns were later built with higher standard. The size of POS in new towns is relatively larger but may not be located near the housing estate as those in old districts. These conditions have determined the difference of landscape and the user experience of POS between old districts and new districts. Due to decay of facilities in old districts, the common concern is maintenance or crowdedness. Whereas, in new towns, the facilities are relatively newer, thus maintenance demands are less.

An expert stated that it is important to see the evidence that some elements, such as maintenance, crowdedness, terrain and quietness, were only significant in old urban renewal districts but not in new towns. She attributed this directly to the higher planning or design requirement of POS in new town compared with those in old districts. When the old area was developed, the planning and design of POS aimed for meeting basic function by using very limited land resource. The standard had been dramatically increased when the POS in new towns was planned and designed.

Others thought the reason for social consideration was only significant in old districts is the elderly residents living in urban renewal old districts may own relatively stronger social networks. This is consistent with the statement given by an expert in the interview who said ‘elderly people, especially people living in the old town would rather stay outside and chat with people from 4 to 5 pm. They need people to talk, they feel not happy being at their house alone’. Thus, social interaction can be regarded as an important function and attractiveness provided by POS in old districts.

In comparison, one expert thought the elderly in new towns are not so familiar with the POS as well as the neighbours. Thus, they have not yet set up a local community and network which involved different friends nearby. In this sense, their expectation on the social function of POS is lower. Given the better quality and quantity of sport facilities and adequate space of POS, they prefer doing exercise more than meeting other social demand in POS.

#### 5.4.3 The policy implications to the planning and design of POS

##### 5.4.3.1 The site selection, size and facility allocation of POS

The experts provided their insights and suggestions about the policy implications of the findings on the planning and design of public open space in Hong Kong. Regarding the significance of facilities quality and quantity of POS in both new and old urban renewal

district, the experts admitted that there is an apparent deficiency of elderly facilities. It should be noted that, other than providing elderly facilities in POS, considerations for users for all age and social groups should be implemented in the planning and design. Thus, it is challenging to achieve a balance between providing more elderly facilities and fulfilling the insufficiency of district amenities, such as soccer pitches, as required by urban planning guidelines. Then this turns to be a major issue of combining land use planning with open space provision and design. In this sense, open space use or elderly amenities may not be the priority. Having said that, LCSD has recognized the elderly needs and has tried to provide more facilities for the elderly.

The size of POS and location is important in planning policy. Given the small size POS cannot accommodate additional facilities, sharing facilities with several nearby POS could be a solution to enlarge the service circle of facilities and enhance accessibility of POS to the elderly users. For instance, there may not be a provision of public toilet for a cluster of small POS due to size limitation. Then, building a new toilet at an appropriate location can be shared by the cluster of small POS. The suitable location of the new built public toilet can be analyzed and determined by using GIS spatial analysis.

Regarding the facility quality and type, some experts highlighted the need for safety and elderly friendly to improve their quality. The elderly prefers elderly-friendly and safe facilities than those with many functions and with advanced technology. Thus, safety and elderly-friendly should be considered if the government intends to provide more types of fitness facilities in the POS.

In response to the questions posed by an expert: for size and walking distance, which one is more important? Do elderly prefer as-near-as-possible parks or larger size parks but in a longer walkable distance? It was suggested to run a multi-variate analysis, including the size of POS, walking distance and the quality of facilities, the results may provide more implications for the future planning. To make the implications of the results more useful in policy-making, identify relationships among these three is needed. It is important to find out how many large-size POS is needed within a certain land area. This kind of integrated and strategic policy is valuable and practical for further planning of POS.

#### 5.4.3.2 The flexible space management and usage

Some experts suggested that the space management should be flexible to accommodate diverse functions for meeting not only elderly but also other user groups' needs. Taking Shatin Central Park as an example, there is a square in the middle of the park. There was a time that someone or organizations had applied for different usage of the square. The LCSD later made the regulation of this square very flexible and allowed different activities to be organized at different part of the central square simultaneously.

Besides, the management of public open space within a large private estate was mentioned by one expert. He had once talked to a staff of Hong Kong Sheng Kung Hui who organized cultural activities at the POS within the estate. These activities include learning cooking skills, distributing and sharing snacks and beverages. The problem was the stringent policy and regulations. Some housing estates do not welcome such elderly-friendly and charity activities. The NGO had to apply for the permission which was not easy. Thus, the regulation on space usage should be more flexible to social entities for organizing different types of activities. In this sense, the elderly may feel more interested in visiting POS. In fact, some parks are very active in cooperating with NGOs in organizing different events, such as exchange of goods between elderly.

## **Chapter 6. Conclusions: Policy Implications and Recommendations**

This study identifies the key factors that affect elderly's preference of visiting public open space and compares the difference between urban old districts and new towns by using a mix of qualitative and quantitative research methodologies. The four proposed objectives have been satisfactorily achieved.

### **Objective 1: To identify the underlying factors affecting the perceptions and preferences of elderly people in visiting public open spaces**

The research findings in chapter 4.3 and 4.4 describe the underlying factors affecting the perceptions and preferences of elderly people in visiting public open spaces.

It is indicated that among factors under 'Departure decision from home', four factors were significantly associated with elderly's preference in visiting public open spaces, which were 'Available leisure time and Security', 'Personal Consideration', 'Intention to visit open space (physical exercise)' and 'Intention to visit open space (Accompany)'. It is indicated that available leisure time, security, health status, actively lifestyle, attractive activities and elderly's intention to visit open space would affect the elderly's decision whether to visit open space or not.

For 'Way to open space' stage, this study found that factor 'Availability and Proximity', 'POS number' and 'POS Integration/ street connectivity' were significantly correlated with elderly's preference of visiting public open space in terms of the surrounding environment. It is illustrated that proximity from open space to home, availability of open space in local neighbourhood, travel time to open space, proximity from open space to other amenities, POS number around particular open space and street connectivity would have impact on elderly's travel routes or walking behaviour to the open space.

In terms of the category 'Inside open space', seven factors related to the quality of public open space were found that would affect elderly's preference of visiting public open space, which were 'Size', 'Facility type', 'Facility quality', 'Urban furniture', 'Landscape', 'Maintenance' and 'Crowdedness'. These factors mainly affect elderly's activity inside open space and their satisfaction level with using the public open space.

### **Objective 2: To identify the relative importance of the different factors in affecting visits to public open space by the elderly in new town and old districts**

The research findings in chapter 4.5.1 presented the relative importance of the influential factors in old districts and new towns.

For the relative importance factors for elderly in urban old districts and new towns (Appendix I.1), there is no apparent difference between the top 5 ranking of factors. However, elderly people in new towns indicated an overall higher importance of the variables 'Cleanliness', 'Pollution', 'Maintenance', 'Safety', 'Landscape', 'Security', 'Physical activity', 'Proximity to home', 'Size', 'Facilities/ amenities' and 'Travel time' than elderly people in urban old districts. It indicates that they have a higher expectation and requirement of the quality of the POS.

The results also show that elderly people in urban old districts believe variables 'Available leisure time', 'Terrain (on the way)', 'Urban furniture', 'Availability', 'Barrier free design (on the way)', 'Wayfinding system (in open space)', 'Wayfinding system (on the way)', 'Means to public open space', 'Residential density', 'Cost', 'Proximity to public transport', 'Availability of public transport', 'Size of living space' and 'Social participation' are more important to elderly's preference in visiting public open spaces than elderly people in new towns.

**Objective 3: To formulate a multidimensional model of the preferences of the elderly in visiting public open space**

In this study, a number of multidimensional models of the preferences of the elderly in visiting public open space were formulated. The research findings in chapter 5.1 shows the multidimensional model of the preferences of the elderly in visiting public open space in all selected districts (Figure 16).

Section 5.2 shows the model for urban old district and new town (Figure 17). It illustrates the difference of influential factors that affect elderly's preference in visiting public open space in urban old districts and new towns,

It is found that for 'Departure decision from home' stage, only 'Personal Consideration' was associated with elderly's preference of visiting public open space in new towns, which shows that elderly people in new towns pay more attention to their health status, active lifestyle and attractiveness of activities.

Under 'Way to open space' stage, 'Public Transport and Street Design' is the only factor associated with elderly's preference in urban old districts, which means that elderly in urban old districts pay more attention to the public transport services and the street network around public open space. In addition, 'Socio-economic status' is correlated with elderly's preference in new towns, which reflects the elderly people in new towns concern about the socio-economic status of the neighbourhood where the open space is located.

In terms of 'Inside open space' category, it was illustrated that several factors, such as 'Social Consideration and Management', 'Maintenance', 'Crowdedness', 'Terrain' and 'Quietness' are associated with elderly's preference in urban old districts. It shows that elderly people in urban old districts have higher requirement of the quality of public open space and social needs of activities inside public open space.

In addition, the empirical findings also led to the formulation of three other multidimensional models which are useful reference for better understanding of the diverse needs of the ageing population. They are as follows.

5.3.2. portrays the factors influencing the preference of the elderly in visiting public open space among different types of housing (Figure 18);

5.3.3 portrays the factors influencing the preference of the elderly in visiting public open space among different genders (Figure 19); and

5.3.4 portrays the factors influencing the preference of the elderly in visiting public open space among different age groups, below 75 and above (Figure 20).

**Objective 4: To provide a policy framework for the planning of public open space which aims to enhance age-friendly environments in new towns and old districts**

The ultimate aim of this study is to formulate practical **policy implications** based on the research results, and to provide the corresponding **recommendations**. These are listed in the following section.

## 6.1 Implications for spatial planning of open space and the surrounding environment

As size is a significant factor affecting elderly's satisfaction level of using public open space, it is better to provide large public open space with good quality rather than to provide open space which are very near to their housing. In addition, elderly people are more satisfied with district or regional open space than local open space. Thus, providing district or regional level open space is better than providing local level open space. Given that, it is better to combine those small open space into a large one (provided that it meets the requirement of district open space). At the same time, the elderly's preference of within 20 minutes walking distance to open space should be incorporated into the spatial planning. It is important to note that Size and size\*facility quality (the combined effect) is significant to elderly's satisfaction level, while all models which include cost and time are not significant. Besides, the open space should be located in close proximity to other amenities that are essential to elderly's daily life.

The walking environment around public open spaces is one of the most important consideration as 94.6% of respondents choose to visit public open spaces by walking. Walkability, terrain (on the way), and pedestrian safety are important in planning particularly to the elderly who live in private housing and the younger elderly. In particular, safe and barrier-free path connective public transport system and public open space is also important.

As POS integration and POS number are negatively related to elderly's satisfaction level, it is better to locate open space in the street with lower integration score (which are streets with fewer street intersections and normally not in the main roads). These streets may have less problem in pedestrian safety, pollution and noise. In addition, providing many open spaces within 500m service area of particular open space is not necessary. Instead, it is important to find out how many large-size POS is needed within an urban land area. An integrated and strategic policy would be valuable and practical for future planning of POS to tackle the limited supply of land resource in urban area.

In regard to location of open space, it is also suggested to allocate open space in close proximity to community facilities, restaurants and shops. Better connectivity between open space and these places is essential spatial consideration. As results indicate that indirect and unphysical form of social interaction also contributes to elderly's health and well-being, pocket parks can be linked to shopping mall space or pedestrian linkages, rather than physically enclosed and isolated.

## 6.2 Implications for design of open space

The results reveal that the design considerations inside open space are more important than the surrounding spatial factors in both urban old districts and new towns. Thus, more detailed and thoughtful consideration should be given to the internal facilities, urban furniture and spatial design in order to enhance elderly's satisfaction with the open space.

The majority of elderly's intention to visit public open spaces is mainly doing physical exercises or chatting with friends, which account for 75.4% and 36.1% respectively and the factor 'Intention to visit open space (physical exercise, accompany, chat with friends)' was important in the regression results. Thus, public open space should provide sufficient physical fitness equipment and quality space for social interaction. In addition, safety and elderly-friendly should be the key consideration in the design and selection of the physical fitness equipment. In regard to space for social interaction, more sub-spaces can be designed to cater the need of different social activities including space for chatting, small group gathering and different hobbies. In particular, open space should also provide some flexible space for group activities as the factor 'Intention to visit open space (group activity)' was significant to male elderly. It is noted that allocation of the fitness facilities and children playground should be carefully

designed to enhance more intergenerational activities and interaction between different age groups.

Facility type is important, open space should provide variety of facilities to meet different needs of different age groups. Commercial facilities, rain and wind protection and sun-shading devices, washroom facilities, drinking water fountain and boundary treatments for different spaces and areas and seating are associated with elderly's preference in visiting public open space. It is also noted that one of the key reasons for less frequent users is the concern of weather condition. In response to this, planning and design of POS should pay more attention to inclusion of sun-shading facility, wind and rain protection design.

Moreover, open space should provide a variety of urban furniture with good quality. Directional sign, sculpture and pleasant landscape features are significantly associated with elderly's preference, thus open space providing these urban furniture could encourage elderly to visit open space and enhance satisfaction level derived from using the open space.

### 6.3 Implications for management of open space

Facility quality is important in influencing elderly's visit to public open space. Thus, the management staff of the LCSD should make sure facilities in the open space are clean and in good condition by adopting a regular checking and maintenance schedule plan.

In regard to Social Consideration and Management, crowdedness and conflict of use are significant in influencing elderly's use of open space. Management action plan should be used to avoid conflict of use and control unacceptable crowding in different areas of the parks during different time of the day and the week. In regard to the quietness concern in open space, the management unit can install sensors to monitor the noise levels in open space and make effective actions to decrease noise levels (such as regulating activities which cause unbearable noise). It is also revealed that information about the location and quality of open space is important for the elderly and it could enhance their visit to POS.

As 'Available leisure time and Security' is also important, it indicates that elderly people are concerned about the security and safety in the park and expect the presence of a security guard. Thus, the LCSD should ensure that every park has at least one security guard or share among several small open spaces in the vicinity. It is important to make elderly users feel safe.

Space management should be flexible to accommodate diverse functions for meeting not only elderly but also other user groups' needs. Regulations of the use of spaces and facilities should be flexible, for example it may allow different activities to be organized

at different part of a space simultaneously. In order to make public open space more attractive to the elderly people, more active collaboration with NGOs in organizing different events would be effective.

#### 6.4 Difference between urban old districts and new towns

For the design of internal area of open space, 'Size', 'Facility type', 'Facility quality', 'Urban furniture', 'Landscape' and 'Pollution' are important to influence elderly's preference in visiting public open space in both urban old districts and new towns. It shows that these factors are the core elements that should be considered during design and management of public open space to encourage the use of public open space by elderly people.

In urban old districts, planning of open space should focus more on street connectivity and network and public transport service as the factor 'Public Transport and Street Design' was only significant in urban old districts. Thus, it is important to make sure open space is near public transport station and ensure pedestrian safety by providing effective wayfinding system and barrier free design around open space.

In addition, management of open space is more important to urban old districts than new towns as Social Consideration and Management, Maintenance, Crowdedness, Terrain, Quietness are significant factors in urban old districts. It is not uncommon that physical conditions of open space in old districts is poor and dilapidated. Thus, more frequent maintenance programme would be needed. As urban old district is relatively small in size and has a higher population density, more people have to share facilities and open space and may also lead to noise problems, thus, special management plan should be designed in accordance with the specific condition of the use of public open space. It is also highlighted that elderly people living in old districts tend to have developed a strong social networks, they would prefer more space and opportunities for social interaction and maintaining a sense of social cohesion.

Given the size of POS in old districts is often small and it cannot accommodate additional facilities, sharing facilities with several nearby POSs could be a feasible solution to enlarge the service circle of facilities and enhance accessibility of POS to the elderly users. For instance, sharing of a public toilet for a cluster of small POSs is desirable.

In new towns, elderly people living in high-SES neighbourhoods are more likely to pay attention to the surrounding environment and socio-economic status of the neighbourhood that public open space is located. However, this does not necessarily mean quality of POS in higher-SES neighbourhood should be higher than lower-SES neighbourhood. Providing good planning and design of POS that can cater for the needs of the elderly should be always promoted in any district.

Based on the research results, the factors ‘Personal Consideration’, ‘Intention to visit open space (Accompany)’, ‘Gender’ and ‘SES’ are significant in new towns. It implies that the government could promote more active lifestyle programme and attractive activities to increase elderly’s willingness to visit open space in new towns.

Overall, there is less policy implication for new towns compare to old districts, the possible reason may because a new town is relatively new and usually provides better overall planning and design of open space. Thus, elderly people are quite satisfied with the open space in a new town and may have fewer special requirements of the physical planning and design of open space. In this sense, the findings of the study would be of particular value to planners and urban designers to improve the design and operation of POS in urban renewal old districts. Renovation of open space in old districts would be more possible because of its lower cost and it being easy to carry out.

#### 6.5 General aspects of ageing policy

The similarity and differences of preferences between male and female should be taken into account when designing POS. It should be take note of the issue of gender isolation in POS usage. The identified factors among male and female elderly’s preference in visiting POS should be considered. For example, providing cultural and fitness facilities encouraging the inter-gender interaction. Promoting elderly couples visiting POS together would be a desirable initiative.

Elderly people among different age groups also have slightly different needs. Pedestrian environment’ is important to older elderly’s preference of visiting open space. Because they usually have lower mobility due to their health condition. Thus, in order to cater for the needs of different age groups, design should enhance adequate pedestrian facilities, clear signage and wayfinding facilities, convenient pedestrian links, elderly friendly passageway, good traffic management and pleasant and attractive greening not only within the open space but also the route to the open space from major transport station.

In general, the personal consideration is an important factor affecting elderly’s desire to visit open space. In response, the government should also promote healthy active lifestyle among elderly people as it would encourage elderly people to visit open space more frequently.

## References

- Andersson, J. E. (2011). Architecture for the silver generation: Exploring the meaning of appropriate space for ageing in a Swedish municipality. *Health & Place*, 17(2), 572-587.
- Arnberger, A., Alex, B., Eder, R., Ebenberger, M., Wanka, A., Kolland, F., ... & Hutter, H. P. (2017). Elderly resident's uses of and preferences for urban green spaces during heat periods. *Urban Forestry & Urban Greening*, 21, 102-115.
- Aspinall, P. A., Thompson, C. W., Alves, S., Sugiyama, T., Brice, R., & 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), 1022-1039.
- Barnett, A., Cerin, E., Zhang, C. J., Sit, C. H., Johnston, J. M., Cheung, M. M., & Lee, R. S. (2016). Associations between the neighbourhood environment characteristics and physical activity in older adults with specific types of chronic conditions: the ALECS cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity*, 13(1), 53.
- Bauman, A., Wallner, F., Miners, A., & Westley-Wise, V. (1996). No ifs no buts Illawarra physical activity project: Baseline research report. Warrong, NSW: Commonwealth Department of Health and Family Services.
- Beckley, T. M. (1995). Community stability and the relationship between economic and social well-being in forest-dependent communities.
- Beng-Huat, C. (2002). Singaporeans ingesting McDonald's. In *Consumption in Asia* (pp. 199-217). Routledge.
- BORGES, I. M. (2007). The Added Value of an Accessible Public Transport for All in the Context of Demographic Ageing. In *23RD PIARC WORLD ROAD CONGRESS PARIS, 17-21 SEPTEMBER 2007*.
- Boyd, F., White, M. P., Bell, S. L., & Burt, J. (2018). Who doesn't visit natural environments for recreation and why: A population representative analysis of spatial, individual and temporal factors among adults in England. *Landscape and Urban Planning*, 175, 102-113.
- Brander, L. M., & Koetse, M. J. (2011). The value of urban open space: Meta-analyses of contingent valuation and hedonic pricing results. *Journal of environmental management*, 92(10), 2763-2773.

Browning, M. & Lee, K. (2017). Within what distance does “greenness” best predict physical health? A systematic review of articles with GIS buffer analyses across the lifespan. *International Journal of Environmental Research and Public Health*, 14(7), 675.

Cattell, V., Gesler, W. M., & Curtis, S. (2006). *Public spaces, social relations and well-being in East London*. Policy Press.

Census and Statistics Department. (2013). *2011 Population Census – Thematic Report: Older Persons*. Retrieved December 2018, from <https://www.census2011.gov.hk/pdf/older-persons.pdf>.

Census and Statistics Department. (2017). *Hong Kong Population Projections 2017-2066*. Retrieved October 2019, from <https://www.statistics.gov.hk/pub/B1120015072017XXXXB0100.pdf>.

Cerin, E., Lee, K. Y., Barnett, A., Sit, C. H., Cheung, M. C., & Chan, W. M. (2013). Objectively-measured neighborhood environments and leisure-time physical activity in Chinese urban elders. *Preventive Medicine*, 56(1), 86-89.

Cerin, E., Nathan, A., Van Cauwenberg, J., Barnett, D. W., & Barnett, A. (2017). The neighbourhood physical environment and active travel in older adults: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 15.

Chau, C. K., Yung, H. K., Leung, T. M., & Law, M. Y. (2006). Evaluation of relative importance of environmental issues associated with a residential estate in Hong Kong. *Landscape and Urban Planning*, 77(1-2), 67-79.

Chen, Y., Liu, T., Xie, X., & Marušić, B. G. (2016). What attracts people to visit community open spaces? A case study of the Overseas Chinese Town community in Shenzhen, China. *International journal of environmental research and public health*, 13(7), 644.

Chiang, Y. C. & Li, D. (2019). Metric or topological proximity? The associations among proximity to parks, the frequency of residents' visits to parks, and perceived stress. *Urban Forestry & Urban Greening*, 38, 205–214.

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and urban planning*, 68(1), 129-138.

Chow, H. W. (2013). Outdoor fitness equipment in parks: a qualitative study from older adults' perceptions. *BMC public health*, 13(1), 1216.

Civil Engineering and Development Department. (2016). New Towns, New Development Areas and Urban Developments. Retrieved December 2018, from [https://www.gov.hk/en/about/abouthk/factsheets/docs/towns&urban\\_developments.pdf](https://www.gov.hk/en/about/abouthk/factsheets/docs/towns&urban_developments.pdf).

Clarke, P., & Nieuwenhuijsen, E. R. (2009). Environments for healthy ageing: A critical review. *Maturitas*, 64(1), 14-19.

Coley, R. L., Sullivan, W. C., & Kuo, F. E. (1997). Where does community grow? The social context created by nature in urban public housing. *Environment and Behavior*, 29(4), 468-494.

Comber, A., Brunson, C., & Green, E. (2008). Using a GIS-based network analysis to determine urban greenspace accessibility for different ethnic and religious groups. *Landscape and Urban Planning*, 86(1), 103-114.

Coomes, E., Jones, A. P., & Hillsdon, M. (2010). The relationship of physical activity and overweight to objectively measured green space accessibility and use. *Social science & medicine*, 70(6), 816-822.

Cornwell, E. Y., & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, 50(1), 31-48.

Coronini-Cronberg, S., Millett, C., Laverly, A. A., & Webb, E. (2012). The impact of a free older persons' bus pass on active travel and regular walking in England. *American Journal of Public Health*, 102(11), 2141-2148.

Day, R. (2008). Local environments and older people's health: Dimensions from a comparative qualitative study in Scotland. *Health & Place*, 14(2), 299-312.

de Vries, S., Van Dillen, S. M., Groenewegen, P. P., & Spreeuwenberg, P. (2013). Streetscape greenery and health: stress, social cohesion and physical activity as mediators. *Social Science & Medicine*, 94, 26-33.

Dinnie, E., Brown, K. M., & Morris, S. (2013). Community, cooperation and conflict: Negotiating the social well-being benefits of urban greenspace experiences. *Landscape and Urban Planning*, 118, 103-111.

Dony, C. C., Delmelle, E. M., & Delmelle, E. C. (2015). Re-conceptualizing accessibility to parks in multi-modal cities: a variable-width floating catchment area (VFCA) method. *Landscape and Urban Planning*, 143, 90-99.

Duan, Y., Wagner, P., Zhang, R., Wulff, H., & Brehm, W. (2018). Physical activity areas in urban parks and their use by the elderly from two cities in China and Germany. *Landscape and Urban Planning*, 178, 261-269.

Emlet, C. A., & Mocerri, J. T. (2012). The importance of social connectedness in building age-friendly communities. *Journal of aging research*, 2012.

Erkip, F. B. (1997). The distribution of urban public services: the case of parks and recreational services in Ankara. *Cities*, 14(6), 353-361.

Eronen, J., von Bonsdorff, M., Rantakokko, M., & Rantanen, T. (2014). Environmental facilitators for outdoor walking and development of walking difficulty in community-dwelling older adults. *European journal of ageing*, 11(1), 67-75.

Fadda, G., Cortés, A., Olivi, A., & Tovar, M. (2010). The perception of the values of urban space by senior citizens of Valparaiso. *Journal of Aging Studies*, 24(4), 344-357.

Fan, P., Xu, L., Yue, W., & Chen, J. (2017). Accessibility of public urban green space in an urban periphery: The case of Shanghai. *Landscape and Urban Planning*, 165, 177-192.

Fermino, R. C., Reis, R. S., Hallal, P. C., & de Farias Júnior, J. C. (2013). Perceived environment and public open space use: a study with adults from Curitiba, Brazil. *International journal of behavioral nutrition and physical activity*, 10(1), 35.

Forrest, R., & Kearns, A. (2001). Social cohesion, social capital and the neighbourhood. *Urban studies*, 38(12), 2125-2143.

Frank, L. D., Schmid, T. L., Sallis, J. F., Chapman, J., & Saelens, B. E. (2005). Linking objectively measured physical activity with objectively measured urban form: findings from SMARTRAQ. *American journal of preventive medicine*, 28(2), 117-125.

Gallacher, P. (2005). *Everyday spaces-the potential of neighbourhood space*, London: Thomas Telford.

Gibson, S. C. (2018). "Let's go to the park." An investigation of older adults in Australia and their motivations for park visitation. *Landscape and Urban Planning*, 180, 234-246.

Giles-Corti, B., Broomhall, M. H., Knuiaman, M., Collins, C., Douglas, K., Ng, K., & Donovan, R. J. (2005). Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*, 28(2), 169-176.

Goličnik, B., & Thompson, C. W. (2010). Emerging relationships between design and use of urban park spaces. *Landscape and urban planning*, 94(1), 38-53.

Gong, Y., Gallacher, J., Palmer, S., & Fone, D. (2014). Neighbourhood green space, physical function and participation in physical activities among elderly men: the Caerphilly Prospective study. *International Journal of Behavioral Nutrition and Physical Activity*, 11(1), 40.

Handy, S. L., Boarnet, M. G., Ewing, R., & Killingsworth, R. E. (2002). How the built environment affects physical activity: views from urban planning. *American journal of preventive medicine*, 23(2), 64-73.

Hillsdon, M., Panter, J., Foster, C., & Jones, A. (2006). The relationship between access and quality of urban green space with population physical activity. *Public health*, 120(12), 1127-1132.

Hong Kong Planning Department. (2014). Chapter 4: Recreation, open space and greening. (December 2007. Retrieved September 2018, from [http://www.pland.gov.hk/pland\\_en/tech\\_doc/hkpsg/full/ch4/ch4\\_text.htm](http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/ch4/ch4_text.htm)).

Jancey, J. M., Clarke, A., Howat, P., Maycock, B., & Lee, A. H. (2009). Perceptions of physical activity by older adults: A qualitative study. *Health Education Journal*, 68(3), 196-206.

Jorgensen, A., & Anthopoulou, A. (2007). Enjoyment and fear in urban woodlands—Does age make a difference?. *Urban Forestry & Urban Greening*, 6(4), 267-278.

Kaczynski, A. T. (2010). Neighborhood walkability perceptions: associations with amount of neighborhood-based physical activity by intensity and purpose. *Journal of Physical Activity and Health*, 7(1), 3-10.

Kaczynski, A.T., Koohsari, M., Stanis, W., Bergstrom, R., and Sugiyama, T. (2014) Association of street connectivity and road traffic speed with park usage and park-based physical activity. *American Journal of Health Promotion*, 28(3), 197-203.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31-36.

Kemperman, A., & Timmermans, H. (2014). Green spaces in the direct living environment and social contacts of the aging population. *Landscape and Urban Planning*, 129, 44-54.

Koohsari, M. J., Kaczynski, A. T., Giles-Corti, B., & Karakiewicz, J. A. (2013). Effects of access to public open spaces on walking: Is proximity enough?. *Landscape and Urban Planning*, 117, 92-99.

- Kotrlik, J. W. K. J. W., & Higgins, C. C. H. C. C. (2001). Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal*, 19(1), 43.
- Kweon, B. S., Sullivan, W. C., & Wiley, A. R. (1998). Green common spaces and the social integration of inner-city older adults. *Environment and Behavior*, 30(6), 832-858.
- Kwok, J. Y. C., & Ng, K. C. H. (2008). User friendly living environmental research and design for older people. In *Designing inclusive futures* (pp. 261-272). Springer, London.
- Labus, A. (2012) Concepts of urban renewal in an ageing society in the XXI century: case studies in Polish cities. Paper presented at the REAL CORP 2012 Tagungsband, Schwechat.
- Labus, A. (2013). Concepts of urban renewal in an aging society in the XXI century-case studies in the Polish Cities.
- Leck, E. (2006). The impact of urban form on travel behavior: A meta-analysis. *Berkeley Planning Journal*, 19(1).
- Levinson, D. M. (1998). Accessibility and the journey to work. *Journal of Transport Geography*, 6(1), 11-21.
- Li, Y., & Ferraro, K. F. (2006). Volunteering in middle and later life: Is health a benefit, barrier or both? *Social Forces*, 85(1), 497-519.
- Loo, B. P., & Lam, W. W. Y. (2012). Geographic accessibility around health care facilities for elderly residents in Hong Kong: A microscale walkability assessment. *Environment and Planning B: Planning and Design*, 39(4), 629-646.
- Loo, B. P., Lam, W. W., Mahendran, R., & Katagiri, K. (2017). How is the neighborhood environment related to the health of seniors living in Hong Kong, Singapore, and Tokyo? Some insights for promoting aging in place. *Annals of the American Association of Geographers*, 107(4), 812-828.
- Loukaitou-Sideris, A., Levy-Storms, L., & Brozen, M. (2014). *Placemaking for an Aging Population: Guidelines for Senior-Friendly Parks*. UCLA Complete Streets Initiative, Luskin School of Public Affairs, Lewis Center for Regional Policy Studies.
- Loukaitou-Sideris, A., Levy-Storms, L., Chen, L., & Brozen, M. (2016). Parks for an aging population: Needs and preferences of low-income seniors in Los Angeles. *Journal of the American planning association*, 82(3), 236-251.

Lui, C. W., Everingham, J. A., Warburton, J., Cuthill, M., & Bartlett, H. (2009). What makes a community age-friendly: A review of international literature. *Australasian journal on ageing*, 28(3), 116-121.

Lyons, K., & Dionigi, R. (2007). Transcending emotional community: A qualitative examination of older adults and masters' sports participation. *Leisure Sciences*, 29(4), 375-389.

McCormack, G. R., Rock, M., Toohey, A. M., & Hignell, D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. *Health & Place*, 16(4), 712-726.

Michael, Y. L., Green, M. K., & Farquhar, S. A. (2006). Neighborhood design and active aging. *Health & place*, 12(4), 734-740.

Mulliner, E., & Algrnas, M. (2018). Preferences for housing attributes in Saudi Arabia: A comparison between consumers' and property practitioners' views. *Cities*, 83, 152-164.

Naderi, I., Sharbatoghlie, A., & Vafaeimehr, A. (2012). Housing valuation model: an investigation of residential properties in Tehran. *International Journal of Housing Markets and Analysis*, 5(1), 20-40.

Neuvonen, M., Sievänen, T., Tönnes, S., & Koskela, T. (2007). Access to green areas and the frequency of visits—A case study in Helsinki. *Urban Forestry & Urban Greening*, 6(4), 235-247.

Office of the Chief Executive, HKSAR. (2011). The 2011-12 Policy Address: From Strength to Strength. Retrieved September 2018, from <https://www.policyaddress.gov.hk/11-12/eng/pdf/Policy11-12.pdf>.

Olawole, M. O., & Aloba, O. (2014). Mobility characteristics of the elderly and their associated level of satisfaction with transport services in Osogbo, Southwestern Nigeria. *Transport Policy*, 35, 105-116.

Orsega-Smith, E. M., Payne, L. L., Mowen, A. J., Ho, C. H., & Godbey, G. C. (2007). The role of social support and self-efficacy in shaping the leisure time physical activity of older adults. *Journal of Leisure Research*, 39(4), 705.

Pasaogullari, N. & Doratli, N. (2004) Measuring accessibility and utilization of public spaces in Famagusta. *Cities*, 21(3), 225-232.

- Pearson, K. (1901). LIII. On lines and planes of closest fit to systems of points in space. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 2(11), 559-572.
- Peters, K., Elands, B., & Buijs, A. (2010). Social interactions in urban parks: stimulating social cohesion?. *Urban forestry & urban greening*, 9(2), 93-100.
- Profillidis, V. A., & Botzoris, G. N. (2018). *Modeling of Transport Demand: Analyzing, Calculating, and Forecasting Transport Demand*. Elsevier.
- Rantakokko, M., Iwarsson, S., Mänty, M., Leinonen, R., & Rantanen, T. (2012). Perceived barriers in the outdoor environment and development of walking difficulties in older people. *Age and Ageing*, 41(1), 118-121.
- Reichert, F. F., Barros, A. J., Domingues, M. R., & Hallal, P. C. (2007). The role of perceived personal barriers to engagement in leisure-time physical activity. *American journal of public health*, 97(3), 515-519.
- Rigolon, A. (2016). A complex landscape of inequity in access to urban parks: A literature review. *Landscape and Urban Planning*, 153, 160-169.
- Rowe, J.W., & Kahn, R.L. (1998) *Successful ageing*. New York: Random House.
- Saelens, B. E., Sallis, J. F., & Frank, L. D. (2003a). Environmental correlates of walking and cycling: findings from the transportation, urban design, and planning literatures. *Annals of behavioral medicine*, 25(2), 80-91.
- Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003b). Neighborhood-based differences in physical activity: an environment scale evaluation. *American journal of public health*, 93(9), 1552-1558.
- Sajadzadeh, H., Amiri, N., & Sina, S. (2015). *The Relationship between Environmental Quality and Elderly Presence Ability in Urban Open Spaces, Case Study: Laleh Park, Tehran*.
- Sang, Å. O., Knez, I., Gunnarsson, B., & Hedblom, M. (2016). The effects of naturalness, gender, and age on how urban green space is perceived and used. *Urban Forestry & Urban Greening*, 18, 268-276.
- Sarkissian, W., & Stenberg, B. (2013). *Guidelines for planning for older people in public open space*. Nimbin NSW Australia. Retrieved September, 2018 from <https://sarkissian.com.au/wp-content/uploads/2013/09/Older-people-in-residential-public-open-space.pdf>.

- Sasidharan, V., Payne, L., Orsega-Smith, E., & Godbey, G. (2006). Older adults' physical activity participation and perceptions of wellbeing: Examining the role of social support for leisure. *Managing Leisure*, 11(3), 164-185.
- Scharlach, A. E., & Lehning, A. J. (2013). Ageing-friendly communities and social inclusion in the United States of America. *Ageing & Society*, 33(1), 110-136.
- Sheffield, K. M., & Peek, M. K. (2009). Neighborhood context and cognitive decline in older Mexican Americans: Results from the Hispanic established populations for epidemiologic studies of the elderly. *American Journal of Epidemiology*, 169(9), 1092-1101.
- Singapore Building and Construction Authority. (2016). Chapter Eight-Six: Parks and Open Spaces, *Universal Design Guide for Public Places 2016*. Retrieved September 2018, from <https://www.bca.gov.sg/data/ImgCont/454/Chap-8.6.pdf>.
- Sugiyama, T. & Thompson, C.W. (2007) Outdoor environments, activity and the wellbeing of older people: conceptualising environmental support. *Environment and Planning A*, 39, 1943-1960.
- Sugiyama, T., & Thompson, C. W. (2008). Associations between characteristics of neighbourhood open space and older people's walking. *Urban Forestry & Urban Greening*, 7(1), 41-51.
- Sugiyama, T., Francis, J., Middleton, N. J., Owen, N., & Giles-Corti, B. (2010). Associations between recreational walking and attractiveness, size, and proximity of neighborhood open spaces. *American Journal of Public Health*, 100(9), 1752-1757.
- Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: The importance of walkable green spaces. *Journal of Epidemiology & Community Health*, 56(12), 913-918.
- Temelová, J., & Dvořáková, N. (2012). Residential satisfaction of elderly in the city centre: The case of revitalizing neighbourhoods in Prague. *Cities*, 29(5), 310-317.
- Thompson, C. W., Roe, J., Aspinall, P., Mitchell, R., Clow, A., & Miller, D. (2012). More green space is linked to less stress in deprived communities: Evidence from salivary cortisol patterns. *Landscape and Urban Planning*, 105(3), 221-229.
- Tinsley, H. E., Tinsley, D. J., & Croskeys, C. E. (2002). Park usage, social milieu, and psychosocial benefits of park use reported by older urban park users from four ethnic groups. *Leisure Sciences*, 24(2), 199-218.

Tu, G., Abildtrup, J., & Garcia, S. (2016). Preferences for urban green spaces and peri-urban forests: An analysis of stated residential choices. *Landscape and Urban Planning*, 148, 120-131.

Turel, H. S., Yigit, E. M., & Altug, I. (2007). Evaluation of elderly people's requirements in public open spaces: A case study in Bornova District (Izmir, Turkey). *Building and Environment*, 42(5), 2035-2045.

U.S. Centers for Disease Control and Prevention (2009). *Healthy Places Terminology*. Retrieved August, 2018 from <https://www.cdc.gov/healthyplaces/terminology.htm>.

United Nations Department of Economic and Social Affairs, Population Division. (2017). *World Population Ageing 2017*. Retrieved August, 2018 from [http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017\\_Report.pdf](http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Report.pdf).

Urban Renewal Authority. (2011). *Urban Renewal Strategy*. Retrieved September 2018, from [https://www.ura.org.hk/f/page/1869/4861/URS\\_eng\\_2011.pdf](https://www.ura.org.hk/f/page/1869/4861/URS_eng_2011.pdf).

Van Hecke, L., Deforche, B., Van Dyck, D., De Bourdeaudhuij, I., Veitch, J., & Van Cauwenberg, J. (2016). Social and physical environmental factors influencing adolescents' physical activity in urban public open spaces: A qualitative study using walk-along interviews. *PloS one*, 11(5), e0155686.

Van Holle, V., De Bourdeaudhuij, I., Deforche, B., Van Cauwenberg, J., & Van Dyck, D. (2015). Assessment of physical activity in older Belgian adults: validity and reliability of an adapted interview version of the long International Physical Activity Questionnaire (IPAQ-L). *BMC public health*, 15(1), 433.

Van Willigen, M. (2000). Differential benefits of volunteering across the life course. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 55(5), S308-S318.

Wan, C., & Shen, G. Q. (2015). Salient attributes of urban green spaces in high density cities: The case of Hong Kong. *Habitat International*, 49, 92-99.

Wang, D., Brown, G., & Liu, Y. (2015a). The physical and non-physical factors that influence perceived access to urban parks. *Landscape and urban planning*, 133, 53-66.

Wang, D., Brown, G., Zhong, G., Liu, Y., & Mateo-Babiano, I. (2015b). Factors influencing perceived access to urban parks: A comparative study of Brisbane (Australia) and Zhongshan (China). *Habitat International*, 50, 335-346.

- Wang, X. (2016). Subjective well-being associated with size of social network and social support of elderly. *Journal of health psychology*, 21(6), 1037-1042.
- Warburton, D. E., Gledhill, N., & Quinney, A. (2001). Musculoskeletal fitness and health. *Canadian Journal of Applied Physiology*, 26(2), 217-237.
- Wen, C., Albert, C., & Von Haaren, C. (2018). The elderly in green spaces: Exploring requirements and preferences concerning nature-based recreation. *Sustainable Cities and Society*, 38, 582-593.
- Wendel, H. E. W., Zarger, R. K., & Mihelcic, J. R. (2012). Accessibility and usability: Green space preferences, perceptions, and barriers in a rapidly urbanizing city in Latin America. *Landscape and urban planning*, 107(3), 272-282.
- WHO. (2002). Active ageing: A policy framework. Retrieved August, 2018 from [http://apps.who.int/iris/bitstream/10665/67215/1/WHO\\_NMH\\_NPH\\_02.8.pdf](http://apps.who.int/iris/bitstream/10665/67215/1/WHO_NMH_NPH_02.8.pdf).
- WHO. (2007). Global age-friendly cities: A guide. Retrieved September, 2018 from [http://www.who.int/ageing/publications/Global\\_age\\_friendly\\_cities\\_Guide\\_English.pdf](http://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf).
- Wong, K. K. (2009). Urban park visiting habits and leisure activities of residents in Hong Kong, China. *Managing Leisure*, 14(2), 125-140.
- Yao, S. & Loo, B. P. (2016). Safety in numbers for cyclists beyond national- and city-level data: a study on the non-linearity of risk within the city of Hong Kong. *Injury prevention*, injuryprev-2016.
- Yuen, B. (1996). Use and experience of neighborhood parks in Singapore. *Journal of Leisure Research*, 28(4), 293-311.
- Yung, E. H., Conejos, S., & Chan, E. H. (2016b). Public open spaces planning for the elderly: The case of dense urban renewal districts in Hong Kong. *Land Use Policy*, 59, 1-11.
- Yung, E.H.K., Conejos, S. & Chan, E.H.W. (2016a) Social needs of the elderly and active ageing in public open spaces in urban renewal, *Cities*, 52, 114–122.
- Yung, E.H.K., Ho, W. & Chan, E.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, 39–53.

Zeitler, E., Buys, L., Aird, R., & 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., & Baran, P. K. (2017). Urban park pathway design characteristics and senior walking behavior. *Urban Forestry & Urban Greening*, 21, 60-73.

Zhang, H., Chen, B., Sun, Z., & Bao, Z. (2013). Landscape perception and recreation needs in urban green space in Fuyang, Hangzhou, China. *Urban Forestry & Urban Greening*, 12(1), 44-52.

Zhu, B. W., Zhang, J. R., Tzeng, G. H., Huang, S. L., & Xiong, L. (2017). Public open space development for elderly people by using the danp-v model to establish continuous improvement strategies towards a sustainable and healthy aging society. *Sustainability*, 9(3), 420.

## **Appendix**

### Appendix A. Questions for Interviews with Experts

1. After reading our analysis results, do you think these factors will affect elderly visits to public open space?
2. To what extent can these factors be used as a reference for planning or policy?
3. For these high-frequency factors mentioned by the elderly, what do you think can be done/improved? Do you have any advice? Will it be difficult to implement in the planning and design of public open space?
4. There are some factors that are not considered important by the elderly. From your perspective, will these factors be considered in planning or policy? Are these factors important and cannot be ignored?
5. In addition to the factors we just discussed, can you think of other factors that will have an impact on elderly visits to public open space?
6. There is the difference between the old and new districts, for example, old districts usually has the situation of high density, lack of land and facilities. From your point of view, will the planning between the new district and the old district needs to be different, and it could better meet the preferences of the elderly?
7. Do you have any additional comments? What factors do you think need to be adjusted/added?

## Appendix B. Questionnaire for Open Space User in Chinese

### 分析長者使用公共開放空間的喜好的研究

公共開放空間是供廣大市民使用和享受的用地，包括公園，運動場，公共花園和遊樂場，海灘，行人流通和休憩處，涼亭，行人專用區和海濱長廊。

1. 您喜歡到訪公共開放空間嗎？

非常不喜歡    不喜歡    一般    喜歡    非常喜歡

如果喜歡，您經常到訪的公園有\_\_\_\_\_

如果不喜歡，原因是\_\_\_\_\_

2. 請您對以下描述的同意程度進行評分。

#### A. 影響我決定從家出發去公共開放空間的因素。

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |                         |   |   |   |   |   |
|---|-------------------------|---|---|---|---|---|
| 1 | 我住在一個人口密度高的社區。          | 1 | 2 | 3 | 4 | 5 |
| 2 | 我住在一個小房子。               | 1 | 2 | 3 | 4 | 5 |
| 3 | 我在家裡感到不夠舒適（所以較喜歡外出）。    | 1 | 2 | 3 | 4 | 5 |
| 4 | 我有自己的車開去公共開放空間。         | 1 | 2 | 3 | 4 | 5 |
| 5 | 我有休閒時間。                 | 1 | 2 | 3 | 4 | 5 |
| 6 | 我身體健康情況良好,使我有能力去公共開放空間。 | 1 | 2 | 3 | 4 | 5 |
| 7 | 在公共開放空間有很多有趣的活動。        | 1 | 2 | 3 | 4 | 5 |
| 8 | 我喜歡積極、活躍的日常生活。          | 1 | 2 | 3 | 4 | 5 |
| 9 | 其他影響我決定從家出發去公共開放空間的因素:  |   |   |   |   |   |

#### B. 影響我更願意去公共開放空間的因素。

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |                        |   |   |   |   |   |
|---|------------------------|---|---|---|---|---|
| 1 | 我家附近有足夠數量的公共開放空間。      | 1 | 2 | 3 | 4 | 5 |
| 2 | 公共開放空間距離我家很近。          | 1 | 2 | 3 | 4 | 5 |
| 3 | 公共開放空間附近有社區中心、街市等社區設施。 | 1 | 2 | 3 | 4 | 5 |
| 4 | 有公共交通可到達公共開放空間。        | 1 | 2 | 3 | 4 | 5 |

|    |                                      |   |   |   |   |   |
|----|--------------------------------------|---|---|---|---|---|
| 5  | 公共交通站點距離公共開放空間很近。                    | 1 | 2 | 3 | 4 | 5 |
| 6  | 去公共開放空間的公共交通的費用合理。                   | 1 | 2 | 3 | 4 | 5 |
| 7  | 去公共開放空間的路上花費少的時間。                    | 1 | 2 | 3 | 4 | 5 |
| 8  | 去公共開放空間的行人路安全且路面車行速度適中。              | 1 | 2 | 3 | 4 | 5 |
| 9  | 去公共開放空間的路上有明確的路牌指引我去公共開放空間。          | 1 | 2 | 3 | 4 | 5 |
| 10 | 去公共開放空間的行人路平坦。                       | 1 | 2 | 3 | 4 | 5 |
| 11 | 去公共開放空間的路上有無障礙設施。                    | 1 | 2 | 3 | 4 | 5 |
| 12 | 去公共開放空間的道路好走。                        | 1 | 2 | 3 | 4 | 5 |
| 13 | 可以經由不同街道去公共開放空間。                     | 1 | 2 | 3 | 4 | 5 |
| 14 | 可以通過不同的方式去公共開放空間，例如步行、乘坐公共交通工具、自己開車。 | 1 | 2 | 3 | 4 | 5 |
| 15 | 其他影響我更願意去公共開放空間的因素：                  |   |   |   |   |   |

### C. 影響我更好使用公共開放空間的因素

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 一個沒有噪音干擾的公共開放空間。                        | 1 | 2 | 3 | 4 | 5 |
| 2 | 一個空氣清新的公共開放空間。                          | 1 | 2 | 3 | 4 | 5 |
| 3 | 一個乾淨整潔的公共開放空間。                          | 1 | 2 | 3 | 4 | 5 |
| 4 | 一個有安全的設施和環境的公共開放空間。                     | 1 | 2 | 3 | 4 | 5 |
| 5 | 一個維修良好的公共開放空間，例如設施、座椅、園藝等。              | 1 | 2 | 3 | 4 | 5 |
| 6 | 一個大型的公共開放空間。                            | 1 | 2 | 3 | 4 | 5 |
| 7 | 一個景觀好的公共開放空間。                           | 1 | 2 | 3 | 4 | 5 |
| 8 | 一個擁有不同類型設施的公共開放空間，例如座椅、小食亭、涼亭、運動器材、球場等。 | 1 | 2 | 3 | 4 | 5 |
| 9 | 一個有清晰指示牌能幫助找到不同設施的公共開放空間。               | 1 | 2 | 3 | 4 | 5 |

|    |                                 |   |   |   |   |   |
|----|---------------------------------|---|---|---|---|---|
| 10 | 一個有多樣，新奇，舒適城市家具，例如桌椅、枱凳的公共開放空間。 | 1 | 2 | 3 | 4 | 5 |
| 11 | 一個可以在任何季節和天氣使用的公共開放空間。          | 1 | 2 | 3 | 4 | 5 |
| 12 | 一個道路平坦的公共開放空間。                  | 1 | 2 | 3 | 4 | 5 |
| 13 | 一個擁有好的無障礙設施的公共開放空間。             | 1 | 2 | 3 | 4 | 5 |
| 14 | 一個不擠迫的公共開放空間。                   | 1 | 2 | 3 | 4 | 5 |
| 15 | 在使用公共開放空間時，和其他群體沒有衝突。           | 1 | 2 | 3 | 4 | 5 |
| 16 | 一個有管理人員的公共開放空間。                 | 1 | 2 | 3 | 4 | 5 |
| 17 | 一個有群體活動的公共開放空間。                 | 1 | 2 | 3 | 4 | 5 |
| 18 | 有機會在公共開放空間與朋友聊天。                | 1 | 2 | 3 | 4 | 5 |
| 19 | 有機會在開放空間運動。                     | 1 | 2 | 3 | 4 | 5 |
| 20 | 有機會參與公共開放空間的規劃和設計。              | 1 | 2 | 3 | 4 | 5 |
| 21 | 其他影響我更好使用公共開放空間的因素:             |   |   |   |   |   |

### 3. 個人資料

性別：男 女

年齡：60 以下 60 至 64 65 至 74 75 至 84 85 及以上

教育程度：小學 中學 專上 大學及以上 其他

每週到訪公共開放空間的次數：

0 1-2 3-5 6-7 >7 如有具體次數請記錄\_

每次到訪公共開放空間的時間：

少於 15 分鐘 15-30 分鐘 30-60 分鐘 多於 60 分鐘

您到訪公共開放空間的方法：乘搭公共交通 步行 自駕 其他\_\_

\_\_\_\_\_

從家到公共開放空間所花費的時間：<10 分鐘 10-20 分鐘 >20 分鐘

您的居住空間大小：<100 呎 100 至 500 呎 500 至 1000 呎 >1000 呎

您的居住區域（屋苑名稱）：黃大仙區 葵青區 將軍澳區 其他\_\_\_\_\_

您居住的屋苑類型：公屋 私人屋苑 其他\_\_\_\_\_

每月生活開支：<\$2000 \$2000-4999 \$5000-7999 >\$8000

您來公共開放空間的目的（多選）：

與朋友聊天 運動 群體活動 景觀 設施 其他\_\_\_\_\_

您個人評估的健康狀況：欠佳 一般 好 很好 非常好

健康狀況描述\_\_\_\_\_

您到訪公共開放空間的時段：

早上 6 時以前 早上 6-9 時 早上 9-12 時 下午 1-6 時 下午 6 時

以後

您對這個公共開放空間的滿意程度：

非常不滿意 不滿意 一般 滿意 非常滿意

(這問題只適用於在公共開放空間的長者)

- 結束 -

## Appendix C. Questionnaire for Less Frequent User in Chinese

### 分析長者使用公共開放空間的喜好的研究

公共開放空間是供廣大市民使用和享受的用地，包括公園，運動場，公共花園和遊樂場，海灘，行人流通和休憩處，涼亭，行人專用區和海濱長廊。

1. 您喜歡到訪公共開放空間嗎？

非常不喜歡    不喜歡    一般    喜歡    非常喜歡

如果喜歡，您經常到訪的公園有\_\_\_\_\_

如果不喜歡，原因是\_\_\_\_\_

2. 請您對以下描述的同意程度進行評分。

#### A. 影響我決定從家出發去公共開放空間的因素。

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |                         |   |   |   |   |   |
|---|-------------------------|---|---|---|---|---|
| 1 | 我住在一個人口密度高的社區。          | 1 | 2 | 3 | 4 | 5 |
| 2 | 我住在一個小房子。               | 1 | 2 | 3 | 4 | 5 |
| 3 | 我在家裡感到不夠舒適（所以較喜歡外出）。    | 1 | 2 | 3 | 4 | 5 |
| 4 | 我有自己的車開去公共開放空間。         | 1 | 2 | 3 | 4 | 5 |
| 5 | 我有休閒時間。                 | 1 | 2 | 3 | 4 | 5 |
| 6 | 我身體健康情況良好,使我有能力去公共開放空間。 | 1 | 2 | 3 | 4 | 5 |
| 7 | 在公共開放空間有很多有趣的活動。        | 1 | 2 | 3 | 4 | 5 |
| 8 | 我喜歡積極、活躍的日常生活。          | 1 | 2 | 3 | 4 | 5 |
| 9 | 其他影響我決定從家出發去公共開放空間的因素:  |   |   |   |   |   |

#### B. 影響我更願意去公共開放空間的因素。

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |                        |   |   |   |   |   |
|---|------------------------|---|---|---|---|---|
| 1 | 我家附近有足夠數量的公共開放空間。      | 1 | 2 | 3 | 4 | 5 |
| 2 | 公共開放空間距離我家很近。          | 1 | 2 | 3 | 4 | 5 |
| 3 | 公共開放空間附近有社區中心、街市等社區設施。 | 1 | 2 | 3 | 4 | 5 |
| 4 | 有公共交通可到達公共開放空間。        | 1 | 2 | 3 | 4 | 5 |

|    |                                      |   |   |   |   |   |
|----|--------------------------------------|---|---|---|---|---|
| 5  | 公共交通站點距離公共開放空間很近。                    | 1 | 2 | 3 | 4 | 5 |
| 6  | 去公共開放空間的公共交通的費用合理。                   | 1 | 2 | 3 | 4 | 5 |
| 7  | 去公共開放空間的路上花費少的時間。                    | 1 | 2 | 3 | 4 | 5 |
| 8  | 去公共開放空間的行人路安全且路面車行速度適中。              | 1 | 2 | 3 | 4 | 5 |
| 9  | 去公共開放空間的路上有明確的路牌指引我去公共開放空間。          | 1 | 2 | 3 | 4 | 5 |
| 10 | 去公共開放空間的行人路平坦。                       | 1 | 2 | 3 | 4 | 5 |
| 11 | 去公共開放空間的路上有無障礙設施。                    | 1 | 2 | 3 | 4 | 5 |
| 12 | 去公共開放空間的道路好走。                        | 1 | 2 | 3 | 4 | 5 |
| 13 | 可以經由不同街道去公共開放空間。                     | 1 | 2 | 3 | 4 | 5 |
| 14 | 可以通過不同的方式去公共開放空間，例如步行、乘坐公共交通工具、自己開車。 | 1 | 2 | 3 | 4 | 5 |
| 15 | 其他影響我更願意去公共開放空間的因素：                  |   |   |   |   |   |

### C. 影響我更好使用公共開放空間的因素

(1.非常不同意； 2.不同意； 3.一般； 4.同意； 5.非常同意)

|   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|
| 1 | 一個沒有噪音干擾的公共開放空間。                        | 1 | 2 | 3 | 4 | 5 |
| 2 | 一個空氣清新的公共開放空間。                          | 1 | 2 | 3 | 4 | 5 |
| 3 | 一個乾淨整潔的公共開放空間。                          | 1 | 2 | 3 | 4 | 5 |
| 4 | 一個有安全的設施和環境的公共開放空間。                     | 1 | 2 | 3 | 4 | 5 |
| 5 | 一個維修良好的公共開放空間，例如設施、座椅、園藝等。              | 1 | 2 | 3 | 4 | 5 |
| 6 | 一個大型的公共開放空間。                            | 1 | 2 | 3 | 4 | 5 |
| 7 | 一個景觀好的公共開放空間。                           | 1 | 2 | 3 | 4 | 5 |
| 8 | 一個擁有不同類型設施的公共開放空間，例如座椅、小食亭、涼亭、運動器材、球場等。 | 1 | 2 | 3 | 4 | 5 |
| 9 | 一個有清晰指示牌能幫助找到不同設施的公共開放空間。               | 1 | 2 | 3 | 4 | 5 |

|    |                                 |   |   |   |   |   |
|----|---------------------------------|---|---|---|---|---|
| 10 | 一個有多樣，新奇，舒適城市家具，例如桌椅、枱凳的公共開放空間。 | 1 | 2 | 3 | 4 | 5 |
| 11 | 一個可以在任何季節和天氣使用的公共開放空間。          | 1 | 2 | 3 | 4 | 5 |
| 12 | 一個道路平坦的公共開放空間。                  | 1 | 2 | 3 | 4 | 5 |
| 13 | 一個擁有好的無障礙設施的公共開放空間。             | 1 | 2 | 3 | 4 | 5 |
| 14 | 一個不擠迫的公共開放空間。                   | 1 | 2 | 3 | 4 | 5 |
| 15 | 在使用公共開放空間時，和其他群體沒有衝突。           | 1 | 2 | 3 | 4 | 5 |
| 16 | 一個有管理人員的公共開放空間。                 | 1 | 2 | 3 | 4 | 5 |
| 17 | 一個有群體活動的公共開放空間。                 | 1 | 2 | 3 | 4 | 5 |
| 18 | 有機會在公共開放空間與朋友聊天。                | 1 | 2 | 3 | 4 | 5 |
| 19 | 有機會在開放空間運動。                     | 1 | 2 | 3 | 4 | 5 |
| 20 | 有機會參與公共開放空間的規劃和設計。              | 1 | 2 | 3 | 4 | 5 |
| 21 | 其他影響我更好使用公共開放空間的因素:             |   |   |   |   |   |

### 3. 個人資料

性別：男 女

年齡：60 以下 60 至 64 65 至 74 75 至 84 85 及以上

教育程度：小學 中學 專上 大學及以上 其他

每週到訪公共開放空間的次數：

0 1-2 3-5 6-7 >7 如有具體次數請記錄\_

從家到公共開放空間所花費的時間：<10 分鐘 10-20 分鐘 >20 分鐘

您的居住空間大小：<100 呎 100 至 500 呎 500 至 1000 呎 >1000 呎

您的居住區域（屋苑名稱）：黃大仙區 葵青區 將軍澳區 其他\_

\_\_\_\_\_

您居住的屋苑類型：公屋 私人屋苑 其他\_\_\_\_\_

每月生活開支：<\$2000 \$2000-4999 \$5000-7999 >\$8000

您個人評估的健康狀況：欠佳 一般 好 很好 非常好

健康狀況描述\_\_\_\_\_

- 結束 -

Appendix D. Park Observation Form

## Park Observation Form

Date: \_\_\_\_\_ Venue: \_\_\_\_\_

### 1. Park facilities/amenities

(tick or mark the detailed facility items and conditions)

| Items  | Quality                     | Remarks/notes   |
|--|-----------------------------|---|
| Fitness/ Entertainment facilities<br>(exercise equipment, reflexology area/ ball games field/ chess playing table, ....) | None / 1 / 2 / 3 / 4<br>/ 5 | What activities are the elderly doing in the park?<br>e.g. playing taichi, dancing, singing,...etc. |
| Commercial facilities<br>(Kiosk, shops)  | None / 1 / 2 / 3 / 4<br>/ 5 |   |
| Rain and sun-shading devices   | None / 1 / 2 / 3 / 4<br>/ 5 | e.g. glass, wooden pergola  |
| Washroom facilities  | None / 1 / 2 / 3 / 4<br>/ 5 |   |
| Drinking water fountain  | None / 1 / 2 / 3 / 4<br>/ 5 |   |
| Boundary treatments and furniture  | None / 1 / 2 / 3 / 4<br>/ 5 |   |
| Others   |                             |   |

### 2. Urban Furniture

| Items | Quality | Remarks/notes |
|-------|---------|---------------|
|-------|---------|---------------|

|                     |                             |  |
|---------------------|-----------------------------|--|
| Seats/ benches      | None / 1 / 2 / 3 / 4<br>/ 5 |  |
| Directional sign    | None / 1 / 2 / 3 / 4<br>/ 5 |  |
| Lighting facilities | None / 1 / 2 / 3 / 4<br>/ 5 |  |
| Sculpture           | None / 1 / 2 / 3 / 4<br>/ 5 |  |
| Trash cans          | None / 1 / 2 / 3 / 4<br>/ 5 |  |
| Others              |                             |  |

### 3. Park landscape

| Items   | Quality                     | Remarks/notes |
|---|-----------------------------|---------------|
| Greenery feature<br>(Lawn grass/ Trees/<br>Shrubs)                                  | None / 1 / 2 / 3 /<br>4 / 5 |               |
| Water feature<br>(fish pond, water fountain,<br>water pool for model<br>boats, etc) | None / 1 / 2 / 3 /<br>4 / 5 |               |
| Plaza for group gathering   | None / 1 / 2 / 3 /<br>4 / 5 |               |
| Pavilion  | None / 1 / 2 / 3 /<br>4 / 5 |               |
| Walking/jogging track   | None / 1 / 2 / 3 /<br>4 / 5 |               |
| Others  |                             |               |

### 4. Park maintenance

| Items  | Subjective evaluation | Remarks/notes |
|--|-----------------------|---------------|
| Security guard around the space (include park office)      | None/Yes              |               |
| Lawn condition   | 1 / 2 / 3 / 4 / 5     |               |
| Extent and upkeep of vegetation                            | 1 / 2 / 3 / 4 / 5     |               |
| Maintenance of trash bins                                  | 1 / 2 / 3 / 4 / 5     |               |
| Cleanliness<br>(Quantity of trash present outside of bins) | 1 / 2 / 3 / 4 / 5     |               |
| Crowdedness  | 1 / 2 / 3 / 4 / 5     |               |

#### 5. Surrounding environment

| Items   | Subjective evaluation | Remarks/notes |
|---|-----------------------|---------------|
| Terrain<br>(Is there obvious height different or a large slope within the POS or around the POS?) | 1 / 2 / 3 / 4 / 5     |               |
| Noise<br>(Is it noisy there in the POS? Can you hear the speaker's voice with a normal loudness?) | 1 / 2 / 3 / 4 / 5     |               |
| Pollution   | 1 / 2 / 3 / 4 / 5     |               |

#### 6. Surrounding pedestrian environment

| Items                 | Quality           | Remarks/notes |
|-----------------------|-------------------|---------------|
| Pedestrian facilities | 1 / 2 / 3 / 4 / 5 |               |

|                                    |                   |  |
|------------------------------------|-------------------|--|
| Signages and wayfinding facilities | 1 / 2 / 3 / 4 / 5 |  |
| Pedestrian links                   | 1 / 2 / 3 / 4 / 5 |  |
| Design of passageway               | 1 / 2 / 3 / 4 / 5 |  |
| Traffic management                 | 1 / 2 / 3 / 4 / 5 |  |
| Greening and attractiveness        | 1 / 2 / 3 / 4 / 5 |  |
| Others                             |                   |  |

Appendix E. Representative statements from the focus groups and the corresponding criteria for public open space from the literature

| Factors                       | Wong Tai Sin  | Tsing Yi   | Frequency             |
|-------------------------------|---|--|-----------------------|
| Facilities or amenities       | WTS01: For example, the park outside here has a bicycle and another facility. But the number of facilities is just one. The park has only one pair of facility but there are so many people. It would be better if we could equip more. It is better to add two or three pairs of it. If facilities are too much, it's like a fitness centre. It is not suitable if facilities are too much. And facilities are not suitable for us to use. It is more suitable for young people. | TY01: The washroom is so important to elderly. Many elders go outside and do exercises in the morning. And we used to drink water before leave home. There is no washroom, should I play in front of the washroom? | Frequency =44, 67.69% |
| Active lifestyle              | WTS15: I go outside at 5:30 every morning. I started playing Tai Chi at 7:00 am in the morning. I often running and stretching the legs.  | TY16: Every morning and every night. I walk to Shing Mun valley park twice a day.  | Frequency =30, 46.15% |
| Intention to visit open space | WTS11: I usually do Eighteen-style Tai Chi Qigong in the park. It does not require any facility.  | TY21: I often visit and walk around the Shing Mun Valley Park and Tai Ha Street Garden.  | Frequency =26, 40.0%  |
| Cleanliness                   | WTS15: The cleaning of the park is good. They clean at about 7 am.  | TY36: I'm satisfied with the management and facilities in the parks because they are clean.  | Frequency =24 36.92%  |

|                                  |  |   |                       |
|----------------------------------|--|---|-----------------------|
| Conflict of use                  | WTS03: I think that the most important thing of public space is management. Some people carry their pillow and bed and sleep in the public open space. It should be managed. They must leave in the morning. They can sit but not lay during the daytime. If many people lying there, less and less people will go there. The places will be wasted. These phenomena need to be managed by some public organization. | TY02: I feel comfortable in many places. But I don't like people who have a dog and bring their dogs to the park. Their dogs urinate everywhere. Children go through the grass when they go to school. They are too devoid of morality. | Frequency =21, 32.31% |
| Landscape                        | WTS07: I like more flowers and trees, or more fitness facilities.  | TY06: The scenery in Tsing Yi park is beautiful that many people take photos there.   | Frequency =18, 27.69% |
| Availability of public transport | WTS07: I went to Sai Kung for activities organized by centre. It is too difficult to visit some far places by myself. Thus, the public transportation is very important.   | TY04: An ideal public open space should be accessible, which can be arrived at by public transportation.  | Frequency =16, 24.62% |
| Maintenance                      | WTS27: The toilet has been taken care of and in good condition.  | TY12: There are some sport facilities. But once it is broken, it will not be repaired for a long time.  | Frequency =16, 24.62% |

|                     |   |   |                       |
|---------------------|---|---|-----------------------|
| Mobility            | WTS04: I am not as health as before, so I seldom go to the park now.  | TY04: I often went to Tsing Yi Park and waterfront promenade before. But now, I go there less frequently because of my deteriorated health condition. | Frequency =16, 24.62% |
| Proximity to home   | WTS01: I like to visit the Kowloon Walled City Park, because I live near the park.  | TY05: I often walk around in the public space in the public estate where I live.  | Frequency =16, 24.62% |
| Social cohesion     | WTS03: I think instructors are important because they can guide us to do some sports. Such as, Tai-Chi, dancing. Some elders would join activities if they see many people stay together. If there is a host, it will be more easily to build a group. Actually, some parks are very big, such as the Morse Park. It is easy to organize some small groups there. | TY31: I sometimes go to the park, but just like a tourist. If there are some people organize an activity, I will join them.                           | Frequency =14, 21.54% |
| Barrier free design | WTS28: It can be said that ordinary toilet is not for wheelchair to use.  | TY14: It is better to install armrest. Because we can stand up by using it. Because we are easily feel leg numb.                                      | Frequency =11, 16.92% |
| Comfort at home     | WTS10: I don't go to the park for rest, I usually stay at home.   | TY35: I prefer to stay in the elderly centre because there is air-conditioner. And it is indoor, so we don't have to worry on the rainy days.         | Frequency =9, 13.85%  |

|                                  |   |   |                      |
|----------------------------------|---|---|----------------------|
| Residential density              | WTS01: The park has only one set of facility but there are so many people.  | TY04: I hope the authority will build more public recreational facilities as the size of population in Tsing Yi increases.                              | Frequency =9, 13.85% |
| Size                             | WTS14: About facilities, some small parks are lack of some facilities in our districts, such as just two bicycles. Parks in our area is very small. | TY11: The park is too small.  | Frequency =9, 13.85% |
| Design for all weather condition | WTS09: I like to use the facility that can cover sunlight.  | TY35: In the surrounding area of my estate, there is no protection for us when there is scorching hot days and rainy days. Please install the shelters. | Frequency =9, 13.85% |
| Social interaction               | WTS02: I go to the open space downstairs my home. I can use some facilities or play chess with my old friends.                                      | TY04: On occasion, I gather with my friends from the South-east Asia in Tsing Yi Park. We make food and bring it for the gatherings.                    | Frequency =9, 13.85% |
| Available leisure time           | WTS03: I don't have much spare time. I often do housework at home. I spend a lot of time in the day, and I rarely go to public space.               | TY02: I only do some exercises in the morning because I have to take care of my grandson.   | Frequency =9, 13.85% |

|                                    |  |   |                      |
|------------------------------------|--|---|----------------------|
| Pedestrian safety or traffic speed | N/A  | TY11: I go to seaside corridor twice a week. But I think the road is not friendly to elders. I go to the seaside corridor from Rambler Crest. It is very dangerous when I cross the road. | Frequency =8, 12.31% |
| Availability                       | WTS03: The site selection of open space is critical.   | TY08: In fact, the open spaces are not enough. The total number of parks in Tsing Yi is not enough.   | Frequency =7, 10.77% |
| Proximity to amenities             | WTS08: I usually go to the park every day, it is about 7am. After a walk in the park, I go to Fairwood or Café de Coral. After breakfast I usually buy something in the market.          | TY25: Every morning, I play Tai Chi with other people in the podium garden of Luk Kwai House. After that, I go to Chinese restaurants to have breakfast.                                  | Frequency =7, 10.77% |
| Noise                              | WTS20: I am not denying the benefits of having many people there. It would be better if they can control their noise level and be quiet.   | TY20: Parks is very good for people to use, but I feel that some people make too much noise. Some people turn on a loud speaker at about 7 to 8 am.                                       | Frequency =7, 10.77% |
| Urban furniture                    | WTS06: In some open spaces that nearby our home, many elders like to visit there for a rest or for sports. If that place lacks some seats or some facilities, I do not like to go there. | TY06: There are some stone chairs for us to have a rest and the number of drinking fountains is adequate.   | Frequency =6, 9.23%  |

|             |   |  |                     |
|-------------|---|--|---------------------|
| Safety      | WTS25: I feel it's very dangerous because the railing is not high enough, thus, I think safety is the most important thing. | TY27: The park below my home is beautiful, but I seldom go there. There is a gang of South Asian teenage boys playing lawn bowls in the park. One time, when i was walking in the park, the ball hit me. I was so scared and told the boys not to play in the public space as it is dangerous. Their attitude was arrogant, and they even argued with me. As I don't want to have quarrel with them, I never visit the park again. | Frequency =6, 9.23% |
| Pollution   | WTS07: The transportation is very important, as well as air quality and environment.  | TY18: I go to the park near overpass, the quality of air is very good there.   | Frequency =5, 7.69% |
| Crowdedness | WTS02: I think some people are difficult to wait for using the fitness facilities as there are too many people.             | TY02: I don't need facilities when doing exercise, but just some empty and comfort place in the open space.  | Frequency =5, 7.69% |

Appendix F. The comparison of regression model result and previous experts' views

| Significant factor (+)  | Dependent variable             | Surveying area |   |   | expert views  | Expert    |
|-------------------------|--------------------------------|----------------|---|---|---|-----------|
|                         |                                | F              | O | N |   |           |
| Available leisure time  | Frequency                      | ✓              | ✓ |   | Available leisure time. Older people who need to take care of grandchildren have less time to go to public spaces. They are busy from Monday to Friday.   | Expert AL |
| Personal consideration  | Length of stay                 |                | ✓ |   |   |           |
|                         | Frequency                      |                |   | ✓ | Active lifestyle. Some people are active. Some of the couples like to go far away, such as New Territories, Hong Kong island. It depends on their personality. Very few people go very far alone. It's common for couples to go together. People who are alone, they usually like to go somewhere nearby. | Expert AL |
|                         | Like                           | ✓              |   | ✓ |   |           |
| Physical exercises      | Length of stay                 |                |   | ✓ | Active lifestyle is a reason. Many people go downstairs to do exercise, so it implies that the facilities can satisfy their requirement.  | Expert DL |
| Drinking water fountain | Satisfaction & length of stay. | ✓              | ✓ | ✓ | Elderly will surely stay longer in a place if they could eat and drink something, given free water, water refill station.   | Expert PZ |

|                                  |              |   |   |   |   |   |
|----------------------------------|--------------|---|---|---|---|---|
| Fitness/Entertainment facilities | Frequency    | ✓ |   | ✓ | In addition to the static park, some simple fitness facilities in the park are better. They are interested in those facilities.   | Expert AL   |
|                                  | Satisfaction |   |   | ✓ |   |   |
| Rain and sun-shading devices     | Satisfaction | ✓ | ✓ | ✓ | They like to use some facilities for sitting and chatting when they visit the open space. And they also want some shading areas and enough seats.   | Expert AL   |
|                                  |              |   |   |   | The weather is sometimes too hot. So, we must provide a good shading for them.  | Expert AY   |
|                                  |              |   |   |   | Some elderly put forward that the shading is critical, the open space should be designed for all weather conditions.  | Expert SL   |
| Commercial Facilities            | Satisfaction | ✓ | ✓ | ✓ | I stop in the park, why don't we have a coffee in the park, because then I can quickly have a cup of coffee I go on. It's very important to have this functionality, food and beverage to me. | Expert PZ   |
| Size                             | Satisfaction | ✓ | ✓ | ✓ | <b>different views</b>  | Expert PZ   |
|                                  |              |   |   |   |   | The facility, landscape, barrier free design is important. Barrier free is a thing like a facility. <b>Size is not so important.</b><br>In other words, if the park has no trees <b>and the size is small</b> , they will not choose to go there. |

|                  |                |   |   |   |   |              |
|------------------|----------------|---|---|---|---|--------------|
| Landscape        | Satisfaction   | ✓ | ✓ | ✓ | the landscape is important.   | Expert<br>BH |
|                  | Frequency      | ✓ |   | ✓ |   |              |
|                  | Length of stay |   |   | ✓ |   |              |
| Crowdedness      | Satisfaction   | ✓ | ✓ |   | If the area is crowded, a large public space may attract them to visit.   | Expert<br>BH |
| Directional Sign | Satisfaction   | ✓ | ✓ | ✓ | <b>different views</b><br>Of course, they know their way. Especially they live in the neighbourhood they don't need wayfinding because they already have knowledge about where the thing is.<br>Wayfinding is for visitors not for... | Expert<br>PZ |

Notes: F= Full Model, O=Old Area, N= New Town. '✓' indicates this factor is significantly associated with the dependent variable in the corresponding sampling area.

Appendix G Results of ordered logit regression estimates for use pattern in open spaces.

Appendix G.1 All selected districts

|  | <b>Model 1:<br/>Like</b> |               | <b>Model 2:<br/>Frequency</b> |                | <b>Model 3:<br/>Length of stay</b> |                |
|--|--------------------------|---------------|-------------------------------|----------------|------------------------------------|----------------|
|  | Estimate                 | Sig           | Estimate                      | Sig            | Estimate                           | Sig            |
| <b>Elderly's perception</b>                  |                          |               |                               |                |                                    |                |
| Factor 1 Public Transport and Street Design  | -0.338                   | 0.003**       | -0.158                        | 0.069          | -0.048                             | 0.586          |
| Factor 2 Quality of Open Space               | 0.081                    | 0.476         | -0.184                        | 0.044*         | -0.076                             | 0.395          |
| Factor 3 Social Consideration and Management | 0.010                    | 0.930         | 0.091                         | 0.294          | 0.021                              | 0.806          |
| Factor 4 Facilities of Open Space            | -0.196                   | 0.080         | -0.266                        | 0.003**        | -0.042                             | 0.632          |
| Factor 5 Walking Environment                 | 0.163                    | 0.134         | -0.029                        | 0.735          | 0.010                              | 0.909          |
| Factor 6 Living Condition                    | -0.059                   | 0.607         | 0.018                         | 0.842          | 0.073                              | 0.429          |
| Factor 7 Availability and Proximity          | <b>0.215</b>             | <b>0.044*</b> | 0.132                         | 0.144          | -0.104                             | 0.238          |
| Factor 8 Personal Consideration              | <b>0.273</b>             | <b>0.014*</b> | 0.121                         | 0.172          | 0.142                              | 0.108          |
| Factor 9 Available leisure time and security | 0.007                    | 0.948         | <b>0.290</b>                  | <b>0.001**</b> | 0.100                              | 0.248          |
| <b>Personal factor</b>                       |                          |               |                               |                |                                    |                |
| Intention to visit open space                |                          |               |                               |                |                                    |                |
| <i>Chat with friends</i>                     | -0.214                   | 0.377         | -0.021                        | 0.912          | 0.003                              | 0.986          |
| <i>Physical exercises</i>                    | 0.384                    | 0.204         | 0.315                         | 0.188          | <b>0.967</b>                       | <b>0.000**</b> |
| <i>Group activity</i>                        | 0.376                    | 0.316         | 0.393                         | 0.171          | 0.444                              | 0.132          |
| <i>Landscape</i>                             | 0.082                    | 0.810         | -0.963                        | 0.000**        | 0.090                              | 0.735          |
| <i>Facilities</i>                            | -0.037                   | 0.911         | 0.000                         | 0.999          | -0.164                             | 0.514          |
| <i>Rest</i>                                  | -0.011                   | 0.981         | -0.393                        | 0.303          | 0.164                              | 0.682          |
| <i>Accompany</i>                             | <b>2.513</b>             | <b>0.032*</b> | -0.330                        | 0.769          | 1.953                              | 0.110          |
| House size                                   | 0.097                    | 0.662         | 0.032                         | 0.854          | 0.223                              | 0.202          |
| Age  | 0.133                    | 0.242         | <b>0.618</b>                  | <b>0.000**</b> | <b>0.293</b>                       | <b>0.002**</b> |
| Education                                    | <b>-0.300</b>            | <b>0.047*</b> | <b>-0.275</b>                 | <b>0.023*</b>  | 0.045                              | 0.706          |

|                        |        |       |        |       |        |       |
|------------------------|--------|-------|--------|-------|--------|-------|
| Health                 | 0.030  | 0.823 | 0.075  | 0.479 | -0.090 | 0.404 |
| Gender                 |        |       |        |       |        |       |
| Male                   | -0.035 | 0.879 | -0.045 | 0.800 | 0.334  | 0.065 |
| Female                 | 0      | .0    | 0      | .0    | 0      | .0    |
| <b>Prob&gt;Chi2</b>    | 0.0000 |       | 0.0000 |       | 0.0000 |       |
| <b>Pseudo r-square</b> | 0.0587 |       | 0.1030 |       | 0.0478 |       |

Appendix G.2 Urban old district

|  | <b>Model 1: Like</b> |               | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |                |
|--|----------------------|---------------|---------------------------|----------------|--------------------------------|----------------|
|  | Estimate             | Sig           | Estimate                  | Sig            | Estimate                       | Sig            |
| <b>Elderly's perception</b>                  |                      |               |                           |                |                                |                |
| Factor 1 Public Transport and Street Design  | <b>0.768</b>         | <b>0.018*</b> | -0.048                    | 0.845          | -0.657                         | 0.010*         |
| Factor 2 Quality of Open Space               | -0.903               | 0.000**       | -0.262                    | 0.168          | -0.005                         | 0.977          |
| Factor 3 Social Consideration and Management | -0.420               | 0.046*        | 0.074                     | 0.652          | <b>0.518</b>                   | <b>0.002**</b> |
| Factor 4 Facilities of Open Space            | -0.289               | 0.237         | -0.283                    | 0.119          | 0.069                          | 0.709          |
| Factor 5 Walking Environment                 | -0.124               | 0.488         | -0.004                    | 0.975          | 0.153                          | 0.255          |
| Factor 6 Living Condition                    | -0.039               | 0.852         | -0.121                    | 0.453          | 0.082                          | 0.626          |
| Factor 7 Availability and Proximity          | 0.208                | 0.262         | 0.171                     | 0.237          | -0.170                         | 0.252          |
| Factor 8 Personal Consideration              | 0.217                | 0.250         | 0.011                     | 0.940          | 0.273                          | 0.058          |
| Factor 9 Available leisure time and security | -0.070               | 0.728         | <b>0.396</b>              | <b>0.012*</b>  | -0.095                         | 0.546          |
| <b>Personal factor</b>                       |                      |               |                           |                |                                |                |
| Intention to visit open space                |                      |               |                           |                |                                |                |
| <i>Chat with friends</i>                     | -0.481               | 0.215         | 0.373                     | 0.214          | -0.180                         | 0.544          |
| <i>Physical exercises</i>                    | <b>1.175</b>         | <b>0.037*</b> | 0.074                     | 0.860          | 0.354                          | 0.382          |
| <i>Group activity</i>                        | 0.746                | 0.287         | 0.853                     | 0.084          | 0.596                          | 0.247          |
| <i>Landscape</i>                             | -0.087               | 0.866         | -0.831                    | 0.035*         | -0.504                         | 0.179          |
| <i>Facilities</i>                            | 0.486                | 0.396         | 0.016                     | 0.968          | -1.219                         | 0.003**        |
| <i>Rest</i>                                  | 0.798                | 0.306         | 0.030                     | 0.960          | 0.924                          | 0.142          |
| <i>Accompany</i>                             | 2.243                | 0.252         | -0.857                    | 0.595          | 0.331                          | 0.820          |
| House size                                   | 0.517                | 0.121         | -0.185                    | 0.460          | 0.322                          | 0.200          |
| Age  | 0.122                | 0.517         | <b>0.729</b>              | <b>0.000**</b> | 0.026                          | 0.858          |
| Education                                    | -0.300               | 0.205         | -0.117                    | 0.514          | 0.104                          | 0.571          |
| Health                                       | -0.012               | 0.954         | 0.055                     | 0.726          | -0.139                         | 0.390          |
| Gender                                       |                      |               |                           |                |                                |                |

|                        |        |       |        |       |        |       |
|------------------------|--------|-------|--------|-------|--------|-------|
| Male                   | -0.227 | 0.520 | -0.073 | 0.775 | 0.182  | 0.493 |
| Female                 | 0      | .0    | 0      | .0    | 0      | .0    |
| <b>Prob&gt;Chi2</b>    | 0.0000 |       | 0.0000 |       | 0.0000 |       |
| <b>Pseudo r-square</b> | 0.1120 |       | 0.1316 |       | 0.0996 |       |

Appendix G.3 New town

|  | <b>Model 1: Like</b> |                | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |               |
|--|----------------------|----------------|---------------------------|----------------|--------------------------------|---------------|
|  | Estimate             | Sig            | Estimate                  | Sig            | Estimate                       | Sig           |
| <b>Elderly's perception</b>                  |                      |                |                           |                |                                |               |
| Factor 1 Public Transport and Street Design  | -0.227               | 0.163          | -0.093                    | 0.490          | 0.133                          | 0.324         |
| Factor 2 Quality of Open Space               | 0.278                | 0.068          | -0.229                    | 0.058          | 0.133                          | 0.296         |
| Factor 3 Social Consideration and Management | 0.118                | 0.441          | 0.089                     | 0.488          | -0.047                         | 0.712         |
| Factor 4 Facilities of Open Space            | 0.051                | 0.706          | -0.130                    | 0.247          | -0.048                         | 0.672         |
| Factor 5 Walking Environment                 | 0.246                | 0.110          | -0.120                    | 0.319          | 0.081                          | 0.505         |
| Factor 6 Living Condition                    | 0.025                | 0.878          | 0.135                     | 0.278          | 0.052                          | 0.690         |
| Factor 7 Availability and Proximity          | 0.249                | 0.089          | 0.069                     | 0.603          | -0.010                         | 0.935         |
| Factor 8 Personal Consideration              | <b>0.426</b>         | <b>0.007**</b> | <b>0.283</b>              | <b>0.027*</b>  | 0.252                          | 0.058         |
| Factor 9 Available leisure time and security | -0.029               | 0.841          | <b>0.241</b>              | <b>0.036*</b>  | 0.173                          | 0.146         |
| <b>Personal factor</b>                       |                      |                |                           |                |                                |               |
| Intention to visit open space                |                      |                |                           |                |                                |               |
| <i>Chat with friends</i>                     | -0.306               | 0.409          | -0.559                    | 0.066          | 0.183                          | 0.551         |
| <i>Physical exercises</i>                    | 0.457                | 0.260          | <b>0.715</b>              | <b>0.033*</b>  | <b>1.167</b>                   | <b>0.001*</b> |
| <i>Group activity</i>                        | 0.356                | 0.442          | 0.085                     | 0.819          | 0.238                          | 0.546         |
| <i>Landscape</i>                             | 0.697                | 0.172          | -0.878                    | 0.033          | 0.613                          | 0.187         |
| <i>Facilities</i>                            | -0.207               | 0.621          | 0.034                     | 0.916          | 0.650                          | 0.073         |
| <i>Rest</i>                                  | -0.541               | 0.419          | -0.900                    | 0.094          | -1.184                         | 0.046*        |
| <i>Accompany</i>                             | <b>3.931</b>         | <b>0.021*</b>  | 1.418                     | 0.363          | 14.693                         | 0.970         |
| House size                                   | -0.404               | 0.207          | 0.135                     | 0.603          | 0.002                          | 0.994         |
| Age  | 0.266                | 0.089          | <b>0.586</b>              | <b>0.000**</b> | <b>0.520</b>                   | <b>0.000*</b> |
| Education                                    | -0.186               | 0.385          | -0.345                    | 0.051          | 0.053                          | 0.761         |

|                        |        |       |        |       |              |               |
|------------------------|--------|-------|--------|-------|--------------|---------------|
| Health                 | 0.134  | 0.487 | 0.104  | 0.501 | 0.046        | 0.777         |
| Gender                 |        |       |        |       |              |               |
| Male                   | 0.309  | 0.356 | 0.077  | 0.773 | <b>0.660</b> | <b>0.018*</b> |
| Female                 | 0      | .0    | 0      | .0    | 0            | .0            |
| <b>Prob&gt;Chi2</b>    | 0.0000 |       | 0.0000 |       | 0.0000       |               |
| <b>Pseudo r-square</b> | 0.0953 |       | 0.1048 |       | 0.1172       |               |

Appendix G.4 Public housing

|  | <b>Model 1: Like</b> |               | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |                |
|--|----------------------|---------------|---------------------------|----------------|--------------------------------|----------------|
|  | Estimate             | Sig           | Estimate                  | Sig            | Estimate                       | Sig            |
| <b>Elderly's perception</b>                  |                      |               |                           |                |                                |                |
| Factor 1 Public Transport and Street Design  | -0.308               | 0.019*        | -0.229                    | 0.027*         | -0.108                         | 0.295          |
| Factor 2 Quality of Open Space               | 0.021                | 0.872         | -0.219                    | 0.047*         | -0.112                         | 0.287          |
| Factor 3 Social Consideration and Management | 0.110                | 0.372         | 0.000                     | 0.997          | 0.074                          | 0.459          |
| Factor 4 Facilities of Open Space            | -0.259               | 0.046         | -0.108                    | 0.305          | -0.075                         | 0.474          |
| Factor 5 Walking Environment                 | 0.086                | 0.522         | -0.004                    | 0.973          | 0.003                          | 0.974          |
| Factor 6 Living Condition                    | -0.224               | 0.109         | 0.095                     | 0.400          | 0.013                          | 0.911          |
| Factor 7 Availability and Proximity          | 0.076                | 0.542         | 0.013                     | 0.902          | -0.095                         | 0.365          |
| Factor 8 Personal Consideration              | 0.121                | 0.383         | 0.130                     | 0.239          | 0.145                          | 0.181          |
| Factor 9 Available leisure time and security | -0.018               | 0.890         | <b>0.332</b>              | <b>0.002**</b> | 0.075                          | 0.469          |
| <b>Personal factor</b>                       |                      |               |                           |                |                                |                |
| Intention to visit open space                |                      |               |                           |                |                                |                |
| <i>Chat with friends</i>                     | -0.428               | 0.168         | 0.320                     | 0.205          | 0.103                          | 0.681          |
| <i>Physical exercises</i>                    | 0.411                | 0.279         | -0.031                    | 0.921          | <b>1.186</b>                   | <b>0.000**</b> |
| <i>Group activity</i>                        | 0.530                | 0.295         | 0.154                     | 0.695          | 0.522                          | 0.204          |
| <i>Landscape</i>                             | -0.076               | 0.852         | -1.163                    | 0.001**        | 0.050                          | 0.876          |
| <i>Facilities</i>                            | 0.476                | 0.236         | -0.048                    | 0.879          | -0.237                         | 0.448          |
| <i>Rest</i>                                  | -0.272               | 0.638         | -0.217                    | 0.661          | 0.162                          | 0.751          |
| <i>Accompany</i>                             | <b>3.039</b>         | <b>0.046*</b> | -1.187                    | 0.394          | 0.660                          | 0.630          |
| House size                                   | -0.261               | 0.403         | 0.421                     | 0.089          | -0.221                         | 0.358          |
| Age  | 0.172                | 0.216         | <b>0.716</b>              | <b>0.000**</b> | 0.213                          | 0.064          |
| Education                                    | -0.290               | 0.126         | 0.094                     | 0.544          | -0.145                         | 0.340          |
| Health                                       | 0.073                | 0.668         | -0.017                    | 0.902          | -0.020                         | 0.887          |
| Gender                                       |                      |               |                           |                |                                |                |

|                        |        |       |        |       |        |       |
|------------------------|--------|-------|--------|-------|--------|-------|
| Male                   | -0.051 | 0.854 | -0.134 | 0.543 | 0.251  | 0.256 |
| Female                 | 0      | .0    | 0      | .0    | 0      | .0    |
| <b>Prob&gt;Chi2</b>    | 0.0000 |       | 0.0000 |       | 0.0000 |       |
| <b>Pseudo r-square</b> | 0.0612 |       | 0.0920 |       | 0.0590 |       |

Appendix G.5 Private housing

|  | <b>Model 1: Like</b> |                | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |               |
|--|----------------------|----------------|---------------------------|----------------|--------------------------------|---------------|
|  | Estimate             | Sig            | Estimate                  | Sig            | Estimate                       | Sig           |
| <b>Elderly's perception</b>                  |                      |                |                           |                |                                |               |
| Factor 1 Public Transport and Street Design  | -0.305               | 0.452          | -0.024                    | 0.922          | -0.497                         | 0.063         |
| Factor 2 Quality of Open Space               | 0.213                | 0.559          | 0.120                     | 0.623          | -0.280                         | 0.286         |
| Factor 3 Social Consideration and Management | 0.073                | 0.845          | 0.075                     | 0.770          | -0.094                         | 0.739         |
| Factor 4 Facilities of Open Space            | -0.036               | 0.916          | -0.643                    | 0.009**        | -0.083                         | 0.741         |
| Factor 5 Walking Environment                 | <b>0.816</b>         | <b>0.007**</b> | -0.176                    | 0.364          | 0.166                          | 0.432         |
| Factor 6 Living Condition                    | <b>0.943</b>         | <b>0.012*</b>  | 0.214                     | 0.354          | <b>0.515</b>                   | <b>0.038*</b> |
| Factor 7 Availability and Proximity          | <b>1.694</b>         | <b>0.000**</b> | <b>0.696</b>              | <b>0.004**</b> | -0.113                         | 0.660         |
| Factor 8 Personal Consideration              | 0.626                | 0.072          | 0.110                     | 0.633          | -0.194                         | 0.465         |
| Factor 9 Available leisure time and security | 0.217                | 0.463          | 0.138                     | 0.506          | 0.050                          | 0.821         |
| <b>Personal factor</b>                       |                      |                |                           |                |                                |               |
| Intention to visit open space                |                      |                |                           |                |                                |               |
| <i>Chat with friends</i>                     | -1.012               | 0.142          | 0.024                     | 0.959          | <b>0.992</b>                   | <b>0.043*</b> |
| <i>Physical exercises</i>                    | <b>2.988</b>         | <b>0.006**</b> | 0.213                     | 0.748          | -0.509                         | 0.545         |
| <i>Group activity</i>                        | 0.383                | 0.682          | 0.596                     | 0.341          | 0.837                          | 0.241         |
| <i>Landscape</i>                             | 0.567                | 0.551          | -1.347                    | 0.042*         | 0.057                          | 0.939         |
| <i>Facilities</i>                            | -1.087               | 0.286          | -0.116                    | 0.870          | -1.150                         | 0.134         |
| <i>Rest</i>                                  | 3.578                | 0.061          | -1.045                    | 0.391          | -3.684                         | 0.009**       |
| <i>Accompany</i>                             | 4.389                | 0.251          | -1.161                    | 0.525          | 14.942                         | 0.989         |
| House size                                   | 0.985                | 0.092          | 0.373                     | 0.342          | 0.448                          | 0.311         |
| <b>Control Variables</b>                     |                      |                |                           |                |                                |               |
| Age  | -0.079               | 0.816          | <b>0.624</b>              | <b>0.009**</b> | 0.282                          | 0.269         |
| Education                                    | <b>-0.854</b>        | <b>0.039*</b>  | <b>-0.969</b>             | <b>0.001**</b> | <b>0.648</b>                   | <b>0.030*</b> |
| Health                                       | 0.061                | 0.867          | <b>0.579</b>              | <b>0.025*</b>  | -0.128                         | 0.618         |

|                        |        |       |        |       |              |               |
|------------------------|--------|-------|--------|-------|--------------|---------------|
| Gender                 |        |       |        |       |              |               |
| Male                   | -0.023 | 0.971 | 0.287  | 0.485 | <b>0.935</b> | <b>0.038*</b> |
| Female                 | 0      | .0    | 0      | .0    | 0            | .0            |
| <b>Prob&gt;Chi2</b>    | 0.0000 |       | 0.0000 |       | 0.0000       |               |
| <b>Pseudo r-square</b> | 0.2848 |       | 0.2007 |       | 0.1808       |               |

Appendix G.6 Male elderly

|  | Model 1: Like |                | Model 2: Frequency |                | Model 3: Length of stay |                |
|--|---------------|----------------|--------------------|----------------|-------------------------|----------------|
|  | Estimate      | Sig            | Estimate           | Sig            | Estimate                | Sig            |
| <b>Elderly's perception</b>                  |               |                |                    |                |                         |                |
| Factor 1 Public Transport and Street Design  | -0.370        | 0.055          | -0.394             | 0.010*         | 0.110                   | 0.472          |
| Factor 2 Quality of Open Space               | 0.013         | 0.937          | -0.353             | 0.010*         | -0.041                  | 0.761          |
| Factor 3 Social Consideration and Management | -0.077        | 0.651          | <b>0.285</b>       | <b>0.045*</b>  | 0.024                   | 0.859          |
| Factor 4 Facilities of Open Space            | -0.374        | 0.038*         | -0.351             | 0.021*         | -0.436                  | 0.005**        |
| Factor 5 Walking Environment                 | 0.168         | 0.329          | -0.027             | 0.856          | -0.022                  | 0.876          |
| Factor 6 Living Condition                    | -0.228        | 0.224          | -0.233             | 0.147          | 0.215                   | 0.161          |
| Factor 7 Availability and Proximity          | <b>0.451</b>  | <b>0.008**</b> | <b>0.291</b>       | <b>0.043*</b>  | -0.056                  | 0.689          |
| Factor 8 Personal Consideration              | 0.194         | 0.218          | 0.125              | 0.357          | <b>0.285</b>            | <b>0.032*</b>  |
| Factor 9 Available leisure time and security | 0.120         | 0.517          | <b>0.389</b>       | <b>0.010*</b>  | 0.124                   | 0.413          |
| <b>Personal factor</b>                       |               |                |                    |                |                         |                |
| Intention to visit open space                |               |                |                    |                |                         |                |
| <i>Chat with friends</i>                     | -0.538        | 0.138          | -0.084             | 0.778          | -0.030                  | 0.920          |
| <i>Physical exercises</i>                    | 0.311         | 0.475          | <b>0.773</b>       | <b>0.032*</b>  | <b>0.779</b>            | <b>0.026*</b>  |
| <i>Group activity</i>                        | 0.353         | 0.605          | <b>1.544</b>       | <b>0.005**</b> | 0.575                   | 0.304          |
| <i>Landscape</i>                             | 0.063         | 0.903          | -0.123             | 0.773          | -0.293                  | 0.481          |
| <i>Facilities</i>                            | -0.131        | 0.787          | 0.225              | 0.562          | -0.189                  | 0.621          |
| <i>Rest</i>                                  | 0.543         | 0.409          | 0.168              | 0.756          | 0.449                   | 0.420          |
| <i>Accompany</i>                             | 0.293         | 0.919          | 2.708              | 0.241          | 14.323                  | 0.987          |
| House size                                   | 0.388         | 0.259          | -0.235             | 0.401          | <b>0.652</b>            | <b>0.016*</b>  |
| Age  | 0.097         | 0.566          | <b>0.661</b>       | <b>0.000**</b> | <b>0.464</b>            | <b>0.002**</b> |
| Education                                    | -0.423        | 0.058          | -0.111             | 0.543          | <b>0.358</b>            | <b>0.049*</b>  |
| Health                                       | 0.218         | 0.275          | -0.069             | 0.666          | -0.247                  | 0.137          |
| <b>Prob&gt;Chi2</b>                          | 0.0000        |                | 0.0000             |                | 0.0000                  |                |
| <b>Pseudo r-square</b>                       | 0.0882        |                | 0.1455             |                | 0.0852                  |                |

Appendix G.7 Female elderly

|  | Model 1: Like |               | Model 2: Frequency |                | Model 3: Length of stay |                |
|--|---------------|---------------|--------------------|----------------|-------------------------|----------------|
|  | Estimate      | Sig           | Estimate           | Sig            | Estimate                | Sig            |
| <b>Elderly's perception</b>                  |               |               |                    |                |                         |                |
| Factor 1 Public Transport and Street Design  | -0.398        | 0.008**       | -0.068             | 0.543          | -0.152                  | 0.189          |
| Factor 2 Quality of Open Space               | 0.188         | 0.243         | -0.070             | 0.589          | -0.060                  | 0.633          |
| Factor 3 Social Consideration and Management | 0.118         | 0.419         | -0.019             | 0.866          | 0.039                   | 0.733          |
| Factor 4 Facilities of Open Space            | -0.043        | 0.773         | -0.232             | 0.041*         | 0.190                   | 0.087          |
| Factor 5 Walking Environment                 | 0.180         | 0.228         | -0.038             | 0.738          | 0.070                   | 0.538          |
| Factor 6 Living Condition                    | 0.003         | 0.985         | 0.191              | 0.113          | -0.032                  | 0.800          |
| Factor 7 Availability and Proximity          | 0.107         | 0.476         | 0.121              | 0.331          | -0.231                  | 0.067          |
| Factor 8 Personal Consideration              | <b>0.348</b>  | <b>0.040*</b> | 0.100              | 0.439          | 0.058                   | 0.666          |
| Factor 9 Available leisure time and security | 0.026         | 0.863         | <b>0.268</b>       | <b>0.019*</b>  | 0.152                   | 0.177          |
| <b>Personal factor</b>                       |               |               |                    |                |                         |                |
| Intention to visit open space                |               |               |                    |                |                         |                |
| <i>Chat with friends</i>                     | 0.091         | 0.792         | 0.144              | 0.583          | 0.173                   | 0.519          |
| <i>Physical exercises</i>                    | 0.621         | 0.160         | -0.041             | 0.903          | <b>1.154</b>            | <b>0.001**</b> |
| <i>Group activity</i>                        | 0.465         | 0.335         | -0.157             | 0.662          | 0.458                   | 0.218          |
| <i>Landscape</i>                             | 0.102         | 0.829         | -1.548             | 0.000**        | 0.409                   | 0.259          |
| <i>Facilities</i>                            | 0.014         | 0.976         | -0.246             | 0.466          | -0.303                  | 0.387          |
| <i>Rest</i>                                  | -0.735        | 0.304         | -1.229             | 0.032*         | -0.172                  | 0.778          |
| <i>Accompany</i>                             | <b>2.907</b>  | <b>0.033*</b> | -1.696             | 0.165          | 1.371                   | 0.301          |
| House size                                   | -0.033        | 0.914         | 0.272              | 0.257          | -0.145                  | 0.542          |
| Age  | 0.175         | 0.282         | <b>0.600</b>       | <b>0.000**</b> | 0.189                   | 0.139          |
| Education                                    | -0.236        | 0.269         | <b>-0.439</b>      | <b>0.010**</b> | -0.124                  | 0.462          |
| Health                                       | -0.161        | 0.417         | 0.203              | 0.181          | -0.056                  | 0.718          |
| <b>Prob&gt;Chi2</b>                          | 0.0000        |               | 0.0000             |                | 0.0000                  |                |
| <b>Pseudo r-square</b>                       | 0.0686        |               | 0.1143             |                | 0.0627                  |                |

Appendix G.8 Younger elderly

|  | <b>Model 1: Like</b> |               | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |               |
|--|----------------------|---------------|---------------------------|----------------|--------------------------------|---------------|
|  | Estimate             | Sig           | Estimate                  | Sig            | Estimate                       | Sig           |
| <b>Elderly's perception</b>                  |                      |               |                           |                |                                |               |
| Factor 1 Public Transport and Street Design  | -0.477               | 0.001**       | -0.212                    | 0.045*         | -0.016                         | 0.884         |
| Factor 2 Quality of Open Space               | 0.246                | 0.089         | -0.184                    | 0.096          | -0.065                         | 0.559         |
| Factor 3 Social Consideration and Management | 0.075                | 0.571         | <b>0.241</b>              | <b>0.024*</b>  | -0.029                         | 0.777         |
| Factor 4 Facilities of Open Space            | -0.214               | 0.128         | -0.210                    | 0.057          | -0.021                         | 0.842         |
| Factor 5 Walking Environment                 | <b>0.326</b>         | <b>0.015*</b> | 0.026                     | 0.801          | 0.093                          | 0.367         |
| Factor 6 Living Condition                    | 0.029                | 0.839         | -0.042                    | 0.709          | 0.070                          | 0.528         |
| Factor 7 Availability and Proximity          | <b>0.290</b>         | <b>0.022*</b> | 0.039                     | 0.723          | -0.138                         | 0.180         |
| Factor 8 Personal Consideration              | <b>0.316</b>         | <b>0.033*</b> | 0.148                     | 0.202          | <b>0.268</b>                   | <b>0.022*</b> |
| Factor 9 Available leisure time and security | 0.056                | 0.680         | <b>0.377</b>              | <b>0.001**</b> | 0.062                          | 0.560         |
| <b>Personal factors</b>                      |                      |               |                           |                |                                |               |
| Intention to visit open space                |                      |               |                           |                |                                |               |
| <i>Chat with friends</i>                     | -0.509               | 0.105         | -0.067                    | 0.780          | -0.243                         | 0.311         |
| <i>Physical exercises</i>                    | 0.188                | 0.647         | 0.474                     | 0.120          | <b>0.796</b>                   | <b>0.010*</b> |
| <i>Group activity</i>                        | 0.318                | 0.495         | 0.652                     | 0.057          | 0.450                          | 0.176         |
| <i>Landscape</i>                             | -0.186               | 0.666         | -1.009                    | 0.002**        | 0.385                          | 0.245         |
| <i>Facilities</i>                            | -0.307               | 0.459         | -0.001                    | 0.998          | -0.477                         | 0.116         |
| <i>Rest</i>                                  | -0.277               | 0.680         | -0.540                    | 0.308          | 0.634                          | 0.242         |
| <i>Accompany</i>                             | <b>2.839</b>         | <b>0.040*</b> | -0.835                    | 0.539          | 15.303                         | 0.979         |
| House size                                   | 0.322                | 0.282         | 0.280                     | 0.229          | 0.077                          | 0.736         |
| Education                                    | <b>-0.444</b>        | <b>0.019*</b> | <b>-0.445</b>             | <b>0.002**</b> | 0.104                          | 0.461         |
| Health                                       | 0.125                | 0.482         | -0.085                    | 0.529          | -0.154                         | 0.278         |
| Gender                                       |                      |               |                           |                |                                |               |
| Male   | 0.039                | 0.896         | -0.118                    | 0.596          | 0.331                          | 0.142         |

|                        |        |    |        |    |        |    |
|------------------------|--------|----|--------|----|--------|----|
| Female                 | 0      | .0 | 0      | .0 | 0      | .0 |
| <b>Prob&gt;Chi2</b>    | 0.0000 |    | 0.0000 |    | 0.0000 |    |
| <b>Pseudo r-square</b> | 0.1150 |    | 0.0793 |    | 0.0408 |    |

Appendix G.9 Older elderly

|  | <b>Model 1: Like</b> |               | <b>Model 2: Frequency</b> |                | <b>Model 3: Length of stay</b> |                |
|--|----------------------|---------------|---------------------------|----------------|--------------------------------|----------------|
|  | Estimate             | Sig           | Estimate                  | Sig            | Estimate                       | Sig            |
| <b>Elderly's perception</b>                  |                      |               |                           |                |                                |                |
| Factor 1 Public Transport and Street Design  | -0.006               | 0.977         | -0.190                    | 0.274          | -0.109                         | 0.537          |
| Factor 2 Quality of Open Space               | -0.256               | 0.202         | -0.200                    | 0.271          | -0.132                         | 0.435          |
| Factor 3 Social Consideration and Management | -0.169               | 0.399         | -0.317                    | 0.061          | -0.020                         | 0.908          |
| Factor 4 Facilities of Open Space            | -0.298               | 0.135         | -0.448                    | 0.007**        | -0.028                         | 0.868          |
| Factor 5 Walking Environment                 | -0.197               | 0.341         | -0.103                    | 0.546          | -0.147                         | 0.403          |
| Factor 6 Living Condition                    | -0.221               | 0.310         | 0.165                     | 0.363          | 0.165                          | 0.373          |
| Factor 7 Availability and Proximity          | -0.123               | 0.613         | <b>0.574</b>              | <b>0.003**</b> | -0.165                         | 0.418          |
| Factor 8 Personal Consideration              | 0.307                | 0.114         | 0.049                     | 0.756          | -0.022                         | 0.888          |
| Factor 9 Available leisure time and security | 0.052                | 0.816         | 0.164                     | 0.360          | 0.295                          | 0.104          |
| <b>Personnel factor</b>                      |                      |               |                           |                |                                |                |
| Intention to visit open space                |                      |               |                           |                |                                |                |
| <i>Chat with friends</i>                     | 0.096                | 0.816         | 0.147                     | 0.669          | 0.396                          | 0.270          |
| <i>Physical exercises</i>                    | 0.691                | 0.154         | -0.260                    | 0.538          | <b>1.473</b>                   | <b>0.001**</b> |
| <i>Group activity</i>                        | 0.273                | 0.698         | -0.120                    | 0.835          | 0.958                          | 0.245          |
| <i>Landscape</i>                             | 0.300                | 0.641         | -1.377                    | 0.009**        | -0.504                         | 0.339          |
| <i>Facilities</i>                            | 0.258                | 0.662         | -0.262                    | 0.604          | 0.088                          | 0.864          |
| <i>Rest</i>                                  | 0.522                | 0.458         | -0.613                    | 0.300          | -0.703                         | 0.256          |
| <i>Accompany</i>                             | 0.312                | 0.907         | 1.683                     | 0.441          | -0.699                         | 0.710          |
| House size                                   | -0.022               | 0.950         | -0.065                    | 0.823          | 0.574                          | 0.073          |
| Education                                    | <b>-0.504</b>        | <b>0.037*</b> | -0.272                    | 0.191          | -0.181                         | 0.407          |
| Health                                       | -0.162               | 0.467         | 0.288                     | 0.129          | 0.066                          | 0.728          |
| Gender                                       |                      |               |                           |                |                                |                |
| Male   | -0.287               | 0.447         | -0.055                    | 0.862          | 0.345                          | 0.283          |

|                        |        |    |        |    |        |    |
|------------------------|--------|----|--------|----|--------|----|
| Female                 | 0      | .0 | 0      | .0 | 0      | .0 |
| <b>Prob&gt;Chi2</b>    | 0.0000 |    | 0.0000 |    | 0.0000 |    |
| <b>Pseudo r-square</b> | 0.0434 |    | 0.0713 |    | 0.1127 |    |

Appendix H Results of Correlation Analysis for satisfaction level with open space

Appendix H.1 All selected districts

|                                     | <b>Model: Satisfaction</b> |
|-------------------------------------|----------------------------|
| <b>Surrounding environment</b>      |                            |
| Proximity                           | .018<br>(.671)             |
| Residential density                 | .030<br>(.492)             |
| SES                                 | .058<br>(.180)             |
| Amenities around open space         | .009<br>(.837)             |
| Transport station around open space | .055<br>(.200)             |
| POS number                          | <b>-.127**</b><br>(.003)   |
| POS integration                     | <b>-.143**</b><br>(.001)   |
| <b>Open space quality</b>           |                            |
| Size                                | <b>.244**</b><br>(.000)    |
| Facility type                       | <b>.338**</b><br>(.000)    |
| Facility quality                    | <b>.145**</b><br>(.001)    |
| Urban furniture                     | <b>.212**</b><br>(.000)    |
| Landscape                           | <b>.344**</b><br>(.000)    |
| Maintenance                         | <b>.113**</b><br>(.009)    |
| Crowdedness                         | <b>.204**</b><br>(.000)    |
| Terrain                             | -.064<br>(.138)            |
| Quietness                           | <b>.221**</b><br>(.000)    |
| Pollution                           | .018<br>(.672)             |
| Pedestrian environment              | .083<br>(.054)             |

Appendix H.2 Urban old districts and new towns

|                                     | <b>Model 1: Satisfaction<br/>(Urban old district)</b> | <b>Model 2: Satisfaction<br/>(New town)</b> |
|-------------------------------------|---|---|
| <b>Surrounding environment</b>      |   |   |
| Proximity                           | .068<br>(.262)  | .019<br>(.755)                              |
| Residential density                 | .039<br>(.520)  | .058<br>(.343)                              |
| SES                                 | .061<br>(.320)  | <b>-.132*</b><br>(.032)                     |
| Amenities around open space         | .075<br>(.219)  | -.010<br>(.872)                             |
| Transport station around open space | .078<br>(.202)  | .018<br>(.765)                              |
| POS number                          | -.109<br>(.072)                                       | -.027<br>(.657)                             |
| POS integration                     | -.092<br>(.129)                                       | -.074<br>(.230)                             |
| <b>Open space quality</b>           |   |   |
| Size                                | <b>.321**</b><br>(.000)                               | <b>.178**</b><br>(.004)                     |
| Facility type                       | <b>.322**</b><br>(.000)                               | <b>.353**</b><br>(.000)                     |
| Facility quality                    | <b>.321**</b><br>(.000)                               | <b>.204**</b><br>(.001)                     |
| Urban furniture                     | <b>.330**</b><br>(.000)                               | <b>.125*</b><br>(.042)                      |
| Landscape                           | <b>.399**</b><br>(.000)                               | <b>.257**</b><br>(.000)                     |
| Maintenance                         | <b>.338**</b><br>(.000)                               | -.036<br>(.563)                             |
| Crowdedness                         | <b>.351**</b><br>(.000)                               | .038<br>(.540)                              |
| Terrain                             | <b>-.262**</b><br>(.000)                              | .099<br>(.106)                              |
| Quietness                           | <b>.321**</b><br>(.000)                               | .105<br>(.089)                              |
| Pollution                           | <b>.228**</b><br>(.000)                               | <b>-.176**</b><br>(.004)                    |
| Pedestrian environment              | .031<br>(.617)  | .085<br>(.168)                              |

Appendix H.3 Association between facility type and satisfaction level with open space

|   | <b>Model 1:<br/>Satisfaction<br/>(full model)</b> | <b>Model 2:<br/>Satisfaction<br/>(Urban old district)</b> | <b>Model 3:<br/>Satisfaction<br/>(New town)</b> |
|---|---|---|---|
| <b>Facility type</b>                    |   |   |   |
| Fitness/<br>Entertainment<br>facilities | .068<br>(.117)                                    | .017<br>(.782)  | <b>.137*</b><br>(.025)                          |
| Commercial<br>facilities                | <b>.258**</b><br>(.000)                           | <b>.271**</b><br>(.000)                                   | <b>.235**</b><br>(.000)                         |
| Rain and sun-<br>shading devices        | <b>.162**</b><br>(.000)                           | <b>.172**</b><br>(.004)                                   | <b>.188**</b><br>(.002)                         |
| Washroom facilities                     | <b>.265**</b><br>(.000)                           | <b>.209**</b><br>(.001)                                   | <b>.298**</b><br>(.000)                         |
| Drinking water<br>fountain              | <b>.197**</b><br>(.000)                           | <b>.143*</b><br>(.019)                                    | <b>.229**</b><br>(.000)                         |
| boundary treatments<br>and furniture    | <b>.279**</b><br>(.000)                           | <b>.414**</b><br>(.000)                                   | <b>.237**</b><br>(.000)                         |
| <b>Urban Furniture</b>                  |   |   |   |
| Seats/ benches                          | .012<br>(.776)                                    | <b>.240**</b><br>(.000)                                   | -.050<br>(.416)                                 |
| Directional sign                        | <b>.272**</b><br>(.000)                           | <b>.392**</b><br>(.000)                                   | <b>.163**</b><br>(.008)                         |
| Lighting facilities                     | .083<br>(0.54)                                    | <b>.225**</b><br>(.000)                                   | -.013<br>(.830)                                 |
| Sculpture                               | <b>.212**</b><br>(.000)                           | <b>.164**</b><br>(.007)                                   | <b>.239**</b><br>(.000)                         |
| Trash cans                              | -.048<br>(.263)                                   | <b>.135*</b><br>(.027)                                    | <b>-.232**</b><br>(.000)                        |

Appendix H.4 Public housing and Private housing

|                                     | <b>Model 1: Satisfaction<br/>(Public housing estate)</b> | <b>Model 2: Satisfaction<br/>(Private housing estate)</b> |
|-------------------------------------|--|---|
| <b>Surrounding environment</b>      |  |   |
| Proximity                           | -.001<br>(.992)  | -.025<br>(.782)   |
| Residential density                 | -.063<br>(.233)  | <b>.228**<br/>(.001)</b>                                  |
| SES                                 | .083<br>(.114)   | <b>.254**<br/>(.005)</b>                                  |
| Amenities around open space         | -.020<br>(.702)  | .072<br>(.427)  |
| Transport station around open space | .023<br>(.661)   | .144<br>(.111)  |
| POS number                          | <b>-.162**<br/>(.002)</b>                                | <b>-.251**<br/>(.005)</b>                                 |
| POS integration                     | <b>-.108*<br/>(.040)</b>                                 | <b>-.336**<br/>(.000)</b>                                 |
| <b>Open space quality</b>           |  |   |
| Size                                | <b>.146**<br/>(.005)</b>                                 | <b>.315**<br/>(.000)</b>                                  |
| Facility type                       | <b>.226**<br/>(.000)</b>                                 | <b>.490**<br/>(.000)</b>                                  |
| Facility quality                    | .075<br>(.157)   | .102<br>(.262)  |
| Urban furniture                     | <b>.125*<br/>(.017)</b>                                  | <b>.225*<br/>(.012)</b>                                   |
| Landscape                           | <b>.240**<br/>(.000)</b>                                 | <b>.393**<br/>(.000)</b>                                  |
| Maintenance                         | .057<br>(.276)   | .051<br>(.573)  |
| Crowdedness                         | <b>.108*<br/>(.040)</b>                                  | <b>.249**<br/>(.006)</b>                                  |
| Terrain                             | -.092<br>(.080)  | -.059<br>(.519)   |
| Quietness                           | <b>.187**<br/>(.000)</b>                                 | <b>.305**<br/>(.001)</b>                                  |
| Pollution                           | .029<br>(.582)   | .037<br>(.683)  |
| Pedestrian environment              | .018<br>(.725)   | .169<br>(.062)  |

Appendix H.5 Male elderly and Female elderly

|                                     | <b>Model 1: Satisfaction<br/>(Male)</b> | <b>Model 2: Satisfaction<br/>(Female)</b> |
|-------------------------------------|---|---|
| <b>Surrounding environment</b>      |   |   |
| Proximity                           | .008<br>(.899)                          | .025<br>(.672)                            |
| Residential density                 | .037<br>(.567)                          | .020<br>(.732)                            |
| SES                                 | .024<br>(.708)                          | .083<br>(.156)                            |
| Amenities around open space         | .031<br>(.630)                          | -.012<br>(.832)                           |
| Transport station around open space | .121<br>(.062)                          | -.012<br>(.834)                           |
| POS number                          | <b>-.150*</b><br><b>(.020)</b>          | -.097<br>(.096)                           |
| POS integration                     | <b>-.135*</b><br><b>(.037)</b>          | <b>-.143*</b><br><b>(.014)</b>            |
| <b>Open space quality</b>           |   |   |
| Size                                | <b>.257**</b><br><b>(.000)</b>          | <b>.221**</b><br><b>(.000)</b>            |
| Facility type                       | <b>.324**</b><br><b>(.000)</b>          | <b>.337**</b><br><b>(.000)</b>            |
| Facility quality                    | .128<br>(.051)                          | <b>.167**</b><br><b>(.004)</b>            |
| Urban furniture                     | <b>.230**</b><br><b>(.000)</b>          | <b>.176**</b><br><b>(.002)</b>            |
| Landscape                           | <b>.399**</b><br><b>(.000)</b>          | <b>.270**</b><br><b>(.000)</b>            |
| Maintenance                         | <b>.156*</b><br><b>(.016)</b>           | .068<br>(.245)                            |
| Crowdedness                         | <b>.217**</b><br><b>(.001)</b>          | <b>.195**</b><br><b>(.001)</b>            |
| Terrain                             | -.111<br>(.087)                         | -.013<br>.829                             |
| Quietness                           | <b>.193**</b><br><b>(.003)</b>          | <b>.234**</b><br><b>(.000)</b>            |
| Pollution                           | .028<br>(.662)                          | .006<br>(.914)                            |
| Pedestrian environment              | .068<br>(.296)                          | .081<br>(.163)                            |

Appendix H.6 Younger elderly and Older elderly

|                                     | <b>Model 1: Satisfaction<br/>(&lt;75)</b> | <b>Model 2: Satisfaction<br/>(≥75)</b> |
|-------------------------------------|---|--|
| <b>Surrounding environment</b>      |   |  |
| Proximity                           | -.002<br>(.965)                           | .049<br>(.483)                         |
| Residential density                 | .029<br>(.593)                            | .024<br>(.736)                         |
| SES                                 | .039<br>(.480)                            | .095<br>(.174)                         |
| Amenities around open space         | -.012<br>(.824)                           | .078<br>(.264)                         |
| Transport station around open space | .023<br>(.673)                            | .100<br>(.154)                         |
| POS number                          | <b>-.133*</b><br><b>(.016)</b>            | -.113<br>(.108)                        |
| POS integration                     | <b>-.151**</b><br><b>(.006)</b>           | -.113<br>(.105)                        |
| <b>Open space quality</b>           |   |  |
| Size                                | <b>.255**</b><br><b>(.000)</b>            | <b>.249**</b><br><b>(.000)</b>         |
| Facility type                       | <b>.339**</b><br><b>(.000)</b>            | <b>.340**</b><br><b>(.000)</b>         |
| Facility quality                    | <b>.150**</b><br><b>(.006)</b>            | <b>.141*</b><br><b>(.049)</b>          |
| Urban furniture                     | <b>.234**</b><br><b>(.000)</b>            | <b>.181**</b><br><b>(.009)</b>         |
| Landscape                           | <b>.364**</b><br><b>(.000)</b>            | <b>.304**</b><br><b>(.000)</b>         |
| Maintenance                         | <b>.178**</b><br><b>(.001)</b>            | .039<br>(.576)                         |
| Crowdedness                         | <b>.258**</b><br><b>(.000)</b>            | .091<br>(.193)                         |
| Terrain                             | -.099<br>(.071)                           | .003<br>(.980)                         |
| Quietness                           | <b>.193**</b><br><b>(.000)</b>            | <b>.295**</b><br><b>(.000)</b>         |
| Pollution                           | .071<br>(.196)                            | -.034<br>(.536)                        |
| Pedestrian environment              | .035<br>(.530)                            | <b>.177*</b><br><b>(.011)</b>          |

Appendix I Relative importance of the factors associated with elderly's visits to public open space

Appendix I.1 Urban old district and New town

| Variables                               | Urban old districts |            | New towns |            | Significant difference (Mann-Whitney) |
|---|---------------------|------------|-----------|------------|---------------------------------------|
|   | Mean                | Rank order | Mean      | Rank order |                                       |
| C3 Cleanliness                          | 4.27                | 1          | 4.5       | 1          | Yes=New town > Urban old district     |
| C2 Pollution                            | 4.22                | 2          | 4.48      | 2          | Yes=New town > Urban old district     |
| C5 Maintenance                          | 4.15                | 3          | 4.26      | 4          | Yes=New town > Urban old district     |
| C1 Noise                                | 4.14                | 4          | 4.16      | 6          | No                                    |
| C4 Safety                               | 4.14                | 4          | 4.29      | 3          | Yes=New town > Urban old district     |
| C7 Landscape                            | 4.1                 | 6          | 4.21      | 5          | Yes=New town > Urban old district     |
| C11 Design for all weather condition    | 4.1                 | 6          | 4.1       | 8          | No                                    |
| A5 Available leisure time               | 4.09                | 8          | 3.99      | 15         | Yes=Urban old district > New town     |
| C12 Terrain (in open space)             | 4.07                | 9          | 4.09      | 10         | No                                    |
| C14 Crowdedness                         | 4.03                | 10         | 4.08      | 11         | No                                    |
| B10 Terrain (on the way)                | 4.01                | 11         | 3.91      | 20         | Yes=Urban old district > New town     |
| B12 Walkability                         | 4                   | 12         | 3.98      | 17         | No                                    |
| C10 Urban furniture                     | 4                   | 12         | 3.76      | 23         | Yes=Urban old district > New town     |
| C16 Security                            | 3.99                | 14         | 4.08      | 11         | Yes=New town > Urban old district     |
| C19 Physical activity                   | 3.97                | 15         | 4.1       | 8          | Yes=New town > Urban old district     |
| B1 Availability                         | 3.96                | 16         | 3.74      | 24         | Yes=Urban old district > New town     |
| C13 Barrier free design (in open space) | 3.95                | 17         | 3.77      | 22         | No                                    |

|                                      |      |    |      |    |                                   |
|--------------------------------------|------|----|------|----|-----------------------------------|
| B2 Proximity to home                 | 3.94 | 18 | 4.03 | 13 | Yes=New town > Urban old district |
| C6 Size                              | 3.94 | 18 | 4.12 | 7  | Yes=New town > Urban old district |
| C18 Social interaction               | 3.94 | 18 | 3.95 | 18 | No                                |
| B8 Pedestrian safety/traffic speed   | 3.93 | 21 | 3.82 | 21 | No                                |
| C8 Facilities/ amenities             | 3.92 | 22 | 3.99 | 15 | Yes=New town > Urban old district |
| B11 Barrier free design (on the way) | 3.9  | 23 | 3.36 | 32 | Yes=Urban old district > New town |
| C9 Wayfinding system (in open space) | 3.9  | 23 | 3.64 | 27 | Yes=Urban old district > New town |
| C15 Conflict of use                  | 3.88 | 25 | 3.93 | 19 | No                                |
| A6 Health status                     | 3.8  | 26 | 3.71 | 25 | No                                |
| B9 Wayfinding system (on the way)    | 3.8  | 26 | 3.28 | 34 | Yes=Urban old district > New town |
| B3 Proximity to amenities            | 3.75 | 28 | 3.62 | 29 | No                                |
| B13 Street connectivity              | 3.75 | 28 | 3.62 | 29 | No                                |
| A8 Active lifestyle                  | 3.74 | 30 | 3.71 | 25 | No                                |
| B14 Means to public open space       | 3.73 | 31 | 3.08 | 37 | Yes=Urban old district > New town |
| A1 Residential density               | 3.72 | 32 | 3.35 | 33 | Yes=Urban old district > New town |
| C17 Social cohesion                  | 3.69 | 33 | 3.63 | 28 | No                                |
| B7 Travel time                       | 3.68 | 34 | 4.01 | 14 | Yes=New town > Urban old district |
| B6 Cost                              | 3.65 | 35 | 3.03 | 38 | Yes=Urban old district > New town |
| B4 Proximity to public transport     | 3.62 | 36 | 2.97 | 40 | Yes=Urban old district > New town |

|                                     |      |    |      |    |                                   |
|-------------------------------------|------|----|------|----|-----------------------------------|
| B5 Availability of public transport | 3.58 | 37 | 2.97 | 40 | Yes=Urban old district > New town |
| A2 Size of living space             | 3.45 | 38 | 3.21 | 35 | Yes=Urban old district > New town |
| A7 Attractive activities            | 3.43 | 39 | 3.56 | 31 | No                                |
| C20 Social participation            | 3.38 | 40 | 2.98 | 39 | Yes=Urban old district > New town |
| A3 Comfort at home                  | 3.33 | 41 | 3.2  | 36 | No                                |
| A4 Car ownership                    | 1.63 | 42 | 1.68 | 42 | No                                |

## Appendix I.2 Open space user and Less frequent user

| Variables                            | Open space user |      | Less frequent user |      | Significant difference<br>(Mann-Whitney) |
|--------------------------------------|-----------------|------|--------------------|------|--|
|                                      | Mean            | rank | Mean               | rank |  |
| C3 Cleanliness                       | 4.38            | 1    | 3.65               | 1    | Yes=Open space user>Non-user             |
| C2 Pollution                         | 4.35            | 2    | 3.63               | 2    | Yes=Open space user>Non-user             |
| C4 Safety                            | 4.22            | 3    | 3.48               | 5    | Yes=Open space user>Non-user             |
| C5 Maintenance                       | 4.2             | 4    | 3.52               | 4    | Yes=Open space user>Non-user             |
| C7 Landscape                         | 4.15            | 5    | 3.39               | 6    | Yes=Open space user>Non-user             |
| C1 Noise                             | 4.15            | 5    | 3.26               | 10   | Yes=Open space user>Non-user             |
| C11 Design for all weather condition | 4.1             | 7    | 3.63               | 2    | Yes=Open space user>Non-user             |
| C12 Terrain (in open space)          | 4.08            | 8    | 3.29               | 9    | Yes=Open space user>Non-user             |
| C14 Crowdedness                      | 4.05            | 9    | 3.13               | 15   | Yes=Open space user>Non-user             |
| C19 Physical activity                | 4.04            | 10   | 3.14               | 14   | Yes=Open space user>Non-user             |
| A5 Available leisure time            | 4.04            | 10   | 3                  | 17   | Yes=Open space user>Non-user             |
| C6 Size                              | 4.03            | 12   | 3.26               | 10   | Yes=Open space user>Non-user             |
| C16 Security                         | 4.03            | 12   | 3.26               | 10   | Yes=Open space user>Non-user             |
| B2 Proximity to home                 | 3.99            | 14   | 2.92               | 19   | Yes=Open space user>Non-user             |
| B12 Walkability                      | 3.99            | 14   | 2.76               | 28   | Yes=Open space user>Non-user             |
| C8 Facilities/ amenities             | 3.96            | 16   | 3.35               | 7    | Yes=Open space user>Non-user             |
| B10 Terrain (on the way)             | 3.96            | 16   | 2.91               | 21   | Yes=Open space user>Non-user             |
| C18 Social interaction               | 3.94            | 18   | 3.23               | 13   | Yes=Open space user>Non-user             |

|   |      |    |      |    |                              |
|---|------|----|------|----|------------------------------|
| C15 Conflict of use                     | 3.91 | 19 | 3.31 | 8  | Yes=Open space user>Non-user |
| C10 Urban furniture                     | 3.88 | 20 | 3.12 | 16 | Yes=Open space user>Non-user |
| B8 Pedestrian safety/traffic speed      | 3.88 | 20 | 2.69 | 30 | Yes=Open space user>Non-user |
| C13 Barrier free design (in open space) | 3.86 | 22 | 2.9  | 23 | Yes=Open space user>Non-user |
| B1 Availability                         | 3.85 | 23 | 2.81 | 25 | Yes=Open space user>Non-user |
| B7 Travel time                          | 3.84 | 24 | 2.66 | 31 | Yes=Open space user>Non-user |
| C9 Wayfinding system (in open space)    | 3.77 | 25 | 2.91 | 21 | Yes=Open space user>Non-user |
| A6 Health status                        | 3.75 | 26 | 2.8  | 26 | Yes=Open space user>Non-user |
| A8 Active lifestyle                     | 3.72 | 27 | 2.92 | 20 | Yes=Open space user>Non-user |
| B3 Proximity to amenities               | 3.69 | 28 | 2.73 | 29 | Yes=Open space user>Non-user |
| B13 Street connectivity                 | 3.69 | 28 | 2.6  | 33 | Yes=Open space user>Non-user |
| C17 Social cohesion                     | 3.66 | 30 | 2.8  | 26 | Yes=Open space user>Non-user |
| B11 Barrier free design (on the way)    | 3.63 | 31 | 2.61 | 32 | Yes=Open space user>Non-user |
| A1 Residential density                  | 3.54 | 32 | 2.97 | 18 | Yes=Open space user>Non-user |
| B9 Wayfinding system (on the way)       | 3.54 | 32 | 2.42 | 36 | Yes=Open space user>Non-user |
| A7 Attractive activities                | 3.49 | 34 | 2.33 | 41 | Yes=Open space user>Non-user |
| B14 Means to public open space          | 3.41 | 35 | 2.42 | 36 | Yes=Open space user>Non-user |
| B6 Cost                                 | 3.35 | 36 | 2.4  | 38 | Yes=Open space user>Non-user |

|                                     |      |    |      |    |                              |
|-------------------------------------|------|----|------|----|------------------------------|
| A2 Size of living space             | 3.33 | 37 | 2.85 | 24 | Yes=Open space user>Non-user |
| B4 Proximity to public transport    | 3.29 | 38 | 2.37 | 39 | Yes=Open space user>Non-user |
| B5 Availability of public transport | 3.28 | 39 | 2.35 | 40 | Yes=Open space user>Non-user |
| A3 Comfort at home                  | 3.27 | 40 | 2.51 | 35 | Yes=Open space user>Non-user |
| C20 Social participation            | 3.18 | 41 | 2.58 | 34 | Yes=Open space user>Non-user |
| A4 Car ownership                    | 1.65 | 42 | 1.56 | 42 | None                         |

Appendix I.3 Results of ANOVA models predicting satisfaction level with open space using key planning parameters

| <b>Dependent variable</b>                | <b>Sum of squares</b> | <b>df</b> | <b>Mean square</b> | <b>F</b> | <b>Sig.</b> | <b>Observed power</b> |
|--|-----------------------|-----------|--------------------|----------|-------------|-----------------------|
| Cost time                                | 0.006                 | 1         | 0.006              | 0.013    | 0.910       | 0.051                 |
| Size                                     | 5.371                 | 1         | 5.371              | 10.803   | 0.001**     | 0.907                 |
| Facility quality                         | 1.748                 | 1         | 1.748              | 3.515    | 0.061       | 0.465                 |
| Cost time *<br>Size                      | 0.105                 | 2         | 0.052              | 0.105    | 0.900       | 0.066                 |
| Size *<br>Facility quality               | 3.812                 | 1         | 3.812              | 7.669    | 0.006**     | 0.789                 |
| Cost time *<br>Facility quality          | 0.191                 | 2         | 0.096              | 0.192    | 0.825       | 0.080                 |
| Cost time *<br>Size*<br>Facility quality | 0.125                 | 2         | 0.063              | 0.126    | 0.882       | 0.069                 |

## Appendix J Dissemination of project results

### International conference presentations

Esther H.K. Yung (2019) Implication of demographic change: understanding older people's needs of leisure activities, 8th International Conference on Social Science, Durbrovnik, Croatia, 25-26 July, 2019.

Esther H.K. Yung (2019) Preferences of the elderly in visiting public open spaces in urban old districts and new town, Urban China Research Network (UCRN), Nanjing University, Nanjing, 21-23 June, 2019.

### Journal papers to be submitted

Esther H.K. Yung and Siqiang Wang. An integrated framework for understanding preferences of older people in visiting public parks in urban renewal district and new town. *Cities*.

Siqiang Wang and Esther H.K. Yung. Diversity of the elderly people and patterns of use of public open space. *Health and Place*.