A Project entitled

Assessing Accessibility of Urban Parks: An Need-based Approach in Hong Kong

Submitted by

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for the degree of *Bachelor of Education (Honours) (Geography)*

Declaration

I, Ho Mei Yi declare that this research report represents my own work under the supervision of Assistant Professor, Dr CHOW Sin Yin Alice, and that it has not been submitted previously for examination to any tertiary institution.

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Abstract

The growing importance of urban green spaces provision has appeared in the land use planning among compact megapolises, securing a sufficient amount of area in wishes of city liveability. Urban parks are one of the urban green spaces. Policy regarding the accessibility of urban parks in Hong Kong is rigid and lagging. Previous research has delineated the accessibility of urban parks in a need-based approach. The role of race, income level, and age were incorporate in the index. In this research project, I use quantitative method of spatial mapping and questionnaires to refine and elaborate the need-based accessibility. Research objectives are (1) The area of UPs (within 400m walking distance) accommodates the population in the community; (2) The functions of UPs (within 400m walking distance) accommodates the residents' preference. Contrary to what has presented in empirical studies, this research found out the need for park functions varies by age. The income level does not contribute to a variety of park functions preference. The findings indicate an uneven distribution of location and area of urban parks in two study area. It brought policy implications to current maintenance and future panning on urban parks in different neighbourhood design.

1. Problem statement

Urban parks are one of the urban green spaces and public open space areas with a broad range of components. The components are listed out by The International Federation of Parks and Recreation Administration (Konijnendijk et al., 2013). Examples are vegetation, such as woodland, plantings and community gardens, water, and sports complexes. The size of urban parks ranges in scale, from federal park to "pocket parks".

Urban green spaces (UGS) are vital to city liveability and neighbourhoods. UGS examples are urban parks, gardens, sports fields, and other ecosystems, such as wetland (World Health Organisation, 2020). It is evident that urban parks relieve urban island heat effects and contributes to human and social wellbeing (Gupta et al., 2016). Park users strengthen their social ties for place attachment and social resilience (Auyeung et al., 2016). Both active and passive uses of parks provide stress reduction and improvement on self-reported physical and mental health due to improved environmental quality (Konijnendijk et al., 2013). By improving the city's environmental quality, urban parks also contribute to economic development (Wolch et al., 2005). Therefore, megacities place urban parks as an indispensable element during land-use planning.

The distribution of urban parks is gaining increasing spotlight, particularly in compact megalopolises with plenty of lands reserved for urban development. However, the open space provision per person in Hong Kong is lacking behind other Asia megacities. Besides the lack of standardized provision and access to urban parks, accessibility measures employ mainly the radius buffering model without taking the needs of residential community and road network into account. The radius buffering model may exaggerate the actual distance to arrive at urban parks.

The research project aims to examine the accessibility of urban parks through a new spectacle. The results will reveal the accessibility of urban parks that fulfils residents' preferences and the park user's characteristics.

2. Literature Review

2.1. **Traditional approach on accessibility of urban parks**

Accessibility is essential for urban parks to perform the functions mentioned above. Having an accessible and approachable UGS enhances the living quality in the city, especially in a dense city with scarce resources. Nicholls (2001) claims that the level of access to urban parks is a significant indicator of the provision of recreational functions. There are four expressions of accessibility measurement, including gravity model, minimizing travel cost, covering objectives, and minimum distance (Talen, 1998). The standard distance threshold that residents are willing to walk to parks is 400 meters, equivalent to a 5-minute walk (Nicholls, 2001; Boone et al., 2009). This minimum distance threshold has been applied to numbers of empirical research through a simple radius buffering analysis (Cetin, 2015; Gupta et al., 2016; Grunewald et al., 2017). However, the linear buffering approach ignores the network of actual routes. The built environment affects the walking distance of residents (Nicholls, 2001; Gupta et al., 2016). For instance, highway and rivers encountered on the trip increase the travelling distance of park visitors. The radius method is not capable of portraying the accessibility in a real-world situation, but somewhat an exaggerated picture (Gupta et al., 2016). To improve the accuracy of the research, Nicholls (2001) employed a network analysis, the shortest path algorithm based on the minimum distance measurement, to perform a network analysis in the Geographical Information System (GIS) (Talen, 1998).

2.2. **Reconceptualising accessibility of urban parks**

Distributional fairness of urban parks

Meanwhile, the distributional fairness of scarce resource in the field of social geography draws researchers' attention beyond the overall accessibility of UGS. The recreational resources are commonly allocated according to the predefined standards, for instance, by travelling distance of 400 meters and per capita allocation without noticing the socio-economic and household characteristics of the area (Talen, 1998). Boone, Buckley, Grove and Sister (2009) created a need index based on age and socio-economic status and identified that preferred park facilities coincide with the residents' characteristics in the United States. In terms of age groups, the elderly and children are the high-need population. The elderly prefer passive functions for socializing, such as sitting area in the park, while middle-aged inhabitants prefer a more structured playground for their children (Wolch, 2005). High- and middle-income families search for less-structured and natural urban parks for exploring and playing since private yards, and playgrounds are offered along with their property (Wolch, 2005; Boone et al., 2009). The authors put them as the low-need population due to the fewer needs for parks within walking distance. The park acreage per capita of African American and the inner-city population is significantly lower than the white and suburbs communities (Boone et al., 2009). However, empirical research cannot be duplicated to Hong Kong since it is a compact city without significant segregation. Lo and Jim (2010) further replenish the personal preference of using UGS in the context of Hong Kong. The scope of accessibility of urban parks is evolving, allowing researchers to study accessibility to urban parks in connection to fairness and justice.

Currently, there are limited empirical studies regarding the equitable accessibility of urban parks in Hong Kong. First, there are no standards on park area per capita accessible within a certain distance. Urban parks in Hong Kong are under the classification of the district and local open spaces. The government standardized the district and local open space provision based on the minimum standards of 1m2 per person, respectively (Planning Department, 2020). The area per capita is varied from districts but still meets the standard, while urban parks are found less accessible in terms of distance (within 400 meters), particularly in Islands, Sai Kung and Yuen Long Districts (Chow, 2018). Second, the accessibility measurement is conducted in the simple radius buffering method. The measurement further exaggerates the accessibility of Hong Kong owing to the hilly urban landscape.

A comprehensive accessibility assessment addressing the compact city nature is under-researched. There is a lack of need-based mapping in Southeast Asian cities, including Hong Kong (Nicholas, 2001). Research studies in Hong Kong see accessibility in a general picture and overlook population density and functional preferences. Adequate and fair accessibility of different groups is paramount in a compact city, as Hong Kong is regarded as one of the highly dense population area (Tian, Jim & Liu, 2017). The scarce recreational resources allocation in an intensive urban area is worth investigating.

3. Research Questions

The main research objective to examine the accessibility of urban parks in the selected areas through a need-based approach. The sub-objectives are constructed on the framework (figure 1), which supports the main objective.

(1) The area of UPs (within 400m walking distance) accommodates the population in the community.

(2) The functions of UPs (within 400m walking distance) accommodates the residents' preference.

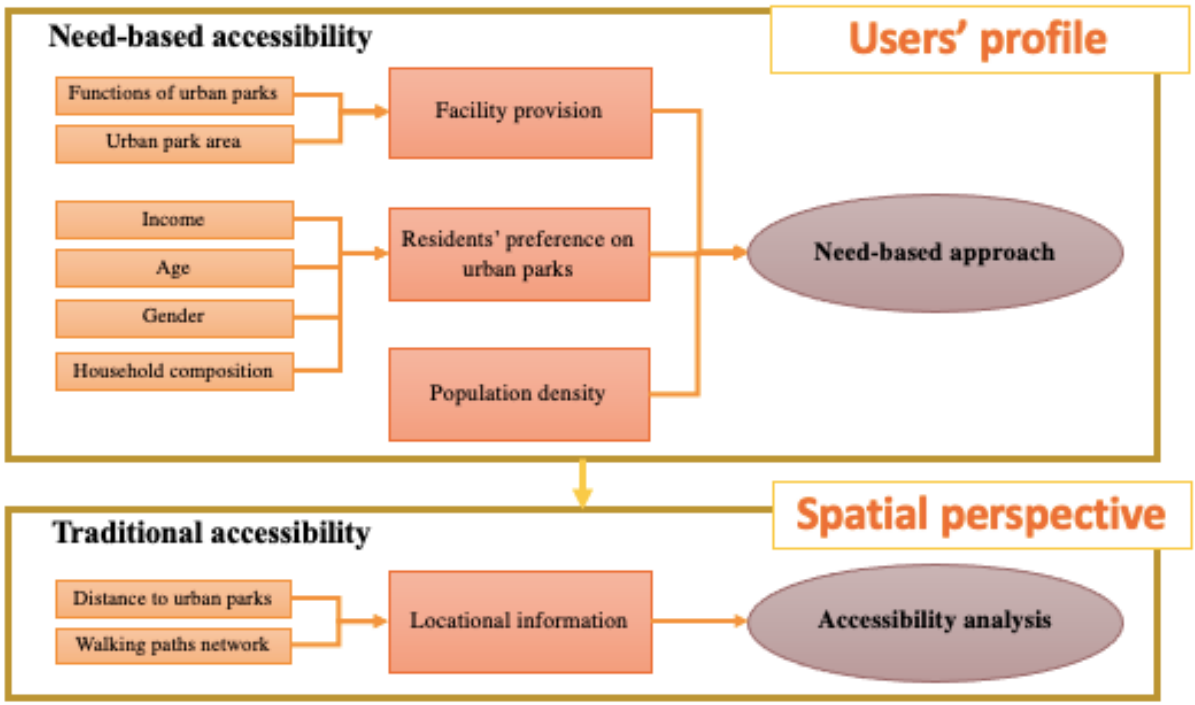

Figure 1 Conceptual framework of the research project

4. Research Methodology

4.1. Research design and method

The research design is expected to be explanatory and evaluation research. It describes and makes sense of a need-based explanation on how residents' preference of urban parks affects the degree of use of urban parks (see figure 1). Figure 2 shows the research timeline, and table 1 is a list of data collected for the analysis.

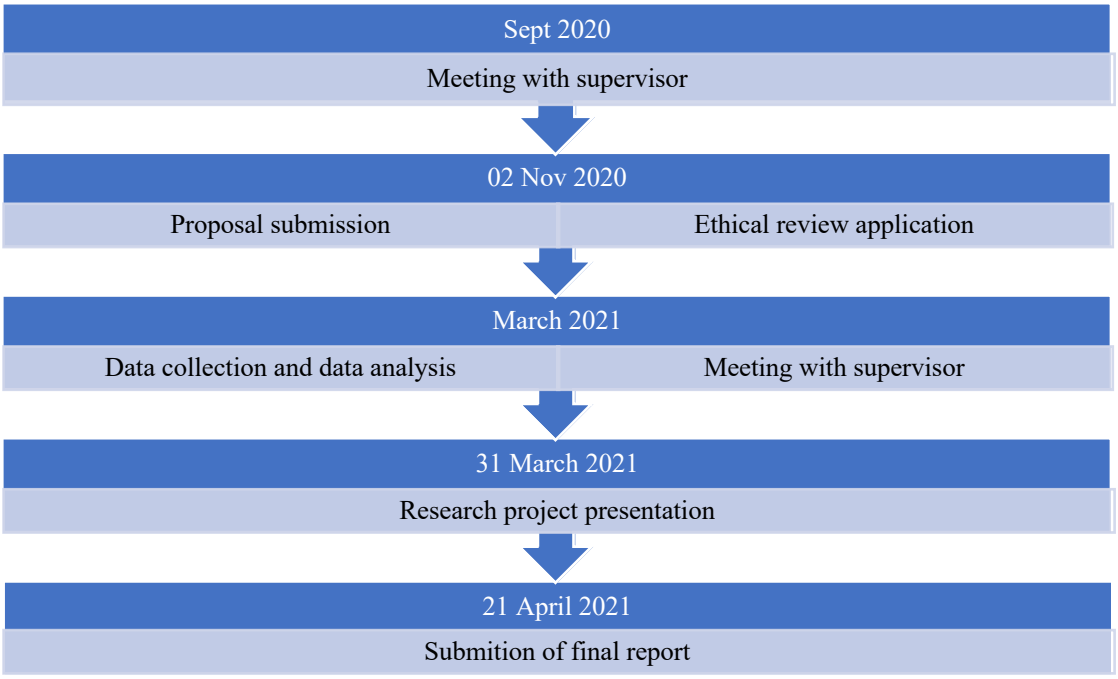

Figure 2 Research timeline

Data	Recording method	Data resources
Distance	Buffing the shortest travel distance in 400m	OpenStreetMap
Walking path network	Identifying local footpath in the area	OpenStreetMap
Area	Calculating park polygons by field calculators	Google Earth
Urban park functions	Identifying the park functions, varying from fitness, sports, active and sedentary functions	Observation assessment by SOPLAY and lcsd.gov.hk
Age	Stratifying into four groups: elderly (65+), middle-aged (45—64), young-aged (15—44) and children (<15)	Major Housing Estates profile from 2016 Population By-census
Population	Population of different age groups	Major Housing Estates profile from 2016 Population By-census
Residents' preference	Gathering personal preferences, frequency of uses, and socio-economic and household characteristics	Questionnaires

Table 1 Data collection for urban parks accessibility analysis

The locational information of urban parks is collected from Open Street Map, Google Earth and direct observation. The Open Street Map offers maps of Tung Chung, providing area and footpath data. Park functions are identified by a direct observation tool, namely SOPLAY (System for Observing Play and Leisure Activity) (McKenzie et al., 2006). It suggests a classification of park functions varies from fitness, sports, active and sedentary.

Likewise, government publication from LCSD lists out urban parks predefined purposes. The park functions available in Tung Chung urban parks is further applied to construct the questionnaires.

Concerning the need-based accessibility of parks and the patterns of park visits, closed-ended questionnaires are obtained from park users. The target population is 150 residents living in Tung Chung North or Tung Chung South with age above 18. Stratified sampling is employed for the research method by age groups. The age distribution is procured from the 2016 population by-census. The first half of the questionnaire obtain residents' preferences and satisfactions on the park functions. Followed by, respondents provide patterns of the park and their background information, including the socio-economic characteristics and household composition. The questionnaire addresses the missing data from the age below 18 by asking their companion, who indicate there are children in their household. Ethical considerations are undertaken in the questionnaire with park users, including the principles of informed consent, voluntary participation, do no harm, confidentiality, anonymity, and only assess relevant components.

4.2. **Study area**

The study area is in Tung Chung New Town. Tung Chung New Town serves as a supporting community for the airport under the Airport Core Program. To cater to a larger and regional community, Tung Chung New Town Extension is launched in 2017 to expand both eastward and westward (CEDD, 2017). Tung Chung North and Tung Chung South are selected as study areas, which comprise mainly private housing and public housing, respectively. The variation in demographic and socio-economic characteristics allows the research to outline the residents' expectation of park facilities and functions. Concurrently, there are natural

barriers, including harbours and mountains, that discourages the population from visiting parks in other Territory Planning Units. Besides, there are no severe topographical constraints that affect walking time. The urban parks in Tung Chung include urban parks under the Leisure and Cultural Services Department and pocket parks in residential areas (see figure 3 & 4).

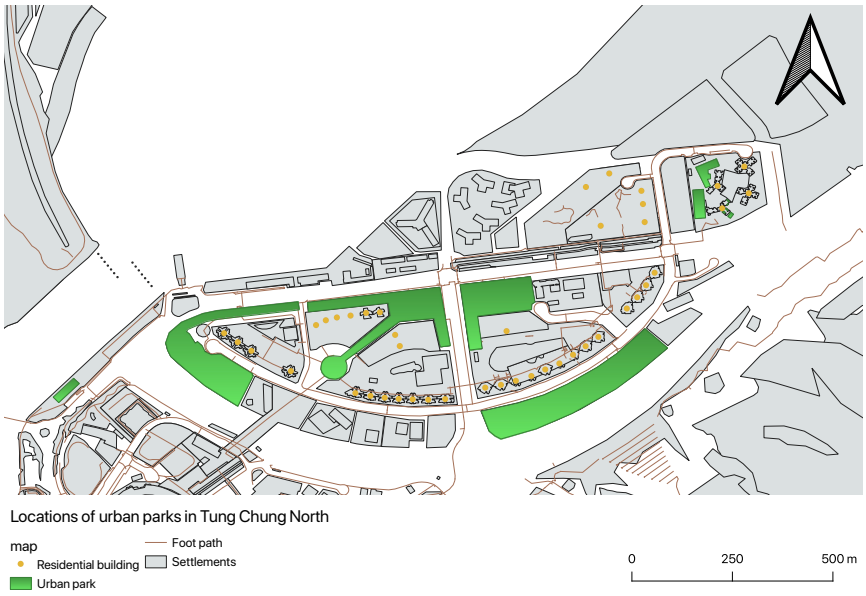

Figure 3 The location of urban parks in Tung Chung North

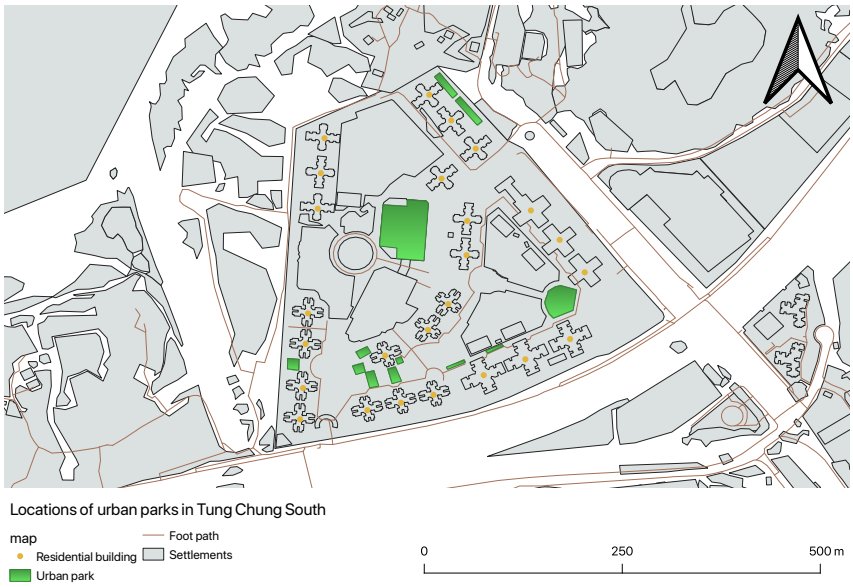

Figure 4 The location of urban parks in Tung Chung South

4.3. **Data analysis**

The data analysis is carried out by the GIS system to delineate the accessibility of urban parks. GIS is robust computer software to map, analyze and create codes for spatial analysis (Gupta et al., 2016). It visually projects the accessibility in various scenarios and shows the area per capita within a catchment area. Network analysis is applied to analyze the minimum travel distance to the urban parks to reach the nearest park (Nicholls, 2001).

SPSS Statistic is also adopted to analyze data collected from the questionnaires, focusing on residents' preferences on park functions, patterns of park uses, and the socio-economic and household characteristics. This assessment tool helps record park use in a free play setting. The data listed (table 1) are appropriately utilized to construct an accessibility analysis. To generate the mean satisfaction of the park functions, the analysis matches the residents' preferences with the actual functions within a 5-minute walk. Other than that, frequency and Pearson correlation analysis is performed in search of the need-based accessibility of residents in the study area. To determine the functions of urban parks within 400m walking distance accommodates the residents' preference, residents who are not satisfied is assumed to travel for a long way to visit their preferred parks. As such, a hypothesis is formulated: the satisfaction of park functions influences the walking time to frequently-visited parks.

5. Findings

5.1. **Accessibility in a traditional approach**

Accessibility within park catchment area

Two accessibility analysis depicted different results on the accessibility of the park. Since the standard distance threshold that residents are willing to walk to parks is 400 meters, the travel cost of both radius buffering and network analysis is 400 meters (Boone et al., 2009). By drawing a 400-meter radius buffer from the urban parks, the catchment area of the urban parks covers all residential buildings of the study areas (see figure 5). Residents in Tung Chung North find at least one urban parks accessible within their 400-meter buffer; and, urban parks in Tung Chung South are small in size and scattered in the housing estates, so residents there are accessible to more urban parks in a 400-meter walk. As for the network analysis (figure 6), the results present high accessibility of both study areas. However, some residential buildings in Tung Chung North are not situated within 400-meter walking distance of any urban parks.

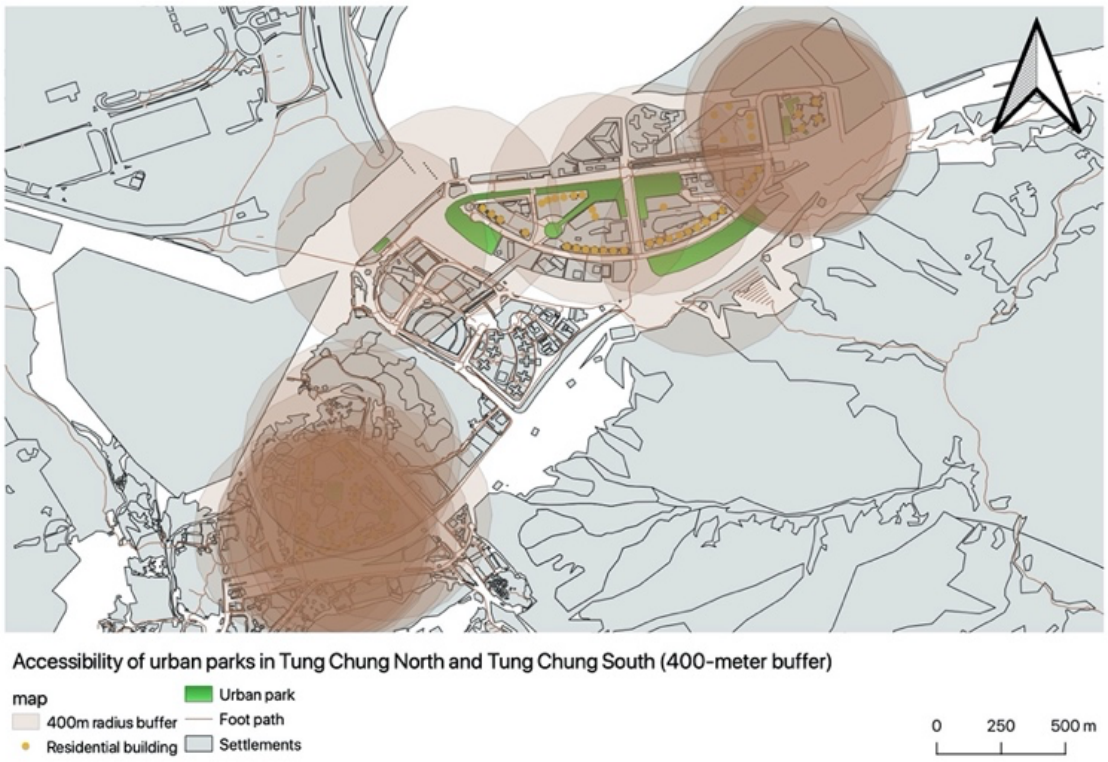

Figure 5 The accessibility of urban parks in Tung Chung North and Tung Chung South (400-meter buffer)

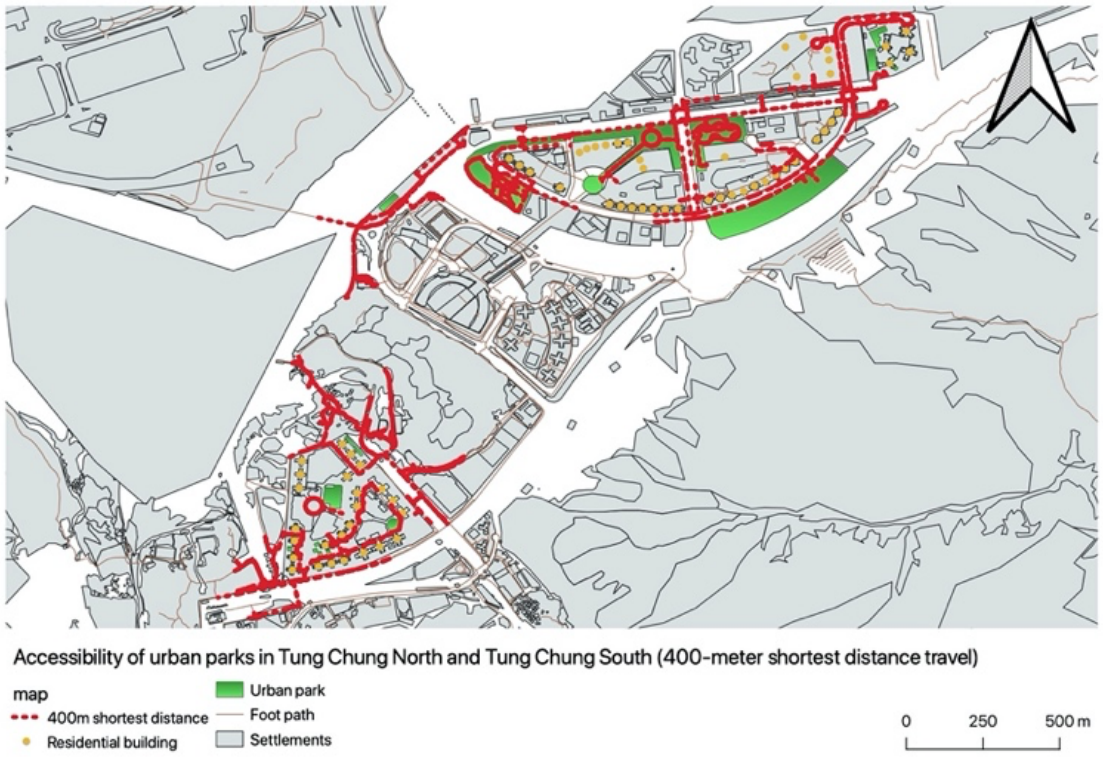

Figure 6 The accessibility of urban parks in Tung Chung North and Tung Chung South (400-meter buffer)

Population density within park catchment area

Apart from looking at the accessibility of urban parks in terms of travelling distance, population density within a 400-meter catchment area is analysed by age groups among the study areas. Overall, the area of UPs (within 400m walking distance) accommodate the population in Tung Chung North, from 0.029 to 0.112 person sharing a meter square. However, it does not accommodate the population in Tung Chung South (see table 2). Every 2.343 persons living in Yat Tung Estate (1) share a meter square of the urban park area, whilst every 2.776 persons living in Yat Tung Estate (2) share a meter square of urban park.

On the topic of population density in a 400-meter area by age groups, both study areas indicate a higher population density for adults aged 15 to 64. They are sharing less park area than other age groups. Children and the elderly, who regarded as the high-need population, share more park area (Wolch, 2005).

Housing Estates / Age group		Tung Chung North			Tung Chung South	
		Caribbean Coast	Coastal Skyline	Seaview Crescent	Yat Tung Estate (1)	Yat Tung Estate (2)
Population density by	Overall	0.11344	0.07893	0.02873	2.34363	2.77697
	0-14	0.01787	0.01137	0.00324	0.11920	0.27661
	15-64	0.08114	0.05957	0.02128	1.94354	2.16462
	65+	0.01343	0.00799	0.00420	0.28088	0.23575

Table 2 The population density in a 400-meter catchment area

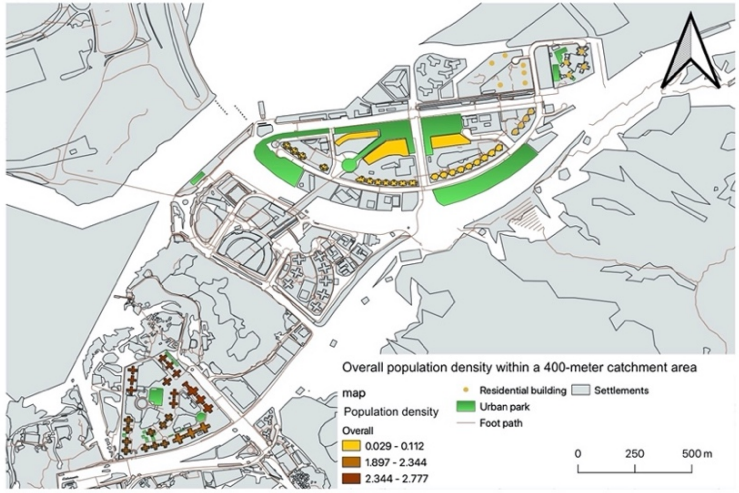

Figure 7 The overall population density within a 400-meter catchment area

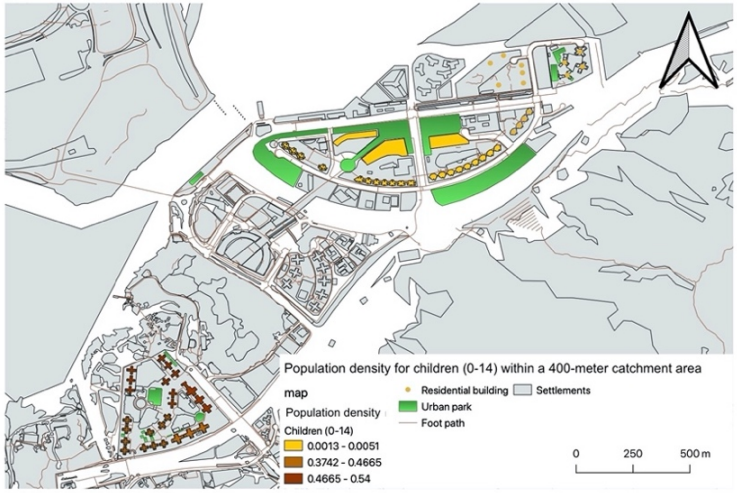

Figure 8 The population density of children (0-14) within a 400-meter catchment area

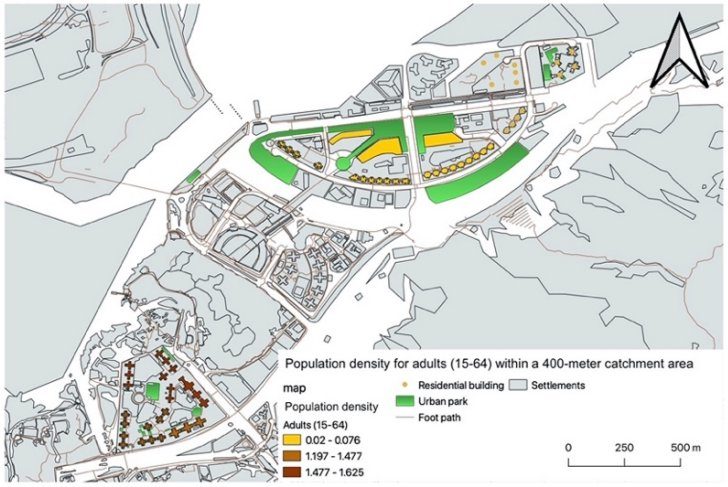

Figure 9 The population density of adults (15-64) within a 400-meter catchment area

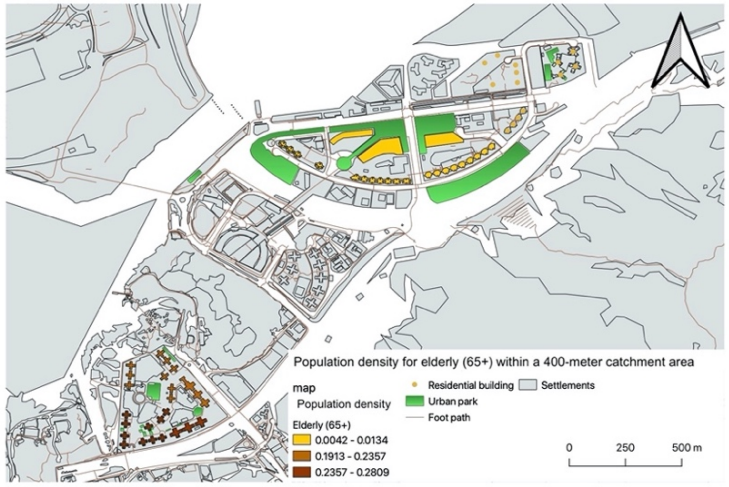

Figure 10 The population density of elderly (65+) within a 400-meter catchment area

5.2. **Accessibility in an need-based approach**

Respondents background

Location	Frequency	%
TC North	50	34%
TC South	97	66%
Age	**Frequency**	**%**
18 - 30	47	32%
31 - 40	51	34.7%
41 - 50	25	17%
51 - 60	13	8.8%
61+	11	7.5%

Monthly income	Frequency	%
<10,000	16	10.9
10,000 - 19,999	55	37.4
20,000 - 29,999	22	15
30,000 - 39,999	10	6.8
No income	30	20.4
Not willing to tell	14	9.5
Household composition	**Frequency**	**%**
With 0 - 4 y.o. toddlers	44	29.9
With 5 - 12 y.o. children	17	11.6%
With elderly	35	23.8%
None of above	65	44%

Table 3 Respondent background

Table 3 presents the frequency and percentage distribution of interviewees by background characteristics, including the location of residence, age, monthly income and household composition. A total of 147 valid responses is collected in the study area. 66% of the respondents live in Tung Chung South, and age distribution is expected from the stratified sampling. In terms of household composition, up to 29% of the respondents have children living together, whilst 23.8% live with the elderly. 44% of the respondents are living without children or the elderly.

Preference on urban park functions

Viewing the preferences on urban park functions by age, young-aged (18 – 30) and old-aged groups (41 – 60) generally have a higher need for sedentary functions (see figure 11). Other than that, middle-aged (31 – 40) has a higher need for fitness and active functions. Likewise, the elderly with age above 60, the same as the middle-aged respondents, has a high need for fitness and active functions. There are no notable characteristics on income level or gender to differentiate the residents' preference.

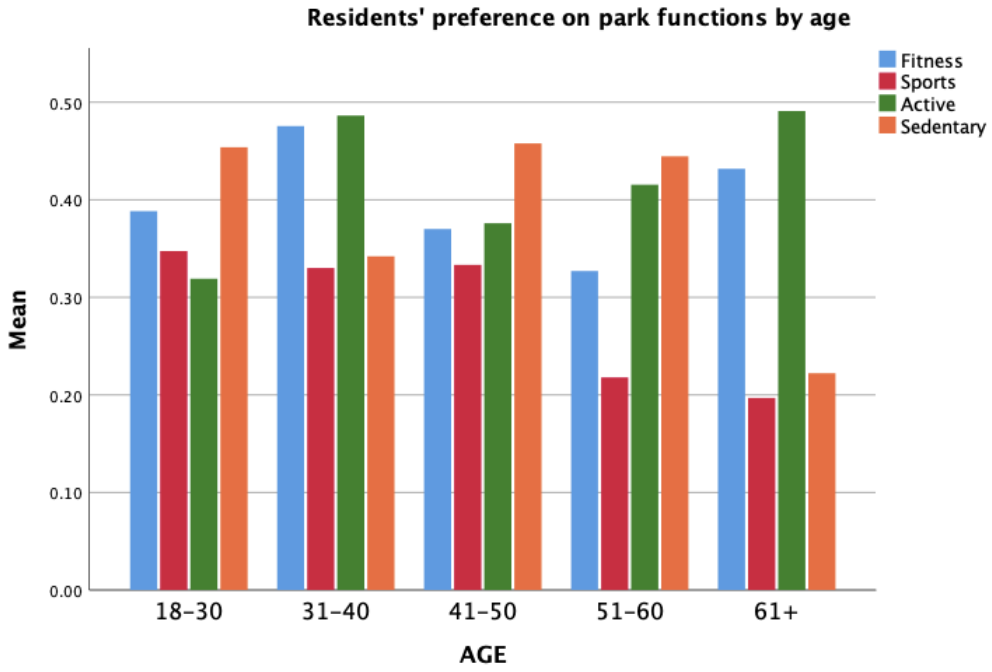

Figure 11 Residents' preference on park function by age
Mean score: 0.00 = lowest preference, 1.00 = highest preference

Satisfaction of park functions

In general, the data findings acknowledged a slight rising tendency in the mean satisfaction of park functions from younger to older age groups. The mean satisfaction of the younger age group (18 – 30) towards park functions within a 5-minute walk is the lowest. Respondents of age between 31 to 40 are not satisfied with the fitness functions. The middle-age group (41 – 50) is more satisfied with the active functions and least satisfied with the sports functions. Respondents between the age of 51 and 60 are satisfied with sports functions.

A closer look at districts' mean satisfaction of park functions for residents in Tung Chung North is higher than Tung Chung South. Results indicate the mean satisfaction on fitness and sedentary functions are high in Tung Chung North which is 0.72 and 0.79, respectively, and lower in Tung Chung South, 0.49 and 0.54, respectively.

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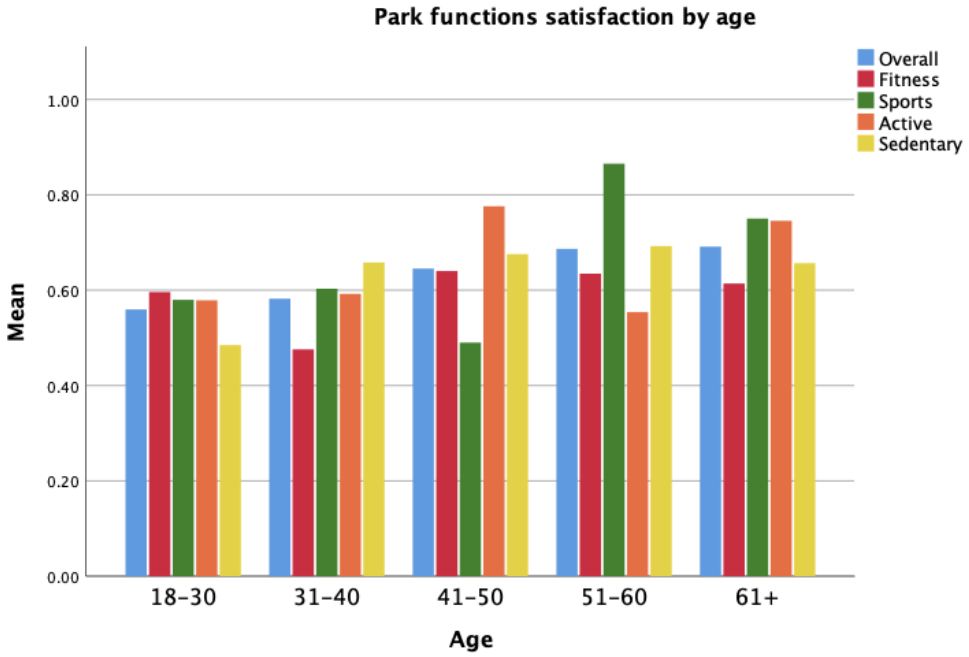

Figure 12 Park functions satisfaction by age
Mean score: 0.00 = Completely unsatisfied, 1.00 = Completely satisfied

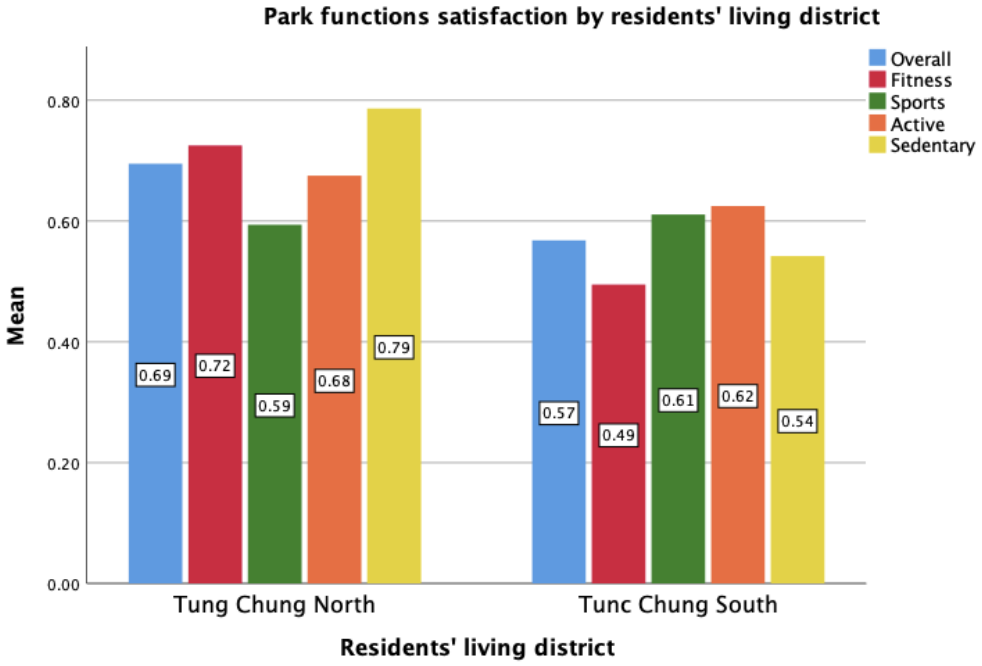

Figure 13 Park functions satisfaction by residents' living district
Mean score: 0.00 = Completely unsatisfied, 1.00 = Completely satisfied

To test the hypothesis, using a Pearson correlation could indicate the relationship between the satisfaction of park functions and walking time to parks. There is a negative relationship

between park functions satisfaction and walking time to parks. The park functions satisfaction and walking time to the most preferred park has a high degree of negative correlation (-.650, $p < 0.01$).

		Overall satisfaction	Walking time to frequently-visited park	Walking time to preferred park
Overall satisfaction	Pearson Correlation	1	-.201*	-.650**
	Sig. (2-tailed)		.014	.000
	N	147	147	147

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 Correlations for the overall satisfaction of park functions and walking time to parks

Relating to the characteristics of the population who travel to parks in another district, a frequency table (table 5) is generated by location of living places, age and household composition. Residents living in Tung Chung South show a high preference for the parks in Tung Chung North (85.6%), while 23.7% frequently travel across the district. On the other side, residents in Tung Chung North claim a low preference (97.5%) to travel across the district. Likewise, their frequently-visited parks (97.5%) located in the same district.

As for characteristics of age groups, the young-aged population (18 – 30) shows the highest willingness (27.7%) to travel for a long distance to another district. In contrast, other age groups have a tendency to stay in the same district. The older age group (51 – 60) expresses the slightest willingness (7.7%). Regarding preference on the park, the young-aged group (18 – 30) indicates their high preferences (89.4%) on parks locating in another district. Remarkably, respondents with age above 51 prefer to stay in parks within their district (84.6% for age 51 – 60 and 81.8% for age 61+).

On the subject of household compositions, all respondents (100%) with toddlers, children or elderly refused to visit parks in another district. 43.1% of respondents who has no

toddlers, children and elderly are visiting parks in another district. 43.2% of residents having 0 – 4 years old toddlers prefer parks in another district, while only 11.8% of those with 5 – 12 years old children alone prefer parks in another district.

		Location of living places			
		Tung Chung North		Tung Chung South	
		Count	%	Count	%
Most frequently-visited park in another district	Yes	1	2.5%	23	23.7%
	No	39	97.5%	74	76.3%
Preferred park in another district	Yes	1	2.5%	83	85.6%
	No	39	97.5%	14	14.4%

Table 5 Frequency count of park visits by location of living places

		AGE									
		18-30		31-40		41-50		51-60		61+	
		Count	%	Count	%	Count	%	Count	%	Count	%
Most frequently-visited park in another district	Yes	13	27.7%	8	15.7%	4	16.0%	1	7.7%	2	18.2%
	No	34	72.3%	43	84.3%	21	84.0%	12	92.3%	9	81.8%
Preferred park in another district	Yes	42	89.4%	26	51.0%	16	64.0%	2	15.4%	2	18.2%
	No	5	10.6%	25	49.0%	9	36.0%	11	84.6%	9	81.8%

Table 6 Frequency count of the park visits and age

		With 0-4 toddlers		With 5-12 children		With elderly		None of above	
		Count	%	Count	%	Count	%	Count	%
Most frequently-visited park in another district	Yes	0	0.0%	0	0.0%	0	0.0%	28	43.1%
	No	44	100.0%	17	100.0%	35	100.0%	37	56.9%
Preferred park in another district	Yes	19	43.2%	2	11.8%	19	54.3%	52	80.0%
	No	25	56.8%	15	88.2%	16	45.7%	13	20.0%

Table 7 Frequency count of the park visits and household composition

Considerations of walking path

As shown in Table 8, general respondents acknowledge the aspect of the functions in their considerations. They agree that smooth pavement evenness (A1) (78.9%), wide pavement (A2) (76.2%), gentle slope (A3) (83.7%) and shadings (A5) (83.7%) are in their list of considerations. However, 32.7% of the respondents disagree that they put a provision of road signs as their consideration. Safety is also widely recognised. They agree that sufficient lights (B1) (91.8%), low crime rate (B3) (77.5%), pedestrian flow (B4) (82.3%),

wide field of vision (B5) (90.1%), separated from roads (B6) (80.3%), and pedestrian priority (B9) (85.7%) are under their considerations. However, 23.8% of respondents disagree that the installation of surveillance systems (B2) is their considerations. Regarding the aesthetic value of walking paths, greenery (C2), Hygiene (C4) and low noise level (C5) are generally agreed by the respondents. 21.1% of them disagree that wild animals (C3) are their considerations. The aspect of facilities (D) takes less importance in walking path consideration as less than 70% agree.

Consideration		Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
		Count	%	Count	%	Count	%	Count	%	Count	%
Functions	A1	0	0%	5	3.4%	26	17.7%	81	55.1%	35	23.8%
	A2	0	0%	16	10.9%	19	12.9%	88	59.9%	24	16.3%
	A3	0	0%	7	4.8%	17	11.6%	68	46.3%	55	37.4%
	A4	17	11.6%	31	21.1%	57	38.8%	34	23.1%	8	5.4%
	A5	0	0%	9	6.1%	32	21.8%	70	47.6%	36	24.5%
Safety	B1	0	0%	3	2.9%	9	6.1%	86	58.5%	49	33.3%
	B2	6	4.1%	29	19.7%	48	32.7%	44	29.9%	20	13.6%
	B3	0	0%	19	12.9%	14	9.5%	50	34.0%	64	43.5%
	B4	0	0%	13	8.8%	13	8.8%	93	63.3%	28	19.0%
	B5	0	0%	2	1.4%	13	8.8%	93	63.3%	39	26.5%
	B6	0	0%	6	4.1%	23	15.6%	61	41.5%	57	38.8%
	B7	0	0%	6	4.1%	31	21.1%	64	43.5%	46	31.3%
	B8	8	5.4%	21	14.3%	36	24.5%	56	38.1%	26	17.7%
	B9	0	0%	6	4.1%	15	10.2%	76	51.7%	50	34.0%
Aesthetic value	C1	0	0%	13	8.8%	56	38.1%	65	44.2%	13	8.8%
	C2	0	0%	10	6.8%	11	7.5%	95	64.6%	31	21.1%
	C3	0	0%	31	21.1%	34	23.1%	55	37.4%	27	18.4%
	C4	0	0%	2	1.4%	7	4.8%	88	59.9%	50	34.0%
	C5	0	0%	10	6.8%	22	15.0%	89	60.5%	26	17.7%
Facilities	D1	4	2.7%	25	17.0%	35	23.8%	67	45.6%	16	10.9%
	D2	10	6.8%	17	11.6%	28	19.0%	72	49.0%	20	13.6%
	D3	8	5.4%	21	14.3%	17	11.6%	72	49.0%	29	19.7%

Table 8 Residents' considerations of deciding walking paths to parks within a 5-minute walking distance
Note: Detailed questions are provided in appendix 1

6. Data analysis and discussion

Firstly, there is an uneven distribution of urban parks between Tung Chung North and Tung Chung South. The number of urban parks in Tung Chung North is small, yet they are large in size. The large scale of urban parks facilitates residents nearby to visit the nearest park within a 5-minute walk. However, some buildings are not covered according to the network analysis, indicating low accessibility for some residents. The accessibility is affected by the building design. The private housing estates in Tung Chung North are narrow in shape, known as the walled buildings (see figure 2). There is no walking path between the buildings, so residents travel a long way to visit urban parks. On the other side, the number of urban parks in Tung Chung South is high, known as pocket parks. Residents there enjoyed high accessibility to urban parks. The accessibility of urban park here does not address the needs of the population.

However, the high accessibility of the nearest urban parks does not imply the sufficient allocation of the park area to residents in the neighbourhood. Residents in Tung Chung South may find a lack of space in the urban parks. The population density within the park catchment area in Tung Chung South is exceptionally high, showing that urban parks in Tung Chung South are congested. Regardless of the large number of urban parks, the park area is pocket-sized and cannot cater to the community's high population. Meanwhile, the large portion of the park area in Tung Chung North provides abundant spaces for residents nearby.

To formulate a need-based index in Tung Chung, various preferences of park functions are defined by age groups (table 9). Young-aged (18 – 30) have a high need for sedentary functions. The middle-aged have a high need for fitness and active functions. Old-aged (41 – 50) have a high need for sedentary functions. The older-aged group have a high need for

active and sedentary functions. The Elderly has a high need for fitness and active functions. Among all functions, fitness, active and sedentary functions are expected by the general population. Examples of sedentary functions are sitting out, picnicking and playing with their pets. There is a prerequisite that these functions require abundant free spaces. Fitness functions, such as jogging and aerobics, require fitness equipment; running trails requires a large area that exceeds the pocket-sized park area. Active functions are the children playground setting, for instance, sliding and chasing. It requires highly structured instalments but works in a relatively small area, such as pocket-sized parks. Together with the revised need-based index in Tung Chung, it is supported that Tung Chung is in lack fitness and sedentary functions, leading to a relatively low satisfaction towards park functions nearby.

Functions \ Age	18 – 30	31 – 40	41 – 50	51 – 60	61+
Fitness	Moderate	High	Moderate	Moderate	High
Sports	Moderate	Moderate	Moderate	Low	Low
Active	Moderate	High	Moderate	High	High
Sedentary	High	Moderate	High	High	Low

Table 9 A revised need-based index of population in Tung Chung

Not only do urban parks in Tung Chung South fail to cater for the population nearby, but they also cannot answer residents' preference for park functions. In the forms of children playground and mini-badminton and volleyball court, the pocket-sized parks lack diversity. During the site observation, park users' behaviours in Tung Chung South are not as expected as the park design encouraged. The mini-badminton courts are filled with children who play chasing and skateboards (see figure 15). Indeed, numbers of children playgrounds provide safety cautions; however, the tiny area (see figure 14) does not allow children to perform such behaviour. Park users, therefore, adapt the limited park functions, turning the wide

spaces into a free-play setting. Besides, residents in Tung Chung South may visit urban parks in Tung Chung North in search of their preferred park functions.

Figure 14 A children playground in Tung Chung South. This is a typical and old-fashioned playground with one large highly-structured installations, with a lack of spaces for other park activities

Figure 15 A mini-badminton court in Tung Chung South. Multiple activities are observed spontaneously. There are park users playing badmintons, chasing and riding rollers.

The residents' mobility influences the willingness of visiting urban parks in another district. Residents are not willing to constantly travel a long distance if they have toddlers and children accompanying them or they are elderly. Even though their preferred parks locate far away from their residence, they still stay nearby. Their frequently-visited parks stay near their living places. On the other side, adult residents without accompanying toddlers and children have higher mobility to travel to another district searching for their preferred park functions.

As for the considerations of walking paths, walking paths in Tung Chung North and South generally cater for the elements of functions. The pavement is smooth, wide and gentle (see figure 16). There are has well-designed ground walking paths surrounding the urban parks. Some shadings are also given along the route. There is some covered walkway (see figure 17) connecting residential buildings in Tung Chung South, while walkways in Tung Chung North are either with shade trees or elevated footbridges. Regarding safety elements, the pedestrian priority with sufficient lights, wide field of vision and pedestrian flow is preferred.

Interestingly, the surveillance system is not being widely considered. The walking paths in Tung Chung South fulfil the safety considerations. The pedestrian sidewalks with shade trees in Tung Chung North are dark at night. The shaded trees block the street light, leading to a short and narrow vision (see figure 18). However, the eyes on the street from sufficient pedestrian flow compensate for the lack of vision. The third element for considerations is aesthetic value, including greenery, hygiene and noise level. There are planters along walking paths in the two study area. The planters in Tung Chung North nurture various species, which work as a noise control buffer. However, the hygiene level is unsatisfactory in the street corners in Tung Chung South, especially around the shopping mall (see figure 19). Park visitors may change their route owning to poor hygiene.

Figure 16 Sidewalk in Tung Chung North. The pavement is wide, smooth and gentle. Along with the shade trees, it is a favorable walking environment.

Figure 17 Covered walkway in Tung Chung South. The covered walkway is connecting residential buildings and most of the urban parks.

Figure 18 Sidewalk to urban parks in Tung Chung North. The shade trees block street lamps, thereby affecting the field of vision.

Figure 19 Walking path between a residential building and a shopping mall. There are objects being thrown from a height and cigarette butts.

6.1. **Policy implications**

Urban park allocation within a walking distance

The case study in Tung Chung suggests that an even distribution of large urban parks in the neighbourhood enable residents to visit parks within a walkable distance. Moreover, urban parks' area should be large, corresponding to the population in the community. For self-contained and compact housing estates, such as Tung Chung South, urban parks could be placed in the middle of the neighbourhood, serving with smaller units of urban parks spreading outwards. An urban park network with corridors connecting in between provides multiple park functions within the same area. Because Tung Chung North consists of several wall-shaped housing estates, building an urban park network may be undesirable for walking. Large urban parks should be scattered across the district to provide park uses within a walkable distance. The case study contributes different approaches according to the competitiveness of the living neighbourhood.

Flexible park functions setting

To address an array of needs, park functions should be flexible and responsive to the population nearby. For the urban park network aforementioned, the centre of the urban park could be park functions that require ample spaces, especially for the sedentary functions. Some areas in the park centre could be free play setting, allowing park visitors to construct the area into their places based on their imaginations. The free play setting provides flexible park functions to the park users. The corridor could become the jogging trails, and the subdivisions could be highly structured children playgrounds and fitness stations. Old-fashion park design standards are observable in Tung Chung South,

so the park planners should renovate the park facilities periodically to react to the residents' need.

Design and maintenance of walking paths

Multiple implications are derived in terms of ease of reaching the destination, that elements of functions, safety and aesthetic values are being considered. The element of functions is well-addressed in both Tung Chung North and Tung Chung South. To ensure park visitors' safety, sufficient pedestrian flow should be encouraged to compensate for the surveillance systems. Pedestrian flow can be boosted by setting up appropriate planters and heat-reducing shadings (Akbari, 2001). These elements are widely recognised for the considerations of walking paths. Furthermore, the regular maintenance of walking paths is needed to provide a clean sidewalk. Pruning shade trees can improve vision at night and address residents' needs of high light intensity at night. (Lo & Jim, 2012). Proper walking path design and maintenance provide a favourable walking environment.

7. Conclusion

This research project presents the accessibility of urban parks through a need-based approach. The accessibility is varied due to an uneven distribution of urban parks between two study areas in terms of location and park area. Most of the urban parks locations cater to residents nearby; however, the park area share is in a wide disparity to a certain extent. There is a mismatch of the parking area and population nearby. Different preferences among age groups formulate a revised version of the need-based index. Among all, sports functions appear to be less critical in the residents' preference for park functions. Together with suggested considerations of walking paths, several elements for policy planning are raised for future planning and

maintenance of the currently available park area. This research project demonstrates a valuable tool in refining person-based and fair access to urban parks in multiple facets.

8. Limitations

The first limitation of the research is that mapping and questionnaires as a quantitative method do not portray a comprehensive view of the target population's personal preferences and behaviours. This research project lacks qualitative face-to-face interviews to delineate factors influencing the decision-making processes on listing out their preferences on park functions and considerations on walking paths.

The second limitation of the research is the cancellation of the park users' activities observation. Initially, the observation allows the research to present park visitors' profile and their types and frequency of behaviours in the park area. It provides a new aspect of research to compare the expected and actual uses on park facilities. However, the government ceases opening public urban parks. As such, the park users' activities and visits are constrained to the pandemic prevention measures.

9. Recommendation for Further Research

The research drew out the problems regarding the need-based accessibility of urban parks and suggested a list of elements for future policy planning. More thorough research should be conducted in the coming future. For instance, carefully designed and objective social surveys to outline a comprehensive list of elements for urban parks design and explore their person-based decision-making processes.

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Appendix 1 Questionnaire design (Chinese only)

市民對鄰近住所的公園的期望和使用習慣

第一部份：對公園的期望

請根據您的***個人偏好***選擇您理想中鄰近住所（5 分鐘路程內）的公園的用途（可選多項）。

A. 健身					
□ 健康舞	□ 健身站	□ 慢跑/散步	□ 其他，請註明：_____		
B. 運動					
□ 足球	□ 籃球	□ 排球	□ 乒乓球	□ 羽毛球	□ 其他，請註明：_____
C. 活動					
□ 攀爬/滑梯	□ 跳躍（跳繩，跳飛機等）	□ 追逐	□ 鞦韆	□ 其他，請註明：_____	
D. 靜態					
□ 棋牌	□ 躺著	□ 野餐	□ 閱讀		
□ 坐著	□ 溜寵物	□ 社交活動	□ 享受大自然		
□ 其他，請註明：_____					

第二部份：鄰近住所的公園所提供的用途

請選擇您***實際中***鄰近住所（5 分鐘路程內或最近）的公園的用途（可選多項）。

A. 健身					
□ 健康舞	□ 健身站	□ 慢跑/散步	□ 其他，請註明：_____		
B. 運動					
□ 足球	□ 籃球	□ 排球	□ 乒乓球	□ 羽毛球	□ 其他，請註明：_____
C. 活動					
□ 攀爬/滑梯	□ 跳躍（跳繩，跳飛機等）	□ 追逐	□ 鞦韆	□ 其他，請註明：_____	
D. 靜態					
□ 棋牌	□ 躺著	□ 野餐	□ 閱讀		
□ 坐著	□ 溜寵物	□ 社交活動	□ 享受大自然		
□ 其他，請註明：_____					

第三部份：疫情前到訪鄰近住所（5 分鐘路程內或最近）的公園的習慣

1. 您有多常到訪公園？	每天	每周 2-6 次	每周 1 次	每月 1 次	幾個月 1 次	每年 1 次
2. 現在***疫情下***，您到訪公園的次數有沒有改變？	減少		不變		增加	
3. 您通常會於公園逗留多久？	多於 5 個小時	2-5 小時	1-2 小時	31-60 分鐘	15-30 分鐘	少於 15 分鐘
4. 現在***疫情下***，您在公園的逗留時間有沒有改變？	減少		不變		增加	

第四部份：鄰近住所的公園的步行時間

1. 請問您所居住的大廈是	_____
2. 請選擇您的區內最常前往的公園。	_____
3. 從您家步行到該公園大概需時多少分鐘？	_____
4. 請選擇您認為**區內最符合你第一部份期望的公園**。	_____
5. 從您家**步行**到該公園大概需時多久？	_____
6. 您理想中從你家**步行**到該公園應該需時多久？	_____

第五部份：前往鄰近住所的公園的步行環境

您有多同意以下是您決定步行路線時的考慮點？

	非常不同意	不同意	中立	同意	非常同意
A. 功能性					
路面平整					
路面寬					
平緩路坡					
有路牌指示					
有遮蔭					
B. 安全					
足夠街道燈光					
有監控系統					
低罪案率					
有人流					
良好視野					
與馬路分離					
與單車徑分離					
有交通燈					
行人優先					
C. 美觀					
有藝術美化					
有綠化					
有野生動物（如雀鳥）					
乾淨					
寧靜					
D. 設施					
無障礙環境					
提供飲水機					
提供座椅					

第六部份：受訪者基本資料

請問您的性別	□ 女 □ 男
請問您的年齡組別	□ 18-30 □ 31-40 □ 41-50 □ 51-60 □ 61 或以上
請問您的月入（港幣）	□ 少於$10,000 □ $10,000-19,999 □ $20,000-29,999 □ $30,000-39,999 □ $40,000-49,999 □ $50,000-59,999 □ $60,000 或以上 □ 學生，退休人士或沒有收入 □ 不方便透露
請問您的家庭是否有	□ 2-5 歲兒童 □ 6-12 歲兒童 □ 65 歲或以上長者 □ 以上皆無