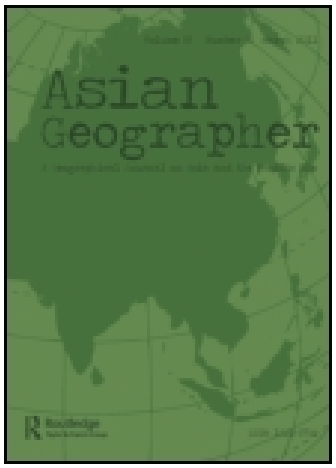

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URBAN OPEN SPACE SYSTEM IN NORTHERN KOWLOON PENINSULA: AN EMERGING GREEN INFRASTRUCTURE NETWORK IN HONG KONG

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Abstract: *Urban open space (UOS) systems are composed of a myriad of interdependent entities in metropolitan areas that ranges from natural features to built structures. This paper intends to use the 'link-hub' network model to examine existing UOS networks in an urban district in Hong Kong. The paper argues that UOS networks, or green infrastructure, can serve important human and natural functions in a city. In Hong Kong, conventional planning practices have led to fragmented UOS development. However, empirical evidences revealed by this study suggests that by linking discrete and isolated UOS together with a network of green connectors, the open space needs of urban dwellers can be served effectively. The emergence of the 'green infrastructure' promotes environmental integrity and community cohesion. Therefore, the idea of UOS networks contributes to better landscape design and enhances the overall livability of metropolitan cities.*

Keywords: urban open space, green infrastructure, network

Introduction

Hong Kong is one of the largest metropolitan cities in southern China. In July 1997 Hong Kong concluded its 150 years of colonial rule by the British to become a Special Administrative Region (SAR) of the People's Republic of China. As witnessed by over a decade of governance under Hong Kong's constitutional document, the Basic Law, the SAR enjoys a high degree of autonomy except in defense and foreign affairs. According to the latest census findings, Hong Kong has about 7 million people at the end of 2009 (Planning Department, 2009) living tightly within slightly more than 1100 km^2 of land area.

The appearance of urban parks and open spaces in Hong Kong can be dated back to the early colonial era of the city. The Botanical Garden, the oldest public garden of Hong Kong, was established in 1871. It signified an ambitious public work scheme of the early colonial regime (Endacott, 1973). Indeed, most urban parks in Hong Kong were built in the postwar period. For instance, Victoria Park was built on reclaimed land in Causeway Bay in the mid-1950s. The formation of the Garden Division within the Urban Services Department in the early 1950s marked the institutionalization of the urban park as a basic urban service provided by the government. As a result of rapid population growth and increasing urbanization and industrialization in the 1960s, many people lived in over-crowding housing estates deprived of open spaces. Therefore, there was a pressing need for recreational open spaces in the 1960s (Lau, 2002; Miao, 2001). Since the 1970s, numerous parks and playgrounds were created in Hong Kong, and many of these were built adjacent to housing estates to meet the leisure and recreational needs of the rising number of working class people. However, it was not until the 1990s that urban parks were considered as an integral part of Hong Kong's overall development plans (Xue and Manuel, 2001). Under the Metroplan endorsed by Executive Council in 1991, provisions were made to build more district parks, as well as to develop the waterfront promenades

(Hinge, 1996).

After the sovereignty-handover in July 1997, the first Chief Executive of the Hong Kong SAR, Mr. Tung Chee Hwa, addressed the need to the improve the quality of the living and working environments in the metro area of Hong Kong in his Policy Address in 1999. Mr. Tung proclaimed that the SAR Government was committed to building Hong Kong as a world-class city with a pleasant and safe living environment. One way to achieve this goal is to facilitate the comprehensive redevelopment of old urban areas by incorporating additional open space, green belts, and related community facilities. The Policy Address also stressed that Victoria Harbor is an integral part of Hong Kong. It deserves our efforts on protection and enhancement so that citizens and visitors can take advantage of the promenades and enjoy the beautiful scenery that it provides. Obviously, the Policy Address has changed the Government's laissez-faire policies on landuse planning during the colonial era. The Address further indicated that the waterfront, including Southeast Kowloon, West Kowloon reclamation, Wan Chai, Central and Western District, should be reserved for the public as open and green spaces. In March 1999, based on a consultancy report the SAR government replaced the Urban Services Department, which was responsible to manage parks and recreational facilities, by the Leisure and Cultural Services Department (LCSD) following the dissolution of the Provisional Municipal Council. The newly established LCSD takes over the culture, arts, recreation and sport services (Lau, 2002). Today, Hong Kong has 109 parks, 335 playgrounds/recreation grounds, 139 children's playground, 363 gardens and 616 sitting out areas, different types of facilities and other small urban open spaces managed by the LCSD[2]. As part of a broader urban agenda, urban parks and open spaces can serve to improve the livability of cities, and can contribute to the provision of greening, leisure, cultural and tourism opportunities.

Types of Urban Open Space in Hong Kong

According to *The Hong Kong Planning Standards and Guidelines* (HKPSG, 2007), the term 'open space' is defined as "a statutory land use zone for the provision of open space and recreation facilities for the enjoyment of the general public" (HKPSG, 2007 Chapter 4, Section 1.6.1a). The Government acknowledges "recreation stems from a basic human need for activities, which are essential to the mental and physical well-being of the individual and the community as a whole" (HKPSG, 2007 Chapter 4, Section 1.1.1). Therefore, the government recognizes that recreation is an essential activity for which land must be allocated. Moreover, Section 1.1.2 of the 2007 HKPSG also states "apart from recreation use, open space also allows the penetration of sunlight and air movement, as well as for planting areas for visual relief." The HKPSG acknowledges that UOS is an essential land use element in urban design. In Hong Kong, nearly all the public urban open spaces are administered by the LCSD, which has specifically categorized different types of UOS into parks, gardens, playgrounds, and sitting-out areas as shown in Table 1.

The LCSD and the HKPSG definitions are useful information that can help us better understand the different types of UOS in Hong Kong in the context of planning and management. Conceptually, Woolley's (2003) tripartite grouping of UOS might be more appropriate for us to analyze these spaces from a user's perspective. Specifically, Woolley classified UOS into three categories—domestic, neighborhood and civic. The categorization, nevertheless, is based upon the concept of home range of the dominant users of the space. Accordingly, there are two aspects of the home range concept: the

physical distance of these spaces from home, and the level of social experience in terms of familiarity, sociability and anonymity. Firstly, domestic urban open space (DUOS) is physically associated most closely with the home of the users. This fits into many of the locally oriented small open spaces in Hong Kong such as gardens, playgrounds and sitting out areas. Secondly, neighborhood urban open space (NUOS), on the other hand, is physically not directly related to the home of the users but to communities in the neighboring districts. The users have to travel a longer distance and take more time to get to the facilities. Socially, these spaces will be used by a greater variety of users. Typical examples of the NUOS include larger comprehensive parks that offer more extensive range of recreational facilities to users. Thirdly, civic urban open space (CUOS) is placed at strategic or specific location, such as city squares or plazas, hospital grounds and university campuses.

Table 1: Definition of Major Types of Open Space in Hong Kong.

Type of open space	Definition
Park	*Area larger than 1 hectare includes both active & passive facilities*
Garden	*Area less than 1 hectare with passive facilities mainly*
Playground/ recreation ground	*Area less than 1 hectare with active facilities mainly*
Sitting-out area	*Area less than 0.5 hectare with passive facilities mainly*

Source: Leisure and Culture Service Department of the HKSAR Government

Objectives

Undoubtedly, urban open spaces are crucial features in livable cities. These spaces are important to people's daily lives, and the benefits and opportunities offered to urbanites are enormous. In particular, these spaces can help to enhance environmental quality and promote community cohesion. Increasingly, more and more metropolitan cities worldwide are building urban open space networks to benefit people and places (Erickson 2006). Conceptually, this study uses the 'domestic-neighborhood-civic' UOS typology proposed by Woolley (2003) and the 'link-hub' network model to analysis existing urban open spaces in northern Kowloon, Hong Kong. This study also attempts to integrate various components to form a connected network of the UOS system of the study area.

The objective of this paper is to promote theoretical and practical deliberations in regards to the development of 'green infrastructure' in the city. The term 'green infrastructure' has now been used increasingly to describe network of connected open spaces and it helps to promote healthier lifestyles, increase recreation opportunities and strengthen connections to cultural and historic places (Erickson, 2006; Benedict and McMahon, 2006). Similar terminologies such as greenway, green corridor or green connector are also used to describe pathways that linking up UOSs together (Hellmund and Smith, 2006). In this study the term "green connector" is used to describe all pathways or roads linking the UOSs together and the resulting UOS system will become the "green infrastructure" of the area. The green infrastructure network links parks and communities together so that people can move freely around to enjoy the facilities provided by different

parks and open spaces in the city. The specific aim of this paper is to describe, supported by empirical evidences, the nature and characteristics of the existing UOS system of the study area. It helps to clarify contemporary UOS planning and design issues, such as the fragmentation and the lack of hierarchy in public space development in Hong Kong. As part of a broader urban agenda, UOS can serve to balance 'green city' and 'compact city' objectives, especially in compact and congested city such as Hong Kong (Jenks and Dempsey, 2005; Miao, 2001). The study employed mixed methodologies to collect data and information for the analysis, which includes literature reviews, field observations and mapping, and questionnaire surveys of UOS users.

Urban Open Space System in Northern Kowloon

Profile of the Study Area

Geographically, the study area is situated in the northern part of Kowloon Peninsula, which represents an urban district characterized by a wide range of landuses and diversity in social strata of its residents. Moreover, the area also has relatively more open spaces for green infrastructure development than other urban districts such as Mongkok and Tsim Sha Tsui (Figure 1). To avoid the interference of the major transportation arteries on people's pedestrian movement, the study area is bounded by major thoroughfares encompassing the region, with Lung Cheung Road in the north, the Kowloon-Canton Railway in the west and the Prince Edward Road East in the south. To the east, the area extends to the former Kai Tak International Airport, now a major redevelopment zone. The area is made up of a variety of urban functions in the broad categories of residential, transportation, and institutional landuses. The area includes the traditional 'garden city' of low to medium-rise, low-density residential developments of Kowloon Tong. It is also a major transportation hub at the Kowloon Tong Station, where the two major lines of Mass Transit Railway (MTR) meet, the East Rail line and Kwun Tong line. The area has one of the best school districts, including many brand name education institutions, in Hong Kong. It was once the hub for the broadcasting industries, including radio and television broadcasting. It contains one of the major People Liberation Army barracks located in the urban area. In addition, there are many public housing estates as portrayed by the famous "On the foothill of the Lion Rock Mountain" TV episode series. Finally, the area contains the long established mixed commercial-residential area, Kowloon City, adjacent to the former Kai Tak International Airport. Therefore, the Northern Kowloon Peninsula is a distinctive district in Hong Kong and contains many facets that inform the history and development of the district as well as Hong Kong at large. And the study area represents a microcosm of different stages of urban development in the territory.

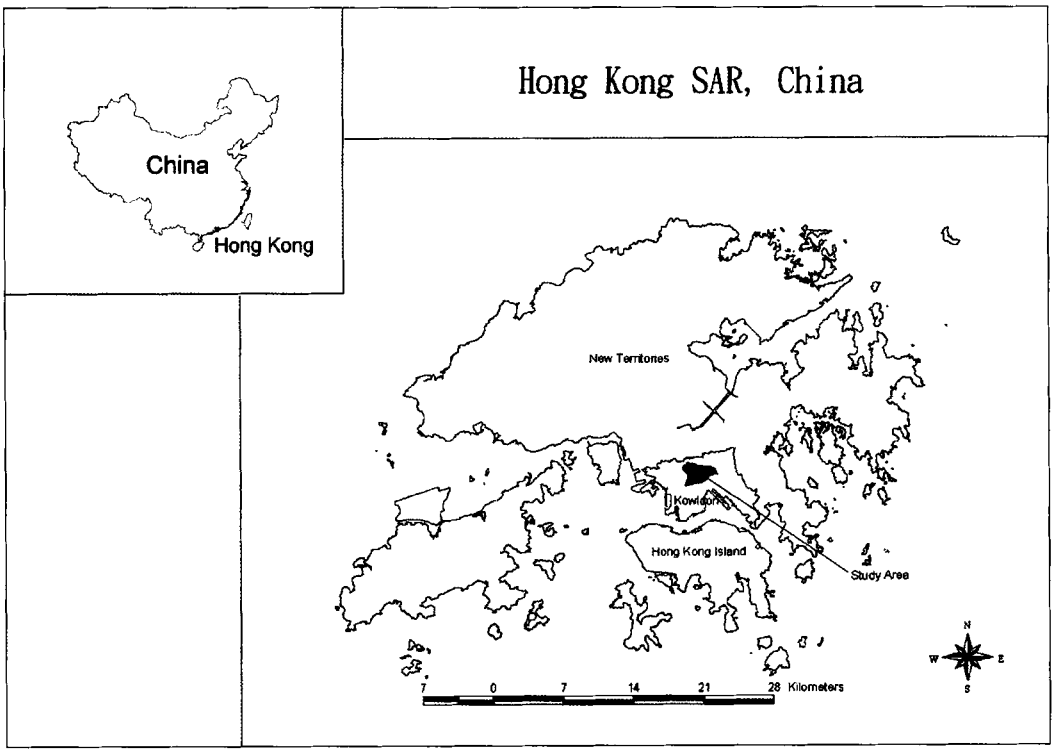

Figure 1. The Geographical Location of the Study Area.

Mapping the Urban Open Spaces

The spatial distribution data collected by field mapping were recorded on a map, and the data were re-drawn on a 1:5000 digital map using *Arc View* software. Figure 2 shows the overall greenery status of the northern Kowloon district, which includes both linear segments (i.e. the green connectors) and non-linear components, such as parks, playgrounds and other UOSs. On the map (Figure 2), the green connectors are subdivided into two categories according to their greenery status: completed-shading and semi-shading connectors. Completed-shading connectors are roadways with trees that can provide sun-shading function to pedestrians, especially in the summer. On the other hand, semi-shading connectors have trees with smaller canopies. As shown in Figure 2, northern Kowloon has a good network of roadside greenery. Completed-shading connectors can be found in the low to medium-rise residential area in Kowloon Tong, and the semi-shading streets are found mainly in the newly developed institutional and community use areas. On the whole, the greenery status is relatively less developed in the mixed commercial-residential area of Kowloon City and the public housing estates in the vicinity. Evidently, the green connectors form an integral part of the urban open space system in addition to parks, playgrounds and other open spaces.

The next step of the study attempted to identify a green connector that can integrate most of the UOSs together to form the green infrastructure network in the study area. Figure 3 shows a six-segment green connector network determined empirically. The entire study area has an area of approximately 4.5 km^2, and 0.74 km^2 (or 16.3%) of the total area is occupied by urban open space. Out of all the USO of the district, about 85% are

linked up by the proposed green connector network. (Table 2) Tables 3a-b present the profiles of major neighborhood UOS and domestic UOS in northern Kowloon situated along the proposed green connector linking up these UOSs. Though civic UOS is not the dominate UOS in the study area, the Academic Community Hall, the Lam Woo International Conference Centre, and the Joint Sports Centre situated within the Hong Kong Baptist University campuses often attract territory-wide visitors to attend conferences, workshops, performances and sport events.

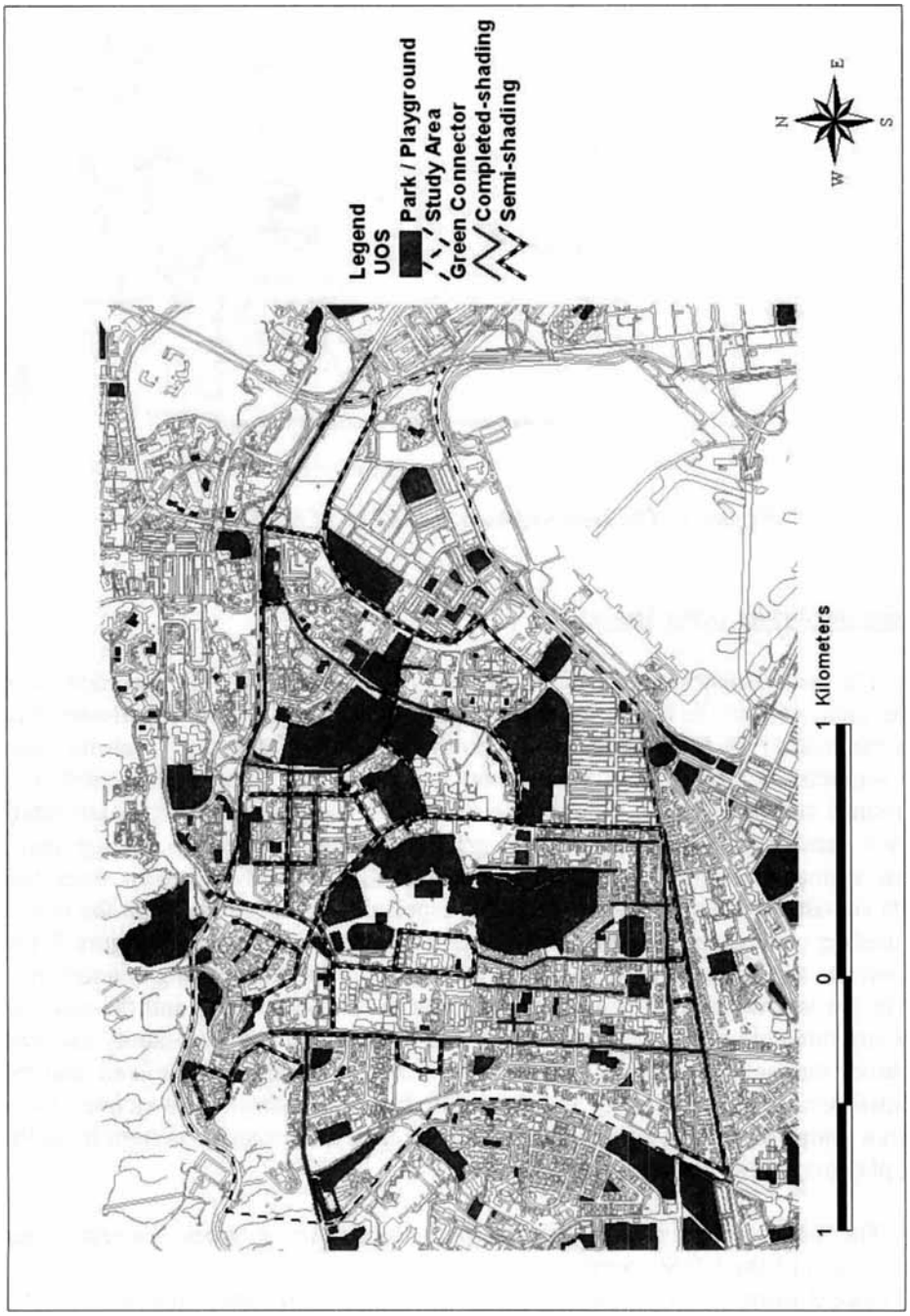

Figure 2. The Overall Greenery Status of the Study Area.

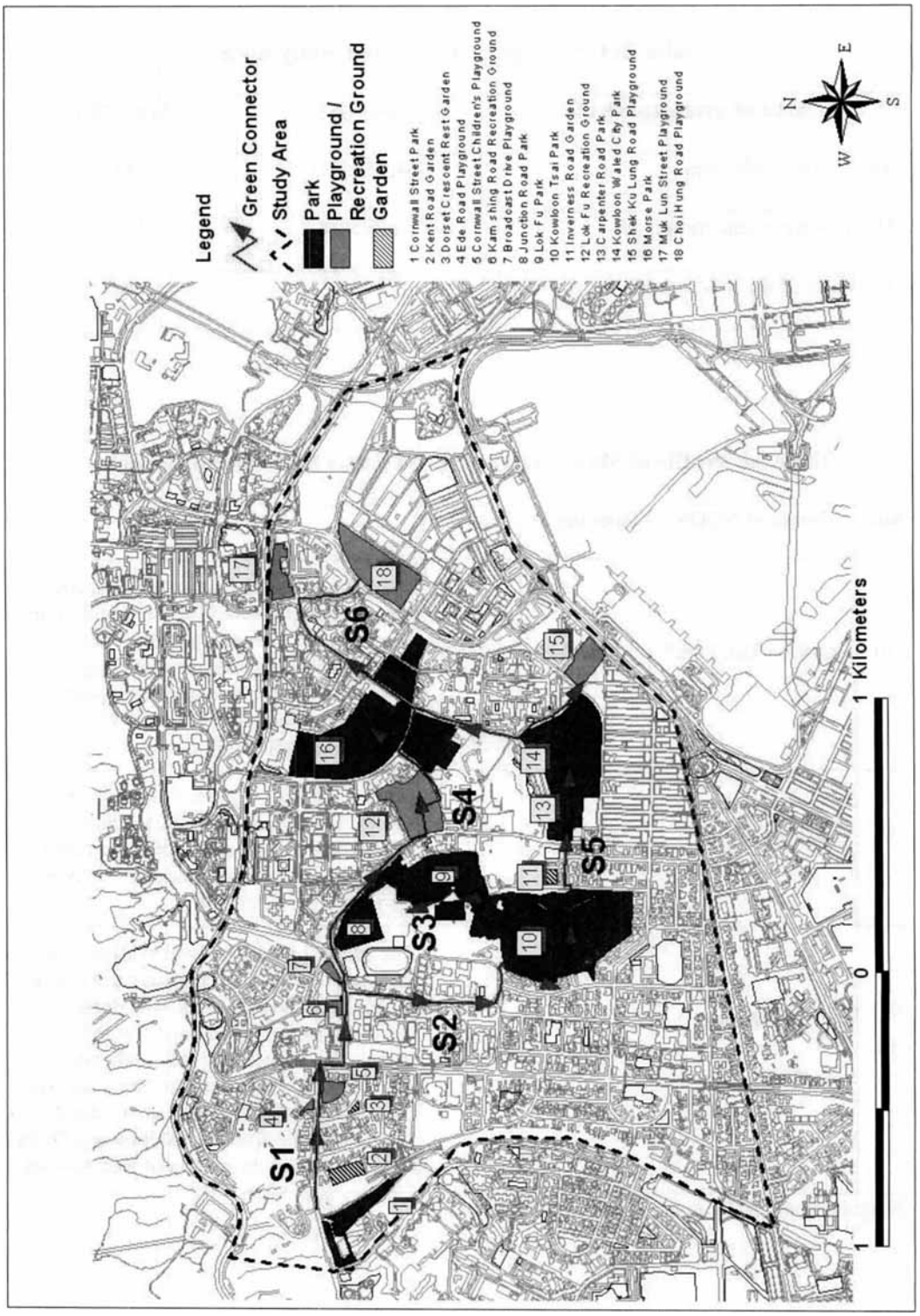

Figure 3. Green Connector Network (S1 to S6) and Major UOSs in the Study Area.

Table 2: Green Space Area of the Study Area

Area of green space of	Area (m^2)	Area (%)
The entire study area	4,534,233	100
UOS along green connector	628,434	13.9
All UOS of the study area	739,881	16.3

Table 3a: Profile of Major Neighborhood Parks in Northern Kowloon

Site	Name of NUOS	Opening at	Area (m^2)	Facilities
10	Kowloon Tsai Park*	June-64	149,900	Natural turf soccer pitch, hard surfaced soccer pitch, basketball court, tennis court squash court, swimming pool, roller skating rink, table tennis room, jogging track with fitness stations, sport ground, children's playground, bauhinia garden, pavilion and rest garden.
16	Morse Park*	Aug-67	175,000	Natural turf soccer pitch, hard surfaced soccer pitch, basketball court, tennis court squash court, swimming pool, sport center, children's playground, conservation corner, pavilion and rest garden.
14	Kowloon Walled City Park*	Dec-95	31,000	The design of the Kowloon Walled City Park is based on the Jiangnan garden style of the early Qing Dynasty. The design is divided into eight landscape features namely the Yamen, the old south gate, the mountain view pavilion, the chess garden, the garden of Chinese Zodiac, the eight floral walk, the Kuixing pavilion and Guibi rock and finally the garden of four seasons.

* Neighborhood parks included in the user survey.

Table 3b: Profile of major domestic urban open spaces in northern Kowloon

Site	Name of DUOS	Opening at	Area (m^2)	Facilities
5	Cornwall Street Children's Playground	May-58	5,300	Children's playground, rest garden and pavilion.
3	Dorset Crescent Rest Garden	Nov-63	594	Rest garden.
2	Kent Rd Garden	Dec-63	7,196	Rest garden.
9	Lok Fu Park	Nov-64	51,200	Grass pitch.
7	Broadcast Drive Playground	October-72	2,600	Children's playground and rest garden.
11	Inverness Rd Garden	November-74	2,400	Rest garden, pavilion.
4	Ede Rd Playground	Oct-80	1,500	Rest garden.
6	Kam Shing Rd Recreation Ground*	April-83	1,666	Pavilion and basketball court.
8	Junction Rd Park*	Nov-83	33,278	Hard surfaced soccer pitch, basketball courts, tennis courts, children's playground, jogging track with fitness stations, rest garden and pavilion.
13	Carpenter Rd Park	Aug-84	54,000	Chinese garden, pavilion, children's playground, cycling track, fitness station, basketball court, hard surfaced soccer pitch and rest garden.
15	Shek Ku Lung Rd Playground*	Jan-85	13,000	Rest garden, hard surfaced soccer pitch, tennis court and badminton court.
17	Muk Lun St Playground*	Sept-85	10,800	Rest garden and children's playground.
18	Choi Hung Rd Playground*	Aug-85	35,000	Children's playground, pavilion, rest garden, badminton centre, basketball court, tennis court and hard surfaced soccer pitch.
12	Lok Fu Recreation Ground*	May-91	28,000	Children's playground, artificial turf soccer pitch.
2	Cornwall St Park*	June-05	26,000	Jogging track with fitness stations, rest garden, Chinese pavilion, artificial fountain and waterfall, squash court and indoor table tennis court.

* Domestic open spaces included in the user survey.

Constructing the Urban Open Space System

In Hong Kong, many of its urban open spaces were the result of fragmented developments that were implemented to meet the planning standards stipulated by the Planning Ordinance overall the past several decades. Many critiques have attributed this to the piecemeal development tactics adopted by the former colonial government, in which there was no comprehensive master plan for urban open space development, with the exception of the stipulations in the Hong Kong Planning Standards and Guidelines. The

following discussion attempts to amalgamate the seemingly discrete and isolated UOSs together by a network of green connectors to form an integrated urban open space system. The UOS network is a framework enabling us to examine holistically the multiple-uses and values of urban open spaces. It stresses on the integrity and quality of the UOS, and it contributes to good green infrastructure development that is so vital to the overall livability of the city.

The 'Link-hub' UOS Network of the Study Area

According to Erickson (2006), a connected UOS network is more beneficial to an urban area than a fragmented one. Cities need not only one single park; they need an integrated urban system that connects different UOSs into a 'link-hub' network. Conceptually, the 'link' refers to the path of movement, and the 'hub' represents the nodal point where people gather for leisure or recreational activities. Therefore, one fundamental objective of this study is to identify green connectors that provide pleasant paths linking major UOSs of the area. There are two criteria used to select a green connector: it must (1) offer opportunity for pedestrian movements, either strolling or jogging; and (2) contain ample greenery to provide a pleasant environment to its users. Accordingly, the assemblage of UOSs linked by green connectors forms the 'hub', and it provides a hierarchy of UOS of different size, shape and functions. Based upon the empirical evidences revealed by this study, a rudimentary UOS network that spanned spatially from Kowloon Tong, Wang Tau Hom, Kowloon City to San Po Kong was identified. Though without the deliberate planning by the government the UOS of the study area provided a network of vegetated and pedestrian friendly green connectors that offered pleasant and safe strolling or jogging pathways to people. Moreover, these green spaces linked very diverse land use types, including upper-class residential, public housing estates, transportation hub, institutional and community uses, and mixed commercial-residential areas.

The 'Green Hub' of Northern Kowloon Peninsula

The above empirical evidence clearly showed that though without deliberate planning, a noticeable 'green hub' consisting of a network of parks, urban open spaces and green connectors has appeared in the study area. As shown in Figure 3, the 'green hub' centered on the three neighborhood parks, Kowloon Tsai Park, Morse Park, and the Kowloon Walled City Park. Together with other smaller domestic urban open spaces, they form the foundation of the 'green infrastructure' development of northern Kowloon Peninsula.

Kowloon Tsai Park is the oldest park of the area. It was opened to the public in 1964. The park is built on an excavated hill site, where the earth was used in the reclamation of the runway of the former Kai Tak International Airport. Morse Park, on the other hand, is the first comprehensive park built to serve the growing working class population living in the public housing estates in the early 1960s. Functionally, both Morse Park and Kowloon Tsai Park are typical recreational facility parks to meet the leisure and recreational needs of the increasing population in the postwar era. In Morse Park, for instance, you can find a natural grass soccer pitch and a multi-function sport center, which are rarely found in urban parks in Hong Kong. In Kowloon Tsai Park, it also has a sport stadium that is unique in the region. Therefore, these unique features help attract users from other districts.

On the other hand, Kowloon Walled City Park is a distinctive neighborhood park in the area. It is the newest neighborhood park developed on a historic site of the Walled City built by the Qing government in 1843. The Walled City was demolished in the late 1980s and subsequently converted into a public park in 1994. Additionally, other smaller domestic parks provide diversified functions serving mainly the needs of local residents.

Greenery Status of the 'Green Connectors'

One dominant feature of a green connector is vegetation. As shown in Figure 3, the six segments of the green connector links all the major UOSs in the study area to form the basic green infrastructure, providing an array of benefits to people and the environment. It is an ecological framework for the environmental, social, and economic health of our city.

Green connector Segment 1 (**S1**) cuts across the upper-class residential area of Kowloon Tong. The section along Cornwall Street is well vegetated. Roadside trees with large canopies are plentiful and provide good sun sheltering to pedestrians. In addition, there are many ornamental plants on the sidewalks. However, the roadside greenery along the Junction Road section consists mainly of newly planted trees with smaller canopies that provide limited sun sheltering functions. Overall, this segment begins from a park adjacent to the Festival Walk Shopping Mall, continues along Cornwall Street, and terminates at the Kam Shing Road recreation ground. The overall greenery status of this segment is excellent.

Green connector Segment 2 (**S2**) starts from the Kam Shing Road recreation ground and passes through the Shaw Campus of the Hong Kong Baptist University and the People Liberation Army barrack. The segment ends at Kowloon Tsai Park. With the exception of the section within Kowloon Tsai Park, the overall greenery status of this segment is moderately high. This segment consists of many newly planted roadside trees with canopies too small to provide good sun sheltering to pedestrians. Additionally, the connector passes through two civic opens spaces of the area: the Joint Sport Centre and the Lam Woo International Conference Centre, both located in the Hong Kong Baptist University campus. Occasionally, the activities offered by these centers will attract users from other districts of Hong Kong.

Green connector Segment 3 (**S3**) links Kowloon Tsai Park and Lok Fu Park by a winding footpath. It passes through a number of recreation facilities found in both parks. It is also the greenest connector with lush vegetation en route. The segment passes through the Radar Station of the ex-airport, which is also the site of a Service Reservoir for the area. It is one of the most preferred routes taken by the people going to the park to do morning exercise. The narrow twisting paths and relatively dense vegetation have given users a sense of exploration. However, they also impose higher security risks because of its relatively concealed environment.

Segment 4 (**S4**) starts from the Broadcast Drive Playground and terminates in Morse Park. The roadside trees along the Junction Road section provide only partial sun-sheltering function. On the other hand, the trees at the section between Lok Fu recreational ground and Morse Park are more mature with larger canopies. The connector links several domestic urban open space facilities, a local shopping center at Lok Fu and terminate at one of the major neighborhood urban open spaces in the area.

The fifth segment (**S5**) provides a link between three of the major neighborhood urban open spaces of the area, i.e. Kowloon Tsai Park, Kowloon Walled City Park and Morse Park. This connector, too, passes though different landuse types, such as upper-class residential, mixed commercial-residential and public housing estates. The roadside greenery is grossly inadequate along this route.

Finally, the last segment (**S6**) is located mainly in the Wong Tai Sin and San Po Kong districts. The overall environment quality of this segment is the poorest amongst the six segments along the green connector. There is clearly a disparity in the quality of the UOSs and their greenery status across the different districts through these segments. The socio-economic status appears to be positively associated with the quality of the UOS and greenery status. (Table 4)

Table 4: Characteristics of the Green Segments along the Proposed Green Connector.

Segment	UOSs Category (D/N)*	Major Landuse Types	Greenery Status
1	• Cornwall St Park (D) • Kent Rd Garden (D) • Dorset Crescent Rest Garden (D) • Ede Rd Playground (D) • Cornwall St Playground (D) • Kam Shing Rd Recreation Ground (D)	• Upper-class residential • Commercial (e.g. Festive Walk Shopping Mall/ Frankie Centre) • Institutional (e.g. HKBU, Baptist Hospital, PLA Barracks)	• Plentiful of roadside trees with large canopies along Cornwall Street (good sun-sheltering effect) • Ornamental plants along sidewalks • Newly planted trees along Junction Road (little sun-sheltering effects)
2	• Kowloon Tsai Park (N)	• Upper-class residential • Institutional (HKBU etc) • Civic open spaces	• Newly planted roadside trees with small canopies (little sun-sheltering effects)
3	• Kowloon Tsai Park (N) • Lok Fu Park (D)	• Recreational	• The greenest connector with lots of vegetations along the route
4	• Broadcast Drive Playground (D) • Junction Rd Park (D) • Lok Fu Recreation Ground (D)	• Institutional • Public Housing • Commercial	• Younger roadside trees along Junction Road with small canopies • Taller roadside trees from Lok Fu Recreation Ground to Morse Park (with larger canopies)

5	• Kowloon Tsai Park (N) • Inverness Rd Garden (D) • Carpenter Rd Park • Kowloon Walled City Park (N) • Shek Ku Lung Rd Playground (D) • Morse Park (N)	• Upper-class residential • Mixed Commercial-residential • Public Housing	• Roadside greenery is grossly inadequate
6	• Morse Park (N) • Muk Lun Street Playground (D) • Choi Hung Road Playground (D)	• Public Housing • Low class residential • Commercial • Industrial	The greenery quality is the poorest among the 6 proposed green connectors

* D = Domestic UOS; N = Neighborhood UOS

Visitation Habits of UOS Users

Urban open spaces are vital social spaces in cities, and the importance of understanding how these public spaces are used had been thoroughly documented in many studies, such as those by Whyte (1980), Francis (2003), Wong and Domroes (2004), and Low et al (2005). In order to find out why some UOSs work and others do not, a user's survey was conducted in selected UOS in the study area (Wong 2006). The survey interviewed 400 users from the three neighborhood parks constituting the 'green-hub' of northern Kowloon Peninsula and seven smaller domestic UOSs scattered along the green connector network that linked up all these spaces. The domestic UOSs were grouped together to form the fourth group in the data analysis. Overall, the sample consisted of slightly more male (52%) than female (48%); it also skewed slightly toward the younger age group with 47% of the respondents under 20 years old. They represented the dominant user group during the survey period from 10 a.m. to 6 p.m. The majority of the respondents have had secondary and above education (78%). Slightly over half of the respondents lived in public housing (54%) mostly adjacent to the parks and open spaces, and the ratio between those who lived in private rental housing (21%) and private self-owned housing (25%) was about the same.

The study revealed that many users went to UOS for strolling, bringing children to playgrounds, exercising, and participating in various sport and recreational activities. Because of the variation in their functions, users' generally demonstrated very distinctive usage patterns in neighborhood UOS and domestic UOS in terms of the frequency of visits, commuting time, traveling modes, length of visits and companions while visiting the UOSs in northern Kowloon.

Domestic UOS users

As reported in Wong's (2006) paper, the majority of domestic UOS users visited the space daily (22%) or weekly (34%), while the remaining only used this space occasionally. Many users (49%) stayed in domestic UOS for a short period of time, often staying for less than half an hour. Seemingly, many users treated domestic UOS as an

extension of their home. They linger around and chat with friends or neighbors on their way to or from their homes. Less than a quarter (23%) of the users, mostly elderly people, spent more than an hour in the space. Since these spaces were so close to their home, most users went there on foot (68%), taking less than 15 minutes to travel from their home. About two-thirds (63%) of the users went to domestic UOS to meet friends, and about a quarter (26%) went there alone. These spaces, which include gardens, sitting-out areas, and children's playgrounds, are an integral part of the housing development. Woolley (2003) argued that domestic UOSs are probably used throughout a person's lifetime. They may be of particular importance in the early years for play, and in the later years as a major social arena for the elderly. Therefore, domestic UOSs have social, health and psychological benefits to local residents, in addition to obvious environmental benefits by providing green space areas that support vegetation and wildlife diversity in an urban setting.

Neighborhood UOS users

Industrial developments in the postwar years resulted in a rapidly growing population (Ho, 2004). As more and more people live in congested housing estates, the demand for urban open spaces also increased. To meet this rising demand, many recreation-based neighborhood parks were built in the late sixties and early seventies, including two of the neighborhood parks in the study area including Kowloon Tsai Park and Morse Park. These parks usually have facilities such as soccer pitch, basketball court, tennis court, squash court, swimming pool, roller skating rink, table tennis room, jogging track with fitness stations, sport ground, and children's playground. Unlike domestic UOSs, neighborhood UOSs have larger user catchments areas and attract users who lives further away. Often users have to make a specific decision to go to neighborhood UOS. For instance, they will go to Kowloon Tsai Park to play soccer or to Morse Park to swim. In the three neighborhood park samples, only about half of the users went there on foot; the remaining users took public transports such as buses, MTR or taxis to the parks. Obviously, users are willing to travel longer distances to recreation-based neighborhood parks. Quite a substantial number of users (over 20%) spent more than half an hour traveling to these spaces. The survey also revealed that visitors used the facilities less frequently, and many of them visited the parks about once a week and even once a month. At the same time, they usually spend a longer period of time in these parks. For instance, more than two-thirds of the users spent more than one hour in the park. In fact, well over half of the respondents (57%) in Morse Park spent two hours or more, compared with only 9 percent in the domestic open spaces. Notably, people usually went to the recreation-based neighborhood parks with friends (over 80%), and some went there either with children or by oneself. In these neighborhood UOSs, one might not only meet friends and close neighbors, but also people from neighboring districts. It offers more opportunities to expand the scope of social interactions of its users. Consequently, it offers a possible transition of the interaction of users from a level of familiarity to sociability (Woolley, 2003).

Concluding Remarks

This paper described the nature and characteristics of urban open spaces in one of the urban districts in the Kowloon Peninsula of Hong Kong. By mapping out the spatial distribution of urban open spaces in the study area, the study has found several potential UOS clusters that might provide multiple services and act as major neighborhood

recreational spaces. Together with the series of green connectors identified, these spaces serve very well as the possible 'green infrastructure' of the area. Contrary, the findings of the visitation survey uncovered that domestic and neighborhood UOS users showed significant differences in the frequency of visit, commuting time, traveling mode, time spent in UOS and accompanying person. Apparently, the spatial fragmentation of existing UOSs discourages mixing uses of both spaces and facilities. Therefore, network of green connectors could help to facilitate the optimum use of the existing UOSs.

In fact, the idea of creating connected urban open spaces is not a new concept (Erickson, 2006). The first and most famous example of an urban park system was planned and designed by Frederick Law Olmsted for Boston in the United States. The park system, known as the 'emerald necklace,' linked the Boston Commons, the Back Bay Fens, Jamaica Pond, the Arnold Arboretum and Franklin Park as a naturalistic open space system (Freestone, 2002). The park system idea was also used extensively in urban open space development in many European cities. For instance, Ebenezer Howard, who drew inspiration from Olmsted, proposed a green belt for London in 1898 (Howard, 1898). In Asia, the concept of interconnectivity of UOS, also known as the 'green connector,' has been effectively used in the urban planning and design in Singapore (Foo, 2001). In fact, the integrated sequential open space concept has been employed in the planning of "the next generation public space" in Singapore's new downtown development project (Chan, 2001).

In Hong Kong, although without deliberate planning, the green connector segments identified by this study forms a rudimentary 'link-hub' network that constitutes an initial form of 'green infrastructure'. The findings implicate that the concerned agencies of the HKSAR Government should review its park provision, planning, design and management policies. In contrast to conventional planning practices, which often lead to fragmented UOS development, the 'green infrastructure' concept could help to rectify many shortcomings in the existing open space policy of the Government. Overall, empirical evidences revealed by this study suggests that by linking discrete and isolated UOS together with network of green connectors could enhance the open space needs of urban dwellers. The emergence of the 'green infrastructure' promotes environmental integrity and community cohesion, and it contributes to better landscape design and enhances the overall livability of metropolitan cities.

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Endnotes

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2. The number is based on the Gazette record of Chapter 132 Schedule 4 Public Pleasure Ground, version date: 9-Oct-2009

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