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Modeling Elderly Accessibility to Urban Green Space in High Density Cities: A Case Study of Hong Kong

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Abstract

Hong Kong is an ageing society. According to the World Health Organization, an estimated 22% of its residents will be 65 years old or above by the year 2030. Physical activities provide an important way for older people to stay healthy. Green space is recognized as an important environmental setting for physical activity. Therefore, improving elderly accessibility to green space is useful in promoting more physical activity among them. The aim of this study is to modeling and assessing the elderly accessibility to urban green spaces in Hong Kong, by (1) modeling urban green spaces available for elderly people using the landscape fragmentation index (LFI) of green space patches, and (2) accessibility analysis in terms of both distance and time for elderly people to get urban green space patches. As a result, regions with LFI from high to low and accessibility from good to poor are Kowloon, Hong Kong Island, and New Territories. Kowloon has the highest LFI and accessibility. However, it is limited by small size green space patches which may not be in good quality and attractive for elder people. New Territories, due to its large number of available lands, has the largest proportion of big size green space patches. However, they are limited by their poor accessibility. Based on these evidences, we would suggest the prior improvement (1) in Kowloon is to have more green spaces with larger sizes, (2) in New Territories is to increase the green space accessibility either by improving the walking routes or building more small to median size green space patches that can well cover the whole region.

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Keywords: Urban green space; Accessibility anaysis; Elderly; High density cities; Hong Kong

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1. Introduction

Hong Kong, a typical high density city in Asia, is an ageing society with increasing life expectancy for men and women. In Hong Kong, men have the longest while women have the second longest life expectancy in the world[1]. An estimated 22% of its residents will be 60 years old or above by the year 2030, according to the World Health Organization. It is widely documented that the living environment plays an important role in promoting or inhibiting physical activity, which is crucial for older people to stay healthy[2]. In particular, green space has been recognized as one of the most important behavior settings for physical activity of elderly people[3].

Urban green space provides a wide range of benefits in sustaining urban natural environments and the social systems that use these spaces. The benefits include improving air quality, reducing urban heating island effects, and making urban environments more preferable. Moreover, exposure to green spaces promotes physical activities and enhances mental health and psychological state of elderly people[4,5]. However, to achieve these benefits, urban green spaces must be accessible to the public, as accessibility is the key to effective social and ecological functioning of cities[6]. The role of accessibility of urban green space is especially important for elderly people in high density city since they are the age group who will beneficial the most from their living environment[1].

In this study, we aim to model and assess the elderly accessibility to urban green spaces in Hong Kong, by (1) modeling urban green spaces available for elderly people using the landscape fragmentation index of green space patches, and (2) accessibility analysis in terms of both distance and time for elderly people to get urban green space patches. Based on the results, some suggestions on planning and design of urban green spaces in Hong Kong are provided.

2. Background

2.1. High density living environment in Hong Kong

Hong Kong is an example of a high density city, including a total of more than 7 million residents and a total land and sea area of 2,754 km^2. Strictly limited by urban policies for land use planning in Hong Kong[7], the sprawl of built-up areas, new towns and metropolitan area (272 km^2) account for about 25% of the total areas (1,104 km^2). As a result of high density and very limited open spaces, high degree of fragmentation, less green space in some areas, week accessibility and connectivity are the major problems of green spaces in high density areas in Hong Kong. As shown in Table 1, the total green park area distributed in 18 council districts in Hong Kong is 22.7 km^2, in which New Territories has the largest green park area (14.9 km^2) and Kowloon the smallest (3.6 km^2). The result of green park area per elderly person shows that, Kowloon and Hong Kong Island has lower value because of their higher density of residential and business area compared to New Territories. As a solution, enhancing the accessibility through public transportation systems and walking lanes to urban green spaces is one of the most cost effective approaches to enable connections between residents and natural environment[8].

2.2. Aging population in Hong Kong

Hong Kong consists of 18 communities named District Council districts for local administrative purpose. The demographic and socioeconomic profiles vary across these districts[1]. Based on statistics on "*Domestic Households, the Thematic Report on Older Persons"* and "*Domestic Households with Older Persons"*, the projection of total domestic household number with older persons can be obtained. Table 1 shows the population distribution and corresponding basic statistics of green park area, both of which are the basic datasets in the following green space accessibility analysis. The population proportion of age group at 65 and above in most council districts are more than 10%, especially the areas in the Hong Kong Island and Kowloon, the proportion is nearly or more than 15%.