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Original article

Urban greenspace delivery in Hong Kong: Spatial-institutional limitations and solutions

C.Y. Jim[a,*], Michael W.H. Chan[b]

[a] Department of Geography, University of Hong Kong, Pokfulam Road, Hong Kong, China
[b] Department of Social Science, Hang Seng Management College, Hong Kong, China

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ABSTRACT

Hong Kong has developed an ultra-dense urban form dominated by buildings and roads with inadequate urban greenspace (UGS). Analyzing the fundamental constraints to UGS provision offers hints for improvements which are relevant to other compact cities. Twenty-five current issues regarding institutional and spatial limitations were evaluated with reference to three themes: open-space planning standards, urban-design guidelines and urban-greening governance. They were studied by interpreting relevant parts of government documents spanning the 1980s to 2015, map analysis, and field assessments. UGS standards of selected cities, and extensive research findings and practices reported in the literature specific to the respective constraints, have been enlisted for comparison and as the basis for formulating recommendations to improve delivery quantity and quality. The low local supply at merely 2.84 m^2/person is tied down by outdated planning standards and policies which have remained unchanged for eight decades. UGS planning, design and management could be enhanced based on urban ecology and landscape ecology principles and best international practices, with suitable adjustments catering to local circumstances and the inordinately tight urban fabric. The package of suggested solutions in relation to the 25 institutional and spatial constraints could be considered for applications in other cities with compact precincts or undergoing densification to forestall problems and resolve difficulties.

1. Introduction

Urban greenspace (UGS) provision is a universal quest with a long history of advocacy (Eisenman, 2013). As a key component of smart growth, UGS attracts ardent followers in different parts of the world (Benedict and McMahon, 2002a). The detachment of humans from nature in cities has generated a desire to re-establish the lost linkage (Ulrich, 1986). To bring relief, the dominant grey infrastructure could be counterbalanced by green infrastructure (European Environment Agency, 2011; Svendsen et al., 2012; Norton et al., 2013) to develop UGS as a connected and permeating network (Foster et al., 2011).

UGS offers a prominent surrogate of nature in built-up areas with valuable ecosystem services and social-economic (Mell et al., 2013; Demuzere et al., 2014; Environmental Protection Agency, 2014a) and health benefits (Tzoulas et al., 2007; Webster and Sanderson, 2012). Some cities have adopted it as a climate-change adaptation tool (Landscape Institute, 2009; IPCC, 2013; Environmental Protection Agency, 2014b). Others have reformed planning systems and instruments to meet the challenges (Birkmann et al., 2014) by embracing nature-based solutions (European Commission, 2015).

Recent advances in urban ecology and landscape ecology provided the conceptual basis to facilitate UGS delivery (Sukopp et al., 1990; Breuste et al., 1998; Douglas et al., 2011). The visual emphasis in urban design could be extended to conservation and creation of natural areas to enhance environmental-ecological functions. The needs and means to augment urban biodiversity could be embraced (Alvey, 2006). The geometric patterns and distribution can be optimized by spatial-ecological planning to enhance services to people and wildlife (Lafortezza et al., 2013). Weaving green components with the built-up fabric can make cities more livable (Benedict and McMahon, 2002a,b).

Some cities are better endowed with ample and high-quality plantable spaces to permit greening (Baycan-Levent and Nijkamp, 2009; Berlin Government, 2014). Compact cities in developing countries often suffer from inadequate greening space (Elewa,

* Corresponding author.
E-mail addresses: hragjcy@hku.hk (C.Y. Jim), michaelchan@hsmc.edu.hk (M.W.H. Chan).

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Table 1
Twenty selected compact cities of the world ranked by population density.

City	Country	Population (million persons)	Land area (km^2)	Population density (persons/km^2)
Dhaka	Bangladesh	15.67	360	43500
Mumbai	India	17.71	546	32400
Hong Kong	China	7.25	275	26400
Karachi	Pakistan	22.12	945	23400
Kinshasha	Congo	11.59	583	19909
Bogota	Columbia	8.99	492	18300
Kabul	Afghanistan	4.64	259	17900
Alexandria	Egypt	4.69	293	16000
Manila	Philippines	24.12	1580	15300
Lagos	Nigeria	13.12	907	14500
Lahore	Pakistan	10.05	790	12700
Kolkata	India	14.67	1204	12200
Dehli	India	25.00	2072	12100
Lima	Peru	10.75	919	11700
Singapore	Singapore	5.62	518	10900
Seoul	South Korea	23.48	2266	10400
Mexico City	Mexico	20.06	2072	9700
Shanghai	China	23.42	3820	6100
Guangzhou	China	20.60	3432	6000
Tokyo	Japan	37.84	8.547	4400

Data Source: Demographia (2016) Table 1 Largest urban areas in the world, available from http://demographia.com/db-worldua.pdf.

2014). Compact city has been defined by different criteria and metrics, including mainly the high-density urban form with mixed and efficient land uses and limited outward expansion to contribute to sustainable urban development. It can enhance efficiency and cost-effectiveness in transport, energy, infrastructural provision and nature conservation. It may improve environmental quality, access to facilities and services, and social interaction and integration (Burton et al., 1996; Burton, 2000). Some cities have adopted the densification or intensification as smart-growth modes, contrasting with urban sprawl, to benefit from compactness and to revitalize and regenerate inner city areas (Lehmann, 2010). Examples of large compact cities are given in Table 1.

Extreme compactness may impose physical and physiological constraints on plant growth, demanding innovative solutions. This study focused on the limitations and solutions regarding UGS delivery in Hong Kong. Its urban growth initiated 160 years ago has been restricted by the rugged topography with few flat lands, resulting in a highly compact urban form (Fig. 1). The 7.32-million population is accommodated in about 250 km^2, a quarter of the land area. The city's excessive impervious paving denotes poor urban environmental quality (Arnold and Gibbons, 1996) with impact on human health and wellbeing (Villanueva et al., 2015). UGS provision at <3 m^2/person (Audit Commission Hong Kong, 2013) is the world's lowest for comparable large cities. As a social indicator for quality of life (Hong Kong Council of Social Services, 2014), the shortage carries health implications especially for deprived and low-income neighborhoods.

The lack of UGS is compounded by poor design and quality. Most sites are dominated by manicured landscape, hard paving and installations with limited green cover. They are discrete and isolated patches with little linkage by habitat corridors or stepping-stone parcels (Wang and Merrick, 2013). New-town development and urban renewal offer chances for improvements. The ageing population has altered outdoor-recreational needs (Sugiyama and Thompson, 2005). Most people live in tiny apartments generate pent-up demands for solution space (Lo and Jim, 2012). The administrative setup and mindset could be adjusted to respond

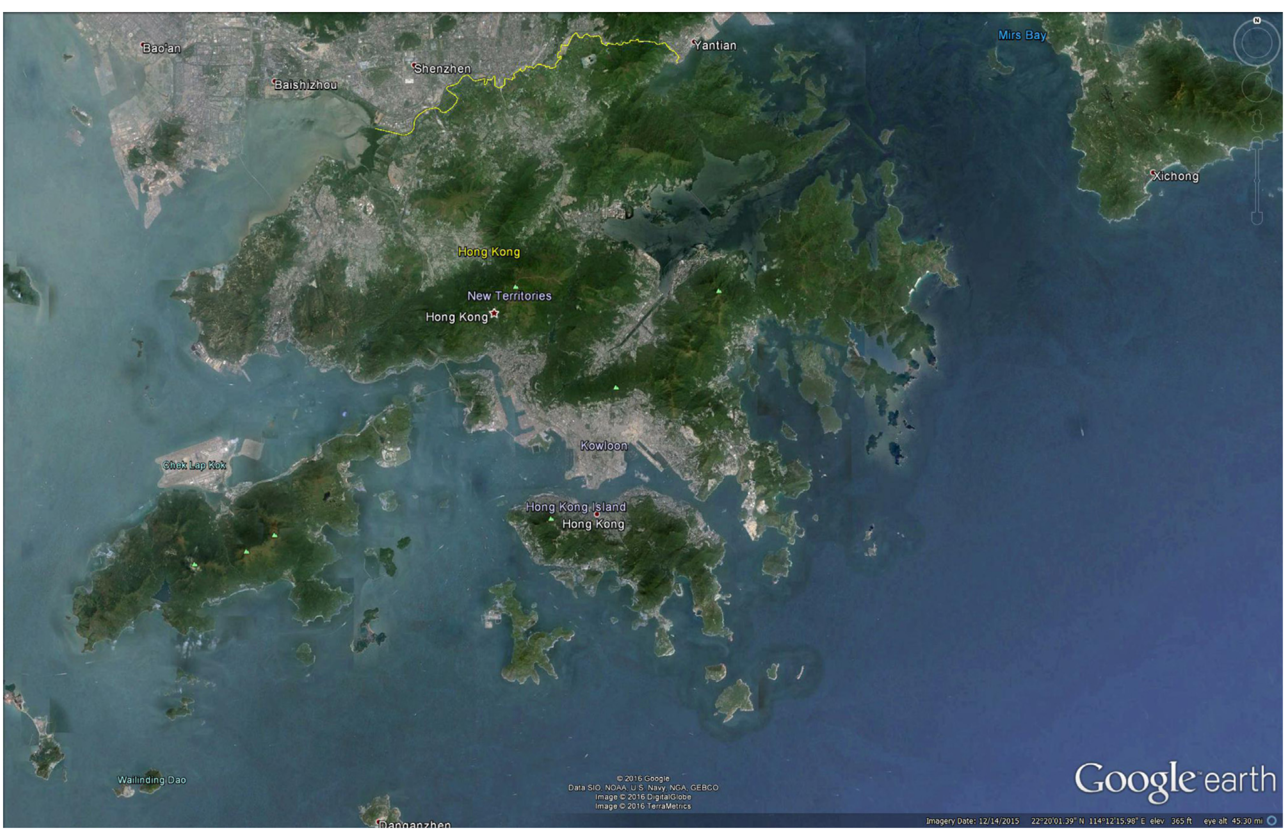

Fig. 1. Satellite image of Hong Kong showing the concentration of ultra-high density urban development (gray color) in about one quarter of the total land area of 1104 km2 accommodating the 7.32 million population; note the extensive countryside area (green color) with a statutory protected area system covering 40% of the land composed mainly of rugged hilly topography not suitable for urban development (Source: Image© 2015 DigitalGlobe). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)