Planning Green Open Spaces for South East Asian Capital Cities

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Introduction

Many cities have ranked the liveability of their capital cities on safety, education, hygiene, health care, culture, sustainability, recreation, political-economic stability, public transportation, and to a smaller extent, the environment. Other cities have placed more emphasis on environmental performance and quality of life issues using indicators that contribute to improving the city's carbon footprint. In other words, some cities use "green" and/or "green open space" only in the broadest sense as an indicator to support the environmental sustainability of a city and have missed the point on how green open space can, and does, impact the economic, social, environmental and health benefits of its people, and through these outcomes, provides for sustainability and liveability. For green open space to be sustainable, it needs to become part of the city's economic imperative, tracked through economic, environmental and social metrics, and integrated within the city's business planning cycle.

What is Green Open Space?

Green space has been defined as "any piece of land covered with vegetation and usually refers to parks, golf courses, sports fields and other open land within the built-up area, whether publicly accessible or not" (State University of New York, 2010). The Planning Institute of Australia (2009) has described open space as "land that has been reserved for the purpose of formal and informal sport and recreation, preservation of natural environments, provision of green space and/or urban storm water management." In almost all instances, the space referred to by the term "open space" is, in fact, green space. With green plant systems providing considerable benefits for the greening of cities, perhaps a more appropriate term may be "green open space."

What are the Benefits of Green Open Space to a City Community?

The broad benefits of green open space provide for a "range of environmental and social services including the conservation of ecological processes and cultural heritage values; sport and leisure functions, enhancing the visual qualities and character of the city landscape; providing linear connections and linkages, including trails, pathways, creeks and beaches; and providing spaces for parks and playgrounds and other public spaces where the community can exercise, play, learn and simply relax" (Hickie, pers. comm. 2010). Although Swanwick et al. (2003) have shown that urban green open space contributes positively to some of the key agenda issues in urban areas, such as social inclusion, health, sustainability and urban renewal, green open space has often reflected on environmental, social, economic and health issues in delivering a range of important benefits for communities and local governments.

- Environmental benefits

Green open space benefits can range from providing "green lungs" to a city by releasing oxygen, and so contributing to improved air

LEFT Green open space encourages human interaction (Photo: National Parks Board, Singapore).

quality, controlling temperature extremes and reducing the "heat island effect" often associated with hot and humid summers, noise pollution and the visual intrusion of traffic. The large surface area of green open spaces can provide large amounts of fresh water to a city, control soil erosion, filter pollutants and other particulate matter, provide for improved rates of carbon sequestration, reduce sound and visual pollution and provide security from calamities such as fire and earthquake. Research has shown that green open space can also control the movement of sediment and run-off water, reduce leaching of pesticides and fertilisers, and provide for shade and wildlife habitat.

- Social benefits

Green open spaces involve engagement with the environment, involvement with structured and unstructured sport activity and involvement with national and international events. Green open space plays a role in providing places for social interaction and cohesion, providing safe play areas for children and closer friendships (Thompson, 2007), a cognitive and social environment for children, and a connection of place attachment with older adults. Crime prevention and reduced juvenile delinquency have also been related to green open spaces. Green open space can also provide the necessary intrinsic values for evoking memories, providing pleasure and satisfaction. Wang (1999) has found that a simple stroll in parkland can provide for spiritual health, creative self-expression and a sense of community pride. Employees with access to views of planted landscapes have reported improved job satisfaction, less job pressure and increased worker productivity.

- Economic benefits

Green open spaces can attract tourists, residents, businesses, partnerships and eco-tourism operations, as well as provide special landscapes for garden festivals and exhibitions (Aldous, 2009). Economic benefits can range from receipts from tourism and direct revenue generation (leases, licenses, event hosting, etc.), to employment opportunities, as well as the boosting of property values and bond ratings. Less tangible economic benefits include energy savings made in terms of air conditioning costs, water savings from electricity generation, pollution and hydrological amelioration and carbon sequestration. Within the Asian City of Chandigarh, the annual value of recreational use from parks and gardens, boulevards, green avenues, reserve forests, wild life sanctuary and other landscape features has been valued in the order of Rs.120.00 million (AUD$279.0 million), Rs.27.50 million (AUD$64.0 million) from residential business and Rs.92.40 million (AUD$214.0 million) from tourism, based on 2002-2003 prices (Chaudhry, 2008). Activities associated with green open space are known to contribute to better individual and community health (Bird, 2002) and are even used to demonstrate an economic link between the cost of health services and the potential use of green space in reducing those health costs (McKenna, 2003).

Objective

The objective of this research was to document peer-reviewed articles that relate to improving green open space in South East (SE) Asia, and discuss the opportunities and challenges associated with the planning of green open space.

Methods and Materials

A systematic literature review was conducted to assess the body of research available on this area, using online searches, reports, journals and e-mail interviews. Documents directly relating to the area have been included as references and websites sources in the reference section.

Results and Discussion

- Differences in the Extent of Green Open Space

More recently, the assets associated with green open space have been broadened and involve both an urban and rural dimension. Urban green open space now includes assets such as botanic gardens, urban forests and racecourses (Aldous, 2010), as well as assets such as private backyards, street verges and medians and school grounds (Barnett et al., 2005). Similarly, rural green open space assets could well include market gardens, landfill sites, airports, parkland and other environmentally sensitive areas (Kingston Green Wedge Plan, 2011) as well as "wild lands, protected areas, forest plantations, cropland and rural settlements" (Cereno, 2009). It makes sense to call a capital city truly green when it can demonstrate the significant relationship between green open space and environmental sustainability when planning its green open spaces.

- Differences in the Percentage of Green Open Space

Both Singh et al. (2010) and the Status of Urban Forestry in the Asia-Pacific Region (1998) reported on the percentage of green open space, as well as the area of green open space per capita, for a number of countries in the Asia Pacific region (Table 1). Singh et al. (2010) noted that cities renowned for their green open spaces contain 20 to 30 percent of their total geographical area under cover, and when the population of the city is taken into account, some 15 to 25 square metres of urban green open space per capita. The United Nations Food and Agriculture Organisation (FAO) (1992) has provided a figure of 9 square metres as the minimum amount of green open space per city dweller. The Chinese researcher Xie (1999) demonstrated a case for an upper limit of 60 square metres per capita of green open space on sustainable development grounds.

COUNTRY/CITY	GREEN SPACE % OF TOTAL CITY	M²/PER CAPITA (YEAR)	COMMENTS (REFERENCE)
AUSTRALIA			
Melbourne (residents)	17.80%	163.3m² (97)	Daytime population is 400,000 and residential 40,000 only; Figure refers to parkland, garden and recreational reserves (Stokie, 1998).
Melbourne (day-time pop.)	17.80%	16.3m² (97)	*Estimated crown cover of about 24 million m² amounting to 80 m² per inhabitant (Brack, 2002).
CHINA			
Average	23.8%	5.7m² (96)	Public parks and other green space (Li, 1997) increase to 40 percent by year 2000 (or 8 m²/ inhabitant (Shan, 1994)
Beijing	28 (1994)	6.83 m²	(Jim, 1998; Chan, 1988).
Hong Kong	39.2% (97)	66.0 m²	*On average, China's cities have 32.54% of green cover. This varies greatly in Chinese cities like Nanjing and Wuhan, i.e., 44.3 m² per person and 10.3 m² per person respectively (Jim & Wendy, 2009).
Hong Kong excl. country parks	1.5% (97)	2.5 m²	
INDIA			
Mean		0.003 (80s)	Unclear if it refers to public green space (Andresen/Plexman, 1980; Pye-Smith, 1996).
Bombay		0.12m²	*In Delhi, India, the average tree and forest cover is about 20% of geographical area, and about 21 m² per inhabitant (FSI 2009, as per population data, 2001).
			*In Chandigarh, India, the average tree and forest cover is about 35.7% of geographical area and about 55 m² per inhabitant (Action Plan 2009-10, as per population data, 2001).
INDONESIA			
Jakarta		0.22 m² (86)	Parks per capita (Ait, 1998).
JAPAN			
Takatsuki City urban forests	84% (1990)	4.52 m²	5,000 ha (Yuji, 1995) refers to parks, planned to increase to 6 m².
Tokyo Metropolitan Area			
SOUTH KOREA			
Seoul	25.2%	14.57 m² (96)	Public green space (Park, 1997).
MALAYSIA			
Kuala Lumpur	5%	2.25 m² (96)	Public green space (Adnan, 1998).
NEW ZEALAND			
Christchurch	12.2%	0.018 m² (97)	Public green space, mainly sport fields with border trees (O'Reilly, 1998).
SINGAPORE	17.8%	7.5 m² (97)	Public parks and open space targeted to increase to 8m² per capita per year (Singapore's National Communication under the United Nations Framework on Climate change, Nov 2010). Singapore now has 46.5% green cover to service a growing population (*www.nparks.gov.sg*).
SRI LANKA			
Colombo	4.4%		Green spaces include 2.4% of private (golf course etc.) and 2.0% of public (municipal parks, etc.) spaces (Wickramasinghe, 1998).
THAILAND			
Bangkok Metropolitan Area		1 m² (97)	Planned to increase to 4-5 m² by the year 2000 (Charmniern, 1998).

Table 1. Comparison of percent green space of total city and m²/per capita (year) for capital cities in SE Asia**

* Modified from Singh, V. S., D. N. Pandey and P. Chaudhry (2010). Urban Forests and Open Green Spaces: Lessons for Jaipur, Rajasthan, India. Rajasthan State Pollution Control Board, Occasional Paper No. 1/2010:1-23. Retrieved from *http://210.212.99.115/rpcb/RSPCB-OP-1-2010.pdf* (Accessed October 20, 2010).

** Modified from the Status of Urban Forestry in the Asia-Pacific Region (1998). FAO Corporate Document Repository. Retrieved from *http://www.fao.org/docrep/003/x1577e/X1577E06.htm* (Accessed 13th August 13, 2010).

Challenging issues relate green open space and sustainability. Not only is there an increasing pressure from the population residing in and around urban areas, but these people are increasingly consuming larger amounts of energy as well as placing pressure on existing natural resources. In addition, the events of climate change have resulted in elevated temperatures, water and air pollution and reductions in plant and animal biodiversity. Research needs to be carried out not only to determine whether the capital cities of SE Asia have sufficient green open space to sustain increasing population growth, but also where planners have to consider changing land use, development pressure and increasing awareness of environmental issues and threats.

Challenges of and Opportunities for Greening SE Asian Capital Cities

A number of challenges and opportunities now face councils in the planning of green open spaces. The planning of green open space also offers a number of challenges and opportunities for planners to retain closer linkages with green open space managers, horticulturists, economists, ecologists, and social and health scientists.

Important challenges involve discussion on the following:

- Percentage of Green Open Space Needed To Achieve Environmental Sustainability

Although Australia's capital cities rank quite highly in terms of green open space and m^2 per capita (Aldous, 2009), there is considerable variation within SE Asian capital cities, particularly on the percentage of green open space to achieve environmental sustainability. Xie (1999) used a range of biological measurements to show that more than 60m2 per capita of urban green space are necessary for optimum residential development and environmental sustainability. Zhang (1999) similarly concluded that one hectare of green open space in Beijing City could absorb 1,767 tones of CO_2 per day, and release 1,230 tonnes of O_2 in gaseous exchange per day. It is suggested that in any long term planning exercise, we need to audit not only the total amount and type of green space, but also whether there is sufficient green open space to ensure sustainability for a growing population. Geographical information systems (GIS) are available that can evaluate the areas of green open space, and also assess their environmental value.

BELOW & RIGHT Maximum daily canopy temperatures of a green, growing bermudagrass turf grass surface was found to be 21 °C cooler than a brown dormant turf and 39 °C cooler than a synthetic surface (Photos: Beard and Johns, 1985).

ABOVE Involvement with national and international horticultural events provides both economic and social benefits within a region (Photo: National Parks Board, Singapore).

- Classification System for Green Open Space

Recent studies have shown that green open space assets can and have varied in type and structure. There is a need to maintain some consistency in the classification of green open space so comparisons can be made within and between SE Asian capital cities. For example, Byrne and Sipe (2010) have recently classified their urban green open spaces using typologies such as parks, plazas, urban trails or greenways and streets, despite recognising cemeteries, rail reserves and rooftops, whereas Brisbane City Council offers a wider classification of green open space assets, such as parks, bush land, the Brisbane River, community gardens, bikeways and paths, spaces around libraries and art galleries and the links between these elements (Brisbane City Council, 2007). Recently, the Commission for Architecture and the Built Environment (CAB) released a new tool that classifies public open space into civic spaces, parks and gardens, natural and semi-natural urban green spaces, green corridors, outdoor sports facilities, provision for children and teenagers, allotments, community gardens and community farms, cemeteries and church yards, amenity green space and accessible countryside assets. This Space Shaper Toolkit (2010) system measures the quality of public open space before the manager has to invest time and money in its improvement. Such an audited approach on existing green open space assets in SE Asian countries, combined with surveying the needs of residents, could well provide for a consistent approach to green open space assets in changing communities.

- Green Strategies, Green Infrastructure, and Open Space Documentation

Green strategies in many SE Asian countries are emerging through a range of open space documentation but require further detail. Capital cities in SE Asian countries would benefit from the concept of green infrastructure (GI) as part of their planning processes. GI highlights the importance of the natural environment in decisions relating to land use planning, recognises all landscape types (including water resources) and emphasises the "life support" functions provided by a network of natural ecosystems. The concept has significant potential to contribute to the sustainable development of green open spaces in many SE Asian countries, either by being embedded in or attached to any new open space documentation as a separate green space strategy.

Conclusions

- Some SE Asian green cities plan to have up to 60 square metres of urban green open space per capita to encourage environmental sustainability.
- Green open space should be an important indicator when developing future indices on environmental performance.
- A model that audits SE Asia's green open space assets, accurately classifies these assets, determines how much green open space is available, and develops common green open space strategies and infrastructure should be prepared. CG

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