

An Overview Biophilic Practices in Singapore

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Homo sapiens evolved as a species around 200,000 years ago. Around 6,000 years ago, cities and urban settlements began to emerge. For more than 97 percent of human's evolutionary history, response and adaptation to the natural environment, including flora and fauna, were the key survival determinants. E.O. Wilson proposed that biophilia, that is the tendency of humans to focus on and to affiliate with nature and other life-forms, has in part a genetic basis. However, cities are associated with human-engineered infrastructure rather than bio-centric features. With urbanisation, humans have become alienated from nature, the environment that ensured our survival and shaped our evolution.

In the twenty-first century, the rate of urbanisation has intensified, and if the current trends continue, urban residents globally would have nearly doubled from 3.5 billion to 6.3 billion from 2010 to 2050. How are humans adapting physiologically, psychologically, and emotionally to the physical and social environments that are radically different from what we had been evolutionarily selected for in the past? Will humans' modern alienation from nature result in the atrophy of innate biophilic characteristics that might compromise our survival as a species? How does urbanisation affect biodiversity and hence our quality of life? These questions are not easy to answer as they are dependent on a complex interplay of several factors. One of the key challenges we face today is how to conserve biodiversity conservation while undergoing rapid urban development.

The Need to Reconnect and Global Trends in Cities

A common assumption is that cities and rich biodiversity are incompatible. This assumption is however being questioned as, surprisingly, spanning all the continents, many cities—including Berlin, Bonn, Brussels, Cape Town, Chicago, Curitiba, Edmonton, Frankfurt, Freiburg, Helsinki, Hyderabad, Kolkata, Mexico City, Montreal, Mumbai, Nagoya, New York City, São Paulo, Seattle, Singapore, Stockholm, and Vienna, just to list a few—have records of high species richness. Diverse natural ecosystems, including forests, mountains, grasslands, peat swamps, mangroves, rivers, lakes, rocky shores, coastal habitats, intertidal mudflats, seagrass meadows, and coral reefs, can be found in cities. Increasingly, industrial landscapes and built-up areas like residential areas, railway tracks, road verges, city centres, car parks, backyard gardens, high-rise buildings, and so on have become refugia for biodiversity.

Acknowledging that the ecosystem services provided by biodiversity are crucial for our existence, cities face the challenges of reconnecting with nature so that people can readapt to the living world. Cities around the world have experimented with many different approaches. I would like to share some initiatives carried out by Singapore where the native biodiversity is still rich (See Fig. 1).

Singapore's Initiatives

The planting of the Mempat tree, *Cratogeomys formosum*, by the late Mr. Lee Kuan Yew on 16 June 1963 marked the

launch of an island-wide tree-planting campaign, which made Singapore a "Garden City". As the different waves of multilayering colourful tree species added complexity and texture to roadside planting and parks, the urban landscape of Singapore evolved into a "City in a Garden". While the original underlying objective of these initiatives was to make Singapore a liveable city, in the course of this journey, many of the principles that have been put to practice are biophilic in nature.

Singapore has four legally protected nature reserves, namely Bukit Timah Nature Reserve, Central Catchment Nature Reserve, Sungei Buloh Nature Reserve, and Labrador Nature Reserve. They are conserved for (a) propagation, protection, and conservation of plants and animals; (b) education and research; and (c) recreation. More than 2.4 million people visit the nature reserves annually to walk, jog, bird-watch, photograph, and so on. In addition to the four nature reserves, 20 nature areas are captured under Urban Redevelopment Authority's Parks and Waterbodies Plan. Conserving these biodiversity-rich areas allows people to reconnect with nature despite working and living in urbanised settings. Less than a 15-minute walk from Orchard Road, which is one of the busiest shopping areas in Singapore, one can enjoy the tranquillity of a primary forest in the Singapore Botanic Gardens, one of the 20 nature areas.

There are over 350 parks, 300 kilometres of park connectors, and around 3,500 kilometres of roads in Singapore. A range

2145 native vascular plant species	35 true mangrove tree species
384 bird species	12 seagrass species
109 reptile species	255 hard coral species
85 freshwater fish species	50 sea anemone species
318 butterfly species	>200 sponge species
125 dragonfly species	>68 echinoderm species
>400 spider species	>30 sea fan & sea whip species
29 amphibian species	



1. Figures on Singapore's Biodiversity.

2. Overarching branches of mature rain trees, *Samanea saman*, form a green tunnel over the road Jurong West Street 52 in Singapore (Photo: Tee Swee Ping).



3. Rabbit fish swimming in Singapore's waters (Photo: Karenne Tun).



4. Marine organisms in pontoons in Marina at Keppel Bay (Photo: Karenne Tun).

of natural ecosystems like secondary forests, grasslands, streams, mangroves, and so on intersperse the maintained gardens and turfs in our parks and often occur adjacent to the park connectors. Overarching canopies (See Fig. 2), multicoloured flower blooms, and butterflies that flit across the roads provide our eyes with relaxing respite on journeys along tarmac roads. Tree-lined roads facilitate biophilia in simple day-to-day activities. Singapore's greening efforts are not confined to the ground. They have reached for the sky with 72 hectares of green roofs and about 5 hectares of vertical green walls. These illustrate how buildings can be infused with biophilia and add another platform to spread practices of biophilia.


As Singapore is an island, biophilia is also relevant to our coastal and marine environments. Conserving marine biodiversity in the natural environment is

accorded status as a priority (See Fig. 3), while biophilic principles are applied to the built environment in parallel. Marine organisms thrive in marinas (See Fig. 4). The planting of mangroves on seawalls has helped to reduce wave erosion and introduced a biological component to human-made structures. Research is also being carried out on how to populate sea walls with tiles that will diversify the substrate texture so that a greater variety of marine organisms can be recruited. Biophilic practices for the coastal and marine environments are increasingly being innovated.

Moving Forward

As the awareness of biophilia increases among the public, people will begin to identify more cases of biophilia, and heightened conscious efforts will be made to apply biophilia more systematically. Research opportunities to measure and assess the benefits of

biophilia are immense. The indicators of the Singapore Index on Cities' Biodiversity can be used to monitor and evaluate biophilic practices.

A symposium on biophilia was held in Singapore on 14 October 2015. Distinguished academics in the field Professor Stephen Kellert, Professor Timothy Beatley, and Professor Peter Newman delivered thought-provoking lectures on different aspects of biophilia. This marked a milestone in Singapore's biophilic journey in reconnecting with nature in a highly urbanised city. 

References

Chan, L., O. Hillel, T. Elmqvist, P. Werner, N. Holman, A. Mader, A., and E. Calcaterra. 2014. *User's Manual on the Singapore Index on Cities' Biodiversity (also known as the City Biodiversity Index)*. Singapore: National Parks Board, Singapore.