e ESSAY

CITY IN NATURE
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Transforming Singapore into a City in Nature

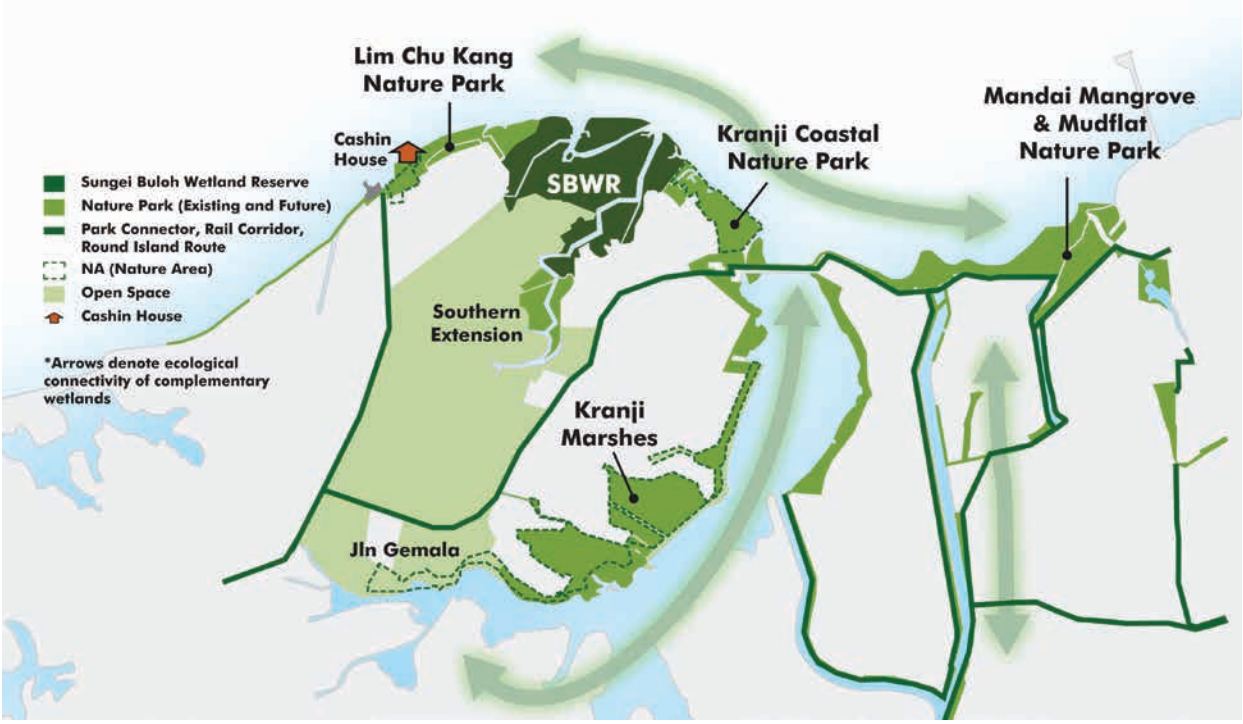
Artist's impression of the upcoming Rifle Range Nature Park, which provides more space for nature-based recreation.
Image: NParks

The importance of nature and green spaces for physical, emotional and mental wellbeing cannot be understated, particularly in a land-scarce country like Singapore. In this essay, Kenneth Er, Chief Executive Officer of Singapore's National Parks Board, explains the country's journey to becoming a City in Nature and the role of the natural environment in post-pandemic cities.

> NParks introduced the City in Nature vision...to ensure a green, liveable and sustainable home for Singaporeans for generations to come.

Situated one degree north of the equator, Singapore resides within a region of perpetual summer and high rainfall. Despite being a small city-state of 728 km^2 and one of the most densely populated countries in the world, Singapore is home to a rich diversity of flora and fauna. This is the result of a concerted effort in the greening of Singapore since the 1960s, which exemplifies the concept of sustainable development from a time when environmental awareness was still low.

Prior to this, when the British arrived in Singapore in 1819, the island was covered with rainforests, swamps and mangroves. By 1900, more than 90% of the primeval forest had been cleared for timber extraction, agriculture, and the creation of settlements. While the British designated forest reserves and nature reserves, much of these areas were eventually replaced with plantations and agriculture, leaving only small reserves scattered across the island. It was not until



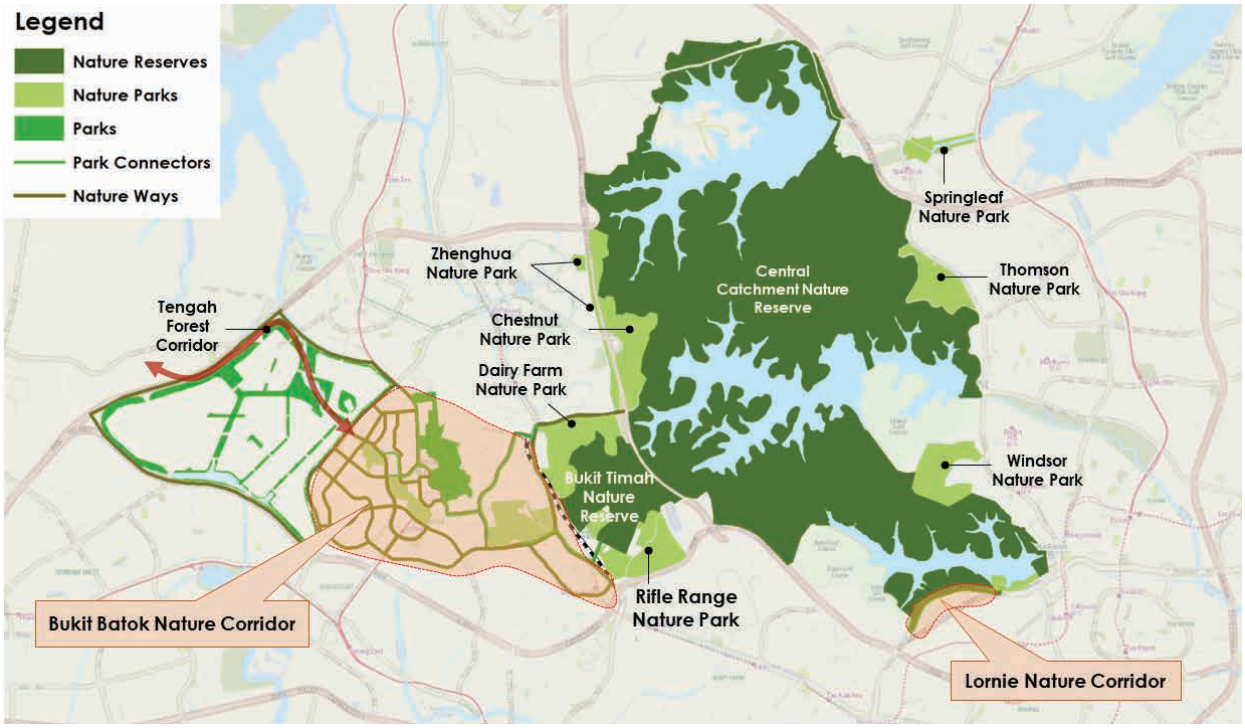
Sungei Buloh Nature Park Network was launched in August 2020. This Nature Park Network safeguards a variety of complementary wetland habitats, strengthening the conservation of wetland biodiversity in the vicinity of Sungei Buloh Wetland Reserve (SBWR).
Image: NParks

the 1960s, that the then-Prime Minister of independent Singapore, Mr Lee Kuan Yew, launched the Garden City campaign and the greening of Singapore.

In the beginning, the aim was to "green" the island as quickly as possible to provide shade and access to green spaces for all. To achieve this, clear parameters for greenery were established through park provision standards and road codes, as part of the urban planning process.

The strategy evolved, and flowering trees and shrubs were planted to provide colour. Parks were linked up by the Park Connector Network and building developers were encouraged to incorporate skyrise greenery to improve the living environment. In recent years, the National Parks Board (NParks) has adopted biophilic design to restore natural habitats, and has been engaging the community to help sustain the greening efforts.

With increasing urbanisation, coupled with a rise in global temperatures and extreme weather conditions due to climate change, the living environment will become less comfortable. Hence, a response that seeks not only to retain and integrate greenery, but also to restore urban nature, is needed to mitigate these effects and continue to provide a high-quality living environment for Singaporeans. This will also ensure that Singapore remains a distinctive global city that instils pride in its people and attracts talent, investment, and visitors.



The Central Nature Park Network, comprising the Bukit Timah Nature Reserve and Central Catchment Nature Reserve and surrounding Nature Parks, together with the adjacent Nature Corridors, help to strengthen the ecological resilience of the nature reserves.
Image: NParks

> In recent years, NParks has been establishing networks of nature parks around the nature reserves to protect them against the impact of urbanisation.

Transforming Singapore into a City in Nature

In March 2020, NParks introduced the City in Nature vision, as part of the next bound in urban planning, which aims to ensure a green, liveable and sustainable home for Singaporeans for generations to come. This bold new vision builds on the greening efforts that Singapore has undertaken over the past decades, and encompasses the following strategies:

Extending Singapore's Natural Capital

Singapore's four nature reserves safeguard the country's most important representative ecosystems, serving as core refugia for biodiversity. They are also primary providers of ecosystem services like clean air and water. In recent years, NParks has been establishing networks of nature parks around these reserves to protect them against the impact of urbanisation. These nature parks serve as buffers and complementary habitats for Singapore's native flora and fauna to thrive. They also enable visitors to enjoy nature-based activities such as hiking, mountain biking and bird watching with minimal disturbance to the nature reserves.

Intensifying Nature in Gardens and Parks

Beyond expanding Singapore's Nature Park Network, landscapes in gardens and parks are also being curated to make them more natural. First, NParks will incorporate nature-based designs into new and existing gardens and parks. A wider variety of planting schemes with a diversity of native plant species emulating Singapore's natural forests will be incorporated. This will bring visitors closer to nature.

Second, more therapeutic landscapes in gardens and parks will be incorporated to cater to the needs of different users. Evidence-based designs will be applied to these landscapes to bring about health and wellbeing benefits, including respite to people with conditions such as dementia, heart and mood disorders, or who are recovering from strokes. A parallel effort is underway to build more nature playgardens, so that children can play within a natural setting. This will help younger generations forge a greater connection with nature through play, exploration and learning.

Third, NParks will naturalise waterways and waterbodies in gardens and parks. Where possible, concrete canals will be transformed into naturalised rivers with adjacent low-lying areas functioning as floodplains, while reservoirs will serve as naturalised lakes that catch and retain rainwater. This will enhance flood protection for nearby homes and properties, while supporting rich biodiversity. Such nature-based solutions will help build resilience against inland flooding.

Fourth, NParks will conserve more native plant and animal species over the next decade. Ongoing habitat restoration and species recovery efforts have enabled Singaporeans to encounter and enjoy once-rare species such as the Oriental Pied Hornbill, Common Birdwing, Singapore Kopsia and native orchids in our gardens, parks and streetscapes.

The lowland forests and wetlands in the Singapore Botanic Gardens' Learning Forest were ecologically restored to conserve a wider variety of native flora and fauna. The restored wetlands also enhance flood resilience in the area.
Image: NParks

Therapeutic landscapes and programmes are designed to bring about greater health and wellbeing to Singaporeans.
Image: NParks

As a result of NParks' species recovery efforts, the Oriental Pied Hornbill and other native species can now be found across Singapore's urban landscape.
Image: NParks

Skyrise greenery, such as in the Kampung Admiralty mixed-use development in northern Singapore, brings greenery closer to residents' everyday lives. *Image: Patrick Bingham-Hall*

> By 2030, all households will be within a 10-minute walk from a park.

Restoring Nature in the Urban Landscape

To bring greenery closer to Singaporeans' everyday lives, nature in the built environment will continue to be restored. This will also cool the urban environment and bring the therapeutic effects of greenery directly to people in their homes and workplaces. One key initiative is the implementation of skyrise greenery in Singapore's buildings and infrastructure. This enables developers and building owners to incorporate even more greenery within Singapore's limited space. Skyrise greenery cools buildings and their spaces, increasing comfort while further softening their appearance and advancing Singapore's status as a world leader in vertical greening.

NParks will also focus on greening industrial estates. Today, these are among the hotter areas on the island, as they are surrounded by less greenery. NParks is working with various stakeholders to increase the total number of trees across industrial estates by almost three-fold. The intensified greenery will not only cool industrial estates, but also help to improve air quality and beautify the surroundings.

Strengthening Connectivity Between Green Spaces

There is a need to strengthen the ecological connectivity between Singapore's green spaces to sustain a healthy natural ecosystem. To achieve this, NParks is incorporating multi-tiered planting into the country's streetscapes to create a forest-like structure along its roads. Roads with such planting are known as Nature Ways. This will also make Singapore's streets cooler and more comfortable for pedestrians, while enhancing resilience against the effects of urbanisation. NParks aims to complete 300 km of Nature Ways by 2030, and aspires to make every road a Nature Way in the longer term. In tandem, NParks will continue to expand the Park Connector Network to ensure that more communities can access nature easily. By 2030, all households will be within a 10-minute walk from a park.

Building Science and Technology, and Industry Capacity

As Singapore is transformed into a City in Nature, a science-based approach will be needed to restore urban nature and address the effects of urbanisation and climate change. A concerted focus on science and technology has underpinned these efforts thus far, and this will be expanded.

In the area of nature conservation, predictive models are applied to identify green spaces to be safeguarded. For example, agent-based modelling predicting the movement and settlement of coral propagules helped validate the suitability of Sisters' Islands as Singapore's first Marine Park. "Least resistance" pathways for various fauna have also been modelled using Geographic Information System (GIS) technology so that the establishment of ecological corridors is soundly based on science.

NParks also works closely with the landscape sector, Institutes of Higher Learning and other Government agencies to promote the adoption of digitalisation and mechanisation in landscaping efforts. An example is the development of a Remote Tree Measurement System, which uses machine learning to automatically extract the geospatial locations and physical parameters of Singapore's trees, such as their height and girth, from Light Detection and Ranging (LiDAR) scans. This will enable arborists to more efficiently obtain an overview of trees in any given area. Data models, such as the Tree Structural Model, are also used to project the stability of trees under different wind speeds.

Fostering Community Stewardship through Biophilia

To nurture community involvement, it is imperative that parks and gardens must be well appreciated. This sense of biophilia—the innate connection between humans and nature—then shifts the focus from simply providing green spaces for respite and recreation, to fostering a sense of ownership and responsibility. NParks works closely with the community through several key programmes to nurture stewards of nature.

The Friends of the Parks (FotP) initiative brings together local stakeholders and volunteers to play a greater role in promoting active and responsible use of Singapore's parks through community-led programmes and initiatives. In late 2019, NParks expanded the initiative to systematically involve communities in the design, development and management of 50 parks between 2020 and 2025. By opening up more opportunities

The structural stability of trees can be monitored virtually through the Remote Tree Measurement System.
Image: NParks

for communities to co-create these parks, NParks hopes to build a greater sense of ownership of these green spaces.

The Youth@SGNature initiative aims to provide youths with more opportunities to engage with nature, and to cultivate them into stewards for biodiversity conservation and greenery. One example is the Youth Stewards for Nature programme, which challenges youths to take up a project to solve real-world problems in research, outreach, biodiversity conservation, or horticulture and landscape design.

In 2020, NParks launched the OneMillionTrees movement to plant a million more trees across Singapore by 2030. It aims to redouble Singapore's efforts to green its urban infrastructure on an unprecedented scale, underpinning the transformation into a City in Nature. The OneMillionTrees movement will be driven by the community with NParks' support. Key partners such as FotP communities, nature groups, corporate partners and volunteers will champion initiatives relating to the tree-planting efforts. By involving the community, NParks hopes to foster ownership in the liveability of the city-state, while building social resilience.

Existing NParks programmes, including the Community in Bloom (CIB) movement and the Community in Nature initiative, already involve volunteers in establishing community gardens and conserving Singapore's natural heritage. Moving forward, NParks is expanding the CIB programme by providing more allotment gardens and encouraging people to grow fruits, vegetables and herbs. These efforts will help engender biophilia amongst Singaporeans.

Members of the community supporting forest restoration efforts as part of the OneMillionTrees movement.
Image: NParks

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A City in Nature in the Midst of a Pandemic

The sudden emergence of COVID-19 disrupted our daily lives on an unprecedented scale, and also cast a spotlight on urban planning practices across the world. Like many other cities, Singapore imposed strict restrictions on movement to control the spread of COVID-19. Termed the "Circuit Breaker", this lasted from 7 April 2020 to 1 June 2020, during which residents could only leave their homes for essential activities such as seeking medical attention, purchasing food and groceries, and exercising. Gardens and parks remained open during the Circuit Breaker, but with restrictions on permissible activities.

When Circuit Breaker restrictions were eased, NParks observed greater interest in our parks, resulting in higher visitorship compared to before the pandemic. This was especially so for parks with a more natural setting like nature reserves and nature parks. This surge in interest comes after a prolonged confinement and limited access to nature during the Circuit Breaker—which may have left many feeling deprived of the wellbeing effects of being in nature, amid the stresses brought about by the COVID-19 pandemic.

Looking beyond the pandemic in the "new normal", these observations reflect the importance of providing accessible urban nature and green spaces in cities. They also underscore how crucial nature is in providing benefits to physical and mental wellbeing as we continue to transform Singapore into a City in Nature.