

Making cities and human settlements inclusive, safe, resilient and sustainable

Centre for Liveable Cities, Ministry of National Development Singapore

Singapore is a city-state with limited land and a high urban density. These unique circumstances demand the prudent and strategic use of space to ensure sustainable development, given an increasing population and the necessity of economic growth. This requires sound and dynamic urban governance combined with integrated long-term planning to ensure sufficient land for sustainable growth as well as a convenient and high-quality living environment for Singaporeans. Singapore therefore works with various stakeholders on policies such as those geared towards public housing and an integrated transport network, while ensuring the incorporation of green spaces throughout the urban landscape. Ultimately, the goal is to create a pleasant environment in which all Singaporeans can work, live, and play.

Integrated land use planning

Singapore takes a long-term approach to urban planning. This is implemented through the Urban Redevelopment Authority (URA)'s Concept Plan, a long-term strategic land use and transportation plan that outlines broad strategies to guide development for the next 40 to 50 years. These strategies are translated into a Master Plan that details upcoming developments over the next ten to 15 years.

The Concept Plan is reviewed at least once every ten years and the Master Plan once every five years. These reviews are necessary to take into account various factors such as changing land use needs; socio-economic and technological trends; demographic changes; the economic, social, and environmental needs of current and future generations; as well as regional and global economic developments.

The Concept and Master Plans map out the directions for Singapore's growth and introduce new and innovative approaches to planning and development. For example, in Master Plan 2014, URA identified future growth areas to meet a wider range of economic needs such as business expansion and diversifying employment areas. As part of the plan, the Jurong Lake District in the western part of Singapore was identified as a new mixed-use business district.

New approaches to district planning include integrating utilities, facilities and services — such as district cooling systems and common services tunnels — at district level instead of at a building level. This will allow the achievement of economies of scale as well as cost savings and the convenience of tapping on shared services. Another example is hawker centres¹ (or cooked food centres) that are co-located with community amenities and offer a variety of high quality and affordable food.

Housing a nation

Over 80 per cent of Singapore's resident population lives in public housing built by the Housing and Development Board (HDB). More than nine in ten of these public housing resident households own their flats. Public housing is heavily subsidised to ensure that it is highly affordable. A progressive system of housing grants has been put in place, on top of subsidised purchase prices for new HDB flats. As a result, most first-time home buyers today use less than a quarter of their monthly income to pay their housing loans. This is well below the international benchmark of 30 to 35 per cent of monthly income allocated to housing.

Beyond shelter, public housing provides an environment in which to live, work, play, and learn. HDB towns have a full range of facilities to meet the various needs of residents, such as commercial spaces, schools, transport nodes, and parks. New towns today are centred on the fundamental philosophy of sustainability, so as to provide residents with a high quality of life and reduce commuting times. Most HDB towns are developed based on the "Neighbourhood Principle", where several neighbourhoods are grouped around a town centre that provides essential services within close reach of residents. Punggol, HDB's youngest town in the northeast of Singapore, is based on a newer planning concept where smaller residential estates share a common green and a variety of well-integrated facilities to enhance accessibility and encourage clean commuting. The green network of nature reserves, parks, park connectors, tree-lined roads and other natural areas built within and around HDB estates has made living in public housing more desirable.

Building safety

The Building and Construction Authority (BCA) champions a strong culture of safety awareness and regulation in the built environment sector. Through regular reviews, BCA upholds high safety standards while ensuring that the regulatory regime remains relevant even as projects grow in size and engineering complexity.

The design and construction of buildings in Singapore is regulated under the Building Control Act and Regulations. This includes a rigorous system of checks and controls throughout the entire building lifecycle of design, construction, commissioning before occupation, and maintenance after completion.

Under the Periodic Structural Inspection regime, regular inspections must be conducted on completed buildings by professional engineers to assess the condition of a building and recommend rectification measures if necessary. BCA's regulatory control also extends to lifts and escalators. Owners must



The distinctive Marina Bay Central Business District skyline demonstrates Singapore's commitment to building a *City in a Garden*

obtain a permit from BCA for each lift and escalator, carry out monthly maintenance, and test them annually. Contractors have to maintain the lifts and escalators in accordance with manufacturers' recommendations and relevant standards.

Transit-oriented development and planning

Singapore employs a transit-oriented approach to development and planning in order to ensure that transport capacity is able to support the variety of land uses, and that limited land is utilised productively. In this respect, land transport strategies and measures are guided by the Land Transport Master Plan, which is reviewed every five years. The long-term goal is to make public transport the preferred mode of transit, through improved connectivity and better services. Active mobility — walking, cycling, and the use of personal mobility devices — is also promoted. Together with new business models and technologies, such as car sharing and self-driving vehicles, Singapore aims to advance a mobility paradigm that is centred away from private transport. The following are some examples of Singapore's transit-oriented initiatives:

Promoting public transport

The aim is that 75 per cent of morning and evening peak journeys should be made using public transport by 2030, and at least 85 per cent by 2050. To achieve this, Singapore's rail network will be expanded from 230km today to 360 km by 2030, enabling eight in ten households to be within a ten

minute walk of a train station, and 85 per cent of public transport journeys of less than 20km to be completed within 60 minutes. In addition, bus networks will be extended and their service levels enhanced. In 2012, the Bus Service Enhancement Programme was introduced to provide commuters with better connectivity, more comfortable journeys, and shorter waiting times. Between 2012 and 2017, 1,000 Government-funded buses were added, with 80 new bus services rolled out to improve connectivity to major transport nodes and key community and commercial facilities.

Walking and cycling plan

Walk Cycle Ride SG is a vision to make walking, cycling and riding public transport a way of life for Singaporeans. To help realise this vision a Walking and Cycling Plan (WCP) was introduced for developments with high pedestrian and cyclist traffic. The WCP requires developers to ensure that designs meet the needs of pedestrians and cyclists instead of catering mainly to vehicular traffic. It also provides for the building of ramps for barrier-free access. Further, developers are incentivised to provide bicycle lots and supporting facilities through exemption of these spaces from the gross floor area calculation. In addition, more covered walkways are being constructed so that people can walk to train stations, bus interchanges, and neighbourhood amenities comfortably, regardless of the weather. To date, 120 km of sheltered walkways have been constructed, with another 200 km completed as of end-2018.

Future challenges

Limited land

As Singapore's population and economy grow, the use of limited land will need to be continually optimised, whether through redevelopment, planning, or building underground in order to keep up with demand.

Changing demographics

The population is expected to age rapidly, with the number of Singaporeans over 65 years of age doubling to 900,000 by 2030. The dependency ratio is also expected to decrease, with only two working adults supporting each elderly person by 2030.

Increasingly diverse population

Singapore's open economy and immigration policies have resulted in a more cosmopolitan society. A "one-size-fits-all" approach to urban planning will no longer be able to cater for a more diverse resident mix.

Ageing infrastructure

As Singapore develops and the population density increases, the government will have to ensure that buildings are safe and well-maintained so as to sustain growth.

Launched in 2010, the National Cycling Plan (NCP) envisions cycling as an integral part of Singapore's transport system. Intra-town off-road cycling paths connected to major transport nodes and key amenities were constructed and bicycle parking facilities enhanced in seven HDB towns. The NCP was revised in 2013 with the more ambitious targets of providing every HDB town with a cycling path network, and building an island-wide off-road cycling path network of over 700 km by 2030. This will be implemented by giving greater priority to cycling in the transport system, enhancing cycling infrastructure, encouraging clear and consistent cycling rules and etiquette, and increasing community support for cycling.

Inclusive transport

Singapore continues to place measures to guarantee the accessibility of public transport to all, including the elderly, disabled, visually handicapped, and families with young children. Since 2006, all train stations have been equipped with at least one barrier-free entrance with a lift, a tactile guidance system, and wheelchair-accessible toilets. More than 85 per cent of train stations now have barrier-free access routes from the station entrance to the platforms. Priority queue zones for passengers with special needs for boarding trains, public buses and lifts were introduced in 2015, and have been implemented in 20 train stations and nine bus interchanges to date. Since 2017, public buses have also been equipped to allow parents to board with children in open strollers. By 2020, all public buses will be wheelchair-accessible.

Safer streets

To make streets safer for the elderly and for those with disabilities, 50 "Silver Zones" will be implemented by 2023 in areas with high senior resident populations, in amenities frequented by seniors, and in areas with high rates of accidents involving senior pedestrians. Silver Zones include road safety features, such as lower speed limits, centre dividers, and humps and chicanes that slow down motorists and

Future opportunities

New growth districts

Singapore is optimising space by transforming existing areas into new growth districts. This includes redeveloping the Greater Southern Waterfront region after the relocation of existing maritime ports to the western part of the country, and the redevelopment of the Paya Lebar region in the northeast, after the relocation of the existing military airbase.

Spatial strategies

Spatial strategies are being applied to avoid overcrowding. This includes setting up economic centres outside the traditional business and financial district in the central region, such as Changi Business Park in the East and one-north² in the west. In tandem, more residential spaces are being planned in central Singapore to enable more people to work nearer their homes.

Underground infrastructure

Options are being explored to shift more of the transport and utilities infrastructure and storage facilities underground. Some examples under study include an underground goods mover system to reduce freight transport on roads, underground electrical substations, and rock caverns for storm water drainage and storage to increase water resilience.

An enabling city

The aim is to transform the country into an enabling place for seniors to live independently and comfortably while remaining integrated in the community. For example, barrier-free accessibility, and more seating and community spaces in housing estates have been introduced. There is also a programme to equip flats with senior-friendly fittings such as grab bars and slip-resistant floor tiles.

To better engage senior citizens, spaces have been integrated with facilities such as day care, and health and community programmes in the estates. Parks are being enhanced with senior-friendly amenities. A network of ten therapeutic pocket gardens based on horticulture therapy will be piloted to support seniors with dementia as well as post-stroke patients through the provision of contemplative spaces and activity zones.

Seniors can live close to their families and communities through priority schemes for new HDB flats, a Proximity Housing Grant³ for resale flats, and purpose-built housing options such as three-generation "3-Gen" flats and short lease two-room "Flexi" flats. The country is also exploring integrating senior-friendly housing and senior care services, such as assisted living developments.

Varied housing options

Singapore's public housing environment offers a range of options to meet varying needs and demands, such as different budgets, designs, and locations. This caters for home buyers with different aspirations and income levels, as well as changing family structures.

Design for maintainability

Instead of approaching maintenance as a downstream issue, consultants and developers are encouraged to consider maintainability outcomes further upstream, i.e. to design buildings that are easier to maintain. Singapore has worked with industry stakeholders to develop the Design for Maintainability Checklist in 2016 and a Façade Access Design Guide in 2017 to motivate designers and developers to integrate suitable solutions at the design stage for safer, more labour-efficient and cost-effective maintenance regimes.

Maintenance of exterior features

Owners of buildings are required to ensure that any exterior features such as windows, claddings and plaster are maintained and securely fixed.

A Periodic Façade Inspection regime will be introduced, focusing on buildings older than 20 years. Inspections will be required once every seven years to allow for the early detection of façade deterioration and to facilitate timely repair.



The green network of parks interwoven throughout public housing estates has contributed to a high quality of life for many Singaporeans

remind them to look out for pedestrians. To date, 15 Silver Zones have been completed.

Green buildings

Singapore is working to ensure that at least 80 per cent of total building gross floor area will be green by 2030. To this end, the BCA Green Mark Scheme was launched in 2005 to promote resource efficiency and reduce any potential environmental impacts on the built environment. The Green Mark Scheme paved the way for the formulation of Singapore's first Green Building Masterplan in 2006, focusing on new buildings. Following consultations with industry stakeholders, the Masterplan was revised in 2009 and 2014 to cover existing buildings and tenanted space, and drive the built environment sector to meet the 80 per cent green buildings target. To date, Singapore has more than 3,200 green buildings with a total gross floor area of more than 94 million m², equivalent to more than 34 per cent of total floor area of all buildings in Singapore.

Green transport

In addition to promoting public transport and encouraging active mobility, Singapore is encouraging a shift to cleaner vehicles. To help vehicle purchasers make more informed decisions, the Fuel Economy Labelling Scheme was introduced, providing information on the fuel efficiency of each vehicle model. Another scheme provides rebates for low-emission vehicles and levies surcharges for high-emission ones. In December 2017, an electric car-sharing programme,

BlueSG, was rolled out to introduce 1,000 shared electric cars and 2,000 charging kiosks island-wide by 2020. In addition, 50 hybrid buses were deployed by the first quarter of 2019, and 60 electric buses are slated for trials by mid-2020.

Green spaces

Despite the constraints, close to 10 per cent of land in Singapore is set aside for parks and nature conservation. Today, more than 80 per cent of households live within 400m, or a ten-minute walk, of a park. The aim is to expand this to more than 90 per cent of households by 2030, by creating more neighbourhood and regional parks. One of the most iconic regional parks is the Singapore Botanic Gardens (SBG). With over 150 years of history, the SBG is a premier tropical botanical garden and is Singapore's first UNESCO World Heritage Site. Located just outside the main shopping district, the SBG is also a prime example of green spaces coexisting within a broader urban landscape.

As Singapore continues its transformation into a *City in a Garden*, the National Parks Board (NParks) has identified six key areas to fulfil this vision:

- Establish world-class gardens
- Rejuvenate urban parks and enliven the streetscape
- Optimise urban spaces for greenery and recreation
- Enrich biodiversity in the urban environment
- Enhance competencies of the landscape and horticultural industry
- Engage and inspire communities to co-create a greener Singapore.



Image: Singapore Tourism Board

Singapore aims to achieve 200 ha of skysire and vertical greenery by 2030. The Park Royal Pickering Hotel was one of the early recipients of the Skyrise Greenery Awards in 2013, which recognised the integration of greenery in its architecture

World Cities Summit

The biennial World Cities Summit (WCS) is an exclusive platform for government leaders and industry experts to address liveable and sustainable city challenges, share integrated urban solutions, and forge new partnerships. Jointly organised by Singapore's Centre for Liveable Cities (CLC) and the Urban Redevelopment Authority (URA), key highlights of the Summit include the WCS Mayor's Forum, the Lee Kuan Yew World City Prize and the WCS Young Leaders' Symposium. The Summit is held in conjunction with the Singapore International Water Week (SIWW) and the CleanEnviro Summit Singapore (CESS).

In 2018, the three events were attended by a record number of over 24,000 participants, with 43 Ministers, and 133 senior officials including mayors, city leaders, government officials, industry leaders, city experts, academics, and representatives from the business community across 110 countries and regions. A total of 1,100 companies participated at the event, with US\$26 billion worth of new business announced.

In 2020, the three events will come under the umbrella of "Singapore Sustainability Week" and take place in Singapore at the Sands Expo & Convention Centre from 5–9 July 2020.

International collaborations

An extensive network of collaborations with international partners and governments has been established over the years to exchange knowledge and best practices on building sustainable cities.

BCA and UN Environment collaborations

The BCA has collaborated with UN Environment on several initiatives related to sustainable buildings. For instance, the Centre for Sustainable Buildings, established through the signing of the 2nd BCA-UNEP Memorandum of Understanding (MOU) in 2011, provides technical support, tools and solutions for the building sector in Asia. In 2013, the BCA and UN Environment established a five-year partnership project, the "Nationally Appropriate Mitigation Action (NAMA) Development for the Building Sector in Asia", which supports four participating Asian countries — Indonesia, the Philippines, Thailand, and Vietnam — in developing national plans to reduce greenhouse gas emis-

sions in their building sectors. The project is part of the International Climate Initiative supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

Global Alliance for Buildings and Construction (Global ABC) Regional Roundtable for Asia-Pacific

The Global ABC is an initiative launched at the 21st Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC), as part of the Lima-Paris Action Agenda. It aims to scale up actions within the buildings and construction sector to reduce emissions. Singapore hosted the Global ABC's inaugural Regional Roundtable for Asia Pacific in conjunction with the International Green Building Conference in September 2016. The two-day event involved a series of activities to meet the global sustainable buildings and climate change agenda. This included a presentation of the UN Environment's Finance Initiative publication "Sustainable Real Estate Investment — Implementing the Paris Climate Agreement: An Action Framework", and the Working Session of the Sustainable Energy for All Building Efficiency Accelerator. It was attended by more than 85 participants from national governments, local authorities, NGOs, international financial institutions and research institutions from 14 countries in the region.

Centre for Liveable Cities' International Capacity Development Programmes

Since 2015, the Centre for Liveable Cities (CLC) has organised international capacity development programmes for 1,472 international city leaders, officials, and practitioners from 42 countries. CLC's international programmes are guided by the Singapore Livability Framework, which identifies the outcomes and systems of a liveable and sustainable city. The Framework is also a means to assess sustainable urban development as outlined in SDG 11 and the New Urban Agenda.

In 2016, Singapore signed a three-year MOU with the UN Human Settlements Programmes (UN-Habitat) to jointly develop international capacity development programmes. The inaugural SG UN-Habitat International Leaders in Urban Governance Programme was held in 2017. To date, nearly

80 participants from 32 cities representing 20 African countries have attended the programme, which shared Singapore's strategies in urban transformation contextualised to African cities' needs.

URA Academy

The URA Academy conducts training sessions to share Singapore's planning experience and expertise with overseas government officials and professionals. Each year, it hosts more than 2,500 delegates from over 45 countries. The URA Academy has also been organising a four-day Integrated Land Use Planning course since 2009 to provide a comprehensive overview of URA's core work.

Sino-Singapore Tianjin Eco-City

In 2007, Singapore and China embarked on a flagship bilateral project to jointly develop the Sino-Singapore Tianjin Eco-city (SSTEC). The 30 km² SSTEC provides a platform for both countries to collaborate on environmental protection, resources and energy conservation, and build a harmonious society. Prior to the development of the SSTEC, the site comprised mainly uninhabitable salt pans, barren saline land and polluted water bodies. As of 2018, the 8 km² Start-Up Area is largely completed. The SSTEC is now home to approximately 80,000 residents and 5,000 registered companies.

SSTEC's development is guided by a Key Performance Indicator (KPI) Framework. The Framework comprises 26 KPIs spanning environmental, economic and social aspects, including 100 per cent green buildings, 100 per cent water potability at tap, more than 20 per cent renewable energy usage, 100 per cent services network coverage, and 100 per cent provision of free recreational and sports facilities within 500 m of residential areas.

SSTEC has been actively pursuing eco-developments. These include rehabilitating its 2.6 km² wastewater pond; conducting research in green development; developing green building standards and constructing green buildings; tapping renewable energy sources such as wind, solar, and geothermal energies; encouraging residents to lead environmentally-conscious lifestyles; and promoting green transport.

In line with SSTEC's vision to serve as a model of sustainable development for other cities, Singapore and China have been working together to document lessons and experiences gained over the last ten years to share with other cities in China and beyond. The documentation was launched at SSTEC's tenth year milestone in 2018.



Image: National Parks Board

The National Cycling Plan launched in 2010, envisions cycling as an integral part of Singapore's transport system. Since 2013, the country has been working towards building an island-wide off-road cycling path network

3816 ENDNOTES

These will appear at the back of the book

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- 1 Hawker centres are open-air food centres in Singapore where people from all walks of life can enjoy affordable food in a clean environment.
- 2 one-north is a 200 ha development hosting a cluster of research facilities and business park space to support the growth of Biomedical Sciences, Infocomm Technology (ICT), Media, Physical Sciences and Engineering industries.
- 3 The Proximity Housing Grant applies to families purchasing public flats to live with or close to each other, i.e. within 4 km. For example, this would apply to married or engaged couples who are buying an HDB flat to live with or near their parents.