PLANNING A CITY FOR HEALTH AND WELL-BEING

Like much of the rest of the world, Singaporeans are living longer. But longer lifespans are meaningful only if more of it is spent in good health. What does it take for a city to continually improve the health and well-being of all who live in it?

This Urban Systems Study traces Singapore's efforts on the fronts of urban and healthcare development, which have resulted in the city being one that protects and promotes the health of its residents. Weaving together archival research and insights from key leaders, policymakers and stakeholders, this Study illustrates the importance of an integrated approach to planning and activating the various urban systems that supports a Healthy City.

"The city, its infrastructure and social fabric, play a big part in influencing individuals' and communities' well-being. By presenting Singapore's experience through the narrative of a multi-system, multi-stakeholder approach, this book offers vital insights for those who are interested in addressing the complexities of achieving health and well-being in an urban setting."

Dr Emi Kiyota, Founder, Ibasho,
Deputy Executive Director, Centre for Population Health, NUS,
Associate Professor, Yong Loo Lin School of Medicine
and College of Design and Engineering, NUS

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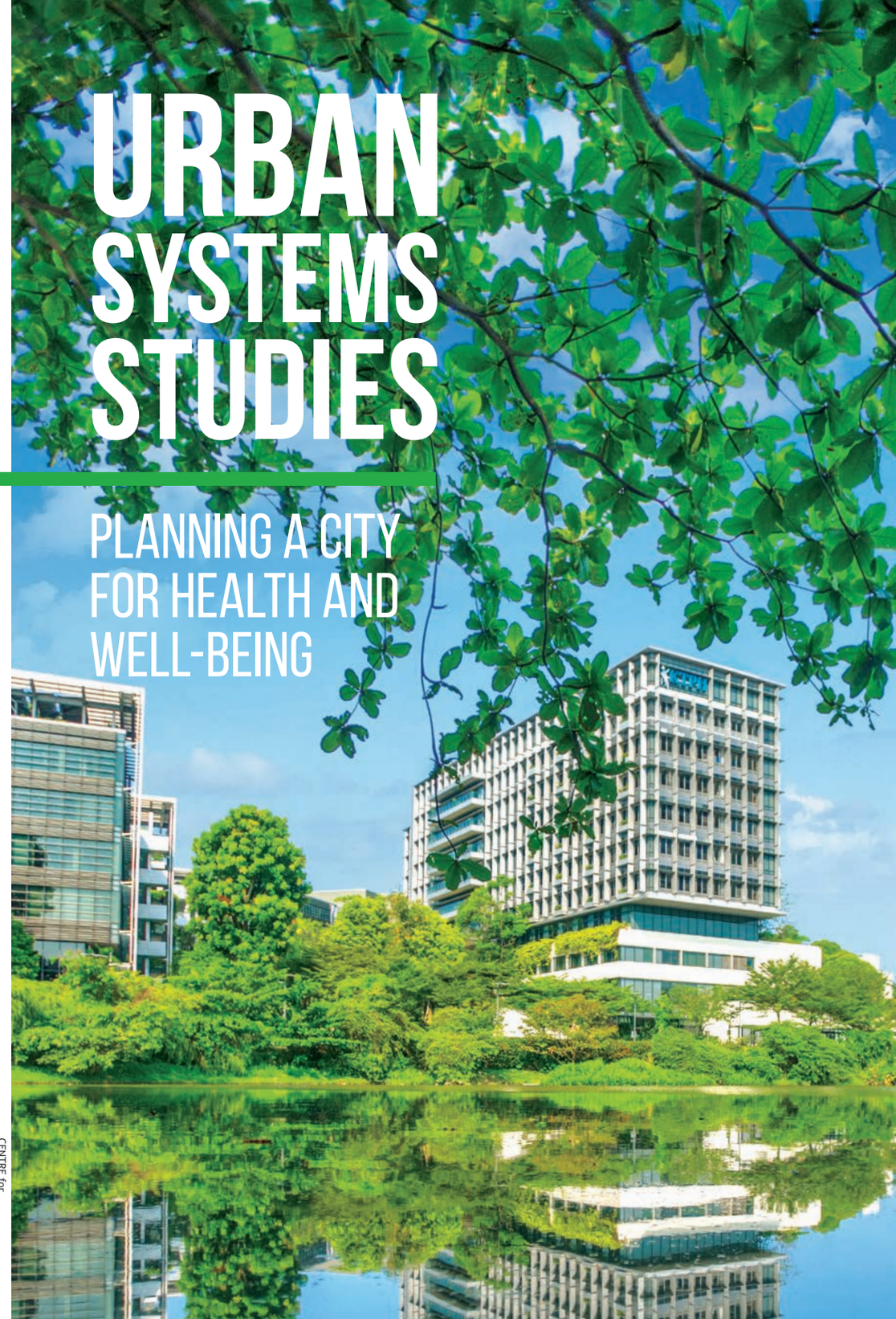

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PLANNING A CITY FOR HEALTH AND WELL-BEING

CENTRE for LiveableCities SINGAPORE

Singapore, 2023

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Set up in 2008 by the Ministry of National Development and the then-Ministry of the Environment and Water Resources, the Centre for Liveable Cities (CLC) has as its mission "to distil, create and share knowledge on liveable and sustainable cities". The CLC's work spans four main areas—Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, the CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. For more information, please visit www.clc.gov.sg.

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FOREWORD

The way we organise our urban infrastructure significantly influences lifestyles and is relevant to the health and social needs of Singaporeans. We saw this during the COVID-19 pandemic. Self-sufficient residential hubs made it easier for residents to access amenities and services during our "circuit breaker" months. Community centres supported the efficient administering of vaccines and distribution of Trace Together tokens to residents. Green and blue spaces within each precinct provided safe outdoor places for respite, recreation and exercise.

Our urban infrastructure now needs to adjust its form to match the need of an ageing population—the demographic challenge of our generation. We want to empower seniors to age actively in the community, to embrace getting old, and to continue to live purposefully. What are the implications?

First, our neighbourhoods and homes need to be more senior-friendly and inclusive. We are upgrading older precincts to include senior-friendly features, such as more ramps and lifts to create barrier-free access, and the creation of Silver Zones with enhanced safety features. We are also expanding the Enhancement for Active Seniors programme to include more features, such as wheelchair lifters, to ensure the safety of seniors at home. Community Care Apartments, which twin housing with care services, also provide more options for seniors to age with peace of mind in the community.

Second, we need to strengthen social care and support in our housing estates. We will significantly expand the network of Active Ageing Centres (AACs). They will be key nodes in the community for seniors to gather, make friends, and participate in active ageing programmes. Beyond their own centres, the AACs can tap on the many common spaces across our HDB estates—like parks, exercise corners, pavilions, coffee shops, void decks, Residents' Centres—to run activities that enable seniors to interact with each other and age healthily in the community.

Third, we need to make health in homes and the community. We are embarking on Healthier SG, our key strategy to encourage healthy living and emphasise preventive care. Healthier SG will encourage residents to enrol with a regular clinic and engender strong and dedicated patient-doctor relationships. Clinic doctors can then conduct regular health check-ups and issue social prescriptions to make residents stay healthy.

We will partner agencies such as the Health Promotion Board, People's Association and Sport Singapore to introduce more health activities to support family doctors.

We need to continue to leverage our living environments to support our social and healthcare needs, and drive better health outcomes and quality of life. Our constraints as a city-state require us to be as creative as possible, to make the best use of every square foot of space to design a city and home that is both vibrant and familiar, and where healthy living is second nature.

Ong Ye Kung
Minister for Health

PREFACE

The Centre for Liveable Cities' research unpacks the systemic components that make up the city of Singapore, capturing knowledge not only within each of these urban systems, but also how they interplay. The studies delve into the key domain areas the Centre has identified under the Singapore Liveability Framework, attempting to answer two key questions: how Singapore has transformed itself into a highly liveable city over the last six decades, and how Singapore can build on our urban development experience to tackle current and future challenges relevant to Singapore and other cities. *Planning a City for Health and Well-being* is the latest publication from the Urban Systems Studies series.

The research process involves rigorous engagement with our stakeholder agencies and numerous oral history interviews with Singapore's urban pioneers and leaders to gain insights into development processes. The tacit knowledge drawn out through this process allows us to glean useful insights into Singapore's governance and development planning and implementation efforts. As a body of knowledge, the Urban Systems Studies, which cover aspects such as water, transport, housing, industrial infrastructure and sustainable environment, reveal not only the visible outcomes of Singapore's development, but the underlying support structures for our urban achievements.

This edition on health and the built environment is a timely one, given the recent COVID-19 pandemic. In this edition, we have sought to share how Singapore's transformation since independence has set the foundations for a liveable and healthy city. This will spur us forward as we continue to create the continuum of care to support an ageing population, better weather the next health crisis, and ensure a health-promoting environment for all.

The Centre would like to thank the organisations, partners and interviewees who have contributed their knowledge, expertise and time to make this publication possible. I wish you an enjoyable read.

Hugh Lim
Executive Director
Centre for Liveable Cities

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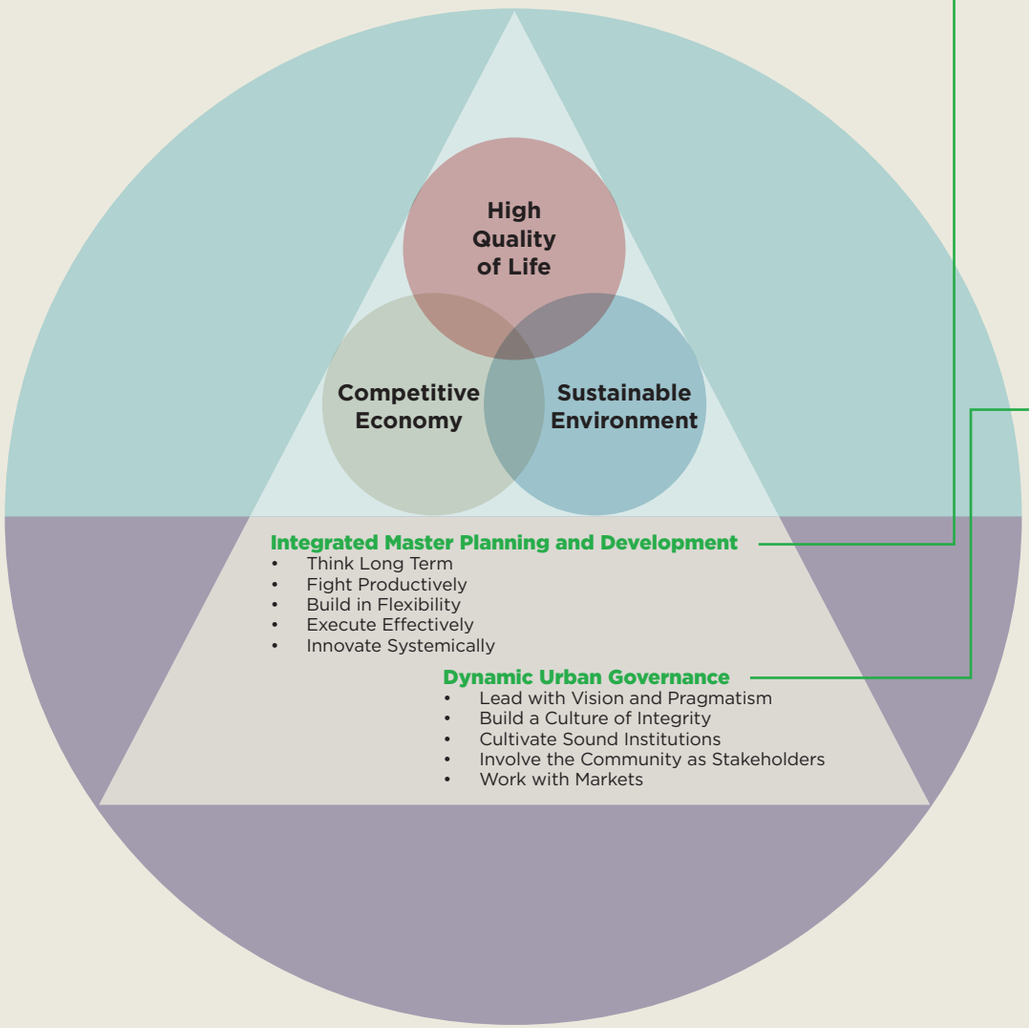
THE SINGAPORE LIVEABILITY FRAMEWORK

The Singapore Liveability Framework is derived from Singapore's urban development experience and is a useful guide for developing sustainable and liveable cities. The general principles under **Integrated Master Planning and Development** and **Dynamic Urban Governance** are reflected in the themes found in *Planning a City for Health and Well-being.*



Integrated Master Planning and Development

Execute Effectively

Facing multiple public health challenges in the 1960s arising from disparate causes such as stray cattle, hawker-related sanitation problems, and the collection and disposal of refuse, a Public Health Advisory Board was formed in June 1964. In the years that followed, legislation and codes were instituted to address the issues, health screenings and vaccinations were mandated, street hawkers were relocated into food centres, and resources were directed towards improving sanitation and refuse collection systems. See Chapter 1, page 8.

Innovate Systematically

Socio-economic and environmental factors account for more than half the variation in population health outcomes. Given the variety of determinants involved, an integrated approach is needed in the way the city is planned, designed, built and activated. In Singapore, this has been done through the integrated planning of urban systems such as land-use planning, transport, town planning, greenery, and the provision of sports and recreation facilities, which has contributed to an urban environment that promotes health by improving choices and enabling behaviours that foster health. See Chapter 3, page 40.

Dynamic Urban Governance

Lead with Vision and Pragmatism

Greenery and nature were recognised by Singapore's leaders as key to the liveability and economic success of the city. In the 1960s, the vision was to develop Singapore as a "Garden City" with abundant greenery and a clean environment. The 1971 Concept Plan incorporated the "Garden City" vision, with plans for parks to be developed as recreational spaces for residents and act as "green lungs" to ventilate built-up areas. The vision has evolved over the years, with the "City in Nature" vision launched in 2020, building on the foresight, plans and initiatives that had been launched more than 50 years ago. See Chapter 3, pages 56–57.

Cultivate Sound Institutions, Work with Markets

Post-independence, in the 1960s, Singapore's primary healthcare system was strengthened as the first line of care in the community, while resources were allocated to expand hospital facilities and build new hospitals. The demand for healthcare continued to grow with the population, especially for non-infectious diseases, and in the 1980s, massive programmes to

expand public healthcare infrastructure were rolled out. This included the "restructuring" of public hospitals, a uniquely Singapore model where healthcare institutions were corporatised, giving hospitals the autonomy to manage resources while receiving government subsidies. This laid the foundation for greater efficiency, flexibility and delivering better care for patients while controlling costs. See Chapter 2, page 25–27.

Involve the Community as Stakeholders

Collaboration among and between the public, private and people sectors is crucial to address health challenges. In November 2018, the HealthySG Taskforce was launched with the aim of transforming Singapore's health promotion landscape by integrating health across various aspects of people's lives and the environment. The Taskforce conducted focus group discussions and public engagement, and agencies across ministries and communities jointly developed policies and programmes that encourage Singaporeans to lead healthy lifestyles. See Chapter 4, page 76.

OVERVIEW

Singapore's Journey from a Clean City to a Healthy City

"Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity."[1]

—The World Health Organization

When Singapore gained self-governance in 1959 and independence in 1965, the young nation had to tackle a myriad of existential issues, including the public health problems of a burgeoning metropolis. Large numbers of people were exposed to risks of infectious diseases from living in overcrowded and unsanitary conditions within the city centre, while those living in rural areas had poor to no access to basic medical services. Industrialisation was necessary for the country to create employment, but if that was not well-managed, such activities could introduce substantial pollution on the small island.

For a small island with limited natural resources, early leaders of Singapore recognised that it was important to "...improve the health of our people, and thus to increase our wealth, as represented by the human resources of our country, which is all that we have to fall on, in order to survive".[2]

This Urban System Study traces Singapore's key efforts on the fronts of urban and healthcare development to highlight how various urban systems have built a solid foundation towards a healthy city through three broad strategies:

- Protecting against disease through improving environmental health,
- Provision of healthcare expertise to support the evolving health needs of Singapore's population, and
- Promoting well-being by enabling behaviours that foster health.

EXHIBIT 1: THE URBAN SYSTEMS THAT CONTRIBUTE TO A HEALTHY CITY: SINGAPORE'S EXPERIENCE.

Source: Centre for Liveable Cities, 2023.

Chapter 1 on "Shaping Urban Environments that Protect Health" documents Singapore's early efforts and investments in urban infrastructure, public health education, and hygiene and pollution control, which dramatically improved the quality of the city's living environments. Rising public health standards contributed to the fall in mortality rates and rise in life expectancy in these early decades.

Chapter 2 on "Developing Healthcare Infrastructure and Enabling Healthcare Delivery" outlines key developments in Singapore's healthcare. Over time, the city built up a robust network of healthcare facilities in the community that could support comprehensive medical services across acute care, specialised care, and primary care. National healthcare financing schemes and the "restructuring" of the public healthcare system kept good quality healthcare services affordable.

Chapter 3 on "Creating Liveable Environments that Promote Health" reviews how the city is planned and activated as a canvas for promoting healthy living. An integrated approach to city and transport planning enables the efficient and comfortable movement of people across the city for life, work and play. Towns have been planned and designed to build communities and foster social well-being, whilst the integration of sports infrastructure provides opportunities for sports and play. Green and blue spaces across the city have also been key systems in building an urban environment conducive to the physical and mental well-being of its inhabitants.

Chapter 4 on "Pushing towards a Healthier City" summarises Singapore's current and future challenges to achieving a Healthy City and outlines various strategies and perspectives on how the city can continue to address the complexities of protecting and promoting health and well-being for its people.

Finally, Chapter 5 on "COVID-19 Response and Management of Future Pandemics" examines strategies, resources and governance that Singapore has put in place to be prepared for infectious disease outbreaks, epidemics or pandemics.

CHAPTER 1

SHAPING URBAN ENVIRONMENTS THAT PROTECT HEALTH

“It does not take very long for those of you who arrive…to notice that Singapore is a very small island indeed, with nearly 2 million busy people living on it….We are a classic example of a highly urbanised society, which could be made better, more comfortable and healthier to live in…[with] forward thinking and planning, which must result in good, not only for the immediate present but also for the future benefit of generations yet to come.[3]”

YONG NYUK LIN
Minister for Health (1963–67)

Housing: Addressing the Issues of Overcrowding

In the late 1950s, Singapore's population reached 1.4 million, with 78.6 per cent living within the overcrowded city centre. The squatter population continued to grow, from 127,000 in 1947 to 246,000 in the mid-1950s.[4] The housing shortfall in 1959 was estimated at around 14,000 units per year.[5]

1. Squatter settlements in Singapore.

Social surveys revealed observations of overcrowding, poverty and slum-like housing conditions. Two and three-storey shophouses meant to house just one to two families were partitioned into many windowless small cubicles of 9 m^2, each of which might accommodate a family of seven or more persons.[6] Outside the city centre, people did not have easy access to piped water, sanitation and basic healthcare services. In low-lying areas of Singapore, frequent floods disrupted livelihoods and increased the risk of malaria.

Such living conditions had a significant impact on disease transmission and the population's health. The 1957 Asian flu pandemic resulted in 680 deaths in Singapore's population of 1,445,900.[7] In 1959, a mass X-ray campaign revealed that one in 27 people was likely to have tuberculosis.[8] Poor public sanitation, which also influenced food hygiene, led to frequent outbreaks of cholera.

Streamlining Governance for Public Housing Development

The turning point for Singapore's residents came following the attainment of self-governance in 1959. The Singapore Improvement Trust (SIT) was dissolved on 31 January 1960, and the Ministry of National Development (MND) was established to guide land use, optimise land resources and deliver affordable quality public housing. The SIT's planning divisions were taken over by the Planning Department and its public housing programme by the Housing & Development Board (HDB), which was constituted on 1 February 1960. At this time, only 9 per cent lived in government flats.[9]

The HDB streamlined decision-making processes for public housing development. Integrating housing, resettlement and town planning functions enabled forward planning and coordination. Facing limited funds, insufficient land and fragmented land parcels, the new government enacted sweeping legislation to obtain land.[10] The 1966 Land Acquisition Act allowed the Government to acquire private land for national development projects such as public housing, industrial parks, and city infrastructure such as sewerage, which was to have a lasting impact on Singapore's urban development and the population's health.

Resettling the Overcrowded Urban Population

With enhanced governance structures that were enabled by new legislation and armed with S$230 million[11]—far more than the SIT had ever received[12]—the HDB could focus its efforts on the housing problem. By 1962, three years after the HDB's establishment, it had built 21,232 units. In comparison, the SIT had built 23,019 units over its 32 years of operation.[13]

Early designs of HDB flats were basic and functional. The blocks were designed as simple, long slab blocks consisting of basic units along a common corridor. The HDB designed the flats to consider space optimisation—spaces where residents could hang their clothes to dry were even factored in.[14] Lifts stopped only at intermediate floors. These simple designs enabled faster, easier, low-cost construction. Furthermore, by building to a height of ten storeys or more and reducing the space between the blocks of flats, the resultant densities could house the displaced squatters and accommodate additional inhabitants.[15]

Attention was paid to adequate ventilation, living space, and access to sunlight, which proved to be beneficial to health. HDB flats also introduced piped drinking water and toilets for each household, and rubbish would be disposed of in centralised and accessible waste chutes. These improved the living conditions for large segments of the population.

By 1965, the HDB succeeded in building 54,000 flats and had overcome the acute housing crisis.[16] By 1986, the HDB housed 84 per cent of Singapore's resident population, which was 2.18 million at the time.[17]

Addressing Poor Hygiene and Transmissible Diseases

Public Health "Menaces"

While the rapid expansion of public housing helped manage health risks that arose due to overcrowding and poor living conditions, poor hygiene standards in public spaces continued to contribute to the spread of diseases.

For example, the phase of rapid urban development in the 1960s reduced the land available for cattle grazing. This resulted in an increase in stray cattle roaming the built-up urban areas, causing damage to property and constituting a "serious health menace"[18]—cattle manure in public places bred flies and polluted water courses, leading to the transmission of infectious diseases.

To add to the challenge, street hawkers were proliferating. With few employment opportunities in the 1960s, many turned to hawking to earn a living.[19] An island-wide census conducted in 1968–69 registered a total of

2. Cattle at the Padang.

28,845 hawkers, of which about 18,000 were street hawkers.[20] Food was frequently prepared under unhygienic conditions. Domestic wastewater, food wastes, and other unwanted items were discharged into open drains, resulting in choked drains and a stench. This attracted stray cats, dogs, crows, rats, cockroaches, and other vermin, many of which are potential disease vectors. Repeated cholera outbreaks in the 1960s highlighted the need for substantive action. A cholera outbreak in 1972 due to the lack of hygiene by food handlers resulted in 114 reported cases and 3 deaths.[21]

By 1961, whilst Singapore had a public cleaning workforce of more than 7,000 workmen, each covering a "beat" of 2–5 km daily to sweep the streets and clear choked drains,[22] the manpower was insufficient to address the rampant littering and poor hygiene practices. Efforts to add 200 additional workers to the cleaning workforce proved unsuccessful, as there was a high level of absenteeism observed, with the highest recorded at 24 per cent.[23]

Centralising Public Health Governance

For better coordination and effectiveness in the handling of public health threats, the Ministry of Health (MOH) was set up in 1959. In 1961, the MOH formed a new Public Health Division, which integrated the City Health Department and Rural Health Department. This division was responsible for preventive health services across Singapore, covering aspects such as sanitation, sale of food and drugs, control of infectious diseases, and health education.[24] As a result, the MOH came to be overall in charge of public health services, except for sewerage and drainage and water supplies, which came under the purview of other ministries.

"A Total Attack of Public Health Problems"[25]

Given the multiple uncontrolled public health threats, then-Prime Minister (PM) Lee Kuan Yew intervened personally, convening a special meeting of senior officers and supervisors of health services in 1961.[26] An 11-man Public Health Advisory Board was formed in June 1964 with representatives from different government agencies "to formulate and advise the Minister for Health on simple yet practical and effective measures for the preservation and maintenance of the highest possible public health standard in all its aspects for Singapore".[27] The Board was to focus on the three most pressing health problems—stray cattle, hawker-related sanitation problems, and the collection and disposal of refuse. The approach of a "total attack of public health problems at one go" scaled across constituencies, starting with Geylang West, then-Minister for Health Yong Nyuk Lin's constituency, to "serve as a 'model' of what can be done if we are determined enough to do so".[28]

The 1964 Cattle Ordinance took effect as law on 2 January 1965[29]—no cattle could be kept without a license. Any unlicensed cattle found straying outside authorised compounds would be seized and destroyed without compensation, and the owners were liable to prosecution. A "cowboy" squad was even set up to deal with stray cattle.[30] The cattle nuisance disappeared within six months of the law being enacted.[31]

To manage the hawkers, a 1966 Hawkers Code was implemented through the Hawkers and Markets Branch.[32] Following a registration exercise conducted from 1968 to 1969, hawkers were licensed at a nominal fee and were required to pass screening tests to prove that they were tuberculosis-free.[33] Additionally, they were to be screened for cholera and typhoid and received cholera vaccinations.[34] As a long-term solution, hawker centres with proper amenities were constructed[35] by the Government from 1971 to 1985, and street hawkers were progressively relocated into these centres.[36]

Issues with the refuse collection system were not forgotten. A public Emergency Cleansing Corps (ECC) over 1,000 strong was formed in October 1965 and put on a two-shift work system to increase productivity.[37] The ECC was more efficient compared to the Public Daily Rated Cleansing Workers,[38] and a 30 per cent increase in the daily volume of refuse collected was observed.[39] The Cleansing Department continued to improve cleansing operations—on 1 February 1971, more than 1,000 ECC members were integrated with 7,000 daily rated workers in the Cleansing Department to streamline daily cleansing operations.[40]

3. View of hawker stalls along the Singapore River.

MOSQUITOES AND DENGUE: AN ONGOING CHALLENGE

The *Aedes* mosquito, which spreads dengue, breeds in clean stagnant water found in houses and outdoors. While efforts in the 1940s through to the 1950s to control post-Second World War mosquito-borne disease outbreaks were successful, the number of reported dengue cases continued to rise after an outbreak in 1960 that resulted in 88 hospitalised cases.[41] Indiscriminate dumping by junk shops, along with hawkers' refuse, provided breeding places for the *Aedes aegypti* mosquitoes.[42] As an anti-mosquito measure, a Public Health Licensing Board was established in 1967 to license and control junk shops. Prior to this, 80 per cent out of the 200 known junk shops had been unlicensed.

A vector control system was also implemented in 1968 to monitor and reduce larval sources to control the mosquito vector population.[43] The Destruction of Disease Bearing Insects Act (DDBIA), enacted in 1968, aimed to discourage mosquito propagation.[44] Government officials could enter any premises to conduct checks and impose fines on the owners or occupiers of those premises found breeding mosquitoes. However, in tropical Singapore, natural breeding habitats are created as quickly as they are eliminated. Public involvement, through public education and law enforcement, is necessary to ensure the sustainability of vector control efforts. A country-wide Keep Singapore Clean and Mosquito Free campaign was launched in October 1969 to secure the public's acceptance and support for the new DDBIA, and highlight the importance of public participation in mosquito control.[45] The implementation of the vector control programme initiated in 1968 was completed in 1973 with measurable success. The *Aedes* house index (percentage of premises breeding *Aedes* mosquitoes out of the number of premises checked) fell markedly from more than 25 per cent in the 1960s to around 5 per cent in 1972.[46] 1970 saw only 55 reported cases of hospital admissions for dengue compared to 848 cases in 1968.[47]

Yet, dengue soon reared its head with a large outbreak in 1973 involving 1,187 cases and 27 deaths.[48] Intensive control measures that included the large-scale fogging of premises eventually contained the outbreak, and with a reduced population of *Aedes* mosquitoes, Singapore enjoyed a 15-year period of low dengue incidence.[49] Unfortunately, the 1990s would see a rise in dengue cases that continued into the 2000s and onwards due to population increase, rapid urbanisation, and a vulnerable population with low herd immunity as a result of the effective vector control programme implemented.[50,51]

In 2020, during the first year of the COVID-19 pandemic, Singapore experienced a historical high of 35,315 reported dengue cases.[52] This surpassed the previous record of 22,170 reported dengue cases in 2013.[53] The 2020 outbreak has been attributed to a confluence of factors. Firstly, there was an increase in the less common dengue virus serotype 3 (DENV-3), which the Singapore population has low immunity to.[54] Next, the reduction and cessation of construction activities due to various COVID-19 control measures hampered good housekeeping at construction sites, resulting in the harbourage of mosquito vectors. In addition, female *Aedes* mosquitoes are day-biters and harbour within indoor environments, so work-from-home arrangements increase the risk of contact. Dengue thus continues to be a menace.[55]

4. A NEA dengue inspection officer collecting samples of mosquito breeding at a construction site.

Blending Public Education and Legislation

Then-PM Lee Kuan Yew saw Singapore's standard of public health as a reflection of the morale and will of the population. He said in 1967, "[O]nce you are resigned to living with mosquitoes, flies and disease, then you are finished. Standards would go down."[56]

Alongside governance and enforcement of public health measures, the lack of cleanliness was deemed a "people-orientated problem",[57] and public campaigns were launched to seek the collaboration and commitment of the community.[58]

5. An anti-spitting pamphlet in Mandarin to reach out to the diverse ethnic groups in Singapore. It reads: "Mass Health Movement: Anti-Spitting Campaign, 1 to 31 August 1958. Singapore City Council".

The year 1968 saw the launch of the first month-long Keep Singapore Clean campaign run by a national campaign committee with representatives from government agencies and non-government organisations like employers' associations.[59] Then, the MOH reflected that "[c]lean and healthy surrounds were a reflection of the discipline, the social consciousness and the civic responsibility of the people".[60] The campaign blended persuasion with punishment and marked the first time that fines were used to control social behaviour.[61] The campaign warned of penalties whereby first-time litterbugs then were fined up to S$500, while repeat offenders were fined up to S$2,000. The campaign continued yearly, and themes expanded to cover mosquitoes, pollution, toilets, street hawking, amongst others, aimed at instilling awareness of the importance of a clean environment.

Aside from urging public co-operation, additional discipline was afforded through the Environmental Public Health Act, which became law in January 1969. Modelled after similar legislations of the time, such as the United Kingdom's Public Health Act, it standardised public health-related codes (except for air and water pollution) and augmented the role of the MOH Public Health Division as the enforcer of the clauses embodied in the Act.[62] The increase in inspections and enforcement of hygiene standards of public places and the removal of refuse led to better sanitation.

Whilst the enforcement of hygiene and social behaviours improved sanitation and health in the city, rapid developments in Singapore's urban planning and infrastructure further contributed to the improvement of Singapore's public health.

Environmental Health: Integrating Health Planning with Urban Development

The Acceleration of Environmental Public Health

In 1967, the World Health Organization's (WHO) 6th Regional Seminar on Public Health Administration: Health Planning in Urban Development was held in Singapore. The Report put forth: "Environmental health is of equal importance to personal health...Health is not an end to itself...The control of our environment can determine whether we live, but it always determines how we live".[63]

The Seminar identified seven essential areas in urban planning for environmental health. These are "water, air, food, housing collection and disposal of wastes (both liquid and solid), the control of natural hazards, and the control of man-made hazards". Discussions emphasised the importance of multi-disciplinary coordination between planning authorities and health planners to achieve comprehensive environmental health that would foster urban health. Challenges in Singapore, such as the inadequacy of sewerage facilities, were highlighted as the result of the lack of inclusion of health planning at all stages of urban planning and development.[64]

Then-Minister for Health Yong Nyuk Lin crystallised this principle well, commenting that "[h]ealth planning is but a part of Planning, as a whole, if there is to be true progressive growth of the entire country".[65] The integration of health planning into planning would be a defining characteristic of Singapore's approach in the following years.

Managing the Externalities of Industrialisation: Air and Water Pollution

Rapid urbanisation and industrialisation increased the challenges of pollution and waste disposal, which continued to be primary sources of health and environmental industrial hazards in the 1970s.[66] Economic development was essential, but rapid industrialisation should not overwhelm quality of life. As early as 1967, the pace of Singapore's industrialisation had prompted the WHO to highlight the likely increase in air pollution and accompanying health risks.[67] Such concerns developed alongside growing international concerns about industrial pollution.[68]

Whilst the then Environmental Public Health Act forbade the discharge of pollutants in quantities that would endanger health, there were no established emission standards, resulting in ineffective enforcement.[69] Thus, the United Nations sent an expert in 1968 to advise Singapore on dealing with water and air pollution as two key fronts of action.[70] This was followed by further consultancy by other visiting experts.[71] They helped conduct surveys and provided guidelines for the establishment of an air pollution control unit and requirements for monitoring pollution and draft legislation, amongst others.

As a result, the Local Government Disposal of Trade Effluent Regulations was gazetted in 1970, which allowed for the controlled discharge of effluents into public sewers after treatment. The Trade and Industrial Waste Section of the Public Works Department's Sewerage Branch identified and monitored sources of industrial pollution and their discharge.[72]

In the meantime, Singapore's clean air programme began with the establishment of an Anti-Pollution Unit under the Prime Minister's Office in 1970. The Unit monitored air quality and vetted applications for the siting of new factories to ensure that the need for pollution control was incorporated in the early planning and design stages.

The Clean Air Act was passed on 2 December 1971, and the Clean Air (Standards) Regulations came into force on 15 January 1972, enabling the control of air pollution caused by industry and trade premises, with the recognition that it was more economical to implement air pollution controls earlier[73] before pollution became a problem. The emission of impurities into the air was regulated, as well as the types of equipment and fuels permitted. Authorities were empowered by the Act to inspect premises and take enforcement actions against offenders. Enforcement and amendments to the Act through the years resulted in the control of air pollution in Singapore. Today, more pollutive industrial activities are located away from residential premises, based on the industrial activities and requirements stated in the Singapore Standard on the Code of Practice for Pollution Control.

Establishing One of the World's First Environment Ministry

In 1972, the population density of Singapore was the second highest in the world, with more than 3,460 persons per square kilometre or about 15,360 per square kilometre in the city.[74] To achieve good public health outcomes, a centralised body to plan and oversee necessary infrastructure and solutions was necessary. Prior to 1972, the management of the wide variety of environmental hazards that threatened health could be disparate and slow.

Another push came during the 1972 United Nations Conference on the Human Environment (also known as the Stockholm Conference), the first world conference on international environmental issues. It highlighted the links between economic growth, pollution and well-being of people.

A few months after the Stockholm Conference, Singapore became one of the first countries to form a Ministry of the Environment (ENV),[75] with the recognition that "environment and development are inexorably linked".[76] Former Director-General of Public Health Daniel Wang recalled that when then-PM Lee Kuan Yew formed the ENV, "his reasoning was very simple: that if you look after the environment well, then you would have taken care of public health".[77]

The new ENV was a result of the merger of several departments under the MND and the MOH, centralising "all anti-pollution and related matters... for concerted and more effective action for a better environment for Singapore".[78]

EXHIBIT 2 : ENV-MERGED DEPARTMENTS FROM THE MND AND MOH.[79]

Ministry of Environment

Engineering Services (Functions)	Environmental Public Health (Functions)
▼ Environmental Health Branch (incl. Food Inspectorate)	▼ Environmental Health Branch (incl. Food Inspectorate)
▼ Sewerage Branch	▼ Quarantine and Epidemiology Branch
▼ Drainage Branch	▼ Markets and Hawkers Branch
	▼ Cemeteries and Crematoria Section
	▼ Vector Control and Research Branch

▼ Formerly divisions under the Ministry of Health
▼ Formerly divisions under the Ministry of National Development

Adapted from *Singapore–My Clean & Green Home*, p. 24.

Soon after the establishment of the ENV, an important decision was made in 1973 for the management of industrial and domestic solid wastes through the building of Singapore's first modern incineration plant at a cost of S$94 million.[80] The growth of solid waste had increased from 1,150 tonnes a day in 1969 to 1,790 tonnes a day in 1974, and with projections of a further increase to 3,800 tonnes a day by 1986 due to population and economy growth.[81] With Singapore's land scarcity, incineration of solid waste was identified as a long-term space-efficient solution as it reduced the volume of solid waste by about 90 per cent.[82] A hefty investment at a time of competing needs for the country, former Director-General of Public Health Daniel Wang credited the political leaders then for their "clear foresight".[83] To aid the financing, Singapore became the beneficiary of the World Bank's largest solid waste investment in the region with a loan of US$25 million,[84] and the Ulu Pandan Incineration Plant became the first incineration project in the world to have received support from the World Bank. The Plant started operations in 1979 and provided for the collection, incineration, and disposal of solid wastes until its closure in 2009.[85]

The Environmental Pollution Control Act was passed in 1999 to consolidate the laws relating to environment pollution control and to repeal the Clean Air Act, Water Pollution and Drainage Act, Poisons Act (for hazardous substances) and Environmental Public Health Act into a single act.[86] This allowed for more effective and efficient control of any pollutant or hazard from any industrial or trade premise by streamlining functions across the ENV. Other legislative provisions were added over the years, such as the inclusion of protection and management of environment and resource conservation in 2008,[87] as well as controls on refrigerants with high Global Warming Potential in 2022 to address emerging environmental and sustainability concerns.[88,89]

In 2002, the National Environment Agency (NEA) was formed under the ENV to focus on the implementation of environmental policies. This allowed the ENV to focus on setting strategic policy directions and address key policy concerns.[90]

Cleaning Our Waters Through Comprehensive Sanitation and Sewerage

Part of the ENV's responsibility was to improve Singapore's sewerage systems. Under colonial administration, municipally administered schemes for sanitation and sewerage had been slow in implementation, hampered by a lack of funding, and early sewerage systems serviced an extremely limited area.[91] As Singapore's population boomed after the Second World War, so did its sewage disposal needs. As late as the 1960s, waterways remained polluted and were a source of diseases. In 1971, the main public sewerage network only served 57 per cent of the population.

The Sewerage Master Plan of 1972 (later renamed the Used Waters Master Plan) was thus drawn up with the assistance of WHO experts. Enabled by grants of US$18 million from the World Bank,[92] this kickstarted the expansion of Singapore's sewerage infrastructure.

Under the Master Plan, the collection of stormwater and sewage was separated into two networks to keep the rainwater clean. The island was divided into six catchments from which sewage was collected and sent through a network of sewers and pumping stations to six treatment works.[93] Additional sewage treatment plants were built, and existing ones expanded between 1979 and 1985. From 1972 to 1992, the network of sewer lines increased from 810 km to 2,340 km, and the number of pumping stations increased from 46 to 136.[94]

In 1984, with over 90 per cent of the population served by a modern sanitation system, the Government started phasing out the night soil bucket system. The last night soil disposal station at Lorong Halus was finally closed in 1987.[95]

Alongside the expansion of sewerage infrastructure, efforts were made to curb pollution in Singapore's rivers and waterways. Besides protecting health and furthering socio-economic development, clean waterways contribute to water security by functioning as water catchments. In 1977, then-PM Lee Kuan Yew laid down the challenge to clean up the Singapore River: "It should be a way of life to keep the water clean...In ten years' time, let us have fishing in the Singapore River."[96]

With this firm mandate, a massive clean-up of the Singapore River ensued and was declared complete 10 years later in 1987. This involved physical cleaning of polluted rivers, removal of pollution sources, and implementation of anti-pollution measures and new facilities to enable the resettlement of residents and businesses.[97] Decades later, clean waterways continue to protect health by reducing the risk of water-borne diseases and help maximise the city's water supply by enabling the clean waterways to function as local water catchments.

As demand for additional capacity grew over the years, the conventional sewerage infrastructure, which occupied a significant footprint, needed to evolve. In the mid-1990s, the Deep Tunnel Sewerage System (DTSS) was conceptualised as a more cost-effective and sustainable solution to meet Singapore's long-term needs for used water collection, treatment, reclamation, and disposal. With the DTSS, most pumping stations will be phased out and used water will be conveyed via gravity to three centralised water reclamation plants for treatment. By removing the need for many pumping intermediate installations,[98] Singapore will have land savings of approximately 214 football fields for other uses when the DTSS is completed.[99]

Tackling the Inter-connected Challenges of Water Supply, Flood Resilience, and Clean Water

"Our struggle to make sure our people have water, is the struggle for Singapore's survival and independence."[100]

—Teo Chee Hean, Deputy Prime Minister (2009–19) and Coordinating Minister for National Security

For Singapore, ensuring a stable and adequate supply of water is an existential challenge, given a lack of natural water resources and limited land availability for water storage facilities. During Singapore's time under colonial administration, an insufficient and unreliable water supply affected residents' health in the form of poor hygiene and a reliance on common and often-polluted wells, which resulted in the transmission of water-borne diseases such as cholera.[101] Fortunately, as the population was rapidly housed in public housing flats from the 1960s, they were able to have access to clean tap water.

The lack of water catchment areas also resulted in problems of flooding, particularly during heavy rainfall. Despite early efforts in the 1950s to improve drainage systems to alleviate flooding, the rapid development of housing and industrial estates in the 1960s led to increased surface flows. With early drainage systems unable to cope, particularly during monsoon surges, Singapore struggled with floods through to the 1980s. In 1954, a year of several serious floods, more than 10,000 people were affected, and nearly 5,000 were made homeless.[102] These events negatively impacted well-being and even contributed to social unrest and political instability.[103]

Another severe flood in December 1969 saw the death of five people and an estimated S$4.3 million of damage.[104]

Ironically, despite the occasional abundance of rainwater, then-polluted waterways rendered this rainwater unfit for treatment for drinking purposes, wasting a potential source of water and contributing to vector-borne diseases. The issues of sanitation, sewerage, water supply and drainage are thus interconnected, and it was imperative to address them holistically to protect public health and ensure Singapore's water security.

Boosting Singapore's Water Supply

In 1963, the Public Utilities Board (PUB) was established and became responsible for the supply of water, electricity, and piped gas to support industrial and economic development and improve the standard of living.[105] In its 1972 Water Master Plan, the PUB identified potential catchment areas, and planned for the long-term development of water resources through the study of new sources of water such as unprotected catchments, water reuse, and desalination.[106]

Through to the 1980s, this master plan guided Singapore through a phase of expansion and construction to increase water supply, improve sanitation and reduce flooding.[107] The expansion of Seletar Reservoir and Peirce Reservoir was completed in 1969 and 1975 respectively. Along with the MacRitchie reservoir, these reservoirs were made protected catchments where no developments were permitted to preserve their natural state and quality of water. The first unprotected catchments, in which restricted developments such as residential estates were allowed, were created between 1975 and 1981 by damming six rivers to create new reservoirs. Additional water catchments were provided by developments in Singapore's sanitation and sewerage systems, particularly from the creation of separate storm and used water systems and the cleaning up of waterways.

To reduce reliance on imported water and diversify Singapore's water supply, two additional "taps" were developed in the 1990s and 2000s: NEWater (high-grade reclaimed water) and desalination.[108] As of 2022, Singapore has five NEWater plants and five desalination plants to provide weather-resilient sources of water.

Strengthening Inland Flood Resilience

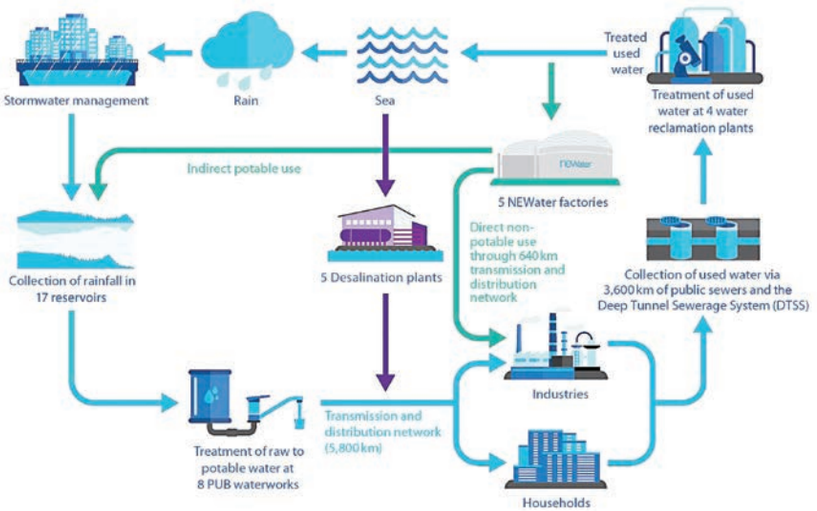
In the 1970s, a Drainage Master Plan was developed, partly in response to the intensification of flooding incidents, to guide the planning and implementation of drainage networks across Singapore, ensuring adequate land provisions for drainage that were often in the form of infrastructural solutions such as concrete canals.[109] As a result, flood-prone areas have been reduced significantly from 3,200 ha in the 1970s to 30.5 ha in 2016.[110]

Today, in the face of climate change and more intense rainfall patterns, there is a need to enhance flood resilience. The government has invested almost S$2 billion in drainage works from 2011 to 2020 and will invest another S$1.4 billion from 2021 to 2025.[111] A multi-pronged strategy covers the entire drainage system, from a source where runoff is generated, to pathways through which stormwater is conveyed and then to a receptor where floodwaters may flow to. There is also exploration of multifunctional drainage measures, such as naturalised waterways, that also serve as recreational sites for the public and habitats for biodiversity in addition to flood protection.

Foundations for the Future

The far-reaching benefits of early infrastructure efforts are still being reaped today. Clean waterways allow rainwater to be collected and channelled to reservoirs before being treated for drinking. The DTSS joins the sewer networks to maximise the collection of used water to be treated and further purified into NEWater.

To better manage Singapore's water supply, used water, and drainage systems in an integrated manner, the PUB was reorganised in 2001—the Sewerage and Drainage Departments of the ENV and the Water Department of PUB were merged into PUB, Singapore's National Water Agency, to oversee all operational nodes of the water loop, crucial to the health and well-being of all.[112]



6. The PUB's Water Loop concept.[113]

Closing Note

"The funny thing about public health...When things [do not] happen because you have taken the right prevention action, people ask, 'Was it necessary?'" [114]

—Daniel Wang, Director-General of Public Health, Ministry of Environment (1979–2004)

From the post-war period through to Singapore's early years of independence, the health, economic and existential needs for a young nation intertwined and were a powerful driving force that accelerated the development of Singapore's urban environments, housing and infrastructure.

In this period, Singapore protected and improved the population's health through firm political will and centralisation of functions for effective governance and implementation, underpinned by an approach that integrated health planning into urban planning and development. By addressing multiple environmental threats to public health in a systematic way, it laid the foundation for a healthier urban environment that Singapore residents continue to enjoy today.

CHAPTER 2

DEVELOPING HEALTHCARE INFRASTRUCTURE AND ENABLING HEALTHCARE DELIVERY

"Enabling citizens to live full and healthy lives is one of the most important responsibilities of the government. Firstly, because good health is fundamental to the happiness, fulfilment, and dignity of every human being. Secondly, because good health is a public good. If a few people in the society get ill, it is not just them who are affected but it affects the well-being of the whole society...Thirdly, good health is a basis for the nation's prosperity and success.[115]"

LEE HSIEN LOONG
Prime Minister of Singapore

Backdrop of Singapore's Healthcare Needs: Expansion of Healthcare Capacity as a Priority in the 1960s and 1970s

In Singapore's first national plan—The People's Plan (1961–64)—after attaining self-governance, health matters featured prominently, with significant funding support given to improve healthcare provision.[116] Out of a national budget of S$871 million set aside from 1961 to 1964, S$35.8 million was allocated to build new hospitals and expand facilities at Tan Tock Seng Hospital (TTSH), Singapore General Hospital (SGH), Middleton Hospital, and Woodbridge Hospital. As a result of the Plan, primary healthcare was decentralised from the general hospitals to a network of outpatient, Maternal and Child Health (MCH) and School Health Service (SHS) clinics. By 1963, there were a total of 26 outpatient and 46 MCH clinics across the island.[117] By 1968, the number of hospitals had doubled from 8 to 16.

7. Students from Bukit Panjang Government School receiving treatment from a mobile dispensary, as part of the School Health Service.

With demand for healthcare continuing to outstrip supply well into the 1970s, the Primary Healthcare Division was set up in 1976 after a reorganisation at the Ministry of Health (MOH) to meet the demand through primary healthcare.[118] The MCH, SHS and outpatient services were brought under the Primary Healthcare Division, and the Division planned the development of polyclinics as "one-stop" primary healthcare centres within the community, in both urban and rural areas. These polyclinics would provide primary medical treatment, preventive healthcare, and health education.

A Plan for Affordability, Efficiency and Capacity: 1980s to 2000s

By 1980, the population had grown from 1.5 million in the 1950s to 2.4 million. Population health issues had also evolved—non-infectious diseases were by then the major cause of ill health and death, while mental stress and suicides ranked among the top 10 major causes of death.[119] In the context of growing stress on existing healthcare facilities and a quadrupling of Singapore's public healthcare expenditure, from S$59 million in 1971 to S$257 million in 1981, the 1983 National Health Plan was formulated.[120,121]

Overhauling Healthcare Financing

Singapore's early healthcare system was based on tax-financed subsidies.[122] Even then, from as early as the 1960s, a fee system had been rolled out where patients paid for some of the cost of healthcare, where even a nominal fee had to be paid for the "free" wards in the hospitals.[123] In the early 1980s, the trend of rising healthcare costs internationally prompted a recalibration of the cost-sharing arrangements for healthcare in Singapore across individuals, employers and the government.[124]

The 1983 National Health Plan set in motion a revised system that finances the healthcare system via a combination of government subsidies, out-of-pocket payments, and compulsory savings from payroll deductions. This would retain individual responsibility while ensuring the affordability of healthcare services. The 3Ms Scheme was created, comprising Medisave (1984), MediShield (1990), and MediFund (1993).[125,126]

"Restructuring" the Healthcare System

> "When hospitals are insulated from price signals and market forces, the potential for inefficiency and waste is enormous."[127]
>
> —1993 White Paper on Affordable Health Care

The second key focus of the National Health Plan was to "restructure" public hospitals, a unique Singapore model where healthcare institutions were individually corporatised. This gave them autonomy to manage areas such as finance, human resource, medical care and research, and operations while remaining government owned.[128] The healthcare providers would continue to receive government subsidies ("subvention") to cover costs and subsidies for lower-income patients. It was also hoped that competition between institutions would encourage more efficiency, flexibility and nimbleness, driving better care for patients whilst controlling costs.

An initial pilot to establish the National University Hospital (NUH) as a corporatised entity in 1984 was assessed to have successfully achieved more responsive service, innovative management, and public acceptance of price adjustments.[129] The MOH proceeded to corporatise other government-run hospitals.

Expanding Healthcare Infrastructure

To meet the demands for healthcare, the 1983 National Health Plan included a massive programme to expand public healthcare infrastructure over the next 20 years. Plans were made to build new hospitals, such as Changi General Hospital (1998), and upgrade existing hospitals, such as TTSH's S$210 million development plan.[130] The number of hospitals grew from 16 in 1965 to 21 in 1990.[131]

In the community, the success of the first generation of polyclinics in towns such as Toa Payoh led to the expansion and consolidation of primary healthcare services as the first line of care in the community. The polyclinics, dispensaries and MCH and SHS clinics were integrated in the 1980s to form 16 polyclinics.[132] Primary healthcare facilities were improved in this decade through the development of new and modern polyclinics.

8. Polyclinics are "one-stop" primary healthcare centres located within housing towns to improve access to residents.

> "Acute hospitals are expensive to build and even more expensive to operate. Studies have shown that it is more cost effective to build and manage community hospitals without sacrificing the standard of medical care."[133]
>
> —Yeo Cheow Tong, Acting Minister for Health (1987–90)

The 1983 Plan also expounded a new decentralised approach. Community hospitals were proposed as a lower-cost intermediate alternative in new HDB towns for people whose need for treatment fell between primary care found in polyclinics and acute specialised care found in general hospitals. Patients, especially the elderly who did not need the full services of a general hospital, could continue their recovery in a community hospital before returning home. The first community hospital opened in Ang Mo Kio town in 1993.[134]

Healthcare Beyond the Hospital: 2000s Onwards

The Clustering of Healthcare Institutions

While restructuring pushed hospitals towards patient-centricity and financial prudence, hospitals started to compete for patients and talent, as each hospital developed more individualised goals. This necessitated further reform to strike a balance between the centralised system of the past and the highly autonomous model of individually corporatised hospitals.[135]

Thus, in 2000, the MOH grouped Singapore's healthcare institutions into two competing clusters—the National Healthcare Group and the Singapore Health Services. The two-cluster system focused on reducing market imperfections and adjusting the balance between competition and collaboration amongst public sector entities.[136]

In 2004, the clusters took control over all the government polyclinics for primary care. By providing horizontally and vertically integrated care for patients (i.e., primary, secondary and tertiary care) within their geographic regions, each cluster could reap economic benefits through scale whilst reducing fragmentation of patient care.

At the same time, the clusters accepted the creation of an electronic medical exchange that enabled the sharing of medical records between clusters. The National Electronic Health Record would eventually expand to allow sharing of medical records across a wider range of healthcare providers to achieve seamless patient care.

The First Reorganisation of the Healthcare System

Between 1980 and 2000, Singapore's population grew from 2.4 to 4 million; this grew further to 5 million by 2010.

By the late 2000s and early 2010s, the continued growth and ageing of Singapore's population led to signs of stress across the healthcare system, such as high hospital bed occupancy and long appointment waiting times. While advancements in medicine led to increased specialisation and sub-specialisation, it meant that patients would often need to seek out numerous specialists, with no one doctor coordinating care for the patient.[137] A growing chronic disease burden required more integrated services across the care continuum, with a shift towards care in the community that would be effective, financially sustainable and affordable.[138]

Unfortunately, the size of the two-cluster system posed challenges. It was difficult for each cluster to provide sufficient management attention and oversight, including stakeholder management, when implementing different strategic initiatives.[139] With 80 per cent of primary care provided by private General Practitioners (GPs) and the majority of intermediate-long term care provided by charities,[140] there was a need for public healthcare institutions to work more closely with the private and social sectors.[141]

Thus, starting in the late 2000s, the public healthcare system was progressively reorganised into six Regional Health Systems (RHSs).[142] By reducing the size of each catchment, it would be easier to integrate care services between the public sector healthcare institutions and the privately run primary and intermediate long-term care providers and realise synergies across the cluster.

Increasing Healthcare Accessibility and Affordability

To address the growing healthcare demand, the 2020 Healthcare Masterplan was launched by the MOH in 2012. New targets were set for the increase of healthcare capacity across acute and community hospitals as well as long-term care services such as nursing homes, senior care centres, and home care services to improve the accessibility of healthcare services.[143]

As part of enhancing healthcare accessibility and providing more holistic care, the Primary Care Master Plan of 2011 included an expansion of the polyclinics and the establishment of Community Health Centres (CHCs) and Family Medicine Clinics (FMCs).[144] The CHCs would provide ancillary services and allied health provider services to support private GPs in managing patients with chronic conditions, while FMCs would provide team-based care for patients who require day surgery and less complex outpatient specialist services. These different models catered to patients with different profiles and preferences and supported chronic disease management.

The Second Reorganisation of the Healthcare System

To ensure the sustainability of the healthcare system and keep Singaporeans healthy, the MOH announced in 2017 the strategy to transform Singapore's healthcare system through three shifts—Beyond Hospital to Community, Beyond Healthcare to Health, and Beyond Quality to Value.[145]

9. Family Medicine Clinics provide medical care with support services for chronic disease management in the community.

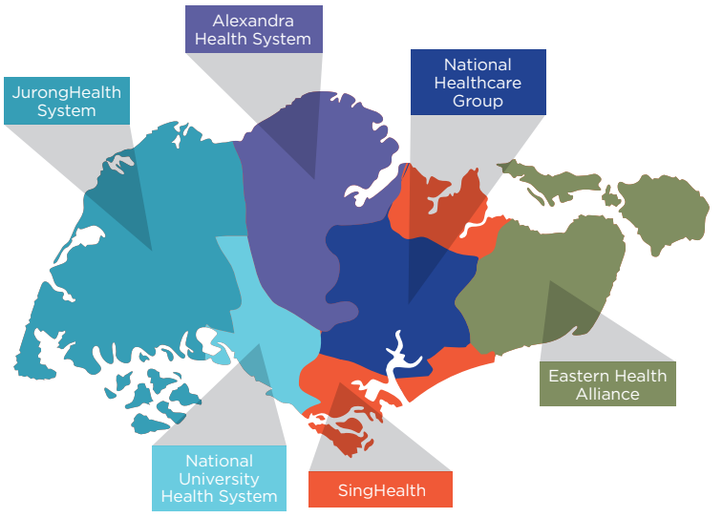
To achieve better system integration, facilitate the scaling up of services, and consolidate a larger pool of manpower resources,[146] Singapore's six RHSs were further reorganised in 2018 into the central region (National Healthcare Group (NHG)), the eastern region (Singapore Health Services (SingHealth)), and the western region (National University Health System (NUHS)). Each new cluster was to have a fuller range of facilities, capabilities, services, and networks across different care settings. This aimed to allow clusters to deliver more comprehensive and person-centred health promotion, disease prevention, and curative and rehabilitative care in their respective regions.[147]

This reorganisation recognised that a wider range of primary care providers, such as polyclinics, GPs, family medicine clinics, and community health centres, played a critical role in the healthcare sector's transformation. It pushed improvements in the coordination of service provision[148] to deliver team-based care.

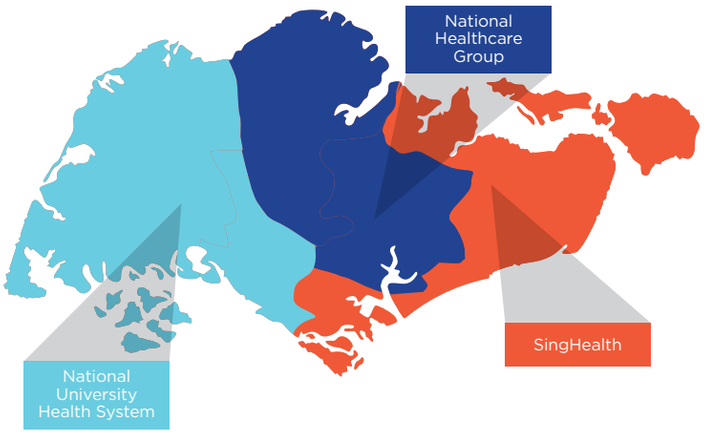
In 2018, the MOH launched the Primary Care Networks, which consist of networks of GPs supported by nurses and care coordinators in providing holistic and coordinated care for patients with chronic conditions. This team-based approach ensures patients are better cared for in the community.[149]

EXHIBIT 3. SINGAPORE'S RECENT REORGANISATION OF THE REGIONAL HEALTH SYSTEMS.[150]

Late 2000s: 6 Regional Health Systems In Singapore.



2018: 3 Regional Health Systems in Singapore



	National University Health System (NUHS)	National Healthcare Group (NHG)	Singapore Health Services (SHS)
Operational Hospitals, Specialty Centres and Polyclinics	• Alexandra Hospital • National University Hospital • Ng Teng Fong General Hospital • Jurong Community Hospital • National University Cancer Institute Singapore • National University Centre for Oral Health Singapore • National University Heart Centre Singapore • Jurong Medical Centre • National University Polyclinics – Bukit Batok Polyclinic – Bukit Panjang Polyclinic – Choa Chu Kang Polyclinic – Clementi Polyclinic – Jurong Polyclinic – Pioneer Polyclinic – Queenstown Polyclinic	• Institute of Mental Health • Khoo Teck Puat Hospital • Tan Tock Seng Hospital • Yishun Community Hospital • National Centre for Infectious Diseases • National Skin Centre • Admiralty Medical Centre • National Healthcare Group Polyclinics – Ang Mo Kio Polyclinic – Geylang Polyclinic – Hougang Polyclinic – Kallang Polyclinic – Toa Payoh Polyclinic – Woodlands Polyclinic – Yishun Polyclinic	• Changi General Hospital • KK Women's and Children's Hospital • Sengkang General Hospital • Singapore General Hospital • SingHealth Community Hospitals – Bright Vision Community Hospital – Outram Community Hospital – Sengkang Community Hospital • National Cancer Centre Singapore • National Dental Centre Singapore • National Heart Centre Singapore • National Neuroscience Institute • Singapore National Eye Centre • SingHealth Polyclinics – Bedok Polyclinic – Bukit Merah Polyclinic – Eunos Polyclinic – Marine Parade – Outram Polyclinic – Pasir Ris Polyclinic – Punggol Polyclinic – Sengkang Polyclinic – Tampines Polyclinic
Upcoming New Facilities (Publicly Announced as of February 2023)	• National University Polyclinics – Taman Jurong Polyclinic – Tengah Polyclinic – Yew Tee Polyclinic	• Tan Tock Seng Hospital, Integrated Care Hub • Woodlands Health Campus • National Healthcare Group Polyclinics – Bidadari Polyclinic – Bishan Polyclinic – Khatib Polyclinic – Sembawang Polyclinic – Serangoon Polyclinic	• Eastern Integrated Health Campus • Singapore General Hospital, Emergency Medicine Building • Singapore General Hospital Elective Care Centre and National Dental Centre Singapore • SingHealth Polyclinics – Kaki Bukit Polyclinic Tampines North Polyclinic

EVOLUTION IN THE DESIGN OF HEALTHCARE INFRASTRUCTURE

Along with the evolution of Singapore's approach to healthcare planning and provision over the years, the physical design of healthcare infrastructure has also evolved, with new design features in hospitals for environmental sustainability, to support new care models, and to improve patient experiences and outcomes.

For instance, Khoo Teck Puat Hospital (KTPH), opened in 2010, has adopted an environmentally sustainable and biophilic approach to its design with a "hospital in a garden, garden in a hospital" concept.[151] The hospital buildings and grounds include water features with aquatic species and plants and balconies with scented plants. Solar panels have been installed on the rooftops of the hospital and the adjacent Yishun Community Hospital to produce clean energy; recently, KTPH has pledged to reach net-zero emissions by 2050.[152]

Other new hospitals have also been designed with biophilic and energy-efficient principles. For example, Ng Teng Fong Hospital and Jurong Community Hospital, which opened their doors in 2015, boast innovations to maximise ventilation and natural light to their patients, while the co-location of these hospitals allows for better coordinated and integrated care.[153]

10. Greenery is integrated throughout Khoo Teck Puat Hospital.

11. An artist's impression of the HealthCity Novena complex.

Incorporating communal spaces in hospitals has also been a key strategy to provide better respite while positioning hospitals as an extension of the public realm to promote wellness. For example, Sengkang General Hospital, which opened in 2018, includes a central "Community Heart" communal space at the ground level.[154] Its physical porosity and permeable design encourage interaction between staff, patients, caregivers, and the public through arts and health programmes.[155] Patients at upper-level wards also enjoy views into the verdant "Community Heart"—studies have shown that natural light and lush greenery can improve patient moods, speed up recovery, and decrease the dependency on pain medication.[156]

Another key strategy in the evolution of Singapore's healthcare infrastructure is developing a healthcare master plan with care integration in mind, as demonstrated in HealthCity Novena. Novena is a precinct that hosts many medical institutions, such as Tan Tock Seng Hospital (TTSH), Dover Park Hospice, Ren Ci Community Hospital, National Skin Centre, National Neuroscience Institute, and the Lee Kong Chian School of Medicine. HealthCity Novena aims to optimise linkages to foster better integration of care and allow greater collaboration. The buildings are well-connected via sky bridges, underpasses, and interconnected basement car parks. HealthCity Novena is also connected to a network of public transport, walkways and roads to create a more convenient place for care and learning. For example, the main TTSH building will be connected to Ren Ci Community Hospital and the upcoming TTSH Integrated Care Hub (TTSH-ICH) via a sky bridge, enabling seamless movement of patients to their next recovery phase.

MENTAL HEALTHCARE INFRASTRUCTURE

The COVID-19 pandemic has shone a spotlight on the importance of caring and providing support for people's mental health.[157,158] Though there has been much progress made in the discourse around mental health and support provided to those with mental health issues, this was not always the case.

During the British Colonial Period, the mentally ill were neglected and stigmatised. The "insane" were criminalised and confined in overcrowded convict jails.[159] In 1841, after a mentally ill inmate killed another, the Insane Hospital was established.[160] Renamed the Lunatic Asylum in 1861, the hospital functioned as a detention centre and was rebuilt and expanded periodically to accommodate the increasing number of patients.

Over time, the understanding of mental health conditions and their treatment improved. The Mental Hospital was set up in 1928 in Yio Chu Kang, where all mental health patients were relocated.[161] Instead of detention, the Hospital was used for treatment. Even then, mental health conditions were thought to be incurable and the best course of action was to institutionalise the mentally ill for life.[162]

12. A ward in the old Woodbridge Hospital.

In 1951, the Mental Hospital was renamed Woodbridge Hospital[163] and was expanded to include a social work department in 1955.[164] The expansion of bed capacity and sub-specialisation of services continued over the years, including the setting up of a child psychiatric in-patient unit.[165]

From the 1970s, perspectives on mental health started to evolve. There were moves to avoid negative labels like "lunatic asylums" and to provide tailored care for patients at different stages of their mental health conditions. Treatment began moving towards rehabilitation and community-based care. The first community-based day centre, the Mandalay Day Centre, opened in January 1981, followed by the Alexandra Day Centre in April 1983.

The 1980s marked the start of Singapore's journey in mental health education. In 1982, the Singapore Association for Mental Health embarked on a wide-scale mental health education programme[166] to educate the public on mental well-being and encourage a better understanding of mental health conditions to reduce its stigma.[167] This novel direction was timely as certain events during the 1980s, such as the collapse of Hotel New World in 1986, saw survivors, families and victims requiring psychological support. Furthermore, the stresses of urban life itself contributed to increasing mental health concerns. Addressing the mental health needs of a nation requires an all-inclusive approach to care for those who are healthy and those who struggle with mental health.

The 1983 National Health Plan announced by the MOH included strategies to improve care for patients with mental health conditions.[168] Enabled by the establishment of a local degree of psychiatry in 1982, the development of new sub-specialties and clinical services ramped up in the 1990s onwards.[169] Multi-disciplinary departments and collaborations with other partners such as the Health Promotion Board added to the increasingly holistic detection, interventions and support for mental health and well-being. In April 1993, the Woodbridge Hospital moved to a new, modern complex in Buangkok. It was reorganised and renamed the Institute of Mental Health / Woodbridge Hospital to reflect its extended role in education, training and research.[170,171] It had facilities for those requiring in-patient and specialist outpatient facilities.

"Mental illness is an inescapable reality in any society, just like physical diseases. Those who are mentally ill need to be treated and tended to, like those who are physically sick."[172]

—Lee Hsien Loong, Deputy Prime Minister (1990–2004)

In 2007, the National Mental Health Blueprint was established by the MOH to promote mental health, build resilience, and reduce the impact of mental health conditions.[173] The Blueprint cemented the policy shift from an acute-centric institution-based model of mental healthcare to a community-based one, recognising that a holistic approach to mental health was needed.

In 2012, the Community Mental Health Masterplan was launched, to place even greater emphasis on mental health support in and for the community and primary care for persons to receive care closer to home.[174,175] Under the Masterplan, the MOH and Agency for Integrated Care work with service providers and public healthcare institutions to develop community mental health services such as community outreach teams, community intervention teams, mental health and dementia services in polyclinics, and train General Practitioner partners to diagnose and support persons with mental health conditions. Social service agencies also provide community-based services and support, such as helplines, counselling services, job training, and peer support, to individuals who face mental health challenges or are in distress.

From a mere mental asylum providing custodial care in the mid-19th century, Singapore now has comprehensive mental healthcare infrastructure and services. However, improving support for people who face mental health conditions in the community remains a work in progress as contexts and challenges evolve.

Closing Note

The development of Singapore's healthcare infrastructure and systems over the years demonstrates unfaltering efforts to increase healthcare capacity and improve its quality while ensuring its affordability.

As the population grew and demographics changed, Singapore has undertaken several rounds of reorganisation of the healthcare system to address new and emerging healthcare needs. There has also been a shift from delivering healthcare largely within the hospital or institutional setting to delivering healthcare within the community, whether to address physical or mental health issues.

A city's healthcare infrastructure is a key urban system that determines people's health, but healthcare is one of many determinants. The next chapter will discuss how Singapore addresses other social determinants of health through the way it plans and activates other urban systems.

CHAPTER 3

CREATING LIVEABLE ENVIRONMENTS THAT PROMOTE HEALTH

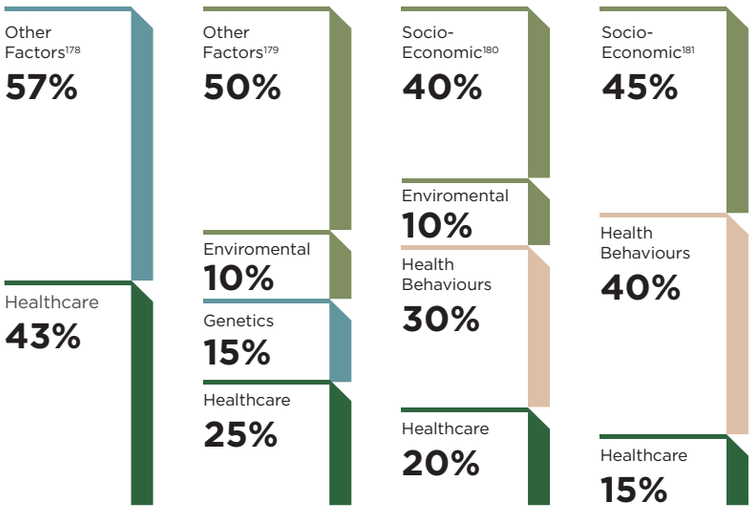
> "The determinants of health are exceptionally broad. Policies made in other sectors can have a profound, and often adverse, effect on health....Instead of diseases vanishing as living conditions improve, socio-economic progress is actually creating the conditions that favour the rise of non-communicable diseases. Economic growth, modernisation and urbanisation have opened wide the entry point for the spread of unhealthy lifestyles.[176]"

DR MARGARET CHAN
Director-General, World Health Organization (2007–17)

Socio-environmental Determinants of Health and Population Health Outcomes

Evidence has shown that achieving a healthy city requires more than good healthcare delivery. In fact, socio-economic and environmental factors account for more than half the variation in population health outcomes. These social determinants of health are defined by the World Health Organization (WHO) as "the conditions in which people are born, grow, live, work, and age" and the "structural conditions that fashion the way societies are organised" such as politics and governance, that result in specific living conditions[177] which impact health.

EXHIBIT 4 : STUDIES SHOW THAT SOCIO-ECONOMIC AND ENVIRONMENTAL FACTORS HAVE THE GREATEST INFLUENCE ON POPULATION HEALTH OUTCOMES.



Adapted from "A vision for population health: Towards a healthier future".[182]

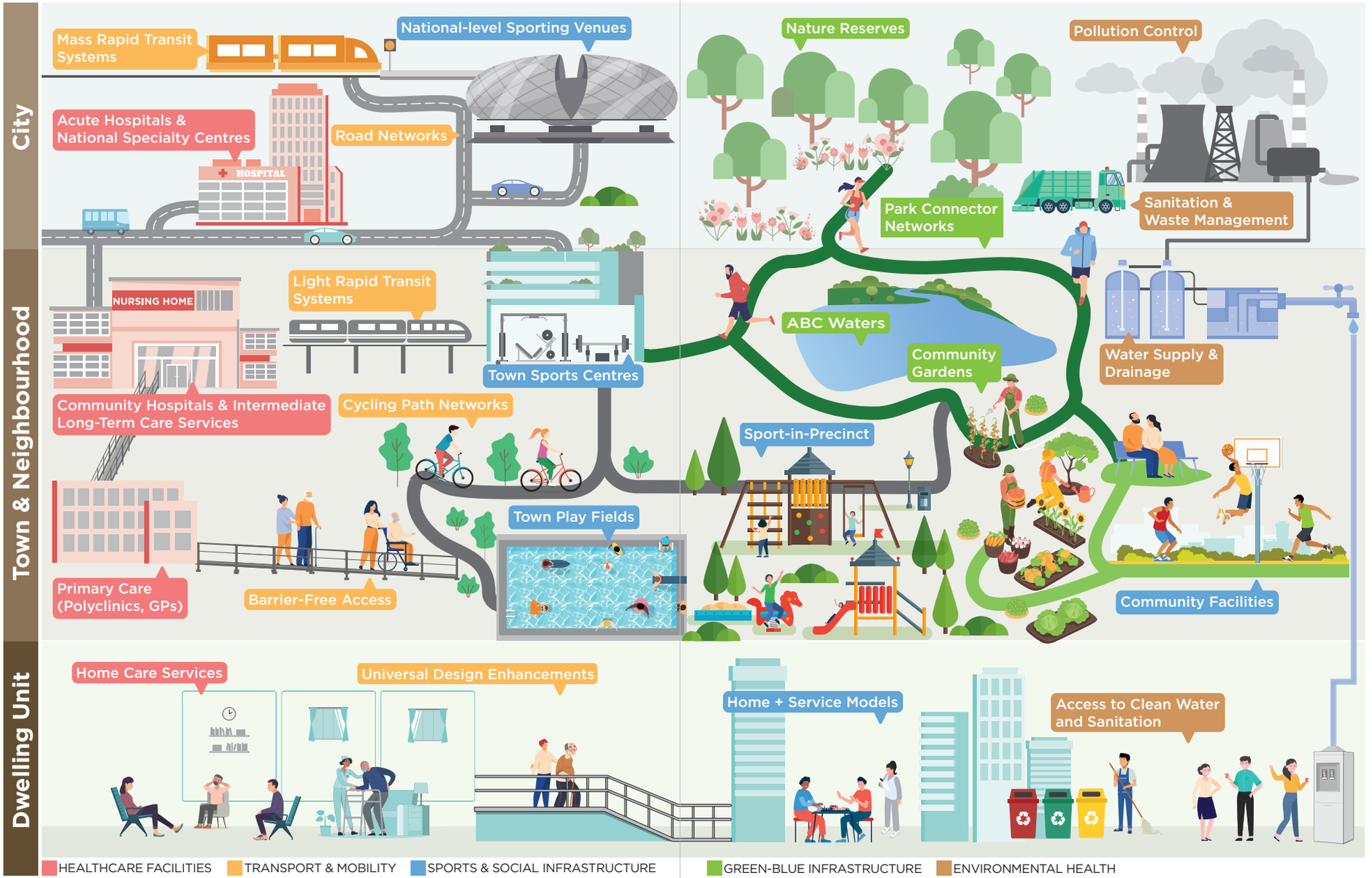
Given the variety of determinants involved, an integrated approach to the way we plan, design, build, and activate the city is needed.

Chapters 1 and 2 discussed how Singapore laid the foundations for baseline protection against health threats and diseases.

This chapter will examine how land-use planning and various urban systems have contributed to an urban environment that promotes health. Health promotion aims to decrease the risk of disease and improve overall health by improving choices and enabling behaviours that foster health. This involves strategies that improve the social and environmental determinants of health.

13. Well planned environments and neighbourhoods can promote people's participation in healthy behaviours, such as physical activity, across all ages.

EXHIBIT 5 : THE URBAN SYSTEMS THAT CONTRIBUTE TO A HEALTHY CITY IN SINGAPORE AT THE CITY, TOWN AND NEIGHBOURHOOD AND DWELLING UNIT-SCALES.

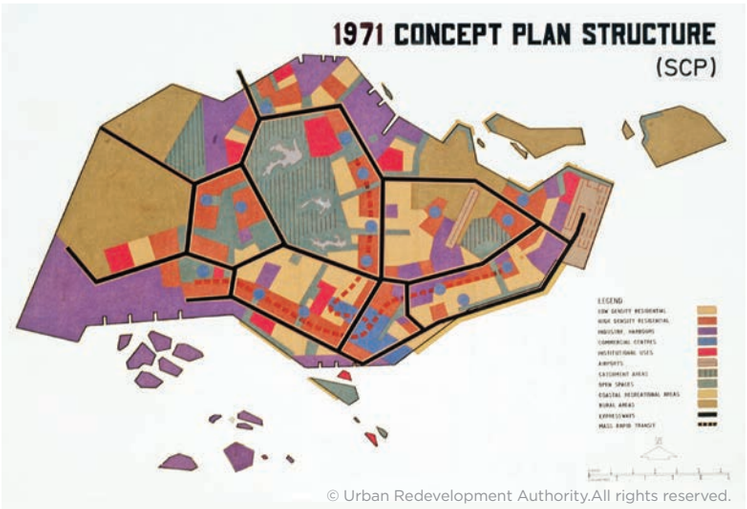


Source: Centre for Liveable Cities, 2023.

Laying the Foundations through Long-term Integrated Land-use Planning

Since independence in the 1960s, Singapore has adopted a comprehensive, forward-looking planning approach to land-use planning, one which addresses development and liveability needs.

Singapore's first long-term integrated land use and transport planning blueprint was the Concept Plan 1971, which envisioned Singapore's urban structure comprising the Central Business District (CBD) and a ring of new satellite towns around the Central Water Catchment Area.



14. The 1971 Concept Plan.

Subsequent Long-Term Plans (LTPs) (formerly known as Concept Plans) were reviewed on a 10-yearly cycle to map out land uses and infrastructure needs over the next 50 years whilst ensuring their relevance in catering to the needs of current and future generations.[183]

Cascading down from the LTPs, Master Plans (MPs)[184] translate broad strategies into more detailed plans for implementation over the next 10–15 years. These statutory MPs are reviewed every five years and show the permissible land use and intensity for developments islandwide.

Development Control (DC) guidelines[185] then regulate and facilitate developments whilst ensuring alignment to the MPs and LTPs.

The integrated approach by which planners and policymakers develop and review the LTPs and MPs ensures that Singapore anticipates and caters to the various needs of an island city-state within its limited land for current and future residents. This land-use planning approach also serves as a foundation on which other urban systems and infrastructure are planned for in an integrated manner. Overall, it enables the creation of a liveable and healthy environment that can help foster the holistic physical, mental, and social well-being of residents.

Planning Self-Sufficient, Liveable Towns That Build Communities

Public housing towns in Singapore are planned and built in ways that address social determinants of health by ensuring clean, liveable environments and fostering community bonds for social and mental well-being.

15. Aerial view of Toa Payoh in 1967. Its town centre was a focal point where residents could meet and shop.

The first public housing neighbourhoods and towns built in the 1960s were planned to improve the level of cleanliness and hygiene, health, and quality of life for those otherwise living in squatter slums.[186] From the late 1960s, the Housing & Development Board (HDB) created larger-scale satellite townships designed to be self-contained with employment opportunities, education, healthcare and recreational facilities, and retail and food outlets. Toa Payoh was the first satellite town to be fully planned and developed by the HDB during its second five-year programme (1966–70).

Early Town Design Principles and their Impact on Physical, Social and Mental Well-being

> "That's a key part of our success: we not only built public housing, we built communities."[187]
>
> —S. Dhanabalan, Minister for National Development (1987–92)

Each new town was pegged at a size of 250,000 people. Towns further from the central area were planned for up to 350,000 people to maximise the amenities that could be incorporated into the town, reducing residents' travel needs to the Central Business District.[188] These plans were guided by the central concepts of sustainability and self-sufficiency[189] and leveraged the critical mass of residents to ensure the town could be self-sufficient, whilst businesses and service providers within the town remain economically viable.

Each town comprised several neighbourhoods of around 4,000 to 6,000 Dwelling Units (DUs) (15,000 people), occupying 50 ha. Each neighbourhood further comprised several precincts of 700 to 1,000 DUs, occupying about 3 ha, which became the planning principle of the HDB precinct.[190] The precinct size was derived from HDB studies on community sizes that would enable residents to meaningfully relate to each other and the scale of territory that people could feel an attachment and sense of identity to,[191] thereby improving social relations and social health.

Homes were within a walking distance of 700–800 m to the neighbourhood centres, which housed amenities such as wet markets and provision stalls. By reducing the need to drive to activity centres,[192] pedestrian activities contribute to incidental physical activity through walking and cycling. Interactions amongst residents and business owners helped build familiarity. Studies have also shown that social cohesion facilitates better health outcomes.[193]

Precincts are linked via pedestrian paths, demarcated by activity nodes such as hard courts, fitness corners and playgrounds with sitting corners to encourage exercise and play amongst young and old. These activity nodes are often surrounded by greenery with tree planting and landscaping to provide shade[194] and bring about physical and visual relief in a built-up environment.

On the ground floor, void decks[195] serve as informal social spaces for residents to interact and provide shelter from weather elements for residents passing through. Tables and chairs also ensure that there are resting points for residents as they go about their daily activities. Facilities such as kidney dialysis centres, clinics, and caregiver respite centres were provided over the years in these void decks to serve different segments of residents who needed access to health services.

16. HDB void decks are like "community living rooms".

Design Considerations in Building Homes that Support Health and Well-being

HDB flats are designed to be functional and comfortable, which supports health and well-being—the earliest HDB flats in the 1960s were built to provide adequate ventilation, living space, and access to sunlight, which proved to be beneficial for health.

In the decades following, these key tenets have remained, even as HDB blocks are built to higher densities. For example, blocks are designed to maintain natural cross-ventilation within the flats and corridors on each floor, and larger windows enhance natural lighting and views. The layout of HDB flats also evolved over the decades in line with changing trends. For example, the washroom and dining space that used to be within the kitchen has been shifted out. For the larger flat types, separate service yards have been introduced so that residents could hang their laundry in an area unaffected by kitchen fumes.[196] At the same time, the rubbish chutes were moved away from the kitchen to the common area outside the units, for better hygiene and to avoid pest issues. In recent years, newer technologies such as pneumatic waste systems have been piloted to increase the efficiency, cleanliness and hygiene of waste disposal at the neighbourhood level, which will be scaled up gradually in new towns over the coming years.

Demographic Changes Transform Needs and Aspirations

From the 1980s, rising affluence led to younger families moving out of older estates, with preferences for newer and larger flats and higher-quality living environments.[197] Another important demographic shift was that of a rapidly ageing population, as the Singaporean life expectancy rose from 64.5 years in 1965 to 75.3 years in 1990.[198]

As earlier HDB designs focused on basic housing needs for a younger population, some aspects no longer catered to the needs of older residents. For example, not every level within older housing blocks had lift landings, which posed a challenge to those with difficulty navigating stairs. The lack of barrier-free access may reduce social inclusion, as the elderly and those with special needs face greater challenges in stepping out of their homes to continue to lead active lives and engage with the wider community.

Recognising these evolving needs, the HDB undertook a massive city-wide upgrading programme that included more elderly-friendly features. Within existing homes, the HDB's Enhancement for Active Seniors (EASE) programme was launched in 2012 to retrofit flats with senior-friendly features, such as slip-resistant treatment to bathroom floor tiles and grab bars.

Universal Design features are now incorporated within new developments to cater to the changing needs throughout a resident's life cycle. This includes ramps at the main entrance for easy access, wider internal corridors and doorways that facilitate wheelchair movements, as well as wheelchair-accessible common bathrooms.[199] By future-proofing the flats from the outset, residents can transit into old age more smoothly and enjoy a better sense of well-being, as compared to customising the flat when new needs arise. In more recent years, new housing typologies are also being developed to provide varying levels of services to support ageing-in-place.

17. Rooftop gardens connect residential blocks for convenience and accessibility and encourage outdoor activity.

BARRIER-FREE ACCESS AND UNIVERSAL DESIGN FOR AN INCLUSIVE CITY

With increasing longevity, residents may face various physical, cognitive, and sensorial challenges, which can reduce their activity levels and engagement with society. Studies have identified social isolation as a serious public health risk linked to medical conditions such as depression and suicide, dementia, and even heart disease and stroke.[200] Inclusive design in the built environment can improve mobility and reduce the risk of social isolation, which in turn can help improve physical, mental, and social health outcomes.

To facilitate physical accessibility, the Building and Construction Authority (BCA) developed a Barrier-Free Accessibility Code in the 1990s to assist developers, architects and engineers in planning and designing facilities and buildings to serve older persons and wheelchair users. The 2004 Committee on Ageing Issues report further recommended that Barrier-Free Access features be provided in an integrated fashion, so that individuals will not be impeded when moving across different infrastructural domains, such as from roads to buildings. The latest 2019 edition of the Barrier-Free Accessibility Code now extends to the whole built environment beyond the confines of buildings and provides for a wider spectrum of people, including persons with disabilities, parents with infants, and the young.[201]

In public housing developments, upgrading programmes included the upgrading of lifts to service every level within the housing block. Walkways and footpaths were added or enhanced with ramps to overcome steps to facilitate physical accessibility of senior residents.[202]

There were also efforts to improve accessibility in transportation. Between 2008 and 2011, the Land Transport Authority completed the S$60-million Barrier Free Accessibility Programme, which resulted in all public roads and 95 per cent of pedestrian walkways, 400 m access around MRT and LRT stations, and taxi and bus shelters, being accessible or barrier-free.[203]

Beyond physical accessibility, there are efforts to drive Universal Design (UD) for the built environment. UD refers to “design for all” and aims to create environments that address the physical, social and psychological needs of as many people as possible, regardless of abilities and age. This includes groups such as infants and children, expectant mothers, older persons, wheelchair users or those who have difficulty walking, and persons with visual or hearing impairments. To that end, the HDB published the HDB Universal Design Guide for Public Housing in Singapore in 2006 and has since incorporated UD features in all new public housing developments to facilitate ageing-in-place and to enable an environment that is user-friendly to all. After publishing the first *Universal Design Guidelines for Commercial Buildings* in 2006,[204] the BCA has since expanded the Guidelines over the years to cover a wider range of building types, including commercial, residential and community facilities as well as public places.

18. These public housing developments in Punggol made waterfront living accessible to all residents by providing barrier-free communal spaces, pavements and a wheelchair accessible promenade and viewing deck with railings for safety.

COMMUNITY CARE APARTMENTS FOR SENIOR RESIDENTS

Seniors in Singapore today live in a variety of housing typologies, some of which are integrated with care services, depending on the seniors' care needs.

A study conducted by the Centre for Liveable Cities (CLC) found that seniors preferred to live within their neighbourhoods, desired greater vibrancy in their community, and hoped to continue their daily activities and socialising with their neighbours. Premature admission into nursing homes is not optimal. Care may be over-medicalised in such settings, and seniors face a loss of agency.

However, most seniors would be considered middle-income and thus might not qualify for subsidised housing and care services.[205] Yet commercial options are too expensive and hiring foreign domestic workers may not be a financially sustainable option.

Following a series of engagements on assisted living, the MOH, MND (Ministry of National Development) and HDB developed a public housing assisted living concept as an affordable option for integrated housing and care for seniors while keeping them engaged with their communities. The first pilot site was launched in 2021 in Bukit Batok.

The Bukit Batok Community Care Apartments are well-connected to recreational facilities, eateries, public transportation, healthcare, and other amenities to ensure accessibility and encourage engagement with the wider community. Within the development, residents have access to a community garden and fitness stations to encourage active lifestyles. Communal spaces on every floor encourage socialisation amongst the residents.

The Community Care Apartments aim to support independent living whilst preparing for the future care needs of seniors. Thus, the units accommodate a variety of mobility needs through designs and fittings, such as a wheelchair-friendly, no-step main door that opens into an internally open layout with sliding partitions.

The health and well-being of residents are supported through a compulsory subscription to a "Basic Service Package". This includes a community manager who will facilitate social programming within the communal spaces, as well as monitor the health status of residents and link them with relevant care services. The Basic Service Package includes 24/7 emergency response to provide seniors with help in a timely manner when needed.

19. Easy-to-slide partitions can separate the living and bedroom spaces for more privacy.[206]

The Community Care Apartments (CCAs) are priced based on a short-term lease tenure, which provides greater affordability for seniors as these leases are more aligned with their expected housing needs. The lease ranges from 15 to 35 years, in 5-year increments, and should cover the applicant and spouse (if any) until the age of 95. Seniors aged 65 and above can apply for a CCA. The income ceiling of the CCA has also been pegged at an average gross monthly household income of S$14,000. Additionally, priority is given to applicants who require permanent assistance with Activities of Daily Living in recognition that they are more likely to require and benefit from the care services available in a CCA. To ensure these CCAs continue to serve the target residents, they cannot be sold or rented in the open market.

Besides new-build, senior-specific housing, agencies are continuing to explore other affordable housing and neighbourhood typologies that will support residents with unique physical, sensory (e.g., vision and hearing), and cognitive needs across the population.

Clean Transport, Cleaner Air, Healthier Environments

Transport within the city is one of the key urban systems that has an impact on our health. Done well, it facilitates efficient and comfortable movement of people, supports economic and social life, and can also encourage the use of public transport and other modes of active mobility. However, transportation can also give rise to negative externalities, such as pollution from vehicular emissions and traffic noise, which need to be managed to protect the population's health and well-being.

Since the 1980s, as the vehicle population grew, policies on vehicle emissions standards and regulations have been introduced. These continue to be revised through the decades; for example, Singapore adopted the Euro 6 emission standards for petrol and diesel vehicles from 1 September 2017 and 1 January 2018, respectively. A Vehicular Emissions Scheme (VES) was also introduced in 2018 to encourage the purchase of cleaner cars with lower emissions of carbon dioxide, hydrocarbons, carbon monoxide, nitrogen oxides, and particulate matter. The VES was subsequently enhanced in 2021 with increased rebates and higher surcharges to further encourage consumers to purchase cleaner vehicles and discourage purchases of more pollutive models.[207] The recent push for the electrification of cars, taxis, and bus fleets in Singapore will help reduce air pollution from vehicles.

Furthermore, strategies that reduce private vehicle usage and ownership also reduce pollutants from vehicular sources[208] and urban temperatures contributed by road traffic,[209] which result in cleaner air and healthier environments.

Promoting Active Commuting

Active commuting, defined as commuting via modes such as walking or cycling, facilitates incidental physical activity, which has been associated with a lower risk of chronic diseases such as diabetes[210] and obesity.[211] A walkable neighbourhood[212] and neighbourhoods with higher public transport accessibility[213] are also associated with greater social cohesion, which contributes to well-being.

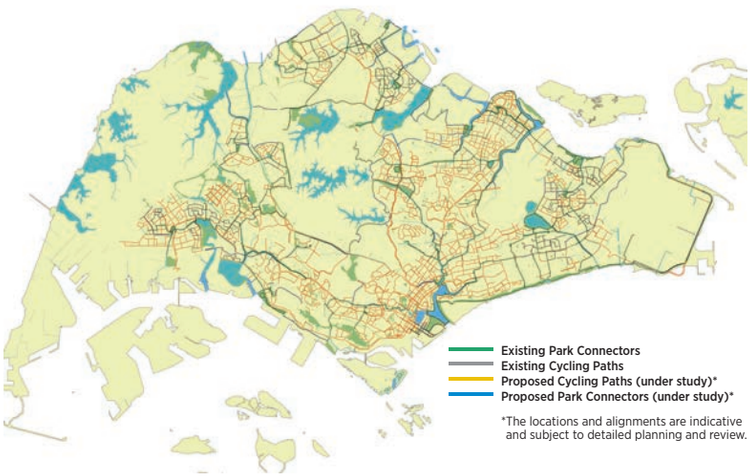
Increasing public transport usage through high public transport density and pleasant public transport experiences further contribute to active commuting due to the need for first and last-mile connections.

In 2008, the Land Transport Authority (LTA) introduced its first Land Transport Master Plan (LTMP) to better integrate transfers, services, journey times and fares and overcome long waiting and journey times and overcrowding. New fare structures were adopted for seamless transfers, transport hubs were constructed, and MRT networks and capacity of rail and bus systems were also expanded amongst other initiatives.[214] By 2012, public transport mode share during peak periods increased to 63 per cent, and this increased further to 67 per cent by 2017,[215] demonstrating less private vehicular usage and more active use of public transport.

To further promote active mobility, an Active Mobility Unit was established within the LTA in 2015 to oversee all walking and cycling-related policies and initiatives in Singapore.[216] Apart from planning for bicycle parking facilities and dedicated cycling tracks, the Unit develops measures such as clear rules and code of conduct relating to shared use of paths in order to ensure safe and conducive environments for all to remain active and healthy.

Land Transport Masterplan 2040

The narrative of Singapore's urban transport system continues to evolve. In 2019, the Land Transport Masterplan (LTMP) 2040 was launched, with goals of 20-minute towns and a 45-minute city through inclusive Walk-Cycle-Ride modes of transport for all.[217] The goal is for walk-cycle-ride modes to make up 9 in 10 peak period journeys by 2040, up from around 7 in 10 in 2021. To support this, the LTMP includes infrastructural plans to extend existing rail lines, build new rail lines, and expand the cycling path network to 1,300 km by 2030.[218] In the coming decades, Singapore's transport system will continue to be an important pillar to support the



20. Island-wide Cycling Network (as of April 2021).[219]

Developing a City in Nature for Respite and Recreation

Greenery and nature is another key urban system that contributes to the social determinants of health in a city. Studies have established that greenery and nature can improve people's physical, mental, and social well-being. A more equitable distribution of natural amenities within the city can also reduce disparities among neighbourhoods.[220]

Singapore's journey towards a "City in Nature" has been long and fruitful in the making. Through the incorporation of greenery and parks into land-use plans, the implementation of building codes and guidelines, and the participation of residents, greenery has played an integral role to improve the health and well-being of urban residents.

Planting Green Foundations

In the 1960s, the vision was to develop Singapore as a "Garden City"[221] with abundant greenery and a clean environment. Furthering the momentum, the 1971 Concept Plan incorporated the "Garden City" vision, with plans for parks to be developed as recreational spaces for residents and act as "green lungs" to ventilate built-up areas. With the passing of the National Parks Act in 1990, the National Parks Board (NParks) was established as a statutory board under the MND to manage and enhance the national parks and nature reserves. Over time, NParks' remit expanded to include the development and management of the "Garden City", such as its roadside greenery and community green spaces.

From "Garden City" to "City in Nature"

Over the years, the vision for greening Singapore has evolved from "Garden City" to "City in a Garden" in 2011, and most recently in 2020, a "City in Nature".[222] The "City in Nature" vision includes the conservation and extension of Singapore's natural capital island-wide. This involves the establishment of networks of nature parks around Singapore's nature reserves to protect them against the impact of urbanisation. The nature parks serve as buffers and provide complementary habitats for native flora and fauna to thrive while enabling visitors to enjoy nature-based recreation activities, such as hiking and bird-watching, which promote physical, mental and social well-being.

NParks has also developed a range of programmes to activate green spaces within neighbourhoods and engage communities in interacting with greenery. This includes the Community in Bloom programme, launched in 2005, which aims to foster a community spirit through community gardening.[223] These efforts provide respite to relieve the stresses of high-density urban living and give rise to opportunities for community bonding through the facilitation of interactions across social groups. There are now more than 1,800 community gardens across the island. With increasing interest in gardening among the public, NParks introduced the Allotment Garden Scheme in 2016 to provide more space for gardening in parklands. To cater to community interest in gardening, NParks aims to have 3,000 community gardens and 3,000 allotment garden plots by 2030.

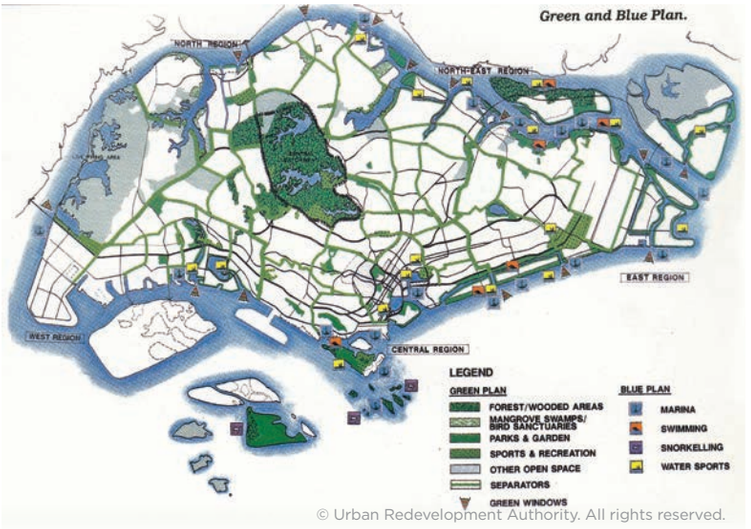
To encourage pervasive and accessible greenery in Singapore's high-rise urban environment,[224] the Urban Redevelopment Authority (URA) introduced the Landscaping for Urban Spaces and High-Rises (LUSH) programme in 2009. As of end-2020, LUSH has played a key role in the introduction of more than 250 ha of greenery within new developments.[225] To complement this effort, NParks introduced the Skyrise Greenery Programme in 2009, which focused on restoring nature into Singapore's urban landscape through retrofitting. More than 300 building projects have benefitted from the scheme to incorporate more greenery, such as green roofs and walls, into their developments to promote climate, ecological and social resilience.

The 2010s also saw developments on the scale of town planning, where the HDB Biophilic Town Framework outlines strategies needed to plan and design urban landscapes to achieve the goals of sustainability, liveability and resilience.[226] Through these programmes, regulations and incentives, Singapore was able to promote the adoption of greenery more pervasively in different environments to achieve better environmental health and human well-being.[227]

Connecting Green and Blue for Recreation, Mobility and More

Going beyond gardens and parks, there have been efforts over the years to connect green and blue spaces in Singapore. Doing so brings nature closer to people and creates multiple opportunities for incidental and recreational physical activity, and facilitates common activities and interactions in public spaces to forge social bonds and improve social well-being.

A key feature in the 1991 Concept Plan was the Green and Blue Plan, the government's first attempt to map out a system of open spaces to complement the city's waterways and create a comprehensive network of parks, green spaces, and waterways.[228]



21. The Green and Blue Plan arising from the 1991 Concept Plan.

In particular, the Green and Blue Plan marked a shift in the use of waterways in Singapore to adapt them for recreation. Starting from the 1980s, initiatives explored the waterways' potential for recreation and sports. For example, areas surrounding reservoirs were developed into public parks while the Public Utilities Board (PUB) opened limited access to some reservoirs for leisure, such as canoeing and fishing.[229]

Park Connector Network

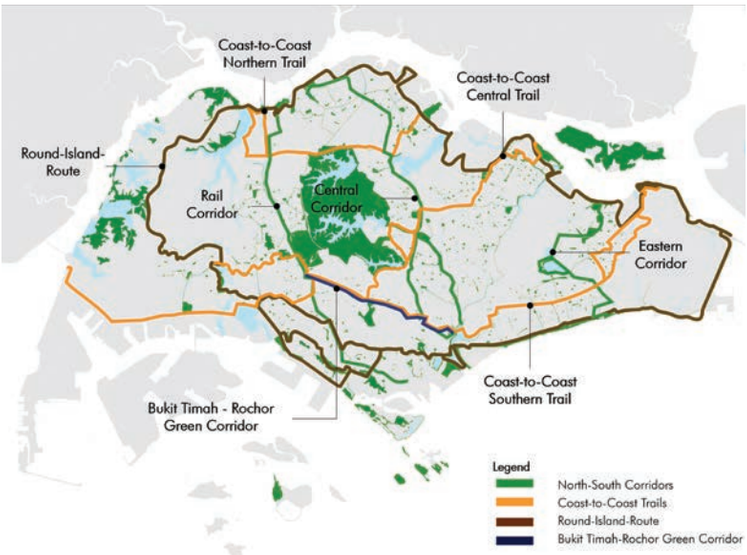
One way by which green and blue spaces are connected across the city is the Park Connector Network (PCN). This was first conceptualised in 1987 as a linear park by Japanese landscape architect Junichi Inada whilst he was working at NParks.[230] Such linear parks would be easily accessible to those who lived or worked near them. These linear parks extend the sense of greenery and open space.

A Park Linkage Programme was started in 1989,[231] which tapped into unused spaces along canals and open spaces around residential estates to link up major parks for recreational access. In 1991, the Garden City Action Committee approved the PCN as a viable solution that optimised

underutilised space whilst enabling more extensive creation and integration of green spaces. The first pilot park connector project at the Kallang River opened in 1992.[232]

Over time, the PCN became an integral part of urban development in Singapore. The first generation of park connectors built separate tracks for cyclists and pedestrians and tended to be very functional. They typically had a 2-m planting strip alongside the tracks, allowing for the provision of big trees to provide shade and simple resting places such as benches. From the late 1990s, designs of the park connectors shifted away from functionality and were developed as parks in their own right. NParks referred to the Chinese landscape philosophy of *jie jing* or "borrowed scenery", where the park connectors could "borrow" from their surroundings,[233] including landscapes, waterways and even nearby housing estates to overcome land constraints.

NParks aims to increase the PCN to 500 km by 2030 and have all households within a 10-minute walk from a park.[234] Complementary to the PCN, NParks is also establishing several island-wide routes, which comprise multiple park connectors and trails. These routes, such as the Round-Island-Route, Rail Corridor and Coast-to-Coast Trails, will provide opportunities to explore more outdoor spaces, and walk or cycle in natural spaces for longer distances, increasing physical activity levels to improve physical well-being and access to green spaces for mental respite.



22. Island-wide recreational corridors and trails.

Active, Beautiful, Clean Waters

> "Our waterways should do more than meet our water needs. They should also enhance our living environment and lifestyle. [Now], we will bring people closer to water so that they will enjoy and cherish it more."[235]
>
> —Prime Minister Lee Hsien Loong

The origins of the PUB's Active, Beautiful, Clean Waters (ABC Waters) programme can be traced back to the Waterbodies Design Panel initiated by the URA in 1989.[236] The panel, comprising representatives from government agencies and the private sector, advised the government on beautifying and re-naturalising Singapore's waterbodies and waterways to integrate them with urban development.

Ideas in the Green and Blue Plan introduced in the 1991 Concept Plan were carried over to the Parks and Waterbodies Plan spearheaded by the URA and unveiled in 2002. This Plan emphasised the planning for Singapore's natural assets like the greenery and waterbodies "to be accessible for recreation yet ensuring preservation of fragile areas".[237] In 2001, inspired by the PCN, the PUB accelerated the concept of re-naturalising Singapore's waterways.

In 2006, the ABC Waters programme was introduced with the aim of harnessing the full potential of Singapore's utilitarian drains, canals and reservoirs into beautiful community and recreational spaces for various outdoor activities and integrating drains, canals and reservoirs with the surrounding environment. It brought the public closer to Singapore's many waterways and waterbodies, where they could derive enjoyment and leisure for their health and well-being.

The flagship ABC Waters project at Bishan-Ang Mo Kio Park was completed in 2012.[238] The 2.7-km straight concrete canal that channelled the Kallang River in the park was naturalised into a 3.2-km meandering river using bioengineering techniques involving plants and natural materials to integrate it with the park and provide ample spaces and facilities for park users. The Park's open lawns proved popular for jogging and cycling, and the rejuvenated park also spurred volunteer groups to help upkeep the park, encouraging the public to take ownership of Singapore's blue and green spaces.

23. The rejuvenated Bishan-Ang Mo Kio Park.

As of 2022, 51 ABC Waters projects have been completed across Singapore, creating many community spaces for the public to gather and enjoy.

Over time, enhanced by the ABC Waters programme and connected through the PCN, Singapore's parks and waterbodies evolved and integrated into larger recreational destinations. The design and programming of green and blue spaces ensure that they are attractive, engaging and multi-functional. By facilitating physical and social activities, they contribute to the well-being of the population. Tan See Nin, Senior Director at the URA, reflected: "Infrastructure for recreation and leisure are not just hard infrastructure. They are means of bringing communities together and are therefore a form of 'social infrastructure'. That should be the way we look at how we plan for sports and recreational uses."[239]

Sports for a Healthy and Independent Nation

> "If our nation is to survive forever and ever, we must nurture a vigorous and healthy people capable of standing up for ourselves and our right to live our lives without being coerced or molested."[240]
>
> —Lee Kuan Yew, Prime Minister of Singapore (1959–90)

With the above statement, then-Prime Minister (PM) Lee Kuan Yew launched the "Sports for All" vision at the official opening of the National Stadium in July 1973. Sports were seen as important for the development of a healthy nation by building a productive workforce to drive the economy and a fit defence force to protect the country.[241,242] Over the years, sports infrastructure has been another crucial urban system that supports the promotion of good health in the city.

The Early Race towards "Sports for All"

Since the 1960s, the HDB's public housing programme improved the provision and distribution of sports and physical recreation facilities in medium to large-sized public housing estates. Community centres and schools were also equipped with recreational and sports facilities.

24. Gymnastics display at the Rochore Community Centre during National Day Celebration in 1967.

Systematic planning of sports infrastructure

In 1973, the Singapore Sports Council (SSC) was established through the merger of the National Sports Promotion Board (NSPB)[243] and the National Stadium Corporation[244] to "streamline and coordinate the development and promotion of sports and building of facilities".[245]

In 1976, the SSC unveiled its Master Plan on Sports Facilities, with a plan costing close to S$21 million to develop 6 multi-purpose indoor stadiums, 3 athletic stadiums, 3 football fields, 7 swimming pools, 30 squash courts, and 70 tennis courts by 1982.[246] A second phase of the Master Plan covered the period up to 1990, with further recommendations after identifying deficiencies in sports facilities in different zones.[247] Under the Master Plan, facilities built included the Kallang Squash and Tennis Centre (1978), and later, the multi-purpose world-class Singapore Indoor Stadium (1989).[248]

Information gathered in the SSC's National Sports Participation Surveys, the first of which was conducted in 1978, helped project sports participation trends to inform these long-term master plans.[249] The HDB also used the projected population size of new towns as the key criterion for determining whether an estate qualified to have sports facilities and where to locate these facilities.

Singapore Sports Council Takes the Reins

By the 1990s, residents could access a nearby park or sports facility with relative ease, with approximately 80 per cent of sports facilities provided for and funded by the HDB.[250]

However, overall national participation levels in sports and recreation fell—in a 1992 national survey, only 24 per cent took part regularly in weekly exercise, down from 36 per cent in 1987.[251] Changing demands and preferences resulted in sub-optimal usage of facilities. Engagement in more "traditional" activities like jogging fell, while demand for more diverse activities such as futsal and street basketball rose.[252]

As the SSC was most familiar with these shifting trends through regular census and operational oversight of the facilities, it took over the planning, design, operation, and maintenance of sports infrastructure in public housing estates in 1988. The consolidation of roles aimed to improve the management of infrastructure and drive greater responsiveness in the design and programming of facilities.[253]

To address the increasingly diverse interest in sports, the SSC set out to broaden the appeal and accessibility of sports facilities. Existing and new sports facilities were integrated and upgraded into Regional Sports and Fitness Centres in housing estates. These boasted a wider range of community-based sports and recreational amenities, including fitness gymnasiums, access to sports courses, and competitions such as street soccer and floorball.

25. The Jurong East Swimming Complex was the first to offer a "lazy river", wave pool and fun slides at an affordable rate.

Facilities were designed to promote family outings and activities. Ng Ser Miang, then-Chairman of the SSC, explained, "to encourage more participation…you want to have fun with the family, and you want to bond the family…[so you need] to create community activities as well. [This] means we really need to see how to create sports facilities that are more easily accessible, which are convenient, which become part of their lifestyle…"[254] New features that promoted water play for children, such as water slides, were introduced.[255] Commercial elements such as F&B and shopping enhanced the vibrancy and attractiveness of sports complexes.[256] The first integrated sports complex developed in this vein was the Jurong East Sports and Recreational Centre, which opened in 2000.[257]

Another significant change was the locations of sports facilities within public housing towns. Because town centres were prime land, most sports facilities previously tended to be at the fringes of towns.[258] The SSC began to champion for sports facilities to be sited within town centres or near transportation nodes. The development of the PCN by NParks in the 1990s was also incorporated in the SSC's provisions for walking, jogging, and cycling facilities.[259] These efforts ensured that facilities were increasingly accessible so that sports could be a part of everyday life to encourage and promote a healthier lifestyle among Singaporeans. By the 2000s, many of

the SSC's sports infrastructure master plans had been completed or were in the process of implementation. Sports participation rate was 34 per cent in 1997, an increase from 24 per cent in 1992.[260]

Rethinking infrastructure to optimise spaces for sports

In 2001, a Committee on Sporting Singapore (CoSS) report expanded the SSC's remit to be responsible for developing professional sports and the sports industry in Singapore to foster a sporting culture. New infrastructure was required to support the building of a sporting culture.

The nearly three-decade-old National Stadium was to be rebuilt into a new multi-use Singapore Sports Hub to support major sporting events and the development of a sports industry ecosystem. The hub catered for a wide range of sports through its 55,000-seat National Stadium, six indoor sports halls, an aquatic centre, and a water sports centre. Furthermore, the design of the new National Stadium was modular, scalable, flexible, and functional to ensure its relevance over the years.[261]

26. Singapore Sports Hub.[262]

Besides the development of new centralised venues, other recommendations in the CoSS report included optimising the use of existing facilities, such as through co-sharing of facilities, optimising spaces in parks, using vacant land, and twinning infrastructure.

In the 2000s, there was also a shift towards developing deliberately open and fluid spaces that encouraged flexible forms of play. New and multiple uses were incorporated, either by repurposing existing facilities or designing new innovative facilities. Sports facilities located with other amenities and services that served other community needs were perceived as the ideal solution for land-scarce Singapore.[263]

Schools presented another opportunity to provide sports facilities to nearby residents. The Dual Use Scheme, first piloted in 2003 by the SSC and the Ministry of Education, introduced the sharing of school fields with the community. Under the scheme, the SSC would maintain the fields and manage paid booking for their use outside school hours.[264] The SSC also started a free-to-play scheme on weekends for certain school fields. To date, there are 83 chargeable school fields, 113 free-to-play school fields, and 228 school indoor sports halls under the Dual Use Scheme.[265]

Sighting the future: Vision 2030

With the completion of the 10-year CoSS plan, the Vision 2030[266] plan was launched in 2012. Vision 2030 moved on from the earlier emphasis on sports participation and excellence to focus on encouraging citizens to "Live Better Through Sport". Sport was perceived to support societal and personal resilience in the face of challenges such as intensifying global competition, changing demographics, rising concerns over income inequality, and increasing health risks such as obesity and diabetes.

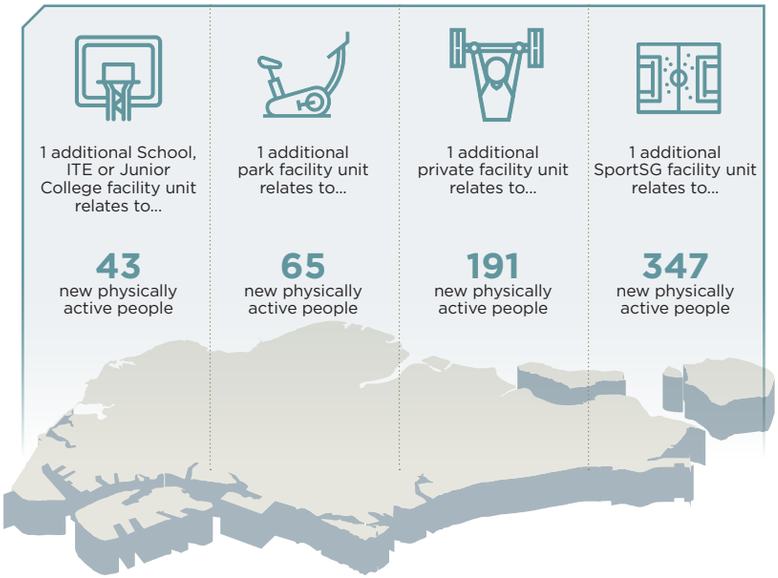
To capture the essence of the SSC's aspiration to empower partners, the community, and the nation to "Live Better Through Sport", the SSC was rebranded "Sport Singapore" (SportSG) in 2014.[267]

Sports Facilities Master Plan

The Sports Facilities Master Plan (SFMP), a key recommendation under Vision 2030 that was unveiled in March 2013, organised sports facilities into four tiers to cater to sporting needs at national, regional, town, and neighbourhood levels. To further enhance accessibility,[268] the SFMP aimed to put sports and recreational facilities with a 10-minute walk from the homes of most Singaporeans by 2030.

At the highest tier of the SFMP are national-level sporting venues that host major events and businesses and support elite sport development while serving recreational users. Examples include the Singapore Sports Hub and the upcoming NS Square. Tier 2 facilities refer to Regional Sports Centres, planned as the focal points for sports programmes, events and activities in Singapore's Central, East, Northeast, North, and West regions. The first Regional Sports Centre, Our Tampines Hub in the East, was completed in 2017. Punggol Regional Sports Centre in the Northeast is currently under construction.

EXHIBIT 6 : SPORTSG FACILITIES HAVE THE LARGEST POTENTIAL TO INCREASE THE NUMBER OF PHYSICALLY ACTIVE PEOPLE.[269]



Source: Sport Singapore.

Tier 3 facilities are located at the town level. Town Sports Centres offer facilities such as swimming pools, indoor sports halls, gyms, and studios. Town Sports Centres may co-locate with other community facilities. An example is the upcoming Bukit Canberra, an integrated development comprising sports facilities and a hawker centre, park, polyclinic, and library.[270] In larger towns, Town Play Fields are provided to supplement Town Sports Centres. An example is the ActiveSG Park@Jurong Lake Gardens, a swimming complex with gym and studio spaces nestled within the lush greenery of Jurong Lake Gardens.

At the neighbourhood level, Tier 4 facilities such as Sport-in-Precinct and Dual-Use Scheme schools provide more spaces for residents to engage in sports and fitness activities within residential estates. Some 20 new Sport-in-Precinct facilities have been launched, which typically comprise a sheltered multi-purpose sports court, multi-generational fitness corner, and playground.[271,272]

In alignment with Vision 2030's theme of "Sport Without Boundaries", SportSG is also implementing the recommendations of the Disability Sports Master Plan (DSMP), rolled out in 2016.[273] The DSMP sought to expand opportunities for participation through Centres of Expertise. These aimed to improve accessibility and availability of inclusive sports facilities, such as specialised gym equipment, and ensure availability of relevant programmes such as para-sports like wheelchair rugby and badminton.[274] The first Centre of Expertise was opened at Sengkang Sports Centre in May 2016,[275] and it is fitted with facilities such as a swimming pool fitted with ramps for wheelchair access.

As a result of these and other efforts, regular participation in sport and physical activity reached an all-time high of 72 per cent by 2021.

Closing Note

Singapore's integrated approach to planning, designing and activating urban systems—be it sanitation, housing, transport and mobility, greenery and nature or sports and recreation—reflect a longstanding commitment to fulfil the needs of its residents over the decades by addressing the social determinants of health.

A liveable city provides urban environments that encourage physical activity, offers green and blue spaces for respite, and engenders community bonding through activities that socialise different community groups. Through these efforts, a positive impact on the physical, mental, and social well-being of its people can be achieved.

CHAPTER 4

PUSHING TOWARDS A HEALTHIER CITY

"[If] we treat ageing as a medical problem, requiring more hospitals and nursing homes to treat or take care of seniors, we are going down an unsustainable path. [We] can prevent, delay and even reverse frailty while in the early stages. [T]he holy grail is to make our healthy and active lifespan almost as long as our biological lifespan.[276]"

ONG YE KUNG
Minister for Health

As the previous chapters have outlined, Singapore has made significant progress in building a healthy city. In 2019, Singapore ranked first globally for life expectancy at birth at 84.9 years, a dramatic jump from the life expectancy of 75.3 years in 1990,[277] and had the lowest disability-adjusted life years burden across the countries.[278]

Yet, there remain ongoing and future challenges that the city will have to plan for and address so that it can continue to protect and promote the health of all who live here. These challenges include an ageing population, a shrinking workforce, mental health and well-being issues, as well as environmental stressors associated with urban living and climate change.

Current and Future Challenges to a Healthy City

Demographic Transitions

An ageing population

With increasing life expectancy and decreasing birth rates, Singapore faces a rapidly ageing population. Currently, 17.6 per cent of Singapore's population are aged 65 and above. By 2030, it is projected to increase to about 23.6 per cent.[279]

Older adults experience functional and cognitive changes that can impact how they navigate daily life and engage meaningfully with society. In a longitudinal study between 2006 and 2018, the percentage of older Singaporeans being diagnosed with three or more chronic diseases, such as high blood pressure, high cholesterol and diabetes, increased.[280] The study also reported an increase in the proportion of older Singaporeans with limitations in Activities of Daily Living (ADLs),[281] and an increase in the proportion of older Singaporeans with limitations in three or more Instrumental Activities of Daily Living (iADL).[282] Age-related cognitive impairment is another challenge. The total number of persons living with dementia is expected to increase from 92,000 in 2021 to 150,000 by 2030.[283]

Amidst these functional and cognitive changes, many seniors would prefer to "age in place" and live in the comfort of their own homes because of the emotional attachment and fond memories associated with their homes.[284] Many also want to stay productively and purposefully engaged with work and their communities for longer. Hence, the city must continue to offer choices and access to a range of housing, employment, and recreation options for an ageing population.

27. As Singapore's population ages, it is critical to create built environments that support healthy ageing.

Lifestyle and work-life balance

Stress and a lack of physical activity associated with overwork have been reported as concerns for Singapore's workforce, issues which can contribute to the rise of chronic and other illnesses.[285] Between 2010 and 2019/2020, for instance, the prevalence of diabetes, high blood pressure, and cholesterol among adults aged 18 to 74 increased by 0.9%, 15.7% and 12.9%, respectively.[286] A 2017 study by Mercer estimates that Singapore's productivity loss due to sick and absent workers may reach S$3.3 billion by 2030.[287]

Alongside efforts to improve work-life balance through changes in employment practices, interventions in the built and natural environments could encourage healthier ways to live, work, play and learn.

To promote active lifestyles, the Health Promotion Board (HPB) offers a variety of self-directed physical activity programmes, such as the National Steps Challenge™, which uses wearables to track physical activity and gamification to motivate residents to build physical activity into their daily routines and engage in moderate to vigorous intensity physical activity. The HPB works with public and private sector partners to organise challenges in the community and at workplaces to engage participants to move more, work towards their fitness goals and make healthier choices when purchasing meals, drinks or groceries.

Mental Health and Well-being Challenges

To protect and promote holistic well-being, both mental and physical well-being must be cared for. Mental health is an important issue. It is estimated that 1 in 7 people in Singapore experience a mood, anxiety, or alcohol use disorder in their lifetime. In addition, more than three-quarters of people experiencing a mental health condition in their lifetime did not seek any professional help. Research has found that the inability to recognise the symptoms of a mental health condition and stigma could deter people from seeking treatment.[288] A study by the Institute of Mental Health estimated the societal cost of common mental disorders at S$1.7 billion per year,[289] arising from costs of direct medical care, indirect medical care, intermediate and long-term care services, and productivity loss.

There is increasing awareness about specific mental health challenges faced by groups such as the youth, employees, and the elderly. The COVID-19 pandemic has exacerbated challenges to mental well-being; for instance, amidst the pandemic, some elderly may choose to stay at home for fear of getting infected with COVID-19,[290] which when coupled with limited proficiency in technology, can increase the elderly's sense of social isolation and lead to negative well-being. In 2020, Singapore reported 452 suicides, representing a 13 per cent increase from 2019.[291] Of these, 154 deaths were elderlies aged 60 and above, representing a 26 per cent increase from 2019.[292]

This underlines the importance of providing safe and conducive environments, as well as respite and support for social engagement and physical activity, to protect and promote holistic health. This is true during "peacetime", and all the more so during shocks such as pandemics.

Environmental Stressors

Other than pollution control for air, water and wastes, which continue to be addressed in Singapore, noise pollution has been of increasing concern. A 2017 National University of Singapore study found that the average outdoor sound level measured throughout the day in Singapore was 69.4 decibels, compared to the National Environment Agency's (NEA) recommended limit of 67 decibels averaged over an hour.[293] In contrast, the World Health Organization's guideline for community noise in outdoor living areas is a limit of 55 decibels averaged out over the daytime and evening, suggesting that Singapore's population "is potentially at risk of adverse non-auditory health effects",[294] which include sleep disturbance, cardiovascular and psychophysiological effects, reduction in productivity, and changes in social behaviour.[295] There is thus a need for the ongoing evolution of urban estate designs and the supporting of policies and regulations to manage noise.

With climate change, Singapore will also have to prepare for rising temperatures, more extreme weather, increased flood risk, and rising sea levels.[296] This will affect all our residents, but particularly those living in low-lying or flood-prone areas, vulnerable groups such as the elderly living in less ventilated conditions, and those working in high-temperature environments such as construction workers, hawkers, and delivery workers. The design of buildings and urban environments should thus consider thermal comfort and plan for more extreme weather.

Climate change, in combination with other forces such as globalisation, increases the incidence of infectious diseases.[297] These include outbreaks of SARS in 2003, H1N1 in 2009, the Zika virus in 2016, and, more recently, the COVID-19 pandemic. Rising temperatures might also exacerbate endemic vector-borne diseases like dengue, where most cases are observed during warmer periods.[298] We need to be prepared for the possibility of Disease X, an unknown pathogen that may have high transmissibility and high severity, without an immediate cure or vaccine.[299] Environmental and bio-surveillance, particularly at entry points such as the port and airport, would aid in early detection of potential diseases.

Health Equity

Within a city, ensuring equitable health outcomes across socio-economic groups is an ongoing challenge. For instance, a National Health Survey by the Ministry of Health (MOH) found that households earning less than S$2,000 per month had the highest prevalence of obese individuals at 14.3 per cent, while households earning more than S$6,000 a month had a smaller percentage of obese individuals at 8.8 per cent.[300] Living in Singapore's public rental flats, which are heavily subsidised flats catered to low-income households, has also been associated with three or more impatient admissions in a year, as well as a higher mortality rate.[301] Contributing factors may include low health literacy and low social support, given that many live alone or come from disadvantaged families.

The built and natural environment has the potential to mitigate health inequities by ensuring provision and accessibility through master planning and universal design that cater for physical, cognitive and sensory challenges, financial affordability through inclusive grants and schemes, and inclusivity through designing welcoming and enjoyable experiences. Singapore has generally done well, with efforts in public infrastructure such as housing, sanitation, transport, sport and recreation, and green spaces. Going forward, we must continue to better identify groups with specific needs, to understand how to bridge gaps between infrastructure, service provision, and health-promoting behaviours, to achieve equitable health and well-being for all.

Addressing the Complexities to Achieve a Healthier City

Planning for a healthy city in the face of these challenges is a complex task because urban health outcomes depend on overlapping interactions between individuals, their behaviours and communities, and the physical and socio-economic environments they live in over time. Creating urban environments that protect and promote health thus requires multi-stakeholder, multi-sectoral approaches that put people and communities at the centre.

Adopting Person-Centric Approaches

To achieve healthier cities, multiple determinants of health and well-being need to be considered from a person-centric perspective. For instance, in 2020, the Housing & Development Board (HDB) launched a Designing for Life Roadmap that places holistic well-being at the centre of planning and designing HDB towns over the next 10–15 years.[302] The roadmap also offers residents more opportunities to connect and involve them in shaping and activating their neighbourhood spaces.

28. The HDB has launched two housing developments at Tengah Park District that showcase its latest planning and design strategies from the Designing for Life Roadmap.[303]

As part of a person-centric approach, the City also needs to identify, engage and understand the needs of people with varied profiles. For instance, person-centric approaches to create a supportive built environment based on the needs of residents can build elderly residents' and caregivers' confidence about ageing-in-place in the community, delay institutionalisation, and slow down deterioration. Resulting solutions will drive overall inclusivity of towns and neighbourhoods.

For example, the Agency for Integrated Care's (AIC) Dementia-Friendly Community initiative seeks to create communities to empower independent living in persons living with dementia (PLWDs) and their caregivers.[304] Nodes within the community, such as "go-to points" act as safe return points within the community, where people can bring PLWDs who appear lost and are unable to identify themselves or find their way home.

In a related vein, the Centre for Liveable Cities (CLC), AIC and the Singapore University of Design and Technology have embarked on a Dementia-Inclusive Neighbourhood Study with PLWDs and their caregivers in a pilot site in Yio Chu Kang to prototype dementia-friendly designs that are evidence-based and co-designed with the community. The results will feed into dementia-inclusive neighbourhood guidelines to augment existing design codes and guides.

Leverage Technology as an Enabler

To support health and well-being needs, the city needs to look at new ways to leverage technology as an enabler at the individual and community levels.

For instance, technology can improve safety within homes. The HDB has developed the Elderly Monitoring System under the HDB Smart Enabled Home initiative.[305] This system learns the daily habits of seniors through motion sensors and alerts family or other caregivers when irregular patterns in behaviour are detected.

Outside the home, technology can provide solutions for a diverse range of issues, from helping the physically disabled conveniently move around[306] to finding smart solutions for Singapore's public transport system.[307] For example, hands-free fare gates are being explored to allow commuters with mobility challenges to enter and exit stations and buses without needing to tap their fare cards on card readers.[308] These solutions can support persons with mobility and accessibility challenges in maintaining engagement with the wider community, which improves social well-being and other determinants of health, such as employment.

Technology can be used as a tool to nudge people towards healthy behaviours, such as the National Steps Challenge™. It can also be applied to planning. For instance, technology can collect and analyse data on where and when people are accessing healthcare services. Such data would help in planning the placement of healthcare facilities to serve the community's needs.[309]

While technology can be a powerful enabler for health, it is important not to forget those on the opposite side of the digital divide, such as the elderly and those who may not be able to afford digital services, lest health inequities worsen. Barriers to technology adoption, such as financial

accessibility or physical and cognitive usability, need to be overcome to realise the potential of technology as an enabler.

Involve Multiple Stakeholders

Collaboration among and between the public, private and people sectors is crucial to address health-related challenges by leveraging diverse capabilities, knowledge, networks, and roles for solutioning.

For instance, in 2018, the HealthySG Taskforce was launched with the aim of transforming Singapore's health promotion landscape by integrating health across various aspects of citizens' lives and the environment.[310] The Taskforce conducted focus group discussions and public engagement, and agencies across five ministries and communities jointly developed policies and programmes that would encourage Singaporeans to lead sustained healthy lifestyles.

In 2021, the HDB, National University Health System (NUHS) and National University of Singapore (NUS), together with stakeholders from the public, private and people sectors, embarked on a pilot Health District @ Queenstown.[311] Queenstown is Singapore's first satellite town and currently has one of the oldest populations in Singapore. Its demographics closely mirror Singapore's national demographics by 2030. The Health District @ Queenstown initiative leverages the broad range of expertise across multiple stakeholders to create integrated solutions for the well-being of residents and encourage social connections.

29. HealthDistrict @ Queenstown.[312]

HEALTHIER SG—A MAJOR TRANSFORMATION OF SINGAPORE'S HEALTHCARE SYSTEM TO EMPHASISE PREVENTATIVE CARE

In September 2022, a White Paper on Healthier SG was released. The paper outlined a multi-year population health strategy to transform our healthcare system and increase the emphasis on preventive care. Healthier SG was developed through consultation with more than 6,000 residents and extensive engagement with stakeholders such as General Practitioners (GPs), employers, and community partners.

Healthier SG will anchor residents with a family doctor and foster community support for healthier lifestyles. Healthcare clusters will step up as regional health managers, and organise and work with partners across healthcare and social services to improve the health outcomes of residents within their assigned geographical region.

Many Singaporeans already seek care regularly at polyclinics and private GP clinics. Through Healthier SG, the MOH will mobilise Singapore's network of family doctors, encourage residents to seek care at primary care first, and shift the focus from illness to improving one's health. Based on an individual's health condition, their family doctor will work with them to develop a personalised health plan, including lifestyle adjustments, regular health screening, and recommended vaccinations.

Partners will also be activated to facilitate residents' participation in community-based activities, from brisk walks to community gardening, right in their neighbourhoods. During public engagements, many residents reflected that they were keen to receive information about suitable healthy living programmes near their homes. The MOH and healthcare clusters will collaborate with agencies such as the Health Promotion Board (HPB), AIC, People's Association (PA), and Sport Singapore (SportSG) to enhance the range and accessibility of such activities. For example, residents can receive personalised guidance at Active Health Labs located island-wide, where coaches conduct multi-disciplinary functional performance assessments and customised coaching on health and wellness. At the Labs, residents are encouraged to make lifestyle changes such as exercising more or practising better screen time management.

30. Community activities and local interest groups cater to residents of different needs and preferences.

Additional support will be also made available for seniors through Active Ageing Centres (AACs). AACs are located within communities and provide activities and services tailored to seniors. There are currently 119 physical AACs across Singapore, constituting the largest national network of ground assets for seniors. Healthier SG plans to expand this to 220 by 2025, which will result in eight in ten seniors having an AAC near their homes. AACs will serve as community connectors to help seniors follow through with lifestyle interventions recommended by their family doctors. They will offer community-based monitoring of selected vital signs, such as blood pressure, which seniors can tap on in between visits to the doctor. Healthcare clusters will also leverage AACs' physical spaces to roll out health initiatives such as end-of-life planning and basic health screening.

Under Healthier SG, healthcare providers and stakeholders will come together, give attention to the upstream care of residents, and intervene in modifiable risk factors early. Residents will receive more information and support so that they are empowered to take steps toward better health for themselves and their families.

Encourage Community Resilience for Urban Health

Community resilience in the face of disruptions has a role in supporting the health of individuals and communities. Community resilience will be crucial to tackle future threats to health and well-being, such as climate change-related heat stress and flooding risks. For example, in 2019, CLC embarked on a study in Singapore's Cambridge Road neighbourhood to pilot participatory planning approaches in co-creating interventions with the community to address local challenges and improve their quality of life. Apart from a measurable increase in community resilience over time, residents also indicated more time committed to physical activity in the maintenance of their green corridor, planting and pruning.

In June 2020, NParks launched the Gardening with Edibles programme to encourage Singaporeans to grow edibles at home. NParks distributed some 860,000 free seed packs to households between 2020 and 2021 to encourage gardening as a form of respite and to promote well-being during the COVID-19 pandemic. The programme played a significant role in strengthening community stewardship and social resilience. Social and community bonds were formed as participants were encouraged to share their gardening experiences and harvests.

31. Cambridge Road residents planting a green corridor as part of the Building Community Resilience initiative to reduce heat stress and provide a visually attractive connector between the public and private housing estates.

A 2022 case study by NParks[313] on participants of the Gardening with Edibles programme showed that gardening may be an effective way for people living in densely populated cities to interact with nature and build mental resilience during the pandemic. During COVID-19, communities in Singapore demonstrated the potential to adapt, cope and self-mobilise, from caring for the needs of vulnerable individuals and families in the neighbourhood, to producing and distributing hand sanitisers.[314]

While a resilient community is particularly crucial during periods of shock, even in "peacetime", a community with greater and deeper social networks is a contributor to people's social well-being.

Measure and Evaluate the Effectiveness of Initiatives on Health and Well-being

Chapter 3 highlighted that socio-economic and environmental determinants account for much of the variation in population health outcomes. Given that many determinants inter-relate to drive health outcomes, we need to develop a systematic understanding of the links between determinants and health outcomes and continually measure the effect of these determinants on health. Such evaluations help urban planners prioritise strategies that protect and promote the population's health.

For instance, NParks has conducted studies on the links between greenery and park access with well-being. Based on the studies, access is strongly associated with park use and well-being in Singapore's urban environment[315] and interaction with urban greenery can have a range of positive health outcomes for older adults, such as encouraging healthy sleep patterns and improving psychological health.[316] Such studies, which could be extended to evaluate the longer-term impact of nature and greenery on population health, are valuable in informing planning and design of green spaces.

In a related example, a growing body of work suggests the effectiveness of therapeutic horticulture in promoting seniors' psychological well-being.[317,318] The first therapeutic garden was built in HortPark in 2016. NParks will set up 30 therapeutic gardens across parks island-wide by 2030 and will facilitate therapeutic horticulture programmes. The evidence-based design of these gardens and programmes cater to conditions such as attention deficit hyperactivity disorder (ADHD), dementia, stroke, heart, and mood disorders. Visitors will be able to experience health benefits, such as relief from mental fatigue, reduced stress, and an overall improvement to well-being.

The Urban Redevelopment Authority (URA) has also conducted a study to better understand older residents' everyday interactions with the built environment in their neighbourhood and the effect on their physical, mental and social health. The goal was to develop planning and design recommendations to make Singapore's residential neighbourhoods more conducive for older residents. Separately, the URA is working with SingHealth on an Elderly Life Activity-Space project to establish the impact of the environment, health and social determinants on an elderly's living space and gain further insights on their travel patterns, including bypass behaviour (preference for services further from home) and travel tolerance (maximum travel distance).

On a more holistic front, the Health District @ Queenstown will evaluate health and non-health dimensions for their contribution to the health and well-being of residents. The Health District @ Queenstown initiative will be assessed using the Health District Evaluation Framework (HDEF), which builds on the Ageing Society Index.[319] The framework comprises four domains, with equity being relevant across domains:

- **Well-being** includes physical and mental health, and positive health behaviours.
- **Cohesion** measures social connection and social capital in the community.
- **Productivity and engagement** refer to opportunities for work and volunteering.
- **Security** covers physical, social, and financial aspects.

Long-term Horizon Scanning and Research

Finally, in the face of volatility and issues such as climate change, a city needs to include longer-term horizon scanning and research in planning for a healthy city.

For example, in 2020, the MOH launched the Programme for Research in Epidemic Preparedness and Response (PREPARE) to strengthen research partnerships, share information and knowledge, and collaborate with institutes internationally to better respond to future infectious disease outbreaks.[320] The programme will finetune models to understand how epidemics spread. Such work will also help inform how the urban environment should be built and adapted in response to pandemics.

Besides this, there are other forward-looking research roadmaps such as the Cities of Tomorrow (CoT) Research & Development (R&D) programme,[321] a multi-agency effort led by the Ministry of National Development, that leverages R&D to address existential challenges and establish Singapore as a highly liveable, sustainable and resilient city of the future. Ongoing R&D efforts under CoT and other programmes will deepen our understanding of how urban planning and built environment

interventions can improve health and well-being. Research interest areas include longitudinal population studies to ascertain the causation between health and the built environment, and urban planning and built environment interventions that support preventive health and ageing-in-place. Apart from improving the quality of life, such research can reduce healthcare utilisation and manpower requirements through built environment interventions in the future.

Conclusion

> "A healthy city is one that continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential."[322]
>
> —The World Health Organization

In the review of Singapore's development as a "healthy city" over the past few chapters, we have seen how the city has achieved good health outcomes today through a combination of hard and soft infrastructure, alongside sound urban governance.

And yet, planning for health will and must always be a work in progress. Health outcomes can take years to realise, and a whole-of-society effort is needed to address the complex determinants of health, especially in the face of known and unknown future challenges. The city needs to continue to look ahead, plan for and develop environments and infrastructure that protect against disease, provide for healthcare needs, and promote good health for people through the course of their lives.

After all, a city is only as healthy as its people are.

CHAPTER 5

COVID-19 RESPONSE AND MANAGEMENT OF FUTURE PANDEMICS

> "Our experience with COVID-19 has taught us valuable lessons for future crises. We will enhance our preparedness for future pandemics, as well as strengthen our healthcare system and community networks more broadly. We will push ahead with Healthier SG to mobilise GPs, who were invaluable during the pandemic, to partner Singaporeans to live longer and healthier.[323]"
>
> **LEE HSIEN LOONG**
> Prime Minister of Singapore

Preparedness and Responding to Epidemics and Pandemics

Singapore, as an open economy and international travel hub, has always been at risk from globally transmitted diseases. Over time, the city has built up its governance approaches and physical capabilities to respond to epidemics and pandemics.

Singapore passed the Infectious Disease Act in 1976 as the principal legislation relating to the prevention and control of infectious diseases in Singapore.[324] The Act empowers the Director of Medical Services, the Director-General of Public Health, and the Director-General of Food Administration to require measures to detect, prevent, treat and control the spread of infectious diseases in Singapore. Examples of such measures include requiring the notification and surveillance of infectious diseases; testing, isolation and treatment of suspected cases or contacts; quarantine of infected vessels; and disinfection of premises where an outbreak has occurred. The Department of Disease Control was subsequently established in 1986 by the Ministry of Health (MOH) to formulate disease control policies and programmes and conduct epidemiological surveillance of disease among the Singapore population and in the region.

Lessons from the Severe Acute Respiratory Syndrome Epidemic

In 2003, the Severe Acute Respiratory Syndrome (SARS) epidemic hit Singapore, resulting in 238 infections and 33 deaths.[325] While the outbreak was successfully contained in 2.5 months, the episode accelerated the expansion of Singapore's capacity to deal with epidemics and pandemics, including healthcare infrastructure, workforce, and coordination structures for such emergencies.

Expansion of healthcare capacity for outbreak response

Since the 2003 SARS crisis, healthcare and isolation capacities were strengthened. New hospitals such as Khoo Teck Puat Hospital, Ng Teng Fong Hospital, and Sengkang General Hospital were built in 2010, 2015 and 2018, respectively. A 330-bed National Centre for Infectious Diseases, which opened in 2019, was also established to serve as a national centre to provide infectious disease outbreak management and public health preparedness. In addition, new facilities, including emergency departments, such as the upcoming Emergency Medicine Building on the Singapore General Hospital campus that is set to open in 2024, are also designed to be operationally ready to enhance our response to national health crises or emergencies.[326]

Planning was done for scenarios such as a mass-casualty incident, pandemic, or mass exposure to hazardous materials requiring a hospital decontamination station to ensure that healthcare facilities are designed with significant surge capacity for complex scenarios.

SARS also prompted a relook of dual and multi-use spaces within public healthcare institutions. For example, at KK Women's and Children's Hospital, selected wards were converted into outpatient consultation rooms that could be retrofitted in 24 hours to become isolation rooms. Flexible-use facilities were further explored during the COVID-19 pandemic for more efficient use of space to minimise holding costs of maintaining surge capacity.[327] Public hospitals created new capacity in isolation wards and intensive care units by repurposing existing beds and hospital facilities and acquiring additional medical equipment such as ventilators.[328]

Besides strengthening and adapting healthcare infrastructure, Singapore also built up adequate medical supplies, such as N95 respirators, sterile gloves, and full-body gowns. These were readily available for healthcare workers during the COVID-19 pandemic.

In the community, to strengthen the support at the primary care level during public health outbreaks and reduce reliance solely on polyclinics, the MOH introduced the Public Health Preparedness Clinics (PHPC) Scheme in 2015.[329] PHPCs play an important role as the first line of care in the community to manage outbreaks, with standardised protocols for testing and escalation to hospitals. The PHPC network proved useful during the COVID-19 pandemic. By the end of 2022, more than 1,100 PHPCs had been activated, increasing the accessibility and prompt delivery of COVID-19 services to patients. With the support of PHPCs, Singapore was able to screen, detect and manage a significant number of COVID-19 cases in the community.

Revamp of the Crises Management Framework

Prior to SARS, Singapore had an Executive Group comprising a group of senior public servants that provided the command-and-control mechanism during any civil crisis or emergency.[330] The Executive Group mainly focused on managing crisis scenarios that were civil in nature. The SARS epidemic challenged the prevailing crisis management paradigm, as the epidemic was not a typical civil emergency or domestic public health issue but a major crisis impacting almost every sector of society and the economy.

Following the SARS outbreak, the Cabinet approved the Homefront Crisis Management System (HCMS) to be the de-facto crisis management system to handle crises with national significance and impact. The HCMS encompasses command-and-control structures and platforms to coordinate Whole-of-Government (WoG) responses from political to

strategic and operational and tactical levels. A Disease Outbreak Response System (DORSCON) framework was also developed to prepare the city's healthcare infrastructure and public sector agencies for disease-related contingencies. A crisis management plan was drafted and refined during the 2009 swine flu pandemic.

Thus, in 2020, even before the first case of COVID-19 was detected locally, Singapore had proactively formed an inter-ministerial taskforce.[331] The taskforce directed the WoG response to the outbreak, coordinated the public's response, and worked with the international community. Additionally, Singapore had readied multiple configurations of Crisis Management Groups to deal with different scenarios, with the Homefront Crisis Executive Group as a central coordinating committee.

COVID-19 and the Agility of Urban Assets

> "I believe the biggest opportunity for reinvention lies in the post COVID-19 world. In many ways, the crisis is like a reset button, forcing us to rethink the way we do things in smarter and better ways."[332]
>
> —Ong Ye Kung, Minister for Health

Outside of healthcare institutions, the COVID-19 pandemic highlighted the importance of having flexible multi-functional infrastructure that can be easily modified for emergency housing and isolation use. It confirmed the need to prepare for disruptions by regularly reviewing land and infrastructure needs across crisis response plans as well as the need to plan for flexibility and scalability upfront. Agencies had to go beyond their usual scope of work to activate various types of infrastructures to serve as healthcare and quarantine facilities soon after COVID-19 reached Singapore in early 2020. For example, the Housing & Development Board (HDB) provided temporary accommodation by converting older flats and building temporary accommodation. Among others, agencies such as the Singapore Land Authority (SLA), JTC Corporation, Ministry of Defence, and Ministry of Education, not usually involved in housing matters, also stepped up to retrofit and stand up properties under their charge for use as emergency housing and isolation facilities.[333]

In response to the increasing demand for emergency housing and isolation facilities, the private sector also played a crucial role in supplying ready infrastructure for use. Hotels and serviced apartments were contracted to fulfil the majority of Singapore's emergency housing and isolation facilities needs throughout COVID-19. Working with private sector providers such as hotels required expertise and agility in structuring

contracts, and the SLA lent their expertise in property leasing.[334] It is worth noting that other private sector providers outside of the hospitality industry, such as PSA Corporation and Experia Events, were also engaged to set up isolation facilities on port land and exhibition spaces. Far East Organisation, a private developer, leaned forward to offer the former Chancery Court en-bloc site for housing healthy migrant workers to support the government's efforts to contain the COVID-19 outbreak in dormitories.

Community facilities helped to shift the load away from hospitals. New facilities were designated in MICE venues, such as the Singapore Expo and Changi Exhibition Centre, for COVID-19 patients with mild symptoms and lower risk factors.[335] By May 2020, about five months into the pandemic, more than 80 per cent of all COVID-19 patients were located at these facilities. More spaces were later added at community recovery facilities at Singapore Armed Forces camps and swab isolation centres.[336] This strategy safeguarded capacity at acute hospitals, as patients who no longer required acute hospitalisation could continue their recovery at private or community hospitals.

32. In enabling the use and setup of infrastructure such as hotels (top) and non-hotel sites (left), the public-private partnership was crucial in managing the acute COVID-19 outbreak.

33. The Singapore Expo was converted into an 8,000-bed community care facility for COVID-19 patients who were asymptomatic or had mild symptoms.

Besides ensuring land-use flexibility for healthcare needs, cities must cater for land and space for surge stockpiling capacity. Singapore faced difficulties in securing essentials amidst the COVID-19 disruptions, and stockpiling was a necessary first response. As the government and the private sector began to stock up on essential goods, storage spaces became scarce, and new ones had to be set up quickly. Flexibility in use was key to realising additional storage spaces—existing spaces were identified and quickly retrofitted for storage. One of the largest retrofits was Tanjong Pagar Terminal, where parts of the 80-ha port were retrofitted and repurposed into a dedicated cold storage facility between April and August 2020, storing a total of 100,000 tonnes of frozen vegetables and proteins.[337]

Reducing Urban Disease Transmission

Besides responding to epidemics and pandemics when they happen, cities can reduce the risks of future pandemic threats by understanding potential transmission pathways of such diseases and addressing them via governance, cleaning and sanitation, behaviour change, as well as built environment design and operations.

On the latter, for example, building ventilation has come under the spotlight, given that COVID-19 can be transmitted through aerosols. Studies are exploring best practices for ventilation to reduce disease spread.[338] Innovations such as contactless lift buttons that use infrared technology are examples of how disease prevention can be further strengthened in the built environment. Beyond transmission via aerosols, urban planners and building designers also need to consider other modes of disease transmission, such as through contact, fomites and vectors.[339]

Besides mitigating disease transmission within cities, control and surveillance at points of entry, such as ports and airports, is also key. In Singapore's past, lazarettos, which were buildings used for detention in quarantine, were set up during cholera outbreaks to quarantine new entrants to Singapore.[340] Today, quarantine remains an important public health strategy for serious disease threats. It was employed during the COVID-19 pandemic and continues to be imposed on persons arriving from countries with risks of Yellow Fever transmission who are unvaccinated for it, as its mosquito vector, the *Aedes aegypti* mosquito, is found in Singapore. Early detection of disease and containment at entry and exit points are important to identify, isolate and quarantine new disease threats and to prevent their spread in the local population. Having robust border health systems and international health regulations capacities is crucial, especially as the inter-connectedness of global cities facilitates the spread of transmissible pathogens around the world at greater speed and scale compared to the past.

Conclusion

Building on an existing foundation of healthcare and crisis management capacity, Singapore has weathered the COVID-19 experience. The experience demonstrated the importance of investing in whole-of-society resilience and adopting an adaptive and nimble approach to emergency preparedness and crisis response so that we are ready for future, as yet unknown, epidemics and pandemics.

POST-SCRIPT

Similar to other countries, Singapore is experiencing an increase in life expectancy and a rapidly ageing population. As of 2021, the average life expectancy at birth in Singapore is 83 years—an increase of 11 years compared to 1980. This trend is expected to continue in the future.

Nevertheless, longevity is only meaningful if it is accompanied by good health. This allows individuals opportunities to pursue our passions, try out various types of work, and cherish the companionship of our loved ones.

Our built environment plays an important role in promoting healthy and purposeful longevity—the way we design our homes and community spaces and how we provide health and care services make a difference. Well-planned spaces and infrastructure not only ensure the safety of users, they can also support their health and well-being. For instance, having convenient, engaging, and pleasant environments may encourage residents to partake in more recreational and incidental physical activity. Green and quiet spaces offer mental respite from the city's busy urban environments. Neighbourhoods that are easy to navigate also reduce barriers to those with cognitive challenges, so they can engage more confidently with those around them.

As a city, we need to study and address the many determinants of health—housing, community, education, employment, transport, social and healthcare services, to name a few—in a coordinated and synergistic fashion to harness the full effect for health outcomes.

This publication, *Planning a City for Health and Well-being,* details the multi-faceted approach we have taken over the years in our journey towards a Healthy Singapore.

Building on this strong foundation, it is crucial that we continue to adopt a person-centric approach as we seek out innovative urban living solutions and advancements. This can be enabled by investing in R&D and implementing these solutions throughout the city. However, this can only be accomplished through a whole-of-society approach to involve residents, communities, care providers, businesses, academic institutions, and government agencies.

The pilot Health District @ Queenstown is an example of how we are drawing from the efforts of stakeholders from the public, private and people sectors to create longevity-ready neighbourhoods. In this first-of-its-kind collaboration, we trial interventions on a larger scale at the town level and experiment with new ideas that marry elements of built environment design, new care approaches, and technology to help Singaporeans age healthily, happily, and independently. Importantly, the suite of initiatives will be co-designed with residents to ensure that they address unmet needs and priorities.

Through partnerships and collaborations, we can seek to bring together multiple sectors and disciplines to collectively construct a Singapore that is healthy, inclusive, equitable, and adaptable to accommodate our evolving needs and aspirations towards a fulfilling life ahead.

Tan Kiat How
Senior Minister of State
Ministry of Communications and Information &
Ministry of National Development

TIMELINE

PROTECTING AGAINST DISEASE

1959

The Ministry of Health (MOH) is set up. Two years later, a new Public Health Division is formed, responsible for preventive health services, including sanitation, sale of food and drugs, and infectious disease control.

1960

The Housing & Development Board (HDB) is established to deliver affordable quality public housing. By 1965, the HDB has built 54,000 flats and the acute housing crisis is resolved.

1964

A Public Health Advisory Board is formed to tackle the three most pressing public health problems: stray cattle, hawker-related sanitation problems, and the collection and disposal of refuse.

1965

The 1964 Cattle Ordinance takes effect, with all cattle requiring licensing.

A public Emergency Cleansing Corps of over 1,000 strong workers is formed to increase productivity in refuse collection.

1966

A Hawkers Code is implemented. Hawkers are subsequently licensed and required to pass screening tests for tuberculosis, cholera and typhoid. From the 1970s, hawkers are progressively relocated to hawker centres with proper amenities.

1968

The Destruction of Disease Bearing Insects Act is enacted to monitor and control the mosquito vector population. Officials can now enter premises to conduct checks.

1969

A country-wide Keep Singapore Clean campaign is launched, marking the first time that fines are used to control social behaviour. The campaign continues yearly and expands to cover mosquitoes, pollution, toilets and street hawking, among others.

The Environmental Public Health Act becomes law, standardising public health-related codes.

1970

The Local Government Disposal of Trade Effluent Regulations is gazetted to manage water pollution, allowing for the controlled discharge of effluents into public sewers after treatment.

1971

The Clean Air Act is passed, with the Clean Air (Standards) Regulations coming into force the following year, enabling the control of air pollution caused by industry and trade premises.

1972

The Ministry of the Environment (ENV) is formed, centralising all environmental health-related functions.

A Water Master Plan by the Public Utilities Board (PUB) identifies potential catchment areas and plans for long-term development of water resources.

The Sewerage Master Plan of 1972 is drawn up with the assistance of World Health Organization (WHO) experts to extend the coverage of the public sewerage network.

1977

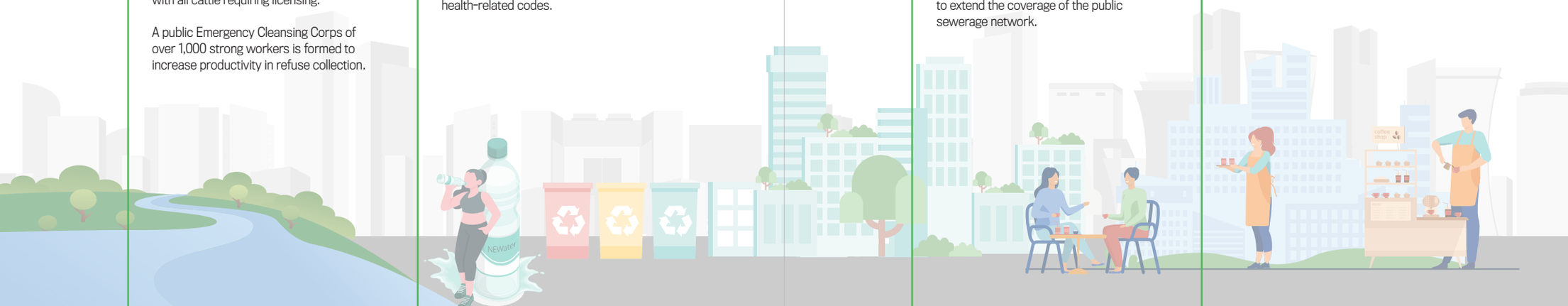
A massive clean-up of the Singapore River begins and is declared complete ten years later. This involved physical cleaning, removal of pollution sources, and implementation of anti-pollution measures.

1979

The first modern incineration plant for the management of industrial and domestic solid wastes starts operations.

1984

With more than 90 per cent of the population served by a modern sanitation system, the Government starts phasing out the night soil bucket system.



PROVIDING HEALTHCARE

1961

The People's Plan includes provisions to build new hospitals and expand facilities at existing hospitals. Primary healthcare is decentralised to outpatient, Maternal and Child Health (MCH) and School Health Service (SHS) clinics.

1976

The Primary Healthcare Division is set up at the MOH. It plans the development of polyclinics as "one-stop" primary healthcare centres within the community.

The Infectious Disease Act is passed as the principal legislation relating to the prevention and control of infectious diseases in Singapore, requiring measures to detect, prevent, treat and control the spread of infectious diseases.

1980

The population has grown from 1.5 million in the 1950s to 2.4 million. Non-infectious diseases are becoming the major cause of ill health and death.

1983

The National Health Plan sets in motion a massive programme to expand public healthcare infrastructure over the next 20 years and a revised system that finances the healthcare system via government subsidies, out-of-pocket payments, and compulsory savings from payroll deductions.

2000

The MOH groups healthcare institutions into two clusters to provide integrated care within their geographic regions.

2003

The Severe Acute Respiratory Syndrome (SARS) epidemic hits Singapore, resulting in 238 infections and 33 deaths. The outbreak is contained in 2.5 months.

2004

The Homefront Crisis Management System is approved as the de-facto system to handle crises with national significance and impact.

2007

The National Mental Health Blueprint cements the policy shift from an acute-centric institution-based model of mental healthcare to a community-based one.

2010

The population has grown to 5 million. The ageing of Singapore's population results in a growing chronic disease burden.

Late-2000s

The public healthcare system progressively reorganises into six Regional Health Systems (RHSs). Reducing the size of each catchment makes it easier to integrate care services across providers within each region.

2011

The Primary Care Master Plan includes an expansion of the polyclinics and the establishment of Community Health Centres and Family Medicine Clinics.

2012

The 2020 Healthcare Masterplan is launched, with plans to increase healthcare capacity across the spectrum of services.

The Community Mental Health Masterplan is launched, emphasising mental health support in the community for persons to receive care closer to home.

2015

The Public Health Preparedness Clinics Scheme is introduced as the first line of care in the community to manage disease outbreaks.

2018

The six RHSs are reorganised into three RHSs, aimed at allowing clusters to deliver more comprehensive person-centred healthcare services.

2019

The 330-bed National Centre for Infectious Diseases opens, serving as a national centre to provide infectious disease outbreak management and public health preparedness.

2020

First confirmed COVID-19 case in Singapore is detected on 23 January 2020. Over the next three years, comprehensive measures are rolled out to protect communities and people.

2022

The White Paper on Healthier SG outlines a multi-year population health strategy to increase the emphasis on preventive care.

2023

Final remaining COVID-19 measures are lifted on 13 February 2023.

PROMOTING WELL-BEING

1960s onwards

The HDB creates larger satellite townships to be self-contained, including healthcare and recreational facilities. Across towns, the provision and distribution of sports facilities are expanded.

1971

Singapore's first long-term integrated land use and transport planning blueprint is developed.

1976

The Singapore Sports Council (SSC) unveils its Master Plan on Sports Facilities, with plans to develop indoor stadiums, athletic stadiums, football fields, swimming pools, squash courts, and tennis courts across the city.

1980s

Recognising the evolving needs that come with rising affluence and an ageing population, the HDB undertakes a city-wide upgrading programme that incorporates more elderly-friendly features.

1989

A Park Linkage Programme is started, tapping into unused spaces along canals and open spaces to link up major parks for recreational access.

1990s

The Building and Construction Authority (BCA) develops a Barrier-Free Accessibility Code to assist developers, architects and engineers in planning and designing facilities and buildings to facilitate physical accessibility for older persons and wheelchair users.

1991

The Green and Blue Plan is developed to map out a comprehensive network of parks, green spaces, and waterways.

The Park Connector Network is approved as a solution for more extensive creation and integration of green spaces. The first pilot park connector project at the Kallang River is opened the next year.

2001

The Committee on Sport Singapore report expands the SSC's remit for fostering a sporting culture. The old National Stadium is to be rebuilt into a multi-use Singapore Sports Hub to support major sporting events and the development of a sports industry ecosystem.

2003

The Dual Use Scheme introduces the sharing of school fields with the community. Under the scheme, the SSC maintains the fields and manages paid booking for their use outside school hours.

2005

The National Parks Board (NParks) launches the Community in Bloom programme, which aims to foster community spirit through community gardening.

2006

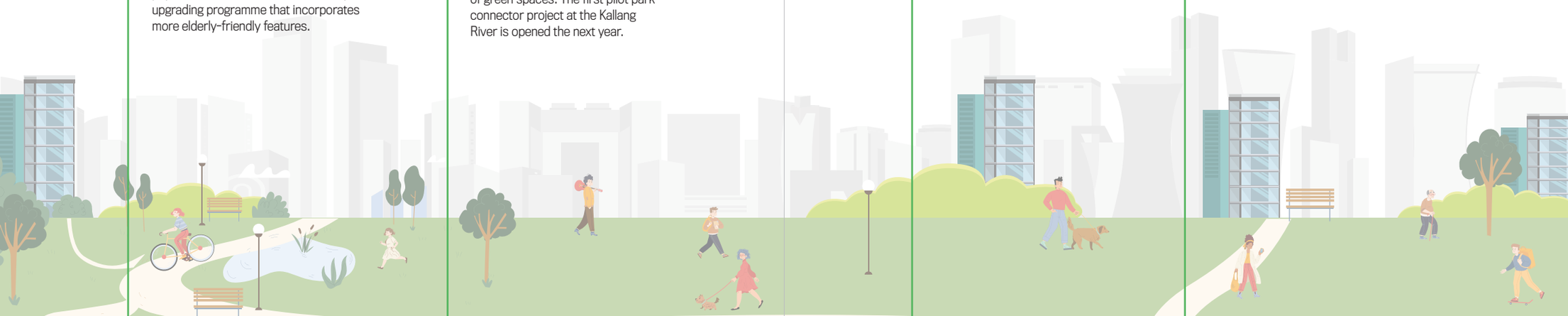
The Active, Beautiful, Clean Waters (ABC Waters) programme is introduced to harness the full potential of Singapore's utilitarian drains, canals and reservoirs as beautiful community and recreational spaces.

The HDB publishes the HDB Universal Design Guide for Public Housing in Singapore. Since then, it has incorporated Universal Design features in all new public housing developments.

The BCA publishes its first Universal Design Guidelines for Commercial Buildings, which has since expanded to cover a wider range of building types.

2008

The Land Transport Authority (LTA) introduces its first Land Transport Master Plan to better integrate transfers, services, journey times and fares and overcome long waiting and journey times and overcrowding.



2008–2011

The LTA completes the Barrier Free Accessibility Programme, which results in public roads, pedestrian walkways, access around MRT and LRT stations, and taxi and bus shelters all being accessible or barrier-free.

2009

The Urban Redevelopment Authority (URA) introduces the Landscaping for Urban Spaces and High-Rises programme to encourage pervasive and accessible greenery in Singapore's high-rise urban environment.

2012

The HDB's Enhancement for Active Seniors is launched to retrofit flats with senior-friendly features.

2013

The Sports Facilities Master Plan (SFMP) organises sports facilities into four tiers to cater to sporting needs at national, regional, town and neighbourhood levels. The SFMP aims to put sports and recreational facilities within a 10-minute walk from the homes of most Singaporeans by 2030.

2015

An Active Mobility Unit is established within the LTA to oversee all walking and cycling-related policies and initiatives in Singapore.

2016

The Disability Sports Master Plan is rolled out to expand the accessibility and availability of inclusive sports facilities.

2019

The Land Transport Master Plan 2040 is launched, with goals of 20-minute towns and a 45-minute city through inclusive Walk-Cycle-Ride modes of transport for all.

2020

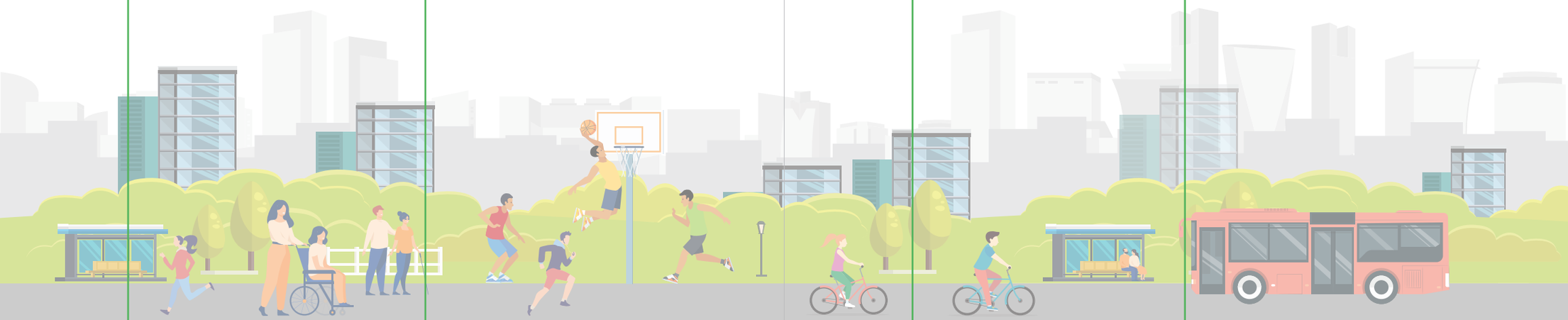
The "City in Nature" vision is launched, which includes the conservation and extension of Singapore's natural capital island-wide, as well as the establishment of networks of nature parks around nature reserves to protect them against the impact of urbanisation.

2021

The Health District @ Queenstown pilot is launched, a first-of-its-kind multi-stakeholder collaboration to galvanise collective efforts in addressing the multiple determinants of health,

The first Community Care Apartment (a public housing assisted living concept) pilot site is launched in Bukit Batok.

The URA embarks on the Long-Term Plan Review 2021, which involves over a year of extensive public engagement.



ENDNOTES

1 Preamble to the Constitution of World Health Organization (WHO) as adopted by the International Health Conference, New York, 19 June to 22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of WHO, no. 2, p. 100) and entered into force on 7 April 1948. The definition has not been amended since 1948.

2 Ministry of Health, "Speech by Mr Yong Nyuk Lin, Minister for Health at the opening of the W.H.O. seminar on 'Health Planning in Urban Development' at the Conference Hall on Tuesday, 21st November, 1967 at 1000 hours", National Archives of Singapore, 21 November 1967, transcript, https://www.nas.gov.sg/archivesonline/speeches/record-details/7a4e7010-115d-11e3-83d5-0050568939ad

3 Ibid.

4 Belinda Yuen, "Urban planning in Southeast Asia: Perspective from Singapore", *The Town Planning Review*, 82.2 (2011): 145–67.

5 Centre for Liveable Cities, *Land Acquisition and Resettlement: Securing Resources for Development* (Singapore: Centre for Liveable Cities, 2014).

6 Ole Johan Dale, "The first 140 years", in *Urban Planning in Singapore: The Transformation of a City* (Shah Alam, Malaysia: Oxford University Press, 1999), 22.

7 Vernon J. Lee, Chia Siong Wong, Paul A. Tambyah, Jeffery Cutter, Mark I. Chen and Kee Tai Goh, "Twentieth century influenza pandemics in Singapore", *Annals, Academy of Medicine, Singapore* 37 (2008): 470–76.

8 Tong Yoke Tho, Sheela Narayan and Paul Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore* (Singapore: MOH Holdings, Ministry of Health, 2015).

9 Ibid.

10 Public Service Division, "Housing a nation, building a city", Public Service Division, 2015, https://www.psd.gov.sg/HOPS/our-institutions/housing-a-nation-building-a-city/

11 "Govt to spend $230 mil on homes in next five years", *The Straits Times*, 10 August 1960, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19600810-1.2.32

12 Centre for Liveable Cities, *Groundbreaking: 60 Years of National Development in Singapore* (Singapore: Centre for Liveable Cities, 2019).

13 Public Service Division, "Housing a nation, building a city".

14 "Evolution of HDB designs", *The Straits Times*, https://www.straitstimes.com/singapore/housing/evolution-of-hdb-designs

15 Dale, *Urban Planning in Singapore*, 119.

16 Centre for Liveable Cities, *Groundbreaking: 60 Years of National Development in Singapore*.

17 Housing & Development Board, *Annual Report 1985/1986* (Singapore: Housing & Development Board, 1986), p. 76.

18 Parliament of Singapore, "Cattle bill", Singapore Parliamentary Records Vol. 23, 19 November 1964, https://sprs.parl.gov.sg/search/#/topic?reportid=007_19641119_S0002_T0003

19 Ministry of the Environment, *Singapore–My Clean & Green Home* (Singapore: Ministry of the Environment, 1997).

20 Ibid.

21 Ibid.

22 Centre for Liveable Cities, *Cleaning a Nation: Cultivating a Healthy Living Environment* (Singapore: Centre for Liveable Cities, 2016).

23 Ministry of Health, "Speech by the Minister for Health, Mr Yong Nyuk Lin, at the inaugural meeting of the Public Health Advisory Board held at the conference room, Palmer Road, on Monday 1st June, 1964 at 11a.m.", National Archives of Singapore, 1 June 1964, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/MSE_20040116001.pdf

24 Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*.

25 Ministry of Health, "Speech of Mr. Yong Nyuk Lin, Minister for Health at the 1st Annual Dinner of the Society of Occupational Medicine at the Imperial Restaurant, Capitol Building, on Saturday, 1st July, 1967 at 2030 hours", National Archives of Singapore, 1 July 1967, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/PressR19670701.pdf

26 Ministry of the Environment, *Singapore–My Clean & Green Home*.

27 Ministry of Health, "Speech by the Minister for Health".

28 Ministry of Health, "Speech of Mr. Yong Nyuk Lin".

29 "Law to curb straying cattle takes effect in Singapore", *The Straits Times*, 2 January 1965, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19650102-1.2.26

30 "Singapore sets up a 'cowboy' squad", *The Straits Times*, 31 January 1965, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19650131-1.2.24

31 Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*.

32 Ministry of the Environment, *Singapore–My Clean & Green Home*.

33 Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*.

34 "The familiar stalls will soon disappear", *New Nation*, 8 August 1972, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/newnation19720808-1.2.51

35 Ibid.

36 Centre for Liveable Cities, "Case study–Hawker centres levelling the playing field with food", *Urban Solutions*, Issue 4, 2014.

37 Ministry of the Environment, *Singapore–My Clean & Green Home*.

38 "Ministry to union: Think again about strike ballot", *The Straits Times*, 30 October 1966, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19661030-1.2.12.33

39 Ministry of Health, "Speech by Mr Yong Nyuk Lin".

40 "Cleansing groups to be integrated", *New Nation*, 26 January 1971, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/newnation19710126-1.2.34

41 "Dengue", *Singapore Infopedia*, https://eresources.nlb.gov.sg/infopedia/articles/SIP_2013-07-19_170116.html

42 Ministry of Health, "Speech of Mr. Yong Nyuk Lin".

43 Eng-Eong Ooi, Kee-Tai Goh and Duane J. Gubler, "Dengue prevention and 35 years of vector control in Singapore", *Emerging Infectious Diseases* 12.6 (2006): 887–93, doi: 10.3201/10.3201/eid1206.051210

44 Ministry of the Environment, *Singapore–My Clean & Green Home*.

45 Chan Kai Lok, "Singapore's dengue haemorrhagic fever control programme: A case study on the successful control of *Aedes aegypti* and *Aedes albopictus* using mainly environmental measures as a part of integrated vector control," Southeast Asian Medical Information Centre Publication No. 45, 1985, 6.

46 K.T. Goh, "Dengue–A re-emerging infectious disease in Singapore", in *Dengue in Singapore* (Singapore: Institute of Environmental Epidemiology, Ministry of the Environment, 1998), 33–46.

47 Ministry of the Environment, *Singapore–My Clean & Green Home*.

48 K.L. Chan, S.K. Ng and L.M. Chew, "The 1973 dengue haemorrhagic fever outbreak in Singapore and its control", *Singapore Medical Journal* 18.2 (1977): 81–93.

49 Centre for Liveable Cities, *Cleaning a Nation*.

50 Goh, "Dengue–A re-emerging infectious disease in Singapore".

51 B.T. Tan and K.T. Goh, "Modus operandi in *Aedes* surveillance and control", in *Dengue in Singapore* (Singapore: Institute of Environmental Epidemiology, Ministry of the Environment, 1998), 108–23.

52 National Environment Agency, "NEA urges continued vigilance as *Aedes aegypti* mosquito population remains high and dengue cases rise at start of 2022", 25 January 2022, https://www.nea.gov.sg/media/news/news/index/nea-urges-continued-vigilance-as-aedesaegypti-mosquito-population-remains-high-and-dengue-cases-rise-at-start-of-2022

53 Centre for Liveable Cities, *Cleaning a Nation*.

54 "Weekly dengue cases fall to lowest in 'historic outbreak year', NEA urges continued vigilance", *Channel NewsAsia*, 18 December 2020, https://www.channelnewsasia.com/singapore/dengue-cases-singapore-lowest-weekly-count-2020-nea-488431

55 "The public must co-operate", *The Straits Times*, 1 October 1968, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19681001-1.2.74

56 "S'pore to become beautiful, clean city within three years", *The Straits Times*, 12 May 1967, http://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19670512-1.2.20.aspx

57 Liak Teng Lit, "Foreword", in *Cleaning a Nation: Cultivating a Healthy Living Environment* (Singapore: Centre for Liveable Cities, 2016).

58 National Heritage Board, "Anti-spitting pamphlet", https://www.roots.gov.sg/collection-landing/listing/1342623

59 Ministry of Health, "'Keep Singapore Clean' campaign, 1st to 31st October, 1968", 23 August 1968.

60 "The public must co-operate".

61 "New approach to keep S'pore litter-free", *Singapore Infopedia*.

62 "Environmental Public Health Act is enacted", *HistorySG*, https://eresources.nlb.gov.sg/history/events/a98889e8-99cd-4637-87c0-54da975aadc3

63 World Health Organization. "Report on the Sixth Regional Seminar on Public Health Administration: Health planning in urban development. Republic of Singapore, 21 November – 4 December 1967", Regional Office for the Western Pacific of the World Health Organization, 1967, https://iris.wpro.who.int/bitstream/handle/10665.1/5792/WPRO_0124_eng.pdf

64 Ibid.

65 Ministry of Health, "Speech by Mr Yong Nyuk Lin".

66 Ministry of the Environment, *Singapore–My Clean & Green Home*.

67 "Industrialisation poses new problems, says Dy", *The Straits Times*, 17 March 1967, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19670317-1.2.29

68 "Clean Air Act of 1971", *Singapore Infopedia*, https://eresources.nlb.gov.sg/infopedia/articles/SIP_2014-04-07_110024.html

69 Ibid.

70 "Expert here this week", *The Straits Times*, 29 March 1968, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19680329-1.2.99

71 "Plan by expert to fight air pollution", *The Straits Times*, 14 October 1971, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19711014-1.2.102

72 Ministry of the Environment, *Singapore–My Clean & Green Home*.

73 "Air pollution controls a must within six months", *The Straits Times*, 10 February 1972, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19720210-1.2.69

74 "Success story of the cleanest city", *The Straits Times*, 7 October 1972, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19721007-1.2.24

75 Ministry of Sustainability and the Environment Celebrates 50 Years of Building a Green and Resilient Singapore (mse.gov.sg).

76 National Council of Social Service, "Keynote address by Mr Tan Yong Soon, Permanent Secretary (National Climate Change) at NUS High School Sustainable Development Youth Conference 2011, 26 August 2011", 26 August 2011, transcript, https://www.nccs.gov.sg/media/speeches/keynote-address-by-mr-tan-yong-soon-permanent-secretary-(national-climate-change)-at-nus-high-school-sustainable-development-youth-conference-2011-26-august-2011

77 Daniel Wang, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, 25 June 2013, transcript, accession number CLC/012/2013/007.

78 "Success story of the cleanest city".

79 Centre for Liveable Cities, *Cleaning a Nation*.

80 Ibid.

81 The World Bank, "Report and recommendation of the President to the Executive Directors on a proposed loan to the Republic of Singapore for an Environmental Control Project. International Bank for Reconstruction and Development", Report No. P-1652-SI, 27 May 1975, https://documents1.worldbank.org/curated/en/929061468103757734/pdf/multi0page.pdf

82 National Environment Agency, "Solid waste management infrastructure", https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/waste-management-infrastructure/solid-waste-management-infrastructure

83 Wang, "Interview by CLC".

84 Carl Bartone, Janis Bernstein and Frederick Wright, "Investments in solid waste management: Opportunities for environmental improvement", Working Paper, The World Bank, 1990, https://documents1.worldbank.org/curated/en/303501468740101285/pdf/multi-page.pdf

85 National Environment Agency, "Solid waste management infrastructure".

86 "Environmental Pollution Control Act 1999", *Singapore Statues Online*.

87 "Environmental Pollution Control (Amendment) Act 2007", *Singapore Statues Online*, https://sso.agc.gov.sg/Acts-Supp/26-2007/Published/20070620?DocDate=20070620

88 "Environmental Protection and Management (Amendment) Act 2021", *Singapore Statues Online*, https://sso.agc.gov.sg/Acts-Supp/24-2021/Published/20211029?DocDate=20211029

89 National Environment Agency, "NEA introduces measures to reduce greenhouse gas emissions from refrigeration & air-conditioning", 4 March 2020, https://www.nea.gov.sg/media/news/news/index/nea-introduces-measures-to-reduce-greenhouse-gas-emissions-from-refrigeration-air-conditioning; and "Reducing Greenhouse Gas (GHG) emissions from the use of refrigerants in RAC sector", https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/reducing-ghg-emissions-from-the-use-of-refrigerants-in-rac-sector

90 Ministry of Sustainability and the Environment, "Our history", https://www.mse.gov.sg/about-us/our-history/

91 Brenda Yeoh, *Contesting Space in Colonial Singapore: Power Relations and the Urban Built Environment* (Singapore: Singapore University Press, 2003), 202–04.

92 Centre for Liveable Cities, *Cleaning a Nation*.

93 Ministry of the Environment, *Singapore–My Clean & Green Home*.

94 Tan Yong Soon, Lee Tung Jean and Karen Tan, *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability* (Singapore: ISEAS Publishing, 2008), 181–83.

95 Centre for Liveable Cities, *Cleaning a Nation*.

96 Ministry of the Environment, *Singapore–My Clean & Green Home*.

97 Ibid.

98 Ibid.

99 National Council of Social Service, "Speech by Masagos Zulkifli, Minister for the Environment and Water Resources, at the MEWR COS debates, 6 March 2018", 6 March 2018, transcript, https://www.nccs.gov.sg/media/press-release/speech-by-masagos-zulkifli-minister-for-the-environment-and-water-resources-at-the-mewr-cos-debates-6-march-2018

100 Prime Minister's Office, "Speech by DPM and Coordinating Minister for National Security, Teo Chee Hean, at the World Water Day Celebrations on 4 March 2017 at the Marina Barrage", 4 March 2017, transcript, https://www.pmo.gov.sg/Newsroom/dpm-teo-chee-hean-world-water-day-celebrations-2017

101 Administrative Report on the Singapore Municipality 1896, as cited in Brenda Yeoh, "Urban sanitation, health, and water supply in the late nineteenth and early twentieth century colonial Singapore", *South East Asia Research* 1.2 (1993): 143–72.

[102] "5,000 homeless in floods", *The Straits Times*, 10 December 1954, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19541210-1.2.2

[103] Fiona Williamson, "The politics of disaster: The Great Singapore Flood of 1954", *E Nature and Space* 1.3 (2018): 1–17, https://ink.library.smu.edu.sg/soss_research/2695

[104] PUB, Singapore's National Water Agency, "Major flood events in Singapore", Internal Paper, 1980.

[105] Tan Yong Soon, Lee Tung Jean and Karen Tan, "Reflections on Singapore's environmental journey", in *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability* (Singapore: ISEAS Publishing, 2008).

[106] PUB, Singapore's National Water Agency, *PUB Annual Report 2014/2015* (Singapore: PUB, Singapore's National Water Agency, 2015), https://www.pub.gov.sg/annualreports/annualreport2015.pdf

[107] Centre for Liveable Cities, *Water: From Scarce Resource to National Asset* (Singapore: Centre for Liveable Cities, 2020).

[108] Ministry of the Environment, "Speech by Mr Lim Swee Say, Minister for the Environment at SingSpring's desalination plant ground breaking ceremony at 10.10 am on 16 January 2004", National Archives of Singapore, 16 January 2004, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/MSE_20040116001.pdf

[109] Centre for Liveable Cities, *Water: From Scarce Resource to National Asset*.

[110] "Major floods in Singapore", *Singapore Infopedia*, https://eresources.nlb.gov.sg/infopedia/articles/SIP_780_2004-12-30.html

[111] Low Youjin, "Flooding in tropics expected by brace for more 'extreme weather', even prolonged dry spells in Singapore, experts say", *Today Online*, 28 August 2021, https://www.todayonline.com/singapore/flooding-tropics-expected-brace-more-extreme-weather-prolonged-dry-spells-singapore

[112] Centre for Liveable Cities, *Water: From Scarce Resource to National Asset*.

[113] PUB, Singapore's National Water Agency, "Singapore water story", https://www.pub.gov.sg/watersupply/singaporewaterstory

[114] Wang, "Interview by CLC".

[115] Prime Minister's Office, "Speech by Prime Minister Lee Hsien Loong at Universal Health Coverage Ministerial Meeting on 10 February 2015 at the Grand Copthorne Waterfront", 10 February 2015, transcript, https://www.pmo.gov.sg/Newsroom/transcript-speech-prime-minister-lee-hsien-loong-universal-health-coverage-ministerial

[116] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 43.

[117] Ibid.

[118] Wei Lim and Adrian Ee, "Primary care", in *Singapore's Health Care System—What 50 Years Have Achieved* (Singapore: World Scientific Publishing, 2016).

[119] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 77.

[120] Ministry of Health, "Blue Paper on The National Health Plan", 18 July 1983, https://www.nas.gov.sg/archivesonline/government_records/docs/c2fd693c-86b3-11e7-83df-0050568939ad/Misc.4of1983.pdf?

[121] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 101.

[122] Lai Wei Lin, "Paying for healthcare", in *Singapore's Health Care System—What 50 Years Have Achieved*, 76.

[123] Lee Chien Earn and K. Satku, "The transformation of the health of our people: An overview", in *Singapore's Health Care System—What 50 Years Have Achieved*, 8–9.

[124] Lai, "Paying for healthcare", 78.

[125] Medisave—a compulsory savings payroll deduction where funds can be drawn to meet personal or immediate family member's hospitalisation, day surgery and certain outpatient expenses; MediShield—an insurance scheme designed to meet hospitalisation bills; and MediFund—government-established endowment fund aimed at helping needy Singaporeans who are unable to afford subsidised medical bill charges.

[126] Lai, "Paying for healthcare", 76, 77.

[127] Ministry of Health, "White paper on affordable health care", 22 October 1993, https://www.nas.gov.sg/archivesonline/government_records/docs/9e27a30c-7aea-11e7-83df-0050568939ad/Cmd.16of1993.pdf

[128] Elizabeth Quah and Neo Boon Siang, "Evolving the governance of public healthcare institutions", in *Singapore's Health Care System—What 50 Years Have Achieved*, 58, 59.

[129] Ibid.

[130] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 109.

[131] Joan Sara Thomas, Suan Ee Ong, Kee Seng Chia and Hin Peng Lee, "A brief history of public health in Singapore", in *Singapore's Health Care System—What 50 Years Have Achieved*, 39.

[132] Lim and Ee, "Primary care".

[133] Ministry of Communications and Information, "Address by Mr Yeo Cheow Tong, Acting Minister for Health, at the groundbreaking ceremony of the community hospital, Ang Mo Kio Avenue 9 on Saturday, 26 August 1989 at 10.00 am", National Archives of Singapore, 26 August 1989, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/yct19890826s.pdf

[134] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 113.

[135] Lee and Satku, *Singapore's Health Care System*.

[136] Quah and Neo, "Evolving the governance of public healthcare institutions", 61, 62.

[137] Ibid., 66.

[138] Ministry of Health, "MOH 2012 Committee of Supply Speech Healthcare 2020: Improving accessibility, quality and affordability for tomorrow's challenges (Part 1 of 2)", 6 March 2012, transcript, https://www.moh.gov.sg/news-highlights/details/moh-2012-committee-of-supply-speech-healthcare-2020-improving-accessibility-quality-and-affordability-for-tomorrow-s-challenges-(part-1-of-2)

[139] Quah and Neo, "Evolving the governance of public healthcare institutions", 62.

[140] Thomas et al., "A brief history of public health in Singapore", 47.

[141] Salma Khalik, "Changes to system are a healthy move", *The Straits Times*, 22 January 2017, https://www.straitstimes.com/singapore/changes-to-system-are-a-healthy-move

[142] Quah and Neo, "Evolving the governance of public healthcare institutions", 66, 67.

[143] Ministry of Communications and Information, "Addendum to the President's Address. Mr Gan Kim Yong, Minister for Health", 2012, https://www.nas.gov.sg/archivesonline/data/data/pdfdoc/20160128001/sgpc_addenda.pdf

[144] Lim and Ee, "Primary care", 214.

[145] Ministry of Health, "Ministry of Health Work Plan Seminar 2021 opening address by Mr Ong Ye Kung, Minister for Health, 25 May 2021 (part 1 of 2)", 25 May 2021, transcript, https://www.moh.gov.sg/news-highlights/details/ministry-of-health-work-plan-seminar-2021-opening-address-by-mr-ong-ye-kung-minister-for-health-25-may-2021-(part-1-of-2)

[146] The Commonwealth Fund, "International health care system profiles: Singapore", 5 June 2020, https://www.commonwealthfund.org/international-health-policy-center/countries/singapore

[147] Ministry of Health, "Reorganisation of healthcare system into three integrated clusters to better meet future healthcare needs", 18 January 2017, https://www.moh.gov.sg/news-highlights/details/reorganisation-of-healthcare-system-into-three-integrated-clusters-to-better-meet-future-healthcare-needs

[148] Ministry of Health, "Opening address by Dr Amy Khor, Senior Minister of State, Ministry of Health, at the Singapore Healthcare Management Congress 2018, 14 August 2018", 14 August 2018, transcript, https://www.moh.gov.sg/news-highlights/details/opening-address-by-dr-amy-khor-senior-minister-of-state-ministry-of-health-at-the-singapore-healthcare-management-congress-2018-14-august-2018

[149] "Primary care model", *Primary Care Pages*, https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn)

[150] Ministry of Health, "Reorganisation of healthcare system".

[151] "Corporate profile", Khoo Teck Puat Hospital, https://www.ktph.com.sg/about-us/corporate-profile

[152] "Singapore hospital draws up plans to meet GreenGov.sg targets and heal earth", *The Straits Times*, 7 February 2022, https://www.straitstimes.com/singapore/singapore-hospitals-draw-up-plans-to-meet-greengovsg-targets-and-heal-earth

[153] Barbara Horwitz-Bennett, "Breath of fresh air: Ng Teng Fong Hospital and Jurong Community Hospital", *Healthcare Design Magazine*, 4 October 2017, https://healthcaredesignmagazine.com/projects/breath-fresh-air-ng-teng-fong-general-hospital-jurong-community-hospital/

[154] Christopher Cheng, "A space to heal", Sengkang General Hospital, https://www.skh.com.sg/ceo-story

[155] "Super spaces", Sengkang General Hospital, https://www.skh.com.sg/news/joy-at-work/sengkang-general-hospital-super-spaces

[156] "Sengkang General Hospital by DP Green", Landezine International Landscape Award, https://landezine-award.com/sengkang-general-hospital/

[157] Ministry of Health, "COVID-19 Mental Wellness Taskforce report", https://www.moh.gov.sg/resources-statistics/reports/covid-19-mental-wellness-taskforce-report

[158] Grace Yeoh, "The rise of mental health awareness—and the stigma that remains attached to certain conditions", *Channel NewsAsia*, 5 June 2021, https://www.channelnewsasia.com/singapore/singapore-mental-health-awareness-stigma-conditions-depression-1973166

[159] Joshua Chia, "Institute of Mental Health", *Singapore Infopedia*, https://eresources.nlb.gov.sg/infopedia/articles/SIP_1094_2010-05-27.html

[160] Ibid.

[161] Chua Hong Choon and Daniel Fung, "Institute of Mental Health", in *Singapore's Health Care System—What 50 Years Have Achieved*, 269.

[162] Lee and Satku, *Singapore's Health Care System*.

[163] Chua and Fung, "Institute of Mental Health", 271.

[164] Chia, "Institute of Mental Health".

[165] Ibid.

[166] Singapore Association of Mental Health, *Touching Hearts, Reaching Minds. Celebrating 40 Years of Community Wellness* (Singapore: Armour Publishing, 2010).

[167] Tong, Narayan and Pradeep, *Caring for Our People: 50 Years of Healthcare in Singapore*, 77.

[168] Ministry of Health, "Blue Paper on The National Health Plan".

[169] Institute of Mental Health, "Milestones", https://www.imh.com.sg/About-Us/Pages/Milestones.aspx

[170] Chua and Fung, "Institute of Mental Health", 273.

[171] Institute of Mental Health, "Milestones".

[172] Ministry of Information and the Arts, "Speech by BG Lee Hsien Loong, Deputy Prime Minister, at the opening of the new Woodbridge Hospital off Hougang Avenue 8 on Friday, 30 October 1993 at 10 am", National Archives of Singapore, 30 October 1993, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/lhl19931030s.pdf

[173] Institute of Mental Health, Healthy Minds, *Healthy Communities. National Mental Health Blueprint. 2007–2012* (Singapore: Institute of Mental Health, 2007).

[174] MOH Parliamentary Question reply: https://www.moh.gov.sg/news-highlights/details/community-mental-health-masterplan-and-national-mental-health-blueprint

[175] Tong See Kit, "MOH reviewing community support for people with mental health conditions", *Channel NewsAsia*, 6 October 2020, https://www.channelnewsasia.com/singapore/mental-health-moh-reviewing-community-support-741376#:~:text=The%20Community%20Mental%20Health%20Masterplan%20was%20launched%20in%202012.,half%20of%20the%20polyclinics%20here

[176] World Health Organization, "WHO Director-General addresses health promotion conference: Opening address at the 8th Global Conference on Health Promotion", 10 June 2013, transcript, https://www.who.int/director-general/speeches/detail/who-director-general-addresses-health-promotion-conference

[177] World Health Organization, "Closing the gap in a generation: Health equity through action on the social determinants of health—Final Report of the Commission on Social Determinants of Health", 27 August 2008, https://www.who.int/publications/i/item/WHO-IER-CSDH-08.1

[178] J.P. Bunker, H.S. Frazier and F. Mosteller, "The role of medical care in determining health: Creating an inventory of benefits", in *Society and Health*, eds. III B.C. Amick, S. Levine, A.R. Tarlov and D. Chapman Walsh (New York: Oxford University Press, 1995), 305–41.

[179] Canadian Institute of Advanced Research, Health Canada, Population and Public Health Branch. AB/NWT 2002. Quoted in D. Kuznetsova, *Healthy Places: Councils Leading on Public Health* (London: New Local Government Network, 2012).

[180] B.C. Booske, J.K. Athens, D.A. Kindig, H. Park and P.L. Remington, *Different Perspectives for Assigning Weights to Determinants of Health* (Madison: University of Wisconsin, Population Health Institute, 2010), http://www.countyhealthrankings.org/sites/default/files/differentPerspectivesForAssigningWeightsToDeterminantsOfHealth.pdf

[181] J.M. McGinnis, P. Williams-Russo and J.R. Knickman, "The case for more active policy attention to health promotion", *Health Affairs* 21.2 (2002) 78–93.

[182] David Buck, Alex Baylis, Durka Dougall and Ruth Robertson, "A vision for population health: Towards a healthier future", The King's Fund, November 2018, 15, https://www.kingsfund.org.uk/sites/default/files/2018-11/A%20vision%20for%20population%20health%20online%20version.pdf

[183] Urban Redevelopment Authority, "Long-term planning", https://www.ura.gov.sg/Corporate/Planning/Our-Planning-Process/Long-Term-Planning

[184] Urban Redevelopment Authority, "Master plan", https://www.ura.gov.sg/Corporate/Planning/Master-Plan

[185] Urban Redevelopment Authority, "Development control", https://www.ura.gov.sg/Corporate/Guidelines/Development-Control

[186] Centre for Liveable Cities, *Groundbreaking*.

[187] S. Dhanabalan, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, 29 July 2019, transcript, accession number CLC/055/2019/001. As cited in CLC's *Groundbreaking: 60 Years of National Development in Singapore.*

[188] Liu Thai Ker, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, 25 June 2013, transcript, accession number CLC/006/2011/001.

[189] Ibid.

[190] Ibid.

[191] Ibid.

[192] Ibid.

[193] Cari Jo Clark, Hongfei Guo, Scott Lunos, et al., "Neighborhood cohesion is associated with reduced risk of stroke mortality", *Stroke* 42.5 (2011): 1212–17, https://doi.org/10.1161/strokeaha.110.609164

[194] Centre for Liveable Cities, *Housing: Turning Squatters into Stakeholders* (Singapore: Centre for Liveable Cities, 2013).

[195] Ibid.

[196] Housing & Development Board, "Home, truly", https://go.gov.sg/HDBHomeTruly

[197] "Words and phrases to remember this decade by", *The Straits Times*, 30 November 1989, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19891130-1.2.36.4

[198] Department of Statistics Singapore, "Singstat table builder—Total life expectancy at birth (residents)", Department of Statistics Singapore, https://tablebuilder.singstat.gov.sg/table/TS/M810501

[199] Housing & Development Board, "Design feature for new flats", https://www.hdb.gov.sg/residential/buying-a-flat/finding-a-flat/design-features-for-new-flats

[200] Centers for Disease Control and Prevention, "Loneliness and social isolation linked to serious health conditions", https://www.cdc.gov/aging/publications/features/lonely-older-adults.html

201 Building and Construction Authority, "Code on accessibility in the built environment", https://www1.bca.gov.sg/regulatory-info/building-control/universal-design-and-friendly-buildings/code-on-accessibility-in-the-built-environment

202 Centre for Liveable Cities, *Housing: Turning Squatters into Stakeholders*.

203 Land Transport Authority, "An inclusive public transport system", Land Transport Authority, https://www.lta.gov.sg/content/ltagov/en/getting_around/public_transport/a_better_public_transport_experience/an_inclusive_public_transport_system.html

204 Building and Construction Authority, "Accessibility & universal design", https://www1.bca.gov.sg/buildsg/universal-design

205 Centre for Liveable Cities, *Towards Ageing Well: Planning a Future-Ready Singapore* (Singapore: Centre for Liveable Cities, 2021).

206 Housing & Development Board, "Community care apartments", https://www.hdb.gov.sg/residential/buying-a-flat/finding-a-flat/types-of-flats/community-care-apartments

207 National Environment Agency, "Air pollution regulations", https://www.nea.gov.sg/our-services/pollution-control/air-pollution/air-pollution-regulations

208 Chia Ngee-Choon and Phang Sock Yong, "Motor vehicle taxes as an environmental management instrument: The case of Singapore", *Environmental Economics and Policy Studies* 4.2 (2001): 67–93.

209 Ghayathiri Sondarajan, "Anthropogenic heat from road transport", ETH Zürich, 11 June 2020, https://sec.ethz.ch/news-events/news/2020/06/anthropogenic-heat-from-road-transport.html

210 Christine Schäfer, Barbara Mayr, Maria Dolores Fernandez La Puente de Battre, et al., "Health effects of active commuting to work: The available evidence before GISMO", *Scandinavian Journal of Medicine & Science in Sports* 30.S1 (2020): 8–14, https://doi.org/10.1111/sms.13685

211 J.M. MacDonald, R.J. Stokes, D.A. Cohen, et al., "The effect of light rail transit on body mass index and physical activity", *American Journal of Preventive Medicine* 39.2 (2010): 105–12, https://doi.org/10.1016/j.amepre.2010.03.016

212 X. Zhu, C. Yu, C. Lee, et al., "A retrospective study on changes in residents' physical activities, social interactions, and neighborhood cohesion after moving to a walkable community", *Preventive Medicine* 69 (2014): S93–S97, https://doi.org/10.1016/j.ypmed.2014.08.013

213 K. Mouratidis and W. Poortinga, "Built environment, urban vitality and social cohesion: Do vibrant neighborhoods foster strong communities?" *Landscape and Urban Planning* 204 (2020): 103951, https://doi.org/10.1016/j.landurbplan.2020.103951

214 Land Transport Authority, "Land Transport Master Plan 2013", Report, 2020, https://www.lta.gov.sg/content/dam/ltagov/who_we_are/statistics_and_publications/master-plans/pdf/LTMP2013Report.pdf, and Land Land Transport Authority, "Land Transport Master Plan 2040", Report, 2022, https://www.lta.gov.sg/content/dam/ltagov/who_we_are/our_work/land_transport_master_plan_2040/pdf/LTA%20LTMP%202040%20eReport.pdf

215 Land Transport Authority, "Land Transport Master Plan 2040".

216 Centre for Liveable Cities, *Walkable and Bikeable Cities: Lessons from Seoul and Singapore* (Singapore: Centre for Liveable Cities, 2016).

217 Land Transport Authority, "Land Transport Master Plan 2040".

218 Ministry of Transport, "Speech by Minister for Transport Mr S. Iswaran at Land Transport Industry Day 2022, 2 September 2022", 2 September 2022, transcript, https://www.mot.gov.sg/news/Details/speech-by-minister-for-transport-mr-s-iswaran-at-land-transport-industry-day-2022

219 Land Transport Authority, "Walking and cycling design guide", November 2018, https://www.lta.gov.sg/content/ltagov/en/industry_innovations/industry_matters/development_construction_resources/walking_cycling_plan.html

220 Peter G. Rowe and Limin Hee, *A City in Blue and Green: The Singapore Story* (Singapore: Springer, 2019).

221 "S'pore to become beautiful, clean city within three years".

222 National Parks Board, "NParks to work with the community to transform Singapore into a City in Nature", 4 March 2020, https://www.nparks.gov.sg/news/2020/3/nparks-to-work-with-the-community-to-transform-singapore-into-a-city-in-nature

223 National Parks Board, "Community in Bloom initiatives", https://www.nparks.gov.sg/gardening/community-in-bloom-initiative

224 Urban Redevelopment Authority, "Updates to the Landscaping for Urban Spaces and High-Rises Programme: Lush 3.0", 9 November 2017, https://www.ura.gov.sg/Corporate/Guidelines/Circulars/dc17-06

225 Urban Redevelopment Authority, "Ecology of cities—nature, liveability and long-term planning", Presentation at the Ministry of National Development's Urban Sustainability R&D E-Symposia 2021, https://www.mnd.gov.sg/docs/default-source/urbansustainability/slides-by-mr-yam-yujian.pdf

226 Housing & Development Board, "Homes at one with nature", 18 July 2018, https://www.hdb.gov.sg/cs/infoweb/about-us/news-and-publications/press-releases/homes-at-one-with-nature1

227 Centre for Liveable Cities, *Groundbreaking*.

228 Ibid.

229 Yee Weng Phei, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 19 July 2017, transcript, accession number CLC/039/2017/012.

230 "Singapore park connectors reach 300 km at 25-year mark", *The Straits Times*, 21 September 2015, https://www.straitstimes.com/singapore/singapore-park-connectors-reach-300km-at-25-year-mark

231 Rowe and Hee, *A City in Blue and Green*.

232 National Parks Board, "Community gathers to celebrate 25 years of the Park Connector Network", 20 September 2015, https://www.nparks.gov.sg/news/2015/9/community-gathers-to-celebrate-25-years-of-the-park-connector-network

233 Yeo Meng Tong, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 22 May 2017, transcript, accession number CLC/039/2017/008.

234 Ministry of National Development, "Speech by 2M Desmond Lee at the Committee of Supply Debate 2020—Transforming Singapore into a City of Nature", 4 March 2020, transcript, https://www.mnd.gov.sg/newsroom/speeches/view/speech-by-2m-desmond-lee-at-the-committee-of-supply-debate-2020---transforming-singapore-into-a-city-of-nature

235 PUB, Singapore's National Water Agency, "Speech by Mr Lee Hsien Loong, Prime Minister, at the Active, Beautiful and Clean (ABC) Waters Exhibition", 6 February 2007, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/20070206997.htm

236 Centre for Liveable Cities, *The Active, Beautiful, Clean Waters Programme: Water as an Environmental Asset* (Singapore: Centre for Liveable Cities, 2017).

237 Urban Redevelopment Authority, "Parks & Waterbodies Plan and Identity Plan", November 2002, https://www.ura.gov.sg/~/media/User%20Defined/URA%20Online/publications/research-resources/plans-reports/pwip_rustic_coast.pdf?la=en

238 "PM Lee opens $76 million Bishan-Ang Mo Kio Park", *AsiaOne*, 17 March 2012, https://www.asiaone.com/News/Latest%2BNews/Singapore/Story/A1Story20120317-333972.html

239 Tan See Nin, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 11 May 2017, transcript, accession number CLC/039/2017/005.

240 Ministry of Culture, "Speech by the Prime Minister, Mr. Lee Kuan Yew at the Tanjong Pagar Community Centre", National Archives of Singapore, 10 March 1966, transcript, https://www.nas.gov.sg/archivesonline/speeches/record-details/73cbab0f-115d-11e3-83d5-0050568939ad

241 Ministry of Culture, "Speech by Encik Othman Wok, Minister for Social Affairs, at the 4th Colours Award Ceremony of the School Sports Council", National Archives of Singapore, 28 February 1976, transcript, https://www.nas.gov.sg/archivesonline/data/pdfdoc/19750228_0001.pdf

242 Ministry of Culture, "Speech by the Prime Minister".

243 Sport Singapore, "Sports in Independent Singapore", https://www.sportsingapore.gov.sg/Sports-Education/History-of-Singapore-Sports/Sports-in-Independent-Singapore

244 Tan Eng Liang and Lynn Tan, *Simple Beginnings: Building a Life of Integrity, Resilience and Service* (Singapore: Graceworks Publishing, 2016).

245 Tan and Tan, *Simple Beginnings*.

246 "Plan for sports to reach out to masses", *The Straits Times*, 9 August 1976.

247 "Priority for top sports", *Singapore Monitor, 2nd Edition*, 6 January 1984, https://eresources.nlb.gov.sg/newspapers/Digitised/Article/singmonitor19840106-2.2.4

248 Tan Eng Liang. "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 18 May 2017, transcript, accession number CLC/039/2017/007.

249 Ibid.

250 Yee Weng Phei, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 27 July 2017, transcript, accession number CLC/039/2017/014.

251 Ministry of Information and the Arts, "Speech by Prime Minister Goh Chok Tong at the Singapore Sports Council's 21st Anniversary Dinner at the Island Ballroom, Shangri-La Hotel on Friday, 9 December 1994 at 7.30 pm", National Archives of Singapore, 9 December 1994, transcript, https://www.nas.gov.sg/archivesonline/speeches/record-details/74030e82-115d-11e3-83d5-0050568939ad

252 Singapore Sports Council, *Census of Sports Facilities in Singapore, 1998* (Singapore: Singapore Sports Council, 1999).

253 Yee, "Interview by CLC", 27 July 2017; Tan, "Interview with CLC".

254 Ng Ser Miang. "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 28 September 2020, transcript, accession number CLC/039/2020/015.

255 Yee, "Interview by CLC", 27 July 2017.

256 Yee, "Interview by CLC", 19 July 2017.

257 "Jurong East Sport Centre", *ActiveSG*, https://www.myactivesg.com/facilities/jurong-east-sports-centre

258 Patrick Lee, "Interview by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 9 May 2017, transcript, accession number CLC/039/2017/004.

259 Yee, "Interview by CLC", 27 July 2017.

260 Parliament of Singapore, "Budget, Ministry of Community Development and Sports", Singapore Parliamentary Records Vol. 73, 14 March 2001, https://sprs.parl.gov.sg/search/#/topic?reportid=006_20010314_S0003_T0003

261 Oon Jin Teik. "Interview with CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 4 July 2017, transcript, accession number CLC/039/2017/010.

262 Sport Singapore, "SportSG annual report 2013/14. Live better through sport: Towards Vision 2030, The National Record", https://www.sportsingapore.gov.sg/-/media/SSC/Corporate/Files/About/Annual-Reports/SportSG--Annual-Report-20132014.ashx

263 Tan, "Interview with CLC"; Richard Seow. "Interview with CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 8 May 2017, transcript, accession number CLC/039/2017/002.

264 Parliament of Singapore, "Budget, Ministry of Community Development and Sports", Singapore Parliamentary Records Vol. 74, 23 May 2022, https://sprs.parl.gov.sg/search/#/topic?reportid=009_20020523_S0003_T0009

265 Sport Singapore, "Facilities", https://www.sportsingapore.gov.sg/About-Us/Facilities

266 Singapore Sports Council, "SSC annual report 2012/2013. Live better through sports", https://www.sportsingapore.gov.sg/-/media/SSC/Corporate/Files/About/Annual-Reports/SSC-Annual-Report-1213.pdf

267 SportSG, "Sport SG annual report 2013/2014".

268 Singapore Sports Council, *Live Better Through Sports—Vision 2030 Steering Committee Report 2012* (Singapore: Singapore Sports Council, 2012), 11.

269 Sport Singapore, *Live Better Through Sports—Vision 2030* (Singapore: Sport Singapore, 2019).

270 Sport Singapore, "Bukit Canberra", https://www.sportsingapore.gov.sg/newsroom/media-releases/2018/7/sembawang-sports-and-community-hub-groundbreaking-event

271 Lee, "Interview by CLC".

272 "Sport-in-precinct", Active Health, https://www.activehealth.sg/move-better/sport-in-precinct

273 The Ministry of Community Development, Youth and Sports (MCYS) was restructured in 2012 to become the Ministry of Social and Family Development (MSF), bringing a sharper focus to the work in the development of families, social services and social safety nets. The Ministry of Culture, Community and Youth (MCCY) took over the MCYS' roles of strengthening community bonds and developing sports, amongst others, https://www.msf.gov.sg/about-MSF/our-organisation/Pages/history-and-milestones.aspx

274 "Disability sports master plan", *Sport Care*, https://sportcares.sportsingapore.gov.sg/persons-with-disabilities/disability-sports-master-plan/

275 Low Lin Fhoong, "Centre of Expertise for Disability Sports launched", *Today Online*, 1 June 2016, https://www.todayonline.com/sports/centre-expertise-disability-sports-launched

276 Ministry of Health, "Speech by Mr Ong Ye Kung, Minister for Health and Chairman of the Ministerial Committee on Ageing, at the launch of the 2023 Action Plan For Successful Ageing, 30 January 2023, 9.00am", Ministry of Health, 30 January 2023, transcript, https://www.moh.gov.sg/news-highlights/details/speech-by-mr-ong-ye-kung-minister-for-health-and-chairman-of-the-ministerial-committee-on-ageing-at-the-launch-of-the-2023-action-plan-for-successful-ageing-30-january-2023-9.00am

277 Ministry of Health,"Global burden of disease 2019 study findings", Ministry of Health, 28 October 2020, https://www.moh.gov.sg/news-highlights/details/global-burden-of-disease-2019-study-findings/

278 Ibid.

279 National Population and Talent Division, PMO, "Overview", https://www.population.gov.sg/our-population/population-trends/overview

280 Angelique Chan, Rahul Malhotra, Normala Bte Manap, et al., "Transitions in health, employment, social engagement, and intergenerational transfers in Singapore Study (The SIGNS Study) – I. Descriptive statistics and analysis of key aspects of successful ageing", Duke NUS Medical School, Centre for Ageing and Research and Education, December 2018.

281 Activities of Daily Living are the fundamental skills required to independently care for oneself. These are washing (showering), toileting (continence management), dressing (wearing of clothes), feeding, mobility (ability to move from one place to another), and transferring (ability to move across different surfaces such as from a bed to a chair).

282 Instrumental Activities of Daily Living are activities that allow an individual to live independently in a community, such as cooking, cleaning and managing transportation and finances.

283 "Your guide to understanding dementia", *Health Hub*, https://www.healthhub.sg/live-healthy/679/yourguidetounderstandingdementia_pdf

284 Cheryl Lin, "Growing preference among elderly residents to 'age in place': HDB survey", *Channel NewsAsia*, 10 February 2021, https://www.channelnewsasia.com/singapore/elderly-hdb-ageing-assisted-living-sample-household-survey-341871

285 "Stress and lack of physical activity are top health issues for workers, say companies", *The Straits Times*, 19 October 2016, https://www.straitstimes.com/singapore/manpower/stress-and-lack-of-physical-activity-are-top-health-issues-for-workers-say

286 Ministry of Health, "National Population Health Survey 2020", 6 December 2022, https://www.moh.gov.sg/resources-statistics/reports/national-survey-2019-20

287 Ann Williams, "Singapore productivity loss due to sick leave may hit $3.3b by 2030: Mercer Study", *The Straits Times*, 25 October 2017, https://www.straitstimes.com/business/economy/singapore-productivity-loss-due-to-sick-leave-may-hit-s33b-by-2030-mercer-study#:~:text=Singapore%20productivity%20loss%20due%20to,Mercer%20study%20%7C%20The%20Straits%20Times

288 M. Subramaniam, E. Abdin, J.A. Vaingankar, et al., "Tracking the mental health of a nation: prevalence and correlates of mental disorders in the second Singapore mental health study", *Epidemiology and Psychiatric Sciences* 5 (2019): e29. (Institute of Mental Health, "2016 Singapore Mental Health Study", https://www.imh.com.sg/Newsroom/News-Releases/Documents/SMHS 2016_Media Release_FINAL_web upload.pdf)

289 Ibid.

290 "Seniors stuck at home, caught between loneliness and fear of COVID-19", Centre for Ageing Research & Education, Duke NUS, 9 October 2021.

291 "Singapore reported 452 suicide deaths in 2020, number of elderly suicide deaths highest recorded since 1991", Samaritans of Singapore, July 2021, https://www.sos.org.sg/pressroom/singapore-reported-452-suicide-deaths-in-2020-number-of-elderly-suicide-deaths-highest-recorded-since-1991

292 "Covid-19: Suicide rate among 10-19 age group rises in 2020 year-on-year", *Today*, 27 July 2021, https://www.todayonline.com/singapore/covid-19-suicide-rate-among-10-19-age-group-jumps-375-2020-year-year

293 Ng Jun Sen and Tang Fan Xi, "Sounds awful, can't talk because of noise", *The Sunday Times*, 23 April 2017, https://www.nus.edu.sg/newshub/news/2017/2017-04/2017-04-23/SOUNDS-st-23apr-pA2-A3.pdf

294 Huey Ting Diong, Richard Neitzel and William Hal Martin, "Spatial evaluation of environmental noise with the use of participatory sensing system in Singapore", *Noise Mapping* 8 (2021):236-48. https://www.researchgate.net/publication/353833571_Spatial_evaluation_of_environmental_noise_with_the_use_of_participatory_sensing_system_in_Singapore/fulltext/611478d01ca20f6f8617012b/Spatial-evaluation-of-environmental-noise-with-the-use-of-participatory-sensing-system-in-Singapore.pdf

295 "Noise", World Health Organization, https://www.euro.who.int/en/health-topics/environment-and-health/noise

296 Audrey Tan, "IPCC report indicates Singapore could take bigger hits from climate change", *The Straits Times*, 9 August 2021, https://www.straitstimes.com/singapore/environment/ipcc-report-indicates-singapore-could-take-bigger-hits-from-climate-change#:~:text=IPCC%20report%20indicates%20Singapore%20could%20take%20bigger%20hits%20from%20climate%20change,-Singapore%20has%20already&text=SINGAPORE%20%2D%20The%20harshest%20impacts%20of,itself%20for%20tougher%20times%20ahead

297 Rachel E. Baker, Ayesha S. Mahmud, Ian F. Miller, et al., "Infectious disease in an era of global change", *Nature Reviews Microbiology* 20 (2022): 193-205, https://www.nature.com/articles/s41579-021-00639-z

298 Shabana Begum, "S'pore at risk of heatwaves, more dengue outbreaks as climate change worsens health woes: Report", *The Straits Times*, 5 November 2021. https://www.straitstimes.com/singapore/environment/spore-at-risk-of-heatwaves-and-more-dengue-outbreaks-as-climate-change-worsens

299 "Prioritizing diseases for research and development in emergency contexts", World Health Organization, https://www.who.int/activities/prioritizing-diseases-for-research-and-development-in-emergency-contexts

300 Jeremy Lim, "Time to measure equity in heath, too", *Today*, 4 July 2016, https://www.todayonline.com/commentary/time-measure-equity-health-too

301 Yuen Sin, "Rental flat residents at greater risk of poor health, studies show", *The Straits Times*, 11 March 2019, https://www.straitstimes.com/singapore/health/rental-flat-residents-at-greater-risk-of-poor-health-studies

302 Housing & Development Board, "Designing for life roadmap", https://www.hdb.gov.sg/about-us/hdbs-refreshed-roadmap-designing-for-life

303 Cindy Co, "HDB launches roadmap for designing towns, with focus on healthy living, green spaces and smart technology", *Channel NewsAsia*, 15 October 2020, https://www.channelnewsasia.com/singapore/hdb-roadmap-designing-towns-greenery-smart-technology-963341

304 Agency for Integrated Care, "Dementia-friendly community", https://www.aic.sg/body-mind/dementia-friendly-community

305 Housing & Development Board, "HDB smart enabled home", https://www.hdb.gov.sg/about-us/our-role/smart-and-sustainable-living/smart-hdb-town-page/hdb-smart-home-exhibition

306 GovTech Singapore, "An inclusive Smart Nation: 5 ways tech can empower persons with special needs", 9 February 2018, https://www.tech.gov.sg/media/technews/an-inclusive-smart-nation-5-ways-tech-can-empower-persons-with-special-needs

307 Smart Nation Singapore, "Smart urban mobility, remaking our transportation roadmap", https://www.smartnation.gov.sg/initiatives/strategic-national-projects/smart-urban-mobility

308 Ibid.

309 Hwang Yu-ning, "Roundtable on USS Healthy City by CLC", Centre for Liveable Cities, Ministry of National Development, Singapore, 15 December 2020, accession number CLC/719/2020.

310 Ministry of Health, "HealthySG taskforce report", December 2019, https://www.moh.gov.sg/docs/librariesprovider5/default-document-library/healthysg-taskforce-final-report-(dec-2019).pdf

311 Housing & Development Board, "Health District @ Queenstown", November 2021, https://www.hdb.gov.sg/cs/infoweb/about-us/news-and-publications/publications/dwellings/Health-District-Queenstown

312 Ibid.

313 Angelia Sia, Puay Yok Tan, John Chee Meng Wong, Sophianne Araib, Wee Foong Ang and Kenneth Boon Hwee Er, "The impact of gardening on mental resilience in times of stress: A case study during the COVID-19 pandemic in Singapore", *Urban Forestry & Urban Greening* 68 (2022): 127448

314 Tessa Oh, "Heroes unmasked: No hand sanitizer? No fear. These 'super mums' are here to help", *Today*, 16 February 2020, https://www.todayonline.com/singapore/heroes-unmasked-no-hand-sanitiser-no-fear-these-super-mums-are-here-help

315 N.A. Petrunoff, N.X. Yi, B. Dickens, et al., "Associations of park access, park use and physical activity in parks with well-being in an Asian environment: A cross sectional study", *International Journal of Behavioral Nutrition and Physical Activity* 18 (2021): 87.

316 A. Sia, W.W.S. Tam, A. Fogel, et al., "Nature-based activities improve the well-being of older adults", *Scientific Reports* 10.1 (2020): 18178.

317 Ted Ng Kheng Siang, Angelia Sia, Maxel K.W. Ng , et al., "Effects of horticultural therapy on Asian older adults: A randomized controlled trial", *International Journal of Environmental Research and Public Health* 15 (2018): 1705.

318 A. Sia, et al., "Nature-based activities improve the well-being of older adults".

319 Cynthia Chen, Dana P. Goldman, Julie Zissimopoulos, John W. Rowe and Research Network on an Aging Society, "Multidimensional comparison of countries' adaptation to societal aging", *Proceedings of the National Academy of Sciences of the United States of America* 115.37 (2018): 9169-74, https://doi.org/10.1073/pnas.1806260115

320 Audrey Tan, "Preparing for Disease X: Singapore to boost defences against future outbreaks in post-Covid-19 world", *The Straits Times*, 11 December 2020, https://www.straitstimes.com/singapore/health/preparing-for-disease-x-singapore-to-boost-defences-against-future-outbreaks-in

321 Ministry of National Development, "Cities of Tomorrow (CoT). About CoT", https://www.mnd.gov.sg/citiesoftomorrow/about-cot

322 World Health Organization, "What Is a healthy city?", https://www.who.int/europe/groups/who-european-healthy-cities-network/what-is-a-health-city

323 Prime Minister's Office, "2023 New Year Message by PM Lee Hsien Loong", 31 December 2022, https://www.pmo.gov.sg/Newsroom/2023-New-Year-Message-by-PM-Lee-Hsien-Loong

324 Ministry of Health, "Infectious Disease Act", https://www.moh.gov.sg/policies-and-legislation/infectious-diseases-act

325 "SARS in Singapore: Timeline", *The Straits Times*, 16 March 2013, https://www.straitstimes.com/singapore/sars-in-singapore-timeline

326 Singapore General Hospital, "New Emergency Medicine Building to meet Singapore's future needs", 22 May 2018, https://www.sgh.com.sg/news/patient-care new-emergency-medicine-building-to-meet-singapores-future-needs

327 Centre for Liveable Cities, *Singapore's Covid-19 Response and Rethinking the New Urban Normal. A Commentary* (Singapore: Centre for Liveable Cities, 2021).

328 Ministry of Health, "Comprehensive medical strategy for Covid-19", 28 April 2020, https://www.moh.gov.sg/news-highlights/details/comprehensive-medical-strategy-for-covid-19

329 "Public Health Preparedness Clinics (PHPC)", *Primary Care Pages*, https://www.primarycarepages.sg/practice-management/moh-national-schemes/public-health-preparedness-clinic-(phpc)

330 K.U. Menon, "Sars revisited: Insights from Singapore. A case study on adaptive capacity, managing risk, and innovation", *NS World*, 2021, https://www.pgionline.com/wp-content/uploads/2021/03/12.-SARS-Revisited-Insights-from-Singapore.pdf

331 Ministry of Health, "Ministerial statement on whole-of-government response to the 2019 novel coronavirus (2019-ncov)", 3 February 2020, https://www.moh.gov.sg/news-highlights/details/ministerial-statement-on-whole-of-government-response-to-the-2019-novel-coronavirus-(2019-ncov)

332 Ministry of Health, "Speech by Mr Ong Ye Kung, Minister for Health, at Singapore Perspectives 2022. 13 Jan 2022", 13 January 2022, transcript, https://www.moh.gov.sg/news-highlights/details/speech-by-mr-ong-ye-kung-minister-for-health-at-singapore-perspectives-2022-13-january-2022-9.00am/

333 Centre for Liveable Cities, *Singapore's Covid-19 Response and Rethinking the New Urban Normal*.

334 Ibid.

335 Jalelah Abu Baker and Matthew Mohan, "Stretched but coping: How Singapore's healthcare system has cranked up efforts to deal with Covid-19", *Channel NewsAsia*, 4 May 2020, https://www.channelnewsasia.com/singapore/covid-19-singapore-health-capacity-hospitals-treatment-935336

336 Ministry of Health, "Comprehensive medical strategy for Covid-19".

337 Centre for Liveable Cities, *Singapore's Covid-19 Response and Rethinking the New Urban Normal*.

338 Ng Keng Gene, "Study to look at reducing disease spread in Singapore buildings", *The Straits Times*, 30 January 2022, https://www.straitstimes.com/singapore/study-to-assess-how-better-ventilation-can-reduce-spread-of-infections-in-buildings

339 Winnipeg Regional Health Authority, "Chain of infection", https://professionals.wrha.mb.ca/old/extranet/ipc/files/manuals/community/1.2.pdf

340 Y.K. Lee, "Quarantine in early Singapore (1819–1874). Part II", *Annals of the Academy of Medicine*, Singapore 7.1 (1978): 82–87.

BIBLIOGRAPHY

Books, Journals and Conference Proceedings

Baker, Rachel E., Ayesha S. Mahmud, Ian F. Miller, et al. "Infectious disease in an era of global change". *Nature Reviews Microbiology* 20 (2022): 193–205. https://www.nature.com/articles/s41579-021-00639-z

Bartone, Carl, Janis Bernstein and Frederick Wright. "Investments in solid waste management: Opportunities for environmental improvement". Working Paper, The World Bank, 1990. https://documents1.worldbank.org/curated/en/303501468740101285/pdf/multi-page.pdf

Booske, B.C., J.K. Athens, D.A. Kindig, H. Park and P.L. Remington. *Different Perspectives for Assigning Weights to Determinants of Health*. Madison: University of Wisconsin, Population Health Institute, 2010. https://www.countyhealthrankings.org/sites/default/files/differentPerspectivesForAssigningWeightsToDeterminantsOfHealth.pdf

Buck, David, Alex Baylis, Durka Dougall and Ruth Robertson. "A vision for population health: Towards a healthier future". The King's Fund, November 2018, 15. https://www.kingsfund.org.uk/sites/default/files/2018-11/A%20vision%20for%20population%20health%20online%20version.pdf

Bunker, J.P., H.S. Frazier and F. Mosteller. "The role of medical care in determining health: Creating an inventory of benefits", in *Society and Health*, eds. Amick, B. C. III, S. Levine, A.R. Tarlov and D. Chapman Walsh. New York: Oxford University Press, 1995, 305–41.

Chan, Angelique, Rahul Malhotra, Normala Bte Manap, et al. "Transitions in health, employment, social engagement, and intergenerational transfers in Singapore Study (The SIGNS Study)—I. Descriptive statistics and analysis of key aspects of successful ageing". Duke NUS Medical School, Centre for Ageing and Research and Education, December 2018.

Chan, Kai Lok. "Singapore's dengue haemorrhagic fever control programme: A case study on the successful control of *Aedes aegypti* and *Aedes albopictus* using mainly environmental measures as a part of integrated vector control". Southeast Asian Medical Information Centre Publication No. 45, 1985, 6.

Chan, K.L., S.K. Ng and L.M. Chew. "The 1973 dengue haemorrhagic fever outbreak in Singapore and its control". *Singapore Medical Journal* 18.2 (1977): 81–93.

Chen, Cynthia, Dana P. Goldman, Julie Zissimopoulos, John W. Rowe and Research Network on an Aging Society. "Multidimensional comparison of countries' adaptation to societal aging". *Proceedings of the National Academy of Sciences of the United States of America* 115.37 (2018): 9169–74. https://doi.org/10.1073/pnas.1806260115

Chia, Ngee-Choon and Phang Sock Yong. "Motor vehicle taxes as an environmental management instrument: The case of Singapore". *Environmental Economics and Policy Studies* 4.2 (2001): 67–93.

Clark, Cari Jo, Hongfei Guo, Scott Lunos, et al. "Neighborhood cohesion is associated with reduced risk of stroke mortality". *Stroke* 42.5 (2011): 1212–17. https://doi.org/10.1161/strokeaha.110.609164

Dale, Ole Johan. "The first 140 years", in *Urban Planning in Singapore: The Transformation of a City*. Malaysia: Oxford University Press, 1999, 22.

Huey, Ting Diong, Richard Neitzel and William Hal Martin. "Spatial evaluation of environmental noise with the use of participatory sensing system in Singapore". *Noise Mapping* 8 (2021): 236–48. https://www.researchgate.net/publication/353833571_Spatial_evaluation_of_environmental_noise_with_the_use_of_participatory_sensing_system_in_Singapore

Institute of Mental Health. *Healthy Minds, Healthy Communities. National Mental Health Blueprint. 2007–2012*. Singapore: Institute of Mental Health, 2007.

Lee, Chien Earn and K. Satku, eds. *Singapore's Health Care System—What 50 Years Have Achieved.* Singapore: World Scientific Publishing, 2016.

Lee, Vernon J., Chia Siong Wong, Paul A. Tambyah, et al. "Twentieth century influenza pandemics in Singapore". *Annals, Academy of Medicine, Singapore* 37 (2008): 470–76.

Lee, Y.K. "Quarantine in early Singapore (1819–1874). Part II". *Annals of the Academy of Medicine, Singapore* 7.1 (1978): 82–87.

Lim, Wei and Adrian Ee. "Primary care", in *Singapore's Health Care System—What 50 Years Have Achieved*. C.E. Lee and K. Satku, eds. Singapore: World Scientific Publishing, 2016.

MacDonald, J. M., R.J. Stokes, D.A. Cohen, et al. "The effect of light rail transit on body mass index and physical activity". *American Journal of Preventive Medicine*, 39.2 (2010): 105–112. https://doi.org/10.1016/j.amepre.2010.03.016

McGinnis, J.M., P. Williams-Russo and J.R. Knickman. "The case for more active policy attention to health promotion". *Health Affairs* 21.2 (2002) 78–93.

Menon, K.U. "Sars revisited: Insights from Singapore. A case study on adaptive capacity, managing risk, and innovation". *NS World,* 2021. https://www.pgionline.com/wp-content/uploads/2021/03/12.-SARS-Revisited-Insights-from-Singapore.pdf

Mouratidis, K. and W. Poortinga. "Built environment, urban vitality and social cohesion: Do vibrant neighborhoods foster strong communities?" *Landscape and Urban Planning* 204 (2020): 103951. https://doi.org/10.1016/j.landurbplan.2020.103951

Ng, Ted Kheng Siang, Angelia Sia, Maxel K.W. Ng , et al. "Effects of horticultural therapy on Asian older adults: A randomized controlled trial". *International Journal of Environmental Research and Public Health* 15 (2018): 1705.

Ooi, Eng-Eong, Kee-Tai Goh and Duane J. Gubler. "Dengue prevention and 35 years of vector control in Singapore". *Emerging Infectious Diseases* 12.6 (2006): 887–93. doi: 10.3201/10.3201/eid1206.051210

Petrunoff, N.A., N.X. Yi, B. Dickens, B., et al. "Associations of park access, park use and physical activity in parks with well-being in an Asian environment: A cross sectional study". *International Journal of Behavioral Nutrition and Physical Activity* 18 (2021): 87.

Rowe, Peter G. and Limin Hee. *A City in Blue and Green: The Singapore Story.* Singapore: Springer, 2019.

Schäfer, Christine, Barbara Mayr, Maria Dolores Fernandez La Puente de Battre, et al. "Health effects of active commuting to work: The available evidence before GISMO". *Scandinavian Journal of Medicine & Science in Sports* 30.S1 (2020): 8–14. https://doi.org/10.1111/sms.13685

Sia, A., W.W.S. Tam, A. Fogel, et al. "Nature-based activities improve the well-being of older adults". *Scientific Reports* 10.1 (2020): 18178.

Sia, Angelia, Puay Yok Tan, John Chee Meng Wong, Sophianne Araib, Wee Foong Ang and Kenneth Boon Hwee Er. "The impact of gardening on mental resilience in times of stress: A case study during the COVID-19 pandemic in Singapore". *Urban Forestry & Urban Greening* 68 (2022): 127448

Singapore Association of Mental Health. *Touching Hearts, Reaching Minds. Celebrating 40 Years of Community Wellness.* Singapore: Armour Publishing, 2010.

Subramaniam, M., E. Abdin, J.A. Vaingankar, et al. "Tracking the mental health of a nation: prevalence and correlates of mental disorders in the second Singapore mental health study". *Epidemiology and Psychiatric Sciences* 5 (2019): e29.

Subramaniam, M., S.A. Chong, J.A. Vaingankar, et al. "Prevalence of dementia in people aged 60 years and above: Results from the WiSE Study". *Journal of Alzheimer's Disease* 45.4 (2015): 1127–38.

Tan, Eng Liang and Lynn Tan. *Simple Beginnings: Building a Life of Integrity, Resilience and Service.* Singapore: Graceworks Publishing, 2016.

Tan, Yong Soon, Lee Tung Jean and Karen Tan. *Clean, Green and Blue: Singapore's Journey Towards Environmental and Water Sustainability.* Singapore: ISEAS Publishing, 2008, 181–83.

The World Bank. "Report and recommendation of the President to the Executive Directors on a proposed loan to the Republic of Singapore for an Environmental Control Project. International Bank for Reconstruction and Development". Report No. P-1652-SI, 27 May 1975. https://documents1.worldbank.org/curated/en/929061468103757734/pdf/multi0page.pdf

Williamson, Fiona. "The politics of disaster: The Great Singapore Flood of 1954". *E Nature and Space* 1.3 (2018): 1–17. https://ink.library.smu.edu.sg/soss_research/2695

World Health Organization. "Closing the gap in a generation: Health equity through action on the social determinants of health—Final Report of the Commission on Social Determinants of Health". 27 August 2008. https://www.who.int/publications/i/item/WHO-IER-CSDH-08.1

_____. "Report on the Sixth Regional Seminar on Public Health Administration: Health planning in urban development. Republic of Singapore, 21 November – 4 December 1967". Regional Office for the Western Pacific of the World Health Organization, 1967. https://iris.wpro.who.int/bitstream/handle/10665.1/5792/WPRO_0124_eng.pdf

Yeoh, Brenda. *Contesting Space in Colonial Singapore: Power Relations and the Urban Built Environment.* Singapore: Singapore University Press, 2003, 202–04.

_____. "Urban Sanitation, Health, and Water Supply in the late nineteenth and early twentieth century colonial Singapore". *South East Asia Research* 1.2 (1993): 143–72.

Yuen, Belinda. "Urban planning in Southeast Asia: Perspective from Singapore". *The Town Planning Review*, 82.2 (2011): 145–67.

Zhu, X., C. Yu, C. Lee, et al. "A retrospective study on changes in residents' physical activities, social interactions, and neighborhood cohesion after moving to a walkable community". *Preventive Medicine* 69 (2014): S93–S97. https://doi.org/10.1016/j.ypmed.2014.08.013

Government Publications and Singapore Parliamentary Reports

Centre for Liveable Cities. "Case study—Hawker centres levelling the playing field with food". *Urban Solutions*, Issue 4, 2014.

_____. *Cleaning a Nation: Cultivating a Healthy Living Environment.* Singapore: Centre for Liveable Cities, 2016.

_____. *Groundbreaking: 60 Years of National Development in Singapore.* Singapore: Centre for Liveable Cities, 2019.

_____. *Housing: Turning Squatters into Stakeholders.* Singapore: Centre for Liveable Cities, 2013.

_____. *Land Acquisition and Resettlement: Securing Resources for Development.* Singapore: Centre for Liveable Cities, 2014.

_____. "Secrets to healthier, happier citizens". *Urban Solutions*, Issue 16, 2020, 35.

_____. *Singapore's Covid-19 Response and Rethinking the New Urban Normal. A Commentary.* Singapore: Centre for Liveable Cities, 2021.

_____. *The Active, Beautiful, Clean Waters Programme: Water as an Environmental Asset.* Singapore: Centre for Liveable Cities, 2017.

_____. *Towards Ageing Well: Planning a Future-Ready Singapore.* Singapore: Centre for Liveable Cities, 2021.

_____. *Walkable and Bikeable Cities: Lessons from Seoul and Singapore.* Singapore: Centre for Liveable Cities, 2016.

_____. *Water: From Scarce Resource to National Asset.* Singapore: Centre for Liveable Cities, 2020.

Goh, K.T., ed. "Dengue—A re-emerging infectious disease in Singapore", in *Dengue in Singapore.* Singapore: Institute of Environmental Epidemiology, Ministry of the Environment, 1998, 33–46.

Housing & Development Board. *Annual Report 1985/1986*. Singapore: Housing & Development Board, 1986, 76.

_____. "Homes at one with nature". Housing & Development Board, 18 July 2018. https://www.hdb.gov.sg/cs/infoweb/about-us/news-and-publications/press-releases/homes-at-one-with-nature1

Land Transport Authority. "Land Transport Master Plan 2013". Land Transport Authority. Report, 2020. https://www.lta.gov.sg/content/dam/ltagov/who_we_are/statistics_and_publications/master-plans/pdf/LTMP2013Report.pdf

_____. "Land Transport Master Plan 2040". Land Transport Authority. Report, 2022. https://www.lta.gov.sg/content/dam/ltagov/who_we_are/our_work/land_transport_master_plan_2040/pdf/LTA%20LTMP%202040%20eReport.pdf

Ministry of Health. "Blue Paper on The National Health Plan". National Archives of Singapore, 18 July 1983. https://www.nas.gov.sg/archivesonline/government_records/docs/c2fd693c-86b3-11e7-83df-0050568939ad/Misc.4of1983.pdf

_____. "Comprehensive medical strategy for Covid-19". Ministry of Health, 28 April 2020. https://www.moh.gov.sg/news-highlights/details/comprehensive-medical-strategy-for-covid-19

_____. "Global burden of disease 2019 study findings". Ministry of Health, 28 October 2020. https://www.moh.gov.sg/news-highlights/details/global-burden-of-disease-2019-study-findings/

_____. "HealthySG taskforce report". Ministry of Health, December 2019. https://www.moh.gov.sg/docs/librariesprovider5/default-document-library/healthysg-taskforce-final-report-(dec-2019).pdf

_____. "Infectious Disease Act". Ministry of Health. https://www.moh.gov.sg/policies-and-legislation/infectious-diseases-act

_____. "White paper on affordable health care", Ministry of Health, 22 October 1993. https://www.nas.gov.sg/archivesonline/government_records/docs/9e27a30c-7aea-11e7-83df-0050568939ad/Cmd.16of1993.pdf

Ministry of the Environment. *Singapore—My Clean & Green Home*. Singapore: Ministry of the Environment, 1997.

National Heritage Board. "Anti-spitting pamphlet". National Environment Agency. https://www.roots.gov.sg/collection-landing/listing/1342623

Parliament of Singapore. "Budget, Ministry of Community Development and Sports". Singapore Parliamentary Records Vol. 73, 14 March 2001. https://sprs.parl.gov.sg/search/#/topic?reportid=006_20010314_S0003_T0003

_____. "Budget, Ministry of Community Development and Sports". Singapore Parliamentary Records Vol. 74, 23 May 2022. https://sprs.parl.gov.sg/search/#/topic?reportid=009_20020523_S0003_T0009

_____. "Cattle bill". Singapore Parliamentary Records Vol. 23, 19 November 1964. https://sprs.parl.gov.sg/search/#/topic?reportid=007_19641119_S0002_T0003

PUB, "Major flood events in Singapore". PUB, Singapore's National Water Agency. Internal Paper, 1980.

_____. *PUB Annual Report 2014/2015*. Singapore: PUB, Singapore's National Water Agency, 2015. https://www.pub.gov.sg/annualreports/annualreport2015.pdf

Public Service Division. "Housing a nation, building a city". Public Service Division, 2015. https://www.psd.gov.sg/HOPS/our-institutions/housing-a-nation-building-a-city/

Singapore Sports Council. *Census of Sports Facilities in Singapore, 1998*. Singapore: Singapore Sports Council, 1999.

_____. *Live Better Through Sports—Vision 2030 Steering Committee Report 2012*. Singapore: Singapore Sports Council, 2012, 11.

_____. "SSC annual report 2012/2013. Live better through sports". Singapore Sports Council. https://www.sportsingapore.gov.sg/~/media/SSC/Corporate/Files/About/Annual-Reports/SSC-Annual-Report-1213.pdf

Sport Singapore. *Live Better Through Sports—Vision 2030*. Singapore: Sport Singapore, 2019.

_____. "SportSG annual report 2013/14. Live better through sport: Towards Vision 2030, The National Record". Sport Singapore. https://www.sportsingapore.gov.sg/~/media/SSC/Corporate/Files/About/Annual-Reports/SportSG--Annual-Report-20132014.ashx

Tan, B.T. and K.T. Goh. "Modus operandi in *Aedes* surveillance and control", in *Dengue in Singapore.* Singapore: Institute of Environmental Epidemiology, Ministry of the Environment, 1998, 108–23.

Tong, Yoke Tho, Sheela Narayan and Paul Pradeep. *Caring for Our People: 50 Years of Healthcare in Singapore*. Singapore: MOH Holdings, Ministry of Health, 2015.

Urban Redevelopment Authority. "Parks & Waterbodies Plan and Identity Plan". Urban Redevelopment Authority, November 2002. https://www.ura.gov.sg/~/media/User%20Defined/URA%20Online/publications/research-resources/plans-reports/pwip_rustic_coast.pdf

Interviews and Oral Histories

Dhanabalan, S. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, 29 July 2019. Transcript, accession number CLC/055/2019/001.

Hwang, Yu-ning. "Roundtable on USS Healthy City by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 15 December 2020. Accession number CLC/719/2020.

Lee, Patrick. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 9 May 2017. Transcript, accession number CLC/039/2017/004.

Liu, Thai Ker. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, 25 June 2013. Transcript, accession number CLC/006/2011/001.

Ng, Ser Miang. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 28 September 2020. Transcript, accession number CLC/039/2020/015.

Oon, Jin Teik. "Interview with CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 4 July 2017. Transcript, accession number CLC/039/2017/010.

Seow, Richard. "Interview with CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 8 May 2017. Transcript, accession number CLC/039/2017/002.

Tan, Eng Liang. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 18 May 2017. Transcript, accession number CLC/039/2017/007.

Tan, See Nin. "Interview with CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 11 May 2017. Transcript, accession number CLC/039/2017/005.

Wang, Daniel. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, 25 June 2013. Transcript, accession number CLC/012/2013/007.

Yee, Weng Phei. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 19 July 2017. Transcript, accession number CLC/039/2017/012.

_____. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 27 July 2017. Transcript, accession number CLC/039/2017/014.

Yeo, Meng Tong. "Interview by CLC". Centre for Liveable Cities, Ministry of National Development, Singapore, 22 May 2017. Transcript, accession number CLC/039/2017/008.

Newspapers, Press Releases and Magazines

Abu Baker, Jalelah and Matthew Mohan. "Stretched but coping: How Singapore's healthcare system has cranked up efforts to deal with Covid-19". *Channel NewsAsia*, 4 May 2020. https://www.channelnewsasia.com/singapore/covid-19-singapore-health-capacity-hospitals-treatment-935336

Begum, Shabana. "S'pore at risk of heatwaves, more dengue outbreaks as climate change worsens health woes: Report". *The Straits Times*, 5 November 2021. https://www.straitstimes.com/singapore/environment/spore-at-risk-of-heatwaves-and-more-dengue-outbreaks-as-climate-change-worsens

Channel NewsAsia. "Weekly dengue cases fall to lowest in 'historic outbreak year', NEA urges continued vigilance". *Channel NewsAsia*, 18 December 2020. https://www.channelnewsasia.com/singapore/dengue-cases-singapore-lowest-weekly-count-2020-nea-488431

Co, Cindy. "HDB launches roadmap for designing towns, with focus on healthy living, green spaces and smart technology". *Channel NewsAsia*, 15 October 2020. https://www.channelnewsasia.com/singapore/hdb-roadmap-designing-towns-greenery-smart-technology-963341

Horwitz-Bennett, Barbara. "Breath of fresh air: Ng Teng Fong Hospital and Jurong Community Hospital". *Healthcare Design Magazine*, 4 October 2017. https://healthcaredesignmagazine.com/projects/breath-fresh-air-ng-teng-fong-general-hospital-jurong-community-hospital/

Khalik, Salma. "Changes to system are a healthy move". *The Straits Times*, 22 January 2017. https://www.straitstimes.com/singapore/changes-to-system-are-a-healthy-move

Lim, Jeremy. "Time to measure equity in heath, too". *Today*, 4 July 2016. https://www.todayonline.com/commentary/time-measure-equity-health-too

Lin, Cheryl. "Growing preference among elderly residents to 'age in place': HDB survey". *Channel NewsAsia*, 10 February 2021. https://www.channelnewsasia.com/singapore/elderly-hdb-ageing-assisted-living-sample-household-survey-341871

Low, Lin Fhoong. "Centre of Expertise for Disability Sports launched". *Today Online*, 1 June 2016. https://www.todayonline.com/sports/centre-expertise-disability-sports-launched

Low, Youjin. "Flooding in tropics expected by brace for more 'extreme weather', even prolonged dry spells in Singapore, experts say". *Today Online*, 28 August 2021. https://www.todayonline.com/singapore/flooding-tropics-expected-brace-more-extreme-weather-prolonged-dry-spells-singapore

Ministry of Health. "Reorganisation of healthcare system into three integrated clusters to better meet future healthcare needs". Ministry of Health, 18 January 2017. https://www.moh.gov.sg/news-highlights/details/reorganisation-of-healthcare-system-into-three-integrated-clusters-to-better-meet-future-healthcare-needs

National Environment Agency. "NEA introduces measures to reduce greenhouse gas emissions from refrigeration & air-conditioning". National Environment Agency, 4 March 2020. https://www.nea.gov.sg/media/news/news/index/nea-introduces-measures-to-reduce-greenhouse-gas-emissions-from-refrigeration-air-conditioning

_____. "NEA urges continued vigilance as *Aedes aegypti* mosquito population remains high and dengue cases rise at start of 2022". National Environment Agency, 25 January 2022. https://www.nea.gov.sg/media/news/news/index/nea-urges-continued-vigilance-as-aedes-aegypti-mosquito-population-remains-high-and-dengue-cases-rise-at-start-of-2022

National Parks Board. "Community gathers to celebrate 25 years of the Park Connector Network". National Parks Board, 20 September 2015. https://www.nparks.gov.sg/news/2015/9/community-gathers-to-celebrate-25-years-of-the-park-connector-network

_____. "NParks to work with the community to transform Singapore into a City in Nature". National Parks Board, 4 March 2020. https://www.nparks.gov.sg/news/2020/3/nparks-to-work-with-the-community-to-transform-singapore-into-a-city-in-nature

Ng, Jun Sen. "How COVID-19, dubbed the 'inequality virus', has further widened the rich-poor gap". *Channel NewsAsia*, 23 August 2021. https://www.channelnewsasia.com/singapore/covid-19-inequality-virus-further-widened-rich-poor-gap-2127951

Ng, Jun Sen and Tang Fan Xi. "Sounds awful, can't talk because of noise". *The Sunday Times*, 23 April 2017. https://www.nus.edu.sg/newshub/news/2017/2017-04/2017-04-23/SOUNDS-st-23apr-pA2-A3.pdf

Ng, Keng Gene. "Study to look at reducing disease spread in Singapore buildings". *The Straits Times*, 30 January 2022. https://www.straitstimes.com/singapore/study-to-assess-how-better-ventilation-can-reduce-spread-of-infections-in-buildings

Oh, Tessa. "Heroes unmasked: No hand sanitizer? No fear. These 'super mums' are here to help". *Today*, 16 February 2020. https://www.todayonline.com/singapore/heroes-unmasked-no-hand-sanitiser-no-fear-these-super-mums-are-here-help

Singapore Monitor. "Priority for top sports". *Singapore Monitor, 2nd Edition*, 6 January 1984. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/singmonitor19840106-2.2.4

Tan, Audrey. "IPCC report indicates Singapore could take bigger hits from climate change". *The Straits Times*, 9 August 2021. https://www.straitstimes.com/singapore/environment/ipcc-report-indicates-singapore-could-take-bigger-hits-from-climate-change

_____. "Preparing for Disease X: Singapore to boost defences against future outbreaks in post-Covid-19 world". *The Straits Times*, 11 December 2020. https://www.straitstimes.com/singapore/health/preparing-for-disease-x-singapore-to-boost-defences-against-future-outbreaks-in

The Straits Times. "5,000 homeless in floods". *The Straits Times*, 10 December 1954. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19541210-1.2.2

_____. "Air pollution controls a must within six months". *The Straits Times*, 10 February 1972. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19720210-1.2.69

_____. "Evolution of HDB designs". *The Straits Times*. https://www.straitstimes.com/singapore/housing/evolution-of-hdb-designs

_____. "Expert here this week". *The Straits Times*, 29 March 1968.

_____. "Govt to spend $230 mil on homes in next five years". *The Straits Times*, 10 August 1960. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19600810-1.2.32

_____. "Industrialisation poses new problems, says Dy". *The Straits Times*, 17 March 1967. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19670317-1.2.29

_____. "Law to curb straying cattle takes effect in Singapore". *The Straits Times*, 2 January 1965. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19650102-1.2.26

_____. "Ministry to union: Think again about strike ballot". *The Straits Times*, 30 October 1966. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19661030-1.2.12.33

_____. "Plan by expert to fight air pollution". *The Straits Times*, 14 October 1971. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19711014-1.2.102

_____. "Plan for sports to reach out to masses". *The Straits Times*, 9 August 1976.

_____. "SARS in Singapore: Timeline". *The Straits Times*, 16 March 2013. https://www.straitstimes.com/singapore/sars-in-singapore-timeline

_____. "Singapore hospital draws up plans to meet GreenGov.sg targets and heal earth". *The Straits Times*, 7 February 2022. https://www.straitstimes.com/singapore/singapore-hospitals-draw-up-plans-to-meet-greengovsg-targets-and-heal-earth

_____. "Singapore park connectors reach 300 km at 25-year mark". *The Straits Times*, 21 September 2015. https://www.straitstimes.com/singapore/singapore-park-connectors-reach-300km-at-25-year-mark

_____. "S'pore to become beautiful, clean city within three years". *The Straits Times*, 12 May 1967. http://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19670512-1.2.20.aspx

_____. "Stress and lack of physical activity are top health issues for workers, say companies". *The Straits Times*, 19 October 2016. https://www.straitstimes.com/singapore/manpower/stress-and-lack-of-physical-activity-are-top-health-issues-for-workers-say

_____. "Success story of the cleanest city". *The Straits Times*, 7 October 1972. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19721007-1.2.24

_____. "The public must co-operate". *The Straits Times*, 1 October 1968. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19681001-1.2.74

_____. "Words and phrases to remember this decade by". *The Straits Times*, 30 November 1989. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/straitstimes19891130-1.2.36.4

Today. "Covid-19: Suicide rate among 10–19 age group rises in 2020 year-on-year". *Today*, 27 July 2021. https://www.todayonline.com/singapore/covid-19-suicide-rate-among-10-19-age-group-jumps-375-2020-year-year

Tong, See Kit. "MOH reviewing community support for people with mental health conditions". *Channel NewsAsia*, 6 October 2020. https://www.channelnewsasia.com/singapore/mental-health-moh-reviewing-community-support-741376

Williams, Ann. "Singapore productivity loss due to sick leave may hit $3.3b by 2030: Mercer Study". *The Straits Times*, 25 October 2017. https://www.straitstimes.com/business/economy/singapore-productivity-loss-due-to-sick-leave-may-hit-s33b-by-2030-mercer-study

Yeo, Eleanor. "Singaporean residents exercising more and eating healthier now compared with last year: Poll". *The Straits Times*, 5 July 2021. https://www.straitstimes.com/singapore/health/singapore-residents-feel-healthier-than-last-year-but-mental-health-has-taken-a-hit

Yeoh, Grace. "The rise of mental health awareness—and the stigma that remains attached to certain conditions". *Channel NewsAsia*, 5 June 2021. https://www.channelnewsasia.com/singapore/singapore-mental-health-awareness-stigma-conditions-depression-1973166

Yuen, Sin. "Rental flat residents at greater risk of poor health, studies show". *The Straits Times*, 11 March 2019. https://www.straitstimes.com/singapore/health/rental-flat-residents-at-greater-risk-of-poor-health-studies

Speeches

Ministry of Communications and Information. "Addendum to the President's Address. Mr Gan Kim Yong, Minister for Health". National Archives of Singapore, 2012. https://www.nas.gov.sg/archivesonline/data/data/pdfdoc/20160128001/sgpc_addenda.pdf

_____. "Address by Mr Yeo Cheow Tong, Acting Minister for Health, at the groundbreaking ceremony of the community hospital, Ang Mo Kio Avenue 9 on Saturday, 26 August 1989 at 10.00 am". National Archives of Singapore, 26 August 1989. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/yct19890826s.pdf

Ministry of Culture. "Speech by Encik Othman Wok, Minister for Social Affairs, at the 4th Colours Award Ceremony of the School Sports Council". National Archives of Singapore, 28 February 1976. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/19750228_0001.pdf

_____. "Speech by the Prime Minister at the official opening of the National Stadium". National Archives of Singapore, 21 July 1973. Transcript. https://www.nas.gov.sg/archivesonline/speeches/record-details/7359f206-115d-11e3-83d5-0050568939ad

Ministry of Health. "Ministerial statement on whole-of-government response to the 2019 novel coronavirus (2019-ncov)". February 2020. Transcript. https://www.moh.gov.sg/news-highlights/details/ministerial-statement-on-whole-of-government-response-to-the-2019-novel-coronavirus-(2019-ncov)

_____. "Ministry of Health Work Plan Seminar 2021 opening address by Mr Ong Ye Kung, Minister for Health, 25 May 2021 (part 1 of 2)". 25 May 2021. Transcript. https://www.moh.gov.sg/news-highlights/details/ministry-of-health-work-plan-seminar-2021-opening-address-by-mr-ong-ye-kung-minister-for-health-25-may-2021-(part-1-of-2)

_____. "MOH 2012 Committee of Supply Speech Healthcare 2020: Improving accessibility, quality and affordability for tomorrow's challenges (Part 1 of 2)". 6 March 2012. Transcript. https://www.moh.gov.sg/news-highlights/details/moh-2012-committee-of-supply-speech-healthcare-2020-improving-accessibility-quality-and-affordability-for-tomorrow-s-challenges-(part-1-of-2)

_____. "Opening address by Dr Amy Khor, Senior Minister of State, Ministry of Health, at the Singapore Healthcare Management Congress 2018, 14 August 2018". 14 August 2018. Transcript. https://www.moh.gov.sg/news-highlights/details/opening-address-by-dr-amy-khor-senior-minister-of-state-ministry-of-health-at-the-singapore-healthcare-management-congress-2018-14-august-2018

_____. "Speech by Mr Ong Ye Kung, Minister for Health and Chairman of the Ministerial Committee on Ageing, at the launch of the 2023 Action Plan For Successful Ageing, 30 January 2023, 9.00am". Ministry of Health, 30 January 2023. Transcript. https://www.moh.gov.sg/news-highlights/details/speech-by-mr-ong-ye-kung-minister-for-health-and-chairman-of-the-ministerial-committee-on-ageing-at-the-launch-of-the-2023-action-plan-for-successful-ageing-30-january-2023-9.00am

_____. "Speech by Mr Ong Ye Kung, Minister for Health, at Singapore Perspectives 2022. 13 Jan 2022". 13 January 2022. Transcript. https://www.moh.gov.sg/news-highlights/details/speech-by-mr-ong-ye-kung-minister-for-health-at-singapore-perspectives-2022-13-january-2022-9.00am/

_____. "Speech by Mr Yong Nyuk Lin, Minister for Health at the opening of the W.H.O. seminar on 'Health Planning in Urban Development' at the Conference Hall on Tuesday, 21st November, 1967 at 1000 hours". National Archives of Singapore, 21 November 1967. Transcript. https://www.nas.gov.sg/archivesonline/speeches/record-details/7a4e7010-115d-11e3-83d5-0050568939ad

_____. "Speech by the Minister for Health, Mr Yong Nyuk Lin, at the inaugural meeting of the Public Health Advisory Board held at the conference room, Palmer Road, on Monday 1st June, 1964 at 11a.m." National Archives of Singapore, 1 June 1964. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/MSE_20040116001.pdf

_____. "Speech of Mr. Yong Nyuk Lin, Minister for Health at the 1st Annual Dinner of the Society of Occupational Medicine at the Imperial Restaurant, Capitol Building, on Saturday, 1st July, 1967 at 2030 hours". National Archives of Singapore, 1 July 1967. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/PressR19670701.pdf

Ministry of Information and the Arts. "Speech by BG Lee Hsien Loong, Deputy Prime Minister, at the opening of the new Woodbridge Hospital off Hougang Avenue 8 on Friday, 30 October 1993 at 10 am". National Archives of Singapore, 30 October 1993. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/lhl19931030s.pdf

_____. "Speech by Prime Minister Goh Chok Tong at the Singapore Sports Council's 21st Anniversary Dinner at the Island Ballroom, Shangri-La Hotel on Friday, 9 December 1994 at 7.30 pm". National Archives of Singapore, 9 December 1994. Transcript. https://www.nas.gov.sg/archivesonline/speeches/record-details/74030e82-115d-11e3-83d5-0050568939ad

Ministry of National Development. "Speech by 2M Desmond Lee at the Committee of Supply Debate 2020—Transforming Singapore into a City of Nature". 4 March 2020. Transcript. https://www.mnd.gov.sg/newsroom/speeches/view/speech-by-2m-desmond-lee-at-the-committee-of-supply-debate-2020---transforming-singapore-into-a-city-of-nature

Ministry of the Environment. "Speech by Mr Lim Swee Say, Minister for the Environment at SingSpring's desalination plant ground breaking ceremony at 10.10 am on 16 January 2004". National Archives of Singapore, 16 January 2004. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/MSE_20040116001.pdf

Ministry of Transport. "Speech by Minister for Transport Mr S. Iswaran at Land Transport Industry Day 2022, 2 September 2022". 2 September 2022. Transcript. https://www.mot.gov.sg/news/Details/speech-by-minister-for-transport-mr-s-iswaran-at-land-transport-industry-day-2022

National Council of Social Service. "Keynote address by Mr Tan Yong Soon, Permanent Secretary (National Climate Change) at NUS High School Sustainable Development Youth Conference 2011, 26 August 2011". 26 August 2011. Transcript. https://www.nccs.gov.sg/media/speeches/keynote-address-by-mr-tan-yong-soon-permanent-secretary-(national-climate-change)-at-nus-high-school-sustainable-development-youth-conference-2011-26-august-2011

_____. "Speech by Masagos Zulkifli, Minister for the Environment and Water Resources, at the MEWR COS debates, 6 March 2018". 6 March 2018. Transcript. https://www.nccs.gov.sg/media/press-release/speech-by-masagos-zulkifli-minister-for-the-environment-and-water-resources-at-the-mewr-cos-debates-6-march-2018

Prime Minister's Office. "Speech by DPM and Coordinating Minister for National Security, Teo Chee Hean, at the World Water Day Celebrations on 4 March 2017 at the Marina Barrage". 4 March 2017. Transcript. https://www.pmo.gov.sg/Newsroom/dpm-teo-chee-hean-world-water-day-celebrations-2017

_____. "Speech by Prime Minister Lee Hsien Loong at Universal Health Coverage Ministerial Meeting on 10 February 2015 at the Grand Copthorne Waterfront". 10 February 2015. Transcript. https://www.pmo.gov.sg/Newsroom/transcript-speech-prime-minister-lee-hsien-loong-universal-health-coverage-ministerial

PUB, Singapore's National Water Agency. "Speech by Mr Lee Hsien Loong, Prime Minister, at the Active, Beautiful and Clean (ABC) Waters Exhibition". National Archives of Singapore, 6 February 2007. Transcript. https://www.nas.gov.sg/archivesonline/data/pdfdoc/20070206997.htm

World Health Organization. "WHO Director-General addresses health promotion conference: Opening address at the 8th Global Conference on Health Promotion". 10 June 2013. Transcript. https://www.who.int/director-general/speeches/detail/who-director-general-addresses-health-promotion-conference

Websites

Active Health. "Sport-in-precinct". *Active Health*. https://www.activehealth.sg/move-better/sport-in-precinct

ActiveSG. "Jurong East Sport Centre". *ActiveSG*. https://www.myactivesg.com/facilities/jurong-east-sports-centre

Agency for Integrated Care. "Dementia-friendly community". https://www.aic.sg/body-mind/dementia-friendly-community

AsiaOne. "PM Lee opens $76 million Bishan-Ang Mo Kio Park". *AsiaOne*, 17 March 2012. https://www.asiaone.com/News/Latest%2BNews/Singapore/Story/A1Story20120317-333972.html

Building and Construction Authority. "Accessibility & universal design". Building and Construction Authority. https://www1.bca.gov.sg/buildsg/universal-design

_____. "Code on accessibility in the built environment". Building and Construction Authority. https://www1.bca.gov.sg/regulatory-info/building-control/universal-design-and-friendly-buildings/code-on-accessibility-in-the-built-environment

Centers for Disease Control and Prevention. "Loneliness and social isolation linked to serious health conditions". Centers for Disease Control and Prevention. https://www.cdc.gov/aging/publications/features/lonely-older-adults.html

Cheng, Christopher. "A space to heal". Sengkang General Hospital. https://www.skh.com.sg/ceo-story

Department of Statistics Singapore. "Singstat table builder—Total life expectancy at birth (residents)". Department of Statistics Singapore. https://tablebuilder.singstat.gov.sg/table/TS/M810501

Duke NUS Medical School. "Seniors stuck at home, caught between loneliness and fear of COVID-19". Centre for Ageing Research & Education, Duke NUS Medical School, 9 October 2021. https://www.duke-nus.edu.sg/care/news-events/news/articles/articles/seniors-stuck-at-home-caught-between-loneliness-and-fear-of-covid-19-(straits-times-premium)

GovTech Singapore. "An inclusive Smart Nation: 5 ways tech can empower persons with special needs". GovTech Singapore, 9 February 2018. https://www.tech.gov.sg/media/technews/an-inclusive-smart-nation-5-ways-tech-can-empower-persons-with-special-needs

Health Hub. "Your guide to understanding dementia". *Health Hub*. https://www.healthhub.sg/live-healthy/679/yourguidetounderstandingdementia_pdf

HistorySG. "Environmental Public Health Act is enacted". *HistorySG*. https://eresources.nlb.gov.sg/history/events/a98889e8-99cd-4637-87c0-54da975aadc3

Housing & Development Board. "Community care apartments". Housing & Development Board. https://www.hdb.gov.sg/residential/buying-a-flat/finding-a-flat/types-of-flats/community-care-apartments

_____. "Design features for new flats". Housing & Development Board. https://www.hdb.gov.sg/ residential/buying-a-flat/finding-a-flat/design-features-for-new-flats

_____. "Designing for life roadmap". Housing & Development Board. https://www.hdb.gov.sg/about-us/hdbs-refreshed-roadmap-designing-for-life

_____. "HDB smart enabled home". Housing & Development Board. https://www.hdb.gov.sg/about-us/our-role/smart-and-sustainable-living/smart-hdb-town-page/hdb-smart-home-exhibition

_____. "Health District @ Queenstown". Housing & Development Board, November 2021. https://www.hdb.gov.sg/cs/infoweb/about-us/news-and-publications/publications/dwellings/Health-District-Queenstown

_____. "Home, truly". Housing & Development Board. https://go.gov.sg/HDBHomeTruly

Institute of Mental Health. "Milestones". Institute of Mental Health. https://www.imh.com.sg/About-Us/Pages/Milestones.aspx

Khoo Teck Puat Hospital. "Corporate profile". Khoo Teck Puat Hospital. https://www.ktph.com.sg/about-us/corporate-profile

Land Transport Authority. "An inclusive public transport system". Land Transport Authority. https://www.lta.gov.sg/content/ltagov/en/getting_around/public_transport/a_better_public_transport_experience/an_inclusive_public_transport_system.html

_____. "Walking and cycling design guide". Land Transport Authority, November 2018. https://www.lta.gov.sg/content/ltagov/en/industry_innovations/industry_matters/development_construction_resources/walking_cycling_plan.html

Landezine International Landscape Award. "Sengkang General Hospital by DP Green". Landezine International Landscape Award. https://landezine-award.com/sengkang-general-hospital/

Ministry of Health. "Live and age well in Singapore". Ministry of Health. https://www.moh.gov.sg/ifeelyoungsg/our-stories/how-can-i-age-in-place/receive-better-care/live-and-age-well-in-singapore

Ministry of National Development. "Cities of Tomorrow (CoT). About CoT". Ministry of National Development. https://www.mnd.gov.sg/citiesoftomorrow/about-cot

Ministry of Sustainability and the Environment. "Our history". Ministry of Sustainability and the Environment. https://www.mse.gov.sg/about-us/our-history/

National Environment Agency. "Air pollution regulations". National Environment Agency. https://www.nea.gov.sg/our-services/pollution-control/air-pollution/air-pollution-regulations

_____. "Reducing Greenhouse Gas (GHG) emissions from the use of refrigerants in RAC sector". National Environment Agency. https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/reducing-ghg-emissions-from-the-use-of-refrigerants-in-rac-sector

_____. "Solid waste management infrastructure". National Environment Agency. https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/waste-management-infrastructure/solid-waste-management-infrastructure

National Parks Board. "Community in Bloom initiatives". National Parks Board. https://www.nparks.gov.sg/gardening/community-in-bloom-initiative

National Population and Talent Division, PMO. "Overview". National Population and Talent Division, PMO. https://www.population.gov.sg/our-population/population-trends/overview

New Nation. "Cleansing groups to be integrated". *New Nation*, 26 January 1971. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/newnation19710126-1.2.34

_____. "The familiar stalls will soon disappear". *New Nation*, 8 August 1972. https://eresources.nlb.gov.sg/newspapers/Digitised/Article/newnation19720808-1.2.51

Primary Care Pages. "Primary care model". *Primary Care Pages*. https://www.primarycarepages.sg/practice-management/primary-care-model/primary-care-network-(pcn)

_____. "Public Health Preparedness Clinics (PHPC)". *Primary Care Pages*. https://www.primarycarepages.sg/practice-management/moh-national-schemes/public-health-preparedness-clinic-(phpc)

PUB, Singapore's National Water Agency. "Singapore water story". PUB, Singapore's National Water Agency. https://www.pub.gov.sg/watersupply/singaporewaterstory

Samaritans of Singapore. "Singapore reported 452 suicide deaths in 2020, number of elderly suicide deaths highest recorded since 1991". Samaritans of Singapore, July 2021. https://www.sos.org.sg/pressroom/singapore-reported-452-suicide-deaths-in-2020-number-of-elderly-suicide-deaths-highest-recorded-since-1991

Sengkang General Hospital. "Super spaces". Sengkang General Hospital. https://www.skh.com.sg/news/joy-at-work/sengkang-general-hospital-super-spaces

Singapore General Hospital. "New Emergency Medicine Building to meet Singapore's future needs". 22 May 2018. https://www.sgh.com.sg/news/patient-care/new-emergency-medicine-building-to-meet-singapores-future-needs

Singapore Infopedia. "Clean Air Act of 1971". *Singapore Infopedia*. https://eresources.nlb.gov.sg/infopedia/articles/SIP_2014-04-07_110024.html

_____. "Dengue". *Singapore Infopedia*. https://eresources.nlb.gov.sg/infopedia/articles/SIP_2013-07-19_170116.html

_____. "Institute of Mental Health". *Singapore Infopedia*. https://eresources.nlb.gov.sg/infopedia/articles/SIP_1094_2010-05-27.html

_____. "Major floods in Singapore". *Singapore Infopedia*. https://eresources.nlb.gov.sg/infopedia/articles/SIP_780_2004-12-30.html

_____. "New approach to keep S'pore litter-free". *Singapore Infopedia*. https://eresources.nlb.gov.sg/infopedia/articles/SIP_1160_2008-12-05.html

Smart Nation Singapore. "Smart urban mobility, remaking our transportation roadmap". Smart Nation Singapore. https://www.smartnation.gov.sg/initiatives/strategic-national-projects/smart-urban-mobility

Sport Care. "Disability sports master plan, sport for persons with disabilities". *Sport Care*. https://sportcares.sportsingapore.gov.sg/persons-with-disabilities/disability-sports-master-plan/

Sport Singapore. "Bukit Canberra". Sport Singapore. https://www.sportsingapore.gov.sg/newsroom/media-releases/2018/7/sembawang-sports-and-community-hub-groundbreaking-event

_____. "Sports in Independent Singapore". Sport Singapore. https://www.sportsingapore.gov.sg/Sports-Education/History-of-Singapore-Sports/Sports-in-Independent-Singapore

The Commonwealth Fund. "International health care system profiles: Singapore". 5 June 2020, https://www.commonwealthfund.org/international-health-policy-center/countries/singapore

Urban Redevelopment Authority. "Development control". Urban Redevelopment Authority. https://www.ura.gov.sg/Corporate/Guidelines/Development-Control

_____. "Ecology of cities—nature, liveability and long-term planning". Presentation at the Ministry of National Development's Urban Sustainability R&D E-Symposia 2021. https://www.mnd.gov.sg/docs/default-source/urbansustainability/slides-by-mr-yam-yujian.pdf

_____. "Long-term planning". Urban Redevelopment Authority. https://www.ura.gov.sg/Corporate/Planning/Our-Planning-Process/Long-Term-Planning

_____. "Master plan". Urban Redevelopment Authority. https://www.ura.gov.sg/Corporate/Planning/Master-Plan

_____. "Updates to the Landscaping for Urban Spaces and High-Rises Programme: Lush 3.0". Urban Redevelopment Authority, 9 November 2017. https://www.ura.gov.sg/Corporate/Guidelines/Circulars/dc17-06

Winnipeg Regional Health Authority. "Chain of infection". Winnipeg Regional Health Authority. https://professionals.wrha.mb.ca/old/extranet/ipc/files/manuals/community/1.2.pdf

World Health Organization. "Noise". World Health Organization. https://www.euro.who.int/en/health-topics/environment-and-health/noise

_____. "Prioritizing diseases for research and development in emergency contexts". World Health Organization. https://www.who.int/activities/prioritizing-diseases-for-research-and-development-in-emergency-contexts

_____. "What Is a healthy city?" World Health Organization. https://www.who.int/europe/groups/who-european-healthy-cities-network/what-is-a-health-city

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