



SMART CITIES

DESMOND LEE

Desmond Lee is the Minister for National Development and Minister-in-charge of Social Services Integration in Singapore.

Singapore's Smart Nation Journey



In Singapore, students and the community are being introduced to fields such as robotics to familiarise them with emerging technologies.
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As the global pandemic opens up new opportunities and ways of thinking, Singapore's experience shows that technology and digitalisation, if harnessed well, can be instrumental in helping cities emerge from difficult times to become more resilient, sustainable and liveable.



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Singapore is an island city-state. We are only 720 km² in size—you could drive from end to end in under an hour—and we are one of the most densely populated countries in the world. We have no natural resources other than the creativity and industry of our people. These are severe constraints that any country would struggle to overcome.

In the face of these challenges, technology has been Singapore's ally. Over the decades, we have used engineering and other innovations to moderate, and sometimes even transcend, these physical limits. We have expanded our land area by a quarter by reclaiming land from the sea. We have also made our water supplies more resilient by harvesting urban stormwater on a large scale, recycling wastewater, and desalinating seawater.

COVID-19: Managing the Pandemic While Accelerating Digitalisation

Technology has continued to evolve, and Singapore is determined to harness it for good. Smart and digital technologies can help us and other countries solve problems, unlock opportunities, and improve people's lives.

This is true not only in calmer times, but also in times of crisis. If anything, the COVID-19 pandemic has highlighted the importance of digital tools and solutions, and greatly accelerated global trends towards digitalisation.

With video conferencing technology, we can safely connect with colleagues and clients even when working from home. We have also used this to keep in touch with family and friends during circuit breakers and lockdowns, while using food delivery apps to get meals delivered to elderly parents. Even as we remain separated to prevent the virus from spreading, technology has been a silver lining in this dark cloud, helping to bridge physical and emotional distances.

Technology has also enabled our children to continue their studies at home during the pandemic. With a public health crisis like this, it is so easy to lose a whole generation of young people if they are unable to attend school for long periods.

The global pandemic has also shown that digitalisation not only makes our lives more convenient, it can be a lifesaver. In Singapore, we have had to come up with apps and technologies quickly to trace



The nationwide use of the TraceTogether app and the national digital check-in system SafeEntry, together with strict temperature checks and safe distancing, have boosted contact tracing efforts and allowed Singaporeans to resume their lives with a degree of normality.
Image: kandl stock / Shutterstock.com

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and contain COVID-19 infections. The TraceTogether app and the national digital check-in system, SafeEntry, have enabled health authorities to swiftly and effectively conduct contact tracing. This has been a gamechanger as we strive to keep Singaporeans safe, and as the country gradually resumes some form of normality.

Integrating Technology Into Planning

Harnessing technology is not new to Singapore. Prior to the pandemic, we have already been consistently using digital tools to help us better plan, develop and manage our city. The pandemic has accelerated this process and spurred us to make better use of these tools in various dimensions, including public health.

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Our urban planners have developed a range of digital planning tools, including ePlanner, which helps analyse datasets from different agencies to improve the design of urban spaces. With ePlanner, our planners can not only identify areas with higher concentrations of elderly, but also analyse travel patterns to assess how easily they can access healthcare facilities. This is especially critical as Singapore's population ages. This additional information helps identify and fill gaps to meet seniors' needs.



Getai shows—cultural performances traditionally staged for live audiences during the Hungry Ghost Festival—were live-streamed to ensure safe distancing during the COVID-19 pandemic.
 Image: REUTERS / Edgar Su



A cinemagoer checking in using the TraceTogether app.
 Image: Centre for Liveable Cities

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Designing, Building and Managing HDB Towns

With more than 80% of Singaporeans living in public housing, digitalisation has also helped to better design, build and manage public housing towns. The Housing & Development Board (HDB) uses environmental modelling tools and computer simulations to analyse wind flow, solar heat and noise within upcoming towns, allowing the design and positioning of newly built homes to conserve energy and optimise comfort. This has been applied on a town-wide level for the very first time in Tengah New Town, which is now being built. Singapore is an equatorial, dense and urbanised city-state, and this technology, far from being purely theoretical, can bring about real benefits.

HDB also has a “Smart Hub”, which acts as a “brain” for municipal operations. It is a central data repository that collects, integrates, processes and analyses data on municipal services across public housing towns. HDB’s planners use it to better understand the usage patterns of common amenities, so they can schedule maintenance works promptly and even pre-emptively.

Transforming the Built Environment Sector

In future, digitalisation will also play a greater role in the life-cycle of the built environment infrastructure that we enjoy today: from conceptualisation and design to construction, as well as facilities management and maintenance.



An artist's impression of the upcoming Tengah New Town, which incorporates smart and sustainable technology such as the world's first large-scale residential centralised cooling system, photovoltaic panels, electric vehicle charging points, and other smart energy and water saving solutions.
Image: Housing & Development Board, Singapore



Functioning like a "brain", the Housing Board's Smart Hub programme collects, integrates and analyses data on municipal services across Singapore's public housing towns, with the aim of improving and optimising estate services.

Image: Housing & Development Board, Singapore

This pandemic has shown us clearly that Singapore needs to embrace digitalisation and move away from a heavy reliance on manual labour. Embracing digital tools and technology also creates opportunities to upskill Singaporeans and create new jobs. This transformation also greatly enhances the cost-efficiency of managing and maintaining buildings. A building's overall life-cycle costs—including energy use, maintenance and facilities management—can be more than four times greater than the initial construction cost. This can be lowered by using technology to design, build, manage and maintain buildings more efficiently.

Many of our government agencies and private developers have begun to embrace these changes. JTC,

which manages industrial estates, uses a range of digital tools to track, analyse and optimise the performance of buildings, gather feedback from tenants, and automatically route the information to a facilities team for quick action. Its headquarters has a command centre that is plugged in to sensors in its industrial buildings across Singapore, allowing it to closely monitor the performance of chillers, lifts and other facilities.

Planning Nature Areas and Parks

Moving from urban to green takes just minutes in small Singapore. Therefore, we have to harness technology and its tools to help us better plan our green spaces. Unlike in larger countries, where

many cities have ample space for parks as well as large tracts of nature reserves, Singapore's nature reserves are in the very heart of the city, surrounded by buildings.

Geospatial modelling tools have helped boost the conservation of local biodiversity, such as migratory shorebirds, forest birds, butterflies, coral reefs and mangroves. The National Parks Board (NParks) uses GIS modelling, for example, to determine the path of least resistance for forest birds and butterflies across the urban landscape. Connective "nature ways" can then be created for these creatures to move between green spaces in the city.

NParks is also using predictive models to understand how coral reefs, mangroves and intertidal flats



Young students assisting elderly participants at an inter-generational IT workshop. Singapore has intensified its efforts to increase the digital literacy of groups such as the elderly and the lower-income.

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are connected within Singapore's coastal waters. This assists urban planners in crafting management strategies to safeguard valuable areas of biodiversity. In tiny Singapore, the tension between development and conservation is a day-to-day reality for our planners. Technology enables us to make optimal decisions within very narrow margins.

Insights from highly technical models can even lead to ambitious national policies such as the creation of protected nature parks. Satellite tracking of migratory shorebirds has helped determine that our small island is a major pitstop along their long-distance migration routes. As they stop over in Singapore, many of these birds roost in Sungei Buloh Wetlands Reserve while they forage for food at the nearby mudflats in Mandai. Understanding this key ecological

relationship enabled our decision to conserve Mandai Mangrove and Mudflat as a nature park.

Conserving and protecting these habitats may seem like a simple act, but it has far-reaching effects. Satellite tracking supports the long-term survival of these birds, some of which are globally endangered.

Active Citizenry

Technology also allows Singapore to harness the energy of greater citizen participation. It meets the aspirations of citizens who wish to play a greater part in making decisions on matters that impact them.

One example is the OneService mobile app, which was created to enable residents to give feedback easily on-the-go. When residents

encounter municipal issues, the feedback they submit through the app is automatically routed to the relevant agency-in-charge. The app's geo-tagging and photo-taking functions enable municipal officers to pinpoint the exact location and nature of the issues, and to respond promptly. The app is regularly being tweaked and improved—for example, a feature was recently added for residents to participate in surveys on topics such as local improvement works, empowering them to take small but meaningful action on issues that concern them.

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Making Technology Inclusive for All

Worsening inequality is a major problem globally. How do we ensure that everyone—from rich to poor, young to old, and across all ethnicities—experiences these technological benefits? Singapore has been working hard to ensure that, in becoming a Smart Nation, no one is left out.

In May 2020, Singapore set up an agency dedicated to raising the digital literacy of groups such as the elderly and the lower-income, and to accelerate how quickly they adopt digital tools. The SG Digital Office organises classes for senior citizens to pick up various simple digital skills, such as creating secure passwords, making e-payments, making video calls to loved ones, searching for information online, and importantly, how to guard against cyber scams even as they explore this new digital world.

The private sector and civil society are also pitching in. Several telecommunications companies have launched subsidised mobile and data plans for seniors, while the Ministry of Education has partnered NGOs and businesses to provide low-income families with subsidised personal computers and options for free broadband connection.

Future-Proofing Singapore

2020 has been a troubling year for the world. The COVID-19 pandemic is an unprecedented global crisis that continues to have far-reaching impacts on economies and peoples' lives. Yet we should keep in mind that, prior to the COVID-19 pandemic, the world was already grappling with complex and growing problems such as climate change and urbanisation, and adapting to technological and social disruptions.

While the global pandemic is a major crisis, it can also trigger societies to act more boldly to find solutions to these challenges, opening up new opportunities and ways of thinking.

Technology and digitalisation should play a key supporting role in these efforts. Singapore's experience has shown that these tools can enhance our strengths and even transcend our limitations. If harnessed well, technology will be instrumental in helping cities and countries emerge from difficult times to become more resilient, more sustainable and more liveable. 