

# Singapore



Source: mikeinlondon

Singapore faces permanent challenges: a lack of natural resources, high dependence on exports, and a high population density. As both a nation and a city, Singapore aims to use technological devices and innovations to provide solutions to these challenges. It seeks to improve its citizens' quality of life by fostering sustainable development and by making itself an attractive hub for businesses and international workers. It has a clear vision of what it wants to achieve, and the tools being used to make that vision a reality are simple: information-based technology and apps.

A recipient of multiple awards, Singapore competes very well against

the other five cities in our study, though it has a slight deficit in the following six dimensions: Employment-Finding Services, Green Spaces, Medical Services, Air Pollution, Recycling Services, and Welcoming of Minorities. We observed a growing interest among the city's executives to formulate policies aimed at helping the elderly.

Singapore is pioneering a concept that it calls the **Smart Nation**. We use that label to describe Singapore's profile in this study. Every government agency plays an active role in promoting and implementing solutions to fulfill the country's Smart Nation objectives. Moreover, Singapore seems more technologically ready than any other

European country, and that readiness is facilitating implementation of the Smart Nation program.

Singapore's state/city initiatives are receiving strong support from artificial intelligence professionals. These initiatives aim to encourage citizens to spearhead Smart Nation policy proactively. Many data- and technology-driven initiatives are bringing about a comprehensive smart ecosystem that could place citizens at its heart. There can be no doubt that Singapore is among the most advanced smart cities in the world. However, the efficiency of its hyperconnected model evokes contrasting thoughts of hope and worry.

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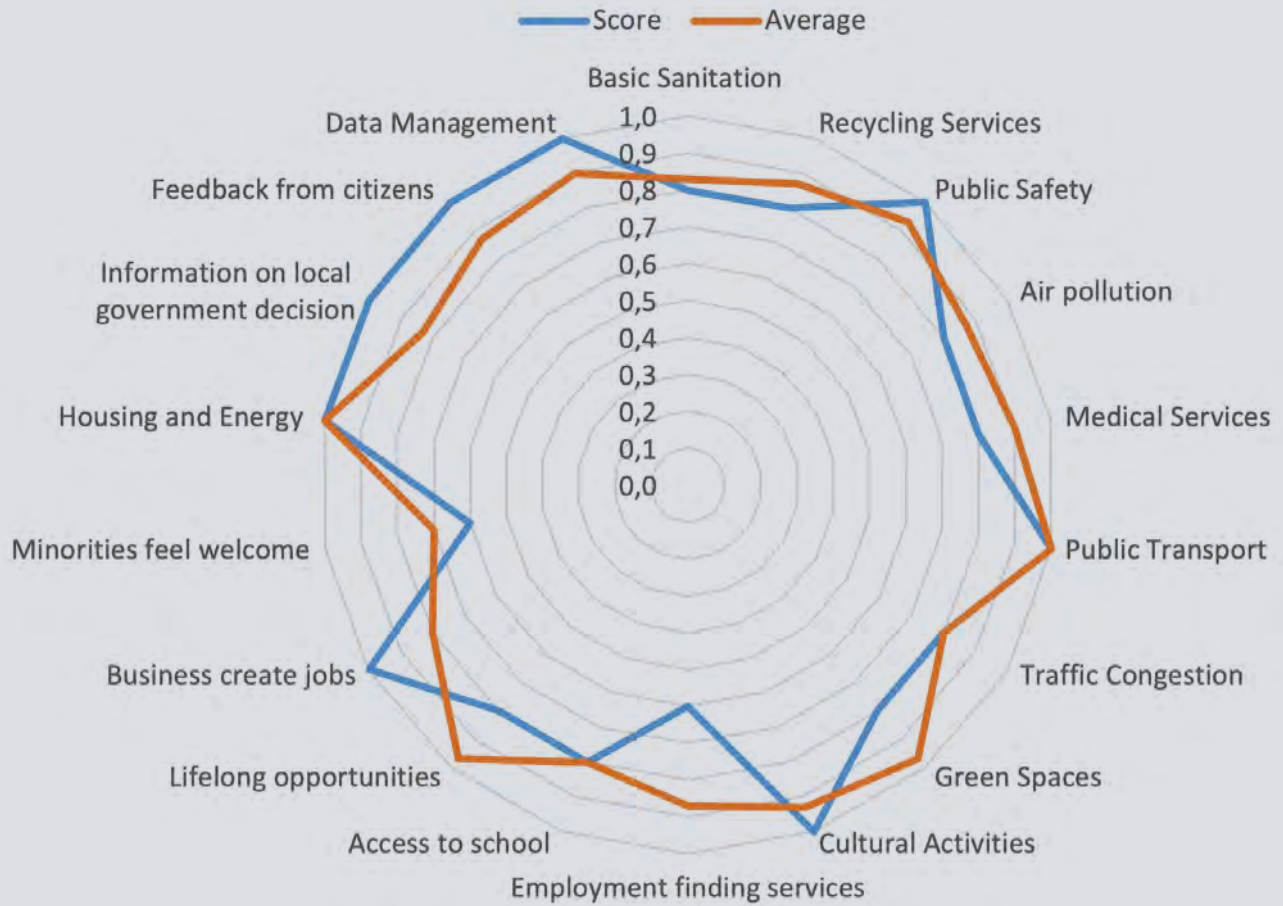


Chart type designed to plot 18 factors translated into values over multiple quantitative variables. Blue line is about the city and Orange line is the average value for the six selected cities. It should be used with care.

## Executive summary

The island city-state of Singapore is an enigma in many ways. In late 2014, Singapore rolled out the Smart Nation initiative. Authorities launched a megadigitalization project to transform the city-state into a hyperconnected nation infused with cutting-edge digital and computing technologies. This Smart Nation initiative (SNI) was officially launched in 2014 by Prime Minister Lee Hsien Loong, and three years later benefited from a government injection of 2.4 billion Singapore dollars (equivalent to 1.73 billion US dollars or 1.51 billion euros).

The basic idea was clear: harness the power of information and communication technologies (ICT) to remediate policy problems and deliver to citizens tangible improvements in the quality of life. Four years into the Smart Nation journey, Singapore had already won various awards, among them the City Award at the 2018 Smart City Expo World Congress in Barcelona, Spain ([Smart City Expo World Congress 2018](#)).

The main objective of Singapore's Smart Nation policy has been to underline the complexity involved in using hyperconnective modern technology to improve urban life. The aim has been to create a city powered by digital innovation and technology that responds to citizens' ever-changing needs. According to the IMD's inaugural Smart City Index, Singapore was recognized in 2018 as not just a smart city but as the smartest city in the world. Many commentators and analysts have gone to great lengths to identify the specific features of this initiative.

### *A wealthy "smart nation"*

It is easy to recognize Singapore's progress as remarkable but more difficult to see it as a model for others to follow. It would surely be more appropriate to refer to it as a laboratory, a city-lab, with its 5.6 million inhabitants packed into a space of seven hundred square kilometers and its status as the second best-performing economy in the world.

### *An ambitious program based on a political vision*

In the case of Singapore, hiding behind the generic term "smart city" is one of the world's most ambitious programs to put technology at a city's disposal. The government has played a proactive role in developing the necessary IT infrastructure and devising pragmatic policies to encourage IT-related multinational corporations to set up operations in Singapore. Information infrastructure has not been left to the private sector.

Fortunately, the program is linked both to economic activities and to improving quality of life, education, and mobility within a systematic approach to exploiting data. On the economic level, the city utilizes the concept of freight as a service (FaaS) to capitalize on its geographical location, optimize the flow of goods, and maintain its role as the logistical hub for Southeast Asia.

To encourage the emergence of urban services, the city is developing an outstanding urban digital ecosystem. Singapore has also opened one of the world's first government-owned open-data platforms. Singapore's Smart Nation vision is driven by the country's desire to stay ahead of the curve and to be among the leading cities of the world.

This city-state remains at the top of the list of the world's smart cities and holds first place in many categories, among them mobility, productivity, health, and security. We have identified six ways in which Singapore is transforming its urban landscape.

### *Mobility as a shared community experience*

Singapore's high urban density allows the city-state to optimize transport efficiency through the use of sensor technology. An autonomous fleet of cars helps the city's elderly and disabled residents to stay mobile. To optimize transportation, public data—or "open data"—is being used on a trial basis to facilitate transport planning.

Data from fare cards with sensors is collected by more than five thousand vehicles, and the real-time tracking of buses is constantly analyzed. Contactless payment technology is being used to streamline the movements and payments made by the 7.5 million passengers who use public transport each day. The city is also running the Smart Mobility 2020 initiative, a joint venture between the Land Transport Authority (LTA) and the Intelligent Transportation Society (ITS) to enhance commuters' travel experience through the development of intelligent transport mechanisms such as toll systems.

### *An aging population in a smart nation*

By 2050, 47 percent of Singapore's population will be sixty-five or older. To reduce the pressure of an aging population on the city's care services, Singapore has digitalized its healthcare system, which now offers, for example, video

consultations, at-home exercise sessions for patients, and Internet of Things (IoT) devices that monitor patients' progress and transmit the data to their carers. Singapore is trying to reduce loneliness among its aging population through measures such as artificial intelligence powered chatbots that talk to the elderly.

#### *A smart nation or an apps nation?*

The phrase "There's an app for that" became very familiar as smartphone use grew. It is particularly applicable to Singapore, where citizens have apps for reporting municipal issues; hailing self-driving vehicles; receiving location-specific environmental alerts on air quality, temperature, and rainfall; monitoring energy consumption; and, if they have young families or are elderly residents, accessing information tailored to those statuses. Singapore comes closer than any other city to being driven by algorithms.

Supporting business has been a much more important priority than encouraging citizen participation. By enabling better integration of industry and academia, Singapore's Punggol Digital District aims to foster development in cybersecurity and IoT technologies. A data-sharing collaboration has also been established to encourage transparent business interactions.

#### *Everywhere-anybody*

The Smart Nation program addresses all aspects of urban life. The omnipresence of technology that it has established is often criticized for its infringement on privacy. The city-state is currently transforming its 110,000 lampposts into nests of sensors that are capable of taking the city's pulse and help to imagine a "data-driven" future. The way to a permanent and generalized surveillance system is being paved. Because privacy is a major concern, even in Singapore, smart technology can be made more acceptable through effective communication and information campaigns. Enhancing digital security will also make a difference.

#### *Legal challenges*

Singapore has taken great and bold strides toward becoming

a Smart Nation, establishing a computerized and Internet-savvy society to promote investment, competitiveness, and efficiency. Broad policies to achieve its vision have proven sufficient for national authorities. Grants have also played an integral role in enabling the uptake of ICT and in facilitating smart grid pilot schemes.

However, the scarcity of legislation on data protection is a growing concern. The emergence of big data must change the way in which Singapore thinks about and regulates privacy and data protection. There are legal challenges that arise when data moves seamlessly from device to device, between organizations, across borders, and into and out of the hands of public agencies, and these challenges have to be addressed. The real-life lab that is Singapore presents a range of issues concerning encryption, the benefits of aggregation and data mining, and the abuse and misuse of personal information. Singapore comes across as a large-scale real-life experiment.

#### *A smart nation or a learning city? Can a city learn to be smart?<sup>1</sup>*

Singapore is making widespread use of artificial intelligence (AI). Its initiatives will support the upskilling of twelve thousand professionals and students in AI. These initiatives aim to encourage citizens to spearhead this movement proactively. Singapore's many data- and technology-driven initiatives are leading to the creation of a comprehensive smart ecosystem that could place citizens at its heart. For many locals, there can be no doubt that Singapore is the most advanced smart city in the world, but the efficiency of its hyperconnected model evokes contrasting thoughts of worry and wonder in visitors.<sup>2</sup>

Overall, while it is clear that Singapore's physical, economic, and social environment will keep evolving, its political leaders, administrators, and civil servants will need to strive to rise to new challenges that have been emerging before and since the COVID-19 pandemic. These challenges include dealing with climate change, fostering economic growth, delivering environmental sustainability, ensuring energy security, and coping with legal issues. More can be done, particularly in educating civil servants and the public on how

[1] In 2020, HEC Paris students Benoît Gufflet and Dimitri Kremp set off on a research expedition to explore seven "smart cities," subsequently publishing their findings in a report called Learning Cities. They coined that term to describe cities that have set their own learning curves and exhibit a good mix of experimentation, experience, and knowledge. <https://www.acrosstheblocks.com/learningcities> (Accessed on 22 March 2021).

[2] Gufflet, B. and Kremp, D. (2021). Op. cit., pp.56-59.

to manage resources such as water better. The challenge is to shift mindsets when it comes to governing this Smart Nation. There is also a need for greater citizen participation in decision making in the context of the environment, something that represents a true test of the collaboration between the state and the people. Given that Singapore is recognized across the world as occupying a leading position in the development of smart city strategies that focus on digital technologies, it is important for us to assess the key determinants of Singapore's smart city policy.

Below we summarize the main advances that the Smart Nation has ushered in.

**Recycling services:** The government implemented the Singapore Packaging Agreement (SPA), a joint initiative by the government, industry, and NGOs to reduce packaging waste. It deals with about one-third by weight of Singapore's domestic waste. So far, fifty-four thousand tons of packaging have been recycled, representing 130 million Singapore dollars in savings over twelve years ([NEA website](#), 2020)

**Public safety:** Back in 2016, the Singapore Police Force stated in its Annual Crime Brief that ten thousand police cameras had been installed by the Housing and Development Board (HDB) and that 3,400 pieces of footage had helped the police to solve more than 1,600 cases (Singapore Police Force, 2016).

- "74% of Singapore citizens want the police to make greater use of CCTV cameras" (Accenture Consulting, 2018);
- "67% of Singapore citizens say the presence of CCTV security cameras makes them feel safer" (Accenture Consulting, 2018).

**Mobility:** Motorized traffic in Singapore produces 75 percent of the city-state's air pollution, and land transport produces 20 percent of its carbon emissions (Smart Mobility 2030, 2014). The city has acknowledged that, with regard to public transportation, it focuses on maintenance actions and investment processes to increase the share of green transportation. Implementing this green mobility focus will involve tripartite collaboration between public agencies, academic and research institutions, and industry players.

**Green Spaces:** The Sustainable Singapore Blueprint, published in 2014, sets achievement of the following objectives by 2030:

- Developing the length of the Park Connector Network

by 32 percent (equivalent to an increase of four hundred kilometers in total);

- Increasing the length of the Nature Ways by 165 percent (equivalent to a 180 kilometer increase in total) (Park Connector Network, 2020: 3);
- Ensuring that 90 percent of households are within a ten-minute walk of a park (the figure having stood at 83 percent in 2015);
- Increasing the number of active green volunteers by 233 percent (which would mean a total of five thousand volunteers; there were 1,500 such volunteers in 2015).

**Lifelong opportunities:** Singapore is always adopting cutting-edge technologies, prompting new job categories and business opportunities (Robert Kamei, 2017). The government is aware that upgrading skills and ensuring access to lifelong learning opportunities would help to maintain and promote the Smart Nation's development. Therefore, on the Smart Nation Singapore online platform, many programs have been created to ensure citizens will have access to lifelong opportunities.

**Business-led job creation:** Singapore's Industry Transformation Program, which has a budget of 4.5 billion Singapore dollars, will digitalize economic growth. The National Environment Agency's recommendations, guided by the Economic Transformation Maps,<sup>3</sup> cover twenty-three economic sectors (SG:D, 2018). Based on this program, we understand the Singapore Smart Nation program essentially focuses on promoting technology as the primary source of growth. Indeed, in Singapore, technology has helped SMEs to flourish, and individuals feel empowered by becoming content creators and service providers (SG:D, 2018).

**Housing and energy:** The Housing and Development Board (HDB) manages around ten thousand residential blocks, allowing the agency to play a vital role in climate transition. In alignment with the Sustainable Singapore Blueprint published in 2015, the HDB has developed a Sustainable Development Framework to ensure that sustainable building design initiatives will be implemented (HDB website, 2020). Moreover, the Building Research Institute (BRI), the research arm of the HDB, is focusing principally on building and environmental sustainability within five key population clusters (HDB website, 2020).

[3] The Environmental Services Industry Transformation Map (ES ITM) is one of the four ITMs under the Built-Environment cluster.

Smart Labs Singapore: Kampong Punggol was a fishing village back in the nineteenth century, making it one of Singapore's oldest settlements. However, from 1990, the town started to implement new planning concepts. It embodied a new vision: "A Waterfront Town of the 21st Century" (SSB, 2015). Two decades later, in 2010, the HDB started working with Punggol<sup>4</sup> to make the village become the first ecotown in Singapore (SSB, 2015).

Latest Technologies: The Singaporean government aspires to maintain its leading position in terms of technological developments and strengthening the digitalization journey. Therefore, the government is always looking into the latest cutting-edge technologies. A 5G mobile network is being implemented as part of its narrowband IoT network plan (SNDGO, 2018). The Wireless@SG initiative will ensure that fiber optic coverage is implemented so that every person can access high-speed Internet.<sup>5</sup>

We have organized our analysis of Singapore's main decisions and projects according to the principal topics and themes summarized above, and we have discussed their scope, implementation, adaptation, and limitations.



[4] Punggol is a planning area and new town situated on the Tanjong Punggol peninsula in the North-East Region of Singapore.

[5] <https://www.imda.gov.sg/programme-listing/Wireless-At-SG> (Accessed on 10 June 2021).