



PLANNING AND GOVERNANCE  
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# Adapting to Disruptions with Urban Systems Innovation



Public housing residents at the Geylang Estuary during a flood in December 1969.  
*Image: Singapore Press Holdings*

**Good planning and governance can help a city overcome the many challenges of urbanisation and emerge more resilient. Khoo Teng Chye, Executive Director of the Centre for Liveable Cities, discusses Singapore's urban systems approach, which underpins its successful transformation from urban disorder into a liveable and sustainable city.**

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### **From Urban Chaos to a Liveable and Sustainable City**

In 1965, Singapore faced the greatest disruption in its short history—becoming, not by choice, an independent city-state. It was then a city struggling with unemployment, overcrowded slums with poor sanitation, droughts, floods, pollution, disease and traffic congestion. With more than 1.8 million people on an island of barely 600 km<sup>2</sup>, an area smaller than that of New York City, and almost no basic resources like water, energy and food, Singapore seemed then to be a case of urbanisation gone wrong. It was neither a liveable nor a sustainable city.

Since then, Singapore has transformed into one of the world's most liveable cities, even as its population has tripled to 5.7 million over the past several decades.

Today, on indices such as Mercer's Quality of Living survey, Singapore consistently ranks highly among the world's most competitive economies and on various liveability, sustainability and green indices.

From a satellite view, more than 40% of the island is covered in green, thanks to several million trees that were planted over the decades. A dense network of national, town and neighbourhood parks is linked by park connectors. More than 80% of the population live in well-designed and inclusive communities, where 90% own high-rise homes that have easy access by foot, bus or train to workplaces, schools, community centres, libraries, sports facilities and parks.

## Even as its population has tripled in the past 50 years, Singapore now ranks highly for liveability.

### **The Urban Systems at Work: Dynamic Governance and Integrated Planning and Development**

Achieving such liveable and sustainable outcomes required a systemic approach that comprises good governance and an integrated approach to planning, building and managing the city. This involves not only the government, but also the private sector and the community, as well as learning from the best practices of other cities and experts from all over the world.

The Centre for Liveable Cities has distilled this approach into the Singapore Liveability Framework, with dynamic governance and integrated master planning as the systems that undergird the city's approach to sustainable development.

This approach is what we call an urban systems approach, and the principles captured in the Liveability Framework are universal and not unique to Singapore.

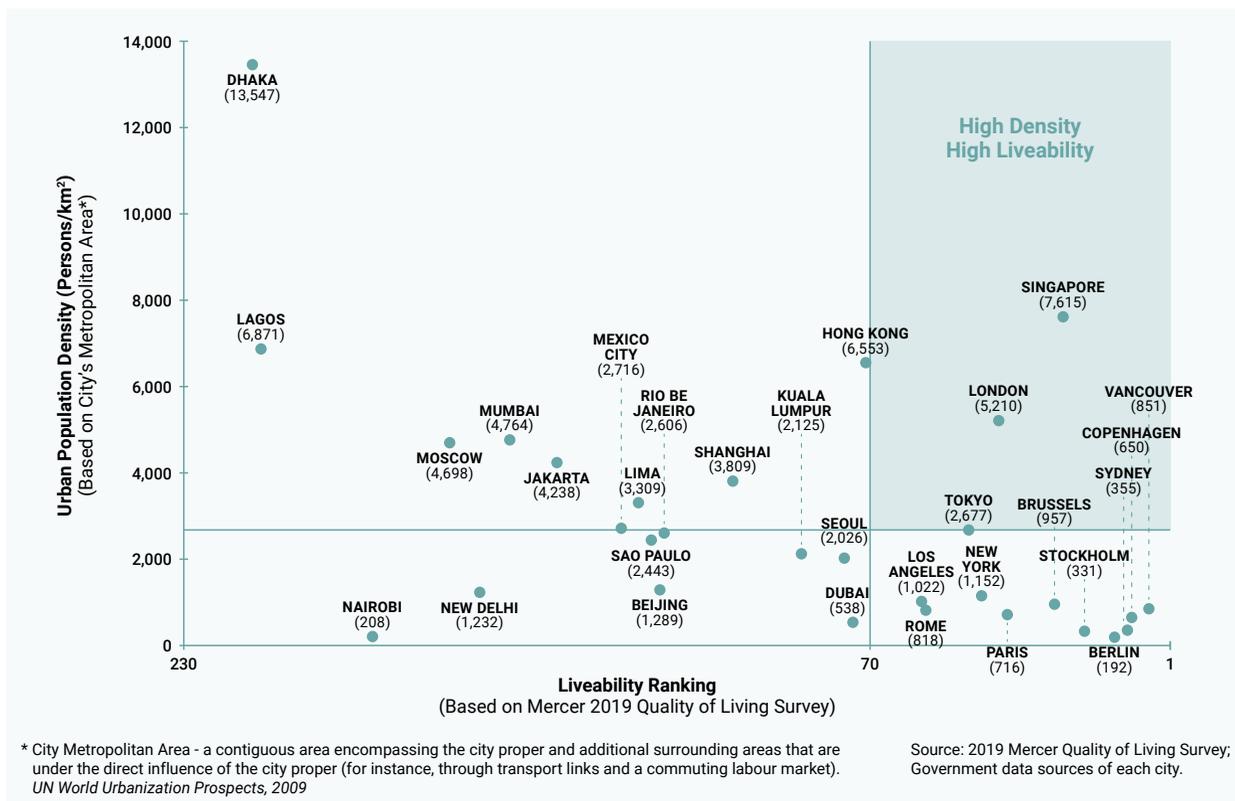
### **Water: An Urban Systems Innovation**

Water is an example of how the urban systems approach has worked in practice to create systemic innovation and support sustainable development in Singapore.

Singapore has an equatorial climate with plenty of rainfall. Yet it is water-challenged, as it does not have enough land to capture and store all that rain, and it has no natural aquifers or other sources of water. So water became an existential challenge when we became an independent nation, as we had to import much of our water.

In the 1960s, when Singapore's founding Prime Minister Lee Kuan Yew challenged our engineers to collect all the water that fell onto the island for consumption—an average of 2,400mm per annum—the engineers balked. Singapore then was a polluted place, its streets filled with rubbish from hawkers, with poor sanitation and discharge from farms and factories going straight into drains and rivers that were effectively open sewers.

Nevertheless, the need to solve this critical challenge for Singapore spurred the water engineers to take a systems approach. They worked



When Mercer's Quality of Living ranking of cities is plotted against population densities, Singapore emerges as one of the few to have achieved high liveability amid high density.  
Image: Centre for Liveable Cities

## The need to solve the critical challenge of water spurred our engineers to take a systems approach.

with the urban planners, the housing agency and the environment ministry to reduce pollution in urbanised areas and enable them to function as water catchment areas. This paved the way for the development of 17 urban reservoirs that harvest the rain that falls on two-thirds of Singapore. It is probably the most extensive urban stormwater harvesting in any city. This innovation was possible only with good leadership, strong institutions, laws and enforcement, and good professional plans based on good science and technology— involving many government agencies, private companies and the community.

Another water system innovation was NEWater, which closed the water sustainability loop by recycling used water. The innovation that Singapore achieved was not just the membrane technology behind water recycling, but also

successfully scaling up the recycling of used water to the city level. To be able to do this requires a systems approach to collect used water, treat it at water reclamation plants, recycle it at NEWater plants and then distribute it to users. Besides the systems engineering challenges, community acceptance was a major challenge and required comprehensive community education and engagement, as well as international experts to audit the recycling process. NEWater is now able to supply up to 40% of Singapore's current water needs. No other city has been able to recycle used water at the scale that Singapore has.



The Sengkang Floating Wetland in Punggol Reservoir helps improve water quality and provides a natural habitat for birds and fishes. Boardwalks allow people to enjoy the views and learn about the wetland ecosystem.

*Image: huntergol hp / Shutterstock*

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## || The systems approach to innovating on a large-scale makes the dense city more liveable.



Innovating within the water subsystem is already a huge challenge for many cities. To further integrate water within the broader urban system is even more challenging. Engineered solutions like pipes, concrete drains and canals are ugly and contribute to urban blight. Singapore has sought to address this by integrating water infrastructure with nature and greenery. This yields multiple benefits for the city. Nature-based solutions soften the urban landscape and make the city more attractive, which in turn improves property values.

The Active, Beautiful and Clean Waters programme aims to make Singapore as blue as it is green by gradually naturalising as much of its 17 reservoirs, 32 rivers and 8,000 km of stormwater network as possible. Projects like the Bishan-Ang Mo Kio Park, where a 3 km concrete canal was turned into a meandering stream in an enlarged park amidst a high-rise residential district, demonstrate the systems approach to innovating on a large scale to make the dense city more liveable.

## A Similar Systems Approach by Successful Cities Worldwide

While the urban systems approach has been deeply ingrained in Singapore's development journey, it is not unique to Singapore. It is also the approach of many successful cities such as Bilbao, New York City, Suzhou and Medellín, which have all been awarded the Lee Kuan Yew World City Prize.

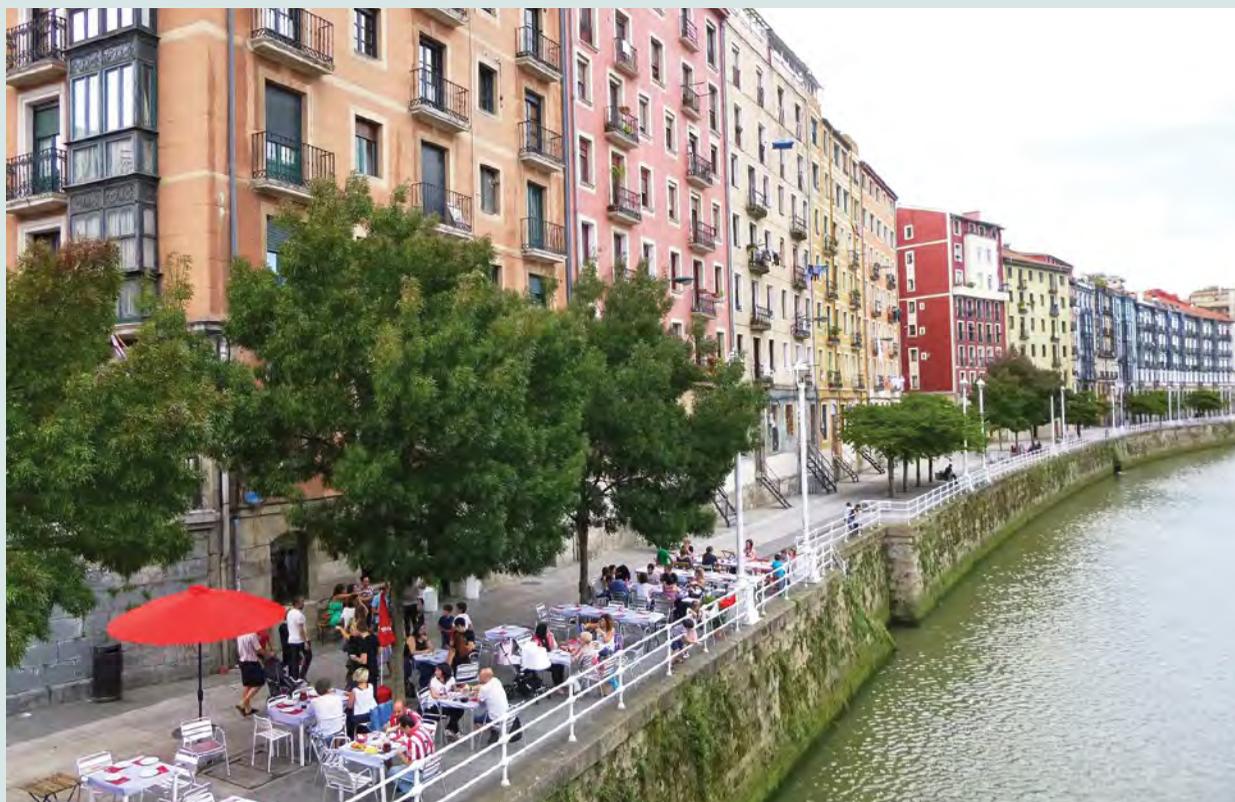
Bilbao, Spain, transformed from a dilapidated industrial city into a knowledge-based economy through an integrated and holistic approach. One key example is the transformation of its Abandoibarra district. It was once an obsolete and run-down industrial area adjacent to the River Nervión, a physical and social barrier between residential

areas and the river. By balancing the twin aims of infrastructure investment and social integration, the river and its waterfront have now been transformed into a hub for social and cultural integration, and a centre for innovation and creativity.

New York City, United States of America, adopted key strategic urban planning initiatives, post-9/11, that enhanced its stature and demonstrated its resilience. Suzhou, China, was recognised for its efforts to transform itself rapidly in the last two decades, going from an agricultural, export-oriented economy to being an innovative, high-value, service-oriented city through proper planning

and investment in key physical infrastructure. It is also known for its efforts to preserve and maintain its historical and cultural heritage.

Once plagued by violence and inequality, Medellín, Colombia has, within two decades, turned into one that seeks to empower every member of society, putting the needs of its citizens at the forefront of planning and policies. For example, the Unidades de Vida Articulada (UVA – Life Articulated Units) programme invites citizens to be actively involved in the building of sports, recreational and cultural venues on previously inaccessible plots of land set aside for various utilities.



The transformation of Bilbao's Abandoibarra district has also led to revitalisation of neighbouring districts such as La Vieja.  
Image: Zarateman / Wikimedia Commons



Suzhou has transformed itself through investments in infrastructure while carefully preserving its historical and cultural heritage.  
 Image: The Publicity Department of CPC Suzhou Committee



Boys playing in Medellín's UVA de la Imaginación, sporting and leisure facilities built on previously inaccessible plots of land.  
 Image: nigel burgher / Flickr



Good governance and integrated planning will help Singapore and other cities remain liveable and sustainable.



Students learning about Singapore's NEWater recycling process.  
Image: Syed Omar Fadzil / Flickr

### A Continued Need for an Urban Systems Approach

The systems approach of good governance with integrated planning and development has helped Singapore achieve water sustainability, become green, create inclusive towns and link them with good transport networks.

But Singapore remains an island with significant resource constraints. To continue to achieve a good quality of life, a sustainable environment and a competitive economy for everyone, the urban systems approach to tackling emerging and future challenges will be more relevant than ever.

Singapore is being confronted with new challenges arising from climate change, especially as a low-lying island with an equatorial climate. The city is already experiencing more extreme weather events such as heavy rains leading to floods, and faces the prospect of sea-level rise. It also faces demographic challenges like a rapidly ageing

population and the challenge of integrating a workforce of one million non-citizens into society.

Good governance and integrated planning will be key to dealing with these challenges. Singapore continues to plan and execute system-wide initiatives such as embracing a “car-lite” transport strategy, weaving nature into the urban fabric to create a City in Nature, and ensuring an inclusive City for all Ages. An investment of S\$19 billion has been committed to research and development for urban and other challenges, spearheaded by the National Research Foundation. The disruption of climate change has been addressed at the highest level by Prime Minister Lee Hsien Loong, who at the National Day Rally 2019 announced plans for S\$100 billion in funding for Singapore to adapt to climate change over 100 years.

Continuing to adopt good governance and integrated planning is an approach that will help Singapore and other cities remain liveable and sustainable. It will also help cities become more resilient, better able to manage and recover from sudden economic, social and environmental disruptions, and emerge even stronger.

The ongoing COVID-19 pandemic has been a great disruption, the likes of which no country has experienced before. But Singapore has learnt from its 2003 SARS experience, and is learning even more as it systematically addresses the evolving situation.

Amidst this major global disruption, the Centre for Liveable Cities continues its work of building and sharing knowledge among urban practitioners and experts, and Singapore hopes to continue connecting with a network of cities that are all working towards becoming liveable, sustainable and resilient. 