URBAN SOLUTIONS

Emerging Stronger

CITY PERSPECTIVES

EMBRACE NEW PERSPECTIVES INSPIRE NEW POSSIBILITIES

At Singapore Management University, we put cities at the heart of our focus. City Perspectives is the platform where we address the pressing issues of our time with insightful ideas on Digital Transformation, Growth in Asia and Sustainable Living from leading experts.

Explore articles, podcasts and videos by esteemed thought leaders on current subjects that impact society, business and the world at large. Whatever the interest, they serve to fulfil one goal: To enlighten, challenge and inspire solutions to bring about change for good.

cityperspectives.smu.edu.sg

URBAN SOLUTIΦNS

ISSUE 21 • JUL 2022

CENTRE for
LiveableCities
SINGAPORE

CLC IS A DIVISION OF

MND
SINGAPORE

FSC
www.fsc.org
RECYCLED
Paper made from recycled material
FSC® C123317

Cover Image: Aerial view of city centre from St. Stephen's Cathedral, Vienna, Austria.
Image: bortnikau / iStock

Image Credits

Emerging Stronger

"Government agencies should see themselves as not just regulators, but also innovators alongside our industry counterparts."

LIM ENG HWEE

46

"In order to meet the challenges of the future, we need to restore a sense of togetherness."

PETER MANUEL FELDMANN

14

"More than a collection of products and services, we can begin to think about our cities as places that we contribute to making and caring for."

SARAH ICHIOKA

34

"Tackling climate change whilst building an inclusive and liveable city is a long-term endeavour that will require the collective efforts of all stakeholders."

INDRANEE RAJAH

06

"By investing in nature, people and institutions, cities can continue to be the powerhouses of innovation, opportunity and growth, anchoring a green, resilient and inclusive recovery."

SAMEH WAHBA

30

3

"PPP policy design should shift from a finance-oriented or an efficiency-oriented approach, to a sustainability-oriented and people-centred one."

PROFESSOR ZHU DAJIAN

38

Contents

4

TODMORDEN
ANTWERP
PARIS
LISBON
BOSTON
FRANKFURT
VIENNA
BARCELONA
SHANGHAI
ALABANG
MEDELLÍN
FREETOWN
COLOMBO
SINGAPORE
SÃO PAULO
BEIRA
SYDNEY

From the Executive Director

Building Stronger and Sustainable Urban Futures Together

Generating 80% of the world's economy and home to half its population, cities are at the frontline of the climate crisis, and womb to the innovations and resources needed to spawn solutions. How then can cities create sustainable futures fast enough, while emerging stronger in the process? What paradigm shifts would pave the way for this vision, changing the way cities are designed, built, financed and operated?

Featuring interviews and guest articles by city leaders and experts, this World Cities Summit special issue of Urban Solutions explores the vision of a stronger and sustainable urban future through various themes. I wish to highlight three key insights that have emerged:

Sustainable financing is the missing piece.

Accelerating sustainable financing to create and enable green solutions is critical. Minister Indranee Rajah's reflection on Singapore's progress in sustainable development and green financing highlights this. Likewise, in his essay Sameh N. Wahba explores how investing in nature, people, institutions and resilience are cost-effective and have long-term payoffs.

Multi-stakeholder ecosystems play a key role in future urban development.

A strong ecosystem comprising the community, institutions, and the private and public sectors is crucial and forms the bedrock of future urban development. In his essay, Professor Zhu Dajian notes the importance of public-private partnerships in urban infrastructure development, and shares an analytical framework based on finance, governance and policy. Lim Eng Hwee examines how collaborations can help usher in a new era of urban logistics.

We need a paradigm shift in the way we think about cities.

Today's cities need to start thinking differently. Sarah Mineko Ichioka argues we should reconsider cities as places we contribute to making and caring for—rather than consume. The New Urban Kampung Research Programme offers us a glimpse into a future neighbourhood built with the help of data, while the Incredible Edible Todmorden and the Loveability Project explore cities thriving on kindness and emotions. Mayor Peter Manuel Feldmann also shares how diversity has been key to the success of Frankfurt so far, and will likely stay so in the future.

Also featured is Vienna, the Lee Kuan Yew World City Prize 2020 Laureate. Austria's capital is a leader in adapting to climate change. Its groundbreaking initiatives include managing flood risks and an eco-friendly mobility that slashes carbon emissions while improving residents' quality of life. The Special Mentions of the Prize also offer inspiration and insights into a stronger and sustainable urban future.

This special issue of Urban Solutions for the 8th World Cities Summit (2022) expresses hope for the future of our cities. I hope it leaves you optimistic too, so we can—and will—emerge stronger.

Hugh Lim

Executive Director
Centre for Liveable Cities

5

IN CONVERSATION WITH
INDRANEE RAJAH

An Inclusive and Sustainable Singapore

Indranee Rajah, Singapore's Minister in the Prime Minister's Office, Second Minister for Finance and Second Minister for National Development, gives us the lowdown on the city-state's net zero transition strategy, and how green finance, technology and the community will underpin its success.

Image: Ministry of National Development (MND), Singapore

> **Singapore has been working hard to build an inclusive and liveable city, undertaking placemaking efforts to forge strong community bonds within neighbourhoods and with the city.**

What would make Singapore an inclusive and liveable city? How will the nation's drive towards net-zero emissions feature in this, and where are we now vis-à-vis the target?

An inclusive and liveable city is one with a high-quality living environment where communities are well connected and thriving. This could be achieved by applying inclusive housing concepts and offering a range of amenities that improve the quality of life, e.g., green and play spaces. Singapore has been working hard to build an inclusive and liveable city, undertaking placemaking efforts to forge strong community bonds within neighbourhoods and with the city.

These strong community bonds are not just a feature of an inclusive and loveable city but also a key driver of our net-zero emissions ambition. That's because tackling climate change whilst building an inclusive and liveable city is a long-term endeavour that will require the collective efforts of all stakeholders. People could take greater ownership of the sustainability efforts in their neighbourhoods, play an active role in coming up with solutions and partner other stakeholders, such as businesses and educational institutions.

Singapore has the right foundations in place to make the transition towards net zero. Beginning with communities, we launched the Green Action for Communities, which brings together members of the community to plan, organise and implement sustainable initiatives in engagement with stakeholders across all districts. Such community-led initiatives are an important complement to regulations and sustainable building policies.

In terms of public policy, Singapore has introduced a carbon tax to address the problem of large emitters. To enable the transition to a low-carbon future, Singapore will raise its carbon tax levels progressively from 2024. Revenue from the carbon tax will be used to support our decarbonisation efforts and transition to a green economy, including cushioning businesses and households from the impact of the shift.

7

Bishan-Ang Moh Kio Park, Singapore.
Image: Kandl / iStock

8

> **Our net zero transition will require a significant redirection of capital towards sustainable financing to create and enable green solutions.**

Finally, on the infrastructure front, Singapore has taken great strides in improving the energy efficiency of buildings. For example, the Building and Construction Authority's Super Low Energy programme encourages the implementation of leading-edge energy-efficient solutions for new and existing buildings. There is also the practice of sustainable construction methods that encourage more recycling and upcycling of construction waste, alongside the efficient use of building materials and substitution of concrete with natural materials. Such initiatives will steadily decarbonise our built environment, for both new and existing buildings.

Together, these solutions work on various fronts to help achieve Singapore's net-zero objectives. They are also a work in progress, which Singapore has been advancing over many years and will continue to do so in our transition towards a low-carbon future.

How important is sustainable financing to Singapore's future development? How is the Singapore government leading the way in sustainable development and financing its built environment while developing partnerships with other governments, multilateral banks and the private sector?

Sustainable financing will be an important component of Singapore's future development because it incentivises businesses to help the environment. This encourages and creates a space for private-sector participation in Singapore's future development. There is better sharing of the risks and costs associated with infrastructure development; private-sector collaboration will also inject fresh ideas and greater innovation, and reduce

project completion times. Moreover, our net zero transition will require a significant redirection of capital towards sustainable financing to create and enable green solutions. This is the future trajectory of sustainable development in Singapore.

We are not new to sustainable financing though. Singapore is the largest sustainable finance market in Southeast Asia, accounting for close to 50% of the region's cumulative sustainable debt issuances, to date. To further develop Singapore into a sustainable finance hub in Asia and to achieve our vision for a sustainable future, the Monetary Authority of Singapore (MAS) has put together a Green Finance Action Plan. This includes ensuring there are consistent, comparable and reliable climate-related data, definitions and disclosures for sustainable finance to work effectively.

Singapore is also actively working with industry and international partners to put in place key enablers to scale sustainable finance globally. This means engaging with financial institutions to include environmental, social and governance (ESG) criteria in their decision-making processes; driving the adoption of industry standards and guidelines; encouraging industry-led capacity-building efforts; developing the green bond market in Singapore; and finally, collaborating with local stakeholders and international counterparts to distil best practices.

To foster the growth of a strong and diverse ecosystem of green financing capabilities in Singapore, the MAS has set up a US$2 billion (S$2.81 billion) green investment programme. Among its focuses are attracting sustainability-focused asset managers to Singapore and catalysing funding for environmentally sustainable projects in Asia.

9

Indranee Rajah, Singapore's Minister in the Prime Minister's Office, Second Minister for Finance and Second Minister for National Development, engaging stakeholders.
Image: Ministry of National Development (MND), Singapore

More recently, Singapore published the Singapore Green Bond Framework, which lays the foundations for the issuance of green bonds by the Singapore government. These new guidelines will serve as a benchmark for corporate green bonds. The sovereign green bonds will be used to finance nationally significant infrastructure, such as the upcoming Jurong Region Line and the Cross Island Line, and will help us achieve the ambitious goal of reducing land transport emissions by 80% by or around 2050. We are also exploring the use of green bonds for climate change adaptation projects, including coastal protection.

Green financing will require the use of digital enablers, such as data platforms that aggregate multiple data points for practical applications in the built environment. How will these platforms contribute to making Singapore's built environment more sustainable?

Currently, there is a shortfall of high-quality, trusted data on sustainability outcomes, which suitable data platforms can help address. Narrowing or closing these data gaps will in turn enable financial institutions to direct capital towards sustainable built environment projects in a more scalable way, in addition to effectively monitoring their sustainability performances and quantifying the risks and real-world impact of their portfolios.

For example, the MAS is currently working on two use cases, using data from its Project Greenprint's ESG Registry and Data Orchestrator to facilitate green and sustainability-linked trade finance in the sectors of building and construction, and palm oil, in collaboration with industry players. This will

10

Reflections at Keppel Bay.
Image: dennisthetiger / iStock

facilitate banks' digitalisation of green trade finance transactions, and provide greater assurance of these transactions meeting the criteria set out in the banks' green and sustainability financing frameworks. The industries will also gain more seamless and timely access to green trade financing from banks.

Overall, the presence of a common data platform supports the development of a green finance ecosystem, where green technology providers are connected to investors and financial institutions, boosting the uptake for sustainable urban development, moving forward.

In what other ways would technology play a part in Singapore's future urban development?

Singapore has consistently turned to technology as an enabler of city planning and a source of solutions to our urban challenges. In Singapore, "smartness" is not just about having the most sophisticated or advanced technologies; rather, it is about innovatively harnessing technology and integrating it in the planning, development and governance of our urban systems, to make people's lives more convenient and liveable.

For example, as part of Singapore's smart and sustainable efforts, our newest housing town at Tengah is planned with green design principles and smart technologies, focused on eco-friendly and improved cooling. To this end, the Housing & Development Board collaborated with local research institute, A*STAR, to study different environmental factors, such as solar heat gain, wind flow, air temperature, and their combined effects on the urban landscape. This helps our urban planners to design open spaces and optimise building layouts and orientation to promote natural ventilation within the town, thereby creating a living environment of improved breathability and comfort. The town will also have an automated rubbish collection system, as well as centralised cooling systems for homes.

The future of mobility is another area where technological innovations will serve to develop a sustainable, people-centric network while supporting efficient urban logistics. This will improve the way people move around in Singapore, and offer us adaptability in meeting our evolving needs. This could be in the use of autonomous vehicles, which would not only reduce the accidents due to human error, but also help optimise road spaces and address manpower shortages while creating new job roles. To support such innovations, Tengah will feature road networks designed to cater for autonomous vehicles. Beyond autonomous vehicles, Singapore is also analysing anonymised data from commuters' fare cards to identify commuter hotspots and in turn, better manage bus fleets. This data contributes towards Singapore's public transport planning, ensuring that the bus system is efficient while meeting commuters' needs.

What other paradigm shifts should cities prioritise to "emerge stronger"?

Cities can emerge stronger by embracing nature and ecosystem services (i.e., the benefits that ecosystems bring to our well-being) in our future urban development. For instance, initiatives like NParks' OneMillionTrees

> **Moving forward, we can collectively do more by leveraging the synergies of ESG for companies to similarly invest in nature-based solutions in Singapore.**

11

Artist's impression of the Tengah New Town.
Image: Housing & Development Board (HDB), Singapore

12

As individuals and communities gain greater awareness of sustainability and climate change issues, we have begun to see the community getting involved in awareness building and solutions development.

movement which aim to plant one million additional trees is an effort to leverage the natural ecosystem to cool the built environment, store and sequester carbon, while strengthening ecological connectivity in Singapore. Moving forward, we can collectively do more by leveraging the synergies of ESG for companies to similarly invest in nature-based solutions in Singapore.

We would also need to consider the role of the community in strengthening our cities. For example, as individuals and communities gain greater awareness of sustainability and climate change issues, we have begun to see the community getting involved in awareness building and solutions development. The Singapore government set up the S$50 million SG Eco Fund in 2020 to support community-based projects that advance environmental sustainability. Through the fund, the community learns to build a more sustainable Singapore for the present and future generations. Awarded projects include a self-help recycling zone by the Buddhist Compassion Relief Tzu-Chi Foundation, set up to teach community residents to recycle in the right way; and an environmental education programme, Student Heroes in Environmental Leadership Development, where student leaders are mentored to implement environmental projects in their communities.

Support for ageing in place is another priority. Specifically in Singapore, the society is maturing into its third age. This may require the rejuvenation and revitalisation of housing typologies, to address the needs of an ageing population. A big part of this involves exploring new housing and care options for senior residents, such as multigenerational dwellings or service-bundled housing. Efforts are already ongoing to introduce new typologies such as those in Kampung Admiralty and the Community Care Apartments, which are elderly-friendly housing with care options. A new project I would like to highlight is the Health District @ Queenstown, where we are piloting various initiatives to support residents to lead healthy and purposeful lives. We hope this will pave the way for supporting seniors nationwide, as successful initiatives in the Health District could be included in future rejuvenation plans and scaled to other towns and estates.

SOLUTIONS FOR SUSTAINABLE CITIES OF THE FUTURE

As one of the world's leading industrial firms, Mitsubishi Heavy Industries Group's extensive technology portfolio and long-term expertise enable us to innovate and deploy tailored infrastructure and energy solutions to meet the unique development and decarbonization needs of each country.

**MITSUBISHI
HEAVY INDUSTRIES** | **MISSION NET ZERO**

IN CONVERSATION WITH
PETER MANUEL FELDMANN

Harnessing Diversity to Emerge Stronger

Peter Manuel Feldmann, Lord Mayor of Frankfurt, shares how the city has harnessed its diversity to be a liveable and sustainable place for everyone, and what it is doing to emerge stronger in the future.

Image: Frank Widmann

▌▌ A population as diverse in its composition as ours is a significant factor of our economic innovation. ▌▌

The city of Frankfurt is known to be culturally and ethnically diverse, with more than half the population having an immigrant background. How has this diversity contributed to the success of Frankfurt as a liveable city?

Frankfurt is one of Germany's most diverse cities, which also characterises how it sees itself. People from 180 countries live here. More than 54% of Frankfurt's residents have an immigrant background, with that figure rising to 70% among those aged under 18. This diversity is reflected on various levels and contributes to the success and well-being of its people.

These different cultural backgrounds, together with the enterprises from all over the world that operate here, give Frankfurt its unique international flair and make the city a leading international business and industrial location. Companies started by immigrants are also playing an increasingly important role. A population as diverse in its composition as ours is a significant factor of economic innovation.

Voices and perspectives that are often neglected or ignored in political and social processes elsewhere are woven into the political fabric of Frankfurt. The composition of our city parliament, for example, is significantly more diverse than the national average. Frankfurt's Kommunale Ausländerinnen- und Ausländervertretung (KAV–Municipal Foreigner Administration Office), the city's political body advocating local integration policy, takes

View of the streets of Altstadt.
Image: Stadt Frankfurt am Main

action against inequality and discrimination. It actively places the concerns of immigrants at the heart of the city's politics. Such representation in political bodies and processes takes lived realities into account, and results in concrete ways to give people visibility and support in their different life situations.

Our diversity also engenders a general openness to new developments in urban society and cultural creativity. Frankfurt's art and cultural scene is very varied. International communities form an institutional body that has an impact not only on working life, but also on social coexistence, the educational landscape, leisure and shopping opportunities. This body considerably enhances the quality of life for all Frankfurt citizens. The annual International Frankfurt Book Fair—the world's largest book fair— is just one of the many attractions of our city. More than 7,000 exhibitors from around 100 countries present their latest offerings here, with a different "host" country whose book industry and culture is highlighted each year. Also worth mentioning is the "Kultüröffner: Museum" project, which provides museum and exhibition tours in various languages. Literally meaning "open culture", the Kultüröffner is a collaboration between Amt für multikulturelle Angelegenheiten, or AmkA (Frankfurt's Office for Multicultural Affairs), five city museums, and socially committed individuals or groups from various communities.

Our diversity also engenders a general openness to new developments in urban society and cultural creativity.

The population diversity in the different city districts is also a basis for reducing tensions. Studies (including in the Frankfurt urban area) show that greater diversity in a neighbourhood leads to more friendships and acquaintances with people from different cultural backgrounds. The result is a special sense of global connectedness that manifests itself, for example, in a willingness to help each other and to react quickly and creatively to challenges. In March 2022, for example, Frankfurt responded swiftly to support the sudden influx of Ukrainians by setting up a coordination centre to advise and help the arriving refugees as best as possible.

The different cultures, religions and languages of the people living here give Frankfurt its own special charm. Frankfurt is an important location for numerous international religious communities. The Bahá'í European Centre, the German headquarters of the Ahmadiyya Muslim Community and the second oldest mosque in Germany, are all here, for example.

Sexual and gender diversity is another living reality in Frankfurt. We have a large queer community that is actively involved in shaping the local cultural and social life. Numerous queer cultural locations are here. For example, the Frankfurt Angel is a memorial in the city centre that commemorates the persecution of homosexuals in Germany and worldwide on each International Day Against Homophobia, Biphobia and Transphobia.

17

The Frankfurter Angel which commemorates the persecution of homosexuals stands near St. Peter's church on Kalus-Mann-Platz.
Image: Reinhard Dietrich

Diversity needs to be protected by measures and legal ground.

What are some of the factors that have enabled such diversity to flourish in Frankfurt?

Our residents actively contribute to a range of associations and civil society organisations with their wide variety of life goals and perspectives. These include numerous immigrant organisations and associations that act as valuable links between newly arrived immigrants and the established society. Community representatives have also set up projects in education, empowerment and participation, shaping our welcoming culture.

But all this does not happen in a vacuum. It requires significant coordination by the municipality, e.g., by promoting a public culture of welcome and recognition. Diversity needs to be protected by anti-discrimination measures and be underpinned by an appropriate legal basis.

Diversity also needs to be nurtured in organisations. This takes the form of processes for intercultural openness and diversity management, as well as gender equality and steps against discrimination. AmkA was founded in 1989 as an independent office—the first of its kind—to reflect this diversity and positively shape coexistence in our city. It handles all issues related to diversity, anti-discrimination and social cohesion. It provides advice as a cross-sectional office interfacing between the administration and civil society, laying important groundwork.

In a 2019 interview with Mercer, the human resources consultancy that publishes the annual Quality of Living City Ranking, you mentioned that Frankfurt's challenges included "development of affordable housing as well as expansion and improvement of transport and digital infrastructure". Has Frankfurt adopted any innovations to address those challenges, which other cities can learn from?

We have passed a building land resolution, stipulating that larger projects and new building areas must consist of 30% subsidised housing, 15% communal and cooperative housing, 15% privately financed rented apartments and 10% reduced-price, privately owned apartments. This means affordable housing is created in mixed neighbourhoods throughout the city. Public housing associations play an important role in creating and maintaining affordable housing. I am very glad that these organisations have not been privatised, but have continued to offer housing for all in Frankfurt for almost 100 years.

Night View of Frankfurt.
Image: Steven Wei / Unsplash

Frankfurt was recently selected to play a key role in the green finance industry, as the headquarters of the International Sustainability Standards Board (ISSB), a new body for devising global sustainability disclosure standards. How else is the city leading or supporting this agenda as a financial hub?

Before becoming the head office of the ISSB, Frankfurt and the State of Hesse had already established the Green and Sustainable Finance Cluster Germany at the Frankfurt School of Finance & Management. Together with the ISSB and numerous public and private supporters, we are developing a sustainability network consisting of financial industry members, universities and regulators, in interaction with the non-financial industries. In addition, the new city government elected in 2021 has included many climate-friendly and sustainability measures in its coalition agenda.

Frankfurt has committed to have all its energy needs covered by renewable energy by 2050. Could you share with us where the city currently stands in achieving that goal, and what key lessons have been learned so far in your journey?

Between 1990 and 2017, Frankfurt's final energy consumption increased 1% in absolute terms. In the same period, its population grew 17% to around 741,000 inhabitants. Per capita greenhouse gas emissions fell 32% during this period. Energy consumption also fell in private households (-13%) and

the industrial sectors (-8%), while increasing in the trade, commerce and services sector (+8%) and in transportation in particular (+23%). The reasons cited for the rise in energy consumption in both sectors are a sharp increase in the number of data centres (accounting for one-sixth of electricity consumption in Frankfurt), as well as an increase in transit and delivery traffic in the city area and a general increase in traffic.

This data indicates that although Frankfurt has undeniably made progress in its efforts to achieve climate neutrality, they are still not enough for us to meet our climate targets. The city is thus considerably stepping up its climate protection efforts. To this end, it has passed far-reaching resolutions, such as the Climate Alliance of 2019, and further resolutions are to follow very soon. In addition, climate protection will continue to be supported, with significant increases in the relevant budget items planned.

One lesson we have learned in recent years is that climate protection requires not only continuous effort, often in the form of small-scale measures, but also the allocation of sufficient resources and the implementation of appropriate decision-making processes in the city. Another important lesson for us is that climate protection must be seen as a task for the society as a whole. Only as a team can we achieve success in climate protection. This is also reflected in our "Team Frankfurt Klimaschutz" climate protection brand. This commitment does not stop at the city level. We regard dialogue—with other municipalities in Germany that support climate protection, and also at the international level—as crucial.

A green city is a more liveable city, and a healthier one.

20

Green spaces in Frankfurt for everyone to enjoy.
Image: Jordi / Shutterstock

Cities across the world are facing many shocks and stresses, including the current public health and climate crises. As you reflect upon your time as Mayor of Frankfurt since 2012, what do you think it is about Frankfurt that has been key to its resilience through it all? And as we look into the future, what is Frankfurt doing to emerge stronger from the recent crises?

Frankfurt has a stable foundation—its firm belief in democracy and freedom. We are proud that the first steps towards German democracy were taken in our city in 1848—and we have learned just how fragile democracy and freedom are. This "never again" attitude, this rejection of hatred and extremism, has particularly deep roots in Frankfurt. We know that we must stand together in crises, and not be seduced by those who promise supposedly easy solutions.

This public spirit makes us strong; it keeps us on the right track. We have benefited from this most recently during the pandemic. The overwhelming majority pulled together, including in cases where it disadvantaged them personally. Even those who had to close their businesses knew we would support them when they would be allowed to re-open. We have lowered bureaucratic hurdles, set up support schemes and promoted local trade. There is also broad consensus in our urban society when it comes to climate protection.

In order to meet the challenges of the future, we need to restore a sense of togetherness. The climate crisis cannot be resolved by individuals acting alone. We have to see the bigger picture. We have to consider the conditions in which future generations will live—and this does not only include those who have grown up in Frankfurt. We cannot leave such matters to the market; we have to take them into our own hands. In short, it's less about "I" and more about "we". In my opinion, this represents a huge opportunity.

What would a stronger Frankfurt emerging from these challenging times look like?

Our Frankfurt will become more social and sustainable. And it will be more attractive to investors, even if this might seem a contradiction in terms at first sight. But a secure society is a stable society. A system that places greater emphasis on providing day care and education produces fewer school dropouts and allows parents to return to work more quickly. That is why it was right to make the day-care centres free of charge. There is a similar story when it comes to sustainability. Of course, sustainability costs money. But a green city is also a more liveable city, and a healthier one. And that is something worth fighting for. 🔍

21

VIENNA

At the Forefront Against Climate Change

TEXT: FENG ZENGKUN AND DAMIEN WOON

Vienna, the Lee Kuan Yew World City Prize 2020 Laureate, is a leader in adapting to climate change and limiting its adverse effects. Here are its ground-breaking initiatives, which have helped residents slash carbon emissions and improve their quality of life.

VIENNA
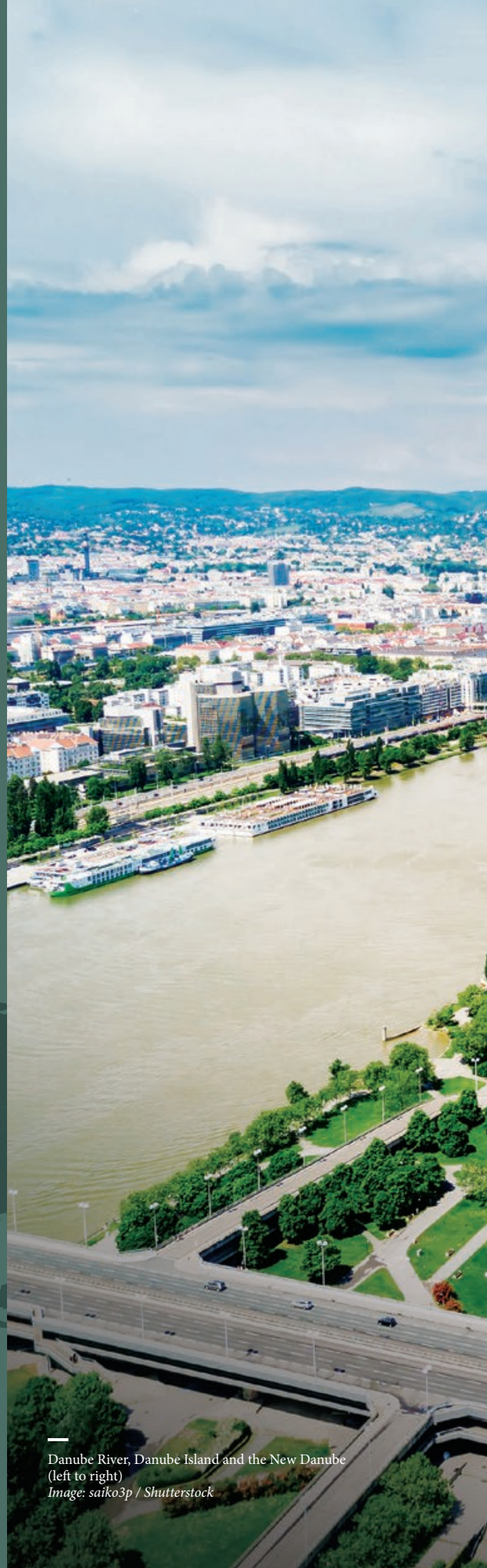
Danube River, Danube Island and the New Danube (left to right)
Image: saiko3p / Shutterstock

Vienna aims to be carbon-neutral by 2040, earlier than the European Union's 2050 target.

Care for the environment has always been at the core of Vienna's planning principles. The city adopted its first climate protection programme in 1999 and launched its Vienna Climate Roadmap in 2022. Over the past two decades, Vienna has reduced its carbon emissions per capita by almost 40% and aims to be carbon-neutral by 2040, earlier than the European Union's 2050 target.

"We have one of the densest public transport networks, are among the best in Europe when it comes to eco-friendly district heating, and have over 50% of our land area dedicated to green spaces. We are in a very good position and will continue to intensify our efforts in climate protection in all areas of the city," said Vienna's Mayor Michael Ludwig.

Boating on Danube River.
Image: WienTourismus / Paul Bauer

Danube Island serves as a centrally located large public space for recreational activities.
Image: Bravavod161 / Shutterstock

Efforts Against Flood Risks

Even before its climate programmes, Vienna had already conducted studies and built defences against flood risks. The New Danube and Danube Island is an ambitious, two-decade joint project completed in 1989 that created a 21 km flood control channel and a recreational island using excavated soil. The undertaking improved the city's flood protection and added a closed water body and a large public park for outdoor activities.

Running parallel to the Danube River, the new channel is designed to cope with otherwise catastrophic river flows statistically expected to occur every 3,000 to 5,000 years. It proved its value by averting major damages during a record torrential downpour in July 2021.

With accelerating climate change, the city started a five-year project in 2018 to further green Danube Island, install a wind-powered ditch irrigation system, and introduce a flock of 70 sheep to graze on its grassland in lieu of lawnmowers. These will decrease the island's carbon emissions and maintenance costs by up to 20% and 15%, respectively.

Vienna preserves over 50% of its land areas as green spaces.
Image: Syed Zain Mujtaba / Shutterstock

Aerial view of Nordbahnhof.
Image: Christian Fürthner

Green Capital of the World

Under its STEP 2025 urban development plan, Vienna actively expanded its green and open spaces, boosted its affordable and sustainable housing, and shifted its mobility options towards public transport, walking, cycling and other environmentally friendly modes.

To maintain the city's greenery, Vienna's guide on building 12 kinds of green and open spaces helps meet a range of constraints and needs. These include greening streets with grass verges, pavement trees and sidewalk gardens; turning open spaces in schools, kindergartens and sports complexes into community allotments; and converting walking and cycling paths into green axes.

Local green plans in renewal projects help guarantee that the city continues to enjoy diverse green and open spaces, by fulfilling conditions such as delivering at least 3.5 m² of such spaces per resident in the neighbourhoods. The city currently has an average of 9.3 m² of green space per person.

Vienna also continues to rehabilitate brownfield sites into parks. By 2025, it will convert the former Nordbahnhof railway station into Freie Mitte, a 93,000 m² park and nature area, and the city's largest new park since 1974. It will feature cycling lanes, skate parks and a wildlife reserve.

A Leader in Sustainable Housing

As Vienna's population grew, the city introduced measures to keep housing affordable and sustainable. Since its first municipal housing estate in 1925, the Austrian capital has erected some 220,000 low-rent public flats for around 500,000 people, or a quarter of its population. Successful applicants are not required to pay any deposit, commission or contract fees, making the flats truly affordable. The funding of 200,000 more subsidised apartments, run by cooperative housing associations, serves a further quarter of Vienna's residents.

Local green plans in renewal projects help guarantee that the city continues to enjoy diverse green and open spaces.

By taking a larger role in housing, including mandating low-energy standards for new public and publicly subsidised flats, the city has reined in its building sector's impact on the environment. For example, electricity for heating, the most power-consuming source in homes, has been limited to 30 kWh per square metre per year. The city estimates that its social housing averts about 371,000 tonnes of carbon dioxide emissions annually.

In June 2020, the city designated three areas as its first "climate protection areas", where new buildings are permitted only if equipped with climate-friendly heating and hot water supply systems. These areas will be extended to phase out fossil fuel-based heating and cooling systems in existing buildings.

Rudolf-Bednar-Park, a park in a modern residential neighbourhood.
Image: Kagan Kaya / Shutterstock

Vienna's historic centre.
Image: lizenzfrei

28

A Model for Eco-Friendly Mobility

Vienna has made strides in cutting carbon from its transport system, with only a third of the population owning a car today. Public transport makes up 38% of passenger trips, while walking has replaced the car as the second most popular mode of transport, at 28% and 27%, respectively, and cycling accounts for the remaining 7%.

The city's investments in its bus, train, tram and cycling networks make them easier and more affordable to use. A low-priced annual public transportation ticket costing 365 euros (S$531), or 1 euro (S$1.46) per day, incentivises more residents to give up driving. The new WienMobil app combines various mobility providers' offerings, such as bicycle and car-sharing services, and allows users to plan and pay for greener journeys.

Recent policies have further persuaded private car owners to make the switch. The government eliminated free parking throughout the city in March 2022, while progressively expanding its

park and ride system. Upcoming initiatives such as a new tram line, and a 7 km-long cycling highway will help make the final push.

"We are taking the right steps towards promoting climate-friendly mobility," said Mayor Ludwig. "We will continue on our consistent path of high quality of life for everyone through social and technical innovation in all areas, while maximising the conservation of resources and being a reliable partner for others." 🔎

The above was adapted from an article from the website of the Lee Kuan Yew World City Prize, first published in May 2022. For more useful city resources, visit go.gov.sg/cities.

Cities as Key to Our Green, Resilient and Inclusive Recovery

To overcome our climate and pandemic crises and emerge stronger, cities could focus on integrating nature, people and institutions, argues Sameh N. Wahba, Regional Director for Sustainable Development, Europe and Central Asia Region, The World Bank.

❚❚

Cities need to focus on integrating the three key dimensions of their spatial planning and service delivery—nature, people and institutions—while building their resilience against crises.

❚❚

Home to more than half of the global population, cities are our economic powerhouses. They generate close to 80% of the world's economic activity, despite occupying only 3% of its land area. When managed well, cities typically offer an escalator out of poverty. Cities are also responsible for 70% of total energy consumption and greenhouse emissions. Not surprisingly then, cities hold the key to our fight against climate change.

Cities were also the epicentre of the COVID-19 pandemic, bearing the brunt in terms of business closures, losses of jobs and livelihoods due to lockdowns, and serious declines in tax revenues.

The priority today is to sustain economic recovery and support the millions of workers and business owners who have been hit hard. Thinking ahead, however, the response to these crises also offers an opportunity for transformative reform—cities can be at the heart of a green, resilient and inclusive recovery.

To overcome the climate and pandemic crises, and emerge stronger, cities need to focus on integrating three key dimensions at the heart of their spatial planning and service delivery processes—namely, nature, people and institutions—while building their resilience against crises.

First, nature. The loss of nature and biodiversity due to rapid, unplanned urbanisation has led to severe environmental degradation in many cities, including increased exposure to and vulnerability from flooding, worsening air pollution, rising temperatures with the urban heat island effect, the spread of zoonotic diseases, and deteriorating liveability and attractiveness. Cities that invested in nature-based solutions and green infrastructure have managed to overcome such challenges though. The restoration of the Beddagana Wetland Park in Colombo, Sri Lanka, for instance, with World Bank support, has not only improved property values in the area but also created a unique environmental amenity in the city. In Beira, Mozambique, the development of a 17 km linear park along the Chiveve River, also with World Bank support, led to improving liveability and environmental quality locally, while also reducing stormwater run-off and flooding impact in the highly climate-vulnerable city. Several Chinese cities have developed "sponge cities" as urban construction models, investing in nature-based solutions to reduce flooding and replenish aquifers. Taking an even more holistic perspective, Singapore has evolved from a "city in a garden" to a "city in nature", by integrating ecology in the urban landscape, strengthening community stewardship, and monitoring progress through a city biodiversity index.

32

Second, people. The pandemic exposed deep-rooted inequalities—poor housing conditions, lack of infrastructure, and overcrowding—conditions for an increased contagion risk. Poor households are also the worst affected by the impact of climate change since they tend to live in areas exposed to severe flooding risk and lack the means to protect themselves. Focusing on the needs of the poorest, however, can turn the tables. In Freetown, Sierra Leone, the city's three-year plan, also supported by the World Bank, aimed to plant one million trees by end-2022 to double its green area and reduce soil erosion and flooding risk. This translated into supporting livelihoods, particularly for women paid to plant trees and monitor their growth. The city also created economic opportunities for youth by involving them in solid waste collection and disposal. As part of its pandemic response, the Spanish city of Barcelona has supported low-income seniors who are often excluded from digital connectivity due to inadequate equipment and infrastructure. Cities around the world have also been receiving growing numbers of people displaced by conflicts, including most recently, Polish cities welcoming Ukrainian refugees. Medellín, Colombia, has demonstrated sustained leadership in integrating low-income communities through its inclusive public transportation system that connects hard-to-reach neighbourhoods, allowing the poor to access jobs and services.

Investments in nature, people, institutions and resilience are cost-effective and have a long-term payoff.

The third dimension is strong institutions. Along with sound policies and local government capacity, this is the critical foundation to facilitate coordination across administrative jurisdictions and enable better spatial and socio-economic integration within recovery plans. To tackle persistent historic spatial inequalities, Colombia has, with World Bank support, implemented policies to strengthen institutions for land management and territorial planning, including reforming the national property registry. Colombia also focused on improving subnational financial management and investment prioritisation by strengthening reporting standards, creating instruments for inter-governmental coordination, and building local government capacity. Post-pandemic, several local governments have been investing in strengthening their cities' resilience by reinforcing inter-institutional coordination and improving preparedness and emergency response capacity by government departments, businesses and local communities.

The good news is, investments in nature, people, institutions and resilience are cost-effective and have a long-term payoff, including by reducing potential economic losses from future disasters. Nature-based solutions offer significant cost savings relative to man-made infrastructure, while also providing superior value in terms of amenity and liveability. Similarly, integrating

people and investing in risk reduction and resilience of poor communities yields significant payoffs: every US dollar invested ex ante in risk reduction and preparedness produces savings of as much as US$7 (S$9.68) in post-disaster reconstruction and recovery. Strengthening institutions and integrating life cycle costing in investment planning and budgeting are also key to long-term sustainability, ensuring that operations and maintenance are factored in and investments are protected in the years to come.

Lastly, land value capture offers an innovative instrument to finance urban revitalisation programmes. By capturing ex ante (e.g., through sale of development rights, as was done in São Paulo and Rio de Janeiro, Brazil) or ex post (e.g., through betterment levies in Bogotá, Colombia), part of the proceeds from urban land valorisation (from infrastructure investments and densification) can go towards paying for public interventions. This said, strengthening municipal finances is arguably the most critical foundation for plugging an ever-growing infrastructure finance gap.

By investing in nature, people and institutions, cities can continue to be the powerhouses of innovation, opportunity and growth, anchoring a green, resilient and inclusive recovery. 🔍

33

VIEWPOINT
SARAH ICHIOKA

Post-pandemic, How Attention and Care Can Help Us Flourish

Our current climate and mental health crises are a wake-up call for us to reinvent a society gone wrong, says strategist and author Sarah Mineko Ichioka, who argues urban space management can be a big part of the solution.

If we want to survive, we must swiftly transform our economies to follow the lodestar of planetary health instead of the metric of GDP growth.

We are waking up. Waking up to more free will after the constrained regimens of the pandemic, we search for new ways to strengthen our cities and communities. We discover how our inner and outer transformations are interlinked; our mental health crisis and today's climate and ecological breakdown are shared symptoms of a system-wide dysfunction.

In this liminal period, those who govern, build and manage our cities face a now-or-never opportunity. As we collectively stretch and rub our eyes, leftover norms of behaviour that no longer serve (or perhaps never did serve) the best interests of people and planet must be questioned and transformed.

To address these symptomatic crises, we must contend with the underlying causes, notably the extractive extremes of hyper production and hyper consumerism, which have distorted both the form of our cities and how we are conditioned to behave within them.

Seeking a better alternative, scholars such as economist Kate Raworth and economic anthropologist Jason Hickel advocate compellingly for an economics that centres our decision on care for living systems and the meeting of real human needs (instead of return on capital and the creation of artificial wants).

If we want to survive, we must swiftly transform our economies to follow the lodestar of planetary health instead of the metric of GDP growth. This is one of the key shifts towards regenerative design and development that Michael Pawlyn and I describe in our book, *Flourish: Design Paradigms for Our Planetary Emergency*. As many traditional cultures already understand, our health as individuals connects to our health as communities, which is in turn embedded within the health of our ecosystems and the biosphere overall.

Moving from theory to application, the city is the scale at which new ideas can be inhabited.

Think of walking through a public space in your city. Whom do you make eye contact with? Think of the volume of multi-channel advertising you encounter on an average journey by public transport.

Too often, we place responsibility on the individual to manage their own behaviour. But faced with the negative effects of pervasive and often addictive technologies and lavishly funded commercial campaigns, we have a challenge that demands government intervention.

More cities should follow the lead of São Paulo, Brazil, which instituted a "Clean City Law" to

35

remove all outdoor advertising. While we might argue for retaining some forms of graphic communication in our public spaces, in the form of artworks or wayfinding, imagine the boost of visual decluttering to our lives. Clearing the cacophony would help to free more of us from the snares of manufactured dissatisfaction, in which our current condition is never as desirable as the next thing to be acquired.

While we advocate for regulation, actions we can take at a local level include designating more zones and periods for distraction-free awareness and/or direct human connection. If a city-wide ban seems unviable, why not designate specific districts as advertising-free zones and observe how the benefits develop?

Several recent examples from Singapore, where I live, help to model how we, as citizens, can experience and share our urban environment in a new way—from distraction to attention, from consumption to care. There is the Big Sit, for instance. Organised by my fellow World Cities Summit Young Leader, Anupam Yog, and mindfulness coach Erin Lee, it runs social meditation and mindfulness sessions in usually hectic spaces in the central business district, turning them into sites of focused stillness, open to all. The result is an act of peaceful subversion; as the organisers put it, "Don't just do something. Sit there."

Investments in mental health should not be justified in terms of productivity, but even so, think how much clearer-headed and more harmonious our cities would be if we all had access to a safe public space—and an open invitation to sit quietly with others for an hour every week. It's a powerful design challenge, to conceptualise how our urban spaces might be shaped to support mindfulness.

Today's exhortation to consume the new currently extends beyond products and services to the way we perceive our urban fabric, driving a cycle of constant demolition and rebuilding. Consider the noise and air pollution—both well-documented health risks—and logistical disruption resulting from frequent cycles of demolition and construction in a city. As our climate emergency looms, we know that working to maintain our existing structures—and all of their embodied carbon—should be the default choice. What if we prioritised care for our existing buildings, both their physical forms and the communities they host?

Housed in a refurbished 1920s building, bordering Singapore's main shopping district, the Temasek Shophouse models an ethic of care on multiple levels. Sensitive renovation made the most of its inherited structure, while its public exhibitions and events—focused on the UN Sustainable Development Goals—promote engagement with some of the most pressing issues of our time

in an accessible manner. Recent exhibitions showcased artfully repurposed second-hand clothing, and an audio archive of stories from seniors who volunteer in the community. Events have convened partners to examine urban solutions to the plastic pollution crisis, or how online culture affects youth mental health. Passers-by can support its social enterprise café, or simply sit and listen to songs played by fellow visitors on its shared pianos.

In sum, Temasek Shophouse provides a purposeful and restorative oasis within an expanse of uninspired, overstimulating retail. How might it further benefit its district?

In the digital realm, susGain, an app founded by entrepreneur Carolin Barr in 2020, provides an attractive alternative to consumption-focused loyalty programmes. Designed to address the "intention-action gap" for Singaporeans looking to green their lifestyles, it rewards behaviours such as volunteering, donating pre-loved items, and spending time in the outdoors, while signposting to more sustainable businesses. Loyalty points can be redeemed to plant mangroves and donate to local charities.

I recently joined a clean-up led by a susGain partner, Ocean Purpose Project (OPP), at Singapore's Pasir Ris beach. A social enterprise founded in 2020 by media personality

Mathilda D'Silva, the OPP seeks to go beyond clean-ups to piloting new solutions to the plastic pollution crisis. Some of the collected ocean plastic is cleaned and converted into hydrogen fuel and high-value carbon nanotubes by scientists from the local Nanyang Technological University. The OPP is also trialing water remediation (not the same as treating wastewater) using shellfish and seaweed, potentially for developing bioplastics.

Deeper transformation of our urban economies would see such promising organisations move from largely volunteer-based teams towards the creation of livelihoods that enable workers to support their families by meeting real needs of human communities and the wider web of life.

When we start thinking about ourselves as more than consumers, a different city opens up to us. We begin to understand ourselves more expansively, as members of diverse communities and constituencies. We begin to think about our shared places in terms of our rights and the rights of others to access them. More than a collection of products and services, we can begin to think about our cities as places that we contribute to making and caring for. When the city and its citizens are de-commodified, they can unlock transformative potential. 🔍

SUSTAINABLE DEVELOPMENT
ZHU DAJIAN
Director of Institute of Governance for Sustainability, Tongji University, Shanghai

In Advancing Sustainable Urbanisation, How Public-Private Partnerships Could Work

PPPs have significantly boosted infrastructure investments and accelerated economic growth in developing countries.
Image: Ernie / Flickr

Public-private partnerships (PPPs) have been key in enabling urban infrastructure building and public services delivery. Focusing on sustainable urbanisation, Tongji University's Professor Zhu Dajian proposes a three-element framework—based on finance, governance and policy—that could make PPPs work for sustainable urban development.

PPPs could finance urbanisation without increasing budget deficits and resource consumption.

Sustainable Urbanisation is a key part of the United Nations' (UN) Sustainable Development Goals (SDGs) (2016–2030). Public-private partnerships (PPPs), a hybrid governance structure, have significantly boosted infrastructure investments and accelerated economic growth in developing countries. However, private-sector monopolisation and inadequate contracts in PPPs may also create unsustainable urban development, leading to limited coverage of the population, inefficient resource use, and environmental and health damage, for example.

In my work with Dr Wei Xiong at Tongji University, we introduce an analytical framework based on the three elements of resource, governance and policy, to understand the relationship between PPPs and urbanisation, and discuss how to make PPPs work for sustainable urban development. Our key opinions are as follows: As a resource potential, PPPs could finance urbanisation without increasing budget deficits and resource consumption. The selection of PPP governance modes should consider a trade-off between safeguarding public values and improving efficiency. Lastly, PPP policy design should shift from a finance-oriented (PPP 1.0) or an efficiency-oriented (PPP 2.0) approach, to a sustainability-oriented and people-centred (PPP 3.0) one.

Private-sector participation could significantly boost innovation in the construction, maintenance and operation of infrastructure and public services.

Resource: Financing Urbanisation in a Sustainable Way

40

Financing urbanisation has been a global challenge. The UN International Committee of Experts in 2014 estimated infrastructure investment financing needs were US$2.5–3.5 trillion (S$3.2–4.9 trillion) per year. Over the last decade, 80–85% of infrastructure investment spending in developing countries came from the public sector. We need to find new and additional resources to close such wide gaps. Three approaches could be used in financing urbanisation—debt-based, land-based and PPPs—each playing different roles. In 2002, PPPs were introduced as a promising instrument for sustainability at the World Summit on Sustainable Development in Johannesburg, South Africa.

Debt-based financing means borrowing from future generations to fulfil the needs of the present.

Money can be raised quickly, but its cost is the debt burden, compromising the ability of future generations to fund their own needs. For instance, local government financing vehicles (LGFVs) in China borrow based on local government credits to deliver public infrastructure and services. After decades of rapid urbanisation, Chinese local governments are facing high debt ratios. Another example of debt-based financing for urbanisation is US municipal bonds.

Land-based financing involves raising funds through land rent-seeking. Its benefit is that local governments could raise funds without increasing their debt burden. But such financing becomes unsustainable if land and resource consumption exceeds the carrying capacity of supporting systems. For instance, China's urbanisation relies

greatly on land rents: 40%–60% of local governments' disposable income comes from the land premium from converting farmland for urban development, according to the Ministry of Land and Resources. The consequence is twofold: the amount of farmland shrinks rapidly, and property prices surge. The urbanisation of many countries has relied on land- (or resource-) based financing, exemplified by the property taxes in Japan and oil exports in Saudi Arabia.

PPPs are long-term contractual relationships between the public and private sectors to deliver urban infrastructure and the public services traditionally undertaken by the government. In PPPs, either the government makes unitary payments to the private sector for making available quality infrastructure and services,

China's first high-speed railway project funded by a PPP connects several cities in east China's Zhijiang Province.
Image: Sharon Hahn Darlin / Flickr

41

Local governments favour PPPs, especially those with financial constraints.

or end-users pay tariffs to the private sector for the usage of public goods. Because major risks, including cost, demand and operation, are transferred to the private sector, PPP investments are usually off the governmental balance sheet and budgets. Hence local governments favour PPPs, especially those with financial constraints.

In the past three decades, China's urbanisation has primarily relied on land- and debt-based financing, which increasingly undermine sustainability.

Since 2014, China's national PPP programme has encouraged private investments in all public sectors, except national security. Local governments began considering PPPs as an alternative approach to develop urban infrastructure and deliver public goods. The Private Finance Initiatives (PFIs), together with concessions, as types of PPPs, were promoted throughout the country. During the period of 2014–2017, the value of such projects in China increased to US$519 billion (S$721 billion), exceeding the infrastructure projects delivered through in-house provision.

Governance Modes: Trade-off for Values and Innovations

Private-sector participation could significantly boost innovation in the construction, maintenance and operation of infrastructure and public services. However, private players tend to focus on their financial interests, rather than objectives associated with sustainable development. Hence, to safeguard public values, the public sector remains indispensable in the delivery of infrastructure and public services. In PPPs, private and public partners share information, resources and capabilities to achieve sustainable outcomes that could not be attained by either side alone. We have identified three PPP modes, each with its advantages for sustainable urbanisation.

Institutionalised PPPs (iPPPs) are hybrid organisations (e.g., alliance, joint venture, mixed company) where public and private partners come together to jointly manage and deliver services. iPPPs allow combining and internalising both the political advantages of the public sector and the innovative advantages of the private sector. The standard capital participation of local governments is at least 51% of shares, to ensure the company's pursuit of social objectives, even if they risk being unprofitable. Property theory suggests that when we adopt an incomplete contracting perspective (e.g., PPPs), ownership becomes quite relevant, and mixed enterprises can accomplish such mixed ownership. SDGs, which can be hard to quantify or enforce in a contract, can be implemented through the public sector taking a lead role on the board of directors. iPPPs are often seen in European countries, such as Portugal and the UK.

Contractual PPPs (cPPPs) entail a transactional relationship based on designing, monitoring and enforcing contracts in which the public sector outsources services to the private partner. In a written contract, the public sector usually specifies its payment, subsidies and safeguards to the private-sector player(s), while the latter commits to the outcomes and performance of contracted services. The SDGs are represented by key performance indicators (KPIs) in the output specification of services. cPPPs take the form of concessions, a usage-based payment arrangement, or PFIs, which cover all availability-based payment arrangements.

Concessions involve greater private-sector participation and less public control. Both concessions and PFIs are popular around the world.

Regulated PPPs (rPPPs), or public–private collaboration (PPC), is a collaborative relationship between the public and private sectors, in which the latter independently provides services under the former's regulation. No contract is involved, but the government partners the private sector to provide relevant public resources, while regulating them against the damage of public values. SDGs are mainly delivered through regulation, including approval, licensing and
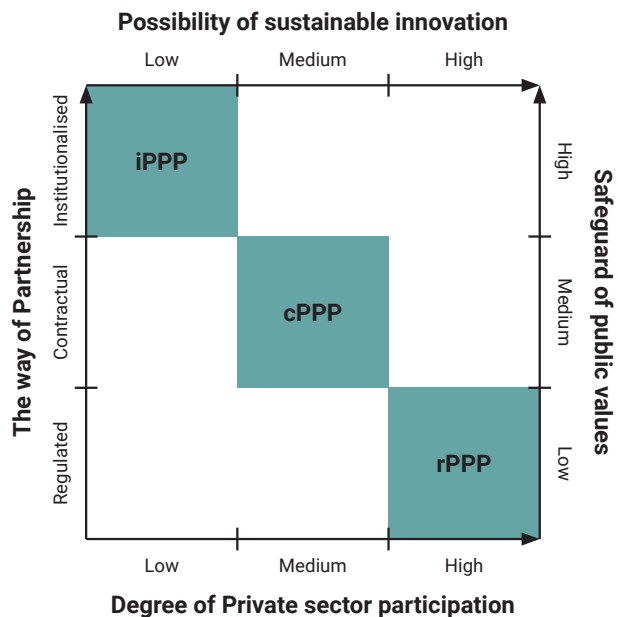
Figure 1. Governance modes of PPPs for sustainability.
Image: Wei Xiong, Bin Chen, Huanming Wang and Dajian Zhu
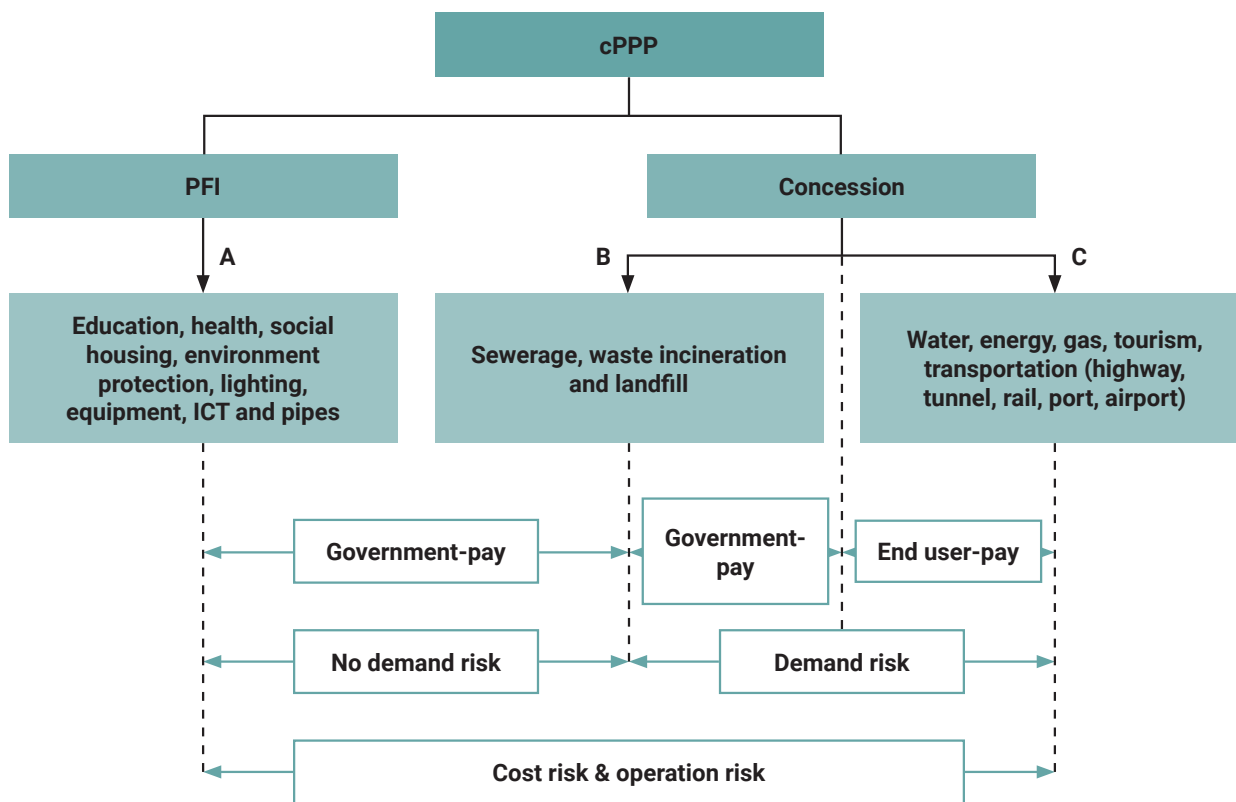
Figure 2. The governance framework of cPPPs inChina.
Image: Wei Xiong, Bin Chen, Huanming Wang and Dajian Zhu

inspection. rPPPs are market-based transactions and have been increasingly popular in many countries.

As shown in fig. 1, the three PPP modes vary in the degree of private-sector participation and public-sector control. Sustainable innovation potential is positively associated with the degree of private-sector participation, while safeguarding public values is positively associated with public-sector control. Reflecting their different advantages, iPPPs are suitable in sectors where public values are vulnerable to market failure, e.g., prisons, education and health. rPPPs are preferable in sectors where innovation is critical for sustainable outcomes, such as energy, defence and

drug development. cPPPs are applicable somewhere in between. Until now, cPPPs have dominated attention in both theory and practice, frequently referencing the narrow definition of PPPs.

In China, a cPPP can be a concession or a PFI, as shown in fig. 2. Concession projects typically fall into two categories. Category A projects earn revenue by charging end-users based on usage, e.g., water, energy, gas, tourism and transportation. Category B projects charge governments (as users) based on usage of services, including in sewerage, waste and incineration projects. Both categories usually take the form of build-operate-transfer and build-own-operate-transfer, and are procured through open

bidding. They also come with high uncertainty, with the private sector bearing the demand, cost and operational risks. In many cases, local governments provide guarantees and subsidies as part of risk-sharing with the private sector, e.g., the minimum traffic guarantee in transportation projects. Category C PFI projects are government-paid and charged based on availability of facilities. Therefore, the private sector only bears the cost and operational risks, while local governments face demand risk. PFI projects usually take the form of design-build-finance-operate and design-build-finance-operate-transfer. Compared with concessions, PFIs have a lower level of private participation and competition, but offer a higher level of safeguard for public values.

Policies: From Finance-oriented to People-centred

Governments' desire to obtain off-balance-sheet financing influenced the initial strategy to adopt PPPs in many countries. To assess performance, a value-for-money (VFM) test is designed to make the best use of government budgets to maximise economy, efficiency and effectiveness. Nowadays, the VFM has been updated to "value for people" (VFP) to optimise the use of natural and social resources—budget, land and carbon credits—to achieve the UN 2030 Agenda for Sustainable Development. Therefore, we see an evolution of the three versions of PPP policies (fig. 3): from financing-oriented (PPP 1.0) to efficiency-oriented

(PPP 2.0), to one that is sustainability-oriented or people-centred (PPP 3.0).

PPP 1.0 attracts private investment to reduce the gap between the need for public goods and the availability of public budgets. The government seeks the accessibility of private funds whereas the private sector focuses on project profitability. The core mission is to design an operational framework, considering financial viability, capital structure, concession period, government guarantees, pricing mechanisms, concessionaire selection, risk management and performance management.
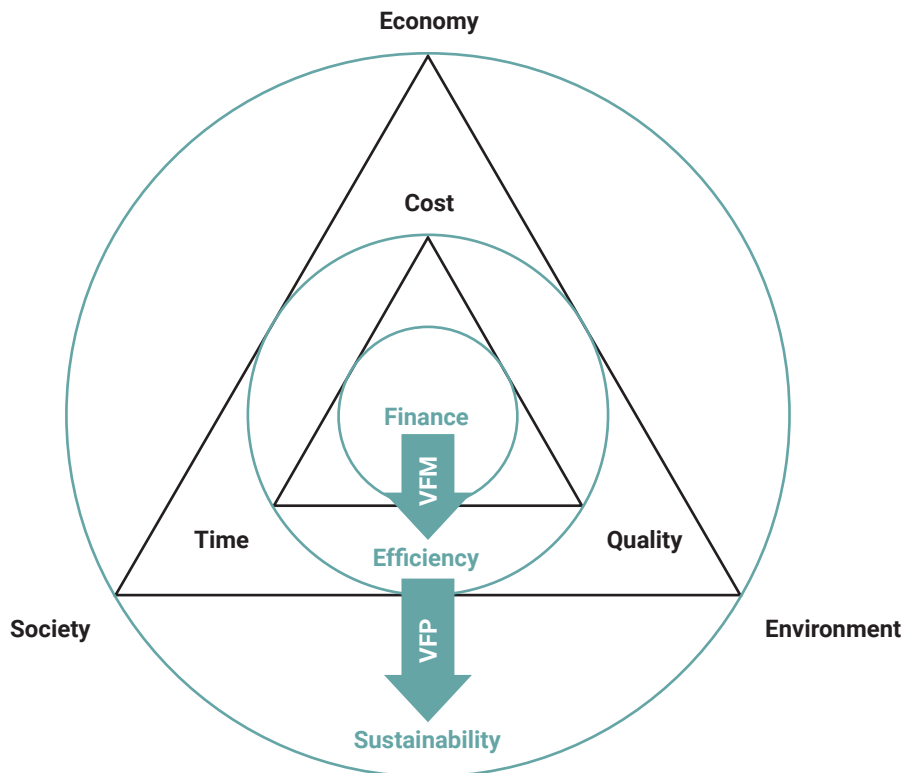
Figure 3. Evolving models of PPP policies.
Image: Wei Xiong, Bin Chen, Huanming Wang and Dajian Zhu

We can see an evolution of PPP policies: from financing-oriented, to efficiency-oriented, to one that is sustainability-oriented.

PPP 2.0 uses the skills, innovations and management of the private sector to increase the efficiency of delivering public goods. The private sector is incentivised to reduce costs and increase quality. Thus such PPPs achieve higher cost and time efficiencies, as well as quality, than traditional approaches, assuming the governance framework is appropriately designed. At this stage, the issue is how best to incentivise contracting parties to achieve high efficiency in PPPs.

PPP 3.0 aims to promote infrastructure and public goods for sustainable development. Private-sector participation eases the problem of public funds shortage and the inefficiencies of bureaucracy, but the private sector, being profit-driven, is likely to ignore social and environmental sustainability. Under the SDGs, PPPs should incorporate all debt, social and environmental sustainability.

Debt sustainability refers to the financial capability of governments to meet their financial obligations in PPP projects; social sustainability refers to equity of public service delivery for lower-income groups; while environmental sustainability refers to the environmental impact, resource conservation and pollution control in the construction and operation of infrastructure.

Sustainability-oriented PPPs are frequently referred to as "people-first PPPs", according to the United Nations Economic Commission for Europe in 2017. To deliver the infrastructure and public services that people really want, PPP 3.0 emphasises the role of public participation in building communities, engaging citizens and increasing the effectiveness of public services. We should put public participation arrangements into the contracts and design indicators to measure the effectiveness of PPPs. 🔎

45

URBAN INFRASTRUCTURE
LIM ENG HWEE

Lim Eng Hwee is the Chief Executive Officer of the Urban Redevelopment Authority, Singapore.

How Singapore is Reinventing Itself in the New Era of Urban Logistics

Today, delivery riders and vehicles are a common sight, providing services deemed essential.
Image: Foodpanda

Singapore, a leading global logistics hub, has continued to improve its urban logistics system in response to the last-mile delivery boom since COVID-19, riding on public-private collaborations and lessons gleaned elsewhere. Lim Eng Hwee, Chief Executive Officer of the Urban Redevelopment Authority, details how.

We need to understand how e-commerce and other fast changing trends impact movement of people, goods, and land use.

Sustaining the supply chain is key to Singapore's resilience and development. The urban logistics system forms the backbone of the supply chain. Every day, this complex system of urban logistics runs in the background, supporting Singapore's operations. Goods travel from ports, airports and land checkpoints to warehouses, factories, stores and more.

In working to optimise urban logistics, Singapore has to study and manage new trends. One such trend is the accelerated shift towards e-commerce during the COVID-19 pandemic due to demand for safe doorstep deliveries and other factors. Globally, e-commerce sales could rise from US$4.9 trillion (S$6.8 trillion) in 2021 to US$7.4 trillion (S$10.3 trillion) in 2025, a 2022 Statista report says. In Singapore alone, official figures show that from 2018 to 2021,

online sales more than doubled to 17.1% of total retail sales and is forecasted to reach US$10 billion (S$13.9 billion) by end-2026, said a report by Facebook and management consultancy Bain & Company forecast last year. Correspondingly, delivery volumes are expected to rise.

Today, delivery riders and vehicles are a common sight, providing services deemed essential. For these services to stay timely and affordable amid increasing delivery demand—and without increasing road traffic—delivery operations must be efficient, with sufficient suitable spaces and infrastructure. As we future-proof Singapore, we need to understand how e-commerce and other fast-changing trends impact the movement of people and goods as well as land use.

Introducing intermediate points to the delivery journey can reduce vehicle trips and distances.

Optimising Established Infrastructure

In view of the dynamically changing operating environment, the Urban Redevelopment Authority (URA) has been partnering public agencies and industry players to study these trends and increase Singapore's capabilities to meet future urban logistics needs.

1. **Integrated and Data-informed Planning**

   As the national land use planning authority, the URA shapes land use activities and their impact on goods and people movement. Through reviews of the Long-Term Plan, a strategic land use and transportation plan that guides Singapore's development over the next 50 years, we study key trends and how they could impact land use and infrastructure needs. Combining ideas, insights, and data, we work closely with stakeholders to develop strategies and plans to meet Singapore's future needs. These are then incorporated into the statutory Master Plan that guides Singapore's medium-term development, that is, over the next 10 to 15 years, and identifies the allowable land use and development intensity for land parcels.

   Through land use zoning, we guide the location of logistics and transportation facilities, including gateways and warehouses. By locating synergistic facilities close together, we optimise the location of Origin, Intermediate and Destination points in logistics networks to minimise delivery vehicle trips and distances. For example, Tuas Port, with a capacity of 65 million Twenty-foot Equivalent Units once fully operational in the 2040s, has been sited near the key logistics and manufacturing clusters in the west of Singapore. This will allow businesses to tap the port's global maritime connectivity and benefit from faster production-to-market turnarounds in the future.

   To identify opportunities to improve the siting of facilities and to increase trip efficiency, we have also carried out studies analysing delivery patterns such as the volume and types of goods delivered to different locations at different times. We can also identify linkages between certain industries and logistics or transportation facilities.

   Introducing intermediate points to the delivery journey can also reduce vehicle trips and distances. Instead of having many vehicles making direct deliveries to multiple destination points across the island, localised distribution centres or offsite consolidation centres could provide space for the sorting and transfer of parcels to a smaller number of vehicles to make last-mile deliveries. Currently, we are working with researchers who are developing modelling and simulation tools that can estimate the costs of different location options for such intermediate points, facilitating better-informed deployment decisions.
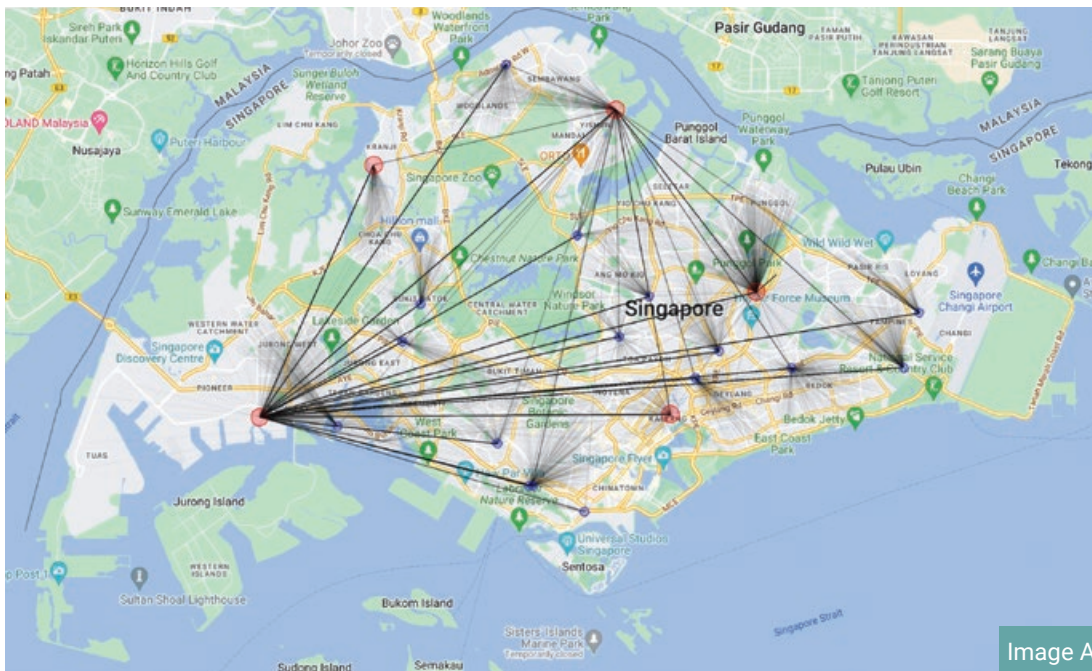
Image A
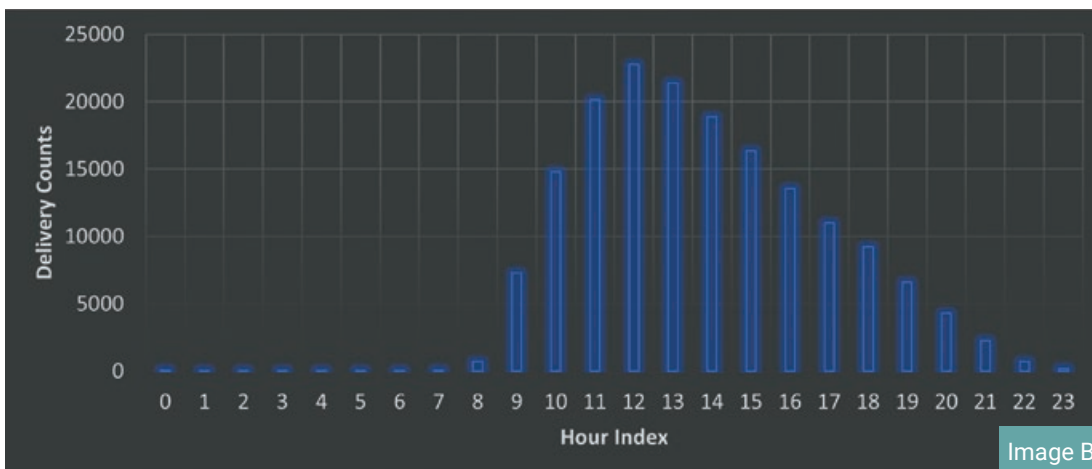
Image B
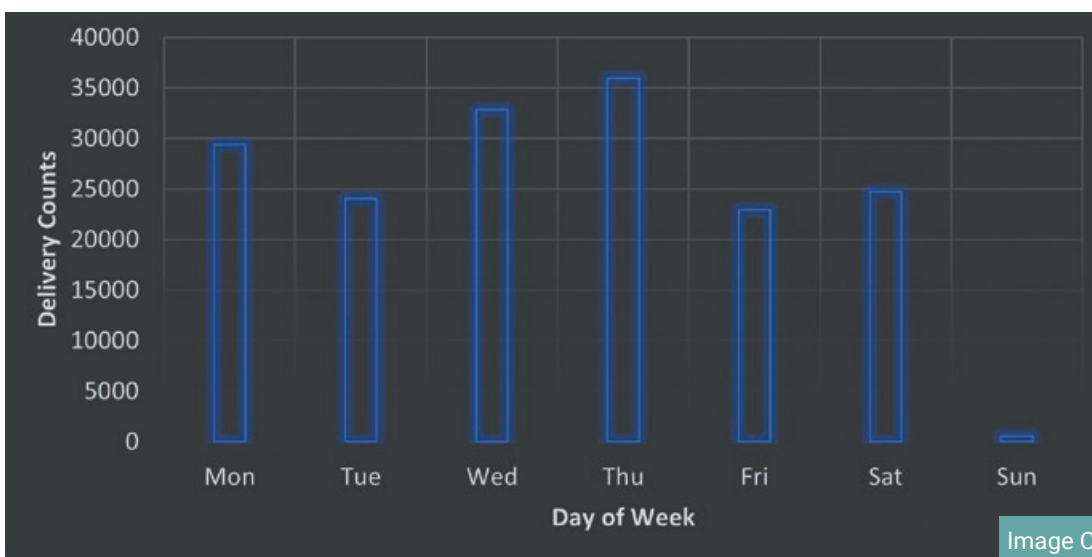
Image C

Modelling and simulation tools can be used to visualise delivery flows and simulate the impact of implementing freight management strategies. This simulation (image A) shows a logistics company's parcel delivery flows from its main warehouses to localised distribution centres and delivery destinations. Studying the delivery patterns by day and time (images B and C) can generate insights to improve delivery operations.
Image: A*STAR Institute for Infocomm Research, Singapore
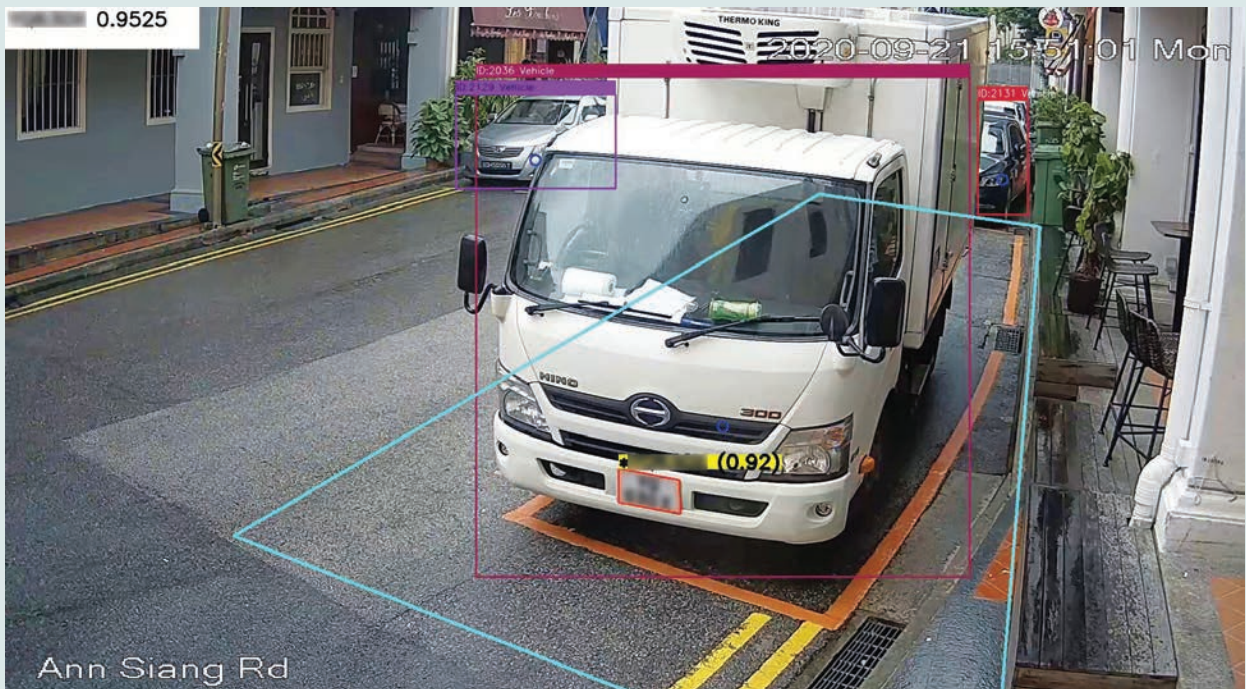
To evaluate the effectiveness of Kerbside Loading Bays, GovTech developed a video analytics software that automated the process of identifying vehicle types and calculating each vehicle's dwell time within the Kerbside Loading Bay. The software detects and tracks vehicles entering and leaving the Region of Interest within the camera's field of view (marked as cyan boxes above), and recognises the license plates of these vehicles.
Image: GovTech, Singapore

To provide more spaces for loading and unloading, we piloted the conversion of kerbside parking lots into loading bays.

2. Repurposing Infrastructure

The URA and partner agencies are keen to explore and support new ways of improving delivery processes. We facilitate businesses' efforts to innovate by repurposing infrastructure to cater to changing logistics needs. For example, through industry and public engagement, we identified certain areas with high delivery volumes but insufficient loading facilities, such as Stanley Street, Arab Street, Amoy Street and Ann Siang Road. These are shophouse areas, which are usually historical neighbourhoods built when urban logistics operations were very different. To provide more spaces for loading and unloading, the URA and the Land Transport Authority (LTA) piloted the conversion of kerbside parking lots into loading bays. To assess

the Kerbside Loading Bays' effectiveness, we collaborated with the Government Technology Agency of Singapore (GovTech) to use video analytics to analyse camera footage to study utilisation rates and patterns. This analysis was complemented by fieldwork to observe delivery distances and feedback from delivery drivers on the ideal location of Kerbside Loading Bays. Overall, the pilot initiative was well received by delivery companies, and we are operationalising the model for deployment in other locations.

3. Collaborating with the Industry

To enhance the urban logistics ecosystem, public-private sector collaboration is crucial—government agencies may shape urban transportation, but industry players are often the ones running operations on the ground.

To enhance the urban logistics ecosystem, public-private sector collaboration is crucial.

In 2020, the URA published a best practice guide to encourage efficient design and operation of loading bays in commercial developments. The guide was based on insights distilled from conversations with developers, companies and agencies, as well as research studies. More efficient loading bays help delivery personnel make deliveries faster, hence reducing the vehicle queues outside developments. Providing ease of access to retail outlets is another good practice, using design features such as locating goods lifts next to loading bays, and implementing universal signage and dedicated corridors to guide the movement of goods from loading bays to lifts.

While the URA's work focuses on the design and use of spaces, the industry has been supported by Enterprise Singapore (EnterpriseSG) in implementing good practices in logistics, such as resource sharing for delivery efficiency. Logistics companies can tap on one another's vehicles to consolidate delivery trips for locations with low loads, freeing up vehicles and drivers for deployment to other transportation jobs. Fewer vehicles heading to logistics nodes help ease congestion in these areas.

51

LOADING BAY

DESIGN AND OPERATIONS BEST PRACTICE GUIDE

Cover page of URA's Loading Bay Design and Operations Best Practice Guide.
Image: Urban Redevelopment Authority (URA), Singapore

Diverse and evolving activities require new strategies, initiatives, and regulatory flexibility.

Prepare for Future Shifts

Over the past few years, we have been studying the likely impact of emerging urban logistics trends on Singapore's future retail and warehousing spaces and transportation networks. Notably, more delivery activities are happening at the last mile and to customers directly. Businesses have innovated food delivery through mobile applications and cloud kitchens; grocery players have boosted deliveries from retail stores and "dark stores" dedicated to fulfilling online orders; couriers do doorstep delivery, and consumers self-collect parcels from lockers and pickup points in stores. These diverse and evolving activities require new strategies, initiatives, and regulatory flexibility.

1. **Updating Policies**

   In 2021, the URA updated guidelines to provide greater clarity on the setting up of cloud kitchens. These changes were driven by conversations with industry players and studies showing the value of cloud kitchens. When planned well, cloud kitchens cut the number of delivery trips by efficiently aggregating orders, putting under-utilised or underperforming spaces to more productive uses, and supporting the needs of F&B businesses. Consumers living or working nearby also enjoy a wider variety of dining options.

52

Interior of a pandamart "dark store".
Image: Foodpanda

Over 1,000 parcel lockers have been installed in public housing estates, community clubs and transport nodes as part of Pick's nationwide locker network.
Image: Pick Network

A food delivery rider waits to pick up an order at a cloud kitchen.
Image: Smart City Kitchens

53

2. **Piloting New Ideas**

Higher delivery volumes require more space, including roads and paths for transporting goods, and areas for sorting and distribution. In view of Singapore's limited land area, innovation and testing of new ideas is important to meet these needs. In 2021, we worked with logistics companies, the Housing & Development Board (HDB), the Singapore Land Authority (SLA) and EnterpriseSG to pilot courier hubs in multi-storey carparks with under-utilised upper decks in public housing estates. The courier hubs have shown promise in facilitating the deployment of walkers to complete last-mile deliveries, which in turn, reduces the number of delivery vehicles needed. The delivery process is also smoother. At one courier hub, driver productivity improved fourfold. As the hubs are within walking distance from housing blocks, walkers can quickly

return to collect more parcels or re-attempt deliveries. They also have designated spaces at the under-utilised upper decks for unloading and sorting, addressing the parcel sorting in housing estates that has sometimes sparked friction between residents and couriers. Agencies are exploring how more companies could benefit from courier hubs.

3. **Leveraging New Technologies**

Looking ahead, autonomous vehicles (AVs) and autonomous robots, which can sense their environment and move with little or no human interaction, could revolutionise the future of urban logistics. While these technologies are still nascent, the URA and other agencies are tracking their progress and studying the necessary infrastructure provisions to facilitate future AV deployment. AVs can enhance delivery

efficiency and improve convenience. This is evidenced by recent pilots in several countries. In the UK, grocery retailer Co-op partnered Starship Technologies in on-demand, contactless and emissions-free delivery by autonomous robots. In China, e-commerce giant Alibaba's 200 autonomous robots delivered over a million parcels in 52 cities within their first year, with the fleet seen growing to 10,000 robots. In Singapore, the Infocomm Media Development Authority partnered the HDB, LTA, URA, CM Logistics PL and OTSAW to pilot using autonomous robots for parcel, grocery, and food delivery from Oasis Terraces mall to neighbouring residential blocks. Through such pilots, agencies can study infrastructure and safety requirements, derive technical standards and address challenges, paving the way for wider use of autonomous robots for on-demand deliveries.
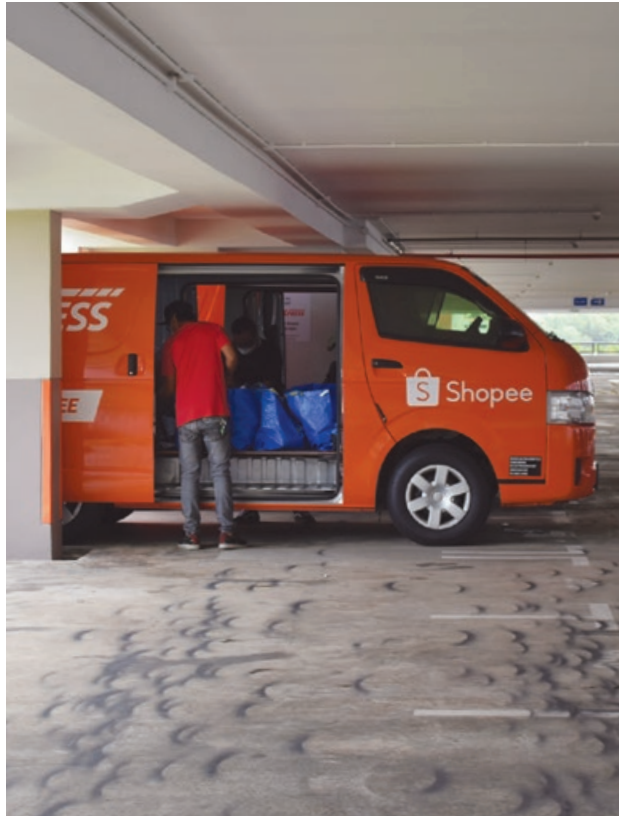
A pilot courier hub in operation—Shopee Xpress personnel tapped on the under-utilised upper deck of a multi-storey carpark space to sort and transfer parcels to walkers to complete last-mile deliveries to nearby residential developments.
Images: Urban Development Authority (URA), Singapore

A customer collecting his delivery order from an Autonomous Mobile Robot, during a recent pilot in Punggol.
Image: OTSAW, Singapore

55

> **Government agencies should see themselves as not just regulators but also innovators.**

Dealing with change and taking an integrated approach to planning is not new to Singapore, and it is imperative that we continue to think in the longer term, for the future of living, working and moving around the island. We have learned from the past few years that co-creating solutions with the private sector is crucial to improving the urban logistics ecosystem to bring greater benefits to citizens, consumers and businesses.

To this end, government agencies should see themselves as not just regulators, but also innovators alongside our industry counterparts. This way, new ideas and technologies can be tested in a timely manner, and infrastructure provision and regulatory guidelines can be developed in advance to prepare for future shifts.

While not without its challenges, the road ahead to building a more resilient and future-ready urban logistics ecosystem in Singapore is an exciting one that could greatly enhance the lives of our current and future generations. 🔍

PLANNING AND GOVERNANCE
FAIZAL ZULKEFLI AND LIVIA TAN

Faizal Zulkefli is an Assistant Director at the Centre for Liveable Cities. His work focuses on sustainability strategies for the built environment. Livia Tan is a Manager at the Centre for Liveable Cities where she focuses on research relating to urban planning and sustainability.

Keeping Cities Cool as The World Heats Up

Conventional air conditioning may not be the most efficient.
Image: Chromatograph / Unsplash

As global temperatures rise because of climate change, demand for cooling is expected to increase. Some cities have implemented district cooling systems as an energy-efficient solution. Faizal Zulkefli and Livia Tan from the Centre for Liveable Cities explore some such projects.

> ❚❚
>
> ## A district cooling system is more resource-efficient and offers space and energy savings, as well as improved reliability.
>
> ❚❚

Cities, because of their high density and the Urban Heat Island effect, are particularly vulnerable to extreme heat due to climate change. With temperatures reaching unprecedented highs and greenhouse gas emissions still rising, cities face ever-greater demand for cooling and pressures to decarbonise. Adopting more efficient forms of active cooling has become paramount for cities' sustainable development.

Conventionally, cooling in buildings is carried out by stand-alone systems, either through individual air conditioning units (for a room or floor), or a centralised chiller plant (for the entire building). Such cooling systems are inefficient as they are designed for peak loads, which only happen about 5% of the time.

A district cooling system (DCS), on the other hand, provides cooling across several buildings through a network of pipes linking them to one or more centralised chiller plants. Being part of a network allows for DCSs to be more resource-efficient than stand-alone systems, creating space and energy savings as well as improved reliability.

Innovation in business models can help to encourage the uptake of high capital expenditure projects like DCSs.

A good example of this is the Tampines Eco Town DCS project, featured in a 2021 white paper jointly published by Singapore's national utility SP Group and sovereign wealth fund Temasek. Connecting the chillers of 14 existing commercial properties in Tampines Eco Town—thereby forming a type of DCS—will result in a 17% reduction in energy consumption and 18% reduction in carbon emissions, the paper said. Additionally, it projected that S$130 million in economic value will be generated over the next 30 years through cost savings and potential earnings from leasing out freed-up chiller space.

58

ACTIVE COOLING SYSTEMS
SINGLE OPERATOR TYPOLOGIES

TRADITIONAL SYSTEMS

DISTRICT COOLING SYSTEMS

01
Air-conditioners at each floor, unit or room
e.g. Typical residential building

02
Centralised chiller in one building
e.g. Typical office building

03
Multiple local clusters with local chillers
e.g. Tengah Town

04
Local cluster with one chiller plant
e.g. Philippines Northgate

05
Mutiple large clusters with multiple chiller plants
e.g. Paris Climespace

06
Single cluster with multiple chiller plants
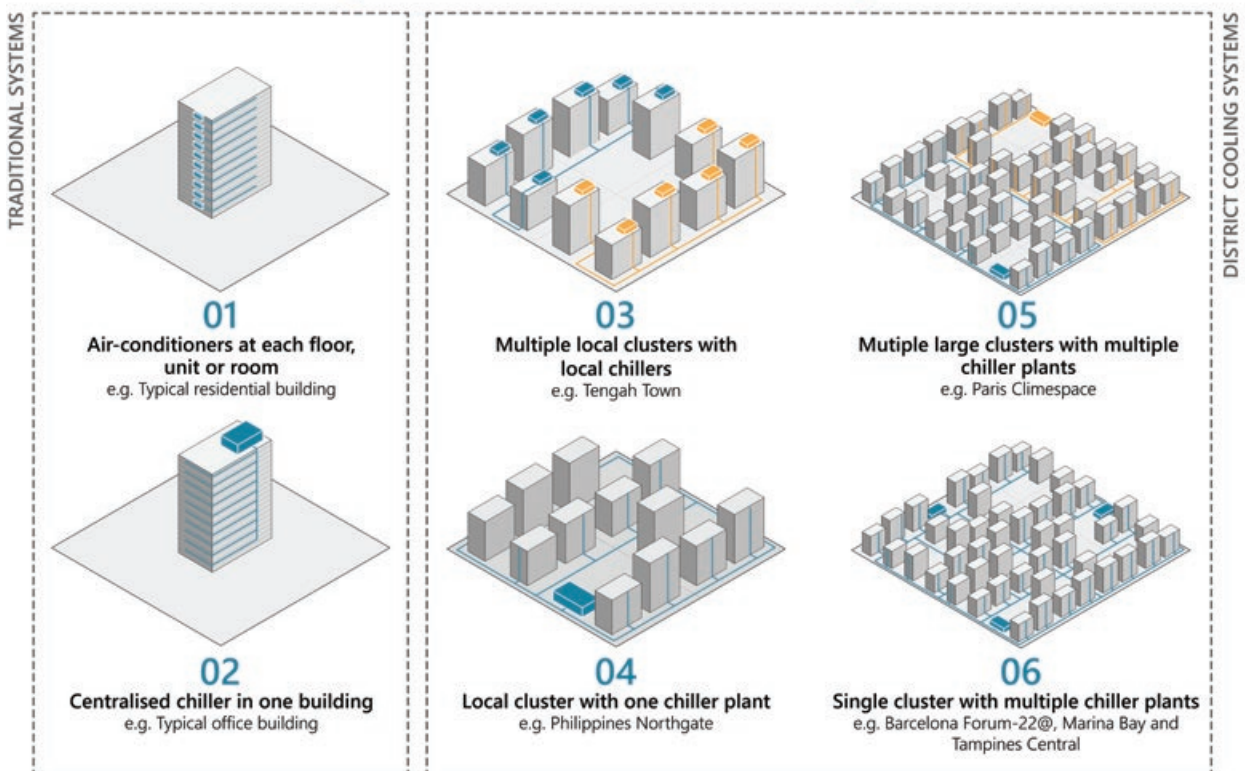e.g. Barcelona Forum-22@, Marina Bay and Tampines Central

Figure 1. Typologies of active cooling systems.
Image: Centre for Liveable Cities

Examples of district cooling in cities

	PROJECT AND CITY	DESCRIPTION
LOCAL	**Marina Bay, Singapore**	Marina Bay was envisioned as a new business district with state-of-the-art infrastructure. Spanning 360 ha (3.6 km²), the Marina Bay DCS started operations in 2006 under SP Group and has been in operation since.
	Tengah Town, Singapore	The 700 ha (7 km²) Tengah Town was conceptualised as Singapore's first smart and sustainable town and will be the first Housing & Development Board (HDB) estate to implement district cooling when completed.
	Tampines Central, Singapore	A feasibility study of 14 existing buildings in Tampines Central was completed in 2021 to support the transformation of Tampines into an eco-town by 2025. This will be the first local project that will implement district cooling through brownfield retrofits.
GLOBAL	**Forum-22@, Barcelona**	The District Heating and Cooling (DHC) system at Forum-22@ was introduced in 2002 as part of the renewal of the Forum area to become the city's technological and innovation district. The DHC system has been operated by Engie and has expanded to an area of about 1,000 ha (10 km²).
	Climespace, City of Paris	The Climespace DCS system in the City of Paris was the first and largest in Europe. It began operations in 1991 under Engie and has been serving a 11 km radius at the heart of Paris.
	Northgate, Alabang, Philippines	In 2017, Filinvest partnered with Engie to implement a DCS in the 18.7 ha (0.19 km²) Northgate district, as part of its efforts to transform the existing industrial park into a green district.

Lowering Barriers to Deployment

Innovation in business models can help to encourage the uptake of high capital expenditure projects like DCSs by transferring the risks from the consumer to the solution provider (the DCS operator in this case), while ensuring financial viability for the latter. This can be seen in an upcoming residential estate in Singapore, Tengah Town, which deployed a form of DCS called the Centralised Cooling System (CCS).

The provision of a CCS for the residential blocks is a key sustainability feature in Tengah and will be implemented in collaboration between the Housing & Development Board (HDB), the public housing authority, and SP Group. The role of SP Group consists of financing, designing, building and operating the CCS, while the HDB designed the building infrastructure to support the CCS, such as provisions for the projected electrical load, structural strengthening and space for CCS plants and pipes. This model allows the HDB and SP Group to each focus on the work that is within their core competencies, thereby reducing risks for both.

In return for their initial investment and provision of services, SP Group will earn revenue from the residents of Tengah through: (i) hardware and installation costs of the CCS indoor units in the apartments; (ii) servicing and providing warranty for the indoor units; and (iii) sale of cooling services, for which residents will be billed monthly based on their consumption. As profits are obtained through the sale of cooling, SP Group will be incentivised to upgrade the equipment and continue innovating to optimise the performance of the CCS. Accordingly, the CCS was designed with modular systems that can be easily upgraded as technology advances to achieve better performance.

59

Complementary Users

By serving a diverse mix of use types with different temporal usage patterns, the DCS would be able to distribute peak cooling demand across different times of the day and different days of the week. In an ideal situation, the DCS will serve complementary users who have different cooling demands. For example, non-residential and mixed-use areas would have cooling demands that typically peak during the day and on weekdays, while residential uses would have cooling demands that peak at night and on weekends.

This can be seen in Climespace, in Paris, which is connected to a wide variety of uses, from commercial uses and public buildings to healthcare and residential uses. Through aggregating the peak demands of diverse uses, it has been able to maximise the capacities of fewer chiller plants to serve a larger number of clients. As a result, it was able to sell 431 MW of cooling power, despite only being designed with a 269 MW capacity.

Greenfield vs Brownfield Considerations

It is typically less complicated for DCSs to be established in greenfield sites, as they could be planned for alongside and integrated with

DISTRIBUTION OF USES
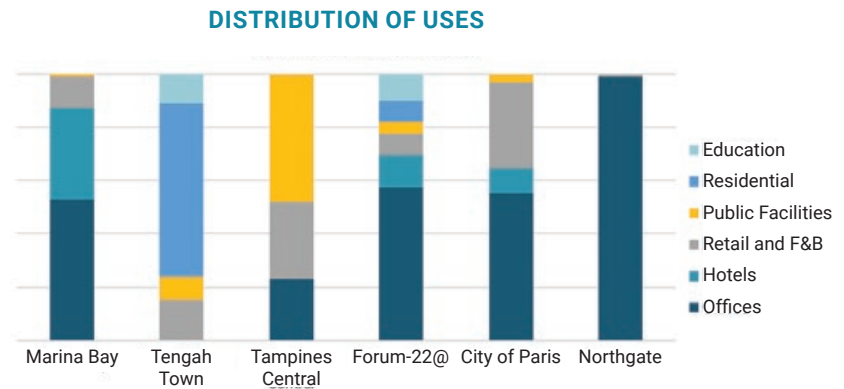
Figure 2: Distribution of uses served by the DCS.
Image: Centre for Liveable Cities, based on aggregated data.

new developments. Such facilities could hence be designed for maximum resource efficiency— crucial for cities with land or space constraints. For example, the DCS chiller plant in Marina Bay Sands was 25 m below ground, which minimised land take in the premier Marina Bay District and kept the machinery out of sight.

There are additional challenges when implementing the DCS for brownfield sites, however. Chiller plants will have to be planned around existing buildings and assets, which may not result in efficient design. Planners will also have to manage various existing stakeholders, who may

not be equally invested in having a DCS. This is particularly so for stakeholders with differing building and land tenures, as they will also have different considerations in terms of return on investment.

Despite the additional challenges, district cooling in brownfield sites should still be explored as a possible solution to meet cooling demand. As the white paper by the SP Group and Temasek illustrated, there can be compelling environmental and economic reasons for doing so. In highly built-up cities like Singapore, implementing the DCS for brownfield sites will be an important sustainability strategy.

60
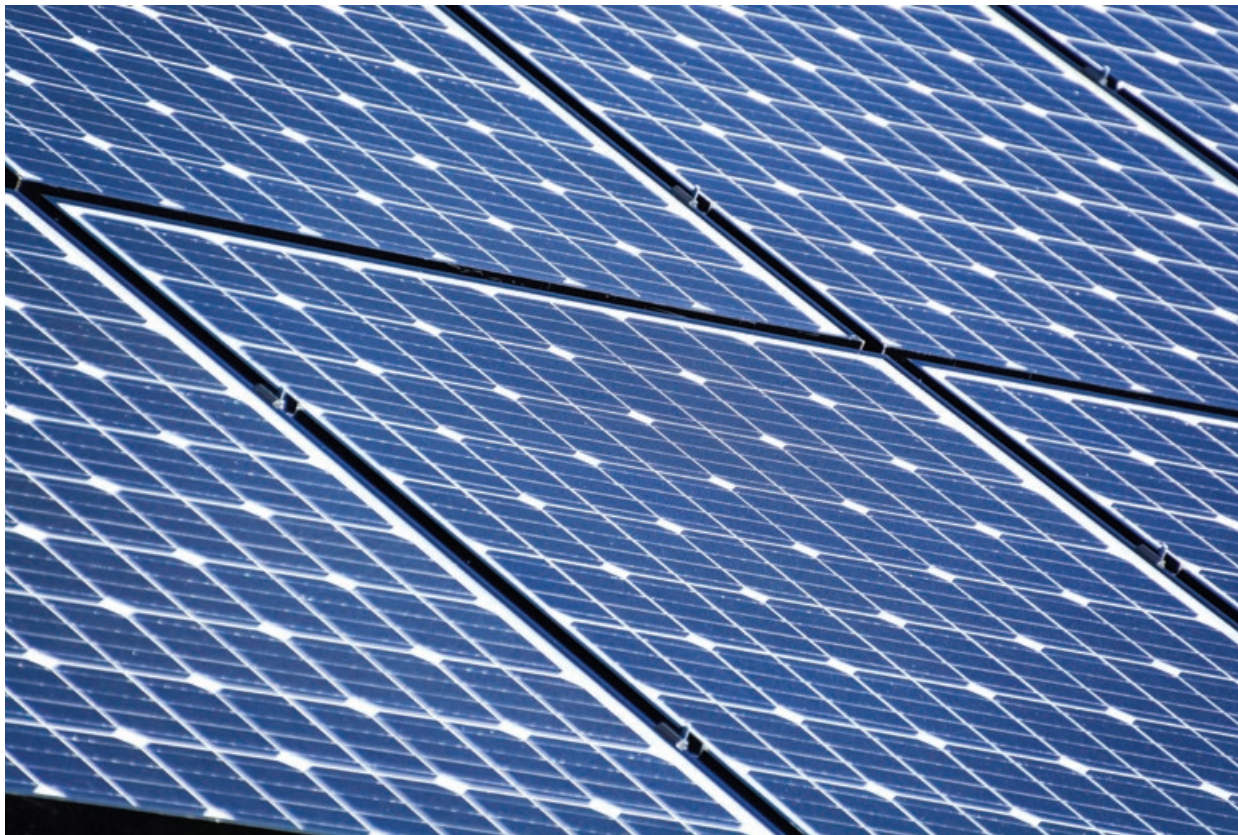
Thermal energy storage can be used to address solar intermittency.
Image: Jeremy Bezanger / Unsplash

61

Opportunities for Innovation

The DCS offers opportunities for extending innovative cooling methods to areas beyond the buildings within its network. One area that can be further explored is the use of the returning chilled water, which in a DCS still has sufficient capacity for further cooling, for outdoor spot cooling. The returning chilled water can be further used to cool down open air areas such as walkways and other public amenities. Another area to explore is thermal energy storage: storing energy in the form of ice or chilled water to be used later. This can be used in conjunction with solar photovoltaic systems to address issues such as solar intermittency and balancing energy demand and supply.

Conclusion

The DCSs are an opportunity for cities to meet their cooling demand, while boasting several advantages not offered by conventional stand-alone in-building chiller plants. These include environmental sustainability through energy savings and emission reductions, greater optionality and reliability for end-users, and less infrastructure and space required for cooling. City planners should take into consideration the various factors discussed above to ensure that resource efficiency and value capture is maximised in their implementation of the DCS. 🔎

EMOTIONAL CONNECTION

Singapore: Designing a Loveable City

TEXT: DESIGNSINGAPORE COUNCIL AND PARTNERS

The Loveable Singapore Project is a multi-party initiative that seeks to uncover what residents love about their city, and what else would boost that love. Led by the DesignSingapore Council as part of an ongoing conversation about Singapore's future as a loveable city for all, the study gave birth to the Loveability Framework, which maps out a spectrum of emotional connections to the city.

Feeling interested in and excited about what the city has to offer

Feeling familiar with and rooted to the city

Feeling close to and affection for others in the city

Feeling that we are able to influence change in the city

ATTRACTION

ATTACHMENT

CONNECTION

AGENCY

Feeling included, accepted, and perceiving ourselves to be treated fairly in the city

FREEDOM

Feeling free to express and be ourselves in the city

INCLUSION

Public Institutions

People & Communities

Cultures & Identities

Places & Spaces

OUR METHODOLOGY

Love is a social activity, so we designed our approach to be dialectic, not didactic.

Understanding enablers that drive loveablity: What we want to protect, maintain, amplify

What is loveable about Singapore

What would make Singapore more loveable
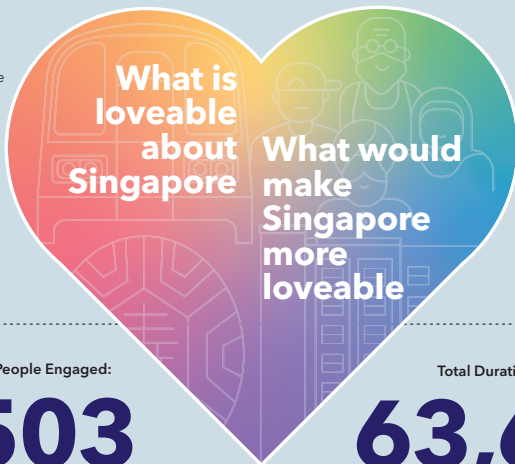
Identifying opportunities for interventions: What we want to discuss more, improve, plug gaps in

Total Number of People Engaged:

2,503

Total Duration Engaged in mins:

63,610

The Loveability Framework

Through a multimodal engagement with 2,500 people across Singapore, DesignSingapore Council (DSG) developed the Loveability Framework based on six types of emotional connections to the city-state, across the four areas of lived experiences that the survey respondents found most impactful. The emotional connection types are: attachment, inclusion, attraction, connection, freedom and agency.

More information about the framework is available at:

The Loveability Framework by DesignSingapore Council.
Image: DesignSingapore Council

Our Sense of Attachment

Through the exercise, we discovered that shared cultural, linguistic and behavioural practices strengthen people's sense of familiarity and rootedness in Singapore. Visual anchors preserved in our built environment also enhance this attachment, especially if they are part of local culture and identity. Shared spaces where people can hang around reinforce the feeling as well, while architectural icons inspire pride in our city.

64

View of a "mama shop", a convenience store sometimes found at the ground floor of public flats.
Image: Singapore Tourism Board (STB), Singapore

Our Sense of Inclusion

Feeling accepted and perceiving ourselves to be fairly treated form another dimension of loveability that we have discovered about Singapore. For many, this means feeling welcome and being able to partake in civic life, e.g., spending time in shared spaces, and taking part in public activities and experiences. On the other hand, shared spaces that exclude certain groups or lack amenities for those with special needs can limit this sense of inclusion. Access to a good quality of life is also important. We feel less at home in Singapore when living in the city subjects us to stress, elitism and competitiveness.

65

Inclusive initiatives in schools and communities strengthen our belonging.
Image (from top): COVID-19 Migrant Support Coalition; Land Transport Authority (LTA), Singapore; Kindle Garden Preschool by AWWA

Connection is built in neighbourhood activities. Here, families gather to learn and create the Indian art of *rangoli*.
Image: My Community

Our Sense of Connection

Our feelings of closeness and affection for others are built through strong micro-communities that provide care, support and resources, especially in neighbourhoods. Public spaces that let us spend time with our loved ones while encouraging interactions with others outside of our social circle can also enhance such connections. Opportunities to co-create or shape our shared spaces help us feel connected to our communities too. However, unfriendly, unpleasant or inconsiderate behaviour, often stemming from a hectic and competitive pace of life, can erode our connection with one another.

Our Sense of Attraction

Many residents feel a heightened sense of attraction to Singapore when they experience vibrant civic life and mixed typology buildings and places, be they open, unprogrammed spaces or well-planned, bustling ones. Attractive architecture, whether in the form of iconic landmarks or cultural and heritage places, also adds to this dimension of loveability. Opportunities for spontaneous interactions and surprise discoveries render Singapore more attractive too. On the other hand, the less pleasant realities of our high-density urban life, generic-looking streetscapes and the loss of authentic cultural anchors can diminish this sense of attraction.

Vibrant streetscape of Haji Lane with high-rise at the background.
Image: Singapore Stock Photos / Unsplash

Our Sense of Freedom

Being able to access spaces that offer a break from the crowds and bustle of urban life, whether in residential neighbourhoods and other places around the island, can enhance our sense of freedom in a high-density city like Singapore. However, the same sense of freedom can be compromised when we are unable to express or be ourselves—because of, for example, limited opportunities to achieve personal aspirations, over-regulation of spaces, and a feeling of disempowerment during civic engagements.

Singapore's Green Corridor.
Image: Ethan Chan / Unsplash

69

Views of the Chek Jawa Wetlands in Singapore.
Image: Singapore Tourism Board (STB), Singapore

70

Public engagement for Neighbourhood Renewal Programme at Tampines, Singapore. Project by Participate in Design.
Image: Participate in Design

71

Our Sense of Agency

The feeling that we can
create change in our city
is an important dimension
of its loveability. Many feel
a sense of agency through
a shared responsibility
of making public spaces
and interactions safe and
pleasant for all. Opportunities
to co-create and shape our
neighbourhoods, and to give
feedback or contribute to
various social causes, can
also enhance this sense of
agency. However, the feeling
of disempowerment arises
when people are unable to
navigate regulations and red
tape, or when they feel they
lack the knowledge, skills
or tools to effect change in
community or national issues.

THE LEE KUAN YEW WORLD CITY PRIZE 2020
SPECIAL MENTIONS

Cities on the Rebound

TEXT: DAMIEN WOON

From haphazard urban development to slow regeneration. From 1980s decline to a knowledge economy. From years of financial woes to innovation and good governance.

These are the transformative stories behind Antwerp, Boston and Lisbon, the 2020 Lee Kuan Yew World City Prize Special Mentions, explored in this photo story.

ANTWERP, BELGIUM

Reversing Undesirable Conditions of the Past

The 2006 Strategic Spatial Plan helped reverse Antwerp's haphazard urban development, which arose due to the lack of strategic post-war city planning. Through strategic interventions to tackle issues such as climate change and housing affordability, formerly neglected areas such as Het Eilandje are transformed into lively neighbourhoods today.

Het Eilandje.
Image: Chedko / Shutterstock

Reactivating Disused Spaces

Developed with three civil society organisations and input from over 800 citizens, the former dilapidated port and urban void of Scheldt Quays was reintegrated as a vibrant part of Antwerp's city centre, with new parks and public spaces such as Droogdokkenpark. The new waterfront area now provides public access to River Scheldt and is future-proofed with raised flood protection walls.

Sections of the refurbished Scheldt Quay.
Image: Jordi Driesen / Unsplash

Blurring Boundaries

Designed as a highly participatory process, the ambitious Over the Ring project looks at the long-term covering of Antwerp's ring road to blur the hard boundaries between the inner and outer city, shift towards sustainable mobility and increase the number of green spaces. The appointment of an independent curator as a neutral party to oversee the project further signals the city's will to be open and work with citizens.

Over the Ring.
Image: Stadt Antwerpen

BOSTON, USA

Moving Things Forward

Shaped with the input of over 15,000 residents, Imagine Boston 2030 (launched in 2017) is Boston's first master plan in over 50 years. Its main goals: tackle key challenges such as the under-provision of affordable housing, increase active low-carbon transportation and boost Boston's flood resilience as a coastal city. The city developed a metrics dashboard on its website to track the progress of the master plan's five key goals, ensuring the continuity and transparency of its project.

74

Aerial view of Boston.
Image: Richard Cavalleri / Shutterstock

Safeguarding Public Assets

Stretching from Dorchester to East Boston, the Boston Harborwalk is one of the city's most important waterfront revitalisation projects. The partnering with developers safeguards the continuous walkway as a public asset to be shared and enjoyed by all. To date, 61 km of the 76 km-long Harborwalk has been constructed to connect the city's neighbourhoods to the harbour, its nearby attractions and public transit.

Boston Harborwalk.
Image: Boston Planning and Development Agency

Establishing a Strong City Brand

Boston has successfully rebounded from industrial decline, thanks to the tenacity of its people that is complemented by a legacy of world-class hospitals and universities, fueling the city's reinvention as a knowledge economy. Local non-governmental organisations, companies and Bostonians alike are motivated to push for lasting positive changes in the city, while the government's willingness to engage its stakeholders has helped build long-term, win-win collaborations.

Casual gatherings on the rooftop of the Bruce C Bolling Municipal Building.
Image: Boston Planning and Development Agency

LISBON, PORTUGAL

Making a Strong Comeback

Lisbon is a historic city that has undergone dramatic rejuvenation in recent years, particularly in its revitalised waterfront areas. Although social tensions, infrastructural problems and financial difficulties had plagued the city over the years, they also provided the impetus for better governance and innovative ideas to do more with less. Today's Lisbon is marked by a new wave of energy throughout, ready to meet future challenges.

Museum of Art, Architecture and Technology on the Lisbon waterfront.
Image: kudla / Shutterstock

Praça do Comércio.
Image: Ingus Kruklitis / Shutterstock

Meeting Strategic Objectives

Faced with limited financial resources, Lisbon developed innovative schemes to partner with private-sector investors to meet the city's strategic objectives. For example, government incentives allowed developers to operate affordable homes for a growing population, while floor area bonuses for private landowners helped the city conserve its significant heritage and recover private parking spaces at prime locations, such as the landmark Praça do Comércio on the waterfront.

The Mouraria (Moorish) Quarter
Image: Damien Woon

Doing More with Less

Partnering with local communities has helped Lisbon do more with less. The case in point is the city's Participatory Budget, which utilises 5% of the municipal budget for citizen-championed projects, thus maximising resources for matters close to the heart. An example is the once-stigmatised Mouraria neighbourhood (Moorish Quarter), which was given a makeover with placemaking efforts, transforming it into an attractive, diverse and safe district today.

SYDNEY | URBAN TRANSFORMATION

From Polluted Terminal to Carbon-Neutral Precinct

The redeveloped precinct of Barangaroo, Sydney, is the first in Australia to achieve carbon-neutral status. The success of this urban renewal project demonstrates the potential for similar sustainable ventures in the country.

SYDNEY 🔍

Hidayah Md Sham is a writer at Tuber, the editorial consultancy for Urban Solutions.

Millers Point Gasworks brought the first coal gas street lights to Sydney but left East Darling Harbour contaminated with large deposits of coal tar.
Image: Mitchell Library, State Library of New South Wales

79

> **The precinct is Sydney's most significant urban renewal project in 20 years.**

The Challenge

The East Darling Harbour area in Sydney was once bustling with maritime and industrial activities over 100 years ago. This was home to the Millers Point Gasworks, which brought gas street lighting to Sydney (and Australia) in the 19th century. More than a century later in the 1960s, the container shipping revolution saw the area transformed into a busy container terminal. By the end of the 20th century, however, shipping technology changes and accessibility issues meant that the site was no longer viable for such functions. Container shipping operations were relocated to a port on the other side of Sydney, and the harbour fell into disuse.

The gasworks and shipping activities had left the East Darling Harbour area, especially its port, heavily polluted. Notably, the site contained highly contaminated groundwater as well as asbestos.

In 2003, the New South Wales (NSW) government announced the area would be transformed into a new urban precinct—Sydney's most significant urban renewal project in 20 years. Six years later, they committed the precinct to the C40 Cities Climate Positive Development Program, a recognition framework promoting sustainable urban development models that successfully reduce greenhouse gas emissions below zero.

Construction work on the precinct—now named Barangaroo—began in 2012. Development plans focused on attaining carbon-neutral, water-positive, zero-waste and socially sustainable outcomes.

█ █

To meet their sustainability goals, the NSW Government made it a bidding process requirement to deliver a Climate Positive result.

█ █

The Solution

The newly redeveloped precinct of Barangaroo will span 22 hectares (0.22 km^2) and be divided into three areas:

- **Barangaroo Reserve:** Six hectares (60,000 m^2) of open space with walking and cycling trails. This area officially opened in 2015.

- **Central Barangaroo:** The area's cultural and civic centre, with spaces for recreation, events and entertainment. Construction is expected to be completed by 2024.

- **Barangaroo South:** A neighbourhood containing residential and commercial buildings, as well as shops, cafes, restaurants and cultural facilities. Construction of all commercial and retail buildings finished in 2019, while the rest of the area will be completed by 2026.

To meet their sustainability goals, the NSW government made it a bidding process requirement to deliver a Climate Positive result, i.e., achieving net-negative operational greenhouse gas emissions.

Being water-positive means Barangaroo recycles more water than the drinking water it imports. To achieve this, 100% of the water used and produced at the precinct is recycled. In addition to blackwater and greywater from toilets, showers and restaurants, additional water is extracted from rainwater harvesting, cooling tower backwash and the sewer main (during times of low load).

The recycled water treatment plant sits in a 77,000 m^2 basement beneath Barangaroo South, along with other cooling, heating and water infrastructure. Instead of having separate systems set up for different buildings, the systems located in the basement power nine buildings in Barangaroo.

Also located in the basement is the District Cooling Plant that powers all air conditioning units in Barangaroo South. It uses water from the Sydney Harbour instead of piped water, saving approximately 40 Olympic-sized swimming pools of water each year.

Placing all this infrastructure in the basement—normally located on roofs—freed up the roofs of

Barangaroo's southern precinct

Carbon neutral by minimising consumption through great design, delivering green infrastructure, and then investing in carbon offsets

Rainwater tanks in each tower capture and recycle rainwater

6000m² of solar panels offset energy usage of public domain and water treatment plant

Offsite renewable energy sized to offset remaining carbon footprint

Office buildings have achieved 6 Star Green Star rating

Zero waste responsible waste management, diversion from landfill and zero waste emissions

Residential buildings have achieved 5 Star Green Star rating

Solar shading on facade includes vertical 'fins' to manage natural light and heat load
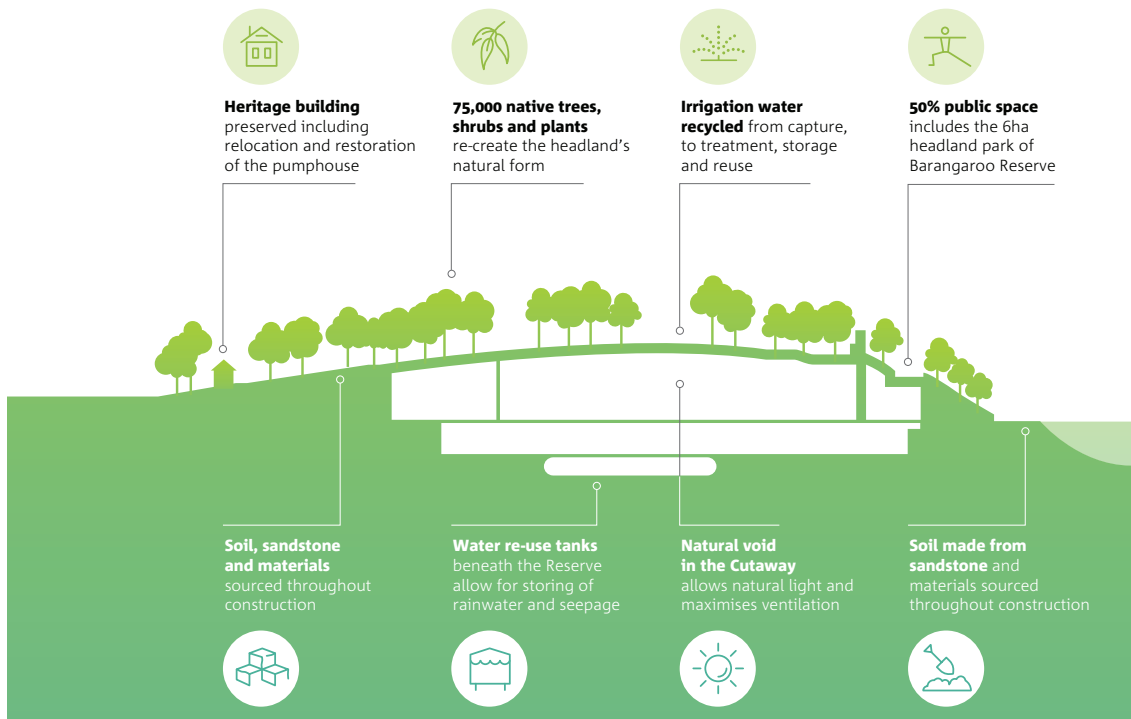
Recycled water from blackwater treatment plant will supply the precinct with water for toilet flushing and irrigation

Chilled water and harbour heat rejection system used throughout

Green travel options encourage cycling, walking and public transport links

Barangaroo Reserve

Heritage building preserved including relocation and restoration of the pumphouse

75,000 native trees, shrubs and plants re-create the headland's natural form

Irrigation water recycled from capture, to treatment, storage and reuse

50% public space includes the 6ha headland park of Barangaroo Reserve

Soil, sandstone and materials sourced throughout construction

Water re-use tanks beneath the Reserve allow for storing of rainwater and seepage

Natural void in the Cutaway allows natural light and maximises ventilation

Soil made from sandstone and materials sourced throughout construction

An overview of the features at Barangaroo South and Barangaroo Reserve, many of which contribute to the carbon-neutral and water-positive outcomes at the precinct.
Image: Barangaroo Delivery Authority, Barangaroo Sustainability in Practice Fact Sheet

Barangaroo's buildings to be fitted with 6,000 m² of solar panels instead. In turn, these panels generate the energy that powers the recycled water treatment plant in the basement, as well as the public domain lighting of Barangaroo South.

In working towards zero-waste output, Lendlease, the developer for Barangaroo South, took a novel approach by appointing an eco-concierge for the residential and commercial tenants in the area. The eco-concierge works directly with the tenants to achieve the prioritised sustainability goals, going beyond giving information. This involves directing tenants to opportunities to reduce waste and recycle. Support is also given to smaller tenants and retailers,

who do not have green initiatives in place, to lessen their daily environmental footprint.

But while infrastructure and operational requirements can pave the way towards achieving sustainability outcomes, a shared belief in the goal can make an even bigger difference. "You can't underestimate the importance of connecting with people on a values level," Lucy Sharman, the then eco-concierge at Barangaroo, told Property Australia in a 2018 interview. "Once we explained our vision for Barangaroo South, almost without exception, people come on board."

This new initiative has helped buildings in Barangaroo to recycle 19 different waste streams,

resulting in 80% of waste from residential and commercial buildings being diverted from landfills between 2015 and 2018.

82

View of Barangaroo's new skyline from Balmain.
Image: Zetter / iStock

All three commercial office towers in Barangaroo South have been awarded 6-Star Green Star Office Design ratings by the Green Building Council of Australia. This makes them the most sustainable high-rise office buildings in the country.
Image: Zetter / iStock

> **It is imperative that cities develop and grow sustainably to help slow the increase in global temperatures. Barangaroo...can be seen as a model for sustainable development.**

The Outcome

Cities take up just 3% of Earth's land today, but they chalk up 60–80% of global energy consumption and 75% of carbon emissions. To mitigate global warming caused by these emissions, the Paris Agreement treaty was drawn up in 2015 and adopted by 196 countries, including Australia. It sets out the goal to limit global warming to below 2°C (ideally 1.5°C) as compared with pre-industrial levels.

At current rates, global warming is likely to reach 1.5°C between 2030 and 2052. Therefore, it is imperative that cities develop and grow sustainably to help slow the increase in global temperatures.

Barangaroo, as one of only 19 projects in the Climate Positive Development Program, is a model for sustainable development. The precinct was awarded carbon-neutral status by the Commonwealth Government (under their Climate Active programme) in 2019, and it has since maintained the certification for three consecutive years. Once complete, it is expected to create 23,000 permanent jobs, house 3,500 residents and contribute over A$2 billion (S$1.95 billion) a year to the NSW economy—demonstrating that urban developments can operate sustainably without compromising their economic viability.

Beyond sustainability outcomes, the Barangaroo project has also raised awareness of the area's Indigenous history and created employment opportunities for First Nations peoples. Lendlease, for example, works with the majority Indigenous-owned company, NPM Indigenous (NPMI), to establish an Indigenous-based supply chain to support the development. So far, metalwork and masonry contracts as well as the design of the green roof have involved Indigenous-owned companies and Indigenous workers.

As a precinct, Barangaroo operates on a small scale and may not encounter the same challenges facing larger urban settlements. Nevertheless, its success paints a hopeful picture for the future of sustainable development in Australia.

83

TODMORDEN | FOOD SECURITY

The Incredible Edible Buffet of Kindness

In the British town of Todmorden, a ground-up community is building both food resilience and community bonds. We trace how a small local initiative grew into a thriving movement.

TODMORDEN

Elyssa Kaur Ludher leads the food and resource resilience research at the Centre for Liveable Cities. She is the co-author of *Food and the City: Overcoming Challenges for Food Security*. Norio Sim is a researcher at the Centre for Liveable Cities, focusing on urban resilience and climate change.

Through the community's united efforts to grow edibles, the declining town of Todmorden turned into one of UK's best places to live.
Image: Incredible Edible Todmorden

85

> **Beyond growing food as a community, the success of the programme is attributed to its focus on kindness.**

The Challenge

Since the closure of its textile industries in the 1960s and 70s, the British mill town of Todmorden had been on a path of economic decline. The town's main streets were unkept and dotted with empty shopfronts. Local employment opportunities were few. The local council lacked the resources to maintain public areas while 17.5% of the population was described as "income deprived", according to the UK's Index of Multiple Deprivation in 2015, higher than the national average. Population health was also worse off than the national average. Housing prices trended downwards, while the resident population declined over time to approximately 15,000.

The global financial crisis of 2008 further exacerbated the economic and social woes in Todmorden and its surrounding region. Faced with dwindling funds, volunteer organisations serving the social needs of the community closed. The situation seemed grim.

(Above and next page) Volunteers meet regularly to convert public and private spaces—at the police station, community college and roadside—into edible gardens. *Image: Incredible Edible Todmorden*

The Solution

In 2008, three women sitting around a kitchen table decided to stop seeing themselves as powerless and started a small initiative to reconnect people with one another, and to the soil and seasons. They were motivated by the hope of arresting the town's decline while also addressing climate change. A town hall meeting was called where the women presented their idea—to clean up derelict spaces and plant edibles, even though Todmorden did not have a history or culture of farming. They were pleasantly surprised to find that many in the town heartily supported the idea. Within days, volunteers were planting edibles wherever they could find space, believing it was far more efficient to "ask for forgiveness than permission".

Since then, Todmorden's volunteers meet on their own every first and third Sunday of the month, from 10 a.m. to 12 p.m. On average, 50 community members participate consistently to plant or garden on any green or clean public spaces. Today, there are more than 70 edible plots around town—from vegetable patches outside the police and fire stations, to herb planters at the train station.

While edibles and the regular group lunches are the glue that have brought the community together, the town attributes the programme's success to its focus on kindness. The wish to spread kindness permeates every decision and action, it says. For example, any member of the public can

87

Stronger social connections—the building blocks of a socially resilient community—have created the confidence to start more complex projects.

harvest the edibles—in fact, they are encouraged to do so with signs saying, "go on, take it, it's free". All are invited to the post-gardening Sunday lunch, including non-volunteers. Kindness is an integral part of approaching problems too. For example, when people were rushing to harvest the rhubarb before the plants were ready, rather than fencing off the plots, the group decided to grow more rhubarb so there would be enough for everyone. When plots were vandalised, volunteers helped to educate the community and at schools; as a result, there are now close to zero incidents. The community sees the plots as "propaganda gardens"—to remind people to live the life of kindness.

The Incredible Edible Todmorden movement supports itself with monies raised by volunteers conducting "vegetable tours" and speaking engagements. Government funding is avoided so volunteers can focus on their actions, rather than the paperwork. They have found the approach of drawing from their greatest resource—people—to be far more sustainable. One survey in 2013 found that because of the movement, 47% of residents in Todmorden expressed they had begun to grow food in their homes and 79% said they would like to see more food growing around the town.

Food is the glue—the free lunch served after the volunteering sessions enhances regular, inclusive socialising, with people from different socio-economic spectrums, ages, mental and physical types, and ethnic backgrounds. These days, it serves vegan curry meals.
Image: Incredible Edible Todmorden

Todmorden introduced the concept of "vegetable tourism", drawing visitors from all over the world.
Images: Incredible Edible Todmorden

> The Incredible Edible movement has since spread to more than 200 localities worldwide.

The Outcome

In 2021, the UK's Sunday Times named Todmorden one of the 10 "Best Places to Live", crediting the Incredible Edible movement. The group has achieved its goal of improving local socio-economic conditions. One study found that for every £1 (S$1.88) invested through volunteer time and small financial contributions, £5.51 (S$10.36) was returned to the townsfolk. Local home prices have also edged higher but remain affordable, avoiding gentrification. The population has become more diversified.

As Todmorden's economic resilience increased, so too did its social resilience. Focusing on kindness has empowered people beyond growing food. Stronger social connections—the building blocks of a socially resilient community—have created the confidence to start more complex projects, e.g., teaching cooking and gardening in schools.

When the UK went into COVID-19 lockdown in 2020, the group mobilised their resources to provide free food daily in two locations for nearly six months. The needy were also given bedding, clothes and toys. Three libraries were set up to offer books. In 2021, volunteers took over a former community college after five years of campaigning and fundraising to set up the Todmorden Learning Centre and Community Hub, providing learning, office and sports facilities for the public.

The Incredible Edible movement has since spread to more than 200 localities worldwide, each tailoring the activities to their own context and needs, with Todmorden's volunteers available to advise them.

The movement took the tiny seed of planting edibles and "grew" it into something powerful. "It takes passion and commitment and the tenacity of a Rottweiler to get the community involved," Mary Clear, one of the founders, said in a TV interview. But any community can do it. They simply have to tap two drivers: the fundamental human value of kindness, and a community's desire to do better for the planet. As Clear added: "Our joy is in the people—our greatest resource."

89

SINGAPORE | SMART COMMUNITY DESIGN

New Urban Kampung Research Programme

With the increasing demographic shifts in Singapore, we propose looking beyond conventional stratification, which is no longer adequate for assessing urban planning and people's diverse needs and perceptions.
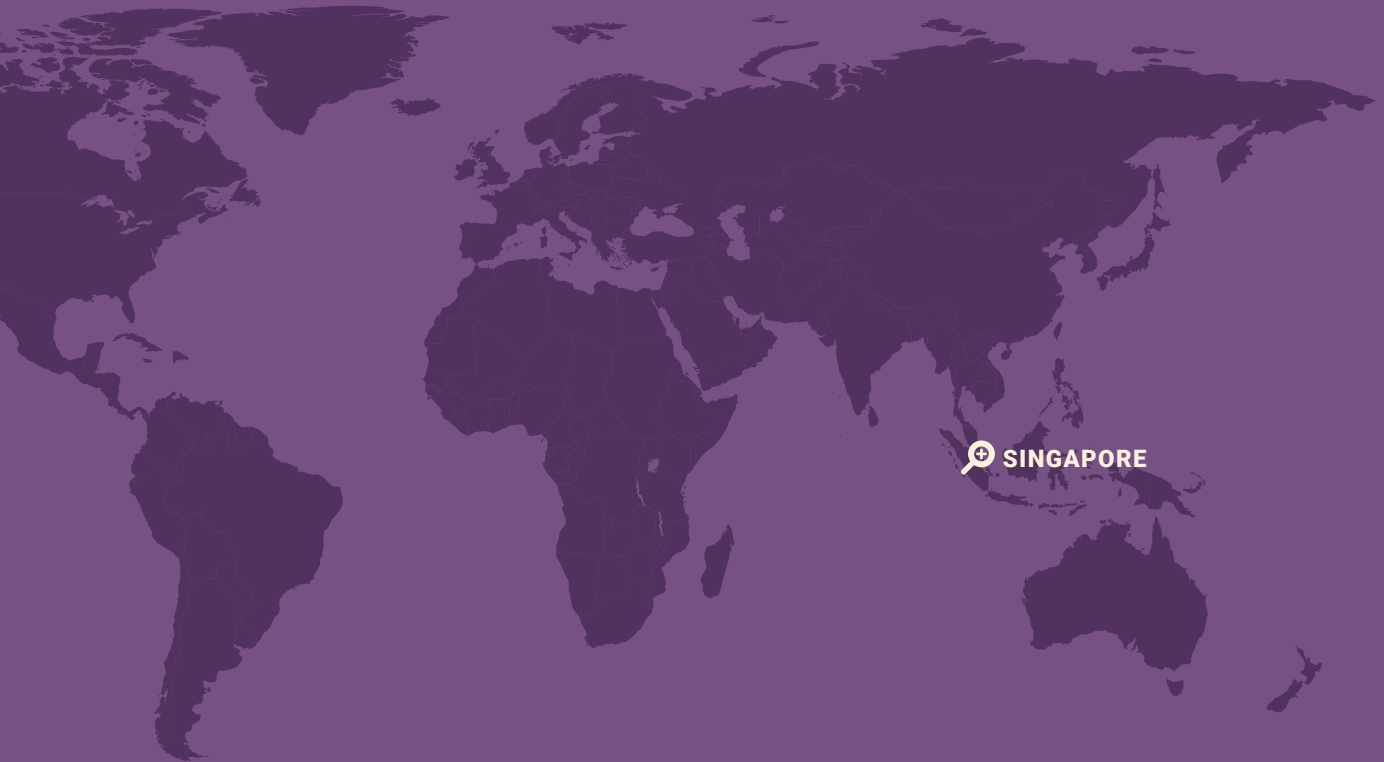
SINGAPORE

Dr Chong Keng Hua
Programme Lead, New Urban Kampung Research Programme
Associate Professor, Architecture and Sustainable Design
Singapore University of Technology and Design

Tan Gee
Co-lead, New Urban Kampung (NUK) Research Programme
Director (Centre of Building Research), Building & Research Institute
Housing & Development Board (HDB)

First-level Clustering

Socio-economic Variables

Age

No. of years lived in the house

% of time spent on Chinese

% of time spent on Tamil

% of time spent on Chinese dialect

% of time spent on Malay

Household Income Levels

Highest education

Tenure status

Employment status

Household type

Second-level Clustering

Lifestyle Variables

Job time

No. of people living in the house

Relatives/ family living within 10 mins walk
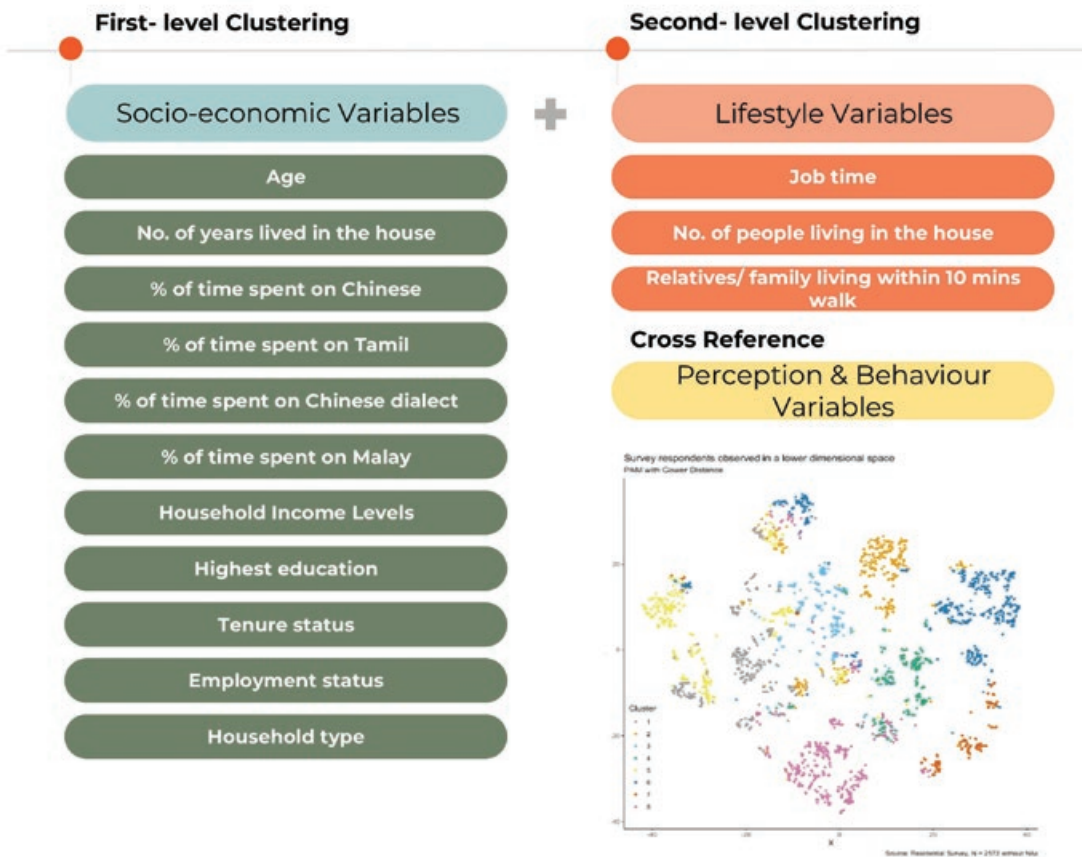
Cross Reference

Perception & Behaviour Variables

Figure 1. Resident segmentation based on multi-variable two-level clustering approach, drawing survey data from Toa Payoh, Jurong East and Punggol, each representing a different life stage of the town, demographic profile, and town planning concept.
Image: Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore

91

The Challenge

Housing development in Singapore has come a long way from providing a home to enabling sustainable living. Yet, as society matures, social sustainability, which covers the aspects of sustainability relating to people, has become one of the major challenges for public housing.

According to Census 2020, the average household size decreased over the past decade from 3.5 persons to 3.2 persons across most housing types. There was an increase of about 4% in the number of singles while the percentage of couples with children decreased from 56.0% to 47.7%.

An ageing population adds to the challenge. About a third of households had at least one senior citizen (aged 65 years and above), while seniors-only households also doubled from 4.6% to 9.3% in the past decade.

Against this backdrop exist widening inequalities and increasingly diverse communities, with their different perspectives and priorities. Traditionally, residents have been profiled based on demographic markers such as age, gender or ethnicity. But such stratifications have become inadequate for the understanding of their circumstances and choices, or for assessing their quality of life, let alone for deriving targeted approaches to support their complex needs.

Figure 2. The eight emerging resident archetypes.
Image: Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore

We developed a comprehensive set of tools and platforms to help planners generate evidence-based neighbourhood designs and promote community bonding.

The Solution

This led to the formulation of the New Urban Kampung (meaning "village" in Malay) research programme at the Singapore University of Technology and Design (SUTD), led together with the Housing & Development Board (HDB). The initiative is supported by the Ministry of National Development and the National Research Foundation, under the Prime Minister's Office for the Land and Liveability National Innovation Challenge (L2 NIC) Research Programme.

The interdisciplinary research couples data analytics with social behavioural studies to derive better insights and thereby more targeted interventions. Our research also developed a comprehensive set of participatory toolkits and digital platforms to help planners generate evidence-based neighbourhood designs and promote community bonding. The programme resulted in four key interlinked outcomes:

1. **Redefined Resident Archetypes**

   Our analysis simultaneously considers multiple variables, i.e., 14 socio-economic and lifestyle variables in a two-level segmentation analysis, to achieve a more complex profile of the population segments (fig. 1). Drawing data from 5,155 door-to-door and street-intercept

surveys conducted in three residential towns (Toa Payoh, Jurong East and Punggol), we identified eight emerging resident archetypes (and 20 sub-segments), with a detailed understanding of their diverse perceptions and needs (fig. 2).

2. **New Quality of Life Framework**

Based on surveys and 241 additional in-depth interviews with residents, we developed

a new Quality of Life (QOL) framework that features seven life domains, 19 sub-domains, and 67 indicators specifically catered to Singapore's public housing context (fig. 3). The bottom-up data analytic process reveals the various factors affecting the residents' QOL, which can be measured through objective and subjective indicators. This new framework gives us a more localised yet comprehensive way of understanding QOL in

public housing and enables analytics comparing different towns, neighbourhoods and resident archetypes.

3. **New Tools for Socio-Environmental Data-driven Planning**

By consolidating survey, interview, behavioural and sensor data, we created four urban analytics tools that can aid the planning process, by uncovering

93

Figure 3. New Urban Kampung Quality of Life (QOL) Framework for HDB Public Housing. The indicators are further distinguished between objective and subjective measures, and between QOL (relating to an individual or family) and QOP (Quality of Place—relating to the relationship with the neighbourhood).
Image: Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore

Figure 4. All four urban analytics tools are integrated in the EDF Lab's City Application Visualisation Interface (CAVI), a web platform with geospatial simulation and visualisation capabilities.
Image: EDF, Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore

94

the interdependencies between urban systems and social factors (fig. 4):

- **QOL Data Visualisation** enables planners to compare QOL indicators between towns and neighbourhoods, and between resident archetypes, which helps identify areas of opportunities and target archetypes for interventions.

- **Accessibility Analysis** uses agent-based modelling to understand how residents navigate and manoeuvre within housing precincts, and the proximity and accessibility of amenities in relation to the resident archetype of interest.

- **Social Centrality Analysis** is a data-light model that identifies places where there is high potential for social interactions, which is useful for site selection. (In light of COVID-19, the same model could also be used to identify places where people would likely congregate and where

safe distancing enforcement would be needed.)

- **Virtual Population Model** provides agent-based predictive analysis to simulate dynamically how the town population, resident archetypes and household composition will evolve with time, thus anticipating emerging needs.

4. **A Community Enablement Playbook and Prototypes**

With such data-driven capability, our proposed community design process departs from conventional development through understanding resident archetypes, their QOL, needs and assets in different neighbourhoods, and employing urban analytics tools to identify gaps and suitable sites for intervention.

An online community platform and two placemaking (a design process to strengthen connections between people

and the places they share) prototypes have been developed and piloted in Jurong East and Punggol towns:

- The **nukampung app** is a one-stop online community platform that brings together all events and activities run by different organisations within a neighbourhood. Through gamification, it also encourages residents to form interest groups with like-minded neighbours and champion community initiatives.

- **Social Deck** is a placemaking enablement kit that transforms the ordinary void deck, an empty space on the ground floor of public housing blocks, into a social space for "resident champions" (residents who lead community initiatives) to temporarily "own" a space to run their initiatives (fig. 5). This is the result of a six-month champion incubation process called **Project Zero**, piloted in collaboration with local

social enterprise Bold At Work. Since its launch in the Yuhua residential estate in western Singapore in early 2021, Social Deck has kickstarted a neighbourhood-wide item exchange initiative and a weekly rescued food-sharing programme.

· **Cascadia Our Secret Yard (COSY)** is a community space co-designed with resident champions from Waterway

Cascadia, a residential compound in northeast Singapore. The design activates an unused third-storey "white space" facing the environmental deck, and transforms it into meaningful social spaces for residents (fig. 6).

This participatory action research has led to the development of the online-

to-offline/offline-to-online **O2O Community Enablement Playbook**. It lets community designers employ different co-creation strategies with residents from different neighbourhoods (fig. 7). The O2O engagement also presents a new opportunity that may adapt well in a COVID-19 endemic world.

95

Figure 5. nukampung, a one-stop online community platform developed by the SUTD (left), now merged with GoodHood; Social Deck, an adaptable, modular system that enables resident champions to run their initiatives (right). Social Deck and nukampung function as complementing O2O community enablement tools.
Images: Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore / Denise Nicole Lim & Natasha Yeo

Figure 6. COSY, for Cascadia Our Secret Yard, is a new typology of community space that includes a flexible live-streaming event zone, COMMUNE; a co-working space, COLLAB; and an explorative hobby area, CREATE.
Images: Singapore University of Technology and Design, Cascadia Connect & Housing & Development Board (HDB), Singapore / Neo Sze Min & Natasha Yeo
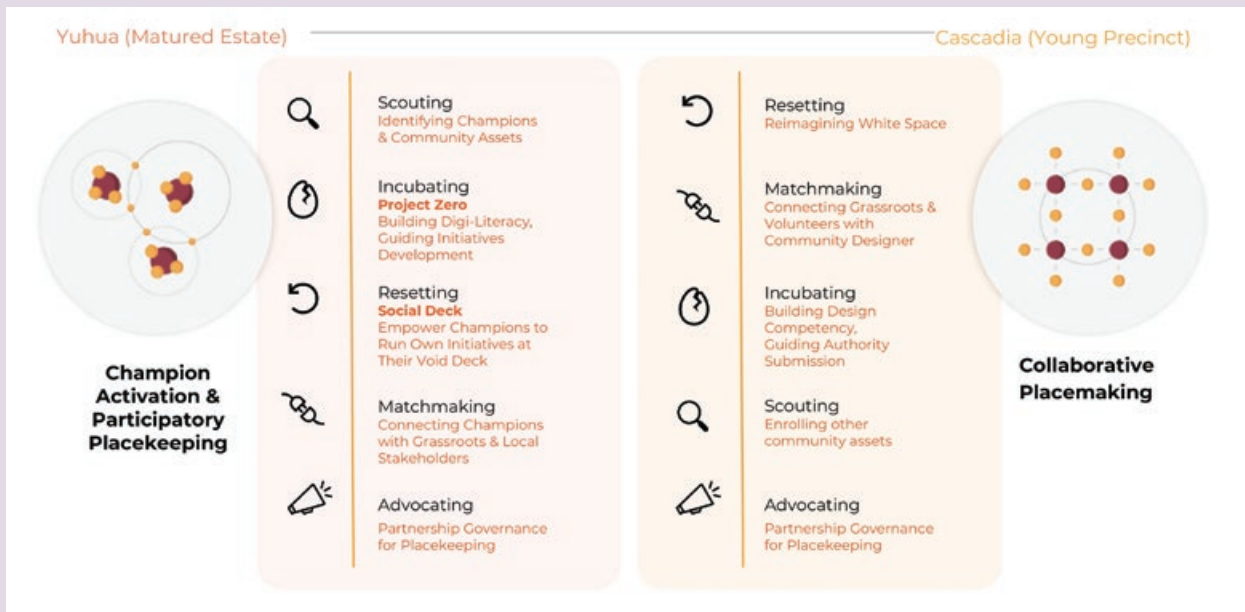
Figure 7. The O2O Community Enablement Playbook consists of five action plans: Scouting, Incubating, Resetting, Matchmaking, and Advocating, all interchangeable in sequence depending on the strategies employed in different neighbourhoods. For example, we can employ an asset-based participatory placekeeping approach building on social capital in mature neighbourhoods like Yuhua (left); the need-driven collaborative placemaking approach is more suitable for younger neighbourhoods like Cascadia (right).
Image: Singapore University of Technology and Design & Housing & Development Board (HDB), Singapore

The Outcome

The comprehensive studies and prototyping have brought forth several design and policy implications.

For example, 26.1% of emerging resident archetypes consist of seniors living alone or those living with other seniors. These senior citizens are at risk of lacking robust social support. For this reason, we need to shift our paradigm from "ageing-in-place" (yet being lonely) to "ageing-in-community". To do this, we need to provide a more diverse and affordable assisted living typology, coupled with a healthy environment and creative programmes to enable outdoor mobility, socialisation and mutual support for this demographic.

More housing options are also needed to cater to a growing diversity of unconventional living arrangements, while promoting a child-friendly environment to reverse the ageing trend. A prototypical housing concept of co-living could be further explored.

Our prototypes show that placekeeping—the active care of popular spaces and their social fabric for the longer term—is crucial in sustaining community spaces and programmes. Participatory placekeeping could be introduced by empowering community groups to manage "white spaces", formalising an ownership contract, and allowing a higher level of autonomy and responsibility. This would lead to a higher sense of ownership and community participation.

Finally, we learned that the success of community development in Singapore lies not only in the activation of individual champions and strong support from grassroots networks, but also in the facilitation by community designers. Their expertise is genuinely needed in building residents' capacity, guiding them through complex administration, linking local stakeholders, translating ideas into designs, and bridging community spaces and programmes.

Powered by the tools and knowledge gained from this research, we believe the future of public housing living in Singapore will be enhanced by diverse offerings, as well as sustain more vibrant, cohesive and resilient communities. 🔎

WORLD CITIES SUMMIT 2022
Liveable and Sustainable Cities: Emerging Stronger

In-person Conference
31 July - 3 August 2022

Virtual Conference
From 10 August 2022

Register for WCS 2022 Virtual Conference to view highlights of the physical Summit and original virtual content such as Special Addresses.

Scan to register

GO.gov.sg

WORLD CITIES SUMMIT

worldcitiessummit.com.sg

@worldcitiessummit

@world.cities.summit

info@worldcities.com.sg

@World Cities Summit

@WorldCitiesSummit