

# ISSUE 19 • JUN 2021

# URBAN SOLUTIONS

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**Greg Clark**

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**Cape Town**  
**Singapore**

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**Adapting to a  
Disrupted World**

A biannual magazine  
published by

CENTRE for  
**LiveableCities**  
SINGAPORE

# Temasek Foundation Leaders in Urban Governance Programme

The Temasek Foundation Leaders in Urban Governance Programme (TFLUGP) is a 5-day mayoral and executive workshop targeted at top leaders from Asian cities. A practitioner-oriented programme, it aims to share knowledge of the guiding principles which contribute to high-density and high-liveability urban development and management through Singapore's urban development experience.

## WHAT TFLUGP OFFERS

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- Dialogues with key leaders who have inspired Singapore's transformation within the last 50 years
- Mentoring of City's Action Plan with CLC's Resource Persons
- Opportunity to pitch City's Action Plan to relevant International Organisations and private sector representatives
- Networking and Peer Learning with participating city leaders

## PAST SPEAKERS

**Mr Desmond Lee**  
Minister for  
National Development

**Dr Liu Thai Ker**  
Former Chairman,  
Centre for Liveable Cities

**Dr Cheong Koon Hean**  
Former Chief Executive Officer,  
Housing & Development Board

**Mr Dirk Sommer**  
Senior Investment Officer,  
International Finance  
Corporation, World Bank Group

**Ms Lauren Sorkin**  
Managing Director,  
Resilience Cities Network

## TESTIMONIALS

“ Many solutions and ideas from CLC Resource Persons... I got a better concept to my project implementation. There was good knowledge and networking with SEA and EA countries. ”

**Mr Vu Quang Hung**,  
Secretary, Lien Chieu District Party  
Committee, Da Nang, Vietnam  
(TFLUGP 2019 Alumni)

“ It was a great networking experience with private sector companies, city mayors and technical experts at the programme. It was very meaningful with a lot of lessons learnt. ”

**Mr Vichak Cheav**,  
Deputy Governor, Preah Sihanouk,  
Cambodia (TFLUGP 2019 Alumni)

A Joint Programme by

29 NOVEMBER TO  
3 DECEMBER 2021



2021's edition will take on a whole new experience with seminars, panel discussions and dialogue sessions going fully virtual.

The Programme will explore the following key themes:

- Integrated long-term planning
- Infrastructure financing
- Resilient and sustainable environment
- Competitive economy
- Strong and inclusive communities

## APPLICATION

Cities are invited to nominate teams headed by a city leader (governor/mayor/municipal commissioner) together with two other senior officials responsible for urban planning, development and governance. Cities should submit a concept paper on a project related to a challenge they wish to implement over a year.

Please email  
**alice\_lim@mnd.gov.sg**  
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## SELECTION CRITERIA

- Fluency in spoken and written English.
- Relevance of city project to making highly dense cities more liveable.

## PROGRAMME FEES

Sponsorship from Temasek Foundation is available. Eligibility criteria apply.

# URBAN SOLUTIONS

ISSUE 19 • JUN 2021

CENTRE for  
**LiveableCities**  
SINGAPORE

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**Cover Image:** A woman practises urban farming in Jakarta, Indonesia in October 2020. COVID-19 lockdowns and disruptions in food supply have pushed many to pursue urban farming, even with limited space.  
Image: Anton Raharjo / Anadolu Agency via Getty Images

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

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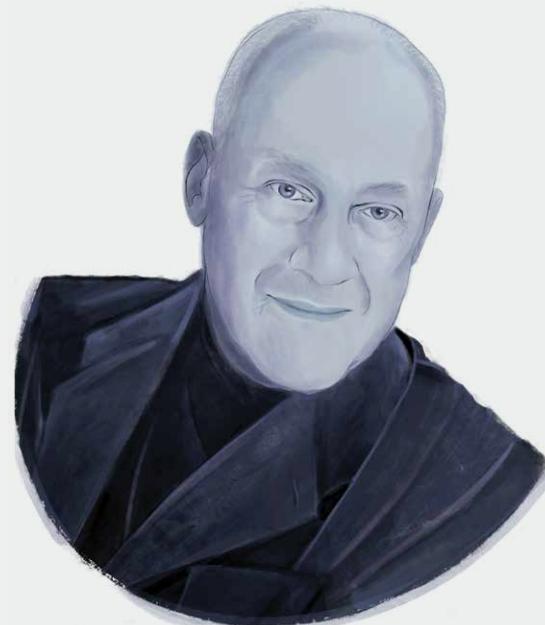
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NORMAN FOSTER

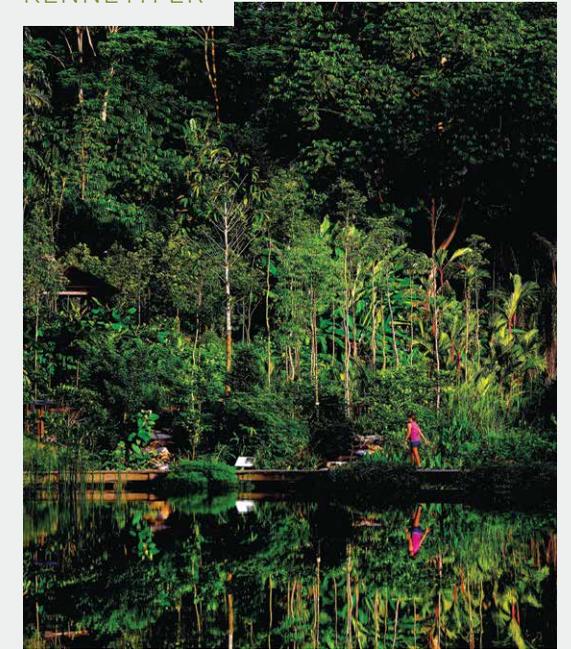


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## From the Executive Director

# Cities are the Crucible for a Green Recovery

The impact of the COVID-19 global pandemic will remain with us for a long time to come. Yet as governments seek to move beyond the devastating consequences of the pandemic, the call to tackle climate change continues to amplify in magnitude and urgency. How can the world recover from COVID-19 to address this?

As Catlyne Haddaoui and Freya Stanley-Price assert in their essay, cities are the solution. Through interviews with city leaders and experts, guest articles and case studies, this issue of *Urban Solutions* explores how cities can exploit their unique identities and strengths to adapt to and even emerge stronger from a disrupted world. Three key insights emerge in our articles:

### It is time to rethink the "city".

The traditional notion of a "city" and all that it entails needs to be revisited to take stock of its continued strengths and identify opportunities for change.

In the wake of COVID-19, Prof Stephen Cairns explains why urban density remains valuable, and how it can be better designed. Prof Sing Tien Foo shares how future office space will evolve alongside changing needs and technology. Prof Greg Clark predicts the rise of blended "physical-digital" cities with greater flexibility in where and how people live, work and play, and Deputy Prime Minister Heng Swee Keat shares how Singapore is charting a new path through the Singapore Green Plan.

### A green and inclusive future is key.

A sustainable future is critical in the fight against environmental crises, and Sylvie Ouziel outlines the challenges for cities to address in their pursuit

of this vision. Yet as Norman Foster reminds us, cities must pursue this vision without leaving its people—including those on the margins—behind. Kenneth Er explains how Singapore is expanding access to urban nature for all communities to boost social resilience.

### Cities must constantly reinvent.

In this time of volatile change, cities cannot rest on their laurels if they want to succeed.

Many cities have shown how this is possible. The Lee Kuan Yew World City Prize laureates—Seoul, Medellín, Suzhou, New York and Bilbao—share how they continue to forge ahead with bold visions for the future, notwithstanding the global pandemic. Cape Town's and Tallinn's respective successes in overcoming a water crisis and developing a smart city from the ground up also provide inspiration that it is possible for cities to adapt and flourish in spite of adversity.

History records the many triumphs of cities that have successfully built back stronger after crises. I hope this issue of *Urban Solutions* will inspire us all to be the history-makers who build cities that not only survive but thrive even in the face of an uncertain future. I wish you all an enjoyable read.

**Hugh Lim**

**Executive Director**  
Centre for Liveable Cities



IN CONVERSATION WITH  
**HENG SWEE KEAT**

# Emerging Stronger in a Post-COVID World

Singapore's Deputy Prime Minister Heng Swee Keat, who is also the Coordinating Minister for Economic Policies, shares how Singapore is charting a new post-COVID path through innovation, sustainable development and collaboration between cities.



Image: Ministry of Communications and Information, Singapore

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**The pandemic has given urban planners a window of opportunity to rethink fundamental planning assumptions and mindsets.**



The Urban Park in Guoco Tower is an example of how Singapore is transforming its CBD into a vibrant space round the clock.  
Image: GuocoLand

**It has been more than a year since COVID-19 first emerged, bringing about unprecedented challenges and changes for the world and for Singapore. What are some lessons that Singapore and cities can learn from the past year to be ready for future disruptions?**

The pandemic has not spared any corner of the world. The high population densities and concentration of activities in cities seemed to make them more vulnerable in particular. But the picture is a complex one—the virus has had an uneven impact across cities, and sometimes even within the same city. It is not just population densities that mattered, but also factors such as access to quality healthcare, trust in government, and whether people complied with mask-wearing and safe management measures.

But the pandemic has also given urban planners a window of opportunity to rethink some fundamental planning assumptions and mindsets, and to consider how to build more resilient cities going forward.



First, the pandemic has unlocked new possibilities in planning cities. One example is the role of Central Business Districts (CBDs). In most cities, people generally live outside the CBDs, and commute to and from work. But during the pandemic, it was surreal to see CBDs virtually empty. Digital technology made remote work not just possible, but more productive for some. Even after COVID-19, remote working is unlikely to disappear, though some jobs will still require a physical presence. Many cities are now considering what this means for the design of CBDs, homes, and public transport networks. Singapore is fortunate to have a head-start. Even before COVID-19, our urban planners were already studying how to transform the CBD into vibrant mixed-use neighbourhoods with more residences. We have

New generation neighbourhood centres like Oasis Terraces (right) provide surrounding housing districts a variety of social, communal and recreational facilities.

Image: Housing & Development Board, Singapore



also been building a “polycentric” city, with regional centres to bring work closer to homes. COVID-19 has given fresh impetus to these earlier efforts. We must also continue to invest in our digital infrastructure, including 5G technology, and integrate them in our planning.

Second, COVID-19 has highlighted the need to design cities that are resilient and adaptable for future pandemics. Cities have focused on optimising the lived experience of residents during normal times. But they have generally not paid the same attention to how cities can be resilient to crises like pandemics. How do we enable people to continue their daily lives with minimal disruption, even with limitations to physical movement? One lesson from the lockdowns worldwide is the importance of being able to access amenities without having to travel too far. Singapore’s public housing agency, the Housing & Development Board (HDB), has done a good job in carefully designing our public housing towns to have social and recreational amenities that are easily accessible. Looking ahead, there is also an opportunity to provide more coworking spaces for those whose homes might not be conducive—for example, in commercial or community spaces.

Community clubs around the island have been repurposed as vaccination centres.

Image: The Straits Times © Singapore Press Holdings Limited. Reprinted with permission.



With overseas travel on hold, Singaporeans are flocking to nature areas such as Pulau Ubin for a quick getaway.

Image: The Straits Times © Singapore Press Holdings Limited. Reprinted with permission.

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**Beyond COVID-19, it is important for urban planners to master emerging trends. After all, what urban planners do will have a lasting impact for many decades.**

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Another important aspect of building resilience is to provide buffers in our urban fabric to enable rapid responses to crises. The pandemic highlighted the value of being able to make use of temporary and flexible spaces in the city, to meet unexpected needs. We have converted major meeting and convention venues into temporary care facilities or accommodations. And we have also repurposed community spaces into vaccination centres. It is important to remain dynamic—while the challenge today is COVID-19, the next time round, it could be a different type of pandemic or challenge.

Third, the pandemic has shown the value of integrating green spaces into urban landscapes. With overseas travel on hold during COVID-19 and activities restricted due to safe management measures, Singaporeans have been exploring our parks and nature reserves more than ever. Footfall has increased significantly. For example, Pulau Ubin, which I visited during my year-end break last year, saw a sharp increase in visitorship, with twice as many visitors compared to the same period before COVID-19. In a small city-state like ours, it will not be easy to balance development needs with the desire to preserve our green areas. But this must be our ambition. This is why we have plans for every household to be within a 10-minute walk from a park by 2030. We are also planning to add 1,000 hectares (10 km<sup>2</sup>) of green spaces by 2035. Health and wellness should be a core objective when designing cities.



**While we will not move the needle globally, we must do our part with the global community, because climate change is an existential threat for everyone.**



More broadly, beyond COVID-19, it is important for urban planners to master emerging trends. There will be other disruptive forces—whether it is changing technological trends, shifting consumer behaviour, or ageing demographics. Understanding the implications of these trends will be critical in shaping planning. After all, what urban planners do will have a lasting impact for many decades.

**Many have spoken of a “green recovery” as key to building back stronger after the pandemic. Singapore is already taking decisive action with the recently announced Singapore Green Plan 2030. Why is it critical for Singapore to embark on this plan now?**

Sustainable development is not new to Singapore. Singapore's first Prime Minister Lee Kuan Yew drove the vision of a Garden City in our early years, even before “green” was fashionable. Our founding generation transformed Singapore from a polluted backwater with mucky rivers in 1965, to one of the cleanest and greenest cities in the world.

And we have not stopped there. We built Gardens by the Bay, a green lung over 100 hectares (1 km<sup>2</sup>) in size right in the heart of our city. The Botanic Gardens is another good example. We added 18 hectares (0.18 km<sup>2</sup>) with



Heng Swee Keat and Minister for National Development Desmond Lee plant a Cengal tree at the opening of the Singapore Botanic Gardens Gallop Extension in March 2021.

Image: Ministry of Communications and Information, Singapore

the Tyersall-Gallop Core, bringing the total size of the Botanic Gardens to 82 hectares (0.82 km<sup>2</sup>). I recently opened new features at the Gallop Extension, which will provide even more outdoor spaces for Singaporeans to enjoy.

Why is it critical for Singapore to take even more decisive action at this point, through the Singapore Green Plan? After all, our emissions are 0.1% of global emissions. But while we will not move the needle globally, we must do our part for the global community, because all of humanity has just this one Earth, and climate change is an existential threat for everyone.

For example, as a low-lying city-state, many parts of Singapore will be submerged by the end of the century if we do nothing. We must therefore build on our earlier efforts to do even more. So I am glad that global momentum on climate change is rising, especially with the US re-joining the Paris Accord, and President Joe Biden convening a meeting of world leaders.

Low-lying countries like Singapore are vulnerable to flash floods caused by more frequent bouts of intense rainfall and rising sea levels caused by climate change.

Image: ROADS.sg

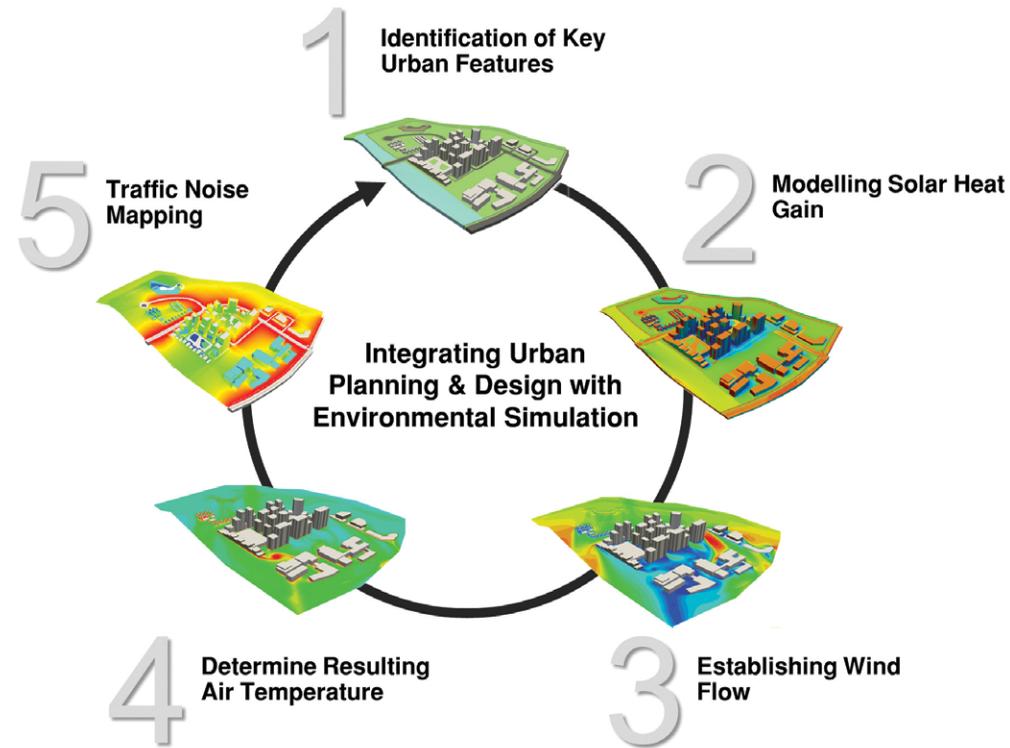


**The Green Economy is one of the key initiatives under the Singapore Green Plan. How does Singapore envision long-term sustainability as a new engine for economic growth?**

There are many exciting opportunities for businesses and workers in the areas of “green growth”—such as in renewable energy and the circular economy. “Green growth” can be an economic driver for Singapore and the region in the decades ahead, as more people take sustainability seriously.

Singapore aims to halve peak emissions by 2050, and achieve net zero emissions as soon as viable in the second half of the century. Underpinning these efforts is a major push towards research and innovation. Last year, I announced our S\$25 billion Research, Innovation and Enterprise 2025 plan, with urban solutions and sustainability as a major focus.

## Integrated Environmental Modeller (IEM)



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The Integrated Environmental Modeller (IEM) helps urban planners optimise thermal comfort when designing new towns.  
Image: Housing & Development Board, Singapore

### What are some of these urban solutions that will be implemented for Singapore to meet the ambitious targets that have been set for the next 10 years?

There are many, and it would not be possible to list all of them. One example is the Integrated Environmental Modeller, which helps urban planners maximise thermal comfort for residents, to combat the Urban Heat Island Effect. We have used this to design Tengah, our newest public housing estate. Another example is how we are making a bigger push on clean energy. Within the decade, we will deploy at least 2 gigawatts of solar power—five times that of today. Given our small size and high population density, we will need creative solutions, such as applied photovoltaics on building facades, and floating solar panels on our reservoirs and offshore waters.

We have an important advantage—our small size allows us to be nimble and agile. Solutions that are worth scaling up can be done quickly across our island. We should continue to innovate and pilot new urban solutions. If we can do these well in Singapore, they could be of use to other cities.

### How is an active citizenry critical in the fight against climate change and in building strong communities? How can the government better support their people in building a sustainable and resilient society, and vice versa?

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**This is the spirit of Singapore Together. It is all of us sharing a common purpose, and doing our part to make a difference.**

||

To build a sustainable and resilient society, everyone has a role to play.

What can individuals do? One important way we can all contribute is by generating less waste. At the current rate, Semakau Landfill—Singapore's only landfill—will run out of space in 15 years! So we must all make a determined effort to "Reduce, Reuse, Recycle". Each of us would also need to make some sacrifices and trade-offs, such as by reducing our energy consumption or paying more for certain products. While our individual efforts may seem small, small acts by everyone can together make a big difference.

Ground-up efforts from the community are also critical. For example, in my constituency in East Coast, residents have stepped forward to volunteer as "Green Ambassadors". Such efforts are helpful not just to drive the green agenda, but also foster a sense of community through a shared purpose.

Businesses also have a role to play. A good start is the Alliances for Action, which we launched in June last year. These are multi-stakeholder partnerships, led by industry, with a strong bias towards action and solving

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Solar panels are being deployed progressively in HDB towns as Singapore moves towards clean energy.  
Image: Sunseap Group

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**As the world seeks to rebuild after the pandemic, cities, as key nodes of ideas and innovation, will be more important than ever.**  
 ||

real-world problems. One of the Alliances focuses on environmental sustainability. Southeast Asia has tremendous potential to contribute to green growth, especially through nature-based solutions for carbon removal. This Alliance seeks to develop a marketplace for high-quality carbon credits, and provide technology-enabled verification systems for carbon solutions. This can catalyse investment in carbon solutions in the region.

In Singapore, the government is committed to working with all Singaporeans on this journey. We value citizens' ideas, feedback and partnership. We will continue to make significant investments in science and technology, and we will take a science-based approach and be upfront in explaining the challenges.

Climate change is a complex issue. To tackle this well, we must put together our collective wits and will, and rally different stakeholders—businesses, community groups and individuals—to make a difference. This is the spirit of Singapore Together. It is all of us sharing a common purpose, and doing our part to make a difference.



The Emerging Stronger Conversations gave Singaporeans a chance to reflect on COVID-19 and share their views with the government on creating a more caring and resilient society.  
 Image: Ministry of Communications and Information, Singapore



The WCS Mayors Forum 2018 convened 124 Mayors from 119 cities to discuss how liveable cities could learn and adopt new technologies, and find more funding sources to finance infrastructure projects.  
 Image: Centre for Liveable Cities

**In the face of rising protectionism around the world, you have spoken of the importance of continued global cooperation as the world seeks to rebuild after the pandemic. What is the role of cities in achieving this?**

Cities have flourished because they are key nodes of economic, cultural, and social activities. Much of the world's economic activity is concentrated in cities, as the economies of agglomeration are a powerful driving force for urbanisation. People will continue to be drawn to cities to pursue their aspirations.

As the world seeks to rebuild after the pandemic, cities, as key nodes of ideas and innovation, will be more important than ever. Singapore must build deep links with vibrant cities, to collaborate and tackle complex challenges, such as COVID-19, which respect no borders.

The challenge of climate change is instructive. Cities today generate 70% of global carbon emissions and consume two-thirds of the world's energy. To tackle this challenge, cities must work together to deepen their innovative capacities. I am hopeful that we can find good solutions.

As a Global-Asia node, Singapore is well positioned to foster collaborations and partnerships across countries. The World Cities Summit is an excellent example of this. It is encouraging to see thought leaders and experts from cities all over the world come together, to share their experiences and ideas. We should continue to bring together ideas to confront our common challenges, share solutions, and forge new partnerships. 🌐



IN CONVERSATION WITH  
**GREG CLARK**

# Pioneering the Post-pandemic City

COVID-19 has forced urbanists to rethink the cities of tomorrow. Prof Greg Clark CBE, Group Advisor, Future Cities & New Industries at HSBC, Chair of the Connected Places Catapult, and Moderator of the World Cities Summit Mayors Forum, has advised more than 250 cities, 50 national governments, and global corporations across the developed and developing world. In this interview, he envisages the possible post-pandemic future for cities.



Image: Centre for Liveable Cities

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**It is important to use the pandemic to accelerate a transition to net zero carbon cities.**

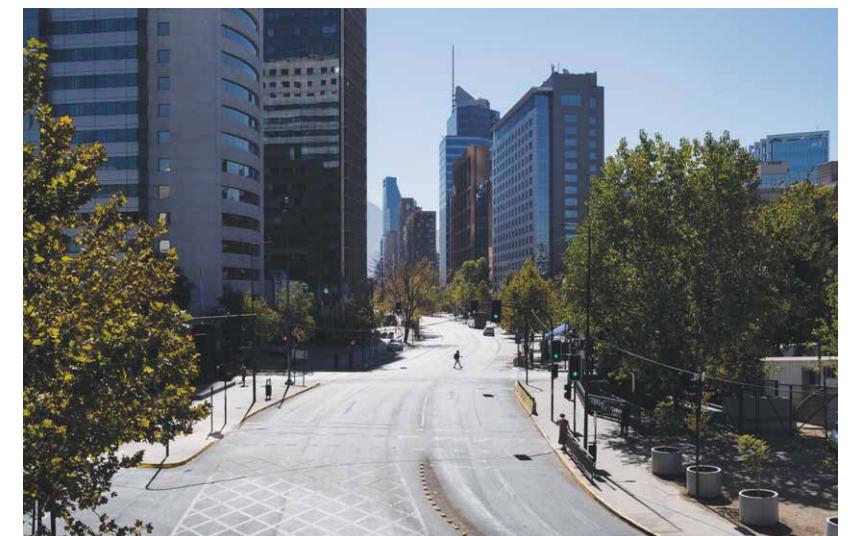


**COVID-19 has hit cities hard. Do you expect this “new normal” to change cities’ identities as magnets for talent, investment, and people seeking opportunities?**

I think that the fundamental attraction of cities remains the same. Cities are places where people can enjoy shared services and amenities, rich experiences and interactions, and where invention and innovation can flourish in creative spaces. The pandemic is accelerating some trends such as digitalisation and decarbonisation. The net effects in our cities are likely to include:

- More digitalised activities within our cities, and an associated fast-growing distribution and logistics economy that brings new land uses.
- More choice for people to decide where to live, how to work, and when and how to travel. People will adopt flexible work arrangements where available and make decisions on where to live accordingly.
- More opportunities to reinvent the role of city centres, with greater emphasis on the experience, habitat (residential), and innovation economies, and less emphasis on commuting, consumption, and the corporate economy.
- Greater agility in our cities, with wider use of digital platforms to create places that are more engaging and flexible. Digitalisation will reinforce the role of place, not replace it.

Overall, we are likely to see more hybrid cities and lifestyles, where the city becomes both a physical space and a digital platform, with the two interacting in dynamic ways.



A deserted downtown road in Santiago, Chile, during a new COVID-19 lockdown in April 2021.  
Image: Alberto Valdes / EPA-EFE

**If digitalisation allows us to be in two places at once, it enables us to be members of more than one city.**

### What is your view on how a “green recovery” and other opportunities can help cities recover economically from this crisis?

It is important to use the pandemic to accelerate a transition to net zero carbon cities. Cities that are healthy for humans are also good for our planet. The pandemic has been an unintended experiment in lower-carbon living, with the surprising conclusion that many industries were able to remain productive while also reducing emissions. How much further can we take the decarbonisation imperative now that we know this? I see six examples of what will be needed next in a green recovery:

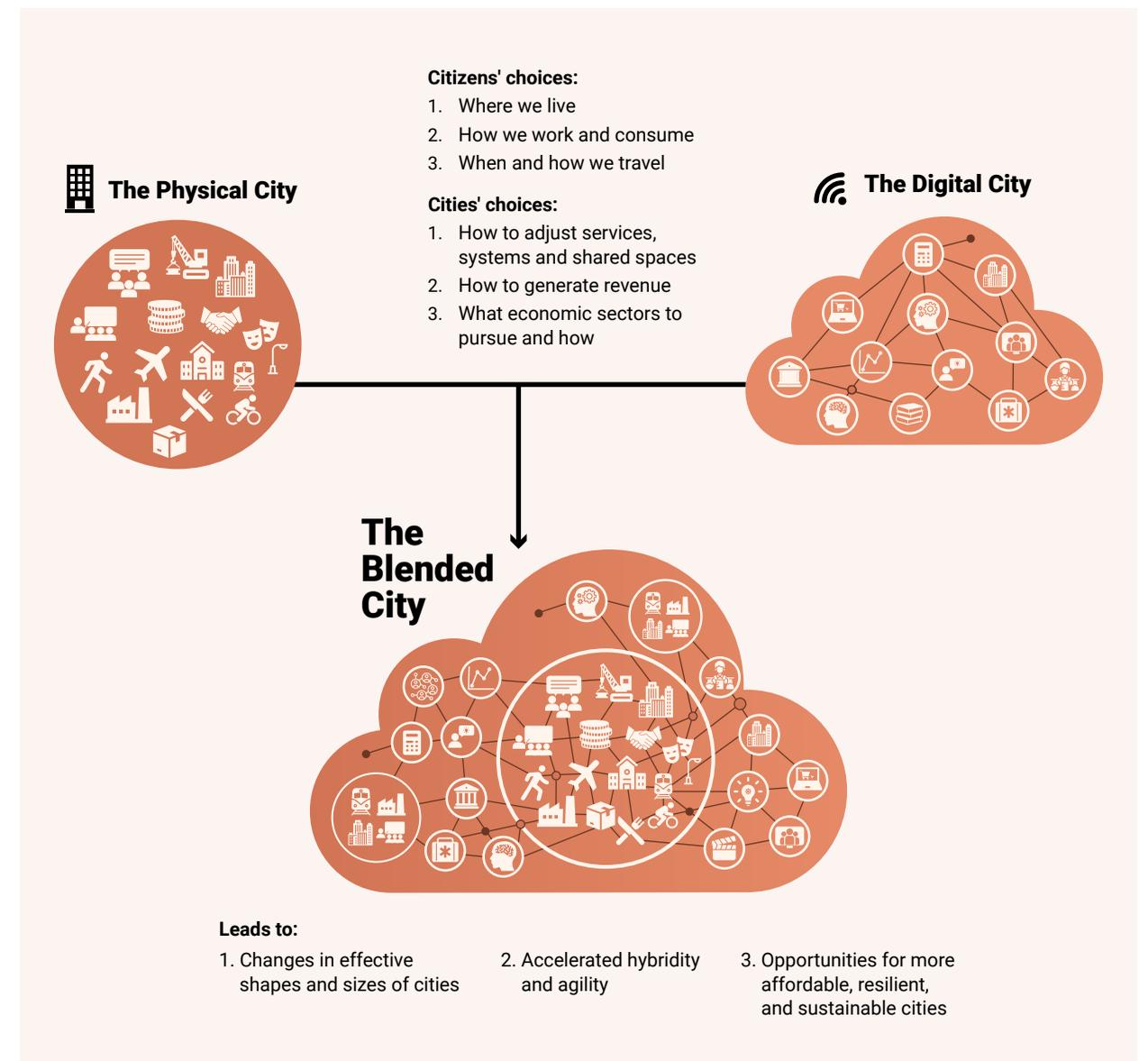
- **Clean energy:** A move towards clean energy in urban systems. For example, a pronounced shift from fossil fuel-powered vehicles towards Electric Vehicles.
- **War on waste:** Continued focus on waste reduction, especially in the areas of water, food and medical supplies where the pandemic has revealed inadequacies and inequalities.
- **New urban mobility:** A greater use of multi-modal and active transport, and incentives to keep journeys in fossil fuel-powered vehicles to a minimum, or to eliminate them fully.
- **Green buildings:** Building Information Modelling technologies and platforms will enable buildings to be more energy-efficient, and to eventually become net energy producers.
- **Urban farming and nature-based solutions:** More focus on food production within cities, or closer to them, with urban agri-tech emerging as a new cluster.
- **Accelerated circularity:** The circular city is a mix of multiple urban systems which become increasingly integrated and interdependent, so that waste is reduced or eliminated, and resources are continually used. For example, a shift towards carbon-capturing building materials such as timber.

Each of these will be an exciting part of the post-COVID-19 world. I foresee that sustainable finance will help to fuel these transitions, and numerous digital platforms will emerge that will both incentivise citizen behavioural change, and help to model the first examples of personal carbon accounts. Green finance and platform technologies will continue to foster new business models in cities that will accelerate decarbonisation.

**You have spoken of “Blended Cities” that are likely to emerge within the next two decades, where as a result of digitalisation, cities become both a place and a service. Please tell us more.**

There is no zero-sum between digital platforms and the physical city. Digitalisation simply means cities becoming more hybrid. Too many voices are prophesying “the end of the city” as a result of COVID-19 and the rapid digital acceleration. I don’t see that.

Whenever new technologies have emerged over the past century, people have predicted the death of cities. But on each occasion cities have grown stronger, utilising such technologies to reinforce the value of proximity, physical interactions, and shared systems, services and spaces.



The Blended City is the hybrid physical-digital city.  
Image: Prof Greg Clark CBE



A couple working from home in March 2020 as New York City sought to curb the spread of COVID-19.  
Image: REUTERS / Caitlin Ochs

Technologies reinforce the power and efficiency of cities, but they also oblige cities to adjust. We need to recognise that while technology enables us to optimise physical space, it does not replace it.

The “Blended City” describes how the hybrid “physical-digital” world can change our lives. The uptick in digital connectivity will allow more people to choose where and how to live and work, and when and how to travel. At the same time, cities can be made more intelligent and responsive. Cities will become more digitalised in terms of space, mobility, amenities and utilities, and more hybrid in consumption, services, entertainment, education, and gatherings. This “Blended City” is a combination of the “City as a Service” and the “City as a Place”.

We have seen versions of this emerging in recent years, with people working remotely from locations favourable to them. For example, living in Philadelphia while retaining a New York City-based job or business. Similarly, new visa schemes for tech engineers, doctors and start-up entrepreneurs now make it possible for them to work simultaneously in more than one city. By accelerating digitalisation, the pandemic has extended these kinds of opportunities to a wider range of people, across more countries and markets.

## || The pandemic is starting to play a “sorting” role, separating the things that still need to be physically done in cities from those that do not.



Eventually, I think this will mean that many more cities can become “cities by subscription or membership”. These are cities where you don’t have to be permanently based, but you can serve your clients, own a property, start a business, or make investments. If digitalisation allows us to be in two places at once, it enables us to be members of more than one city. Fast-growing cities in countries with smaller populations, such as those in the Gulf, Caribbean, and the Baltics, may adopt these models rapidly.

One important implication is that cities will need to reform their financial systems to capture revenue from the value that is created digitally, as well as physically: they will need to be able to charge their “virtual citizens” in addition to their “physical” ones.

### What could this mean for the future of top-tier “Global Cities” such as London, New York, Paris, Tokyo and Singapore?

Global service sectors such as finance, law, consulting, media and information technology, which fuelled the rise of many of these cities in the 1990s and 2000s, are likely to be the most disrupted by the rise of flexible work. It will be important for these global cities to adapt and embrace new opportunities, and not lament the reduction in corporate jobs.

The pandemic is starting to play a “sorting” role, separating the things that still need to be physically done in cities from those that do not. Nonetheless, there are exciting opportunities over the next few years for these cities, in:

- **Innovation:** Cities will continue to host innovation if they make the required changes. For example, by shifting towards innovation economy sectors such as the life sciences, regenerative medicine, and creative media production, where face-to-face proximity is often needed, and by developing innovation districts in places where demand from corporate jobs may be reduced, such as central business districts.
- **Experience:** To reinvent city centres affected by digitalisation and flexible work, cities will need to better curate and combine arts and culture, heritage, education, entertainment, dining, retail and public space into a mix of surprising and spontaneous attractions, using digital platforms to enhance their appeal.
- **Habitat:** Growing the resident population of cities is an opportunity to underpin urban amenities and retain vitality while also making efficient use of space and services. One option for many people is not just to work from home, but also to live nearer to work. Where buildings are convertible, we will see more of this. At the same time there are opportunities for smaller urban centres to develop co-working spaces and mixed-use districts that support work and leisure near home. With many people having been in “lockdown” during the pandemic, these new patterns have yet to emerge. But they will.

- **Agility:** More spaces will perform multiple purposes. Some homes will become primary workplaces. But the larger trend will be for buildings in city centres to become more versatile. By day an office or shop, by night a bar or art gallery, or even a live performance venue.
- **Talent attraction:** Cities will increasingly compete to attract top talents and skilled workers, drawing them with special visas, incentives, and flexible live-and-work models available in a “Blended City”.
- **Digital platforms in physical space:** A new logistics economy driven by digital commerce is emerging in cities. The growth of home delivery and its related mobility systems, the rise of data centres, fulfilment centres, dark kitchens and collection hubs, and their links to infrastructure webs, present new opportunities for cities to re-engineer space. One key issue is how to both enable these digitalised services, and also protect public goods such as safe pavements, clean air, and mobility flows. These new activities will need to address their own externalities and I expect to see new regulations requiring them to do so.



Dark kitchens, like this one in Singapore, produce meals exclusively for delivery.  
Image: The Straits Times © Singapore Press Holdings Limited. Reprinted with permission.

## || A new logistics economy driven by digital commerce is emerging in cities... presenting new opportunities for cities to re-engineer space.

### How can cities in developing nations, which are growing rapidly and struggling to find the resources to adapt to the pandemic and other major disruptions such as climate change, cope in the long-term?

The pandemic has different implications for people living in cities in developing nations. COVID-19 has made the link between human health and housing conditions more visible, as people in the worst quality housing have been the most impacted. This is not a function of density per se, but about housing quality. Hence, in Latin America, Africa, India and ASEAN, I expect to see new initiatives emerge to tackle housing quality and inequality, as well as other urban systems like healthcare and water. These investments require fiscal power, not only from national governments, but through cities generating their resources and partnering with the private sector.

The pandemic will also accelerate the shift in population growth from very large cities to medium-sized cities. It is thus critical to prepare the latter for this through infrastructure investment and effective, sustainable planning. The largest cities in developing nations were often unprepared for rapid population growth. Sustainable urban development is easier to manage and achieve while population growth is occurring rather than afterwards, once patterns of informal settlement and transport have set in.

Post-pandemic, many developing nations will try to manage an overall system of cities, rather than focus narrowly on individual cities. In Indonesia, for example, we may see policies that simultaneously seek to regenerate Jakarta, create a new capital in East Kalimantan, increase the role and size of Bandung and Surabaya, and support the growth of another 6 to 10 cities. This approach will be essential to embrace sustainability and manage population movements.

One permanent challenge, which the pandemic has starkly revealed, is weak urban governance. COVID-19 has highlighted the need for well-run cities that are able to manage extreme situations effectively.



At no time in the past 50 years has it been more important to share innovation and drive solutions that work across borders.



### In light of COVID-19, how can Singapore further its role as a successful world city?

Singapore occupies a unique and important role in the global network of cities. It is not just a successful city-state; it is a global laboratory on how 21st century urbanism can work.

Singapore has established a reputation for innovation in water, education, housing, transport, and city planning, and for world-class standards in business policies, urban governance, and R&D investment. Like other leading cities, Singapore will now need to make a further shift towards innovation, habitat, and experience, underpinned by a rapid net zero carbon transition. Singapore is already on that path and can teach the world what it has learned.

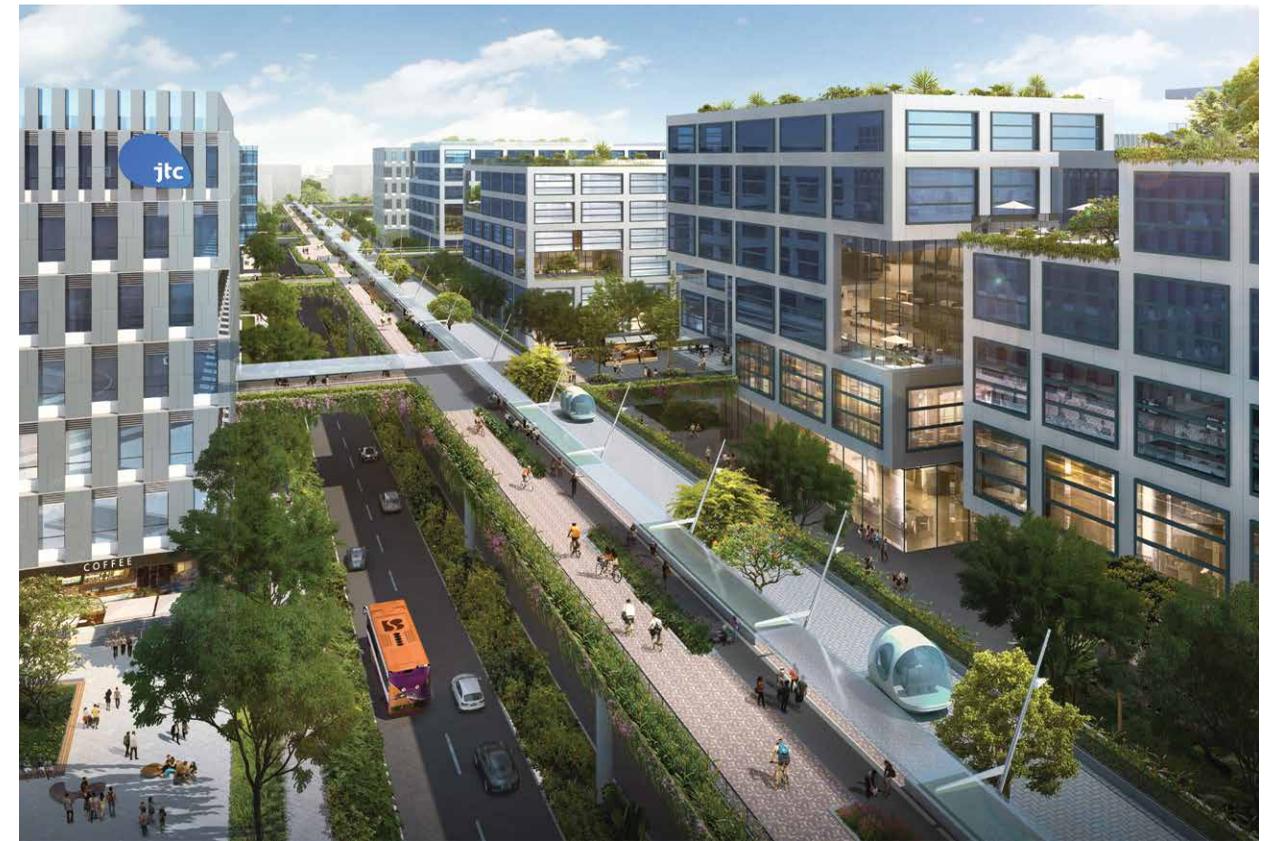
What I hope to see is that Singapore uses its acquired advantages to demonstrate a “fast track” towards circularity, as it has done with water, and towards innovation districts such as in Jurong and Punggol.

### Finally, in this time of crisis where global travel and the international conference sector remain severely curtailed, while some nations have turned inward-looking, a word please on the prospects for continued global collaboration.

At no time in the past 50 years has it been more important to share innovation and drive solutions that work across borders. The pandemic itself, the subsequent global public health and bio-security efforts, and the vaccine discoveries and rollouts, have proven that. Without global collaboration the pandemic would be very much worse.



Brazil's cities have been hit hard by COVID-19, especially residents living in poorer quality housing.  
Image: Fernando Bizerra / EPA-EFE



Artist's impression of the future Jurong Innovation District in Singapore.  
Image: JTC Corporation

I do not believe in the idea of de-globalisation. Globalisation does need to be better managed to be more socially and environmentally responsible but working across borders is essential to address the planet's imperatives. The individual countries that lead efforts to put their national interests first are often the ones that have no intention to address the major issues of our time such as climate change and global inequality. They seek to leave multilateral agreements and platforms in order to pursue regressive policies.

Despite severe constraints on reaching multilateral agreements on climate protection, inter-continental inequality, fair taxation, and technology dependency, it is essential to seek such global agreements. To abandon these efforts would be to abandon hope.

For cities, the appeal of international cooperation remains compelling. Every city is its own laboratory of urban life, creating fresh experiments that use different environments, methods, catalysts, and interventions to find solutions that work. Learning together by sharing knowledge and insights will enrich all cities' efforts to become better places to live. Because successful cities are fundamental to creating a better planet, there is no real competition. We need all cities to succeed. 🌐



CITY FOCUS

LEE KUAN YEW  
WORLD CITY PRIZE

# Laureates Retrospective

BY: LEE HAO WEI AND DAVID EE

The Lee Kuan Yew World City Prize is awarded biennially in recognition of the laureate city's success in overcoming urban challenges and transforming itself. This special photo essay takes a look at how the past five laureates succeeded in doing so, and highlights their respective visions for the future.



## Seoul 2018 Laureate



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Citizens spending time at the restored Cheonggyecheon Stream, formerly the site of a noisy, congested highway.  
Image: Seoul Metropolitan Government

Seoul was awarded the 2018 Prize for its transformation from a bureaucratic, top-down city into an inclusive, socially stable and innovative city. With rapid urbanisation, Seoul had faced challenges like environmental degradation, and increasing resistance from a citizenry largely left out of planning decisions. The Seoul Master Plan 2030 was a turning point, with its bold move to make citizen participation the norm in urban planning. Seoul built trust with its citizens, assuring them that through engagement, they could shape the future of the city.



In 1995, Cheonggyecheon was a busy urban industrial centre, which gave rise to problems like noise, air pollution, and traffic congestion.  
Image: Seoul Metropolitan Government



A beautiful city with enriching cultural heritage and dynamic character, Seoul is where urban vitality and greenery coexist. As part of growth-oriented measures in the past, Seoul had concentrated on expanding urban infrastructure, a period that was known as the “Miracle on the Han River”. However, some of these measures induced urban problems. Seoul sought answers from its past experience and implemented urban renewal projects focusing on recovery and resilience: such as Cheonggyecheon Stream, Dongdaemun Design Plaza (DDP), and Seocho 7017.

Now, we face the challenges of COVID-19, which restrain every aspect of our lives. The pandemic drives Seoul to take robust and coordinated actions to improve the city for all. Once again, focusing on existing and new plans, the Seoul Metropolitan Government is striving to make the city more sustainable and resilient, both during and beyond this COVID-19 pandemic.



**Mayor of Seoul, Oh Se-hoon**

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An overpass reborn as an elevated Skygarden, Seocho 7017 is a prime example of Seoul's urban regeneration.  
Image: Seoul Metropolitan Government

## Medellín 2016 Laureate



Metrocable, a cable car transit system, connects outlying hilly, informal settlements with central Medellín, improving residents' access to employment, education and social opportunities.  
Image: Medellín's Mayor's Office

Medellín was awarded the 2016 Prize for its success in overcoming uncontrolled urban expansion, and violence resulting from social inequalities. A succession of leaders took on these deep-rooted problems. Solutions included the world's first cable car mass transit system, library parks that doubled as social nodes, and urban escalators that improved mobility in its hilly settlements. The city has transformed itself from a notoriously violent city into one that has been held up as a model for urban innovation.



Years ago, violence resulting from inequality robbed Medellín's citizens of the possibility of social interactions in public spaces.  
Image: Medellín's Mayor's Office



This artist's impression depicts Medellín's plans to become an Eco-City, with people and intelligent sustainable mobility as major priorities.  
Image: Medellín's Mayor's Office



Medellín has a potential like few other cities to adapt to new economic, environmental, ecological and social contexts. At the same time, and paradoxically, it faces unprecedented challenges that demand our ability to work collectively, not only to add value to the public sector but also to reduce social inequality in our pursuit of a sustainable and equitable city.

In our bet to make Medellín an Eco-City, we recognise that the next major disruption is climate change. This is why we are moving forward with the construction of a new Metro rapid transit line and Metrocable, as well as promoting electric mobility. We are also developing cycling infrastructure such as the north-south route that will connect the ten municipalities of the future Software Valley. Finally, we are building new public spaces for residents, especially in parts of the city where there is a greater lack of these.



**Mayor of Medellín, Daniel Quintero Calle**

## Suzhou 2014 Laureate



With balanced urban development, Suzhou transformed itself into a prosperous city with historic culture, verdant greenery and scenic waterways.  
Image: The Publicity Department of CPC Suzhou Committee

Suzhou was awarded the 2014 Prize for overcoming the challenges of balancing economic growth with protection of its cultural and built heritage. To preserve its historical and cultural core in the old city, Suzhou redirected urban growth pressures to a new mixed-use Central Business District for the 21st century. Suzhou also invested in its rich heritage, making it come alive. Suzhou's clear long-term vision and planning, with strong leadership and political support, has enabled it to tackle urban challenges effectively.



The iconic Gate to the East building, which was completed in 2016, pictured under construction on the Suzhou skyline.  
Image: Zha Zhengfeng

Looking forward, Suzhou will continue its people-oriented, open and inclusive development. Having inherited a craftsmanship spirit of striving for the best, Suzhou is dedicated to the harmonious integration of the city's tradition and modernity.

We are currently working on a "Made in Suzhou" brand initiative to highlight the outstanding quality of Suzhou's industries. Meanwhile, another hallmark programme entitled "Jiangnan Culture" has been launched to preserve and promote Suzhou's traditional culture in innovative ways.

Thanks to its superb services, Suzhou also provides a world-class business environment. The city is innovative, open, cultural and ecological, and features high liveability and good governance. Suzhou aims to be an international modern metropolis with the unique charm of an oriental water city, as well as a beautiful home and a happy paradise on earth.

**Mayor of Suzhou, Li Yaping**



Jinji Lake Business District, designed to integrate the concept of a modern garden city with that of a traditional Chinese garden.  
Image: SIPAC

# New York City 2012 Laureate



Times Square, previously congested with traffic, has been transformed into a safe and vibrant pedestrianised space.  
Image: dconvertini / Flickr

New York City was awarded the 2012 Prize in recognition of its remarkable transformation over the first decade of the 2000s. The year 2001 was a traumatic point. Under visionary leadership, the city faced that adversity by defining a bold vision for its future. With crime reduction and other initiatives, its leaders renewed New Yorkers' confidence in the future. New York City's transformation was testament to the dynamic partnership between its leaders, government agencies and stakeholders to implement a shared vision for the city.



New York City is moving forward with congestion pricing to ease traffic jams and boost mass transit.  
Image: Craebby Crabbon / Flickr



There were times when we were laid low, when so many naysayers said New York City's best days were over—after the Great Depression, after the 9/11 attacks, after Hurricane Sandy. And yet New York City fought back. By January 2020, we were at the strongest point we'd ever experienced in our history. Then COVID-19 hit.

In April 2020 we were the epicentre of the crisis. But we built ventilators, produced PPE, and created our own testing lab. Whatever it took, we found a way here in New York City. By the summer of 2020, we went from worst to first, from the epicentre to one of the safest places in the United States. We created the largest Test and Trace Corps. in the nation, protecting thousands and thousands of New Yorkers.

That's our way forward. That spirit, that heart, that willingness to take on any challenge, that is how we build a new city.



**Mayor of New York City, Bill de Blasio**  
*Edited excerpt from 2021 State of the City Address*



Artist's impression of the Brooklyn Bridge-Montgomery Coastal Resilience Project, which will reduce flooding risk while preserving access to the waterfront.  
Image: New York City Economic Development Corporation

## Bilbao 2010 Laureate



Present-day view of Bilbao's Abandoibarra waterfront, the Guggenheim Museum, the estuary and the surrounding green belt.  
Image: Bilbao City Council

Bilbao City Hall was named the inaugural Lee Kuan Yew World City Prize Laureate in 2010 in recognition of its integrated and holistic approach to urban transformation. This was instrumental in transforming Bilbao from an obsolete and dilapidated industrial city into a knowledge-based economy. Bilbao rejuvenated itself by emphasising environmental clean-up, design and culture, major improvements to its infrastructure, and restoration of its historic areas. This boosted social and cultural integration, and made the city a centre for innovation and creativity.



Bilbao suffered an economic slump in the 1980s that led to high unemployment, environmental degradation and other problems.  
Image: Bilbao City Council

Bilbao has substantially changed its urban landscape in recent years. We are now facing a great opportunity, as well as a great obligation: to move towards a smart, green, socially cohesive city model that stands out for its high levels of wellbeing and urban quality. We are working on a new strategic framework with four key objectives:

- (1) Competitive and innovative capacity
- (2) Continuous process of urban regeneration
- (3) Environmentally sustainable transformation
- (4) Social cohesion as an inclusive city

Following these principles, there are several projects under development in Bilbao. First, the Zorrotzaurre project, Bilbao's latest major urban renewal project. This is an integral and sustainable plan to recuperate a derelict site and convert it into a new quarter. Second, to increase green space for our residents, we are expanding the Bilbao Green Belt, which connects the city with the surrounding natural terrain. Lastly, the Bilbao estuary, after a strong environmental recovery, is the undisputed axis of the city. We are enhancing it further to integrate it with our citizens' daily social, economic and cultural lives.

**Mayor of Bilbao, Juan Mari Aburto**



Artist's impression of Zorrotzaurre Island, an upcoming mixed-use district with affordable housing, green space and an eco-friendly business park.  
Image: Bilbao City Council



VIEWPOINT  
**NORMAN FOSTER**

# Will COVID-19 Redefine Cities?



With the COVID-19 pandemic disrupting communities, work, mobility, real estate, business models and supply chains in unprecedented ways, is it the end of cities as we know them? Lord Norman Foster, Founder and Executive Chairman of Foster + Partners, shares his view on what lies ahead for cities.



In the short term, it might seem as if everything is in flux, but looking further forward I believe we will see that the pandemic has simply accelerated trends that were already evident.



If we could transport ourselves back to the last major global pandemic, the Spanish Flu of 1918 to 1920, we would find deserted city centres, curfews and quarantines. But a century ago, the pandemic gave way to the social revolution of the Roaring Twenties—or *Les Années Folles*. The future for humanity then was not two-metre social distancing any more than it will be for us.

Nonetheless, it's worth asking: how will cities survive the current crisis, and how will they be different? In the short term, it might seem as if everything is in flux, but looking further forward I believe we will see that the pandemic has simply accelerated trends that were already evident.

The first and dominant trend is the power of the city as a social magnet. That collective energy creates wealth and opportunity—the GDP of New York City, for example, is four times that of Switzerland. There is also a statistical relationship in terms of greater life expectancy, lower infant mortality, and higher levels of education.

History tells us that cities are often transformed in response to crises. The Great Fire of London resulted in building codes that created the DNA

of the elegant Georgian city; the response to the London cholera epidemic of the mid-19th century was a new citywide sanitation system. In the same century, health concerns saw the rise of public parks and gardens. Closer to our time, the smoggy conditions of London and Los Angeles in the 1950s and 1970s created Clean Air Acts. You might argue that each of those developments would have happened independently, but there is no doubt that crises hastened the inevitable.

In a time of climate change and decarbonisation, the changing nature of mobility is another significant trend. We are already witnessing a move away from fossil fuel-powered vehicles to those that use electric propulsion that can charge by induction while on the move. When driverless, these vehicles will be able to park densely and safely, platooning nose-to-tail. All of this is happening at a time when younger generations are eschewing car ownership and embracing ride-sharing and on-demand services, available at the touch of an app.

Trends in mobility cannot be separated from changes in the patterns of work and the nature of the workplace. Working at home was, for a fortunate few, always an option. While the

pandemic has prompted an upsurge in home working, it has also spurred the rise of the “third place”, whether that’s a Starbucks on the High Street, or a rural retreat. And while “Zoom-ing” into conferences has stretched technology beyond expectations, it has also made us aware of the innate need to come together creatively and socially in shared spaces.

Progressive designs for the workplace have always blurred the edges between work and leisure in pursuit of a better life balance. The term “green building” embraces a sustainable approach that has been proven to be healthier and more productive. Until recently, those who championed green buildings have been on the enlightened fringe. But soon the concept will become mainstream, especially given a younger, more health-conscious workforce.

Industry, agriculture, culture and manufacturing—the order is not hierarchical—have also been undergoing change and will impact the city of tomorrow. Along with spaces for culture and the arts, new clean industries are capable of reinvigorating urban economies. Similarly, urban farms and market gardens—a reality familiar to previous generations of city dwellers—are on the cusp of a renaissance. Using hydroponics, obsolete multi-storey car parks could be repurposed to grow fresh produce on the city’s doorstep.

These topics have been the subject of workshops in the Norman Foster Foundation in Madrid, to encourage young graduates, who might one day be civic leaders, to anticipate the future. But I have detected something new and that is *attitude*. This is evident in some bold initiatives taken during the pandemic, such as the creation of 650 km of cycle lanes in Paris. It is also manifest in London, where streets in Soho have been commandeered by outdoor cafés. Neighbourhoods outside the city core have also seen a resurgence in appeal. Tagged the “15-minute city”, these are places where working, learning, dining and recreation, can all happen within walking distance from home. Again, this is not new, but it has been boosted by the pandemic. Taken together, these trends add up to cities that can be cleaner, quieter, healthier, more walkable and bikeable, and—vitaly—greener.

Debates about the city often ignore those who make it function behind the scenes—essential workers in health services, cleaning, maintenance, sanitation and security. A key consequence of change should be greater reward and better housing for this vital sector of society—in other words, a more equitable city.

Change is also linked to the rate of urbanisation. Before the pandemic, the equivalent of eight cities the size of New York were emerging

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annually around the world. All of this adds up to another 2.5 billion people living in cities in 30 years’ time.

One of the challenges of rapid urbanisation is the plight of the 14% of humanity who live in informal settlements. How do we bring civic betterment to those who lack access to electricity, sanitation or adequate shelter? A research programme between the Foundation and MIT—called “Cities Without”—has addressed the inability of centralised networks to deliver energy and sanitation to these communities. Instead, it proposes autonomous local sources of energy and the conversion of waste.

Looking further afield, could the impact of the pandemic lead to a reassessment of global networks and supply chains? Politically, will it lead to more global collaboration on the big issues, such as energy production and climate change, or will we see more fragmentation and a shift towards an “everyone for themselves” approach? The hope is that it will be “we, we, we” and not “me, me, me”. The ideal outcome is global action on the big environmental and health issues, and local action in all the activities such as governing and improving our connected societies. 🗣️

VIEWPOINT  
STEPHEN CAIRNS

# Designing Density Better for Cities and Nature



COVID-19's rapid spread in confined spaces has led to some criticism of high urban density. Professor Stephen Cairns, Director of the Singapore-ETH Centre's Future Cities Laboratory, explains why this perception is flawed, and calls for better design of density to benefit both cities and the natural world.



As more information about COVID-19 became available, the perceived link between disease transmission and population density became less credible.



The outbreak of the COVID-19 pandemic in early 2020 triggered widespread anxiety about the role of high urban population densities in spreading the virus. As we learnt, the virus was transmitted through respiratory droplets and contact. Maintaining physical distance and avoiding close, unprotected contact was essential if we were to stop its spread. This led many to assume that densely populated cities were dangerous places to be in.

In Europe and North America, the anxiety erupted in a slew of city-sceptical headlines, such as The New York Times' "Density is New York City's Big 'Enemy' in the Coronavirus Fight", and Bloomberg's "New York and San Francisco Can't Assume They'll Bounce Back".

This was understandable. But as more information about COVID-19 became available, the perceived link between disease transmission and population density became less credible. Cities with high densities, such as New York, did indeed record high numbers of infections. But Manhattan, the city's most densely populated borough, had lower infection rates than some suburban areas. High density cities such as Shanghai, Tokyo and Hong Kong had relatively low per capita infection rates. Conversely, cities with relatively low densities, like Detroit and Dublin, had comparatively high infection rates.

The current evidence suggests that population density tells us little about how cities interact with the pandemic. For dense cities that proved resilient to the virus, a variety of factors have been significant. For example, healthcare access and the ability to work from home were crucial in Manhattan. In Mumbai's Dharavi, one of the world's most densely populated slums, the quality of grassroots collective action helped mitigate early infection numbers. High density alone does not predict high infection rates; how density and urban policy is designed matters.

Urban designers, planners and policymakers are thus presented with two related challenges. The first is to intensify efforts to widen and maximise the benefits of urban density for residents, such as in the areas of healthcare, the economy and the living environment. This can be done by, for example, co-locating diverse services, amenities and complementary jobs for convenience, thus reducing travel demand. Underlying these efforts is the need to reduce inequities in healthcare and prevent non-communicable diseases through active mobility, thereby reducing the risk of COVID-19 mortality.

The second challenge is perhaps less familiar but increasingly important. It involves considering the benefits that urban density can deliver to regions surrounding cities. If cities integrate

carbon-neutral policies and circular economy principles, the benefits of urban density could extend to regions far beyond them. This is because reducing cities' ecological—as well as physical—footprints would reduce pressure on their surrounding natural ecosystems and agricultural regions.

The way in which urban density can benefit not only cities but also natural ecosystems is emerging as an especially important factor to reduce the likelihood of future pandemics. COVID-19 is a uniquely global phenomenon, and its emergence now is no coincidence. Globalisation and rapid urbanisation have led to unprecedented patterns of demographic growth and interconnectedness. These in turn have become essential mechanisms of disease transmission. Quite simply, cities are pressed up against natural ecosystems and their biodiversity as never before, and an increased threat of zoonotic diseases is but one profound consequence. This can only mean that further pandemics are likely. Indeed, COVID-19, as UN Secretary-General António Guterres has put it, is a “dress rehearsal”.

Clearly, harnessing the benefits of urban density becomes ever more critical. How might this be achieved?

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**The way in which urban density can benefit not only cities but also natural ecosystems is emerging as an especially important factor to reduce the likelihood of future pandemics.**  
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The history of urban design and planning around the world offers a rich catalogue of approaches. Singapore's planners, architects, engineers and urban designers contributed a relatively recent chapter to this long history. They embraced the modernist high-rise building form, innovating technologically and integrating principles of liveability. Today, Singapore supports a population density of about 8,000 people/km<sup>2</sup>. The country features passively-cooled housing blocks, with open ground floors, situated in green, landscaped new towns. These towns provide amenities, education, commerce and jobs—all accessible by efficient public transit. Ongoing innovation in dense, green and low-carbon urban design continues to enrich this endeavour.

Designing density better, especially in rapidly urbanising regions of the world, can build upon this tradition. First, density needs to be measured in more nuanced ways. These methods should consider not only the spatial aspects of what is built in a city, but also the temporal, in terms of the various ways in which those spaces are occupied and used over the course of a day or week.

There is also a need to assess the quality and sustainability of how a built environment is put together: What sort of materials and construction

methods are being employed? Do designs for such spaces support opportunities for mixed-use living and working? What transportation options are available to access services, and how is green space integrated?

Finally, we need to harness the potential of digitalisation to enhance communication, community identity and social solidarity in cities. This will help us to better appreciate how the “cyber-physical” city can improve the quality of everyday life.

Realising the promise of urban density will not be easy, not least if COVID-19 is a harbinger of further challenges to come. As a complex enterprise, designing density intensifies the need for multi-sectoral and interdisciplinary collaboration. It is clear that new compacts will be needed between public health and urban design, transport planning and architecture, and businesses, community and government. Perhaps the most important new compact, one underlying all of these, will be between cities and nature, encompassing innovative human and non-human kinds of density. 📍



VIEWPOINT  
SING TIEN FOO

# Reimagining the Workspace of Tomorrow



Prof Sing Tien Foo, Director of the Institute of Real Estate and Urban Studies at the National University of Singapore, shares how physical office spaces will remain relevant in a post-pandemic economy, but with a new focus on flexibility and public health.



The design of the future office space is likely to centre on flexibility.



The agglomeration economy has long shaped today's Central Business Districts (CBDs), which have the highest concentration of skyscrapers and the most expensive office spaces. Like-minded people meet and interact in the city centre, and firms co-locate close to their customers and competitors to create network effects. In Singapore, for example, the downtown core has the highest concentration of office spaces, despite covering only approximately 0.6% of the total land area. It provides 3.86 million square metres or an equivalent of 48.14% of the island's total net office space.

### The Demise of the CBD?

However, the COVID-19 pandemic has disrupted the traditional use of CBD office space and hastened its decentralisation. Firms are diversifying operational risks by distributing work close to their employees' homes and not concentrating their workforce in a single location.

Social distancing protocols imposed to stem the spread of the disease have forced firms to quickly adopt business continuity plans, such as by splitting employees for critical

business functions into teams with alternating workdays in the office. Companies are also staggering employees' working hours to reduce the possibility of exposure to COVID-19, or completely shifting backroom operations to offices outside the CBD.

The pandemic has forced many business activities and interactions to shift to virtual platforms. Firms have stepped up investment in cloud-based office systems, such as Google for Work and Microsoft Office 365, and conferencing technologies, such as Zoom and Microsoft Teams. People have adapted to a work-from-home (WFH) routine and working online with people from anywhere around the world. They no longer need to commute to work, reducing the potential cross-transmission of viruses either on the road or at the workplace. Some companies such as Google and Twitter are allowing WFH to remain as the default mode for their staff even after the pandemic.

If more companies choose to take a similar path, this trend could permanently and adversely impact demand for traditional physical office space. However, it is unlikely to cause its demise.

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**People will still need workspaces where they can connect face-to-face and build relationships and careers.**  
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### Future Office Space

Traditionally, office demand is derived from economic growth. However, in the post-pandemic economy, technology adoption and public health safety measures (including the efficacy of vaccinations) are two new factors that could fundamentally change how real estate space will be used.

The design of the future office space is likely to centre on flexibility. Firms could reconfigure physical offices to create hybrid spaces for mixed use to support a more collaborative and less structured working environment. The combination of core and flexible space could reduce firms' risks of over-leasing permanent spaces that are not used.

Hoteling space, through either off-site or third-party coworking offices, may emerge to provide on-demand office space for workforces. Employees could just "check in" to an office near their home and plug into their workstations as and when needed.

Coworking operators offer shared spaces that give firms greater flexibility in space planning and lease tenure options. Some of these operators expanded their footprint rapidly in Singapore

in the pre-COVID-19 period, tripling their office space demand from 2015 to 2019. WeWork, IWG plc and JustGroup are covering more than half of the coworking space in Singapore.

In the post-COVID-19 world, coworking firms are likely to shift towards having a combination of private offices and dedicated spaces in lieu of big, open-plan areas that have come to define this sector. Some coworking operators offer customised workplace solutions for firms' various needs. For example, Chinese company Tencent, the owner of Chinese messaging app WeChat, operates out of JustCo's coworking space in Singapore's CBD. The coworking space allows the Chinese company more time to assess and plan for future expansion into a more permanent space.

### Future Challenges for Work

Thomas L. Friedman, in his bestseller *The World Is Flat: A Brief History of the Twenty-first Century*, predicts that digital technology would break down geographical "borders" between countries and revolutionise trade exchanges and labour. For instance, a digitally enabled "office" would allow workers to go beyond "work-from-home" to "work-from-anywhere", an increasingly common scenario since the onset of COVID-19.

A significant threat that could emerge from this is local firms facing more intense competition in attracting foreign talent. At the same time, the local workforce would need to match up to the highly portable skillsets from across the globe. For example, tech firms could recruit programmers from countries like China and India and remunerate them based on the cost of living in their home countries.

Traditional work priorities are also being shaken up. With many organisations adopting WFH practices during the pandemic, a recent global survey by real estate firm JLL has shown employee expectations shifting towards a greater work-life balance over securing a comfortable salary, and prioritising health and wellbeing as much as finding purpose in their work. At the same time, many still hope to return to their offices at some point, but with greater freedom of choice across locations and schedules.

Indeed, people will still need workspaces where they can connect face-to-face and build relationships and careers. With technology, the size and scale of those physical spaces and operations will require recalibrating going forward, but without losing sight of public health and safety. 🧐



GREEN RECOVERY

**CATLYNE HADDAOUI  
AND FREYA STANLEY-PRICE**

Catlyne Haddaoui is Research and Policy Coordinator at the Coalition for Urban Transitions. Freya Stanley-Price is Head of Communications at the Coalition for Urban Transitions.

# Putting Cities at the Heart of Recovery



A COVID-19 public notice in London, England, urging people to stay home.  
Image: Andy Rain / EPA-EFE

**As vaccine roll-outs continue, many countries have turned their attention from pandemic control towards economic recovery. In this essay, the Coalition for Urban Transitions' Catlyne Haddaoui and Freya Stanley-Price argue that national governments must not miss this opportunity to invest in cities and let them drive the recovery.**

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**While cities are at the epicentre of the crisis, they are also the solution to recovery.**  
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As countries around the world went into lockdown, it was clear that the greatest impact of the COVID-19 pandemic would be felt in cities. Urban areas are home to 55% of the world's population and are responsible for over 80% of global gross domestic product. As of June 2020, 95% of COVID-19 cases were registered in cities, putting them on the frontline of the unfolding crisis. Not surprisingly, it is in the world's cities where the impact of job and income losses, a global economic downturn, and increasing poverty and inequality levels is being felt most urgently, and those in the developing world are hardest hit. The urban poor, in particular, have suffered enormously, and millions remain jobless.



People queuing outside an Australian government welfare centre after the forced closure of numerous workplaces during the pandemic.  
Image: William West / Getty Images

## Investing in cities offers some of the most promising opportunities to respond to the crisis with speed and impact.

### Cities as the Solution to Recovery

While cities are at the epicentre of the crisis, they are also the solution to recovery. Cities have proven to have unique strengths that have helped them deal with the pandemic and its socio-economic impacts—from social cohesion (including grassroots mutual-aid efforts) and well-run social protection systems, to key infrastructure and efficiencies of scale.

Now that national governments and international financial institutions are already pledging unprecedented levels of funding to revive economies, it is critical that this stimulus is directed to the places and people that are most impacted: cities and their residents. For national governments looking to foster sustainable economic

prosperity in the wake of COVID-19, investing in cities offers some of the most promising opportunities to respond to the crisis with speed and impact. This is also the key to accelerating the vital transformation towards a resilient and low-carbon future for all.

To help accelerate this transformation, the Coalition for Urban Transitions published *The Economic Case for Greening the Global Recovery through Cities*—identifying some of the major economic and environmental benefits of a green recovery from COVID-19. The paper identified seven priority areas for urban investment, through which national governments can yield substantial economic dividends, rapidly



The Swatch and Omega Campus in Biel, Switzerland, uses solar panels and radiative heating and cooling to reduce energy consumption.  
Image: Bogdan Lazar / Alamy Stock Photo

create and protect millions of jobs for vulnerable populations, and deliver quick, durable and inclusive economic, health, and environmental benefits for their citizens, all whilst contributing to long-term urban resilience:

1. **Green construction and retrofits**  
Create low-carbon built environments where people will love to live
2. **Clean mobility**  
Promote clean and shared transport for connected, accessible cities
3. **Renewable energy**  
Invest in renewable energy generation and electrification for low-carbon cities
4. **Active transport**  
Foster pedestrian and cycling schemes for healthy, active citizens
5. **Nature-based solutions**  
Deliver green spaces that benefit citizens and their cities
6. **Waste and resources**  
Support workers and create a circular economy for clean, resource-smart cities
7. **Research and development (R&D) for clean technologies**  
Foster a culture of green innovation for long-term benefits

Identified on the basis of criteria such as the potential to generate jobs and social, environmental and

health co-benefits, investments in these areas are financially sustainable beyond this initial stimulus.

More importantly, the Coalition for Urban Transitions' research shows that if stimulus is directed at these sectors, it can create much needed economic security in the short term, while at the same time making rapid strides towards the longer-term goal of low-carbon economic prosperity.

## The Economic Case for Letting Cities Drive the Recovery

Despite the clear immediate and longer-term opportunities available, bailout and recovery packages have generally not been explicitly directed towards cities. This is a significant missed opportunity, especially given that the current spending window is unlikely to be repeated as government budgets across many countries become squeezed post-stimulus.

Analysis conducted by Vivid Economics through their existing Green Stimulus Index (GSI) concluded that, as of June 2020, only 7% of the total stimulus measured in the Green Stimulus Index has gone to sectors that are relevant for cities, such as energy and transport. Of the stimulus earmarked for these sectors,

only 16% is green. But because much of the financial stimulus is expected to end up funding long-lived infrastructure assets, national governments need to ensure that these investments respond to both current priorities and the need to create a low-carbon and resilient future.

National governments are uniquely placed to put cities on the path to recovery, particularly by creating an enabling environment for low-carbon investments. Major urban infrastructure investments have significant potential to unleash new economic activity, create local jobs, improve public health outcomes and set cities on a path of prosperity and sustainable long-term development.



Usage of public transport in cities declined during lockdowns due to risk of infection from COVID-19. Image: Neil Hall / EPA-EFE



A bicycle hire service station in Paris, France. Low-carbon investments are crucial to recovery. Image: Pline / Wikimedia Commons

## National governments are uniquely placed to put cities on the path to recovery, particularly by creating an enabling environment for low-carbon investments.

These investments span areas such as energy-efficient buildings (including affordable housing), low-carbon transport systems, renewables-based distributed energy systems, the preservation and incorporation of natural capital into the urban landscape, and better management and retention of critical resources in local economies.

Low-carbon urban investment stimulus measures enacted so far include the UK government providing a US\$1.97 billion (S\$2.6 billion) support package to Transport for London to cover revenue lost due to reduced ridership. This measure is expected to be in place for a year and is conditional on the increase in

congestion charge from £11.50 to £15 (S\$21 to S\$28). An additional US\$2.5 billion (S\$3.3 billion) in funding for cycling and pedestrian infrastructure has been earmarked nationwide. In China, as people shift to private transportation modes they consider safer in the COVID-19 context, the government has extended subsidies on electric vehicles to 2022 and announced US\$379 million (S\$508 million) in funding for EV charging infrastructure.



Fast-charging stations for electric vehicles installed near the Bund in Shanghai, China.  
Image: Imaginechina Limited / Alamy Stock Photo

Local authorities are typically reliant on national governments for major investments, and their finances are currently under severe strain.

### The Vital Role of National Governments

To tackle the COVID-19 and economic crises, leadership from national governments is vital as they must purposefully and strategically set their cities on the path of recovery. This requires appropriate national policies combined with strong and proactive investments, to enable cities to leverage recovery strategies to go digital, green and inclusive while generating jobs and improving the wellbeing of their residents.

National governments typically have two unique roles to play: regulatory and financial. As state and national governments are primarily responsible for at least one-third of urban carbon mitigation potential globally, there is a unique opportunity for them to invest in recovery packages to create low-carbon, resilient and inclusive cities of the future.

### Regulatory Powers at the National Level

Many policies that enable and shape investments in cities are set at the national level. These

would include, for example, policies relating to building energy efficiency standards. Other national policies, such as those for housing and transport, hugely influence investment outcomes in cities. Therefore, the national government's leadership and investments are critical to complement the green investments being planned or laid out at the local government level to build a sustainable and resilient recovery.

### Financial Support from the National to the Sub-national

Local authorities, especially in smaller cities, are typically reliant on national governments for major investments, and their finances are currently under severe strain. Some city governments are making low-carbon investments under their own urban recovery strategies, even as their budgets shrink. It is now critically important for national governments to support them because much of the financing required for these investments will either be provided by or mediated through national governments.



Given the growing share of people, economic activity and emissions concentrated in cities, national governments should be placing cities at the heart of their national development and climate strategies.



### Preparing for an Uncertain Future

The COVID-19 pandemic has led to a fundamental re-think of where people live, how they earn a living, how they move, and what services they need. Responding to the climate emergency requires a similar mindset and set of tools. To prepare for an uncertain future, urban systems can and must future-proof themselves from pandemics and future climate shocks. Building wider resilience through early action can prevent catastrophic consequences, foster economic security and social inclusion, and enhance public health systems.

Central to this is the role of national governments, although currently few of them have robust plans to

deliver prosperity in the context of the global health and climate emergency. Given the growing share of people, economic activity and emissions concentrated in cities, national governments should be placing cities at the heart of their national development and climate strategies. This is with a view to building a national system of cities in which people can thrive, rather than just survive—as is currently the case in many of the world's cities. Comprehensive national strategies, focused on cities that have liveable density and connectivity, and that are clean and inclusive, could help the world tackle poverty, reduce inequality and avoid climate catastrophe. 🌱

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SUSTAINABLE CITIES  
**SYLVIE OUZIEL**

Sylvie Ouziel is the International President of Envision Group.

# Sustainable Cities: Bridging the Gap Between Vision and Reality



Wind turbines at Serra da Lousã, Portugal.  
Image: Nuno Marques / Unsplash

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**Protecting the future of the planet is not only a moral obligation but a matter of survival.**

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**Cities recognise that prioritising sustainability is the way forward to overcome challenges such as climate change and socio-economic inequalities, but do not always achieve results on the ground. Envision Group's International President Sylvie Ouziel outlines the challenges that cities must address to translate their vision of a smart and sustainable future into reality.**

I expect to find the reader in violent agreement if I plead for more sustainable cities: powered by renewable energy, fostering recycling and a circular economy, embracing diversity of all kinds, promoting social blending, and seamlessly including vulnerable groups.

Yet reality has not caught up with this vision. The United Nations estimates that by 2030, 16.5% of the global population will be over the age of 60 and 59% of us will be living in cities. Ahead of that milestone, cities already contribute two-thirds of global emissions and consume over 70% of global energy production. Fossil fuels, long regarded as a cheap option, make up a large part of our energy needs, but burning these non-renewable fuels contributes to 87% of carbon dioxide emissions. This is a far cry from the ideal of net zero emissions and a circular lifestyle that many

envision as key to protecting the future of the planet, which is not only a moral obligation but a matter of survival.

COVID-19 has also threatened the livelihoods of many and exacerbated existing socio-economic fault lines against a backdrop of rising tension and polarisation. It is imperative that cities act quickly to bridge the gap between their vision of the "ideal city" and current reality. I outline four challenges that cities can address to do so.

## **Financing Sustainability for the Long Haul**

While public money will be needed to ensure part of the financing for sustainable solutions, the pandemic has severely impacted nations' debt levels. Tenable private business models are also needed

## Embracing digital technology can enhance long-term project bankability.

to ensure scalability. But the latest technological advancements provide assurance that such solutions will be all the more compelling and sustainable in the long run.

For example, the cost of renewable electricity generation—notably, solar and wind—and battery storage is falling year-on-year by double-digit percentages. Unlike fossil fuel prices, which are subject to the availability of natural resources and market fluctuations, renewable electricity and storage prices centre around the technology required to produce them from green sources such as wind and sunlight, and follow a "Moore's law" of steady decrease with rapid advancement in technology. In the long run, project costs can be expected to decline further with technological advancements such

as pre-fabrication technology or the emergence of new materials from the application of circular economy principles in the built environment sector.

Embracing digital technology can also enhance long-term project bankability. For instance, solar micro-grid projects underpinning green campuses, districts, or cities can be modelled into a "design digital twin" that stacks up various monetisation levers—such as self-consumption, grid injection, spot market trading, and ancillary grid services—to recoup capital expenditure of the photovoltaic panels and electricity storage. Once the project is funded and built, the same digital twin technology can be used to monitor actual outcomes and optimise, in real time, the overall economic efficiency and carbon footprint of the infrastructure.



Digital technology like blockchain allows the Brooklyn Microgrid to create a local energy marketplace. This provides more reliable energy and benefits both consumers and infrastructure owners financially.  
Image: Sasha Santiago, Storylabs I/O, Future Relics



British local authorities like Oxford City Council are partnering the private sector to achieve its Net Zero targets by 2040.  
Image: greir / iStock

### Aligning Siloed Responsibilities

On their own, public or private institutions struggle to deliver high-impact sustainable solutions. Collaboration between the public and private sectors is therefore fundamental to align investment, regulation and innovation.

Some British local authorities are doing this by moving from tactical to strategic procurement, to reach a net zero carbon emissions target by 2050 or sooner, at the lowest possible cost to their citizens and businesses. They use open tender processes to identify consortia partners that can deliver integrated local net zero and smart city solutions. In partnering with these local authorities, leading clean energy and smart infrastructure companies utilise innovative, low-cost and clean energy

technologies underpinned by a common Artificial Intelligence of Things (AIoT) digital backbone.

By operating under these collaborative frameworks, local authorities remain in the driver's seat of their decarbonisation and smart city programmes, while attracting low-cost capital from institutional investors keen to build on their sustainable investment portfolios. The pioneering local authorities behind these net zero transformations also make their frameworks accessible to other public sector organisations around the country, ensuring that everyone can benefit from these models at the lowest cost to the consumer, in an aligned way, without any top-down imposition or "obligation".



The ComerciosLocal.es website allows users to discover local shops in La Rambla by linking data of local businesses from Open Data BCN with Google Maps.  
Image: Jorge Fernández Salas / Unsplash

## Democratising Data and Technology to Lower Barriers

When executed well, electric micro-mobility and other public transportation technology can bring citizens closer together.

Even as many people support wind energy, social diversity and waste recycling, there are still numerous others who would object to installing wind turbines, social housing or a waste treatment plant in their neighbourhood. To overcome this, it is crucial that differing viewpoints be heard and addressed as part of decision-making processes.

Traditionally, public data such as city budgets, investments, new tenders, regulations and new laws are available to only a part of society. But initiatives that democratise data access and

transparency can help lower social barriers and involve the community in building a city that works better for everyone.

Barcelona has deployed digital tools such as the Open Data BCN service to democratise its governance since 2015, with open data and open standards as key enablers. For example, citizens can access contractual KPIs for each public supplier, request improvements and report any contractual non-compliance. The city makes privacy, data sovereignty, and data security core elements of its governance approach through participatory



Emerging micro-mobility solutions founded on digital technology, such as e-scooters, make the city more accessible to all citizens.  
Image: Max Claus

processes, to ensure that citizens choose how the smart city should serve them, rather than the other way around.

Technology can also help narrow geographical divides. As a complement to efficient public transport and smart-traffic solutions, emerging micro-mobility—often in the form of free-floating solutions such as bicycles, mopeds, scooters and ride-sharing—shortens commute times and enhances accessibility. In Rio de Janeiro, dockless e-scooter app Lime has been part of the daily commute of people from all backgrounds.

Tourists and locals use this electric micro-transportation option to avoid traffic congestion and move around the city, to and from beaches, the city centre, high-end residential neighbourhoods and underprivileged communities. Technology is a fundamental part of Lime's operations, giving users real-time information on the location of scooters via its mobile app, and detecting user patterns to minimise scooter damage. When executed well, electric micro-mobility and other public transportation technology can bring citizens closer together.

Real-time information transparency can help mitigate some of the geographical challenges that large urban areas face. The Dutch approach to flood risk management relies not only on massive engineering feats to raise physical flood defences, but also on AIoT technology to operationalise flood resilience. This technology includes high-resolution weather forecasts, real-time sensors and early warning systems, and integrates data from different provinces, municipalities and private parties, to keep citizens informed and prepared to respond in emergencies.



Completed in 1931, the Empire State Building has been completely retrofitted with smart technology, which has helped it reduce energy consumption by 38%, with more than \$4.4 million in energy savings each year.  
 Image: Jonas Brief / Unsplash

## Adopting less intrusive technologies can help cities embrace their rich urban legacy sustainably.

### Embracing the Weight of History

Finally, few cities have the luxury of starting with a clean slate. Virtually all cities must transform themselves from a state of urban legacy. Retrofitting for energy efficiency, accessibility and inclusivity is more challenging than designing from scratch. For instance, adding renewable electricity supply or expanding grid capacity into a district, deploying high-speed internet to historical buildings, and making services more accessible for the elderly and vulnerable populations, can quickly become monumental headaches. Once again, adopting less intrusive technologies such as 5G and 5G LANs versus WIFI, smart sensors and systems to optimise energy

usage, and even drones to improve safety and accessibility, can help cities embrace their rich urban legacy sustainably.

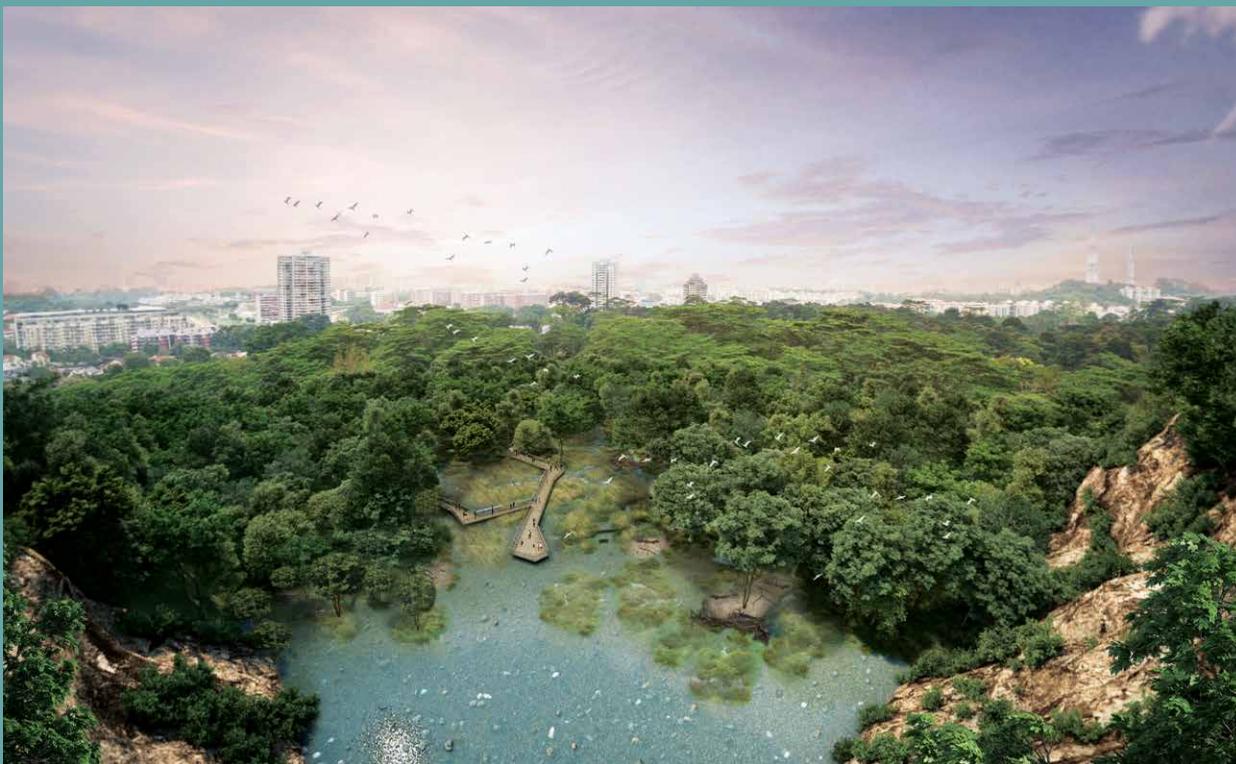
Inasmuch as the world is charging towards a climate catastrophe, not all is lost just yet. Cities already recognise the urgency for sustainability, whether by way of short-term or long-term solutions, to overcome existing challenges and to avoid certain scenarios in the future. With technological progress, coupled with proper financing, governance, alignment and transparency mechanisms, unleashing the potential of cities to achieve a smart and sustainable future is fully possible. 🌱



CITY IN NATURE  
**KENNETH ER**

Kenneth Er is the Chief Executive Officer of the National Parks Board, Singapore.

# Transforming Singapore into a City in Nature



Artist's impression of the upcoming Rifle Range Nature Park, which provides more space for nature-based recreation.  
Image: NParks

**The importance of nature and green spaces for physical, emotional and mental wellbeing cannot be understated, particularly in a land-scarce country like Singapore. In this essay, Kenneth Er, Chief Executive Officer of Singapore's National Parks Board, explains the country's journey to becoming a City in Nature and the role of the natural environment in post-pandemic cities.**

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**NParks introduced the City in Nature vision...to ensure a green, liveable and sustainable home for Singaporeans for generations to come.**

## ||

Situated one degree north of the equator, Singapore resides within a region of perpetual summer and high rainfall. Despite being a small city-state of 728 km<sup>2</sup> and one of the most densely populated countries in the world, Singapore is home to a rich diversity of flora and fauna. This is the result of a concerted effort in the greening of Singapore since the 1960s, which exemplifies the concept of sustainable development from a time when environmental awareness was still low.

Prior to this, when the British arrived in Singapore in 1819, the island was covered with rainforests, swamps and mangroves. By 1900, more than 90% of the primeval forest had been cleared for timber extraction, agriculture, and the creation of settlements. While the British designated forest reserves and nature reserves, much of these areas were eventually replaced with plantations and agriculture, leaving only small reserves scattered across the island. It was not until



Sungei Buloh Nature Park Network was launched in August 2020. This Nature Park Network safeguards a variety of complementary wetland habitats, strengthening the conservation of wetland biodiversity in the vicinity of Sungei Buloh Wetland Reserve (SBWR).  
Image: NParks

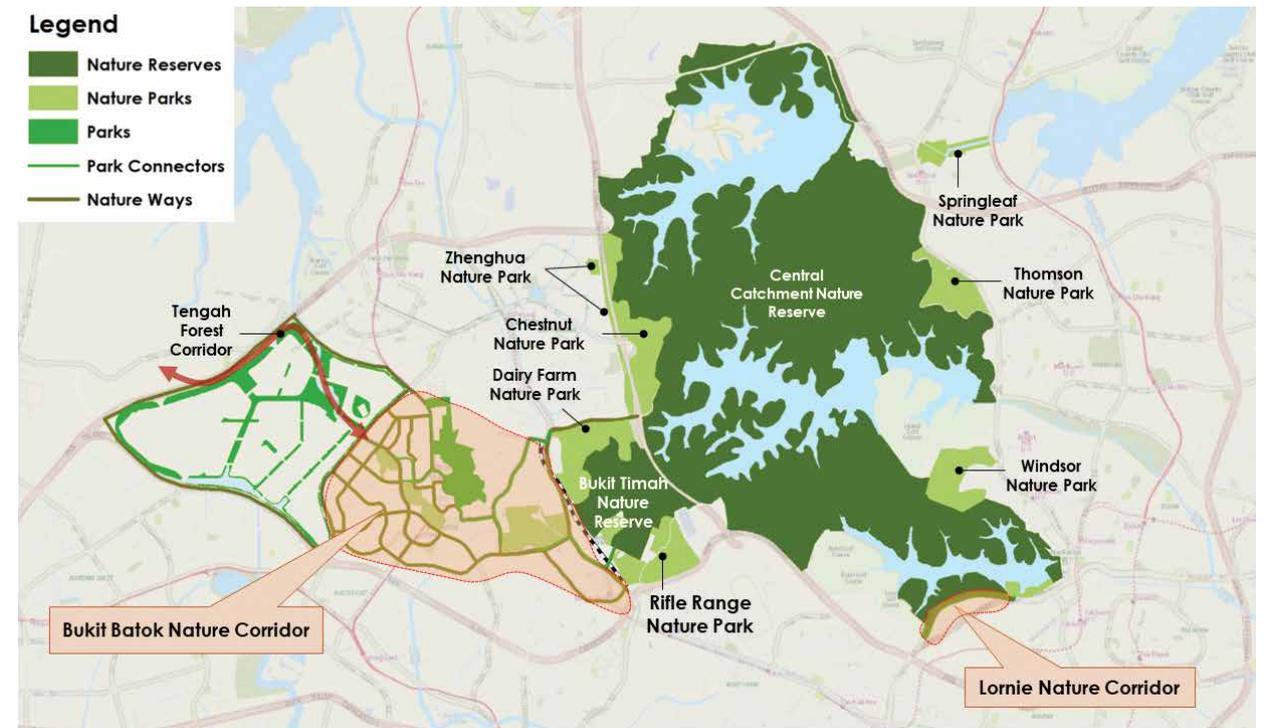
the 1960s, that the then-Prime Minister of independent Singapore, Mr Lee Kuan Yew, launched the Garden City campaign and the greening of Singapore.

In the beginning, the aim was to “green” the island as quickly as possible to provide shade and access to green spaces for all. To achieve this, clear parameters for greenery were established through park provision standards and road codes, as part of the urban planning process.

The strategy evolved, and flowering trees and shrubs were planted to provide colour. Parks were linked up by the Park Connector Network and building developers were encouraged to incorporate skyrise greenery to improve the living environment. In recent years, the

National Parks Board (NParks) has adopted biophilic design to restore natural habitats, and has been engaging the community to help sustain the greening efforts.

With increasing urbanisation, coupled with a rise in global temperatures and extreme weather conditions due to climate change, the living environment will become less comfortable. Hence, a response that seeks not only to retain and integrate greenery, but also to restore urban nature, is needed to mitigate these effects and continue to provide a high-quality living environment for Singaporeans. This will also ensure that Singapore remains a distinctive global city that instils pride in its people and attracts talent, investment, and visitors.



The Central Nature Park Network, comprising the Bukit Timah Nature Reserve and Central Catchment Nature Reserve and surrounding Nature Parks, together with the adjacent Nature Corridors, help to strengthen the ecological resilience of the nature reserves.  
Image: NParks

## In recent years, NParks has been establishing networks of nature parks around the nature reserves to protect them against the impact of urbanisation.

### Transforming Singapore into a City in Nature

In March 2020, NParks introduced the City in Nature vision, as part of the next bound in urban planning, which aims to ensure a green, liveable and sustainable home for Singaporeans for generations to come. This bold new vision builds on the greening efforts that Singapore has undertaken over the past decades, and encompasses the following strategies:

#### Extending Singapore's Natural Capital

Singapore's four nature reserves safeguard the country's most important representative ecosystems, serving as core refugia for biodiversity. They are also primary providers of ecosystem services like clean air and water. In recent years, NParks has been establishing networks of nature parks around these

reserves to protect them against the impact of urbanisation. These nature parks serve as buffers and complementary habitats for Singapore's native flora and fauna to thrive. They also enable visitors to enjoy nature-based activities such as hiking, mountain biking and bird watching with minimal disturbance to the nature reserves.

**Intensifying Nature in Gardens and Parks**

Beyond expanding Singapore's Nature Park Network, landscapes in gardens and parks are also being curated to make them more natural. First, NParks will incorporate nature-based designs into new and existing gardens and parks. A wider variety of planting schemes with a diversity of native plant species emulating Singapore's natural forests will be incorporated. This will bring visitors closer to nature.

Second, more therapeutic landscapes in gardens and parks will be incorporated to cater to the needs of different users. Evidence-based designs will be applied to these landscapes to bring about health and wellbeing benefits, including respite to people with

conditions such as dementia, heart and mood disorders, or who are recovering from strokes. A parallel effort is underway to build more nature playgardens, so that children can play within a natural setting. This will help younger generations forge a greater connection with nature through play, exploration and learning.

Third, NParks will naturalise waterways and waterbodies in gardens and parks. Where possible, concrete canals will be transformed into naturalised rivers with adjacent low-lying areas functioning as floodplains, while reservoirs will serve as naturalised lakes that catch and retain rainwater. This will enhance flood protection for nearby homes and properties, while supporting

rich biodiversity. Such nature-based solutions will help build resilience against inland flooding.

Fourth, NParks will conserve more native plant and animal species over the next decade. Ongoing habitat restoration and species recovery efforts have enabled Singaporeans to encounter and enjoy once-rare species such as the Oriental Pied Hornbill, Common Birdwing, Singapore Kopsia and native orchids in our gardens, parks and streetscapes.



The lowland forests and wetlands in the Singapore Botanic Gardens' Learning Forest were ecologically restored to conserve a wider variety of native flora and fauna. The restored wetlands also enhance flood resilience in the area.  
Image: NParks



Therapeutic landscapes and programmes are designed to bring about greater health and wellbeing to Singaporeans.  
Image: NParks



As a result of NParks' species recovery efforts, the Oriental Pied Hornbill and other native species can now be found across Singapore's urban landscape.  
Image: NParks



Skyrise greenery, such as in the Kampung Admiralty mixed-use development in northern Singapore, brings greenery closer to residents' everyday lives.  
Image: Patrick Bingham-Hall

## By 2030, all households will be within a 10-minute walk from a park.

### Restoring Nature in the Urban Landscape

To bring greenery closer to Singaporeans' everyday lives, nature in the built environment will continue to be restored. This will also cool the urban environment and bring the therapeutic effects of greenery directly to people in their homes and workplaces. One key initiative is the implementation of skyrise greenery in Singapore's buildings and infrastructure. This enables developers and building owners to incorporate even more greenery within Singapore's limited space. Skyrise greenery cools buildings and their spaces, increasing comfort while further softening their appearance and advancing Singapore's status as a world leader in vertical greening.

NParks will also focus on greening industrial estates. Today, these are among the hotter areas on the island, as they are surrounded by less greenery. NParks is working with various stakeholders to increase the total number of trees across industrial estates by almost

three-fold. The intensified greenery will not only cool industrial estates, but also help to improve air quality and beautify the surroundings.

### Strengthening Connectivity Between Green Spaces

There is a need to strengthen the ecological connectivity between Singapore's green spaces to sustain a healthy natural ecosystem. To achieve this, NParks is incorporating multi-tiered planting into the country's streetscapes to create a forest-like structure along its roads. Roads with such planting are known as Nature Ways. This will also make Singapore's streets cooler and more comfortable for pedestrians, while enhancing resilience against the effects of urbanisation. NParks aims to complete 300 km of Nature Ways by 2030, and aspires to make every road a Nature Way in the longer term. In tandem, NParks will continue to expand the Park Connector Network to ensure that more communities can access nature easily. By 2030, all households will be within a 10-minute walk from a park.

## Building Science and Technology, and Industry Capacity

As Singapore is transformed into a City in Nature, a science-based approach will be needed to restore urban nature and address the effects of urbanisation and climate change. A concerted focus on science and technology has underpinned these efforts thus far, and this will be expanded.

In the area of nature conservation, predictive models are applied to identify green spaces to be safeguarded. For example, agent-based modelling predicting the movement and settlement of coral propagules helped validate the suitability of Sisters' Islands as Singapore's first Marine Park. "Least resistance" pathways for various fauna have also been modelled using Geographic Information System (GIS) technology so that the establishment of ecological corridors is soundly based on science.

NParks also works closely with the landscape sector, Institutes of Higher Learning and other Government agencies to promote the adoption of digitalisation and mechanisation in landscaping efforts. An example is the development of a Remote Tree Measurement System, which uses machine learning to automatically extract the geospatial locations and physical parameters of Singapore's trees, such as their height and girth, from Light Detection and Ranging (LiDAR) scans. This will enable arborists to more efficiently obtain an overview of trees in any given area. Data models, such as the Tree Structural Model, are also used to project the stability of trees under different wind speeds.

## Fostering Community Stewardship through Biophilia

To nurture community involvement, it is imperative that parks and gardens must be well appreciated. This sense of biophilia—the innate connection between humans and nature—then shifts the focus from simply providing green spaces for respite and recreation, to fostering a sense of ownership and responsibility. NParks works closely with the community through several key programmes to nurture stewards of nature.

The Friends of the Parks (FotP) initiative brings together local stakeholders and volunteers to play a greater role in promoting active and responsible use of Singapore's parks through community-led programmes and initiatives. In late 2019, NParks expanded the initiative to systematically involve communities in the design, development and management of 50 parks between 2020 and 2025. By opening up more opportunities



The structural stability of trees can be monitored virtually through the Remote Tree Measurement System.  
Image: NParks

for communities to co-create these parks, NParks hopes to build a greater sense of ownership of these green spaces.

The Youth@SGNature initiative aims to provide youths with more opportunities to engage with nature, and to cultivate them into stewards for biodiversity conservation and greenery. One example is the Youth Stewards for Nature programme, which challenges youths to take up a project to solve real-world problems in research, outreach, biodiversity conservation, or horticulture and landscape design.

In 2020, NParks launched the OneMillionTrees movement to plant a million more trees across Singapore by 2030. It aims to

redouble Singapore's efforts to green its urban infrastructure on an unprecedented scale, underpinning the transformation into a City in Nature. The OneMillionTrees movement will be driven by the community with NParks' support. Key partners such as FotP communities, nature groups, corporate partners and volunteers will champion initiatives relating to the tree-planting efforts. By involving the community, NParks hopes to foster ownership in the liveability of the city-state, while building social resilience.

Existing NParks programmes, including the Community in Bloom (CIB) movement and the Community in Nature initiative, already involve volunteers in

establishing community gardens and conserving Singapore's natural heritage. Moving forward, NParks is expanding the CIB programme by providing more allotment gardens and encouraging people to grow fruits, vegetables and herbs. These efforts will help engender biophilia amongst Singaporeans.



Members of the community supporting forest restoration efforts as part of the OneMillionTrees movement.  
Image: NParks

## In 2020, NParks launched the OneMillionTrees movement to plant a million more trees across Singapore by 2030.

### A City in Nature in the Midst of a Pandemic

The sudden emergence of COVID-19 disrupted our daily lives on an unprecedented scale, and also cast a spotlight on urban planning practices across the world. Like many other cities, Singapore imposed strict restrictions on movement to control the spread of COVID-19. Termed the "Circuit Breaker", this lasted from 7 April 2020 to 1 June 2020, during which residents could only leave their homes for essential activities such as seeking medical attention, purchasing food and groceries, and exercising. Gardens and parks remained open during the Circuit Breaker, but with restrictions on permissible activities.

When Circuit Breaker restrictions were eased, NParks observed greater interest in our parks, resulting in higher visitorship

compared to before the pandemic. This was especially so for parks with a more natural setting like nature reserves and nature parks. This surge in interest comes after a prolonged confinement and limited access to nature during the Circuit Breaker—which may have left many feeling deprived of the wellbeing effects of being in nature, amid the stresses brought about by the COVID-19 pandemic.

Looking beyond the pandemic in the "new normal", these observations reflect the importance of providing accessible urban nature and green spaces in cities. They also underscore how crucial nature is in providing benefits to physical and mental wellbeing as we continue to transform Singapore into a City in Nature. 🌿

## TALLINN | DIGITAL INNOVATION

# Becoming a Global Smart City Role Model

Over the last 30 years, the Estonian city of Tallinn has shed its former Soviet-era lifestyle and embraced a largely digital one. It has done this thanks to visionary leaders who put digital transformation and its people at the heart of their governance.



Tan Yi Xuan is a researcher at the Centre for Liveable Cities, focusing on Complexity Science for Urban Solutions, Sustainable Innovation Districts and Smart Cities.



Estonia was forced to reinvent itself after regaining independence in 1991.  
Image: Hans Birger Nilsen / Flickr

**You're either slow and get eaten or you become very fast and develop the economy and digital society—Estonia opted for the latter.**

## The Challenge

When Estonia regained its independence after leaving the Soviet Union in 1991, the nation was forced to quickly reinvent itself. The small European country of only 1.3 million citizens lagged behind its more technologically advanced neighbours, and also had to build its public services from the ground up. The government also understood the need for the country to stand out with a competitive edge over others. Former Prime Minister of Estonia Taavi Rõivas once said: "You're

either slow and get eaten or you become very fast and develop the economy and the digital society—Estonia opted for the latter."

Digital transformation was quickly recognised as the key to unleashing Estonia's potential in achieving economic progress and a vibrant society in an affordable manner. As the capital of Estonia, Tallinn led the way in digital development for the rest of the nation.

## Citizens are at the core of Tallinn's digitalisation journey.

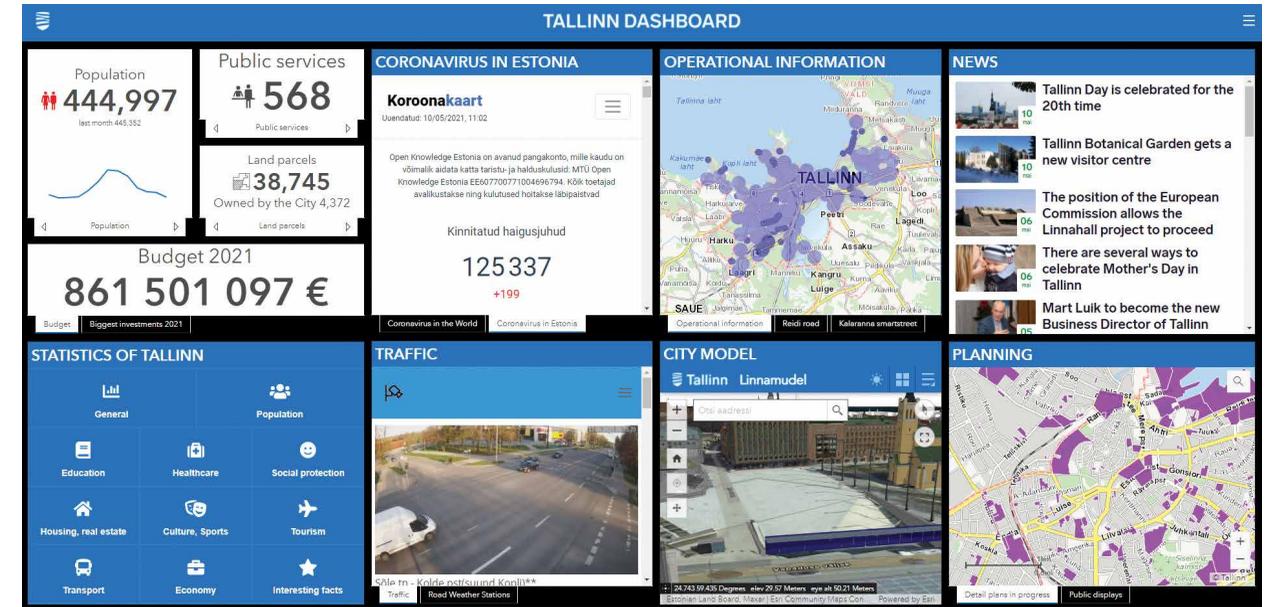
### The Solution

Citizens are at the core of Tallinn's digitalisation journey. Recognising that its citizens must be willing and ready to use digital solutions, Tallinn strategically identified three key pillars of accessibility, user-friendliness and interoperability in its smart city transformation.

Firstly, digital infrastructure was rolled out to all schools, government administrations and households across the city, and Wi-Fi hotspots were set up across all public spaces. Education complemented the development of digital infrastructure to ensure citizens' readiness to be a part of the digital transformation. For instance, students as young as seven were

introduced to digital culture through training programmes to teach them how code and algorithms work. Public servants were also trained in design thinking to equip them with skills in designing content that meets users' needs. Recognised as a fundamental enabler of digital transition, accessibility to the Internet was declared a human right in Estonia in 2001.

The heavy investment in digital infrastructure laid the foundation for digitalising public services such as municipal and healthcare services. User-friendliness was emphasised to smoothen any inertia in adopting digital technologies.



The Tallinn Dashboard offers citizens open access to the city's data. Image: Tallinn Dashboard. Accessed 14 May 2021.



Digital infrastructure is highly accessible throughout Tallinn, including schools, where students are exposed to the applications of technologies at a young age. Image: Arno Mikkor / Wikimedia Commons

For instance, the Estonian digital identity card (eID), a mandatory identity document for Estonians, offers citizens convenience as it can be used to authenticate and sign almost all kinds of transactions and procedures, ranging from tax filing, accessing public healthcare and transportation.

To further ease citizens' access to digital services across different organisations, the Tallinn administration abides by the "once-only principle" to allow users to submit their information only once. This required information to be shared between different organisations efficiently yet securely. With this in mind, the X-Road data exchange system

was launched in 2001. It connects various organisations' databases to seamlessly share citizens' data across public sector institutions, organisations and enterprises securely, without compromising privacy. Such data interoperability allows the city to integrate their service delivery to better serve its people. Citizens are also empowered through strong privacy and data management: citizens own their data and can restrict authorities' access to it.

Open data and transparency also engender trust and create opportunities for citizens to participate in planning. Tallinn has made municipal data open and accessible to citizens via

digital tools such as the Tallinn Dashboard. The dashboard collects live data and offers information on a wide range of subjects, including traffic livestreams, city statistics, official announcements such as COVID-19 updates and 3D models of the city to support planning. Such openness in data gives both the city government and citizens deeper insights into problems and opportunities to work together to create better solutions.



Located within a former industrial complex, Tallinn's Telliskivi Creative City is Estonia's largest creative centre and is home to a thriving ecosystem of creative businesses, start-ups, shops and restaurants.  
Image: Relkmsaiia / Wikimedia Commons



Tallinn is a living testbed for smart city solutions such as driverless buses.  
Image: Holo

## Tallinn's vibrant digital culture and lifestyle have made it a living testbed for smart city innovations.

### The Outcome

With these policies, systems and trust in place, Tallinn was able to build a digital system that served and protected its citizens well, and model a digital lifestyle for the rest of Estonia. In less than two decades, more than 99% of Estonia's residents now use an e-ID to access government services.

With a well-established digital infrastructure and a community that has embraced a digital lifestyle, Estonia was able to remain resilient during the COVID-19 pandemic. More than 99% of its government services remained available online despite the country's lockdown, and citizens were also able to apply for social benefits easily with their e-ID. And with more than 97% of schools equipped with digital study resources, schools were able to seamlessly move online. The well-established digital infrastructure and culture also helped Tallinn to adapt quickly to rapidly changing circumstances. For instance, the Tallinn City Council quickly developed e-sessions and voting systems for Council meetings to continue seamlessly during the pandemic.

Tallinn's successful digital transformation and widespread digital culture has also cemented

its status as a global smart city role model and innovation hotspot. In 2020, the city won the UNESCO Netexplo Smart Cities Award for digital transformation and was named Europe's 12th largest start-up hub despite not being among the 50 largest cities in Europe. The city's vibrant digital culture and lifestyle have made it a living testbed for smart city innovations, and it is the birthplace of many cutting-edge technology businesses like Skype and Starship Technologies.

In recent years, Tallinn's digital transformation approach has also been shared beyond its borders and adopted by the European Union to effect greater impacts regionally. Digital technology was never the only answer to Tallinn's—and by extension, Estonia's—digital transformation. It is the foresight, trust and respect for its people's privacy that formed the basis of its smart city governance and may prove to be a lesson for other cities seeking to build their own digital societies. 🌐



CAPE TOWN | WATER SECURITY

# Defeating Day Zero

Cape Town became the first major city to nearly run out of drinkable water in 2018, an almost apocalyptic scenario caused by persistent drought and water mismanagement. Within a few years, it successfully reversed this national emergency, turning this water crisis into an opportunity to secure a water-confident future.



Toh Ee Ming is a Singaporean journalist with bylines in the Associated Press, National Geographic, South China Morning Post, Southeast Asia Globe and more.



Dangerously low water levels at Theewaterskloof dam, one of Cape Town's six major supply dams, at the height of the crisis. Image: Bruce Sutherland, City of Cape Town

## The Challenge

When Day Zero was announced in January 2018, it seemed like doomsday for Cape Town. The city of 4 million people was running dangerously low on its water supply, having endured a devastating three-year drought—the worst on record.

Day Zero, predicted to be on April 12, 2018, was a shorthand reference for when the city's dam levels would plummet below 13.5% and taps would be turned off. At the height of the crisis, the dams supplying the city had shrunk to one-fifth their capacity in March that year.

But besides climate change, poor planning, political inertia and complacency contributed to the water shortage.

As early as 2007, the national Department of Water and Sanitation had flagged the acute need for Cape Town to boost its water supply with other sources, due to projected overpopulation and climate change risks.

These concerns were dismissed in the face of bountiful rains from 2013 to 2014. The city's six reservoirs brimmed at almost 97% capacity. Previous water conservation measures in place since the 2000s were also deemed to be sufficient.

By the time Day Zero was announced, South Africa's second most populous city realised it was in trouble.



Residents queue to fill water containers with spring water in Cape Town in February 2018.  
Image: Bram Janssen / AP Images

### The Solution

This sense of impending doom led officials and residents to take aggressive steps to avert potential catastrophe.

In its immediate response, the local government temporarily diverted water stored for agricultural purposes to supply the city, buying it time to formulate a water management plan.

Water usage limits were revised downwards and enforced. People were urged to adopt new habits, such as slashing their water consumption from around 200 litres per person per day before the drought to 50 litres at the height of the crisis. Activities requiring large amounts of water—such as watering gardens, washing cars or filling swimming pools—were banned.

High tariffs were imposed to deter users while officials rolled out around 250,000 water management

devices to shut off water supply to properties that had reached their daily water limit. High-usage households which flouted the rules were slapped with hefty fines. Enforcement officers patrolled neighbourhoods to shut down informal car wash businesses and fine errant users.

Technological solutions were also crucial. Under a collaboration with the University of Cape Town, city authorities rolled out a water map which made homes publicly accountable for their water use. It was colour coded with green dots indicating properties within the water restriction limit, which aimed to highlight exemplary households and to encourage others that water saving was a combined effort.

Devices such as Count Dropula, a smart water meter developed by Thinus Booysen, also helped the city manage its water use by monitoring water usage per minute in real time. Users could receive instant alerts on the exact time and place of water usage spikes, which allowed maintenance to be carried out quickly and effectively.

Businesses including Shoprite, Africa's largest food retailer, and Cape Talk radio station partnered with the Western Cape Education Department to install these meters in 350 schools. Coupled with water-saving campaigns in schools to

encourage students to save water, the schools saved almost 550 million litres of water in 17 months.

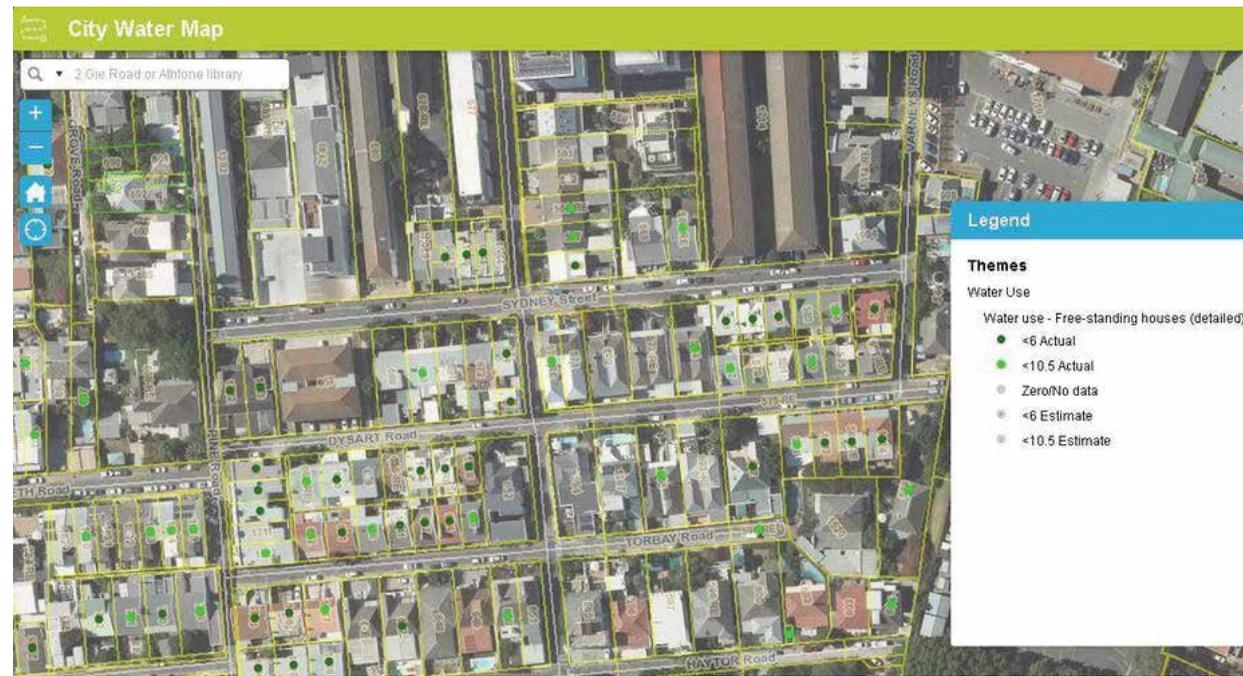
The city also sought to make behavioural change positive and fun, with creative initiatives including two-minute shower songs, catchy toilet slogans like "if it's yellow, let it mellow", and campaigns sharing water-saving tips. Start-ups even held dirty shirt contests to see who could go the longest without washing their work shirts. These light-hearted approaches imbued the campaigns with a sense of positivity and collective action.

**This sense of impending doom led officials and residents to take aggressive steps to avert potential catastrophe.**



Creative campaigns and slogans provided practical advice on how Capetonians could use water within allotted personal limits.  
Images: City of Cape Town





Cape Town's city water map aimed to highlight exemplary water usage.  
Images: City of Cape Town



In October 2020, Cape Town's reservoirs topped 100% capacity for the first time in six years.  
Images: Bruce Sutherland, City of Cape Town

In October 2020, Capetonians celebrated the historic moment when dam levels topped the 100% mark.

### The Outcome

Through the enormous whole-of-society effort and combination of interventions, Cape Town pulled off the impressive feat of having reduced water demand by more than half to just over 500 million litres between 2015 and 2018. Rains also brought some relief, and Cape Town managed to avert Day Zero. In October 2020, Capetonians celebrated the historic moment when dam levels topped the 100% mark. The city also developed "Our Shared Water Future", its roadmap to provide sufficient water for all, and for Cape Town to become more resilient to future water-related disruptions.

Cape Town's experience shows that multi-prong interventions at the city and community levels, together with

enforcement, technological and ground-up efforts, are required to inspire people towards long-term behavioural change.

As the world grows hotter and drier, Cape Town's story serves as a cautionary tale to other cities. Policymakers should prioritise long-term strategies, early action and factor in uncertainties for effective management of water in the long run. But the onus also lies with citizens to protect this life-giving source. As Cape Town has shown, communities have demonstrated tremendous resilience and resourcefulness—offering hope that the human spirit can triumph amid adversity, if they act early. 📌

SINGAPORE | COVID-19 CARE FACILITY

# Crisis Accommodations

To manage a surge in COVID-19 cases in mid-2020, Singapore swiftly repurposed several large developments—such as the Singapore Expo Convention Centre—into temporary but robust community care facilities, helping to relieve pressure on hospitals.



Thaddeus Tan was a researcher at the Centre for Liveable Cities, where he focused on governance and land use.



The Singapore Expo Convention Centre's ten exhibition halls were temporarily converted into a care facility for COVID-19 patients in April 2020. Image: SingEx-Sphere Holdings Pte Ltd

**The government had to react quickly to alleviate any potential stress accumulating on Singapore's hospitals.**

### The Challenge

When COVID-19 first appeared in Singapore in January 2020, the country's pandemic response system swung into full gear. Hospitals divided medical personnel into work teams, freed up wards to deal with confirmed cases and deployed additional equipment to treat conditions such as severe pneumonia.

In the two months after the first COVID-19 case was confirmed in Singapore, the disease was kept firmly under control, even as it spread rapidly across the world. However, the number of new daily COVID-19 cases began to increase dramatically in April 2020. The disease was spreading

among migrant workers residing in dormitories and interacting at workplaces as well as recreation centres. By month's end, Singapore had recorded more than 16,000 COVID-19 cases.

The rapid spread of the disease threatened to place immense pressure on Singapore's healthcare system. Only 13,000 hospital beds are available across public and private hospitals, and specialty care facilities. Many healthcare workers had already been deployed to affected worker dormitories. The government had to react quickly to alleviate any potential stress accumulating on Singapore's hospitals.



Before the pandemic struck, the Singapore Expo Convention Centre regularly hosted large-scale events such as car shows.  
Image: The Straits Times © Singapore Press Holdings Limited. Reprinted with permission.



Interior view of an exhibition hall at the Singapore Expo Convention Centre, after it had been temporarily converted into a care facility for COVID-19 patients.  
Image: Ministry of Health, Singapore

|| In April 2020, the government converted a series of large-scale non-medical venues into “Community Care Facilities” to accommodate COVID-19 patients who did not require acute medical care.

### The Solution

As the disease spread, so did more information about its epidemiology. For one, it emerged that many who are infected only require minimal medical care. In addition, COVID-19 has been found to have a relatively low mortality rate: in fact, among patients aged below 60 with no underlying medical conditions, the rate is close to zero.

These COVID-19 characteristics meant that the government could look for innovative ways to isolate and care for a majority of patients who did not require urgent medical care, thereby reducing the strain on Singapore’s hospitals.

In April 2020, the government converted a series of large-scale non-medical venues into “Community Care Facilities” (CCF) to accommodate COVID-19 patients who did not require acute medical care. One of them was the Singapore Expo, the country’s largest convention and exhibition

venue. The Expo was sitting unused as events had been cancelled due to the pandemic.

The Expo was converted into a CCF in a few phases. In the first phase, two of the Expo’s ten exhibition halls were repurposed into a medical-grade care facility that could house 950 patients in individual cubicles. The work was completed in three days. By June 2020, all ten of the Expo’s exhibition halls were converted into a CCF, with a total capacity of 8,500 beds.

The venue housed two groups of COVID-19 patients: (i) individuals who were asymptomatic or only had mild symptoms, and (ii) formerly hospitalised patients who had significantly stabilised.

The Expo CCF had to meet strict safety, liveability and sanitation standards. This not only included the construction of makeshift cubicles, toilets and



A patient at the Expo Community Care Facility having a teleconsultation via Temi, a remote-controlled robot.  
Image: SingHealth

## The Expo Community Care Facility had to meet strict safety, liveability and sanitation standards.

shower facilities, but also the sourcing of essential medical and communication devices, and furniture. Additionally, each exhibition hall was split into two zones: a red zone for COVID-19 patients and a green zone to house on-site medical staff. Exhaust systems and filters had to be installed to prevent cross-circulation of air between the zones.

The government enlisted various entities, such as state-owned investment company Temasek Holdings, to gather resources required for the facility. For instance, Surbana Jurong, an infrastructure consultancy under Temasek, was responsible for designing and outfitting the facility.

From the healthcare sector, companies such as Woodlands Health Campus and Parkway Pantai were responsible for tasks such as establishing workflows for medical staff and providing manpower for medical operations.

Hospitality firm Resorts World Sentosa provided non-medical care for patients such as cleaning and meal management, while security company Certis CISCO enforced security operations at the venue.

From the public sector, the Singapore Armed Forces activated its medical corps to provide care to patients, supplementing the efforts of the Ministry of Health.

These facilities played a critical role in enabling Singapore to manage the spread of COVID-19 especially after cases started to increase significantly around the beginning of April 2020.

### The Outcome

Collectively, the CCF established at Singapore Expo and other venues such as the Big Box shopping mall in Jurong and the Changi Exhibition Centre were able to house more than 17,000 individuals at any one time. These facilities played a critical role in enabling Singapore to manage the spread of COVID-19 especially after cases started to increase significantly around the beginning of April 2020.

As the situation in Singapore stabilised and the number of new daily infections fell during the second half of 2020, the government started to close the CCFs, starting with the Changi Exhibition Centre facility in August. The Expo was also repurposed into a first-of-its-kind “bubble” facility which opened in February 2021 to house business travellers arriving in Singapore without the need for them to serve a period of quarantine, provided they remained at the facility throughout their stay.

The conversion of the Expo into a CCF is an example of a national-level pandemic response that capitalised on the expertise and capabilities of public agencies and private sector entities in a synergistic way. The government negotiated and finalised the land and space requirements with the owners and operators of venues such as the Expo, but it took the concerted effort of all partners to mobilise the infrastructure, manpower and other resources needed.

These factors have been important elements in the country’s response to the current pandemic, and promise to establish a firm foundation for approaches to future health crises. 🗨️



ILLUSTRATION

BUILT ENVIRONMENT

# The Built Environment, Disrupted

TEXT: FAIZAL ZULKEFLI

Climate change, an ageing workforce, resource scarcity and the COVID-19 pandemic are some disruptions challenging the built environment sector, but new technologies, designs and innovations are turning traditional approaches on its head to help the sector build back stronger. See how the built environment sector is adapting in the face of disruption to build cities that are more sustainable and resilient.



ILLUSTRATION

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## Maximising Synergies in Infrastructure – Gujarat, India

Creative placement of solar panels can help cities maximise limited land resources while maximising synergies between water supply and energy generation: The solar panels provide shade, reducing the evaporation of water from the canal and leaving more for nearby residents and crops. The water beneath in turn lowers the temperature of the solar panels, making them more efficient.

Solar panels suspended over a canal in Gujarat.  
Image: Sam Panthaky / Getty Images



### Net-positive Sustainable Energy Buildings – Trondheim, Norway

Through the solar panels on its sloped roof, Powerhouse Brattørkaia can generate twice as much energy as it consumes daily. The excess energy is fed into the electrical grid and used by neighbouring buildings, electric buses, cars and boats. As solar panels become more efficient, cities can consider how buildings can go beyond self-sufficiency in sustainable energy to benefitting adjacent energy consumers.

Powerhouse Brattørkaia, the world's northernmost energy-positive building, harvests solar power in challenging conditions.  
Image: Ivar Kvaal



### Applying Circular Economy Principles – Eindhoven, The Netherlands

Circularity principles in the built environment were demonstrated in the construction and subsequent disassembly of the People's Pavilion for Dutch Design Week 2017. Built with borrowed or recycled materials, such as recycled plastic for the colourful shingles on the cladding, the building's materials were dismantled and returned to the respective suppliers, effectively closing the loop in the value chain. Incorporating such circularity principles upstream in the planning and design of buildings can help cities close the resource loop and reduce waste in the built environment.

The People's Pavilion during Dutch Design Week 2017.  
Image: Filip Dujardin



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An aerial view of Sanya Mangrove Park.  
Image: Kongjian Yu / Turenscape



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## Restoring Nature Through Design – Sanya, China

At Sanya Mangrove Park, designers successfully rehabilitated the mangroves previously destroyed by rapid urban development, through an innovative design of “interlocking fingers” that channeled sea tides into the park while mitigating strong storm currents that could damage new mangrove plantings. Aside from high technology, design strategies and nature-based solutions can be equally effective in resolving urban environment challenges such as urban flood risks, while creating public spaces for communities to enjoy.

### Robotic Delivery Services – Fairfax, United States of America

Autonomous robots allow for contactless delivery, an increasingly sought-after service to reduce disease transmission risk between people during the COVID-19 pandemic. Robotic delivery may provide a more sustainable and affordable alternative to traditional delivery vehicles in the long run, reducing a city's traffic congestion and vehicular carbon emissions, while enhancing the provision of on-demand delivery services.



A Starship Technologies delivery robot on delivery in George Mason University, Fairfax, Virginia. Image: Starship Technologies

### Automation to Address Labour Constraints – Mie Prefecture, Japan

Robotics and automation are heavily used in a trial project by the Japan Water Agency to construct a dam in Mie Prefecture. Greater automation reduces the strain on an ageing workforce by reducing manpower needs, speeding up repetitive work, taking on dangerous tasks and even working through the night. This potentially boosts overall productivity and makes the construction industry more attractive to younger workers.



A dam in Japan is being built almost exclusively with automation and robots. Image: Obayashi Corporation

## Innovative Construction Materials – Singapore

The Wave, a sports hall in the Nanyang Technological University, is the first large-scale building to be constructed in Southeast Asia using Mass Engineered Timber (MET). MET is from Forest Stewardship Council-certified sources only and also serves as a carbon sink via the carbon sequestered in the wood. Innovative construction materials like MET allow for faster and greener construction as its high strength-to-weight ratio makes it easier to handle, and it has a far smaller environmental footprint than traditional building materials like reinforced concrete or steel.

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The Wave sports hall at the Nanyang Technological University can host three full-sized basketball courts or 13 badminton courts.  
Image: TODAY



# WORLD CITIES SUMMIT 2021

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### SPEAKERS

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22 July 2021  
16.00–17.10 (GMT +8)

**Alice Charles**  
Cities, Infrastructure and Urban Services, World Economic Forum

**Prof Carlo Ratti**  
MIT Senseable City Lab

**Chew Men Leong**  
ST Engineering

**Josephine Teo**  
Minister for Communications and Information, and Minister-in-charge of Smart Nation and Cybersecurity, Singapore

**Matthias Rebellius**  
Siemens AG

**Michael Donaldson**  
Barcelona



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#### MAKING SENSE: LEVERAGING THE SCIENCE OF CITIES

2 September 2021  
16.00–17.10 (GMT +8)

**Aaron Maniam**  
Ministry of Communications and Information, Singapore

**Daniel Plato**  
Cape Town

**Eva Gladek**  
Metabolic

**Peter Ho**  
Urban Redevelopment Authority, Singapore

**Prof Tim Stonor**  
Space Syntax



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**Ahmed Aboutaleb**  
Rotterdam

**Bernard Charlès**  
Dassault Systèmes

**Dr Cheong Koon Hean**  
Centre for Liveable Cities, Singapore

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#### HOPE YOU'RE WELL: BUILDING HEALTHY AND HAPPY CITIES

21 October 2021  
16.00–17.10 (GMT +8)

**Prof Lam Khee Poh**  
National University of Singapore

**Teoh Zsin Woon**  
Public Service Division, Singapore

#### RETHINKING GLOBAL CITIES IN A NEW ERA

18 November 2021  
16.00–17.10 (GMT +8)

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HSBC

**Hugh Lim**  
Centre for Liveable Cities, Singapore

**Jeremy Bentham**  
Shell

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