

ISSUE 23 • SEP 2023

URBAN SOLUTIONS

INTERVIEW

Oh Se-hoon
Jukka Mäkelä

CITY FOCUS

Singapore

OPINION

Hyeyoung Kim

ESSAY

Sanjeev Sanyal
Lily Kong
Vanessa Evers

CASE STUDY

San Jose
Campbelltown
Valencia
Barcelona, Bogotá,
Fayetteville, Madrid
and São Paulo
Guizhou



Inclusive Smart Cities

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ISSUE 23 • SEP 2023

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Contact

Centre for Liveable Cities

T +65 6645 9560

E mnd_clc_publications@mnd.gov.sg

W www.clc.gov.sg

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Limin Hee
Stephanie Tan
Zhiyi Teo

Editorial Consultant

Hedgehog Communications

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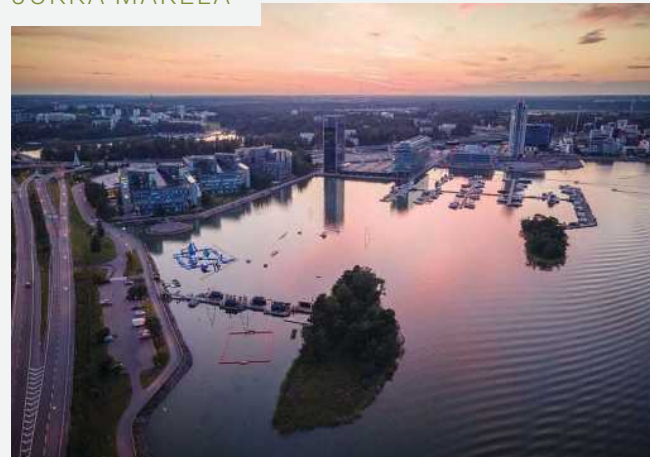
Cover Image: A child using the mobile phone with her grandmother.

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From the Executive Director

Smart with Heart: Leaving No One Behind in Smart Cities

Many cities are increasingly leveraging technology to tackle urban challenges, optimise city services and infrastructure, and improve the overall quality of life. With increasing urbanisation, cities must be ready to support larger populations that are both ageing and more diverse.

Inclusivity in cities refers to the idea that cities must pay attention to connecting with, serving and providing opportunities for their diverse resident population. This can foster stronger communities, as well as innovation and productivity for economic growth and sustainability. I wish to highlight three key insights that have emerged in this issue of *Urban Solutions*:

Collaboration and outreach bridges divides.

Seoul Mayor, Oh Se-hoon highlights that bridging the digital divide is important within the city, and beyond as well. Jukka Mäkelä, Mayor of the City of Espoo, further demonstrates that beyond providing solutions, a city can also be a platform that orchestrates multi-sectoral cooperation.

Lily Kong cautions that smart initiatives may have unintended consequences on inclusivity. Doreen Tan shares that when done right, smart solutions empowers residents like seniors in their daily lives.

Big data can help.

Big data can yield better public policies, plans, projects and services when supported by sound analyses. In Sydney's Campbelltown, an accessible real-time interactive dashboard tracks the impact of urban interventions.

Hyeyoung Kim shares how big data is utilised to formulate accessible and inclusive mobility strategies. The Cycle Road Assessment Program (CycleRAP) has developed a proactive model to improve overall road safety for cyclists.

Vanessa Evers argues that citizen science is a potential tool for improving big data collection. Crowdsourced data can be easily obtained, exemplified through the SmartBFA initiative, and even has the potential to build social empathy.

Smart Cities can be inclusive places too.

Guizhou's digital economy development stepped up economic inclusivity and social well-being, whilst enhancing ecological protection. Valencia's smart tourism created economic opportunities, whilst promoting its culture and heritage, and sustainable tourism. In the City of San Jose, an innovative Cash for Trash initiative helped to manage blight, whilst providing extra income to the homeless.

Whilst it is easy to prioritise the latest technology, Sanjeev Sanyal reminds us that social and economic factors remain equally important.

I hope you find this issue of *Urban Solutions* inspiring, and gain some insights on what it means for a liveable city to be Smart with Heart.

Hugh Lim

Executive Director
Centre for Liveable Cities



IN CONVERSATION WITH
OH SE-HOON

Inclusivity and City Diplomacy

Oh Se-Hoon, Mayor of Seoul, South Korea, shares about Seoul's new vision and highlights the links between inclusivity, competitiveness and international cooperation.



Image: Seoul Metropolitan Government

||
Having a comprehensive definition of who the socially neglected are has enabled the Seoul Metropolitan Government to take a proactive approach in rectifying the social welfare gaps.
||

The slogan *Seoul, Going Together with the Socially Neglected, and Striving to Become a Globally Attractive City* is known as Seoul's new vision. Could you share more about the first part of the vision on *Going Together with the Socially Neglected*?

Seoul became the first city in the Republic of South Korea to pass the Seoul Metropolitan Government's (SMG) Ordinance on spreading and revitalising the value of *Going Together with the Socially Neglected*. Enforced on 27 April 2023, this official ordinance recognises the importance of addressing the needs of the socially neglected and establishes the institutional framework for related policy initiatives.

The "socially neglected" encompasses individuals and groups who face limited access to fair opportunities due to factors such as financial, physical, mental, social, economic, or technological constraints. In addition to economically disadvantaged individuals, people with disabilities, pregnant women, and the elderly who clearly require social assistance, it also covers the elderly who struggle with digital devices like kiosks and smartphones, individuals at risk of domestic violence and being stalked, socially isolated and reclusive youth, and people who require support to manage social, economic, and technological changes.

Having a comprehensive definition of who the socially neglected are has enabled the SMG to take a proactive approach in rectifying the social welfare gaps. SMG's aim is to ensure that disadvantaged groups have equal access to fundamental services vital to quality of life, such as earning a livelihood, housing, education, healthcare, and safety. We are currently focused on four key projects in the areas of livelihood, housing, education, and healthcare.



8 The new Seoul City Hall is an eco-friendly building—its design is based on the eaves of traditional Korean houses. The old City Hall building in front of it is now the Seoul Metropolitan Library. Public spaces make up 38% of the area.
Image: Seoul Metropolitan Government

The Seoul Safety Income Project (SSIP) is a pilot initiative that provides comprehensive support to low-income households. Eligible households, earning 85% or less of the standard median income, receive monthly assistance to reach 85% of this median. The SSIP aims to transform the welfare support model by addressing the wealth gap and underserved areas.

The Seoul-style High-Quality Rental Housing initiative aims to improve residential stability through policies that promote desirable and high-quality rental housing. These include the use of better construction materials and regular maintenance of older complexes to eradicate negative perceptions associated with rental housing.

The Seoul Learn programme aims to provide fair access to educational opportunities and resources to students from low-income households and vulnerable youth who face socio-economic challenges.

Finally, the Seoul-style Public Healthcare Service Expansion aims to expand Seoul's public healthcare infrastructure to provide the medically vulnerable with improved medical care.

Five basic digital rights—communication, mobility, education, safety and technology utilisation—underpin Seoul's digital inclusion policies.

The Seoul Metropolitan Government's recent win in the city category at the Smart City Expo World Congress 2022 recognises its Smart City strategies for the underprivileged. Why is digital inclusion important to Seoul and what are some of its key strategies?

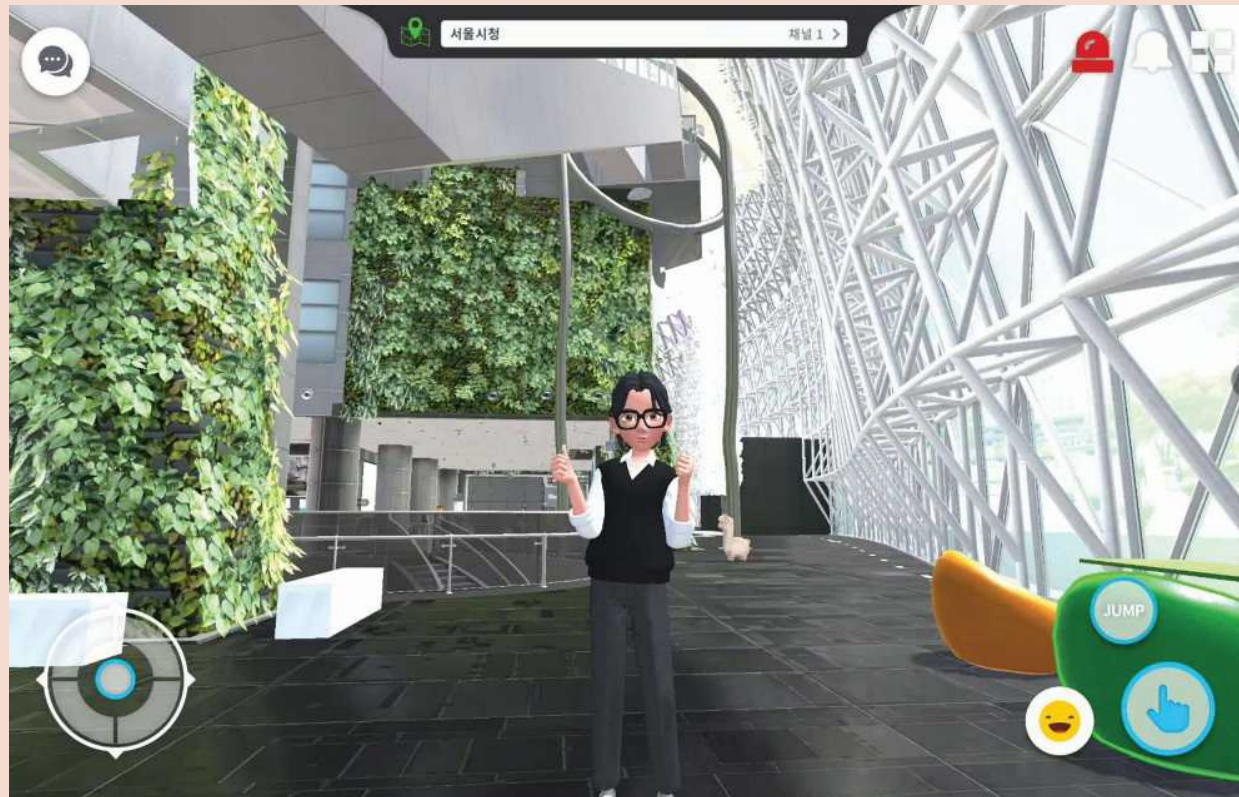
The world has witnessed rapid digital transformation resulting from the Fourth Industrial Revolution and the COVID-19 pandemic. These have widened the digital divide, particularly in urban areas. To bridge the digital gap, Seoul aims to promote smart inclusion, which involves providing customised digital education programmes to empower vulnerable groups with the necessary digital skills and knowledge.

Seoul's digital inclusion policies are thus aligned with the vision of *Going Together with the Socially Neglected*. By fostering a virtuous cycle of education and job linkage, Seoul strives to create opportunities for individuals to utilise their digital skills and gain employment. The goal is to ensure that no one is left behind in the digital age and we create an inclusive society where the benefits of technology are accessible to all, regardless of their level of digital literacy.

Five basic digital rights—communication, mobility, education, safety, and technology utilisation—underpin Seoul's digital inclusion policies. For example, the right of "mobility" recognises that all citizens should be guaranteed the freedom to move. The SMG facilitates this by operating autonomous vehicles for the disabled, providing parking spaces equipped with Internet of Things (IoT) sensors and surveillance cameras to assist disabled individuals, and offering virtual sightseeing services using the metaverse.

Metaverse Seoul is one of SMG's recent key strategies to promote digital inclusivity and guarantee the five basic digital rights. The virtual public platform for social activities promotes inclusivity and a sense of community without discriminating against physical condition, occupation, age, and the like. This online communication channel emerged during the pandemic as an enabler for people with disabilities and the elderly to overcome limitations and engage in virtual interactions.

The SMG plans to integrate Metaverse Seoul into its administrative system to create a unique virtual public service that transcends space and time. The goal is to establish a user-friendly platform that is accessible to people of all ages without marginalisation. In 2023, the SMG plans to introduce an Easy Mode to enhance accessibility for the elderly who are unfamiliar with digital technology.



Virtual Seoul City Hall in Metaverse Seoul.
Image: Seoul Metropolitan Government



Virtual Dongdaemun Design Plaza in Metaverse Seoul.
Image: Seoul Metropolitan Government

Seoul aims to create a smart city growth model by fostering collaboration among cities worldwide based on innovative technologies.

As the world's first city-led metaverse platform, Metaverse Seoul was recognised as one of the "200 Best Inventions of 2022" by TIME magazine. By leveraging the metaverse and implementing digital inclusion policies, Seoul has established its position as a global leader in smart city initiatives, surpassing previous efforts with technologies such as high-speed networks, IoT, and artificial intelligence. We are delighted that Seoul's digital inclusion efforts earned international recognition as it received the Best City Award at the Smart City Expo World Congress 2022 in Barcelona.

Besides focusing on digital inclusion within Seoul, we are also keen to contribute to the international development of inclusive smart cities. As a leader in digital transformation, Seoul is a smart city with world-class smart infrastructure, advanced technology-based smart services, and smart citizens who actively embrace digital experiences.

Leveraging these capabilities, Seoul actively participates in the World Smart Sustainable Cities Organisation (WeGO) and serves as the Chair City. Together with WeGO, we also established the Seoul Smart City Award this year to further contribute to the development of smart cities worldwide by sharing excellent smart city policies that will bridge the digital divide between cities. The Seoul Smart City Award recognises inclusive and innovative projects that contribute to the realisation of an attractive smart city which prioritises the socially neglected.

Thus, Seoul aims to create a new smart city growth model by fostering collaboration among cities worldwide based on innovative technologies, reflecting Seoul's vision of *Seoul, Going Together with the Socially Neglected, and Striving to Become a Globally Attractive City*.

Seoul is focusing on three key areas: culture, economy and industry.

That is a great segue to the second half of Seoul's vision. Could you share more about the vision to make Seoul a *Globally Attractive City*?

The concept of attractiveness represents the competitiveness of a city. For Seoul to be a global leader, it is essential that the city is appealing to people everywhere, in terms of living, visiting, working, and investing.

Seoul, with its population of 10 million, offers captivating experiences with its rich history, beautiful natural surroundings, leading-edge science and technology, and trendy lifestyles. The city's cultural and lifestyle offerings, including Hallyu (Korean Wave) such as K-pop, dramas, movies, K-beauty and fashion, have become highly desirable and have gained attention and influence around the world. Seoul is a much sought-after destination, ranking 7th in the Global Power City Index.

To enhance its attractiveness and become the 5th most competitive city in the world, Seoul is focusing strategically on three key areas: culture, economy and industry.

With the post-pandemic reopening of tourist routes, the city plans to create a vibrant cultural scene throughout the year. Seoul Festa, the city's signature culture and tourism festival, has attracted a significant number of foreign visitors who want to experience the charm of Seoul through various events beyond K-pop.



Seoul's urban landscape is characterised by a mix of heritage sites, such as *Deoksugung* (Palace of Virtue and Longevity), modern architecture and nature.
Image: Seoul Metropolitan Government



A rendering image of Yongsan International Business District
Image: Seoul Metropolitan Government

Seoul's economy and industry will be further accelerated through the envisioning of the Han River region as the Global Innovation Core, to foster industries and sectors that will drive the future economy. The old city centre will be transformed into a high-density mixed-use business town, connecting Yongsan's international business functions with Yeouido's global financial functions. Yongsan International Business District will be developed into a smart city, leading in cutting-edge science and technology, and serving as a hub for industry, economy, and digital transformation.

The Han River region's economic development will also improve Seoul residents' quality of life. In 2023, we initiated the Great Han River Project—also known as the Han River Renaissance 2.0. To achieve its vision of a *Greater Han River That We Enjoy Together*, this project will pursue four core strategies: Han River that Coexists with Nature, Easily-Accessible Han River, Attractive Han River, and Invigorating Han River. The version 2.0 strategies build on the initial 2007 project principles of restoration and creation, to further address social changes, new opportunities and areas of improvement.

The focus of Han River that Coexists with Nature is on expanding ecological and scenic conservation areas, maintaining ecological parks, and implementing wildlife habitat protection projects. Easily-Accessible Han River will enable citizens to reach Han River parks within ten minutes from peripheral areas by enhancing travel and transportation connectivity via land, water, and air. Attractive Han River will create emotive experiences and landscapes, featuring the Seoul Ring ZERO ferris wheel, events like fireworks displays, a revitalisation of water sports through the Han River Sports Renaissance, and the like. Lastly, Invigorating Han River involves creating urban innovation zones and dynamic cityscapes in key locations along the river, such as the Yongsan International Business District, to transform monotonous areas.

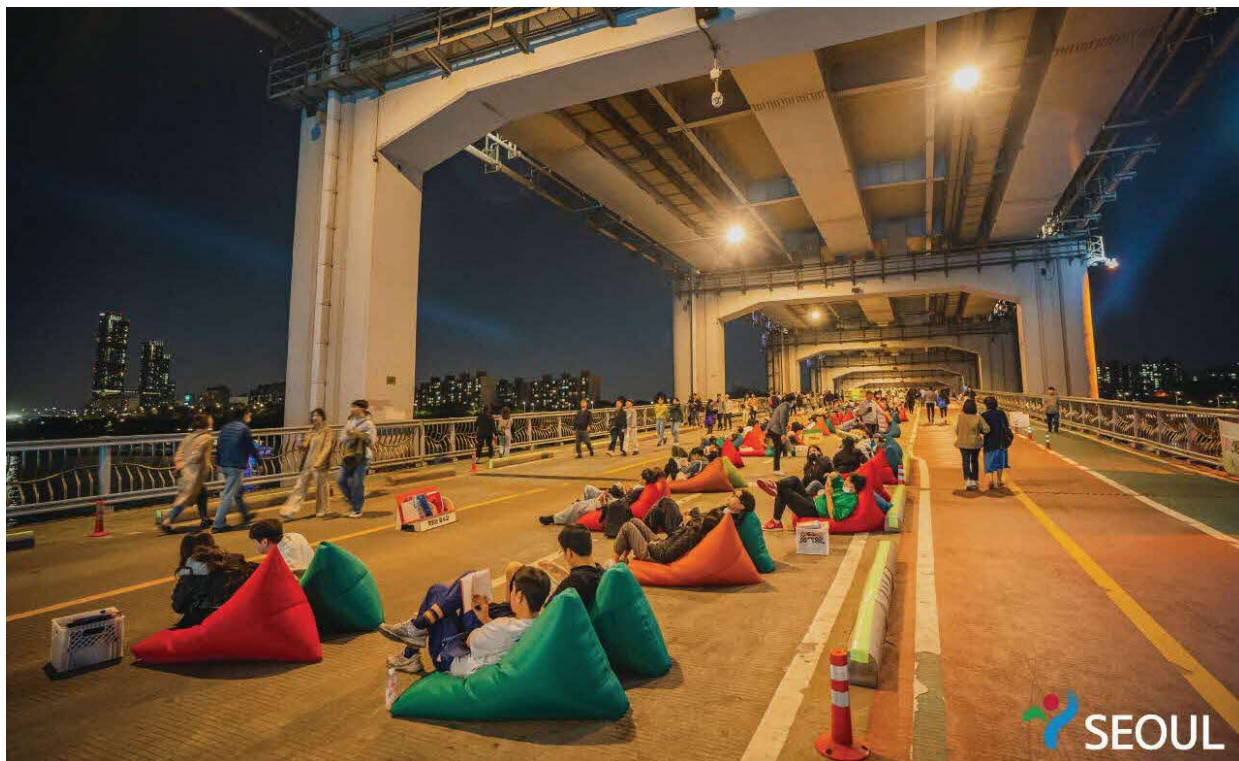
What role does city diplomacy play in enhancing Seoul's global competitiveness?

2023 will be an important year for the SMG's urban diplomacy and international cooperation especially as the world recovers from the COVID-19 disruptions. It is a significant year for showcasing Seoul's charms to foreign cities and working together to address common challenges.

Seoul actively engages with 75 cities worldwide to establish close ties. These partnerships play a crucial role in facilitating effective policy implementation, policy discussions, and the exchange of best practices. Recently, Seoul established friendly city relations with Miami, USA, and Dublin, Ireland, and plans to expand cooperative exchanges in areas like transportation, economy, and culture.

Seoul is expanding its leadership in multilateral diplomacy by joining 25 international organisations to focus on urban issues. It holds the Chair City position in city-focused international organisations like WeGO and CityNet. As a member of the C40 Steering Committee, Seoul actively cooperates with international cities to address the climate crisis, particularly in East Asia, Southeast Asia, and Oceania. Seoul aims to promote policies that support vulnerable communities affected by climate change.

Leveraging its experience in overcoming challenges related to rapid urbanisation, population concentration, and infrastructure development, Seoul aims to assist cities worldwide facing similar issues.



The Great Han River Project envisages the Han River as a space loved by citizens.
Image: Seoul Metropolitan Government

Partnerships play a crucial role in facilitating effective policy implementation, policy discussions and the exchange of best practices.

Through city-to-city exchanges and engagement in international organisations, the SMG identifies policy needs of developing countries and supports the overseas expansion of Korean private companies with advanced technologies to those countries.

Acknowledging the heightened suffering of vulnerable populations globally due to factors such as COVID-19-induced polarisation, climate change, wars, and conflicts, Seoul implements various policies to support those in need beyond its borders. The city plans to deploy an Overseas Volunteer Corps - comprising Seoul's youth - to countries in the Asia-Pacific region. This initiative seeks to enhance the quality of life in developing nations and foster friendly relations with partner cities. Additionally, Seoul extends support to foreign citizens and governments affected by disasters through its Emergency Relief Fund, thus fulfilling its role as the capital of Korea and a responsible international city.

Seoul's global recognition in urban administration is evident through its notable achievements. In 2018, the city was honoured with the prestigious Lee Kuan Yew World Cities Prize, often hailed as the urban administration equivalent of the Nobel Prize. To further highlight its leadership in urban development, Seoul is set to host the World Cities Summit Mayors' Forum at the Dongdaemun Design Plaza (DDP) from 24 to 26 September. This influential gathering will convene mayors from prominent cities worldwide, along with senior officials from international organisations, to engage in comprehensive discussions aimed at fostering sustainable, resilient, and inclusive cities.

The DDP is known not only for its architectural significance but also its status as a global beauty industry hub and base for cooperative regional development. It offers a unique setting for a range of events for international leaders that go beyond traditional hotel-based conferences. From Seoul Beauty Week, which showcases the city's innovative technology and K-beauty essence, to the Seoul Smart City Award Ceremony, visitors can experience Seoul's fashion, beauty, and future firsthand through a rich array of attractions. 📍



IN CONVERSATION WITH
JUKKA MÄKELÄ

Radical Collaborations for Innovative Urban Solutions

Jukka Mäkelä, Mayor of Espoo, Finland, discusses the city's approach of leading the city strategy based on a co-created narrative—the Espoo Story—to achieve a sustainable and inclusive society.



Image: City of Espoo, Olli Urpela

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Our goal is to be a responsible and humane pioneer city and a good place for everyone to live, learn, work, and be an entrepreneur.
||

With its cultural landscape, architectural gems and vast natural areas, Espoo has a reputation as “Finland in miniature”. Could you share more about Espoo?

For a long time, Espoo was a quiet countryside parish. Over the last 50 years, Espoo has developed from a town of 100,000 residents into one of the leading innovation communities in Europe. With a population of 300,000 today, Espoo is the fastest growing city in Finland. It is home to 155 different nationalities, with growth coming mostly from international immigration.

As a network city, Espoo has five unique urban centres which are connected by public transport and designed to provide services to residents in the immediate neighbourhood. It is economic, ecological, social, and cultural sustainability at its best.

Espoo is a rare mix of deep tech and nature. The city is recognised as a hub for know-how, research, and development, with Aalto University at its heart. Over half the population have a higher education degree. Espoo is also a centre of international company headquarters and high-tech businesses, such as Nokia and Kone. Almost half of the turnover on the Helsinki Stock Exchange comes from companies based in Espoo.

At the same time, over 90% of Espoo residents live no more than 300 metres from a nature area. Espoo is home to 165 islands, 95 lakes and a 40 km long shoreline on the Baltic Sea. The Nuuksio National Park attracts visitors from near and far. The all-surrounding nature is one of the things Espoo residents value the most.

Espoo uses English as a service language and offers services tailored to meet the needs of an increasingly diverse population. We support everyone moving here by creating a sense of belonging. In Espoo, residents can truly make a difference.

We address the challenges of demographic changes, climate change and the other global issues by working together. Our goal is to be a responsible and humane pioneer city and a good place for everyone to live, learn, work, and be an entrepreneur.

To tackle these challenges, we need to combine technological innovations, with a strong focus on sustainability and inclusive development of city services. This is the basis of our city strategy, the Espoo Story. It is a visionary narrative created through an inclusive process, involving our city employees, residents, communities, and companies. Espoo's approach of leading the city strategy and political action based on a co-created narrative is unique – and has proven to be impactful.

Espoo's Voluntary Local Review (VLR) extensively involved people and stakeholders from all walks of life and is an inspiration as to how a city can localise the United Nations' Sustainable Development Goals (SDGs) 2030. Can you share more about the VLR?

Being among the forerunner cities to reach the United Nations 2030 Agenda for SDGs by 2025, our aim is to accomplish this objective while upholding the spirit of "leave no one behind". For us, the SDGs are not only a way of

Espoo is known as "Finland in miniature".
Image: Visit Espoo, Marjaana Tasala



Situated by the sea in south-eastern Espoo, Keilaniemi is a hub of high tech, innovations and business life.
Image: Visit Espoo, Tomi Tähti

measuring our sustainability – but also a way to learn how we can become more sustainable and to share our vision and aspirations with our residents, partners, and other cities.

The VLR is based on the city's long-term work to promote economic, ecological, social, and cultural sustainability. The VLR process is initiated and decided by the city management and jointly implemented by the entire city organisation and its stakeholders.

More than 1,000 people participated in the voluntary review process, through which pragmatic and concrete ideas, projects and actions were reviewed against the UN 2030 agenda and the SDGs. The rationale behind this holistic process is simple: the SDGs are both a cornerstone and a capstone that we will use to determine our actions for Espoo.

Espoo's VLR has been referenced by UN-Habitat, UN DESA, the EU, Nordregio, several European and global regions and cities, as well as other organisations as a model for participatory process. Consequently, the City of Espoo is a Lead Partner in the strategic SDG network of nine European forerunner cities for developing sustainability governance until end 2025.

|| The city orchestrates the cooperation, brings together different actors and builds a project portfolio aimed at solving systemic challenges in the city, piece by piece.

What is the role of innovation in the Espoo Story and Espoo's sustainable and inclusive development goals?

According to the Espoo Story, Espoo aims to be known as Finland's safest and most vibrant pioneer city for education and culture, expertise, innovation, and business with strong international connections. Espoo is one of the leading cities that is combining technological innovations with ambitious sustainability goals and inclusive development of city services.

Today, Espoo's 300,000 inhabitants churn out roughly 60% of Finland's patent applications—the fourth highest number per capita among all cities in Europe. In 2020, Espoo-based start-ups raised almost half of the total Finnish capital invested and Espoo's total amount was the eighth highest in Europe.

In 2022, Espoo was one of the cities chosen to be an experimentation and innovation hub under the new EU Mission on 100 Climate-neutral and Smart Cities by 2030, to lead the way for all European cities to achieve similar goals by 2050.

In Espoo, we believe in radical cross-disciplinary collaboration—a form of working where people from all walks of life collaborate to find new solutions to major systemic problems of our century. With over 400 research and development outfits, a top-level business, design and tech university, and a host of leading companies clustered in a small area, Espoo is likely to be the world's densest centre of systemic innovation. The city, together with Aalto University and Technical Research Centre VTT, forms a core that brings together all players—start-ups, students, top companies, researchers, and ordinary citizens—to create innovation for a better life. In Espoo, decision-makers, thinkers and doers from all industries and disciplines are just a bike ride away, which provides a good basis for collaboration and innovation.

An example of such collaboration is the Sustainable Espoo programme, which launched its third consecutive term in 2021. Its goal is to support the implementation of the Espoo Story through co-creating innovations that drive systemic change towards a climate-neutral city. In practice, the City of Espoo, together with its partners, co-creates innovations that are both sustainable and commercially successful. Focus areas include smart energy,



Kera Talks is Kera's sustainable urban development event that convenes cities, companies, research institutes for open dialogues and partnership building.
Image: City of Espoo, Kerttu Penttilä

smart mobility, circular economy, city planning and built environments. The city orchestrates the cooperation, brings together different actors and builds a project portfolio aimed at solving systemic challenges in the city, piece by piece.

The results include carbon-neutral district heating during the 2020s and co-designing new city districts. One such district is Kera, an old industrial area which is being transformed into a circular sustainable neighbourhood with housing for 14,000 people and 10,000 jobs. The Kera district has become known for its innovative use of disused spaces. Since 2019, old logistics buildings and factories have provided temporary bases for start-ups and companies to run their operations from, including growing mushrooms, microbreweries, gyms, an all-wheel park, and so much more.

Even though some of the buildings will be demolished eventually, the communal, circular, and carbon-neutral brand and ideology created will form a foundation for the new district. Industrial activities are being replaced by vibrant urban culture, art, events and services, many of which are based on the sharing of resources and the circular economy.

The overarching idea driving Kera's transformation is sustainability. At the same time, we are seeking ways to solve larger issues, such as climate change, loss of nature and the energy revolution. Kera is a testbed for various sustainable development solutions, ranging from the 19 smart poles



Transforming a former logistics area, Keran hallit is a facility in temporary use, which also houses the largest mural cluster in Finland, local production from breweries to urban cultivation, and a sports centre.
Image: Visit Espoo, Antti Rastivo



A 40m pilot mini-street at Keran hallit, opened on June 2022, sets the direction for future street environments by providing light street equipment that can be easily changed. People are encouraged to hold events there, with no need for additional permissions, and companies can showcase their sustainable urban solutions. Here, Hyperion Robotis present their street furniture: concrete flower boxes 3D printed with their technology which replaces carbon-emitting cement with a zero-emission binder made from the side streams of mining.
Image: City of Espoo, Kerittu Penttilä

used to test sustainable mobility solutions near the Nokia headquarters, to the pioneering of a carbon negative district heating network, and experimenting with the future of a socially and ecologically sustainable streetscape at Kera New Street.

The story of Kera suggests that cities may have to grow in their role as a digital services platform and producer. What are some important considerations for city governments?

In the rapidly growing City of Espoo, multiple regional development projects are taking place simultaneously. Without sophisticated digital design tools, such as BIM (building information modelling) solutions, and harmonised information management practices, it would be nearly impossible to carry out complex and evolving urban development projects like those in the Kera district.

An excellent example of this is the use of Espoo 3D city model and digital platforms by local project managers to integrate diverse stakeholders using shared virtual environments. These virtual platforms enable stakeholders to observe and analyse alternative design solutions for supporting the requirements of functional and sustainable urban districts. Furthermore, the digital platforms allow project managers to engage in dialogue with residents to understand specific needs. These may include the requirements of individuals with reduced mobility, or insights into designing and locating services within developing city districts.

The City of Espoo has a long tradition of innovation cooperation between schools and entrepreneurs. Espoo's schools have become innovation platforms by experimenting with education innovations, and early childhood education units have adopted digital play equipment and participated in their co-development. This established process speeds up the entrepreneur's innovation development, while teachers, students and children have opportunity to learn about new technologies and innovation, and even influence the design of more user-friendly solutions.

The same experimental culture extends into the development of other city services and the Digital Agenda programme. The involvement of residents and businesses in developing Espoo's services has accelerated the digitalisation goals of the Espoo Story.

What does the future look like for Espoo?

Co-created by thousands of Espoo residents, the Espoo Story strategy defines our vision and key goals by 2025. Espoo, together with its partners Aalto University and Technical Research Centre VTT, aims to strengthen its position in the international arena as the most interesting and attractive centre of innovation in Northern Europe.



It all comes down to the spirit, the action, and the people.



We aim to be climate-neutral by 2030. Together with our partners, we will move towards net zero by investing in clean energy, the circular economy, sustainable land use and construction, as well as sustainable transportation. To achieve a climate-neutral Espoo, we are finding ways to rapidly reduce CO2 emissions while building a unique innovation ecosystem for piloting emerging smart and sustainable solutions. The use of coal in district heating will be abandoned by 2025 and replaced by renewable energy sources. The world's largest waste heat recovery project for data centres by Microsoft and Fortum will be built in Espoo and will demonstrate cross-industry collaboration that is unique to Espoo.

This cooperation contributes not only to our own climate goals but also increases the size of our community's carbon handprint, as innovations developed in Espoo will contribute to the reduction in global emissions. Businesses in Espoo will first pilot solutions locally and then export the best solutions globally. Investments in carbon-neutral solutions will also create jobs and strengthen the city's economy.

Polycentric urban planning is our strategy for securing spaces for innovation and creating new connections. A networked city structure with rail transport and access to clean nature will provide us with optimal opportunities to develop our city.



Polycentric urban planning connects spaces and people, and facilitates collaboration and innovation.
Image: Visit Espoo, Omar El Mrabt



Access to clean nature in Keilaniemi enables sports and recreation alongside economic activities.
Image: Visit Espoo, Antti Rastivo

The city provides an administrative structure and facilitates sustainable innovation. In other words, instead of direct economic results, the city is here to create opportunities. What guides our innovation and strategy implementation is the vision that Espoo will play a significant role in developing and activating networks to support innovation by individuals, communities and companies, as well as through collaborative development and testing.

Once this is in place, it all comes down to the spirit, the action, and the people. We believe that the companies and people working here may well have the biggest positive handprint per capita in the world and the smallest gap between personal and organisational values. 🌱



SINGAPORE

Digital for Life in Singapore

TEXT: DOREEN TAN

Digitalisation is both an imperative and an opportunity. To build a more digitally inclusive society, a whole-of-nation effort is required to engage and equip individuals, families and youths, businesses and the community to participate in the new social and economic environment.

SINGAPORE 



Doreen Tan
Assistant Chief Executive, Strategic Planning & Digital Readiness,
Infocomm Media Development Authority

Doreen currently oversees strategic planning and digital readiness in Singapore's digital transformation efforts. She has over 20 years of experience in the public sector, with deep expertise in policy and planning, economic, public finance, and international relations.



Image: Anekoho / Adobe Stock



A senior learner with family members after receiving his recognition at Digital for Life: Celebrate Digital @ Bukit Panjang community event.
Image: SG Digital Office

What does it mean to build a digitally inclusive society? At its core, it means that no one is left behind as Singapore becomes more digital in how we live, work and play. In 2022, Singapore became the first country in the world to be fully covered by standalone 5G.

To strive towards becoming digitally inclusive, a multi-pronged strategy is needed.

First, ensuring digital access for all is crucial. In 2022, 99% and 90% of resident households in Singapore have internet access and computers (desktops, laptops and tablets) respectively. Smartphone ownership has reached almost 100% among residents. To achieve this coverage, the Singapore Government has implemented schemes to subsidise digital devices and internet connectivity for specific groups such as lower-income seniors or families.

Second, digital inclusion needs to go beyond digital access to equipping citizens with essential digital skills for daily living, including staying well, safe and kind online.

Third, building a digitally inclusive society will require a whole-of-society effort, enabled by strong private, public and people sector collaboration, to strengthen digital for life efforts in Singapore.

SG Digital Office (SDO) – Upskilling Communities Towards ‘Digital for Life’

The SG Digital Office (SDO), under Singapore’s Infocomm Media Development Authority (IMDA), was set up in June 2020 during the COVID-19 pandemic when many activities transitioned online. The aim of the SDO is to equip individuals

What Singapore strives to be is a digital-first—and not a digital-only—society. Digitalisation is not an end in itself, but a means to enrich quality of life.

and small businesses with digital skills so that they can participate in an increasingly digital environment.

Seniors Go Digital

To date, the SDO has mobilised Digital Ambassadors (DAs) to help over 210,000 senior citizens acquire digital skills. To reach the seniors, DAs are deployed all over Singapore at 37 permanent high-human-traffic hubs (e.g. community clubs and public libraries) and 200 roving counters at workplaces and community spaces (e.g. clinics) where seniors frequent. The DAs teach the seniors in different ways to help them learn more effectively - such as through one-to-one or small group settings, or by using a vernacular dialect when necessary.

SDOs’ DAs teach skills that are relevant to daily living so that seniors are motivated and confident in acquiring digital skills. This includes setting up smartphones, finding information and communicating online, and transacting electronically.



“You can learn whatever you want to learn. Do not worry and do not be fearful of the phone”, said Mr Kulasingham Sabapathy, a senior learner who was recognised for his efforts to pick up digital skills at the Digital for Life: Celebrate Digital @ East Coast Digital Festival on 10 Jun 2023.
Image: SG Digital Office

To develop programmes for specific digital skills, SDO collaborates with different partners, including local banks to design a hands-on e-payment learning journey for the seniors, and the Cyber Security Agency of Singapore and Singapore Police Force to raise awareness of cybersecurity. Having a deeper understanding of users' experiences also equips the SDO to provide feedback to government agencies to facilitate design of more user-friendly digital government services.

As a form of motivation, seniors who have done well in their digital learning are recognised publicly at major community events, often in the presence of their family members. This brings much joy and pride to the senior learners.

Recognising the power of peer learning, 365 Silver Infocomm Wellness Ambassadors (SIWAs) have been trained under a joint initiative by IMDA and another government agency, People's Association. SIWAs are digitally savvy seniors who volunteer to teach and encourage their peers. They help to lead the 45 Digital for Life: Digital Clubs at Community Clubs and community

spaces in collaboration with the People Association's Active Ageing Council.

Hawkers Go Digital

Singapore's hawkers are a unique and integral part of our local food scene. As Singapore's adoption rate of cashless payments is now the highest in Southeast Asia, SDO sought to ensure that hawkers would not be left behind in the digital economy.

IMDA established the Hawkers Go Digital programme, which has helped about 11,000 (>50%) stallholders adopt e-payments. This was especially relevant during COVID-19 when people were averse to handling cash. Besides providing training for hawkers through the DAs, SDO also worked with e-payment solution providers on system features that could overcome challenges faced by hawkers in busy and noisy environments. These include bigger fonts that hawkers can view easily from a distance, the use of colour to highlight the latest transaction, and a distinct audio alert for incoming transactions that is loud enough to be heard in a hawker environment.



A SDO Digital Ambassador promoting e-payment solutions to a food hawker.
Image: SG Digital Office



SIWAs (in blue T-shirts) appointment ceremony in Nov 2022
Image: SG Digital Office

Galvanising Businesses and Communities in the Digital for Life Movement

In February 2021, IMDA launched the national Digital for Life movement to galvanise private and public sector organisations and people in the community to rally and equip more vulnerable Singaporeans with the skills, habits, and tools to thrive in a digital future. Since then, more than 130 partners have kickstarted approximately 140 ground-up initiatives and pledged support for different programmes to benefit more than 270,000 beneficiaries. These initiatives include providing low-income residents, persons with disabilities and seniors, among others, with digital tools and skills, as well as promoting digital wellness among our youth and communities.

As a result, the Digital for Life Movement was recognised as a Champion Project at the prestigious World Summit on Information Society (WSIS) Prize Ceremony 2023, organised by the International Telecommunication Union (ITU) under the United Nations (UN).

Digital-First, Not Digital-Only

What Singapore strives to be is a digital-first – and not a digital-only – society. Digitalisation is not an end in itself, but a means to enrich quality of life. Putting people first in Singapore's digital transformation journey is vital, as this directs our focus towards building a digitally inclusive society and future where no one is left behind. 🗣️

To find out more about SG Digital Office programmes, please refer to www.imda.gov.sg/sdo

VIEWPOINT
HYEYOUNG KIM

Deploying Accessible and Sustainable Mobility in Smart Cities



Public-private partnerships and the use of technology play key roles in improving transportation, and the equity and inclusivity in cities, says Ms Hyeeyoung Kim, Vice President and Head of Smart City Innovation Group, Hyundai Motor Group.

Driven by the intrinsic motivation to understand the supply and demand tensions underpinning mobility choices, the private sector plays a key role in enabling positive commuter choices and supporting public-private partnerships that sustain such choices.



Hyundai operated the EnableLA service in Los Angeles using Palisade and Telluride sport utility vehicles to form a fleet of wheelchair accessible vehicles.
 Image: Hyundai

As one of the leading global automakers, Hyundai is committed to enabling everyone to experience the joy and freedom of travel by making transportation more accessible in two ways: firstly, by providing services that can be utilised by all people; and, secondly, by making these services environmentally and economically sustainable.

Thus, it is necessary to address a myriad of complex and challenging factors, such as:

- The diversity of citizens' needs,
- The need for different approaches in brownfield and greenfield cities, and
- The time-consuming and sensitive coordination and planning processes involving diverse stakeholders, including governments, public and private transportation providers, and commuters.

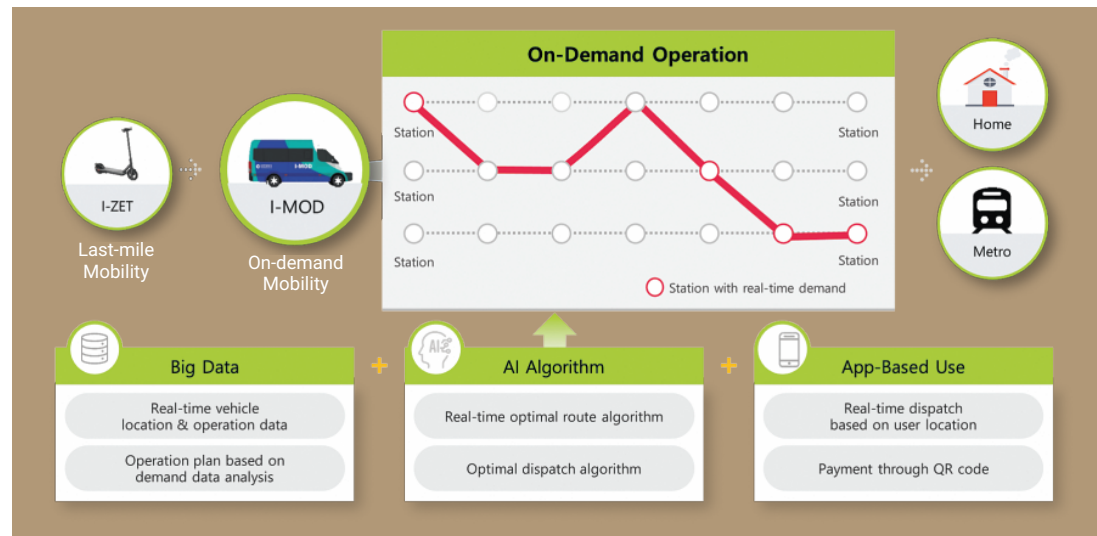
Driven by the intrinsic motivation to understand the supply and demand tensions underpinning mobility choices, the private sector plays a key role in enabling positive commuter choices and supporting public-private partnerships that sustain such choices.

Technology, with its ability to connect, analyse and scale, further enables wider outreach that support private sector initiatives. Improving accessibility and sustainability of a city's transportation furthers equity and inclusion.

Tailoring Vehicles to Enhance Inclusiveness and Accessibility

Enabling accessibility is key to enhancing social equity and inclusivity and allows those who are differently-abled to gain equal access to education, employment, care, and social opportunities as well as participate in the wider society. Vehicle designs that cater to the transport-disadvantaged, whether on physical, social, or economic fronts, offer the most direct way to improve transportation accessibility.

In Los Angeles, California, Hyundai Motor Group launched EnableLA, a universal mobility service to assist people with mobility barriers. Hyundai's Palisade and Telluride sport utility vehicles were modified to provide wheelchair access, in compliance with the Americans with Disabilities Act. The modified wheelchair accessible vehicles



I-MOD leverages Big Data, AI, and App data to plan flexible on-demand public transit routes that utilise existing bus and metro stops.
Image: Hyundai

are equipped with UV-free antimicrobial lights for improved sanitation and are operated by drivers trained to aid users. This real-world effort helps to inform hardware designs that would serve wheelchair users better.

The success of EnableLA resulted in its handover to a local fleet operator, which continues to operate the service today. An upcoming Universal Mobility Project aims to expand its services to include the elderly, pregnant women, children, and low-income families, and provide different vehicles, such as purpose-built vehicles with a variety of seating configurations and capacities.

On-Demand Mobility as a Gap Filling Solution in Brownfield Cities

A defining feature of developed brownfield cities is the completed infrastructure that may be expensive and difficult to retrofit. The lower-hanging fruits to improve mobility in brownfield cities may lie in supplementing public transportation with demand-responsive mobility services. Unlike other strategies, such as deploying innovative mobility technologies and re-designing infrastructure which may require high capital, infrastructure investments and time for innovation maturity, adding on-demand services to fill the gaps of public transportation require a better understanding of commuter behaviour.

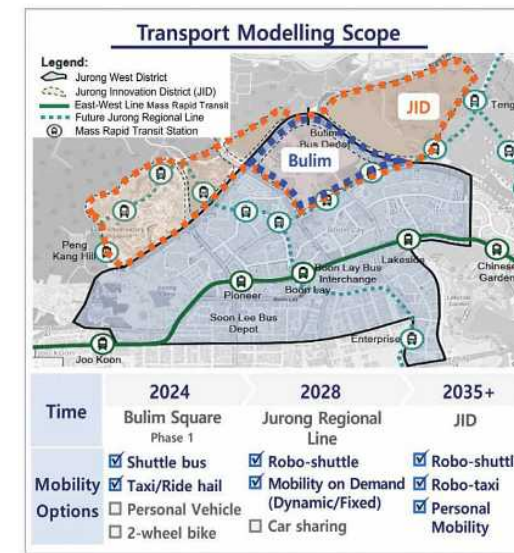
The ability to supplement existing public transportation services requires a balance in commuter demand—tricky in low-density and/or rural areas—and service supply. Too long a wait makes private cars more attractive, and high frequency of services may not be a sustainable business model.

Big data and artificial intelligence are promising enablers for improving predictions of commuter behaviour patterns and optimising transport routes and service provision, overcoming challenges typically faced by on-demand mobility.

Hyundai Motor Group successfully piloted demand-responsive mobility services in Korea to overcome the limitations of public transportation that residents encounter, such as low frequency of service provision and complex routes that may result in long waiting intervals for public buses.

An example is the I-Mobility On Demand (I-MOD) project in Incheon, a fairly mature and well-developed city. Whilst many may be familiar with the Incheon airport, the gateway to South Korea, there are rural areas within Incheon with small populations and limited public transportation.

I-MOD provides on-demand, flexible routing, based on big data, and thus better connectivity to geographically underserved populations. Wait times are reduced by 82%, and travel times by 41%, compared to traditional public buses.



Greenfield transport planning should consider existing and upcoming land use and infrastructure in the area and its surroundings, to ensure seamless connectivity.
Image: Hyundai

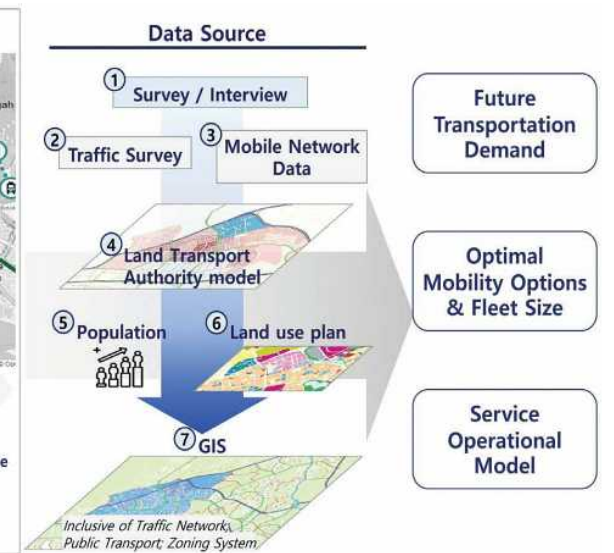
Transportation Modelling with Better Understanding on Future Estate and Travel Patterns in Greenfield Cities

In greenfield cities, there are more options for improving mobility. Unlike brownfield projects, greenfield developments can accommodate changes at the infrastructure level. Road and traffic systems, as well as locations of charging stations, mobility hubs, and so on, can be adjusted.

Hyundai completed a transportation modelling project in a greenfield area in Singapore, in collaboration with JTC Corporation (JTC), who masterplans, develops and operates leading industrial districts. JTC hoped to improve transport options for tenants and Hyundai aimed to improve transport sustainability by optimising the demand-supply gap.

Data—such as land use plans, population statistics, mobile network data, and citizen surveys and interviews on future mobility acceptance—was utilised to project changes in future transportation demand, and model different mobility service combinations and required fleet strength.

With many developments in the pipeline—such as a new MRT line by 2029, and a sky corridor with a 11 km dedicated lane for autonomous vehicles, bikes and pedestrians by 2034—changes to transport infrastructure and



citizens' travel patterns required dynamic simulations to understand the potential impact of infrastructure changes.

The study can shape urban planning guidelines to optimise transport flows and support smart mobility transport models in next-generation estates. It will also maximise the operational efficiency and sustainability of mobility services.

A video about the Bulim project

Conclusion

Public-private partnerships play a crucial role to improve accessibility for all commuters and public transportation usage, and future-proof transportation planning. Public infrastructure needs to serve long-term transportation demand and cater to new mobility services, to support more sustainable mobility innovations.

To this end, Hyundai continues to partner the public sector and leverage new technologies to create smart cities with advanced transportation solutions that enhance daily travel and meet the needs of all.



URBAN TRANSFORMATION
SANJEEV SANYAL

Sanjeev Sanyal is currently a member of the Economic Advisory Council to the Prime Minister, and Secretary to Government of India.
All opinions expressed in this article are the author's and do not represent the views of the Government of India.

Cities in the Post-COVID Age



The agglomeration of people and economic growth can drive local creative/lifestyle sectors such as the restaurant scene. Pictured, Lau Pa Sat, one of Singapore's most bustling dinner spots in town.
Image: Ethan Hu / Unsplash

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New communication technologies accelerated human interactions, which in turn generated a significant surge of socio-economic value in cities.

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Changes to the world's urban dynamics in the post-COVID world are challenging many of the assumptions of the 1995-2020 period. Sanjeev Sanyal looks at how urban dynamism has shifted globally, from Hong Kong to Singapore and Dubai, California to Texas, Istanbul to Warsaw and so on. In particular, he looks at how Richard Florida's thesis of the "creative class" as the driver of urban growth, is being turned on its head. In the post-COVID world, if the creative class has become the outcome rather than source of growth, what then are the emerging forces that will drive growth in successful cities?

In the early 1990s, as developed world cities de-industrialised, and new digital communications systems (e.g. the internet and mobile telephony) emerged, many urban experts were of the opinion that cities would become obsolete. Why would anyone live in a crowded city, and suffer the traffic and high rents, when one could work and communicate from anywhere? Subsequent events, however, proved this prediction wrong.

Not only did digital communications radically change the world in the decades that followed, they facilitated the great revival of megacities. New York and London reawakened after decades of decline, even as newly-rich cities like Dubai and Singapore boomed. In the developing world, cities like Delhi, Bangalore and Shanghai experienced exponential growth. Even Tokyo managed to attract additional people in a country with a shrinking population.

It turned out that the new digital technologies enabled these cities to become the nodes of a rapidly globalising world. Far

from encouraging people to live far away from cities, the new communications technologies accelerated human interactions, which in turn generated a significant surge of socio-economic value in these cities. Indeed, the larger cities benefitted disproportionately as they attracted young, creative workers who could take advantage of the opportunities made possible by new digital platforms, such as social media.

Cities succeeded in the first two decades of the 21st century because of the concentration of urban infrastructure, direct human interaction and, importantly, the concentration of a "creative class", which generated so much value that it negated the high cost of living in them.

Richard Florida, in his influential books *The Rise of the Creative Class* and *Cities and Creative Class*, wrote passionately about how the creative class changed cities and drove urban economies. However, human interaction has become increasingly digital – video conferencing on Zoom, WhatsApp messaging,

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Many cities seem to be thriving even in an age when face-to-face interaction is no longer about physical meetings. At the same time, other cities seem to have suddenly lost their charm.
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Instagram posts, and so on. There is now a generation that has grown up using digital platforms and is completely comfortable with them (and perhaps even prefers them).

Across the world, companies are struggling to get workers back to working regularly in the office, rather than remotely. Moreover, the COVID-19 pandemic demonstrated the downside of living in areas of high density. What then is the role of cities? Will the urban experts of the 1990s be proved right after all?

The evidence does not yet show a strong trend in urban declustering; perhaps it is too early to see a clear direction. Despite the shock of the COVID-19 pandemic, some cities seem to have come back strongly. If rising rents in Singapore and Dubai are any indication, certain global hubs have made significant gains in the post-COVID world. Cities in India continue to expand at a pace where local municipalities struggle to keep pace.

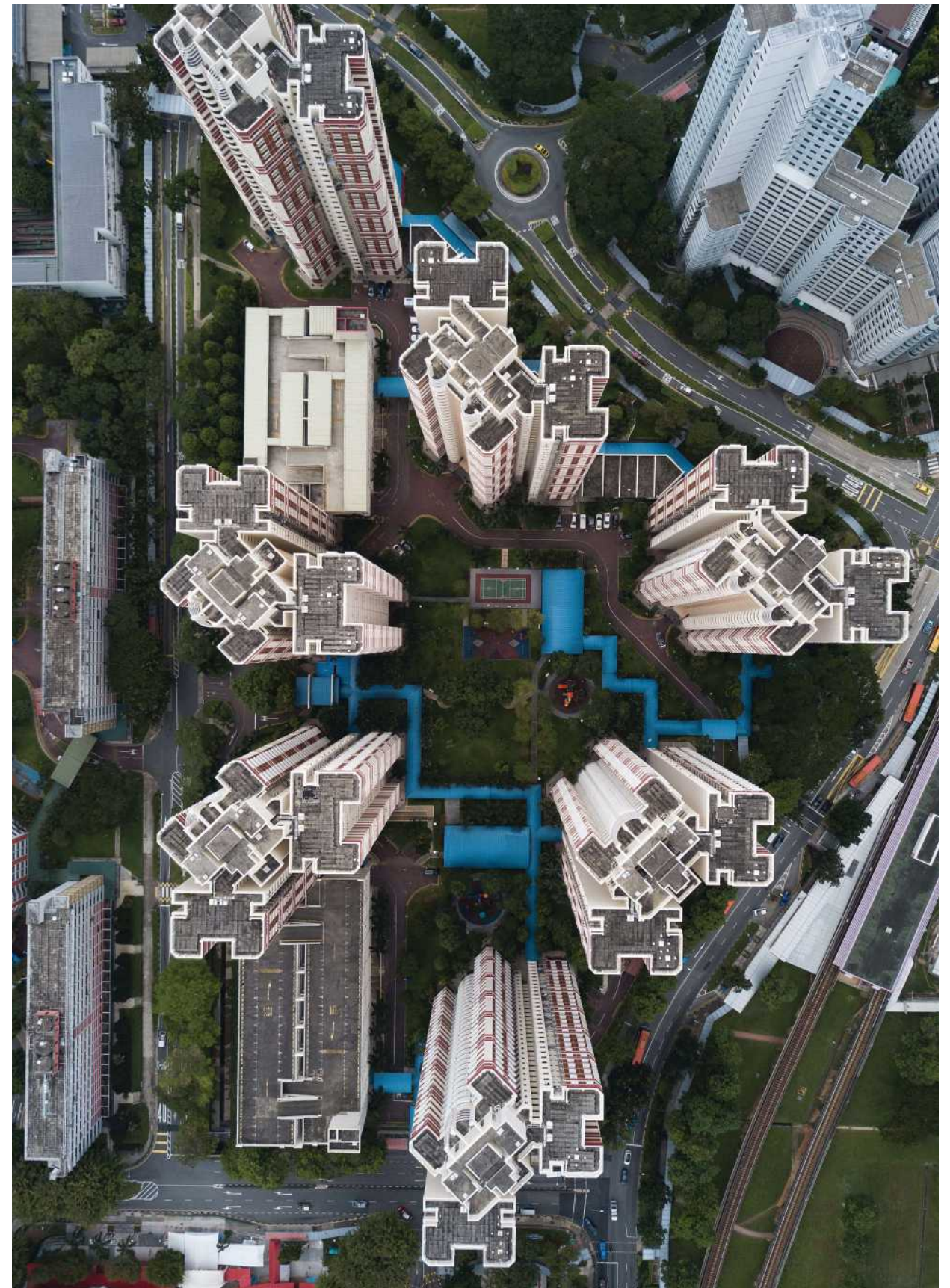
Perhaps this is the lull before a storm, but many cities seem to be thriving even in an age when face-to-face interaction is no longer about physical meetings. Increasingly, ideas are being generated and disseminated digitally, and going to office is seen as an occasional necessity in many sectors. At the same time, other cities seem to have suddenly lost their charm. So, what keeps some cities ticking while others decline? A comparison between relative winners and losers may provide some answers. As we will see, the available evidence of the post-COVID period seems to violate Richard Florida's creative class thesis.

Dynamics of the Post-COVID World

Transparent and consistent data for the post-COVID world is not yet available, but the Urban Land Institute's Asia Pacific Home Attainability Index 2023 provides some interesting insights about the relative trends between cities.

According to the report, Singapore's private homes have surpassed Hong Kong SAR as the most expensive in the region, with a median price of US\$1.2 million. This is partly due to a spike in Singapore but also a decline in Hong Kong. The latter saw home prices drop substantially in 2022, returning to 2017 prices, caused at least partly by a drop in population. This was the third consecutive year of population decline for Hong Kong – with net outflow of 60,000 residents reported by Hong Kong's Census and Statistics Department – even as the birth-to-death ratio plunged. The fall in real estate price brings no respite as the signs are that this declustering is accelerating. Meanwhile, CNBC notes that the opposite seems to be happening in Singapore as net inward migration, much of it from Hong Kong, is driving up real estate prices, despite its own problem with low birth rates.

The relative fortunes of Singapore and Hong Kong are mirrored in some ways in what is happening within the United States: the movement of people from California to Texas, and from New York metropolitan area to Florida. Again, this is not the movement of retirees to cheaper locations. There are few systematic studies of the post-COVID acceleration of a phenomenon that was becoming visible even before the pandemic. The evidence pulled together by



Post-COVID net inward migration in Singapore has driven up real estate prices.
 Image: Alex Qian / Pexels

Neither the pandemic nor technological change seem to have changed perceptions that Indian cities are among the world's fastest growing.

a moving company Storage Café suggests that the median migrant is an educated millennial. A survey of 100 companies that moved to Texas since 2020 found that 40% were from California, which includes high profile entrepreneurs like Elon Musk.

The situation in Europe is more complicated. The Financial Times reports that London continues to see modest population growth despite Brexit and Britain's economic woes, but it is bleeding its youth. Population in the 25-39 age group has dropped. As this group abandons London, the number of children too has fallen, leading to the closure of primary schools and kindergartens. High real estate prices have been cited as the cause of youth flight, but who is moving in? Good data is not

available for the post-COVID period but anecdotal information suggests strong demand from wealthy investors from South Asia and the Middle East. In other words, young talent is being replaced by semi-resident, older foreigners.

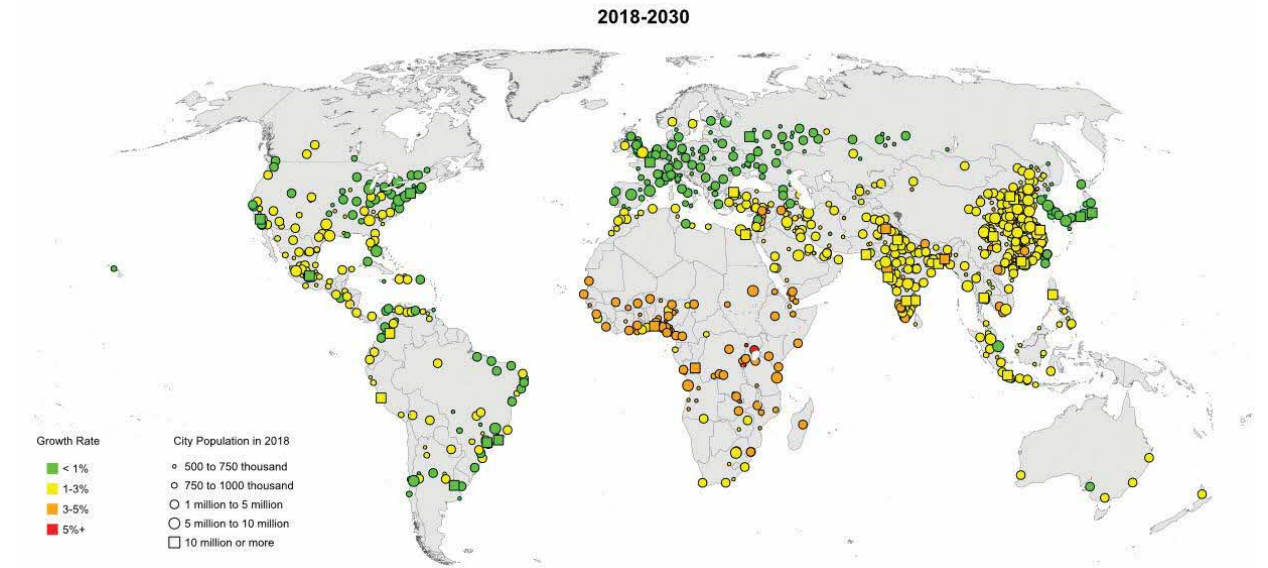
Similarly, a study by Oxford Economics of the fastest growing cities of Europe provides some interesting insights on how growth dynamics perceptions have changed after COVID-19. Till 2019, the perception was that Istanbul was the most economically dynamic place in Europe, followed by Sofia and Bratislava. In other words, South-Eastern Europe seemed to be the most dynamic in the pre-COVID era. They have since been replaced by Warsaw, Budapest and Prague in the top three positions (see Table 1). Inner London has dropped from 9th to 17th position, but Istanbul's drop is especially steep from 1st to 16th.

Meanwhile, India is witnessing very rapid urbanisation and the pandemic shock seems to have had little long-term impact. The UN's World Urbanisation Prospects report of 2018 had placed Indian cities among world's fastest growing (see map and Table 2). The same report is not yet available for the post-COVID period but reports by other agencies still routinely place the likes of Delhi-National Capital Region, Bengaluru and Hyderabad among the fastest growing in Asia-Pacific and/or the world. Indeed, Oxford Economics places Bengaluru and Hyderabad as the two fastest-growing cities in Asia-Pacific in 2023. In other words, neither the pandemic nor technological change seem to have changed perceptions. In contrast, after having defied national demographic trends for years, Tokyo has finally begun to shrink.

Fastest-growing major European cities by GDP over the next 5 years (2020-24 and 2022-26)

	RANK IN DEC 2019 FORECAST	RANK IN MAR 2022 FORECAST
Istanbul	1	16
Sofia	2	5
Bratislava	3	7
Warsaw	4	1
Bucharest	5	11
Budapest	6	2
Stockholm	7	12
Oslo	8	14
Inner London	9	17
Prague	10	3

Table 1. Warsaw, Budapest and Prague replaced Istanbul, Sofia and Bratislava as Europe's most economically dynamic cities. Source: Oxford Economics



Africa, India, and East and Southeast Asia have higher projected population growth rates. Source: © 2018 United Nations, DESA, Population Division.

The world's ten largest cities in 2018 and 2030

CITY SIZE RANK	CITY	POPULATION IN 2018 (THOUSANDS)	CITY	POPULATION IN 2030 (THOUSANDS)
1	Tokyo, Japan	37 468	Delhi, India	38 939
2	Delhi, India	28 514	Tokyo, Japan	36 574
3	Shanghai, China	25 582	Shanghai, China	32 869
4	São Paulo, Brazil	21 650	Dhaka, Bangladesh	28 076
5	Ciudad de México (Mexico City), Mexico	21 581	Al-Qahirah (Cairo), Egypt	25 517
6	Al-Qahirah (Cairo), Egypt	20 076	Mumbai (Bombay), India	24 572
7	Mumbai (Bombay), India	19 980	Beijing, China	24 282
8	Beijing, China	19 618	Ciudad de México (Mexico City), Mexico	24 111
9	Dhaka, Bangladesh	19 578	São Paulo, Brazil	23 824
10	Kinki M.M.A. (Osaka), Japan	19 281	Kinshasa, Democratic Republic of the Congo	21 914

Table 2. Indian cities are among the world's fastest growing. Source: United Nations

What is Driving the Urban Divergence?

As discussed above, there seems to be big shifts taking place post-COVID in the prospects of cities around the world - from Hong Kong to Singapore, Californian cities to Texan cities, Istanbul to Warsaw. Yet, there are places like India, where neither the pandemic nor the explosion of digital technologies, are disrupting overall trends. While these are still early days, can we derive any general insight from these shifts?

The literature on urban clustering between 1995-2020 made much of the importance of “soft” factors, such as the “creative class”, “lifestyle”, “urban buzz”, and so on. Influential writers like Richard Florida did much to popularise this view. This is what made Manhattan and San Francisco “cool” even as Singapore was deemed too “strait-laced”.

Yet, the underlying pull and push forces the post-COVID urban dynamics described earlier seem to lean towards “hard” factors. For instance, the push factors often given by people leaving Californian cities include perceptions about increase in crime, high real estate prices, and a decline in business-friendliness; for Hong Kong, it relates to perceptions about rule of law; for Istanbul, it relates to macroeconomic and political stability; while Tokyo has fallen victim to Japan’s demographics. It is beyond the scope of this

paper to explore whether these perceptions are justified, but there is indication that these issues have an impact on urban dynamics.

Similarly, the pull forces driving the rising cities of the post-COVID era are mostly hard factors: Singapore is benefitting from perceptions about rule-of-law and business friendliness; Dubai from low taxes; Texas from perceptions of business friendliness and cheaper homes, and so on. Indian cities are being driven by the raw agglomerative

power of economic growth and young demographics. This is not to suggest that Dubai, Warsaw, Delhi and Singapore do not have a creative class or offer lifestyle. However, it can be argued that the creative/lifestyle aspects are the outcome of growth, and not the cause. No one moves to Dubai, Warsaw or Dallas because of the great restaurant scene, but the agglomeration of successful people drives the demand for such restaurants. This turns Richard Florida’s thesis on its head.



Indian cities like Bengaluru, Asia-Pacific’s fastest growing city in 2023, continue to witness rapid urbanisation, with little impact from the COVID shock.

Image: Andrea Leopardi / Unsplash

Hard pull and push factors, such as crime, tax rates, demographics, economic growth, rule-of-law, macro-economic stability and business-friendliness may have returned as the main driving force of cities.

Conclusion

This paper is not aimed at making the case that soft factors and the creative class do not matter, but merely argues that hard pull and push factors, such as crime, tax rates, demographics, economic growth, rule-of-law, macro-economic stability and business-friendliness, may have returned as the main driving force of cities. This is what explains the current rise of Dubai, Singapore, Dallas, Houston, Warsaw, Delhi and Bengaluru, as well as the relative decline of Los Angeles, Hong Kong and Istanbul. The so-called creative class is mobile and will easily relocate wherever the opportunities emerge. In the post-COVID era, Richard Florida’s creative class may be outcome rather than the cause of urban success.

At the very least, there is a case for going back to the drawing board and re-evaluating many of the rules-of-thumb and received wisdom of the last 25 years in light of the new evidence that is emerging. In the end, cities have existed through history for a variety of reasons, ranging from commerce and administration to culture and religion. Driving forces change with the times as technology, social mores and economic dynamics evolve. A certain set of circumstances drove successful cities in the 1995-2020 period, but there is a case for looking at the emerging evidence for a sense of what will drive growth in the next 25 years. 🗣️



URBAN TRANSFORMATION
LILY KONG

Lily Kong is the President of the Singapore Management University. Internationally known for her research on urban transformations in Asian cities, Professor Kong was identified as among the world's top 1% of scientists in the field of Geography in a 2020 global study by Stanford University.

The Smart City Dialectic: Challenging Assumptions of Inclusivity



Proponents of smart urbanism often assume a seamless convergence of physical and digital realms for empowering citizenry to actively engage with the intricacies of city-living and governing.
Image: Getty Images

With the advent of data and technology-driven initiatives, many cities across the globe have embarked on projects capitalising on the power of technology to improve urban living conditions and overcome existing limitations. The 'smart city' strategy is neither confined to top tier cities nor to cities in the developed world, as the Association of Southeast Asian Nations (ASEAN) Smart Cities Network exemplifies.

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In the last two decades in particular, the vision of inclusive and human-centred smart cities has gained momentum.

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A city's 'smartness' is indexed to its ability to effectively utilise information and communication technologies to plan, manage and respond to feedback loops provided by various data streams and trends. Thus, smart technologies are often broadly positioned as solutions to a wide spectrum of urban maladies. They are harnessed to resolve traffic congestion and pollution, improve logistical efficiency, boost productivity and economic competitiveness, promote more equitable access to services, empower citizens, encourage more transparent and participatory forms of governance, realise more sustainable environmental

practices, and more. In the last two decades in particular, the vision of inclusive and human-centred smart cities has gained momentum.

A technologically sophisticated urban metropolis premised on 'smartness' is often presented as a utopia of sorts, with sustainable and socially inclusive agendas attuned to the disparate and evolving needs of a city's environment and population. How realistically achievable is such a vision?

Discourse and action are often rooted in the rational and functional, and most likely market-driven in terms of interests. Serious consideration and accommodation of social rights and the common good are at best secondary, if not peripheral to these conversations.

The Premise of Smart Urbanism—Ideals and Aspirations

This premise of smart urbanism, as the panacea for challenges arising from or wrought within urban environments, is founded on various fundamental assumptions.

First, the concept of the Fourthspace, which represents the convergence of physical and digital realms. This is seen as a unique platform to facilitate participatory governance and empower citizens to actively engage in decision-making processes.

Second, the integration of data and technology within urban infrastructures can build or enhance partnerships between corporate and social institutions, and in so doing, create impactful solutions for urgent challenges.

Third, an inclusive smart city is one which gives every segment of the population the capacity to influence urban strategies and political outcomes through active participation. Alongside this is the assumption that smart citizenship—civic engagement facilitated via technology—allows co-design and co-creation to take place in an inclusive and transparent manner.

The Promise of Inclusivity—Unearthing the Chasms

Despite the lofty ideals of smart urbanism, significant disparities and challenges persist, which hinder the realisation of genuine inclusivity.

Disparities in digital connectivity create a digital divide, where marginalised communities are excluded from the benefits of smart city initiatives. For instance, there may be segments of the population who cannot afford to purchase a smart home console or a smart phone, or may have only intermittent, unreliable access to digital connectivity.

Exclusions can be further perpetuated by paternalistic power structures that limit the influence and participation of certain groups. Discourse and action are often rooted in the rational and functional, and most likely market-driven in terms of interests. Serious consideration and accommodation of social rights and the common good are at best secondary, if not peripheral to these conversations.

Additionally, language barriers and unmet expectations exacerbate challenges faced in achieving inclusivity. Some city inhabitants may be less open to adopting new habits, unlearning established ways of being or learning new digital skills. Contrary to assumptions underpinning policies and technological solutions, digital non-natives (such as the elderly) do not seamlessly transform into tech-savvy citizens who take technological disruptions in their stride. For some groups, even the term “technology” may have negative connotations, causing confusion or discomfort.

The Path Towards Human-Centered Smart Cities: Reclaiming the Fourthspace

To overcome divisions and achieve human-centered outcomes in smart cities, the following baseline enablers need to be put in place.

1. Developing Testbeds for Smart Solutions

Creating dedicated spaces for experimentation allows for piloting and refinement of innovative solutions. Testbeds provide platforms for collaboration between stakeholders to foster a culture of experimentation and learning. Such designated spaces can potentially generate innovative solutions that address specific needs within the community.

For example, Singapore's Jurong Lake District serves

as a living lab for sustainable urban solutions. Through initiatives such as smart energy management systems and intelligent transportation networks, the district explores ways to enhance energy efficiency, reduce carbon emissions, and improve transportation accessibility, that ultimately benefit the entire community.

2. Nurturing a Culture of Experimentation and Sustainable Innovation

Promoting a culture of experimentation encourages continuous learning and adaptation. By supporting innovative ideas and approaches, cities can evolve and respond

effectively to the needs of their citizens.

Singapore's Smart Nation initiatives exemplify this approach, with the Smart Nation Sensor Platform enabling deployment of various sensors across the city for collecting real-time data on environmental conditions, traffic patterns, and public safety.

3. Enhancing Computational Capabilities

Enhancing the computational capabilities of the general population through digital literacy programs can empower individual participation in the digital sphere.



Singapore has set its sights on becoming a world-class, tech-driven city-state to transform the way its people live. Its vision of a Smart Nation is built on the three pillars of Digital Society, Digital Economy and Digital Government.
Image: Lee Aik Soon / Unsplash



BioLit is a non-profit citizen science project that engages people in a monitoring and alert system along France's coastlines, helping scientists better understand coastal biodiversity and how it is changing.
Image: G. Mannaerts / wikimedia

Creating a viable Fourthspace means implementing citizen-focused agendas that tend to the perspectives and experiences of vulnerable stakeholders and groups who may have been outpaced by technological (r)evolution.

For instance, Barcelona's Citizen Science programme encourages people to actively participate in data collection and analysis. Training programmes enable citizens to pick up skills to leverage technology and contribute to smart city initiatives. An ongoing project, Cities-Health, involves residents of five European cities, including Barcelona, in designing and conducting experiments that explore how pollution in their environment is affecting their health. Participants define what and how to investigate, and outline follow up actions.

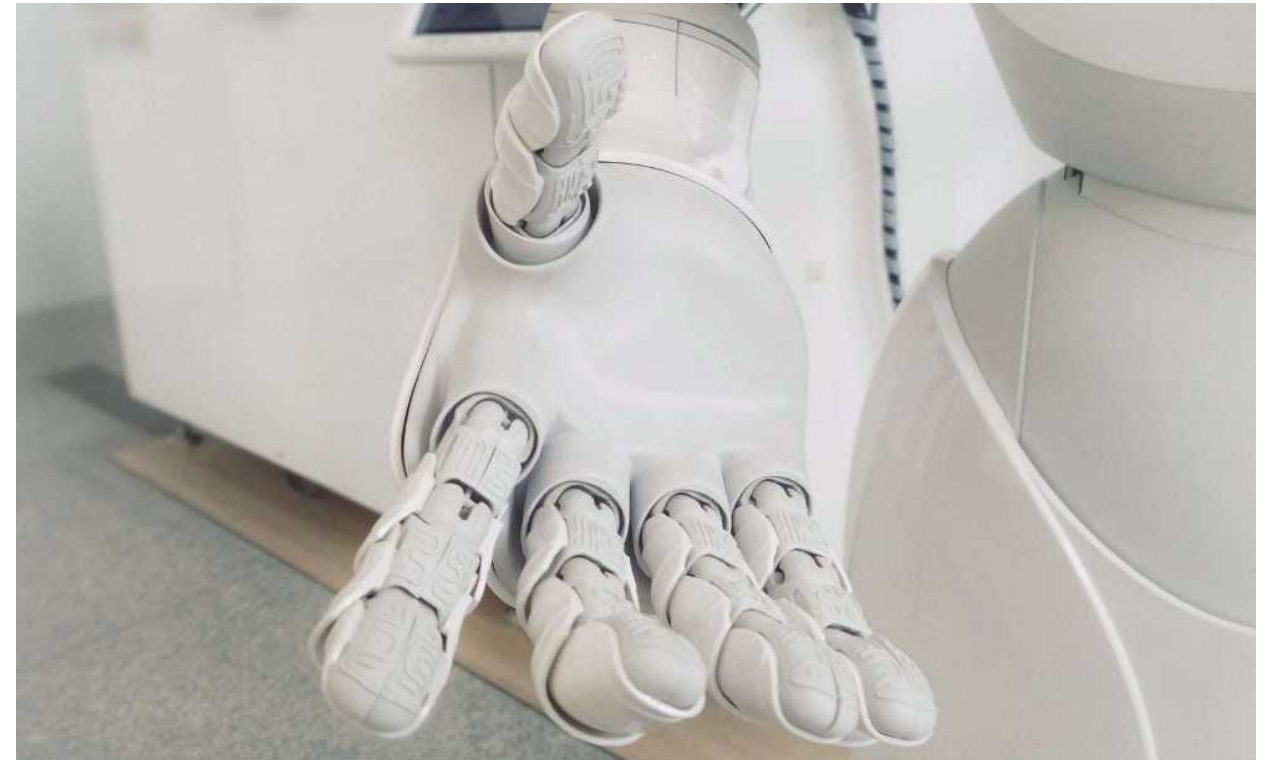
The benefits of smart city technologies are democratised when citizens are active stakeholders in decision-making processes.

4. Public-Private and Public-Public Collaborations

Collaborations between stakeholders, such as global technology firms, local universities, and government bodies, play a pivotal role in driving innovation and addressing social inequalities.

One such example is the partnership between the City of Hamburg and Philips Lighting, which led to the development of an intelligent lighting system that provides energy-efficient lighting and integrates sensors to monitor air quality, noise levels, and pedestrian traffic.

In Singapore, Changi General Hospital (CGH) is home to the Centre of Healthcare Assistive



Robotics can be a critical enabler for enhancing inclusivity in smart cities. Targeted public-private collaborations offer immense potential to improve the quality of life for all.
Image: Possessed Photography / Unsplash

Citizen Focused Agendas

and Robotics Technology (CHART). CHART and therapists from CGH have worked with Japanese robotics company Reif Co. Ltd to develop a portable gait assessment robot which captures metrics, such as stride length and stride width of patients, that are not easily detected by humans. The data obtained can also be used for patient education.

These collaborations illustrate how academia, industry, and research institutions can work together to produce synergistic solutions that address urban challenges and improve the quality of life for different target groups.

In addition to these enablers, it is important not to overlook or simplify the divide between active and inactive citizens when envisioning and building inclusive smart cities.

Creating a viable Fourthspace means implementing citizen-focused agendas that tend to the perspectives and experiences of vulnerable stakeholders and groups who may have been outpaced by technological (r)evolution.

1. Working With Vulnerable Stakeholders

Engaging with vulnerable communities and enabling their active participation is paramount for inclusive smart city development.

In 2015, India launched its Smart Cities Mission by selecting 100 cities for redevelopment. Under this initiative, the Kalyan-Dombivli smart city project in Mumbai sought to transform informal settlements into sustainable, resilient neighborhoods.

An E-governance programme facilitated government-to-citizen interaction through websites providing information, and citizen-to-government interaction through grievance redressal systems via internet and mobile phone channels. This paved the way for extensive community engagement, empowering residents to co-create solutions and address their specific needs.



Smart governance must go beyond simply utilising technology and data.



By involving vulnerable stakeholders, the project aimed to build trust, address concerns, and ensure that the benefits of smart city initiatives reached all segments of society.

2. Managing Varying Comfort Levels Toward Technology

Implementing smart city solutions may encounter resistance from certain groups or individuals who have concerns about privacy, data security, or the impact on their daily lives. It is vital to address these concerns through transparent communication, robust data protection measures, and active public engagement.

In Amsterdam, the CitySDK project engaged citizens in the development of smart city applications, providing them

with control over their personal data and a choice in their level of participation that aligned with their comfort levels.

3. Overcoming Language Barriers and Addressing Expectations

In multilingual societies, it is essential to provide smart city initiative platforms with different language support, translated resources, and culturally sensitive engagement strategies to ensure that language does not become a barrier to participation.

In Singapore, a study on smart homes to enhance eldercare highlighted two important lessons. Firstly, communicating the objectives for new programmes clearly, such as how installing motion sensors at home can mitigate elderly fall risks, help foster a sense of buy-in amongst target audiences. Secondly, providing clear explanations about potential limitations, such as the response time for support when a panic button is activated, is key to managing participant expectations and preventing disillusionment or apathy.

4. Aiming for Incremental Changes

For smart cities to uphold fundamental principles of equity and justice, pre-existing urban infrastructures must accommodate digital solutions. It will be counter-productive to simply impose new (digital) solutions onto what is old (or material).

Innovations like interactive bus timetables and smart traffic lights should not be

substitutes for addressing more fundamental infrastructure needs, such as wider roads or fewer potholes. Instead, a holistic approach where technological advancements are implemented alongside improvements to basic amenities should be adopted. By focusing on incremental enhancements where investment in the material is augmented with the digital, cities can achieve more equitable and sustainable development in the long run, while addressing the immediate needs of their residents.

5. Designing for Different Social and Economic Contexts

The economic and social contexts of different urban environments must be considered when implementing smart solutions. What is successful in one city may cause adverse effects in others, especially if predefined rules cause significant disruptions to citizen's daily lives.

In Myanmar, the initiative to fit GPS trackers in garbage trucks to optimise routes did not recognise its impact on the livelihoods of truck drivers who needed flexibility to carry out other informal economic activities. As a result, some resisted this overt surveillance by tampering with the GPS systems. Urban planners and policymakers must recognise the importance of context-specific approaches and empower communities to actively participate in the decision-making process.



The success of smart cities should be contingent on the extent to which it facilitates marginal groups and the marginalised to equitably access opportunities for growth and fulfilment.
Image: Getty Images

Conclusion

Often, instead of being veritable Fourthsplaces, some smart cities paradoxically perpetuate urban inequalities. If steps are not taken to mitigate the risks of facelessness and anonymity, entire communities may be alienated.

Smart governance must go beyond simply utilising technology and data. It entails governments enhancing their capacity to bridge divisions within and across communities.

Against the backdrop of economic growth and efficiency, it is crucial to evaluate the success of any smart city based on its ability to foster equality and create a liveable environment for all, including the marginal and marginalised. Only by prioritising the well-being of its myriad of residents can a smart city truly fulfill its transformative potential. 🌐



CITIZEN SCIENCE

VANESSA EVERS

Professor Vanessa Evers is the Inaugural Director of Singapore's Nanyang Technological University (NTU) Institute of Science and Technology for Humanity (NISTH) and a Visiting Professor at the NTU School of Computer Science. She is also the founder of the DesignLab and Director of the Robotics Centre at the University of Twente, the Netherlands.

Citizen Science and Participation for Inclusive Smart Cities



Citizen scientists documenting wildlife activity, plant phenology and trail use in the Greater Snow King Area, at the Bridger-Teton National Forest.
Image: Bridger Teton NF / Wikimedia Commons

Professor Vanessa Evers advocates for citizen science and participation to enhance policymaking processes and support the advancement of inclusive smart cities.

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Citizen science may be essential to bridge the gaps in understanding and acceptance of technological and scientific innovations.

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Skepticism in a Rapidly Changing Society

Digital transformation is rapidly changing society and having a profound impact on people. The launch of ChatGPT, for instance, has left many wondering how their job prospects and education will be impacted. Other generative artificial intelligence (AI) systems that can manifest 'on-the-spot' videos, photographs and music raise important questions about distinguishing real content from fake.

While most people acknowledge that technological innovations—such as AI and big data—can offer solutions for tackling complex global challenges, including climate change, increasing inequality, ageing populations and health crises, many struggle to weigh the potential benefits of adoption against negative consequences on job security, personal privacy and cyber safety, among others.

This uncertainty extends to scientific advancements. For example, during the COVID-19 pandemic, the development of effective vaccines at speed was a

scientific breakthrough. However, widespread disinformation—the phenomena that would trap people in filter bubbles on social media—led to mistrust and vaccine hesitancy, which greatly impacted the effectiveness of immunisation programmes worldwide. Bringing people on board only at the end of the innovation process proved very challenging.

A key factor contributing to resistance to new innovative solutions may be the lack of citizen participation in and ownership of the scientific research, technological development, and policy translation processes that resulted in the innovation.

It is against this backdrop that this essay argues for strong citizen participation in research and development (R&D)—or what we call *Citizen Science*—and policy translation processes. This may be essential to bridge the gaps in understanding and acceptance of technological and scientific innovations that can benefit people and society.

Strong citizen participation in the early policy design process increases the chance of successful translation of R&D into policy.

'Traditional' Research

In most societies, finding solutions for societal challenges has traditionally started with academic research, in fields such as engineering, humanities, social sciences, arts and business. Such research would typically be commissioned by major users, such as governments, and conducted within specialised institutions or laboratories.

Governments depend on research data to inform policies, such as climate change regulations for mitigating greenhouse gas emissions.

Hence, they also decide on what research to prioritise. This may range from 'blue sky research' – which is curiosity-driven and not applied to address specific problems, thus has unclear immediate-medium term impact – to research on government agenda issues that impact people's health and wellbeing.

Translating the completed research into solutions may involve communication of the findings, and collaboration among various government bodies to formulate new policies.

As citizens are usually involved late in this process, this may have implications on the success of new policies.

What is Citizen Science?

Unlike the 'traditional' scientific research for developing government policy, citizen science involves citizens and civil society organisations as active participants in the R&D process to share their views, needs and concerns, as well as to seek their buy-in. For example, citizen participation can range from general crowdsourcing of information (e.g., uploading pictures of birds spotted in nearby parks to monitor biodiversity) to extensive involvement, where citizens partner with academic experts or research scientists to define problems, determine the research agenda, and collect and analyse data.

The diversity and impact of research themes—such as health, sustainable energy, and a safe and accessible digital world—offer motivation for the public to participate.

Guided by academic researchers who play a key role in ensuring rigorous methodologies, objective peer reviews and expert data interpretations, citizen science can greatly enhance data collection and deliver highly reliable and accurate findings. Thus, citizen science can complement academic research to advance scientific knowledge and address complex challenges to improve the lives of individual citizens and society as a whole.

Citizen participation is also key in the policy translation process. While democratic instruments, such as opinion polls, allow for feedback from the population, they are very much removed from specific government interventions, such as public health measures or environmental regulations. Strong citizen participation early in the policy design process increases the chance of successful translation of R&D into policy, thus ensuring that innovation can be applied to solve societal challenges.

The Benefits of Citizen Participation

Leveraging citizen science as a powerful new way of engaging in R&D brings a number of benefits:

- 1. More Data:** As citizen science involves more people in collecting data, information can be gathered from more places and over an extended time. Policymakers can make better decisions based on more extensive data.
- 2. Learning and Engaging:** Citizen science projects help people understand and take part in scientific work. By taking an active role in collecting and analysing data, people gain better understanding of the R&D process, which enables them to contribute meaningfully to discussions and decisions about policies.
- 3. Local Knowledge:** Citizen scientists often have important knowledge about their local areas and communities. They know things that scientists might miss. Policymakers can tap into this local knowledge to design policies that address specific needs and contexts.
- 4. Collaboration:** Citizen science projects bring together scientists, policymakers, and community members to solve problems by sharing ideas and expertise. By collaborating, scientists, citizens and policymakers can design research projects, analyse data, and create policies that are based on both scientific evidence and local knowledge.
- 5. Trust and Openness:** Involving the public in data collection and analysis demonstrates that everyone's opinions and actions are valued, which helps promote trust among scientists, policymakers, and the public. This also makes the policymaking process more transparent and accountable.
- 6. Awareness and Action:** Citizen science raises awareness about important issues and encourages people to join in research efforts. Active participation often results in stronger connections to issues, which in turn drive public support and advocacy for policymakers to address the concerns raised by citizen science projects.



Citizen scientists sorting microplastic samples from the Yarra river to quantify plastic pollution, as part of the Port Phillip EcoCentre's Clear Bay Blueprint project in Melbourne, Australia.
Image: Australian Citizen Science Association

Enabling Citizen Science for Inclusive Smart Cities

Governments looking to address issues that are important to their citizens, inform their policies based on science and innovations co-designed with citizens, and foster public trust in their development of inclusive smart cities, can consider implementing four strategies to increase citizen participation:

1. Establish an inventory and agenda of research topics that is aligned to what citizens consider to be top priority and important to investigate;
2. Assist the transition of researchers and scientists from being research owners to becoming effective facilitators of citizen science research;
3. Support the development of new frameworks, methods, facilitation tools and other technologies for problem definition, data collection, analysis and fact-checking to be managed in an inclusive, safe, accountable, academically sound and ethical manner. As citizen science requires different research methodologies and facilitation, this will ensure that resulting citizen-led research will be sound and of high academic quality whilst guaranteeing the privacy and safety of citizen's data; and,
4. Support the communication of research findings beyond scientific publications to include other public outreach channels, as this will enhance citizen science related education, social media awareness and life-long learning opportunities.

Level 4 'Extreme Citizen Science'

- Collaborative Science - problem definition, data collection and analysis

Level 3 'Participatory Science'

- Participation in problem definition and data collection

Level 2 'Distributed Intelligence'

- Citizens as basic interpreters
- Volunteered thinking

Level 1 'Crowdsourcing'

- Citizens as sensors
- Volunteered computing

There are four levels of participation in citizen science, from general crowdsourcing to extreme citizen science.
 Image: Buckingham Shum et al., "Towards a Global Participatory Platform: Democratising Open Data, Complexity Science and Collective Intelligence", *The European Physical Journal Special Topics* 214(1) (2012): 109–152.

To illustrate, a government agency responsible for the city's economic policies may start a citizen science project to understand the potential consequences of generative AI for jobs in different industry sectors. This may be developed on an online portal, where citizens can collect interviews with friends and families using research instruments and tools facilitated by researchers. The data can then be analysed, visualised and statistically evaluated to draw out main themes and findings, and the results automatically generated to a text that can be peer reviewed and published in academic and public media channels.

Finally, as citizen science is achieved through collaborations involving citizens, academics and government officials, more time and resources may be required to accelerate its implementation in

an increasingly fast-moving world. Recommendations to encourage more government officials to adopt citizen science approaches include:

1. **Raising awareness:** Workshops and public events can be organised to showcase how citizen science projects can provide valuable data, engage communities and foster public trust, which are essential to address real-world challenges, such as environmental monitoring, public health, disaster response, urban planning and natural resource management. Policies that incentivise the use of citizen science in government decision-making processes and the integration of citizen science principles in relevant policy frameworks can be promoted during such events.



Mount Rainier National Park's Cascades Butterfly project citizen science team members collecting data on subalpine butterflies and plant phenology to inform and adapt land management practices for national parks and forests.
 Image: Park Ranger / Wikimedia Commons

2. **Capacity and capability building:** Training programmes, webinars and content to drive understanding and effective implementation of citizen science practices can build capacity for adoption of citizen science approaches. Guidelines, toolkits, platforms and resources can be tailored for government officials to navigate the process of integrating citizen science into research that informs policymaking to further enhance capabilities.
3. **Fostering collaborations:** Opportunities to participate in citizen science initiatives or advisory boards may provide policy makers with first-hand insights into the process and its benefits. Collaborations between citizen science practitioners,

researchers and government officials may be facilitated through joint initiatives, funding opportunities and collaborative research projects.

4. **Success sharing:** Success stories and best practices of citizen science initiatives that have contributed to evidence-based policy decisions, community empowerment and positive societal impact should be recognised and celebrated. Inclusivity and transparency may be highlighted by demonstrating how underrepresented communities have been engaged through citizen science, where the data collection and analysed has led to greater governance transparency.

Conclusion

Innovations from science and technology and reliable research findings are key to solving urban and societal challenges. A two-pronged strategy—comprising efforts by researchers to facilitate sound citizen science programmes and by governments to integrate citizen participation to enhance their policymaking processes—will enhance their ability to successfully leverage citizen science to support the advancement of inclusive smart cities. 🌐



ILLUSTRATION

BARRIER-FREE ACCESS

Crowdsourcing Towards Barrier-Free Access

SmartBFA is a non-profit TechforGood project that uses crowdsourced path accessibility data to provide quicker, barrier-free navigation for wheelchair users. We work with wheelchair users, able-bodied volunteers and government agencies to improve Singapore's accessibility and empower wheelchair users to lead independent lives.

TEXT AND IMAGES: KAI REUBER (SMARTBFA) AND STEPHANIE TAN (CENTRE FOR LIVEABLE CITIES)

Navigational Challenges

As existing map applications do not support features such as wheelchair-accessible navigation, wheelchair users may resort to scouting their entire route using Google Maps' Street View. This can take 30 to 60 minutes.

Detours may result in wheelchair users taking up to 10 times longer than an able-bodied person to reach the same destination. This discourages wheelchair users from leaving their homes, especially when faced with new places and unknown routes.

Sometimes I feel like my destination is so near yet so far...



illustrated by @quietly.doodling

Environmental Challenges

Recommended paths on existing map applications often include stairs, kerbs and steep slopes, and alternative routes may not be safe.



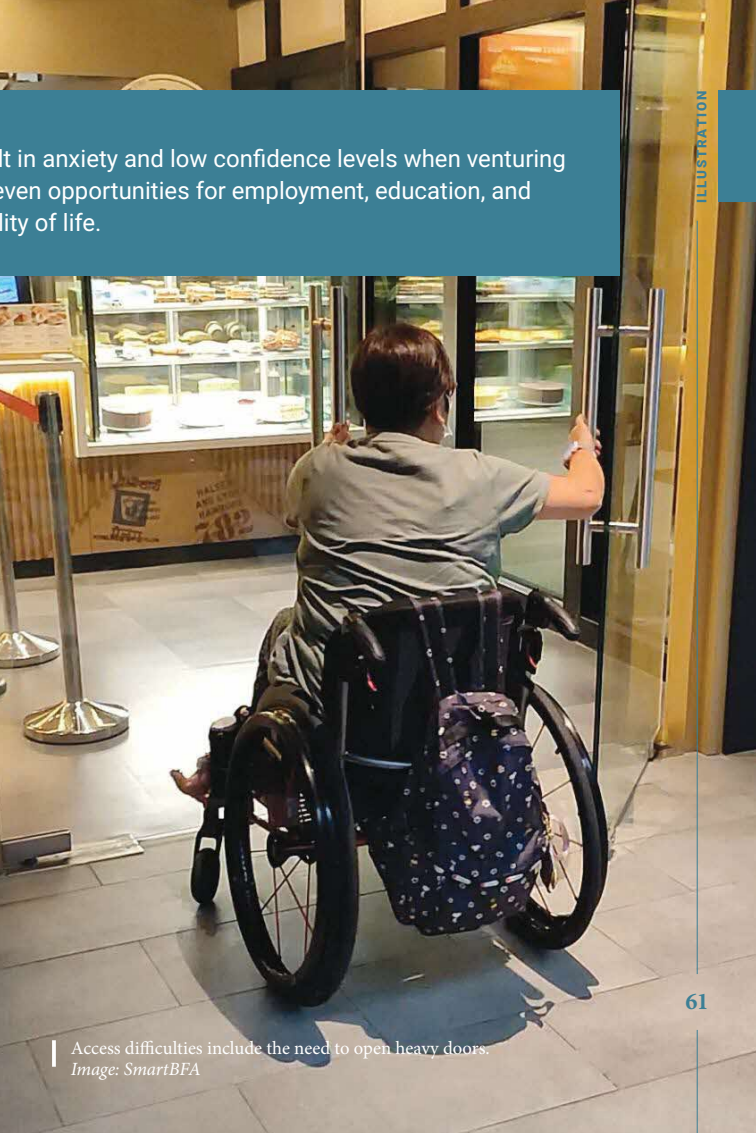
Heritage shophouses have inaccessible 5-foot ways. A Powered Mobility Device user resorts to the unsheltered and busy road in tropical Singapore.
Image: Kai Reuber



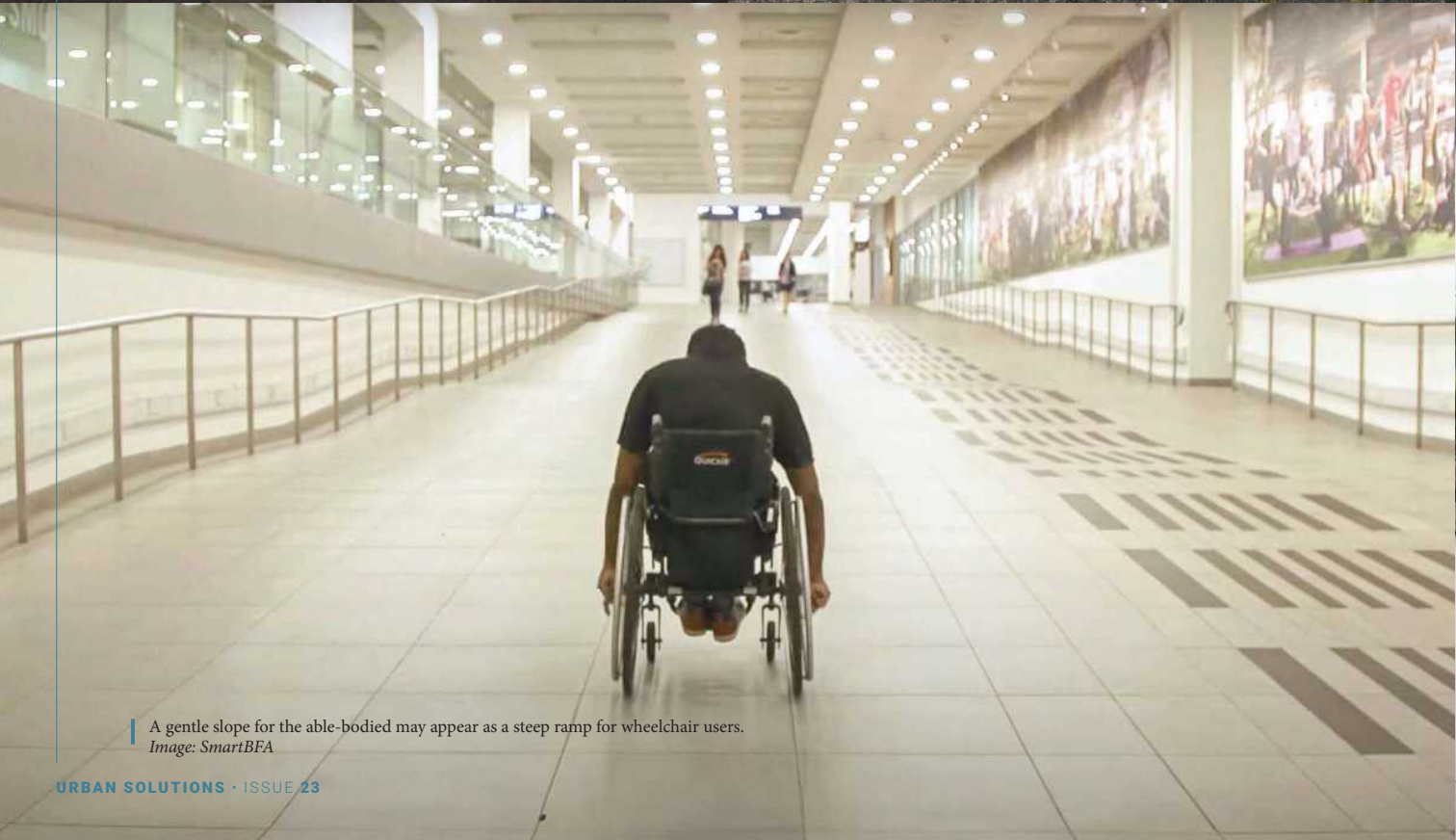
Alternative routes may include unsafe back streets that feature construction activities and heavy usage by delivery vehicles.
Image: SmartBFA



This restaurant street poses many obstacles for a wheelchair user to navigate, and shops with kerbs are inaccessible.
Image: Stephanie Tan



Access difficulties include the need to open heavy doors.
Image: SmartBFA



A gentle slope for the able-bodied may appear as a steep ramp for wheelchair users.
Image: SmartBFA

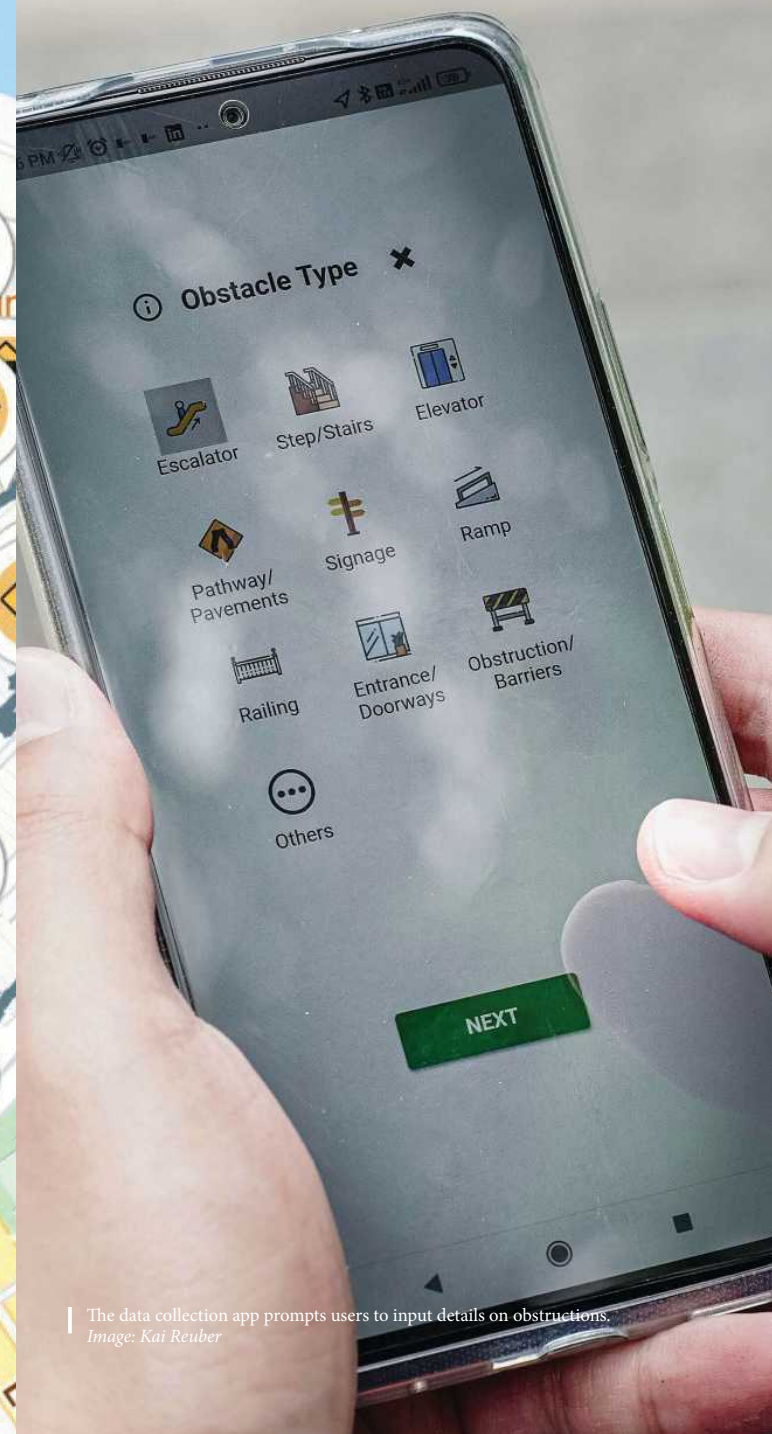
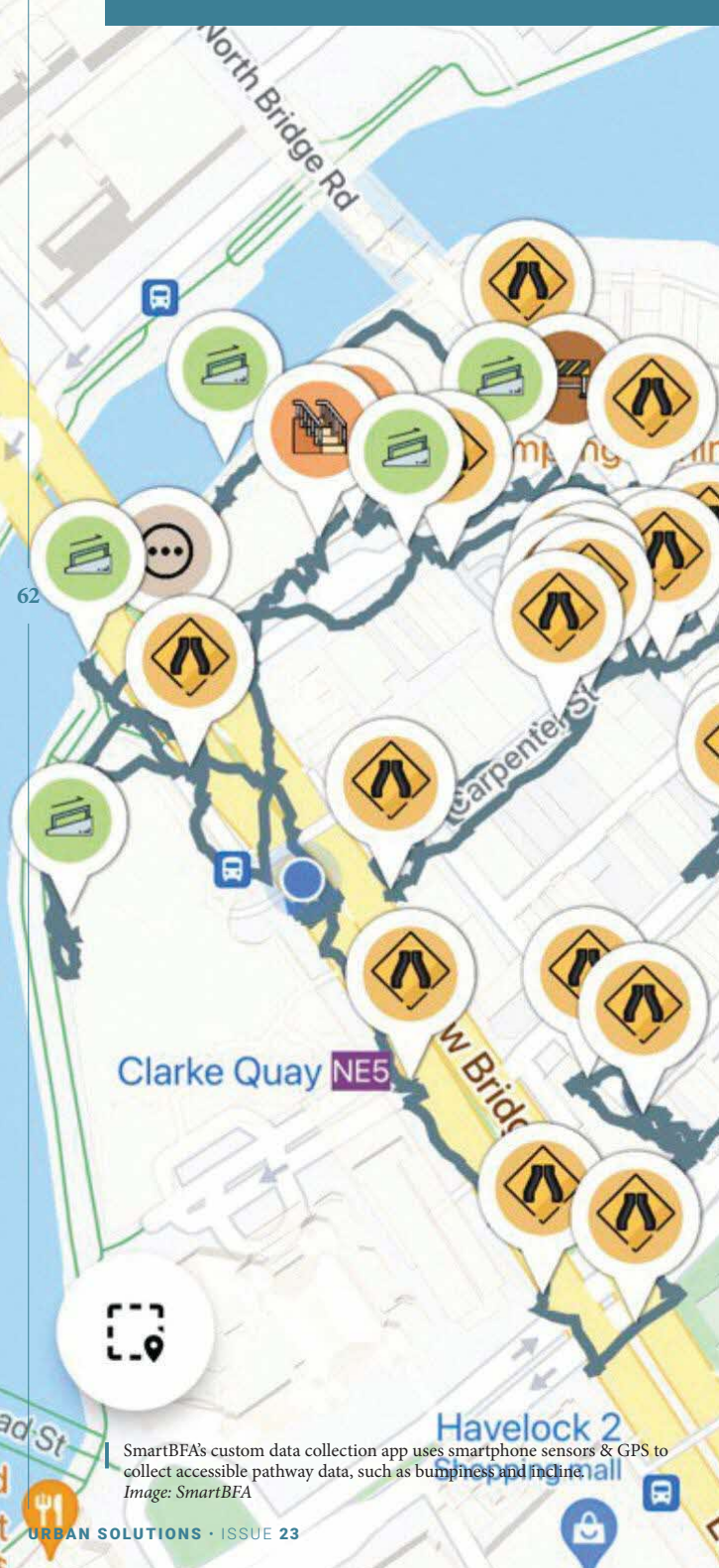


This disabled drop-off point is too close to the ramp for effective usage, and not weather-proof.
Image: SmartBFA

SmartBFA Application

Smart Barrier Free Access (SmartBFA) provides a public application that crowdsources barrier-free accessibility information around Singapore using smartphones. It leverages Singapore's high smartphone penetration rate, and the smartphones' GPS, gyroscope, altimeter, and camera functions.

With the crowdsourced data, the app provides wheelchair users with more information about their route.

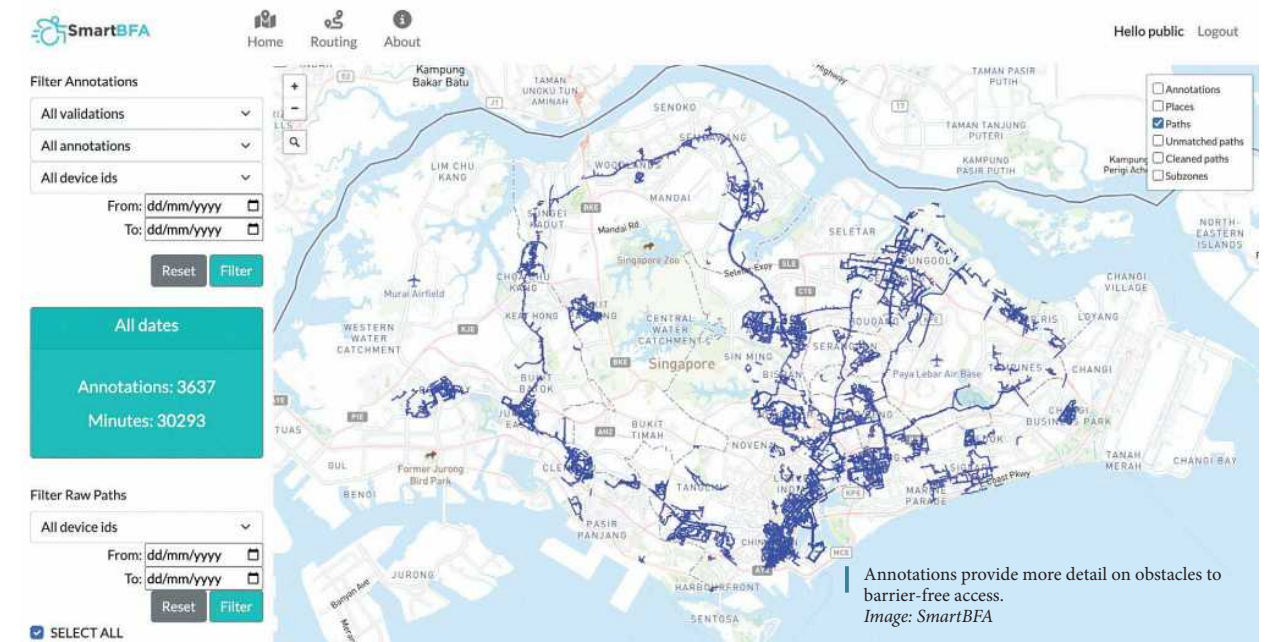


SmartBFA's custom data collection app uses smartphone sensors & GPS to collect accessible pathway data, such as bumpiness and incline. Image: SmartBFA

The data collection app prompts users to input details on obstructions. Image: Kai Reuber

SmartBFA Dashboard

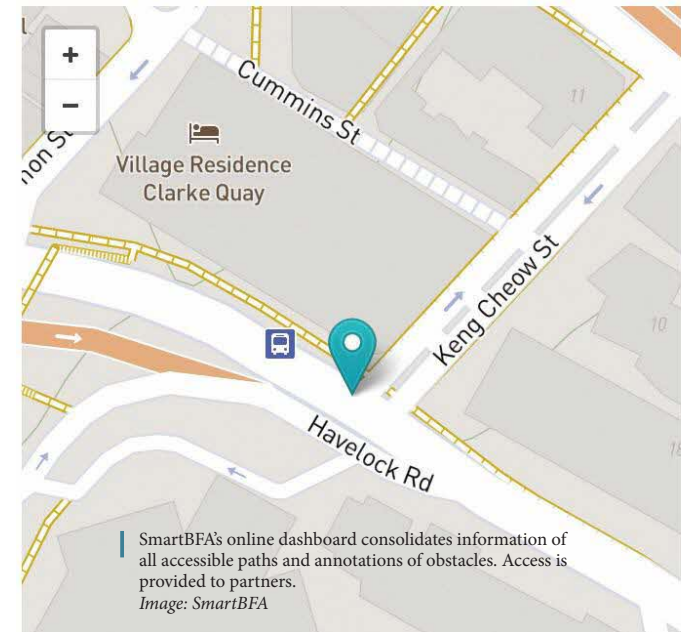
The crowdsourced data enables SmartBFA to create a one-stop online portal for barrier-free accessibility information in Singapore. Through this portal, the SmartBFA team communicates evidence-based recommendations to town planners and relevant public and people sector partners, such as Singapore's Urban Redevelopment Authority and the Disabled People's Association (DPA), to inform the planning of new developments and improve barrier-free accessibility on both the macro and micro levels.



Annotations provide more detail on obstacles to barrier-free access. Image: SmartBFA

Type: Ramp

Steep ramps



SmartBFA's online dashboard consolidates information of all accessible paths and annotations of obstacles. Access is provided to partners. Image: SmartBFA



From Volunteer Scientist to Empathetic Neighbours

As of July 2023, SmartBFA has recruited 320 volunteers and collected 510 hours of data.

As only 20% of volunteers use a wheelchair daily, the inclusive and active participation by the wider community not only increases data collection, it also yields dividends in building awareness and empathy.



Inclusion Ambassadors are DPA members with disabilities who have undergone training to engage the public and promote inclusion.
Image: Kai Reuber



Non-wheelchair users become more aware of obstacles faced daily by wheelchair users.
Image: Kai Reuber



Senior leadership from Certis being guided by Inclusion Ambassadors to collect data in July 2023, as part of Certis' Corporate Social Responsibility programme.
Image: Kai Reuber

Next Plans

SmartBFA is an example of how thoughtful application of sensor and big data technology can enhance understanding of how different residents experience their communities and cities.

Beyond the use of data and type of technology, the ways in which the community is activated and information is shared are key to accelerating universal barrier-free access.

Funding for this TechforGood project remains critical to support plans to integrate data collection and navigation into a single app, as well as to develop additional routing capabilities for a more seamless user experience.



Image: NVM Stocker / Adobe Stock

SAN JOSE | ECONOMIC INCLUSIVITY

Economic Inclusivity Through Public-Private Urban Innovation

Mastercard City Possible is a global ecosystem of cities, industry partners, NGOs and academia driving inclusive economic development and building resilient communities since 2018. The network enables scaling of innovative urban solutions, such as Cash for Trash.



Dusk views of the Santa Clara Valley, where San Jose is located.
Image: Yuval Helfman / Adobe Stock



Maximilian Barnes is a Manager for Public Sector Communications at Mastercard. Prior to joining Mastercard, he worked in San Francisco Mayor London Breed's Office of Housing and Community Development. He has 7+ years of experience working at the intersection of urban governance and innovation.

The Challenge

By 2050, the United Nations estimates more than two-thirds of the world's population will live in urban areas. With the high-cost of living in cities, tackling the issue of homelessness has taken on a renewed meaning across the globe. As cities look to support high-density populations of people, the concepts of equity and inclusivity must be at the forefront of how cities govern. This goes beyond delivering government services to opening more pathways that promote economic mobility and sustainable wealth creation for all residents.

During the recent pandemic, increased unemployment led to higher rates of homelessness. Even in cities with eviction moratoriums, shelters were impacted by health and safety protocols. Many had to limit bed space or close, resulting in increased numbers of unhoused individuals.

Located in the heart of Silicon Valley, San Jose, California is the 10th largest city and one of the most diverse in the United States of America (USA). Whilst San Jose has one of the largest concentrations of technology companies and expertise in the world, greater San Jose is also an extremely affluent community with vast wealth disparity that continues to widen as deeply embedded poverty increases. Currently, San Jose has the highest youth homelessness rate in the nation, with 85 unhoused young adults (age 18-24) for every 100,000 residents.

The City of San Jose ("City") launched a variety of innovative programmes to address illegal dumping and support sanitation and public health efforts, one of which is the Cash for Trash programme.



Cash For Trash provided opportunities for the City to engage with communities that were typically hard-to-reach.
Image: City of San Jose

Equity and inclusivity must be at the forefront of how cities govern. This goes beyond delivering government services to opening more pathways that promote economic mobility and sustainable wealth creation.

The Solution

The Cash for Trash programme was launched in November 2020. It was piloted under the BeautifySJ initiative, which sought to increase civic participation and support residents' efforts to beautify their neighbourhoods for a cleaner and more vibrant San Jose.

The goal of the programme was twofold: firstly, to mitigate the growing homeless crisis by providing some extra income; and, secondly, to combat illegal dumping throughout the city while encouraging sustainable practices. Cash for Trash received US\$230,000 from the Santa Clara Valley Water District and the City's trash clean-up budget.

The programme sought to battle blight by incentivising homeless residents to pick up trash at encampments. This trash can be redeemed at US\$4 per bag, and participants are able to turn in up to five bags per week for a total of US\$20, which would be deposited into a reloadable City Key debit card as income.

These City Key debit cards are programme-specific maintenance-free cards powered by Mastercard, as part of an urban innovation partnership under the Mastercard City Possible network. City Possible worked directly with the City to outline a strategy to address underlying issues and build trust with the unhoused community, while making the traditional financial system accessible.

Local businesses were very supportive of the programme because the cleanup efforts led to more foot traffic. The City also saved money on their waste management budget as they did not have to hire third-party contractors to support sanitation.

It was also important for San Jose to ensure the deposited funds were used to pay for essential items, with minor restrictions, such as prohibiting purchase of alcohol and tobacco. The City leverages the spend data provided by the card programme manager to understand how the money is being spent, in order to inform other policy and programme decisions.

The City envisions longer-term goals as a result of the programme, including a pathway to exit homelessness and into affordable housing. At the same time, unhoused individuals can also avail themselves of the larger social service ecosystem and chart steps toward economic stability.

The City Key card provides a platform for the City to maintain and deepen relationships with a hard-to-reach community. It also promotes inclusive engagement, which increases opportunities for City staff to offer much needed resources.



Reducing blight not only beautifies neighbourhoods, but also has a positive impact on sanitation and public health.
Image: City of San Jose



The maintenance-free City Key debit cards improves access to the traditional financial system.
Image: City of San Jose



Homeless residents worked with the City to clean up the neighbourhoods.
Image: City of San Jose

|| The private sector plays a unique role by leveraging technologies to serve impacted communities, partnering governments to drive innovation and inclusion, and promoting economic growth that results in more vibrant economies.



The Outcome

San Jose is the first city in the USA to launch a programme like Cash for Trash, incentivizing homeless residents to be part of the solution.

Within 10 months of launching Cash for Trash, 294 unsheltered residents had participated, removing over 243 tons of trash at 22 locations. Speaking to the pilot's success, former Mayor of San Jose Liccardo allocated additional funds in March 2021 towards the expansion of the project to serve 500 unsheltered residents and planned to create further incentives for the housing insecure to receive government services, such as checking into shelters and working shifts at local businesses. During FY21-22, the programme collected 401 tons of trash. In May 2023, Cash for Trash was yet again expanded to support an increase of at least 200 participants to an estimated total of 700 participants, while doubling the weekly limit of bags that participants are compensated for.

Cash for Trash had a larger impact on the wider community. The resulting data from the programme showed that individuals were spending the money they earned from the programme on basic needs, like food and clothing, at locations within a half mile of where they had been residing, thus putting funds back into the local economy.

This programme further illustrates the importance of public-private sector collaborations, where the private sector plays a unique role by leveraging technologies to serve impacted communities, partnering governments to drive innovation and inclusion, and promoting economic growth that results in more vibrant economies with greater opportunities and access to services. Networks such as Mastercard's City Possible, built around diverse stakeholders such as cities, businesses, academics, and communities, become increasingly vital as a model for piloting and scaling urban innovation, to create more digital, inclusive, and sustainable cities.

With the "smart city" moniker rapidly becoming a fundamental part of the urban lexicon over the last few decades, it is important to remember that the "smartest cities" are the ones that are the most inclusive, where everyone's needs are met. 🌱



CAMPBELLTOWN | URBAN TRANSFORMATION

Measuring Place in the Cloud

Supported by Amazon Web Services (AWS), Campbelltown City Council and Place Intelligence demonstrate how big data and cloud platforms enable evidence-based urban planning.



CAMPBELLTOWN



Mr Linh Le is the Principal Program Manager and Global Lead for AWS Smart City Competency Program, leading the curation, development and support of AWS Partners in innovating and delivering smart city solutions on AWS Cloud.



Campbelltown is a growing city located 53km south-west of the Sydney central business district. Image: Campbelltown Council



Revitalise Queen Street is a place activation programme that sought to identify the complex place-specific priorities and actions required to realise a sustainable, inclusive and prosperous precinct.



The Challenge

Campbelltown City Council ("Council") is a local government municipality in the fast-growing Macarthur region, a declared priority growth area in Sydney, Australia.

In 2020, Council adopted the *Reimagining Campbelltown City Centre Master Plan*, which articulates the community's vision to transform the area into the economic, cultural, and lifestyle capital of Sydney's Macarthur region. As part of this Master Plan, Council developed *Revitalise Queen Street*, a place activation programme for the town centre's pedestrian corridor. Going beyond a simple land use planning strategy, the programme sought to

identify the complex place-specific priorities and actions required to realise a sustainable, inclusive and prosperous precinct.

Campbelltown City Council developed a series of place performance indicators to evaluate and quantify the economic and cultural impact of temporary infrastructure and activation programmes on Queen Street - the city's main pedestrian street. These indicators would help build a business case for more permanent changes.

Jessica Noyes, then-Council's Reimagining Campbelltown Lead, elaborated, "We'd developed an



Measuring the impact of places for effective urban planning requires access to large volumes of data on how places are used over time.



evaluation framework identifying key performance indicators (KPIs) for the program but needed help measuring the impact.”

Measuring the impact of places for effective urban planning requires access to large volumes of data on how places are used over time. However, methods for measuring place use often rely on manual data collection which results in retrospective analysis, and more advanced approaches tend to be too costly for local governments.

The Solution

To effectively measure the impact of places with a data-driven approach, Council looked to Place Intelligence (PI), an Amazon Web Services Smart City Pilot Partner that specialises in location intelligence services using big data and machine learning. PI built its platform on the AWS Cloud to leverage services such as Amazon S3 (a storage solution for frequent data access), Amazon Glacier (an archive solution for long-term storage), and Amazon EC2 (a scalable compute platform) to provide scalability, data availability, and security.

Moving towards the goals of measuring place impacts, Council and PI worked together to address:

1. the immediate need to quantify and validate the Queen Street activation programme’s impact on place functions; and
2. the increasing demand from government departments for access to big data and place benchmarking.

These objectives called for a real-time data reporting dashboard that could be sustainably maintained and utilised. Three plans of action were undertaken:

1. Indicators and key metrics needed to be developed to support Council’s existing measurement framework and Place KPIs;

2. The measurement of these indicators and metrics needed to feed into interactive dashboards to enable different stakeholders (e.g. Council delivery, development, and growth teams) to quantify and track place performance over time; and

3. Stakeholders needed to use the dashboards confidently to guide and review policy decisions.

Noyes and her team held upfront discussions with PI to work through the programme proposal and plan an intelligence dashboard to track key metrics for activity, place use, and economic performance. These included changes in footfall in downtown areas, catchment area calculations to determine how far people travelled to visit an event, sequence of places visited, and dwell time—the amount of time spent in a target area.

To achieve Council’s community and stakeholder inclusive engagement priorities, PI collaborated with the University of Western Sydney (UWS) to conduct social and demographic research, which focused on audience segmentation and using big data to measure community voice at scale. Through the UWS surveys, Council gained insights into the local community’s preferences and values. For example, 80% of respondents wanted to swap 20+ parking spaces for one shared public space;



Instead of rows of data, Place Intelligence visualises movement and activity data in place, which tells a strong story of Queen Street and the surrounding areas of Campbelltown.
Image: Place Intelligence, Australia



Under Revitalise Queen Street, over 315 new plants to the streetscape were added, providing a greener and more pleasant urban environment.
Image: Campbelltown Council

a similar number also wanted more events on Queen Street. Council took these preferences into consideration as they designed and implemented events and programmes on Queen Street.

An intelligence dashboard, developed on an app, was co-designed by Council and PI. With the app, Council stakeholders were able to track the key metrics to make evidence-based decisions on improvements and changes on Queen Street.

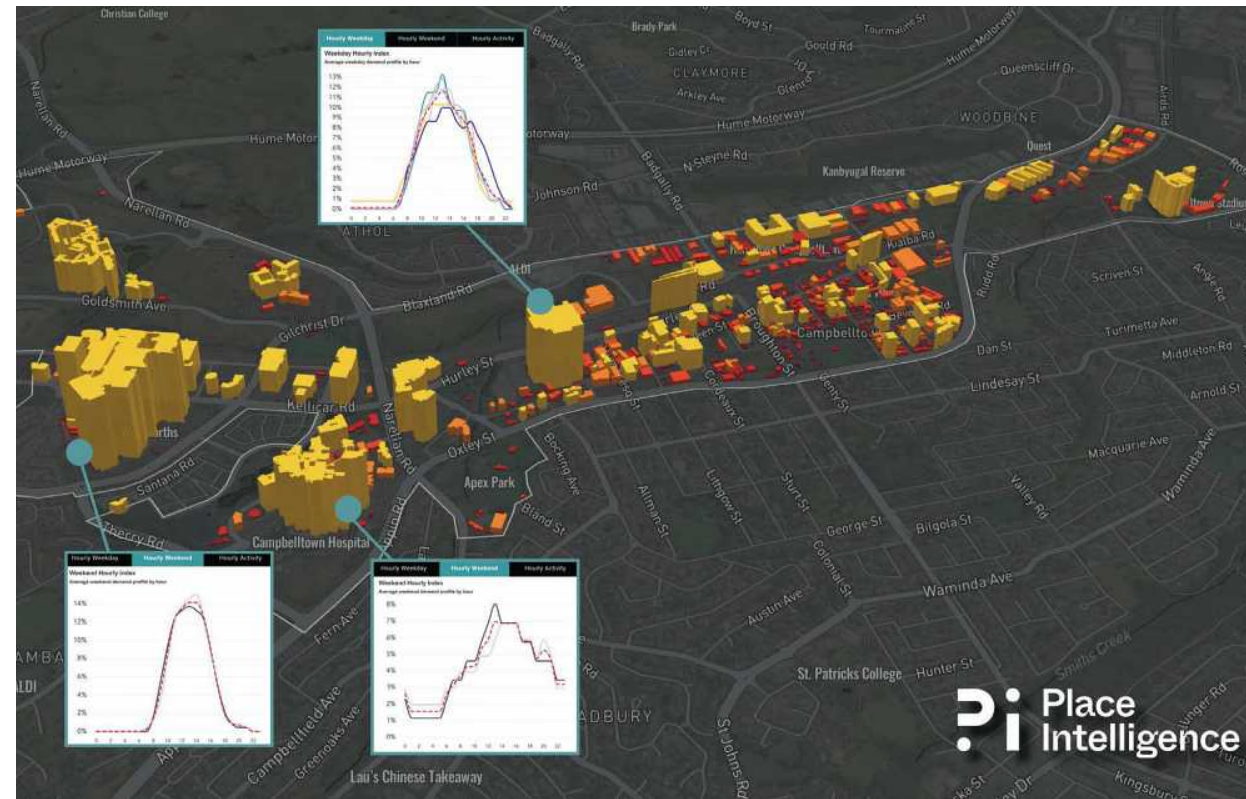
Since this was the first time Council staff were using a big data application, PI also provided

comprehensive training for Council team members on accessing and interrogating the data to obtain the most beneficial insights.

“The PI dashboard is intuitive and easy to use. It’s more a question of drawing insights and making sure we’re not jumping to conclusions incorrectly,” Noyes says. “We appreciate how the [PI team] is constantly working to update their data sets to make it as user-friendly as possible.”

|| It's a completely different experience when you look at the place and its data together. ||

A video of resulting Queen Street activities.



PI's visualised dashboard helps the Council understand the areas and patterns of peak activity that occur around Queen Street provides a starting point for tactical urbanism approaches.
Image: Place Intelligence, Australia

The Outcome

The development of a dynamic intelligence dashboard enabled Council to conduct ongoing place performance with real-time analysis and insights. Custom-built dashboards were used to support diverse precinct redevelopment plans, wayfinding, transport strategies and ongoing place activation initiatives. Insights were used to validate the New South Wales State government's expenditure on the city's place activation strategy.

Council continues to use PI data to guide and evaluate policy decisions, such as its parking rules review in the city centre. Notably, PI data was used to build the business case for a new precinct as well as develop Council's place-based transport and infrastructure capital plans and building prioritisation. Council also leveraged the PI dashboard to provide impact assessment data to stakeholders and the broader community. Having an objective, evidence-based foundation to support policy dialogues has helped build trust between Council and key stakeholders, especially citizens.

“Working with PI has opened up a whole range of opportunities about what sort of information we can access. It's a completely different experience when you look at the place and its data together,” said Jessica Noyes.



Events such as pop-up street markets on weekends allow locals to feature their wares whilst bringing the community together.
Image: Campbelltown Council

While Council explores further applications of location intelligence data to realise the *Reimagining Campbelltown City Centre Master Plan*, and achieve the city's strategic ambitions, PI continues to leverage their AWS-based data and analytic platform for other cities and organisations in Australia, the United States and around the world.

As Bonnie Shaw, Co-Founder and Chief Impact Officer at Place Intelligence, said, “Access to cost-effective infrastructure on AWS allows us to build international automation and standardisation without purchasing our own super computers.” AWS looks forward to supporting partners and cities to innovate and grow further on its platform. 🌐

VALENCIA | INCLUSIVE TOURISM

Smart Tourism Isn't Just for Tourists

Visit Valencia is a non-profit Foundation encompassing more than 450 companies and bodies, such as the Valencia City Council, the Chamber of Commerce, and the Valencian Business Confederation. The collaborative governance model has contributed to the evolution of tourism in Valencia since 1991, directly influencing the wellbeing of Valencian society.



A view over the old town in Valencia.
Image: northleg_official / Unsplash



Miguel Angel Pérez is the Brand & Markets Director of Visit Valencia. He has spent 15 years in the development and promotion of Valencia as a destination, and the city's tourism products. He is member of the Board of City Destinations Alliance.

The Challenge

Whilst a strong tourism industry can boost the economy and contribute to the development of the destination, if not managed well, tourism can also create problems in cities across a range of domains. Within cities, negative economic impacts include tourism gentrification, which may push out local small businesses and result in changes of the local vicinity's physical and cultural identity, and rising costs of living in popular destinations; negative social impacts include possible friction between visiting and local populations and disruptions in the daily life of local residents; and, negative environmental impacts include noise pollution, increased waste, and depletion or increased competition for local natural resources. It is therefore

important to not only manage potential negativities of tourism, but also ensure that the local resident population are included in the benefits that a vibrant tourism industry could bring.

Valencia lies on the Spanish south-eastern coast and is the third-most populated municipality with close to 800,000 city residents. Its historic centre is one of the largest in Spain, spanning 1.69 km². The city provides a diverse range of tourism experiences, from the historic churches and UNESCO-heritage sites to its Mediterranean beaches, museums, and futuristic buildings. In 2022, Valencia's figures for overnight stays and travellers reached close to pre-pandemic records in 2019, confirming the recovery of the city's tourism sector.

PLANO GENERAL



Partnering experts, including the Aragonese Center of Augmentative and Alternative Communication and the Valencian Association of Parents of Persons with Autism, deployed more than 60 pictograms as inclusive signage across Valencia to help persons with communication or language difficulties identify main tourist attractions and services.

Image: Visit Valencia

The Solutions

This recovery is in part facilitated by Valencia's move to prioritise its tourism sector for "smart" transformation. Recognising the significant potential of the industry in driving economic growth and enhancing the city's reputation, Valencia City decided to capitalise on increasing demand for sustainable and inclusive travel experiences. Additionally, Valencia aimed to tap on the potential of leveraging technology and data to optimise tourism operations, improve visitor experiences, and minimise the negative impacts of tourism on residents and the environment.

1. Developing Accessible Experiences for People with Disabilities

Investments in accessible tourism aimed to ensure that individuals with disabilities could fully enjoy the city's attractions and amenities. Valencia's city representatives worked closely with PREDIF, the state representative platform of people with physical disability, and 52 tourism entities to meet the requirements of PREDIF's inclusive tourism programme.

Accessible tours were implemented in several languages for those with reduced mobility. Information offices offer braille translations and pictograms. A 24/7 interactive InfoTourist platform provides a comprehensive English guide, and its Visualfy

Valencia City adopted three key strategies for the smart transformation of its tourism industry.

system—an auditory accessibility system—leverages artificial intelligence (AI) to send visual notifications to users. All in all, these cater to diverse needs to enable greater inclusivity, which not only enhances the tourism experience, but also solidifies Valencia's reputation as an inclusive and welcoming destination.

2. Monitoring and Quantifying Tourism Footprint

As part of Valencia's commitment to sustainable economic growth, and its aim to become carbon neutral by 2030, it was important to manage tourism's impact on the city and its residents. By monitoring and quantifying the tourism footprint, through methods including citywide installation of sensors and regular public surveys, local authorities gained insights into visitor flows, resource consumption, and environmental impacts.

Valencia is the first city in the world to verify and certify the carbon and water footprint of tourist activity in the city.

Additionally, this data-driven approach allowed the city to anticipate and make informed decisions to mitigate negative social impacts of tourism, such as implementing crowd control measures, controlling irregular accommodation, and regulating noise, thus ensuring a more sustainable and harmonious coexistence between tourists and locals. Altogether 60 people, representing the tourism ecosystem, citizens

and institutions, participated in tourism governance through the Municipal Tourism Council.

Milestones in Valencia's development of sustainable tourism were reached steadily over the years. In 2020, Valencia was the first city in the world to verify and certify the carbon footprint of all tourist activity in the city. This involved measuring the sources of greenhouse gas emissions and their effect on the environment in 10 different areas related to tourism, such as transport, accommodation, waste treatment, and others. In 2021, Valencia became the first city in the world to measure the water footprint of tourist activity, by calculating the consumption and pollution of fresh water that is derived from different components of tourist activity.

3. Digitalising Tourism for Small and Medium Enterprises (SMEs)

With tourism contributing an estimated €3,600 million to the city's economy, digital strategies that promote and include tourism-related SMEs are important to develop the local industry and ensure economic inclusivity.

By providing digital tools and platforms, such as online booking systems and digital marketing support, local businesses gained broader exposure and accessibility to potential customers. For example, tourists can access any venue simply by using a QR code, without the need for paper tickets. Guides, maps and brochures are available in digital format, and tourist information



Valencia's beaches are popular destinations for both locals and visitors during the summer.
Image: Charlie Gallant / Unsplash

agents are ready to help at tourist offices, and via WhatsApp and live chats. These are enabled by more than 400 free, high-speed public Wi-Fi hotspots available throughout Valencia, as part of the European Union's WiFi3EU programme.

Sistema de inteligencia turística (SIT, in English: Tourism Intelligence System), a big data platform designed by Visit Valencia and hosted in the cloud, is helping tourism providers and operators understand key traveler trends in a simple and easy way.

Public data—covering passenger demand, accommodation offers and demand, and air traffic—is updated every week, whereas destination-specific information is accessible and tailor-made to restricted users. This comprehensive database of tourism data helps relevant stakeholders and business provide optimised offerings, such as collecting data for sustainable tourism management, improving the accessibility of tourism services, and developing new products that diversify or improve the market.

Thus, Smart Tourism has improved tourists' experiences, facilitated local business growth, increased competitiveness, stimulated the local economy and supported sustainability, benefiting both established enterprises and emerging entrepreneurs.



L'Umbracle, part of the City of Arts and Sciences complex, is a sculpture garden and landscaped walk with plant species indigenous to Valencia.
Image: herraiz / Adobe Stock

Valencia's Smart Tourism drive has contributed to the local economy's growth and resilience, fostered a more inclusive society, and enhanced the long-term viability and attractiveness of the city as a destination.

The Outcome

Valencia's Smart Tourism drive has contributed to the local economy's growth and resilience. With SMEs experiencing improved business performance and market reach, this has in turn led to increased job opportunities and entrepreneurship, enhancing economic vitality and stability within the city.

Beyond economic inclusivity that has benefitted both residents and the local economy, the focus on accessible tourism has not only improved the experiences of visitors with disabilities, but also promoted social inclusivity. Valencia City's efforts to ensure equal access to attractions, transportation, and services has fostered a more inclusive society, strengthening social cohesion and cultural diversity.

Smart Tourism has further advanced Valencia's sustainability, through monitoring and quantifying its tourism footprint to identify areas where implementation of sustainable practices can be improved. By optimising resource allocation, managing visitor flows, and reducing environmental impacts, the city has minimised the strain on its infrastructure, natural resources, and local communities. This commitment to sustainable tourism is contributing to the long-term viability and attractiveness of Valencia as a destination.

As a result, Valencia was named European Smart Tourism Capital in 2022 and will be the first Mediterranean city to be named European Green Capital in 2024. 📍

GLOBAL | URBAN MOBILITY

Cycling Towards Safety and Inclusivity

The International Road Assessment Programme (iRAP) is a registered charity dedicated to preventing road deaths and serious injuries worldwide. A new CycleRAP tool was launched in 2022 to address increasing cycling and light mobility risks.



Monica Olyslagers is a transport and mobility specialist, with over 15 years of experience managing international public policy and road safety.



A memorial for Marina Harkot near the crash site. Image: Debora Ungaretti / Labcidade



The rise in use of light mobility vehicles calls for more proactive design and provision of safer cycling infrastructure. Image: Monica Olyslagers

|| Providing safe infrastructure is a critical ingredient for more inclusive mobility and is a vital economic resource. ||

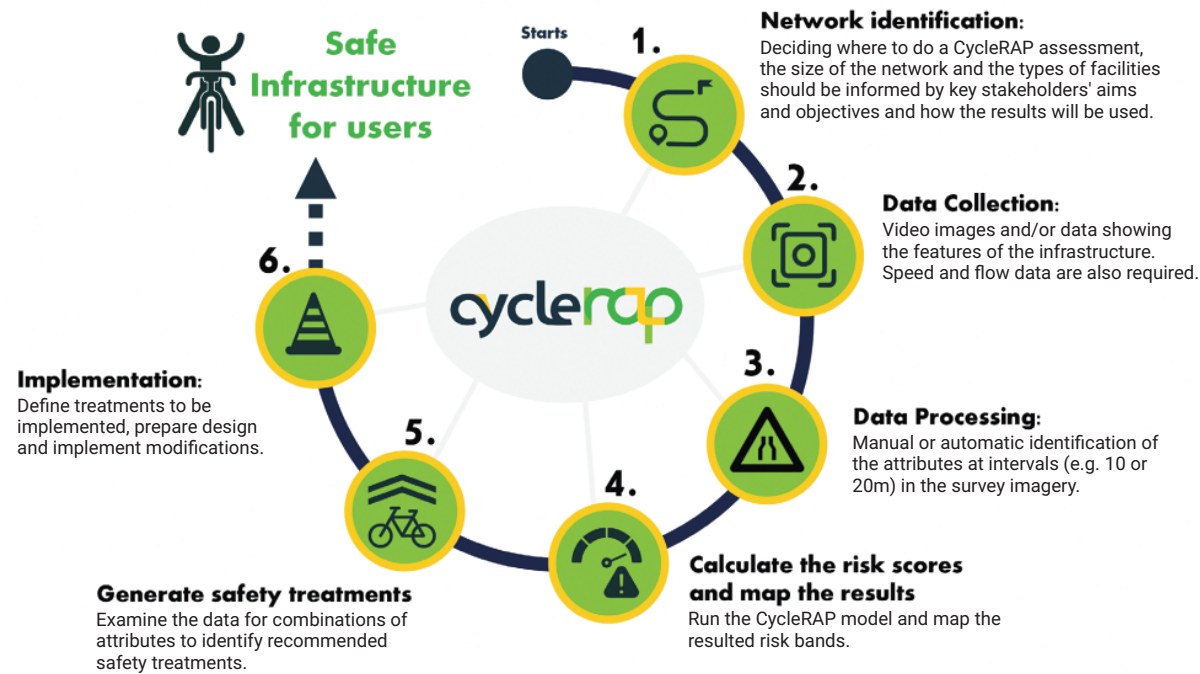
The Challenge

Marina Harkot was a 28-year-old sociologist, cycle activist and researcher on urban mobility. On 8 November 2020, while Marina was riding her bike home in São Paulo, Brazil, she was struck and killed by a 35-year-old man who was driving a sports utility vehicle (SUV). He did not call for medical assistance. Marina's death sparked widespread community response and protests about conditions for bicyclists.

Lack of safe infrastructure for bicyclists is a common issue for cities worldwide. This deficit is becoming ever more critical with the steep increase in the use of bicycles

and other light mobility vehicles. Rapid changes in technologies, the appearance of cycling service providers, the growing sharing economy and food delivery services are some of the contributing factors to the exponential growth of two-wheel vehicles.

Providing safe infrastructure is vital to reducing crashes and saving lives, guaranteeing a positive cycling experience, and encouraging new users to take up cycling. It is also a critical ingredient for more inclusive mobility for women, children, elderly, disabled and disadvantaged, and is a vital economic resource



This reflects the typical CycleRAP assessment. To see the attributes considered in the analysis and test how they affect risk, readers can access the CycleRAP Demonstrator at <http://www.irap.org/cycleraap/demonstrator>.
Image: iRAP

for villages and low-income communities to access markets, employment, education, and other benefits, such as cycling tourism.

The obstacles to safer infrastructure for bicyclists and other forms of light mobility are not simply political or community reluctance. There is a lack of knowledge—about both the problems and how to address them. The lack of data on bicycle trips, travel patterns and crashes is a significant challenge to understanding how the design of streets and cycling facilities impact safety and risk.

This is exacerbated by high levels of crash underreporting, particularly for those that do not involve motor vehicles. This is because traffic police rarely attend the site of a bicycle crash where no vehicle is directly involved, and so no crash

reports are made. As a result, many more injured bicyclists are hospitalised than are recorded in official crash reports. A study led by Paul Schepers of hospital data in 12 countries found that between 60% and 95% of hospitalisations and 17% of fatalities from bicycle crashes did not involve conflict with a vehicle.

The World Health Organisation reports that on average, 41,000 cyclists are killed each year on roads around the world. Many more suffer severe, life-long injuries. More effort is needed to improve safety for bicyclists and light mobility users in cities to support new and greener mobility choices. With so many urban challenges ahead, cities need to ensure the proper allocation of resources in light mobility infrastructure, to maximise road safety.

The Solution

Addressing road safety typically uses a 'reactive' approach. That is, road managers fix known crash sites and then propose remedies. Road safety assessments, on the other hand, employ a 'proactive' approach. Rather than waiting for crashes to happen, this method objectively identifies risks and proposes safety treatments. This is done before any crash happens, based on well-known high-risk road and facility-related attributes.

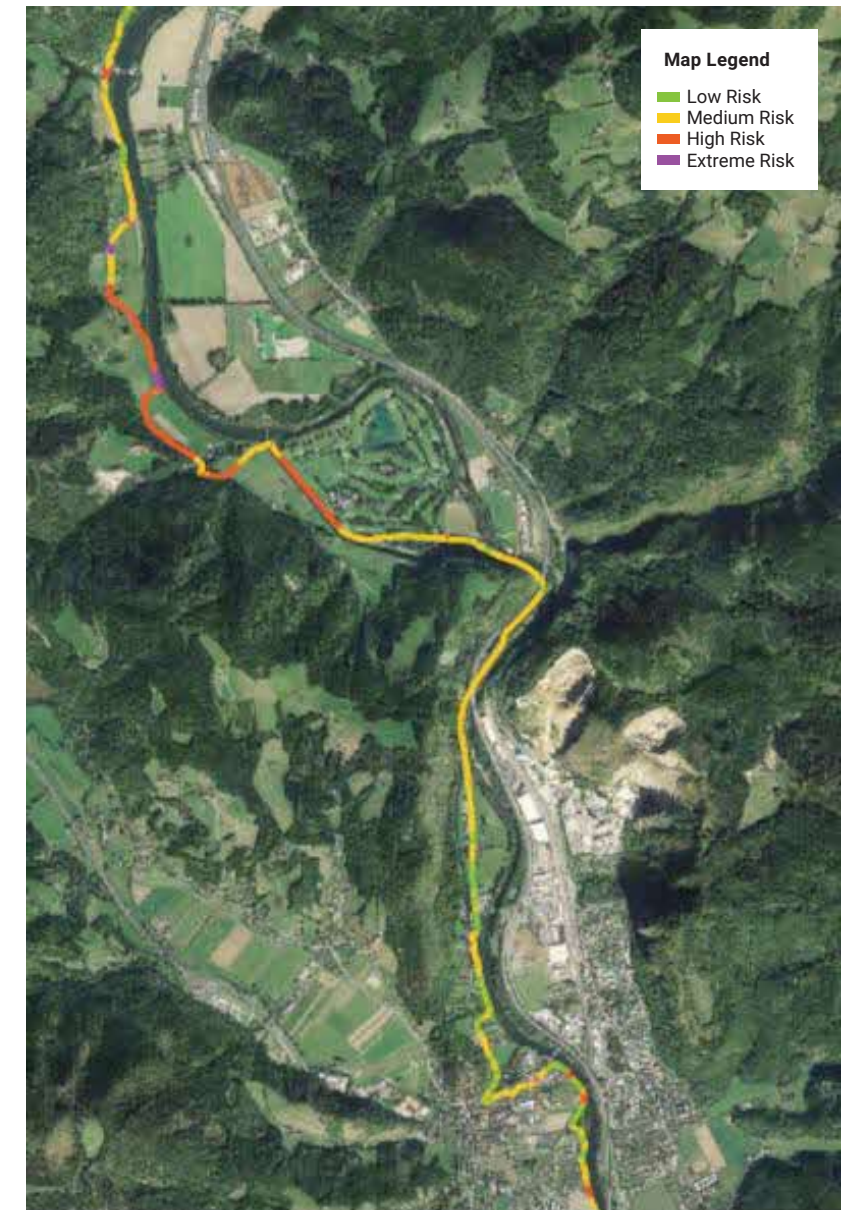
iRAP launched its new CycleRAP tool in 2022 to meet increased demand for tools to help road managers understand and address cycling and light mobility risk. CycleRAP is an evidence-based infrastructure risk evaluation model which aims to reduce crashes and improve safety specifically for bicyclists and other light mobility users. The model identifies high-risk

Addressing road safety typically uses a 'reactive' approach. Road safety assessments, on the other hand, employ a 'proactive' approach before any crash happens, based on well-known high-risk road and facility-related attributes.

locations without the need for crash data, and pinpoints and maps where crashes are likely to occur. It also offers suggestions for treatments to reduce this risk. Its efforts relate directly to the UN Sustainable Development Goals, specifically Goal 3.6 to halve road deaths by 2030, and Goal 11.2 for access to safe, affordable, accessible and sustainable transport.

The CycleRAP model classifies the cycling infrastructure into four levels of risk (low, medium, high or extreme) for four crash types (vehicle-bicycle, bicycle-bicycle, bicycle-pedestrians and single-bicycle), based on the combination of 50 data points.

As part of the CycleRAP safety treatment plan, the model results are analysed and mapped to inform



CycleRAP results mapped for the city of Deutschfeistritz, Austria, using data from the SABRINA project.
Image: EIRA over Google Earth Background

|| CycleRAP was also used to assess trails, paths and shared-use spaces that were beyond the scope of traditional road inspection.



local authorities about the risky areas and propose solutions. The model is designed to be easy, affordable, and fast to perform.

CycleRAP has now been used in several cities internationally. This includes the European Interreg SABRINA project where Eurovelo routes across eight countries in the Danube region—covering central and eastern Europe—were assessed using CycleRAP, alongside other assessment methods. CycleRAP was also used to assess trails, paths and shared-use spaces that were not connected to the road network, hence beyond the scope of traditional road inspection.

More recently, CycleRAP pilots were launched in Barcelona, Bogotá, Fayetteville, Madrid and São Paulo, as part of a project funded by Foundation Mapfre, UCI and PTV. This project aims to present to the cities the infrastructure risks and recommended treatments to increase safety. It showcases what a safe facility for cyclists and other light mobility vehicles is and how they can implement CycleRAP projects in other cities. CycleRAP has also been used in Addis Ababa, Ethiopia, as part of a masters thesis study at the University of Berkeley.



This is the equipment used to collect CycleRAP data.
Image: iRAP



Examples of different low-risk infrastructure in Fayetteville, Ljubljana, Madrid, São Paulo and Vienna where CycleRAP was piloted.
Image: iRAP

The Outcome

Where data is often severely lacking, CycleRAP helps cities identify, understand, prioritise and address high-risk locations for cyclists and light mobility users. CycleRAP does this by ranking the risk levels—from extreme to low risk—of sections in the assessed network. This can also be done for specific crash types, such as bicycle-pedestrian conflicts. CycleRAP then provides recommendations for treatments to reduce risk. The mapping results can help cities to prioritise spending resources, based on the risk hierarchy and recommended interventions at each section.

CycleRAP can also be used to guide the definition and design of safer infrastructure. Low-risk facilities can be showcased to inspire other cities to deliver safe infrastructure.

To prevent more riding fatalities, every city in the world must create safe infrastructure for users. Tools such as CycleRAP, can support city planners to improve the efficiency and impact of investments, to ensure safer streets and paths for bicycles and light mobility users. These tools support evidence-based decision-making and can be used to communicate success in promoting sustainable transportation and safe mobility. 🗨️

GUIZHOU | DIGITAL TRANSFORMATION

Leapfrogging with All-Round Digital Transformation in Guizhou

Guizhou's development and digital transformation in the recent decade is a showcase of China's pioneering efforts and success in implementing its national big data strategy.



Dr. Xiheng Jiang is the Director-General of International Cooperation Department, and a senior research fellow at Development Research Center of the State Council (DRC) of the People's Republic of China. Her 20 years of experience spans international cooperation, development studies, public policy and UN 2030 Agenda.



Changyu Liu is an assistant researcher at the Center for International Knowledge on Development, a thinktank affiliated with the DRC, where she focuses on topics related to the digital economy.



Zhaoxing Village in Guizhou - one of the largest Dong minority villages. The province has the highest number of traditional villages under China's national protection - 757 in total.
Image: Collins Zhao / Pexels

|| Guizhou was long considered one of the poorest and most disadvantaged provinces.

The Challenge

Typical of China's southwestern plateau lands, Guizhou Province's rugged terrain creates challenges for transportation and communication, which in turn contributes to its geographical isolation. Home to many ethnic minority groups, Guizhou was long considered one of the poorest and most disadvantaged provinces. As the ancient saying goes: *The sky is not clear three days; the land is not level for three miles; the people don't have three cents.*

For decades, limited resources and challenging environmental conditions slowed Guizhou's pace of development of traditional industries and industrialisation.

About 60% of value-add from larger enterprises came from traditional industries, including coal, electricity, tobacco, and *baijiu* (Chinese traditional distilled liquor).

As a result, Guizhou's economic level ranked among the lowest in China, with per capita GDP falling far below national average. In 2015, 4.93 million people in Guizhou were living in poverty, the highest among all provinces.

To overcome this, Guizhou needed to cultivate new industries, businesses and better governance processes.



The world's highest bridge, Beipanjiang Bridge, above the Beipan River Canyon in Guizhou.
Image: Xinhua



Five-hundred-metre Aperture Spherical Telescope (FAST) in Guizhou.
Image: Xinhua

Guizhou's digital economy has become a major growth engine for the province.

The Solution

In 2012, big data developments caught the local government's attention and led to the cultivation of strategic emerging industries in information technology. Guizhou's unique conditions were well-suited for this emerging sector: a secure and hidden geographical location, lower temperatures, along with sufficient water and power supply for reducing energy consumption and costs.

As China's first big data pilot zone, Guizhou received investments to make significant improvements to its public infrastructure, in particular its digital infrastructure. Digital industrialisation and industrial digitisation became the drivers of productivity and growth for large enterprises while creating more opportunities for SMEs with support from the Guizhou government's institutional reforms.

In 2017, the launch of Guizhou's Industrial Cloud Platform promoted cloud services usage among local industrial enterprises. Today, the cloud platform connects more than 170,000 registered users and nearly 3,000 companies with 14,178 main production equipment, 204 industrial software and 2308 industrial apps.

One enterprise, which utilised the Guizhou Industrial Cloud's big data analysis system for customer and market information collection to support new product design, achieved over 50% surge in output, a 15% rise in economic returns, and a 46% decline in site requirements.

Guizhou's digital transformation attracted internet giants and associated investments to further accelerate digital economic development and upgrading of traditional industries. At the same time, the deep integration of governance and digital technologies became the foundation to deliver more sustainable development, benefitting the local population.

Digital transformation at different government levels contributed to building a moderately prosperous society. China's first provincial government data platform was established in Guizhou and extends across provincial and city levels, down to county or village level. The cloud platform gathers data—including income, employment, education, healthcare, and so on—from more than 10 government departments. Such data enables civil servants to identify and provide timely social support—such as jobs or medical insurance assistance—to those who need help.

Public services administration is further enhanced by connecting grassroots service stations with online service platforms. Launched in 2015 and accessible at village service stations, the Guizhou Provincial Online Service Hall delivers online services from all four levels of government – provincial, municipal, county, and township, so that more people enjoy convenient access to “last mile” public services, such as payments for vehicle insurance and social security.

Guizhou's successful transition—from a traditional industrial province into a digital economy—has aligned its economic development, social progress and ecology protection.

In 2015, following President Xi Jinping's Guizhou visit where he emphasised the dual importance of development and ecology, the Guizhou government outlined strategic actions prioritising “big data” and “big ecology”. It established an intelligent ecological governance system—leveraging digital tools—to improve environmental management of air, water, forest and mountains.

In 2019, to deepen its cultural focus, the Guizhou government invested financial resources to construct a digital protection platform for ethnic minority villages. This initiative includes building provincial-level traditional village digital platforms and digital museums.



A screenshot of a digital museums of Nanhua Miao Village in Guizhou.
Image: Guizhou Provincial Department of Housing and Urban-Rural Development



A Tencent data center in Gui'an New Area, in Guizhou.
Image: Xinhua

The Outcome

Guizhou's successful transition—from a traditional industrial province into a digital economy that is responsible for pioneering the implementation of China's national big data strategy—has aligned its economic development, social progress and ecology protection.

Guizhou's digital economy has become a major growth engine for the province. The integration of its economy with digital technology brought significant opportunities that support new business models and emerging businesses. As a result, Guizhou's digital economy growth rate ranked first in China for seven consecutive years. In 2021, the digital economy accounted for 35.2% of the province's GDP, with its growth rate reaching 20.6%—this was 4.4% higher than the national average.

The economic progress and poverty rates of Guizhou

YEAR	GDP GROWTH RATE, %	GROWTH RATE OF THE DIGITAL ECONOMY, %	POVERTY RATES, %
2012	13.6	-	26.8
2013	12.5	-	21.3
2014	10.8	-	18.0
2015	10.7	(ranking 1 st in China)	14.3
2016	10.5	(ranking 1 st in China)	10.6
2017	10.2	37.2	7.75
2018	9.1	26.9	4.29
2019	8.3	22.1	0.85
2020	4.5	15.0	0
2021	8.1	20.6	-

Table 2.
Source: Guizhou Provincial Bureau of Statistics; China Academy of Information and Communications Technology (CAICT)

Guizhou's inclusive digital transformation successfully combines data-driven solutions, rural rejuvenation, industrial development, and governance.

Creating a digital government has also modernised Guizhou's governance capabilities. Moving its provincial administrative licensing processes fully online improved the overall quality and efficiency of its public and legal services, and friendliness of its business environment.

The use of digital technologies to support the Guizhou government's management, service and decision-making capacities has boosted public well-being and alleviated poverty. By the end of 2020, Guizhou had eradicated extreme poverty from the nine most impoverished counties in the province.

Guizhou's inclusive digital transformation is an epitome of Chinese-style modernisation, which successfully combines data-driven solutions, rural rejuvenation, industrial development, and governance. Guizhou's practice of leveraging regional advantages to advance economic inclusivity and social well-being may provide lessons for other developing regions. 📍

The Development Research Center of the State Council (DRC) is a comprehensive policy research and consulting institution directly under the State Council, the central government of the People's Republic of China.

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