

# 21st century cities: Asia Pacific's urban transformation





## Preface

“21st century cities: Asia Pacific’s urban transformation” is an MIT Technology Review Insights report developed in partnership with Accenture. Based on a series of expert interviews conducted in June and July 2021, this report explores how cities across Asia Pacific are responding to regional and global priorities to become more sustainable and inclusive. Adam Green was the writer of the report, Francesca Fanshawe was the editor, and Nicola Crepaldi was the producer.

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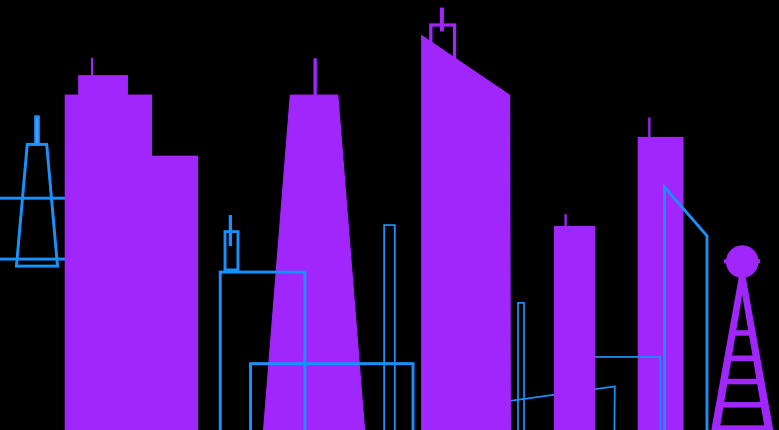
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## Foreword

While some urban dwellers have sought temporary refuge away from cities during the covid-19 pandemic, cities matter and are here to stay. Particularly in Asia Pacific, which is home to 34 (70%) of the world's top 50 most populous cities<sup>i</sup> today and where urbanization is expected to expand much faster than the rest of the world.<sup>ii</sup>

Especially in the last decade, progress has been made in laying the groundwork for smart cities across Asia Pacific. But there is still much work to be done. Now is an opportune time for us to rethink the future of cities and their priorities in a post-pandemic 21st century, as we acknowledge the urgency to make not only faster but also better progress.

In this white paper, we outline what is needed in the next decade: bold implementation plans to deliver more sophisticated private services and greener public infrastructure, boosted by the compounding potential of modern technology breakthroughs that are coming of age today (5G, multiparty systems, intelligent digital twins). Only then will it be possible to build cities that are powerhouses of not only economic growth but also better living.<sup>iii</sup>

### Imagine...

A city that drives sustainable progress through its built environment and public service provisions. Neighborhoods that are designed with hyper-local accessibility and traffic flows in mind.<sup>iv</sup> With most commuters choosing to ride exclusively on public or shared transit, through a mobility network that serves macro (buses, trains) and micro (e-bikes, single-seat EVs) needs. Health-care services and facilities that are available within convenient proximity to residents, making it possible to access

the right level of care at the right time. The last-mile ecosystem—retailers, couriers, consumers—run on “green-route” schedules that are optimized for each city block, based on data insights such as the expected number of deliveries per hour and day of week.<sup>v</sup>

A destination city where visitors are inspired to stay longer and live like insiders, and insiders are inspired to make everyday choices that lead to healthier, higher-quality lifestyles because of what the city offers—such as affordable access to locally grown, organic produce that contributes to the city's farm-to-fork strategy, and public zones abundant with greenery, which support both biodiversity and modes of active outdoor play.

Ultimately, a city of the future is an inclusive one where every person has access to essential services—physical security, public mobility, and life-enriching health care. This may sound utopian today, but we believe it can become a shared reality in the future of cities.

From the vantage point of Asia Pacific, the future is bright for cities that prioritize sustainable progress (not limited to environmental concerns) and that are inclusive by design (looking after the needs of residents and visitors alike). We invite you to take actions that will build such a future together.

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i. “World City Populations 2021,” World Population Review

ii. “The strategic plan 2020 - 2023,” UN Habitat, May 2019

iii. “Technology Vision 2021,” Accenture, 2020

iv. Peter Yeung, “How ‘15-minute cities’ will change the way we socialise,” BBC, January 4, 2021

v. Andre Pharand, “The sustainable last mile,” Accenture, 2021

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# 01 Executive summary

**A**s hubs of economic growth and employment, cities across Asia Pacific have the potential to be testing grounds for innovative new business models, especially in the digital era. But urban centers are also battling significant challenges, including climate change and inequality. Due to a combination of low-lying geographies, propensity to extreme weather events like flooding, and messy, unplanned urbanization trajectories, Asia Pacific cities are among the most vulnerable in the world. They also include some of the highest levels of inequality, with large segments of urban poor who lack access to amenities, safe housing, and full social participation.

Despite the challenges, cities across the region are beginning to break ground in exploring innovative and creative responses to social, economic, and ecological challenges. This report, based on a wide-ranging interview program with subject matter experts, explores how Asia Pacific cities are building momentum toward a more inclusive and sustainable urban model. Key findings of the report include:

- **Leading Asia Pacific cities are breaking new ground in sustainability innovation, offering ideas to their peers in the region—and globally.** Singapore has successfully transformed itself from an ecologically stressed, densely populated city with water shortages, pollution, and inadequate housing to a global metropolis with among the best liveability metrics in the world. Through coordinated planning and policy innovation, Singapore offers an example of how rapid improvements in sustainability and citizen wellbeing can be achieved in
- the face of unpromising starting conditions. Other cities are pioneering new approaches to city planning to leverage nature-based resilience, such as China's "sponge cities" and the urban forests of Melbourne, along with more environmentally friendly building materials to replace carbon-intensive concrete and steel. Transport systems are being reimaged and active mobility such as cycling is being encouraged. Innovators are also using cloud computing, artificial intelligence, and big data to enable circular economy supply chains, optimize traffic, and track and respond to extreme weather.
- **Inclusive tech can make cities better for everyone.** City leaders are pioneering new ways of ensuring better inclusion and participation. Geospatial innovation is helping citizens who live in areas of unplanned development or without a formal address system to access employment opportunities, facilities, and emergency services. Consumer apps are adapting their offerings to support vulnerable groups, including live location sharing, female-specific ride sharing, and crowdsourcing data for safety assessments on potentially risky areas. And innovations in connected devices and the internet of things are offering information and support to elderly communities.
- **Despite positive initiatives and projects, there are gaps between the ideal of more sustainable, inclusive cities and reality on the ground.** The first wave of "smart city" thinking tended to be overly technology-centric, experts say, without clearly defining the problems or identifying what are the different needs across city populations. More constructive approaches need to start with a deeper understanding of the experiences and desires of the varied urban communities and to focus on the key challenges. Once these have been established, then appropriate solutions can be deployed, with the right technology, where applicable. Potential solutions need to offer flexibility and adaptability for the ever-evolving needs of an urban population, and to balance a city's overall vision for its future with the coordination and devolution of decisions at a local level. Beyond the urban boundaries, cities can learn a lot via global networks that encourage idea sharing and best practices. This collaborative spirit will be ever more important to ensure the percolation of successful models and innovations across the region and beyond.

# 02

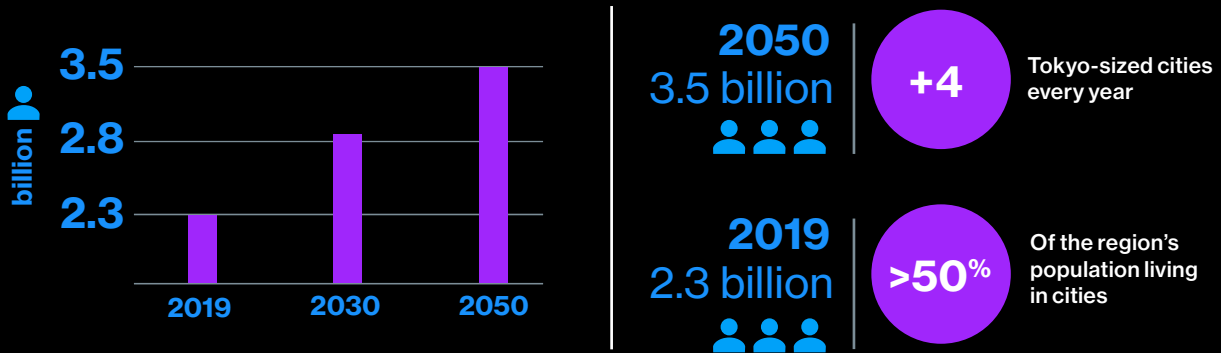
## Cities: fulcrum of Asia Pacific's future

The Asia Pacific<sup>1</sup> region has enjoyed decades of economic growth—from the post-Second World War rise of Japan, to the rapid industrialization of the “Four Asian Tigers” (South Korea, Taiwan, Singapore, and Hong Kong) between the 1960s and 1990s, along with China’s meteoric rise through the late 20th century, and today’s fast-growing markets in Southeast Asia. At the heart of this transformation is the region’s rapid urbanization. Between 1970 and 2017, Asia’s developing economies outpaced the rest of the world in both population expansion and growth rate, with the urban population increasing 3.4% per annum, compared to 2.6% in the rest of the developing world, and 1% in developed economies.<sup>2</sup> The pace will continue in the years ahead, with the region set to add over 1 billion new urban dwellers by 2050 (see Figure 1).

Today, Asia Pacific cities are achieving international renown with Auckland, Osaka, Adelaide, Wellington, Tokyo, Perth, Melbourne, and Brisbane forming eight out of the top 10 performers in the 2021 Global Liveability Index by the Economist Intelligence Unit.<sup>5</sup> But in the continent’s lower-income geographies, citizens face among the harshest living environments in the world. In a 2021 ranking of the world’s 100 cities most at risk from environmental factors such as pollution, extreme heat stress, dwindling water supplies, natural hazards, and vulnerability to climate change, 99 are in Asia.<sup>6</sup> Most at risk, according to the index, is Jakarta in Indonesia, which is so threatened by flooding that the government has considered moving the country’s capital city to the island of Borneo. Elsewhere, cities are experiencing water shortages that threaten the lives of urban inhabitants.

**Figure 1. Projected urban population in Asia and the Pacific, 2019 to 2050**

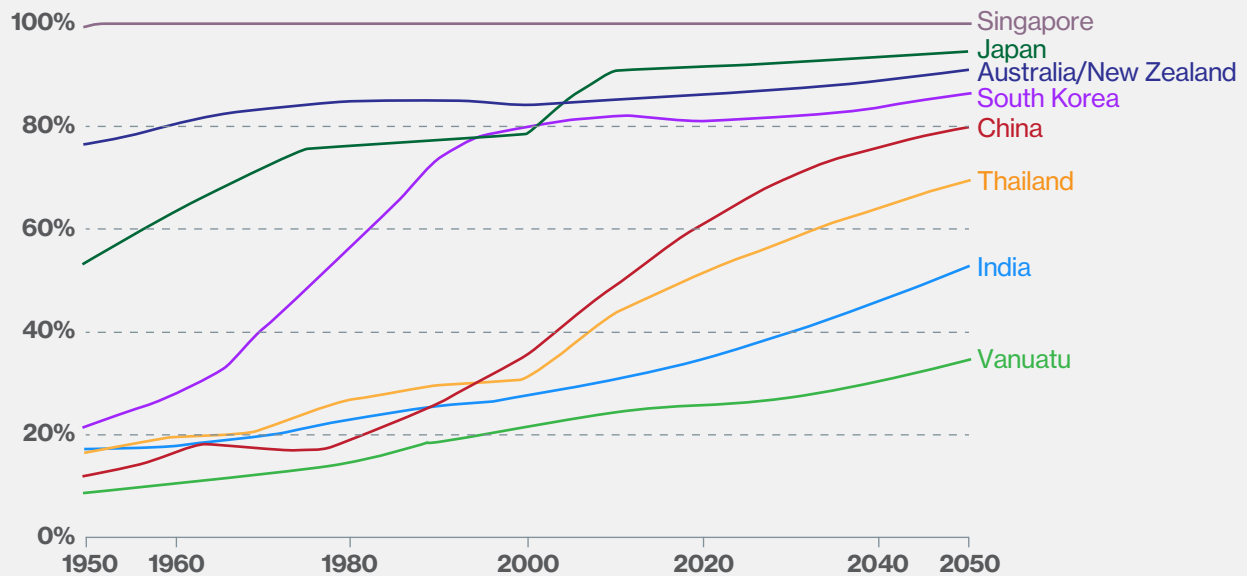
The United Nations (UN) estimates that Asia Pacific became majority urban for the first time in history in 2019, with more than 50% of the region’s population living in cities.



Source: UN, 2019<sup>3</sup>

**Figure 2. Share of the population living in urban areas in Asia-Pacific countries, 1950 to 2050**

After decades of growth, the number of people living in Asia-Pacific cities is expected to keep rising, although less rapidly, over the next 30 years.



Source: Our World in Data, 2019<sup>4</sup>

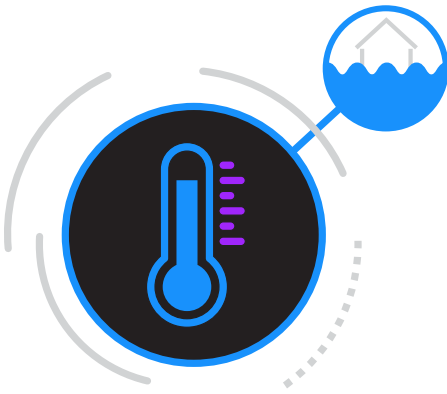
While some Asia Pacific cities are achieving international renown as some of the most liveable in the world, citizens in the continent's lower income geographies face among the harshest living environments in the world.

For example, India's Chennai reached the dreaded "day zero" in 2019 as all four of its reservoirs ran dry.<sup>7</sup>

The Pacific islands too are especially vulnerable to warming oceans, rising sea levels, and extreme weather events.<sup>8</sup> Here the effects of climate change are driving rapid—and often unplanned—growth in urban areas. In Vanuatu, for example, inhabitants are driven to its cities because there are few rural economic opportunities, and climate change is threatening the country's subsistence crops and fisheries. Migration to Vanuatu's capital, Port Vila, is growing at an average rate of 6.6% per year. But urbanization does not shield against natural disaster. A tropical cyclone that hit Port Vila in 2015 destroyed 30% of its dwellings. The losses were equivalent to 64% of national GDP.<sup>9</sup> Across Asia Pacific, climate vulnerability

poses a real threat to countries' economic growth and stability. Some of the region's most dynamic cities are also its most climate vulnerable, including Jakarta, Bangkok, and Ho Chi Minh City.

Across Asia Pacific, poor design and insufficient planning can make cities further prone to the effects of natural disaster. "Urban heat islands" caused by a lack of green space, combined with the use of heat-trapping materials like asphalt and concrete, can push up urban temperatures by several degrees.<sup>10</sup> And too many impermeable surfaces combined with inadequate drainage can cause flash flooding, which, in turn, can damage sanitation and sewage systems. Disasters like these can claim lives, detrimentally impact the health and wellbeing of citizens, and cause extensive economic losses.



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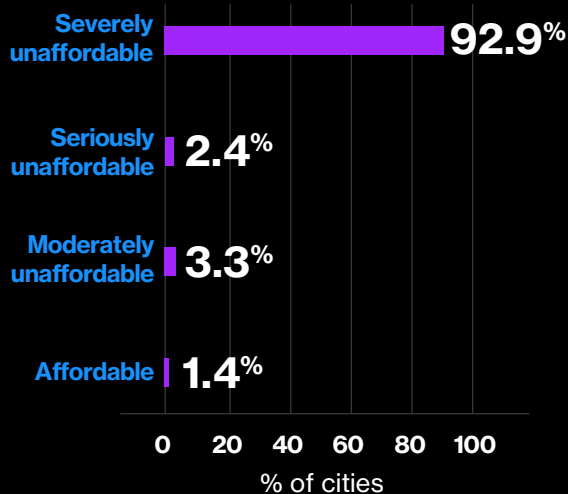
The urban inhabitants often worst affected by climate vulnerability are from lower socioeconomic groups, who may live on hazardous and marginal land, in lower-quality buildings that lack anti-flood measures and temperature control. They may also lack access to facilities such as air conditioning and have fewer financial buffers to withstand income shocks caused by disasters like flooding.

As cities grow, they can often become more unequal as increased economic activity pushes up land values and pollution, which disadvantages lower-income citizens who are less able to move to better areas. Even laudable investments can worsen the problem. For example, mass transit systems that reduce travel time to central urban areas can also increase rents along routes, forcing lower-income residents to relocate.<sup>11</sup> Houses in Asia have become increasingly unaffordable for many. One analysis of 211 Asian cities found home prices to be severely unaffordable for median income households (see Figure 3).<sup>12</sup> With affordable housing out of reach, many urban residents settle for inadequate housing with limited access to safe water and sanitation.<sup>13</sup>

Demographic change creates new groups of vulnerable people, including in higher-income cities, as evidenced in the rising numbers of elderly urban residents who need more proactive support.<sup>14</sup> Cities can be dangerous places for women, and preventative measures against violence toward vulnerable citizens have rarely been part of urban planning, even in simple interventions like adequate lighting.<sup>15</sup>

**Figure 3. The price isn't right: housing affordability in 27 Asia Pacific economies, 2019**

The Asian Development Bank measured the price-to-income ratio of 211 cities across Asia Pacific, finding that 98.6% of surveyed cities had unaffordable housing; a figure that has substantially increased since 2000.

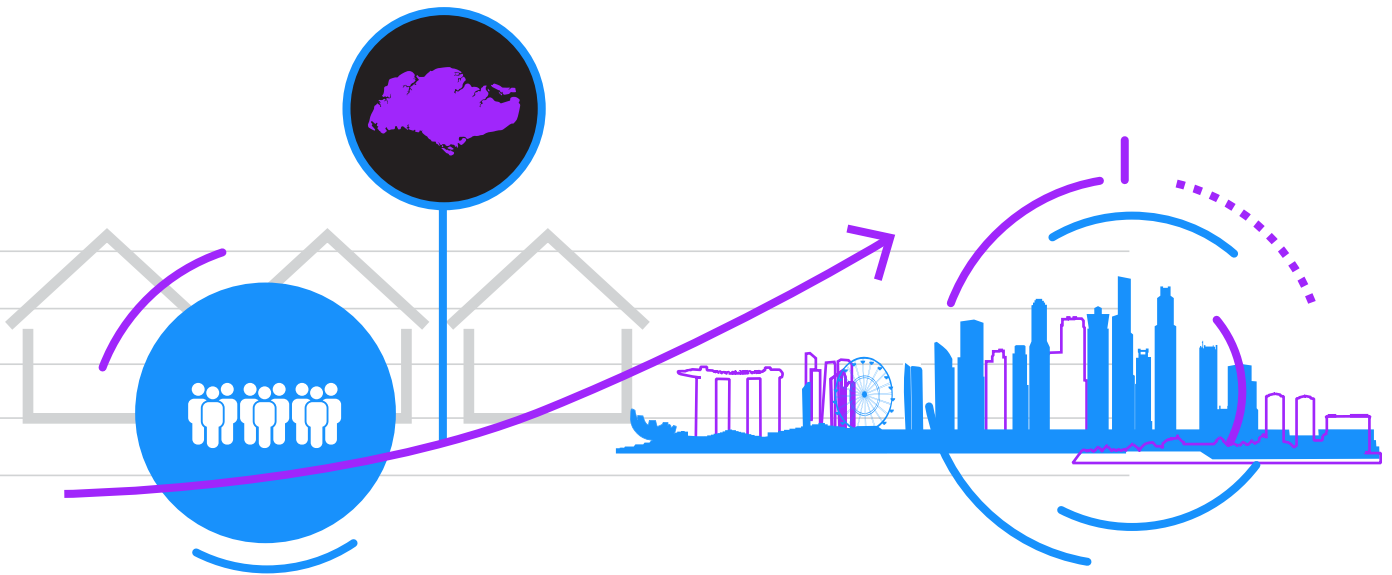


Source: Asian Development Bank, 2019<sup>16</sup>

### Making cities better

Despite the breadth and diversity of the challenges, the region can take heart from its past and present. Singapore stands out as among the most liveable cities in the world, but it started from a tough beginning, recalls Khoo Teng Chye, former executive director for the Centre for Liveable Cities at the Ministry of National Development (MND) in Singapore. "In the early 1960s, [Singapore was] rapidly growing and overcrowded, with a shortage of housing, a lot of slums, and people in poor, squalid conditions. The Singapore river was an open sewer and there was water rationing. I remember when I was a child, taps would run dry for the whole day, yet during monsoons we would have flooding. All the urban problems you can think of, we





“In the early 1960s, Singapore was rapidly growing and overcrowded, with a shortage of housing, a lot of slums, and people in poor, squalid conditions. All the urban problems you can think of, we had them! Today, our population has tripled and yet the city has become more liveable, attractive, and resilient.”

Khoo Teng Chye, Former Executive Director, Centre for Liveable Cities at the Ministry of National Development, Singapore

had them! Today, our population has tripled and yet the city has become more liveable, attractive, and resilient.”

The city-state has unique features, of course, not least its small size. And not all policies and programs are portable, but Tanvi Maheshwari, an associate director at the Future Cities Lab Global, sees Singapore as a petri dish of innovation that can inspire others. “Singapore’s urban planning and policy innovations have been exported around the world in one form or another,” she says. “It’s a place where you experiment with new technologies and systems in a controlled setting, where there’s a lot of executive oversight so you can track performance. And that gives you a unique opportunity to test out ideas that may seem almost utopian in a real-life setting.”

Historically, urbanization has been broadly a sign of good health in a country. All high-income regions have passed through a large-scale rural-to-urban transition. As

centers where talent and capital come together, cities can be hubs of innovation and engines of growth. Some Asian mega-cities are bigger than national economies; for example, Jakarta’s GDP is larger than that of Sweden.<sup>17,18</sup> Japan’s urban clusters of Tokyo-Yokohama, Osaka-Kobe-Kyoto, and Nagoya all featured in a 2017 ranking of the world’s top 10 innovation geographies based on patent filing.<sup>19</sup> And China megalopolises Shenzhen and Beijing have been instrumental to the country’s economic success. The conglomeration of many citizens in one geographical area enables the development of new business models, such as the rise of Asian super-apps like Didi, Grab, and Gojek that offer on-demand services like ride-hailing and food delivery. Apps like these can only reach scale in highly populated areas, which, in turn, gives them the commercial clout to broaden into smaller cities and rural areas.

# 03 Sustainable cities

## Built for tomorrow

Given the environmental challenges in the region—and globally—improving urban sustainability will be essential for Asia Pacific in the 21st century. That means reducing the environmental impact of cities and improving their ability to adapt to potential dangers in the future. Globally, building and construction are responsible for 39% of all carbon emissions, with operational emissions—energy used to heat, cool, and light buildings—accounting for 28%.<sup>20</sup> Buildings in Asia often account for a larger percentage of greenhouse gas emissions than global averages.<sup>21</sup>

Across the region, efforts are being made to upgrade older buildings. Retrofitting systems could cut energy costs by 15% to 35%, depending on the level of investment.<sup>22</sup> In Hong Kong, for example, the 48-storey China Resources Building, built in 1983, was riddled with inefficient mechanical and electrical systems. A 2012 retrofit included a new glazing system to minimize the transmission of solar energy into the building, reducing the need for air conditioning, as well as energy efficient lighting, a demand control ventilation system, and air-handling unit upgrade. Altogether the changes cut the building's CO<sub>2</sub> emissions by 1,370 tons, the equivalent CO<sub>2</sub> absorbed by 200,000 pine trees, in one year.<sup>23</sup>

In Seoul, the Building Retrofit Program, introduced in 2008, offers financing support to assist private and public sectors to modify buildings to boost their efficiency.<sup>24</sup> The Seoul Metropolitan Government scheme provides low-interest loans to help spread the installation costs and

Without greater strides toward more systematic “net zero carbon” building innovations, urban growth will consume vast amounts of natural resources and energy, contributing to an expected doubling of the total global consumption of raw materials by the middle of the century.

facilitate eco-friendly construction practices. The benefits include reducing energy consumption and construction waste, freeing up funds to be channelled into citizen welfare programs.<sup>25</sup> National sustainability plans in Thailand also include the retrofitting of government buildings as well as commissioning green low- and middle- income housing, and instilling national green building specifications. Thailand's Energy Efficiency Plan aims to reduce energy intensity by 30% by 2036, compared to 2010 levels.<sup>26</sup>

Action across the whole construction value chain in Asia Pacific is needed. Without greater strides towards more systematic “net zero carbon” building innovations, urban growth will consume vast amounts of natural resources and energy, contributing to an expected doubling of the total global consumption of raw materials by around the middle of the century.<sup>27</sup> Driven by a combination of regulatory tightening, public attitudinal shifts, and environmental, social and governance (ESG) pressures, steps are being taken to rethink construction methods from the ground up.

Pockets of progress do exist. CIC-Zero Carbon Park is home to Hong Kong's first zero carbon building.

It incorporates climate-responsive passive design, low carbon materials and construction methods, including the use of a high pulverised fly ash content cement substitute for its reinforced concrete structure, reused rocks and debris salvaged from the demolition phase for structural elements, and regionally manufactured and renewable materials for furniture, fixtures, and flooring.<sup>28</sup> In a first for the Philippines, Mactan Cebu International Airport used glulam timber, a natural alternative to steel and concrete, to build a terminal.<sup>29</sup> In Australia, Sydney and Melbourne boast two notably environmentally friendly buildings: the carbon-neutral Pixel Building, featuring vertical wind turbines and shade-providing panels, and One Central Park, bedecked in 250 species of plants and flowers that contribute to a 25% reduction in energy consumption compared to a conventional buildings of a similar size.<sup>30</sup>

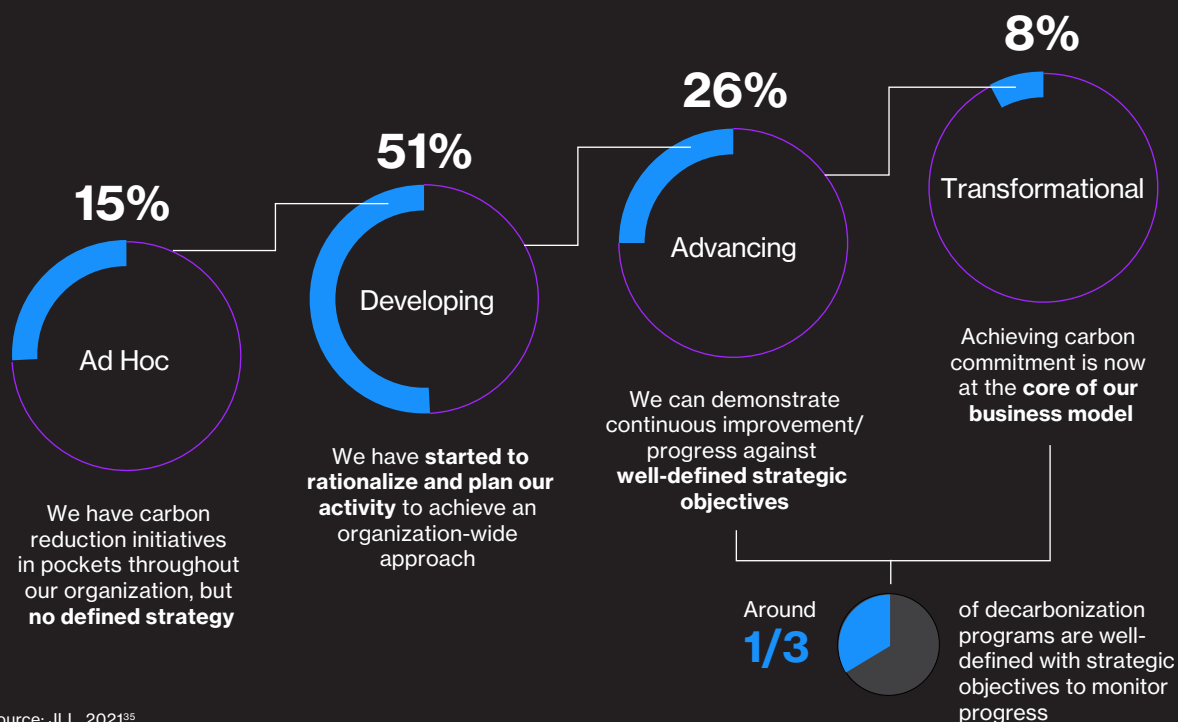
Cities across Asia Pacific are also reimagining the environment in which urban developments are constructed in a bid to lower ecological impact and improve resilience. Melbourne is planning urban forests to improve air quality, and Chengdu—a 20-million population city in southwestern

China—is planning a large network of parks and greenways.<sup>31</sup> Since 2014, China has become a test bed for “sponge city” pilots, which reintroduce natural structures including open green space, vegetation on rooftops, porous road and pavement materials, and the use of urban wetlands. The pilots have been a success, offering improved absorption, reduced flooding, and increased municipal access to usable water. There are an estimated 30 cities currently participating in the pilot projects and China’s state council has set 2030 as a target for sponge cities to be integrated into regional urban development plans.<sup>32</sup> Thailand, too, is looking to natural water dynamics like wetlands, trees, and parks to increase infiltration and slow water flow during heavy rains.<sup>33</sup>

But sponge city design principles can only be part of the solution. On July 20, 2021, a deadly deluge of more than 200 millimeters of rain fell on China’s city of Zhengzhou in a single hour, overwhelming its spongy water management system that was designed to cope with 180-200 mm of rain over 24 hours.<sup>34</sup> As flooding disasters become more extreme and frequent in Asia Pacific and elsewhere, green

**Figure 4. Sustainable real estate: how corporations in Asia Pacific are working to lower their carbon footprint (2021 survey)**

Two-thirds of corporations in Asia Pacific are reducing carbon emissions as part of their sustainability strategy.



Source: JLL, 2021<sup>35</sup>

and sponge infrastructure will need to form part of a comprehensive and systematic effort to curb the impact extreme weather events have on cities.

### Evolving urban transport: closer is better

Asia Pacific is home to some of the most sophisticated public transport systems in the world, in cities like Singapore, Tokyo, and Seoul, for example. But elsewhere, much of the demand is still being met by motorization. Without effective public transport development, baseline projections estimate that by 2050, cars could account for 40% of trips in Asia, up from 28% in 2015, driving up transport emissions, pollution, congestion, and road accident fatalities.<sup>36</sup> The Organization for Economic Co-operation and Development (OECD) estimates that Asia will account for 43% of global transport demand in passenger-kilometres by 2050, putting ever-more pressure on existing transport networks and driving up

carbon emissions if more sustainable transport solutions are not effectively implemented (see Figure 5).<sup>37</sup>

One approach to managing demand for transport is by averting the need for long car journeys. With the right planning, authorities can ensure that residents have the jobs and services they need—including hospitals, schools, parks, playgrounds, and supermarkets—within a short walk or bus ride of their home. The idea, often called the “15-minute city,” has gained traction during the pandemic, as urban centers emptied out and workers set up offices at home. Though implementation is in its early stages, cities such as Singapore,<sup>39</sup> Guangzhou, and Shanghai<sup>40</sup> have sketched out plans for walkable suburbs. Melbourne is leading the pack with its 30-year vision for “20-minute neighborhoods,” giving residents most of what they need within 800 meters of their homes.<sup>41</sup> It has tested the approach in three suburbs and estimates that the state of Victoria would save AU\$165 million (approximately

**Figure 5. Share of car and public transport as a percentage of all trips by region**

The OECD predicts that Asia will be the continent with the highest growth in car share by 2050 if nothing is done to lower the expansion rate. But policy changes and sustainability priorities can make a big difference.

#### KEY

**ROG** = The Robust Governance Scenario assumes local governments adopt pricing and regulatory policies to slow down the use of personal vehicles from 2020.

**LUT** = In addition to the ROG scenario, the Integrated Land Use and Transport Planning scenario assumes stronger prioritization for sustainable urban transport development.

	PRIVATE CAR				PUBLIC TRANSPORT			
	2015	2050			2015	2050		
	(%)	Baseline (%)	ROG (%)	LUT (%)	(%)	Baseline (%)	ROG (%)	LUT (%)
<b>Asia</b>	<b>28.3</b>	<b>40.3</b>	<b>19.2</b>	<b>16.2</b>	<b>23.8</b>	<b>20.6</b>	<b>56.3</b>	<b>61.7</b>
<b>Africa</b>	<b>20.2</b>	<b>27.4</b>	<b>9.8</b>	<b>7.4</b>	<b>27.1</b>	<b>25.1</b>	<b>64.3</b>	<b>71.0</b>
<b>EEA + Turkey</b>	<b>56.4</b>	<b>44.4</b>	<b>19.7</b>	<b>18.4</b>	<b>19.4</b>	<b>24.9</b>	<b>49.9</b>	<b>52.7</b>
<b>Latin America</b>	<b>40.5</b>	<b>42.4</b>	<b>24.6</b>	<b>21.7</b>	<b>22.1</b>	<b>21.3</b>	<b>47.4</b>	<b>52.0</b>
<b>Middle East</b>	<b>54.6</b>	<b>56.3</b>	<b>38.8</b>	<b>35.5</b>	<b>15.9</b>	<b>15.9</b>	<b>37.8</b>	<b>42.4</b>
<b>North America</b>	<b>81.2</b>	<b>76.1</b>	<b>61.1</b>	<b>60.5</b>	<b>7.0</b>	<b>9.5</b>	<b>20.9</b>	<b>21.6</b>
<b>OECD Pacific</b>	<b>59.6</b>	<b>48.9</b>	<b>24.1</b>	<b>23.4</b>	<b>16.8</b>	<b>22.0</b>	<b>46.2</b>	<b>47.8</b>

Source: OECD, 2017<sup>38</sup>

“For city transport to be environmentally and economically sustainable, and also increase social inclusion, individual travelers should have the freedom to choose from a multi-modal network of conventional transport operators and new mobility services, balanced with walkability in local neighborhoods, to meet their travel needs. The role of government would then be to help make such a network financially viable.”

Fumihiko Nakamura, Project Professor, University of Tokyo

US\$120 million) per year in congestion, health, and environmental costs if half of short car trips were made on foot.<sup>42</sup>

### Active mobility: multi-modal commuting

In many cities, the transition to a more sustainable mobility infrastructure includes a shift to cleaner, active transport. Shared bikes and e-scooter programs have already been rolled out in cities across the region with varying degrees of success. An exemplar is Taipei, where its bike share scheme, YouBike, is integrated into its metro card system, delivering last-mile services to millions of users.<sup>43</sup> To promote uptake, it offers discounts for commuters connecting with other forms of public transport, and free rides for seniors.<sup>44</sup> On-the-ground innovation has also led to the development of modes of active transport made from sustainable resources: bamboo bikes, for example, are becoming increasingly available in Singapore, Thailand, and Philippines.

Despite the practicality and demonstrable green credits, uptake on active transport in some cities has been slow. Advocacy is crucial to encourage greener modes of transport, says Derlie Mateo-Babiano, a senior lecturer in urban planning at the Melbourne School of Design. “It really helps to have a green champion to normalize cycling, walking, and public transport,” she argues, noting that social media and public communications efforts can help. A grassroots movement in the Philippines, the Move as One Coalition, has been pushing to establish a cycling culture in Manila since the start of covid-19 lockdowns. The initiative was born as a Facebook page linking bike

owners with essential workers, after the government closed public transport to limit the spread of covid-19, says Mateo-Babiano. “They’ve been able to get support from the Philippines Department of Transport and are influencing the government to create pop-up bike lanes.”

Elsewhere, authorities across Asia are leveraging economic instruments to speed up the transition toward active mobility. Singapore uses an electronic congestion charge system that automatically imposes a levy on drivers as they pass into the central business district,<sup>45</sup> while cities like Beijing ration road use using an “odd-even” approach that allows only certain registration plates onto roads on given days. Shanghai auctions a limited number of new license plates for cars each month, restricting the number of carbon-emitting new vehicles onto the road—with the average price to win a plate around \$13,000, it has been referred to as “the most expensive piece of metal in the world.”<sup>46</sup>

### The transition to smart sustainability

While supporting active transport will help reduce congestion, Asia Pacific cities will still need to improve existing transportation systems, by investing in low-carbon infrastructure, promoting electric vehicles, and harnessing more advanced technologies to streamline traffic.

Many countries have made and are acting on pledges to electrify their transport systems. China, for example, is already home to 99% of the world’s electric buses and around 40% of its electric two-wheelers.<sup>47</sup> The city of



“Being sustainable is not just a technology transformation, it is a human transformation as well. There’s a lot to be done on simple things like recycling and in being more conscious with how you consume power at the citizen level.”

Raymond Makhoul, Managing Director, Accenture Strategy

Shenzhen had electrified its entire fleet of over 16,000 buses by 2018, reducing fuel consumption by more than 95% in the transport industry, and slashing carbon dioxide emissions by 1.35 million tons.<sup>48</sup>

For the most advanced markets, autonomous vehicles are the next phase. A promising prelude was recently showcased at the Tokyo Olympics in 2021, where Toyota’s fleet of driverless e-Palette shuttles ferried athletes and staff around the Games Village.<sup>49</sup> In car-dependent cities, the use of shared, on-demand autonomous vehicles “will allow us to reclaim some road space,” says Tanvi Maheshwari of the Future Cities Lab Global. “What we are trying to do in Singapore is maintain the current modal mix with high use of public transit and use these technologies to improve our public transport service and reduce private car ownership. The mass transit system is still the central spine of transportation, but autonomous on-demand mobility connects people to the public transport system in a more seamless and efficient way, making it even more attractive. In this sense, Singapore offers a very interesting model where autonomous vehicles are seen as a complement to the public transport system.”

While overhauls to transport infrastructure are critical to sustainability, data-driven platforms and apps are beginning to have a significant impact on how Asian cities run. In some cities, tech giants are deploying the latest in cloud computing and artificial intelligence to tackle sustainability and liveability challenges. Alibaba’s City Brain project in Hangzhou harnesses artificial intelligence (AI) to collect data like video from intersection cameras and the GPS locations of cars and buses, analyzing the information to prevent congestion and gridlocks. After two years of testing, Alibaba says the technology has shortened commutes and helped first responders get to emergencies earlier. Previously China’s seventh most congested city, Hangzhou now ranks 57th.<sup>50</sup> This example speaks to the rise of “platform urbanism”—that is, the coproduction of data to facilitate better governance. As of 2019, City Brain was present in 23 cities, including China’s Beijing and Chongqing, and Kuala Lumpur in Malaysia.<sup>51, 52</sup> Cloud computing platforms are also bringing efficiency to the complex infrastructure work involved in transport development, as with Microsoft’s cloud support for Malaysia’s transit expansion.<sup>53</sup>

## Thailand's smart cities



Thailand's Phuket Island may be known as a tropical paradise, drawing tourists from around the world, but many may not know that the island's capital, Phuket City, is touted as Thailand's first ever smart city. It's one of 26 cities included in the ASEAN Smart Cities Network (ASCN) that sets out a collaborative framework for selected cities to work toward sustainable and smart development.<sup>56</sup>

Phuket's Smart City Action Plan aims to build on the island's internationally renowned tourism reputation, focusing on safety, the environment, the economy, governance, education, and health care alongside tourism. It hopes to serve as a blueprint for other cities that rely on tourism. As part of the initiative, the Phuket Smart City Data Platform, a prototype development project, aims to integrate multiple sources of information at a city level for continued management and planning within the city. The platform combines government data, transportation, and tourist data with public Wi-Fi and environment sensors. The aim of the centralized systems approach is to better understand the needs and behaviors of tourists and create partnerships with local businesses, allowing them to benefit from the data collected.<sup>57</sup>

Back on the mainland, in east Thailand's Rayong province, is the country's first "fully functioning" 5G-based smart city. Situated near three international airports, Ban Chang is harnessing 5G and cloud to provide live traffic and public safety analytics. Thailand's state-owned National Telecom Public Company Limited (NT), in collaboration with The Eastern Economic Corridor (EECO—an economic zone comprised of three provinces in eastern Thailand), is planning to specialize in remote telemedicine, logistics, robotics, and factory automation.<sup>58, 59, 60</sup>

Startups and innovators are also finding solutions to areas like waste reduction and "circular economy" systems. One such innovation, AuREUS, developed by Mapua University in the Philippines, uses a material made with crop waste that covers walls and windows and converts ultraviolet light into renewable electricity, simultaneously supporting the agriculture industry while improving solar energy utilization in cities.<sup>54</sup> In India, a cloud-based plastic waste management startup called Recykal digitally connects waste generators, aggregators, and processors. Participants can efficiently schedule the collection or drop-off of recyclable items and earn reward points for online vouchers for each completed transaction. A pilot in Pune collected 810 metric tons of plastic waste over a five-month period. It is now set to be expanded to other cities across India.<sup>55</sup>

Digital platforms are proving vital allies during climate emergencies. In Jakarta, PetaBencana.id gathers real-time flood reports from Twitter posts by residents and visualizes collated data into an online map. Created in 2014 at the University of Wollongong, Australia, in collaboration with the Jakarta Emergency Management Agency and Twitter, the platform's effectiveness is in part thanks to Jakarta's status as—at one time—the world's most active "Twitter city." Users tweet photographs using the keyword "banjir" (meaning "flood") during severe weather, enabling a real-time flooding conditions map.<sup>61, 62</sup> Data are cross-referenced with traditional sources by the Emergency Management Agency, allowing for flooding assessments, response, and management.<sup>63</sup>

Another similar project, geoBingAn, has been adopted by city and central governments in Bangladesh, the Philippines, and Fiji.<sup>64</sup> The app crowdsources data on disasters such as floods, landslides, and tsunamis, allowing citizens to express personal needs and providing information on evacuation and shelter.<sup>65</sup> These tools demonstrate the tangible value of social media and citizen-driven platforms within the disaster response "information ecosystem" and the importance of crowdsourcing time-critical information to coordinate rescue efforts and save lives.



# Inclusive cities

## Geographical inclusion

An inclusive city, as defined by UN-Habitat, the United Nations' program for human settlements and sustainable urban development, is one that promotes growth alongside equity—that is, a place where everyone, regardless of their economic means, gender, race, ethnicity, or religion, is able to participate in the social, economic, and political opportunities cities have to offer.<sup>66</sup> Realizing this vision will be both a worthwhile and complex challenge for cities.

Leveraging technology is helping cities to tackle gaps in service provision and proactively support vulnerable people. Digitizing land rights, for example, provides security of tenure and helps citizens who were previously without a formal address to open bank accounts and apply for jobs, enabling them to climb the economic ladder. Institutions are now exploring whether distributed ledger technology—which underlies blockchain—could help improve transparency and trust. The Asian Development Bank, for example, has been supporting the Fijian iTaukei Land Trust Board (TLTB) to explore a blockchain pilot to digitize native land records.<sup>67</sup> The program aims to harmonize government records and increase trust through the more rigorous encryption and verification powers of decentralized ledgers, diminishing the risk of fraud. Blockchain pilots are also being applied to build land registries in Panchkula, India, creating a viable template for poorer communities.<sup>68</sup>

Geospatial innovation is also helping citizens in areas that were once inaccessible or whose location was rendered invisible by a lack of formal address systems and accurate maps.<sup>69</sup> What3Words, a proprietary geocode system

which can be accessed by an app globally, is helping emergency services reach people more swiftly. The app's system divides the world into three-metre-squared areas, with each square having a unique three-word identifying code. In Singapore, a recent rescue of two 14-year-olds was executed quickly after the Singapore Police Force requested the boys' What3Words location when they called for help.<sup>70</sup>

## Technology for safety

Startups across the region are addressing the challenge of urban safety through the development of consumer apps. Safetipin is one such example, developed by New Delhi-based activist Kalpana Viswanath in response to the gang rape of a woman on a city bus in 2012. Safetipin crowdsources data from three apps and collates it into safety audits to make cities safer for women.<sup>75</sup> Users can report infrastructure issues that contribute to unsafe environments, as well as using the app while traveling to view safer alternative routes. The data collected are fed back to governments, non-governmental organizations, and local corporations to provide recommendations and facilitate safety improvements.<sup>76</sup> Grab Thailand has also begun offering the option for women to request women drivers with no fare difference, and enhanced safety features such as ride audio recording.<sup>77,78</sup> The Pakistani city of Sialkot is exploring a new Uber-like taxi and van service project for women,<sup>79</sup> while the cities of Mardan and Abbottabad have also launched the Safe Women mobile app that allows commuters on Pink Sakura buses to share live locations with family and friends.<sup>80</sup>



While digital platforms can do much to aid safety and inclusion, cities still need to ensure digital access gaps are considered. In the Indonesian city of Banda Aceh, Syiah Kuala University, with support from the United Nations Development Program, is implementing a program that promotes digital accessibility for vulnerable community groups through research that has identified limited digital connectivity among poorer citizens. This has led to strategic smartphone dissemination to facilitate equal access to Banda Aceh digital services.<sup>81</sup>

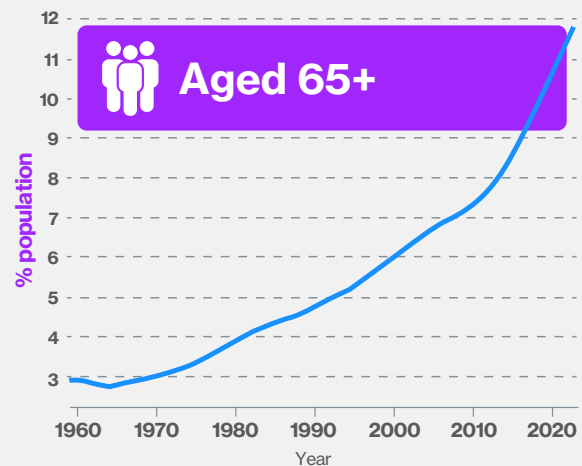
## Access to health care

Patchy transport infrastructure and unevenly distributed services can mean that access to health services is one of the main sources of urban inequality in some cities in Asia Pacific. That is beginning to change, as better technology helps facilitate the flow of information, supplies, and equipment.

Elderly residents are one major concern for Asia Pacific countries with ageing populations. The number of people over 65 in East Asia and the Pacific is on a sharp incline, creating a growing vulnerable community that needs more support, including proactive help to ensure they are safe and secure (see Figure 6).

**Figure 6. Percentage of population aged 65 and above in East Asia and the Pacific**

The World Bank estimates that the number of people aged 65 and over in East Asia and the Pacific in 2020 was nearly double that of the year 2000.

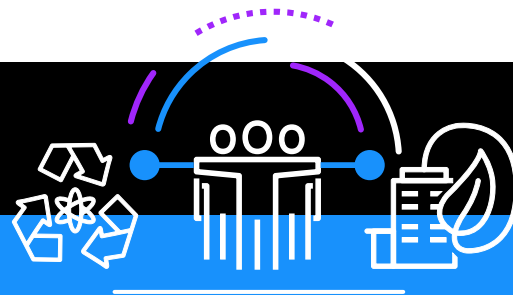


Source: World Bank, 2020<sup>82</sup>

## Inclusive decision-making: Surabaya's lead

In recent years, the sprawling metropolis of Surabaya, one of Indonesia's major cities on the island of Java, has been transformed into a connected, citizen-led urban center, with a focus on cleanliness and sustainability, under the city's first female mayor. "It was well-run by a mayor with a very inclusive approach, getting citizens engaged and involved in looking at sustainability and recycling," says Khoo Teng Chye, former executive director at Singapore's Centre for Liveable Cities.

During her decade in power (2010-2020), Mayor Tri Rismaharini directed an urban strategy that matched physical infrastructure development with social reforms to engage citizens in the city's progress.<sup>71</sup>



The Surabaya Green and Clean program is a community-based waste management system engaging local people including through an education program and competition initiatives that reward citizens with tools to further community recycling goals. The program has a social focus, with organizations forming locally to manage waste.<sup>72</sup> Initiatives such as the Adiwiyata program, an environmentally friendly school program, and the government's Eco-Campus program that seeks to reduce emissions, improve waste management, and implement low-emissions transport on campuses, demonstrate a multi-levelled commitment to sustainability education.<sup>73, 74</sup>



“A smart city strategy needs to be anchored in what experiences you want to enable in all your stakeholders: citizens, tourists, and business travelers. Then you can start thinking about the commercial models, but they must be anchored in experience, as opposed to technology.”

Jurgen Coppens, Managing Director, Accenture Strategy

In South Korea, telecoms operator SK Telekom and the Korea Land and Housing Corporation have launched a new service to equip the elderly with a smart speaker that recognizes their voice and provides them with information, entertainment, and connectivity.<sup>83, 84</sup> The voice-activated AI assistant enables seniors to check the weather, request music, and—importantly—call for emergency assistance. It can also monitor memory and cognitive function.<sup>85</sup> In Thailand’s Saensuk Smart City, the municipality has launched a patient monitoring program for its elderly inhabitants, which make up 15% of the population. Senior citizens are provided with wearable devices that track activity and sleeping patterns, detect unusual movement

such as falls, and include a panic button. The initiative aims to provide more-targeted care and enable a swifter response to emergencies.<sup>86</sup>

In Indonesia too, mobile health innovations are empowering citizens with better health-care support. Makassar City is using telemedicine provider Dottoro’ta to bring health services to patients’ homes. The program, available 24 hours a day, includes a fleet of Mobil Dottoro’ta vehicles equipped with ECG, ultrasound, and other essential care devices linked online to 46 health centers, facilitating real-time directives from a network of health professionals and nursing staff.

# 05 Conclusion

Cities will play a central role in shaping how the 21st century plays out across Asia Pacific. The challenges they face vary across the region's diverse geographies and contexts, but for all cities, taking proactive steps to becoming more sustainable and inclusive will be paramount in securing a resilient and equitable future for urban residents. While meaningful inroads in sustainability initiatives and inclusion programs are already underway, city leaders and ecosystem participants will need to focus on bridging the gap between planning and implementation to push through greater change in the next decade.

- **Smart cities must start with people.** The first wave of the “smart city” agenda was technology-centric, focused on what new innovations could do for cities. This has often led to disappointing or even backfiring outcomes, such as deepening inequality as those with less digital access are left further behind. It has also led to “white elephant projects” that never took hold, like Songdo, South Korea’s 1,500-acre from-scratch smart city. What it offered in convenience, sustainability, and efficiency, it lacked in community, vibrancy, and sense of place.<sup>89</sup>

The focus should now be on understanding cities as a composite of lived experiences across different communities and interest groups. “Your smart city strategy needs to be anchored in what experiences you want to enable in all your stakeholders: citizens, tourists, and business travelers,” says Jurgen Coppens, managing director at Accenture Strategy. “Then you can start thinking about enabling that and the commercial models, but anchored in experience, as opposed to technology.”

Similarly, Accenture’s Raymond Makhoul believes too many smart city projects in times past wrongly asked “What is the latest technology?” without really having targeted investments geared towards solving problems.” Singapore’s Smart Nation strategy was laudable because it identified clear areas of focus: health care, congestion, and the environment. “It’s about harnessing technology and innovation to create better outcomes for citizens and for the city.”

Even where technologies are in place, they need to be flexible and adaptable to the changing needs of a city’s inhabitants. “Tools can often be too sophisticated for the planner or policymaker to access,” says Maheshwari, referring to complex data-heavy urban modeling and simulation tools. “They are also usually not agile enough to support the process of planning and design, which is very iterative. You make decisions on the go. You go back to the drawing board several times over.”

- **Strike the balance between control and improvisation.** Cities need to have both an overarching vision as well as room for adaptation to respond to local needs and context. The former is an essential trait of successful cities past and present. “The secret sauce in Singapore was a very integrated approach in the way we plan, design, build, and manage the city,” says Khoo Teng Chye of Singapore’s Centre for Liveable Cities. Of Southeast Asia’s emerging economies, Harvey Neo, senior researcher and geographer at the Lee Kuan Yew Centre for Innovative Cities, is most optimistic about Vietnam’s ability to adapt and modernize its cities due to its highly coordinated governance model.

Yet some devolution and local tailoring are vital, too. Khoo Teng Chye credits Indonesian reforms that gave “a lot more autonomy to local leaders, and [as a result] some of the more progressive mayors and governors are beginning to do interesting things.” In China, some experts advocate “blueprints” that can be adapted to

local circumstance, rather than rigidly determined visions.<sup>90</sup> “When you have the concept of a smart city at the top of government, and a governance model that gives stakeholders an equitable stake, contribution, and control, this is where you create the right strategy to succeed,” says Accenture’s Raymond Makhoul.

In developing the City Resilience Strategy of Jakarta, over 50 workshops, forums, public consultations, and meetings were held, involving more than 1,000 stakeholders. This enabled the city’s strategy to be built upon shared visions and consensus, with practical considerations accounting for the multiple stakeholders engaged in building the city’s resilience.<sup>91</sup>

- **Collaboration within and across borders.** As former Chicago Mayor Rahm Emmanuel argued, cities today have a level of power and influence that, if wielded beneficially, can make as much difference to people’s lives as central governments.<sup>92</sup> But to work through the politically complex realities of urban decision-making, cities need to improve collaboration internally, eliminating silos between departments for nimbler responsiveness to events like public health crises and climate disasters,<sup>93</sup> and to encourage integrated planning for important initiatives in areas like sustainability. “It’s not just where you build something like water retention ponds, but also who owns the land, who lives around that land, who is governing that piece

of land. There are a lot of managerial and operational issues that crop up,” says Maheshwari.

As cities expand, collaboration between centers and surrounding jurisdictions is imperative to managing urban sprawl, says Hyun Bang Shin, professor of geography and urban studies at London School of Economics. “A lot of new developments are taking place in the peripheral areas on the outskirts of urban boundaries, and therefore require coordination between urban and regional governments and rural areas.”

And beyond national borders, cities need to be looking to other global centers to build on each other’s progress. Accenture’s Jurgen Coppens says the standardization of smart city digital platforms and data architectures will allow scaling across cities to avoid them “reinventing the wheel.” Already around the world, Singapore has become a model for Chinese urban planners and Rotterdam in the Netherlands has provided advice to Sarat, India, in handling water management.<sup>94</sup>

As city leaders in Asia Pacific and around the world prepare for a more sustainable and inclusive future, they need to be prepared to actively learn from their peers regionally and internationally. As Raymond Makhoul observes: “Being inclusive and open is an important mindset shift in how cities need to behave differently.”

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#### Footnotes

1. This paper defines the Asia Pacific region as the countries of East Asia, South Asia, Southeast Asia, Australasia, and the Pacific islands, and excludes Central and Western Asia, Russia, and the Gulf Cooperation Council.
2. Asian Development Bank, “Fostering Growth and Inclusion in Asia’s Cities,” September 2019. (pdf, p. 20).
3. United Nations Development Program, “The future of Asian & Pacific cities,” 2019. (pdf, p. 20).
4. Hannah Ritchie and Max Roser, “Urbanization,” Our World in Data, November, 2019.
5. “The Global Liveability Index 2021,” The Economist Intelligence Unit (Download requires free registration).
6. Will Nichols, “Asian cities in eye of environmental storm – global ranking,” Verisk Maplecroft, May 12, 2021.
7. Kalpana Sunder, “How to stop another ‘Day Zero,’” BBC Future Planet, January 6, 2021.
8. Ashley Westerman, “‘We Need Support’: Pacific Islands Seek Help and Unity to Fight Climate Change,” NPR, October 5, 2019.
9. Alexei Trundle and Darryn McEvoy, “Pacific island cities call for a rethink of climate resilience for the most vulnerable,” The Conversation, April 17, 2019.
10. “Learn about heat islands,” United States Environmental Protection Agency.
11. Asian Development Bank, “Enabling Inclusive Cities: Toolkit for Inclusive Urban Development,” 2017.
12. Asian Development Bank, “Fostering Growth and Inclusion in Asia’s Cities,” September 2019. (pdf, p. 52).
13. Asian Development Bank, “Fostering Growth and Inclusion in Asia’s Cities,” September 2019. (pdf, p. xii).
14. “Demographic trends and urbanization,” The World Bank, May 19, 2021.
15. Amy Fleming, “What would a city that is safe for women look like?,” The Guardian, December 13, 2018.
16. Asian Development Bank, “Fostering Growth and Inclusion in Asia’s Cities,” September 2019. (pdf, p. 52).
17. Statistical Yearbook of Indonesia 2020 (Free download, not in English, pdf p. 409).
18. International Comparison Program, “GDP, PPP (current international \$),” The World Bank.
19. Financial Times (download requires paid subscription).
21. Andrew Janes and Shawna Kwan, “From Singapore to Rio Green Buildings Keep Tropical Tenants Cool,” Bloomberg Green, May 6, 2021.
22. Andrew Janes and Shawna Kwan, “From Singapore to Rio Green Buildings Keep Tropical Tenants Cool,” Bloomberg Green, May 6, 2021.
23. Matthew Keegan, “The city of sustainable skyscrapers,” BBC Future Planet, February 10, 2021.
24. Jae Min Song, “Building Retrofit Program,” Seoul Solution, June 4, 2017.
25. “Case Study: Seoul’s Building Retrofit Program,” C40 Cities, December 18, 2014.

26. "Building for green growth in Thailand," UN Environment Programme, March 12, 2018.
27. Matthew Adams, "Advancing Net Zero, Asia Pacific Embodied Carbon Primer," World Green Building Council, September 2020. (pdf, p. 6).
28. Matthew Adams, "Advancing Net Zero, Asia Pacific Embodied Carbon Primer," World Green Building Council, September 2020. (pdf, p. 27).
29. Matthew Adams, "Advancing Net Zero, Asia Pacific Embodied Carbon Primer," World Green Building Council, September 2020. (pdf, p. 28).
30. "Green buildings: 18 examples of sustainable architecture around the world," CNN Style, April 24, 2020.
31. "Chengdu plans big for a 'city within a park,'" Metropolis, May 14, 2021.
32. "Sponge City Concepts Could Be The Answer to China's Impending Water Crisis," Earth.org, August 24, 2020.
33. Matthew McCartney et al., "Fighting floods with 'sponge cities,'" Flood Resilience Portal, February 7, 2018.
34. Laurie Winkless, "Could 'Sponge Cities' Help Us Prepare for Our Flooded Future?," Forbes, July 27, 2021.
35. "Sustainable Real Estate: From Ambitions to Actions" (pdf, p. 10), JLL, June 2021.
36. "ITF Transport Outlook 2017, Chapter 2: Transport Demand and CO2 Emissions to 2050," OECD Library, January 30, 2017.
37. "ITF Transport Outlook 2017, Chapter 5: Mobility in Cities," OECD Library, January 30, 2017.
38. "ITF Transport Outlook 2017, Chapter 5: Mobility in Cities," OECD Library, January 30, 2017.
39. Gwyneth Teo, "45-minute city, 20-minute towns: Advisory panel outlines vision for Land Transport Master Plan 2040," Channel News Asia, January 12, 2019.
40. Apolitical, "The 15 minute city: fantasy or reality?," The Mandarin, November 12, 2020.
41. "20-minute neighbourhoods," Victoria State Government Planning, March 23, 2021.
42. "20-Minute Neighbourhoods: Creating a more liveable Melbourne" (pdf, p. 10), Victoria State Government Planning, 2019
43. "Taipei," Copenhagenize Index, 2019.
44. George Liao, "Taipei introduces new incentives for senior YouBike users and riders of public transportation," Taiwan News, March 8, 2021.
45. Hannah Parks, "Investigating the Impact of Congestion Pricing Around the World," Climate XChange, May 29, 2019.
46. Stephen Davis, "What would a free market for parking look like? It'd look a lot like Japan," City Beautiful NZ, September 21, 2018.
47. Bambang Susantono and Robert Guild, "Creating Liveable Asian Cities" (pdf, p. 6), Asian Development Bank, April 2021.
48. Bambang Susantono and Robert Guild, "Creating Liveable Asian Cities" (pdf, p. 156), Asian Development Bank, April 2021.
49. River Davis, "Hyperdrive Daily: The Driverless Shuttle Helping Toyota Win Gold," Bloomberg, August 2, 2021.
50. Michelle Toh and Leonie Erasmus, "Alibaba's 'City Brain' is slashing congestion in its hometown," CNN Business, January 15, 2019.
51. "City Brain now in 23 cities in Asia," Alibaba Cloud Community, October 28, 2019.
52. Michelle Toh and Leonie Erasmus, "Alibaba's 'City Brain' is slashing congestion in its hometown," CNN Business, January 15, 2019.
53. Dashika Gnanewaran, "Malaysia builds its Mass Transit System in the Microsoft Cloud," Microsoft Malaysia News Center, June 22, 2020.
54. "AuREUS: Aurora Renewable Energy UV Sequestration," James Dyson Award.
55. "Dow launches Rethink+," (press release) Dow Corporate, October 2, 2020.
56. "Smart city spotlight: Phuket," The Asean Post, June 26, 2018.
57. "Phuket Smart City Data Platform," Phuket City Data.
58. "Thailand to launch 5G pilot to create country's first smart city," Tomorrow.City, March 18, 2021.
59. Alita Sharon, "Ban Chang: Thailand's First 'Fully Functioning' 5G-Based Smart City," Open Gov, June 2, 2021.
60. "News Release," (press release) Eastern Economic Corridor Office, March 17, 2021.
61. Ingrid Lunden, "Analyst: Twitter Passed 500M Users In June 2012, 140M Of Them In US; Jakarta 'Biggest Tweeting' City," Tech Crunch, July 30, 2012.
62. T. Holderness, E. Turpin, et al., PetaJakarta.org: assessing the role of social media for civic co-management during monsoon flooding in Jakarta, Indonesia," University of Wollongong, 2015.
63. "Peta Jakarta," University of Wollongong.
64. "geoBingAn: Strengthen the Community Capacity for Disaster Resilience" (pdf, p. 1), GeoThings Inc.
65. "Are crowdsourced apps the future for disaster response?," Aid & International Development Forum, June 29, 2018.
66. "An inclusive city," World Urban Campaign, UN-Habitat.
67. Chee Anne Rono, "Creating open, honest government through blockchain," Asian Development Blog, July 17, 2018.
68. Helena Vieira, "Using blockchain to make land registry more reliable in India," London School of Economics (blog), April 13, 2018.
69. Anne-Claire Blet, "A more efficient alternative to unreliable street addresses: India Post pilots what3words," What3Words, October 4, 2018.
70. "Singapore Police Force uses what3words to rescue lost teenagers," what3words, January 28, 2021.
71. "Social Minister Risma Will Be Dismissed From The Position Of Mayor Of Surabaya," VOI News, December 23, 2020.
72. "Green and Clean Initiative, Surabaya Indonesia" (pdf, p. 3), UCLG Committee, 2010.
73. Lufti Agus Salim, "Challenges for Surabaya as a Smart City" (pdf, p. 9), Envirotech Journals, August 5, 2020.
74. Ridho Hantoro et al., "Emission Reduction Study for Eco-Campus Program, Case Study in Sepuluh Nopember Institute of Technology Indonesia," IPTEK Journal of Proceeding Series, December 2017.
75. "Safetipin" (free download).
76. "Case Study – Delhi," Safetipin.
77. Prowd Issarasena, "Grab Thailand Now Allows Users To Request Female Drivers For Women To Feel Safer When Commuting," The Smart Local, March 24, 2021.
78. "Uber to add three new features to make rides safer in India," DNAIndia, January 9, 2020.
79. Fei Huang, "5 ways to make Asian Cities more inclusive," Asian Development Blog (blog), February 16, 2018.
80. "KPITB relaunches 'Safe Women' App with enhanced features," (press release) UN Women, Asia and the Pacific, January 16, 2020.
81. "Digital Inclusion in Banda Aceh, Indonesia," UNDP City2City, December 4, 2020.
82. "Population ages over 65 and above (% of total pop) East Asia & Pacific – graph," World Bank Data.
83. "Smart cities are teaching senior citizens new tricks," Korea JoonAng Daily, October 28, 2019.
84. Associated Press, "Controversial AI monitors South Korea's senior citizens amid virus crisis," Daily Sabah, May 31, 2020.
85. Lim Chang-won, "SK Telecom releases AI-based emergency service to rescue senior customers," Aju Business Daily, March 4, 2021.
86. Suchit Leesa-Nguansuk, "Saensuk kicks off smart city for the elderly," Bangkok Post, July 27, 2016.
87. "Dottoro'ta, New Era of Mobile Doctor Service," Sehat Negeriku, March 6, 2017.
88. Elyssa Ludher et al., "ASEAN Smart Cities Network" (pdf, p. 26), Centre for Liveable Cities Singapore, 2018.
89. Linda Poon, "Sleepy in Songdo, Korea's Smartest City," Bloomberg CityLab (free registration required), June 22, 2018.
90. "The Future of Asian and Pacific Cities" (download link).
91. Oswar Muadzinn Mungkasa, "Collaborating Towards a More Resilient City," NewCities, October 8, 2019.
92. Rahm Emanuel, The Nation City (Penguin Random House Canada, 2021).
93. 100 Resilient Cities, "Cities Taking Action" (pdf, p. 12), The Rockefeller Foundation, July 2017.
94. "Surat and Rotterdam cooperate to meet urban water challenges," International Urban Cooperation Network, European Union.

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