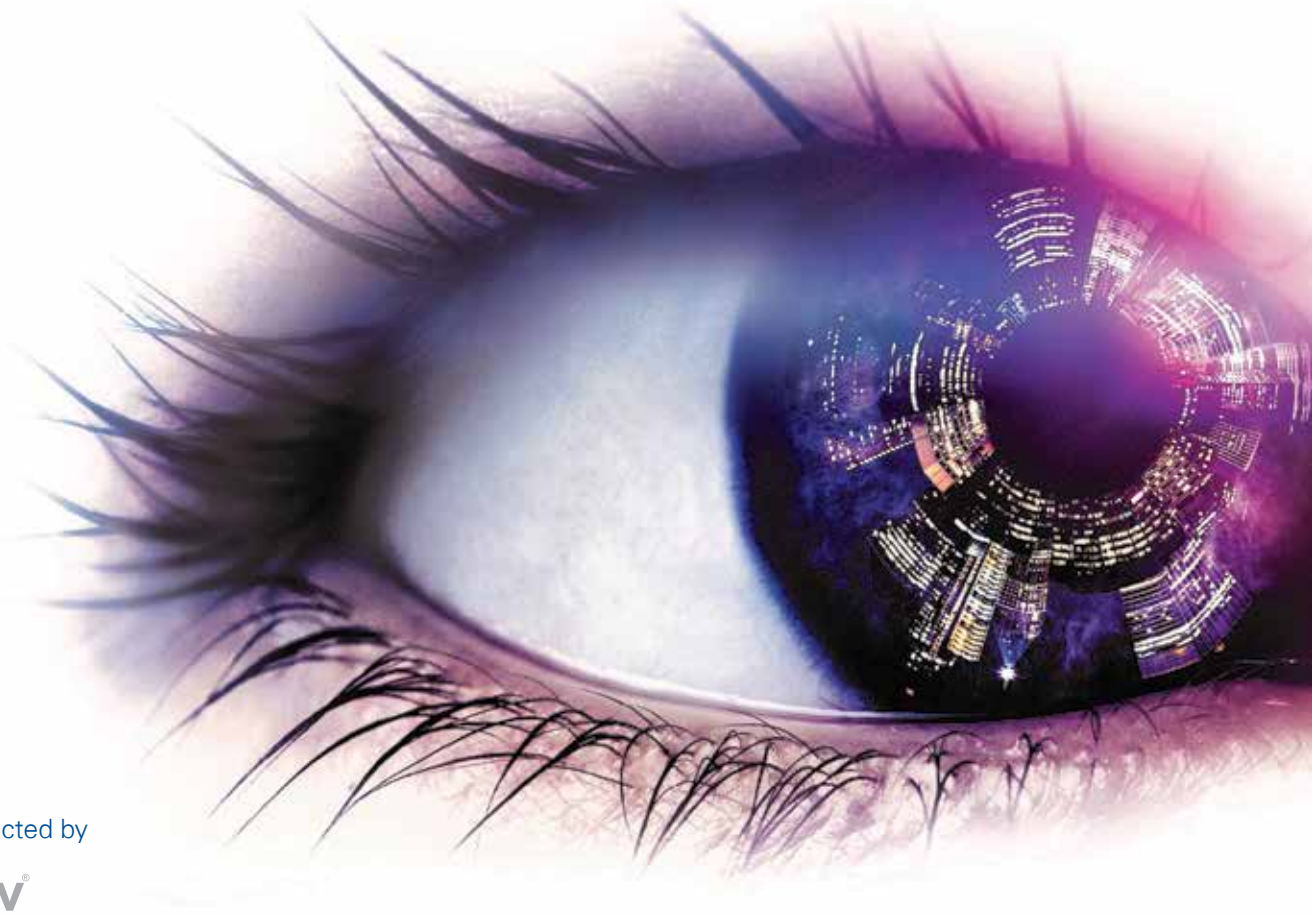
Connected Cities

Citizen insights across Asia Pacific

2019 survey



Survey conducted by

YouGov
What the world thinks

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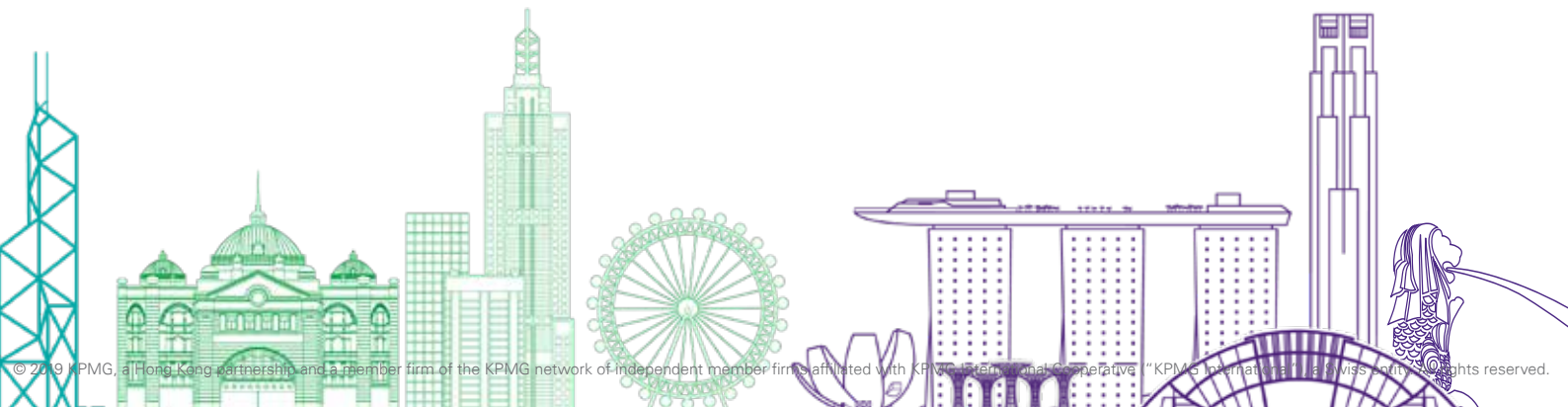

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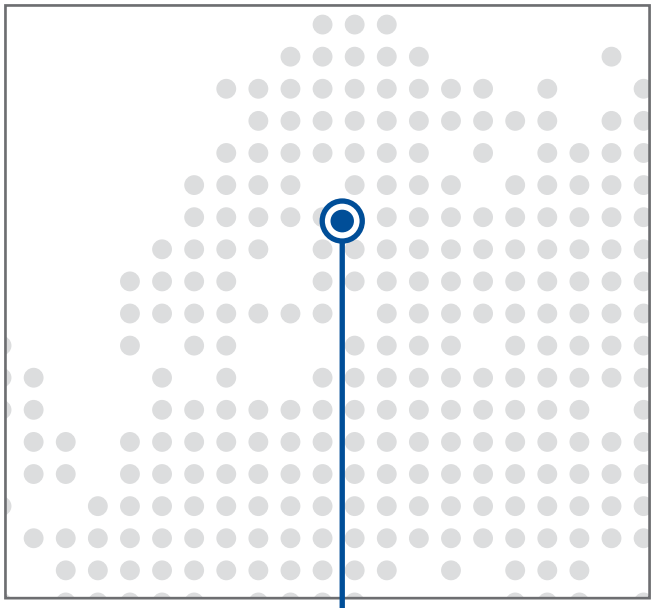

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- Smart city framework
- Transportation and mobility
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- Living environment
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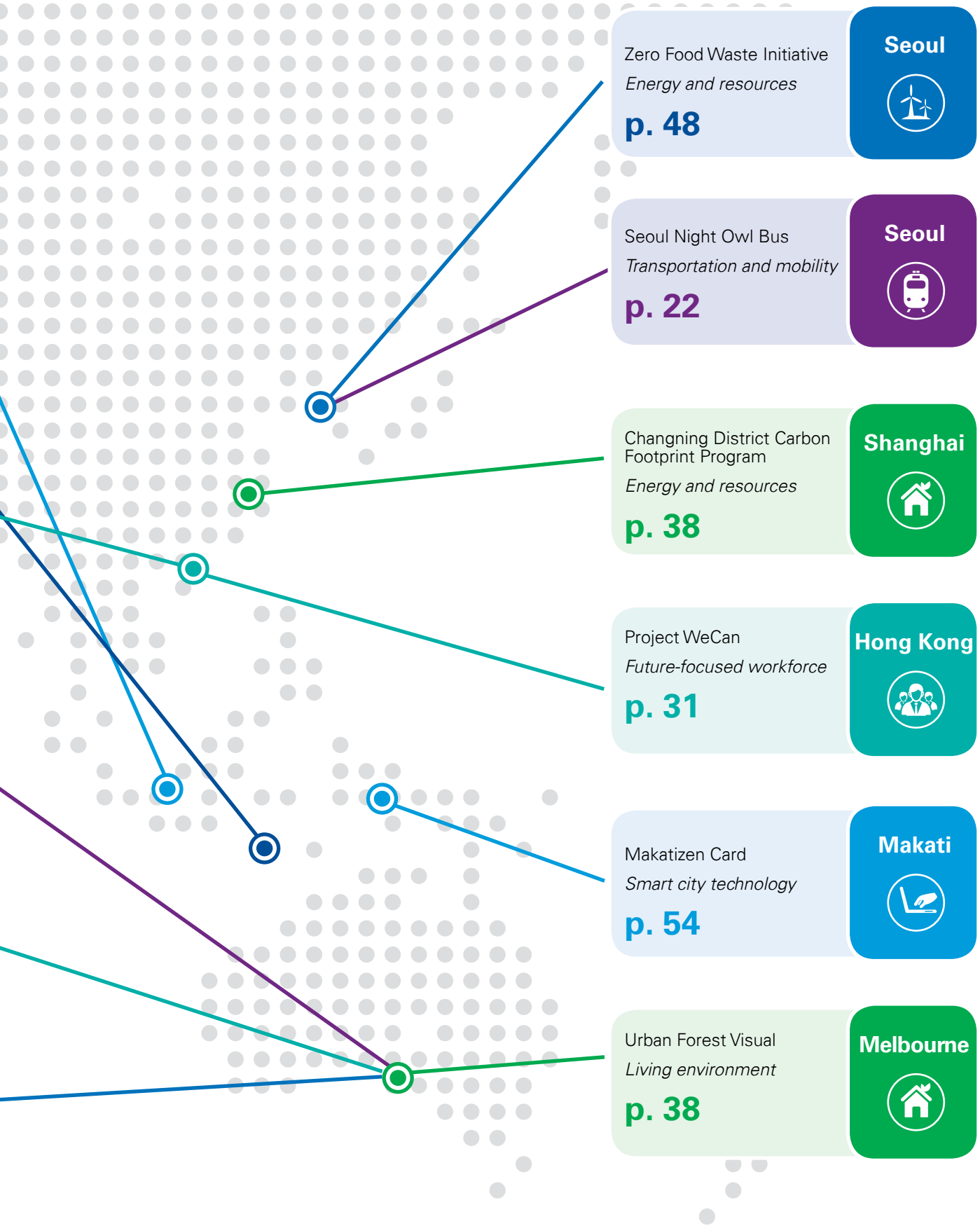

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Foreword

Our *Connected Cities: Citizen insights across Asia Pacific* report tracks the current state of smart city development in five Asia Pacific urban centres: Hong Kong, Melbourne, Seoul, Shanghai, and Singapore.

The survey seeks 4,192 residents' opinions on the smart city development areas that are most important to them as well, as what benefits they expect as their cities become 'smarter'. It takes a detailed look at progress and key development actions needed in six key areas: transportation and mobility, building a future-focused workforce, living environment, healthcare, energy and resources and technology solutions.

This year's study builds on our inaugural *Connecting Hong Kong* report published in January 2018. In that study, we defined what makes a 'liveable city'. In addition, for a city to be smart, its government needs to be conscious of the needs and wishes of its population and the potential impact – both positive and negative – of technological developments. This includes measures to enhance liveability by creating public amenities and promoting overall quality of life.

To further complement these findings, we include viewpoints from senior private sector and NGO practitioners, as well as case studies that showcase best practices across the region. We hope you find the report informative and we would like to thank all the participants and contributors for their valuable insights.

About the survey

KPMG commissioned YouGov to conduct an online survey of residents, 18 or older, in the five Asia Pacific cities. It was conducted in November 2018, receiving roughly an equal amount of responses from each location. In terms of the analysis, for some areas - transportation and mobility, education system, living environment and healthcare in particular - we also measured residents' opinion overall quality. Scores given for each are calculated on a five-point scale (1= lowest, 5=highest), based on an average of responses assigning numerical values to respondents' feedback (5 = 'Excellent', 4='Good', 3='Average', 2='Poor', 1='Very Poor'). Survey respondents could choose among the above word-based definitions of quality only and did not have a numerical choice.

Executive summary

Throughout Asia Pacific, countries are continuing to urbanise at a rapid pace. Strong population growth in cities is necessitating improved transportation links, more sustainable urban planning, and better management of energy and resources. Meanwhile, ageing populations in urban areas across the region reinforces the need to enhance and improve healthcare services and make cities more accessible for the elderly.

The survey analyses how five cities, Hong Kong, Melbourne, Seoul, Shanghai, and Singapore, are implementing initiatives to adapt to these developments. To better assess how smart city development initiatives align with citizen needs, our survey tracks residents' expectations and priorities for development in six focus areas: transportation and mobility, building a future focused workforce, living environment, healthcare, energy and resources and technology solutions.

Overall, residents identified creating a better living environment with thoughtful urban planning and design as the number one most important development area, cited by 51 percent of those polled.

This is followed by improving access and delivery of healthcare for residents as the second most important priority for cities' development overall, named by 49 percent of respondents in the five cities (including 51 percent in Hong Kong). Transportation and mobility is the third most important development priority (cited by 43 percent of all respondents), closely followed by developing a future-focused workforce, also a leading priority for all five of the cities listed (40 percent overall).

Looking deeper, the findings reveal noteworthy differences among the five cities in how these goals should be achieved, with highlights as follows:

Living environment: In Hong Kong in particular, residents see availability of affordable housing as the most needed change to improve living environment. In Shanghai, a large portion of residents we polled mentioned the need for more parks and green space as well as improvement of recycling and waste management infrastructure. Singapore residents we surveyed are especially concerned about making their living environment more accommodating for the elderly and disabled. Meanwhile, reducing pollution is a key concern for Seoul respondents.

In terms of preferred actions to improve living environment, Hong Kong respondents noted that improvements in land use are needed – including redevelopment of underused land and updating or renovating ageing buildings. In Shanghai, a key action mentioned by respondents is encouraging construction of green buildings and development of green building standards.

Healthcare: Overall, a top concern is how cities will cope with ageing populations and the demand this will place on healthcare systems. Across the board, respondents want to see a greater emphasis on preventative healthcare, such as check-ups, immunisations and health education. In Hong Kong, nearly half of residents polled cited the need for greater cooperation between the public and private sector on healthcare initiatives. Respondents in Singapore, Shanghai and Melbourne also listed this as a top priority. Shanghai residents also cited the need to improve predictive healthcare

applications that can utilise data analytics and artificial intelligence to improve treatment. As mentioned in our interview with the World Sustainable Smart Cities Organisation (WeGO), this reflects the need to better incorporate citizen participation into public private partnerships (PPPs) (see p. 16).

Transportation and mobility: With a large amount of mobility and infrastructure projects already underway in the Asia Pacific cities we polled, our survey findings highlight areas that should not be overlooked. Across the five cities surveyed, two important priorities for development are improved walkability and safety for pedestrians and more rail and underground transport links. The desire for more rail links is especially strong in Melbourne, where it is mentioned by 73 percent of respondents. In Seoul, more infrastructure for electric vehicles and incentives to drive them ranked high among residents' preferred areas for development. Meanwhile, Hong Kong respondents polled called for tighter regulation of private cars and vehicles.

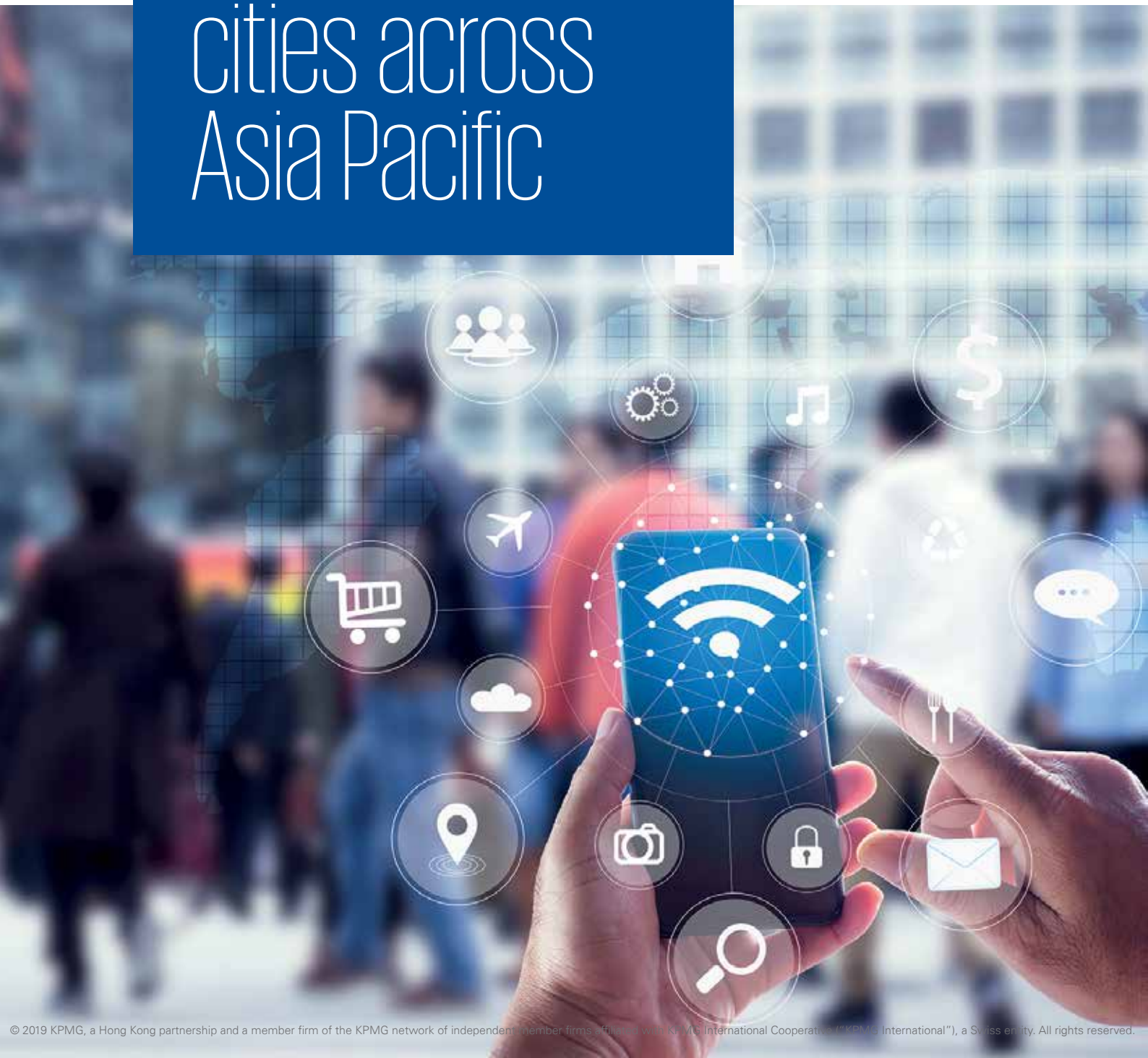
Building a future-focused workforce: In this area, which encompasses education, entrepreneurship and innovation, a key priority for residents polled is supporting continuing education and life-long learning. This reflects people's desires to retain relevant skills as technology disrupts traditional industries. Meanwhile, to build a stronger, more future-focused workforce, respondents prioritise education programmes that focus on creativity and risk-taking, and – especially in Hong Kong and Melbourne — more funding for education and research in science, technology, engineering, and mathematics (STEM) disciplines. Case studies in our future-focused workforce section (p. 30) further showcase how Asia Pacific cities and organisations are working to foster an innovation culture.

Energy and resources: Residents we polled felt especially strong about the need to improve energy efficiency and develop renewable energy sources in their cities, with 68 and 63 percent respectively citing these as key improvement areas. In terms of preferred actions to improve cities' management of energy and resources, residents surveyed in Seoul and Melbourne ranked making renewable energy a greater percentage of their city's overall power supply as their top choice. Meanwhile, in Hong Kong and Singapore, residents favoured incentives for residents to use energy- and water-saving home appliances. In Shanghai, respondents mentioned the use of technology to better manage the city's power grid as the most needed action.

The impact of technology: To better understand the impact of smart technology adoption, we measured residents' awareness and perceived benefit of nine commonly-implemented technology solutions. Overall, we find that as resident awareness increases, so does their impression that these technologies have a positive impact. Residents' views on whether specific technologies have a positive impact is also largely consistent across the five cities. The findings point to gaps in awareness where cities can increase their outreach efforts. They also emphasise that when communicating about technology initiatives, cities must focus on how such solutions improve quality of life.

Look to our next steps section (p. 58) for further commentary on the approach cities should take when developing smart city solutions.

Building smart cities across Asia Pacific



Introduction

In recent years, motivations for smart city development have shifted – from excitement over what digital technologies have to offer to a more thoughtful consideration of how these technologies can be put to work to improve the lives of citizens. As such, each of the five cities in our survey has developed its own comprehensive smart development plans.

In December 2017, Hong Kong published its Smart City Blueprint, a document intently focused on raising liveability standards. As it noted in the blueprint's introduction, a smart city is "people-centric" and should be built upon the needs of the people, with benefits that can be seen and felt by residents and visitors alike.

2018 was a landmark year for both technology and infrastructure development in Hong Kong, with the launch of the Faster Payment System (FPS) digital payment network and the Guangzhou-Shenzhen-Hong Kong Express Rail Link in September, and the opening of the Hong Kong-Zhuhai-Macau Bridge in October.

To follow up on these infrastructure improvements, the city is planning ambitious targets for smart development in the next two years – including a rollout of electronic identity (eID) for residents, a launch of commercial 5G, and a plan to replace half of coal-powered energy to the city's grid with renewable sources.

Five years ago, Singapore launched its Smart Nation initiative, at the heart of which are a number of strategic national projects aimed at improving daily life for Singaporeans. These include enabling e-payments, rolling out a national digital identity scheme, building a nationwide sensor platform, and increasing urban mobility with autonomous vehicles. Another major initiative is the development of a new, more agile platform to enable the government to deliver digital services to citizens faster and in a more cost-efficient way.

Melbourne is working towards smart city development initiatives that address climate change as well as the city's rapid population growth. It is currently working on a scheme to help people who are blind or hard of hearing move around the city more easily. Another one of its key smart city initiatives is an open data platform with almost 100 datasets that anyone can access and use, such as pedestrian tracking data for the city's busiest locations and real-time parking information, and a network of more than 400 solar-powered smart rubbish bins with sensors able to detect when they need emptying.

Seoul's Digital 2020 strategy forms part of a master plan for the city's residents to access high-quality digital services. Focus areas include communication between government and the public, efficient disaster response, more support for the digital industry, and the opening of a cloud centre. One key initiative, the Digital Civic Mayor's Office, brings together 167 different departments, 10 million data points and 800 CCTV cameras in real time, making it easier for everyone to track projects and policies.[1]

In Shanghai, one example of the city's efforts to build a smarter future is its plan to support greener buildings. A project in the city's Changning District has set the ambitious target of achieving a 20 percent reduction in energy use among the city's commercial and public buildings by 2036. The district also plans to construct a series of new 'zero-carbon emission' buildings in a pilot 'low-carbon' zone.

[1] Seoul Metropolitan Government, *Sustainable Seoul Smart City: Seoul e-Government*, December 2017. P. 40

Hong Kong milestones, December 2017 – present

2017

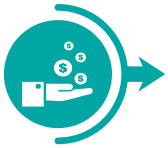
December

- HKSAR government releases its Smart City Blueprint, with the goal of making Hong Kong a world-class smart city in the next five years

2018

April

- Hong Kong Financial Secretary Paul Chan announces HKD 50 billion for research and development in biotechnology, artificial intelligence and fintech



2018

September

- Hong Kong Monetary Authority launches Faster Payment System (FPS), supporting instant payments in HKD or RMB with the use of mobile phone numbers, email addresses or QR codes.

2018

September

- Guangzhou-Shenzhen-Hong Kong Express Rail Link opens, reducing travel time from Hong Kong's West Kowloon station to Shenzhen to under 20 minutes and connecting Hong Kong to China's high speed rail network

2018

October

- Hong Kong-Zhuhai-Macau Bridge opens, improving Greater Bay Area transportation links and access to Hong Kong International Airport

Planned initiatives

2019

- Hong Kong Hospital Authority to set up a big data analytics platform to facilitate healthcare-related research

2020

- Hong Kong to provide all residents with a free electronic identify (eID) for authentication when conducting government and commercial transactions online
- As part of its Climate Action Plan 2030+, the city plans to reduce coal power to 25 percent of the energy supply compared to 47 percent in 2016
- Planned launch of 5G services and applications, enabling better implementation of Internet of Things (IoT)

Sources: Hong Kong Monetary Authority, Hong Kong Smart City Blueprint, MTR Corporation, Hong Kong Transport and Housing Bureau

Key survey findings

Our report shows that the surveyed Asia Pacific cities have much in common in their priorities for future development.

Across all five cities, creating a better living environment with thoughtful urban planning and design emerged as the overall top priority, cited by 51 percent of residents we polled (Figure 1.1). A close second was improving healthcare delivery and access for residents, chosen by 49 percent.

The survey also identified several key areas on which city planners can focus on. Reducing traffic congestion is a widely expected benefit from a 'smarter' city (cited by 54 percent overall), as is economic growth and improved delivery and management of public services (see figure 1.2).

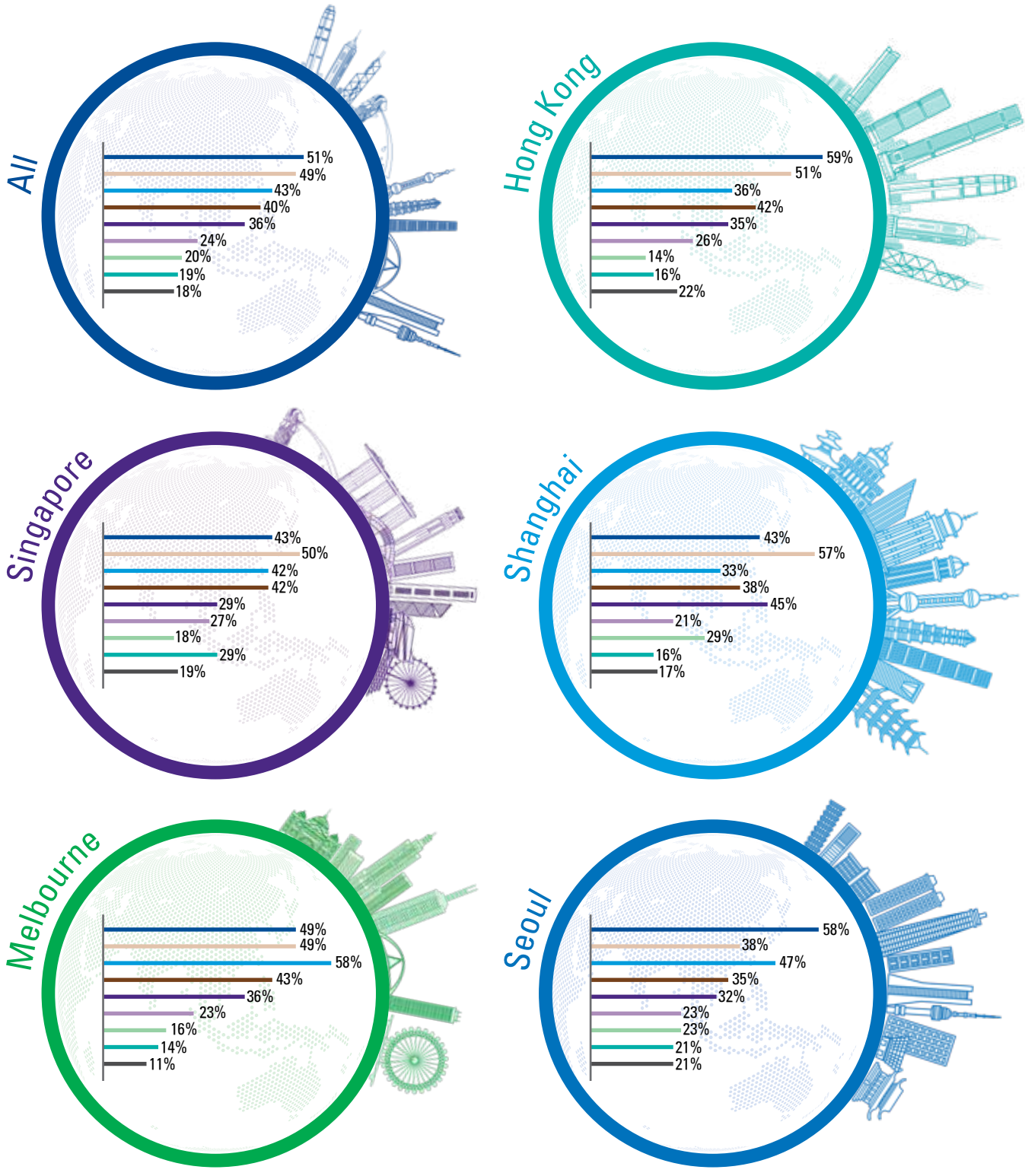
Demand for stepped-up environmental measures is also strong, with citizens everywhere wanting to see improved energy efficiency, a greater use of renewable energy and reductions in greenhouse gas emissions and carbon footprint.

Views of where cities should focus their efforts in order to ensure their continuing success and the expected benefits of living in a smarter city vary significantly from location to location.

For Hong Kong residents, the biggest wish for their city's continued success is for a better living environment with thoughtful urban planning and design (chosen by 59 percent of those polled), followed by improved access and delivery of healthcare (51 percent), and stronger education and development of a future-focused workforce (42 percent).

> *"It takes good planning and governance to make smart cities work. A framework that is respectful of cities' development context and goals, and highlights the necessary urban systems and enablers to achieve these goals, can offer valuable guidance to cities at varying stages of development"*
>
> ***Dr. Limin Hee***
> *Director,*
> *Centre for Liveable Cities Singapore*

Figure 1.1: Key development areas for your city's continued success



- Creating a better living environment with thoughtful urban planning and design
- Improving access and delivery of healthcare for residents
- Improving transportation and mobility
- Strengthening education and developing a future-focused workforce
- Improving use and conservation of energy and resources and reducing carbon footprint
- Improving technology infrastructure
- Support for entrepreneurs and creating a culture of innovation
- Strengthening citizen engagement
- Digitising public services

Source: KPMG survey analysis

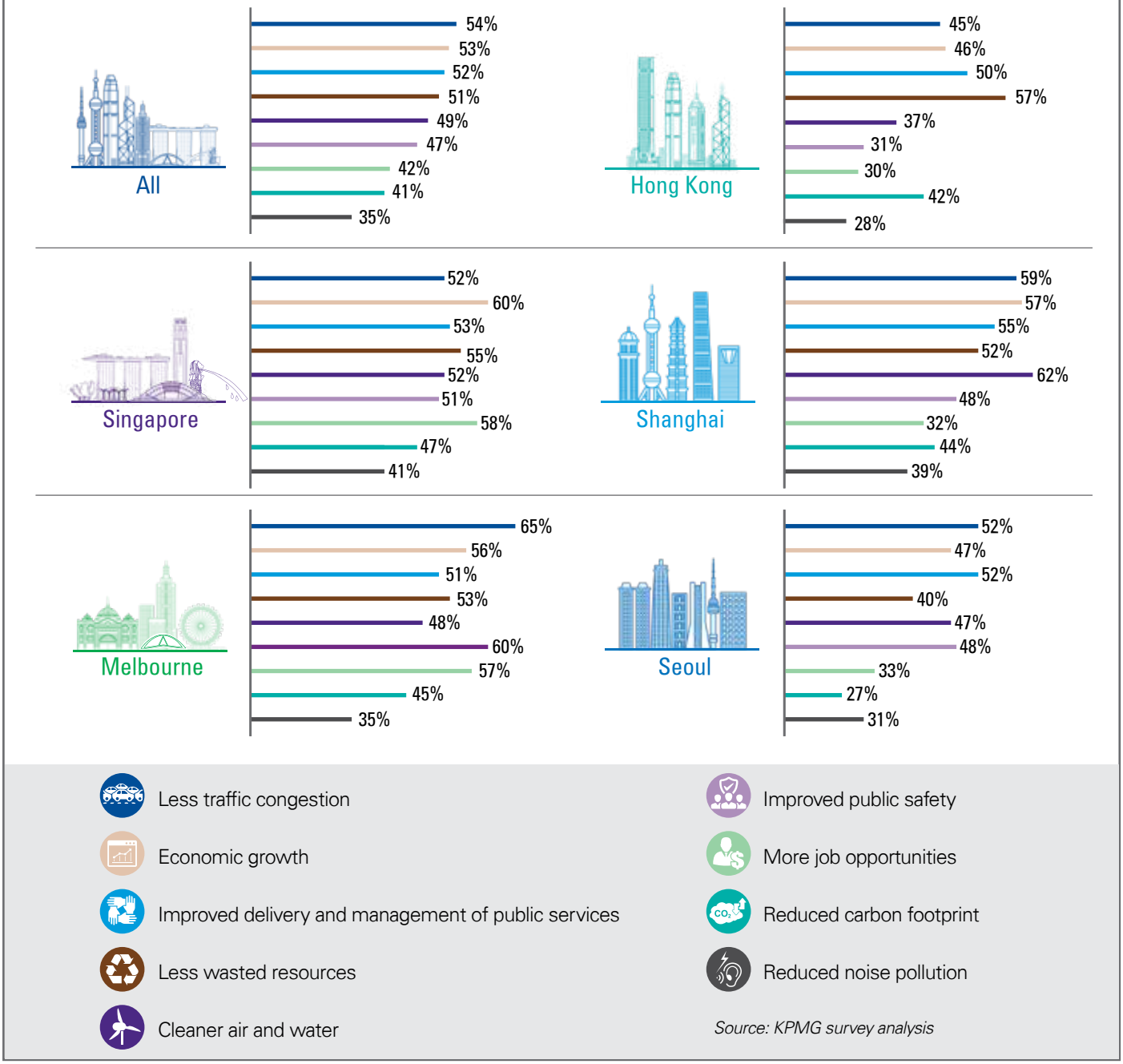
For residents in Seoul, the creation of a better living environment is the most pressing issue (chosen by 58 percent), with improving access and delivery of healthcare also a leading concern. Meanwhile, in Shanghai and Singapore, improving access to and delivery of healthcare is the top-ranked concern, while in Melbourne it is improving transportation and mobility.

The survey also revealed some noteworthy variations in outlook among the five cities.

For example, Shanghai residents more often cited technology-driven solutions as opposed to conventional solutions as key actions needed, compared to the other four cities. In Shanghai, 57 percent favour utilising technology to better manage their city's power grid, considerably higher than respondents in the other four cities (see Figure 6.2). Meanwhile, people in Hong Kong, judging from quality ratings in various sectors we measured, would like to see changes in their city's education system and, especially, greater availability of affordable housing.

As the findings of this report show, comparing and contrasting what residents in five of Asia Pacific's most important cities think about smart city issues has some major benefits. It highlights those areas which people think their cities are getting right; it points to where people would like to see more effort; and it offers some useful ways in which cities can draw on the experiences of their peer cities to strengthen their performance.

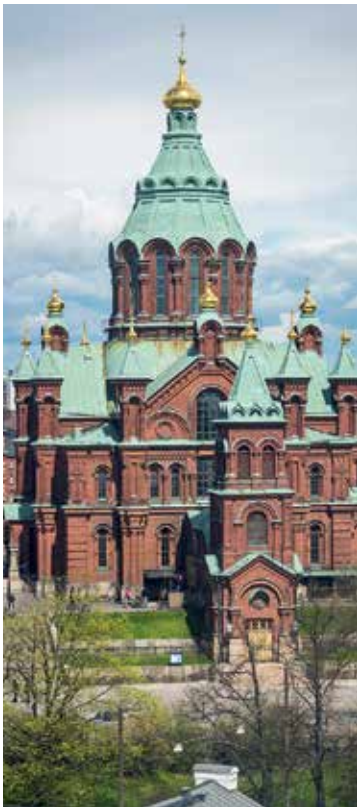
Figure 1.2: Expected benefits from a "smarter" city



Source: KPMG survey analysis

Case studies

Helsinki: Six City Strategy



When it comes to smart technology, Finland believes there is strength in numbers. The country's Six City Strategy taps the innovation of its six largest cities to generate ideas, develop projects and share how solutions can be implemented on common issues. Helsinki, Espoo, Vantaa, Tampere, Turku and Oulu together hold one-third of Finland's population, account for 40 percent of all jobs and generate in their metropolitan areas 60 percent of national GDP.

Materialising from a shared goal of the cities' officials to strengthen their economic competitiveness, the strategy launched in 2013 and is budgeted under a government programme called Sustainable Growth and Jobs 2014-2020. The cities share access to large amounts of data relating to the environment, traffic conditions, financial information and other sectors.

Coordinators from the cities meet weekly to discuss smart technology projects and give updates on their development. To date, more than 100 companies, including many high-tech firms, are engaged in development projects and piloting new solutions with Six City. Projects require at least two participating cities to go forward. While not every project can be scaled to all six cities, pilot programmes help determine viability, and at any time, about 30 projects are up and running.

As an example, a project called Last Mile in Helsinki and Espoo addresses the difficulty of getting people from a transportation hub like a bus depot to their final destination. Last Mile pilot programmes include smart solutions such as e-bikes with audio-guided tours and a ride-hailing system relying on boats.

Sources: Six City Strategy Office, Forum Virium Helsinki

Jakarta: A smart approach to urban development

Jakarta takes its waste management seriously. To that effect it launched smart city initiatives in 2015 to tackle the issue and other urban challenges based on real-time data compiled on a citywide scale.

A programme called a waste bank, for example, encourages residents to sort their rubbish between organic and non-organic items in return for cash. An intermediate treatment facility is now under construction to help manage the waste. It is expected to be fully operational in 2021 and process approximately 2,000 tons daily in a city where about 7,800 tons of rubbish go to landfill daily.

In another initiative, an app based on flooding data, for example, shows Jakarta residents the areas of town that are submerged in water due to heavy rains. The app also details the condition of water pumps and where people can seek help from government departments.

Meanwhile, smart maps draw real-time data from about 7,300 CCTVs across Jakarta to store information on everything from land prices to hospital room availability to food prices. The maps help residents be more informed consumers and guide officials in allocating resources to areas and issues based on need. Towards this end, officials enlist the Internet of Things to track the movement of public buses, ambulances and garbage trucks.

Sources: Jakarta Smart City, WeGO

Harnessing the United Nations Sustainable Development Goals and New Urban Agenda in smart city planning

Cities across Asia Pacific already recognise the importance of data to support planning and urban development. But what kind of data should be collected, and how can cities build a high-quality data infrastructure that enables them to make better informed policy decisions?

In 2015, 193 nations committed to adopt the United Nations Sustainable Development Goals (SDGs), a list of 17 goals aimed at ending poverty, protecting the planet and ensuring prosperity for all. This was followed by the adoption of the New Urban Agenda (NUA) by 167 nations in 2016 – a set of global standards for how we plan, manage and live in cities.

Far-reaching in ambition, the UN SDGs can be considered as frameworks for deep societal innovation, for which data plays a big role. For example, SDG 11 calls for "a direct participation structure of civil society in urban planning and management" while SDG 16 calls for "responsive, inclusive, participatory and representative decision-making at all levels." The NUA further calls for information and communications technologies and systems to be "open or provided to the public".

To this end, open data projects present a prime opportunity for greater citizen involvement in urban affairs. As we are already seeing in major urban centres across Asia Pacific from Seoul to Singapore, more government-citizen collaboration leads to better ideas and innovative practices to tackle persistent urban problems. However, more can be done to make such efforts inclusive to all citizens, including economically disadvantaged residents. One example could be utilising technology to track the contributions of informal 'waste pickers' to urban waste management systems in Asian cities, to better show how they contribute to city economies.

As they plan their 'smart city' agendas, mayors and other officials should make better use of the UN SDGs and NUA guidelines and tools to ensure their cities are not only well-connected but also more sustainable.

Waltraut Ritter
Principal
Knowledge Dialogues

The United Nations Sustainable Development Goals

Source: United Nations, About the United Nations Sustainable Development Goals.
https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Kyong-yul Lee

Secretary General
World Smart Sustainable
Cities Organization (WeGO)

Pathways to success in smart city development initiatives

Technology is constantly evolving, providing cities with numerous ways to be more connected, efficient, transparent, and interactive. The transformative potential of artificial intelligence, blockchain, augmented and virtual reality, 5G and cloud, IoT, and cashless technologies for cities is still being unlocked. To make best use of these new tools, it is important for Asia Pacific cities to attract the right partners and know how to measure success.

Established in 2010, the World Smart Sustainable Cities Organization (WeGO) is an international organisation that pursues smart sustainable city development around the world. Headquartered in Seoul, its membership currently consists of 131 cities and local governments, seven national and regional institutions, and 13 corporations worldwide, with a particularly strong presence in Asia Pacific. The organisation's programmes range from knowledge sharing and matchmaking to the implementation and testing of smart city solutions in member cities.

One factor that can influence success is a city's perceived transparency and willingness to engage in civic innovation, says Kyong-yul Lee, secretary general of WeGO. A good example for cities to follow in this regard is Seoul's Open Data Plaza project, through which the government shares data on the environment, healthcare, traffic, urban management and other services. "The Open Data Plaza allows private companies or citizens to extract the data that they need and come up with new services that benefit the public," Lee says.

To better identify and solve problems, governments also need to engage citizens to make sure they are actively involved, Lee says. With the help of social networking services it is easier for city officials to communicate and share positive experiences with the public. "Putting initiatives in the right light helps to overcome potential resistance," he says.

Another way to support cities' smart transformation initiatives is to match them with private sector and NGO partners who can help them carry out pilot projects. One of WeGO's programmes includes conducting a feasibility study and pilot in a beneficiary city selected from a pool of applications. WeGO matches the target city with a private partner who then carries out the study and runs the pilot project.

'PPPP': A new approach to PPP

Developing public private partnerships (PPPs) for smart city development projects is a major implementation route. However, some of the biggest challenges of PPPs are developing mutual trust as well as aligning on a project's proposed risk and revenue model, Lee says. In developing PPPs, WeGO finds it important to incorporate citizen participation, to form what they call "public-private people partnerships" (PPPPs).

"The civic sector can serve as a mediating force between the government and the private sector, as the goals between the two entities are not always aligned," Lee says. Having citizens involved in the decision-making process is key because it can help the government to consider which partnerships it considers to be most essential.

One of the best ways to forge successful PPPPs, Lee adds, is to set up an open research and innovation process known as a "living lab". This allows for the parties involved to test out not only the actual project but also their working relationship.

With a successfully implemented living lab, it is much easier to obtain additional funding as there is proof of concept.

Advancing projects beyond the pilot phase

Despite a successful pilot, many smart city projects face barriers to wider adoption due to a lack of available financing. In addition, other issues might include the lack of a holistic strategy, slow rollout of infrastructure, or limited technical capacity.

To secure financing for the projects it works with, WeGO partners with multilateral development organisations like the World Bank, national agencies and private companies. When applying for funding, development agencies differ in their specific requirements but generally require a letter of intent from the city as well as proof of concept.

In addition to securing the appropriate funding, success in implementing large-scale development projects requires strong support and vision from the relevant public and private sector leaders, Lee says.

Alexandra Sidorova and Andrew Lim, senior program officers at WeGO, contributed to this article.

Eric Chong

President and CEO
Siemens Ltd.

Keith Cheng

Head of Hong Kong
Digitalization Hub

MindSphere Application
Center – City, Siemens Ltd.

IoT solutions for a smarter Hong Kong

As the challenges posed by ageing populations and climate change become more immediate, sustainable urban development has emerged as a pressing goal for Asia's cities.

Eric Chong, president and CEO of Siemens Hong Kong and Macao, believes achieving sustainability is only possible if cities can harness the power of big data to efficiently and proactively solve problems.

"As urban populations age, finding a more efficient way to manage assets with fewer people will be a major imperative for cities," he says.

Marshalling all that data

While technology allows people to come up with solutions for these areas, the key enabler will be data collection and analysis: in short, putting information to work in ways that allow cities to act more efficiently and effectively.

For Hong Kong, part of Siemens' answer on how best to marshal and organise data is its Smart City Digital Hub, an IoT research centre it opened in December 2017 in Hong Kong Science Park.

The centre has two objectives: first, to help users digitise their operations, and second, to build an ecosystem that can support everyone from the biggest of companies to the youngest of startups.

Thus far the centre has signed memorandums of understanding (MOUs) with major Hong Kong entities such as CLP, MTR and the Smart City Consortium. The centre also has an agreement with the city's Vocational Training Council for talent development and is working with PhD students at universities locally to bring them up to speed on digital transformation.

Smart City Digital Hub is crafting an AI model that can predict energy consumption in buildings throughout the Science Park. To date, the model has achieved an accuracy rate exceeding 90 percent. This allows for energy savings that reach double-digit percentages, Chong says.

An open data and IoT network for Hong Kong

An important aspect of Siemens' solution is MindSphere, its cloud-based Internet of Things operating system. Businesses can use MindSphere to connect their plants, systems, machines and products, and then carry out advanced analytics on the information each component generates. The results are displayed via "dashboards", which are custom-built and detail how systems and processes are performing in light of insights gained from the analytics process.

Smart City Digital Hub head Keith Cheng describes MindSphere as "a Swiss army knife" for data, providing multiple connections through a host of devices, allowing information to be collected and then used to conduct analytics tasks. As an open system, MindSphere and the various apps Siemens has developed for it are available.

In the Science Park, MindSphere is embedded in sensor boxes installed on lamp posts, gathering data on pollution and monitoring vehicular and pedestrian traffic.

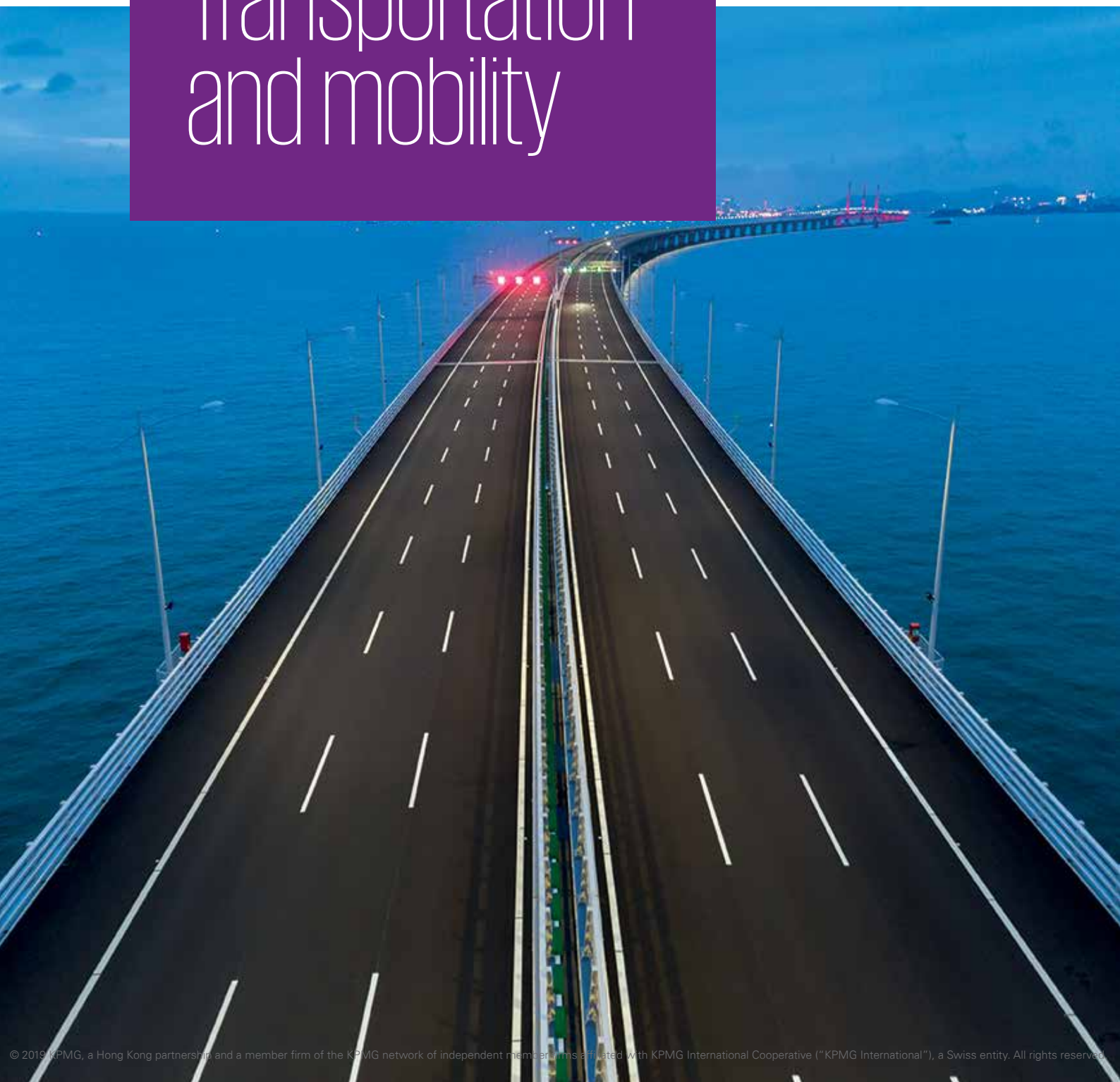
It furnishes real-time information to the public about road congestion or potential accident hotspots as well as makes conditions better for autonomous vehicles. In each functionality, MindSphere offers decision-makers cost-benefit analysis tools to improve city planning and governance.

Such a system paves the way for any number of smart city services, Chong says. Now the task is to share the know-how.

"We're launching a developer community with students, startups, SMEs and MNCs to develop ideas and share what everyone has been doing," Chong says. "Starting from the Science Park, the vision is to scale to other parts of Hong Kong, and then elsewhere across Asia."

> *"As urban populations age, finding a more efficient way to manage assets with fewer people will be a major imperative for cities"*
>
> ***Eric Chong***

Transportation and mobility



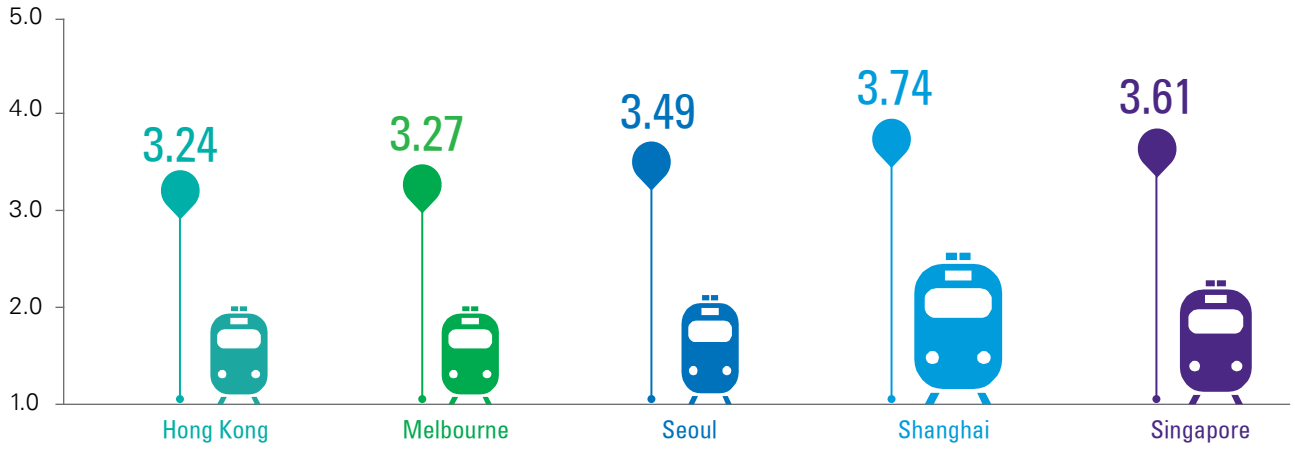
An effective public transportation system helps communities as a whole by providing access to jobs, healthcare and education centres.

Improving transportation and mobility is a key priority for smart city development across all of the five cities we surveyed. In particular, less traffic congestion is the top-ranked expected benefit of a "smarter" city (see Figure 1.2), and the third most important development priority overall (see Figure 1.1).

In Hong Kong, residents' average rating of the quality of the city's transportation and mobility infrastructure ranks below other cities polled (3.24 on our five-point scale).[2] Shanghai residents give their system the highest average rating (3.74) followed by Singapore (3.61), Seoul (3.49) and Melbourne (3.27).

Figure 2.1: Quality of your city's public transportation and mobility infrastructure

Average of citizen ratings, from 1 (lowest) to 5 (highest)



Source: KPMG survey analysis

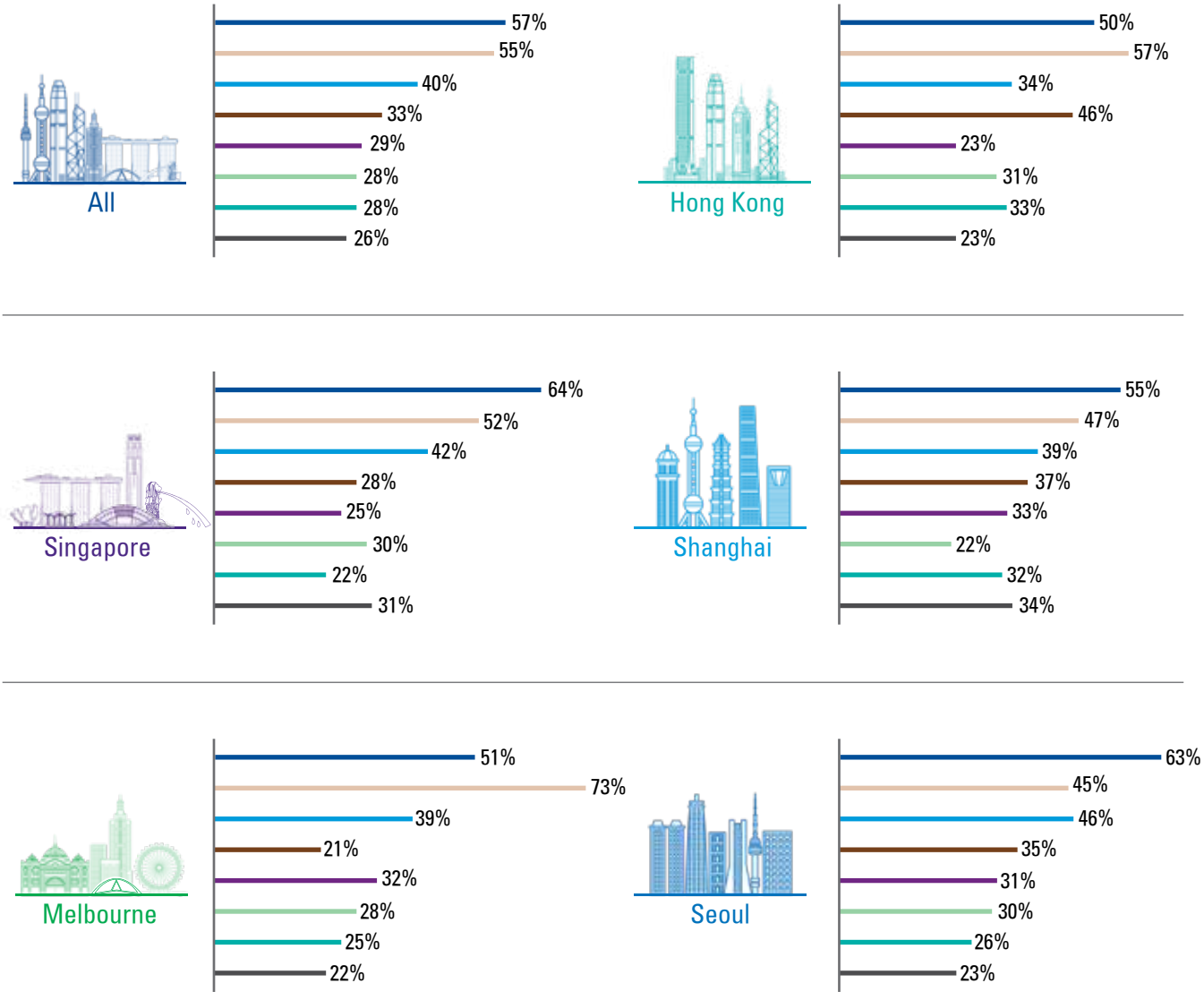
The ratings reflect residents' growing expectations for transportation and mobility services as well as changing attitudes on private vehicle ownership in some locations. Hong Kong's relatively low ranking compared to the other cities may seem counterintuitive given that the city's public transport network and airport are consistently ranked among the best in the world. However, a rise in traffic congestion due to a steady increase in the number of cars on the road may be influencing public opinion, according to an interview with Wilson Group, Hong Kong's largest car park operator (see p. 23).

Meanwhile, Hong Kong's transport links both within the city and between the city and other parts of the Greater Bay Area continue to strengthen. The opening of the Hong Kong Express Rail Link in September 2018 cut cross-border journey times to Guangzhou to 50 minutes and to Shenzhen to less than 20 minutes,[3] while the Hong Kong-Macau-Zhuhai Bridge, which began operation in October, has simplified travel to the western side of the Pearl River Delta.

[2] Please see 'About the survey' on p. 4 for more information on rating scores

[3] MTR, High Speed Rail Short-Haul Timetable, updated 2018. https://www.highspeed.mtr.com.hk/res/pdf/short-haul-train-timetable-tc.pdf

Figure 2.2: Actions needed to improve transportation and mobility



Source: KPMG survey analysis

Melbourne's top priority to improve transport and mobility, according to residents polled, is constructing more rail and underground transport links, voiced by 73 percent of respondents (see Figure 2.2). The city of Melbourne is addressing these concerns by refreshing its seven-year-old Transport Strategy,[4] which previously set a goal that 90 percent of commuter trips to the city's central business district will be by public transport, cycling or walking by 2020, compared to 72 percent in 2006.[5] The Victoria Government is also investing AUD 38 billion (USD 27.3 billion) in major infrastructure and smart technology projects and a further AUD 10 billion (USD 7.1 billion) to upgrade the state's roads, rails and ports. A key initiative is constructing a Metro Tunnel in Melbourne to run more trains in and out of the city.[6]

Elsewhere, residents in Singapore, Seoul and Shanghai all rated improved walkability and safety for pedestrians as their top need. As highlighted earlier in this report, this finding appears to reflect changing attitudes that 'smart cities' should offer a high level of liveability in addition to convenience in order to attract both residents and businesses.

Meanwhile, encouraging the greater use of electric vehicles via building infrastructure or offering incentives also receives significant support across all cities — particularly in Seoul, where it is backed by 46 percent.

Hong Kong residents are the keenest advocates of tighter regulation of private cars and vehicles, supported by 46 percent, well above the overall average of 33 percent for all cities, and especially Melbourne (21 percent).

Hong Kong respondents are also the strongest backers of smart toll and parking systems, cited by 33 percent as an action that would improve mobility in the city. This will come as good news for the city's Transport Department, which in October 2018 invited tenders for two contracts to develop and operate next-generation parking meters. The meters, due to be installed this year, will be capable of supporting remote payment through mobile applications and equipped with sensors that can pass information about vacant spaces to motorists in real time.[7]

[4] City of Melbourne, Transport Strategy Refresh, 2018. https://participate.melbourne.vic.gov.au/transportstrategy

[5] City of Melbourne, Transport Strategy: Key directions and actions, 2012. https://www.melbourne.vic.gov.au/parking-and-transport/transport-planning-projects/Pages/transport-strategy.aspx

[6] Victoria State Government, updated 7 October 2018. https://transport.vic.gov.au/our-transport-future/our-projects

[7] Hong Kong Transport Department Press Release, 26 October 2018. https://www.td.gov.hk/en/publications_and_press_releases/press_releases/transport_department/index_id_3070.html

Smart Data Takes Off at Hong Kong International Airport

Hong Kong International Airport has turned to data in order to enhance operational efficiencies with the help of its Digital Twin, a 3D computer-generated replica of the airport's physical layout and functions.

The twin collects real-time data fed from Internet of Things devices deployed throughout the airport. Using past, current and predictive data, it can create virtual reality models useful for making decisions about design, construction, operations and maintenance. This allows airport operators to visualise potential challenges and allocate resources more effectively, ultimately helping to keep passenger traffic flowing and more accurately track cargo volume.

"The Digital Twin's lifelike visualisation helps us to streamline our design review for new construction projects, especially as we use more off-site construction methods which require careful planning," Hong Kong Airport Authority Chief Information Officer Andy Bien says. "Also, using predictive analytics, it can provide alerts that inform how we deploy resources, resulting in cost savings and improved service."

The Digital Twin has been completed for most of the customer-facing areas of Terminal 1. Remaining areas of the airport will be added through 2019.

Source: Hong Kong Airport Authority

Case studies

Seoul: Night Owl Bus

Seoul's "Owl Bus" is a public transportation system that operates locally between midnight and 5am, offering a safe and affordable way to travel. Launched in 2013 after officials carried out surveys through a call centre and city blog, the initiative draws upon big data to identify which routes would serve commuting needs best. Owl Bus has lowered transportation costs while providing greater convenience to nearly 12,000 passengers daily.

Since 2016, Owl Bus has comprised 72 buses for nine routes – a significant increase from the 45 buses for eight routes introduced in 2013. On average, the buses come every 25 to 30 minutes and cost passengers around a quarter of what a typical taxi ride would.

The main beneficiaries are those living on the socioeconomic margins who need to commute during the bus system's service hours. Passengers can also access real-time service information while on board. Owl Bus now operates on a quasi-public basis, with the city managing the routes and revenues as private companies run the buses.

Sources: Seoul Metropolitan Government, WeGO

Melbourne: 24-hour Pedestrian Counting System

With some 727,000 pedestrians traversing Melbourne daily, a more walkable city is a key priority for officials. The Pedestrian Counting System uses a network of 55 automated sensors on Melbourne's urban streets to collect data and transmit it to a centralised server. The sensors are mounted on awnings and light poles, monitoring multi-directional people movement in high-traffic locations.

The data provides concrete information to justify spending public resources on improving walkability. By comparing foot traffic with previous time periods, city officials can measure the effects of infrastructure, address risk areas for mobility, improve energy response planning and enhance future strategies for walking in the city. The system is also used to help boost pedestrian safety, extreme weather planning and management of traffic flow and crowds for major street events.

Giving insights to retail business owners on how best to attract walk-in customers, the information is available on an online portal accessible to the public. The aim is to generate more business through a safer and more convenient pedestrian experience.

Source: City of Melbourne

Henry Louie

Managing Director
Wilson Group

Bringing smart mobility to Hong Kong

Hong Kong's public transportation system is well developed in terms of overall reach, convenience and cost. However, rising car ownership is presenting a challenge to urban mobility.

Last year, the city saw net growth in cars and drivers on the road – with private car registrations growing more than 2 percent, according to Transport Department figures.

With traffic congestion commonly cited as a major concern for Asia Pacific cities, 'smart mobility' solutions leverage newly available technology to help reduce delays and hassles and get to their destination more quickly and easily. For Wilson Group, Hong Kong's biggest car park operator, smart mobility means using technology to help customers save time and get them on their way faster.

"The principal objective is how to make things more convenient," says Henry Louie, Wilson Group's managing director. One way is through automated payments. The company's 300-plus car parks around the city have long been cashless – customers can pay using their Octopus card, credit card or UnionPay. In the future, systems that recognise your vehicle can collect your payment automatically and allow easy entry and exit – without the need to roll down your window, Louie says.

To help people find a place to park, Wilson already has an app that can advise the location of its car parks and available spaces. This year, Wilson will introduce a new shared economy app, 'Let's Park', that will provide a platform linking individual and corporate owners of available spaces to motorists looking for a space. "Hong Kong has a lack of parking spaces, while many existing spaces are underutilised. 'Let's Park' extends Wilson's desire to make life more convenient for motorists," Louie says.

Helping vehicles move more efficiently

Improving vehicle traffic in cities means reducing delays at choke points. Next year, the government will introduce licence vehicle labels featuring radio frequency identification (RFID) technology that will allow free-flow tolling. This means cars will no longer need to stop or slow down at tollgates, which should help to improve traffic flow, Louie says.

Better technology also opens the way for better law enforcement, Louie adds. Improved camera systems can allow police to monitor whether drivers are using their mobile phones, not wearing seatbelts or committing other traffic offences, and assess fines accordingly.

The current challenge for officials, Louie explains, is keeping pace with technological change. "Many technology solutions already exist that can help ease traffic problems or move mobility towards being more sustainable, but many of them call for changes in regulations or updating tendering procedures to bring them in line with new practices and solutions," he says.

Creating opportunities for businesses

Nonetheless, Louie points out that the urgent need to create smart mobility solutions for Asia Pacific cities has the potential to benefit a wide range of private sector players, including technology companies and startups.

Wilson has been evolving to suit the times, Louie says. In addition to operating its car parks, Wilson supplies and operates on-street parking meters, equipment for monitoring traffic and electronic toll collection, licence plate recognition and other traffic-related systems.

The company is now looking to leverage its experience with these technologies to play a greater role in helping Hong Kong develop smart transportation solutions. "As we shift from being a parking provider to offering smart mobility solutions, it is creating lots of new opportunities for our business," Louie concludes.

> *"As we shift from being a parking provider to offering smart mobility solutions, it is creating lots of new opportunities for our business"*

Building a future-focused workforce

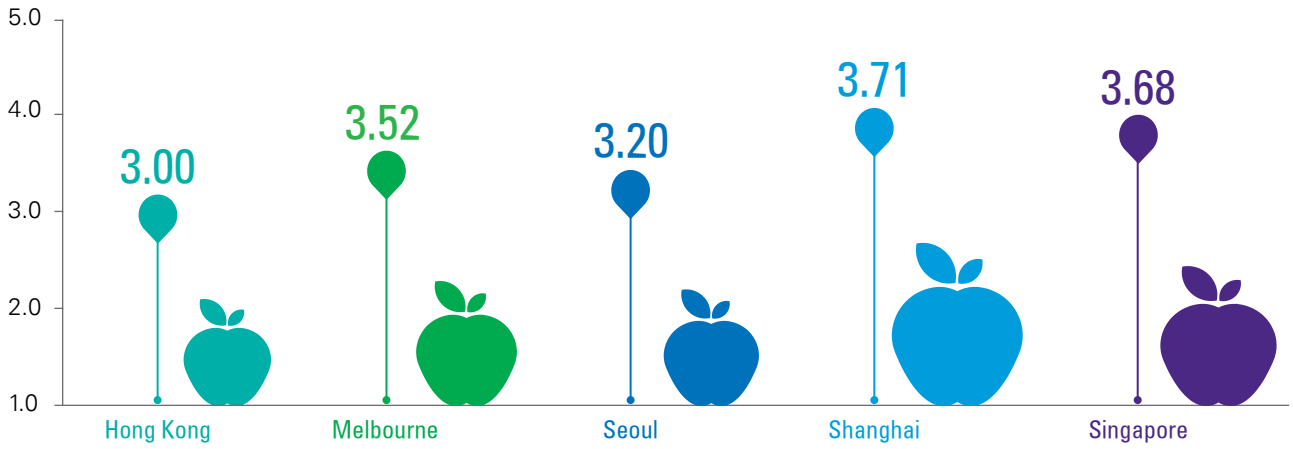
A smart city begins with smart citizens who are more engaged in civil society, more innovative and more able to adapt to disruptions caused by technology and other factors.

As such, strengthening education and developing a future-focused workforce is a top priority for all five cities in our survey, mentioned by 40 percent of 4,000 residents polled. This includes 43 percent in Melbourne, 42 percent in Hong Kong and Singapore, 38 percent in Shanghai and 35 percent in Seoul — (see Figure 1.1).

Evaluating the capability of education programmes in the cities we surveyed to prepare workers for the future is an important place to start. Views on existing education programmes differ widely across the five locations, with Shanghai residents ranking their city the highest, with an average rating of 3.71, a little ahead of Singapore (3.68), Melbourne in the middle (3.52) and Seoul and Hong Kong the least satisfied (3.2 and 3.0 respectively).

Figure 3.1: Quality of your city's public and private education programmes

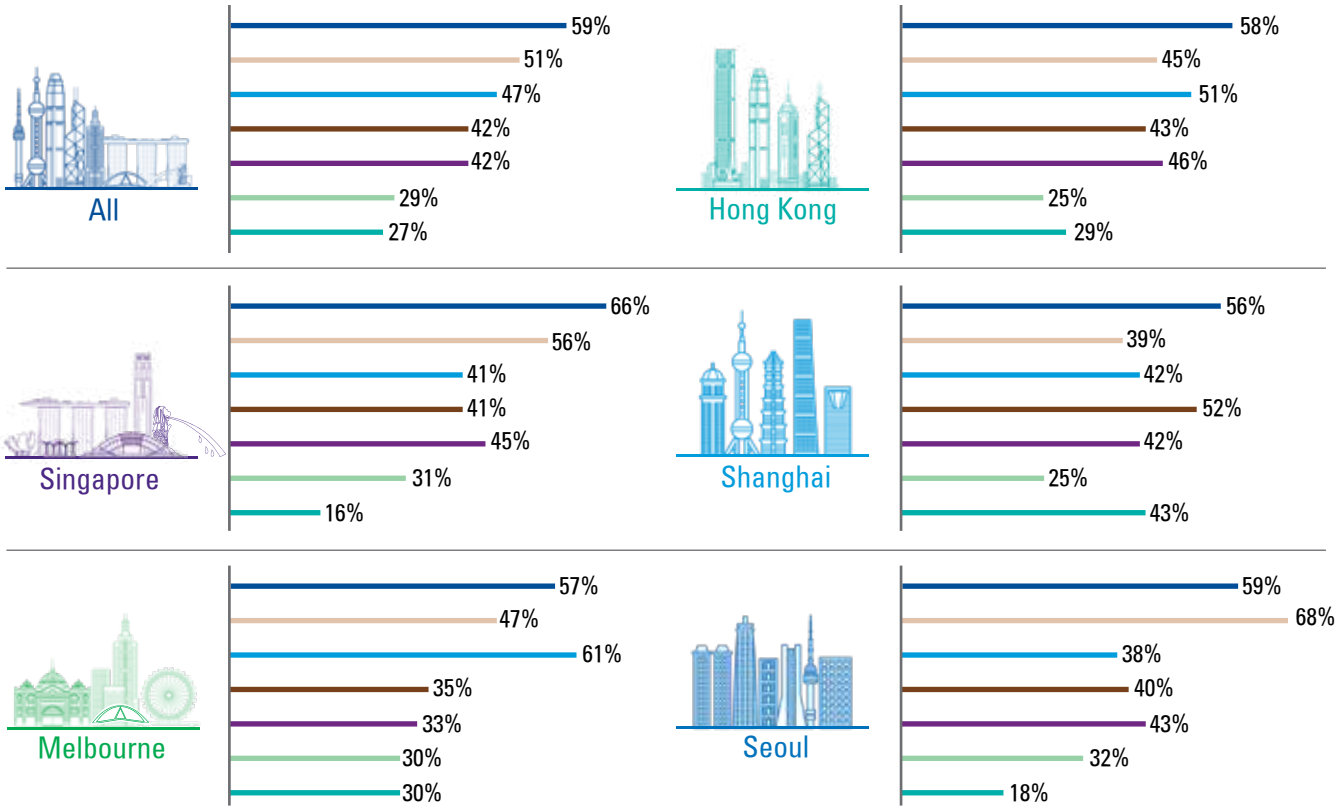
Average of citizen ratings, from 1 (lowest) to 5 (highest)



Source: KPMG survey analysis

When it comes to education, the top cited action needed for development overall (and also specifically for Hong Kong, Shanghai and Singapore) is greater encouragement of continuous education and lifelong learning, noted by 59 percent of survey respondents (see Figure 3.2). In Seoul, encouraging creativity and risk-taking is the standout priority, selected by 68 percent of respondents.

Figure 3.2: Key actions to accelerate education development in your city



Source: KPMG survey analysis

In Melbourne and Hong Kong, a key priority among those surveyed is for greater funding for education and research in the "STEM" disciplines — science, technology, engineering, and mathematics.

In her 2018 policy address, Hong Kong Chief Executive Carrie Lam reaffirmed the importance of supporting STEM education to promote innovation. To this end, the city announced plans for the first school in Hong Kong with STEM as the focus of its curriculum planning as well as HKD 500 million (USD 63.7 million) to organise a "City Innovation & Technology Grand Challenge" annual competition.[8]

In Shanghai, 52 percent of residents would like to see an increase in smart city and innovation technology training for professionals at different levels – a notably higher percentage compared to the other cities surveyed.

Two actions that elicit comparatively little support are providing mandatory coding/programming training, and attracting top scholars and professors to do research or teach, both of which are mentioned by less than 30 percent of overall respondents. Shanghai was an exception in this area, with 43 percent supporting visiting scholars and professors as a key action to promote education development.

[8] Hong Kong SAR Government, "The Chief Executive's 2018 Policy Address". https://www.info.gov.hk/gia/general/201810/10/P2018101000207.htm

Encouraging entrepreneurship and innovation

As cities roll out their smart development agendas, fostering a culture of entrepreneurship and innovation is an integral way they can develop and execute the solutions necessary to respond to future challenges. Our survey measures residents' opinions on six common ways that cities can support an entrepreneurial ecosystem.

Measures that gain the most support across all five Asia Pacific cities we surveyed are improved access to capital and funding and tax incentives to start a business or invest in research and development, cited by 71 and 69 percent of respondents respectively (Figure 3.4). Ranking third and fourth are easier business registration and licensing regulations or processes (57 percent) and mentoring programs for entrepreneurs (51 percent). Supporting student entrepreneur competitions and cross-border student exchange programmes measured considerably lower at 26 and 24 percent of overall respondents.

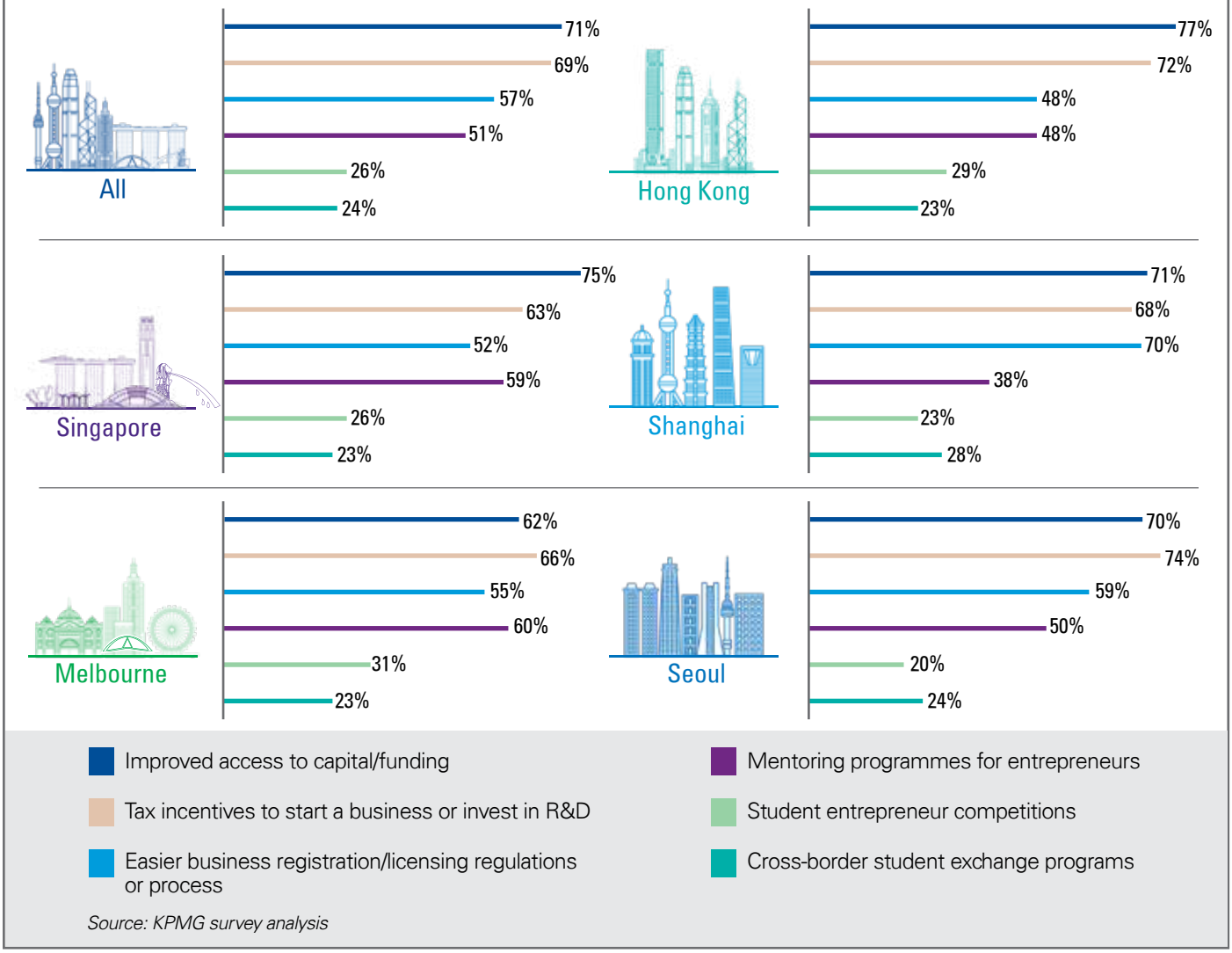
Residents' preferred measures to support entrepreneurs were largely consistent among the five cities we polled; however, the cities differed in their top choices. In Shanghai, residents polled felt more strongly about the need to ease business registration processes to support the entrepreneurship ecosystem, with 70 percent citing it as a key area of improvement. In Seoul, 74 percent of respondents, a higher number compared to other cities surveyed, mentioned tax incentives to start a business as a key factor. Residents in Melbourne were more mixed about the key improvement needed, favouring access to capital, tax incentives and mentoring programmes as their top three choices.

In Hong Kong, the standout action is improved access to capital and funding (77 percent). This echoes the findings of a July 2018 joint KPMG/Alibaba Entrepreneurs Fund (AEF) study which lists expanded access to capital and financial services as a key recommendation to strengthen the city's entrepreneurial ecosystem.[9]

> *"With today's business climate in a constant state of disruption, businesses must equip their workers with the right tools to stay ahead of the pace of change. This includes investing in the right technologies to adopt data-driven efficiencies. But it also means investing in people – nurturing the right talent to encourage innovation from within the organisation"*
>
> ***Anson Bailey***
> *Head of Technology, Hong Kong;*
> *Head of Consumer & Retail, ASPAC*
> *KPMG China*

[9] KPMG and Alibaba Entrepreneurs Fund, Transforming Hong Kong Through Entrepreneurship, July 2018. https://home.kpmg/cn/en/home/insights/2018/07/transforming-hong-kong-through-entrepreneurship.html (Further cited in this report as KPMG/AEF Study)

Figure 3.3: Key factors to improve support for your city's entrepreneurs



Source: KPMG survey analysis

> *"Fostering a vibrant, robust and sustainable innovation ecosystem calls for continuous improvement to a city's capabilities and encouraging an entrepreneurial mindset and a sense of purpose among its citizens"*

Patrick Kirby
Director, Technology, Media, Telecommunications & Innovation
KPMG China

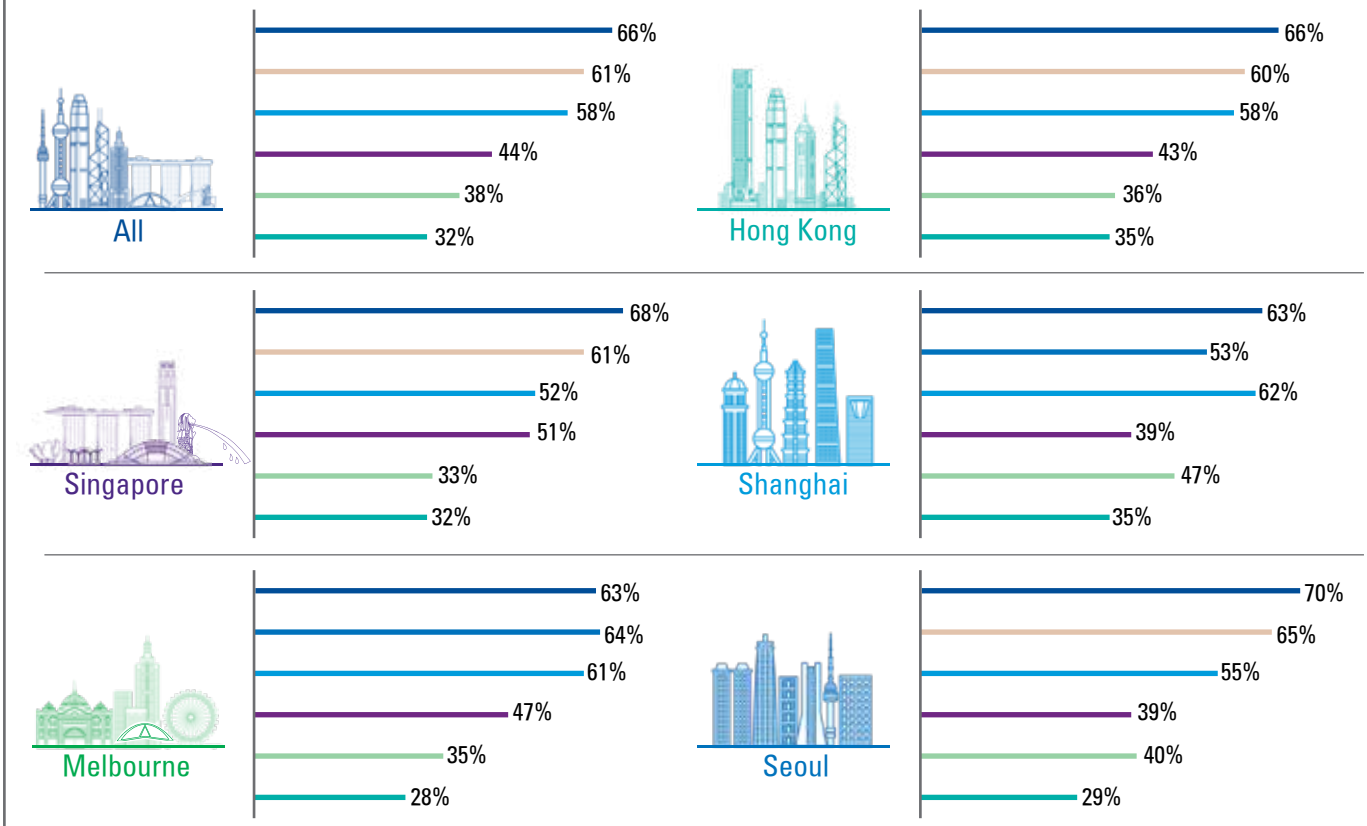
To encourage a culture of innovation, three factors stand out across all the cities. First is providing education programmes that encourage independent thinking, creativity and risk-taking (selected by 66 percent overall) (see Figure 3.4). Respondents' second-most cited action needed is offering incentives for businesses to invest in research and development (61 percent), and third, providing more funding for science, technology, engineering and mathematics (STEM) disciplines (58 percent).

In Hong Kong, pro-innovation policies as well as a strong network of incubators, accelerators and co-working paces is contributing to strong growth in the city's startup ecosystem. In 2018, the number of startups in the city grew 18 percent on the previous year, according to research from InvestHK (see p. 29).

As cited by the KPMG/AEF joint study, further boosting Hong Kong's innovation capabilities and entrepreneurial ecosystem requires strengthening the free flow of academics, research and development and business knowledge. The study also recommends expanding networks of experts across the Greater Bay Area and internationally as well as increasing awareness of entrepreneurship through community engagement and participation.[10]

[10] KPMG/AEF study, July 2018.

Figure 3.4: Key factors to encourage an innovation culture in your city



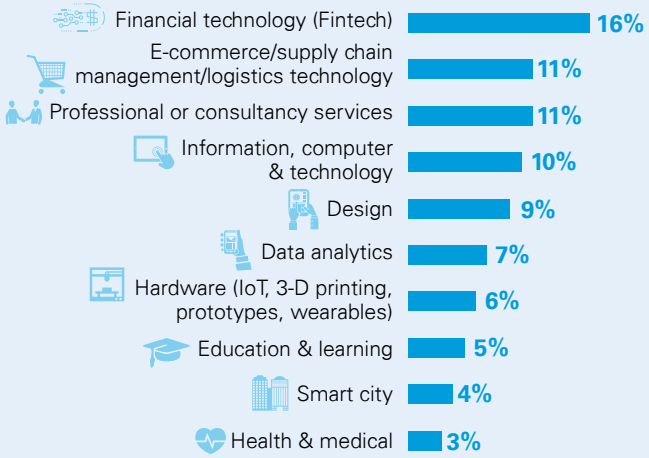
Source: KPMG survey analysis

Hong Kong's startups: building a smarter city

Hong Kong's startup ecosystem continued to show rapid growth in 2018. The number of startups in the city grew 18 percent on the previous year and 146 percent in the last five years, amounting to 2,625 companies in total, according to a November 2018 survey from InvestHK. Among the factors contributing to this growth include a strong network of incubators, accelerators, co-working spaces, and pro-innovation policies.

At present, companies that target smart city development make up around 4 percent of Hong Kong's startups. Meanwhile, the ecosystem attracts a diverse range of industries, including fintech, data analytics, IoT, and education tech that contribute to smart cities.

Key startup industry sectors in Hong Kong



Source: InvestHK
Based on sector breakdown of startups provided by major co-working spaces, incubators and accelerators. Some startups were engaged in more than one sector

Case studies

Future City Summit: Next Generation Leaders in Dialogue

For one Hong Kong-based non-profit group focused on Asia's young workforce, the future is now. The Future City Summit seeks to accelerate emerging cities in the region develop through public-private partnerships. The group encourages young people from local governments and business startups to collaborate across sectors to offer creative urban solutions.

Fireside chat with Ida Bagus Rai Mantra, mayor of Denpasar, Bali, on designing a charismatic city for tourism

Its project series, titled *Public-Private Partnership by Youth*, has a wide reach and includes topics such as sustainable tourism in Denpasar, Bali; the future of media and entertainment in Bangkok; social impact through fintech in Manila; and the future workforce in Ramallah. Stakeholders have included the Asian Development Bank, the African Union, Harvard Graduate School of Design, and the University of Hong Kong.

In early 2019, the project in Denpasar brought together city government officials with Balinese members of Global Shapers Community, an international network of more than 7,000 people under the age of 30 seeking grassroots solutions for local community challenges. Over a five-day period, attendees across various disciplines discussed innovation in sustainable tourism, including the best ways to work with tech companies and how current labour policies and regulations affect the industry.

Content and image source: Future City Summit

Melbourne: Technical and Further Education (TAFE) programmes

Australia's Technical and Further Education system (TAFE) helps provide new skills to unemployed workers and those seeking to boost their careers. The initiative comprises dozens of state-run vocational institutes across the country.

By 2015, 870,000 students were enrolled in TAFEs nationally. In the state of Victoria, which includes the city of Melbourne, TAFEs contribute roughly USD 2.9 billion to gross state product. This means that for every one USD spent by Victorian TAFEs, there was a flow-through impact of USD 2.19 of value added in the state's economy.

Participants can obtain certificates and diplomas through TAFE, potentially giving them brighter economic prospects. Every year, TAFE programmes result in more than 8,700 people in Victoria finding gainful employment – of whom 40 percent come from disadvantaged socioeconomic backgrounds. Statistics further show that Victoria students who complete TAFE programs are able to boost their employment rate from 62.2 percent to 72.5 percent post-training.

Course offerings range from business and finance to construction and information technology. Beginning this year, the state is offering subsidised tuition for eligible students pursuing training in high-need areas such as accounting, aged care, hospitality, nursing and plumbing.

Sources: State Government of Victoria, Australia; KPMG, The Importance of TAFE to Victoria's Prosperity, 2018.

https://home.kpmg/au/en/home/insights/2018/08/importance-of-tafe-to-victorias-prosperity.html

Hong Kong: Project *WeCan*


Project *WeCan* Career Exploration Day

Project *WeCan* serves Hong Kong secondary students who are academically and socioeconomically disadvantaged in learning. Some of the children come from immigrant families who are new to the city and unfamiliar with the local education system. Working with partners and sponsors across Hong Kong, *WeCan* offers financial and volunteer support to secondary schools to empower students with engaging opportunities and programmes that nurture their confidence and foster their innovation. Through its 'school adoption' model, *WeCan* pairs schools with companies ranging in size from SMEs to global firms for multi-year collaborations.

WeCan's annual Job Tasting Programme is one such initiative. Debuting in 2012, it included 32 companies putting together nearly 200 internship opportunities for secondary school students in 2018. The programme simulates the job application process: reviewing postings, writing application letters and attending interviews. Those who secure an internship work for two to four weeks at the participating companies.

WeCan also operates a Young Innovators Bazaar to encourage creativity and independent thinking. Students operate a retail business from the startup phase to its opening. The experience allows them to develop skills in leadership, management, collaboration, marketing and communication.

In 2018, *WeCan* grew in scale to work with 76 schools and 66,000 students, compared with 11 schools and 10,000 students after its launch in 2011. Community engagement has also blossomed, as the past year saw 68 organisations take part in the programmes – up from the mere 11 companies and one university at the inception.

Content and image source: Project WeCan

Cyberport: driving digital entrepreneurship and innovation

Helping startups thrive in the technology sector requires a range of financial and professional support. This can include connecting entrepreneurs with investors; partnering them with local and international businesses; and connecting them with corporations and SMEs to collaborate on the adoption of new technology solutions.

Cyberport is an innovative community of over 1,200 startups and technology companies located on Hong Kong Island's south side. This network includes over 300 fintech startups – comprising one of Asia's leading fintech clusters.

A network of new economy companies, universities, investors and enterprise partners complete the ecosystem. The Cyberport Investors Network, created in 2017, comprises 80 funds. In its first year of operation, the network raised more than HKD 234 million (USD 29.8 million) for eligible startups.

In addition, the Cyberport Enterprise Network helps corporations accelerate their digital transformation through exploring locally developed technology solutions.

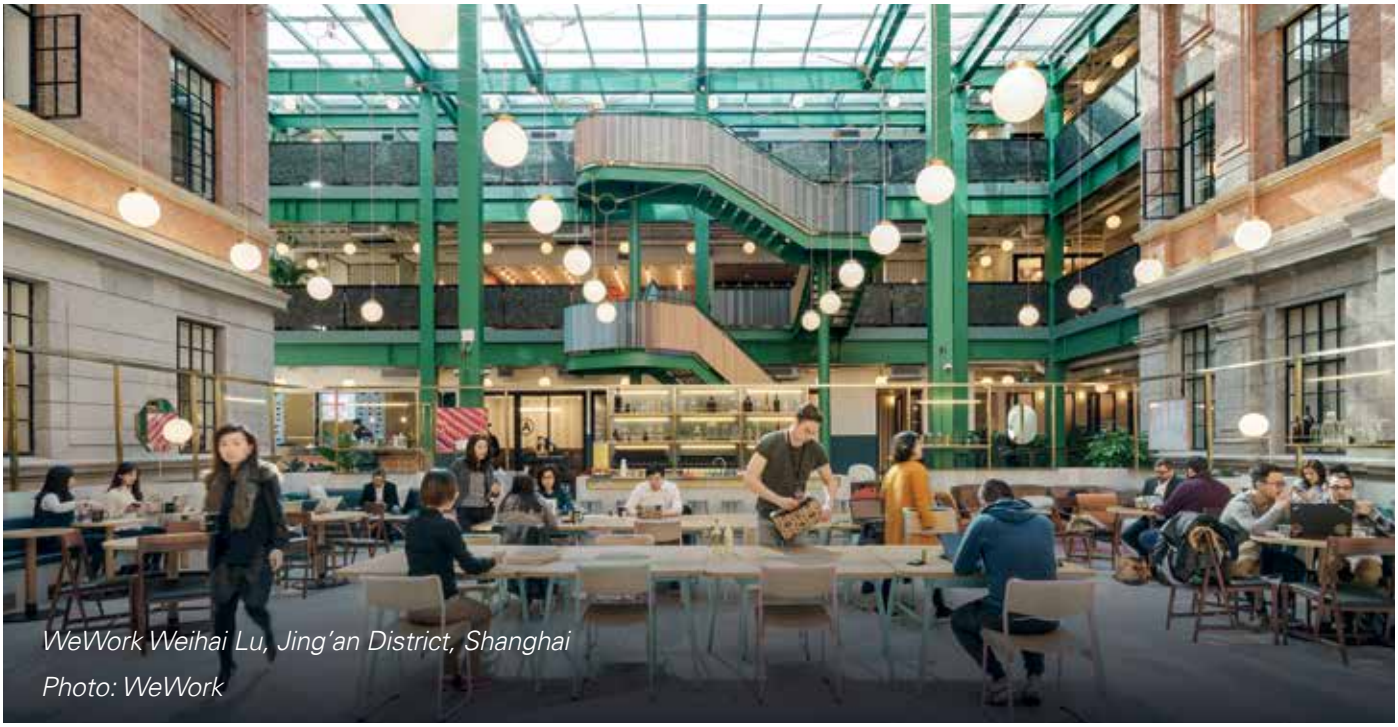
Peter Yan, Cyberport's CEO, says the community is currently focusing on five development key sectors: fintech, e-sports/digital entertainment, smart city/ smart living, AI/big data, and blockchain.

"We aspire to make digital technology a key economic driver of Hong Kong. We are taking advantage of our unique value chain to turn this goal into reality," Yan says.

In 2018, Cyberport also launched its first off-campus working space, Smart-Space 8, aimed at connecting young entrepreneurs from different districts around the city.

Peter Yan
CEO
Cyberport

Photo: Cyberport



WeWork Weihai Lu, Jing'an District, Shanghai
Photo: WeWork

Shaping the future of work: Creating a community of engaged corporate teams and innovative entrepreneurs

As urbanisation and technology are changing work across the world, employee expectations are evolving. At the same time, companies of all sizes are understanding the impact workspace can have on employee engagement and satisfaction.

WeWork, which provides companies around the world with space, community and services, manages 425 office locations in 100 cities worldwide. In 2010, the company began providing collaborative space for freelancers and startups. Today, its fastest-growing segment is enterprise members: businesses with more than 1,000 employees.

In Shanghai, Fung Group, a Hong Kong-based supply chain manager, turned to WeWork to redesign its 30,000 square-meter headquarter in LiFung Plaza in Shanghai's Minhang District. As part of WeWork's Powered by We offering, an integrated team of designers, architects, and workplace strategists worked closely with Fung Group to design, build and operate an optimal environment for its employees.

In addition to housing the group's headquarters, LiFung Plaza will also be home to a new WeWork location which Fung Group employees can access, giving them more flexibility and closer proximity to WeWork members and events.

Through the partnership, Fung Group's employees will also become a part of WeWork's global network of more than 400,000 members, including a range of companies from early-stage startups to 1,700 other enterprises. Through the network, Fung Group will have the opportunity to collaborate, connect and learn from creative freelancers, aspiring startup entrepreneurs and professionals from companies of all sizes – helping to support the entrepreneurial ecosystem in Greater China and globally.

Fung Group employees will also be able to book WeWork hot desks or conference rooms around the world and attend WeWork community events through the WeWork Members Network App.

Sources: WeWork, Fung Group

Living environment

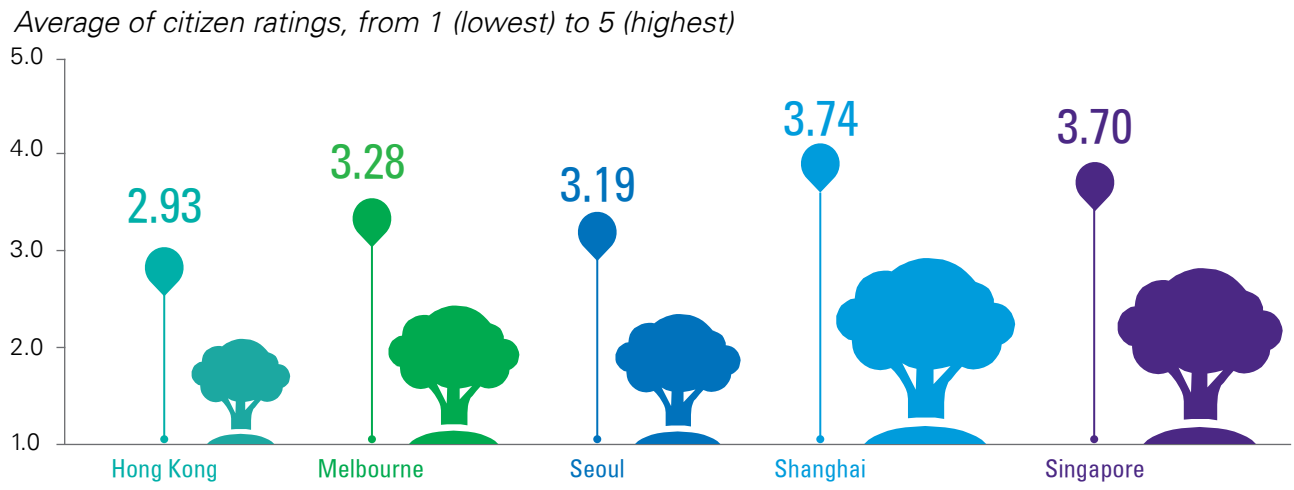
In the five Asia Pacific cities we polled, creating a better living environment with thoughtful urban planning and design is the most important development area for residents, cited by 51 percent of respondents.

This finding comes as urban populations across Asia Pacific comprise an ever greater number of elderly residents. Overall, residents aged 60 and older are expected to increase to more than a quarter of the region's overall population – or 1.3 billion people – by 2050, according to United Nations Economic and Social Commission for the Asia and Pacific (ESCAP) projections.[11] As populations age, cities are faced with a more pressing need to make urban environments more accessible for the elderly and people with disabilities.

Notably, most residents we surveyed feel positive or neutral about the living environment in their respective cities. Overall, 46 percent regard their own city as either good or excellent and 41 percent see it as average.

Beneath these overall numbers, however, are some notable contrasts in satisfaction, with people in Shanghai and Singapore rating the quality of their living environment most highly, with average rating scores of 3.74 and 3.70 respectively. Melbourne occupies the middle ground with a score of 3.28, followed by Seoul with 3.19 and Hong Kong with 2.93 (see Figure 4.1).

Figure 4.1: Quality of your city's urban living environment



Source: KPMG survey analysis

In terms of residents' opinions on the most needed changes to improve their living environment, Hong Kong residents' biggest wish is for greater availability of affordable housing (Figure 4.2). A need for affordable housing also ranks as the top priority for those polled in Singapore and the second highest priority for both Melbourne and Seoul.

[11] ESCAP, Addressing the Challenges of Population Ageing in Asia and the Pacific, 2017. https://www.unescap.org/sites/default/files/publications/Addressing%20the%20Challenges%20of%20Population%20Ageing%20in%20Asia%20and%20the%20Pacific.pdf Accessed 11 January 2019.

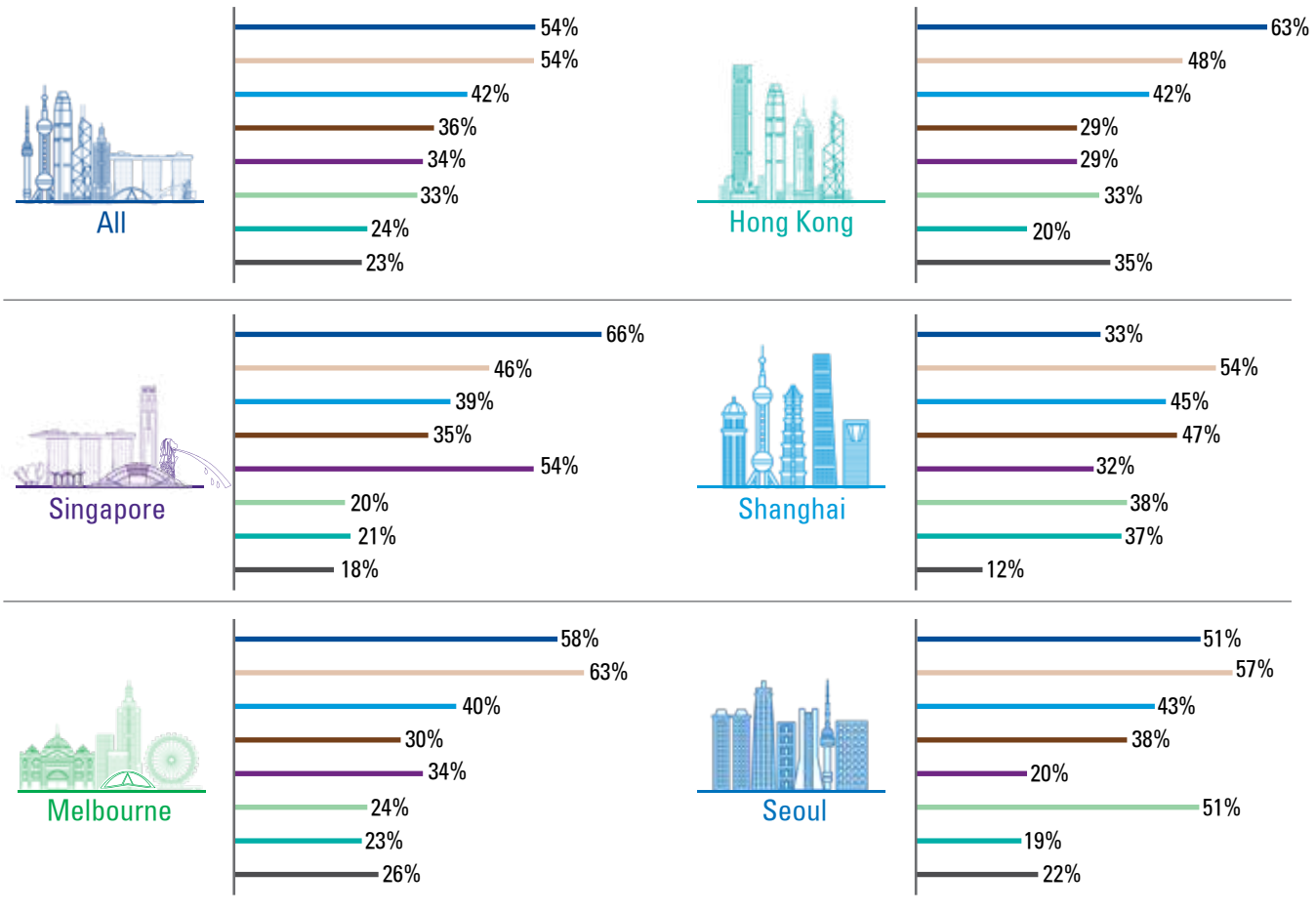
In Singapore, one of the most needed changes cited by residents surveyed is a living environment that caters more to elderly and disabled residents. This points to growing concerns about the impact an ageing population will have on the city-state.

Meanwhile, in Shanghai, Melbourne and Seoul, reducing traffic congestion and improving transport and mobility for residents is cited as the most needed change to improve the living environment.

In terms of actions for improvement (Figure 4.3), Hong Kong's top priority (named by 56 percent of respondents) is an improved balance of land use between commercial space, residential space and public space, followed by the updating or renovating of ageing buildings and the redevelopment of underused land (49 percent).

Meanwhile, Singapore respondents' feedback on the changes needed to improve their city's environment are a greater encouragement of recycling (chosen by 44 percent) followed by the updating or renovation of ageing buildings and the redevelopment of underused land (42 percent).

Figure 4.2: Most needed changes to improve your city's living environment

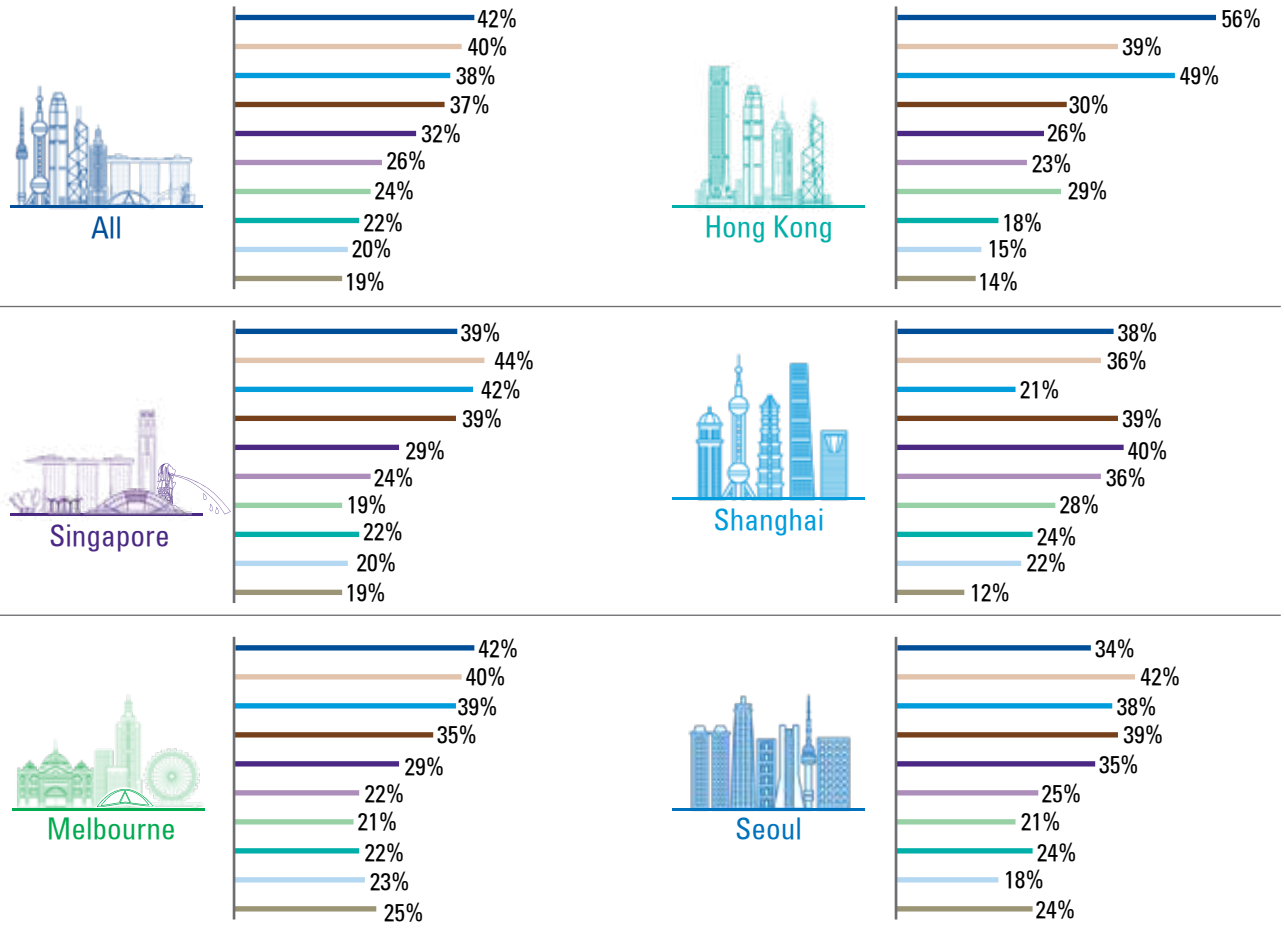


Source: KPMG survey analysis

Shanghai differed from the other cities in saying that building more green space and parks was a leading priority (chosen by 40 percent), followed by encouraging the construction of green buildings and development of green building standards (39 percent) and improving the balance of land use between commercial, residential and public space (38 percent). Combined, these findings suggest a greater emphasis on sustainable urban planning is important to Shanghai residents. A low-carbon building pilot project underway in Shanghai's Changning District reflects the city's current commitment to green buildings (see page 38).

Three actions which ranked relatively low across all cities are making them more bicycle or pedestrian-friendly, having more entertainment and cultural venues, and installing more cameras/sensors to regulate traffic and improve public safety. These findings suggest that a large amount of initiatives are already underway – and also that initiatives to improve land use and sustainability are a higher current priority for residents.

Figure 4.3: Key actions needed to improve your city's living environment



Source: KPMG survey analysis

Case studies

Melbourne: Urban Forest Visual

With more than 70,000 trees and many of them dating to the late 19th century, the city of Melbourne has taken steps to protect its streetscape development. To that end, the Urban Forest Visual is an interactive web-based map that compiles datasets of trees.

The initiative includes a tree-planting schedule showing the plan for each city street over the next 10 years. The virtual map contains the trees' coordinates across the city, essentially giving each one an ID. Details such as a tree's species and life expectancy are indexed in easy-to-track shapes and colours – raising awareness of species at risk due to climate change, pests, disease and urban redevelopment.

Meanwhile, through the project, Melbourne aims to increase the overall level of tree planting to reduce the city's carbon footprint and counter the effects of urban heat. By making this information more accessible to the public, residents can more easily offer input on areas for replanting.

Source: City of Melbourne

Shanghai: Changning District low-carbon buildings

Green energy is top of mind for Shanghai. Its low-carbon buildings project in the city's Changning district, launched in 2016, targets a heavily residential area which is a transportation and commercial hub. The initiative was the pilot project for China's Better Buildings Challenge programme and is carried out in cooperation with C40 Cities, an international organisation tackling climate change in urban areas.

In the programme, district officials seek a 20 percent reduction in energy use across Changning's commercial and public building sector over a 10-year period. Other programme goals include piloting nearly zero-carbon emission buildings in a low-carbon emission zone in the district, and developing at least three buildings that achieve energy savings of 5 percent or more, beyond Shanghai's current baseline for energy-efficient buildings.

The Better Buildings Challenge follows on a World Bank investment in low-carbon buildings between 2013 and 2018. The funding included a grant of US$4.345 million from the bank's Global Environment Facility for technical assistance and a US$100 million loan from the International Bank for Reconstruction and Development to retrofit existing buildings with low-carbon technology.

These green efforts align with Shanghai's 13th Five-Year Plan (2016-2020) of including all commercial and public buildings whose floor space exceeds 10,000 square metres in a citywide online energy-monitoring platform. Officials plan to use verified energy data to help measure a building's green performance, with quality control mechanisms eventually being fully automated.

Sources: C40 Cities, World Bank

Timothy Mak

Group General Manager
Signify

Smart lighting for a brighter future

Whether it is driving on city streets, crossing the road or walking home at night, street lights are a major point of interaction between urban residents and a city's infrastructure. Always on, they require significant amounts of energy and capital to operate and maintain. As such, installing 'smart' street lighting systems can help cities brighten the path towards achieving their liveability and sustainability goals.

What makes lighting systems 'smart'? A first step is switching to LED lights – this alone can significantly cut energy usage, helping cities save on cost while reducing carbon emissions. When LED systems are equipped with sensors and chips, they can easily be integrated into Internet of Things (IoT) networks, immediately turning lighting infrastructure into an information network.

Timothy Mak, Group General Manager in Hong Kong for Signify, the digital lighting solution provider formerly known as Philips Lighting, says such systems are just scratching the surface of what light has to offer in helping today's cities become more sustainable and liveable.

Smart lighting applications to improve life quality – on the street, at work, or at home

Traditionally, street lights have required frequent maintenance, Mak says. Connected to an IoT network, 'smart' lights can be monitored remotely, simplifying maintenance and repair procedures. Equipped with sensors, lights can not only turn themselves on automatically in the presence of foot, bicycle or vehicular traffic, but also adjust their brightness according to weather or other conditions.

Today's 'smart' street lighting systems incorporate 5G, WiFi, and CCTV and directly connect to a city's information systems, Mak adds. As such, they can be used to manage traffic flows, help drivers find parking spaces, monitor the environment and improve public safety. This in turn gives city authorities greater information about where resources should be directed.

In offices, workspaces or homes, lighting can be personalised to the needs or preferences of individual users via their mobile phones. Such tailoring, Mak points out, can make people feel happier and be more productive.

In shops, smart lighting systems can be used to help shoppers find goods and retailers sell them. LED lighting systems in supermarkets, for example, can send information about special offers to customers' mobile devices depending on what section of the store they are in. Such systems can track location accuracy to within 30 centimetres, notes Mak.

The future of smart lighting

Looking ahead, Mak says improvements in technology now allow far greater control over the output of lighting systems – extending the possibilities of what can be done in urban areas.

For example, smart lighting systems can be used to grow food indoors on racks that allow multiple layers of plants to be grown within a single space. "This is just the environment needed for higher value food plants such as herbs and salads, within easy reach of restaurants and retailers," he says.

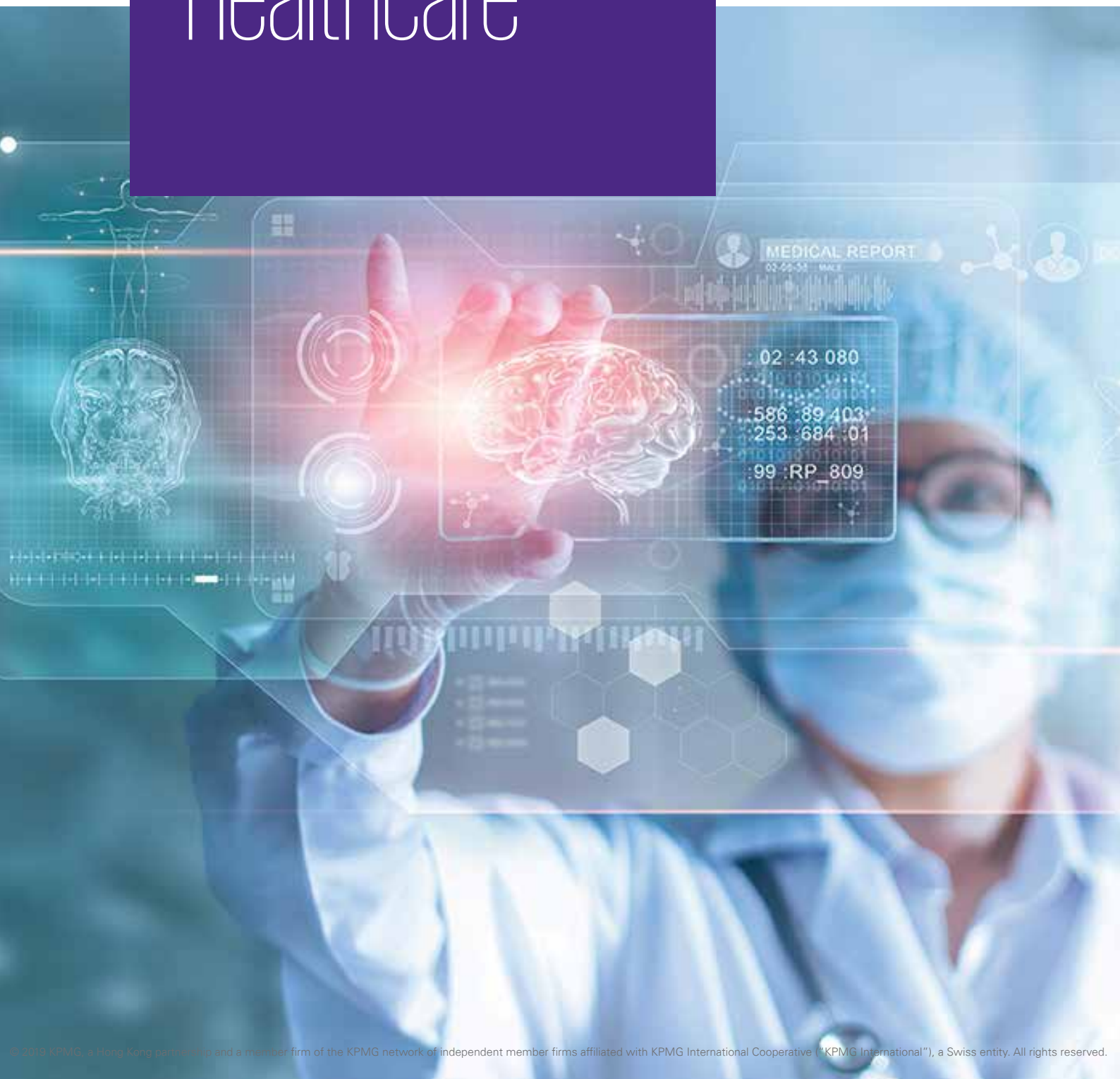
In addition, the ability of light waves to carry information in much the same way as radio waves means that lighting systems can also collect and transmit data. Rather than using radio waves and WiFi networks to move information around, in the future people can use LiFi (Light Fidelity) networks that use light waves to transmit and receive data.

Such systems are particularly useful for locations such as hospitals, where using radio waves can interfere with vital equipment, or for places with poor WiFi connections. And where necessary they can be used to add another layer of security.

"LiFi is different than WiFi, but its strengths give it enormous potential to connect smart cities," Mak says.

> *"LiFi is different than WiFi, but its strengths give it enormous potential to connect smart cities"*

Healthcare



As populations age and workforces shrink, improving healthcare delivery and access is an increasingly urgent priority across Asia Pacific.

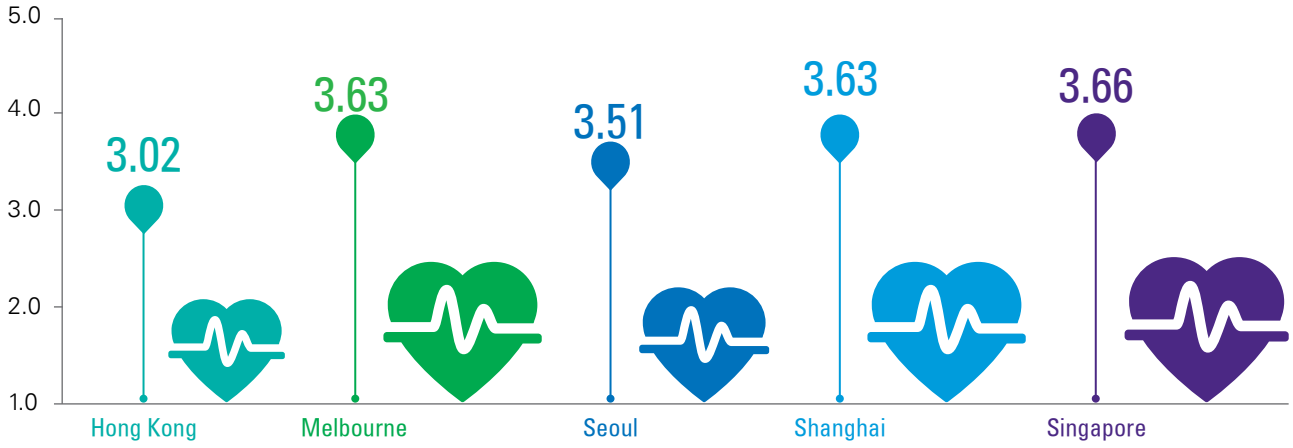
This is echoed in our survey: among the five cities, improving access and delivery of healthcare was identified as the second most important development priority overall, identified by 49 percent of respondents, just two percentage points behind creating a better living environment.

In Shanghai and Singapore in particular, healthcare is cited by respondents as the most important development area (picked by 57 percent and 50 percent of those polled respectively). Meanwhile, in Hong Kong and Melbourne, healthcare is ranked as the second overall priority, respectively picked by 51 percent and 49 percent of respondents.

As with other categories measured in our survey, average ratings on the quality of healthcare providers varied from location to location. In Singapore, Shanghai and Melbourne, each of which posted an average score exceeding 3.6 (see Figure 5.1), citizens appeared relatively positive on the quality of healthcare providers in their cities. In Seoul and Hong Kong, residents rated healthcare quality somewhat lower, with a score of 3.51 in the former and 3.02 in the latter.

Figure 5.1: Quality of healthcare providers (both public and private) available in your city

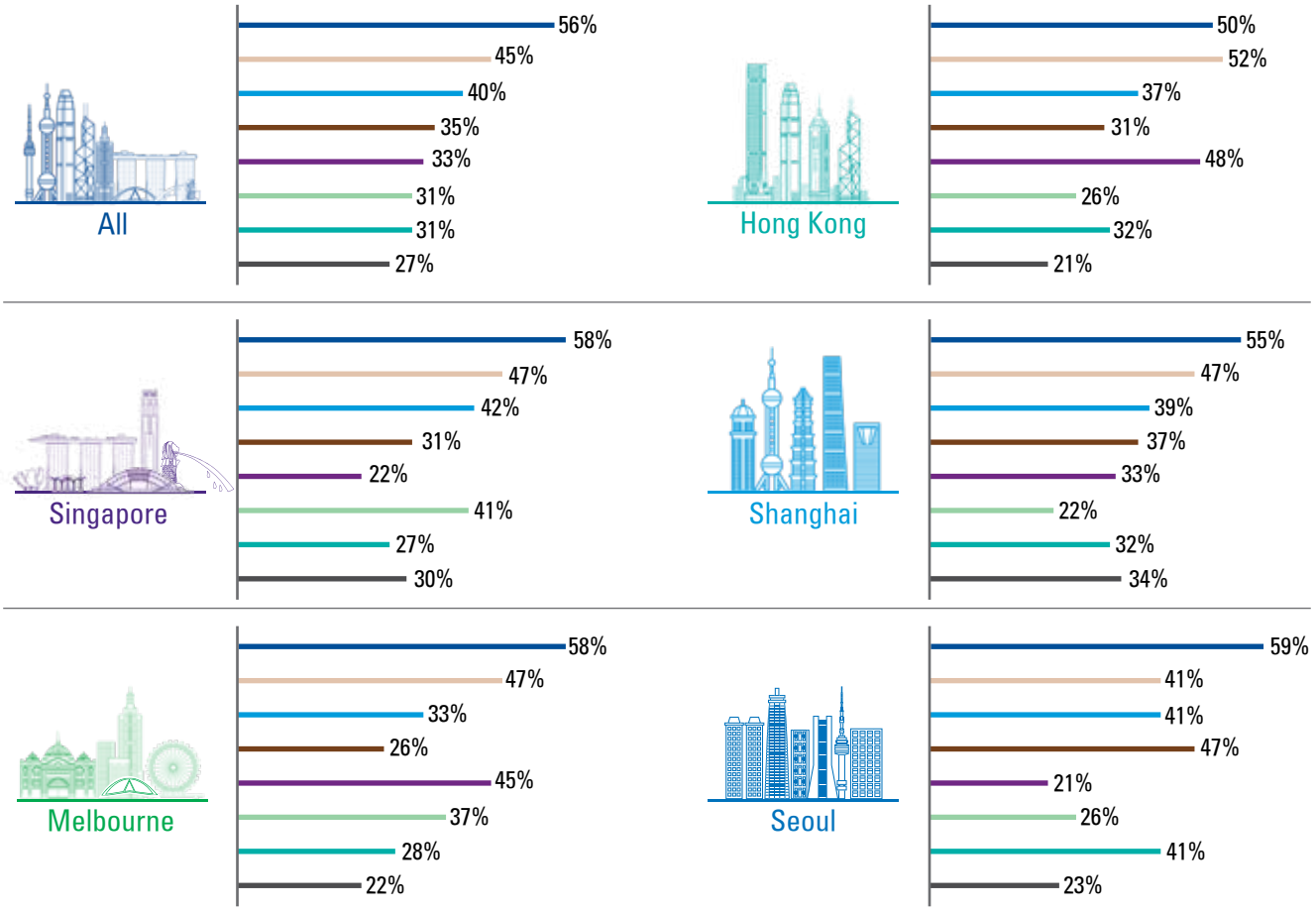
Average of citizen ratings, from 1 (lowest) to 5 (highest)



Source: KPMG survey analysis

Across the five cities polled, improving preventative measures is seen as the most important action that can be taken to improve healthcare (Figure 3.2). This is the top-ranked development area for every city except Hong Kong, where the most pressing matter is seen as strengthening public-private cooperation on healthcare initiatives and services (chosen by 52 percent of those polled), followed by improving preventative healthcare (chosen by 50 percent) and building more hospitals and clinics (48 percent).

Figure 5.2: Key actions to improve your city's healthcare system



- Improve preventative healthcare (such as check-ups, immunisations, health education)
- Strengthen public-private cooperation on healthcare initiatives and services
- Improve predictive healthcare applications that utilise data analytics and artificial intelligence to improve diagnoses and treatment
- Improve electronic record sharing and interoperability between primary and secondary healthcare providers
- Build more clinics and hospitals
- Invest in technology for remote monitoring of elderly and long-term care patients
- Strengthen infectious disease control and prevention
- Encourage citizens' use of health technology including mobile devices and apps

Source: KPMG survey analysis

Like Hong Kong, Melbourne places a high priority on building new hospitals and clinics (45 percent), and both Singapore and Melbourne see strengthening public-private cooperation on healthcare initiatives and services as the second most important action (picked by 47 percent in both cities).

In Shanghai, a top-ranked action is improving predictive healthcare applications that utilise data analytics and artificial intelligence to improve diagnoses and treatment. In Seoul, the second most important among those polled is improving electronic record sharing and interoperability between primary and secondary healthcare providers. Both of these findings suggest that improved management of public services should come as a result of greater smart city development.

With the exception of Shanghai, residents polled across the five cities did not prioritise encouraging the use of health technology mobile devices and apps as a key action to improve healthcare.

Clube Ng

Chairman, Industry Liaison & Partnership Special Interest Group

Smart City Consortium (SCC)

Smart solutions to address the ageing dilemma

Ageing populations in many cities across Asia Pacific pose complex challenges for healthcare, social welfare and elderly care service providers. In Hong Kong, the number of persons aged 65 and older will make up one quarter of the city's population by mid-2030, up from 16.5 percent in mid-2017, according to Labour and Welfare bureau statistics. Following current trends, elderly residents will comprise over a third of the city's residents by 2041 – making the need for innovation in service delivery models all the more urgent.

To better prepare the city to cope with these eventualities, in 2017 Hong Kong's Elderly Commission released its Elderly Services Programme Plan, containing over 20 recommendations to boost support services for seniors. One year later, through Hong Kong's Smart City Blueprint, the government announced concrete plans to integrate technology solutions into these efforts, including a HKD 1 billion (USD 127.5 million) initiative in 2018 to trial the use of smart technology in elderly and rehabilitation service units.

On the front lines in two pilot initiatives to address the city's senior care dilemma is Hong Kong Smart City Consortium (SCC). Founded in 2016, the SCC advises the Hong Kong government on smart city development and serves as a bridge between government and private industry to implement projects. Its nearly 300 members include some of Hong Kong's largest companies, major technology providers as well as startups.

SCC is currently collaborating with two of the city's largest elderly care providers, Yan Chai Hospital and Pok Oi Hospital, to test how Internet of Things (IoT) technologies like sensor-based health and operation monitoring, alert systems and remote healthcare technology can help ease the burden on staff at nursing homes and elderly care centres. Additional technologies being tested are robotic training devices that can assist with physical therapy as well as user-friendly communication devices that can help seniors get in touch with family and caretakers.

As it embarks on these pilot programmes, Hong Kong is looking at 'gerontechnology' solutions that have been successfully implemented in other global cities, says Clube Ng, chairman of industry liaisons and partnerships for SCC, who has over 20 years of experience in eHealth and information technology.

For example, Denmark has successfully tested microtrackers for dementia patients as well as service robots for nursing home residents. Another model is Singapore, where the government has introduced a 'Smart-Health Assist' programme that uses sensors to remotely monitor patients with chronic health conditions. Readings are automatically transmitted to a trained professional who can make decisions about potential interventions in real time without the need for patients to schedule an appointment to visit the hospital.

"These technologies can also be applied to support elderly patients in Hong Kong to live more independently and securely at home," Ng says. "This will help support the city's overall strategy to promote 'ageing in place' for seniors, with institutional care available as a backup."

Sharing patient data to promote research and healthcare innovation

Helping Hong Kong better utilise emerging technologies for healthcare delivery will not only help address talent shortages – it can also be a catalyst for research and innovation, Ng says.

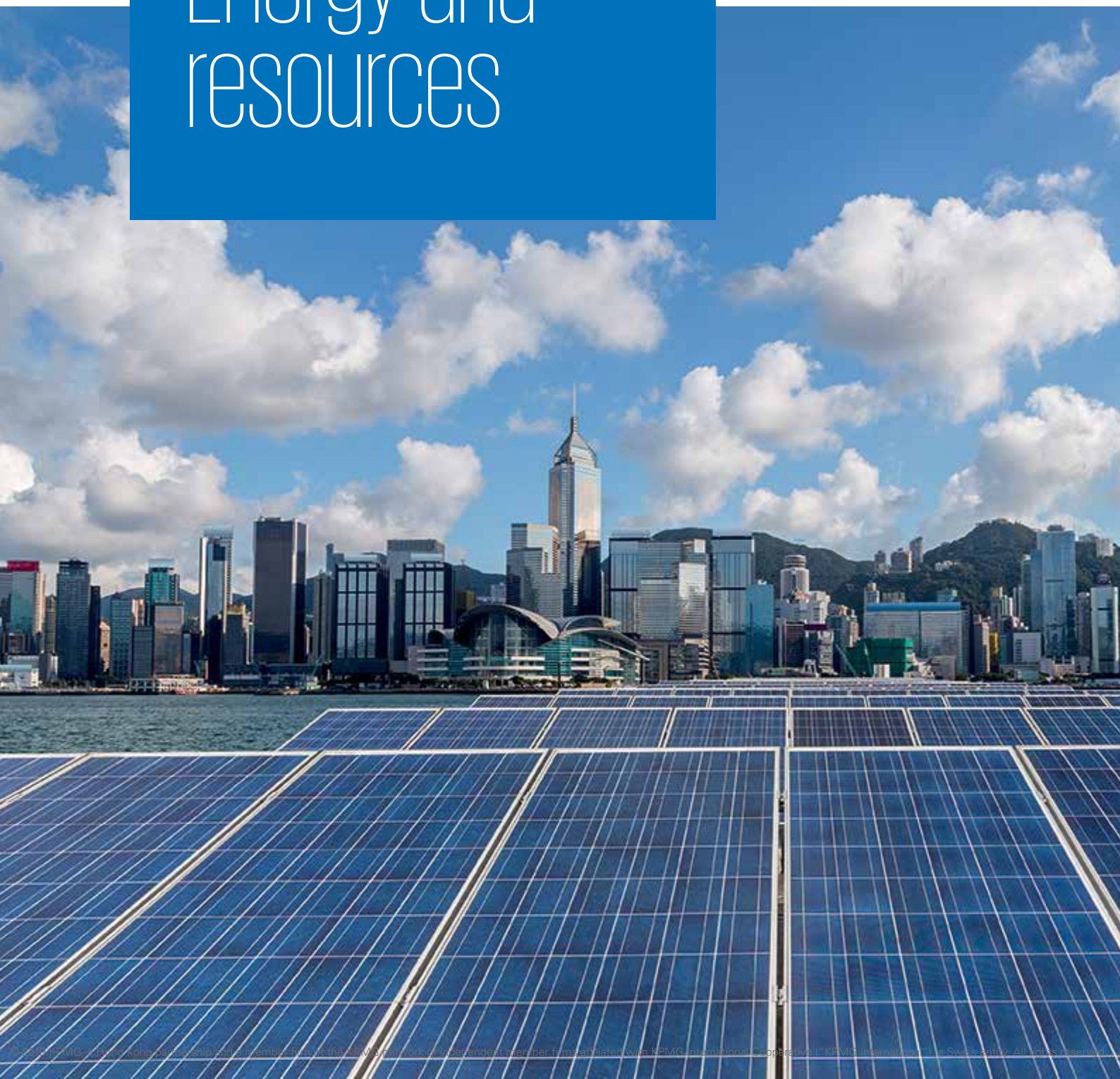
A key way that Hong Kong can do this, Ng says, is by expanding the city's Electronic Health Record Sharing System (eHRSS). First initiated 10 years ago, the eHRSS currently stores patient data collected from Hong Kong's public hospitals, while private hospitals and clinics can opt in to share their data.

Going forward, the key to enabling the eHRSS to fulfil its purpose is to provide more incentives for private hospitals and clinics to share their data. Ng says. To this end, Ng says there should be stronger efforts to facilitate the establishment of an open health data platform in Hong Kong.

Such a platform, Ng says, would enable patients to better manage their health records and also share them safely and securely with dedicated family members, healthcare providers, and health systems and apps.

"Furthermore, it would allow technology developers, private sector companies and entrepreneurs, academia and other healthcare providers to access anonymous health data for the purposes of enhancing healthcare delivery and public health research," he says.

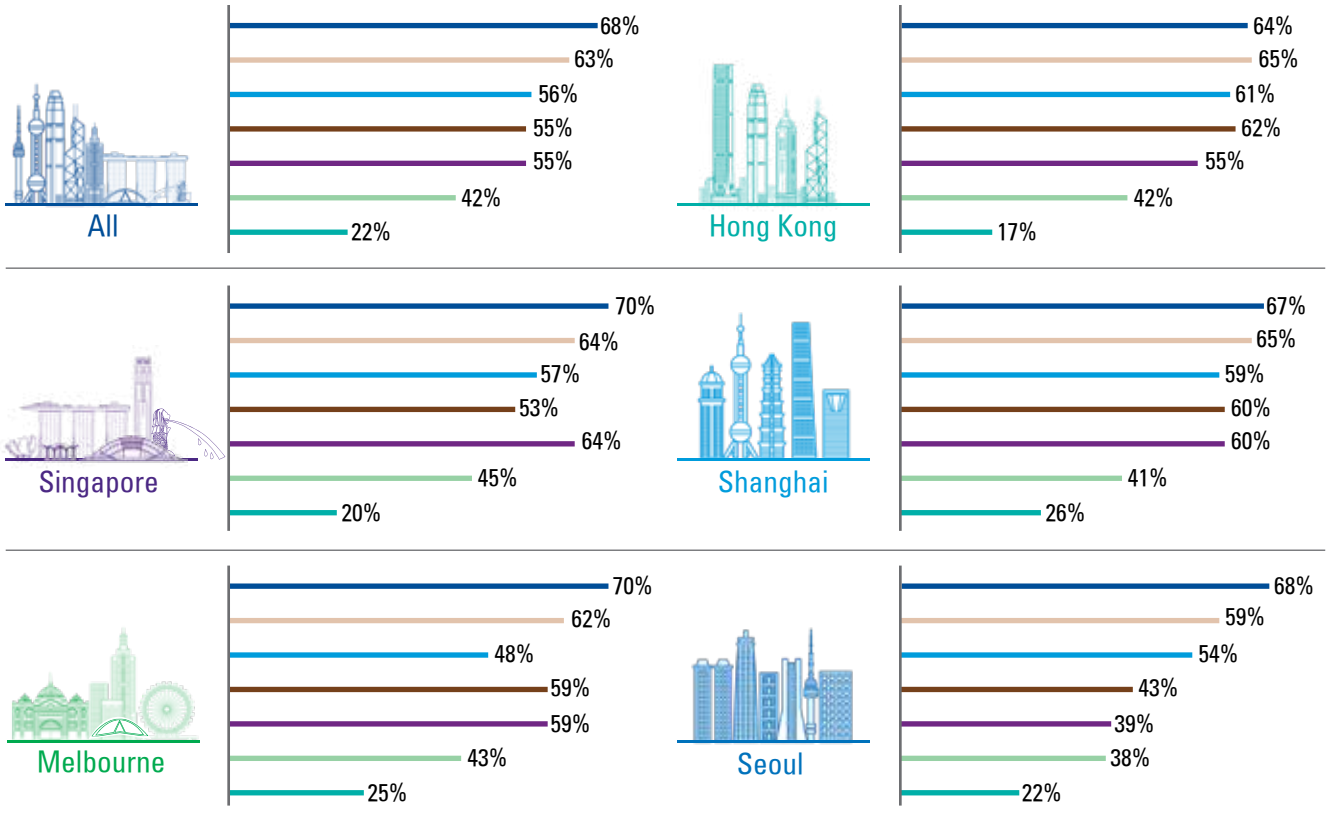
Energy and resources



Residents across the five cities we polled had strong views on the future of energy and resource management in their respective cities. The promotion of green and renewable energy resources is popular in every one of the five cities polled, and there is also broad support for action aimed at improving energy efficiency, generating more power from hydroelectric, solar and wind sources, cutting greenhouse gas emissions, the amount of garbage sent to landfills and saving water.

Respondents in Hong Kong, along with those in Shanghai and Singapore, express stronger concerns on these issues compared to other cities. For Hong Kong in particular, four concerns stand out: accelerating the use of renewable energy sources (chosen by 65 percent), improving energy efficiency (64 percent), cutting the amount of garbage sent to landfills (62 percent) and reducing greenhouse gas emissions/the size of the city's carbon footprint (61 percent).

Figure 6.1: Needed improvements for your city's management of energy and resources

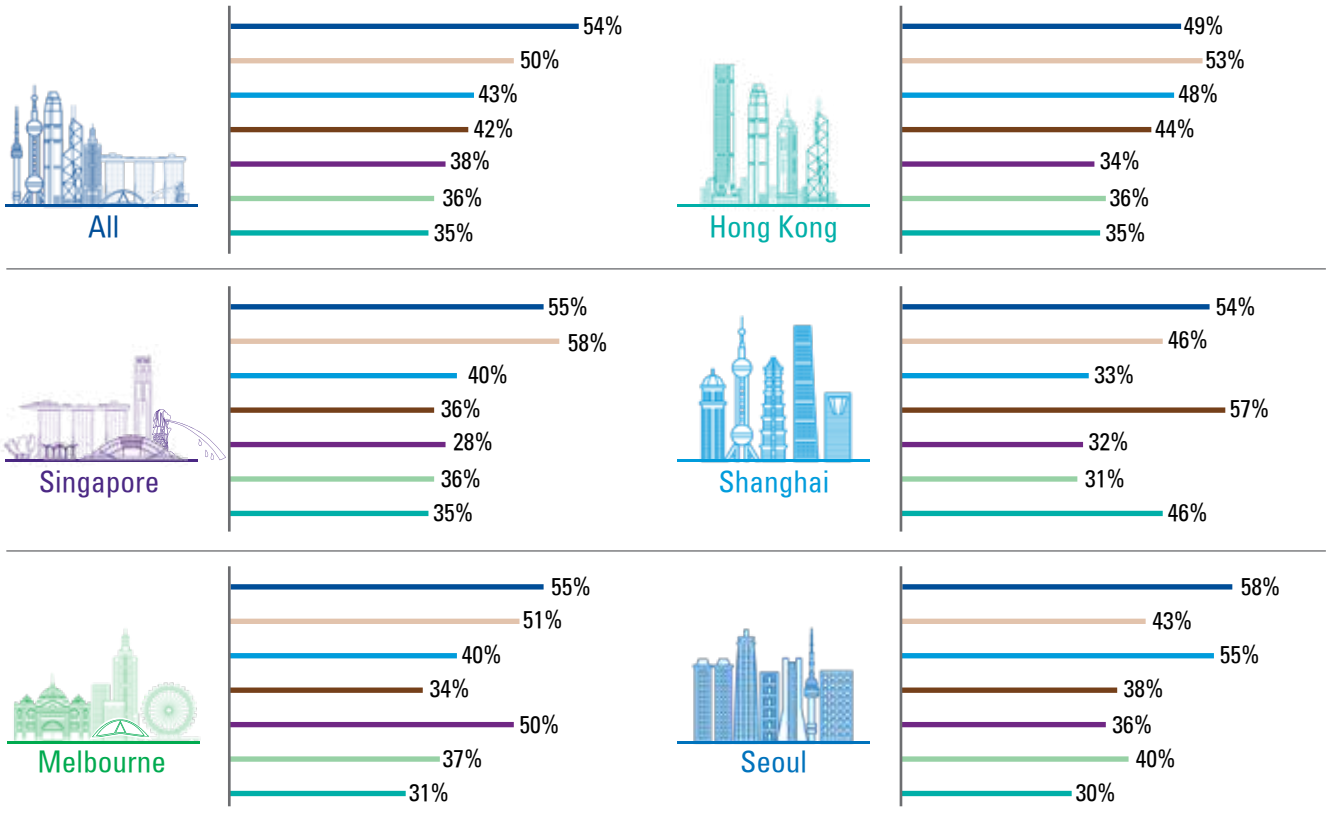


Source: KPMG survey analysis

Under the city's Climate Action Plan 2030+, Hong Kong is aiming to reduce its carbon intensity by 65 to 70 percent by 2030 from 2005 levels. It is also phasing out coal-fired electricity generation, replacing it with natural gas and non-fossil fuel sources, so that coal will only account for a quarter of the city's power grid by 2020, down from 47 percent in 2016. In April 2018, the government also announced a feed-in tariff system under which households, businesses and other institutions can sell electricity generated by solar or wind systems to Hong Kong's two power companies.

Meanwhile, Seoul's smart city efforts directed at energy and resources management may be having a positive impact on public opinion. Seoul citizens polled see significantly less need for action in the areas of reducing the amount of garbage sent to landfills (43 percent in Seoul versus 59 percent in the other four cities), conserving water (39 percent versus 59 percent) and reducing the burning of fossil fuels (38 percent versus 43 percent). In terms of most needed actions, Seoul residents cited construction of energy-efficient buildings as a far higher priority than in the other five cities (55 percent) (Figure 6.2).

Figure 6.2: Key actions to improve your city's management of energy and resources



Source: KPMG survey analysis

Making renewable energy sources a greater percentage of overall power supplied to their city ranked highest in Seoul and Melbourne. In Hong Kong and Singapore, by contrast, it is citizen action which is seen as most important, via offering incentives for people to use energy- and water-saving home appliances.

In Shanghai, more effective energy management is a priority. Top-ranked actions are utilising technology to better manage the city's power grid, chosen by 57 percent, and having renewable energy sources supply a greater share of power, chosen by 54 percent. Further, Shanghai residents see utilising technology to better manage water resources seen as a high priority, cited by 46 percent of those polled.

People in Melbourne highly rank incentives to install solar power devices in their homes (chosen by 50 percent), far more than any of the other cities.

Among needed improvements, the lowest priority among those polled is accelerating the use of nuclear power. On average, just over one-fifth of those polled see it as a priority.

Case studies

Melbourne: Litter Hotspots

A collaborative approach to collecting rubbish has paid dividends in Melbourne. The city's Litter Hotspots programme targets 436 heavily populated areas where data shows rubbish accumulates quickly. Local councils work with community groups to come up with solutions in each area.

One project within the programme is Clean Cubes, a smart rubbish bin that uses solar energy to activate a compactor inside it and communicates information it collects in real time. According to Smart City Solutions Australia, the national distributor of the bins, the installation of nearly 400 Clean Cubes across the city has created enough new trash storage capacity for the city to remove 49 percent of regular bins in the areas where the solar ones are used. Further, the Clean Cubes use sensor technology to detect when bins are nearly full, helping the city optimise collection. Melbourne has achieved waste reductions of up to 85 percent since Clean Cubes were deployed. These collections are undertaken overnight, allowing the city to achieve a 96 percent reduction of litter bin waste trucks in the central business district during the day.

In a separate campaign, called Operation Binfrastructure, the city of Melbourne collects 200,000 cigarette butts weekly and recycles them into industrial products. University campuses and hospitals were identified as producing a high volume of this waste. After Melbourne installed 300 cigarette butt bins at 60 hotspot sites, more than 1.12 million butts were collected.

Sources: City of Melbourne, Smart City Solutions Australia, WeGO

Seoul: Zero Food Waste Initiative

Seoul's Zero Food Waste Initiative has made a significant impact as the city's overall daily food waste in 2017 decreased by 10 percent, or more than 300 tons per day. In the programme, residents and businesses are required to separate food waste from other refuse. A fee must be paid based on the amount of waste generated.

Seoul has come a long way since 2013, when more than 3,000 tons of food waste were generated every day, with nearly 63 percent coming from households and the rest from restaurants, markets and other commercial operations.

People living in multi-unit apartment buildings used to pay a flat sanitation fee to dispose of as much food waste as they wished. In 2011, Seoul began a two-year pilot for a volume-based fee, using radio frequency identification (RFID) tags and 'trash ID cards' to help count and assess the refuse volume per household or per housing complex. Feedback from the pilot prompted the government to roll out the citywide programme in 2013.

Apart from regulating food waste disposal, the city has invested in treatment centres that are helping to recycle the waste, turning nearly 1,000 tons of it per day into biogas and animal feed. At the same time, Seoul encourages residents to compost their own garbage, which they found reduces food waste from households by up to 80 percent in participating districts.

Source: Seoul Metropolitan Government

Austin R. Bryan
Senior Director – Innovation
CLP Holdings Limited

Driving Hong Kong's energy transition to build a smarter and greener city

Momentum for Hong Kong's energy transition is strengthening, driven by public and private sector efforts to deploy cleaner power sources and digital innovations.

As part of the Hong Kong government's plans to build a smarter and greener city, the city aims to reduce carbon intensity by 65 to 70 percent of 2005 levels by 2030. In the past year, the government has launched significant initiatives that have prompted industry to keep pace.

In 2018, the government announced new tax incentives to promote energy-efficient buildings. These allow capital expenditures on energy-efficient building installations to be fully tax-deductible in the first year of purchase, instead of over five years.

In addition, the government has worked together with electricity firms to enable renewable energy to be sold to the city's grid at preferential rates. CLP, Hong Kong's largest electricity supplier, started purchasing power from customers based on the newly established feed-in tariff systems in October.

Austin R. Bryan, CLP's Senior Director of Innovation, says he is hopeful that the programme will have a positive impact to make renewable energy sources a larger part of Hong Kong's total power supply.

"We are working with all kinds of partners to install rooftop and other renewable energy assets," Bryan says. "Alongside this, we are introducing new digital technologies to help users manage these distributed energy resources."

Digital technologies enable smarter energy services

CLP has announced plans to install smart meters for all of its customers by 2025. This enables the development of smarter and more energy-efficient services through analytics and predictive technologies, leveraging insights from digital data.

CLP's Eco Building Fund aims to promote energy efficiency and conservation, supporting building owners to install new technologies such as digital sensors to reduce energy consumption from fixtures such as lighting, air conditioning and escalators.

Building managers can compare power usage across different sites, and energy data helps detect and predict faults and therefore reduce wear and tear in machinery. In homes, if customers choose, energy data can be used to recognise changing routines of elderly residents. This can provide an early warning for potential health issues.

"This smart technology will provide customers with the tools necessary to move into a new era of connected and low-carbon living, while allowing businesses to manage resources more efficiently," Bryan says.

Building partnerships to build a more connected power grid

CLP is working with a growing number of technology providers including Hong Kong-based and internationally-based startups, and is constantly scouting for the most advanced and disruptive energy applications.

To this end, the company has set up CLP Innovation Hub, a new office in the Hong Kong Science and Technology Park, to develop and pilot new technologies. These include energy-saving solutions such as smart lighting, smart office, battery storage and microgrids. There, the company is currently running a pilot project that uses artificial intelligence to optimise customers' energy assets.

Bryan says the pilot will be a foundation for similar projects across Asia Pacific. "This project is an important element in our strategy to capture greater opportunities in the rapidly evolving smart energy space," he explains. "Innovation will play an increasingly critical role for our business as the electricity sector enters an exciting time of technological change."

Bryan notes the potential of 5G and blockchain to support the new structure of the industry. "5G will enable millions of devices to connect to smart grids," he says. "Meanwhile, with more and more electricity coming from distributed sources, mechanisms will be needed to monitor transactions that are trusted by both sides, which is where blockchain comes into play." He adds: "As these new technologies are implemented, organisations will need to implement advanced cybersecurity in order to safeguard assets."

The impact of technology

As governments implement smart city initiatives, they are incorporating new technologies to address a multitude of challenges. Cities across Asia Pacific are increasingly attempting to harness user-generated data to understand citizens' needs and better facilitate citizen interaction with government departments.

Our survey findings suggest that building a smart city also requires a strong sense about how to link technology with liveability, so that cities are aware of the benefits.

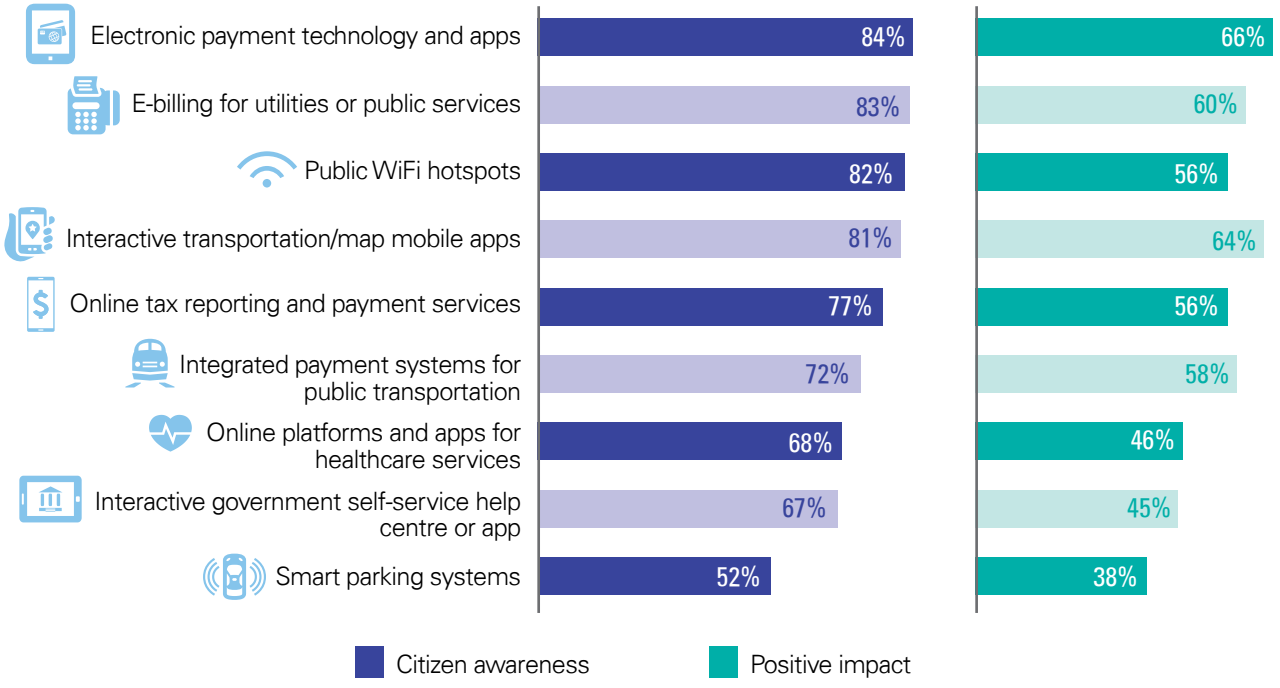
To better understand the impact of smart technology initiatives on quality of life, we asked residents in the five Asia Pacific cities we polled about their awareness and perceived benefit of nine commonly-implemented solutions (Figure 7.1).

Overall, we found that as residents' awareness of these tech solutions increases, so does the perception that these technologies have a positive impact on quality of life.

In our poll, 84 percent of respondents expressed awareness of electronic payment technology and apps, with 66 percent saying they find such apps beneficial. Interactive transportation maps and mobile apps also achieved a high degree of recognition (81 percent), with a similar proportion (64 percent) saying they improve day-to-day life.

Accordingly, as overall awareness decreases, so does perceived benefit among those who are aware of such solutions. In the case of smart parking, overall awareness amounted to 52 percent, with positive impact amounting to 38 percent.

Figure 7.1: Awareness vs. impact of smart city technology solutions



Positive impact based on the percentage of respondents saying the following technologies have a positive impact on their quality of life, as a factor of all who are aware of these solutions in their cities

Source: KPMG survey analysis

Looking deeper into residents' awareness across the five cities we polled, levels are more or less consistent among specific types of applications (Figure 7.2). Electronic payments, e-billing for utilities, public WiFi hotspots and interactive maps/transportation apps were more widely cited as available, with around eight out of 10 respondents on average cognizant of these solutions.

Levels of awareness on smart parking across the five cities is generally consistent with the overall average, with the exception of Singapore, which showed considerably higher recognition (75 percent). Interactive government services and online healthcare platforms and apps are cited as available by nearly seven out of 10 respondents in most of the cities surveyed, with Seoul showing considerably lower figures (50 and 46 percent respectively).

Comparing the five cities, Singapore showed the highest overall awareness of smart city technology solutions included in our survey. In contrast, Seoul residents are the least aware, with no single technology scoring more than 77 percent and three achieving 50 percent recognition or below.

These numbers point to differences in how effective cities are in communicating to residents about existing solutions. They may also suggest gaps in cities' ability to effectively roll out apps, platforms or other user interfaces.

Figure 7.2: Citizen awareness of smart city technology solutions

	Hong Kong	Melbourne	Seoul	Shanghai	Singapore
Electronic payment technology and apps	82%	87%	71%	89%	91%
E-billing for utilities or public services	81%	86%	73%	90%	89%
Public Wi-Fi hotspots	80%	82%	74%	81%	92%
Interactive transportation/map mobile apps	80%	81%	77%	77%	88%
Online tax reporting and payment services	80%	83%	69%	66%	89%
Integrated payment systems for public transportation	65%	72%	73%	66%	84%
Online platforms and apps for healthcare services	61%	74%	46%	75%	85%
Interactive government self-service help centre or app	67%	71%	50%	65%	85%
Smart parking systems	42%	60%	40%	47%	75%

Source: KPMG survey analysis

"Governments in Asia Pacific need to take the lead in having more open data and data sharing as part of the solution to making cities smarter"

Marcos Chow
Head of Technology Enablement, Hong Kong; Partner, Smart City Group, KPMG China

In the cities we surveyed, residents' perception of how beneficial technologies are largely correlates with awareness. Shanghai residents were the most positive about the nine solutions, with higher scores for government-provided apps and platforms, including healthcare, and a markedly higher score for smart parking systems (Figure 7.3). Seoul residents, meanwhile, were more positive about integrated payment systems for public transport and public Wi-Fi hotspots.

The findings show a high level of consistency across the cities we surveyed in the benefits that specific solutions are bringing to cities. This suggests that smart city technology applications need to be designed with a paramount focus on improving quality of life for residents.

Gaps in awareness shown by the survey findings point to areas where cities could increase outreach efforts, particularly since these gaps often align with residents' expected benefits from a smart city. For example, there was relatively low overall awareness of smart parking initiatives (Figure 7.1), despite the expectation that smarter cities will result in less traffic congestion (Figure 1.2, p. 13). Similarly, interactive government self-service help centres and apps ranked second to last in terms of overall awareness; however, improved delivery and management of public services is a top-three expected benefit for smart city development.

Meanwhile, the results suggest that improved outreach on the benefits that technology solutions bring can positively affect public opinion. To achieve this, cities should explore ways of better communicating to residents how smart technology can improve their quality of life. Furthermore, people who use and have a favourable opinion of technologies can serve as advocates for these solutions. This is a way of engaging those who are less aware or yet to be exposed to these initiatives.

Figure 7.3 Positive impact of smart city technology solutions

	Hong Kong	Melbourne	Seoul	Shanghai	Singapore
Electronic payment technology and apps	61%	69%	62%	68%	70%
E-billing for utilities or public services	57%	62%	51%	67%	58%
Public Wi-Fi hotspots	51%	49%	68%	63%	52%
Interactive transportation/map mobile apps	66%	61%	67%	63%	64%
Online tax reporting and payment services	57%	56%	51%	61%	56%
Integrated payment systems for public transportation	53%	49%	70%	56%	62%
Online platforms and apps for healthcare services	47%	40%	31%	58%	47%
Interactive government self-service help centre or app	45%	43%	34%	55%	45%
Smart parking systems	35%	36%	32%	58%	34%

Based on the percentage of respondents saying the following technologies have a positive impact on their quality of life, as a factor of all who are aware of these solutions in their cities

Source: KPMG survey analysis

Case studies

Makati: Makatizen Card

The Philippines' financial hub Makati launched the Makatizen Card in 2017 to grant comprehensive access to social and financial services. Targeting the more than 580,000 people living in the city located in greater Manila, the card serves as residents' primary government-issued ID while it can be used to get social services benefits and conduct financial transactions. City government employees, public school students, and city residents who are active registered voters are eligible to apply for it.

Intended to be an all-purpose identification and payment solution, the card can be used at various ATMs and wherever MasterCard is accepted, including online. A mobile wallet feature also enables the cardholder to store and send money, pay bills and obtain prepaid phone credit. To incentivise usage, partnering establishments are offering discounts and loyalty points to customers who pay via their Makatizen Card.

According to Makati's Urban Development Department, the card combines personal identification with the means to transact secure electronic payments. To make a relevant comparison, the card incorporates elements of Singapore's National Registry Identification Card with its NETS cashless payment card, UDD says.

With more than 85,000 applications already approved, city officials estimate that by the end of 2019 all Makati residents will use it. In future, holders of the Makatizen Card will be able to book seats on public transport and pay local taxes.

Sources: City Government of Makati, WeGO

Singapore: Municipal services made easier

Receiving 3,000 cases daily of public feedback on municipal issues prompted Singapore to turn to technology. As different local authorities oversee everything from road infrastructure to stray dog reports, the government saw fit to build a better system for the public to file its inquiries and for officials to track and act on them efficiently. In response, Singapore set up a Municipal Services Office in 2014 to simplify the feedback reporting process. Then came a mobile application called OneService.

Unveiled in 2015, the app enables the public to report issues without having to pinpoint which particular agency is to get back to them. Users can also receive case updates, as OneService and its accompanying web portal provide a map to track the location of the feedback being generated.

To accelerate responses, the office developed an integrated system linking the feedback management practices of 11 agencies and 16 town councils, which in Singapore are non-government bodies that manage public housing estates.

In 2017, the number of registered app users surged by 43 percent to 114,000, while the number of submitted cases doubled to 153,000. By the end of 2017 it took 11 working days on average to close 90 percent of complex cross-agency cases – a marked improvement from the 16 working days that were typical of such inquiries at the end of 2015.

Source: Centre for Liveable Cities Singapore

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Embracing technology to enable more liveable and sustainable cities

In Singapore, people are at the heart of our Smart Nation journey. Technology is used as an enabler to make everyday life better. With apps like OneService@SG (see p.54), citizens find no "wrong-door" in reporting municipal issues to authorities, as it integrates such services within a single interface. The Smart Housing & Development Board (HDB) Town Framework demonstrates how Singapore is harnessing the power of data and technology to enhance homes and living environments. Computer simulation and data analytics are used to analyse the wind flow, solar irradiance and shaded areas within a town, to improve the design of new flats and create a more conducive living environment for residents. Public housing estates are also linked with a network of sensors to capture real-time information to optimise maintenance and to conserve energy and water. Smart technologies are also used to better understand and engage residents, enhance community bonding, and empower communities to take greater ownership in co-creating their living environments.

It takes good planning and governance to make smart cities work. As the ASEAN Chairman in 2018, Singapore helped to set up the ASEAN Smart Cities Network to synergise regional smart city development. A framework, such as the ASEAN Smart Cities Framework, that is respectful of cities' development context and goals, and highlights the necessary urban systems and enablers to achieve these goals, can offer valuable guidance to cities at varying stages of development.

Dr. Limin Hee
Director
Centre for Liveable Cities, Singapore

Mark Lunt
Group Managing Director
JOS

Aligning technology with purpose to make cities smarter

Building a smart city means tackling the real problems people and companies face day to day in ways that add value. For Hong Kong and other Asia Pacific cities, this means finding incremental, practical solutions that can improve sustainability and boost life quality for residents.

Hong Kong-based JOS, part of the Jardine Matheson Group, is a systems integrator, solutions provider and technology consultancy with extensive experience across Asia and a history dating back more than 60 years.

Mark Lunt, group managing director of JOS, says his company's approach towards helping clients find the best solutions can best be described as 'pragmatic': it is not just about implementing the latest technology – it is carefully understanding how the right technologies can solve problems, improve performance and give companies the best return. Cities should apply a similar philosophy when considering 'smart' solutions, he says.

Embracing industry best practices

At JOS, one way this approach has been put to work is in harvesting and analysing information. The combination of greater availability of a wide variety of data with powerful and increasingly affordable hardware means more sophisticated software can be run – making new kinds of answers available to businesses. For example, by asking questions based on probabilities, artificial intelligence (AI) solutions can help detect fraudulent insurance claims and credit card transactions speedily and accurately. "Chatbots, which just a few years ago were often a source of major frustration for many customers, can now handle more complex queries – and decide when they can't answer a question and should transfer the customer to a real person," Lunt says.

Fault diagnosis for vehicles and other machines is another area where technology has made dramatic improvements in recent years, Lunt explains. This shows how systems can combine data from different sources, codify it and then make it available in a form that allows relatively inexperienced operators to diagnose problems. "Before, to identify those same problems, you would have needed someone with many years of experience," he says.

Pursuing development with purpose in mind

When addressing deficiencies in their technology infrastructure, cities could start by looking at how technology has been effective in addressing business problems across various sectors.

In Hong Kong, a very positive step towards a 'smarter' future has been the government's willingness to match private sector investment in technology R&D. In doing so, the city is helping to create the necessary basic conditions for innovation, but more still needs to be done, Lunt says.

"It's easy to call for more investment – but to what end?" he asks. "We always have to ask how we can make things better while lowering risks for users and providers of products and services in the city."

The way forward, Lunt emphasises, is looking at how technology can optimise the use of resources to address some of the problems Hong Kong faces – such as a shortage of land and the lack of available talent in specific areas.

"To build a smarter future together, clarity of purpose is necessary," Lunt says. "We don't want solutions looking for problems – we must identify what our problems and priorities are and marshal investment and resources in the innovations and technology that can solve them."

Here, he suggests the purpose-driven approach JOS has followed when developing solutions for its clients is one that Hong Kong could consider. "Hong Kong is already a first-world city with first-world infrastructure," he says. "What we should be doing now is looking at what other cities are doing and adopting those things which are relevant," Lunt adds. "But as well as following and learning from others we should seek opportunities to take the lead in finding solutions to the problems that are most pressing for Hong Kong."

Next steps: Smart thinking for smarter cities

Julian Vella
ASPAC Regional Head – Global Infrastructure Advisory
KPMG China

Anson Bailey
Head of Technology, Hong Kong; Head of Consumer & Retail, ASPAC
KPMG China

Marcos Chow
Head of Technology Enablement, Hong Kong; Partner - Smart City Group
KPMG China

As our survey results support, an overarching goal for smart development in Asia Pacific cities is to improve liveability for residents. In other words, people don't just want a connected city; they want a city that serves them well.

Building a smart city means enabling it to handle future challenges, whether it is better catering to the needs of ageing populations, increasing the accessibility of healthcare, developing a future-focused workforce, or offering transport services that provide optimum mobility for all types of residents. It means having education systems that equip people with the imagination, creativity and preparedness to develop new answers to new challenges.

It also means cities must address long-standing problems, such as providing affordable housing for all members of the community, optimizing the use and conservation of scarce resources, and undertaking urban redevelopment programmes that enhance both the liveability and effective management.

Technology plays a vital role in this, and will do so even more in coming years as cities roll out digital solutions for everything from transport to payments to public services.

As we see from our survey findings, the more citizens are aware of smart technologies at work in their city, the more likely they are to believe the technologies are having a positive impact. This suggests that outreach plays a big role in influencing public opinion. It also serves as a reminder that cities must not only focus on connectivity – they must make the case for how technology improves quality of life for citizens. In addition, cities should align outreach efforts for solutions in the areas where citizens expect to receive benefits – especially transportation and healthcare.

Furthermore, proposed solutions must address these needs in ways that are sustainable in the long run. To this end, smart cities need smart governments — ones that have vision, think long term, operate seamlessly across departments and respond rapidly, as disruptive factors such as technology and innovation create both risk and opportunity.

"Smart cities need smart governments that have vision, think long term, operate seamlessly across departments and respond rapidly as disruptions create both risks and opportunities"

Julian Vella

In Hong Kong, for example, addressing land use issues, updating or renovating ageing buildings and re-developing underused land are keys to fulfil residents' expectations on liveability.

Since the release of its Smart City Blueprint, Hong Kong has been making progress on its goals – including allocating new funding to support innovation and technology. In addition, the city is on its way towards reducing its dependence on fossil fuels. For example, utility companies like CLP are now beginning to purchase from private sources following the government's introduction of feed-in tariffs in April 2018 (see interview on p. 48).

As cities continue to advance their smart city agendas, they should pay particular attention across the following areas:

- Putting liveability and quality of life at the heart of all smart city development and investment plans
- Becoming leaders in technology adoption in order to engage with citizens, inform policy, and design services to meet citizen needs
- Expanding the use of data and analytics to improve the effectiveness and efficiency of service delivery
- Placing a greater emphasis on sustainability and resilience, and ensuring these are core parts of project planning and development
- Embracing community engagement and, in particular, increasing the collaboration between the public and private sectors in the development and application of smart city solutions

Continued success will require officials to be bolder in the ways they interact with citizens and companies to roll out sustainable solutions. As mentioned in our interview with WeGO (p. 16), incorporating more citizen participation while developing public-private partnerships can enable governments to make sure initiatives align with the needs of the general public.

Well-informed governments should take the leading role in smart city projects, ensuring citizen involvement and drawing on best practices from private industry. In doing so, they can make the right decisions to improve liveability, foster economic growth and competitiveness, and adapt to better suit citizens' needs.

About KPMG China

KPMG member firms and its affiliates operating in mainland China, Hong Kong and Macau are collectively referred to as "KPMG China".

KPMG China is based in 21 offices across 19 cities with around 12,000 partners and staff in Beijing, Changsha, Chengdu, Chongqing, Foshan, Fuzhou, Guangzhou, Hangzhou, Nanjing, Qingdao, Shanghai, Shenyang, Shenzhen, Tianjin, Wuhan, Xiamen, Xi'an, Hong Kong SAR and Macau SAR. Working collaboratively across all these offices, KPMG China can deploy experienced professionals efficiently, wherever our client is located.

KPMG is a global network of professional services firms providing Audit, Tax and Advisory services. We operate in 153 countries and territories and have 207,000 people working in member firms around the world. The independent member firms of the KPMG network are affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity. Each KPMG firm is a legally distinct and separate entity and describes itself as such.

In 1992, KPMG became the first international accounting network to be granted a joint venture licence in mainland China. KPMG was also the first among the Big Four in mainland China to convert from a joint venture to a special general partnership, as of 1 August 2012. Additionally, the Hong Kong firm can trace its origins to 1945. This early commitment to this market, together with an unwavering focus on quality, has been the foundation for accumulated industry experience, and is reflected in KPMG's appointment for multi-disciplinary services (including audit, tax and advisory) by some of China's most prestigious companies.

About CLP Holdings Limited

CLP Holdings Limited, a company listed on the Stock Exchange of Hong Kong, is the holding company for the CLP Group, one of the largest investor-owned power businesses in Asia Pacific. Through CLP Power Hong Kong Limited, it operates a vertically-integrated electricity supply business providing a highly-reliable supply of electricity to 80% of Hong Kong's population.

Outside Hong Kong, CLP holds investment in the energy sector in Mainland China, India, Southeast Asia, Taiwan and Australia. Its diversified portfolio of generating assets uses a wide range of fuels including coal, gas, nuclear and renewable sources. CLP is one of the largest external investors in the Mainland's renewable energy sector. In India, it is one of the biggest renewable energy producers and among the largest foreign investors in the electricity sector. In Australia, its wholly-owned subsidiary EnergyAustralia is one of the largest integrated energy companies, providing gas and electricity to over 2.6 million households and businesses.

CLP is listed on the Global Dow – a 150-stock index of the world's leading blue-chips, the Dow Jones Sustainability Asia Pacific Index (DJSI Asia Pacific), the Dow Jones Sustainability Asia Pacific 40 Index (DJSI Asia Pacific 40), Hang Seng Corporate Sustainability Index Series and MSCI Global Sustainability Index Series.

About JOS

With over 60 years' experience in Asia, JOS is a systems integrator, solutions provider and technology consultancy with deep local and industry knowledge and an exceptional ability to execute. With 2,000+ IT professionals working from nine offices across Asia's major business hubs in China, Hong Kong, Macau, Malaysia and Singapore, JOS aims to improve the performance of business and governments across the region by applying the best technology to address their challenges. JOS has extensive experience across a range of industries, more than 10,000 private and public sector customers in Asia, and core capabilities in artificial intelligence, big data, cloud computing, enterprise applications, enterprise security, Internet of Things (IoT), mobility and next generation infrastructure. JOS is a division of JTH Group, a member of the Fortune Global 500-listed Jardine Matheson Group.

For more information, visit www.jos.com. Follow us: Facebook (JOS it solutions), LinkedIn (JOS) and WeChat (jos-china).

About Siemens

SIEMENS
Ingenuity for life

Siemens is a global technology powerhouse that has stood for engineering excellence, innovation, quality, reliability and internationality for more than 170 years. The company is active around the globe, focusing on the areas of electrification, automation and digitalization. One of the largest producers of energy-efficient, resource-saving technologies, Siemens is a leading supplier of efficient power generation and power transmission solutions and a pioneer in infrastructure solutions as well as automation, drive and software solutions for industry. In fiscal 2018, which ended on September 30, 2018, Siemens generated revenue of €83.0 billion and net income of €6.1 billion. At the end of September 2018, the company had around 379,000 employees worldwide. Further information is available on the Internet at www.siemens.com.

In 1911, Siemens opened its first sales office in Hong Kong. Since then, the company has committed to being a trusted technology partner and providing innovative solutions in Hong Kong and Macao. Siemens has provided integrated solutions for infrastructure development projects, including gas turbine at Black Point Power Station and power substations for CLP Power in Hong Kong and CEM in Macao; signaling, main control and fixed communication systems for Shatin Central Link; traffic control and surveillance system for Liantang / Heung Yuen Wai Boundary Control Point and total building solutions for City of Dreams in Macao. In December 2017, Smart City Digital Hub (also called MindSphere Application Center - City) was set up to unlock the potential of digitalization.

About Wilson Group

Wilson Group

A proud member of Sun Hung Kai Properties Limited, Wilson Group has set the standard for Hong Kong's transport infrastructure network for more than three decades. Excelling across five dynamic divisions: Parking, Tollways, Technology, Smart Mobility and more Facilities Management, it is our long-standing vision to ensure our clients always stay ahead of the curve. Employing nearly 4,000 people across its divisions, Wilson Group is synonymous with vehicle ownership in Hong Kong, from operating car parks, operating and maintaining the iconic Tsing Ma Bridge, collecting tolls electronically and capturing the photo of a speeding car. By continuously innovating and creating more digital offerings, Wilson Group aims to bring more convenience and safer roads to Hong Kong's motorists.

Address:
Wilson Group
Room 2601, 26/F
World Trade Centre
280 Gloucester Road
Causeway Bay. Hong Kong

About Smart City Consortium (SCC)

Smart City Consortium (SCC) is formed by a group of professionals from different corporations and organsations to provide opinions and suggestions to the government for formulating related policies and standards in the development of Hong Kong as a world-class smart city. We encourage worldwide collaboration with different stakeholders to create the right ecosystem which fosters innovation and sustainable economic growth for Hong Kong.

Our vision is to build Hong Kong as the world's leading Smart City to foster knowledge-based economy, enhance the quality of life and to create a vibrant ecosystem leveraging relevant Information and Communication Technologies and adopting effective resources management. We provide related opinions and suggestions based on our members' professional knowledge for the development of Smart City in Hong Kong. We are the vanguard in creating smart living culture and collaborate with the Government in developing Smart City strategic plans.

In past years, with the continuous support of our members, SCC has successfully organized and supported over 280 local and international events and over 10,000 people joined us there. To facilitate the international exchange of experience and to accelerate business opportunities, we have signed 34 memorandums of understanding with worldwide Smart City organizations, with many professional views and ideas exchanged with the overseas experts during our visits. As we know, Hong Kong has all the elements to be a global and regional fintech hub. It is an international financial centre with a free economy, rule of law, a large talent pool, an enduring legacy of trade and a strong work ethic. Hong Kong is looking to capitalize on financial technology to keep its leading position as one of the world's top financial hubs in the world. We believe that with the Alliance, we can play a more proactive role in this aspect.

At the same time, with the joint effort of SCC and the Smart City Development Alliance (SCDA) in mainland China, I would like to introduce you our international business matching platform under the theme of Smart City, called LinkedSmart. Along with the Alliance, it can provide more support to startups when they are ready to go for market or looking for investors. This platform aims at accelerating collaborations among strategic partnerships, startups and investors with the strong network of SCC so as to co-create a unique ecosystem for those innovative entrepreneurs in Hong Kong and around the world.

Contact us

KPMG

Andrew Weir
Senior Partner, Hong Kong,
KPMG China; Global Chairman of
Real Estate and Construction
T: +852 2826 7243
E: andrew.weir@kpmg.com

Julian Vella
ASPAC Regional Head -
Global Infrastructure Advisory
KPMG China
T: +852 2140 2309
E: julian.vella@kpmg.com

Anson Bailey
Head of Technology, Hong Kong;
Head of Consumer & Retail, ASPAC
KPMG China
T: +852 2978 8969
E: anson.bailey@kpmg.com

Andrew Poon
Partner, Smart City Group
KPMG China
T: +852 2143 8538
E: andrew.poon@kpmg.com

Alan Yau
Partner, Smart City Group
KPMG China
T: +852 2143 8600
E: alan.yau@kpmg.com

Marcos Chow
Partner, Smart City Group
KPMG China
T: +852 3927 5628
E: marcos.chow@kpmg.com

Irene Chu
Partner, Head of New Economy
and Life Sciences, Hong Kong
KPMG China
T: +852 2978 8151
E: irene.chu@kpmg.com

Patrick Kirby
Director, Technology, Media,
Telecommunications & Innovation
KPMG China
T: +852 2913 2568
E: patrick.kirby@kpmg.com

Cynthia Chow
Assoicate Director,
Infrastructure Advisory
KPMG China
T: +852 2847 5119
E: cynthia.chow@kpmg.com

CLP

Austin Bryan
Senior Director – Innovation
T: +852 2678 8032
E: austin.bryan@clp.com.hk

Wendy Wong
Senior Manager,
Smart Home &
Business Development
T: +852 2678 6899
E: wendywong@clp.com.hk

Elke Kornalijnslijper
Commercial Manager
T: +852 2678 8405
E: elke.kornalijnslijper@clp.com.hk

JOS

Mark Lunt
Group Managing Director
T: +852 2565 2011
E: marklunt@jos.com

Eric Or
Managing Director
Greater China
T: +852 2516 2628
E: eric.or@jos.com

Cannie Tsang
Head of Group Marketing
T: +852 2565 2011
E: cannie.tsang@jos.com

Siemens

Eric Chong
President and CEO
T: +852 2583 3388
E: contact.hk@siemens.com

Keith Cheng
Head of Hong Kong
Digitalization Hub, MindSphere
Application Center – City
T: +852 2583 3388
E: contact.hk@siemens.com

Foley Leung
Communications Manager
T: +852 2583 3388
E: contact.hk@siemens.com

Smart City Consortium

Eric Yeung
President
T: +852 3480 4230
E: eric.yeung@smartcity.org.hk

Clube Ng
Chairman, Industry Liaison and
Partnership SIG
T: +852 3480 4230
E: clube.ng@smartcity.org.hk

Eddie Cheung
Chief Executive Officer
T: +852 3480 4230
E: eddie.cheung@smartcity.org.hk

Wilson Group

Henry Louie
Managing Director
T: +852 2830 3860
E: henrylouie@wilsongrouphk.com

Matthew Chung
General Manager,
Business Development
T: +852 2830 3809
E: mchung@wilsongrouphk.com

Jessica So
General Manager,
Digital Initiatives & Let's Park
T: +852 2380 3848
E: jessicaso@wilsongrouphk.com

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Publications Team: Nina Mehra, Corey Cooper

Designers: Isabella Hung, Rita Guan

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