Future Hong Kong 2030

Public and private sector insights for smart city development

Survey conducted by

YouGov
What the world thinks

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About the study

The Future Hong Kong 2030 white paper is published by KPMG China in cooperation with CLP, Cyberport, HKBN JOS, Smart City Consortium, Siemens, Weave Co-Living, and Wilson Group. It analyses the internal and external factors shaping Hong Kong's smart city transformation over the next ten years and looks at how effective governance, smart infrastructure and innovation can be used to address the city's biggest urban challenges. This is the third annual report on smart city development, building on the Connected Cities report launched in 2019 and the Connecting Hong Kong report in 2018.

To examine how organisations can contribute to Hong Kong's smart city development in the next decade and identify opportunities for future engagement, YouGov was commissioned to survey 430 executives in corporate enterprises, small-and-medium size businesses, start-ups, government, not-for-profit and academia, across a broad range of industry sectors.

Among the executives surveyed, 81 percent are "senior management", including C-level (CEO, COO, CFO, or equivalent) or department heads. The respondent pool features a diverse pool of organisations: 42 percent are small or medium-sized businesses; 38 percent large businesses/corporates; 9 percent independent contractors and consultants; 7 percent not-for-profit organisations/non-governmental organisations (NGOs); 2 percent government/civil service; and 2 percent academic institutions. 97 respondents (23 percent) identified their organisations as "start-ups". 71 percent of respondents' organisations are headquartered in Hong Kong.

In total, 13 key industry sectors are represented, most prominent of which are technology and innovation (20 percent); professional services (12 percent); real estate (11 percent); financial services (10 percent); infrastructure (7 percent) and manufacturing (6 percent).

The report also includes in-depth interviews with industry practitioners and case studies showcasing best practices in Hong Kong and other cities.

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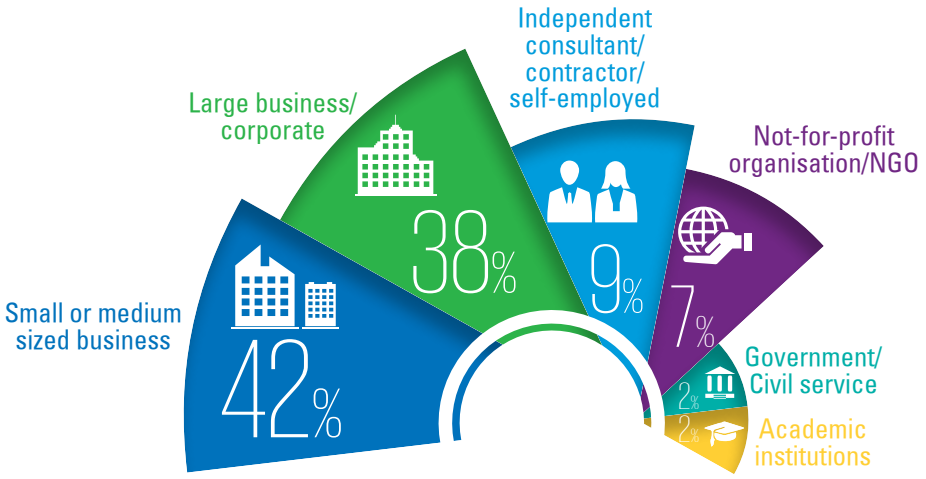
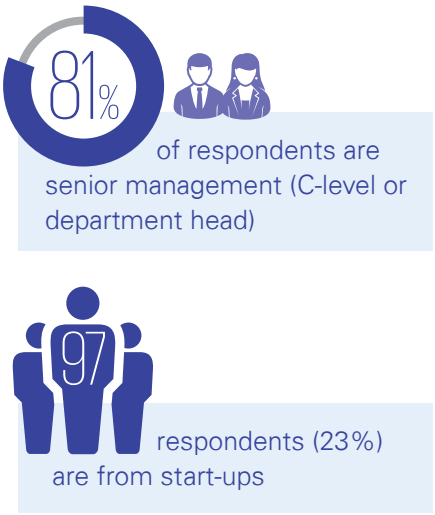
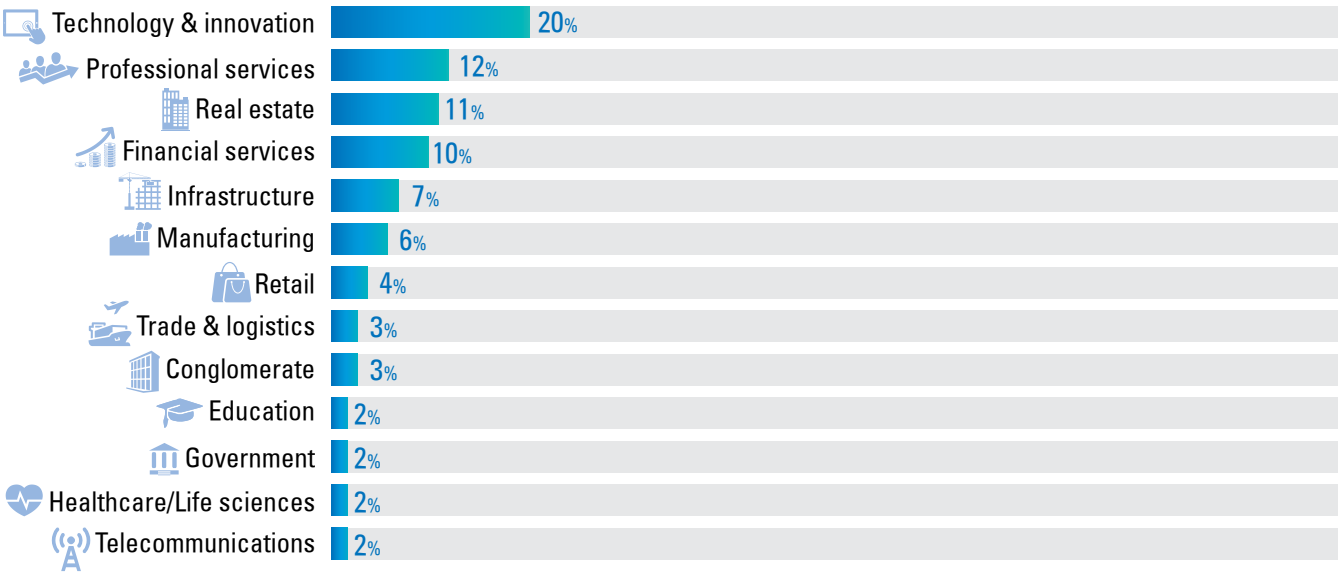
Survey demographic highlights

430 executives from business, not-for-profit organisations, government, and academic institutions





Top sectors represented are technology/innovation, professional services, real estate, financial services, infrastructure and manufacturing



Other highlights

71% of respondents' companies are headquartered in Hong Kong

64% have been working in Hong Kong more than 10 years

More than half (55%) of respondents have more than 15 years of experience in their industry sector

73% have lived in Hong Kong more than 10 years

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Executive summary

There are a number of long term global trends, coupled with several internal factors specific to Hong Kong that will shape the city's smart transformation in the future. Many of these are interconnected and represent complex challenges for the city's leaders. Effective governance, prioritising the needs of residents, and an ongoing focus on technology innovation will be crucial for Hong Kong to achieve its smart city objectives over the next 10 years.

A key finding in this year's *Future Hong Kong 2030* survey is that the government has an important role to play in facilitating smart city development. Having future-focused government regulation and policy, together with the development of technology infrastructure, are considered by survey respondents to be the most critical factors to support Hong Kong's continued progress.

Housing affordability is seen as a top issue to address, with respondents identifying the creation of more affordable homes as the leading priority for Hong Kong's future development, closely followed by making more efficient use of land and public space.

Respondents also highlight the importance of innovation to the success of the city as well as their own organisations. Three-quarters of those surveyed are planning to increase investment in research and development (R&D) in the coming year with more than half prioritising local R&D investment in Hong Kong.

Ensuring the city has a workforce equipped with the necessary skills is also a major imperative. Respondents consider providing training to ensure their staff have the right skills as being just as important, if not more so, than investing in new technology itself. Three-quarters of survey respondents plan to increase specialised training in digital technologies, broadly in line with the proportion planning to increase investment in technology.

Industry players interviewed for this report would also like to see Hong Kong's education system adapted to encourage more students to take up Science, Technology, Engineering and Mathematics (STEM) subjects to ensure they have a steady flow of relevant talent in the future.

When it comes to their own success, having access to the right talent will be the key determining factor for Hong Kong organisations in the coming decade. Respondents see mainland China, particularly the nine mainland China cities in the Greater Bay Area (GBA), as well as ASEAN countries as important sources to fill local talent gaps.

Co-creation and cooperation between the public and private sector also play an important role in smart city development. Survey respondents expressed a strong willingness to partner with the government on projects in this area. However, only a minority of organisations surveyed are currently working with the government on smart city initiatives, with most saying there are insufficient opportunities for partnerships.

Developing a broader base of shared data for the public to use is another area requiring improvement. Open data can greatly contribute to smart city development, allowing government departments, individuals and businesses to harness analytics tools to optimise city management and urban planning.

The past year has seen some progress in this area with around 4,000 data sets now available on the government's open data portal, data.gov.hk. However, the survey highlights the need to continue to raise awareness about the platform,

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with nearly half of respondents saying they are either not familiar with it or do not plan to use it. Private businesses also showed a lack of awareness or a lack of willingness to share their own data through the platform, with only a small minority of those polled currently contributing to it.

Sustainability plays an important role in smart city development, and technology can be used to help conserve resources and reduce Hong Kong's impact on the environment. Organisations recognise this and are focused on improving their own sustainability, with more than a third of respondents investing in technology to reduce their energy usage, carbon footprint or waste levels. Integrating environmental, social and governance (ESG) into their overall digital transformation strategy is also a top consideration for a similar proportion of respondents.

The ability to reduce costs is the key motivation among organisations for implementing ESG practices, followed by a desire to stay competitive with other leading brands, the survey finds. Demand from customers is also a key factor driving the adoption of ESG.

Hong Kong is economically connected with substantial markets in close proximity. A significant proportion of the city's economic activity is linked to Greater China – and within that the GBA – as well as the ASEAN region. The GBA is viewed by Hong Kong's larger corporates as the preferred destination for outbound direct investment including R&D. Meanwhile, small and medium-sized enterprises, including start-ups, plan to prioritise trade and investment with ASEAN countries, according to the survey. Continued development of Hong Kong's trade and investment links with these markets will be fundamental to Hong Kong's economic prosperity, acting as drivers for growth and the creating of future employment opportunities for its citizens.

The survey also suggests that start-ups also need to more effectively leverage the benefits of the GBA. While many start-up respondents say their organisation currently partners with Hong Kong-based corporations or universities on R&D projects, only a minority said the same for similar organisations in the rest of the GBA.

There is also a need for deeper collaboration between corporates and start-ups on smart city projects, in order to develop solutions that can most effectively benefit the community. Although nearly half of corporates plan to partner with start-ups on pilot projects in the coming year, a smaller number plan to develop new products or services with them, or to partner on go-to-market initiatives.

Next steps

The report analyses next steps to help optimise Hong Kong's development as a smart city. These include greater connectivity between individual government departments, best practices for effective governance as well as increased collaboration between the public and private sector. Corporates should also expand their partnerships with universities, start-ups and other companies, while focusing on sustainability and talent development. Start-ups and SMEs need to make full use of the resources available to them, and proactively seek out opportunities to collaborate with both larger businesses and universities. Please see p. 60 for a summary of key takeaways.

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Envisioning Hong Kong 2030

Building a smarter, more sustainable, more liveable city together

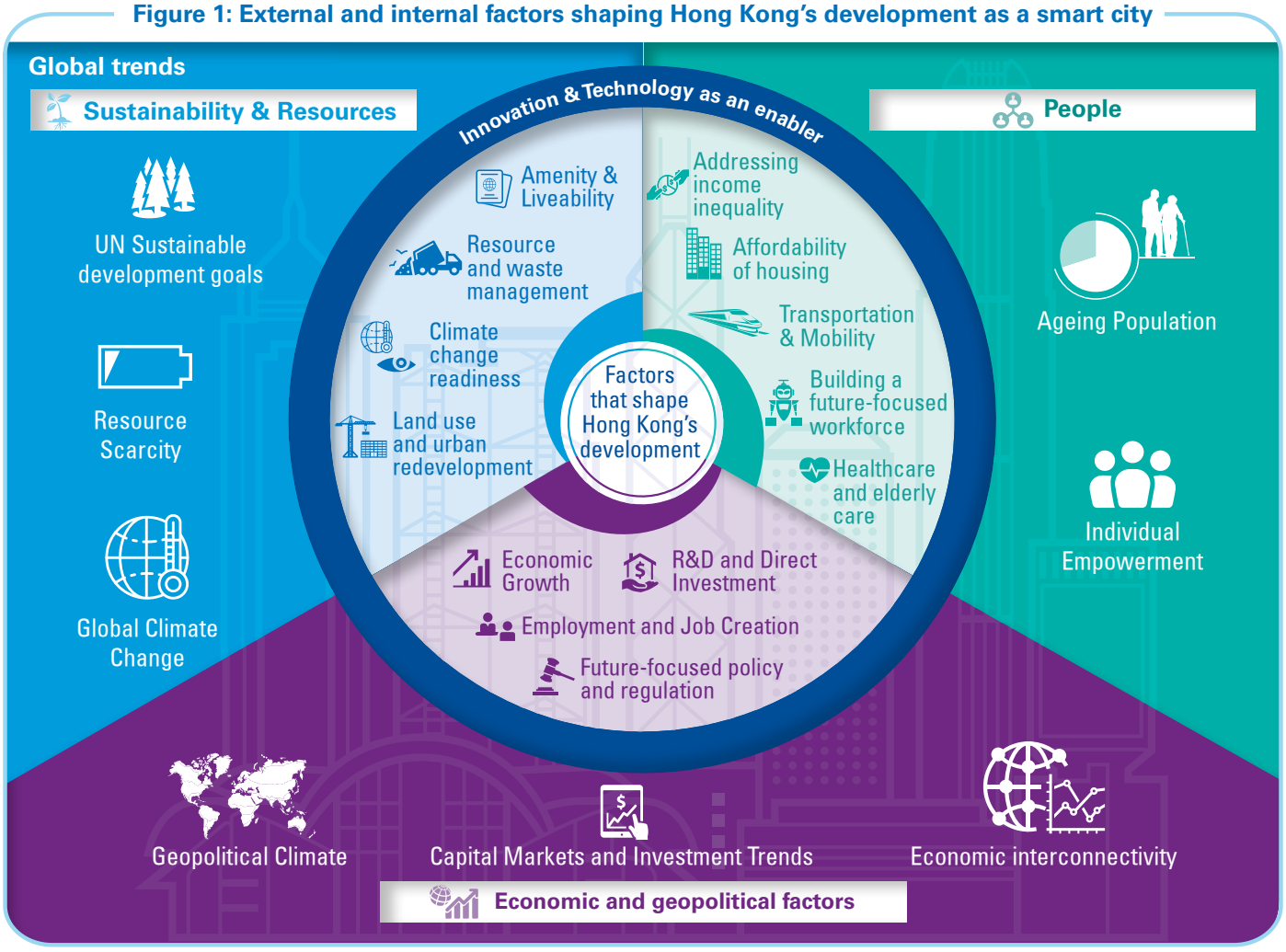
The starting point for this report is the challenges Hong Kong will face in the coming decade – and how effective governance, smart infrastructure and technology can be harnessed to address these issues and enhance residents' lives.

There are a number of long-term global trends that will impact Hong Kong and shape its development. Any future vision for Hong Kong must respond to where the city sits economically, socially and demographically in both the region and the world.

Global trends such as increasing empowerment of individuals, ageing populations, climate change, resource scarcity, economic interconnectivity, the geopolitical climate, and rapid technological disruption all present both risks and opportunities to cities. The impact of these factors must be clearly understood and factored into Hong Kong as it plans for the future.

At the same time, there are a range of internal factors specific to Hong Kong which need to be considered. These include the amenity and liveability of the city, land use and urban redevelopment, resource and waste management, and the need to boost R&D and innovation. In addition, there are several societal issues impacting Hong Kong that will need to be addressed for it to realise its 2030 ambitions. These include tackling income inequality and poverty, housing affordability, equipping the workforce with skills needed for the future, and taking care of the city's growing elderly population (see Figure 1).

Figure 1: External and internal factors shaping Hong Kong's development as a smart city



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Liveability and Sustainability

A city's liveability goes to the heart of the wellbeing and quality of life for its citizens. It is influenced by factors such as its built and natural environments, access to efficient and cost-effective government services, mobility, education and employment opportunities, and the welfare of its most disadvantaged citizens.

In 2019, Economist Intelligence Unit ranked Hong Kong as the 38th most liveable city in the world, noting its "high quality infrastructure and broad cultural and recreational activities". The ranking was two places ahead of Singapore but behind other Asia-Pacific hubs such as Sydney, Melbourne, Tokyo and Osaka, all of which ranked in the top ten.[1]

Hong Kong's physical sustainability will be shaped by its resilience to climate change and its management of scarce resources. Climate change is one of the most pressing challenges the world currently faces. The city's ability to transition its energy sources from fossil fuels to renewable energy will be increasingly important going forward.

Hong Kong is ranked as the ninth most sustainable city in Asia in Arcadis' latest Asian Sustainable Cities Index,[2] but there are still further improvements to be made. Electricity generation accounts for 70 percent of Hong Kong's total carbon emissions,[3] with just 1 percent of Hong Kong's energy currently coming from renewable sources. At current rates, this level is expected to rise to only 3 percent to 4 percent by 2030.[4]

As well as generating more energy from sustainable sources, Hong Kong also needs to develop ways to reduce energy usage. Building-related activities account for 90 percent of Hong Kong's total energy consumption, compared with a global average of 40 percent.[5] The introduction of a smart power grid and artificial intelligence-driven technology can help to optimise energy consumption. Implementing green building standards and retrofitting existing buildings to make them more environmentally friendly can also save energy. However, at the end of 2019, only 1,577 buildings in the city had a BEAM Plus rating, a tailor-made standard for Hong Kong which assesses the sustainability of a building throughout its lifecycle, out of more than 42,000 private sector properties.[6]

The adoption of electric vehicles is also an important part of an environmentally sustainable city. While Hong Kong's MTR network, which is used by an average of more than 4.3 million people a day,[7] is electric, progress has been slower for other forms of transport, particularly public buses and private cars.

Waste management and recycling is another key aspect of sustainability that requires attention in Hong Kong. The city recycled just 30 percent of municipal solid waste in 2018,[8] down from 46 percent in 2007 and below Singapore's rate of 60 percent.[9] Hong Kong should not only consider investing in more domestic recycling facilities, but also explore increasing the number of waste-to-energy plants, which generate power and reduce the amount of waste sent to landfills.

The United Nations Sustainable Development Goals[10] (UN SDGs) also form an important framework for societal development and innovation. With increasing levels of personal data being collected, individuals must be able to trust how institutions will use and manage this data, in line with Sustainable Development Goal (SDG) 16 which calls for "effective, accountable and inclusive institutions at all levels." Equally, people will need a certain level of income and education in order to be able to participate in an increasingly connected world (SDG 1 and 4), while cities will need resilient infrastructure that promotes inclusive and sustainable industrialisation and fosters innovation (SDG 9).

The government has been taking steps to embed the UN SDGs into its long-term planning, however, more needs to be done to align government departments, the private sector and the community to collectively address these goals (for more information, please see page 32 of this report).

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Economic connectivity and innovation

Cities operate in world of increasing economic connectivity. This presents significant opportunities to generate economic growth and mitigate risk by developing and diversifying trade and investment activities with other economic markets.

Hong Kong's competitiveness is evidenced by its ranking by the World Economic Forum in 2019 as the third most competitive economy in the world, behind Singapore and the United States.[11] The city has been actively expanding its economic connectivity, with eight free trade agreements currently in place, including one signed with Australia in the past year.[12]

Mainland China is Hong Kong's key trading partner, accounting for 50.4 percent of total trade in 2018.[13] Hong Kong is set to benefit substantially from being part of the GBA initiative, which will give it access to a large, more connected industrial and consumer market comprising nearly 70 million people. This means a deeper talent pool and increased R&D capacity, as well as more opportunities for collaboration with universities and other research institutes in the region.

Connectivity within the GBA has already improved through the opening of the Hong Kong-Zhuhai-Macau Bridge and the Guangzhou-Shenzhen-Hong Kong Express Rail Link, which has reduced travel times from Hong Kong to Shenzhen to just 18 minutes and to 46 minutes to Guangzhou. Initiatives are in place to improve further the flow of talent, goods, finance and data within the GBA, while a Guangzhou-Shenzhen-Hong Kong-Macau innovation and technology corridor is being developed.

ASEAN nations are also set to play an increasingly important role in Hong Kong's economy. Hong Kong signed a free trade agreement and related investment agreement with ASEAN in 2017, with the agreement coming into force in three ASEAN countries, including Singapore, Thailand and Malaysia, in 2019.[14] Hong Kong's total exports to ASEAN grew by 2.6 percent year-on-year during the first nine months of 2019 to stand at US$29.6 billion.[15]

Alongside connectivity, R&D investment can also be an important driver for GDP growth due to the increased productivity it creates. The government has set a target to increase spending in this area from 0.86 percent of GDP in 2018,[16] to 1.5 percent by 2022.[17] Whilst this represents a significant increase, the figure is still below Shenzhen's R&D spending of 4.13 percent[18] of GDP as well as that of other major competing economic centres in Asia, suggesting a continued long term focus on encouraging increased spending on this area will need to be maintained.

Hong Kong must also continue to invest in its growing start-up ecosystem. The number of start-ups in the city has been increasing at a rapid pace, with 3,184 start-ups in 2019, 21 percent more than in 2018 and a rise of 163 percent in the past six years.[19] Hong Kong's start-up ecosystem includes Hong Kong Science and Technology Park and Cyberport, while there are also plans to create a Data Technology Hub and Advanced Manufacturing Centre at the Tseung Kwan O Industrial Estate. In the 2020-2021 budget, the government earmarked HKD 3 billion for the phase 2 expansion of Hong Kong Science and Technology Park. The city is also considering establishing a third InnoHK research cluster, in addition to the two existing clusters covering healthcare technology and artificial intelligence/robotics.[20] The ongoing development of the Hong Kong-Shenzhen Innovation and Technology Park, located in the Lok Ma Chau Loop on the Hong Kong-Shenzhen border, will also serve to boost cross-border R&D collaboration.

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Prioritising societal needs

The principal focus of any city must be the welfare and wellbeing of its citizens.

Two key global trends relevant to this are ageing populations, as well as an enhanced ability of ordinary citizens to communicate, enabled by technology. Citizens are increasingly providing feedback on how public services can be improved and how they, as individuals, can better manage their use of those services. To be successful, cities need to actively and effectively engage with residents to better understand their needs, to develop and communicate their responses, and ultimately improve service quality.

Hong Kong's population stood at 7.52 million at the end of 2018, and it is expected to reach 8 million by 2030.[21] As the population increases, so will the stress on the city's transport system, healthcare facilities and housing.

Housing affordability and falling homeownership rates are a key challenge for the city. The proportion of people in Hong Kong who own their own property has declined from 52.8 percent in 2006[22] to 49.9 percent in the third quarter of 2019.[23] By contrast, Singapore has a homeownership rate of 91 percent.[24] Housing affordability has also deteriorated significantly following a tripling of property prices since 2008.

As industry players have pointed out, smart city solutions can help alleviate the situation through increasing connectivity, opening up new areas for housing, while using innovative building techniques can also lower the cost and speed up the rate at which properties are constructed. Increased availability of data can also provide a better understanding of how land and buildings are being used in Hong Kong, helping to identify areas for regeneration and individual buildings for retrofitting to create more housing.

Whilst median household income in Hong Kong has generally outpaced inflation from 2008 to 2018,[25] this has not translated into greater income equality for residents. Hong Kong's Gini coefficient, a key measure of inequality, has reached a 45-year high, and an estimated 1.37 million people, or almost 20 percent of Hong Kong's population, currently live below the poverty line.[26]

Increased economic connectivity should help to drive growth, which in turn can increase incomes in the city, as well as provide new employment opportunities. However, this should be coupled with specific measures to address income inequality and poverty. Hong Kong's education system also needs to adapt to encourage more students to take up STEM subjects to ensure the workforce has the skills needed to pursue R&D and secure positions in emerging industries.

Like many developed economies, Hong Kong also faces the challenge of an ageing population. In mid-2019, 1.3 million people in Hong Kong were aged 65 or over.[27] This figure is expected to increase to 2.1 million by 2030, or more than a quarter of the population.[28] It is also estimated that by 2039, 11 percent of people in Hong Kong aged over 60 will be suffering from dementia.[29] This ageing population will lead to a significant rise in government spending on services for the elderly and increase the burden on Hong Kong's healthcare system. It also creates challenges in terms of where elderly residents will live, who will take care of them and what quality of life they will have.

There are currently just over 33,100 places at government and non-profit elderly care homes and nursing homes.[30] A report by Hong Kong's Elderly Commission has forecast the city will need 64,000 subsidised residential care places by 2030, which it says is unlikely to be achieved due to land and manpower shortages and lead times from planning to coming into service.[31]

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Technology has been successfully implemented in other cities to address shortages in long-term care facilities. For example, in Singapore, the government is exploring using assistive technology to help with care for elderly people. It has introduced an elderly monitoring system which learns the daily habits of elderly people through motion sensors and alerts their family or caregivers if irregular patterns of behaviour are detected,[32] to help people stay in their own homes. It is also using robots to help recovering stroke patients exercise and to alert early stage dementia patients when to take their medicine, while its TeleHealth system offers online consultations to patients in their homes through video conferencing.[33]

Meanwhile, improving transportation and mobility in the city is critical to ensure that residents have access to services and employment opportunities. Reducing traffic congestion is a key issue, as the number of private cars in Hong Kong has increased significantly in the past five years from 541,751 in 2014 to 626,405 in October 2019.[34] This growth in private vehicles has contributed to rising congestion levels. Smart road systems can be used to manage congestion, adjust the duration of traffic lights and help drivers find the fastest route at any given time. There is also scope for infrared cameras to be used to detect and give priority to vehicles with higher occupancy.

In June 2019, the Transport Department began the second phase of installing smart sensors along strategic routes, as part of its Smart Mobility initiative.[35] The data is already being used to help motorists find the fastest routes to their destination. Smart parking meters, through which consumers can pay parking fees via a mobile app and include sensors that can detect whether a space is occupied, will start to be installed from May next year.

The primary focus of successful cities is on the welfare and quality of life of their citizens. To facilitate smart city development, effective governance is required as well as increased opportunities for collaboration between the public and private sector, and between corporates, start-ups and SMEs. Dialogue between government, businesses and society will also play an important role as increasing levels of data are collected, analysed and shared.

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Recent public measures to promote a smarter, more liveable, more sustainable city

Smart city governance and open data

- Plans to release Hong Kong's "Smart City Blueprint 2.0" in 2020 to further promote smart city development
- HKD 100 million allocated to develop an integrated digital platform for data integration and information exchange
- Plans to launch a territory-wide 3D digital map in phases starting from 2020
- HKD 60 million earmarked to establish the first Geospatial Lab to promote the application of spatial data
- Plans to launch "iAM Smart", a one-stop personalised digital service platform, in the fourth quarter of 2020

Economic connectivity and innovation

- HKD 3 billion earmarked to take forward Phase 2 of the Hong Kong Science and Technology Park Expansion Programme
- Plans to explore the establishment of a third InnoHK research cluster
- The grant ceiling under the Technology Voucher Programme increased to $600,000, with the government's funding ratio raised to 75%
- HKD 345 million allocated for a pilot subsidy scheme to enhance the productivity of the logistics industry through smart technology applications
- HKD 1 billion earmarked for the Smart Traffic Fund to subsidise research and application on vehicle-related innovation and technology
- HKD 30 million in additional funding allocated to enhance Labour Department employment programmes and raise the ceiling of on-the-job training allowances
- HKD 2.5 billion allocated to the Employees Retraining Board to enhance the "Love Upgrading Special Scheme", which helps train unemployed workers with new skills they can use when they re-enter the job market

Liveability and sustainability

- HKD 300 million per year earmarked to implement waste paper collection and recycling services in the second half of 2020, to help stabilise the quantity and price of local waste paper
- Plans to set up a HKD 200 million Green Tech Fund to support the R&D and application of decarbonisation and green technologies
- Plans to develop Hong Kong's first roadmap on the use of electric vehicles, coinciding with the launch of a HKD 2 billion pilot scheme to subsidise the installation of charging-enabling infrastructure in car parks of private residential buildings
- HKD 80 and 350 million earmarked respectively to launch pilot schemes for electric public light buses and electric ferries
- Plans to phase out 40,000 diesel commercial vehicles with HKD $7.1 billion earmarked for ex-gratia payments to vehicle owners
- HKD 300 million earmarked for the Cleaner Production Partnership Programme to encourage Hong Kong-owned factories to adopt cleaner production technologies

Addressing societal needs

- HKD 500 billion earmarked for two 10-year Hospital Development Plans, providing over 15,000 additional hospital beds and more than 90 operating theatres to meet projected service demand up to 2036
- Plans to provide an additional HKD 3.6 billion to the Hospital Authority to retain talent in the five-year period starting from 2021-22
- HKD 300 million allocated for recurrent funding to provide 3,000 home care service quotas for elderly persons in the coming two years, and issue 1,000 community care service vouchers to elderly persons in the coming year
- HKD 75 million in recurrent funding allocated to subsidise elderly service units to provide soft meals to elderly persons with swallowing difficulties
- HKD 46 million in recurrent funding allocated to subsidise Social Welfare Department-subvented NGOs operating day service units

Source: The Government of the Hong Kong Special Administrative Region, "The 2020-2021 Budget", February 2020. https://www.budget.gov.hk/2020/eng/index.html

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Priorities for smart city initiatives

As Hong Kong looks ahead to 2030, improving the lives of its citizens is seen as the top priority for smart city projects. Initiatives should focus on improving housing affordability and ensuring employees have the skills they need, according to the survey. Corporates also highlighted having access to a future-focused workforce as a top priority for their own development. For its part, the government should facilitate progress through introducing future-focused regulation and providing the necessary infrastructure on which to build smart city solutions.

Going forward, nearly half (49 percent) of survey respondents say creating more affordable housing for residents should be the top priority for smart city projects over the next decade (See Figure 2). This was followed by making more efficient use of land, public space and buildings at 44 percent. Creating a future-focused workforce was also among the top three priorities at 41 percent.

Affordable housing is a fundamental societal requirement for Hong Kong. Although this challenge exists in many cities in the developed and developing world, Hong Kong's situation is exacerbated by the dual factors of land scarcity and a growing population. Nonetheless, the provision of affordable housing is critical to the city's positioning as a major financial and commercial centre.

Sachin Doshi, Founder and Chief Executive Officer of Weave Co-Living, says: "If you look at the development of most major cities, one of the things that is attracting talent to these cities is the provision of good quality, well-priced accommodation."

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Sachin Doshi
Founder and Chief Executive Officer, Weave Co-Living

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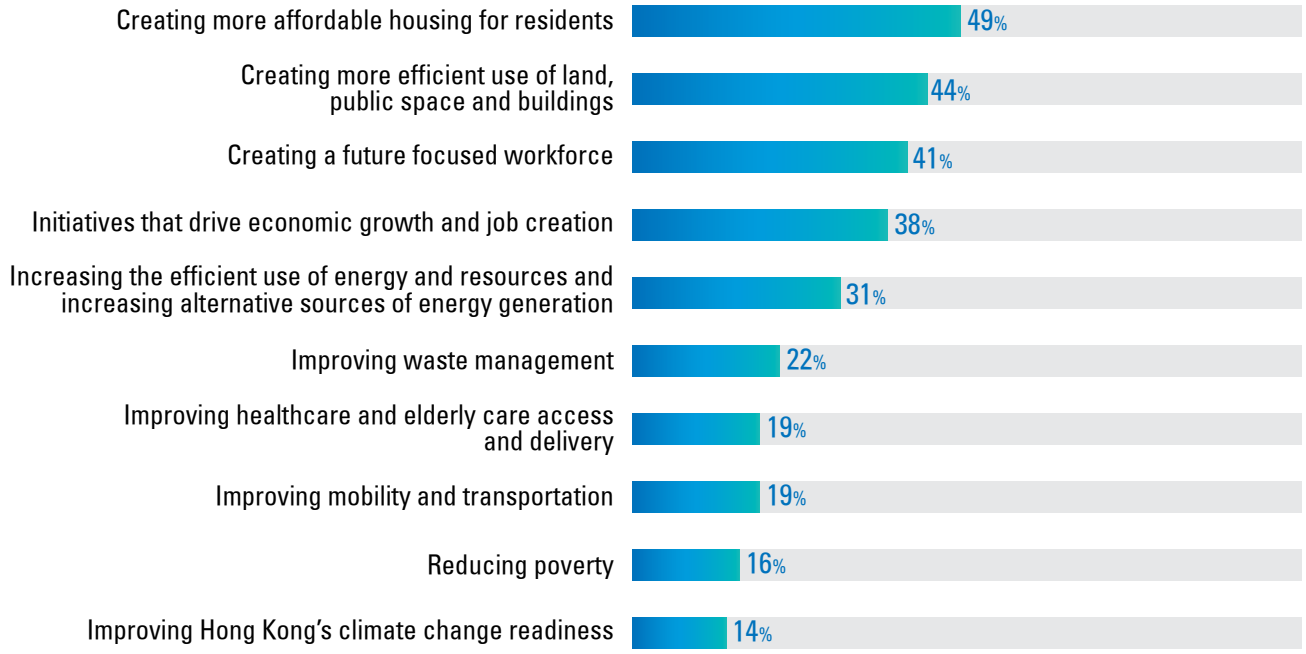
Figure 2: Top priorities for smart city development in the next 10 years



Source: KPMG Survey Analysis
Respondents could select up to three choices

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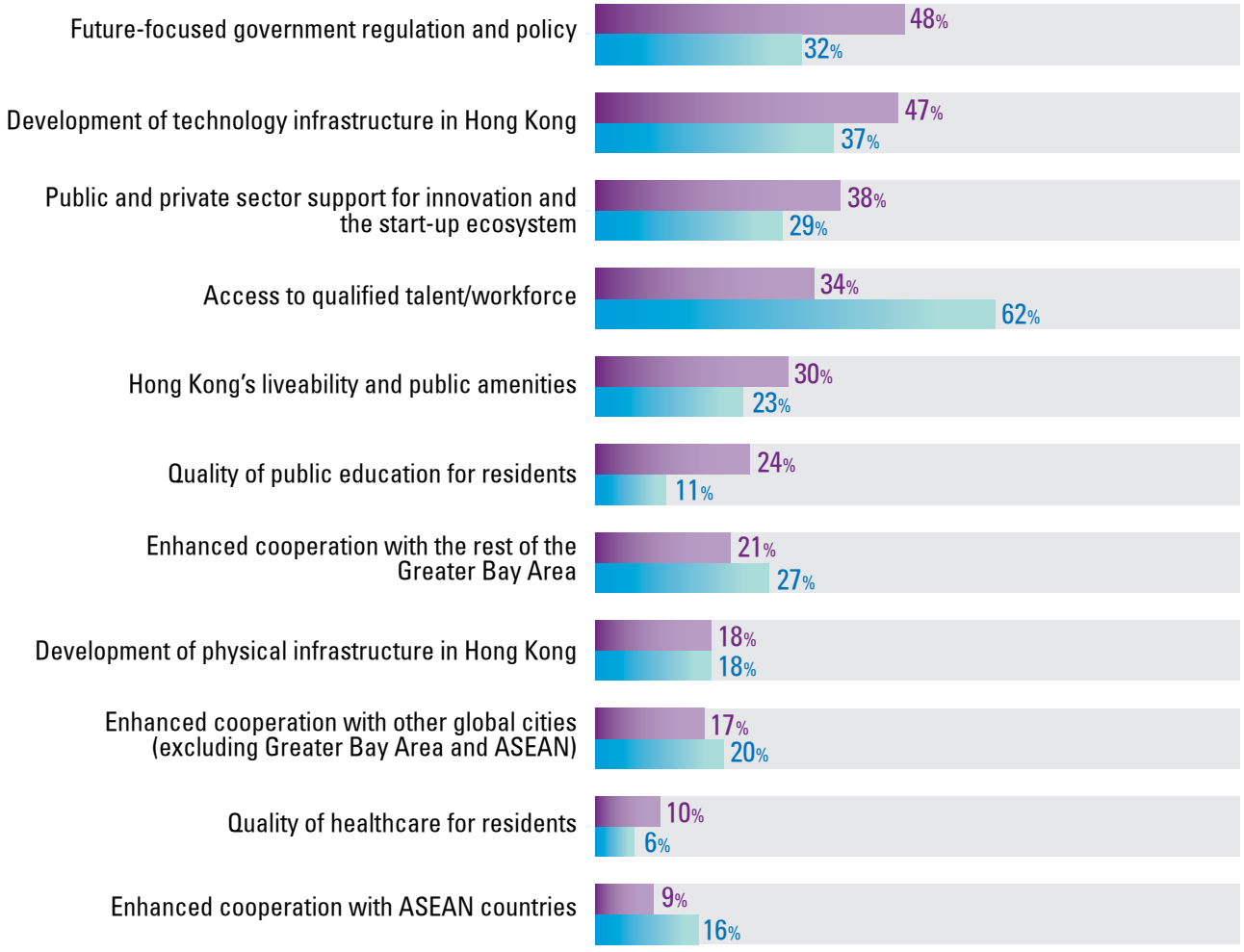
Key factors for Hong Kong's smart city development

Having future-focused government regulation and policy is seen as being the most critical factor in Hong Kong's development as a smart city in the next 10 years, cited by 48 percent of survey respondents (see Figure 3).

This relates to the requirement for policy coordination across government as well as having a regulatory system that both protects society and has the flexibility to adapt to and accommodate technological change.

Figure 3: Critical factors for Hong Kong development as a smart city by 2030



Source: KPMG Survey Analysis
Respondents could select up to three choices

Industry players interviewed for this report observed that it is not enough for individual government departments to be pursuing initiatives in their own areas, but rather that a coordinated, connected approach is needed. They also pointed out that where smart cities have been successful, governments have set a theme or vision for development and had interdepartmental collaboration and regulatory flexibility to achieve it.

"The government should take a holistic look at the entire needs of Hong Kong as a city and then connect individual departments to work on solutions. We also live in a world of significant technological disruption and we must be able to respond to this in a way that best serves the interests of citizens," says Julian Vella, Co-Head – China, Global Infrastructure Advisory at KPMG China.

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"Connectivity is the most critical area to drive the city to become smarter because it is the base layer for all the technologies to be put on"

Timothy Mak
General Manager,
Hong Kong and Macau, Signify

The development of technology infrastructure was seen as the second most important area in enabling Hong Kong to become a smart city, with 47 percent of survey respondents seeing this as a top priority.

A key part of improving the city's connectivity will be the introduction of 5G networks, which have higher capacity and speeds and lower latency than 4G, increasing the amount of data that can be collected through Internet of Things (IoT) devices. 5G service is expected to begin roll out in the second quarter of 2020, after four mobile network operators bid for 5G spectrum in a government auction in October 2019.[36]

"Connectivity is the most critical area to drive the city to become smarter because connectivity is the base layer for all the technologies to be put on," Timothy Mak, General Manager, Hong Kong and Macau at Signify explains.

While regulation and technology are seen as key factors in Hong Kong's development as a connected city, having access to qualified talent is the top priority cited by survey respondents for their own organisations' success in the next 10 years, with 62 percent saying having access to the right workforce is critical. Talent was seen as being particularly important by large corporates, with 73 percent of these organisations citing it as their top priority.

To address current gaps in employee skillsets, the government has allocated an additional HKD 2.5 billion in the 2020-2021 budget to the Employees Retraining Board to provide unemployed workers with new skills they can use when they re-enter the job market.[37]

Anson Bailey, Head of Telecommunications, Media and Technology, Hong Kong, at KPMG China says that such retraining programs must have a strong focus on emerging technologies. "For 'Future Hong Kong 2030' to succeed, we need to ensure that we invest in a more agile workforce that is fit for the future," Bailey says. "This means that we must start upskilling workers – including non-technical staff – on digital capabilities such as Data Analytics, AI and Blockchain to ensure they are prepared in advance of mainstream adoption of these technologies."

Over the longer term, Hong Kong's education system will need to adapt to produce more graduates with the skills needed by the innovation and technology sector and other emerging industries.

"In Hong Kong, we see fewer young people wanting to go into STEM. I think the industry has to work together to attract more people to enter the technical, technology and IT fields to sustain smart city development," Eric Chong, President and CEO of Siemens Limited says.

There are also concerns that Hong Kong lacks the technology innovation needed to drive development. A significant proportion of survey respondents (44 percent) believe innovation in this area will be insufficient to optimise smart city projects over the next 10 years, compared to only 24 percent who say it will be sufficient. In contrast, more respondents say they believe physical infrastructure will be adequate to keep pace with smart city development. (see Figure 4 on next page). Industry players say the situation could improve with the rollout of 5G technology.

"With the coming of 5G technology that has ultra-high speed, super low latency and massive connectivity, we see the limitless possibilities in smart construction, smart buildings, smart hotels, smart health, and many more. We are expecting a lot more enhancements in digitalised solutions, especially in the areas of IoT sensors, AI-based analytics and mobile edge computing, coming to market in the next few years. It will be a critical time for Hong Kong to ride on the new wave of innovations to live up to its Smart City vision," says Anna Yip, Chief Executive Officer of mobile operator SmarTone.

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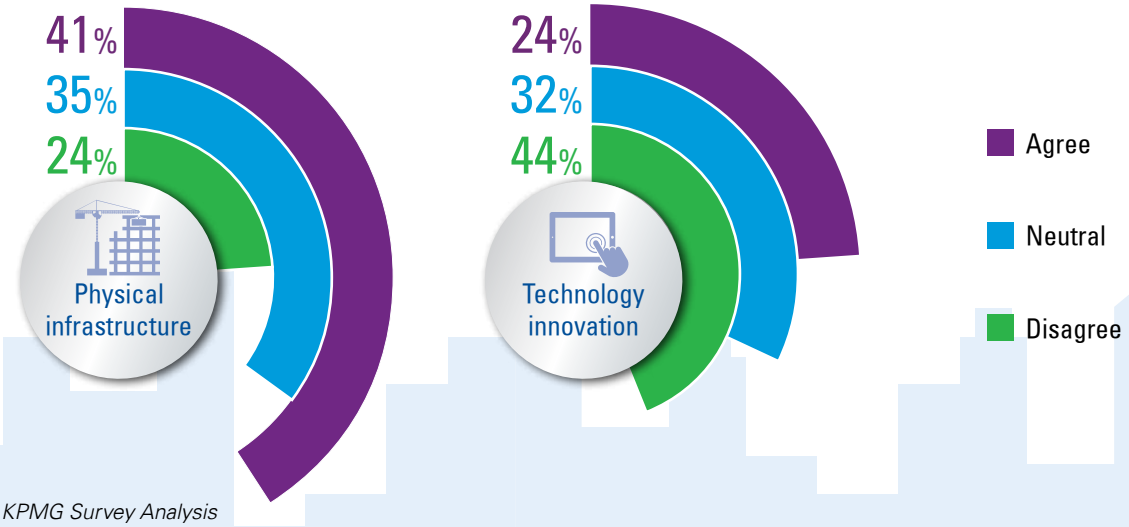
Figure 4: Conditions to optimise smart city development

Percentage of respondents who agree physical infrastructure and technology innovation will be sufficient to optimise smart city development over the next 10 years



Source: KPMG Survey Analysis

"The government should take a holistic look at the entire needs of Hong Kong as a city and then connect individual departments to work on solutions"

Julian Vella
Co-Head – China,
Global Infrastructure Advisory
KPMG China

Looking ahead: Hong Kong's "Smart City Blueprint 2.0"

The government is due to publish an updated version of its Smart City Blueprint in 2020, building on the original blueprint published in December 2017, which set out 70 initiatives under six priority areas, including smart environment, smart people and smart economy.[38]

As this document is being developed, the government should maintain a three-way dialogue between government, corporates and citizens to validate its priorities. "There needs to be a strong focus on communication between all elements of society in order to understand the needs of the community and involve it in developing solutions for the future," KPMG's Julian Vella says.

Proposed solutions should work to involve more co-creation between the public and private sector. It is also important that citizens have a clear understanding of the benefits of new technologies, and how their data will be collected and used.

Marcos Chow, Head of Technology Enablement, Hong Kong, KPMG China, suggests the government should produce a compelling vision for Hong Kong as a smart city to help residents understand what it means for them. One example from which Hong Kong can draw ideas is the 2030 Seoul Master Plan, which sets out the changes the Seoul Metropolitan Government plans to introduce by 2030 in terms of how it will impact the lives of children in the city as they grow to become adults.[39]

Chow says the government should be ambitious as it sets its new goals. He points out that as Hong Kong is looking at introducing 5G, Helsinki is already planning for 6G, and while the Hong Kong government is encouraging the switch to electric vehicles, Seoul is planning towards hydrogen vehicles. "We need to be more ambitious or we will always be playing catch up," he says.

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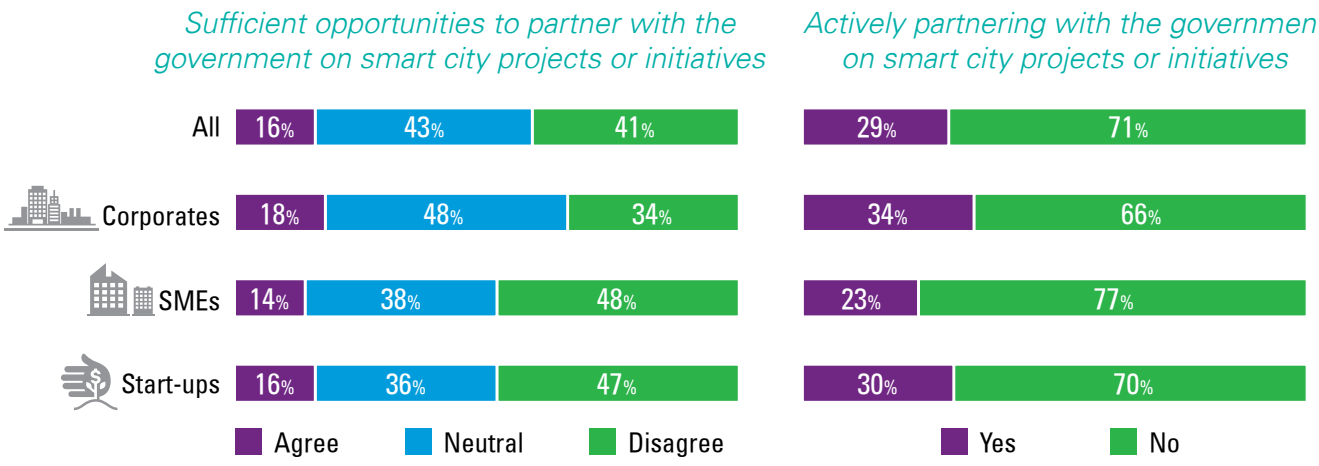
Improving smart city governance and public-private cooperation

Governance plays an important role in smart city development due to the collaboration required between the public and private sector. Governments must look at how they can encourage both businesses and citizens to participate in initiatives, removing hurdles that limit opportunities for partnerships.

In Hong Kong, respondents surveyed expressed a strong willingness to collaborate with the government in smart city projects but pointed to a lack of opportunities to do so. Overall, 29 percent of respondents surveyed said their organisation is currently partnering with the government on smart city-related projects and initiatives, with corporations more likely to partner as opposed to start-ups or small and medium-sized enterprises (SMEs). Roughly four out of 10 respondents (41 percent) disagreed there are sufficient opportunities to partner with the government on these projects, while 16 percent agreed (see Figure 5).

Figure 5: Partnering with the government on smart city projects



Source: KPMG Survey Analysis

Flexibility on partnership models seen as key enabler

The government's current models for working with the private sector may be a factor in discouraging some businesses from participating in projects. For example, the tender process currently used by the government can be a hurdle, explains Henry Louie, Managing Director at Wilson Group. "Contracting is typically prescriptive – they come out with a tender, you read the technical requirements and you give them a price," he says.

Timothy Mak of Signify says that in some cases the government's scoring system for contracts can place a higher emphasis on price, rather than the quality of the solution, meaning the lowest bid typically wins.

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As an alternative to the tender model, interviewees said they would prefer to see the public-private partnership (PPP) model adopted more frequently, with a key focus being "value for money" rather than predominantly being the price offered. Under this model corporates build infrastructure or provide a service for the public from which they receive a revenue stream for a set period of time. "A PPP model is much more cooperative, as you define a lot of the requirements together," Louie says.

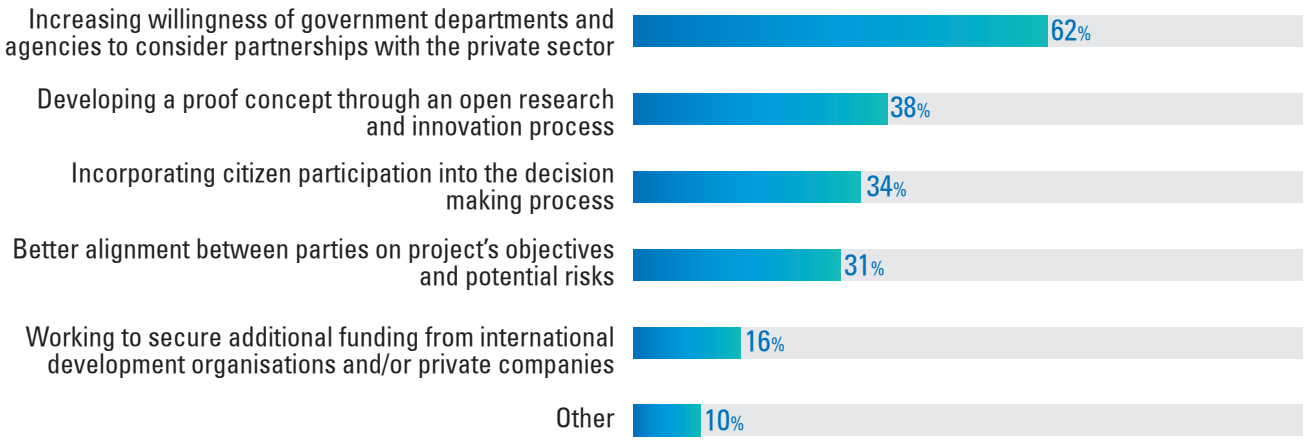
Mak adds that other government processes may also be off putting for companies: "In our experience proof of concept takes a long time, requiring a tendering process and bidding and then deployment. Leveraging the R&D arms of the government, like Cyberport and Science Park, could eliminate the lengthy process and lead to earlier deployment."

Optimising public-private cooperation

Responses from the public and private sector executives surveyed suggest they see increased collaboration as playing an important role in Hong Kong's smart city development.

62 percent of respondents say that willingness on the part of government departments and agencies to consider partnerships with the private sector is an important factor to enable smart city initiatives to achieve their objectives (see Figure 6). In addition, they stress the need for more community participation: 38 percent say that development of proof of concepts through an open research and innovation process would optimise projects; while 34 percent say incorporating citizen participation into the decision-making process is a key factor.

Figure 6: Factors that can optimise cooperation with the government on smart city projects



Source: KPMG Survey Analysis
Respondents could select up to two choices

Cities, in all their complexity, generate huge volumes of data. It opens up a world of opportunity for IoT by enabling sensors to collect and connect information about city assets. The performances of these assets will then be analysed to create true value and savings for Hong Kong, Macau, and the region"

Keith Cheng
Head of Digital Hub, Internet of Things, Siemens Limited

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Best practices in other cities

In the UK, the Greater London Authority has collaborated with Siemens on a smart city model for the 'Arc of Opportunity' area in east London. The area has been retrofitted with smart sensors to use IoT and data analytics to improve energy efficiency and mobility. Smart grids have been introduced to reduce energy loss in transmission, while buildings have been fitted with energy management systems to reduce power consumption in real time. Smart systems and intelligent data are also being used to improve mobility in the area with less infrastructure investment. Overall, Siemens estimates the improvements will bring benefits worth EUR 1.08 billion over the course of 35 years.

Keith Cheng, Head of Digital Hub, Internet of Things, Siemens Limited remarked, "Cities, in all their complexity, generate huge volumes of data. It opens up a world of opportunity for IoT by enabling sensors to collect and connect information about city assets. The performances of these assets will then be analysed to create true value and savings for Hong Kong, Macau, and the region."

In Korea, the government has significantly reduced regulation in order to promote smart city development.[40] It has created two national pilot smart cities on greenfield land in Sejong and Busan, to act as testing grounds for new technologies, such as AI, 5G and blockchain, to develop new industries, including autonomous vehicles, drones and renewable energy. The government has also introduced what it describes as "drastic deregulation" to encourage participation in smart city development from the private sector. It has set up a smart city regulatory sandbox which eliminates all relevant regulations relating to the implementation of smart city projects. To encourage collaboration, a series of "living labs" have also been established where citizens and businesses can come together to identify urban problems and find solutions to them.

As other cities have shown, collaboration between the public and private sector can be an effective way of driving smart city development. The survey findings suggest that while there is a high level of willingness among businesses in Hong Kong to enter into such partnerships, there may not be enough opportunities, while the process can be too difficult. To help overcome these issues, the government should consider revising its processes and looking for more ways in which it can work with the private sector.

"In the challenging economic times ahead, it is important that the government work more closely with the private sector to improve the resilience of Hong Kong's core industries while building up the ecosystem in innovation and technology sectors," Anson Bailey of KPMG China says.

To streamline the process for public-private cooperation on smart city projects, Smart City Consortium has advocated for a "Fast-Pass" programme that would grant short-term permission for eligible businesses to trial their projects in a defined area or space under a more relaxed regulatory environment. Such a programme would reduce time-to-market uncertainties caused by potential regulatory hurdles. In addition, it would increase investor confidence in such solutions by allowing companies to demonstrate proof-of-concept in a live environment. The programme would also include the option to terminate trials when it is determined that a project's risks outweigh its benefits.[41]

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Case study

Taipei Smart City Living Lab facilitates testing of co-created developed solutions

Experimentation, citizen-centricity and public-private partnerships (PPPs) are the cornerstones of smart city development in Taipei.

The Taipei Smart City Living Lab project aims to turn the city into a zone where smart city ideas from PPPs can be tested with citizen engagement. The Taipei Smart City Project Management Office (TPMO) was created to oversee this project. Established by the city's Department of Information Technology (DoIT), the TPMO's goal is to create a platform and framework to facilitate PPPs.

The TPMO looks for needs in the city through feedback at smart city seminars. The information gathered is also used to match public and private entities that can develop products and services that can address those needs. Since the project was initiated in 2016, the DoIT and TPMO have jointly interviewed more than 500 information and communication technology vendors, hosted over 600 public-private matchmaking meetings and collaborated with more than 30 different agencies.

As a result of these efforts, the TPMO made more than 170 successful matches on a range of projects such as promoting the use of augmented reality or virtual reality videos for tourism in Dadaocheng, the use of aerial drones in communication transmission stations for the Taipei City Fire Department, establishing an Internet of Things innovation lab, and an experimental platform to link city departments and private corporations.

Once mature, there are plans to adapt the Living Lab project for other cities. In addition, Taipei City initiated GO SMART in 2018 as the global open platform for engagement of smart city stakeholders, including cities and corporates, with support from more than 180 organisations around the world. GO SMART aims to accelerate urban innovation and speed up smart city development via inter-city collaboration.

Source: Taipei Smart City PMO, WeGO

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Effective smart city governance requires flexible models for public-private cooperation

Jaewon Peter Chun
President, World Smart Cities Forum

This year, the Hong Kong government will be releasing a refreshed version of its Smart City Blueprint originally unveiled in 2017. The document will shape the city's vision for how it can build a more liveable and sustainable city, improve education for young people, care for the elderly, address inequality and provide long-term economic prosperity.

As Hong Kong lays out its smart development plans for 2030 and beyond, implementing a variety of technology solutions will be critical to improve government services, raise living standards and address urban challenges. By employing flexible, innovative methods to work with the private sector, city governments can increase the likelihood that solutions will have a real impact on people's lives, says Jaewon Peter Chun, president of World Smart Cities Forum (WSCF), an international nongovernmental organisation that advises municipalities on smart city planning.

As an example, WSCF is currently advising the Hanoi city government in Vietnam to develop its smart city master plan. In the plan, Chun says he is advising the government that when developing public-private partnerships (PPPs), private businesses should take a leading role in the partnership as opposed to the government.

"Many people think the PPP model means a 50/50 contribution from both private sector and the government," Chun explains. "My idea on PPP is that more than 70 percent of investment should come from the private sector. The private partner should lead the smart city project, while the government can support in the form of complementary policies and regulations, and providing a tech sandbox for companies to develop solutions."

> *"Governments cannot lead innovation, so they need to focus on creating a favourable policy to ultimately increase the city's potential for sustainable growth"*

Specifically, targeted legislation can streamline the process for smart city development, Chun adds. In Vietnam, he has advised the government to establish a special law that allows smart city projects to bypass normal government procurement procedures.

"As each country's own bidding process and bidding structure is different, an aggressive and reasonable bidding method is needed to properly introduce disruptive technologies and services, Chun says. "Legislation to create a 'regulation-free zone' with regards to procurement can help foster a smart city innovation ecosystem."

Chun adds that disruptive technologies are an important part of a smart city vision, which are something that large companies cannot deliver directly. "Since this part needs to be implemented with various young companies involved, an R&D lab is absolutely necessary for them," he says. He cites East London's Tech City as an example of a collaborative tech cluster than can produce unicorns.

"Governments cannot lead innovation, so they need to focus on creating a favourable policy to ultimately increase the city's potential for sustainable growth," he concludes.

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Smarter solutions through open data

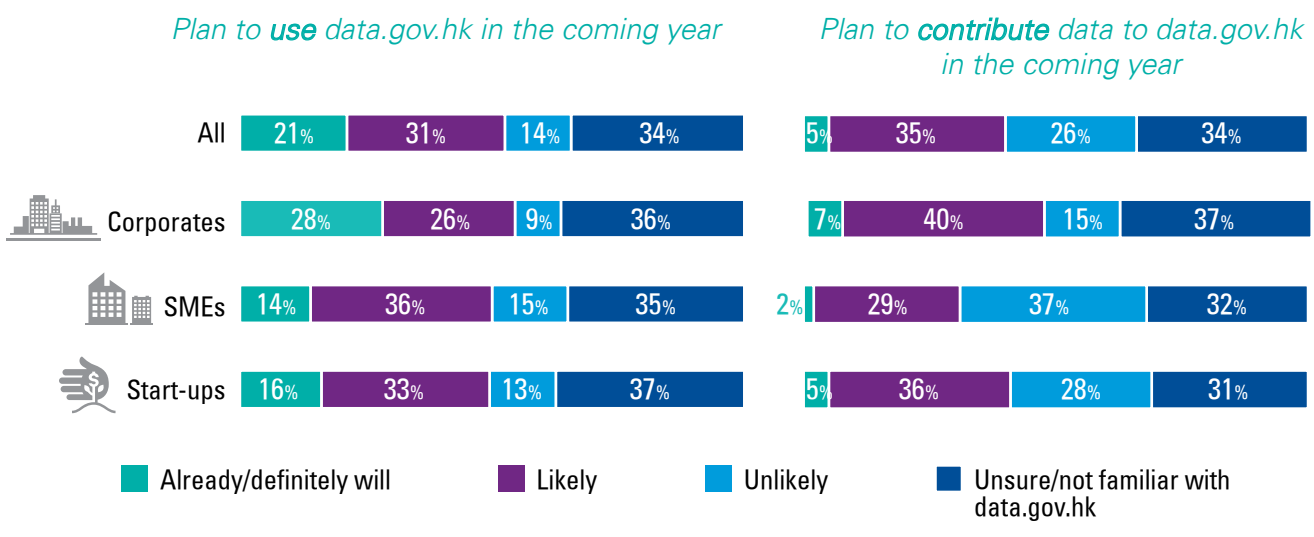
Data forms the foundation for smart city projects, providing both insights into where improvements are needed and the necessary information to help create solutions. To facilitate access to data, the government has created an open data portal, data.gov.hk.

Over the last 12 months, the government has continued to open up its data to both corporations and the public through the platform. The number of data sets available, which range from real time transport and meteorological information to public services availability to information on where key infrastructure is located, increased by around 20 percent during 2019 to 4,000, with approximately 4.5 billion data downloads made from the platform during the year, according to the Office of the Government Chief Information Officer (OGCIO).

According to the survey findings, 21 percent of respondents are currently using the government's open data platform or definitely plan to do so in the next year, with 31 percent saying they are likely to do so. However, 48 percent of respondents are either unfamiliar with the platform or unlikely to use it, highlighting the need for a programme to raise awareness about the initiative. Furthermore, while companies see the value of accessing data, only 5 percent are currently contributing to the open data platform, although 35 percent said they were likely to do so in the next year. [See Figure 7].

Roughly four out of 10 organisations (42 percent) think the platform will provide substantial business opportunities for them in the next 10 years. However, 23 percent of start-ups did not think it would benefit them, suggesting they may need more or different data before they can utilise it [See Figure 8].

Figure 7: Utilisation of the data.gov.hk platform



Source: KPMG Survey Analysis

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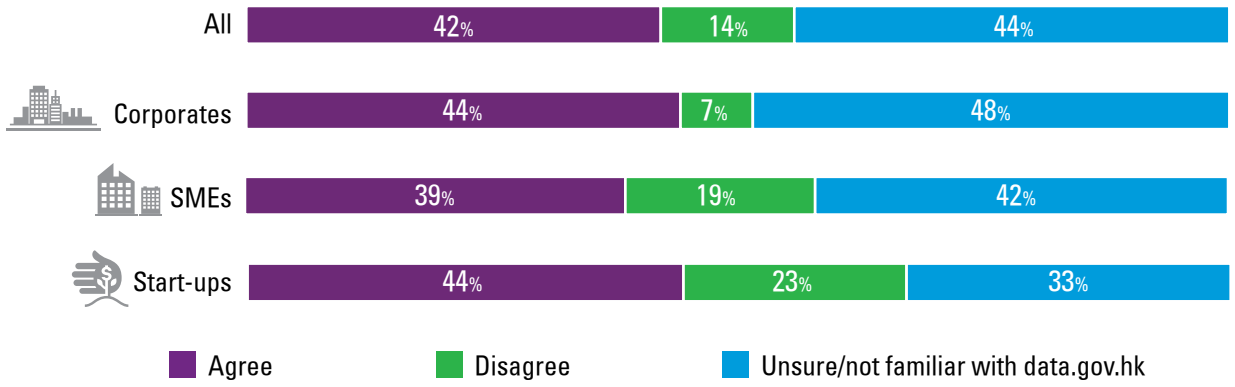
Figure 8: Potential for data.gov.hk to provide business opportunities

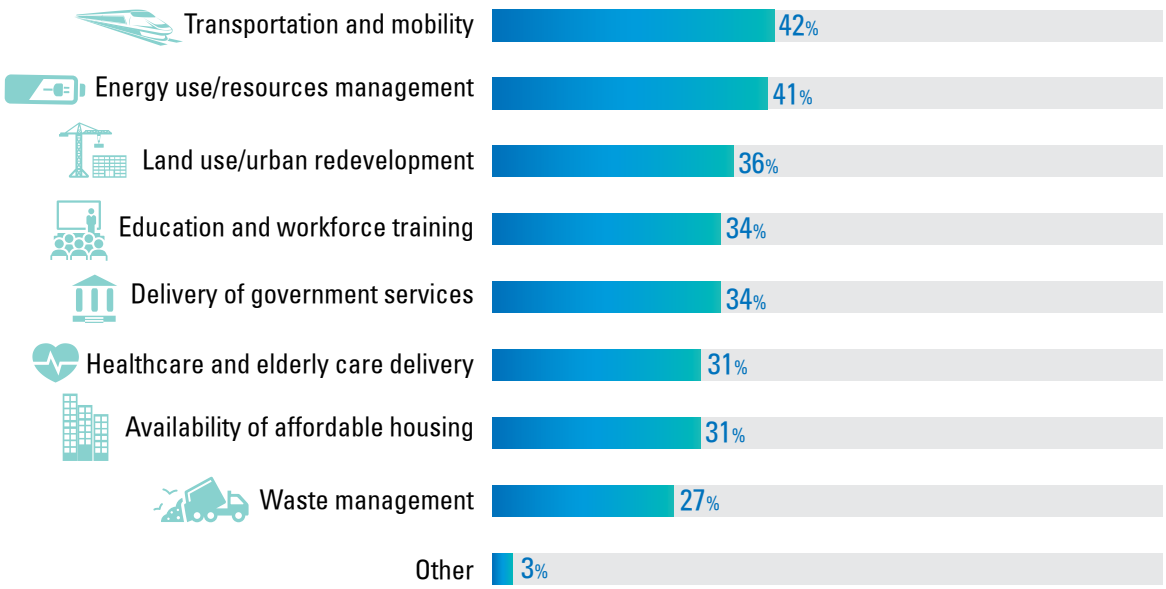
Percentage of respondents who agree that data.gov.hk will provide opportunities for their organisation over the next 10 years



Source: KPMG Survey Analysis

Transport and mobility issues were seen as the main challenges that a more effective open data system could best address, cited by 42 percent of respondents, closely followed by energy use and resource management at 41 percent. Land use and urban redevelopment – which was listed by respondents as a top issue to be addressed by smart city projects – was also seen as a key area that could benefit from open data sharing [See Figure 9].

Figure 9: Urban challenges that can be best addressed by an open data ecosystem in Hong Kong



Source: KPMG Survey Analysis
Respondents could select up to three choices

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To increase the amount of data being shared, Dr. Winnie Tang, Honorary President of Smart City Consortium, would like to see the introduction of an open data law in Hong Kong, similar to the Open Data Law introduced by the New York City Council in 2012,[42] mandating that the government and even certain private sector companies have to open up their data for smart city development.

Having easy access to high quality data is an important part of smart city development, Tang says. "Smart city is all related to data. A smart city is a data-driven city. We use it to analyse problems, make decisions and carry out advanced planning."

The government recognised the important role of data in its original Hong Kong Smart City Blueprint[43] published in 2017, which stressed the need for more public and private data to be made available through the data.gov.hk portal, which has been in place since 2011. In her 2018 Policy Address, Hong Kong Chief Executive Carrie Lam also announced a policy requiring all government departments to formulate and publish annual open data plans.[44]

The past year has seen some progress in the availability of data, with more than 80 government departments and bureaux now sharing information through the data.gov.hk portal. Some private sector companies have also shared their own data through the platform, with a number of the city's bus operators and the MTR now publishing real-time data on arrival times, leading to the launch of the Citymapper journey planner app. More than 30 apps have been developed using data from the platform, helping people move around the city more efficiently, find a home to buy or rent and locate the nearest public restroom.

As part of the government's open data policy, it is creating a common spatial data infrastructure (CSDI) platform, which presents data as diverse as utility networks, building plans, traffic conditions and access to healthcare in a standardised, shareable, geo-tagged format.[45] The data, which will facilitate the development of smart city applications and help optimise urban design, will be made available to the public and private sector in stages. In the 2020-2021 budget, the government allocated HKD 60 million to establish a Geospatial Lab to promote the application of spatial data.[46] The Lands Department is also planning to launch a territory-wide 3D digital map in phases starting from 2020, while there are also plans for a pilot project creating 3D indoor maps of 150 buildings. The information will assist with smart city applications ranging from journey planning to healthcare management to more efficient use of land resources.[47]

In order to more effectively process the high levels of data that will be generated once 5G is rolled out in Hong Kong, OGCIO is also in the process of building a data analytics platform with a "digital highway" to facilitate the exchange of real-time information between different government departments (see OGCIO viewpoint on page 21).[48] In the 2020-2021 budget, HKD 100 million has been earmarked to develop a digital platform for the government to integrate and exchange data, with the aim of gaining additional supervision over projects. In addition, the government announced that it will rollout iAM Smart, a platform enabling residents to use a single digital identity to conduct government and commercial transactions, starting in the fourth quarter of 2020.[49]

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Easier access to legitimate data sets is equally as important as funding for start-ups to scale and succeed

Marcos Chow
Head of Technology Enablement, Hong Kong, KPMG China

Ensuring data privacy

If consumers are going to be willing to share their data, they must have confidence over how it will be stored and used. As such, data privacy plays an important role in the take up of smart city initiatives. Any data that is shared must comply with Hong Kong's Personal Data (Privacy) Ordinance, which covers both the private and public sector. Under the regulation, data can only be collected on a fully-informed basis, must be stored securely, cannot be held for longer than needed and cannot be used outside of the original purpose for which it was collected.[50]

Individuals also have the right to access and make corrections to their data. Lena Low, Senior Director, Customer and Business Development at CLP Power, points out: "As 5G and IoT get more prevalent and customers get more educated that data can be used in multiple ways, the awareness and demand for higher security and data protection measures will increase."

In order to maximise the use of data for smart city development, the government will need to persuade more private companies to share their data, while ensuring all data being shared is anonymised and stored securely to ensure individuals are protected.

Marcos Chow, Head of Technology Enablement, Hong Kong, KPMG China, says that the government's current initiatives such as data.gov.hk, the Hong Kong Monetary Authority (HKMA)'s Open API framework, and updates to the Personal Data Ordinance should give private companies the confidence to share their data in a secure manner. In addition, he stresses that access to data sets of sufficient volume, variety and veracity is integral to further develop the city's start-up ecosystem.

"We often hear the expressions 'data is the new currency' and 'data is the new oil' to emphasise the importance of data," he says. "Easier access to legitimate data sets is equally as important as funding for start-ups to scale and succeed."

Case study

Open data increases transparency and connectivity for Canada city

The Open City Initiative in Edmonton, Canada has helped the city in its efforts to improve its services and promote transparency.

Introduced in 2014, the initiative consists of a series of programs that open access to different aspects of life in the city. A Citizen Dashboard allows residents to share information about municipal services. The Edmonton Insight Community conducts public surveys on municipal issues. Open Budget opens the city's finances, such as revenues and expenditures, to the public at large. Open Science shares social issues with the education community to find solutions to existing problems. Open Access and Open Wi-Fi give all city residents internet access. Finally, the city can respond to information and service requests through the Edmonton 311 hotline program.

Edmonton connects all these platforms to its Open Data Portal, a website accessible to all citizens. To facilitate its use, the Portal includes an "open analytics" platform featuring video guides for sorting and searching datasets, creating maps and charts, using data lenses and aggregating data.

According to the city's Open Data Strategy published in 2017, its open data program includes best practice standards and operational expectations consistent with the International Open Data Charter, which was developed based on the fundamentals of the United Nations Sustainable Development Goals.

A key element of the strategy is constant surveying to incorporate citizen feedback on the open data sets available. As a result, the Open Data portal has boasted a high rate of return users, with roughly 22 percent of its 504,626 users regularly using the portal. The addition of real-time transit data has also greatly boosted its use rate, resulting in over 50 million downloads in 2018 alone.

Source: City of Edmonton, WeGO

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Creating a dynamic open data ecosystem in Hong Kong

Donald Mak
Assistant Government Chief Information Officer (IT Infrastructure), Office of the Government Chief Information Officer (OGCIO), HKSAR Government

Building a connected city requires implementing a wide range of smart applications that can enable city planners and citizens to make better informed decisions. Open data can be an effective way that government, academia, private sector institutions, and the general public get access to urban data for research, analysis, and developing smart applications for commercial use.

With Hong Kong's 5G rollout, large amounts of data can be transmitted at rapid speed with lower latency. This will enable Hong Kong's open data initiative, data.gov.hk, to enter a new phase with speedier sharing of real-time data, says Donald Mak, the government's Assistant Government Chief Information Officer for IT Infrastructure.

From retrospective to real-time

Originally set up in 2011 as the Public Sector Information Portal, data.gov.hk has expanded its number of publicly available datasets to over 4,000 by the end of 2019, up from 3,300 in 2018. Categories of data included on the portal range from census data to transportation and traffic, food safety, permits and licenses, public housing, and weather conditions. In 2019, the site recorded over 4.3 billion data downloads, up 20 percent from the previous year.

With 5G coming into play, there is huge potential to make real-time data available on data.gov.hk in coming years, particularly in the transport space, Mak says. With that in mind, the government has been working with operators to widen the scope of data shared on its portal. In August 2019, the Transport Department brokered agreements with the MTR and bus operators including Citybus, New World First Bus and New Lantao Bus to contribute real-time arrival information on the portal.

The addition of more open data relating to the city's transport and traffic will be a boon for the site in the coming few years, Mak adds. The government will start releasing parking vacancy data collected from the Transport Department's next generation on-street parking meters to be installed throughout the city starting from mid-2020. In addition, the Transport Department plans to open traffic data collected from traffic detectors along 80 percent of strategic and major roads in 2021. Furthermore, global positioning devices will be installed in some 3,000 green minibuses that will be able to transmit their real-time positioning by 2022.

"Once available for public use, application for these real-time transport and traffic data will be huge," Mak says. "The opportunity to develop smart mobility applications will be much greater because we will better understand the latest traffic conditions and public transportation information."

Closer coordination between government departments a key for success

Prior to 2018, government departments contributed data sets to the data.gov.hk portal on a voluntary basis. That changed with the announcement of open data policy in Chief Executive Carrie Lam's 2018 Policy Address mandating departments to open up government data to promote smart city development.

However, according to Mak, challenges still exist in terms of how these data are processed and formatted into machine-readable format for public distribution. To facilitate government departments in doing so, OGCIO is currently developing a centralised cloud platform that will enable various bureaux and departments to develop programs to extract and format data from their IT systems to publish the open datasets on the data.gov.hk portal.

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Another concern as Hong Kong moves ahead with its open data push in the coming years is data security, in particular for data collected in real-time from Internet of Things (IoT) devices. OGCIO is closely monitoring international developments on IoT security – such as standards for IoT-connected sensors and other devices. Mak says the government is also considering relevant measures to update its IT security guidelines and best practices with regards to IoT devices.

Expanding public outreach

Looking ahead to 2030, making the open data ecosystem more robust will require strong community support – particularly from app developers, who can leverage the data for their own commercial benefit as well as creating value for the community. At the same time, a key element will be encouraging public and private organisations to contribute their data to the portal.

A few examples of applications that currently utilise data from data.gov.hk include real estate apps Spacious and 28Hse and transport apps Citymapper and Moovit.

Mak says that to boost outreach in the coming year, the government plans to reach out and organise hackathons with local universities or industry bodies, and invite relevant industry players and students to join. OGCIO will also actively coordinate with academia to promote the use of data.gov.hk datasets in coursework and student research projects.

"I think universities were doing a great job in utilising our data, and we observed that some university professors were well-aware of the open data development and had encouraged their students to make use of open data for data analysis, research and coursework," Mak says. "Our next push will be reaching out to practitioners in the IT industry who may not aware what data sets are available on our portal. The launch of the city dashboard, developed by the OGCIO, at end of last year can also help to promote how open data can create value for the public. By doing more promotion and gathering more feedback from open data users and application developers, we aim to build up a healthy and robust open data ecosystem within the community."

> *"By doing more promotion and gathering more feedback from open data users and application developers, we aim to build up a healthy and robust open data ecosystem within the community"*

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Common Spatial Data Infrastructure: a critical investment for Hong Kong's smart city development

Dr. Winnie Tang
Honorary President, Smart City Consortium

For a fast-moving city such as Hong Kong to be truly smart, it must be able to generate data-driven insights across all sectors of human activity: from land records to urban planning to environmental management, healthcare, education and economic development, among many others. Fully realising the potential of smart city applications across these sectors requires data to be fully standardised, interoperable, discoverable and shareable.

Establishing a Common Spatial Data Infrastructure (CSDI) provides the means for government departments, developers, researchers, companies and the public to harness the power of the vast amounts of data the city generates.

Spatial data refers to any data – such as traffic, fires, parking, income distribution and many other measurements – attributed to a specific geographic location that can be mapped, accessed, visualised and analysed through application software. CSDI includes the policy framework, institutional setup, technical standards and operational platform to develop and manage spatial data generated by a city.

Dr. Winnie Tang, Honorary President of Smart City Consortium, says CSDI is critical to Hong Kong's development as a smart city over the next ten years, allowing development to transition from "project based" to "truly collaborative".

CSDI in action

The Hong Kong government's Smart City Blueprint released in 2017 included the development of CSDI by 2023 "as a key strategy for Smart Government and Smart City Architecture".

Jurisdictions around the world have already taken steps to develop CSDI frameworks – including the Australia, Canada, the European Union, Finland, Singapore, the United Kingdom and the United States.

In 2018, the government saw the potential of CSDI during Typhoon Mangkhut, bringing 12 departments together to form an interdepartmental system called Common Operational Picture (COP), which contained an interactive map with disaster-related information like road damage. "This proved to be a huge help for engineers to locate damage and understand where repairs were needed," Tang says.

Potential economic benefits

One of the measurable benefits of CSDI is that SMEs and start-ups can directly use spatial data and combine them with other public data to generate new information and develop innovative applications.

According to two separate studies by the UK government in 2016 and 2018 respectively, spatial data is expected to generate between £6-11 billion (HK$ 60-110 billion) per year in value for the UK over the next 10 years.

Tang says that the relative economic impact for Hong Kong would be similar. "Through CSDI, we can release the power of innovation and promote the transformation of traditional industries."

A map for the future

Tang stresses that in order for the government to realise its goal to implement CSDI in 2023, stronger coordination between government departments is needed – particularly with regards to establishing policies and allocating resources.

Furthermore, Tang says, Hong Kong needs to more aggressively promote the benefits that CSDI will bring to the business community. "For Hong Kong, as an international financial centre, business comes first," she says. "That's why we need to promote the value-added elements that CSDI will bring to our city – particularly benefits for fintech start-ups and the banking industry."

Smart City Consortium assists with these outreach efforts, connecting professionals in Hong Kong with mainland China, ASEAN, and the rest of the world to support joint initiatives. In 2019, the "Belt and Road Smart City Alliance" was formed jointly with the Smart City Development Alliance of China. "We hope that we can assist Hong Kong to export our advanced smart city technology and experience to other countries," Tang says.

> *"We need to promote the value-added elements that CSDI will bring to our city – particularly benefits for fintech start-ups and the banking industry"*

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Data security: an essential part of a vibrant IoT ecosystem

Eric Chong
President and CEO, Siemens Limited

Data security is set to play an increasingly important role in Hong Kong's smart city development, with the introduction of 5G set to enable the connectivity of Internet of Things (IoT) devices feeding data to city planners, app developers and the general public.

As IoT takes off in Hong Kong, guidelines on IoT and data collection need to be introduced to give the public confidence about how their information will be used and stored, says Eric Chong, President and Chief Executive Officer of technology company Siemens Limited.

The first step in ensuring IoT data security is for organisations to have good governance and risk-based rules covering cyber security, backed by standards that protect the different layers of the technology: namely band security, network security and system security. Individual organisations must also commit to cyber security and keeping their customers' data safe.

"We emphasise building up this trust and commitment, because following the rules and following the standards may not be enough," Chong says. "If the culture of the company is about compliance, then a single person can affect the trust. All we need is to build a culture of commitment to integrity of data."

Creating a data privacy culture

As the volume of data collected increases, it is also important that it is anonymised to protect individuals' privacy. Chong points out that although privacy regulations are well established in Hong Kong's legal system, there needs to be more awareness that these laws are applicable to the cyber world.

"The first step before you can collect any data is to look at the privacy regulations, which are very clear about what you can do and what you cannot do. The second step is making sure you have a secure industrial grade platform from the point of collection from IoT devices all the way up to the cloud," Chong says.

Three years ago, Siemens teamed up with leading companies to present the Charter of Trust, which calls for binding rules and standards to build trust in cyberspace and sets out 10 basic principles for a safer digital world. It now has a total of 16 signatories, including big names such as Cisco, IBM and Dell Technologies.

"Awareness plays a key role in security, and companies need to discuss the issue openly, while consumers should educate themselves to understand the various standards and check if their devices comply with them," Chong says.

Standards for IoT systems and devices

Chong says that organisations installing IoT data collection systems and devices need to ensure that their systems comply with international standards to prevent potential security breaches.

Siemens plays close attention to international guidelines such as IEEE P2413, the Standard for an Architectural Framework of the Internet of Things developed by the Institute of Electrical and Electronic Engineers (IEEE). The standard provides a reference model for the relationship of different IoT verticals, such as transportation, healthcare and smart grid, and a blueprint for data abstraction, and the protection, security, privacy and safety of data.

In addition, the International Electrotechnical Commission (IEC) and International Organization for Standardization have developed standards for the interoperability of IoT systems, so that different entities within a system are able to exchange information and use data in an efficient way, and separate systems are interoperable, Chong says.

A unified approach to IoT connectivity

Chong says that one current challenge to the wider adoption of IoT-based smart city solutions in Hong Kong is adopting a "unifying methodology" in terms of how devices are connected.

The need for a unified approach is imperative as corporates like Siemens work with start-ups to test various solutions in Hong Kong. In 2017, Siemens launched its Smart City Digital Hub at Hong Kong Science Park to assist start-ups working on smart city projects. The Hub is particularly focused on data analytics, IoT, connectivity, smart building, smart energy and smart mobility. Projects at the digital hub utilise MindSphere, Siemens' cloud-based IoT operating system, which collects and analyses data.

"If we do a project with a certain entity in a certain location, I would want to scale it up all over Hong Kong, but because of the lack of a common connectivity environment, when we move locations, we need to apply different standards or methodologies, and that makes it more difficult," Chong says. He says the government should do more to push connectivity standards to ensure that systems are aligned, allowing solutions to be more easily scalable.

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Increasing liveability and reducing climate impact

A smart city must be a sustainable city, with technology used to help preserve resources and reduce the impact on climate change. The Hong Kong government has set a number of targets in this area in its *Climate Action Plan 2030+*. These targets include a 26 percent to 36 percent reduction in carbon emissions by 2030 from 2005 levels, a progressive switch from coal to natural gas for electricity generation, and a pledge to have 3 percent to 4 percent of energy generated from renewables by 2030.[51] Other initiatives include increasing access to public transport and adapting city infrastructure to cope with higher levels of rainfall and rising sea levels.

To help meet its renewable energy targets, in 2018 the Hong Kong government introduced the Feed-in Tariff Scheme, under which individuals and companies that generate renewable energy, such as through having solar panels or wind systems on their property, can sell the energy to Hong Kong's two power companies at a premium of up to five times the normal electricity tariff rate.[52] Utility company CLP received more than 4,300 applications under the scheme by August 2019, with the potential for the installation of 330,000 square metres of solar panels, able to generate approximately 62 gigawatt hours of electricity each year.

The government is also introducing waste-to-energy initiatives, which not only generate power, but also reduce the amount of waste going to landfill each year. The city's first waste-to-energy plant, T.Park near Tuen Mun, opened in 2016, with a second plant due to be ready in 2021, and a large-scale plant scheduled to be operational by 2024.[53] Overall, the government hopes 1.5 percent of Hong Kong's energy needs can be met by waste-to-energy by 2030.[54]

Getting private businesses on board

As the government moves forward with its sustainability plans, businesses are also focused on becoming more sustainable. As they develop their environmental, social and governance (ESG) strategies, more than a third (36 percent) of organisations polled consider investing in technology improvements to reduce or monitor energy use, their carbon footprint or waste levels as their top ESG priority, rising to 43 percent among corporate respondents [See Figure 10].

Integrating ESG initiatives into the organisation's overall digital transformation strategy was also a priority for 34 percent of organisations, with large businesses most likely to be doing this at 41 percent. Just over a third (34 percent) of respondents also say promoting a carbon neutral or zero waste culture is a priority. The ability to reduce costs is the main motivator for implementing ESG initiatives for 37 percent of organisations, followed by a desire to stay competitive compared with other leading brands in their space at 32 percent, rising to 39 percent among large corporates. Demand from customers, and government regulations or incentives are also motivating factors, at 28 percent each [See Figure 11].

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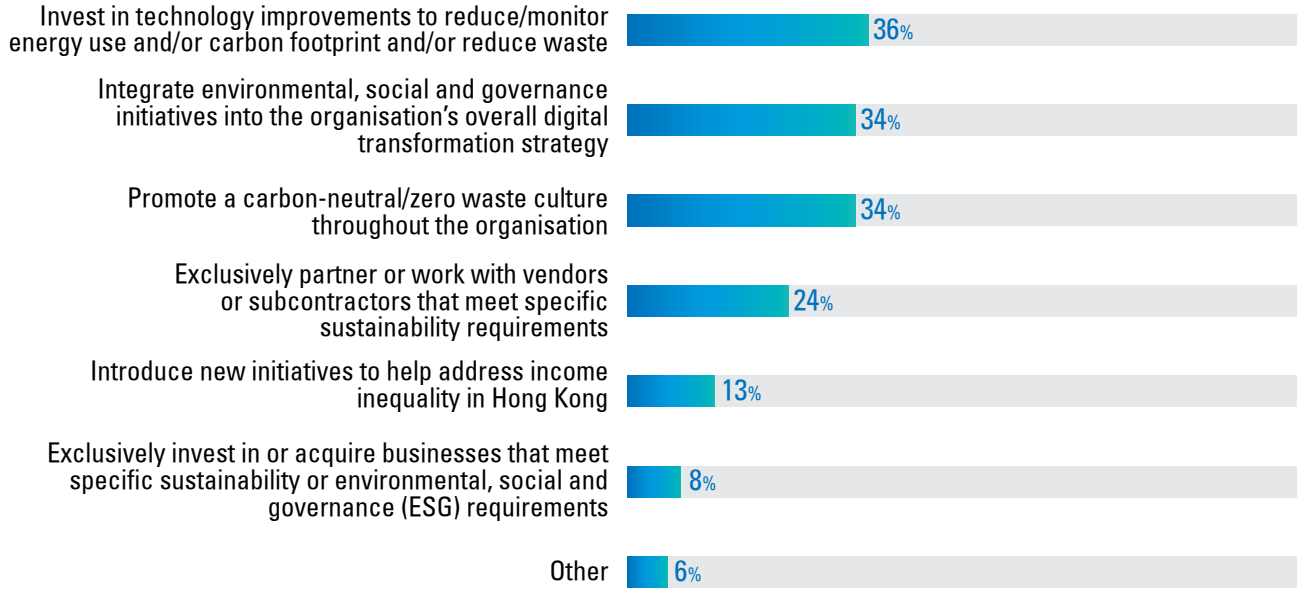
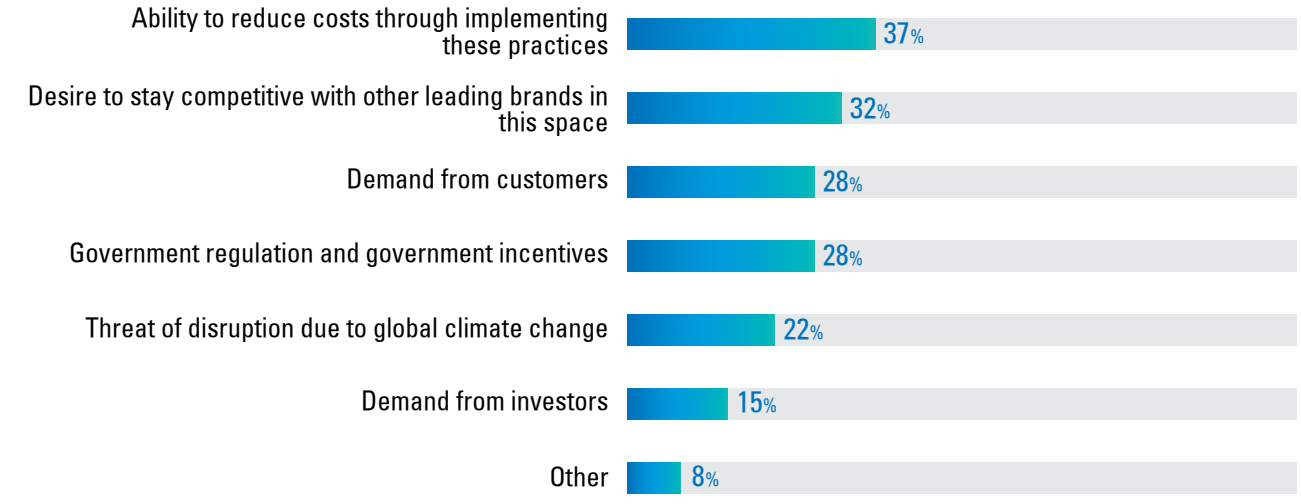
Figure 10: Top Environmental, Social, and Governance (ESG) priorities for organisations in the coming year



Source: KPMG Survey Analysis
Respondents could select up to two choices

Figure 11: Top motivators for organisations to implement ESG initiatives



Source: KPMG Survey Analysis
Respondents could select up to two choices

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ESG principles are increasingly being incorporated into companies' overall business strategies, due to rising expectations from investors, regulators and customers, according to KPMG China's *Integrating ESG into your business* report published in January 2020.[55]

In December 2019, the Hong Kong Stock Exchange published new reporting requirements on ESG, including enhancing the board's responsibility for managing ESG issues, requiring greater disclosure on issues relating to climate change and stipulating that targets on environmental key performance indicators must be shared, as well as the steps being taken to achieve them.

The Hong Kong Monetary Authority (HKMA) has also incorporated ESG investment principles in its HKD 4 trillion Exchange Fund under management.[56] In addition, the government launched a HKD 100 billion green bond plan to establish Hong Kong as an international green finance hub.[57]

"We have reached a tipping point where ESG is concerned. It is no longer seen as something that is nice to have, but rather something that is essential to have," says Pat Woo, Partner, Head of Sustainable Finance, Hong Kong, KPMG China.

Woo points out that companies with a higher ESG performance are also likely to have a stronger financial performance, better talent retention, and higher long-term value creation. "Investors, bankers and customers are now demanding businesses improve their sustainability practices. It is essential that leaders take steps to integrate ESG into their business models."

"We have reached a tipping point where ESG is concerned. It is no longer seen as something that is nice to have, but rather something that is essential to have"

Pat Woo
Partner, Head of Sustainable Finance, Hong Kong, KPMG China

Key areas to reduce carbon footprint

As well as introducing more sustainable methods of energy generation, reducing the amount of energy being used also plays a key role in sustainability. According to the government's *Climate Action Plan 2030+* report, buildings in Hong Kong account for around 90 percent of the city's electricity usage.[58] The Buildings Energy Efficiency Ordinance requires new buildings and those being retrofitted to comply with energy efficiency standards for lifts and escalators, air conditioning, electrical and lighting installations,[59] but smart city solutions can help to reduce electricity consumption further.

Austin R. Bryan, Senior Director, Innovation, at CLP, explains: "What is increasingly easy to do is put technology into buildings to have visibility for energy consumption, to control abnormalities, and to reduce the carbon footprint." He points out that energy management solutions are typically asset-light and software intensive, so are not expensive to install. "Only around 5 percent of buildings in Hong Kong today have intelligent building management systems. Our goal is to actually have much greater penetration of those existing buildings to give them transparency and visibility," he says. When sensors are in place, artificial intelligence (AI) technologies can be used to find ways of reducing energy consumption, leading to cost reductions for companies of between 15 percent to 25 percent. In 2019, CLP started Smart Energy Connect (SEC), an online marketplace offering energy management solutions developed by the company and its partners.

Timothy Mak of Signify points out increased connectivity and IoT technology can also be used to make government infrastructure more energy efficient. "We have 150,000 light posts in Hong Kong that are either switched on or switched off," he says. He suggests that if sensors and AI were introduced, street lighting could become more dynamic, turning on and off in response to local conditions, using less power when less light was required.

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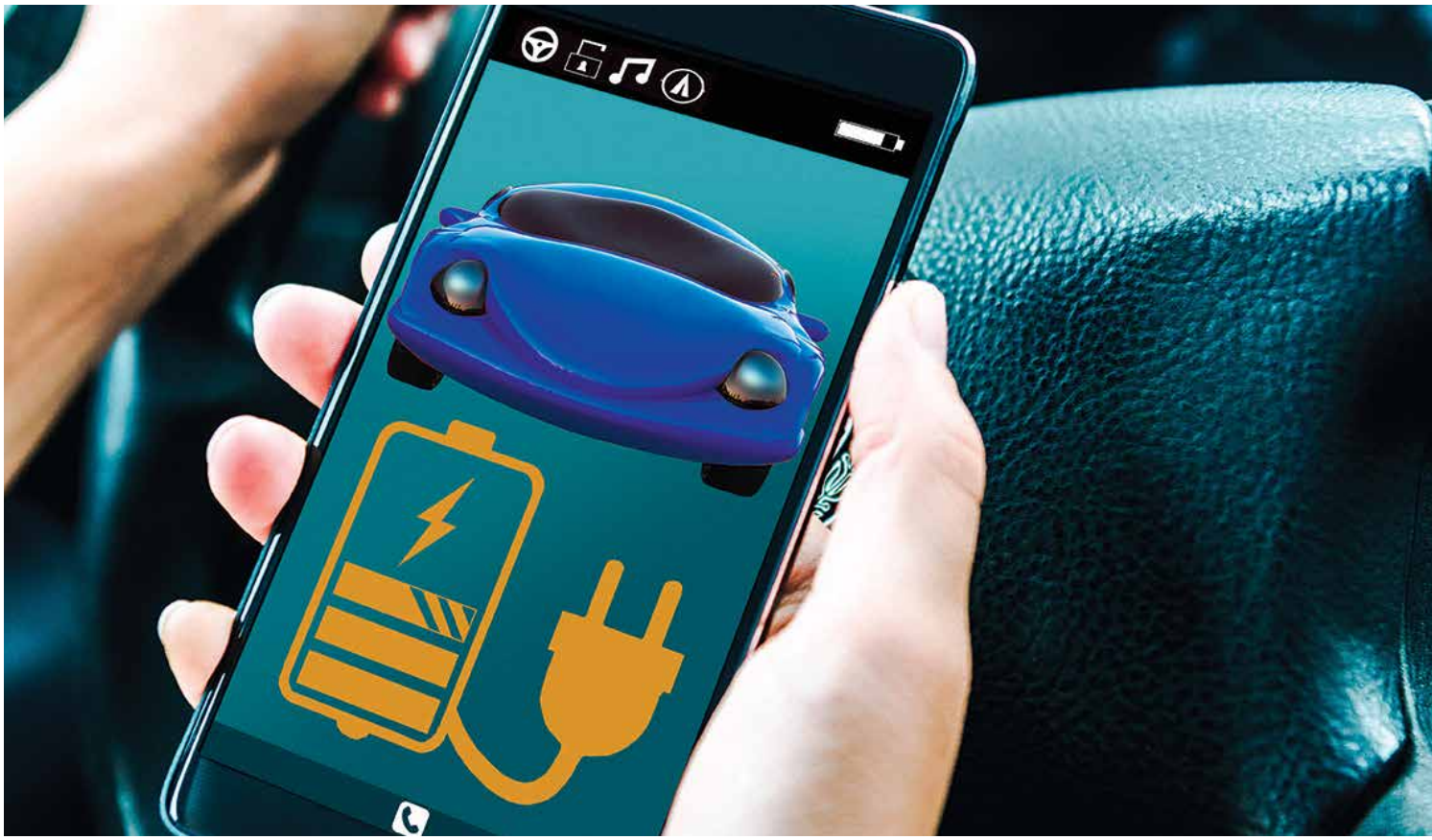
Another key focus area is reducing carbon emissions from transport vehicles, which make up about 16 percent of Hong Kong's total emissions.[60] In October 2019 the Environment Bureau launched a HK$2 billion scheme to subsidise the instillation of electric vehicle charging infrastructure in carparks of private residential buildings, to encourage people to switch to electric vehicles.[61] In the 2020-2021 budget, the government has designated HKD 80 million and 350 million respectively for electric public light bus and electric ferry pilot schemes. It also plans to launch a scheme in the second half of 2020 to phase out over 40,000 diesel commercial vehicles, with HKD 7.1 billion allocated in ex-gratia payments for vehicle owners concerned. Plans are also in the works to formulate Hong Kong's first roadmap on the use of electric vehicles.[62]

Bryan of CLP says that government action is critical to drive the city's transition away from fossil fuel cars. "We have to tackle the transportation sector changeout from internal combustion engine to electric vehicles," he says. "Those cities that are going to be leading the way towards lower carbon intensity and role model sustainability will not just set targets but enforce those targets being achieved."

Waste management is another area that can benefit from innovation. In the Hong Kong Blueprint for Sustainable Use of Resources 2013 - 2022, the government sets a target to reduce the per capita disposal rate of municipal solid waste by 40 percent by 2022.[63] There are also a number of community-led initiatives that aim to reduce waste through recycling. For example, V Cycle upcycles plastic water bottles into fabric, umbrellas and bags, while Garment-to-Garment reduces waste from clothing by recycling discarded textiles into new garments.

Developing a green city is not only important to limit Hong Kong's impact on climate change, but it also creates a pleasant environment in which to live. Julian Vella of KPMG China says: "Liveability is a key issue. It is really important for both the local Hong Kong community and also for Hong Kong itself if it wishes to maintain its position as a leading global financial centre."



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A sustainable Hong Kong for future generations

Working towards the UN 2030 Sustainable Development Goals

The global challenges of climate change, income inequality and demographic shifts require cities to implement bold strategies and actions into their long-term plans.

The United Nations' "Transforming our world: the 2030 Agenda for Sustainable Development", originally adopted in 2015, sets an ambitious agenda for countries and cities around the world. The Agenda contains 17 Sustainable Development Goals (SDGs) and 169 targets that cut across different sectors and policy areas, including poverty, food, health, gender issues, energy, climate, and biodiversity.

The UN SDGs are a universal set of goals, targets and indicators that UN members are expected to align with their own agendas and policies, and, through an agreed set of indicators, provide a concrete framework for transformative change.

As an associate member of the UN, the Hong Kong SAR government has embedded a number of SDGs into the territory's long-term planning, with a focus on goals addressing urban sustainable development.

The boxes below show how some of the government's key actions and planning documents incorporate the UN SDG(s):

Goal 7 – Access to affordable, reliable, sustainable and modern energy

Goal 12 – Ensure sustainable consumption and production

Goal 13 – Take urgent action to combat climate change and its impacts

Key actions:

Hong Kong's Environment Bureau and Environmental Protection Departments work in the broad directions set out in the UN 2030 Agenda for Sustainable Development. The Environment Bureau's signature initiatives include its *Energy Saving Plan for Hong Kong's Built Environment 2015-2025+* as well as *Climate Action Plan 2030+*.[64]

Goal 9 – Industry, Innovation and Infrastructure

Goal 11 – Sustainable Cities and Communities

Goal 13 – Take urgent action to combat climate change and its impacts

Key actions:

Hong Kong's Planning Department is developing Hong Kong 2030+ which defines Hong Kong's long-term strategy. The plan takes into account local and global factors shaping the city's development, which include land and resources, demographics, macroeconomics and climate change.[65]

"The overarching goal of Hong Kong 2030+ is to promote sustainable development with a view to meeting our present and future social, environmental and economic needs and aspirations," says Ivan Chung, Deputy Director of Planning.

Goal 14 – Conserving the oceans, seas and marine resources

Goal 15 – Sustainable use of terrestrial ecosystems, forests, and halt biodiversity loss

Key actions:

With land reclamation as a future strategy to reduce Hong Kong's affordable housing shortage, the government is looking at how it can retain biodiversity along shorelines. Currently, the Civil Engineering and Development Department (CEDD) is working with a partnership with the University of Hong Kong to study how it can implement "eco-shoreline" features at seawalls in Sai Kung, Lung Kwu Tan in Tuen Mun, and Ma Liu Shui in Sha Tin.[66]

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The United Nations Sustainable Development Goals

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

Goal 17 – Partnerships for the Goals

Key actions:

The Council for Sustainable Development (SDC) is an advisory body established by the Chief Executive and supported by the Sustainable Development Division of the Environment Bureau. In June 2019, SDC has carried out public outreach for its *Long-Term Decarbonisation Strategy* involving multiple departments, bureaus and the public.[67]

Accelerating efforts for a sustainable future

In a dominantly urban world, the UN SDGs are particularly powerful. Actions at the city level are crucial to achieve an impact. With only a decade left until 2030, strategic partnerships across the community in Hong Kong can help to accelerate Hong Kong's development towards a sustainable future.

In her foreword for the 2019 Asia and the Pacific SDG Progress Report, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) Executive Secretary Armida Salsiah Alisjahbana comments that "...on its current trajectory, Asia and the Pacific will not achieve any of the 17 SDGs by 2030. Accelerated progress is required on all fronts".[68]

It is encouraging to see that Hong Kong government departments are incorporating the SDGs into their long-term plans. However, there needs to be more of a concerted effort between government departments and the private sector to align on the sustainability agenda.

Locally, Hong Kong's Policy Innovation and Coordination Office (PICO) can help to facilitate effective public, public-private and civil society partnerships – not only on sustainable environment, but also socio-economic issues ranging from poverty, inequality, education, health and gender equality.

Originally set up in 2018, one of the objectives of PICO is to provide "one-stop" consultation and coordination for innovative development projects. Since the UN SDGs are essentially a public policy innovation, this agency can help to engage the public to work together with the government towards these goals.

Finally, city-to-city collaboration is critical to advance the SDGs. A number of cities are leading by example by translating the UN SDGs into their initiatives, and linking them with their "smart" city agendas. Programs like the UN's SDG Cities Leadership Platform can facilitate this by supporting city-level actors and enabling them to share best practices. 25 cities across the world are part of this mutual learning project, including the megacities of London, Hangzhou, Seoul and Tokyo.

Waltraut Ritter
Principal,
Knowledge Dialogues

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Case studies

'Upcycling' plastic to reduce ocean pollution and benefit elderly residents in Hong Kong

Hong Kong produces more than 2,000 tons of plastic waste every day, but recycling and managing plastic waste remain a challenge. Raising public awareness is a major step to address the problem. Organisations such as A Plastic Ocean Foundation and V Cycle have launched a number of initiatives to address this challenge.

In 2016, A Plastic Ocean Foundation released the documentary film *A Plastic Ocean* to show how plastic pollution can affect the world and what can be done about it. Both the Foundation and V Cycle organise roadshows, seminars, beach clean-ups, recycling drives and talks to educate the public.

There are also efforts to give plastic waste a second life. The process, called upcycling, involves collecting, cleaning and processing plastic products like water bottles to create rPET fabrics for further use. VCycle makes reusable yarn, fabric, baseball caps, umbrellas, foldable tote bags and backpacks using rPET fabrics to reduce the need for virgin materials.

According to V Cycle, upcycling has significant environmental and economic benefits. rPET uses 80 percent less water, 70 percent less energy and has a 50 percent lower carbon footprint compared to virgin materials.

Another important element of V Cycle's programs is poverty alleviation. In Hong Kong, independent waste pickers, the vast majority of whom are elderly, gather approximately 193 tons of recyclable waste per day, earning only HKD 24 per day on average. V Cycle's model creates jobs for the underprivileged and elderly that are hired to sort plastic while working in a safe and caring environment. V Cycle contributes proceeds from the sale of products made from upcycled material to poverty alleviation programs.

Sources: V Cycle, A Plastic Ocean Foundation

Garment-to-garment recycling gains steam in Hong Kong

As a city, Hong Kong produces enormous amounts of waste of all kinds, including more than 392 tons of textile waste every day which goes straight to landfill.

Local NGO Redress and R&D centre The Hong Kong Research Institute of Textiles and Apparel (HKRITA) are working to repurpose textile waste and encourage sustainable fashion.

The Garment-to-Garment recycling system (G2G) developed by HKRITA uses a closed-loop textile recycling process to collect and process unwanted sweaters and t-shirts and turn them into new pieces of clean clothing. The process involves sanitising a garment, removing hard trims, cutting fabric into smaller pieces, opening and mixing fibre, carding, spinning, and knitting.

The work is done at The Mills, a revitalized cotton mill in Tsuen Wan. The environmentally conscious can make an online appointment and then bring their unwanted clothes to G2G for recycling or buy a sustainable item from its retail shop.

Meanwhile, Redress is tackling the issue with efforts to minimise waste through education. Its initiatives include The Redress Design Award, the world's largest sustainable fashion design competition, which aims to educate young designers about minimising waste at source and recognise creative and sustainable fashion design.

Through Get Redressed Month, Redress' annual October public awareness campaign, Redress actively engages corporates, clubs, schools and brands to raise awareness about the environmental impact of the fashion industry and the importance of keeping clothing in use for longer. In 2019 the campaign included 130 companies, clubs and schools who set up clothing collection points across the city.

Through the campaign, Redress collected 15.4 tons of unwanted clothes and redistributed them for resale, reuse by 20 local charities, recycling and downcycling, with the help of corporate and community volunteers. Redress also provides post-consumer clothing waste collection, recycling, re-purposing, re-sale and redistribution.

Sources: HKRITA, Redress

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Innovation to drive sustainability

Austin R. Bryan
Senior Director, Innovation, CLP Holdings

To realise its smart city ambitions over the next decade and improve liveability for residents, Hong Kong must not only be digitally-enabled but also citizen-centric and carbon aware.

Digital innovations powered by clean energy will drive Hong Kong's development as a lower-carbon and future-ready city, says Austin R. Bryan, Senior Director, Innovation at energy giant CLP Holdings.

To achieve this, businesses need to transition to low-carbon operations, processes and supply chains by taking advantage of smarter, more connected and sustainable technologies.

Transition to electric transportation

Bryan sees the shift to electric transportation as an important component of Hong Kong's smart city aspirations. "We have to reorient both public and private transportation and usher in electrification, leaving internal combustion engines behind," he says.

CLP's Smart Charge joint venture is working to put electric vehicle charging infrastructure into residential areas across Hong Kong. In 2019, CLP became the first Hong Kong company to join EV100, a global initiative that aims to accelerate the transition to electric vehicles, pledging to transition its vehicle fleet to electric by 2030.

Rising demand for data storage is an opportunity to drive energy efficiency

Electric transportation is only one of many strategies for Hong Kong to reduce carbon emissions. Data centres could account for as much as 20 percent of global power consumption by 2025. As Hong Kong aims to become a data centre hub, the city must have the supporting energy infrastructure in place and take steps to ensure that centres are maximising their power efficiency.

"Data centre operators have become some of the most astute renewable energy purchasers and consumers," Bryan says. "If Hong Kong wants to compete in the data centre space against Singapore and other regional players, it is not just going to be about the approval process and the availability of land - a robust and sustainable energy system is also imperative."

CLP is currently deploying artificial intelligence-based solutions from technology partners around the world, including the United States, Israel, Switzerland and China, to help optimise energy consumption by businesses, including data centres. By understanding and predicting activity, AI technologies can help companies reduce their energy costs by 15 to 25 percent, making their businesses greener and more sustainable.

'Changing the incumbent mindset' to partner with start-ups

Looking ahead to the coming decade, Bryan believes collaboration between established and emerging companies will be the key to success for smart city innovation.

In 2019, CLP hosted Free Electrons, a global energy start-up accelerator programme, in Hong Kong. Each year, Free Electrons is a platform that connects 10 of the world's biggest electricity utilities with the best start-up companies, bringing them together to work on innovative energy services powered by the latest digital technologies such as AI, data analytics and Internet of Things. CLP also started Smart Energy Connect, an online marketplace for energy management technologies developed by the Hong Kong company and its partners from around the world.

To optimise collaboration, Bryan thinks corporations need to change the incumbent mindset to work successfully with start-ups. He says CLP has simplified its commercial agreements with start-ups to become 'light touch' without creating more risk, in order to bring more partners on board and allow them to focus on product innovations.

"As start-ups are typically short of time, capital and resources, giving them a 20-page non-disclosure agreement or 30-page commercial agreement to sign is distracting, disruptive and unhelpful. To enable faster smart city innovations, the incumbents need to create productive and mutually-beneficial partnerships with the best and brightest start-up companies," Bryan says.

> *"We have to reorient both public and private transportation and usher in electrification, leaving internal combustion engines behind"*

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Smart lighting: making Hong Kong more liveable and sustainable

Timothy Mak
General Manager, Hong Kong and Macau, Signify

Connectivity is the most critical aspect driving Hong Kong's development as a smart city because it forms the base layer upon which other technologies can be built.

Faster connections with the ability to handle the increased levels of data being generated by devices, supported by more intelligent analysis, are core to making Hong Kong smarter, says Timothy Mak, General Manager, Hong Kong and Macau, at lighting company Signify.

Getting 5G off the ground

With its faster speeds and increased capacity, Mak sees 5G as a significant enabler of smart city infrastructure. At the same time, he points out that unlike 4G, 5G is low range, meaning it requires a greater number of base stations.

It is in this area that Signify sees itself playing a key role. The group is working on creating dynamic smart lighting infrastructure for Hong Kong that is not only energy efficient, but also acts as a means of collecting data and connecting devices.

"We are looking to cut the power from the luminaries on the streetlamps by 30 percent and then using it to drive the 5G base stations inside the lamp poles," Mak says. These smart poles, he says, can also be used to collect real-time data, such as traffic information, air quality and temperature, which can then be fed into apps to help improve citizens' daily lives.

The data generated, in turn, will make a positive impact on Hong Kong's liveability. Mak gives the example of traffic data being used to help drivers find the least congested routes, or localised information on temperature triggering notifications to vulnerable citizens, such as the elderly, advising them not to go out without water and an umbrella if it is a hot day.

Reducing climate impact

Smart cities need to be sustainable, and Mak sees smart lighting as playing a key role in helping to reduce electricity consumption.

"There are 150,000 light posts in Hong Kong that are either switched on or switched off. If you put in sensors and IoT connectivity you can make lots of adjustments to how much energy is being used," he says.

For example, streetlamps could be turned on at a lower level in the evening if it has been a sunny day, but at a higher level or earlier in the day if the local area is experiencing heavy rainfall.

In addition, there are many ways we can use technology to improve installation efficiency and maintenance cost, Mak says. For example, streetlight suppliers can put a QR code on the luminaire, or lighting unit. An installer then scans the QR code during installation on site, which immediately feeds back data including the streetlight's geolocation, power rating and other related information to the lighting asset management software. Facility managers can harness this data to more efficiently plan maintenance.

Another type of technology Signify is investing in is Power over Ethernet (POE), which provides power along with ethernet data to workstations. Signify can use POE to create "interactive offices" that provide insights on energy consumption and the use of space. Sensors in the lights can detect whether an area is being used, and can then turn lighting and air conditioning on or off accordingly.

"It can create a sustainable environment that uses less workspace to accommodate the same workforce and less energy," Mak explains.

The need for open standards

In developing smart lighting solutions for Hong Kong, Mak stresses the importance of collaboration between different partners to expand the ecosystem, as well as the need for APIs and data sharing.

Signify currently provides various application program interfaces (APIs) to enable third party apps to connect to its products, such as Philips Hue and Interact IoT. In this way, connected lighting infrastructure can become a core part of wider IoT ecosystems, providing many potential smart applications for public buildings, co-working spaces, elderly homes and other types of facilities.

"Being smart is all about open standards and open API," Mak says. "If Signify wanted to do something proprietary and nobody can touch the solutions, there is no way to integrate, and it defeats the whole purpose of the solution. That is why the ecosystem is the most important part."

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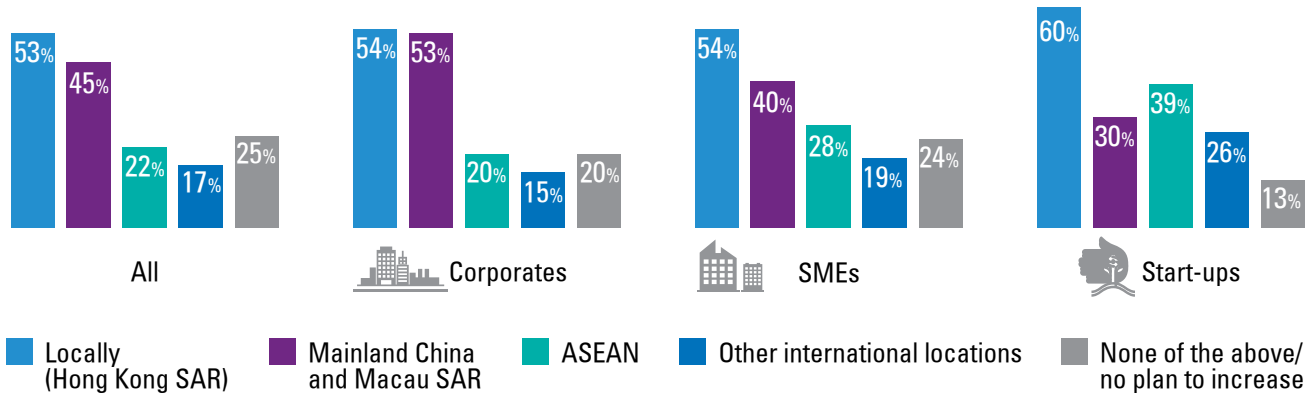
Economic interconnectivity and innovation

Tapping into regional opportunities has seen organisations actively invest in R&D, while also leveraging mainland China and ASEAN countries as investment destinations and to meet their talent needs.

More than half of survey respondents (53 percent) say increased local investment in R&D in Hong Kong is a priority in the coming year, rising to 60 percent among start-ups [See Figure 12]. They are also capitalising on Hong Kong's position as a regional business hub, with mainland China and Macau SAR mentioned as top targets for R&D investment in the next 12 months for corporates and SMEs, at 53 percent and 40 percent respectively. Meanwhile, start-ups are prioritising R&D investment in ASEAN countries, with 39 percent of respondents mentioning ASEAN as a top R&D investment destination, compared to 30 percent for mainland China and Macau SAR and 26 percent for other international locations.

Figure 12: Priority areas to increase R&D investment in the coming year



55% of start-ups partner with Hong Kong-based corporates and universities on R&D

19% of start-ups partner with Greater Bay Area (excl. HK)-based corporates and universities on R&D

Source: KPMG Survey Analysis
Respondents could select up to two priority areas

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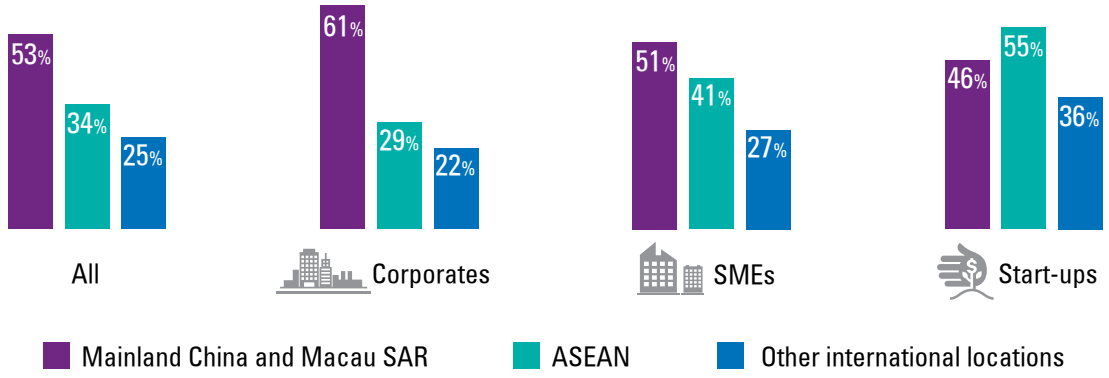
For outbound direct investment, mainland China and Macau SAR are the preferred destinations overall, mentioned by more than half (53 percent) of respondents as a top priority for the coming year, including 61 percent of corporates and 51 percent of SMEs. Among mainland China destinations, 40 percent of respondents say they are prioritising GBA cities, versus 24 percent for other locations in China.

Meanwhile, among start-ups polled, there is a current preference for direct investment in ASEAN – 55 percent of respondents chose ASEAN as their top outbound investment destination compared with 46 percent for mainland China and Macau. [See Figure 13]

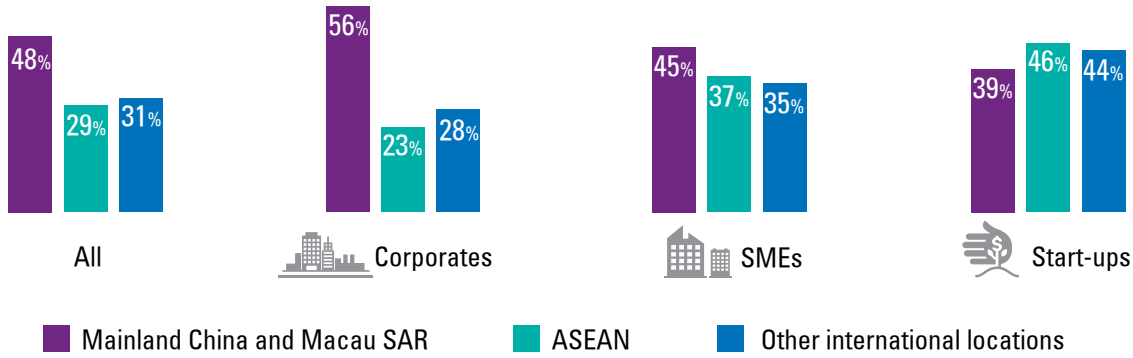
Figure 13: Priority areas for outbound direct investment in coming year



Source: KPMG Survey Analysis
Respondents could select up to two priority areas

In terms of where organisations look to recruit talent when they are not able to find a suitable local hire, 56 percent of corporates see mainland China and Macau as priority areas to source talent. GBA cities in particular are a key pool of talent for corporates, cited by 44 percent of respondents. In contrast, start-ups polled consider ASEAN and other international locations as top sources (mentioned by 46 and 44 percent of respondents respectively), with mainland China and Macau SAR coming in third at 39 percent [See Figure 14].

Figure 14: Priority areas for cross-border talent recruitment



Source: KPMG Survey Analysis
Respondents could select up to two priority areas

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Hong Kong, together with the rest of the GBA, will be an important R&D centre for start-ups, providing them with the capability to rapidly prototype and scale their businesses

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

Karena Belin, Co-founder and Chief Executive Officer of WHub and AngelHub, says: "One of the strengths of Hong Kong, in particular if we look at Hong Kong in the larger context of the GBA, is the fact that it can really play this role of international power connector of resources, for talent, for capital and for data."

KPMG China's *Keys to success in the Greater Bay Area* report, launched in January 2020, found that companies in Hong Kong are keen to benefit from the revenue growth and talent recruitment opportunities the GBA offers.[69] However, there remain a number of hurdles to maximising the opportunities available, including policy and regulatory ambiguity, and issues relating to the cross-border movement of capital. Smaller companies located in Hong Kong in particular may need additional help in accessing the rest of the GBA, as they do not have the resources of their larger counterparts to navigate some of the regulatory complexity associated with expanding into the region.

Targeted policies aimed at strengthening inter-GBA cooperation could also be mutually beneficial to help boost innovation. One example could be streamlining tax incentives in relation to R&D activities and intellectual property (IP) ownership across the GBA, explains Alice Leung, Partner, Corporate Tax Advisory at KPMG China.

"For example, if a Hong Kong-based firm sets up a subsidiary in Shenzhen to carry out R&D, R&D tax incentives should be granted under a set of unified conditions, such as IP ownership," Leung says. "Such alignment could enable Hong Kong firms with operations in mainland China GBA cities to take advantage of the relevant tax incentives in both jurisdictions."

Irene Chu, Head of Technology, Hong Kong and Head of New Economy and Life Sciences, Hong Kong, KPMG China, says that a clear and transparent roadmap agreed to by jurisdictions throughout the GBA is needed, so that policies can be designed to align and strengthen the strategic roles each city plays. The resulting policies can enable the easy flow of talent, the creation and protection of IP and enhanced R&D cooperation and technology commercialisation.

"With its world-class and diverse professional talent pool in a wide range of sectors including infrastructure, banking and insurance, finance, healthcare, logistics, and legal, Hong Kong can help to elevate the GBA into a leading knowledge-based innovation hub," Chu says.

Room for growth in cooperation between corporates and start-ups

Anson Bailey of KPMG China points out that increased economic connectivity within Hong Kong itself also forms an important part of smart city development, particularly in terms of start-ups, established companies and the government working together.

The survey found room for growth in cooperation between corporates and start-ups. While 43 percent of corporates plan to partner with start-ups on pilot projects in the coming year, only 35 percent plan to develop new products or services with them, while 30 percent will partner on go-to-market initiatives. The majority of corporates were also not planning to assist start-ups with financing, with just 17 percent expecting to provide investment capital for them in the coming year and 14 percent saying they would facilitate access to funding for start-ups. The findings suggest corporates should explore opportunities to collaborate with start-ups beyond just doing pilot projects.

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With its world-class and diverse professional talent pool in a wide range of sectors, Hong Kong can help to elevate the GBA into a leading knowledge-based innovation hub

Irene Chu
Head of Technology, Hong Kong
Head of New Economy and Life Sciences, Hong Kong
KPMG China

The findings also suggest there is scope for more cross-border collaboration between Hong Kong start-ups and organisations in the rest of the GBA. It found that while 55 percent of start-ups are currently partnering with Hong Kong-based corporations or universities on R&D projects, only 19 percent are currently doing so with corporations or universities in other GBA cities.

"While Hong Kong is clearly an important R&D centre for start-ups, there is further potential for start-ups to utilise the rest of the GBA for R&D," Bailey says.

To help start-ups develop, both government and larger corporates should expand their support for them, particularly in terms of helping them to access funding, while they should also help them to better leverage the opportunities offered by the GBA initiative.

In addition, larger corporates should also review the way they work with start-ups. Belin of WHub and AngelHub suggests more collaboration, for example through setting up joint "sandboxes" or co-innovation programs, to allow start-ups to develop and test solutions based around existing customer data.

Austin R. Bryan of CLP thinks the corporate incumbent mindset also needs to change for collaboration between established companies and start-ups to be successful. For example, start-ups do not have the time or the resources to go through 20-page non-disclosure agreements or 30-page commercial agreements when they are partnering with a larger firm for a pilot. Being more "light touch", while still assessing and minimising potential risks, gives start-ups room to innovate, he says.

Opportunities for collaboration and cross-border exchange

Increased regional connectivity creates new economic opportunities for Hong Kong. Marcos Chow of KPMG China suggests Hong Kong can capitalise on its strong rule of law through positioning itself as an international data hub to enable data circulation and trading. This is a creation of a new industry and is similar to Guiyang's Global Big Data Exchange and Shanghai Data Exchange, he says.

The government has committed to helping Hong Kong become a prime location for data centres in the region, developing it as a hub for technical cooperation and trade. It has set up the Data Centre Facilitation Unit to support data centre operators who are interested in setting up or expanding data centres in the city, while it has also put in place a number of incentives, including measures to encourage industrial buildings to be converted into data centres, and it is in the process of creating a Data Technology Hub in Tseung Kwan O, which is expected to be completed this year.[70]

Patrick Lau, Deputy Executive Director of the Hong Kong Trade Development Council (HKTDC) suggests Hong Kong should build on its trade links with ASEAN countries by exporting smart manufacturing or industry 4.0. "The ultimate goal should not just be Hong Kong becoming a smart city. Hong Kong is positioned as a hub for global trade, so smart city solutions should also be part of the tradable items," Lau says. He adds that HKTDC is actively trying to find clusters of SMEs to move some of their capacity to ASEAN countries.

"ASEAN looks up to Hong Kong as a trendsetter in quality and creativity," he says. The government is also providing support in this area, with plans for an Advanced Manufacturing Centre in Tseung Kwan O to open in 2022.[71] These important initiatives are likely to help take Hong Kong's smart city ambitions forward.

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Hong Kong's smart development equals opportunities in Southeast Asia

The economic rise of Association of Southeast Asian Nation (ASEAN) countries will bring opportunities for Hong Kong to export leading-edge technologies and position itself as a regional hub across a range of sectors, according to Patrick Lau, Deputy Executive Director of the Hong Kong Trade Development Council (HKTDC).

Hong Kong signed a Free Trade Agreement with ASEAN in 2017. In June 2019, the agreement went into effect in three ASEAN states: Myanmar, Singapore and Thailand, and is currently undergoing ratification in the remaining seven member states.

One sector in which Hong Kong has a lot to offer is advanced manufacturing, with the migration of plants to lower cost regions outside of China accelerating the process. Lau says HKTDC is currently focusing on supporting small and medium-sized enterprises expanding into ASEAN to set up manufacturing operations.

"In our recent discussions, Thailand wants to upgrade their manufacturing to the latest industry 4.0 standards, and they admire our Cyberport and Science Park," Lau says. "We really want to see Hong Kong export our services to ASEAN to help them modernise their production capabilities."

Lau adds that Hong Kong can also act as a regional networking hub to showcase 5G-enabled Internet of Things (IoT) solutions, energy efficiency technologies and waste management innovations and best practices – to ASEAN governments and businesses.

In addition, Hong Kong is well-placed to use its unique strengths as an international city strategically located in the Greater Bay Area (GBA) to promote regional trade with the young, growing economies of ASEAN.

"We will encourage people to use Hong Kong to access the whole GBA – with a population of 70 million and a market worth US$1.6 trillion." Lau says.

Source: Hong Kong Trade Development Council

Patrick Lau
Deputy Executive Director, Hong Kong Trade Development Council

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Case study

Connecting start-ups and corporates to power the next generation of innovation

Creating a dedicated space for corporate innovation teams and start-up founders can foster new partnerships to innovate and co-create solutions for corporate clients and customers.

Present in over 50 cities and 19 countries around the world, WeWork Labs is WeWork's global platform for early-stage start-ups and forward-thinking enterprise companies. Through dedicated spaces and equity-free incubator service, WeWork Labs partners with local incubators, accelerators and large corporations to provide holistic, long-term support for start-ups throughout their journey. Moreover, WeWork Labs' corporate innovation service and vertical innovation labs help address today's most pressing business challenges.

To date, WeWork Labs has opened nine spaces in Greater China, with presence in Hong Kong, Beijing, Shanghai, Shenzhen, Hangzhou and Chengdu. WeWork Labs is designed to be an inclusive, collaborative and flexible program, welcoming entrepreneurs and start-ups from all backgrounds and industries.

Through a start-up focused curriculum, a global member network, and a robust mentorship program, WeWork Labs guides entrepreneurs through the initial stages of building a business, creating the framework that gives them the support they need to succeed. Resources provided to start-ups include guidance and training by industry experts, access to strategic investment opportunities, and networking events. This helps to create a more vigorous development environment for founders to expand their domestic and overseas businesses.

Dylan Huang, Head of WeWork Labs, Greater China says, "Since its official landing in Greater China in April 2019, WeWork Labs has continued to expand its presence in the market. We are committed to providing all innovators with comprehensive support. In addition to start-ups, we also support large enterprises such as Alibaba Cloud and SHISEIDO to achieve innovation, transformation and integration." In the future, WeWork Labs plans to continue to deeply cultivate the Greater China market and join hands with more partners to further empower innovation.

Source: WeWork

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Strengthening Hong Kong's role as a bridge between markets

Peter Yan
CEO, Cyberport

The rapid development of innovative technologies allows Hong Kong's traditional economy enterprises to capitalise on the immense opportunities that have emerged in the digital era.

Cyberport, a digital community hosting around 1,500 technology companies located on Hong Kong Island's south side, aims to be the "glue" to facilitate this integration of traditional and new economies in Hong Kong by helping both sides better understand government policy changes as well as connecting them so that traditional companies can identify and adopt innovative solutions from technology start-ups and companies.

By working closely with start-ups in fintech, smart living, digital entertainment and e-sports as well as other emerging sectors to provide mentoring, funding and market access, Cyberport acts as a catalyst for the development of digital technology industries.

This process is further enhanced by Cyberport's myriad entrepreneurship programmes that support the cultivation of young talent, development of aspiring entrepreneurs, as well as facilitate overseas market expansion, which, in total, could provide over HK$1 million in funding. This is on top of the rent-free office space, tailored mentoring, and unique networking opportunities with Cyberport's local and international partners.

Cyberport's work in driving the digital transformation of Hong Kong's incumbent sectors, in addition to the cultivation of talent and development of digital technology industries in Hong Kong, complete the three pillars on which Cyberport builds its dynamic ecosystem upon.

"Our vision is to become the hub for digital technology, creating new economic drivers for Hong Kong," Cyberport CEO Peter Yan says.

Increasing interactivity between start-ups and incumbents

Latest figures from InvestHK's 2019 Annual Startup Survey show that there were 3,184 start-ups in Hong Kong employing over 12,400 people, with the number of companies up 21 percent from 2018.

As the start-up ecosystem continues to grow, the government is planning to expand Cyberport's facilities. Last year Financial Secretary Paul Chan Mo-po announced a HK$5.5 billion expansion for Cyberport which will provide a gross floor area of 66,000 square metres. Yan says the new facility will mean a 35 percent increase in Cyberport's office space and Smart-Space, which is expected to house around 100 technology companies and 750 start-ups and incubatees. The project is scheduled for completion in 2024 at the earliest.

The addition of this new space will also mean that Cyberport will have expanded capacity to serve as a testing platform for the business operations surrounding digital solutions, particularly for smart living. Cyberport plans to further unite its commercial facilities and its public mission, Yan says: "We're encouraging more smart living companies to implement applications at our campus. For instance, we currently feature market-ready products at our smart living concept store, which allows start-ups to perfect how they carry out their operations." The new space presents an exciting opportunity for more products to be showcased and on a larger scale.

Another way that Cyberport plans to enrich its digital ecosystem is by facilitating co-creation between start-ups and industry incumbents. Cyberport is currently testing a new digital platform that allows fintech and financial services companies to co-develop applications, using sanitised data.

"In our discussions with financial institutions, we identified that a pain point for them is finding the right partners or service providers to work with," Yan says. "Our new platform provides a digital environment with all the relevant data for start-ups to define and simulate certain use cases in order to demonstrate their existing solutions to incumbents or come up with new applications together."

Positioning Hong Kong as an innovation centre in Asia

With the rollout of 5G this year, Yan believes this will provide a huge opportunity for Internet of Things (IoT) developers, and that Hong Kong and the Cyberport community could play an important role in driving the adaptation of smart city solutions designed in GBA and mainland China for the international market.

"When people talk about the GBA, they often focus on how it can be a springboard for Hong Kong companies to enter the mainland market," Yan says. "However, we should also pay attention to how Hong Kong can play the role of an international bridge to help GBA companies go global."

Hong Kong's advantages in this role are twofold, Yan says: First, as an international finance centre, Hong Kong has the experience and proven track record to assist companies with international expansion. Secondly, Hong Kong tech companies understand the user experience requirements and preferred marketing strategies to target overseas customers.

In short, Hong Kong has the expertise and exposure to help these companies internationalise. "This is the way we can add value," says Yan.

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Regulation, funding and talent: three keys to boost start-up innovation

Karena Belin
Co-Founder, WHub and AngelHub

Hong Kong already has many of the conditions it needs for its innovation ecosystem to thrive: a power connector and ecosystem platform with WHub, a growing and diverse pool of start-ups, access to latest technology and physical infrastructure, an ideal geographic location and a solid reputation as an international talent and financial hub.

To take the ecosystem to the next level and provide lasting economic benefits that will endure for future generations, the city needs to continue to reform its regulatory landscape, says Karena Belin, co-founder of the innovation community network WHub and equity crowdfunding platform AngelHub. In addition, the city needs to increase access to capital and talent for start-ups to ensure they have the support they need.

Originally founded in 2013, WHub's network currently includes over 3,000 start-ups as well as corporates, educators, investors and mentors comprising more than 75 percent of Hong Kong's current innovation ecosystem. AngelHub is Hong Kong's first Securities & Futures Commission (SFC)-regulated crowdfunding platform for professional investors and growth companies scaling in Asia.

Improving open data regulations can unlock innovation

With respect to smart city initiatives, Belin says that regulatory reforms will be critical to encourage the government and businesses to share data via open application programming interface (API). One recent example is the Hong Kong Monetary Authority's Open API Framework for the Hong Kong banking sector. The more organisations can share their data with start-ups, the higher the potential is for innovation, she says.

"For start-ups, a lot of learning is by doing," she says. So sandboxes need to be put into place for start-ups to experiment in real-life environments, all by ensuring that this agile trial - feedback - pivot approach does not cause major defaults of existing systems and technologies are only released once proven successful.

Belin adds sandboxes provide a way for start-ups to demonstrate proof of concepts before technologies and solutions are fully deployed. WHub offers a wide range of start-up-corporate co-innovation programs and services. With these, WHub unleashes the synergies between the agility of start-ups and scale of corporates: Startup Scouting, Open Innovation Challenges, Hackathons, Co-Learning and full acceleration programs.

"Democratising" access to funding

A healthy innovation ecosystem requires start-ups to have sufficient access to capital to scale their businesses. In the past year, the Hong Kong government has made notable efforts to encourage venture capital investment through matching schemes such as the Innovation and Technology Venture Fund and Mainland-Hong Kong Joint Funding Scheme.

However, more needs to be done to connect other types of investors, including angels and family offices to start-ups, Belin says.

AngelHub allows qualified individual investors and companies to invest in a pool of start-ups across different industries vetted by AngelHub and its investment committee comprised of successful investors, serial entrepreneurs and industry experts. To-date the platform has vetted over 600 growth stage companies, organised roadshows in over 12 countries and has successfully supported start-ups that have been raising in total over USD 50 million at various stages of growth.

These investments not only have the opportunity to create wealth for investors, but also to provide jobs, and thus stimulus for Hong Kong's economy, Belin adds. "Approximately 80 percent of money invested into start-ups is going towards the salaries of people who work at those companies," she says.

Regional connectivity means a larger talent pool

Access to qualified talent is a key issue for start-ups, particularly those in the growth stage, when they need to develop business functions that may be outside of their founders' core areas of expertise.

As evidenced by our survey conducted for this report, start-ups currently see both mainland China and ASEAN as priority areas to source talent. Belin sees enhanced connectivity between Hong Kong and the rest of the Greater Bay Area (GBA) as a main way that both Hong Kong and mainland China start-ups can benefit from a larger talent pool.

Improved collaboration between Hong Kong and mainland universities, she adds, is a key enabler and has a proven track record of building successful ventures. "If we look at Hong Kong in the larger context of the GBA, the fact is that Hong Kong can really play the role of an international power connector of resources, for talent, for capital and for data."

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Prioritising societal needs

For any smart city-related initiative to be successful, it must also address social needs with very specific applications

Peter Yan
CEO, Cyberport

The importance of putting citizens at the heart of smart city development is recognised by survey respondents. Nearly half (49 percent) say creating more affordable housing for residents should be the top priority for future smart city projects, followed by 44 percent who would like to see more effective use of land, public space and buildings. Creating a future-focused workforce is also a top priority for 41 percent of respondents, while 38 percent think initiatives should drive economic growth and job creation (See Figure 2 on page 13).

Peter Yan, CEO of Cyberport, says: "For any smart city-related initiative to be successful, it must also address social needs with very specific applications."

Empowerment through education

Technology is set to have a two-fold impact on education. On the one hand, it can be used to increase access to high-quality, personalised learning. On the other hand, Hong Kong's current education system must be adapted to ensure the future workforce is equipped with the skills that both they and companies need in the future.

Andy Chun, Adjunct Professor at City University of Hong Kong, says artificial intelligence (AI) can be used to create adaptive learning by analysing data on a student and creating a personalised set of content. Learning analytics can also be used to understand exactly how students are progressing. "There are never enough resources in terms of teachers. Technology and AI helps to provide higher quality and personalised education to more people," he says. Chun adds that technology can also level the playing field by enabling schools with fewer resources to leverage resources online and provide a quality education at a low cost.

If corporates want to help students grow and become more innovative, and ultimately develop talent with the right skills, they need to get involved a lot more at a junior level

Alan Yau
Head of Real Estate, Hong Kong
KPMG China

At the same time, interviewees say Hong Kong's education system must adapt to embrace new technology and put a greater focus on STEM (Science, Technology, Engineering and Mathematics) subjects. A recent initiative announced in the 2020-2021 budget is HKD 40 million to subsidise short-term internships for Hong Kong students enrolled in STEM university programmes.[72]

Alan Yau, Partner, Head of Real Estate, Hong Kong at KPMG China, thinks there is still a mismatch between the school curriculum and the skills companies need. He suggests corporates and schools should collaborate to identify these skills and help develop them in students, changing the way that students are taught so that they become used to leveraging technology, such as Internet of Things, at a much earlier age. "If corporates want to help students grow and become more innovative, and ultimately develop talent with the right skills, they need to get involved a lot more at a junior level," he says.

Smart City Consortium has called for additional funding from the Innovation and Technology Commission to sponsor mentorship programmes for promising young engineers and scientists at the secondary school and undergraduate level. Such programmes could further encourage students to develop their talents, apply for patents and partner with SMEs to commercialise their inventions.[73]

Citizens must also be helped to understand new technologies and how to use them, otherwise they will be excluded from their benefits. The majority of organisations recognise this need and are investing in increasing their employees' digital capabilities, with 74 percent of survey respondents planning specialised training in the next year, broadly in line with the 77 percent of organisations that will be spending on new technology capabilities. Among specific sectors, manufacturing companies are most likely to be investing in staff training at 83 percent, followed by real estate firms and infrastructure companies [See Figure 15 on next page].

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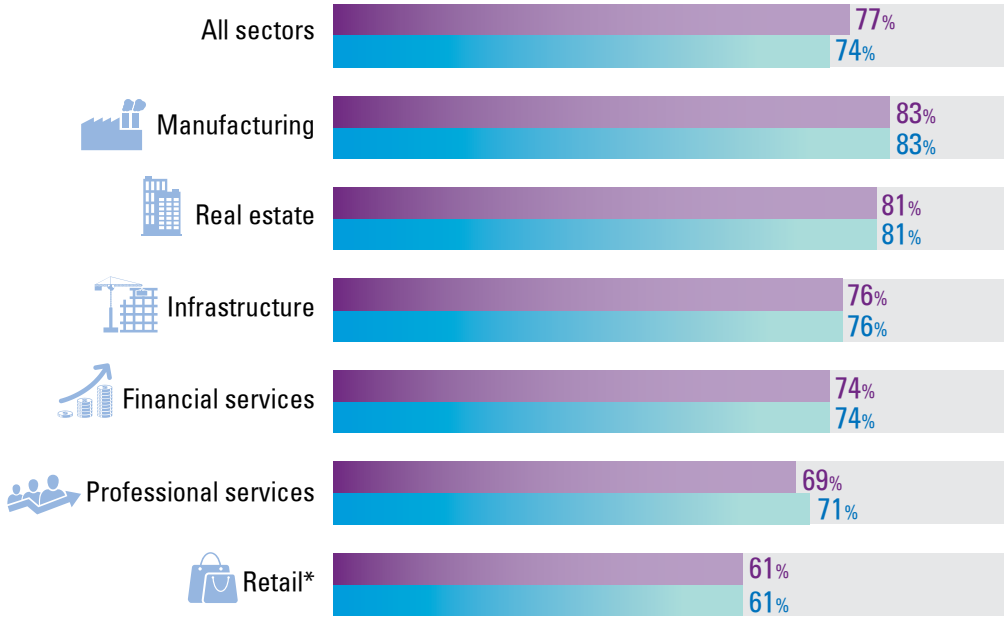
Figure 15: Investment in technology and digital skills training for employees

Percentage of respondents who report their organisations are planning an increase in current capabilities in the coming year



Source: KPMG Survey Analysis
** Low sample size for Retail sector (n<20)*

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Case studies

Supporting an equitable workforce in Kowloon East

Urban redevelopment projects help to stimulate economic growth, but they also can affect poorer families in nearby neighbourhoods due to the resulting higher living costs.

MIT Hong Kong Innovation Node, a Hong Kong-based team of Massachusetts Institute of Technology (MIT) teaching staff and professionals-in-residence, is studying how the redevelopment of Kowloon East, one of the city's most densely populated areas, will impact poorer residents.

The study aims to identify the biggest barriers to inclusive economic growth faced by migrant women, youth, and small and medium-size enterprises in the area. Based on the study recommendations, which are set to be published in the first quarter of 2020, MIT Hong Kong Innovation Node plans to engage the community to jointly develop solutions that can help to support these vulnerable groups.

Source: MIT Hong Kong Innovation Node

The Kwun Tong District in Kowloon East is currently undergoing a transition into one of Hong Kong's primary business centres. Within six years' time, the district is expected to contain Hong Kong's largest volume of office space, which will boost demand for commercial services, retail and other related support services.

"In Kwun Tong, underprivileged individuals lacking employment opportunities are threatened by increasing gentrification and real estate costs during the urban regeneration process," says Sunnie S.Y. Lau, Director of Smart City Research and Industry Collaboration – MIT Hong Kong Innovation Node. "We hope this endeavour can help initiate discussions among community stakeholders and drive collaboration between public, private and non-profit organisations to address these challenges."

AI technology can enrich student learning and empower teachers

With technology disrupting traditional industries, Hong Kong's education system is adapting to prepare students for tomorrow's workforce.

Teachers can harness artificial intelligence (AI) technologies to gain a better understanding of their students' needs and help personalise learning, says Professor Andy Chun, Adjunct Professor at City University of Hong Kong.

As City University's former Chief Information Officer, Chun helped introduce Canvas, a cloud-based learning management system, enabling students to access learning materials, including notes and PowerPoint presentations, on their tablets or smartphones.

Chun says AI has potential to lighten overworked teachers' workload while supporting the development of both gifted and underperforming students.

"Learning analytics is great for teachers because in a large class, it's hard for teachers to know if the class is progressing smoothly," Chun explains.

Source: City University of Hong Kong

By looking at the performance of students, he says, the learning system knows how often you log in to an online course portal, how long you log in, which page(s) you look at, what content you look for, how long, and exam results. "It is able to paint a very clear picture of how students are progressing in class, to allow teachers to better gauge the pace of the class and tailor how they present the course material."

The technology also enables teachers to share learning resources and experiences with educators from around the world to help create a "map" of what students should be learning. Adaptive learning can then be used to highlight areas which students may have missed, Chun says.

Andy Chun
Adjunct Professor,
City University of Hong Kong

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There is scope for urban regeneration in certain areas of Hong Kong. If you look around the world, ports are shrinking in size in terms of the land they use, so there may be parts of the port that could be regenerated

Julian Vella
Co-Head – China, Global Infrastructure Advisory, KPMG China

Addressing housing needs

The need to address housing affordability was identified by survey respondents as a key priority for smart city development.

Sachin Doshi of Weave Co-living says Hong Kong needs to provide good quality, value-for-money rental accommodation which appeals to young people, is centrally located and enables them to feel part of a community. He says co-living spaces are able to meet this need in an efficient way through deconstructing the elements of a home, providing a private bedroom space, but also shared spaces for cooking, doing laundry and socialising, amongst other things.

"A simple thing that the city can do is earmark certain residential pieces of land that are for rent only," he says. Real estate companies could also explore offering 'property as a service' under which customers buy a package of services that enable them to make best use of the space, with the asset owner operating the building and covering the related costs.

Julian Vella of KPMG China suggests the wider use of technology in the planning and construction of homes could enable buildings to be constructed for a lower cost, and in a more efficient and environmentally friendly way. The *Construction 2.0 – Time to change* report published by the HKSAR Government in 2018 in collaboration with KPMG, suggests adopting more innovative approaches to design and construction, such as increasing the use of modular integrated construction, under which modules of buildings are completed offsite.[74] These lower construction costs could then be passed on to buyers.

In addition, Dr. Winnie Tang of Smart City Consortium thinks utilising common spatial data infrastructure can help Hong Kong make the most efficient use of land resources. "You can see where things are and why they are there and how they relate to each other," she says.

Vella stresses that building more homes should not come at the expense of liveability and amenability, adding that renovation and retrofitting of existing buildings that have served their original intended purpose, as well as the redevelopment of areas of the city, should also be considered. "There is scope for urban regeneration in certain areas of Hong Kong. If you look around the world, ports are shrinking in size in terms of the land they use, so there may be parts of the port that could be regenerated." Alan Yau of KPMG China points out: "The process for redevelopment, such as acquiring strata titles, is currently very slow, and the government may need to introduce policies to speed up it up, as well as provide incentives for developers to look at redevelopment."

Improving mobility

The Transport Department aims to improve the connectivity of Hong Kong through its Smart Mobility programme. The initiative aims to reduce congestion through using 1,200 sensors along Hong Kong's key strategic routes to feedback information to an app to help drivers find the quickest route to their destination.[75] The department has launched a new mobile app, HKeMobility, which combines its three previous apps offering information on transport options, routing and traffic news.[76] The MTR and a number of the city's bus and ferry operators are also sharing data on real-time arrival times through the Citymapper app to help people plan their journeys on public transport. From 2021, the Transport Department will pilot the use of intelligent traffic signal systems for pedestrians and vehicles at road junctions.[77] Additionally, in the 2020-2021 budget, the government has set aside HKD 1 billion for a new Smart Traffic Fund, aimed at supporting enterprises and organisations conducting research on vehicle-related innovation and technology. The Fund is expected to start operations in 2020-2021.[78]

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One barrier to wider rollout of smart solutions is a lack of scientific data to demonstrate that solutions work. New technologies that more accurately measure pedestrian and car traffic flow can help provide more definitive evidence to citizens

Roy Leung
Head of Transport, Hong Kong
KPMG China

In terms of examples in other cities, the Taoyuan City government in Taiwan has partnered with Avalue Technology to use AI to improve traffic management.[79] A smart AI detection system has been installed in bus bays and no-parking zones to detect and record traffic violations to reduce congestion. Dedicated short-range communication is also being used to change traffic signals in favour of ambulances to reduce their response times. In addition, AI recognition systems have been installed at road junctions where there are no traffic signals to flash warnings to drivers on LED screens, such as if pedestrians are crossing the road or vehicles are approaching from a different direction.

To improve mobility within the GBA, Roy Leung, Head of Transport, Hong Kong, at KPMG China, suggests data could be used to create an integrated transport network within the region, with bus, rail and ferry timetables coordinated with each other to connect the different modes of public transport to reduce the traveling time between Hong Kong and the other cities.

The government is also making improvements to the walkability of the city through increasing the connectivity of footpaths and elevated walkways and incorporating pedestrian networks into urban design.[80] It is also enhancing barrier-free access on public walkways, such as through the installation of lifts.

Looking ahead to the next decade, Henry Louie of Wilson Group foresees that autonomous vehicles may play a role in increasing mobility for Hong Kong residents, particularly for those who are elderly, disabled or do not have convenient access to public transportation.

Managing an ageing population

Smart City Consortium forecasts that in the next 15 years, Hong Kong will face a double ageing" phenomenon consisting of ageing buildings combined with an ageing population. The city can address this challenge with a "Double Smart" approach to retrofit the city's building stock with smart living technologies, while using preventative digital healthcare to enable the future elderly population to live healthier lives.[81]

Case study

ParkDC makes parking easier in Washington, DC with cost-effective approach

In a major city like Washington, DC, parking is always at a premium.

The US capital city has a population of more than 700,000, and swells to over one million each day with more than 500,000 commuters. This translates to a high demand for the District's curbside space. In particular, there is a growing need for curbside loading zones due to the growth in popularity of online shopping, on-demand delivery, and ridesharing services.

One of the District's early innovative strategies to rethink the use of the curbside was to introduce the parkDC: Penn Quarter/Chinatown pilot: a demand-based system to manage curbside parking spaces. Depending on the time of day, prices in the District's bustling Penn Quarter and Chinatown neighbourhoods fluctuate to improve parking utilization and turnover at the curb. Travellers can now access parking information in real-time on two mobile apps, parkDC and VoicePark.

The parkDC pilot examined the impact of different parking occupancy detection approaches and combining data sources, which allowed for a more 'asset-lite' sensor deployment. Data collected during the pilot show that drivers reported spending seven minutes less finding parking. Fifteen percent of drivers surveyed found it easier to understand parking signage and posters. Also, the length of double-parking stays at loading zones dropped by 43 percent while the time spent circling for parking also dropped by 15 percent.

Based on the results of the pilot, the District Department of Transportation (DDOT) released a final report on the parkDC pilot in January 2019. The report outlined plans to deploy an incremental expansion plan, increase deployment of parking occupancy detection technologies, continue tests of alternative technologies, and ensure flexible mechanisms to contract technology vendors.

Source: Government of the District of Columbia, WeGO

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The "smart home" and "smart building" component of the "Double Smart" approach incorporates assistive technologies and elderly-friendly design. This is accompanied by the "smart neighborhood" concept allowing improved walkability and a more elderly-friendly distribution of amenities and services. Finally, it advocates for "smart healthcare" – featuring the use of IoT networks and data analytics to remotely monitor patients, identify trends and predict health risks.

To address space shortages in public long-term care facilities, in its 2020-2021 budget the government announced HKD 300 million in funding to provide home care services for up to 3,000 seniors over the next two years as well as community care service vouchers for an additional 1,000 elderly residents in the coming year.[82]

As the government looks at ways to further manage its healthcare resources to take care of an ageing population, technology solutions have the potential to make a big impact. CLP is currently working with a start-up to test a smart elderly monitoring system which uses a combination of sensors and an AI platform to monitor an elderly person's heart rate, breathing and behaviour from their own home. If it detects any changes in behaviour of the elderly living pattern or key health readings, a member of the family is notified. This could help ensure the well-being of the elderly person and potentially detect illnesses earlier than before. "Potentially this can also be an interesting application for hospitals to remotely monitor elderly patients after they are discharged," Lena Low of CLP Power says.

The examples above show the role technology can play in helping to empower citizens and improve their lives. As Hong Kong continues to develop, it is important that the needs of the population are addressed, and people are equipped with the skills they need to access the benefits technology brings.

Case study

Smart solutions for elderly homes

By 2030, the number of Hong Kongers aged 65 or older is expected to rise to 2.1 million, up from 1.3 million in 2019, which will greatly increase demand for elderly care facilities. Key challenges include providing an adequate standard of care with limited staff while helping facilities to reduce power usage and waste.

In 2019, CLP organised a Smart Elderly Home Experience Day showcasing 50 smart products and solutions, aimed at improving care, rehabilitation, cooking, energy management, indoor air quality, elderly safety and entertainment for seniors. Some of the products were developed by local start-ups. The event was attended by over 500 elderly home operators and solution providers.

One of the featured products was a smart rehabilitation system featuring a motion sensor and radio frequency identification (RFID) to record and monitor elderly people doing physiotherapy exercises. The data allows care home staff to monitor in real time their progress to facilitate better health outcomes. Another is a mobile phone-controlled congee cooker, which allows more efficient cooking for large amounts of people requiring fewer staff.

Lena Low, Senior Director, Customer and Business Development at CLP, says CLP currently works with elderly home operators to help them implement smart technologies that can increase sustainability and energy efficiency while enabling staff to better serve residents.

"We want to encourage existing care homes to conduct pilots, so that the public and private operators are more aware of these solutions when they design new facilities," Low says.

According to Low, for public facilities to adopt solutions, technology vendors must clearly demonstrate how the solution solves a customer pain point through proof of concept (POC). She says CLP helps start-ups facilitate contact with relevant operators and works with them throughout the pilot and POC phase.

"We test [solutions] together with start-ups and give them feedback as an independent party," she says. "As POCs may take multiple rounds, we also encourage them to be persistent and keep trying until they succeed."

Source: CLP

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Value-for-money quality housing critical to Hong Kong's future innovation

Sachin Doshi
Founder and CEO, Weave Co-Living

While technology can be an enabler, innovation first and foremost comes from people. In Hong Kong, access to high quality, affordable housing is a basic need that needs to be addressed in order for the city to continue to attract top talent in the coming decade.

Creating a thriving institutional rental accommodation market is one way the city can improve urban living standards and make housing more affordable for professionals and entrepreneurs, according to Sachin Doshi, Founder and CEO of co-living spaces owner and operator Weave Co-Living.

Founded in 2017, the company owns four properties in Hong Kong, with two of its spaces in Prince Edward and Hung Hom neighbourhoods currently open with 255 bedrooms. Its private bedroom suites rent for between HKD 8,000 to 12,000 per month depending on size. The properties feature spacious shared living rooms, kitchens and gym facilities as well as rooftop decks. Weave's residents come from over 20 countries, with a current mix of about 40 percent locals and 60 percent expatriates, at an average age of 28 years old.

Doshi says he founded Weave to address the housing unaffordability issues that affect so many young professionals across Asia. "Many young people are increasingly globally mobile. When they're deciding where they should go to plant their roots, a key decision point for them is the liveability of a particular city. And a big part of that is the quality and affordability of their accommodation," he says.

Changing the incumbent property mindset

Maximising Hong Kong's professional talent pool means making more high quality affordable rental housing available in the city centre, Doshi says. Doing so would help to change the traditional mindset that home ownership is preferable to renting.

"No young person wants to live an hour and a half outside the city," he explains. "The reason why a lot of people end up wanting to own is because there is no good quality, viable rental alternative."

He points out that in cities like London, the rise of institutionally-owned private rental housing is improving housing conditions for renters. "There, more people are willing to live in rental accommodation because the quality is good and there is certainty of tenure."

For a change to occur in Hong Kong, Doshi says the government needs to adapt its policies on land use to earmark more land for rental-only housing.

"A thriving rental accommodation market can only be supported through more progressive regulations and rules in the city. Currently, there is too much focus on maximising land sale proceeds, and that is a major pain point for anyone looking to create rental accommodation," he says.

Doshi adds that more flexibility on land use, including building height and plot ratio restrictions, would create incentives for developers to build more rental units. "However, the key is to make sure this does not create a moral hazard where developers just go in and build more units for sale, which further makes a frothy market. There has to be a concerted strategy towards rental accommodation."

Incorporating environmental and social responsibility

As Hong Kong moves to implement its Climate Action Plan 2030+, a key element is making buildings more energy efficient and reducing household waste.

Weave has installed smart devices in its bedroom units that set temperature parameters and automatically trigger the air conditioner to shut off when the tenant leaves the room. In addition, it is implementing a "single-use plastic-free" policy and training its housekeeping staff to properly sort recyclable waste. It is also looking to install solar panels at its Prince Edward property and plans to encourage residents to grow their own food in rooftop gardens.

Another focus for Weave is to improve the mental and physical well-being of young people in Hong Kong. Doshi says co-living creates a community where residents can develop social connections.

"It has been well documented that social media has led to a massive increase in the feeling of loneliness and depression in young people, and a big reason for that is a lack of meaningful social interactions and relationships," Doshi says. "Weave Co-Living allows you to instantly plug into a network of like-minded people to experience new things with and inspire each other."

By taking away the hassles of renting, co-living also gives tenants peace of mind allowing them to focus on their careers and personal lives, Doshi adds. "You're not spending your time worrying about a sub-optimal living condition, so you can focus on the things that matter."

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Digital literacy and community outreach: paths to a smarter city

NiQ Lai
Co-Owner & Group Chief Executive Officer, Hong Kong Broadband Network (HKBN)

Human development plays the central role in any smart city project, as smart cities are founded on smart people.

As such, Hong Kong's population must have the necessary skills and digital literacy to embrace smart city innovation if these developments are going to be a success, according to NiQ Lai, Co-Owner & Group Chief Executive Officer of HKBN, a leading integrated telecom and technology solutions provider.

Our survey conducted for this report suggests companies recognise the importance of reskilling their workforce to embrace technological change, with roughly three-quarters (74 percent) of organisations planning to increase specialist training in digital capabilities for employees, broadly the same level as those that are planning to invest in new technological capabilities.

Lai says that Hong Kong's education system needs to embrace change to ensure the future workforce is equipped with the skills that both they and companies need in coming decades. "We need to teach students how to systemically dream beyond rote learning," Lai says. "Our education system needs to evolve to teach people how to embrace technology change rather than be afraid of it."

Embracing AI as a learning tool

In education, artificial intelligence can be used to customise lessons for individual students according to their needs, Lai says. One example is Snapask, an online tutoring company in Hong Kong, which uses IBM Watson data analytics capabilities to analyse in-app behaviour between students and tutors to predict students' academic needs and personalise learning content for them.

Other countries have taken AI in education a stage further, with some schools in mainland China experimenting with using facial recognition technology to detect emotion and whether students are paying attention, while Japan is using AI robots to improve students' English skills due to a shortage of teachers in this area.

Alongside ensuring people have the capabilities to access new technology, Lai says citizen involvement and increased communication have an important role to play in the implementation of smart city initiatives. "A key aspect of involving citizens is enabling them to see the benefits of new technology," he says.

Technology adoption goes hand-in-hand with digital literacy

As it moves to boost digital literacy, Lai stresses that Hong Kong needs to be at the forefront for smart city technology adoption in order to maintain its global relevance.

Building Internet of Things (IoT) networks is a major enabler for smart city solutions. However, Lai says that organisations face challenges when deploying IoT, such as high cost of installing wireless sensors, high energy consumption and complexity to maintain sensors.

In December 2019, HKBN announced that it is partnering with Australian low power wide area network (LPWAN) operator Thinxtra to launch an "0G" IoT platform solution in Hong Kong, becoming the first Hong Kong-based telecom company to provide this technology.

0G, developed by French technology company Sigfox, has already been deployed in over 70 countries and territories. It relies on a compact radio protocol (each uplink message has up to 12 bytes of payload), meaning it uses less power, has a lower data footprint, is more reliable, easier to maintain, and costs less than a conventional IoT network. The solution has been dubbed "The Internet of Small Things".

"The overwhelming majority of IoT use cases require wireless sensors to send small data messages," Lai explains. "Sigfox's unique low-energy, low-cost device-to-cloud approach makes it the ideal platform for companies to build and expand smart city innovation via IoT."

Transforming into the future rather than holding onto the past

Just like how electric cars will eventually supersede petrol cars, smart cities will eventually supersede non-smart cities, Lai says. "Smart cities are a necessary part of human development for us to better utilise the limited resources of our one and only Earth."

In the last decade, HKBN has transformed from a fixed telecom service provider to a leading integrated telecom and technology solutions provider via a sequences of acquisitions. These include Y5Zone, a leading wholesale WiFi provider; New World Telecom, a leading enterprise fixed line carrier; ICG, a leading cloud consultant, WTT, leading enterprise fixed line carrier, and HKBN JOS, a leading system integrator.

"With these new capabilities, HKBN is now ideally positioned to help companies transform into smart companies, which are the foundation of smart cities," Lai says.

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Connectivity and innovative cooperation models are equally critical to realise smart mobility in Hong Kong

Henry Louie
Managing Director, Wilson Group

Hong Kong's roads are some of the most heavily used in the world, with an average of 370 licensed vehicles for every kilometre of road, according to the city's Transport Department. The city's dense development and difficult terrain further adds to the challenge of keeping traffic moving.

The government is in the process of installing traffic detectors on all strategic routes in Hong Kong to provide real-time information on traffic speed and volume, with the data fed back to Transport Department websites and apps. Drivers can then use these apps to find out how long it will take to get to certain locations.

Much of the current technology, as well as future innovations, will be able to be fully utilised with the improved connectivity and reduced latency of 5G, says Henry Louie, Managing Director of Wilson Group, one of Hong Kong's leading providers of transport infrastructure management and smart mobility services.

Data-driven solutions should improve traffic flow and promote higher vehicle occupancy

While the planned Transport Department sensors will improve the flow of information, they may not necessarily improve the flow of the traffic itself, Louie says. He suggests that new technologies should be harnessed to help improve traffic flow and promote sustainability.

He gives the example of infrared cameras, which he says could be used to identify how many people are in a vehicle. Based on the data, the government could then introduce express lanes for private vehicles with higher levels of occupancy.

"Traffic congestion affects the environment, so such solutions would create a better living environment for the public with less pollution," Louie says.

Traffic lights could also become smarter, and instead of operating on timers, they could use sensors and artificial intelligence to detect how many people are waiting to cross the road, and even how long they will need to cross it, based on whether there are any elderly people among them.

The introduction of a new free-flow electronic tolling system for the city's tunnels will also create the potential to implement a congestion charge to help manage traffic volumes, Louie says. He emphasises that as these technologies are being implemented, concerns over data privacy need to be fully addressed in co-operation with the public.

> *"The PPP model allows companies to invest in a project and receive an income stream from it for 20 or 30 years. It is much more cooperative, defining a lot of the requirements together"*

A smarter city requires flexibility in cooperation models

At the core of innovative mobility solutions is not just technology, but a framework that harnesses the insights, best practices and expertise of private businesses. Louie says that to facilitate data sharing from corporates that can be used to co-develop smart city solutions, he would like to see the government shift from its normal practice of contracting with private vendors to alternative cooperation models, including public-private partnerships (PPPs).

One example of where PPP could work is with parking, Louie says. Currently the government is in the process of introducing smart parking meters, which include sensors to detect whether a space is occupied to provide real-time data to motorists. As the biggest commercial parking operator in Hong Kong, Wilson Group provides the government with information on public-owned and some commercial carparks. It also provides information about parking availability across all of its carparks in its own app.

"Hong Kong is unique in the sense that a lot of the data that is potentially available is owned by the private sector, but the private sector may be reluctant to share that data with the government without a return on it," he says.

"The PPP model allows companies to invest in a project and receive an income stream from it for 20 or 30 years," Louie says. "It is much more cooperative, defining a lot of the requirements together."

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Looking ahead: the road to Hong Kong 2030

As we head towards 2030, to jointly realise Hong Kong's smart city ambitions, the study identifies a number of key development areas for public and private sector organisations.

A first step is to understand the global trends as well as factors specific to Hong Kong that are affecting the city's development trajectory. We have grouped these trends into three broad categories: sustainability and resources; economic and geopolitical factors; and the changing needs of citizens. By addressing these factors in their long-term planning, organisations in Hong Kong can position themselves to take advantage of the related opportunities to boost the city's liveability and competitiveness while managing evolving risks. The planning process should be continuous, with care taken to regularly review and refresh plans as future trends are identified.

Going forward, smarter regulation and governance will further boost Hong Kong's ability to develop solutions that are embraced by the public. As noted by survey respondents, housing affordability is an important challenge to address. This will require new policy approaches as well as harnessing new technologies to more efficiently make use of available land, reduce construction costs and effectively repurpose ageing buildings.

Measures that enable cooperation between the public sector, corporates, start-ups and SMEs will be critical to fully develop the smart city ecosystem. A more flexible regulatory environment can help drive smart city innovation while spearheading new industries. Taipei's Smart City Living Lab cited in this report is an example of how city governments can facilitate partnerships with the private sector to co-develop technology-based solutions. Meanwhile, the creation of a 'smart city regulatory sandbox' in the Korean cities of Sejong and Busan demonstrates one way governments can experiment with more flexible regulation and other incentives that can enable public-private partnerships.

Creating a more liveable and sustainable city is essential to Hong Kong's future competitiveness. Businesses need to lead by example in improving their ESG practices to enable the city to achieve its sustainability goals and help to address poverty and rising income inequality. The Hong Kong Stock Exchange's improved ESG reporting requirements are a positive step towards enacting lasting change. However, going forward, companies of all sizes must see integration of ESG into their business models as an urgent imperative that will yield long-term benefits.

Finally, leveraging Hong Kong's strengths as a regional connector and empowering the local workforce through future-focused education will ensure the city's future economic resilience and help to improve quality of life for residents.

As mentioned in the City University of Hong Kong case study, technology can play a role to help educators teach more effectively and compensate for manpower shortages in schools. At the same time, corporates should also get more involved in advising curriculum development for younger-age students in order to help them more effectively develop the skills they will need for a future workforce.

To better facilitate regional connectivity, the survey suggests that start-ups should expand their R&D cooperation with corporates and universities based in the nine mainland China cities in the Greater Bay Area. To capitalise on its strengths, Hong Kong should also strengthen its positioning as an international data hub and do more to export its 'smart manufacturing' expertise to the ASEAN region.

The following suggestions illustrate how both city administrators and the business community can build on their current strengths and address gaps to collectively boost development in the coming decade.

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Suggestions

For the public sector

- Strive for a joined-up approach to smart city development with increased cross-departmental collaboration
- Keep citizens at the centre of development and partner with corporates, SMEs and start-ups to develop smart city solutions
- Ensure regulation is flexible and evolves with new technology to support development
- Increase the focus on technology innovation, offering support where necessary
- Revise the tendering process so that it is less prescriptive and encourages greater collaboration; consider introducing more public-private partnership opportunities

For corporates

- Focus on sustainability and holistic integration of ESG into their business models
- Expand partnerships with start-ups from predominantly conducting pilots to also include projects further down the line, such as developing products and services and go-to-market initiatives
- Work with schools, universities and the education sector to encourage more students to take up STEM subjects
- Focus on cooperation and co-creation with other corporates, sectors and start-ups
- Continue to invest in training their workforce to ensure they have the digital skills needed for the future

For start-ups and SMEs

- Make full use of public data available through the data.gov.hk portal to inform their strategies and develop solutions
- Capitalise on Hong Kong's status as a regional hub by exporting smart manufacturing solutions to ASEAN countries
- Proactively seek opportunities to collaborate and co-create with larger corporations
- Take up opportunities to work with universities on R&D in the GBA, including in Hong Kong
- Leverage the advantages the GBA offers in terms of support for innovation, technology infrastructure and access to talent

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KPMG is a global network of professional services firms providing Audit, Tax and Advisory services. We operate in 147 countries and territories and have 219,000 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 investments 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 about 2.5 million households and businesses.

CLP is included in 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 ESG Leaders Indexes.

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Cyberport is an innovative digital community with about 1,500 technology companies. It is managed by Hong Kong Cyberport Management Company Limited, which is wholly owned by the Hong Kong SAR Government. With a vision to be the hub for digital technology thereby creating a new economic driver for Hong Kong, Cyberport is committed to nurturing a vibrant tech ecosystem by cultivating talent, promoting entrepreneurship among youth, supporting start-ups on their growth journey, fostering industry development by promoting strategic collaboration with local and international partners, and integrating new and traditional economies by accelerating digital adoption in the public and private sectors.

Cyberport focuses on fostering the growth of major technology applications namely FinTech, smart living, digital entertainment & esports, as well as technological development such as artificial intelligence (AI) & big data, blockchain and cybersecurity. With a team of committed professionals providing all round, value-added services, state-of-the-art facilities and smart workspaces to support our digital community, Cyberport is the flagship for Hong Kong's digital tech industry.

About HKBN JOS

With over 60 years of experience in Asia, HKBN JOS is a systems integrator, solutions provider and technology consultancy with deep industry knowledge and an exceptional ability to execute. Comprising 2,000+ IT professionals from nine offices across Asia's major business hubs in mainland China, Hong Kong, Macau, Malaysia and Singapore, HKBN JOS aims to improve the performance of businesses and governments across the region by applying the best technology to address their challenges. HKBN JOS has extensive experience across a range of industries, boasting 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.

HKBN JOS is a subsidiary of HKBN Group ("HKBN" or "The Group"). HKBN Group is a leading integrated telecommunications and technology services provider in Asia, offering comprehensive one-stop Information and Communications Technology ("ICT") services to both the enterprise and residential markets. HKBN embraces a Core Purpose to "Make our Home a Better Place to Live". The Group is managed by hundreds of Co-Owners (supervisory and management level Talents in the Group) who invested their savings to buy shares of HKBN Ltd. (SEHK Stock Code: 1310). For more information about HKBN, please visit www.hkbn.net/en.

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About Smart City Consortium (SCC)

Smart City Consortium (SCC) is formed by a group of professionals from different corporations and organisations 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.

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.

In past years, with the continuous support of our members, SCC has successfully organized and supported over 350 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 36 memorandums of understanding with worldwide Smart City organizations, with many professional views and ideas exchanged with the overseas experts We encourage worldwide collaboration with different stakeholders to create the right ecosystem which fosters innovation and sustainable economic growth for Hong Kong.

About Siemens Limited

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 2019, which ended on September 30, 2019, Siemens generated revenue of €86.8 billion and net income of €5.6 billion. At the end of September 2019, the company had around 385,000 employees worldwide. Further information is available on the Internet at www.siemens.com.hk.

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.

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WEAVE
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Weave Co-Living is a leading co-living company in Asia. In response to the rising property prices and expensive high rents for millennials across Asia, Founder and CEO Sachin Doshi established Weave Co-Living to provide young people in our cities a beautifully designed, stylish and comfortable home that delivers superior value for money with a strong sense of community.

Weave Co-Living is committed to developing close-knit communities for millennials and young professionals in a hassle-free city living environment, where residents can enrich their lives by sharing experiences and inspirations to achieve aspirations and ambitions. The company curates stunning shared spaces as well as social and cultural events. We will soon be launching the Weave App, a smart-management platform, to enhance our provision of services, benefits and information to the Weave community.

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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 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.

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