



# Smart Cities

Awareness survey conducted covering five major cities in Japan  
- What we can do to create a livable city where people enjoy a better life

2020 survey

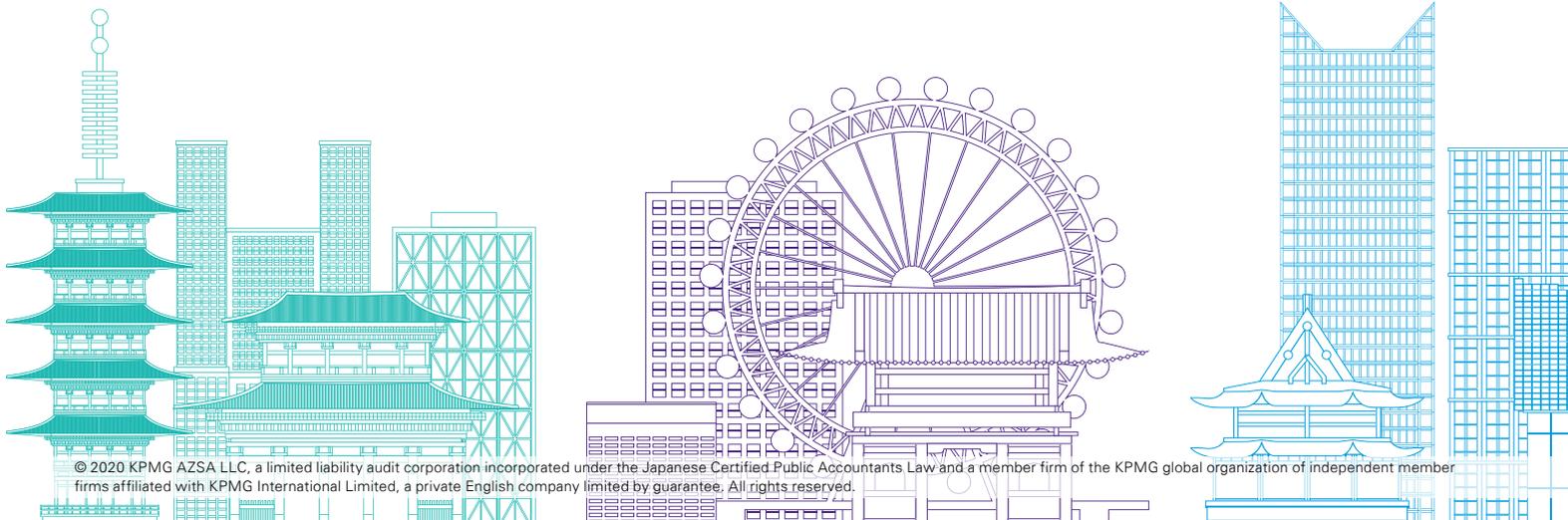
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# Messages

This report *Smart city: Awareness survey conducted covering five major cities in Japan - What we can do to create a livable city where people enjoy a better life* summarizes the survey results of awareness of citizens in five major cities in Japan: Tokyo, Osaka, Nagoya, Sapporo and Fukuoka.

This survey was conducted in the form of questionnaires sent to 4,147 citizens in the five cities in total where we requested them to respond to the questions as to how they assess the current situations and what they expect going forward with respect to the following six areas related to smart cities:

- ▶ Transportation and mobility
- ▶ Education: Building a future-focused workforce
- ▶ Living environment
- ▶ Healthcare
- ▶ Energy and resources
- ▶ Technology solutions

KPMG professionals specialized in each field analyzed the survey results.

In addition, as we aligned the survey items with those included in *Connected Cities: Citizen insights across Asia Pacific* a report published by Hong Kong office of KPMG China in January 2019 (a Japanese version issued in March 2020)<sup>1</sup>, we realized the survey results can be compared to those in the report.

To further supplement the survey results, we also included the views and opinions of specialists in each field and good examples inside and outside Japan.

The analysis of questionnaire survey results and messages of specialists and academic experts have given us a good opportunity to revisit the concept of smart city, including “Smart is for whom” and “Challenges we must address in developing a city”. We also re-recognized the importance of aiming at building a city that is friendly to the environment and the earth, and where convenience, health and safety of residents and common citizens can be pursued, as well as the need of sustainable and comprehensive solutions beyond the pursuit of benefits for specific individuals.

We would like to thank all the participants in our survey and contributors for their valuable insights.

We would be deeply delighted if this report would assist those involved in various areas such as urban planning, medical services and education including mobility and public transportation, and energy, in considering the smartification of cities in response to the true picture of cities in Japan.

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<sup>1</sup> KPMG China, “Connected Cities: Citizen insights across Asia Pacific”  
<https://home.kpmg/cn/en/home/insights/2019/01/connected-cities.html>



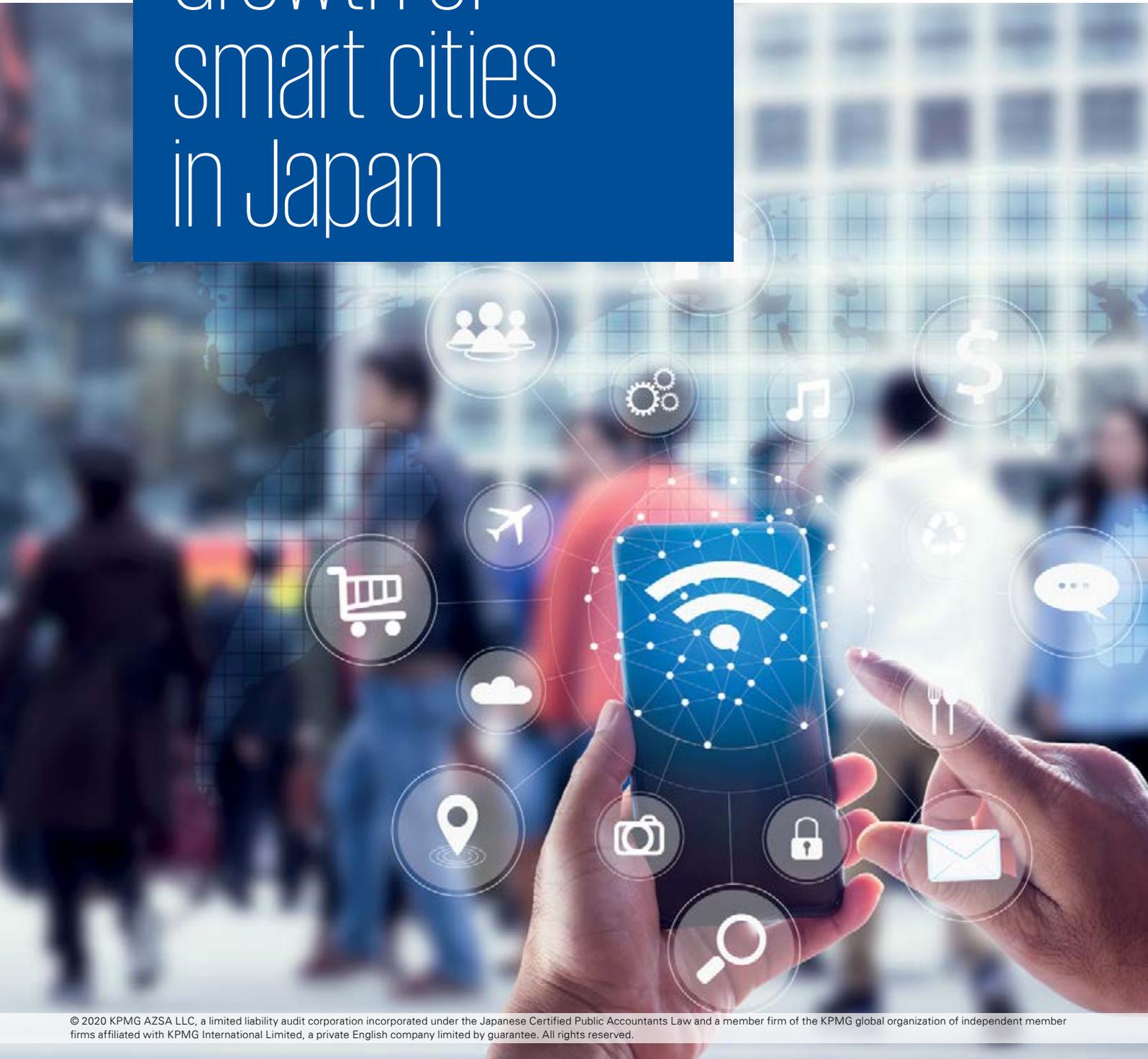
## About this survey

KPMG Mobility Research Japan engaged Macromill, Inc. to conduct an online survey in January 2020, targeting those aged 18 and older living in five major cities in Japan: Tokyo, Osaka, Nagoya, Sapporo and Fukuoka. We obtained approximately 800 responses to the survey from each city. We adjusted the gender and age compositions of survey results to the demographic composition of each city.

From the perspective of analysis, we generally assessed the quality of opinions of respondents concerning certain areas (in particular, transportation/mobility, education, living environment and medical services) by assigning relevant scores to them. A score assigned to each area was determined based on the average of scores to each question (5=Excellent, 4=good, 3=Average, 2=Poor, 1=very Poor) and 5 was a full mark (5 is the highest and 1 is the lowest). Respondents were requested to select their relevant answers from sentences described related to defined quality, rather than the number as mentioned above.



# Growth of smart cities in Japan



# Introduction

Recently, we have observed the second boom of smart city development for the first time since around 2010, as various cities and regions in Japan announced and promoted demonstration projects, concepts and plans concerning a smart city. Many of these have been initiated and carried out mainly by the Japanese Government, local governments, universities and corporations. However, as Japan has provided the required high-level infrastructures, a comprehensive approach has not necessarily been adopted from the perspective of problem solutions. Rather, technology-oriented plans using new technologies, in particular digital technologies, have accounted for a majority of such plans. On the other hand, only the application of new technologies is not sufficient for the realization of a smart city and we have to address various challenges including:

- ▶ Deregulation and establishment of new rules to maximize the effect of new technologies;
- ▶ Enhanced literacy and heightened awareness of users; and
- ▶ Collaboration among industries, academia and governments.

Needless to say, all of these must satisfy the needs and wants of urban citizens who are end users.

KPMG Mobility Research Japan examined six out of those elements required for the realization of a more advanced smart city, which relate especially to transportation and mobility, education (building a future-focused workforce), living environment, healthcare, energy/resources, and technologies.

We conducted questionnaire surveys in five cities in Japan in addition to surveys in major cities in the Asia Pacific region conducted by Hong Kong office of KPMG China in 2019. Unfortunately, it appears that expectations and needs perceived from the questionnaire responses still deviate from the objectives and concepts of current smart city planning and demonstration projects significantly, as follows:

- Smart cities demanded by urban citizens could be characterized as higher needs for cities closely connected to daily living, for example, having sophisticated and advanced medical services, rather than highly convenient cities applying leading-edge technologies.
- Urban citizens are, to some degree, satisfied with mobility and energy included in many smart city plans.
- A smart city contemplated by KPMG considers supply of human resources and innovation for the sustainable development of cities themselves to be essential factors, in addition to building a smart city itself. However, urban citizens did not necessarily indicate high interest in them.

The observation of each element shows characteristics specific to cities in Asian countries, as well as cities in Japan, which are summarized as follows:

## Transportation and mobility

Overall assessment of large cities in Japan is high compared to other cities in Asian countries partly because they already have a well-developed public transportation network. What requires improvements going forward in urban areas would be transportation infrastructure with an emphasis placed on pedestrians. Such results were obtained because the survey covers large cities. However, local areas encounter significant challenges of the maintenance of public transportation itself, and they would need to further deepen discussion on this issue.

## Education: Building a future-focused workforce

The sustainable development of a smart city will inevitably require the citizen's participation. However, in general, Japanese cities have received relatively low assessment for education on which the development is based, compared to those of educationally advanced jurisdictions such as Shanghai and Singapore. On the other hand, every city acknowledges the importance of "encouraging continuous education/lifelong learning" and it is expected that improvements to education including lifelong education and relevant technologies would substantively be evolved.

While Asian countries consider the education itself to be important to promote innovation which is a component of a smart city, the survey results indicate that, in Japanese cities, more citizens place emphasis on the collaboration with educational institutions and other cities and incentives for the promotion.

## Living environment

As the quality of living environment is significantly different among cities in Asian countries, we can detect the mix of cities with both high satisfaction of citizens and low satisfaction of citizens. Five large cities in Japan show relatively high degree of satisfaction of citizens with respect to living environment. On the other hand, the survey results recognized that some improvements would be required that is "A living environment that is more accommodating to elderly and disabled residents" with reflecting an aging society with a low birthrate. Also, more people have now been more concerned with the "Reducing traffic congestion and improving transport/mobility" which would directly affect urban activities. In addition, more citizens have currently been conscious of climate changes probably due to increasing damages caused by natural disasters. This is one of the points that should be considered with respect to living environment and smart cities.



### Healthcare

Enhanced healthcare is of greatest concern to the citizens in five cities in Japan. Although this survey was conducted before the outbreak of novel coronavirus (COVID-19) pandemic, respondents noted that “Strengthen infectious disease control and prevention” was most needed. Considering that such responses in Asian countries accounted for much less, the survey results indicate that citizens in Japan are highly concerned about infectious diseases. On the other hand, Japanese citizens were less interested in the need to improve the healthcare system by using technologies. However, it is assumed that the expectation of citizens of technologies would have been greatly heightened due to the current experience of COVID-19.

### Energy and resources

Japanese citizens placed less emphasis on “Improving energy efficiency”, which was ranked higher in other Asian countries, as Japan has well-developed urban energy infrastructure. On the other hand, against the backdrop of increased consciousness of the environment represented by the key words such as ESG (environment, society and governance) and SDGs (sustainable development goals), Japanese citizens have defined the accelerated use of renewable energies including hydroelectric power generation, wind power generation and solar power generation as a priority in the context of energy supply.

### The impact of technology

Rapidly evolving technologies have been making smart cities feasible and viable. However, in implementing them, consideration should be given to how citizens would think about it. The survey results show that mobility-related technologies and settlement-related technologies have been relatively widely used in the five cities in Japan. On the other hand, technologies related to administrative services and healthcare have been less applied. Going forward, we will need to address the challenge of wider application and use of such technologies as the current COVID-19 pandemic revealed some of them.

Given the smart city plans being developed all over Japan and the results of the survey conducted, we should renew our awareness of the need to seek solution to a challenge revisiting “What is a smart city in the first place” and “A smart city is for whom”, from the perspective of citizens, in order to promote building smart cities in Japan and achieve higher quality of living in cities. Furthermore, in addition to the development and building of smart cities, it would be important to consider how to evolve the demonstration project phase to the implementation phase by effectively incorporating development and building of smart cities into ongoing initiatives in the city management.

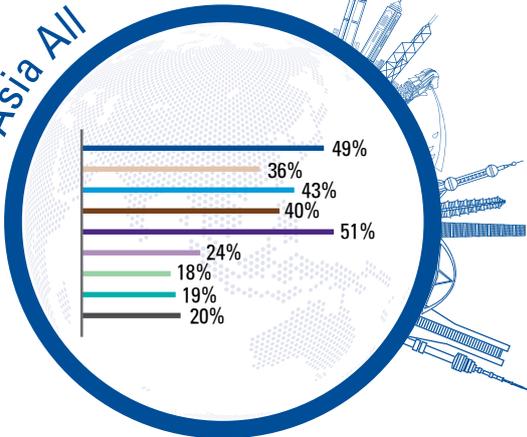
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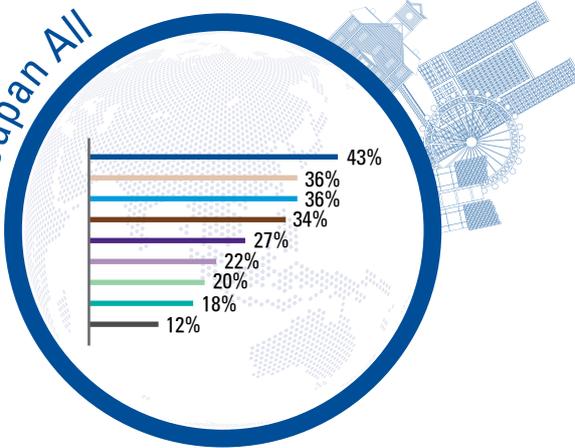
- |  |  |
|--|--|
|  Improving access and delivery of healthcare for residents                            |  Creating a better living environment with thoughtful urban planning and design |
|  Improving use and conservation of energy and resources and reducing carbon footprint |  Improving technology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

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

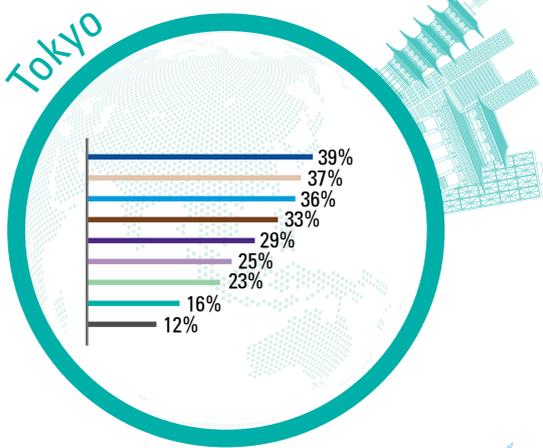
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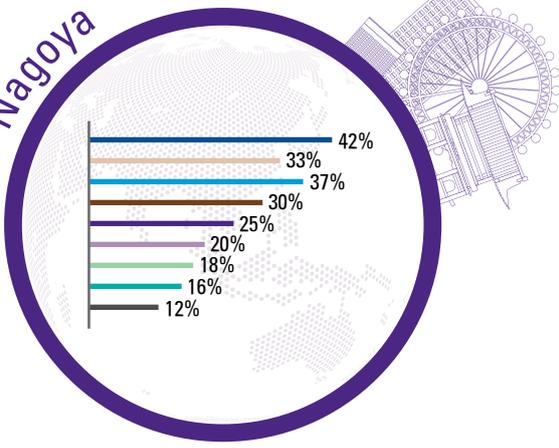
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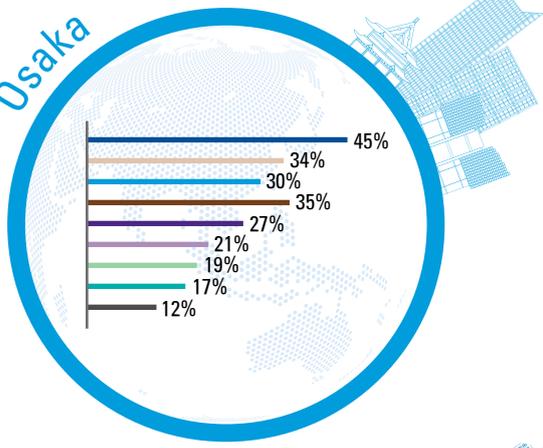
Tokyo



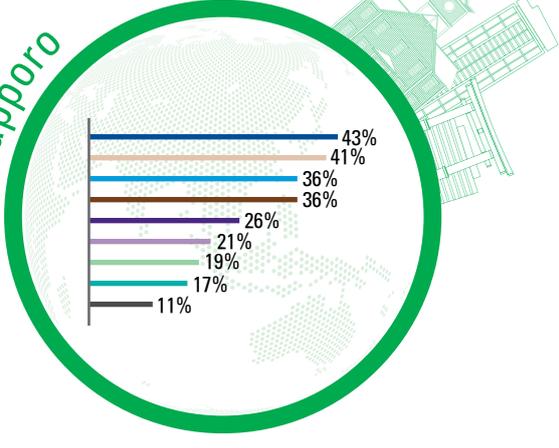
Nagoya



Osaka



Sapporo



Fukuoka

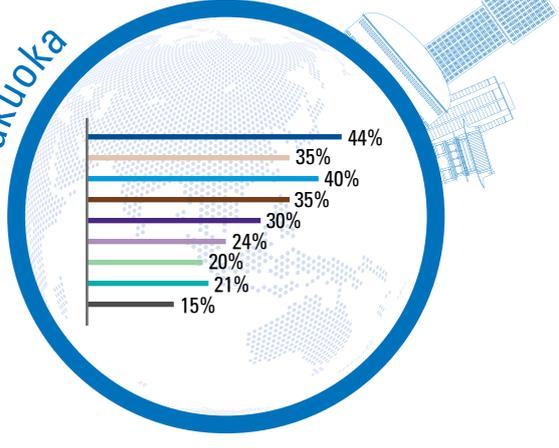
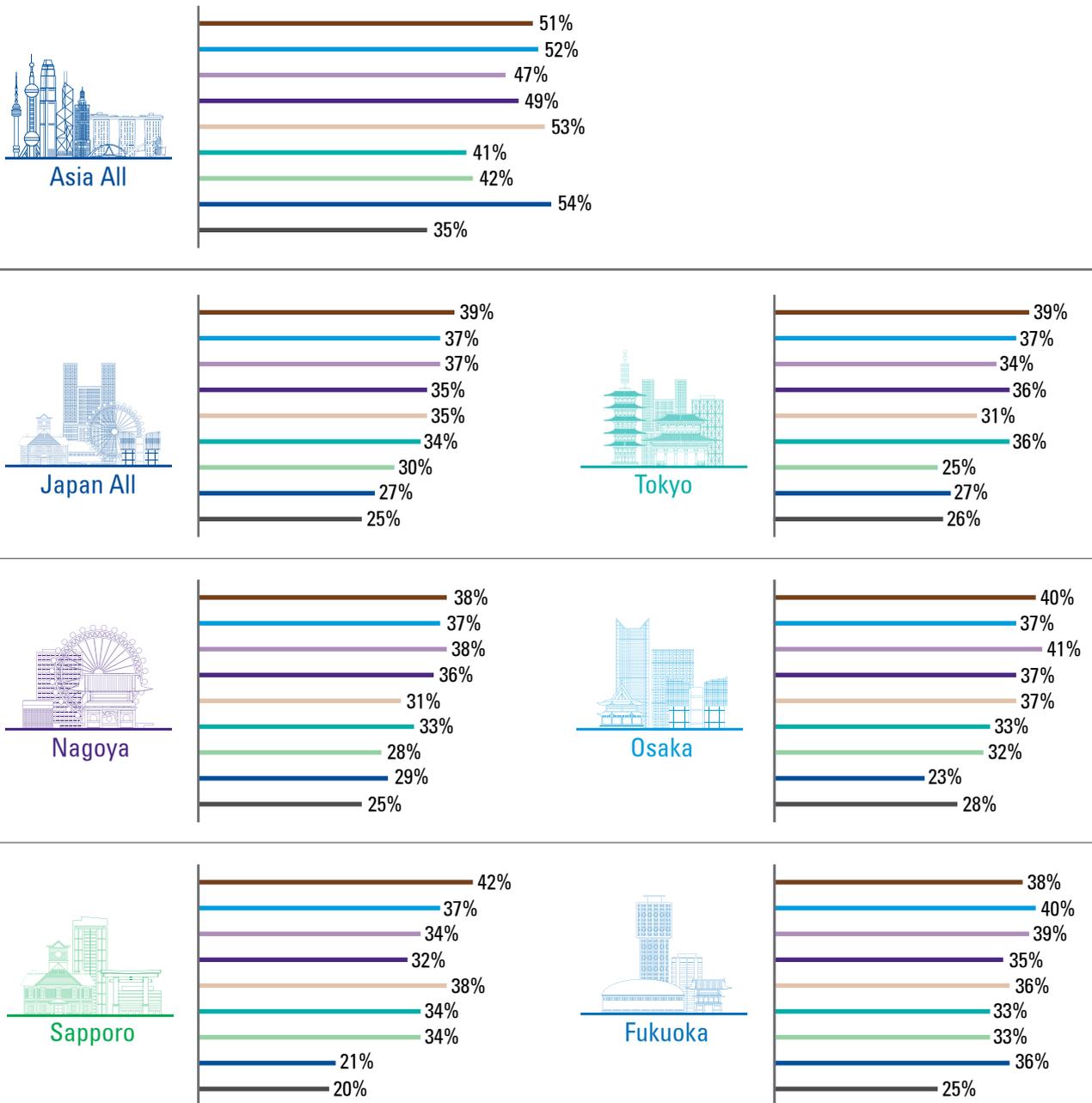


Figure 1.2: Expected benefits from a "smarter" city



-  Less wasted resources
-  Reduced carbon footprint
-  Improved delivery and management of public services
-  More job opportunities
-  Improved public safety
-  Less traffic congestion
-  Cleaner air and water
-  Reduced noise pollution
-  Economic growth

## Major milestones to date concerning smart cities in Japan



1988

Commencement of undertaking initiatives to revitalize the center of cities by constructing public and commercial facilities under the Central City Invigoration Law.



2000

Promotion of compound developments represented by skyscrapers mainly in the center of large cities under the regulations concerning exceptional floor area ratio districts.



Around 2010

Smart city plans were developed in line with Eco-Model City Project, 2008, Cabinet Secretariat; Next Generation Energy/Social System Demonstration Project, 2010 and Smart Community Project, 2011, Ministry of Economy, Trade and Industry; Future City Initiative, 2011, Cabinet Secretariat, Energy Autonomous System at Agricultural, Forestry and Fishery Areas, 2012, Ministry of Agriculture, Forestry and Fisheries; and ICT Smart Town Project, 2012, Ministry of Internal Affairs and Communications.



2013

National Strategic Special Zone Act enabled deregulation of laws and regulations concerning urban development at the level of individual areas, which resulted in the promotion of city developments across Japan.



2015

The Cabinet Secretariat initially positioned smart cities as “Society 5.0” as part of “Integrated Innovation Strategy 2015”.



2019

The Cabinet Secretariat, the Ministry of Internal Affairs and Communications, the Ministry of Economy, Trade and Industry and the Ministry of Land, Infrastructure, Transport and Tourism promoted the smart city project together and created the “Smart City Public-Private Partnership Platform” under the “Integrated Innovation Strategy 2019”.



2020

Act to Amend the Act on National Strategic Special Zone (Super City Act) has facilitated the implementation of smart cities aiming at sustainable city management using data.



## Haruo Ishida

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Japan / Professor emeritus,  
University of Tsukuba

# Are Japanese less interested in city planning?

The results of the questionnaire survey conducted at this time indicate that the Japanese residents' sense of participation in the solutions of city-related issues is lower compared to other cities in Asia. However, I have a slightly different view in this respect. This might be attributed to the modesty in nature specific to Japanese, i.e. Japanese characteristics not to seek more than what they would be expected to obtain. In other words, these results might be attributed to insufficient communications between government administrations and citizens. Any city planning cannot be determined solely by government administrations but it requires the formation of consensus involving entire local industries, including residents and transportation operators. It appears that the results reflect weak awareness of government administration officials responsible for and charged with citizen participation in city development and poor communications between administrations and citizens.

### City planning project and smart city: Making cross-sector benefits visible

In 1919, old City Planning Law was enacted, which was largely amended in 1968. Since then, there have been no significant amendments to the law. In practice, the City Planning Law was implemented in accordance with Act on Special Measures concerning Urban Reconstruction, but the entire system contemplated in the law has been too complicated to understand. A city planning is implemented based on the master plan and there has been no specific tactical theory on how to realize the city plan even after developing the master plan. On the other hand, it is important for a smart city to be managed until it is realized. Any amendment to the City Planning Law would be a significantly onerous task, but it may be time to revisit the city planning system itself.

For example, BIDs (Business Improvement Districts) are often utilized overseas, while few instances of applying the concept of BIDs have been identified in Japan. On the other hand, we may identify some projects which perform well in terms of business. Large developers have now been actively involved in the area development of Daimaruyu, Nihombashi and Kashiwanoha because they have concluded that they could obtain significant profit from the investment in city development, as the asset values are expected to increase. We should develop know-hows and frameworks to make invisible economic values inherent in smart cities, i.e. cross-sector benefits, clearly visible and communicate the benefits.

### A smart city in Japan should seek: Key word is "resilience".

Active discussions have now been observed concerning a smart city in Japan. We should define the value inherent in smart city development and actual goals as to what we should aim at in developing smart cities, but we still have a long way to address these issues and disseminate information on the progress. A French noted that the concept of human-centric smart city and smart city for solving social issues at the local level, aimed at by Japan, was rather difficult to understand. On the contrary, the person said that the concepts of smartification of energy in Switzerland and the maintenance of communities in North America would be easy to understand.

What I am concerned about is that a city putting emphasis on efficiency using tools and data connection would make inhabitants feel straightjacketed and constrained as observed by some cities in Asia. If Japan can demonstrate a "resilient" smart city to significant natural disasters, great problems of Japan, current hot issue of the outbreak of COVID-19 and a variety of other social and economic enormous external pressures including super-aging society, such developments could become a focus of world attention.

"Smart city" might be commonly associated with a large city. However, looking at every corner of Japan, the concept of "smart local" would also be important. Consistent with Daimaruyu mentioned above, the development projects conducted by railroad operators along the railroads would obtain cross-sector benefits as the operation of commercial facilities and real estate, hotel and leisure-related businesses would naturally be expected to be successful businesses. One could go so far as to say that they are likely to be successful without much effort. However, this is not the case with 95% of the land of Japan.

When discussing with persons charged with the city planning in large corporations or local governments, we note that many of them have no idea of what they should do and no ways to get tips for the planning, although they deeply acknowledged that they should do something. However, some noteworthy instances have recently emerged. For example, the local government of Masuda City, Shimane Prefecture, has now expressed its strong intention to transform the current transportation mode, and Kakogawa City of Hyogo Prefecture is now seriously considering resilience to flood disasters. While Aizu-Wakamatsu City, Fukushima Prefecture is famous for ICT, separately from ICT, some groups have steadily been trying to transform and evolve the city by applying analog techniques. A project called "Choisoko", a transport mode to bring people to quite near locations, developed by Aishin Seiki, Co., Ltd. domiciled at Toyoake City, Aichi Prefecture could be a good example to solve the local transportation problems with the mix of digital means and actual transport modes.

### Disseminating sense of values specific to Japanese

Some foreigners note that Japanese, though mysterious, appear to be doing well, but they do not understand what we are in reality, and that Japanese society would not easily accept those foreigners or foreign corporations that have been attracted by Japan with such features. They have assessed that Japanese have addressed the outbreak of COVID-19 well though they do not understand why this is the case and what Japanese have been doing. Specifically with respect to this issue, this could be due to the effect of sense of ethics or moral specific to Japanese, rather than smart cities with digital environment with the focus on efficiency.

Recently, in the sense of the realization of happiness of citizens, a smart city has sometimes been referred to in the context of SDGs. The sense of ethics or moral specific to Japanese has something in common with the achievement of SDGs, which is common language used all over the world. In that sense, now is a good chance to show off a smart city model to the world, that is resilient and visualizes cross-sector benefits, as defined by the sense of values unique to Japanese.





**Mr. Hiroyasu Amano**

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Chief Researcher

# How a smart city project in Fukuoka has been progressing?

On May 1, 2020, there was a news that the population of Fukuoka City exceeded 1.6 million, and it is the fifth city reaching this size of population following Yokohama, Osaka, Nagoya and Sapporo, among cities designated by ordinance. This news brought a bright topic to Fukuoka under the voluntary restraint due to the outbreak of COVID-19. Fukuoka is recognized as one of the few growing cities in Japan where many cities are facing decreasing population. Fukuoka City analyzes such growth as a result of good cyclical effect with sufficient employment attracting people, resulting in favorable expansion of the city through the improvements to living environment supported by the increase in tax revenue.

This section highlights the strategic initiatives of Fukuoka City to generate a “good cyclical effect” by linking them to the building of smart city.

## Accepting various demonstration projects and characterizing the city as an innovation city

Initiatives of Fukuoka to generate a good cyclical effect date back to 2012 when the Mayor, Mr. Soichiro Takashima, commenced the first term of city administration and the cyclical effect was defined as the city’s basic strategy as part of basic policy and plan of Fukuoka. Inherent in each of the policies is the basic concept of attracting people and economic activities through high quality of living and then further enhancing the quality of living driven by virtue of the vitality of such people and economic activities attracted. On the other hand, start-ups and creative industries together with MICE (meeting, incentive tour, convention/conference and exhibition) as well as tourism industry have been regarded as main players to generate the vitality of the city.

In the wake of the Great East Japan Earthquake, the need to use the open data of cities and assist various challenges in solving social issues has been recognized. Under the leadership of the mayor, Fukuoka has endeavored early on to use open data, carry out public procurements encouraging innovation and assist start-up communities, which have led to the nature of the amendments to the basic policy and plan.

Subsequently, Fukuoka applied for the designation as a National Strategic Special Zone, submitted a proposal for deregulation and provided a site for demonstration project. From 2016, it commenced “Full Support Project of Fukuoka Demonstration Project” supported by Fukuoka City, and has

designed the framework where Fukuoka City publicly seeks/adopts social issue solution projects using the leading-edge technologies such as IT and IoT and Fukuoka City fully supports them. As the demonstration project is still at the pre-stage prior to the implementation, a smart city with new solutions or IoT technologies implemented will evolve from a series of such demonstration projects.

In addition, many years of initiatives undertaken by the city concerning start-ups and consistent communications by the mayor have given rise to the perception among not only companies but also citizens that Fukuoka City is a city full of innovations, which in turn could contribute to the creation of environment where more demonstration projects can be challenged and citizens can flexibly accept new structures.

## Framework for the cooperation among industries, academia and governments in line with the growth of city

The “good cyclical effect” of cities could not be brought about solely by the policies and activities of a city and the participation by economic entities is essential. Fukuoka Directive Council (FDC) created principally by Fukuoka City in April 2011 is a useful platform where a team is organized to generate a good cyclical effect across the Fukuoka district economy. In addition, FDC is a “Think and Do Tank” with 213 members including companies, universities and local governments (as of April 23, 2020), which establishes and implements growth strategy with the collaboration among industries, academia and governments so that FDC could design a new future Fukuoka economy and strengthen the international competitiveness. FDC aims at increasing opportunities for innovations through the collaboration among organizations within and outside the Fukuoka economy area. Organizations outside the Fukuoka metropolitan area account for the majority of member organizations of FDC.

Fukuoka City has been promoting the collaboration among industries, academia and governments and the creation of consortium utilizing FDC in areas that could lead to the growth of Fukuoka metropolitan area as a whole and wider economic effect and where the city shares the interests with FDC participation entities. For example, while the Smart City Committee of FDC makes specialized discussions for each of the themes in which participants would indicate interest, including the consideration of the use of IoT in developing a city, new exchange of values or security system, it has been

balancing interests among stakeholders and promoting various social projects in harmony with projects of Fukuoka City.

At the initial stage of the creation of FDC, human resources, where the interests of participants were common, were focused as an area that is essential for economic growth of the Fukuoka metropolitan economy as a whole. Participants agreed that the entire area should educate and train human resources who support the growth of regional economy, including entrepreneurs challenging themselves to new areas, global human resources acting across borders/regions, and hospitality resources necessary for MICE and tourism industries. As a result, several projects related to human resources have been carried out. Interestingly, the region reached the consensus that it should first start with the education and training of human resources, which would take the longest time in initiating new activities.

#### **Leadership of mayor playing a key role in building a smart city and partnership among stakeholders**

A smart city is a city that, in a smart way, offers values commensurate with the lifestyles or needs of those living in a city. Fukuoka Smart East Project that commenced on the site after the relocation of Kyushu University is currently carrying out projects to identify the needs of citizens and explore the feasibility of commercialization of new solutions through the social project involving citizens.

Establishing premises for such social projects, addressing a wide variety of challenges and making residents flexibly accept such initiatives largely depended on the leadership of mayor and his/her information communication capability, as mentioned previously. Also, the determination of direction where interests are shared by stakeholders and the creation of mechanism where various entities cooperate and participate would be very important bases for creating new values of a city.



# Transportation and mobility

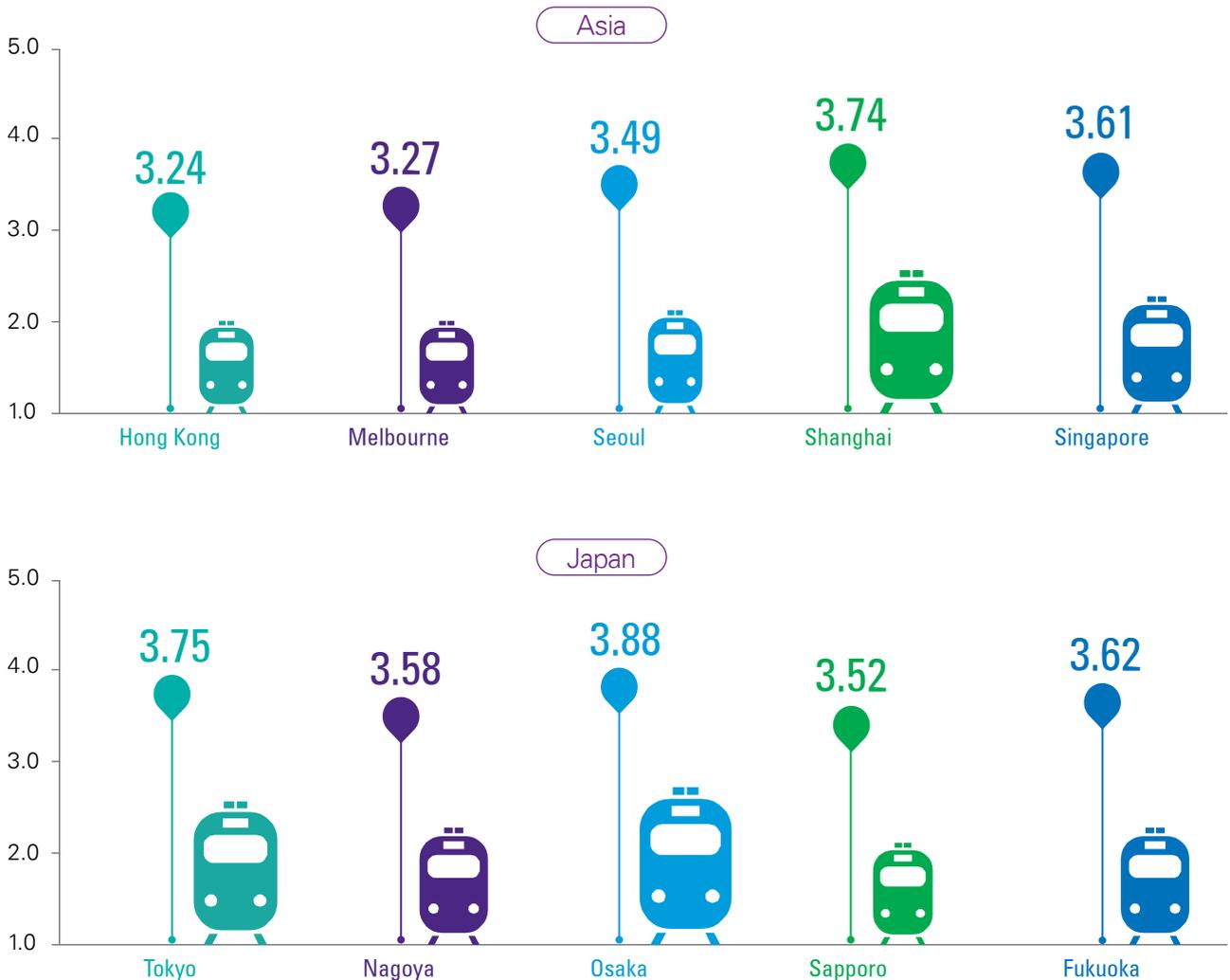
Effective public transportation system enables people to easily access workplaces, healthcare and educational institutions, and, on the whole, contributes to the activation of community.

Improvements to transportation and mobility were regarded as a priority in developing a smart city by five cities covered by the survey. They were ranked third in terms of major areas to be developed for consistent successful development of cities (Figure 1.1). This trend is shared by cities in Asia.

The survey results of five cities concerning “Constructing more rail and underground transport links” indicated less emphasis compared with other cities in Asia. This might stem from the fact that major cities in Japan already have well-developed public transportation networks (Figure 2.2).

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

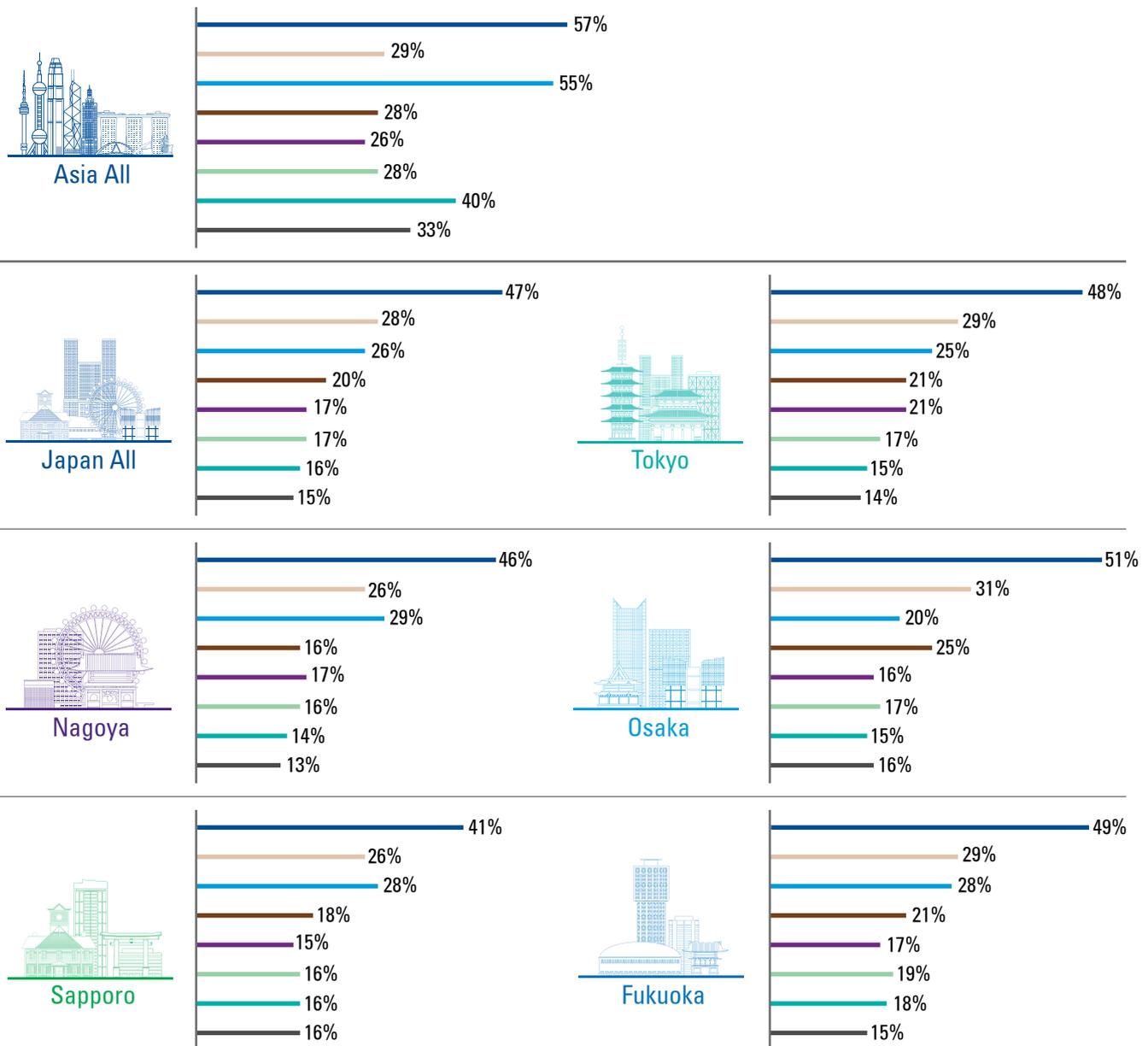
Average of citizen ratings, from 1 (lowest) to 5 (highest)



On the other hand, “Improved walkability and safety for pedestrians” was an item to which the respondents of five cities in Japan gave the most importance, consistent with those in other cities in Asia. Japanese sidewalks are conventionally narrow, sometimes with no boundary line

between roads and sidewalks, and it is noted that there have been clear problems of separation of pedestrians and automobiles. Roads in large cities such as Tokyo, Osaka and Nagoya are still car-centric and in fact, they are not cities where pedestrians can walk safely and comfortably.

**Figure 2.2: Actions needed to improve transportation and mobility**



- Improved walkability and safety for pedestrians
- Constructing more bicycle lanes/bicycle paths
- Constructing more rail and underground transport links
- Installing cameras/sensors to record traffic violations
- Studying feasibility of driverless transportation models
- Smart tolls and smart parking (Reservation and payment for parking through mobile applications)
- Building infrastructure for electric vehicles and providing incentives to electric vehicle owners
- Tighter regulation of private cars and vehicles

The survey results conducted this time also indicated the following trends.

25% of the respondents in Osaka regarded “Installing cameras/sensors to record traffic violations” as a priority in improving transportation and mobility. For all the five cities covered by the survey, the respondents indicating that it would be a priority accounted for only 20% of the total respondents. However, understanding of flows of people and traffic by mounting cameras/sensors and others would be an important factor in improving mobility. In practice, Toyama City and Saitama City are now trying to grasp the flow of people and traffic using cameras or sensors and use them as inputs in developing urban cities.

The re-definition of city development by using data would provide a valuable perspective in considering a smart city.

Compared to other Asian cities, less percentage of respondents to the survey in major cities in Japan tended to regard as a priority “Studying feasibility of driverless transportation models”, “Smart tolls and smart parking”, “Building infrastructure for electric vehicles and providing incentives to electric vehicle owners” and “Tighter regulations of private cars and vehicles”. However, a wider use and expansion of mobility not relying on human operations, including “driverless cars” would be a significant theme in developing stronger measures to address unexpected incidents such as the recent outbreak of COVID-19 in Japan where fewer children and aging population would result in the shortage of workforce.

Development of cities where “driverless cars will be widely available and used” would be essential in order to address various risks that could occur in future.

Haruhiko Ikeda  
Director

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# Case studies

## Toyama City: Creation of prosperous and crowded town centered on pedestrians

Toyama City is often compared to “Dango and Kushi (Skewered ball shaped rice cakes)” and is famous as a city which is trying to develop a compact city town with the public transportation as a main element. It also aims to activate the central part of city by building a compact city.

To activate the central part of city requires a space where people hang around comfortably. While Toyama City has introduced a low-cost LRT (light rail transit) by using the existing railway tracks, held local events and operated open cafes utilizing road spaces, it also aims to promote the use of public transportation and activate city streets by communicating information for town walking and locations of public transportation using ICT.

Furthermore, Toyama City developed a smartphone application for town walking called “TomiCon Plus”, which would provide GPS data that help the city in analyzing the movements and activities of people. Toyama City will then apply the analysis results to the city development plan. These initiatives have produced specific effects such as the increase in the population of the central part of the city.

Every local government would be required to undertake initiatives similar to those of Toyama City to gather and analyze the information on pedestrians and use it in developing and improving the city going forward.

Source : Toyama City, “Toyama City Master Plan”



## Saitama City: Improving the ease of getting around for walkers using GPS data

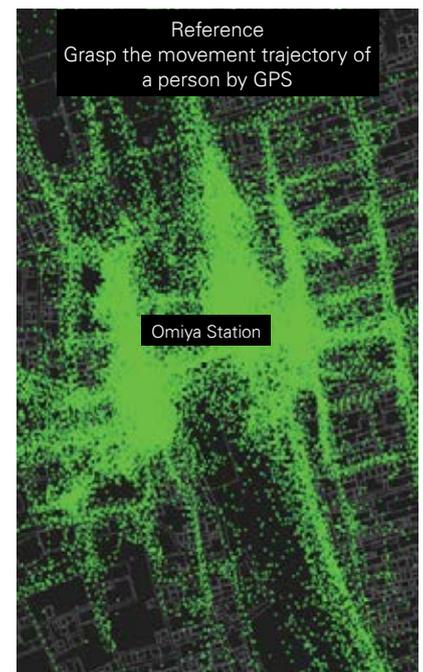
Slightly different from the direction taken by Toyama City, Saitama City is also undertaking initiatives to improve the ease of getting around for walkers using GPS data.

Saitama City plans to improve the ease of getting around at east and west areas of Omiya Station and redevelop open spaces in front of the station as well as road spaces by gathering GPS data to reconstruct areas around Omiya Station.

The city also developed a notion of building a city where “people wish to move their bodies unconsciously” and introduced a program to grant credit points depending on the number of steps. It is also striving to incentivize people to walk more or promotes the consumption activities of people by connecting this credit point system to tourist spots around Omiya Station.

Activation of a city requires a system by which people gather and a city crowded with people should be created. Enhanced walkability using data on flows of people or logistics would be further required.

Source : Saitama City, “Data on the 7<sup>th</sup> Omiya Central Station Promotion Conference”



Haruhiko Ikeda  
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# Improved walkability and safety for pedestrians

The survey results on the part of transportation and mobility revealed that the expectation on “improved walkability and safety of pedestrians” stands out. 47% of the respondents in five cities gave the highest score on this item while 20% range or less on other items. This indicates that citizens living in large cities are very concerned about “walking”.

In addition, concerning “Most needed changes to improve your city's living environment”, the highest score relates to “A living environment that is more accommodating to elderly and disabled residents” followed by “Make the city more bicycle or pedestrian-friendly”. These results imply that citizen's interest and consciousness are consistent in terms of walkability and safety of pedestrians.

Conversely speaking, the results indicate that both, residents living at the central part of city where “prosperous crowdedness” is an important element and those living in local regions, are not satisfied with current “safety”, “walkability” and “friendliness (to people)”. Walkways and roadways have been made to coexist in limited spaces. As a result, walkways are relatively narrow for pedestrians in city areas while automobiles are moving at the speed of 30 to 40 kilometers per hour past walkers in residential areas as walkways and roadways are not clearly separated. These indicate that people in large cities are patient with the situations.

Recently, people have placed more importance on the “distance” among people due to the outbreak of COVID-19. In this context, people would become more “concerned”, “dissatisfied” and “demanding”. Improvements to spaces for “pedestrians (bicycles)” would be more important in considering mobility in large cities once life returns to normal after COVID-19.

One of the key elements in considering initiatives going forward relates to the utilization of road infrastructure. Major cities in Europe and the US that have taken smart city initiatives under the notion of “building human-centric city” or “walkability” are now attempting to realize the mobility transformation in considering “New Normal” after COVID-19, which could serve as a good reference for Japan. The following are representative examples:

### 1. Provide exclusive spaces for bicycles and pedestrians blocking roadways. ”Slow Streets”

- Many cities mainly in the US and Canada, including City of Oakland, California, have adopted slow streets.
- Example of City of Oakland:
  - Construction of slow streets in the total length of 120 kilometers (only three types of services, i.e. roads, crossings and other essential services are provided).
  - Slow streets are primarily characterized by the installment of only simple blocks or gates and signboards (20 kilometers of permanent slow streets).
  - City homepages communicate the conditions of slow streets with relevant updates, and city welcomes a variety of comments and advice from citizens (including votes for the roads requested by residents to be transformed into slow streets, and relevant use conditions).

Spaces where everyone can keep distances and walk, play exercise and enjoy recreation safely and comfortably



Source : City of Oakland, Canada  
Oakland Slow Streets  
<https://www.oaklandca.gov/projects/oakland-slow-streets>

## 2. Make a part of roadway exclusive for pedestrians and bicycle or modify a part of roadway to be used for other purposes such as patio. “Tactical Urbanism”

- It has been adopted by many cities in Europe and the US.
- New Zealand expressed national intention to promote use conversion.
  - There are measures to find true solutions of issues specific to communities and districts/disapproval of events without distinct effects and purposes/disapproval of increase in the automobile traffic.
  - There has been accelerated promotion of recommended approaches by grants or subsidies since 2019 (expected to be realized in June 2021).
  - Total subsidies of NZD 7 million; an application is submitted by a city government which contributes the same amount of subsidies.
  - Simplified approach will be available for use conversion and projects will be proceeded as the progress is measured.

Illustrative examples of Tactical Urbanism recommended by the NZ Government



Source : NZ Transport Agency, Waka Kotahi (2019)  
<https://www.nzta.govt.nz/roads-and-rail/innovating-streets/case-studies/>

## 3. Low-speed driving regulations will be imposed on cars and an entire road would be designated as a shared space for walkways and roadways. “Shared Space”

- City of Brussels would be a representative example of such cases.
  - A social demonstration project has been under way for three months from May 11, 2020; the entire central part of the city has been used for that purpose.
  - Car speed should be limited to 20 kilometers per hour and absolute priority is given to pedestrians and bicycles.
  - People can freely use walkways and roadways, ensuring social distancing (1.5 meters).

Provision of spaces for pedestrians to walk through the central street of City of Brussels



Scope of Shared Space



Source : City of Brussels, Zone20

Each of the fact patterns given here relates to the exercise of “temporary” or “simplified” measures by which spaces for “pedestrians (and bicycles)” would be provided and expanded without any significant investments by reducing spaces for roadways or regulating car movements.

People have become more concerned about the use of public transportation due to the outbreak of COVID-19 and major cities in Europe and the US where users of public transportation have dramatically decreased have strong concerns about increasing use of private cars and tend to revisit policies placing a high priority on pedestrians and use of bicycles.

Furthermore, relevant authorities are now considering societies with the “New Normal” after the COVID-19 outbreak assuming that the use of public spaces such as parks, commercial facilities and amusement facilities would be constrained to a certain extent. Some argue that “lack of sufficient open spaces” might cause a negative effect on the mental health of people. As a result, blocking a road in front of residences has the benefit of providing a space where children can run around and adults can exercise. (Of course, the aged also have the benefit of moving safely.)

In Japan, roads are physically constrained due to their narrow width in cities, so it is not easy to flexibly change how to use spaces for walking (and bicycles) and roadways. However, the outbreak of COVID-19 has posed a great challenge to Japan as it is now required to seriously discuss and consider the “New Normal” including “social distancing” and build a “new lifestyle” including daily living and work. Especially, the realization of “improved walkability and safety of pedestrians”, including spaces would form a fundamental part of city life.

Given the Japanese initiatives following the above fact patterns, it would be appropriate for Japan to implement the relevant measures by limiting days and times, and consider full-scale measures while understanding the effects and challenges arising from the implementation on a real-time basis. For example, (1) for business areas at the central part of cities, some parts of roads around stations are provided exclusively for pedestrian lanes limited to rush hours in the morning and evening (Tactical Urbanism), (2) for tourist spots, the movement of private cars or sightseeing buses would be constrained only on the weekends, so that pedestrians and bicycles would be able to move comfortably and safely (park and ride approach plus regulated inflow and mandatory low-speed driving) (Brussel Approach), (3) for residential areas, the movement of automobiles is regulated during the daytime (especially evening time), which could provide spaces where children can play freely (slow streets). These initiatives would demonstrate effectiveness of shared space. In doing so, it is important to obtain data concerning the flow of people and logistics on a real-time basis while introducing a system where the results would be disclosed to public administrations, business operators and users (citizens) on a daily basis. (If the understanding and consensus are obtained from citizens

and business operators, it would be effective to monitor the movements of pedestrians and automobiles by installing cameras and sensors alongside roads.)

The economic recovery inevitably requires bustle and crowd of people in large cities, giving rise to more active consumptions and new businesses. A living environment where the aged and children can live safely relates to the essential requirements for enhanced QOL (quality of life). The initiatives of major cities in the world to address the outbreak of COVID-19 imply the need to reconfirm these “fundamentals for cities” and new developments. Consistent with this, the survey results on smart city seem to show the importance of similar basic measures. “Improved walkability and safety for pedestrians” are challenges that apply to local cities with high dependence on automobiles in addition to large cities. Rather, in small-sized cities, local governments, business operators and entire citizens may define it as an issue specific to themselves and reach consensus easily. The mix of “wisdom of people” and “IT and data driven” is expected to contribute to substantially accelerating the building of a smart city where people can live in a “safe, secure and comfortable” manner.



# Education: Building a future- focused workforce



Issues currently faced by cities could positively be addressed by the citizens who seriously consider problems specific to the city where they live and are actively involved in their solutions. Also, in achieving the smartification of cities, it would be essential to explore necessary innovative solutions to address complicated problems expected to occur in future and develop entrepreneurship to apply the solutions. For societies facing the problem of fewer children and aging population as well as decrease in population, creativity and ability to apply solutions shall be required to address challenges encountered by cities including the update of social infrastructure and natural disasters as well as infectious diseases. Emergence of entrepreneurs who ambitiously challenge new issues and produce new ideas and establishment of an education system that develops such entrepreneurship would be needed.

As shown in the section concerning major developmental areas for continuous success of cities, Japanese respondents did not place high importance on “Strengthening education and developing a future-focused workforce” compared to other cities in Asia (Japan: 34%, Asia: 40%). “Support for entrepreneurs and creating a culture of innovation” was regarded as least important by all Japanese cities covered by the survey contrary to Asian countries which placed moderate importance on this item (Japan: 12%, Asia: 20%) (Figure 1.1).

As indicated by the responses to “Key actions to accelerate education development in your city”, Japanese cities have placed relatively low importance on education-related indicators compared to Asian cities (Figure 3.2). Data published by UNESCO<sup>2</sup> also shows that the budgets allocated to education in Japan as a percentage of the GDP are lower compared to other advanced countries, indicating relatively low interests of Japanese people in education.

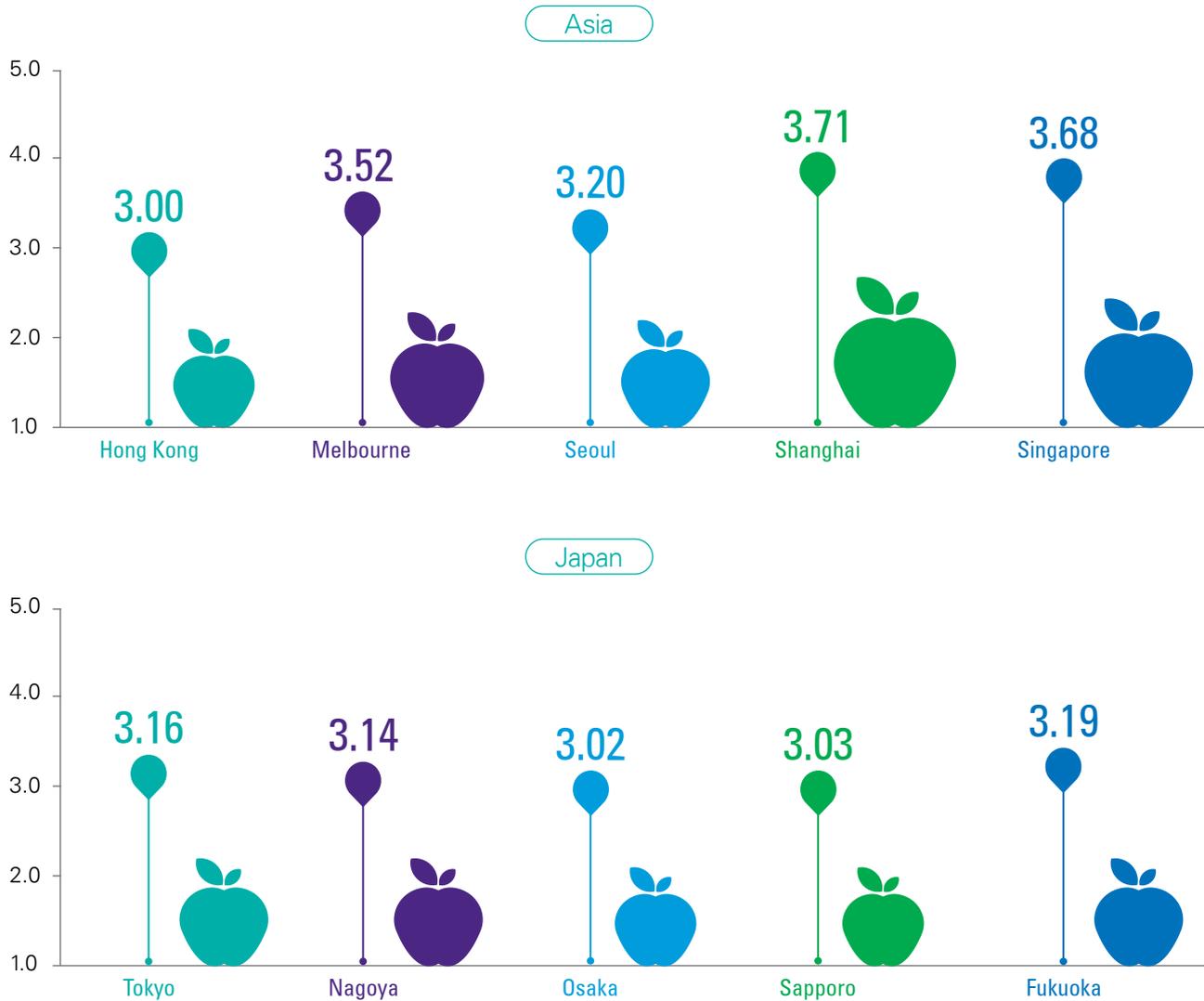
For the assessment of quality of your city's public and private education programs, the overall rating was 3.11, which was relatively low compared to other question items such as public transportation (average of 3.67) and healthcare (average of 3.39), and it was generally lower even compared to the scores of education for advanced cities such as Shanghai and Singapore (3.71 and 3.68, respectively). In this context, Fukuoka shows the highest rating of 3.19 while Osaka shows the lowest rating of 3.02 (Figure 3.1).

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2 Global Note, “the government education expenditure of various countries in percentage of GDP, UNESCO” (as of June 30, 2020)  
<https://www.globalnote.jp/post-1479.html>

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

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

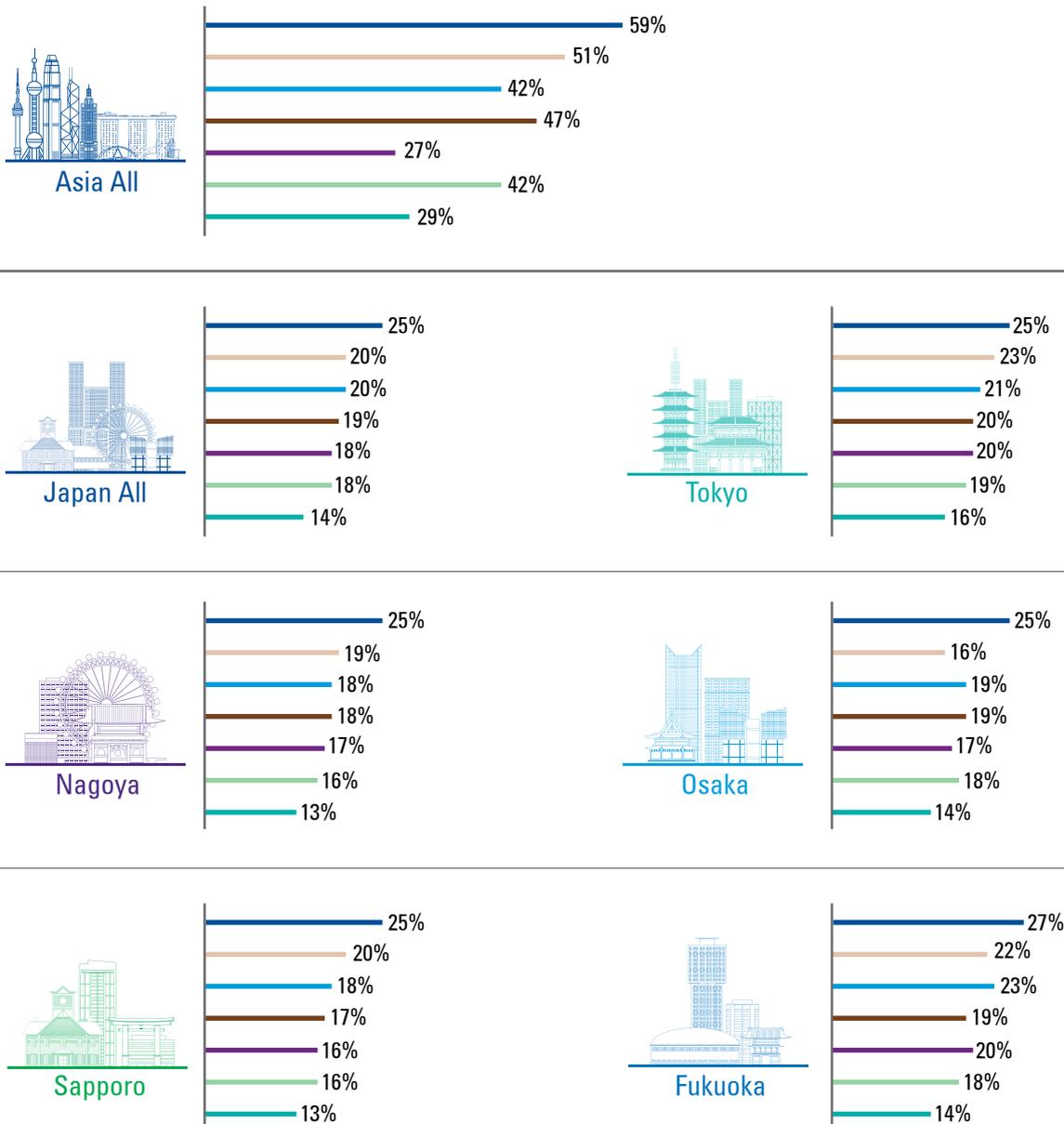


“Encouraging continuous education/lifelong learning” is considered by all the cities as the most important major activity to promote the development of education, and other cities in Asia showed similar trends. Although overall trends in this respect are quite similar among all the cities, the response of “Important” as a percentage is relatively high in Fukuoka City (Figure 3.2).

Tokyo ranked the highest with respect to “Developing education programs that encourage creativity and risk-taking”, “Programming education” and “STEM education”\*. It is assumed that this is because Tokyo metropolitan areas offer more opportunities to receive highly advanced education (Figure 3.2).

\*STEM education: STEM stands for science, technology, engineering and mathematics. If art is added to them, it will be STEAM.

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



■ Encouraging continuous education/lifelong learning

■ Developing education programs that encourage creativity and risk-taking

■ Developing education programs/courses/training in artificial intelligence (AI), data analytics and machine learning

■ More funding for education and research in science, technology, engineering, and mathematics (STEM) disciplines

■ Attracting top scholars and professors to do research/teach in your city

■ More smart city and innovation technology training for professionals at different levels

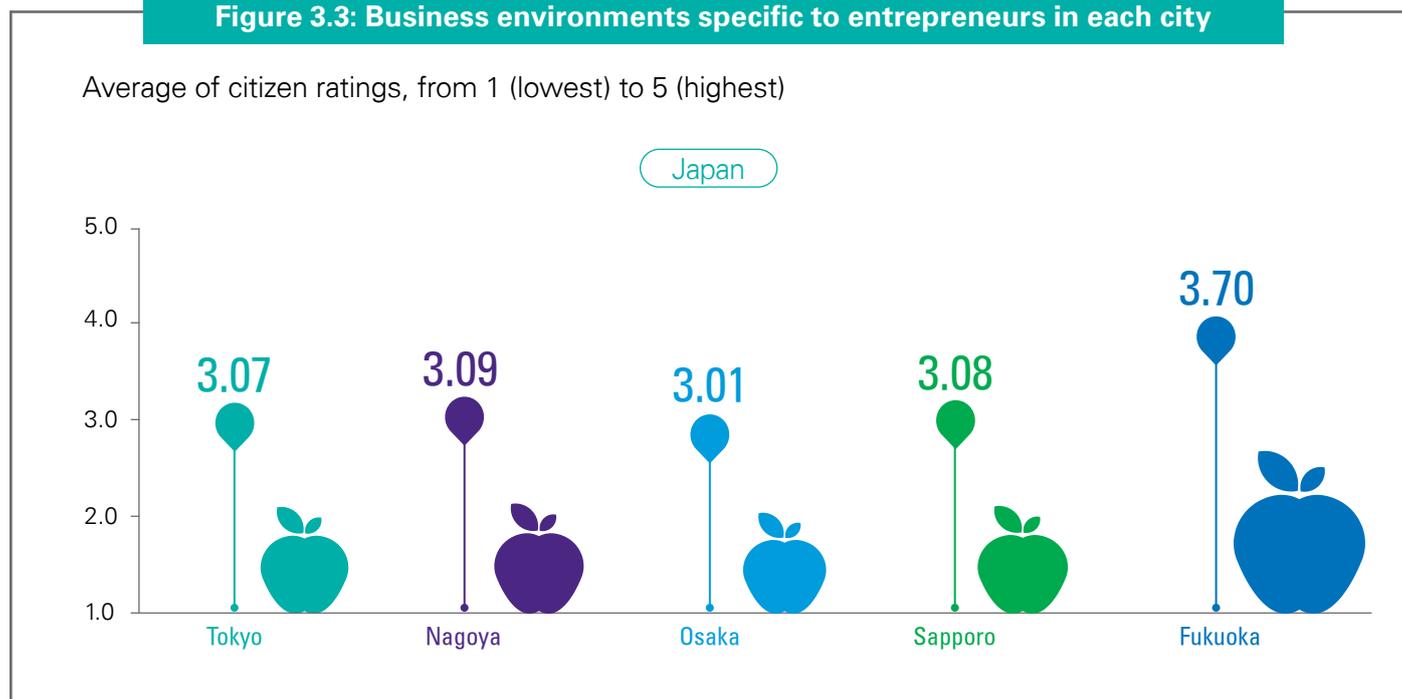
■ Providing mandatory coding/programming training starting from primary school

The importance of next-generation education and recurrent education to develop more value-added workforce has been highlighted in the growth strategy of the Japanese Government, and they have been strengthened in line with a variety of policy measures. It is expected that the promotion of STEAM-based education or deeper understanding of SDGs

would lead to the development of human resources who take solution to social issues faced by cities as their own.

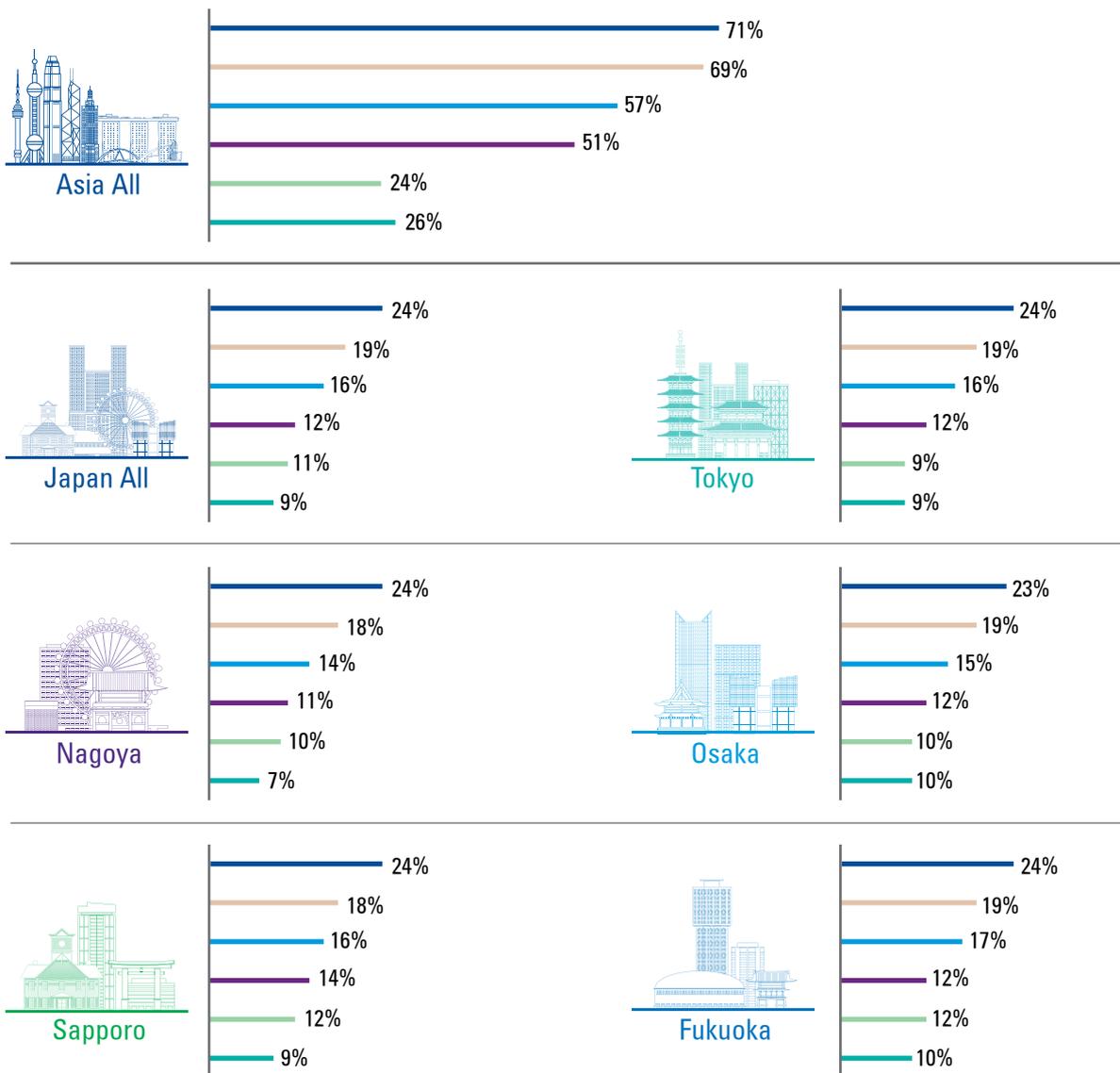
In terms of business environments for entrepreneurs, the rating of Fukuoka was outstandingly high at 3.70 (Figure 3.3).

**Figure 3.3: Business environments specific to entrepreneurs in each city**



With respect to important issues for the support for your city's entrepreneurs, the largest number of citizens noted that it related to "Improved access to capital/funding" (24%), followed by "Tax incentives to start a business or invest in R&D" (19%), substantially consistent with other cities in Asia. However, a percentage of citizens who responded that they are generally important was lower compared to other cities in Asia (Figure 3.4).

Figure 3.4: Key factors to improve support for your city's entrepreneurs

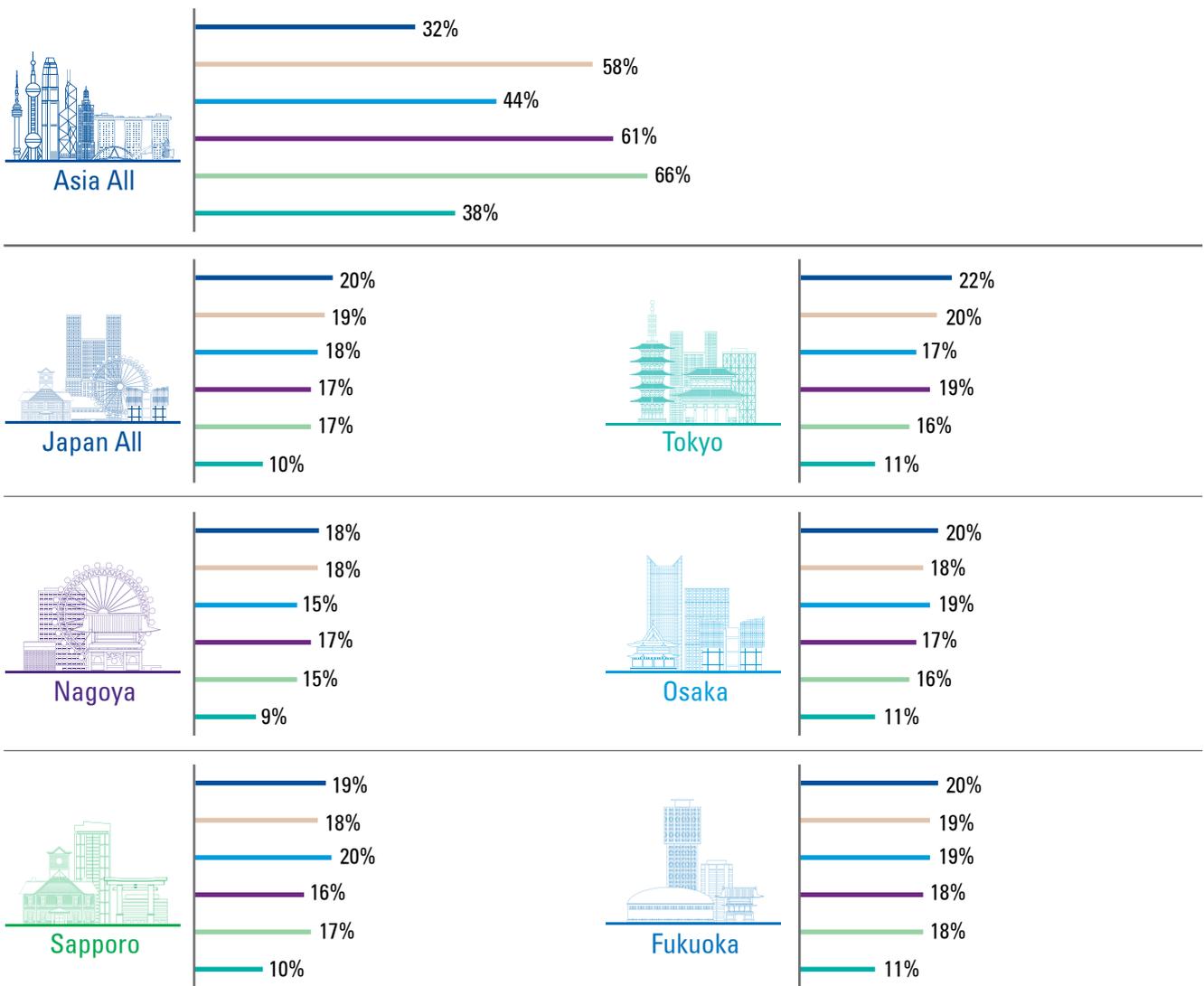


- Improved access to capital/funding
- Tax incentives to start a business or invest in R&D
- Easier business registration/licensing regulations or process
- Mentoring programs for entrepreneurs
- Cross-border student exchange programs
- Student entrepreneur competitions

While Asian countries placed the highest emphasis on “Education programs that encourage independent thinking, creativity and risk-taking” as key factors to encourage an innovation culture in your city, Japan has not placed so much importance on them. Consistent with the previous issue, a percentage of citizens in Japan responding that it was important is generally lower compared to Asian countries.

This is because the economic growth rate of Japan is relatively low and the implementation of innovations including DX (digital transformation) has been belated. However, it is noteworthy that Fukuoka City which has been very active in addressing start-ups or innovations has indicated a strong interest in the support for entrepreneurs (Figure 3.5).

Figure 3.5: Key factors to encourage an innovation culture in your city



- Cross-border academic and research exchange
- More funding for science, technology, engineering and mathematics (STEM) disciplines
- Greater connectivity with other cities to share best practices
- Incentives for businesses to invest in research and development
- Education programs that encourage independent thinking, creativity and risk-taking
- Business regulations that encourage competition

Japan is a country at the very front in addressing the issue of super-aging societies and fewer population that is common to advanced countries in the world. In addition to them, Japan frequently suffers from natural disasters including earthquakes and typhoons. It is imperative for the Japanese Government to substantively improve education for citizens and foster entrepreneurship including strengthening future labor forces

to create societies where people can live more comfortably while addressing these issues. The exploration of sustainable solutions of city problems requires the realization of cyclical innovation where the recognition of educational outcome results in the recognition of the need to invest in education.

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 Partner

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**Mr. Daisuke Asano**

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# Citizen's participation in city planning and education

The results of questionnaire survey conducted this time revealed that Japan indicated less interest in STEAM education, placed less importance on entrepreneurship education and was less conscious of citizen's participation in city planning compared to other Asian countries. I believe that they would stem from similar causes.

People still strongly believe in relation to the Japanese education that it is important for students to study hard to get higher marks in the examination of five major subjects to enter top universities, and have placed importance on conventional educational system. In effect, people as a small percentage of the total population may only argue that the importance of producing things with the STEAM-oriented subjectivity should be recognized.

Though citizens indicate high interest in participation in local festivals or school events, they would significantly be less interested in the creation of a new style of town or society. This would be particularly because of Japanese education system.

School is the first place where children participate in a society and they learn how to respect and comply with school rules or rules of club activities. However, they are not educated or trained so that they can fundamentally change or modify their environment. If they become an adult as is, they would follow the rules of country, society, region or company. Hence, they would tend to believe that the creation of town is given by relevant government authorities and that it is not the area where they could express their own opinions or views.

The results of the survey showed that respondents in Fukuoka City were generally more interested in these issues than other cities. These results could be significantly attributed to the leadership of the Mayor, Mr. Takashima. Various policy measures were developed and implemented under the leadership of Mr. Takashima during the period when schools were closed due to the outbreak of COVID-19. In addition, Fukuoka has been very fast in responding to natural disasters and this is because citizens responded to them on a timely basis, in addition to the power of Mr. Takashima. Fukuoka gives us an impression that it is very active in the creation of businesses and cooperation between industry and academia.

## **GIGA School Project promoted as a national undertaking**

The Ministry of Economy, Trade and Industry has recommended at EdTech Workshop that a personal computer should be provided to each junior and senior high school student. The recommendation was determined to be adopted for the early realization in the form of GIGA School Project, which would be carried out together with the Ministry of Education, Culture, Sports, Science and Technology and the Ministry of Internal Affairs and Communications. The reason why the environment is important where a PC is provided to each individual student is that they will be required to use it naturally in the society as a tool to read and write. They could easily find answers to questions by using it, record what they researched with the computer in the form of sentences or images, and frequently refine them to achieve a level at which it can be shown to others. Furthermore, the computer enables students to share and communicate many things with others. It is the essence of GIGA School Project that the PC is a tool for the purpose and cannot be more or less than that.

However, many school operators, including teachers, have not fully recognized the meaning of providing one PC to each student. The most important thing is that each student should investigate and write and communicate the result to others in a specific manner. This may raise a question as to whether students have developed such practices since they were a child. It is important for schools to be penetrated by the practices naturally implemented in societies and for teachers to understand the meaning of what the students do. However, in fact, some boards of education in some local jurisdictions are very reluctant to introduce such practices. Despite the fact that the government has supported such initiatives, if they elect not to provide mandatory tools to students, they should clearly explain the reasons to their citizens. As some of those local jurisdictions might misunderstand the objective of such undertakings, the Education Board should keep proper communications with them on these topics.

### Advanced initiatives in education fields

The first two role models I have examined are Hiroo Gakuen Junior and High School and Kojimachi Junior High School. I was very impressed by the courses for entering medical and science schools with which Mr. Kenta Kimura, a teacher at Hiroo Gakuen, is charged, where teachers have carefully followed up the courses and designed thorough lessons starting with basics to students while producing high-level questions and researches even at the phase of junior high school.

Under the leadership of the former principal, Mr. Kudo, Kojimachi Junior High School is fully committed to building a school based on self-independence of students.

A good example of a pioneer with a focus on PBL (project-based learning) among schools having a long history is Ina Elementary School where the exploration study is placed at the center of learning for a one-year curriculum.

Each class is responsible for cultivating vegetables, producing miso or breeding goats and it finally offers them at a bazaar. They are trying to change their cultivation and breeding conditions while observing them on a daily basis. They carry out their projects by exercising scientific methods. It is surprising that an ordinary public elementary school has continued to place such projects at the center of learning for 50 years or more while providing conventional subject-based education. On the other hand, it is regrettable that some teachers are reluctant to use IT. Learning which cannot be achieved only through experiences should be supported by the power of digital means. Interestingly, I wonder what digitalization would be brought about through the main learning course by means of exploration study.

### Effect of COVID-19, and education going forward

It is reasonably certain that the school system would be significantly altered directly due to COVID-19. On the other hand, it is disappointing that many schools are returning to what they were before the outbreak of COVID-19 after the lifting of the state of emergency. Schools may truly start the new style of learning when and only if second and third outbreaks of COVID-19 end.

People have obtained a deeper understanding as to what a remote learning is. Next, what style of schools we should develop? Remote learning would be available even if students are not at home. We could design a system in which half of students take ordinary classes while others do so on a remote self-learning basis with the help of university students. Classes involving teachers are dedicated to discussions or projects requiring a group of students and knowledge would be obtained through self-learning, therefore avoiding the crowdedness. I wish if some schools would begin to design and depict school spaces with the mix of separate groups of appropriate number of students and individual learning.

Considering the reason why Japanese companies have gradually become relatively less competitive, I believe that it would mainly be attributed to the Japanese education system. Of course, some EU and the US frameworks have been applied to the management of Japanese companies in order for executives and employees to discharge their duties more properly, as outside directors have been nominated as part of a corporate governance reform. Are they truly substantive? I believe that Japan would not change unless the education system is fundamentally reformed from the beginning. I encourage everybody to proactively participate in the social reform.

# Case studies

## KPMG's education for the next generation

In order to make cities smarter while solving urban problems, research institutions such as universities that are researching the latest technology and start-ups that boldly challenge social issues using new technology need to be used, not just governments and large companies. With the aim of contributing to solving social issues and realizing a sustainable

society, at KPMG Japan, we are carrying out various activities that are focused on goal 4 of the SDGs (education) in order to establish a venture ecosystem, develop leaders who will lead the next generation, and widely return to the world the knowledge and experience we have cultivated through activities as business professionals at an accounting firm.

## Initiatives of the incubation department

In recent years, even in Japan, activities to bring about innovation from universities are being carried out as a national policy. The number of university-launched start-ups, such as commercialization of research results and student entrepreneurship, is increasing mainly at national universities such as the University of Tokyo, Osaka University and Kyoto University. On the other hand, compared to other countries, the burden ratio of research expenses at universities by the private sector is low, and the scale of investment by companies in universities is small. Based on this situation, we have set up an “incubation department” at KPMG Japan. In order to serve as a hub for collaboration between industry and academia, we are energetically engaged in activities such as sponsoring courses at universities, dispatching mentors to support management and administration for students who want to start a business, and entrepreneurship seminars.



At the Tokyo Stock Exchange, we held an entrepreneurship support seminar for students and researchers in collaboration with the Venture Council formed by the medical departments at private universities in the Tokyo metropolitan area. It included a tour of the exchange, and we provided information about starting a business and later taking it public.



Many excellent private companies participated in an open innovation seminar we held at one of the former imperial universities. We are engaged in activities aimed at bringing to society the intellectual property held by universities and expanding the investment in universities by private companies.

We will continue to give entrepreneurship support to students and researchers, keep bringing intellectual property to society, and help expanding investment in universities by private companies through our activities.

Hiroshi Abe  
Partner  
Incubation Department Director, KPMG AZSA LLC

## Entrepreneurship education for high school students

In Japan, it is said that the younger generation has less opportunity to receive education about business and entrepreneurship compared to other developed countries. According to a survey of Japanese entrepreneurs conducted by the Venture Enterprise Center, the most common motivation for starting a business is “I want to solve social issues and help society.” While it can be seen that they are highly motivated to solve social issues and contribute to society, few of them have received any education about entrepreneurship or business. In light of these circumstances, KPMG is actively engaged in activities to develop future leaders of the next generation, with the main target being high school students nationwide who are interested in starting a business. At a workshop for enthusiastic high school students from all over the country that is held with the theme of solving social problems through business, KPMG Japan professionals provide basic knowledge about accounting and finance, which are indispensable for solving social problems through business, and useful tips about starting a business.



Nearly 200 high school students participated.

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KPMG Mobility Research Japan / KPMG AZSA LLC





# Living environment



In Asia, “carefully considered urban planning” is seen as the most important area of development for the continued success of cities, but in Japan it is of medium importance. (Figure 1.1)

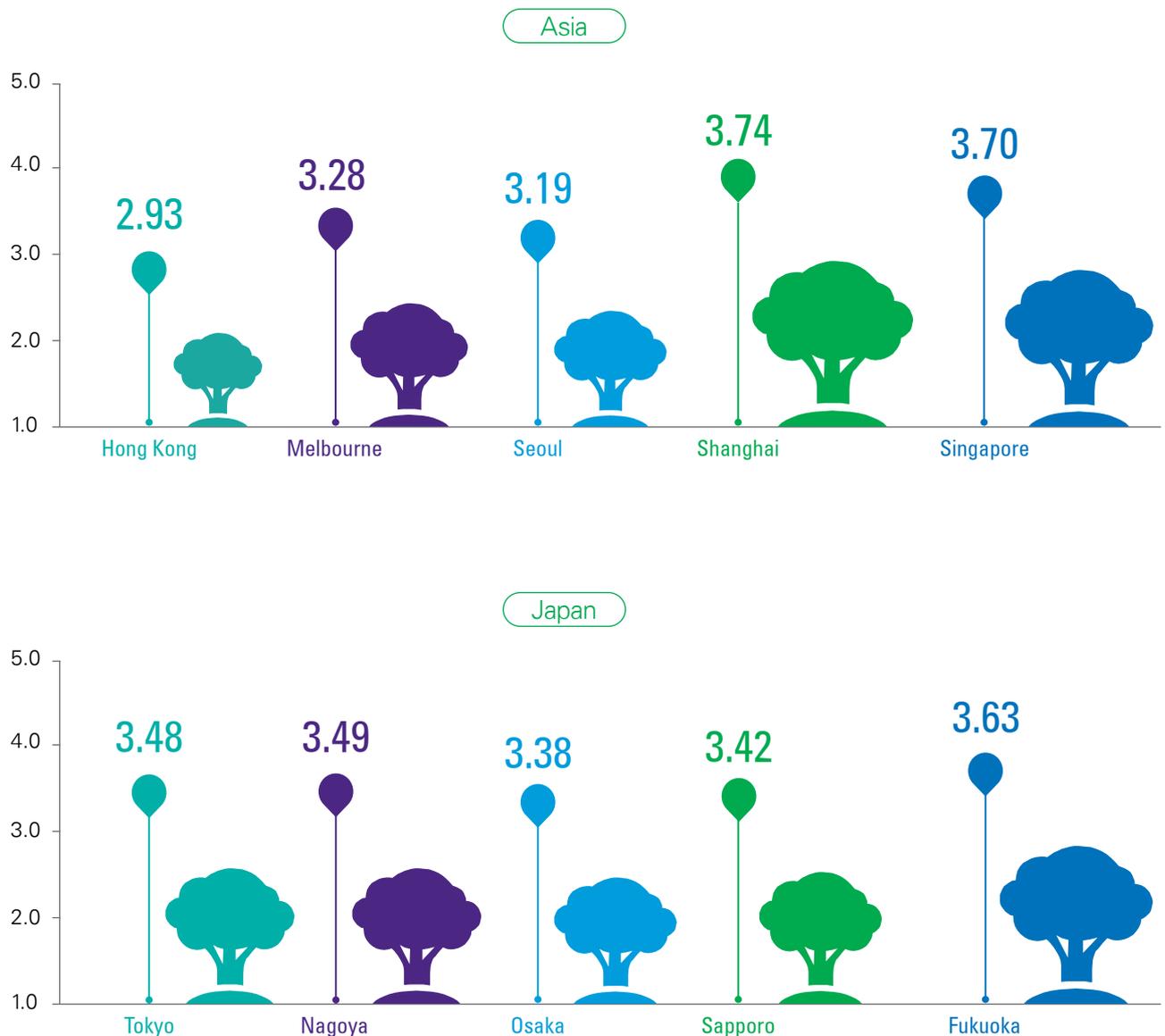
Looking at the quality evaluation of the living environment, Fukuoka was the highest (3.63), followed by Nagoya (3.49) and Tokyo (3.48), while Osaka had the lowest result (3.38). Compared to Asia, Japan does not have a large difference in the scores (Shanghai 3.74 and Hong Kong 2.93). (Figure 4.1)

In addition, a living environment that is friendly to the elderly and disabled residents is emphasized, and we can see interest in the possibility that our own living environment will be impacted in the future by the measures for the declining birthrate and aging population. (Figure 4.4)

In addition, we can see that there is a high level of interest in the environment and health, such as “Reducing the carbon footprint”, which on average had a low survey result in Asian cities, but on average was the third highest in Japan as a whole.

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

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



As the most necessary change to improve the living environment, “A living environment that is more accommodating to elderly and disabled residents” was the most important in Japan, followed by “Make the city more bicycle or pedestrian-friendly”, reflecting the advancement in an aging society with a declining birthrate, and the high level of health consciousness associated with it. They were followed by “Reducing the carbon footprint” and “Reducing pollution”, which also emphasizes the viewpoint of protecting health. It became clear that, as mature cities, each city has a high level of health consciousness. (Figure 4.4)

If you look at the items where there is a high or low awareness compared to other cities, each city has different characteristics.

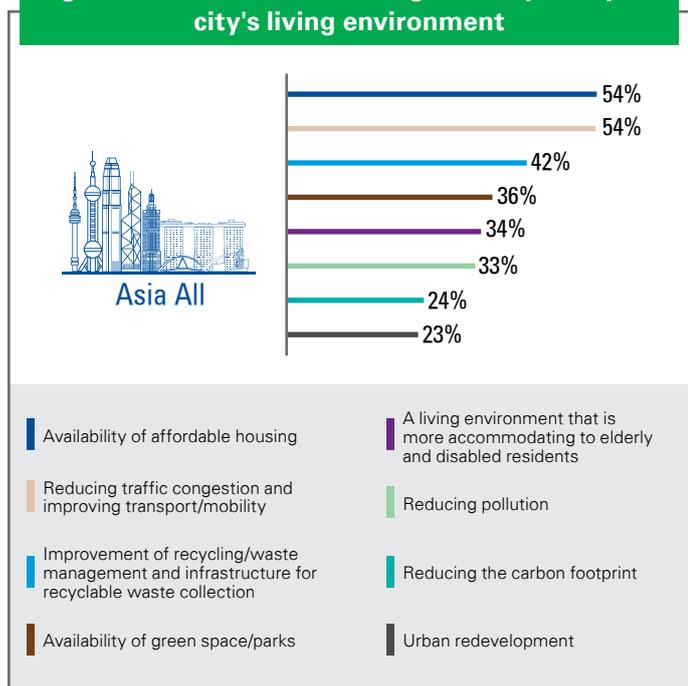
In Tokyo, “Availability of affordable housing”, “Reducing the carbon footprint” and “Reducing pollution” were high. This is probably due to the large influx of population compared to other cities.

In Nagoya and Fukuoka, “Reduction of traffic congestion and improvement of mobility” was high, which may reflect the road traffic situation in the center of the cities. Compared to the other cities, in Osaka “Reducing pollution”, “Build more green space/parks” and “Install more cameras/sensors to regulate traffic and improve public safety” were high. In addition, “Make the city more bicycle or pedestrian-friendly” was higher than “A living environment that is more accommodating to elderly and disabled residents”.

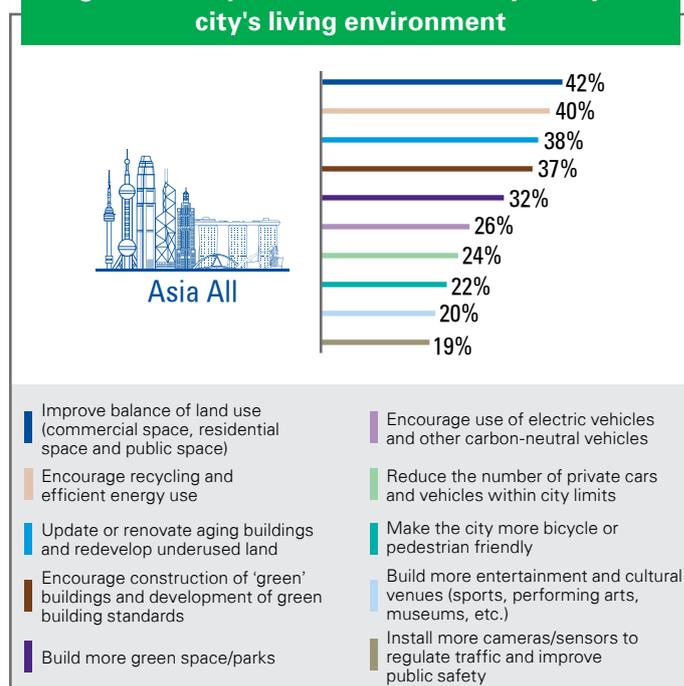
In Sapporo, “Reducing the carbon footprint” and “Improvement of recycling/waste management and infrastructure for recyclable waste collection” were high, showing a high level of interest in energy issues and the thermal economy. In addition, it is characteristic that “Make the city more bicycle or pedestrian-friendly” was not considered to be very important compared to other cities.

As residents aim to create healthy cities, the use of bicycles is rapidly increasing around the world due to the impact of COVID-19. In some cities in Europe, the number of bicycles has increased by 50% from the last year, and as a measure against COVID-19, bicycles were selected to avoid trains and buses, for exercising after the restrictions on going out, and as a measure against climate change. In countries such as France and Italy, the government subsidizes bicycle purchase and repair costs. They are also proceeding with such urban planning as the development of bicycle-only roads and bicycle parking lots. The development of bicycle lanes has been progressing in Japan as well, and further progress is expected in the future. It is important to connect to evidence-based policy making (EBPM) to improve the living environment by acquiring data on behavior changes before and after support and improvements, as well as understanding the relationship with other data such as data about the impact of incentives, and climate and public transport user data.

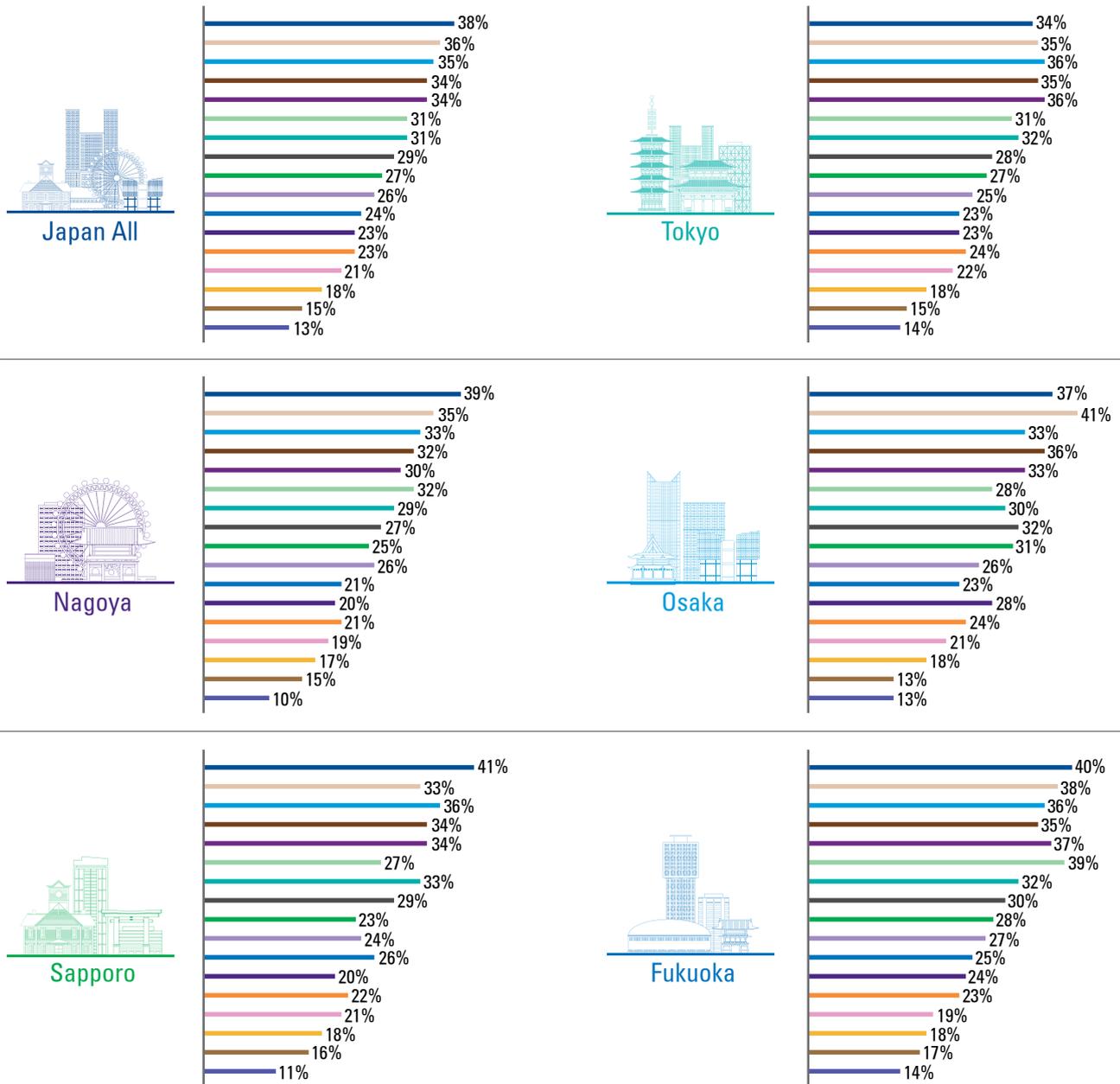
**Figure 4.2: Most needed changes to improve your city's living environment**



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



**Figure 4.4: Most needed changes to improve your city's living environment**



- A living environment that is more accommodating to elderly and disabled residents
- Make the city more bicycle or pedestrian-friendly
- Reducing the carbon footprint
- Reducing pollution
- Availability of affordable housing
- Reducing traffic congestion and improving transport/mobility
- Encourage recycling and efficient energy use
- Update or renovate ageing buildings and redeveloping underused land
- Build more green space/parks
- Improve balance of land use (commercial space, residential space and public space)
- Improvement of recycling/waste management and infrastructure for recyclable waste collection
- Install more cameras/sensors to regulate traffic and improve public safety
- Encourage construction of 'green' buildings and development of green building standards
- Encourage use of electric vehicles and other carbon-neutral vehicles
- Urban redevelopment
- Build more entertainment and cultural venues (sports, performing arts, museums, etc.)
- Reduce the number of private cars and vehicles within city limits

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# Toward the Construction of Resident Participation-type Smart Cities

## **A living environment that is friendly for the elderly and disabled, bicycle-friendly and pedestrian-friendly city planning: Walkable cities**

For example, since Sapporo has a shorter healthy life expectancy compared to other designated cities, they are considering a project from the perspective of extending healthy life expectancy as much as possible. Health is also a topic of great interest in other regions, and we think there is some kind of latent trepidation about the future. The key word health is certainly one of the important factors for many smart cities.

Ensuring the quality of life (QOL) for residents is an important point in advancing urban government administration, and from this point of view, we think that health and welfare must be emphasized. We believe that cooperation with the medical and welfare administrative fields needs to be further strengthened in the future.

Recently, the City Bureau of the Ministry of Land, Infrastructure, Transport and Tourism has been enhancing measures related to the theme of “walkable cities” where comfortable communities are created that make you want to go for a walk. Walkable cities are also an initiative that have a high affinity with smart cities. Local governments are highly interested, and the City Bureau of the Ministry of Land, Infrastructure, Transport and Tourism appreciates the idea of walkable urban development. When we recruited cities that will promote specific measures, 260 cities supported this initiative as “cities promoting walkability”. They created joint councils by region and participated in councils to consider cities and roads (known as Machi-Michi Councils).

Creating spaces where it is easy to walk and that make you want to walk is an important point in urban development. Not only does it improve the health of residents, but it also

leads to more people staying in cities longer. As a result, it has a positive effect on the prosperity of cities and their local economies. In addition, if the residents become healthy, it will not only improve the QOL, but also lead to a reduction in social welfare costs and contribute to making local government finances more sound.

At the moment, many local governments have started from the perspective of elderly people moving freely, but we think that it may become a universal system for those with disabilities as well.

## **Examples in Japan of healthy and walkable cities: Sapporo and Himeji**

In Sapporo, a leading model project for smart cities, in addition to improving urban development infrastructure that makes you want to walk based on data of how citizens move, there is a device that gives residents “Kenko Points” according to the number of steps they take. By giving incentives and increasing the number of citizens who walk, it will lead to good health, and from the collected data, various simulations can be done to create more natural walking spaces. This is an interesting example of aiming to create cities where you can walk and become healthy, including infrastructure, software and psychological problems.

Himeji is also famous as a walkable city. The main street that extends from the front of the train station to Himeji Castle used to be centered on cars, but they have built a ring road to prevent cars from passing through, and redeveloped the train station plaza and main street into a space that gives priority to pedestrians. As a result, many people are now walking on streets where there were once few pedestrians. When the image of a public space changes, the cityscape changes, making it even more interesting.

### **Future important perspectives for health-oriented smart cities: Psychological aspects in addition to infrastructure and software**

Even if a beautiful city is created by constructing magnificent buildings and improving the paving of the roads, it does not necessarily mean that many people will walk. In other words, there is no point in improving only the infrastructure or hardware side, and we believe that it is important to superimpose onto that intangible factors and social psychology aspects (or kinetics). Spaces in the city where you walk around naturally when noticed are the best, and when trying to improve such spaces, EBPM is important for considering what kind of measures and projects are effective. In the past, we used to do urban planning based on empirical rules, but instead of that, it is important to share with the residents a plan that verifies the effects of the measures through simulations (smart planning) based on proper data about how residents are walking in the city. Furthermore, considering that residents and companies are responsible for urban activities, we not only present proposals, but also share the smart planning process with residents based on 3D city data (3D city models). It is also important to participate in city planning while having fun together. Even if spaces are improved, it is a matter of what the space is improved for if only some of the residents are utilizing and enjoying it. While the final decision is made by the government, we think cities will not move unless there are incentives and fun that will benefit the residents themselves and allow them to participate happily along the way.

With regard to financial resources for smart cities, each project has its own problems. It would take a considerable amount of time to form an ecosystem in which projects can be completed only with the data business and city OS usage fees. Especially in regional cities, we expect that the

government will basically bear the cost to a certain extent. Of course, it is a different story if both the government and residents recognize that smart cities are indispensable as a kind of essential social infrastructure, but for the time being, it may be possible for the government to bear the burden in exchange for reducing administrative costs and upgrading administrative services by utilizing various smart technologies.

We also consider social impact bonds (SIB) to be effective as one of the frameworks covered by the government. From the perspective of participation by residents, we are promoting an initiative called "i-City Renovation" to visualize urban development. First of all, we are working to have local public organizations experience "i-City Renovation" and use it as a tool for urban development. Specifically, the information about city planning is put in the geographic information system (GIS), and we use the actual situation of cities at briefing sessions and workshops. Through such initiatives, it is possible to increase the participation and interest of citizens in city planning, which we think is important for the future of smart cities.



# Healthcare



With regard to quality assessment of medical services, there is not much variation among cities compared to Asian countries. (Figure 5.1) Until now in Japan, it has been taken for granted that medical services can be received anywhere and

at any time by anyone. This is probably due to the environment where it is difficult to foster in individuals a strong awareness about preventive medicine and health management.

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

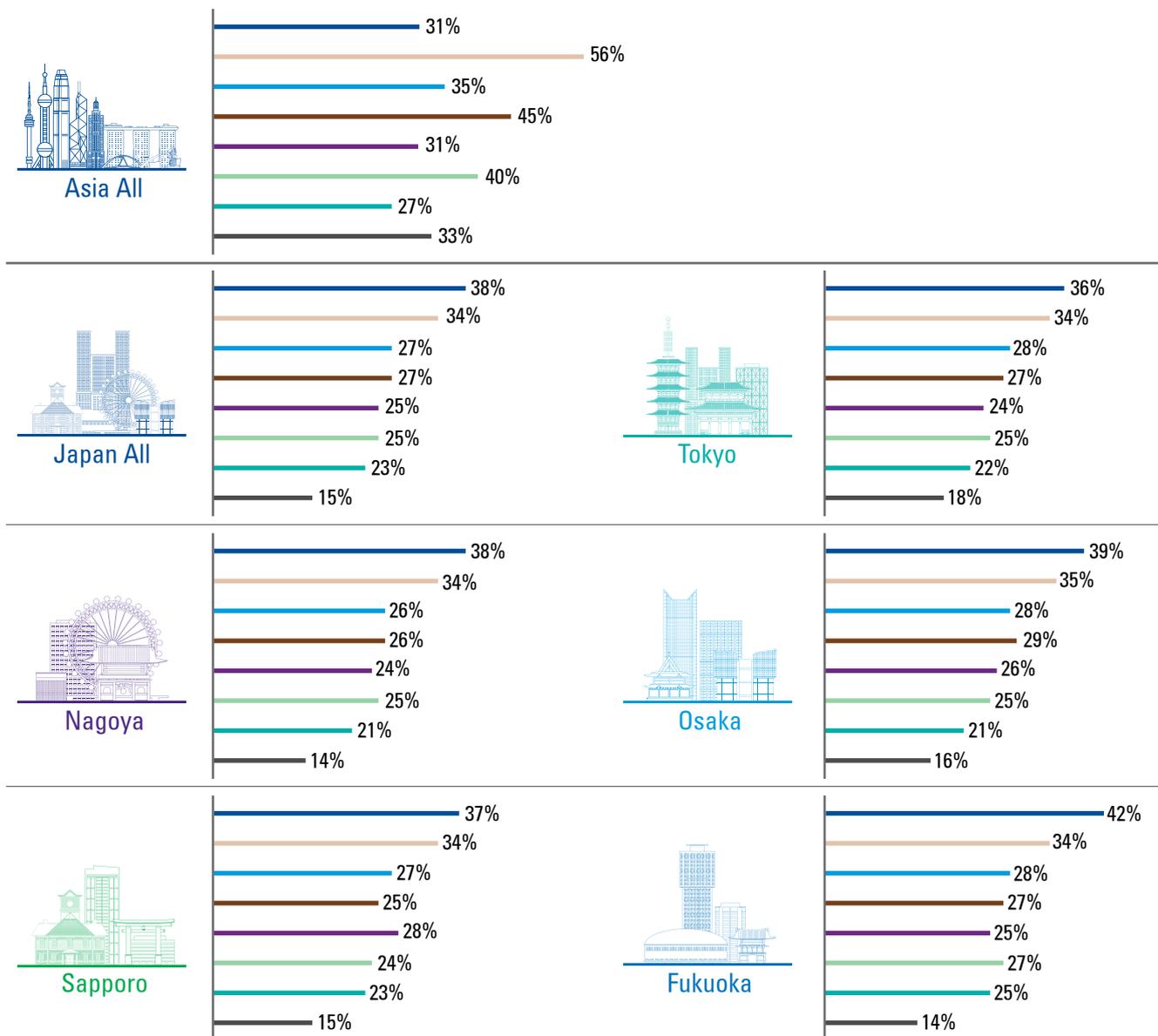
Average of citizen ratings, from 1 (lowest) to 5 (highest)



As a feature of the survey results this time, there is a high awareness in Japan about “Strengthen infectious disease control and prevention” and “Improve preventative healthcare (such as check-ups, immunisations, health education)”. (Figure

5.2) Even bearing in mind that the survey was conducted in January 2020, it indicates that people have a high sense of danger about unknown viruses.

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



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

The medical system in Japan has 12.9 hospital beds per 1,000 people (excluding dental clinics) and 2.5 doctors per 1,000 people (excluding dentists).<sup>3</sup>

In addition, while Japan has adopted free access, many Asian countries have adopted a registration medical system and set access restrictions so that medical services can be provided with the limited medical resources.

With regard to the public insurance system that impacts medical treatment trends, Japan has universal insurance and the insurance coverage rate is almost 100%. For most medical services, it is possible to receive medical treatment covered by public insurance. Although there are public insurance systems in Asian countries, many people find it difficult to enroll, and many countries have a limited range of medical care covered by the public insurance.

Therefore, while in Japan a part of the health management of citizens has been left to medical institutions due to the ease of access to medical care, it can be said that the results of this survey show the differences in environment and culture for national medical care that is left to the individual (daily preventive medicine and health management) due to the limited access to healthcare in Asian countries.

On the other hand, it can be said that the above-mentioned medical environment in Japan is manifested as an awareness about the issue of “promoting the sharing and mutual utilization of electronic records among medical service providers” common to the five major cities surveyed this time. Despite the concentration of medical resources compared to regional cities, ease of access to medical care seems to be one of the factors that has caused medical issues that are unique to big cities.

Until now, based on the strong sense of crisis that regional medical care may collapse in the future due to the uneven distribution of medical resources, and changes in the proportion of disease and an increase in patients because of a rise in the percentage of the elderly, medical cooperation and electronic medical information sharing have been promoted mainly by regional cities across a wide area (prefectures and healthcare areas, etc.) On the other hand, in the five major cities, since medical resources are concentrated and the number of medical institutions is large, there is little need for medical cooperation over a wider area. The focus has been on electronic medical information sharing with medical institution groups or between neighboring medical institutions.

However, even in the five major cities, if medical cooperation is not carried out over a wider area including neighboring cities, it is a pressing situation that could lead to the collapse of the medical care system. The percentage of elderly citizens is rising and there is a net increase in the number of patients due to the concentration of the population, and in addition, the number of patients is increasing dramatically due to the spread of COVID-19. In particular, patients are concentrated in highly specialized medical institutions, university hospitals and core medical institutions, and it is difficult to accept patients within the scope of cooperation so far. The importance of balancing the load on medical institutions and promoting functional differentiation through medical cooperation over a wider area is rapidly increasing. In the case of cooperation over a wider area, such information as the patient’s underlying disease and medical history are needed by the institution that accepts them, and we believe that the results of the survey show this.

Among the five major cities, Sapporo plays a role in covering medical care in the entire area of Hokkaido. It has an urban environment that is different from the other four major cities as medical cooperation with and support of local cities in Hokkaido are essential because medical resources are

scarce, and physical movement is restricted in winter. As a result, awareness about the issue of “investing in technology that promotes remote diagnosis of elderly or long-term care patients” is higher than in the other four cities, but as mentioned above, from the perspective of the rise in the percentage of the elderly and measures for COVID-19 (preventing direct contact), it is expected that awareness of the issue will increase in the other four major cities as well.

Based on the above, the future medical system in Japan can be considered as follows.

- (1) While reducing the number of medical examinations by having individuals do their own preventive medical care and health management (PHR: Personal Health Records), individuals bring their PHR when medical care is required, and access medical institutions or facilities where they can be indirectly examined (face-to-face and telecommunication).
- (2) Before the consultation, in order for the institution that does the examination to obtain information such as the underlying disease, historical electronic medical information are shared between medical institutions (EHR: Electronic Health Records), or the EHR is stored in the PHR so that it can be presented by the patient.
- (3) When diagnosis and medical treatment is difficult at a single medical institution or a single department within the institution, based on next-generation, high-speed, high-capacity telecommunication infrastructure, remote diagnosis and online medical care support are provided with partners and other departments.

However, this requires high-definition real-time video streaming, mutual simultaneous connections and sharing of high-definition medical information stored by each institution and department, and remote access to medical systems.

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3 Ministry of Health, Labor and Welfare, “2018 Overview of the Medical Facility (Dynamic) Survey & Hospital Report”  
Ministry of Health, Labor and Welfare, “2018 Overview of Doctor, Dentist & Pharmacist Statistics”

# The medical system that will be needed in the future

- From the site of medical cooperation in Shiga Prefecture -

## The promotion of medical and nursing care cooperation is essential in Shiga Prefecture

Shiga Prefecture has Lake Biwa, which occupies about one-sixth of the prefecture's area in the central part of the prefecture. As of January 1, 2020, it had a population of about 1.41 million and the percentage of elderly residents was 26.0% (population aged 65 and over). Compared to the national average of 28.1% (according to a Cabinet Office survey as of October 1, 2018), the aging of the population in the prefecture as a whole seems to be progressing slowly, but in the western, northern and southeastern parts of the prefecture, the outflow of young people and the aging of the population are progressing significantly. In the south and east, the percentage of elderly residents tends to be low due to the large influx of young households, but it is an area where the population is certain to age in the future. For this reason, it is expected that demand for medical care will generally increase in Shiga Prefecture in the future.

On the other hand, on the medical care supply side, although medical care is provided in seven secondary healthcare areas, medical resources are unevenly distributed. Medical resources are scarce in the west, north, and southeast, with high dependence on other healthcare areas. In the southern part of Shiga, which is near Kyoto and Osaka, medical resources are more abundant than in the western, northern and southeastern parts of the prefecture, and the southern part accepts patients from the other areas. Since it provides advanced acute medical care for the entire prefecture, it needs to maintain its support function going forward.

Therefore, as the demand for medical and nursing care is expected to significantly increase in Shiga Prefecture going forward, it is necessary to make effective use of the limited resources of the prefecture to cope with it. We are promoting consistent medical and nursing care cooperation from advanced acute care to home care support.

## “Biwako Asagao Net” for patients

The most important point in medical and nursing care cooperation is how to provide seamless cooperation. Since diseases such as COVID-19 could lead to a rapid deterioration in conditions, any interruption in the cooperation must be avoided.

As a mechanism to realize this cooperation, the Shiga Prefecture Medical and Nursing Care Information Cooperation Network system “Biwako Asagao Net” is being operated (EHR: Electronic Health Records), and it has the following two main functions. (1) A groupware function such as secure email that allows information to be shared only between system users, and group chat within a medical team structure. You can also share things such as life information related to patients and videos of rehabilitation in a secure environment shielded from the outside. (2) A function to share medical information and home care information only for patients who have agreed to cooperate from medical information systems such as electronic medical records and business systems for nurses and care managers. Information on the same patient is identified, and it is possible to centrally check when, where, and what kind of treatment was performed in a chronological order.

In fact, the system can lead to agreement on therapy and medical treatment policies among the parties concerned and coordination of cooperation across the whole prefecture before a patient is moved, and to smooth and continuous therapy and medical treatment at the host institution after the patient is moved. Also, in dealing with COVID-19, host medical institutions and administrative officials such as health center staff can monitor each patient’s medical treatment status remotely through dispatched medical staff and confirm the information required for administrative reports not only by telephone but also electronically without actually visiting the facilities where the patient is staying. Thus, the system also helps prevent the spread of infection and reduces the burden on host medical institutions and administrative agencies.



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Representative Executive Director of the NPO  
Shiga Prefecture Medical Information Cooperation  
Network Council, and Chief Director of the  
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#### Impending limitation of regional medical care system

The current Biwako Asagao Net is based on the premise that patients are moved to medical institutions with necessary equipment and medical resources. On the other hand, in the future (after 2025), it is expected that it will be very difficult to secure a system on the medical care supply side that is responsible for regional medical care. Even if the patients are moved, there is a risk that the necessary medical resources (equipment and people) will not be secured, and sufficient medical and nursing care services will not be provided. Taking also into account new measures against infectious diseases including COVID-19, we must build a method that can maintain the service level without lowering it to meet the ever-increasing demand for medical and nursing care going forward.

This method is to build a group of more highly specialized medical institutions, including the concentration and reallocation of medical resources in the prefecture. In addition to moving patients to the institutions that can provide the necessary medical and nursing care services, the only way to provide medical and nursing care services going forward is to move medical professionals to various locations according to the needs of the patients without them being tied to medical institutions, equipment or facilities.

It is necessary to expand the medical system going forward so that this method can be realized.

#### The future of local medicine opened up by new communication infrastructure

The local medicine is expected to enable healthcare professionals and others to access patients' medical / long-term care information in real time with full specifications, and to check and record the details. At present, in Biwako Asagao Net, it is limited to the minimum information required for cooperation.

Medical care requires the improvement of medical mobility. While medical equipment is becoming more sophisticated and electronic medical records are becoming more widespread, medical professionals are restrained by the location of the medical equipment and medical information systems. One of the factors is the limit on telecommunication capacity and speed in the communication infrastructure of medical institutions (in-hospital LANs and out-of-hospital networks). While medical information is becoming more advanced and

it is becoming commonplace to utilize things such as high-definition images and 4K and 8K videos, the communication infrastructure to transmit them within hospitals and outside of the hospital including Biwako Asagao Net has not caught up at all.

We hope that 5G and future information and telecommunication technology, which will be fully widespread in the future, will solve this problem. And we would like to work toward the realization of the following three measures.

- (1) Sharing of real-time, high-definition image information within the hospital that is not tied to medical equipment and facilities by eliminating limitation of communication capacity and speed of the current telecommunication infrastructure of medical institutions (in-hospital LANs and out-of-hospital networks).
- (2) Direct access to information that allows continuous medical care when the relevant doctor moves to a medical institution other than their own facility to treat the same patient.
- (3) Realization of full PHR utilization where patients can access and carry their own medical information as described above and information can be shared even at medical institutions outside of Shiga Prefecture with access permission by patients.



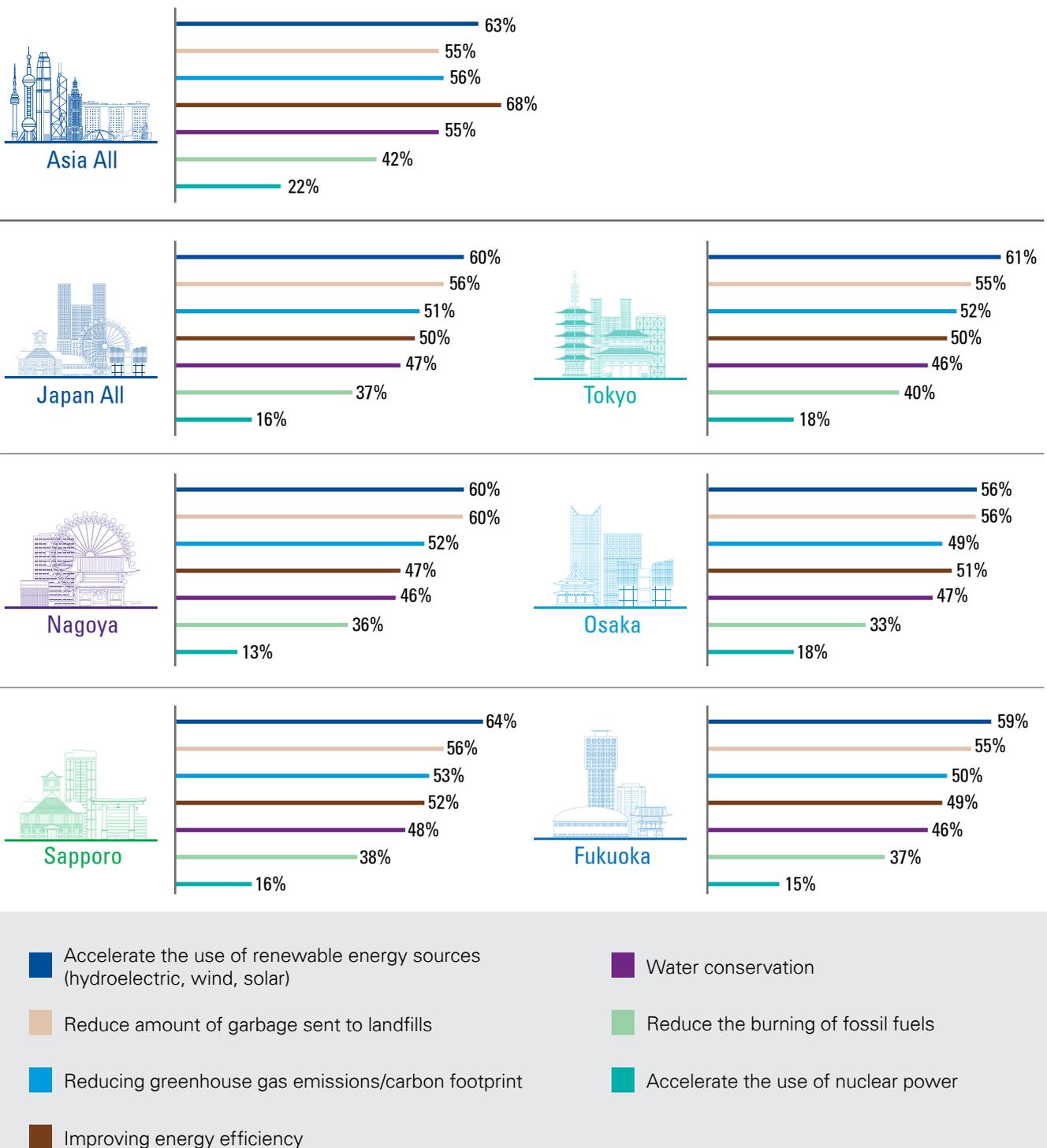
# Energy and resources



With regard to points that should be improved for urban energy and resource management, “Accelerate the use of renewable energy sources” was the highest in each city. In addition, while there is a high level of interest in environmental measures such as “Reducing greenhouse gas emissions/ carbon footprint” as a whole, “Accelerate the use of nuclear power” is noticeably lower. “Improving energy efficiency”,

which was the highest in each Asian city, was not necessarily that high, and it is presumed that the main reason is that Japan's energy prices are stable. In addition, anxiety about nuclear power generation due to the 2011 Tohoku earthquake and tsunami has pushed down interest in this item, which is clearly a reason that is unique to Japan. (Figure 6.1)

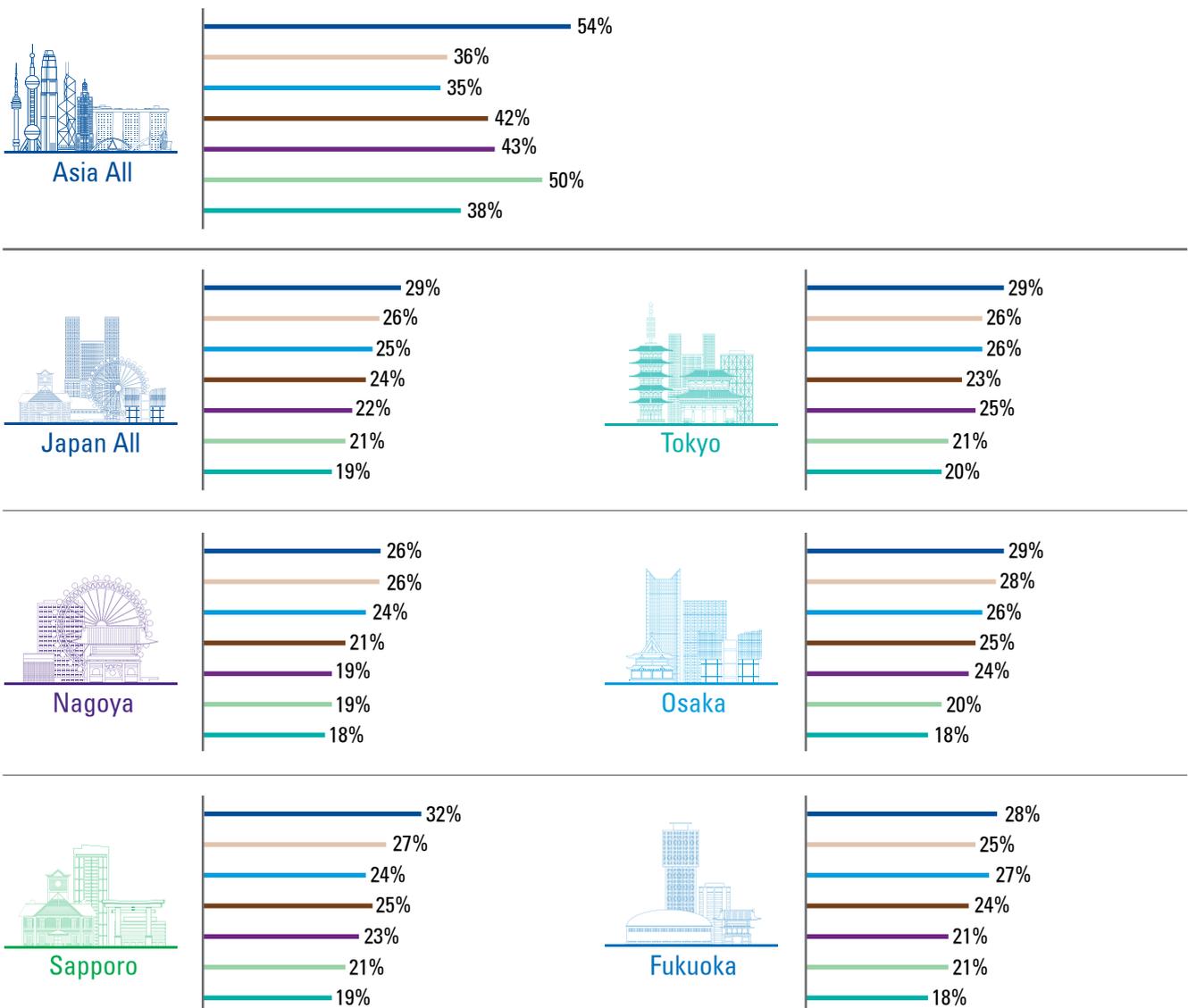
**Figure 6.1: Needed improvements for your city's management of energy and resources**



In the next 10 years, regarding what is important for improving the energy and resources of cities, “Making renewable energy sources a greater percentage of overall power supplied to the city” was the highest in each city, but incentives for residents were relatively low. (Figure 6.2) It is presumed that this is

due to the implementation of output power control caused by power transmission and distribution capacity limitations, in addition to the loss of economic benefits associated with lower feed-in tariff (FIT) purchase prices.

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



- Making renewable energy sources a greater percentage of overall power supplied to the city
- Adjust the charging schemes for electricity, water and gas use to discourage waste
- Utilise technology to better manage the city's water resources
- Utilise technology to better manage the city's power grid
- Promote construction of energy-efficient buildings
- Incentives for citizens to use water-saving and energy-saving home appliances
- Incentives for citizens to install solar power devices in their homes

It seems that the results of this questionnaire reflect Japan's energy policy and supply situation to date. On the other hand, the domestic energy market has undergone major changes in recent years, where deregulation, decentralization, digitization and decarbonization are complexly intertwined. Let us take the electric power business as an example.

### Deregulation

Prior to the deregulation of the electricity market, Japan had put priority on delivering energy safely and stably with a vertically integrated and regulated market for power generation, power transmission and distribution, and retail, and the freedom to choose a power source did not exist on the consumer side. However, the completion of the legal separation of the power transmission and distribution sector in April 2020 gave consumers the freedom to choose their power source. For example, the system has made it possible to select a company that supplies cleaner electricity. Furthermore, going forward, institutional changes that encourage changes in energy utilization are planned one after another, such as development of the market for electric power, or opening distribution networks such as the power distribution licensing system.

### Decentralization

Looking at the energy supply side, due to the opening of the power generation business through deregulation, the number of clean but relatively small and decentralized power sources has increased dramatically, represented by solar and wind power. However, such power supplies have the problem that they might not be useful for a stable supply due to issues such as unstable power generation caused by changes in the weather and environment.

On the other hand, due to changes in the social situation represented by COVID-19, the demand side is beginning to show signs of change, such as shifting from heavy concentration in urban areas to decentralization.

### Digitization

With the development of telecommunication technology and sensor technology represented by 5G, and the evolution of real-time data analysis capabilities through things such as AI, we are opening the door to a new world of utilizing data that was previously thought to be impossible to collect and analyze. This is due to the explosive spread of the Internet of things (IoT). For example, it is becoming technically possible to operate a virtual power plant (VPP) that virtually bundles decentralized power sources (e.g. small storage batteries installed in household solar power generation and electric vehicles), controls supply and demand in real time and utilizes decentralized renewable energy in a stable manner as if it were a conventional large-scale power plant. The establishment of digital technology will increase the possibility that solutions for energy problems will again be taken up as an important component of the Japanese version of smart cities.

### Decarbonization

With the effects of climate change, it has been a long time since people started calling for the promotion of decarbonization. As mentioned above, in addition to the fact that until now there has been little incentive to aggressively shift from traditional fossil fuels (which are stable and relatively inexpensive) to comparatively small and decentralized renewable energy, things have tended to be slower than Europe due to circumstances unique to Japan, such as priority being given to urgently responding to supply insecurity caused by disasters such as the 2011 Tohoku earthquake and tsunami. However, in addition to the stable supply of decentralized renewable energy becoming a reality due to the establishment of digital technology mentioned above, from the perspective of responding to SDGs and ESG and raising funds, the response to decarbonization in corporate activities is becoming an urgent issue we must deal with, which is different from the past.

Due to the expansion of options through deregulation, changes in the supply and demand structure due to decentralization, the realization of detailed monitoring and control of supply and demand through digitization, and increasing demand for decarbonization amid the mandatory shift to renewable energy, which appears to be separate signs of changes, the basic environment to realize drastic changes in urban energy utilization is being developed.

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# The impact of technology

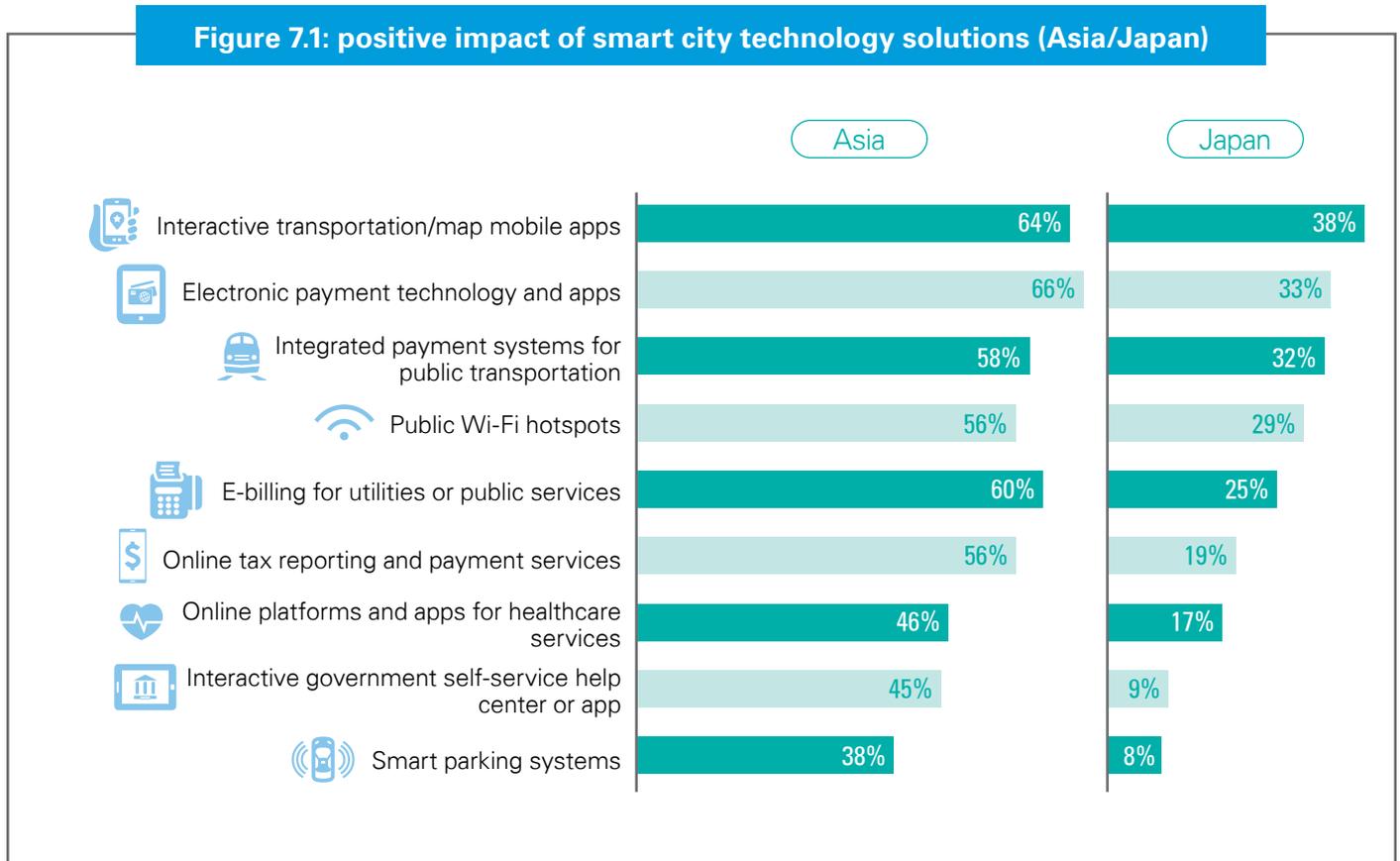


In smart cities, various data such as consumer behavior, urban transportation, facility operations and environmental changes are collected and utilized in order to improve the convenience of inhabitants and the efficiency of corporate activities.

According to the results of this survey, the most common answer for a technology solution that has contributed to improving the quality of life in the past year was “Interactive transportation/map mobile apps”, with a particularly high response rate in Tokyo. Other than that, the standardization of electronic payment and public transportation payment

systems is relatively high. This indicates that things such as transportation route search tools, the standardization of contactless transportation cards and mobile payments are becoming widespread, especially in urban areas. On the other hand, the percentage of replies was low for items such as online administrative services such as public utility charge collection and tax payments, online medical services, and online parking lot reservations (smart parking), indicating that these are not spreading even when compared with other countries. (Figure 7.1)

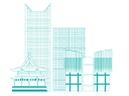
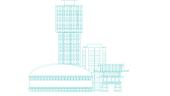
**Figure 7.1: positive impact of smart city technology solutions (Asia/Japan)**



**Figure 7.2: Positive impact of smart city technology solutions (Asia)**

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

**Figure 7.3: Positive impact of smart city technology solutions (Japan)**

	 Tokyo	 Nagoya	 Osaka	 Sapporo	 Fukuoka
 Interactive transportation/map mobile apps	43%	39%	38%	31%	38%
 Electronic payment technology and apps	34%	31%	32%	32%	35%
 Integrated payment systems for public transportation	33%	33%	31%	28%	33%
 Public Wi-Fi hotspots	29%	27%	27%	31%	32%
 E-billing for utilities or public services	23%	25%	24%	24%	27%
 Online tax reporting and payment services	18%	20%	20%	17%	18%
 Online platforms and apps for healthcare services	17%	17%	17%	16%	18%
 Interactive government self-service help center or app	10%	8%	9%	9%	10%
 Smart parking systems	8%	8%	9%	7%	10%

The situation where administrative digitization has not progressed sufficiently in the processing of special cash payments as a measure against the COVID-19 pandemic has become a hot topic, and future improvements are expected. On the other hand, as we proceed with digitization in smart cities in the future, the key is the collection and utilization of data in technology solutions and the technology that enables it.

As for data collection, advances in technology have led to diversification, miniaturization and price reduction for devices and sensors, and the speeding up and price reduction of telecommunication environments. The scope is expanding to goods and services that were not connected until now, and this trend is expected to keep growing going forward.

If the amount and type of data to be acquired increases, the problem of data noise that impacts the accuracy of analysis becomes more serious with anomaly data related to the natural environment, not only the standardized data input by humans. On the other hand, data that is different from normal may be necessary information rather than noise due to a defect, and cleansing once it is included in the data is not easy. In order to collect data that is easy to use even in such a situation, along with measures to prevent noise from being mixed in the device or sensor itself, there is a need for technology that eliminates noise on the system and equipment side as close to the original data as possible.

In order to utilize data, single data analysis is not enough, and multiple data analysis is needed according to the purpose. Multiple data are rarely physically collected in one place. Currently, the mainstream method is to collect information from multiple sources via an “interface”. The interface is a rule or mechanism that regulates the exchange of information, but if this is different among information sources, it will not be easy to collect it.

In order to promote data utilization, efforts are needed to standardize this “interface” that regulates access to information sources.

When utilizing external data, it is also a problem that various data cannot be easily provided to a third party because the source of the data is responsible for data management. In particular, due to the recent increase in privacy awareness, personal data is prohibited from being used for purposes other than those agreed upon at the time of acquisition under the personal data protection regulations of each country. For data utilization in such a situation, there is a method called data anonymization so you cannot identify the data subject from

the original data, but if you want to provide to a third party this information that has been made anonymous, you need to disclose it to the data subject. Furthermore, since society has become stricter about data leakage, technical security measures are also important to keep the data itself safe, including the data before it is processed.

In this way, behind the brilliant and cutting-edge data utilization in smart cities, even in the defensive part of keeping data accurate and safe, the role of technology is required more than ever in areas such as improving data accuracy, standardizing interfaces and security measures.

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# Data utilization, security and considering privacy

In smart cities, the societies that realize Society 5.0, which was set by the government, there is no doubt that data utilization and security are the bases of the technological components, but we would like to consider the important points to further promote utilization.

Going straight to the point, we think that the following might be important keys.

As data utilization:

- (1) Transforming the way of thinking about information and communication technology (ICT)
- (2) Increasing the investment ratio in offensive ICT

As security:

- (3) Life cycle care with regard to dynamic data and privacy data

## (1) Transforming the way of thinking about ICT

As a component necessary to realize Society 5.0 and demonstrate its true value, at the beginning of the “2019 White Paper on Information and Communications in Japan”<sup>4</sup> (hereinafter referred to as the White Paper on Information and Communications) published by the Ministry of Internal Affairs and Communications, it states, “What kind of reforms are necessary in Japan for ICT to be effective? First, companies need to position ICT as a means of creating new value, rather than simply positioning it as a means of improving efficiency, and then transform to a system that is in accordance with this.” So far, with the development of IoT and network technology, while it is thought that the generation, collection and accumulation of data have made great technological progress, maybe it is realistic to think that there is still much room for improvement in the analysis and use of the collected data.

Therefore, while there is a plan to utilize AI in order to greatly advance the analysis and use of data, at the current practical level, it has not yet reached a perfect condition (a state that functions as artificial intelligence), and it is still at the stage of being used for deep learning, machine learning and reinforcement learning. Since it is a stage where humans need to give a substantial definition for AI, the intention and will of people to give input is important.

When considering the use of data in smart cities, from the perspective of ensuring the safety and security of residents such as disaster and crime prevention, and from the perspective of improving the efficiency of urban functions such as online medical care, public services and simplification of tax filing procedures, you can consider whether new value can be created by further adding and analyzing multiple data.

**(2) Increasing the investment ratio in offensive ICT**

The White Paper on Information and Communications organizes the positioning of ICT as follows.

Mode 1	SoR (Systems of Records)	"Defensive ICT" as an in-house operational efficiency and system foundation.
Mode 2	SoE (Systems of Engagement)	"Offensive ICT" that creates new business by connecting with customers.
—	Sol (Systems of Insight)	ICT for gaining business insights, such as by utilizing data collected through SoR and SoE.

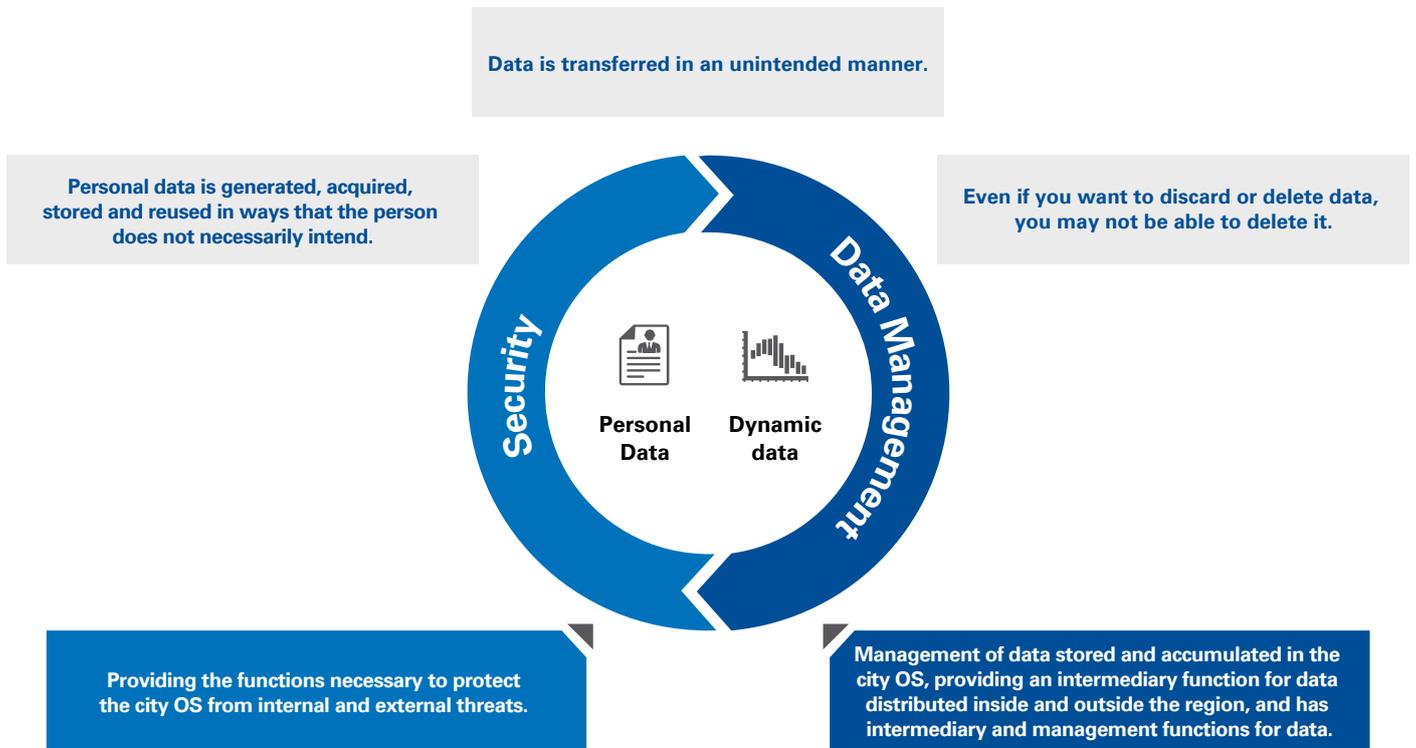
In order to further accelerate data utilization in smart cities, it is important to increase the ratio of SoE and Sol to the investment proportion of ICT. In order to increase the ratio of SoE and Sol, "(1) Transformation in the way of thinking about ICT", it is necessary to change mindset and shift from defending the purpose of use for the ICT to the offensive with an awareness of providing high value-added services as mentioned in the previous section as well as to improve the flexibility of development without sticking to the conventional framework or knowledge, such as adopting an agile type of development method. Furthermore, in order to push this, we believe that it will be important to change from the conventional model of executing a budget planned at the beginning of the fiscal term, to a flexible budget allocation system that can squeeze money for new service development costs that are generated by needs during the term.

**(3) Life cycle care with regard to dynamic data and privacy data**

As a result of the "Cross-ministerial Strategic Innovation Promotion Program (SIP) Phase 2/Architecture Construction and Empirical Research Project of Big Data and AI-Enabled Cyberspace Infrastructure Technologies" announced by the Cabinet Office in March 2020, the "Smart City Reference Architecture White Paper"<sup>5</sup> (hereinafter referred to as the Architecture White Paper) was published. In the Architecture White Paper, data utilization and security in smart cities are organized as "data management" and "security", respectively as a technical component of the urban operating system (city OS).

In smart cities, the handling of personal data is very important. For example, acquiring video information by surveillance cameras (including smart poles) that can identify individuals, identifying location information using GPS and IoT device information, and collecting personal information from website usage data and IC cards. Regarding the handling of personal data, the security concerns felt by the residents, who are the users, may be as follows.

- Personal data is generated, acquired, stored and reused in ways that the person does not necessarily intend.
  - The storage of streaming data by surveillance cameras.
  - Even if an individual cannot be identified by each set of data, AI generates identifiable personal data by combining multiple data without your knowledge.
- Data is transferred in an unintended manner.
  - You do not know what kind of data will be transferred in the first place.
  - The recipient uses the data in unintended ways.
- Even if you want to discard or delete data, you may not be able to delete it.
  - You cannot know where and how much personal data exists, and you cannot erase it.



Source : Revised by KPMG based on the Cabinet Office's Smart City Reference Architecture White Paper.

In the past field tests of smart cities in Japan and overseas, there have been reports of cases in which residents were particularly worried about the management of personal data, and the tests were delayed or forced to be canceled.

In terms of managing the entire life cycle of data from creation to deletion, the requirements of the EU's General Data Protection Regulation (GDPR) that came into effect in Europe in May 2018 have become a global trend that has been incorporated into personal data protection laws not only in Europe but also in other countries. It is also useful for security measures when using data in smart cities.

When considering how to use data to make cities smarter, it goes without saying that a perfect data security system should be built, but from the perspective of utilizing personal data, it is necessary to give sufficient consideration to privacy protection. For that purpose, after gaining sufficient understanding from residents via thorough dialogue, it will be necessary to establish safe and effective policies and rules, fully disseminate them, and ensure compliance and operation.

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4 Ministry of Internal Affairs and Communications, "2019 White Paper on Information and Communications in Japan"  
<https://www.soumu.go.jp/johotsusintokei/whitepaper/>

5 Cabinet Office, "Results of the SIP Cyber/Architecture Construction and Empirical Research" (March 18, 2020)  
<https://www8.cao.go.jp/cstp/stmain/20200318siparchitecture.html>



## Conclusion

For smart city initiatives in Japan and overseas so far, it has been pointed out that in many cases it was a technology-oriented approach centered on the use of new technologies. Smart cities need to solve the various problems faced by cities, contribute to the improvement in QOL, and aim to build a sustainable system that covers operating costs with the benefits. In order to achieve it, it is necessary to evolve an “issue-oriented” approach where we understand the needs of end-user residents regarding urban issues and consider what kind of technology to utilize to recognize and resolve bottlenecks for problem solving.

In this report, we understand and analyze the needs of residents regarding urban issues through questionnaire surveys in various cities in Japan and Asia, but while there is a common issue of aging population, variations in priorities were also recognized due to differences in the individual environments and awareness of residents in each city.

In the future, it will be important for the development of smart cities in Japan to proceed with an issue-oriented approach, but in considering the issues, not only the current situation but also future environmental changes should be taken into consideration. It will be necessary for the business side to discover the potential needs of the residents who are end users, and to specifically present what kind of benefits can be created by utilizing the latest technology. For that purpose, it is considered effective to take an approach in which local residents and companies actively participate in the consideration of the solutions to problems, with a promotion of deep dialogue between the provider and the users.

In addition, smart cities enable the provision of new services by combining physical infrastructure (roads, water supply and power grids, etc.) and digital infrastructure (cross-sectional data linkage infrastructure)<sup>6</sup>. In order to solve the problems, it is necessary to consider and make use of the knowledge and know-how of real infrastructure as well as digital, and cooperation with various businesses is required. In addition, smart cities should be introduced not only from the perspective of individual issues but also from the perspective of overall optimization of urban development. Given the need to handle deregulation and coordinate various stakeholders, including residents, the involvement of the government is also important. For this reason, when introducing smart cities, it

is considered useful to adopt an area management method in which businesses, governments, local residents and industry cooperate. Specifically, it is assumed this will include identification of issues and an overall strategy, consideration of solutions based on the know-how of both real and digital businesses, clarification of the benefits from participation for the local residents and industries who are the users, and deregulation and coordination of the stakeholders by the government.

With regard to the current situation for smart cities, it is in the proof-of-concept stage, with the main financial resources being subsidies from the government and up-front investment by businesses, but in the future, it will be necessary for smart cities to be established as an ecosystem and to be able to cover the costs required for things such as data linkage infrastructure with the service value provided. In addition to cost reductions on the government side, smart cities will create new businesses in mobility, education and medical services. Furthermore, it has the potential to be a major seed for industry within the fourth industrial revolution with things such as multiplier effect business creation that utilizes big data, domestic infrastructure businesses and exports of smart city packages. In order to fill the time lag until the initial investment is recovered, in addition to considering the optimal combination of the government obligation, such as subsidies and commissions, and private sector funds, it is necessary to develop a business scheme such as a rational rate model from the operating cost and data users that is commensurate with the benefits.

In April 2020, a bill to partially revise the National Strategic Special Zones Law (Super City Bill) was passed by the Diet. While there are concerns about economic losses due to COVID-19, which will greatly exceed the impact of the collapse of Lehman Brothers, the crisis can be seen as an opportunity to overcome the current issues that will lead to a fundamental revision of the system. It is expected that this smart city survey report will serve as an opportunity to make progress in efforts toward the future introduction of smart cities and super cities in Japan.

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<sup>6</sup> “Final Report for the Realization of the Super City Concept” (February 14, 2019, Advisory Panel for the Realization of the “Super City” Concept)



# KPMG Mobility Research Japan

While the automotive industry is in the midst of a major revolution, KPMG is developing research on the ideal future mobility ecosystem (called “Future Mobility”) with its global network. Mobility, or the movement of people or things, is an important theme that has a big impact on the world’s industrial structure through three major advancements in innovative technology—that is, the introduction of electric cars, diffusion of connected cars and self-driving cars, and Mobility-as-a-Service, represented by car-sharing services. While the automotive industry will have a central role in the era of mobility, insights based on knowledge collected from many other industries such as energy, industrial equipment, finance, information and communication, and civil service, will be important in exploring this kind of mobility future.

According to the research conducted by KPMG in the US, a value chain equivalent to the conventional value chain in scope (approximately USD 1 trillion) will be newly created for the mobility service market in the future.

At KPMG Japan, mobility related initiatives had been led by our automotive industry group and technology innovation department in the past, but in going forward, the KPMG Mobility Research Japan will take the lead in the research across all industries, in looking at changes in societal structure from a mobility perspective and working globally with all relevant overseas research groups within the KPMG network. The KPMG Japan lead partner for the automotive industry, Megumu Komikado, has been appointed as head of KPMG Mobility Research Japan. He will function as a hub for industry-academia-government collaboration in the future, with the aim of contributing to mobility development in Japan.

<b>Company name</b>	<p>KPMG Mobility Research Japan</p> <p>Head: Megumu Komikado</p> <p>Advisors: Haruo Ishida, Professor emeritus, University of Tsukuba and Director of Research Institute for Road and Street Shinsuke Ito, CEO, rimOnO Corporation Haru Miyadai, Non-resident fellow, Institute for International Economic Studies</p>
<b>Establishment</b>	1 September 2018
<b>Office location</b>	<p>Otemachi Financial City South Tower Otemachi 1-9-7, Chiyoda-ku, Tokyo</p>
<b>Business description</b>	<p>Global information gathering and investigative research of industry-academia-government initiatives related to mobility</p> <ul style="list-style-type: none"> <li>• Fostering experts in mobility related fields</li> <li>• Issuing newsletters comprising internal and external expert knowledge</li> <li>• Planning and executing relevant seminars and forums</li> <li>• Information sharing through article contributions or publications</li> <li>• Organizes industry-academia-government consortia and conducts demonstration tests etc.</li> </ul>



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