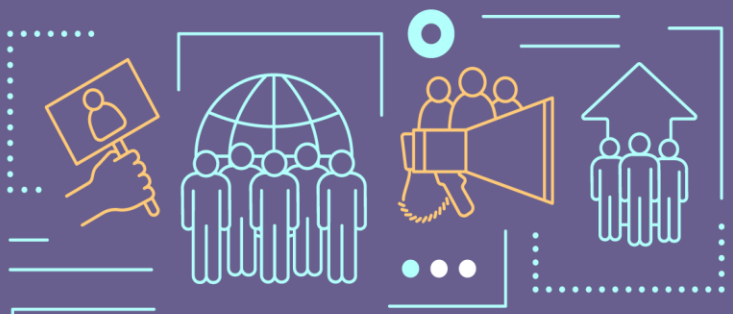

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EU-Japan Joint Study: Demographic trends and territorial policy responses

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Contents

1. Chapter 1: Introduction

1.1. Background and rationale of the Study

In recent years, as society has matured, particularly in developed countries, the birth rate has declined and population has aged, and it has become necessary to respond to the various challenges that these trends have given rise to, such as maintianing work forces and enhancing social welfare. In particular, Japan is one of the fastest ageing countries in the world, with more than a quarter of the population aged 65 years old or over, and it is expected that the birth rate will continue to decline population will continue to age over the coming decades. In Europe, the same trends are evident and discussions are intensifying on developing a system to ensure that the elderly receive appropriate social protection and have access to essential services.

Against a backdrop of such social challenges facing developed countries with regard to demographic trends, the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter MLIT) and the European Commission's Directorate General for Regional and Urban Policy (hereinafter DG-REGIO) signed the "Letter of intent on an urban policy dialogue" in 2013 in order to work towards the resolution of common challenges through sharing knowledge between the two sides. Based on this agreement, exchanges between the two have been promoted, such as holding a "EU-Japan Urban Development Policy Dialogue" five times as a framework for dialogue between MLIT and DG-REGIO and implementing a "Exchange meeting of the EU and Japanese cities" six times as an EU-Japan city-to-city cooperation initiative.

Both Japan and the EU share a common economic and social system based on liberal democracy, and account for approximately 30% of total global GDP. In addition, Japan and the EU are the world leaders in technology. In this context, it is important for Japan and the EU to work together in respect of urban and regional policies, particularly to address common social issues by utilizing advanced solutions, including the realization of smart cities, in order to proactively address the social issues that the world's developed countries will face.

Recognizing this challenge, MLIT and DG-REGIO agreed to undertake a joint study on demographics, and have conducted the study in 2020 and 2021. The purpose of thie study is to identify the challenges facing different urban types in terms of population dynamics, and to showcase policy interventions that will contribute to solving urban and regional challenges, while keeping in mind factors such as the use of smart solutions, contribution to SDGs, and the impact of the COVID-19 pandemic.

1.2. Objective and scope of the Study

This joint study analyzes demographic trends in Japan and the EU, identifies social and economic issues arising from demographic changes, and analyzes the interventions being implemented in response to issues through case studies of cities and regions in Japan and the EU. In analyzing policies, this joint study places special focus on the potential use of smart solutions in the light of global trends in technologies, such as the recent advances in digital transformation (DX) in society and the implementation of the SDGs, with the aim of sharing knowledge that can be utilized in policy-making in Japan and the EU in the future. Through this joint study, Japan and the EU aim to strengthen their partnership by deepening the cooperative relationship between MLIT and DG-REGIO in respect of urban and regional policy.

In the study, the following subjects were selected for specific analysis:

- Demographic trendschanges in Japan and EU Member States
- Identification of social and economic issues in different types of cities and analysis of concrete policy responses through case studies
- Identification of advanced technological initiatives in cities and regions (Smart Solutions) and examination of their potential for wider application
- Preliminary analysis of the impact of COVID-19 on urban and regional policies

1.3. Methodologies

1.3.1. Survey method

- While collecting basic information through literature research, interviews were conducted in Japan with the following organizations to obtain unpublished or detailed information.
  - Road Traffic Division, Urban Development Department, Tama City, Tokyo
  - City Planning Division, Urban Development Department, Tama City, Tokyo
  - Policy Promotion Division, Shimokawa-cho, Kamikawa-gun, Hokkaido
  - General Affairs Division, Minamiyamashiro-mura, Soraku-gun, Kyoto Prefecture
  - Stock Utilization Planning Division, Tama Area Management Department, East Japan Rental Housing Headquarters, Urban Renaissance Agency
  - Tokyu Land Corporation (Cooperation of site visit at Tokyo Port City Takeshiba)

  In the EU, reliance was placed largely on published information, obtained through detailed web searches and direct approaches to the city authorities covered in the case studies

- The following experts were invited from both Japan and the EU sides to provide advice on the preparation of the final report from expert perspectives on urban and regional policies. They also made presentations on demographic changes at the European Week of Regions and Cities (EWRC held on October 14, 2020), during which the interim report of this joint study was presented.

  (Japan)
  - Dr. /Mr.)Kensuke Katayama Associate Professor, Graduate School of Fisheries and Environmental Sciences, Nagasaki University

  (EU)
  - Mr. Terry Ward Applica Director
  - Dr Marco Bontje Professor, University of Amsterdam
  - Dr. Pieter Ballon, Vrije Universiteit Brussels, Senior Researcher and Professor, Scientific Director, Centre of Excellence Humanized Technologies
- MLIT and DG-REGIO held regular web conferences with the above-mentioned experts to share the progress of the joint study and coordinate the preparation of the final report.

1.3.2. Analytical approach

In this joint study, in order to identify policy issues faced by cities and regions, cities are categorized into three types according to their size: 1) large cities, 2) middle sized cities, and 3) smaller towns and/or rural areas. The features, challenges, and policy responses to demographic changes for each type of city are analyzed accordingly.

The reason for categolizing cities into these three types is that each city has different socio-economic positions in the country.To be specific, the main characteristics of the three types are as follows: (1) large cities are the national centers of politics, economy, and culture, where population is concentrated; (2) middle sized cities are the basis of economic activity and regional governance within a certain geographical area and (3) smaller towns and/or rural areas are areas with small populations and limited concentration of industry and commerce. Each has somewhat different demographic characteristics and face slightly different policy challenges.

In the case of large cities, the urban area tends to extend to cover neighboring settlements to form a metropolitan area, and the latter, the suburbs, tend to have different characteristics from the city center as such, even though they are located in the same metropolitan area. This is particularly the case in “new towns” in Japan, which form suburban residential areas in many cities and these are analyzed separately (in Chapter 3) from large cities as a independent type.

2. Chapter 2 Demographic trends in the EU and Japan

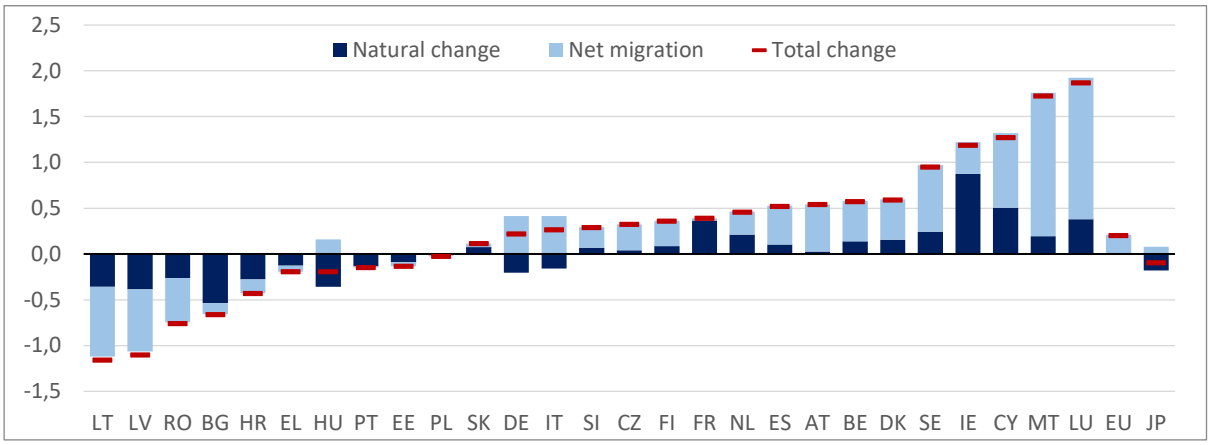
2.1. Demographic trends over recent years

2.1.1. Total population

Between 2006 and 2020, population in the EU increased but by very little (by 0.2% a year on average) (Figure 1). All of the increase was the result of net inward migration, natural population growth (the number of births minus the number of deaths) being negligible. In 10 Member States, all in Central and Eastern Europe or in the South, population declined, most notably in Lithuania and Latvia, it fell by around1% a year. In all of the 10 countries, except Hungary, net outward migration reinforced the natural population decline. By contrast, population increased significantly – by 1 to 2% a year- in 5 countries, Luxembourg, Malta, Cyprus, Ireland and Sweden (marginally less than 1% in the last), in all apart from Ireland because of net inward migration. Net inward migration was also significant in Germany and Italy, where it more than offset a decline in natural population.

Over the same period, in Japan, as in the EU, there was virtually no natural change in population (population declining marginally – the number of deaths being larger than the number of births – while in the EU it increased marginally), but unlike in the EU, there was very little inward migration to compensate for this.

Figure 1 Population change in the EU and Japan, 2006-2020 (% a year)

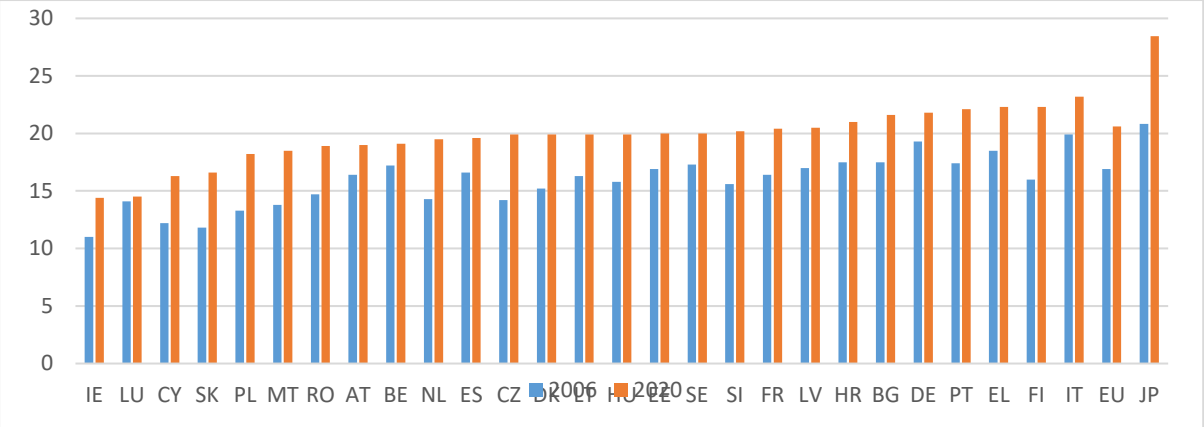


Note: Change for Japan relates to 2006-2019.
Source: Eurostat and Japanese government statistics

2.1.2. The age composition of the population

As corollary of the lack of population growth coupled with increased life expectancy is that the proportion of the population aged 65 and over increased in the EU as a whole and in all Member States between 2006 and 2020. The increase in the EU, however, was only half the size of that in Japan (just under 4 percentage points as opposed to just over 7 percentage points), where some 28% of the population in 2019 were 65 and over, 8 percentage points more than in the EU (Figure 2). Whereas, therefore, in nearly all EU Member States, around one in five people were aged 65 and over – slightly more in some, slightly less in others, the main exceptions being Slovakia, Cyprus, Luxembourg and Ireland, where the figure was one in 6 or one in 7 – in Japan, it was well above one in four. In all EU countries, moreover, the increase over the 2006-2019 period was less than in Japan (it was largest in Finland at just over 6 percentage points).

Figure 2 Population aged 65 and over in the EU and Japan, 2006 and 2020 (% total)

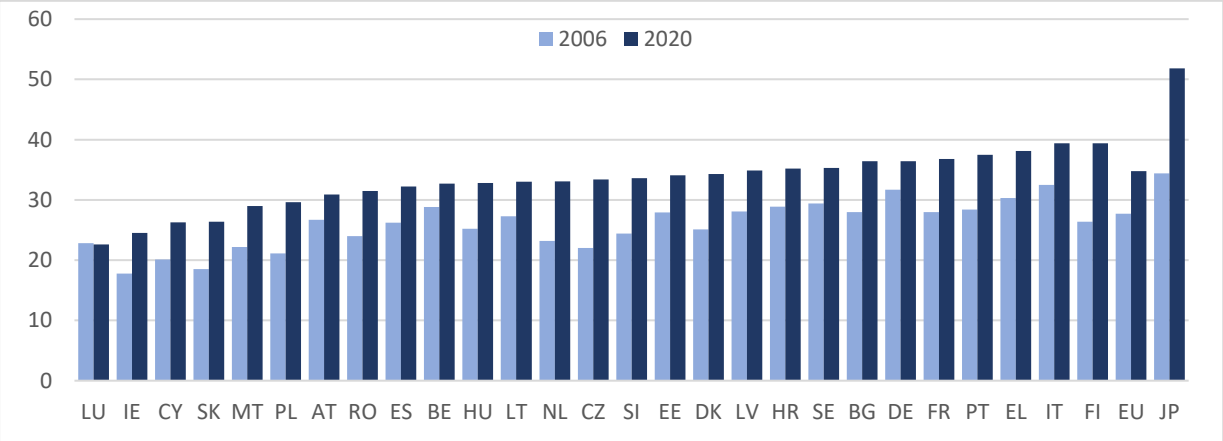


Note: The figure for Japan in 2020 relates to 2019.
Source: Eurostat and Japanese government statistics.

The main counterpart of the increase in the share of the population of 65 and older in both the EU and Japan has been a reduction in the share of those of working-age, taken here as 20-64. The number of the former as a proportion of the latter – the old-age dependency rate- has, therefore, increased by more than the rise in the share of those of 65 and over in the population. In the EU, the old age dependency rate increased from 28% in 2006 to 35% in 2020. This implies that, in 2020, for every three people of working-age in the EU, there was one person aged 65 and over in 2019, who in nearly all cases are likely to be in retirement (only 6% of this age group were economically active in 2019) and who, therefore, effectively need to be supported by them (Figure 3).

In Japan, the increase in the dependency rate was much larger, the rate rising from 34% in 2006 – the same as in the EU in 2019 – to 52% in 2019, implying that for every two people of working-age, there was just over one person aged 65 and over. The dependency rate is substantially higher than in any EU Member State – the highest rate being in Italy and Finland at 39%- and the increase over the period was equally well above that anywhere in the EU (the largest increase was in Finland at 13 percentage points, 4 points less than in Japan),

Figure3 Old-age dependency rate in the EU and Japan, 2006 and 2020 (population aged 65+ as % 20-64)



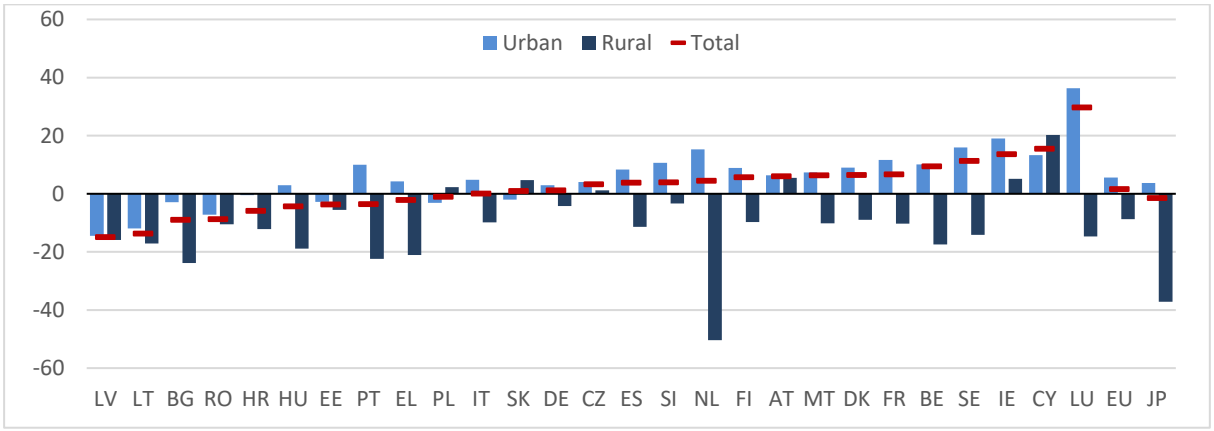
Note: The figure for Japan for 2020 relates to 2019.
Source: Eurostat and Japanese government statistics.

2.1.3. Population Change in in urban and rural areas

Population trends in urban and rural areas have tended to differ over the long-term throughout the world, with a distinct shift in population occurring from rural to urban areas, though at different rates across countries and over time. In both the EU and Japan, this tendency has continued over recent years. Between

2006 and 2020, population in the EU in urban areas increased by 5.5% while that in rural areas declined by just under 9% (Figure 4). In Japan, the relative shift from rural to urban was even more pronounced, population in rural areas declining by 37% over the period. Within the EU, population in urban areas increased in 19 of the 27 Member States – in Greece, Portugal and Hungary, despite a decline in total population – while in rural areas, it declined in all countries, apart from Austria, Ireland, the Czech Republic, Cyprus, Slovakia and Poland. The last three countries were the only ones in which there was not a shift in population from rural areas to urban over this period.

Figure 4 Population change in urban and rural areas in the EU and Japan, 2006-2020 (%)

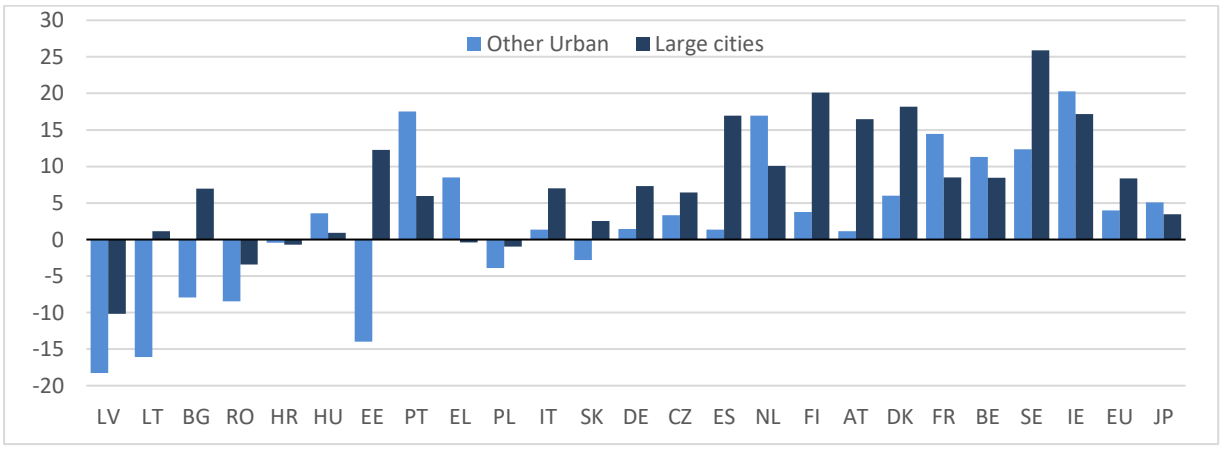


Note: In France, only the Metropolitan regions – i.e. excluding the overseas territories –are covered.
Source: UN World Urbanization Prospects: 2018 Revision Data, own calculation.

2.1.4. Population change by size of city

The shift of population from rural to urban areas has also been accompanied over recent years in the EU by a shift from smaller to larger urban areas. Over the period 2006-2020, population in large cities (defined as those with population of 300,000 or more) in the EU rose, on average, by 8.5%, twice the increase in other urban areas (Figure 5). This, however, is not the case in Japan, where population growth in other urban areas exceeded that in large cities over the period, if not by much (5% as against 3.5%). Nor was it the case in all parts of the EU, where there were 8 countries out of 23 where the growth in population in large cities was lower than in other urban areas, including France. In other larger Member States, on the other hand – Germany, Italy and Spain – the increase in population in large cities was significantly larger than in other urban areas over the period.

Figure 5 Population change in large cities and other urban areas in the EU and Japan, 2006-2020 (%)



Note: Large cities are defined as those with population of 300,000 or more in 2018. Cyprus, Luxembourg, Malta and Slovenia are excluded as there are no cities with population of this size.. In France, only Metropolitan regions are covered.

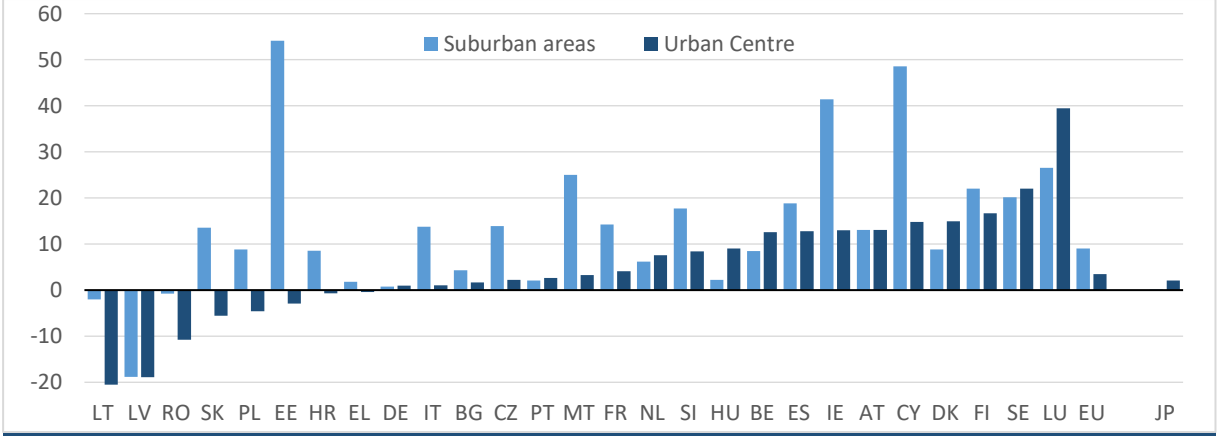
Source: UN World Urbanization Prospects: The 2018 Revision Data, own calculation.

2.1.5. Changes in population in city centres and suburbs

The Cities in the World database, compiled by the OECD and European Commission, provides a means of examining population trends in urban centres relative to those in other parts of the functional urban area which makes up the commuting zone of a city, or its labour market[4]. These areas can roughly be regarded as suburban areas and the data enable population changes in these to be compared with those in central parts to see how far there is evidence of a trend shift either into these areas from the centre or in the other direction, from these areas into the centre. In practice, the data show that in the EU, the predominant shift over recent years has been from the centre to other parts of functional areas, whereas in Japan, the shift, though small, has been in the opposite direction, towards city centres rather than away from them.

In the EU, therefore, population in urban centres increased by 3% on average over the period 2000-2015 (the latest period for which data from this source are available) as against an increase of 9% in more peripheral areas (Figure 6). In Japan, population increased by 2% in urban centres over these 15 years but remained virtually unchanged in other urban areas. In most EU Member States (18 of the 27), the same pattern of population growing by less, or declining by more, in urban centres than in more peripheral areas is evident as in the EU as a whole. The 9 countries where this was not the case, however, tend to be the more advanced ones in terms of GDP per head, namely, Luxembourg, Sweden, Denmark, the Netherlands, Belgium, Germany and Austria, with only Latvia, Portugal and Hungary being exceptions. Equally, the 18 where the effective shift was away from the city centre are predominantly those with GDP per head below the EU average, with only France being an exception. This suggests perhaps that population tends to grow by more in central parts of cities than in more peripheral or suburban areas after a certain level of economic advancement has been reached. Before then, however, population growth tends to be concentrated in the suburban parts rather than in the centre, a phenomenon known as 'urban sprawl' – or 'suburbanisation' – as the built-up area of cities expands outwards.

Figure 6 Population change in urban centres and suburban areas in the EU and Japan, 2000-2015 (%)



Note: Based on data for population in functional urban areas. Population in Suburban areas is defined as population in functional urban areas minus population in urban centres.
Source: Cities in the World database, http://www.worldcitiestool.org/ and own calculations.

[4] http://www.worldcitiestool.org/

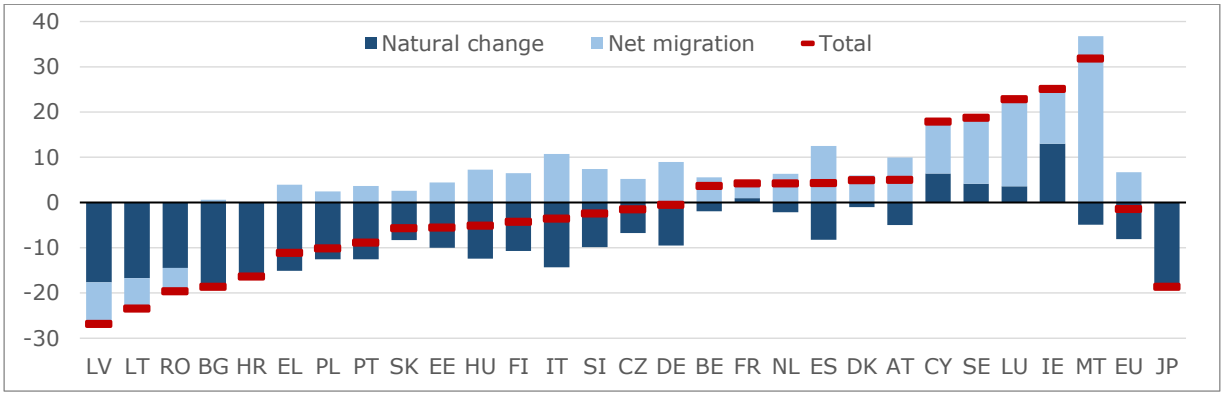
2.2. Population Projections

2.2.1. Total population

The latest demographic projections (from Eurostat and OECD), based on current population trends, are that population in the EU will decline by around 2% between 2020 and 2050[5] (Figure 7). For the EU, there is projected to be a natural decline in population of 8% over the period, which is offset in part by net inward migration of just under 7%, resulting in an overall decline of just over 1%. For Japan, the natural decline in population, given trends in birth and death rates, is projected to be much larger at 19%, but in this case, there is hardly any offset from net inward migration, so that the overall reduction in population is much the same as the natural decline.

Within the EU, deaths are projected to exceed the number of births in 22 of the 27 Member States over these 30 years (i.e. there is a projected natural decline in population), the only countries where the reverse is projected to be the case being France, Cyprus, Sweden, Luxembourg and Ireland. In 6 of these 22 countries, however, the decline is projected to be more than offset by net inward migration, so that total population is expected to increase rather than fall. Net inward migration is also projected in all but four of the other Member States – the exceptions being Latvia, Lithuania, Romania and Croatia – but in these cases, it is not enough to offset the natural decline in population.

Figure 7 Projected changes in population in the EU and Japan, 2020-2050 (%)



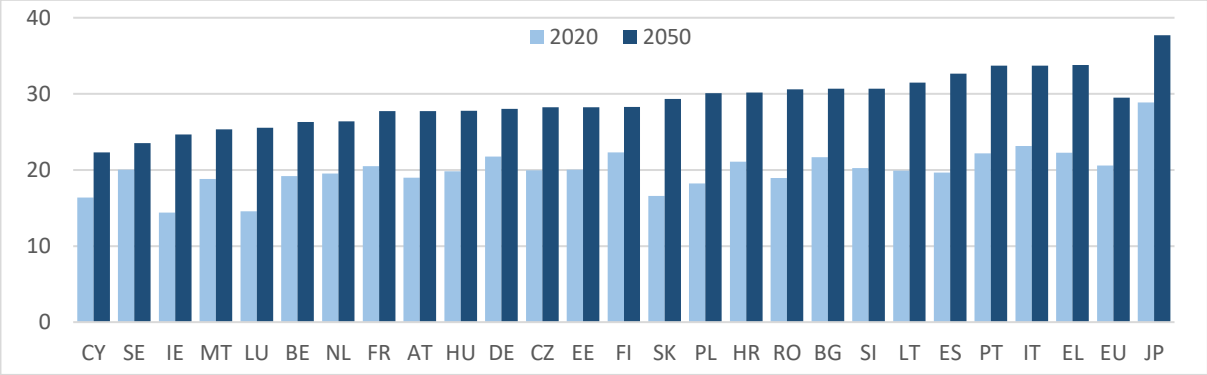
Source: Eurostat and OECD Population statistics, own calculations.

2.2.2. Projected changes in the age composition

The same population projections indicate that, given demographic trends, the share of the population aged 65 and over will increase by 9 percentage points over the next 30 years, reaching 30% by 2050 (Figure 8). In Japan, the projected increase is slightly smaller but starting from a higher level, so that by 2050, the share is projected to reach 38%. This is significantly higher than in any EU country, though the difference is smaller than at present, with all 4 southern mainland EU Member States – Spain, Portugal, Italy and Greece – projected to experience an increase in the share over the period which is significantly larger than the EU average (and large than the increase in Japan) . In these 4 countries, therefore, the share of those aged 65 and over is projected to reach 33-34% by 2050. At the other extreme, there will be still be three countries – Cyprus, Ireland and Sweden – with the share below 25% in 30 years' time.

[5] These projections are the 'baseline' ones. There are also two other projections, a low and a high one, which assume different rates of inward migration. Under the high migration assumption – which is still lower than has been the case in a number of years in the past – net migration in the EU would more than offset the natural decline in population and total population would increase rather than decline. Under the low migration assumption, it would obviously fall by more.

Figure 8 Proportion of population aged 65 and over in the EU and Japan, 2020 and projected in 2050 (% total)

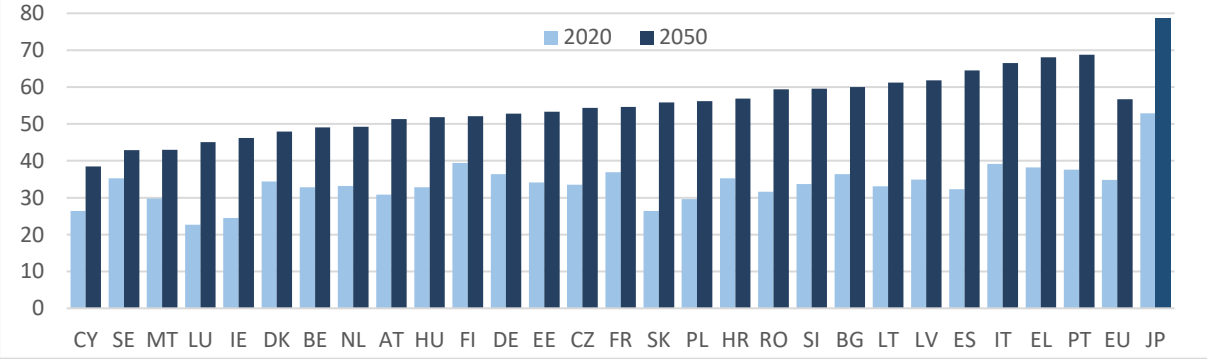


Source: Eurostat and OECD Population statistics, own calculations.

The implication of the projections for the share of population of 65 and over, coupled with those for the share of population of working-age (20-64) – which is expected to go on declining – is that the old-age dependency rate will continue to increase markedly over the next 30 years in all EU countries as well as in Japan. In the EU as a whole, the rate is projected to rise from 35% in 2020 to 57% in 2050, i.e. to a higher level than in Japan at present, implying that there will be more than one person of 65 or over for every two people of working-age (Figure 9).

In Japan, the increase is projected to be even larger over the period than in the EU, the old-age dependency rate rising to 79% by 2050. Again this is higher than in any EU Member State, though the projected increase is larger than in Japan in the 4 southern mainland countries, where in each case, the rate is expected to be 65% or higher in 30 years' time. In all Member States, except Cyprus, the rate is projected to increase to well over 40% by 2050 and in most countries to well over 50%.

Figure 9 Old-age dependency rate in the EU and Japan, 2020 and projected in 2050 (%)



Source: Eurostat and OECD Population statistics, own calculations.

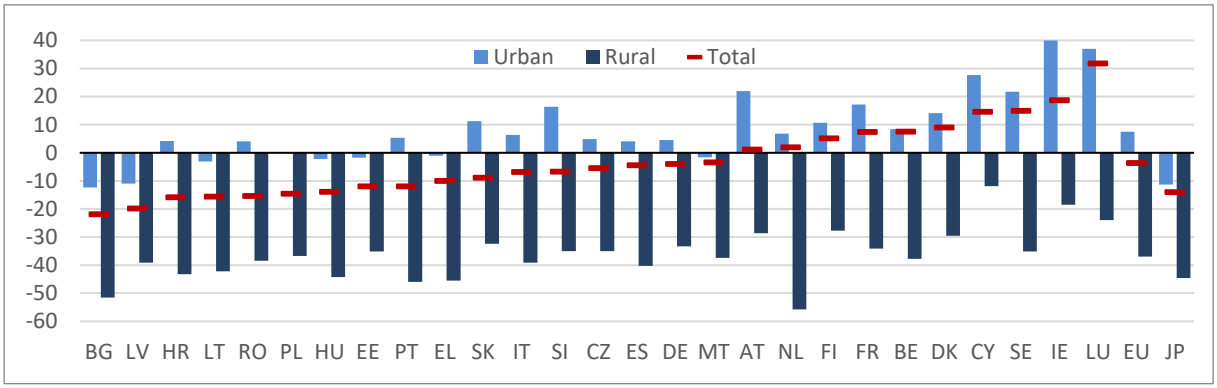
2.2.3. Projected changes in urban and rural populations

According to UN population forecasts, there will continue to be a shift from rural areas to urban over the next 30 years. In the EU, population in urban areas is projected to increase by 7% over the period 2020 to 2050 while population in rural areas is projected to decline by 37% (Figure 10).In Japan, the shift is in the same direction, but it is projected to be less pronounced. Here, however, population in both types of area in projected to decline, but by much less in urban areas than in rural areas, by 11% as against 45%.

Within the EU, population in rural areas is projected to decline markedly in all Member States over the next 30 years, by over 30% in all countries apart from Cyprus, Ireland and Luxembourg. By contrast, population in urban areas is projected to increase in all but 7 Member State – in 5 of the Central and Eastern European

countries together with Greece and Malta – though in 6 others, the increase is only 5% or less (in another three of the Central and Eastern European countries to together with Portugal, Spain and Germany).

Figure 10 Projected changes in population in urban and rural areas in the EU and Japan, 2020-2050 (%)



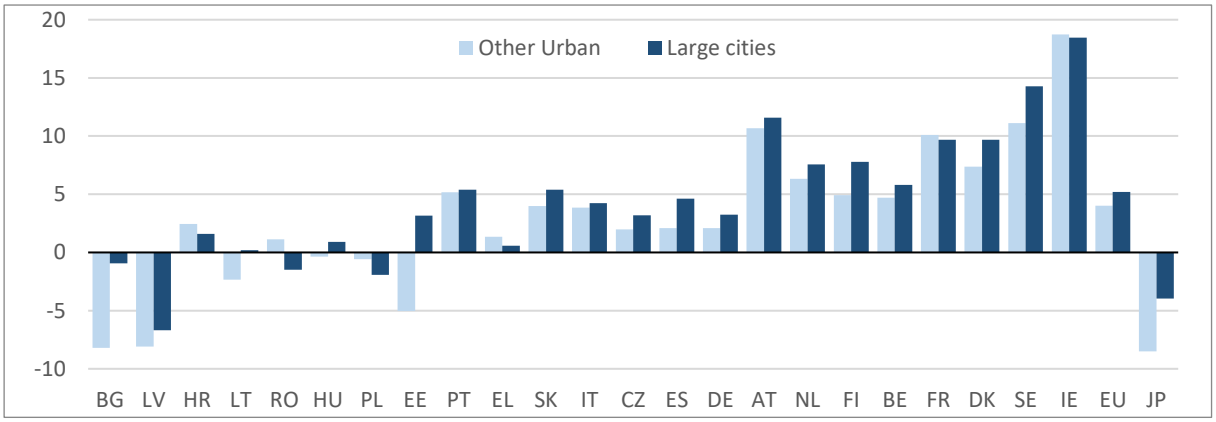
Note: In France, only Metropolitan regions are covered.
Source: UN World Urbanization Prospects: The 2018 Revision Data, own calculation.

2.2.4. Projected changes in population large cities and other urban areas

The UN has made projections for changes in population in large cities (again defined as those with population of 300,000 in 2018) as opposed to other urban areas, though these extend only to 2035. These indicate a continuing increase in population in the EU in large cities and a smaller one in other urban areas, though the difference is only small. On average, population in the former is projected to rise by just over 5% between 2020 and 2035, slightly more than the projected increase of 4% in other urban areas (Figure 11). In Japan, where a decline is forecast for both sizes of city on average over these 15 years, in contrast to the relative changes over recent years, the decline in large cities is projected to be smaller than in other urban areas, population falling by 4% in the former and 9% in the latter.

Within the EU, in most Member States – in all but 6 (Croatia, Romania, Poland, Greece and marginally in France and Ireland) – the projected growth of population up to 2035 is bigger in large cities than in others, or the projected decline is smaller. Accordingly, the effective shift of population across the EU towards large cities is expected to continue and in Japan a similar pattern of change is forecast.

Figure 11 Projected changes in population in large cities and other urban areas in the EU and Japan, 2020-2035 (%)



Note: Large cities are defined as those with population of 300,000 or more. Cyprus, Luxembourg, Malta and Slovenia are excluded because they have no cities of this size. In France, only Metropolitan regions are covered.

Source: UN World Urbanization Prospects: The 2018 Revision Data, own calculation.

2.3. Concluding remarks

A number of points emerge from the above review of demographic trends:

- Over the past 10-15 years, population has declined in a number of EU Member States, as it has in Japan. In most of those where it has not declined, the natural reduction in the population has been more than offset by net inward migration, either from other EU Member States or, to a larger extent, from third countries. Projections, based on current trends in fertility and mortality rates, are for the natural decline in population in both the EU and Japan to continue and at an increasing pace. How far this leads to a reduction in total population depends on the scale of net inward migration. If this diminishes in the EU as projected, then it will not be sufficient to offset the natural decline, while in Japan, where it is very small, it would have to increase substantially to prevent total population from falling significantly.
- A corollary of the low birth rates, which underlie the natural decline in population, and of the increasing life expectancy, which tends to accompany rising income levels (if not inevitably), is a growing share of the population aged 65 and over – or, more pertinently, of people who are elderly and predominantly in retirement. In Japan, this share is already approaching 30% and is projected to continue increasing towards 40% over the coming years. In the EU, the share is much smaller on average, at only just over 20%, but it is projected to increase at an even faster pace than in Japan in the coming years. The growing share of the elderly is coupled with a declining share of the population of working-age, resulting in an increasing old-age dependency rate, and the likelihood of fewer people in employment effectively needing to support an increasing number in retirement.
- The above demographic trends have been accompanied by a long-term shift in the spatial distribution of the population from rural areas to towns and cities in both the EU and Japan, a shift which shows no sign of coming to an end and which is likely to continue in future years. The implication is that population is likely to decline markedly in rural areas in the EU as in Japan in the coming decades.
- At the same time, in the EU at least, there is evidence of the growth of larger cities relative to that of smaller ones. This is projected to continue in future years, though the increase in population in urban areas, irrespective of their size, is likely to be small on average and in a number of case, population is set to decline. In Japan, where the same phenomenon has not been so evident in the past (at least on the basis of the definition of large cities adopted here), population in both larger and smaller cities is projected to decline in future years, though less in large cities than others. As in the EU, the rate of change is likely to vary markedly between individual cities, with some experiencing a rapid pace of decline and others perhaps little decline at all.

There is also evidence in Japan over recent years of a shift in population from more peripheral parts of cities to more central parts, a trend which in the EU is mainly visible in cities in the higher-income, more economically-advanced countries. This too may well continue in future years (though no projections exist as such) as incomes grow and as more attention is paid by urban planners to the environmental consequences of continuing urban sprawl and the increasing encroachment of cities into the countryside.

3. Chapter 3: Challenges arising from demographic trends by type of city and the direction of policy responses

3.1. Categorization of the Target Cities

3.1.1. Overview of the city categories

As described in Chapter 1, this joint study has conducted an analysis by classifying cities into three categories. And in the Japanese part of th study, the large cities are sub-categorized into a central part and a suburban area The table below provides an overview of demographic trends, main challenges, and direction of policy interventions in each category of city. Since the size and characteristics of cities and regions in each category differ somewhat between Japan and Europe, these differences were taken into account in the selection of the cities and regions to be analyzed in detail in the case studies and so far as possible, an attempt was made to compare like with like, particularly in terms of the challenges faced.

Figure 12 Overview of the characteristics of cities in Japan anf the EU

Category	Large Cities [*]6		Middle sized cities [7]	Smaller towns and/or Rural areas[8]
		Suburban areas		
Demographic trends	**Japan and EU**: • Population inflow and concentration • Rapid aging • Increasing single-person household	**Japan**: • Old "new-town area" faces rapid aging society • Unbalanced • Age composition	• Japan and EU: • Population decline and rapid aging • Young generations' movement to large cities	**Japan and EU**:: • Larger population decline and ageing in smaller towns and villages
Main challenges	**Japan:** • Congestion during peak hours • Lack of nursing care facilities and professional staff • Isolated older people **EU:** • Congestion plus air pollution • Rundown areas + vacant buildings • Lack of green spaces	**Japan:** • Unbalanced population structure with a combination of aging district and family district • Simultaneous aging of people and facilities	**Japan:** • Increasing vacant houses and cavity in the central city area • Decreasing regional young workers **EU:** • Rundown central areas++old industrial sites • Need to: ○ attract new entrants and retain existing residents; ○ ensure job opportunities; ○ maintain access to essential services	**Japan:** • Insufficient successors in local industry • Maintaining public services **EU:** • Need to: ○ retain existing residents+attract new ones; ○ provide access to essential services; ○ improve transport links with neighbouring urban areas
Direction of policy interventions	**Japan**: • New transportation system with advanced technology • Developing a model for a healthy and silver society **EU:** • Redevelopment of old industrial sites, rundown areas • Development of knowledge-intensive services • Measures to reduce traffic in city centres	**Japan**: • Efficient facility maintenance and renewal planning • Support development for inclusive community	**Japan:** • Promoting retention of young people • Controlled shrinking with compact city plan • Strengthen public transportation network & services **EU:** As above plus: • Ensuring availability of essential services and leisure facilities	**Japan:** • ・Consolidation of infrastructure and public services • ・Regional cooperation for land management **EU:** As above plus: • Improvement in transport links; • Cooperation between neighbouring cities/local authorities in provision of services+facilities

6 Large cities within the three major metropolitan areas: Tokyo, Nagoya, & Osaka
7 Central cities of prefatures of relatively large scale and capacity
8 Small towns or villages in rural areas

3.2. Large cities

3.2.1. General information

Large cities are densely populated and form political, economic and cultural hubs in a national and regional context. In addition to the concentration of major domestic industries and services in these cities, the largest of them in Japan and the EU, especially the capital cities, are of global importance, forming a gateway to the country with people and goods flowing in from overseas.

In Japan, the population is concentrated in the three major metropolitan areas of Tokyo (Figure 13), Nagoya, and Osaka, which form metropolitan areas.[9] In this study, three major metropolitan areas are taken as being representative of large cities in Japan.

Figure 13 Examples of large cities in Japan

<Tokyo Metropolitan Area>

Tokyo Metropolitan (Approx. 14 million)

Yokohama City (Approx. 3.76 million), etc.

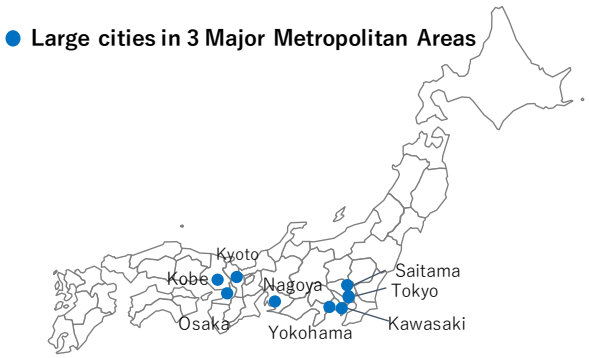
<Nagoya Metropolitan Area>

Nagoya City (Approx. 2.3 million), etc.

<Osaka Metropolitan Area>

Osaka City (Approx. 2.69 million)

Kyoto City (Approx. 1.48 million) , etc.



In the EU, population also tends to be relatively concentrated in the largest cities in Member States, especially the capitals. Very few of the largest cities in Europe, however, are facing population decline.This is mainly an issue for slightly smaller, though still large, cities, especially those which were the centres of ttraditional industries in the past, whch experienced substantial decline and severe loss of jobs in the 1970s and 1980s and which are still in the process of restructuring.. The large cities chosen for the case studies are Genoa in Italy and Bilboa in Spain, both of which fall into this category and which are broadly representative of old induistrial cities in the EUfacing population decline[10]. Both cities are signifantly smaller than the large cities examined in Japan, Genoa having a population of 565 thousand, though a metropolitan area of 1.5 million, and Bilbao, a population of 350 thousand and a metropolitan area of 1.1 million, but face similar challenges.

3.2.2. Challenges arising from demographic trends and policy response

3.2.2.1. Demographic trends

The population of three major metropolitan areas in Japan have seen a continuous inflow of population since the middle of the 1950s because of the higher education and job opportunities they offer.[11]

9 The Population Movement Report on the Basic Resident Register published by the Ministry of Internal Affairs and Communications Bureau of Statistics defines the three major metropolitan areas as the Tokyo, Nagoya and Osaka areas.Source: "Explanation of Terminology in the Population Movement Report of the Basic Resident Register" Ministry of Internal Affairs and Communications Statistics Office, https://www.stat.go.jp/data/idou/2.html

10 It was decided to exclude cities in former Communist countries in Central and Eastern Europe, which in many cases are facing population decline, but which are less advanced economically than cities in Japan, so that their experience, and policy responses, are less relevant,

11 Source: "Three major metropolitan areas" Ministry of Internal Affairs and Communications Statistics Office, https://www.stat.go.jp/data/idou/topics/topi60-4.html

The inflow has slowed in the Osaka and Nagoya metropolitan areas since the mid-1970s, while it is continuing in the Tokyo metropolitan area. However, the declining birth rate and ageing population are already progressing in all major cities, and it is estimated that the trend of overall population growth will weaken in the future as the declining birth rate and ageing population progress further so offsetting more of the inflow of people from outside, including in the Tokyo metropolitan area.[12]

In more detail, while population growth in the central part of three major metropolitan areas is estimated to continue, it is estimated to decline in the outskirts,[13] mainly as a result of the inflow of people from outside the metropolitan area to take up jobs in the large enterprises located there and to study in the universities and technical colleges which are also concentrated there.. In addition, the number of single-person households has been increasing, a corollary of the declining birth-rate and of population ageing, allied to the decline in the extended family.

In short, while Japan will continue to see concentration of population to large cities, tailor-made policy responses are required to address the differences between cities in the rate of population growth/decline in city centres and outskirts, in the pace of population ageing and in the increase in the number of single households.

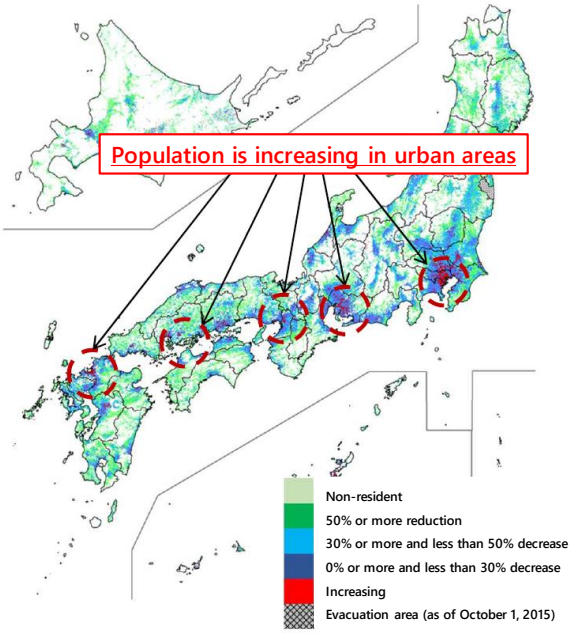


Figure 14 Population Change in 2050 (compared to 2015)

Much the same trends are evident in large cities in the EU, in that these are the main places which have experienced inflows from people from outside, both from within the country concerned and from outside, for the same reasons as in Japan, as well as a growth in single-person households. In the more developed countries too, as indicated in the previous chapter, there is evidence of a relative shift of population from the outskirts to the centre, reversing the tendency of earlier years.

The above observations are based on the historical trend of demographic changes over the long term. However, as a result of the impact of the COVID-19 pandemic, a tendency for population to decline in metropolitan areas is evident in Japan over the past year. In Tokyo, the number of people moving out to other prefectures increased asworking from home remotely became more common, the population in the city beginning to fall in July 2020. A reduction in the number of births was accompanied by .a simultanous increase inthe number of residents moving from Tokyo to the three neighboring prefectures (Saitama, Kanagawa and Chiba). The three, however, have seen a net outflow of people since then as outflows to other regions have outpaced inflows from Tokyo[14].

There are indications of the same tendency for people to be less in city centres in the EU, though this seems to be more a case of people commuting less as they work more from home, rather than of people moving

12 Source: "Medium- and Long-Term Regional Issues and Directions for Response" Cabinet Office Area Future Working Group, https://www5.cao.go.jp/keizai-shimon/kaigi/special/future/wg3.html
13 Source: "Situations concerning National Land (4)-1 (Current status and issues of national land and cities)" Ministry of Land, Infrastructure, Transport and Tourism, https://www.mlit.go.jp/policy/shingikai/content/001325315.pdf
14 Source: "Overview of "Population of Tokyo (Estimates)" (As of March 1, 2021)", Tokyo Metropolitan Government Bureau of General Affairs, March 29, 2020, https://www.metro.tokyo.lg.jp/tosei/hodohappyo/press/2021/03/29/03.html

out of the centres of cities to live in the outskirts or in neighbouring areas. This, however, could occur in the longer-term if the need to work in central city offices diminishes.

It remains to be seen whether the tendency in Japan for people to move out of city centres is more than temporary and whether the tendency in Europe to commute less proves to be permanent and is followed by a move out of city centres among those that live there. Both depend on whether working from home takes root.

3.2.2.2. Main challenges and policy responses

Large cities in both Japan and the EU face various challenges from demographic change and the tendency for them to attract inflowsfrom smaller cities and rural areas and, in Europe, especially, migrants from abroad. The resulting concentration of population means congestion and excessive traffic, resulting in air pollution, damage to buildings and people's health and a poor living environment. At the same time, they face the challenge of maintaining their competitiveness in global markets which is crucial for the competitiveness of the national economy and, accordingly, for real income growth, in the face of a decline in working-age population. This, in practice, means adopting new technologies to increase productivity and developing knowledge-intensive services and doing so in a sustainable way. In Europe, in old industrial cities, it means continuing the restructuing of the economy and to develop new sectors to provide the income and jobs needed.

This section summarises the main challenges faced by large cities and their policy responses in respect of (1) public finances, (2) the urban environment, and (3) the economy. Medium-sized cities and smaller towns and rural areas are examined in the following sections in the same way below In each case, concrete examples are given of the way that smart city solutions, in the form of digitalisation, artifical intelligence (AI), the internet of things (IoT), Big Data and ways of analysing these, sensors and so on, are being used to tackle the challenges concerned and to implement policy responses in a more efficient, effective and timely manner.

(1) Public Finances

Large cities are facing the challenge of developnig and maintaining infrastructure, services and facilities for the people and businesses located there amid growing fiscal pressure from the increasing demand for healthcare and social services, in particular, resulting from population ageing in the context of a declining, or at best, a slowly increasing, revenue base. They also face a challenge of increasing their resilience to climatic events and natural disasters caused by global warming and of responding quickly and effectively to these.

In response to these challenges, large cities are making efforts to maintain and improve the services and facilities they provide by initiating and expanding public-private partnerships, involving businesses in the financing of redevelopment, by introducing new taxes (such as water charges in Bilbao) and other sources of revenue and by taking advantage of smart solutions, in particular through the use of AI and IoT. Tokyo's policy of utilising smart solutions for reducing the risk from disasters and make it possible to provide accurate evacuation information by visualising the movement of people in urban areas is one example.[15] Another is the use of similar technologies to monitor and control flows of traffic and people in Genoa, as well as the use of robots and sensors in the same city to check the state of the new bridge over the river Polcevera to replace the one which collapsed in 2018.

(2) Urban Environment

As noted above, the living environment in central parts of large cities has been deteriorating over time as a result of traffic congestion, air pollution, cramped housing, rundown areas and a lack of green spaces. In addition, the sense of local community in many places has diminshed with the influx of people from other areas and, in the EU, in particular, from abroad. This has led many older people to feel isolated and lacking

15 Source: "Otemachi, Marunouchi and Yurakucho Smart City Project", Otemachi/Marunouchi/Yurakucho Smart City Promotion Consortium, March 2020 https://www.mlit.go.jp/common/001341988.pdf

support. To address these challenges, the response has been to redevelop, and revitalise, inner city areas, to rehabilitate old industrial sites, to convert old abandoned buildings for new uses, to create more green spaces and to clean up contaminated soil and polluted rivers. In Europe, in addition, it has been to regenerate riverside and coastal areas, previously used by heavy industry or by docks, and to locate recreational and cultural facilities there.

At the same time, efforts have been made to reduce cars in inner city areas, by imposing restrictions on motor vehicles and creating traffic-free zones and by encouraging and facilitating the use of more environmentally-friendly means of getting around, including, in particular, walking and cycling. (In Bilbao, for example, increasing parts of the city have been made pedestrian only zones, the maximum speed of vehicles on city streets has been reduced to 30 km an hour, metro and tram lines have been extended, traditional buses have been replaced by electric-powered ones and e-bike sharing scheme has been introduced. In 2019, 64% of journeys were made by foot and only 11% by car.)

A number of large cities in both Japan and the EU have also been at the forefront of developing innovative measure to support older people, making use of smart solutions. In 2018, Bilbao adopted a Pact for Social Policies to promote active ageing and give older people a better quality of life. Its Age-Friendly City programme has led to the introduction of innovative services for those living at home, such as a telemonitoring service to check the health of people with chronic conditions, a Home-Help service that offers technical support to adapt homes for elderly care, and an 'Active Search' programme (*Mirada Activa*) to identify and support those who live alone. In addition, in two public parks, the city has installed a range of physical as well as cognitive games for older people suffering memory loss and loneliness to enable them to improve their attention span and memory and to interact with others.

In Genoa, the FRAGILE project (Frailty Research and Assessment – Intervention in Ligurian Interdisciplinary Laboratory for the Elderly) has been implemented to make use of technologies to enable older people to live independently, to support their well-being, to help identify those at risk of frailty and functional and cognitive decline and to improve the quality of homecare services.

In Japan, advanced innovative initiatives are being promoted, such as the implementation of a MaaS platform[16], measures to identify vacant housing using AI, and the provision of high-quality services, efficiently managed, through the construction of an urban OS to coordinate and integrate them and the implementation of various IoT technologies.

(3) Economy

As regards their economies, large cities have had to adapt quicly to a rapidly changing environment, with accererating innovation and digital technological advances in the context of a need to reduce emissions and their use of fossil fuels and a decline in population of working age. In Europe, this has been accompanied in many cases with a continuing need to reduce reliance on decliining industries, for environmntal as well as economic reasons, since they tend to be major carbon emitters.

To address these challenges, cities are making much effort to support economic restructuring, to stimulate the development of knowledge-intensive services and high-tech manufacturing. In addition, in Europe, in particular, such efforts have been extended to developing cultural and leisure activities with the prime objective of increasing tourism to provide both additional income and jobs. In Bilbao, for example, the Guggenheim Museum was built in the 1990s in a former industrial area close to the city centre and designed by a renowned architect with the express intention of attracting tourists, which it was extremely successful in doing. Such culture-led urban regeneration became known as the 'Bilbao effect' and is a strategy that many cities have copied since.

Equally, the age-friendly city initiative which has been implemented in a number of cities in Europe has highlighted the economic opportunities created by population ageing as well as the challenges it presents.

[16] To perform integral functions such as data import, data storage, journey planning, optimisation, ticketing, payment and communication.

The city of Genoa, for example, hosts each year the Silver Economy Forum, an international event designed to highlight the needs of the growing population aged 55 and over and to promote the development of enterprises to produce the goods and services to cater for those needs.

In both Japan and the EU, efforts have been made to increase the participation of women and older people in the work force through improving the working environment and the possibilities for enjoying a better work-life balance by, in particular, expanding child and elderly care facilities.

Smart soluations have also beein used to provide more support to businesses, through, for example, in Japan, DX –the digital transformatioon of processes – to enable real-time information collected from sensor devices installed throughout the city to be used to monitor and analyse movements of shoppers and tourists as well as traffic, information which can then be made available to businesses so that they can plan their marketing and sales strategies. In Europe, a number of cities have adopted a 'living lab' approach to smart specialisation, which involves establishing a common testbed infrastructure on which companies and researchers can cooperate in developing innovations.

What are suburban areas in Japan?

Large-scale residential areas (commuter-town) exist in the suburbs of many urban areas in Japan. They are called "new towns" and have developed their own characteristics. They were constructed against the background of the concentration of population in urban areas during the period of high economic growth from the 1950s to the 1970s as overspill residential areas for over-crowded cities. According to the Ministry of Land, Infrastructure, Transport and Tourism, "Nationwide New Town List (Prepared for fiscal year 2018)[17], there are currently about 2,000 new towns across Japan.

In many new towns, development has been carried out gradually and intermittently over a long period of time, with many of those moving in being families with small children,. As a result, even in the same new-town area, the demographics are different between the initial 'move-in' area and the later ones, and in the areas where ageing has progressed furthest – those which were initially established – they have become 'old' rather than new towns. There are areas, therefore, which are largely populated by older people because of the earlier exodus of their children, in which the housing and infrastructure are also ageing at the same time, and there has been insufficient response to the need to establish earthquake resistance standards of the buildings.

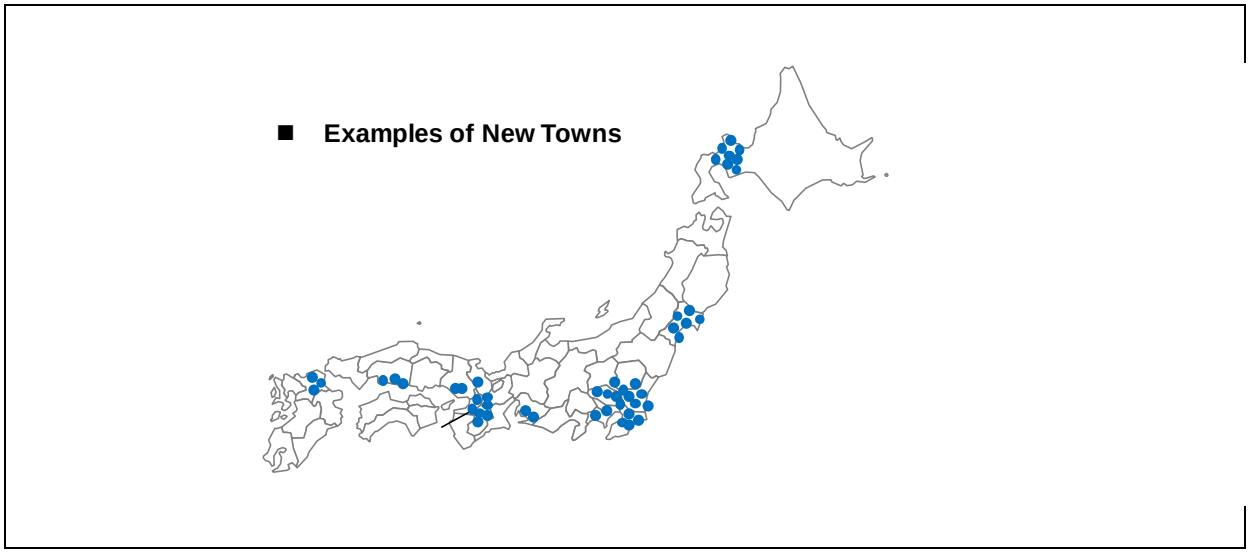
There, is, therefore, as need to create a system for maintaining infrastructure and sustaining communities. In response, , in some new towns, efforts have been made to increase their attractiveness t through renovation and the provision of accessible facilities, especially to younger people so as to restore more age balance to the community,. In addition, initiatives are being implemented to support older people in the community under the concept of a 'smart wellness' city that links medical care, nursing care, and welfare with community development.[18]

For example, in Tama New Town, the main developer and the company responsible for housing are jointly undertaking a housing complex renovation project which is creating spacious interiors in a modern style that is popular among the younger generation. This is helping to rebalance the age structure of the areas concerned by young people moving in.

[17] Source: "Residential Land Supply / New Town", Ministry of Land, Infrastructure, Transport and Tourism

18 "The city of Kenzai and the Urban Renaissance Agency have concluded a partnership agreement to establish a comprehensive community care system for Tama City! The Community General Support Center and the Elderly Watchful Consultation Service will be established in Tama New Town!" , Urban Renaissance Agency , November 16, 2016 https://www.ur-net.go.jp/east/press/lrmhph000000bvzh-att/ur2016_e1116_teiketsusiki.pdf

Figure 12 Examples of New Towns in Japan

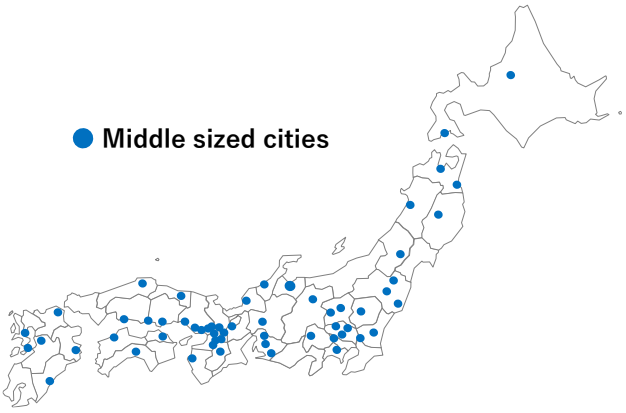


3.3. Medium sized cities

3.3.1. General Information

Medium-sized cities, which, in many cases, are large in regional terms, have populations of around 100- 500 thousand (such as prefectural capitals in Japan) are facing challenges from both a natural decline in population and net outflows of people, often to larger cities. .

Figure 16 Examples of Middle sized cities in Japan



- Asahikawa City, Hokkaido Prefecture (Approx. 340,000)
- Fukushima City, Fukushima Prefecture (Approx. 290,000)
- Toyama City, Toyama Prefecture (Approx. 420,000)
- Kurashiki City, Okayama Prefecture (Approx. 480,000)
- Matsuyama City, Ehime Prefecture (Approx. 510,000)
- Nagasaki City, Nagasaki Prefecture (Approx. 410,000)

In Europe, medium-sized cities are scattered across the continent and in many smaller countries, may include the capital. Indeed, in some countries, only the capital can be categorised as a medium-sized city.

3.3.2. Challenges arising from demographic trends and policy responses

3.3.2.1. Demographic trends

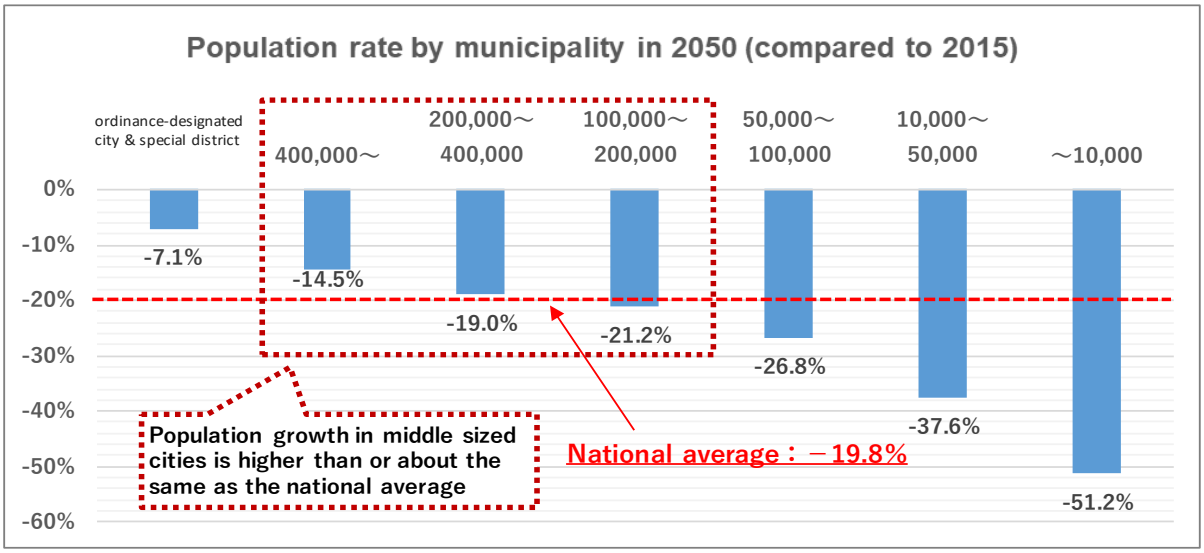
The total population of medium sized cities in Japan has been decreasing due not only to the natural decrease in population but also to the migration outflow of young people to larger cities to take up higher education

and employment opportunities there, and this tendency is expected to continue. In addition, while the young population is continuing to decline, the older population is increasing and the rate of ageing is on the rise.[19]

The population of cities of between 100,000 and 400,000 is, therefore, estimated to decline by 20% by 2050, which is more than that of large cities.

The number of single-person households, on the other hand, is tending to increase, especially among older people, because of the demise of the extended family.

Figure 17 Population decline in middle sized cities in 2050 (compared to 2015)[20]



Many cities in Europe of this size face very similar challenges to those in Japan, a natural decline in population putting a premium on attracting new people, especially young families, to move in, along with new businesses to provide the jobs for them, while at the same time on trying to retain existing residents and discouraging them from leaving.

3.3.2.2. Main Challenges and Policy Responses

(1) Public Finance

In medium sized cities, as in larger ones, an ageing population has resulted in a growing demand for healthcare and social services. This has put pressure on public finances at the same time as sources of revenue have tended to diminish.

As a response, cities have attempted to maintain the size of the population, and the revenue base, by trying to attract new entrants through implementing policies to make them pleasanter places in which to live, through new housing developments and increasing the provision of cultural and leisure facilities as well as essential services. In Japan as well as in Europe, such policies have been accompanied by the provision of childcare and other support to young familiies.. In addition, in both places, efforts are being made to reduce administrative costs through more efficient management of social capital and services, including through the use of new technologies.

19 "Second Basic Plan for Toyama City Comprehensive Plan (Basic Plan for the First Half of the Plan)" , Toyama City , https://www.city.toyama.toyama.jp/kikakukanribu/kikakuchoseika/sogokeikaku/kousouzennki_2.html

20 See 13 above

In Europe, the pressure on public finances has been met by medium-sized cities seeking finance from regional and national authorities, as well as from EU sources, especially the European Regional Development Fund (ERDF) through undertaking cooperative ventures, such as joint infrastructure projects.

The pressure has also been met by making use of smart solutions to reduce the cost of the provision of services and support. In Kortrijk in Belgium, for example, robots have been introduced for cleaning streets and digital support implemented for care of older people. Indeed, more generally, technology is increasingly being used for elderly care, in the form of the development of domotics, or 'smart homes', which involves the installation of devices using cameras and sensors to improve security, the use of the internet to control appliances remotely and smart lighting and heating systems to increase energy efficiency. E-healthcare is also being developed to remotely diagnose health problems and care robots are being used to provide assistance in carrying out routine tasks.

Moreover, applications are being targeted not just at professionals but also at informal carers and at older people themselves, especially those living alone. Prevention and remediation of social isolation has, therefore, become a priority in many cities, along with remote monitoring, supporting care-givers, and creating 'dementia-friendly' neighbourhoods.

(2) Urban Environment

In Japan's medium sized cities, residential areas expanded into suburbs as the population grew during the period of high economic growth, which coincided with an increase in the ownership of private cars. In the 1980s, large-scale shopping centres and recreational facilities were located in the suburbs because of deregulation, adding to the use of private cars and increasing urban management costs. At the same time, land and housing became vacant in areas where population was declining.

In response, many medium-sized cities have attempted to consolidate urban functions, through such means as location optimisation plans to improve the efficiency of the provision of services and facilities. In particular, many cities have reorganised such provision around public transport networks with the aim of creating a more compact city. For example, the city of Toyama has been facing the urgent issue of revitalizing the city centre, and to this end, it introduced Japan's first full-scale LRT (Light Rail Transit), the Toyama Light Rail, in 2006. Since then, the city has continued to develop the network and improve the service provided. In addition, the city has subsidized the construction of apartment blocks and the acquisition of houses in order to enable people to live in the areas close to the rail lines. It has also promoted the integrated urban development of the north and south sides of the Toyama railway station through rehabilitating land project around the station. In recent years, the city has encouraged the use of public transport and created a bustling city centre though the development of the LRT and a pedestrian only shopping mall together with organising events in the city. In addition, efforts have also been made to encourage the use of under-utilized, or vacant, land and buildings by setting up "vacant housing banks"so as to bring upply and demand more into balance.

In the EU too, policy in a number of medium-sized cities has focussed on improving both public transport, while making it more sustainable, as well as transport links with other cities nearby. It has also centred on improving the accessibility of essential services. In Kortrijk, for example, ensuring the proximity of public services to transport nodes has been an important criterion in spatial development projects. Equally, there has been concerned to limit the loss of open spaces by increasing the density of existing built-up areas and bundling multiple functions and facilities together, while at the same time ensuring that there are ample green spaces in the city and sufficient affordable housing of a type to attract young families. In addition, it has attempted to take cars out of the city by giving highest priority in development projects to the needs of pedestrians, followed by those of cyclists and then public transport.

The Covid-19 pandemic has accelerated the trend towards cycling significantly, and the city authorities have reinforced this by creating designated 'cycling zones' and 'cycling streets', in which cars are still allowed, but with their maximum speed limited to 30 km an hour and being not permitted to pass cyclists, who are entitled to use the entire width of the street.

Kortrijk has also demonstrated that cities do not necessarily need to be large to use new technology to develop smart city solutions, being at the forefront in Belgium in terms of applying digital technologies to urban management issues. Examples include: the use of smart security cameras to report suspicious or unusual movements, smart parking sensors to detect when a car is parked and how long it stays, sensors located throughout the city to measure air quality, analysis of mobile phone and credit card payment data to help guide tourist and marketing policies and robots for street maintenance.

(3) Economy

In medium sized cities in Japan, the declining birth rate, population ageing and people leaving to move to other pplaces, especially larger cities, have led to shortages of local entrepreneurs, including of children to take over family-run businesses.. This, together with the relative growth of national and global companies has led tothe decline of local busineses and a general loss of vitality of the cities themselves, as well as of their income, with rundown inner city areas being one of the most viisble signs of this.

In response, the local authorities concerned have sought to increase inflows of people from outside and supporting SMEs, as well as new start-ups, through incentives. An an increasing number of cities (including Toyama) are taking initiatives to create new businesses, especially in new sectors and innovative activities by setting up incubation offices to foster innovative business ideas and to support new start-ups. There are also many cities which have taken advantage of culural and environmental assets to promote tourism as a source of income and driver of local businesses, as well as to attract companies and people to move in.

The latter is equally true of medium-sized cities in Europe, which have used the attractiveness of their locations to entice new entrants to set up business there. As in Japan, they have also focused on supporting SMEs, not necessarily directly through financial incentives, but by pursuing policies favourable to business development, by ensuring the availability of essential services and leisure facilities and by creating an attractive living environment. For smaller cities, in particular, it is about portraying the city as having many of the amenities and attractions of a large city, while possessing the advantages of a small city in terms of lack of congestion, ease of moving around, affordable and high-quality housing and a pleasant and ‘green’ environment, (Kortrijk is portrayed in its promotional literature as having both ‘large city allure’ and ‘village charm’.)

While some manufacturing typically still takes place in medium-sized cities, the economy is invariably service-oriented, supported in many cases by regional centres of governance and higher education institutes being located there.

In addition, in many cities of this size, as in Japan, the main shopping areas in the centre had become rundown, partly because of the development of ‘out-of-town’ shopping complexes, and efforts have been made to renovate them to make them more attractive to shoppers, including from outside the city. In many cases, this has involved making them pedestrian only and providing free or low cost transport from car parks on the outskirts of the city.

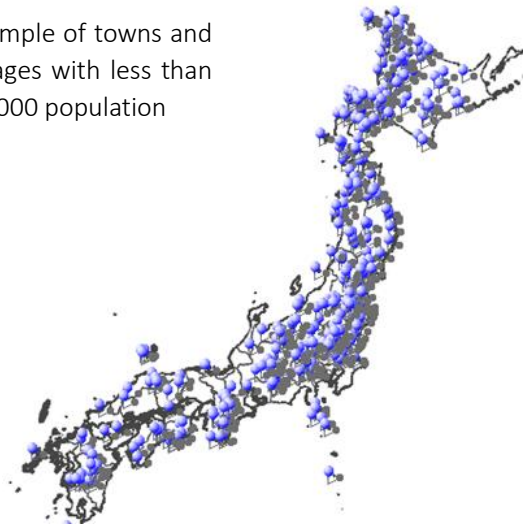
3.4. Small towns and villages

3.4.1. General Information

Figure 18 Distribution of smaller turns/villages in Japan

Small towns and villages (such as those with a population below 10,000) in rural areas are facing particularly severe challenges from rapid population decline, espeicially as regards maintaining public and other essential services. .

Example of towns and villages with less than 10,000 population



In Japan, as in Europe, such towns and villages[21] are located right across the country. The two, cases selected for the present study are:

- Shimokawa Town (Hokkaido, approx. 3,500 population)
- Minamiyamashiro Village (Kyoto prefecture, approx. 2,600 population)

In the EU, it is difficult to find data on villages of the same kind as in Japan[22]. Accordingly, the equivalent EU case study is that on Zuid Limburg in the Netherlands which as being similar in terms of the challenges faced. This is a largely rural region with villages but also small cities and towns and it is the latter, and their policy responses to population decline, which are the focus of attention here.

3.4.2. Challenges arising from demographic trends and policy response

3.4.2.1. Demographic trends

In Japan, the population in many small towns and villages has been on a declining trend since the period of high economic growth and this trend is expected to continue and at a substantial rate. It is projected that small town and villages will seea decline in population of over 50% by 2050, i.e.a reduction which is much bigger than in larger cities .[23] In small cities, population of working age, as well as of young people is declining significantly, while the number of older people of 65 and over is increasing, both at a rate above the national average, so that the old-age dependency rate is also increasing faster than nationally. These tendencies are even more marked in smaller towns and villages.[24] At the same time, the relative number of households in which an older person is living alone is increasing, as young people move out to take up jobs or pursue education elsewhere.

21According to the Local Autonomy Law, in order for a village to become a town, it is necessary for each prefecture to meet the requirements specified by its ordinance (population, number or percentage of permanent households, necessary public offices, etc., and the ratio of the working population by industry, etc.). The most common population requirement for a town is to have at least 5,000 inhabitants. There are no specific requirements for villages, so that any place which does not meet the population requirements for town, automatically is labelled a village.

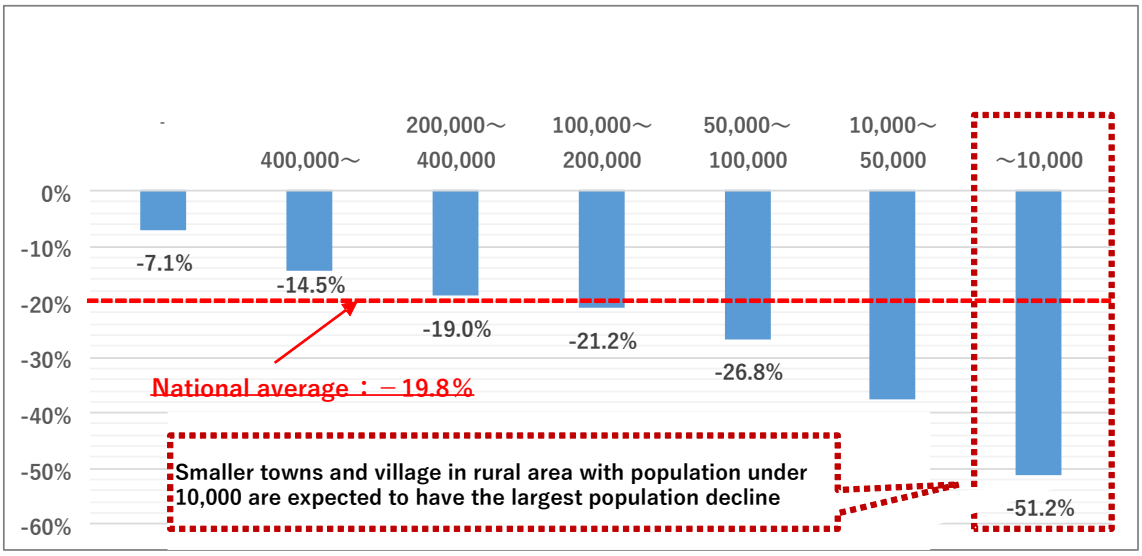
[22] It is also the case that responsibility for rural areas and villages in the European Commission lies to a large extent with DG Agriculture rather than DG Regional and Urban Policy.

23 See 13 above**¡Error! Marcador no definido.**

24Source: "Status of Small Municipalities: Number of Organizations, Population, Age Structure, Financial Status, etc." Ministry of Internal Affairs and Communications, https://www.soumu.go.jp/main_content/000020461.pdf

Nevertheless, there are examples of smaller towns and villages seeing inflows of population as a result of successful initiatives to attract people from larger cities, initiatives which may have been given a boost by the Covid-19 pandemic and the reduced need for people to be physically present in offices.[25]

Figure 19 Population decline of small municipalities in 2050 (compared to 2015) [26]



In the EU, small towns and villages in rural areas have also tended to expeerience the biggest decline in population over recent years in most countries and are expected to continue to do so over the coming years (see Chapter 2 above).

3.4.2.2. Main challenges and policy response

(1) Public Finances

In Japan, small towns and villages have been forced to scale down and reduce their finances as a result of the natural decline in population coupled with an outflow of people moving to other area, making it difficult to maintain an acceptable level of public services and even an administrative presence. In consequence, such places, in the same way as medium-sized cities, have made efforts to attract people to move in and to encourage those already there to stay. Similar efforts have been made in comparable places in the EU, through highlighting the advantages that small towns and cities have over larger ones in terms of the peaceful environment, the countryside around and the lack of congestion.

In Japan, where it has proved difficult to maintain population the local authorities concerned have reduced the public services and facilities they provide to a scale which is more in line with their population. In this context, , in small towns and villages where there is a strong community spirit, efforts have been made to to complement public services and compensate for cutbacks by volunteers providing assisttance (such as in respect of monitoring and helping older people in need of care).. In the EU, local authorities which have found it difficult to maintain services have, in many cases, entered into cooperation agreements – or have informal understandings- with neighbouring authorities in a similar position to provide such services and facilities jointly, so that the people living these have reasonably close access to them.

25 According to "Population, demographic movement, and number of households based on the Basic Resident Register" (As of January 1, 2020), the representative towns and villages whose populations were showing an increase were Shimukappu-mura (Hokkaido), Aogashima-mura (Tokyo), Niseko-cho (Hokkaido), Yuzawa-machi (Niigata Prefecture), Tobishima-mura (Aichi Prefecture) and so on.
Source: "Population, demographic movement, and number of households based on the Basic Resident Register (As of January 1, 2020)" Ministry of Internal Affairs and Communications, August 5, 2020
https://www.soumu.go.jp/menu_news/s-news/01gyosei02_02000220.html
26 Source: See 13 above

They have also made use of smart technologies to reduce the cost of service provision, particularly labour costs, as well as the need for people to travel, by introducing and extending e-services. This applies especially to elderly care, where cameras, sensors, the internet and fast broadband connections are being used to diagnose health problems and to detect instances where help is required. An example in the Zuid Limburg region is the Maastricht Electronic Daily Life Observation Tool (MEDLO), which is a tablet-based device specially developed to monitor people with dementia living in long term care homes, More specifically, it checks their involvement in activities, the physical environment in which the activities take place, their social interaction with others and their emotional well-being.

There are also instances of municipalities in rural areas banding together to develop and implement smart city solutions to the provision of services in order to increase the scale of research projects that can be undertaken and to provide a larger space for putting them into practice.

(2) Urban Environment

Population decline in rural areas has often been accompanied in both Japan and the EU, not only by a reduction in public services, but also by degradation in infrastructure and facilities because of a lack of finance for maintenance and renovation. This extends to transport links, to the road and rail network, in particular, where services have been cut back or withdrawn completely, creating difficulties for people to be able to access essential services and facilities, including shops as well as communal services. Improving transport links and public transport is, therefore, critical for towns and villages to be able to maintain their populations and to attract people to move in from other areas along with ensuring a pleasant living environment. It is also critical for the local authorities in such places to be able to cooperate over providing essential services and facilities.

Some effort in both Japan and the EU has, therefore, gone into upgrading road and rail links and improving public transport, including through the use of new technologies, such as on-demand transport and the flexible provision of services according to user needs.

In addition, measures have been taken to protect the countryside which lies between the urban areas concerned and which is a major attraction for people considering moving into the towns and villages concerned from other areas. This involves planning spatial development so that it is concentrated in either the urban areas or in designated parts of rural areas where development has already occurred or which do not threaten the landscape or damage the environment. It implies redeveloping, or regenerating, urban areas which are rundown or in need of modernisation.

Minamiyamashiro Village, for example, has concluded an agreement over the "*Vision for the Coexistence of Settlement and Independence Blocks*" with neighbouring municipalities in an effort to ensure that the housing and essential facilities are present for people to live in the area they cover, that there is an economic base for the area to be self-reliant and a source of local pride, and that the area is revitalized. In the area in which the village is situated, each municipality has undertaken to complement each other in developing and improving the infrastructure needed for daily life and to sustain jobs, such as a healthcare system, childcare support, a disaster prevention system and a public transport system. They have also undertaken to improve the attractiveness of facilities and amenities throughout the area and to create a lively environment and a community where people want to live.

It also reinforces the need for cooperation in planning between the local authorities concerned, In Zuid Limburg, for example, 7 authorities have joined together to form Parkstad, an administrative area which is responsible for spatial planning and for determining policies on housing, mobility and economic development. In addition, protected status has been given in the region to 'Heuvelland', a hilly and predominantly rural area, with a number of small villages, in between the three main urban areas and a policy of developing tourism to supplement income from agriculture, as well as creating an attractive place to live so encouraging those living in the region to stay and others to move in.

(3) The Economy

As in medium-sized cities, but even more so, small towns and villages in Japan and the EU are facingeconomic challenges from a declining work force and an ageing population, coupled with the decline of tradtional industries and the disappearance of family-run businesses, such as local shops., as the owners age and their children move away. These challenges also extend to agriculture, where in Japan, the retirement of owners, shortage of workers and the consequent absence of management have led to farmland deteriorating and food supply declining, as well as water supply being threatened.

In response, small towns and villages are implmenting measures to maintain the local work force, especially young people, and to support the sustainable development of local industries which are rooted in the area, in some cases, because of the raw materials and know-how involved.. Measures are being taken to support the sustainable development of local industries, and in Japan, support is available from local authorities and the national government for this. Minamiyamashiro Village, for example, has established "*Ocha-no-Kyoto Minamiyamashiro Villag*e", with the goal of "making ti possible to contue to live in the village", and an intra-regional recycling-based industrial system. This is a model of a joint-stock company taking charge of public services, initiating a cycle of job creation in the community, esablishing a brand which is recognised , and increasing the motivation for local production to meet local demand, which in turn creates a sense of attachment and pride in the community..

In the EU, support extends to the development of creative industries, as well as traditional crafts, with disused buildings, such as old factories and warehouses, being converted into workshops to house a number of small businesses. It also extends to developing higher education and research facilites across the region, as in Zuid Limburg, where the Brightlands development consists of establishing campuses in each of the three urban areas, each specialising in a particular area of innovation, and of providing space and facilities for companies to use. The aim is to attract existing companies, recent start-ups and entrepreneurs wanting to start a business in the area of specialisation concerned and to initiate a cluster development process.

One of the campuses concerned is the Smart Services Campus which provides flexi desks and office and meeting spaces for data-driven companies, as well as a number of laboratories, such as the MKB Datalab Limburg, which provides practical advice and support on data science to SMEs and the Blockstart programme for use of blockchain technologies[27] in SMEs.

In Japan as well as the EU, support is also going to developing tourism, in part to supplement income from agriculture, though this is combined with a concern to protect the countryside, which is key to attracting tourists, as well as encouraging people from outside to take up residence in the region.

An effect of the COVID-19 pandem has been to make it poissible to work remotely. This has increased the attractiveness of the phenomenon known as "regional migration," or "dual residency," which means people living for periods in rural areas or particular places, other than twhere they primarily live,.

3.5. Summary and opportunities for smart solutions

This chapter has examined demographic trends, main challenges and policy interventions in three urban categories in both Japan and the EU. The present section summarizes the abiove findings and focuses on the applicability of smart city solutions to implement these policies and the opportunities they provide.

[27] A blockchain is a digital ledger of transactions that is duplicated and distributed across an entire network of computer systems, in a way which makes it impossible to change or hack.

3.5.1. Common but different level of challenges arising from demographic trends

All three urban categories have experienced the impact of demographic change, especially low birth rates and population ageing. However, the impact is quite diverse, depending on the size of population and regional characteristics, as are the policy challenges.

For example, large cities need to address the negative impact from concentration of population, such as traffic congestion, preventing disasters (e.g. support for stranded commuters), and deteriorating living environments, including rundown areas and housing scarcity.At the same time they have to maintain the internatinonal competitiveness of industry through digitalization, innovation, de-carbonization and so on, to maintain their competitiveness in the face of a declining working age population. Suburban areas of large cities in Japan, where population in most cases is declining, tend to focus on improving the living environment to attract people to move in, such as through the New Town Revitalization scheme.

Medium sized cities are also experiencing a reduction in population, as many of them in both Japan and the EU are suffering from a long-term decline in local industry and an outflow of young people to larger cities for higher education and employment purposes. These tend to have a dispersed urban structure and a ligh use of private cars for daily mobility.

Small towns and villages face an even large decline in population and more rapid ageing and here the focus tends to by on maintaining essential services, joining forces with neighbouring towns and villages to help them do so and increasing interaction with larger cities nearby..

As summarisd below, smart solutions provide an opportunity to address the disparate challenges that all cities, towns and villages face more effectively and at lower cost.

3.5.2. The potential of smart solutions

For large and medium sized cities, smart city policies are closely linked to urban renewal and economic regeneration and they provide opportunities for maintaining and improving economic competitiveness, sustainability and social inclusiveness in the face of the advsrse effects of demographic trends.

Sustainable energy use and mobility are one of the most important aspects of smart policies in larger cities in both Japan and the EU. E-mobility, shared transport, and positive renewable energy districts with smart grids are increasingly incorporated into smart city strategies. Both Japanese and European cities are promoting the use of smart solutions to improve the well-being of older people by making use of new technologies, such as remote monitoring and diagnosis. Bilbao's Age-Friendly City programme and the Smart Wellness policy of Tama New Town are among the initiatives comcerned.

Collaboration between the public, private and research sectors as well as ordinary citizens are key to the development of innovative solutions, Genoa's smart city association and Takeshiba's urban data platform (City OS) being examples of the basis for this.

Smart solutions are also a means of increasing the safety and security of cities. The city of Genoa, for example, has installed a network of sensors to monitor the safety of a new bridge spanning the river estuary and there are similar initiatives in Japan to check ageing infrastructure.

The adoption of smart solutions is not restricted to larger cities. They also provide opportunities for achieving sustainable, inclusive growth for smaller cities facing ageing and population decline. Many smaller towns and villages are using digital technologies to improve public services, including public transport and elderly care, and to maintain infrastructure. In both Japan and the EU, the collection, analysis and reporting of real time data combined with more environmentally-friendly public transport are improving both its usability and sustainability. The Shop & Go system in Kortrijk and Toyama's LRT system are examples, while smaller towns and villages, including Minami-Yamashiro in Japan, are increasingly using demand-based transport systems to ensure essential mobility at lower costs.

Smart solutions are increasingly being used in elderly care in smaller cities as well as large ones to ensure the well-being of older people and to maintain the financial sustainability of the local authorities concerned. Maastricht's Electronic Daily Life Observation Tool (MELDO) in Zuid-Limburg to monitor people with dimentia living in long-term care homes is one such initiative.

Smart solutions are eqially beung used to boost lthe ocal economy in small cities, towns and villages. Kortrijk's smart city policy includes the use of telecom and credit card payment data to help guide tourist and marketing policies, while, in Japan. smaller municipalities, including Shimokawa and Minami-Yamashiro, provide incentives to encourage more interaction of larger cities with them, an inititaive which the COVID pandemic has given a boost to.

In addition, there are a number of examples of rural municipalities in both Europe and Japab banding together to develop smart city solutions and to overcome the fact that it is not viable for themto attempt to do so independently.

4. Chapter 4 Summary and conclusions

4.1. Demographic trends

Demographic trends over the past decade or so are similar in Japan and the EU in terms of declining birth rates, increasing life expectancy and their consequences for population and its age composition. Though up to now, they have been more pronounced in Japan, this is likely to be less so in future years. More specifically:

- Over the past 10-15 years, there has been a natural decline in population, i.e. with deaths exceeding births, in Japan and in many parts of Europe. In Europe, however, this has been offset in a number of countries by inward migration. In Japan it has been the case only to a marginal extent.
- The forecasts for the next 30 years on current trends in fertility and mortality rates are for the natural decline to accelerate and for inward migration to be less than in the past in Europe and in Japan to be minimal. As a result, overall population is expected to decline in the EU as a whole over this period and in most Member States and at a faster rate than in the past in Japan.
- At the same time, there will be a growing share of the population aged 65 and over, coupled with a declining share of population of working age, which means fewer people in employment effectively needing to support an increasing number in retirement.
- Demographic trends have been accompanied by a long-term shift of population from rural areas to cities in both the EU and Japan, which is forecast to continue, implying a marked reduction of population in rural areas.
- There has also been a shift from smaller towns and cities to larger ones, which is equally forecast to continue, though to varying extents across both Japan and the EU, so that some smaller cities may experience some growth in population, others a steep decline.
- In Europe, though less in Japan, the extent of population decline, or whether there is a decline at all, is related in some degree to the historical development of cities, and, in particular, whether they were important locations of declining industries.
- There is evidence of a continuing shift of population in Japan from peripheral areas of cities to central ones, a shift which in the EU is occurring mainly in higher-income cities, but which could spread more widely as income grows and environmental concerns over urban sprawl intensify.

4.2. Challenges

- Demographic trends give rise to a number of challenges for cities and other areas from a declining population, a shrinking work force and growing numbers of older people across a range of policy domains:
- In the economy, the decline in the number of people of working age will tend to reduce the growth of income, or even lead to income falling, unless it is offset by increasing labour productivity and/or higher labour force participation, putting a premium on finding ways of supporting both.
- For labour productivity, the challenge is to find ways of increasing the goods and services which workers can produce by using new technologies and more efficient ways of working.
- For labour force participation, the challenge in both Europe and Japan is to increase the number of women in work and the number of older people remaining in employment.
- In public finances and public sector planning, the challenge is to maintain revenue as real income declines, or at most grows only slightly, and to respond effectively to the changing demand for public services as the age composition of the population changes.
- In healthcare and social services, the challenge is to meet the growing need for these as the number of older people increases, together with the number living alone without access to the care provided by the extended family.
- For spatial planning, the challenge is to respond to the needs of a growing population of older people with more limited ability to move around, as well as to maintain viable communities as younger people move elsewhere.
- For housing and the urban environment, the challenge is not only to accommodate the people moving in and to replace or renovate older housing but to ensure an environment which attracts new entrants with ample green spaces and plenty of leisure facilities and which at the same time is

safe and secure.
- For transport and mobility, the challenge is to ensure that people can move around easily as the pattern of settlements, and population density, changes and as the number of older people needing public transport increases.

While demographic trends give rise to challenges, they also open up opportunities. They can mean that public authorities no longer have to expand essential services to cater for a growing population – other than health and social care – but can focus on improving their quality, so long as, of course, revenue can be maintained.

The challenges posed by demographic trends are not the only ones. They are reinforced by other challenges of no less importance:

- A need to pursue a sustainable path of development that safeguards the environment and is compatible with a reduction in carbon emissions and air, water and soil pollution.
- A need to ensure that green spaces exist in urban areas not only for environmental but also for health reasons, to make the fullest use of existing buildings and built-up sites and to prevent urban sprawl encroaching into the surrounding countryside.
- A need to respond to the Covid-19 pandemic, to ensure that the policies put in place are compatible with protecting people against both the present outbreak and similar ones in the future, and to support those deprived of their income because of the restrictions put in place.
- A need reinforced by the pandemic for fast broadband internet connections in all areas.

The challenges listed above are common to cities and towns where population is declining in both the EU and Japan, though they tend to differ in magnitude according not only to the size of the city or town concerned but also its location, features and historical development:

- Large cities tend to face less of a challenge of attracting people to move in from outside to offset any natural decline in population but have increasing problems of congestion and air pollution together with a growing demand for more green spaces, allied with a need to maintain their international competitiveness.
- Medium-sized cities face more of a challenge of attracting people to move in and persuading existing residents to stay, putting a premium on creating and maintaining a pleasant living environment with a good supply of housing and accessible essential services and amenities as well as sufficient job opportunities.
- Smaller cities, towns and villages in rural areas face even more of a challenge to retain population and maintain ready access to essential services, leading to an incentive to cooperate with other urban areas nearby in order to ensure their provision, which entails a need to have good communication links between them.

4.3. Policy responses

The policy responses in Japan and the EU to the challenges faced by these different-sized cities and urban areas are similar:

- As regards the economy, the widespread strategy particularly in large cities is to support the development of knowledge-intensive services and high-tech manufacturing, which generate high value-added and cause minimal damage to the environment.
- Such development has tended to be focussed, in particular, on sectors or activities in which the city or urban area has some comparative advantage because of its economic heritage, of the skills and know-how built up over time, so that although production processes and what is produced change, historical experience remains relevant.
- In smaller cities and towns and villages in rural areas, especially- and in Europe also in parts of larger cities – there is increasingly a focus on creative industries and cultural activities, which equally build on traditional skills.
- The establishment of research institutes and business incubation units are a further means used to attract both people and companies to locate, in smaller cities and to be as a source of job creation In Europe, this has been complemented by the establishment of universities, or branches of these, and technical colleges.

- The move towards higher value-added activities has also been accompanied by a growing concern to promote tourism in cities of all sizes as a means of generating income and jobs, which gives an added incentive to increase the attractiveness of places.
- Such promotion, however, has gone along with a concern to limit the pressure on the environment from increasing tourist numbers and to seek an acceptable balance between the interests of tourists and those of the resident population.
- In many cities, particularly the larger ones, culture, in the form of museums, art galleries, exhibition centres and so on, has played a major role in stimulating economic development by attracting tourists.
- The use of culture as an attraction extends to renovating historical centres in cities of all sizes.
- New or refurbished shopping centres have equally been seen as a means of attracting tourists and generating income, with centres of smaller cities and towns being redeveloped to attract people away from shopping complexes in the outskirts.
- As regards public finances, public authorities have responded to the decline or lack of growth in revenue by:
- initiating or expanding public-private partnerships, involving businesses in the financing of redevelopment programmes;
- increasing local taxes or introducing new ones;
- reducing the cost of public services by implementing innovative ways of providing them, including through the use in particular of new technologies;
- as noted above, generating additional income by attracting tourists from outside;
- obtaining finance from national and regional authorities to undertake joint development projects of common interest, and in the case of the European cities, finance from EU sources, the European Regional Development Fund (ERDF), in particular.
- The pressure on public finances allied to the decline in population and therefore in the consumers of public services has led public authorities in neighbouring smaller cities and towns to cooperate together to provide essential services, as well as various leisure, cultural and sporting facilities, jointly in one or other of the locations.
- Such a collaborative strategy has been accompanied by improvements in the transport links between the towns or cities involved so that people can readily access the services and facilities in the different places.
- It has also entailed developing e-services so that people can access essential services online without the need to physically travel to use them, which has implied the development of high-speed broadband internet connections to make this possible.
- The use of new technologies has extended in particular to healthcare and social services, where efforts have been made to ensure that older people have ready access to care and support when they have need.
- Reducing congestion and traffic in cities, together with catering for the mobility needs of older people, has led to both improvements in public transport and an expansion of services and restrictions on private car use, including the creation of traffic-free areas.
- This has been combined in many cases with moves towards the electrification of public transport, of buses and railways, as well as the construction of tramways and metros.
- It has also been combined with the construction of cycle paths and walkways to encourage people to move around the city by cycle or to make short journeys on foot.

4.4. Smart city responses

In both Japan and the EU, there have been increasing efforts to make use of new technologies as a means of delivery services at less cost and more efficiently, though also to meet the other challenges posed by population decline and increasing concern to protect the environment. Examples of smart projects, employing AI, sensors, cameras, analysis of Big Data and so on, therefore, include:

- The monitoring, reporting and diagnosis of the health and well-being of older people at home as well as in care homes or in hospitals, enabling the provision of fast support and assistance when required.

- The use of robots to perform routine care tasks and to diagnose ailments and illnesses in older people.
- The revitalisation of marginalised communities through collective housing which is energy self-sufficient.
- The monitoring and analysis in real time of movements in cities to ensure the safety of people, to provide immediate advice and guidance on journeys, to control traffic flows and to identify the need for more transport.
- The building of urban computer systems that can collect and analyse data on various aspects, and its use in conjunction with data held by local authorities and businesses.
- The monitoring and analysis of infrastructure and equipment to detect defects and to give warning of possible failure or breakdowns as well as to identify the action needed.
- The development of smart innovation hubs and campuses in cities to help generate economic activity and create jobs, as well as to stimulate changes in the behaviour of companies through demonstrating the potential of new technologies.
- The installation of a smart grid to manage renewable energy production and to maximise energy efficiency.

A number of lessons can be drawn from the case studies undertaken in Europe, which might be equally relevant in Japan:

- Smart city projects should be linked to a clear 'smart specialisation' strategy to be most effective given the wide range covered by the term ‘smart city’ and given also the possibility of importing smart solutions developed elsewhere. Efforts should, therefore, be focussed in a limited number of areas with the aim of making the city a hub, or centre, for a specific smart domain, so inter alia attracting business investment and expertise from elsewhere.
- Smart city strategies work best through a ‘living labs’ approach, involving companies, business start-ups, semi-public organisations (hospitals, care homes, public transport, etc.,), academia and civil society organisations as well as public authorities and the general public. The aim is not just to get their views and advice on projects but to get them to think about innovation and to become active investors and innovators themselves.
- Governance is an important success factor, while broad involvement is important, government at city, or regional, level needs to lead the way through establishing a specific agency that is ultimately responsible for determining the strategy, giving direction, pooling investment, coordinating effort and setting clear goals, as well as monitoring progress towards achieving them.