The development of Japan's transportation infrastructure for the Tokyo Olympics and Paralympics

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1. Transportation infrastructure development in preparation for the Tokyo Olympics and Paralympics

In this paper, we outline the development of transportation infrastructure in Japan in recent years. In particular, we focus on transportation infrastructure projects that were accelerated following the announcement that the 2020 Olympic and Paralympic Games were to be held in Tokyo.

1.1 The 1964 Tokyo Olympics and Paralympics and the development of transportation infrastructure

On 7 September 2013, Tokyo was chosen by the 125th IOC General Assembly in Buenos Aires, Argentina, to host the 2020 Summer Olympic and Paralympic Games for the first time since 1964. When the 1964 Olympics and Paralympics Games were awarded to Tokyo, the Japanese economy was expanding rapidly, and there was an urgent need to construct transportation infrastructure to meet the growing demand for transportation. Consequently, the decision to award the Olympics to Tokyo promoted the development of transportation infrastructure.

Approximately 50 years have passed since the 1964 Games, and the areas of infrastructure investment have changed considerably. The investments that were made in preparation for the 1964 Games were mainly in the area of high-speed transportation. The Meishin Expressway, Japan's first toll expressway, was opened in 1963, and the Tomei Expressway opened in 1969. The Tokaido Shinkansen (Tokyo to Shin-Osaka), the world's first high-speed railway, was also opened in 1964. However, capital accumulation was insufficient in Japan at that time, and the construction of these projects was mainly financed by the World Bank.

Traffic congestion in the Tokyo city center also remained chronic, and thus the Tokyo Monorail and the Tokyo Metropolitan Expressway were built to provide access from Haneda Airport in the bay area to various locations in Tokyo. Subsequently, the Tokyo Metropolitan Expressway was expanded to cover the entire capital region, and in 1966, the Tokyo Metropolitan Expressway No. 1 between Haneda Airport and Yokohama opened, its construction having been funded by a loan from the World Bank.

In recent years, the maintenance of infrastructure built for the 1964 Olympic and Paralympic Games has become a critical issue. One such item of infrastructure is the Metropolitan Expressway, which has

been the subject of a major repair and renewal project since 2014. There is no question that funding is essential for the maintenance and management of transportation infrastructure, including toll highways. Moreover, despite the rapid increase in social security expenditure in the national budget as a result of Japan's aging population, public works expenditure has fallen to about half of what it was in 1998 (see Figure 1). Further, as shown in Figure 2, the results of inspections of bridges and tunnels show that there are numerous locations requiring immediate repair work. It has been estimated that preventive maintenance would reduce maintenance costs, and thus local municipalities are now required to formulate "long-life repair plans."

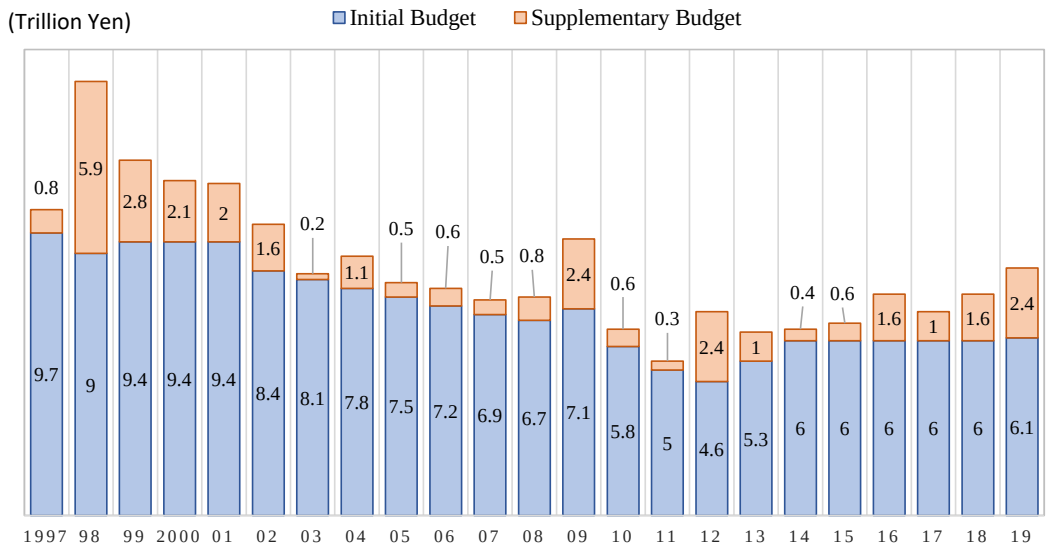
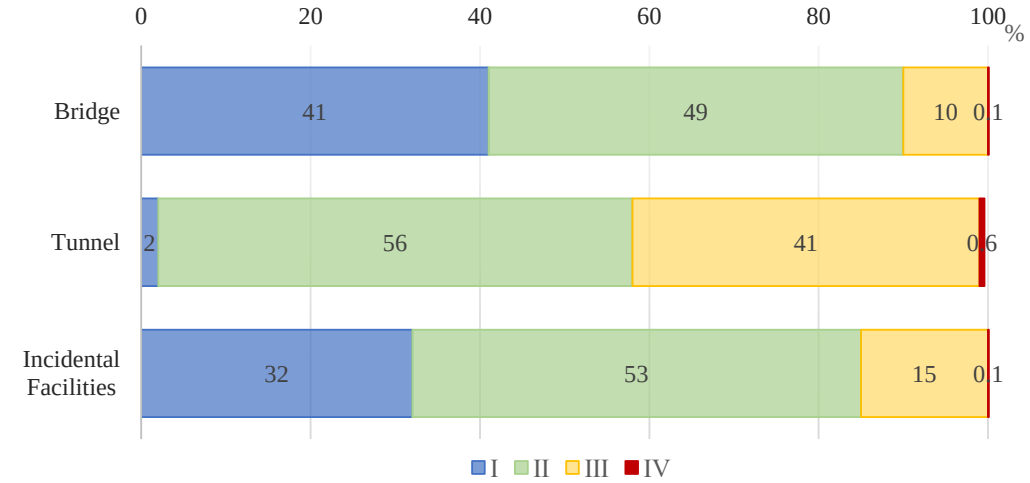


Figure 1. Public-works-related expenditure by both the national and local governments (1997–2019)
Data source: Outline of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) budget for FY2020.



Notes:
I: No deterioration of the function of the structure.
II: No deterioration of the function of the structure, but action is required.
III: Deterioration of structural functions requires repair.
IV: Deterioration of structural functions requires immediate repair.

Figure 2. Current conditions of bridges, tunnels, and incidental facilities.
Data source: Road Bureau and City Bureau, MLIT, "Outline of the Budget for Roads in 2020."

In this section, we focus on infrastructure development for the 2020 Olympic and Paralympic Games. In terms of expressway infrastructure, construction of the Loop Arterial Road 2 (Kan-ni-dori), the Tokyo Outer Loop Expressway (Gaikan-do), and the Metropolitan Inter-city Expressway (Ken-o-do) has been accelerated (Figure 3). Although some sections of these expressways had already been constructed, the decision to award the Games to Tokyo meant that the construction of these expressways was given priority. The section of the Loop Arterial Road 2 connects the athletes' villages and venues in the waterfront area with the city center. In conjunction with this development, there are plans to redevelop the area along the Loop Arterial Road 2 to enable Tokyo to become an international business center in the future. Meanwhile, the Outer Loop Expressway and the Metropolitan Inter-city Expressway are loop expressways running along the outer edge of the Tokyo city center, and are expected to ease congestion in the city center during the Games.

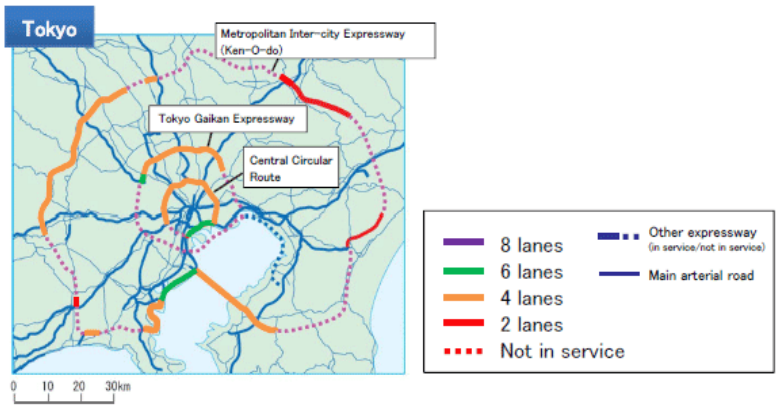


Figure 3. Loop expressways in the Tokyo metropolitan area.
Data source: Road Bureau, MLIT, "Outline of the Budget for Roads in 2020."

When these expressways are being built, the "stock effect" is emphasized rather than the "investment multiplier effect". This is the effect of rationalizing communications and logistics, stimulating private sector investment, revitalizing tourism, and increasing the population and employment as a result of the construction and opening of roads, all of which contribute to long-term economic growth[1]. As a result, roads built for the Olympics and Paralympics are expected to improve productivity and the quality of life of residents along these routes in various ways after the Games.

Along with the development of the road network, smart-use initiatives are also being promoted to maximize the functions of the overall road network in the metropolitan area through improvements in the operation of existing toll highways. In the Metropolitan and Kinki regions, tolls that seamlessly link various highway companies were introduced in April 2016 and June 2017, respectively, and have had the effect of diverting traffic from metropolitan centers to the outer loop roads. As a result, highway congestion on the most populated area has declined. These initiatives rely on a new tolling system based on the "Three Smart Use Principles of Tolling," an approach common to all metropolitan areas

[1] See the MLIT website (https://www.mlit.go.jp/road/road_e/q6_evaluation.html#a2).

that was outlined in the basic policy of the Expressway Subcommittee of Roads Subcommittee of Social Infrastructure Development Council in 2016. Currently, there are plans to introduce a congestion-based toll system in preparation for the Games.

In addition to the inadequate road infrastructure, there has been a noticeable shortage of truck drivers in Japan. As a result, moves to increase wages are spreading in both the corporate logistics sector and the home delivery service sector. The reasons for this shortage are believed to include an increase in the volume of parcel deliveries and other services as a result of the growth of e-commerce, as well as problems related to the working environment. Leading up to and during the Games, the shortage of truck drivers will become a serious problem, as the transport of athletes and spectators is essential in addition to the usual transportation requirements. Therefore, the industry has undertaken reform of its work practices. Specifically, the industry is working to improve labor productivity and the management of carriers through the use of technologies such as IoT (Internet on Things) and AI (Artificial Intelligence), as well as revising the salary system and creating a work environment that is more comfortable for women and the elderly in order to secure and develop the necessary human resources.

In April 2016, the Council for Transport Policy within the MLIT published a report titled “Approaches to Future Urban Railways in the Tokyo Area” which stated that urban railways in the metropolitan area should aim to: (1) contribute to strengthening international competitiveness, (2) contribute to a prosperous national life, (3) remain sustainable in conjunction with urban development, (4) maintain qualitative evolution in terms of station spaces with the creation of next-generation stations, (5) remain reliable and secure, and (6) undertake strong promotion of disaster countermeasures and “visualization” of their efforts.

The report also referred to the development of specific railway lines based on three criteria: (1) projects that contribute to the strengthening of international competitiveness, (2) projects that contribute to the enhancement of the railway network in response to regional growth, and (3) projects that contribute to the qualitative evolution of station spaces. In relation to the first criterion, in anticipation of the increase in the number of visitors during and after the Olympic and Paralympic Games, projects to improve access between central Tokyo and its major airports (Narita and Haneda) have been drafted as part of the project to improve airport access. Similar plans are also underway in the Kinki region.

In relation to this, the development of barrier-free environments has been promoted. During the Olympic and Paralympic Games, a tremendous number of tourists and athletes will visit the metropolitan area, and thus the major stations that serve as transfer points as well as the airports are being redesigned to be barrier-free. Specifically, larger elevators and platform doors are being installed at stations, and airport access buses are being equipped with lifts. In particular, the East Japan Railway Company, which operates railways in eastern Japan, including Tokyo, is expanding its barrier-free facilities in stations near the Games venues and on airport access lines; this is in addition to expanding the ticket gates and concourses to make them more accessible for wheelchair users.

2. Growth in visitor numbers and expansion of airport capacity in the metropolitan area

As mentioned in the previous section, a tremendous number of visitors and athletes are expected to visit the Tokyo metropolitan area for the Olympic and Paralympic Games. The efficient transit of these people will be an important factor in the success of the Games. Thus, this section outlines Japan's responses to receiving an increased number of visitors and its efforts to strengthen its capacity to accommodate these visitors during the Games.

2.1 Growth in visitor number

In recent years, the Japanese government has implemented various initiatives aimed at increasing the number of visitors to the country. In 2003, the Visit Japan Campaign was launched with the aim of increasing the number of visitors to the country to 10 million by 2010. In 2007, the Tourism Nation Promotion Basic Law was enacted, and the Japan Tourism Agency was established within the MLIT in 2008. Thus, a system has gradually been established to implement policies aimed at attracting more visitors to Japan. In 2019, it was announced that the aim was to attract 40 million visitors annually by 2020 and 60 million annually by 2030, and a number of initiatives were proposed to assist in achieving those targets. The official number of visitors to Japan in 2019 was 31,882,049, or approximately 6.1 times the 5,211,725 visitors in 2003, when the Visit Japan campaign was launched (Figure 4). The number of visitors has increased rapidly, especially since 2013 when the number of visitors to the country surpassed 10 million for the first time.

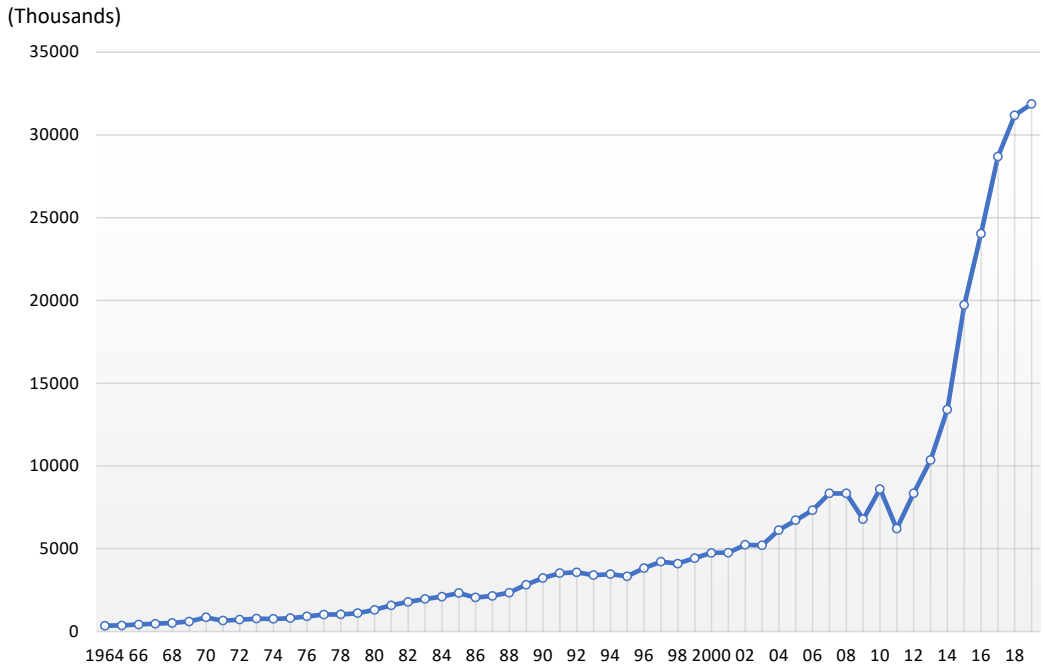


Figure 4. Foreign visitors to Japan (1964–2018).
Source: Japan National Tourism Organization (JNTO).

Currently, Japan is ranked 11th in the world and third in Asia in terms of visitor numbers[2]. As an island nation, Japan is characterized by the fact that all visitors enter the country by either air or sea, and Japan is ranked seventh in the world and first in Asia in terms of visitors arriving by either air or sea[3]. Thus, air and sea travel are emphasized in programs aimed at attracting visitors. Figures on visitor arrivals by airport show that in 2012, most visitors arrived at Narita Airport, but the number of visitors arriving at Kansai International Airport steadily increased and by 2018 was approaching the number of visitors arriving at Narita Airport (Figure 5). There was also an increase in the number of visitors arriving at Fukuoka, Shin-Chitose, and Naha Airports from 2012 to 2018. This implies that many visitors are arriving in Japan at the large regional airports rather than at the three major metropolitan airports.

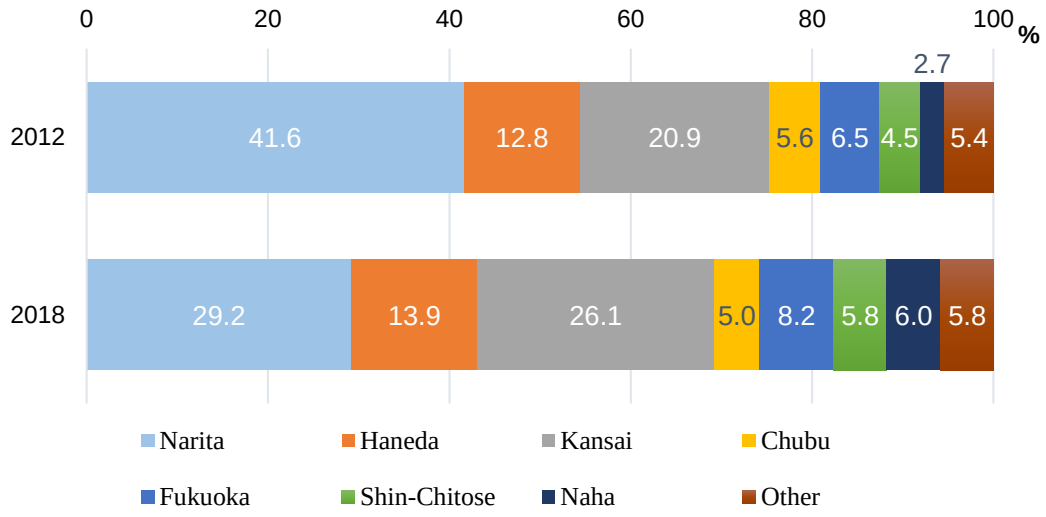


Figure 5. Percentage of visitors by airport.
Source: Ministry of Justice immigration statistics.

One factor contributing to the increase in the number of visitors has been the promotion of Open Skies. In the late 1990s and early 2000s, the Japanese government adopted an Open-Skies policy based on the premise of expanding capacity through the development of airports in the Tokyo metropolitan area. In 2002, a parallel runway at Narita Airport was provisionally opened and regular charter flights from South Korea and Hong Kong were permitted to land at Haneda Airport, and in 2007 the Asia Gateway Initiative was announced by the Japanese Cabinet[4]. In 2008, the Japanese Cabinet also announced that when Haneda Airport's fourth runway and international terminal opened in 2010, they expected a total of 60,000 scheduled international flights (30,000 during the daytime and 30,000 late-night and early morning flights). Today, bilateral agreements have removed numerous restrictions on airlines including those related to the number of flights and points of entry. 35 countries/regions have signed an Open Skies Agreement[5]. "Beyond rights (the fifth freedom rights)" have also been granted to airports outside the metropolitan area.

Currently, many visitors to Japan use foreign airlines, which has led to an increase in the number of

[2] Based on 2018 data (see the White Paper on Tourism 2020 at https://www.mlit.go.jp/statistics/content/001348581.pdf).
[3] Based on 2018 data (see the White Paper on Tourism 2020).
[4] This liberalized the opening of routes at local airports through bilateral negotiations in Japan.
[5] Haneda Airport is excluded from the Open Skies program.

visitors arriving at non-metropolitan airports in Japan. The number of passengers using low-cost carriers (LCCs) has also grown. Especially in Asia, the use of LCCs, which offer inexpensive flights, has become more popular and the number of visitors to Japan has been increasing. In this context, local municipalities and airport officials are paying large sums to foreign airlines and/or travel agencies in the form of incentives and subsidies to attract international flights. However, there has been excessive competition based on the provision of incentives and subsidies, a situation that has been termed "subsidy competition."

2.2 Expansion of airport capacity in the metropolitan area

Both Narita Airport and Haneda Airport have been working to increase their capacity since 2012. Haneda Airport gradually increased its capacity from 300,000 flights per year in 2012 to 450,000 flights per year in 2015 (including 90,000 international flights) as a result of the opening of the fourth runway. Narita Airport also gradually increased its capacity from 220,000 flights in 2012 to 300,000 flights in 2015, resulting in a significant increase from 520,000 flights to 750,000 flights between 2012 and 2015 for both airports (see Figure 6). However, the capacity of Japan's metropolitan airports is still substantially lower than that of other countries' major airports. For example, New York and London both cater for more than a million flights each year.

According to previous studies, the number of visitors from abroad decreases with distance, whereas it increases with higher GDP of the origin country, higher expenditures on tourism by governments and/or municipalities, and relatively lower price levels in the destination country. Many of the Asian countries that are close to Japan have been experiencing economic growth over recent years. On the other hand, Japan's experience of low economic growth over the past 30 years has resulted in relatively low price levels. Reflecting those factors, the number of visitors will continue to increase even after the Covid-19. Therefore, the government is taking a number of initiatives to expand the capacity of the metropolitan airports. As a priority measure until 2020, the government has increased the number of international flights at Haneda and Narita airports by 80,000 flights per year, from about 750,000 as of 2015 to about 830,000 in total. The review of the runway operations and flight paths at Haneda Airport is designed to increase the capacity of the airport by changing flight paths and operational systems rather than building a new runway. Previously, noise-related issues meant that low-altitude airspace above Tokyo's city center and other areas had been only minimally used, except for occasions when visibility was limited. A new flight path through low-altitude airspace over urban centers was due to commence operation in late March 2020, increasing the airport's international flight capacity from about 60,000 flights to about 99,000 flights each year. However, in recognition of the potential new noise impact in the city center and elsewhere, the new flight paths will be restricted to peak-hour operations.

On the other hand, at Narita Airport, for after 2020, the government has set a target of increasing the number of flights to and by building a new runway, extending Runway B, and easing restrictions on

night flights at the Narita Airport by 160,000 per year. As a result, the total number of flights to and from metropolitan airports will reach one million per year. Prior to that, in September 2015, a four-party council had already been held at Narita Airport to discuss the development of a new runway. Its members were the MLIT, the Governor of Chiba Prefecture, 9 municipalities around the airport, and NAA. The council confirmed its policy to extend Runway B 1,000 meters north and build a new Runway C 3,500 meters south of Runway B. The land area of Narita Airport will be expanded by approximately 1,000 hectares, enabling an additional 500,000 flights per year.

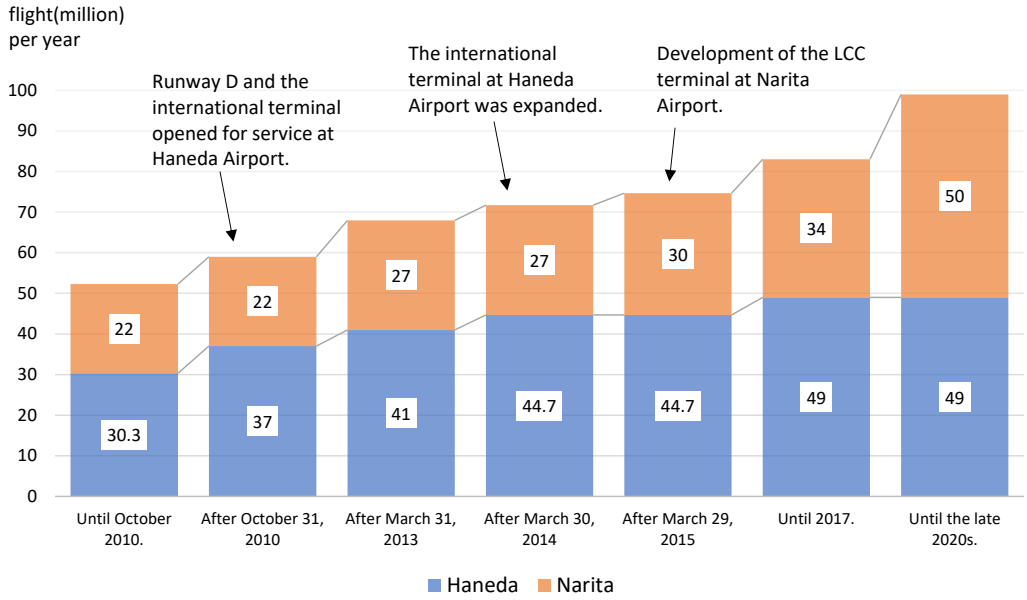


Figure 6. Expansion of airport capacity in the Tokyo metropolitan area.
Source: Author's compilation based on Maeda (2019).

3. Various problems in Japan and preparations for the Olympics and Paralympics

In the previous sections, we discussed the development of transportation infrastructure and the strengthening of readiness to receive visitors for the 2020 Tokyo Olympic and Paralympic Games. In this section, we focus on various problems that are likely to be closely linked to Japan's hosting of the 2020 Games.

In Japan, it is necessary to develop transportation infrastructure that responds to three social issues, and this infrastructure will also benefit Olympic Games participants and spectators. First, it is necessary to develop transportation infrastructure that supports a barrier-free society. As of March 2020, the population of Japan was estimated to be 125.96 million. According to the results of the census conducted every five years by the Ministry of Internal Affairs and Communications, the population, which had been growing consistently from the start of the survey until 2010, began to decline for the first time in 2015.The estimated population in 2020 is also lower than the population based on the 2015 census (127.79 million), which suggests that the population continues to decline. Figure 7 shows population trends in G7 countries by decade. The population of the United States and Canada has been increasing consistently, and those of the European countries have also shown a slight increase in population since 2010. On the other hand, as mentioned earlier, the population of Japan has been in a declining phase since 2010. In addition, according to Annual Report on the Ageing Society FY 2019, the proportion of elderly people (the aging rate) has been increasing every year, from 9.1% in 1980 to 28.4% in 2019. The aging rate has also increased rapidly in Japan compared with the other G7 countries, and Japan now has the highest aging rate among all developed countries. Meanwhile, the birth rate is declining, having reached 1.36 in 2019, and thus the population is expected to decline even further in the future.

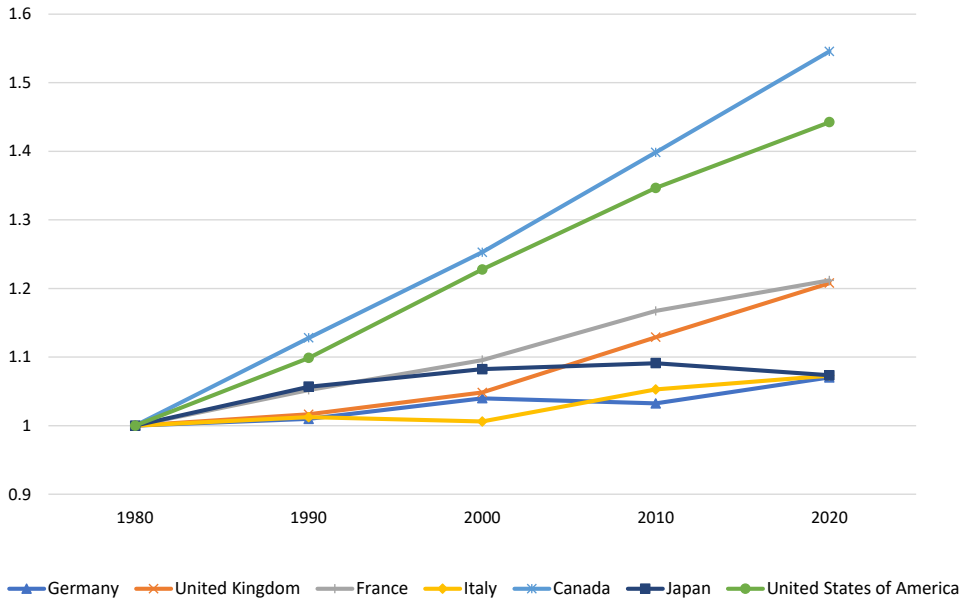


Figure 7. Population trends in G7 countries by decade (1980＝100)
Source: Created by the author from the United Nations' World Population Prospects 2019.

Second, it is necessary to develop transportation infrastructure aimed at easing congestion in Tokyo. Since the period of rapid economic growth that followed the end of World War II, a phenomenon known as “unipolar concentration in Tokyo” has continued unabated, with large numbers of people flowing from other urban and/or rural areas into Tokyo. While the concentration of the population in the metropolitan area, particularly in Tokyo, has produced a variety of positive effects, it has also caused problems such as traffic congestion in the transportation system in the city center and a decline in the population in rural areas. Since the end of World War II, the Japanese government has consistently implemented policies aimed at decentralizing the population and various industries, and is currently implementing a regional revitalization program, but the concentration of the population in Tokyo continues. While it would be desirable to host the 2020 Summer Olympics and Paralympics in regional cities, this is not possible because of financial and security concerns. However, preliminary rounds of some sports such as baseball, softball, and soccer are expected to be held outside the Tokyo metropolitan area. In addition, there is a plan to host the 2030 Winter Olympics and Paralympics in Sapporo, which previously hosted the 1972 Winter Olympics.

Third, it is necessary to develop transportation infrastructure that enhances national resilience in response to the increasing frequency and intensity of natural disasters. Earthquakes, typhoons and floods have been occurring more frequently in recent years, causing extensive damage in many areas.

Typhoon No. 21 in 2018 revealed that Japanese airports were inadequately prepared for typhoons. With transport to and from Kansai International Airport cut, travelers were trapped at the airport, which also lost power as a result of ocean inundation. The MLIT formulated the “A2-BCP (Advanced/Airport Business Continuity Plan)” guidelines in November 2019, which included a response plan for the loss of airport access and other functions, and provision of information to airport users. These guidelines reflect the events experienced at Narita Airport when Typhoon No. 15 struck in 2019, and have since been adopted at airports across the country.

Another important aspect of the response to typhoons is the “planned suspension” of transportation services. This means that public transportation systems will suspend operations with advance notice when weather conditions are expected to affect operations. In September 2018, railway operators, both private and public, implemented planned suspensions to prepare for the arrival of typhoons No. 21 and No. 24. In July 2019, based on the responses the previous year, a final version of the planned railway suspension guidelines was published, setting out the timing and methods for the disclosure of information to users and the provision of alternative means of transport.

Preparations for possible disasters during the Olympic and Paralympic Games are also in progress. In 2017, a roadmap for countermeasures against inland earthquakes was formulated, which sets out guidelines for earthquake preparedness during the Games, including procedures aimed at ensuring the safety of large numbers of visitors and assisting them to return home. The roadmap includes multiple measures aimed at assisting people to return home, including river-boat transport should land-based

transportation be disrupted by an earthquake.

The preparations for the Olympic and Paralympic Games described in this manuscript are closely related to the three major issues discussed above. Specifically, the policy of promoting barrier-free environments at major train stations and airports is important in relation to the ongoing aging of the population. The facilities that have been built for the Games are expected to meet the growing need for barrier-free access and are expected to continue to be used following the Games. In addition, the establishment of crisis management systems by both the public and private sectors in preparation for the Games will provide guidelines for future disaster prevention and mitigation measures, and will also serve as a foundation for safe and secure urban development beyond the Games.

However, we should also recognize that the preparations for hosting the Games may exacerbate the problems that currently exist in Japan. Measures to improve transportation infrastructure and the ability to cater for increased numbers of visitors are being taken primarily in Tokyo, the host city for the Games. As a result, there is a risk that this will lead to further concentration of the population in Tokyo. To overcome this problem, it is necessary to use existing infrastructure, such as the Shinkansen and the airlines, to attract more visitors to regional cities during the Games. A survey conducted by the Development Bank of Japan and the Japan Travel Bureau Foundation found that 96% of people in Asia and 92% of people in Europe, the United States, and Australia who plan to attend the Tokyo Olympics and Paralympics said they would either "like to" or "prefer to" take a sightseeing excursion to a regional city during their visit to Japan, which suggests that demand for tourism to regional cities during the Games will be high[6]. It is expected that increase of the visitors to the rural areas with the Olympic and Paralympic Games will lead to provide job opportunities in the tourism industry in the areas. The employment growth will increase the resident population in the rural areas, which will contribute to alleviating the future concentration of population in Tokyo. There is also a concern that the development of additional infrastructure in preparation for the Games may prove to be counterproductive given the declining population. However, aging infrastructure and maintenance continue to be major problems that are likely to become more serious in the future. As the population continues to decline as a result of the low birth rate and the aging population, the per capita cost of infrastructure maintenance and management will increase. Given these trends, excessive investment is undesirable. Thus, high-quality investment with a high level of cost-effectiveness must be promoted in the future.

In conclusion, we discuss the impact of Covid-19. In March 2020, the World Health Organization declared a pandemic and indicated that Covid-19 was spreading worldwide. Against this background, the Tokyo Olympic and Paralympic Games were postponed until 2021. Meanwhile, preparations for the Games, including the development of transportation infrastructure, have continued. However, as a result of the spread of the disease, Japan, in line with other countries, has restricted the entry of visitors

[6] The data on which the figures are based are from the "DBJ/JTBF Survey of Foreign Travelers from Asia, Europe, the United States and Australia Travelling in Japan"
(https://www.dbj.jp/topics/dbj_news/2019/files/caa39a65c78ec61d9891348b9f3e6da5.pdf).

from abroad, resulting in a significant decrease in the number of visitors in 2020. Thus, for the organizers of the Olympic and Paralympic Games in Tokyo in 2021, how to accommodate visitors in such a way as to prevent transmission and possible infection will present a challenge.

It has been suggested that Covid-19 may lead to increased migration from metropolitan areas to rural areas. The numbers of infected people in populous metropolitan areas has increased, which has led many organizations to promote teleworking in an effort to prevent their employees from becoming infected. This has led to a growing interest in migration to rural areas, especially among young people living in central Tokyo[7]. As mentioned earlier, rural cities are currently experiencing a decline in population, and various measures are being adopted with the aim of encouraging people to migrate to rural areas to address this problem. If the number of people leaving the Tokyo metropolitan area increases in the near future, the problem of "unipolar concentration in Tokyo" will be alleviated. To encourage this movement, it is expected that the spillover effects of the Olympic and Paralympic Games will spread to rural areas as well.

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[7] Based on survey data from the Cabinet Office. (https://www5.cao.go.jp/keizai2/manzoku/pdf/shiryo2.pdf).

References

Cabinet Office, *A survey of changes in lifestyle awareness and behavior under the influence of new coronavirus infection*, Cabinet Office, viewed 31 August 2020.

Cabinet Office, *White Paper on Measures for Society with Decreasing Birthrates*, Cabinet Office, viewed 31 August 2020.

Development Bank of Japan (DBJ), *DBJ/JTBF Survey of Foreign Travelers from Asia, Europe, the United States and Australia Travelling in Japan*, Development Bank of Japan, viewed 31 August 2020.

Japan National Tourism Organization (JNTO), *Japan Tourism Statistics*, Japan National Tourism Organization, viewed 31 August 2020, Japan National Tourism Organization.

Metropolitan Expressway Company Limited, *Major Renovations to Metropolitan Expressway Structures*, Metropolitan Expressway Company Limited, viewed 31 August 2020.

Ministry of Justice, *Immigration Statistics*, Ministry of Justice, Ministry of Justice, viewed 31 August 2020.

Ministry of Land, Infrastructure and Transport 2019, *Outline of measures taken by the Ministry of Land, Infrastructure and Transport for the Tokyo 2020 Olympic and Paralympic Games*, Road Bureau, viewed 31 August 2020.

Ministry of Land, Infrastructure, Transport and Tourism, *Ring Roads*, Road Bureau, viewed 31 August 2020.

Ministry of Land, Infrastructure, Transport and Tourism, *Road projects*, Road Bureau, viewed 31 August 2020.

Maeda, R. (2019). "On Haneda Internationalization", *aviation policy research association series* No.643.