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TRANSPORT POLICY

IN PERSPECTIVE: 2020

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Preface

Automobile and road transport have advanced rapidly in the last half century in Japan and contributed greatly to the advancements of our socio-economic system. Our lifestyles and the economy have been enjoying the benefits brought about by the mobility provided by automobiles in all aspects of our society. But, at the same time, over-reliance on automobile has caused serious social and environmental problems such as traffic accidents, air pollution, greenhouse gas emissions and social disparity. Recently, the Center started research on how our cities and transport should be in response to repeated natural disasters and pandemics.

Faced with these challenges, we are reaching a major turning point for a matured and secured transport society with major technological innovations in automobile and road traffic including EV/FCV and a connected and autonomous vehicle or a fully connected ecosystem created by advanced ICT, ITS, etc. These innovations in the next generation vehicle systems will be most beneficial to us as they will provide much safer/secured, less polluting and user friendly mobility for all when Japanese society faces depopulation and rapid aging, and it needs to solve many existing problems and to move towards a more equitable, inclusive, healthy and efficient transport system that support a vibrant and sustainable society.

The Japan Research Center for Transport Policy was founded in 1971 as a private non –profit organization involving transport academics and practitioners active in universities, research organizations and private industry. Since then, the Center has been carrying out interdisciplinary research focused on road transport and proposing transport policies that will contribute to the beneficial development of Japanese society, and the Center was officially certified as a public-interest incorporated association in 2010.

Every year since the year 2000, with the full support of the Japan Automobile Manufacturers Association, we have published a booklet in Japanese, “Research on Automobiles and Transport – Environment and Policy” annually, which introduce the general trends in policy and research concerning automobiles and road traffic in Japan, with basic statistics. This is a translation of the major parts of the 2020 booklet with additional introduction for overseas readers who are interested in the transport policy of Japan. We hope that this booklet will be useful in understanding Japanese experiences.

Finally, we would like to express our sincere gratitude to the Japan Automobile Manufacturers Association, which has given us its full support, and to all who have given their valuable time in writing or editing articles, or who have provided important data for inclusion in the booklet.

December 2020

Noboru Harata
Chairman, Editorial Committee
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TRANSPORT POLICY IN PERSPECTIVE 2020

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As of October 2020

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

Kazusei Kato, Tomoaki Nakamura and Toshinori Nemoto

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."

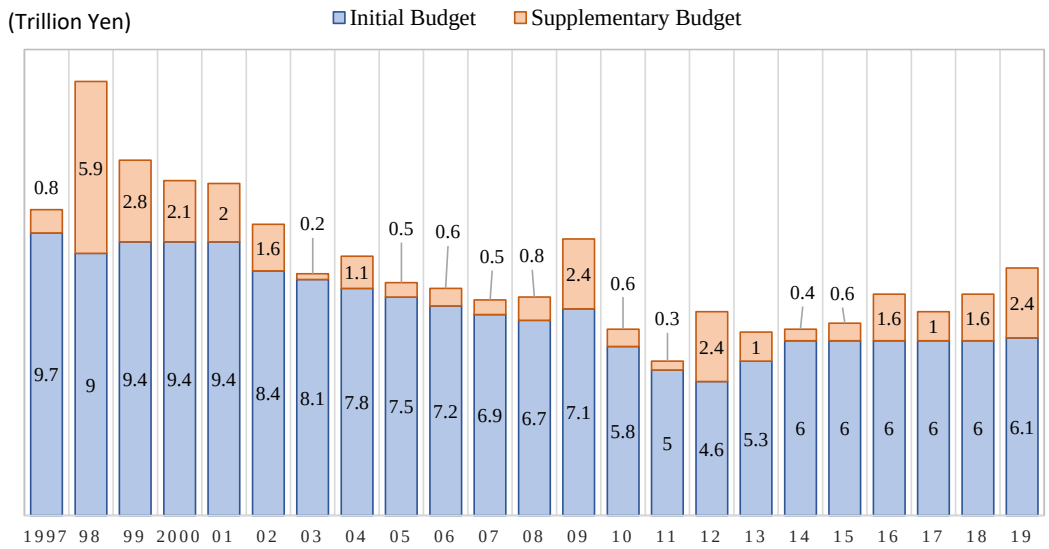
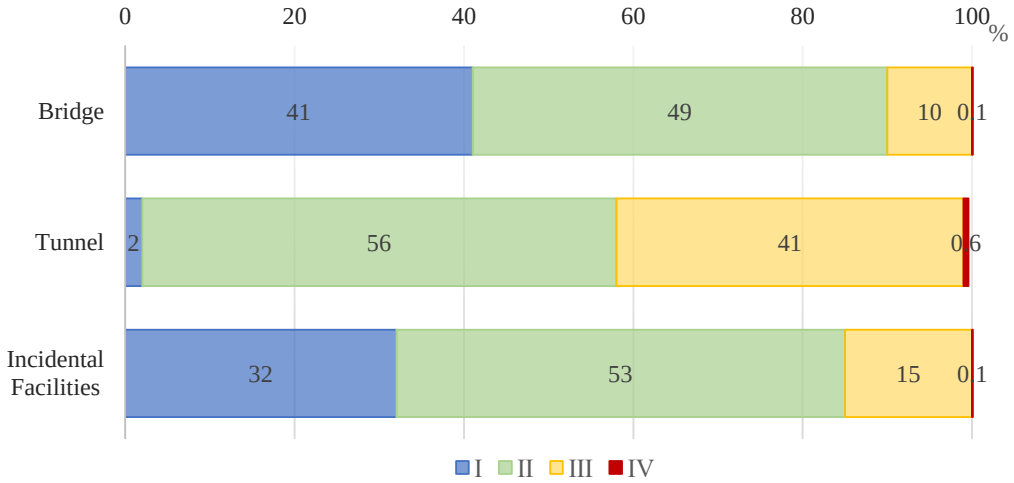


Figure 1. Public-works-related expenditure by both the national and local governments (1997–2019)
Data source: Outline of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) budget for FY2020.



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.

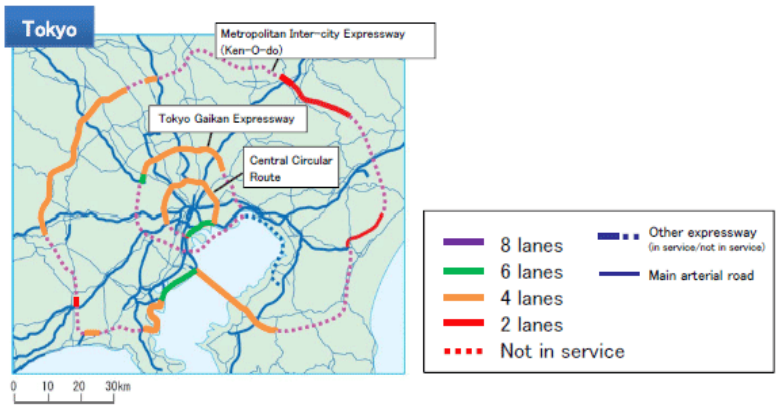


Figure 3. Loop expressways in the Tokyo metropolitan area.
Data source: Road Bureau, MLIT, "Outline of the Budget for Roads in 2020."

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.

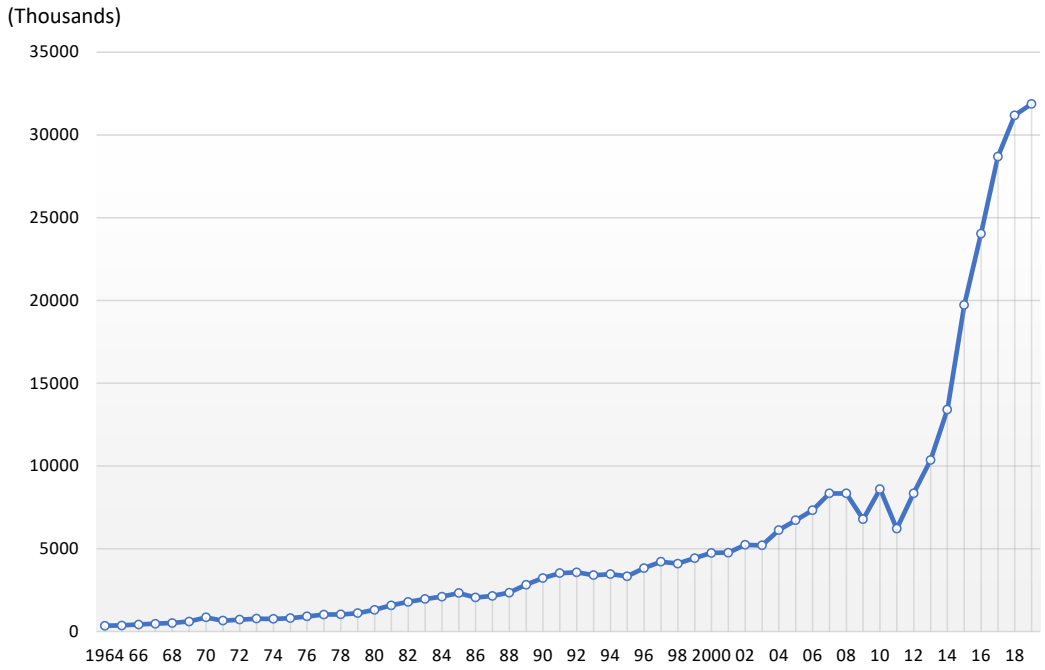


Figure 4. Foreign visitors to Japan (1964–2018).
Source: Japan National Tourism Organization (JNTO).

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.

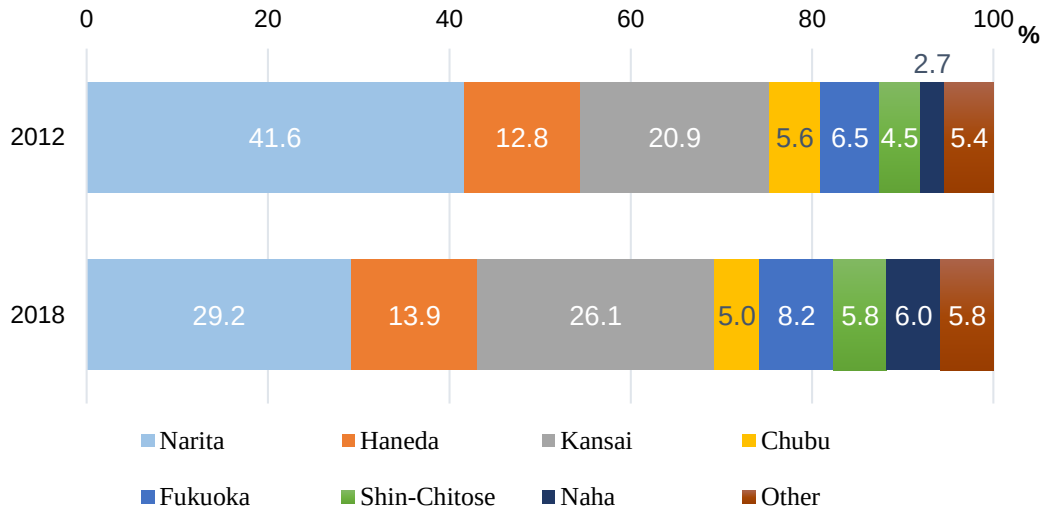


Figure 5. Percentage of visitors by airport.
Source: Ministry of Justice immigration statistics.

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.

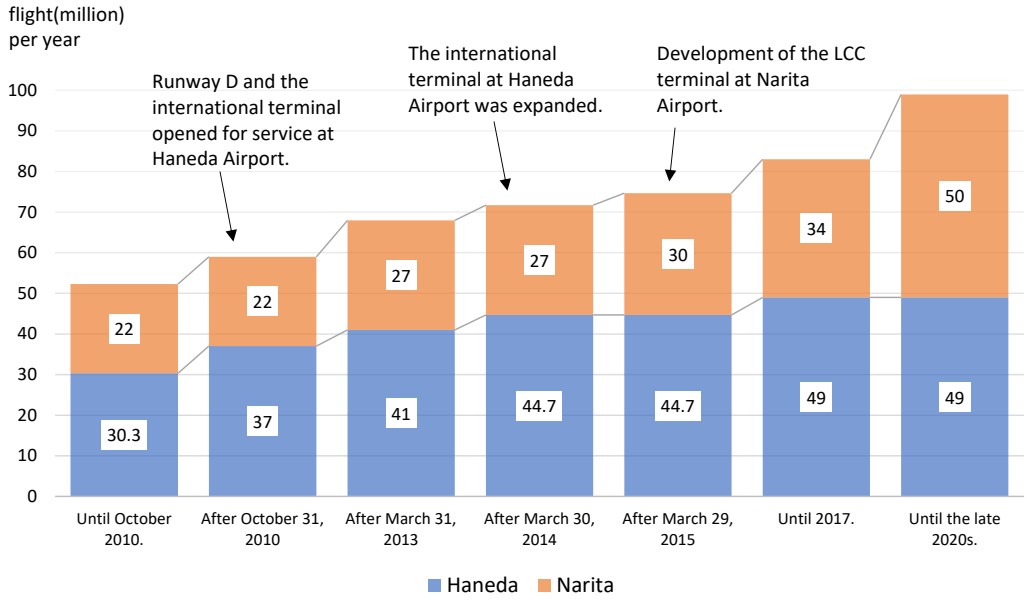


Figure 6. Expansion of airport capacity in the Tokyo metropolitan area.
Source: Author's compilation based on Maeda (2019).

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.

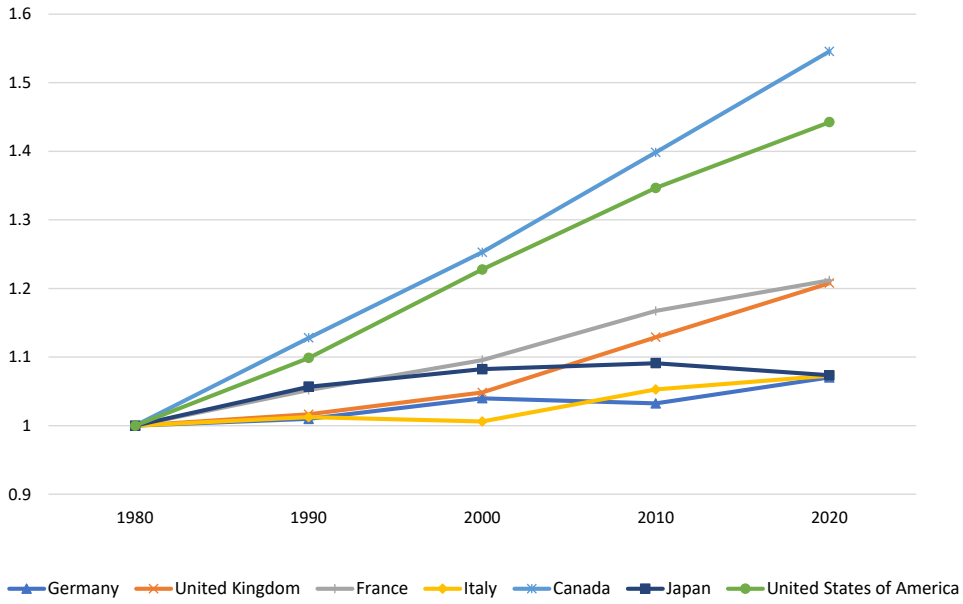


Figure 7. Population trends in G7 countries by decade (1980＝100)
Source: Created by the author from the United Nations' World Population Prospects 2019.

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).

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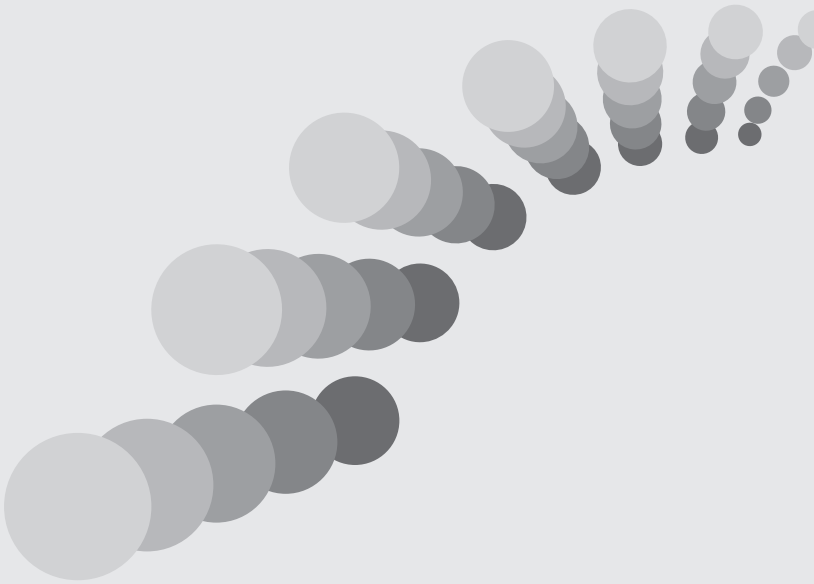


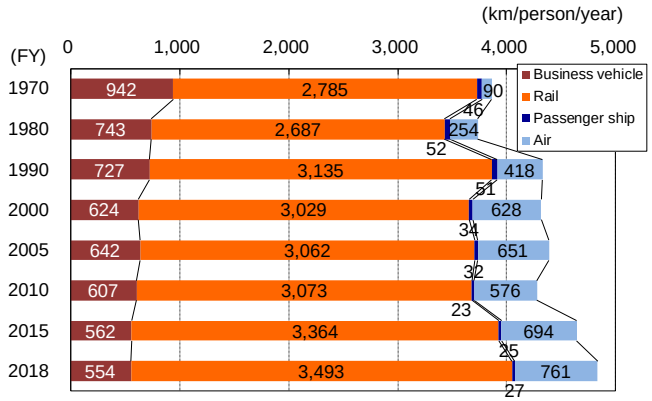
1-1 Mobility Changes in Quality and Quantity

Associate Professor, The University of Tokyo
Kiyoshi Takami

This section shows the basic statistics on the recent trends of passenger and freight transport. Regarding the passenger transport, the distance traveled per capita has risen and fallen in a cyclic manner, and the per capita vehicle-kilometers travelled by private cars has begun to increase again after remaining flat briefly. From the latest nationwide person trip survey, interesting trends are observed such as increases in the trip generation rate of the elderly and in the car modal shares for the elderly and females, rise in the number of private trips, and decrease in the car modal share for young males. Regarding freight transport, both tonnage and ton-kilometer transported per capita have decreased over the last several decades.

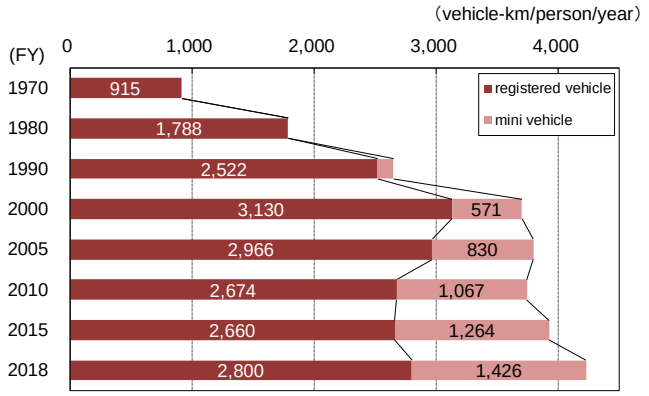
☐ Annual passenger-kilometers traveled per capita are on the rise for rail and air travel, with the rail in FY 2018 recording highs. Those by business vehicles and passenger ships are in a long and gradual decline, while the latter has remained almost unchanged for nearly a decade. Annual vehicle-kilometers of passenger car increased rapidly until around 2000, and then the growth has slowed down. More than one-third of it is attributed to mini vehicles. (Figures 1 and 2)

Figure 1 Annual Passenger-kilometers Traveled per Capita



Note: Corrected and estimated values are included.
Data source: Transportation-related statistics (MLIT)

Figure 2 Annual per Capita Vehicle-kilometers Traveled by Private Cars



Note: Statistics on light vehicle did not exist before FY 1986. Corrected and estimated values are included.
Data source: Survey on Motor Vehicle Transport, Survey on Motor Vehicle Fuel Consumption (MLIT)

☐ The freight tonnage per capita by rail has been decreasing since around 1970, those by freight vehicle and coastwide vessel are also in a declining trend since the 1990s, and has remained roughly flat in recent years. The ton-kilometers transported per capita by freight vehicles overtook coastwise vessels in the early 2000s, with small increases and/or decreases for all modes in recent years. (Figures 3 and 4)

Figure 3 Annual Freight Tonnage Transported per Capita

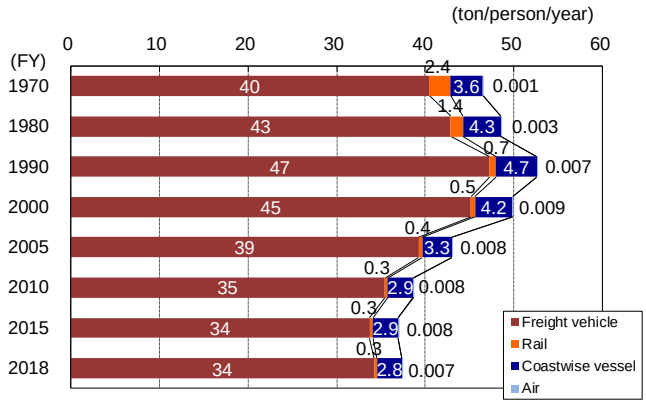
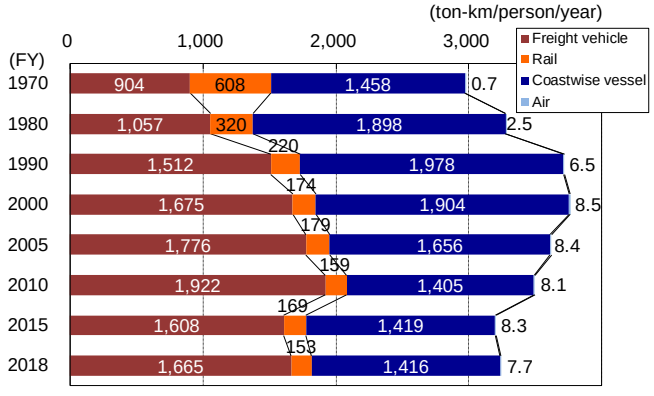


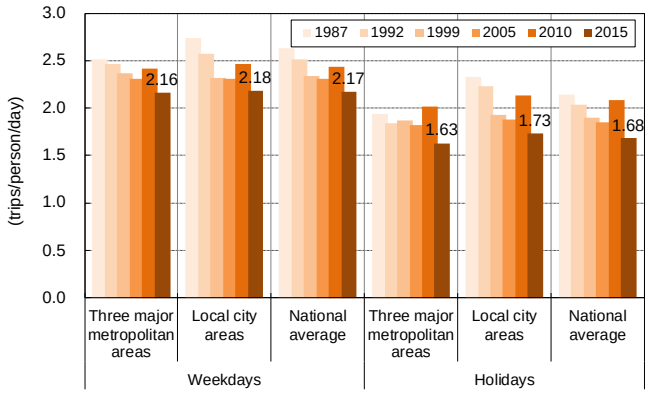
Figure 4 Annual Freight Ton-kilometers Transported per Capita



Note: Freight vehicles do not include private light vehicles in any year, and include business mini vehicles since FY 1987. Corrected and estimated values are included.
Data source: Transportation-related statistics (MLIT)

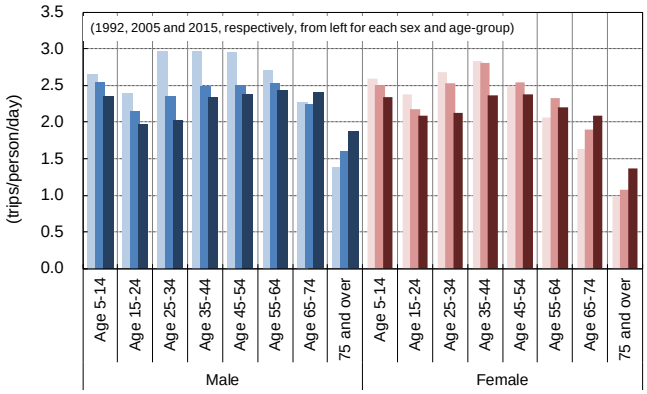
☐ Trip generation rate from the Nationwide Person Trip Survey has been decreasing, except for the 2020 survey which shows a different tendency. By age-group, it has been decreasing among males under 65 years old and females under 45 years old and increasing among the older age-groups. (Figures 5 and 6)

Figure 5 Trip Generation Rate



Data source: The 6th Nationwide Person Trip Survey (MLIT)

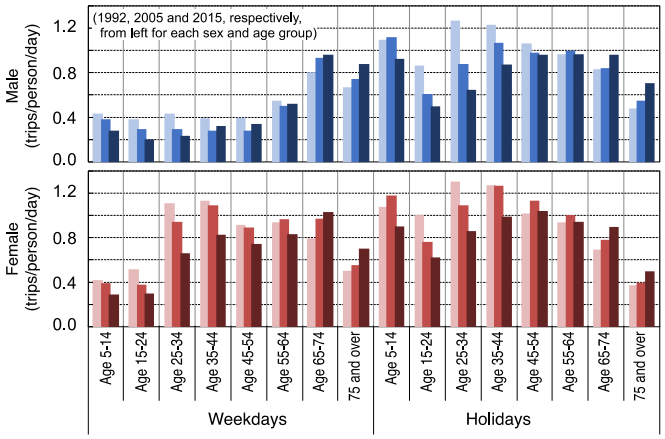
Figure 6 Trip Generation Rate by Age-group (Nationwide, Weekdays)



Data source: The 6th Nationwide Person Trip Survey (MLIT)

Figure 7 Trip Generation Rate for Private Purpose by Age-group (Nationwide)

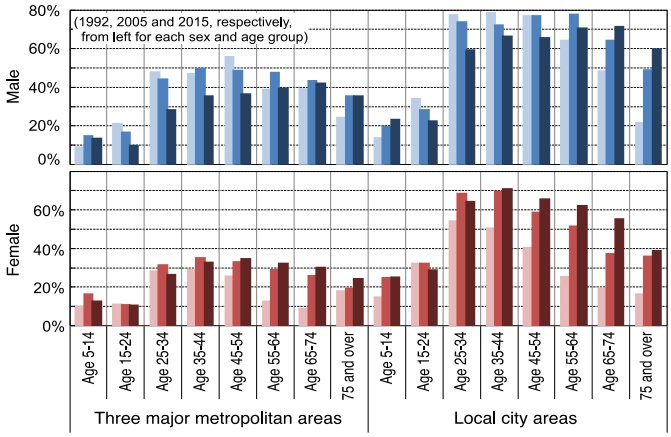
■ Declining for the young and middle-aged and increasing for the elderly, regardless of sex and weekdays/holidays.



Data source: The 6th Nationwide Person Trip Survey (MLIT)

Figure 8 Modal Share of Car by Age-group (All Purposes, Weekdays)

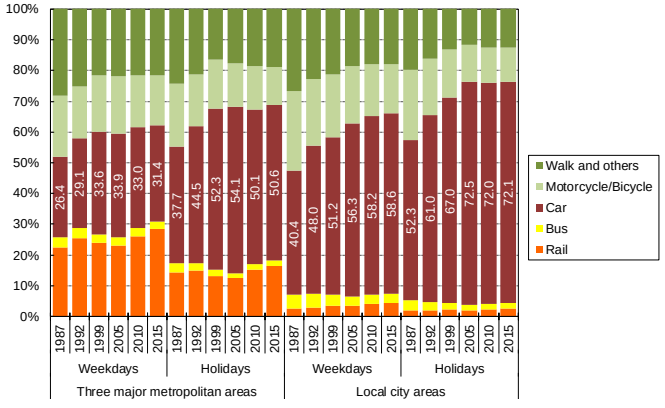
■ Increasing for elderly men and for women of wider age-groups and decreasing for young and middle-aged men.



Data source: The 6th Nationwide Person Trip Survey (MLIT)

Figure 9 Modal Share (Representative Modes, All Purposes)

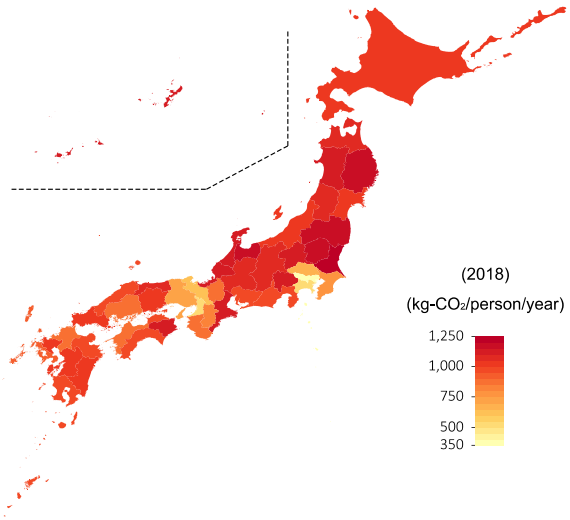
■ Car modal share has plateaued, and is already in decline in three major metropolitan areas (especially on weekdays).



Data source: The 6th Nationwide Person Trip Survey (MLIT)

Figure 10 CO_2 Emissions from Private Cars by Prefectures (per Capita)

■ Tokyo, Osaka and surrounding prefectures emit less CO_2. The tendency of “east high, west low” can also be seen.



Data source: Survey on Motor Vehicle Fuel Consumption (MLIT)

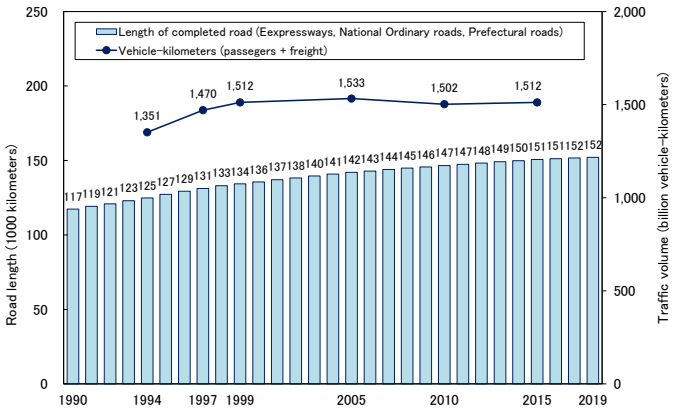
1-2 Road Network Today

The Institute of Behavioral Sciences
Tsutomu Yabe

The length of our roads has been steadily increasing thanks to ongoing road improvement, yet it is still not sufficient for traffic demand. As a result, the average speed on roads remains unchanged at a lower level. A case in point: in city centers such as Tokyo and Osaka, and in DID areas, there is still chronic traffic congestion. Given that background, road network improvements (e.g., the ring road improvement plans that are proceeding in the major metropolitan areas) are obviously playing a significant role. The road subcommittee of the Panel on Infrastructure Development has put together a policy for the effective and efficient use of the expressway network and the fare structure within the metropolitan areas.

Figure 1 Changes in Traffic Volume and Road Length

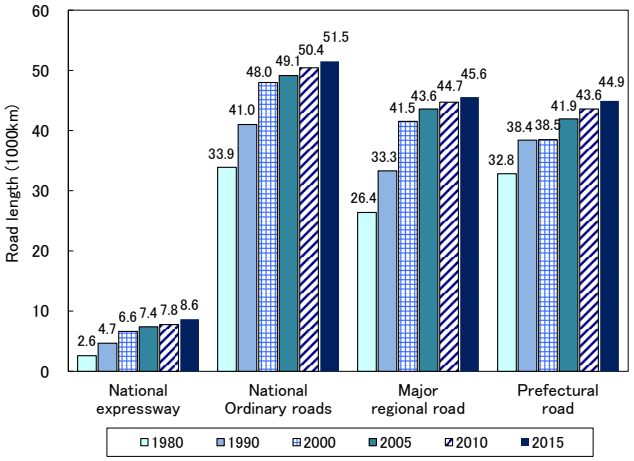
■ Traffic volume, measured in vehicle-kilometers, is on a downward trend after peaking in 2005; but the volume of light motor vehicles is on an upward trend. Road length nationwide is steadily increasing.



Source: Road Statistics Annual Report (MLIT) ,
Road Traffic Census (MLIT)

Figure 2 Changes in Length of Completed Roads by Road Type

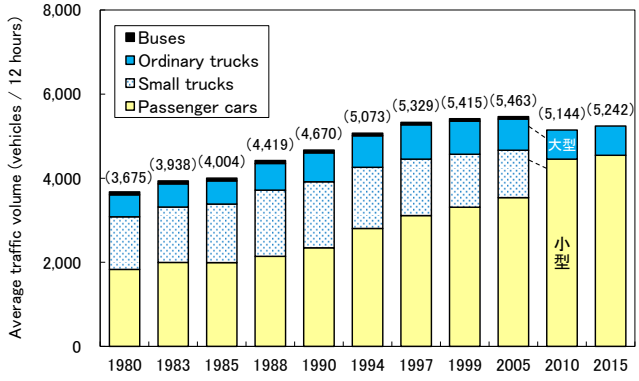
■ For all types of road, the length of completed road (i.e., with improvements completed) is increasing steadily.



Source: Road Statistics Annual Report (MLIT)

Figure 3 Average 12-hour Traffic Volume on Ordinary Roads in Types of Vehicles

■ On ordinary roads, the traffic volume of passenger cars is on an upward trend.

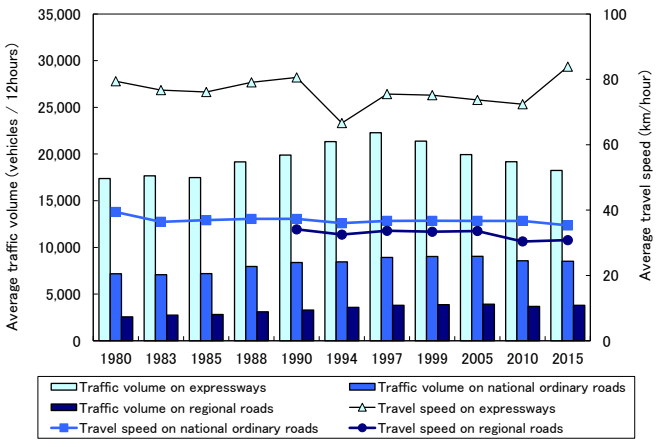


Notes: Figures in parentheses are the average traffic volume of all types of vehicles

Source: Road Traffic Census (MLIT)

Figure 4 Changes in Average Traffic Volume and Average Travel Speed by Type of Road

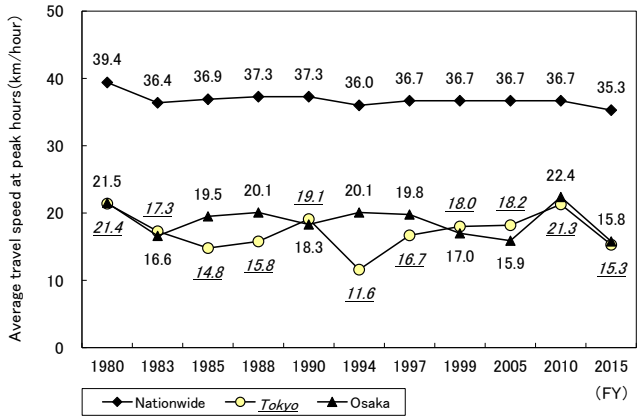
■ The average traffic volume on expressways has been on a downward trend since 1997, partly because the newly constructed ones has less traffic. The average travel speed for either type of road remains at the same level or is on a slightly downward trend.



Source: Road Traffic Census (MLIT)

Figure 5 Average Travel Speed on National Ordinary Roads (Nationwide, Tokyo, Osaka)

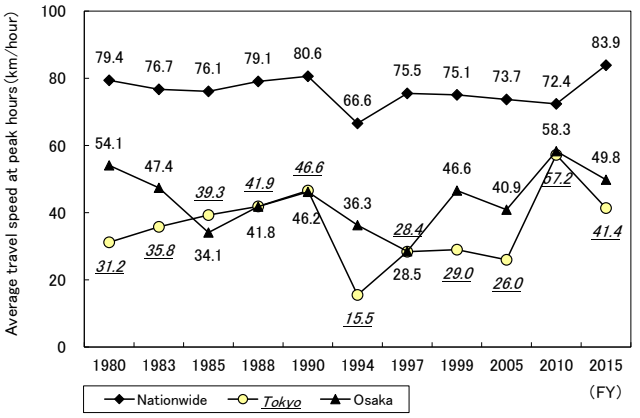
■ There has been almost no changes in the nationwide average. The average travel speed in the wards of Tokyo and in Osaka City is about half of the nationwide average; there is still severe traffic congestion.



Source: Road Statistics Annual Report (MLIT)

Figure 6 Average Travel Speed on Expressways (Nationwide, Tokyo, Osaka)

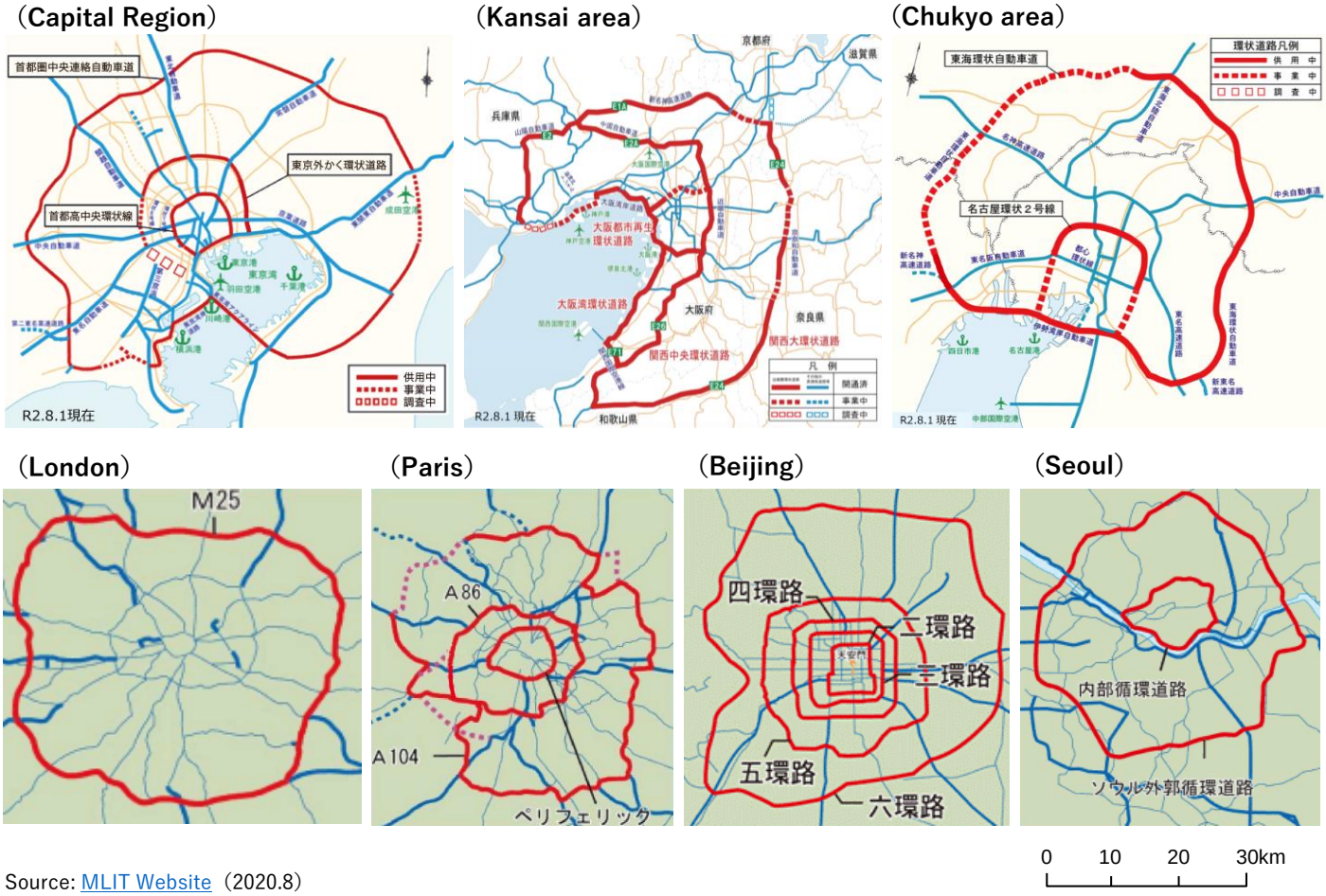
■ The nationwide average has been on a slightly downward trend. Though there had been changes in the average speed in the wards of Tokyo and in Osaka City, both speed levels remain lower than the nationwide average.



Source: Road Statistics Annual Report (MLIT)

Figure 7 National Comparison of Expressway Network Condition

■ Many cities have implemented ring roads, and its construction is completed in London, 90% done in Paris. For major cities in Asia (Beijin, Seoul), it is almost completed as well. In Tokyo, to make alternative expressway routes, the policy for "Smart use of infrastructure" with a focus on expressways is being implemented (e.g. metropolitan expressway Shinagawa-line, Ken-O expressway).



Source: MLIT Website (2020.8)

1-3 Freight Road Transport Today

Professor, Senshu University
Eiichiro Iwao

This section shows the basic statistics on the recent trends of freight road transport. Regarding the freight transport, both tonnage and ton-kilometer transported per capita have decreased over the last several decades. The number of commercial trucks increased until 2007. From 2008, there is a decrease. The number of private trucks have been declining since 1990. The number of large size motor vehicle license holders between the ages of 18 and 29 continued to decline until 2018. However, the number of large size motor vehicle license holders over the age of 70 continues to increase.

☐ Cargo weight by vehicle type for ordinary vehicles (commercial) has been increasing since FY2009. However, from FY2012 onward, it has continued to decrease with the exception of FY2016. Cargo ton-kilometers of ordinary vehicles (commercial) has been decreasing from 2007 to 2015 except for 2013. However, it started to increase after FY2016.

Figure 1 Changes in Cargo Weight, by Vehicle Type

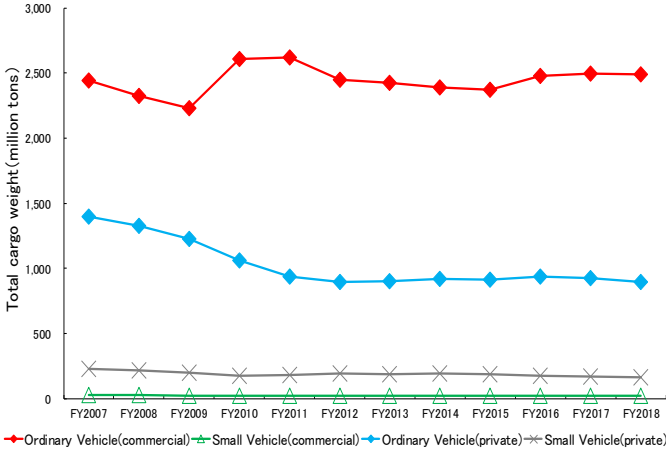
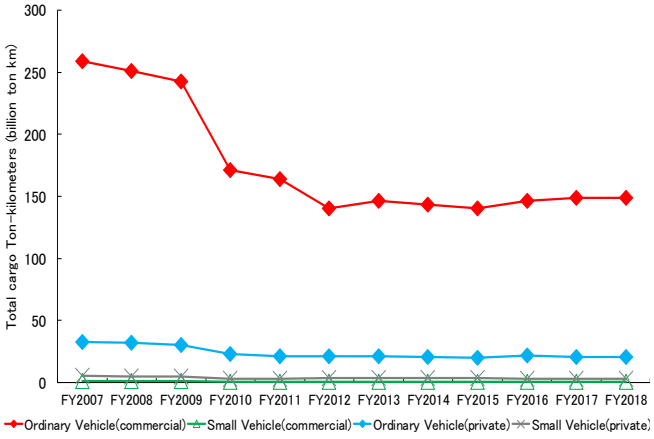


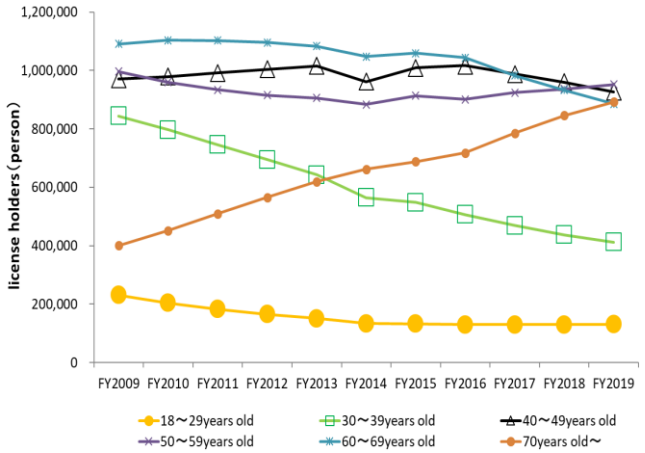
Figure 2 Changes in Cargo Ton-kilometers, by Vehicle Type



Note: It doesn't include Hokkaido District Transport Bureau and Tohoku District Transport Bureau numbers of March 2011 and April
Source：Annual Statistical Report on Motor Vehicle Transport (Information Policy Division, Policy Bureau, MLIT)

Figure 3 Changes in Large Size Motor Vehicle License Holders

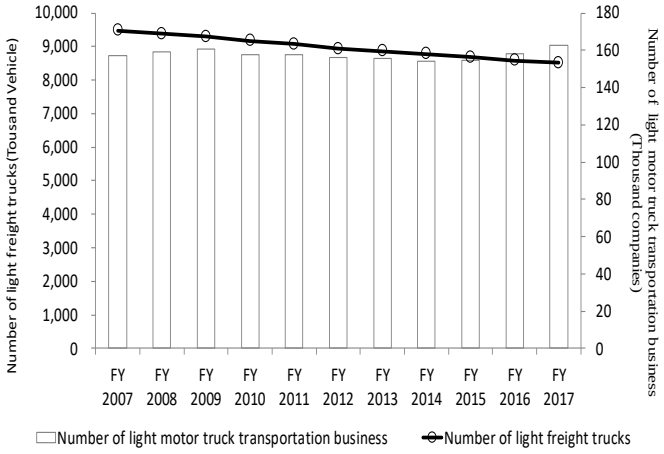
■ The number of large size motor vehicle licenses between the ages of 18 and 29 continued to decrease until FY2018. However, it increased in FY2019. The number of licenses for the 30-39 age group continues to decrease, while increasing for the over 70 group.



Source: Driver's license statistics (National Police Agency)

Figure 4 Changes in Number of Light Freight Trucks and Light Motor Truck Transportation Business

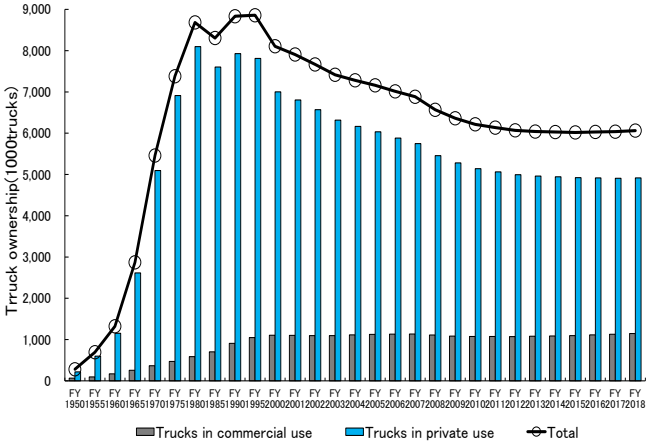
■ The number of light freight trucks owned continues to decrease since FY2007. The number of light truck business decreased from FY2010 to FY2015, with the exception of FY2011. However, it has been increasing since FY2016.



Note: The number of light freight trucks includes hearses and motorcycles.
Source：Transportation-related statistics data collection (Information Policy Division, Policy Bureau, MLIT), Statistical data (Japan Light Mortar Vehicle and Motorcycle Association)

Figure 5 Changes in Private and Commercial Truck Ownership

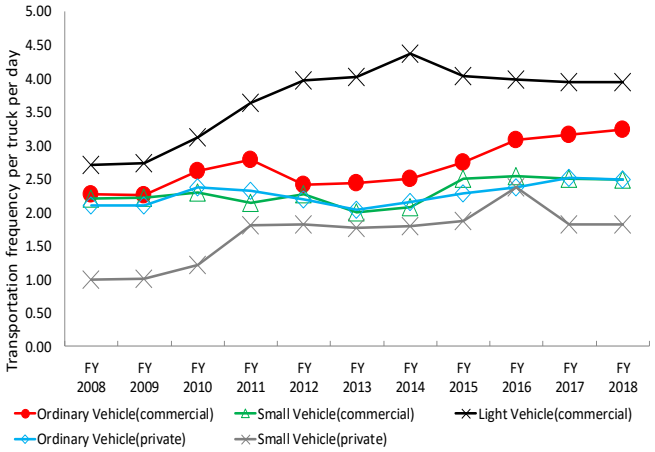
■ The number of trucks in commercial use increased until FY2007, but decreased from FY2008 to FY2011. After that, it increased from FY2012.



Note: It doesn't include Hokkaido District Transport Bureau and Tohoku District Transport Bureau numbers of March 2011 and April
Source：Transportation-related statistics data collection
(Information Policy Division, Policy Bureau, MLIT)

Figure 6 Changes in Transportation Frequency per Truck per Day

■ The transportation frequency per truck per day in actual use by ordinary truck (commercial) increased except for FY2012.



Source：Annual Statistical Report on Motor Vehicle Transport
(Information Policy Division, Policy Bureau, MLIT)

Figure 7 Changes in Load Factor, by Type of Use (Private vs. Commercial)

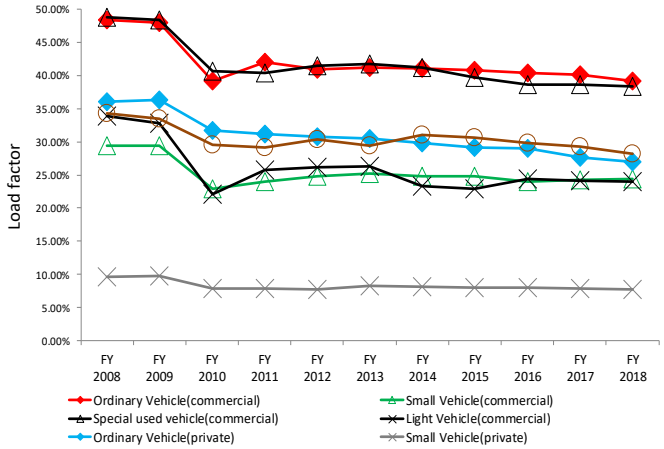
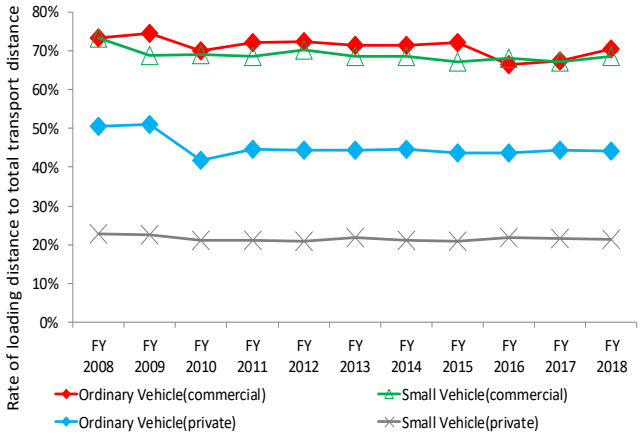


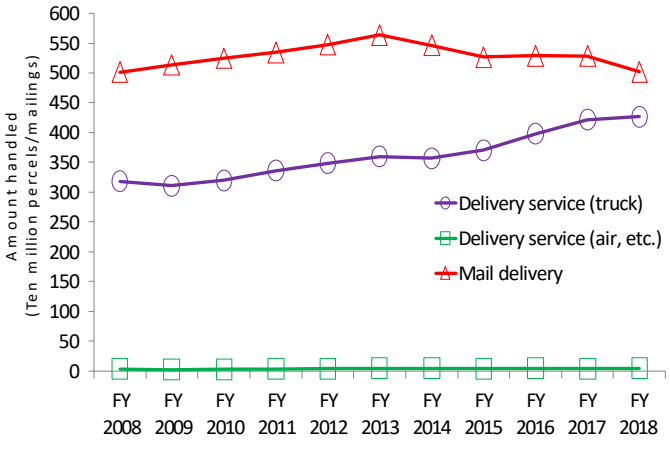
Figure 8 Changes in Rate of Loading Distance to Total Transport Distance, by Type of Use (Private vs. Commercial) Type



Note: It doesn't include Hokkaido District Transport Bureau and Tohoku District Transport Bureau numbers of March 2011 and April
Source: Annual Statistical Report on Motor Vehicle Transport
(Information Policy Division, Policy Bureau, MLIT)

Source: Transportation-related statistics data collection
(Information Policy Division, Policy Bureau, MLIT)

Figure 9 Changes in the Amount of Package and Mail Handling, as Well as Regular Parcel Post Delivery



Source: website of MLIT

Table 1 Trends in Courier Redelivery Rates

■ Redelivery rates are higher in urban area than in Local area. Comparing the 2017 and 2019, the redelivery rate is decreasing everywhere except for urban areas.

	Oct-17			Oct-19		
	Total number of deliveries	Number of Redelivery	Redelivery rate	Total number of deliveries	Number of Redelivery	Redelivery rate
Urban area	884	151	17.1%	839	139	16.6%
Suburban area	1,354	199	14.7%	1,325	190	14.3%
Local area	119	16	13.5%	131	15	11.5%
Total	2,357	366	15.5%	2,295	344	15.0%

Note: The unit of total number and redelivery number is 1,000.
This number is the total of Sagawa Express: Hikyaku Express Courier, Japan Post: Yupack, Yupacket, Yamato Transport: Takkyubin.
The October 2017 term is from October 1st to October 31st.
The October 2019 term is from October 1st to October 31st.
Source: website of MLIT

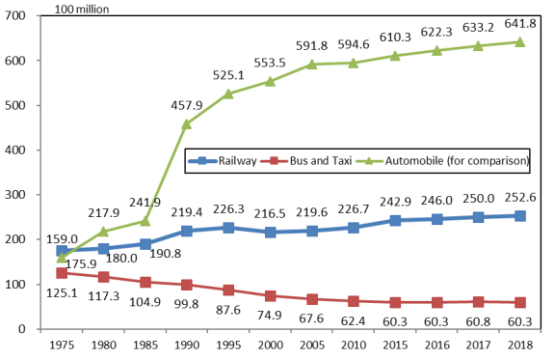
1-4 Public Transport Today

Professor, Ryutsu Keizai University
Kazuya Itaya

In recent years, the downward trend in the use of public transportation is slowing down. On the other hand, the use of private cars is on a recovery trend. From the statistical data, it can be said that the mobility in Japan has improved overall. In the three major metropolitan areas the utilization of railway is increasing. But the congestion rate of trains has continued to decline. In the Chukyo and Kansai areas, congestion is being relieved. The bus business has become unprofitable for a long time. The balance ratio has been improving. As a whole, the public transport safety has been maintained. However, many of the railway lines destroyed by the disaster are difficult to recover.

Figure 1 The Number of Passengers of Railways and Buses

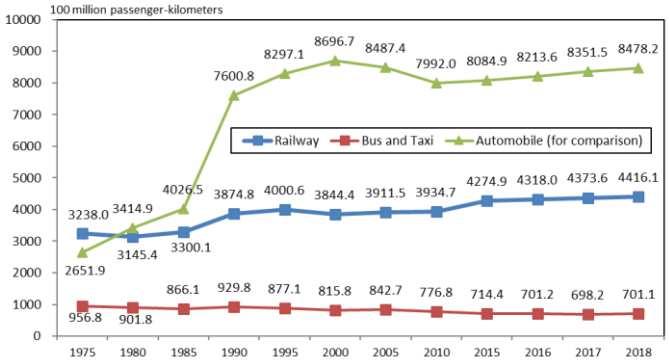
■ The use of Railways and buses remains almost unchanged.



Source: Annual Statistical Report on Motor Vehicle Transport, Annual Statistics Report on Railway Transport

Figure 2 Railway and Bus Passenger Kilometers

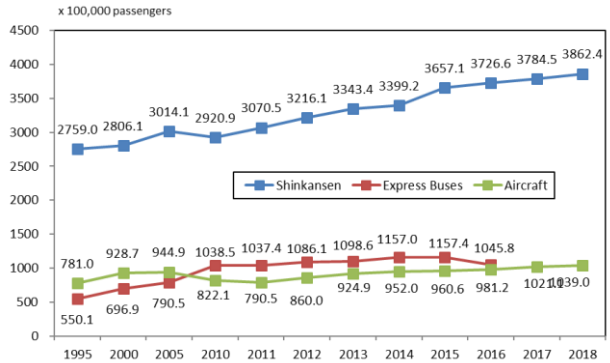
■ The use of railways has been gradually increasing, but the use of buses is almost unchanged.



Source: Annual Statistical Report on Motor Vehicle Transport, Annual Statistics Report on Railway Transport

Figure 3 The Number of Intercity Passengers, by Mode

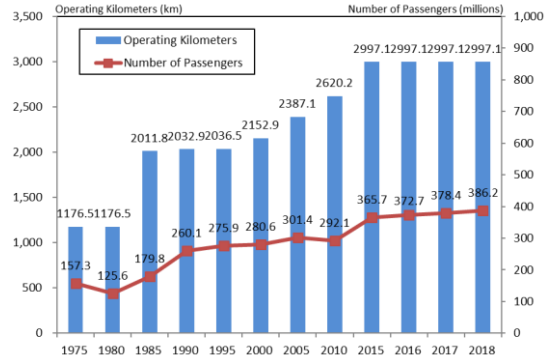
■ The use of Shinkansen, aircraft and express buses continues to increase.



Source: Annual Statistical Report on Railway Transport, Bus Business in Japan, Annual Statistical Report on Air Transport

Figure 4 Operating Kilometers and Number of Passengers of Shinkansen

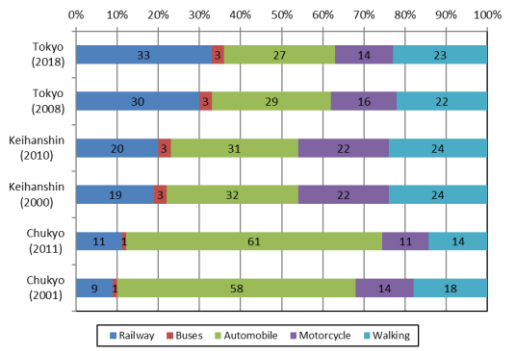
■ Since 2010, the use of Shinkansen has increased.



Source: Before 1985: Railways 2008: the Numbers.
After 1990: Annual Statistical Report on Railway Transport

Figure 5 Modal Share in the Three Metropolitan Areas

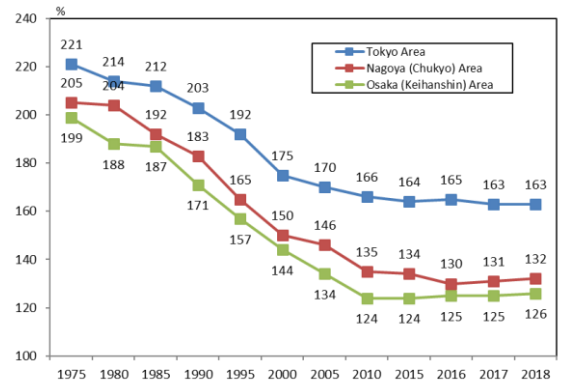
■ The use of railway tends to increase and automobile tends to decrease in each area.



Source: Urban Area Person Trip Survey Results in Tokyo, Osaka (Keihanshin), Nagoya (Chukyo) Area

Figure 6 Railway Congestion Rates in the Three Metropolitan Areas

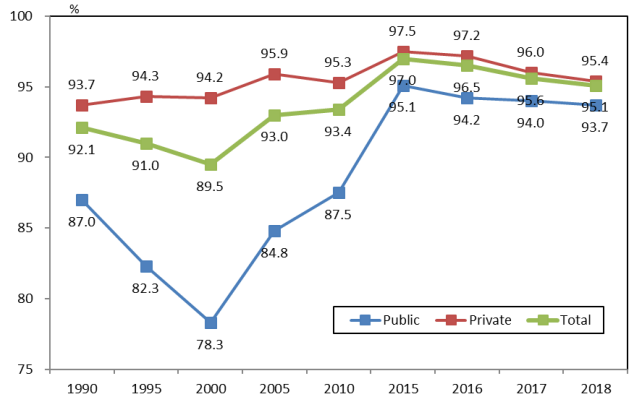
■ Railway congestion rates keep decreasing in all three areas.



Source: Railways 2019: the Numbers

Figure 7 Bus Industry Incomes vs. Expenditures

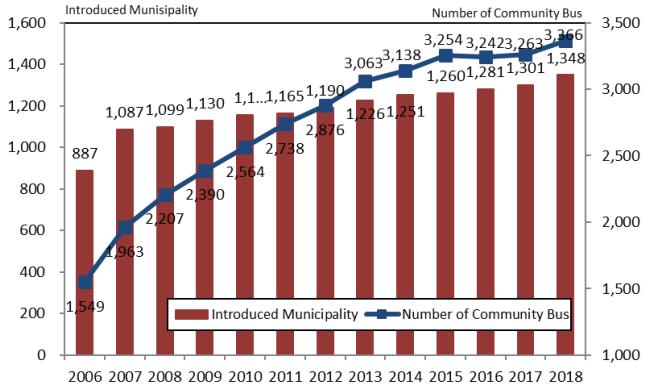
■ In the past 20 years, the balance ratio overall has never exceeded 100. [Balance ratio = (current income / current expenditure) × 100]



Source: Bus Industry Income and Expenditures

Figure 8 The Number of Municipalities Introduced Community Bus

■ Mainly in the areas where bus operators withdrew, the community bus routes are continuing to increase.



Source: White Paper on Transport Policy 2020

Table1 Long-Term Suspended Railway Lines Due to a Disaster

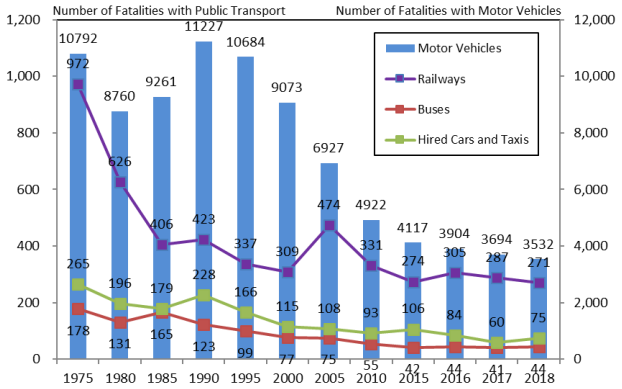
■ Many railway lines have been suspended for a long time due to disasters. There are some lines that are unlikely to be restored due to the great damage.

Names and Section of Lines	Period	Details of the Disaster
JR East Tadami Line (Aizu-Kawaguchi – Tadami)	2011/Jul/30–	July 2011 Heavy rain in Niigata and Fukushima
●JR Hokkaido Hidaka Line (Mukawa – Samani)	2015/Jan/8–	Sediment runoff due to high waves
Minami-Aso Railway Takamori Line (Tateno – Nakamatsu)	2016/Apr/14–	The 2016 Kumamoto Earthquake
●JR Hokkaido Nemuro Line (Higashi-Shikagoe – Shintoku)	2016/Aug/31–	2016 Typhoon No. 10
●JR Kyushu Hitahikosan Line (Soeda – Yoake)	2017/Jul/5–	July 2017 Heavy rain in northern Kyushu
JR East Suigun Line (Fukuroda – Hitachi-Daigo)	2019/Oct/12–	2019 Typhoon No. 19
Abukuma Express Line (Tomino – Marumori)	2019/Oct/12–	2019 Typhoon No. 19
Ueda Kotsu Line (Ueda – Shiroshita)	2019/Oct/12–	2019 Typhoon No. 19

Note: As of August 2020, lines that have been suspended for over a year due to a disaster are listed.
● has no plans to restore.
Source: Author's Investigation

Figure 9 The Number of Traffic Fatalities with Public Transport

■ The number of fatalities with buses, hired cars, and taxis continues to decrease. Compared to the number of traffic fatalities with motor vehicles (3532 in FY 2018), public transport safety is outstanding.

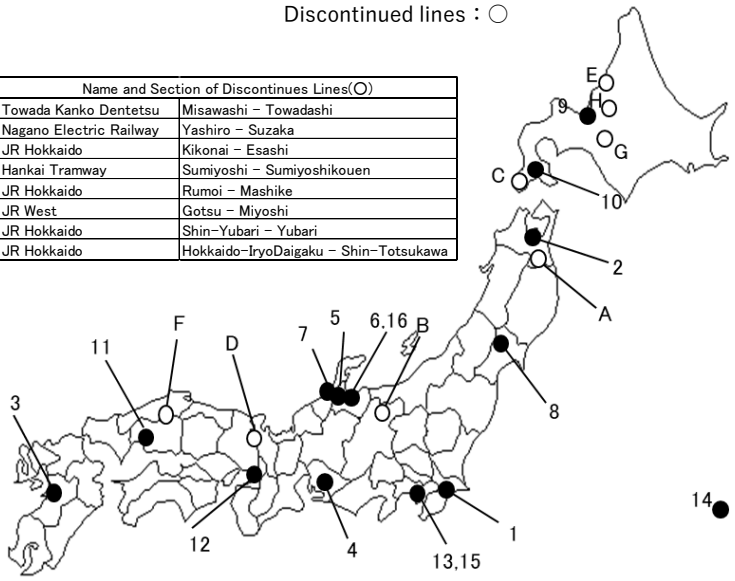


Source: (Railway and Automobile): White Paper on Traffic Safety in Japan, (Bus, Hired Car and Taxi): Statistics on Traffic Accidents of Motor Vehicles for Business Use

Figure 10 Newly Established / Discontinued Railway Lines

Examples between 2010 and 2020 Newly-established lines：●
Discontinued lines：○

	No	Name and Section of Discontinues Lines(○)	
2012	A	Towada Kanko Dentetsu	Misawashi – Towadashi
	B	Nagano Electric Railway	Yashiro – Suzaka
2014	C	JR Hokkaido	Kikonai – Esashi
2016	D	Hankai Tramway	Sumiyoshi – Sumiyoshikouen
	E	JR Hokkaido	Rumoi – Mashike
2018	F	JR West	Gotsu – Miyoshi
2019	G	JR Hokkaido	Shin-Yubari – Yubari
2020	H	JR Hokkaido	Hokkaido-IryoDaigaku – Shin-Totsukawa



Source: Author's Investigation

■ There are many newly established lines in the Hokuriku region. The case of the JR West in 2017 is a revival of a line that was once abolished. At the same time, the number of discontinued lines has been on a downward trend over the past several years.

	No	Name and Section of New Lines(●)	
2010	1	Keisei "Narita Airport Line"	Keisei Takasago – Narita Airport
	2	JR East "Tohoku Shinkansen"	Hachinohe – Shin Aomori
2011	3	JR Kyushu "Kyushu Shinkansen"	Hakata – Shin Yatsushiro
	4	Nagoya City Transportation Bureau	Nonami – Tokushige
2014	5	Manyosen	Takaokaeki – Takaokaekimae
2015	6	Toyama Chihou Tetsydou	Toyamaeki – Dentetsu Toyamaeki・Esta Mae
	7	JR East, West "Hokuriku Shinkansen"	Nagano – Kanazawa
	8	Transportaton Bureau City of Sendai	Yagiyama Zoological Park – Arai
	9	Sapporo City Transportation	Susukino – Nishi yon chome
2016	10	JR Hokkaido "Hokkaido Shinkansen"	Shin-Aomori – Shin-Hakodate-Hokuto
2017	11	JR West	Kabe – Aki-Kameyama
2018	12	JR West	Shin-Osaka – Hanaten
2019	13	Yokohama Seaside Line	Kanazawa Hakkei Station extension
	14	Okinawa Urban Monorail	Shuri – Tedako-Uranishi
2020	15	JR East, Sotetsu	Nishiya – Hazawa Yokohama-kokudai
	16	Toyama Chihou Tetsydou	Toyama Station north-south direct service started

1-5 Recent Trends in New Urban Transport Systems

Professor, Yokohama National University
Fumihiko Nakamura

New technology has been meeting the diverse needs of mobility and responding to policy issues. Vehicle design with advanced technology has been applied to several cases in LRT and BRT. BHLS (Bus with High Level of Service) has been popular in EU. One-way car sharing with electric vehicles has been demonstrated. Innovations in bicycle sharing systems have enhanced management efficiency. Ropeway systems and escalators have been applied for mobility needs in hilly urbanized areas.

Table 1 Summary of Trends in New Urban Transport Systems

Modes	Environment, Safety	Social Welfare, Social Inclusion	Planning, landscape
LRT and trams	Low floor and low emission		No catenary tram
BRT and buses	Fuel cell, EVs	Low floor, community buses	Designers' involvement
Bicycles	Bicycle sharing		
Automobiles	Car sharing		
Pedestrian support	Personal mobility		
Service Integration	MaaS (Mobility As A Service)		
Others		Ropeways, escalators, elevators	

Figure 1 Catenary-less Tram

Anges (France)
Source: http://www.angers.fr/actualites/photos/

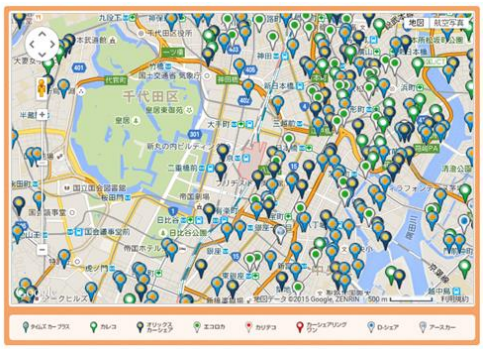
Figure 2 Rubber-tyre Tram

Medelline (Colombia)
By the author

Figure 3 Bus with High Level of Service

Metz (France)
By the author

Figure 4 Car-sharing Station Map in Tokyo



Source: http://www.carsharing360.com/site.html

Figure 5 One-way Car-sharing Demonstration at Yokohama

Source: http://www.smart-j.com/smaco/

Figure 6 Cancellation of EV Sharing in Paris (Auto'lib) Due to Problems

By the author

Figure 7 Increase of Bike Sharing Projects

Shang-Hao I (xqchuxing)
By Ms. Hanako Kaminokado

Figure 8 E-scooter Demonstration Initiated by Share-taxi Operator in Jakarta

By Mr. Akira Hosomi

Figure 9 Chinese EV Bus Introduced in Kyoto

■ Batteries above front tyre houses

By the author

Figure 10 Japanese Hybrid Articulated City Bus

■ Isuzu Motor started selling.

Source: ISUZU

Figure 11 Japanese Fuel Cell Bus

Introduces in Tokyo in 2018
Source: Tokyo Metropolitan Transit Authority

Figure 12 Hybrid Bus in Beijing, China

Trolly-driven with catenary and battery driven
By the author

Figure 13 Autonomous Bus Demonstration

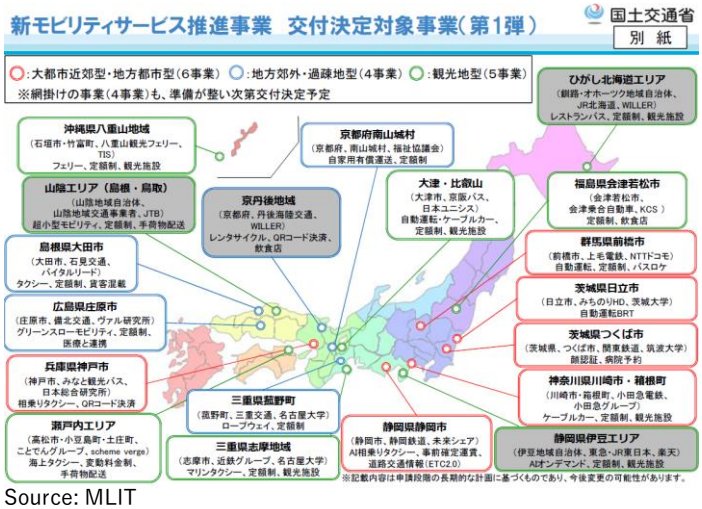
Robot Shuttle
Source: DeNA HP

Table 2 Classification of MaaS

Lv.	Outline	Detail	Examples
0	No integration	Info. provided by each operator	App. by each operator
1	Information provision	Integration of information	Trip Planner App.
2	Booking and payment	By each of trip	Hanover
3	Service integration	Subscription and membership	Helsinki, Los Angeles
4	Policy integration	Coordination between regions Private-Public Partnership	EMMA

By the author

Figure 14 Japanese MaaS Demos. In 2019 (19 Projects)



Source: MLIT

Figure 15 Segway Sightseeing Tour

San Francisco
By the author

Figure 16 Ropeways and Escalators in Low Income Districts

Ropeway (left) and Escalator (Right) in Medellin, Colombia
By the author.

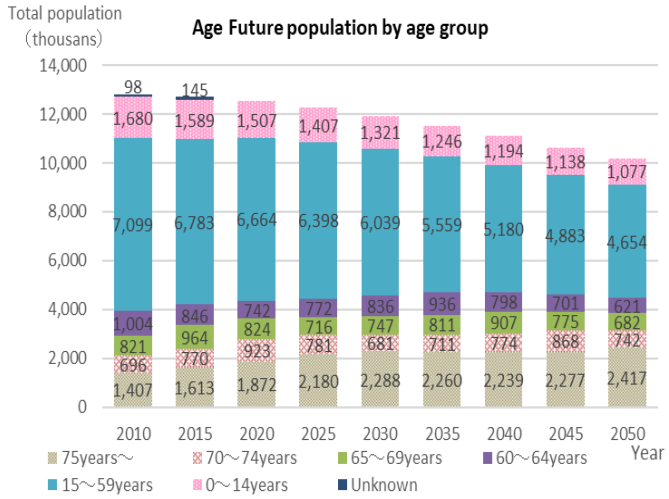
1-6 Easy-to-use Transportation for Everyone

Specified Nonprofit Corporation
Healthy town development
Atsushi Matsubara

Six years have passed since the Government of Japan ratified the Convention on the Rights of Persons with Disabilities in 2014. The Olympic and Paralympic Games were about to be held, but there remain problems because Japanese Government has not admitted "the right to transport". Elderly people and people with disabilities, who are vulnerable, are refraining from going out due to fear of COVID-19 infection. There is a problem that the measures to encourage going out that have been tackled so far are not useful. Not going out is associated with deterioration in physical strength. Even when traveling by private car, which can be expected to prevent infection, driving errors due to deterioration in cognitive function of elderly drivers is becoming a social problem.

Figure 1 Future Population by Age Group

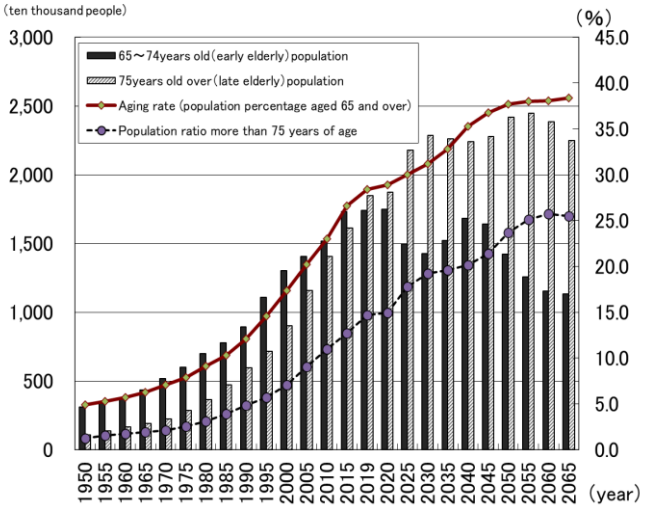
■ Japan's total population and productive population are steadily decreasing.



Source: Statistics Bureau of Japan : 2020

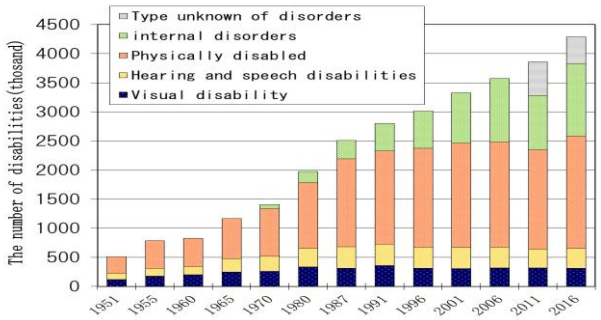
Figure 2 Changes in the Elderly Population over Time

■ Aging rate (over 65 years old) is 28.4%. The proportion of people aged 75 and over is 14.7%. From 2018, the number of late-stage elderly exceeded the number of early-stage elderly. Super-aging is progressing.



Source: 2020 version of "aging society White Paper"

Figure 3 The Number of the Persons with Disabilities



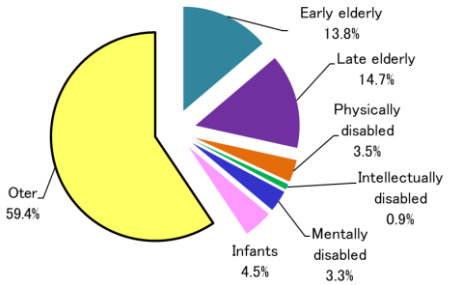
Source: MHLW "in 2016: Survey on the difficulty of life (nationwide home handicapped Survey)"

Table 1 The Number of Persons with Disabilities at Home

Fault type	Total number
Physically disabled	4.36 million people
Intellectually disabled	1.09 million people
Mentally disabled	4.19 million people

Source: Annual Report on Government Measures for Persons with Disabilities 2019

Figure 4 Breakdown of Japan's Total Population (126 Million People)



Source: Annual Report on the Aging Society: 2020, Annual Report on Government Measures for Persons with Disabilities 2019

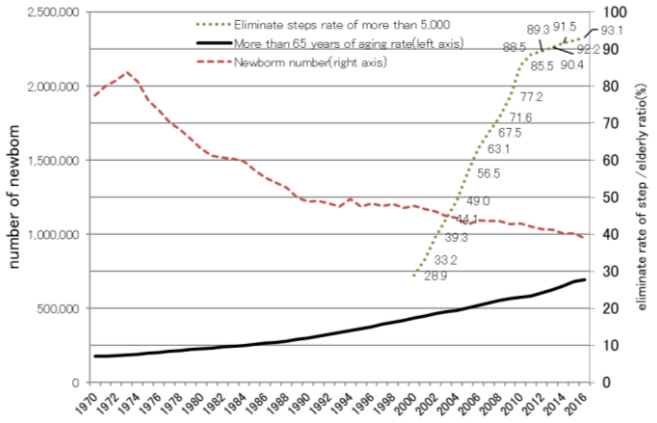
Table 2 The Compliance of Standards Stipulated in the Transportation Barrier-Free Law

	2020 year-end target	2018 year-end	Year-on-year
Railway vehicle	70%	73.2%	2.0p+
Low-floor bus	70%	58.8%	2.8p+
Welfare taxi	28,000 vehicles	28,602 vehicles	8,489 vehicles+
Passenger ship	50%	46.2%	2.4p+
Aircraft	90%	98.2%	0.4p+

Source: Compiled from MLIT documents

Figure 5 Rate of Elimination of Grade Disparities in Railway Stations

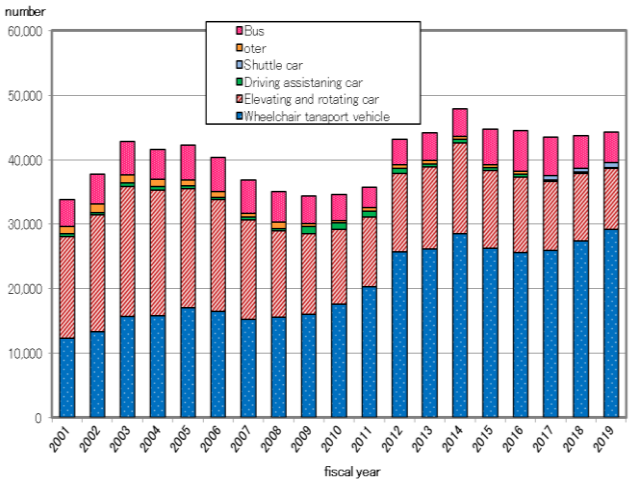
■ As the population ages, stations are becoming barrier-free. The number of newborns using strollers is decreasing.



Source: Compiled from MLIT, MHLW of documents

Figure 6 Trends in the Sales of Welfare Vehicles

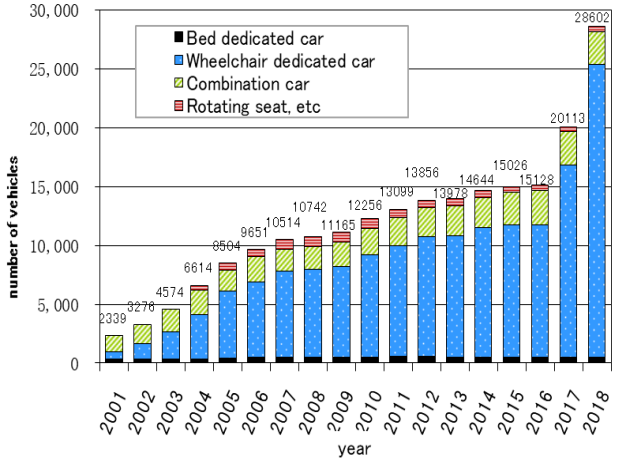
■ Sales of welfare vehicles are picking up.



Source: Compiled from JAMA documents

Figure 7 The Number of the Welfare Taxi

■ With the introduction of wheelchair-friendly vehicles, welfare taxi number is increasing rapidly.



Source：Compiled from MLIT document

Table 3 The Number of Driver License Holders by Gender and Age Group

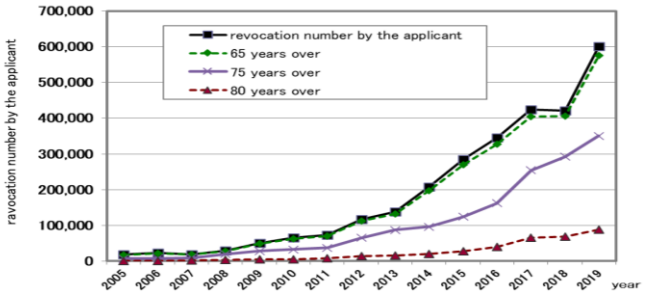
■ Decrease in driver's license possession among young people.

age	2017 year-end		2018 year-end		2019 year-end		2018-2019 increase or decrease ratio	
	men	women	men	women	men	women	men	women
16～19	547,135	378,755	520,310	363,264	508,314	356,736	−2.3	−1.8
20～24	2,565,106	2,174,669	2,567,301	2,174,090	2,531,713	2,140,939	−1.4	−1.5
25～29	2,935,654	2,590,231	2,874,219	2,536,875	2,867,111	2,530,227	−0.2	−0.3
30～34	3,445,970	3,112,442	3,353,104	3,019,729	3,239,191	2,908,120	−3.4	−3.7
35～39	3,858,449	3,543,644	3,766,712	3,457,413	3,695,692	3,389,708	−1.9	−2.0
40～44	4,607,085	4,520,685	4,433,462	4,090,554	4,256,783	3,927,731	−4.0	−4.0
45～49	4,656,760	4,294,527	4,755,227	4,392,762	4,818,948	4,454,490	1.3	1.4
50～54	3,974,943	3,640,619	4,086,014	3,756,213	4,177,627	3,850,087	2.2	2.5
55～59	3,622,611	3,251,334	3,650,321	3,298,832	3,711,229	3,373,090	1.7	2.3
60～64	3,566,117	3,054,565	3,519,656	3,064,001	3,490,170	3,078,885	−0.8	0.5
65～69	4,299,868	3,367,040	4,066,902	3,271,012	3,793,321	3,105,198	−6.7	−5.1
70～74	3,124,570	1,997,104	3,368,967	2,289,675	3,598,414	2,528,031	6.8	10.4
75～79	2,177,322	1,006,977	2,262,875	1,110,327	2,329,766	1,211,247	3.0	9.1
80～84	1,240,107	380,742	1,242,698	407,636	1,232,337	430,319	−0.8	5.6
85～	512,074	78,090	526,934	87,839	528,080	94,924	0.2	8.1
total	45,133,771	37,391,424	44,994,702	37,320,222	44,778,696	37,379,732	−0.5	0.2

Source: National Police Agency “driver‘s license statistics 2019 version”

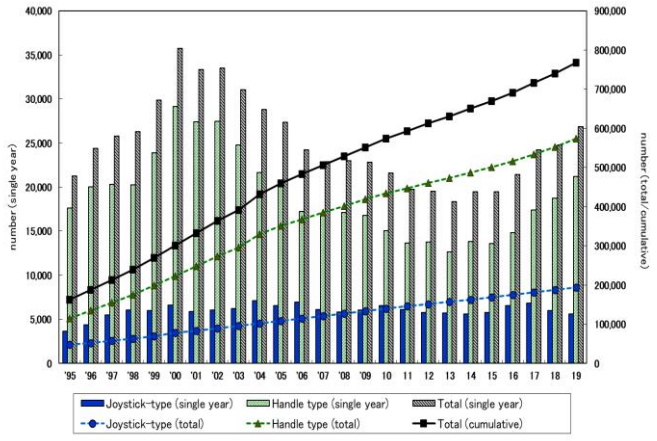
Figure 8 The Number of Persons Who Voluntarily Return Their Driver’s Licenses

■ By conducting a driver's license aptitude test, the number of people returning licenses is increasing rapidly.



Source: National Police Agency “driver’s license statistics 2019 version”

Figure 9 Electric Wheelchair Shipments



Source: Electric wheelchair safety Promotion Association material

Figure 10 The Advent of Wheelchair-accessible Taxi

■ Before the Olympic and Paralympic Games, wheelchair-accessible taxis were introduced by Japan Taxi in 2017. And to improve the time to get on and get off the wheelchair, the special temporary slope was added in 2019.

1-7 The Future of the Transport Infrastructure

The Institute of Behavioral Sciences
Yuichi Mohri

The table summarizes transportation policies and other initiatives from 2015 to 2018. In addition, for 2019, the following plans were formulated and laws were issued. 1) Promulgation of the "Law for Partial Amendment of the Road Vehicles Act", 2) Formulation of the "Draft Basic Plan for Safety and Security on Expressways", 3) Promulgation of the "Anti-Monopoly Law Special Provisions for Buses and Regional Banks", 4) Implementation of road pricing (additional charge of 1,000 yen) on the Metropolitan Expressway during the Tokyo 2020 Olympic and Paralympic Games, 5) Formulation of Road Policy Vision: "Changing Road Landscape in 2040".

Table 1 Transportation Policy and Other Initiatives in 2015-2018

Year and month	Transportation policy and other initiatives in 2015-2018
August 2015	Based on the National Spatial Planning Act, the Cabinet approved the new National Spatial Strategy, the seventh national plan in the post-war era.
September 2015	Based on the Act on Priority Plan for Infrastructure Development, the Cabinet approved the Fourth Priority Plan for Infrastructure Development for the planning period from FY2015 to FY2020.
December 2015	The "Report on the Basic Direction of Future Logistics Policy" which indicates the way to proceed with future initiatives and concrete measures to achieve them was compiled.
March 2016	New Regional Plans for each of the eight blocks across the country have been finalized in light of the National Spatial Strategy of August 2015.
April 2016	In light of the progress of the development of the three ring roads, an expressway toll scheme that promotes it use via a distance-based system was introduced in the Metropolitan Area.
June 2017	A part of the Environmental Action Plan of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has been revised, and the inspection results of the MLIT's environment-related measures for the period up to 2020 have been presented.
June 2017	As in the Metropolitan Area, a new toll scheme was introduced for the Kinki region's expressways, using a distance based system to promote it use.
July 2017	In addition to setting out guidelines for logistics policies and administration, the Cabinet approved the Comprehensive Logistics Policy (FY2017-2020), which aims to promote comprehensive and integrated logistics policies in cooperation with the relevant ministries and agencies.
July 2017	A (draft) proposal "Road/Transport Innovation: Realizing affluent lifestyles by pursuing functional improvement and utilization of "Michi"" was presented as a road policy that should be pursued in the future.
July 2017	The national government, the Tokyo Metropolitan Government, and the Metropolitan Expressway Company Limited, in coordination with the development of the Nihombashi area, jointly presented a proposal of burying the Metropolitan Expressway underground, including its alignment, structure, and expressway sections of the project.
January 2018	A (draft) proposal for transportation management of the Tokyo 2020 Olympic and Paralympic Games was presented.
February 2018	The Cabinet has approved the "Bill to Revise a Part of the Road Law", which takes measures such as the obligation to maintain and manage properties occupied by the road and the establishment of an important logistics road system for the purpose of further improving safety by enhancing road management and strengthening the function of important road networks for logistics.
June 2018	Based on the Bicycle Utilization Promotion Act, the Cabinet approved the Bicycle Utilization Promotion Plan, which is a basic plan for the comprehensive and systematic promotion of measures to promote the bicycle use.
November 2018	An interim report of the Ministry of Land, Infrastructure and Transport (MLIT) has been published, which shows the directions of the Ministry's technology policy and the main technology policy.
December 2018	" Ministry of Land, Infrastructure, Transport and Tourism's Future Efforts toward the Realization of Autonomous Driving" was published toward the solution of various problems involving automobiles and roads.

Promulgation of the "Law for Partial Amendment of the Road Vehicles Act".

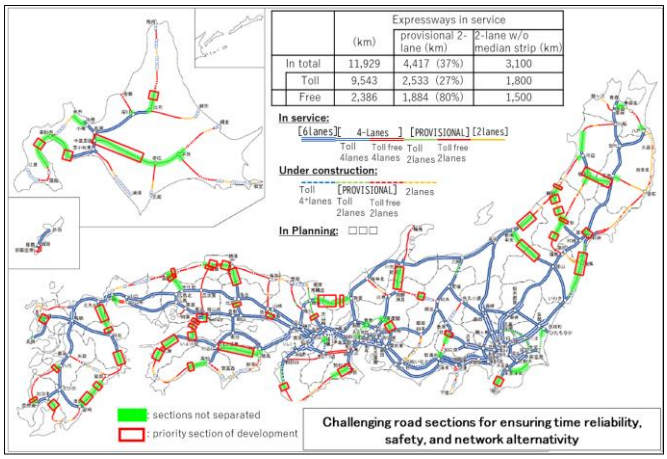
■ The Bill of Partial Amendment of the Road Vehicles Act, which establishes a system to ensure the safety of automated vehicles and other vehicles in an integrated manner from design and manufacturing to their use, while promoting the safe development, commercialization, and dissemination of automated vehicles and other vehicles, was approved by the Cabinet in March 2019 and promulgated in May 2019. The bill (1) adds automatic navigation devices to the devices subject to safety standards, (2) organizes the legal entities that will be required to perform administrative tasks related to the management of technical information necessary for the electronic inspection of vehicles, (3) expands the scope of overhaul and require the provision of necessary technical information for inspection and maintenance, and (4) establish a licensing system to modify automatic navigation devices and other devices by modifying the embedded programs. Based on this bill, the targets are the commercialization of automated driving on expressways (level 3) (by 2020), the commercialization of unmanned automated driving services (level 4) in limited areas (by 2020), and the installation rate of automatic braking in new passenger cars (over 90% by 2020).

Source: MLIT

Figure 1 Draft Basic Plan for Highway Safety and Security

■ In September 2019, the Draft Basic Plan for Safety and Security on Expressways was formulated including the level of service to aim for, in order to steadily promote measures in safety and security of the expressway network from the perspective of improving safety, reliability and user-friendliness. The specific measures in the Basic Plan are (1) elimination of the provisional two-lane sections, (2) evolution of the expressway in response to innovations such as automated driving, (3) realization of the safest expressway in the world, (4) dramatic improvement of network reliability, and (5) improvement of user-friendliness based on user needs. In particular, in the provisional two-lane section, the number of provisional two-lane toll sections is to be reduced by half in 10 to 15 years (this will be fully eliminated in the long term), and in order to promote the systematic conversion of the sections with provisional two-lane into four-lane in the tolled sections, priority is given to sections with major problems (priority maintenance sections), which will be projected and maintained.

【Priority maintenance sections of provisional 2-lane】



Source: MLIT

Promulgation of the "Anti-Monopoly Law Special Provisions for Buses and Regional Banks"

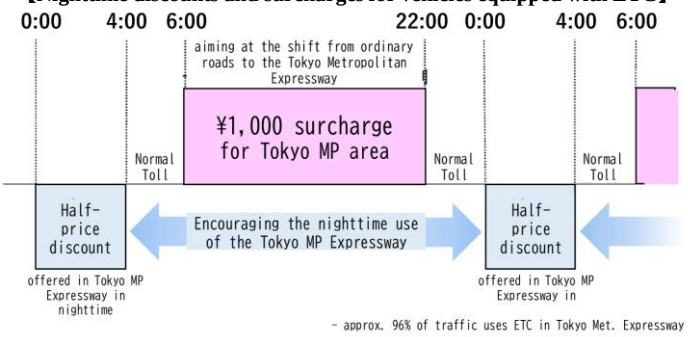
■ The "Act on Prohibition of Private Monopolization and Maintenance of Fair Trade for the Purpose of Maintaining the Provision of Fundamental Services Related to the General Ride-by-Bus Transportation Business and Banking Business in the Region", which establishes special provisions of the Private Anti-Monopoly Law, has been introduced to maintain the services provided by bus companies and regional banks. The law was approved by the Cabinet in March 2020 and promulgated in May 2020. This special law enables (1) setting fares and charges that allow users to use regional public transportation within its network (e.g., flat-rate for unlimited travel, etc.), (2) joint and shared operation of routes and systems within the network (e.g., restructuring "hub-and-spoke" network, etc.), and (3) The Anti-Monopoly Act was exempted from the application of the Anti-Monopoly Act to the conclusion of a joint management agreement that includes the setting of the number of buses and schedules of services (e.g., evenly spaced services, patterned schedules, etc.) of routes and systems within the network, allowing for the necessary actions such as fare pooling.

Source: MLIT

Figure 2 Tokyo Metropolitan Expressway Tolling Policy for the Tokyo 2020 Olympic and Paralympic Games

■ In the summer of 2019, one year before the Games, the Tokyo 2020 Olympic and Paralympic Games Organizing Committee, with the cooperation of traffic and road managers and other relevant organizations, conducted an experiment on easing congestion during the Games, mainly on expressways and a part of ordinary roads, to congestion levels close to the target levels during the actual Games. Specifically, in addition to TDM measures such as telework, staggered working hours, and so-called “Smooth Biz” measures (by the Tokyo metropolitan government) such as changing the delivery time of goods and equipment, traffic restrictions were implemented for vehicles flowing into the city from mainline toll booths on expressways and for vehicles flowing into the city from Ring Road (Beltway) 7 on ordinary roads on Wednesday, July 24 and Friday, July 26. Based on these results, it was concluded that additional TDM measures should be taken to further reduce traffic volume and implement additional measures in preparation for the Games, and after considering the economic burden of the fees, a half-price discount should be introduced during nighttime to encourage the shift to nighttime in the use of the Tokyo Metropolitan Expressway and to discourage the shift from ordinary roads to the Tokyo Metropolitan Expressway. In order to do so, Japan's first full-scale road pricing (1,000 yen surcharge) will be implemented for the first time in the country.

【Nighttime discounts and surcharges for vehicles equipped with ETC】



Source: Bureau of Tokyo 2020 Olympic and Paralympic Games Preparation

Formulation of Road Policy Vision: “Changing Road Landscape in 2040”

■ In February 2020, the Basic Policy Working Group of the Roads Subcommittee of the Council of Infrastructure Development proposed a vision for the society of 2040, with an eye on new post-COVID-19 lifestyles and socio-economic changes, and the direction of medium- and long-term policies to achieve this vision through road policies (2040, Changing the Landscape of Roads - Towards Roads That Lead to People's Happiness) was developed.

Source: MLIT

1-8 Funding Japan's Highways Following the Tax-Earmarking

Professor, Keio University
Kazusei Kato

Though more than ten years have passed since highway earmarked funding system ended in 2009, automobile users are still burdened by several taxes in Japan. In FY 2020, the total amount of revenue from automobile-related taxes is 6.1 trillion yen. Highway expenditure remains constant, the national highway budget is earmarked for disaster prevention and reduction, and national resilience. Based on the national inspection, the national subsidy increased because the subsidy projects were established for extending the life of highway and other structures of local governments. In the US, the highway condition in urban areas have worsen in recent ten years, though there are no permanent measures to increase the revenue of Federal Highway Trust Fund.

■ The System of Revenues Earmarked for Highway ended the end of March 2009. All taxes has been remaining as the general tax, but revenues have been decreasing.

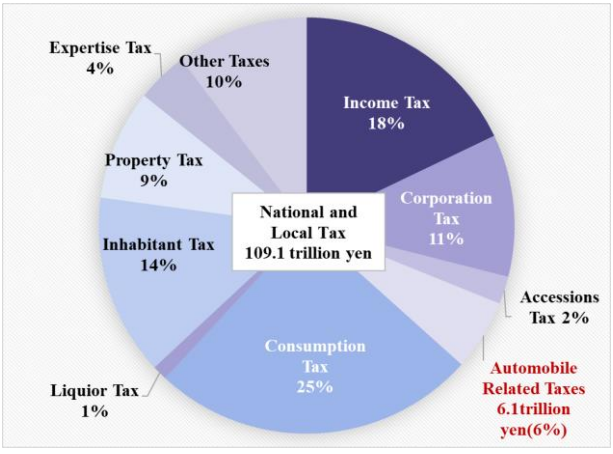
Table 1 Automobile-Related Taxes

Tax Items(Government)	Implementation Year	Earmarked for Highway in 2008	Main Rules	Temporary Tax Rate (FY2008)	Temporary Tax Rate (FY2015)	Revenue (FY2008)	Revenue (FY2019)	Revenue (FY2020)
Automobile Acquision Tax (Local)	1968	All	3% of Acquisiton Cost(private)	5% of Acquisiton Cost(private)	3% of Acquisiton Cost(private)	402.4	84.0	—(※3)
Motor Vehicle Tonnage Tax (National)	1971	77.5% of National Tax Revenue(=2/3 of Total Revenue)	2,500yen per 0.5t	6,300yen per 0.5t	4,100yen per 0.5t (less than 13years)	554.1	376.0	393.0
Motor Vehicle Tonnage Transfer Tax (Local)	1971	1/3 of Total Revenue	593/1000 of the revenue from the tax is credited to the General Accounts of the Central Government(above). The remaining 407/1000 is granted to local Governments.			360.1	274.2	284.5
Gasoline Tax (National)	1954	All	24.3 yen/ℓ	48.6yen/ℓ	48.6yen/ℓ	2,729.9	2,303.0	2,204.0
Liquefied Petroleum Gas Tax (National)	1966	1/2 of Revenue	17.5 yen/kg	—	—	14.0	7.0	6.0
Local Gasoline Tax (Local)	1955	All	4.4 yen/ℓ	5.2yen/ℓ	5.2yen/ℓ	299.8	246.4	235.8
Liquefied Petroleum Gas Transfer Tax (Local)	1966	1/2 of Revenue	1/2 of the revenue from the tax is credited to the General Accounts of the Central Government. The remaining 1/2 is granted to local Governments.			14.0	7.2	6.3
Light Oil Delivery Tax (Local)	1956	All	15.1yen/ℓ	32.1yen/ℓ	32.1yen/ℓ	991.4	953.7	958.6(※4)
Total (billion yen)						5,365.7	4,251.5	4,088.2

※1 Total may not match sum of the number due to rounding off.
※2 The consumption tax is imposed as a national tax at the time of acquisition. The automobile tax is imposed as prefectural resident tax and the light vehicle tax is imposed as municipal inhabitant tax in the possession stage.
※3 Automobile acquisition tax was abolished from October 2019 and "environmental performance-based tax break" was introduced.
※4 The taxation system of the gas oil delivery tax was revised in 2018. The number is the expected income under the existing law , However, the expected income under the revised law is 964.1 billion yen.

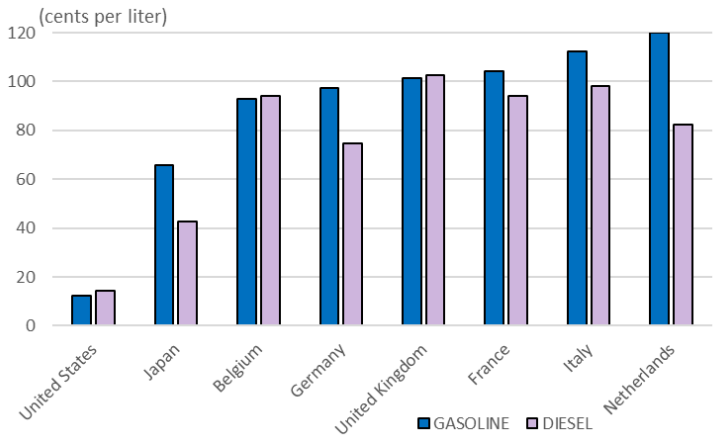
Data source: MOF, MIC, Japan Automobile Manufacturers Association, Inc.

Figure 1 Tax Revenue and Automobile-Related Taxes (FY2020)



Data source: MOF, General Account Budget,（Initial Budget）; MIC, Revenue Estimates of Local Taxes and Local Transfer Taxes

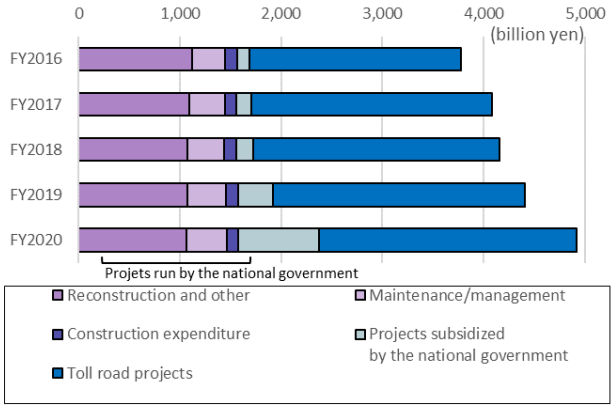
Figure 2 Motor Fuel Tax Rates for Selected Countries (2019)



Note US includes the weighted average of state fuel taxes plus the federal fuel tax.
Data source: USDOT, Federal Highway Administration

Figure 3 Highway Budget in Recent 5 Years

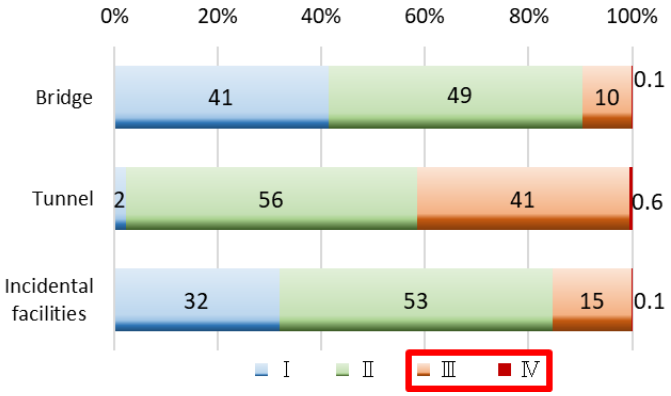
■ The national highway budget is earmarked for disaster prevention and reduction, and national resilience. The national subsidy increased because the subsidy projects were established for extending the life of highway and other structures of local governments.



Note In addition to these, there are comprehensive social infrastructure maintenance grants and disaster prevention/safety grants that can be used for road maintenance in response to the needs of local governments.
Data source: MLIT, Road Bureau and City Bureau, Budget Summary

Figure 4 National Inspection of Facilities

■ As a result of nationwide inspection, 10% of the bridges (about 70,000) and 42% of tunnels require repairs.

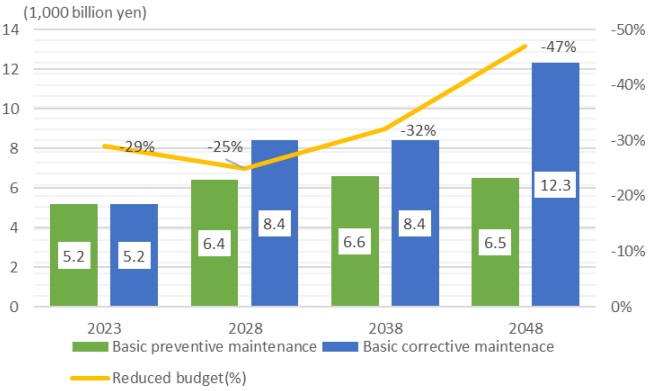


Ⅰ：No Deterioration of the function of the structure
Ⅱ：No Deterioration of the function of the structure, but action is required.
Ⅲ：Deterioration of structural functions, requires repairs.
Ⅳ：Deterioration of structural functions, requires immediate repairs.

Data source: MLIT, Road Bureau and City Bureau, Budget Summary

Figure 5 National Inspection of Facilities

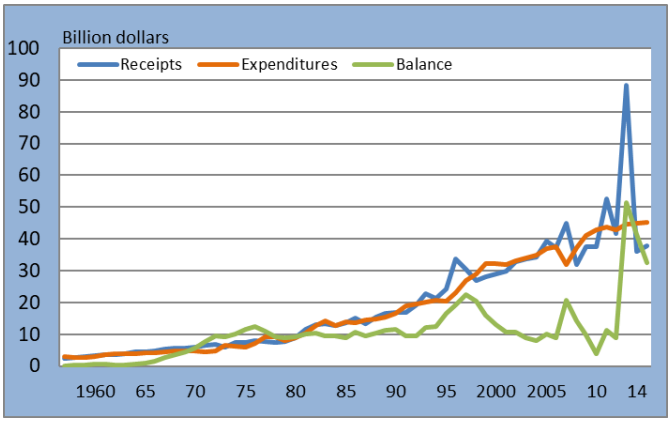
■ The cost of preventive maintenance will be reduced by about 50% after 30 years compared with the case of corrective maintenance (FY2018 estimation).



Data source: MLIT, Infrastructure Maintenance Information.

Figure 6 Balance of Federal Highway Trust Fund in the US

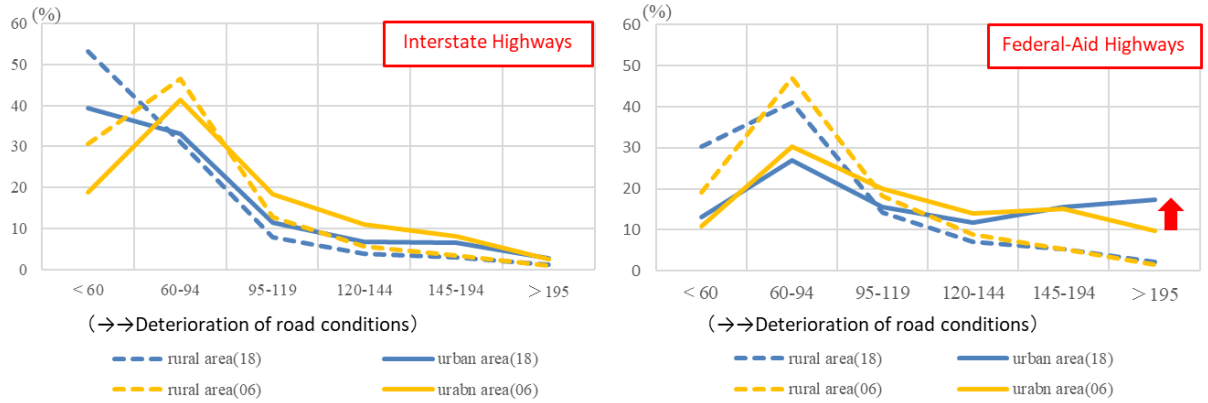
■ The balance of the Federal Highway Trust Fund was decreasing. In 2015, $70 billion were transferred from the general account, improving the balance.



Data source: USDOT, *Highway Statistics*, Fe-210c

Figure 7 Highway Conditions in the US Based on the International Roughness Index (Comparison between 2006 and 2018)

■ The larger the International Roughness Index (IRI), the worse the highway condition. The condition of the Interstate Highway System is generally maintained and improved (left). Federal-Aid highways in urban areas are deteriorated (right).



Data source USDOT, *Highway Statistics 2006,2018*, HM－47

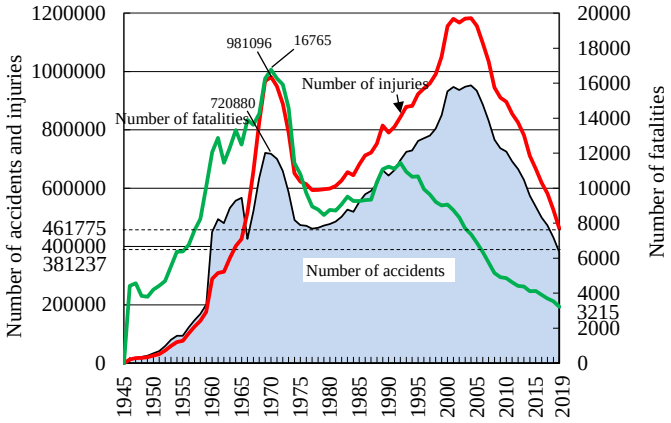
2-1 Trends and Present Situation of Road Traffic Accidents

Professor, Okayama University
Seiji Hashimoto

After the latest peak in 1992, the number of traffic fatalities has shown a downward trend; in 2019, it dropped to 3,215, continuing for 4 years under 4,000. There has also been a continuous reduction in the number of traffic accidents and the number of casualties. This is the first time since 1960 that the number of traffic accidents has fallen below 400,000. The use of seat belts has become mandatory for all seats due to the revision of the Road Traffic Act in June 2008. However, when viewed by age, the wearing rate of elementary school students is lower than that of adults, which leads to a smaller decrease in the number of casualties while riding in passenger cars of this age group.

Figure 1 Changes in the Numbers of Fatalities and Injuries from Traffic Accidents, and Changes in the Number of Accidents

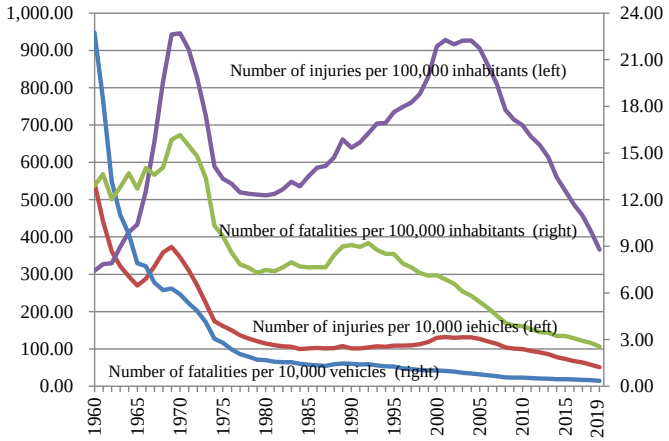
■ Both the number of traffic accidents and the number of traffic accident injuries have decreased, and the number of traffic accident fatalities has fallen below 4,000 for 4 consecutive years.



Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Figure 2 Changes in the Numbers of Fatalities and Injuries from Traffic Accidents, by the Number of Inhabitants and Vehicles

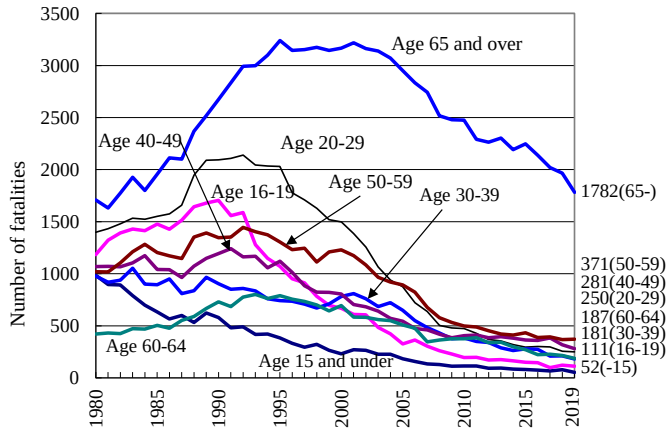
■ The number of fatalities per 10,000 vehicles are stable in low level.



Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Figure 3 Changes in Number of Fatalities by Age Group

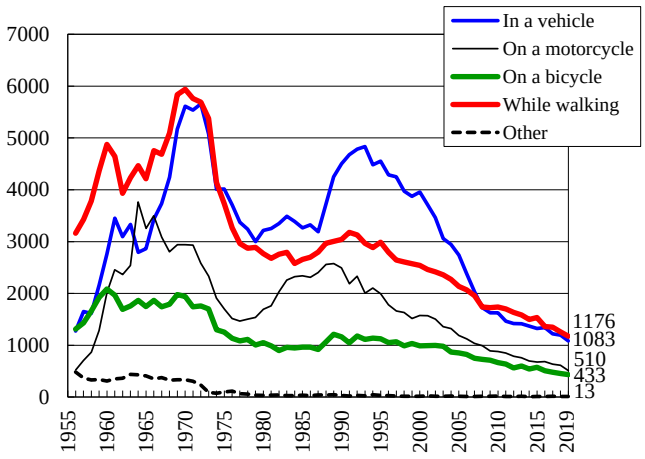
■ All in all, a downward trend is evident. The number of fatalities is high for the elderly (65 and over).



Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Figure 4 Changes in the Number of Traffic Fatalities

■ Fatalities “in a vehicle” decreased noticeably since 2008.

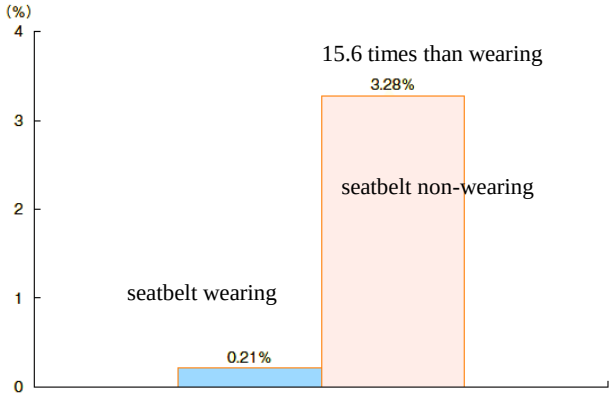


Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

☐ It has been found that wearing a seatbelt greatly contributes to reducing the number of fatalities while riding a car in the event of a traffic accident. However, when viewed by age, the wearing rate of elementary school students is lower than that of adults, which leads to a smaller decrease in the number of casualties while riding in passenger cars of this age group.(Fig. 5-7)

Figure 5 Fatality Rate by Seatbelt Wearing or not in a Traffic Accident while Riding a Car (2019)

■ Wearing a seatbelt greatly reduces the fatality rate in a traffic accident.

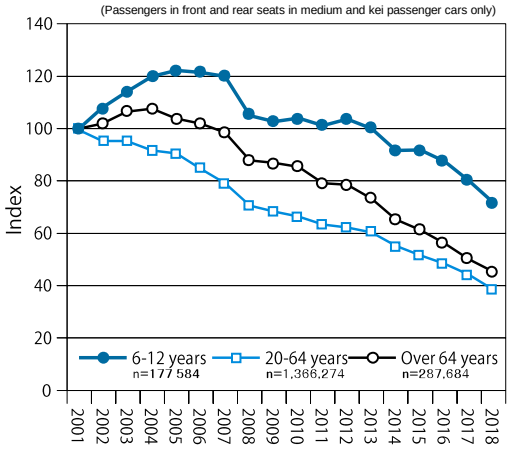


fatality rate = number of deaths / number of casualties × 100
Source : National Police Agency materials

Source: White Paper on Traffic Safety in Japan 2020

Figure 6 Changes in the Number of Fatalities per 100,000 Population by Age Group of Passengers (100 in 2001)

■ The degree of decrease in casualties in elementary school students age is smaller than in other age groups.

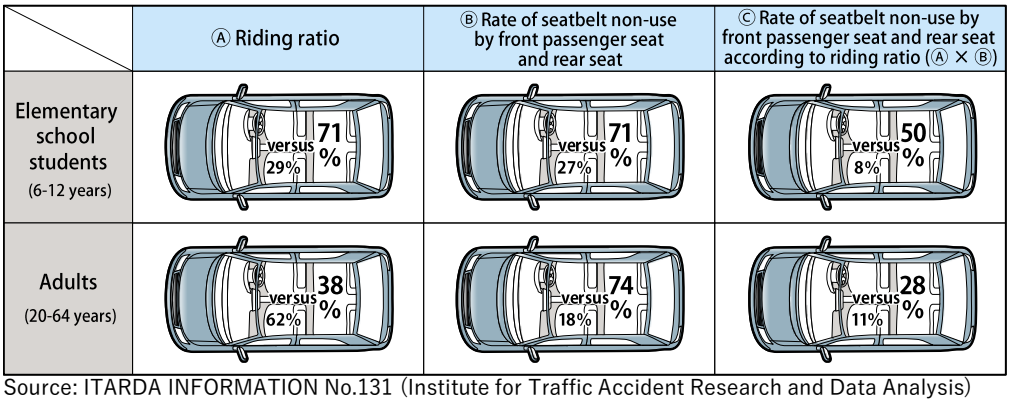


Source: ITARDA INFORMATION No.131 (Institute for Traffic Accident Research and Data Analysis)

Figure 7 Seatbelt Non-Wearing Rate in Traffic Accidents in Cars

■ Although there is no big difference in the non-fastening rate of seat belts at the back seats between elementary school students and adults(see (A)), there are many opportunities for elementary school students to get on the back seats(see (B)), and as a result, there is a high probability that children are not wearing belts(see (C)).

(Based on total number of fatalities or serious injuries in 2001 through 2018)



(A) ratio of seats for children to sit on = Number of fatal injuries in passenger seat : Number of fatal injured in rear seats
(B) Seatbelt wearing rate by seat = Number of fatal injuries people without seatbelt / Number of fatal injured people × 100
(C) Seatbelt wearing rate by seat according to the ratio of seats to sit on = (A) × (B)

Source: ITARDA INFORMATION No.131 (Institute for Traffic Accident Research and Data Analysis)

Table 1 Traffic Fatalities Worldwide, by Situation

Situation / Country	Number of fatalities	In a car	On a motorcycle	On a moped	On a bicycle	While walking	Other
Canada	1,841	1,122	197	3	48	299	172
(2017)	100.0	60.9	10.7	0.2	2.6	16.2	9.3
France	3,248	1,637	627	133	175	471	205
(2018)	100.0	50.4	19.3	4.1	5.4	14.5	6.3
Germany	3,275	1,424	619	78	445	458	251
(2018)	100.0	43.5	18.9	2.4	13.6	14.0	7.7
Netherlands	535	194	53	19	139	64	66
(2017)	100.0	36.3	9.9	3.6	26.0	12.0	12.3
Spain	1,806	732	359	62	58	386	209
(2018)	100.0	40.5	19.9	3.4	3.2	21.4	11.6
U.K.	1,856	823	355	3	103	485	87
(2017)	100.0	44.3	19.1	0.2	5.5	26.1	4.7
U.S.A.	36,560	12,775	4,901	84	857	6,427	11,516
(2018)	100.0	34.9	13.4	0.2	2.3	17.6	31.5
South Korea	3,781	725	640	99	207	1,487	623
(2018)	100.0	19.2	16.9	2.6	5.5	39.3	16.5
Japan	4,166	894	438	261	636	1,482	455
(2018)	100.0	21.5	10.5	6.3	15.3	35.6	10.9

Upper figure: number of fatalities; Lower figure: percentage of total (%)
For countries that used the coefficient to convert the number of fatalities into a 30-day figure, the total may not represent the sum of each figure.
Source: International Traffic Safety Data and Analysis Group (IRTAD)

Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Table 2 Number of Traffic Fatalities Worldwide by Age Group

age / country	Number of fatalities	5 and under	6-14	15-17	18-24	25-64	65 and over	Unknown
Canada	1,841	38	37	54	270	1,059	372	11
(2017)	100.0	2.1	2.0	2.9	14.7	57.5	20.2	0.6
France	3,248	33	53	106	503	1,711	842	-
(2018)		1.0	1.6	3.3	15.5	52.7	25.9	0.0
Germany	3,275	30	49	77	369	1,698	1,045	7
(2018)		0.9	1.5	2.4	11.3	51.8	31.9	0.2
Netherlands	535	5	10	13	57	259	190	1
(2017)	100.0	0.9	1.9	2.4	10.7	48.4	35.5	0.2
Spain	1,806	14	11	24	183	1,070	496	8
(2018)		0.8	0.6	1.3	10.1	59.2	27.5	0.4
U.K.	1,856	16	29	45	265	1,024	477	-
(2017)	100.0	0.9	1.6	2.4	14.3	55.2	25.7	-
U.S.A.	36,560	416	622	963	5,282	22,238	6,907	132
(2018)		1.1	1.7	2.6	14.4	60.8	18.9	0.4
South Korea	3,781	11	30	46	173	1,839	1,682	-
(2018)		0.3	0.8	1.2	4.6	48.6	44.5	0.0
Japan	4,166	30	47	66	252	1,385	2,386	-
(2018)		0.7	1.1	1.6	6.0	33.2	57.3	0.0

Upper figure: number of fatalities; Lower figure: percentage of total (%)
For countries that used the coefficient to convert the number of fatalities into a 30-day figure, the total may not represent the sum of each figure.
Source: International Traffic Safety Data and Analysis Group (IRTAD)

Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

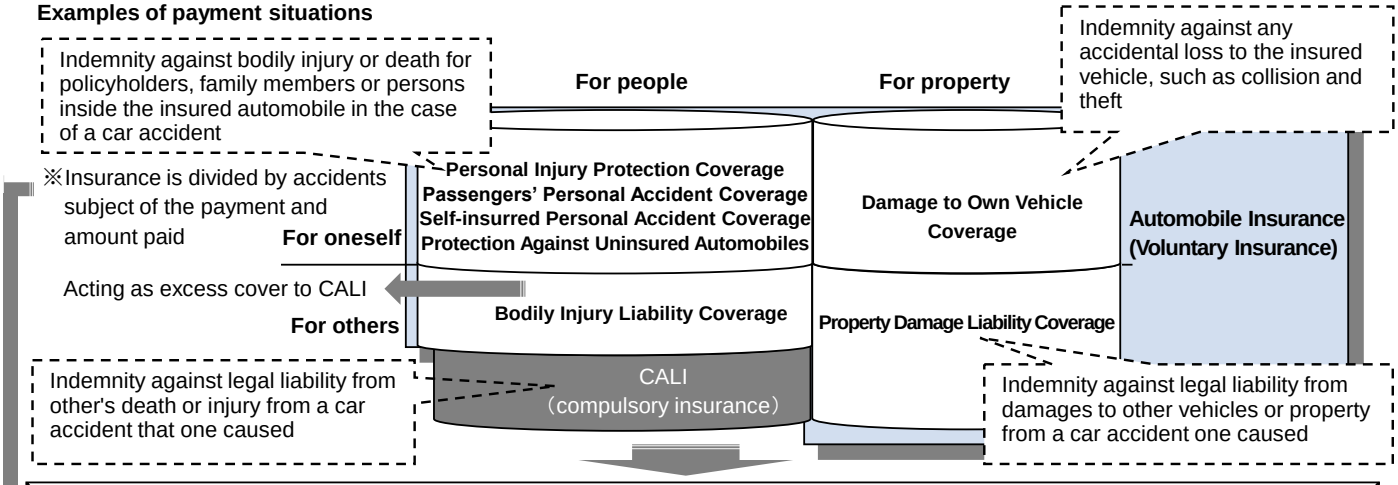
2-2 Automobile Insurance System In Japan

General Insurance Rating Organization of Japan
Fuhito Tanabe

There are two main indemnifications in the Japanese automobile insurance system, which are Compulsory Automobile Liability Insurance (CALI) and Voluntary Automobile Insurance. CALI provides basic indemnification for victims. When the amount of loss is more than the limits of CALI, Voluntary Automobile Insurance will be paid additionally. It is an excess cover to CALI. In order to charge premiums fairly between policyholders, voluntary automobile insurance has more classifications than CALI and premium sets adequately.

Figure 1 Compulsory Automobile Liability Insurance (CALI) and Voluntary Automobile Insurance

■ There are Compulsory Automobile Liability Insurance(CALI) which indemnifies for victims against an accident resulting in injury or death, and Voluntary Automobile Insurance which acts as excess cover to CALI in Automobile Insurance system. Various products are offered by putting together the coverage of Voluntary Automobile Insurance below.



A valid CALI certificate must be presented at each vehicle inspection which ensures that every automobile is insured by CALI (※1 compulsory insurance). Furthermore, it is stipulated that premium rates shall be as low as possible under ※2 no-loss, no-profit rule and CALI indemnifies within ※3 the limits of insurance.

※ 1 compulsory insurance
No automobile (including motorized bicycle) shall be operated without a contract for CALI.

※ 2 no-loss, no-profit rule
Under the Act, it is stipulated that premium rates shall be as low as possible within the range of compensating reasonable costs of insurance business under the efficient management.

※ 3 the limits of insurance
The limits of insurance currently in force are as follows.

Types of damage	The items of loss	The limits of insurance per victims
For bodily injury	- Hospital fees - Documentation fees - Loss of earnings due to absence from work - Damages for pain and suffering etc.	¥ 1.2 million
For permanent disability	- Loss of future earnings - Damages for pain and suffering etc.	¥750 thousand ～ 40 million depending on the grade
For death	- Funeral expenses - Loss of future earnings - Damages for pain and suffering	¥ 30 million

	Accidents subject of the payment		Amount paid
	Accidents while being inside the automobile	Other accidents	
Personal Injury Protection Coverage	○*		Actual amount of damage (calculate according to the standards under policy conditions)
Passengers' Personal Accident Coverage	○	×	Insured amount irrespective of actual amount of damage
Self-insured Personal Accident Coverage	○(only self-insured personal accident)	×	Amount under policy conditions irrespective of actual amount of damage
Protection Against Uninsured Automobiles	○* Will be paid only if -insured is killed or has sustained permanent disability -an automobile is not insured against bodily injury liability etc.		Amount in excess of CALI and Bodily Injury Liability Coverage within legal liability for an accident

＊Only "accidents while being inside the insured automobile" can be the subject of the payment depending on the contents of the contract.

Figure 2 Risk Classification for CALI and Voluntary Automobile Insurance

■ There are two types of risk classification. One is depending on characteristics and another is depending on coverage.

[CALI]

	Classification
Charac-teristics	Area (Ex. mainland, Okinawa, etc.)
	Vehicle Use & Type (Ex.passenger car, freight car, private car, business car, etc.)
Coverage	Term (Ex. 5 days, 1-37 months, 48 or 60 months depending on term of automobile inspection)

[Voluntary automobile insurance]

	Classification (Example＊)
Charac-teristics	Vehicle Use & Type (Ex.passenger car, freight car, private car, business car, etc.)
	Vehicle Model Code (17 classification depending on model code)
	New vehicle/ Old vehicle
	With AEB(Autonomous Emergency Braking)/ No AEB
	Main Driver's Age (Can be classified only when 26 years old or over)
	Bonus-Malus 20 grades according to claim history, the number of accidents, whether there was a contract previously Grade from 7 to 20 are divided into two, claim free and claim made
Coverage	Insured Amount, Deductible
	All ages / 21 years or over / 26 years or over (3 classifications depending on indemnified drivers' age) ※4
	the insured, and spouse / All drivers (2 classifications depending on the extent of indemnified drivers)

＊It shows main classification of Reference Loss Cost Rates above, and insurance companies set their own classifications.

※4 Premium change depending on the age as it shows below. Premium for person of advanced age is quite high. The smaller coverage is, the lower premium is. Also, over 90% of drivers is 26 years or over.

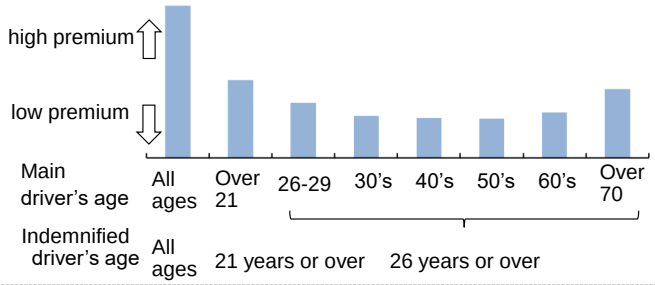


Table 1 Examples of Judicial Precedent for Large Amount of Compensation by Car Accident

■ Almost every policyholder set their insured amount of Liability Coverage to no limit because there are some judicial precedents more than 100 million yens. The % of insured amount to no limit for Bodily Injury Liability Coverage is 99.6%, and for Property Damage Liability Coverage is 95.0%.

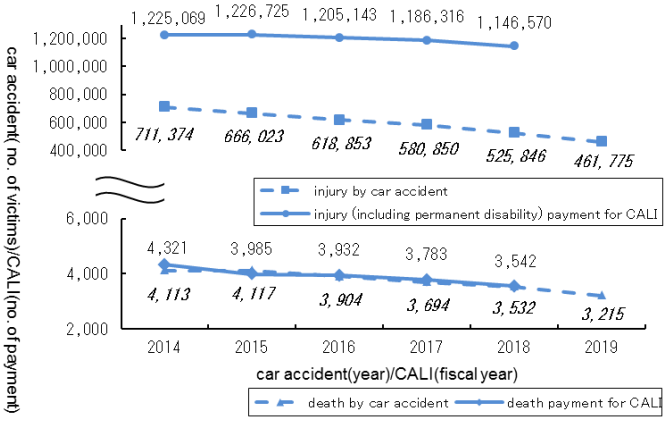
(Million yen)

Injury or death		Property damage	
Amount of damages	Date of judgment	Amount of damages	Date of judgment
¥528.53	1/11/2011	¥261.35	19/7/1994
¥453.81	30/3/2016	¥134.50	17/7/1996
¥453.75	18/7/2017	¥120.36	18/7/1980

Source: Disclosure document from General Insurance Rating Organization of Japan

Figure 3 Change in Number of Death and Injuries by Car Accidents and the Number of Payments for CALI

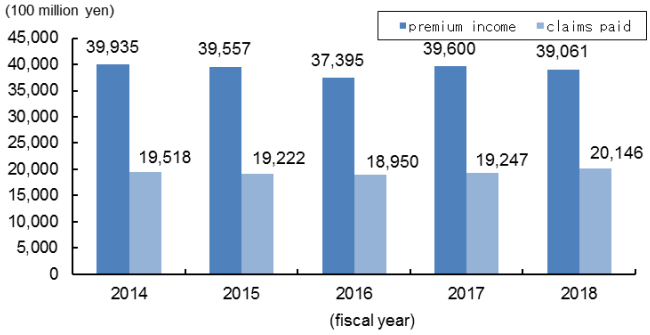
■ The number of death and injury by car accident, and payment for CALI decrease.



・Fiscal year represents the period starting on April 1 of the year and ending on March 31 of the following year

Source: Disclosure document from General Insurance Rating Organization of Japan and National Police Agency

Figure 4 The Change of the Premium Income and Claims Paid for Automobile Insurance (Voluntary Insurance)

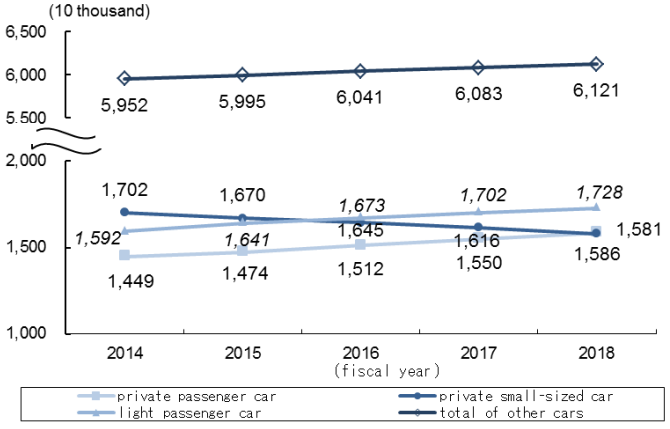


・Including expense loading in premium income

Source: Disclosure document from General Insurance Rating Organization of Japan

Figure 5 Change of the Number of Insured Cars for Voluntary Automobile Insurance (Bodily Injury Liability Coverage)

■ While the number of cars owned increases, especially the number of light passenger cars insured increases.



・Total of other cars include taxi and freight etc.

Source: Disclosure document from General Insurance Rating Organization of Japan

2-3 Traffic Safety Program

Professor, Akita University
Hidekatsu Hamaoka

Causes of traffic accident are widely distributed and influence each other. Moreover, occurrence of traffic accidents is rare, and it is hard to identify the cause. To decrease the number of traffic accidents, many countermeasures were conducted such as to implement measures against blindspots and to inform the location of blindspots to the driver. As a result of these countermeasures, number of fatalities was decreased below 5000. Now, under the Basic Principles of 10th Fundamental Traffic Safety Program, road management authority is strengthening to apply various countermeasures that focuses on the pedestrian safety especially for the elderly person to realize the most safe road environment in the world.

Table 1 10th Traffic Safety Basic Plan

■ 10th Traffic Safety Basic Program (FY2016-20) was designed on 11th March, 2016.

1. Three Factors that Constitute Transport Society
With regard to the three elements of human beings, transportation, and the traffic environment, while considering their mutual relationships, the Ministry formulates measures based on scientific research and analysis of traffic accidents and strongly promote them.

2. Use of Information Communication Technologies (ICT)
The Ministry will actively use Intelligent Transport Systems (ITS), enhance and strengthen comprehensive investigation and analysis of traffic accident causes, and promote necessary research and development.

3. Enhancement of Rescue and First-Aid Activities and Support of Victims
The Ministry will enhance rescue and first-aid activities when a traffic accident occurs, and further enhance the support of victims in all traffic safety fields.

4. Promotion of Traffic Safety Activities Based on Participation and Cooperation
In order to actively promote the voluntary participation of citizens in traffic safety activities, the Ministry will promote traffic safety activities based on participation and cooperation, such as the establishment of a mechanism in which each citizen can participate from the planning stage of a policy.

5. Implementation of Effective and Efficient Measures
The Ministry will ensure efficient budget implementation by engaging in measures that will produce the maximum effect in a concentrated manner according to the actual traffic situation of each community in view of the difficult financial situation.

6. Ensuring Further Safety in Public Transport
Maintenance audit and transport safety management evaluation will be enhanced and strengthened. In order to prevent an accident due to lack of health management or a sudden change in physical conditions of a driver, the use of the "Health Management Manual of Drivers of Fleet Vehicles" should be made thoroughly known.

Source: Cabinet Office

Table 2 Effort to Install Bicycle Safety Measures

■ Bicycle accidents become a social problem due to improper usage of bicycle. New legislation focuses on the following infractions:

1. Red light running **2.** Illegal usage of passage **3.** Over speeding at the pedestrian road **4.** Violation of passage **5.** Roadblock to pedestrian **6.** Irruption to closed railroad crossing **7.** Unsafe movement at the intersection **8.** Roadblock to prioritized vehicle **9.** Unsafe movement at the roundabout **10.** Violation of stop sign **11.** Illegal usage of the pedestrian road **12.** Using bicycle with defective brake **13.** Drunk driving **14.** Unsafe driving

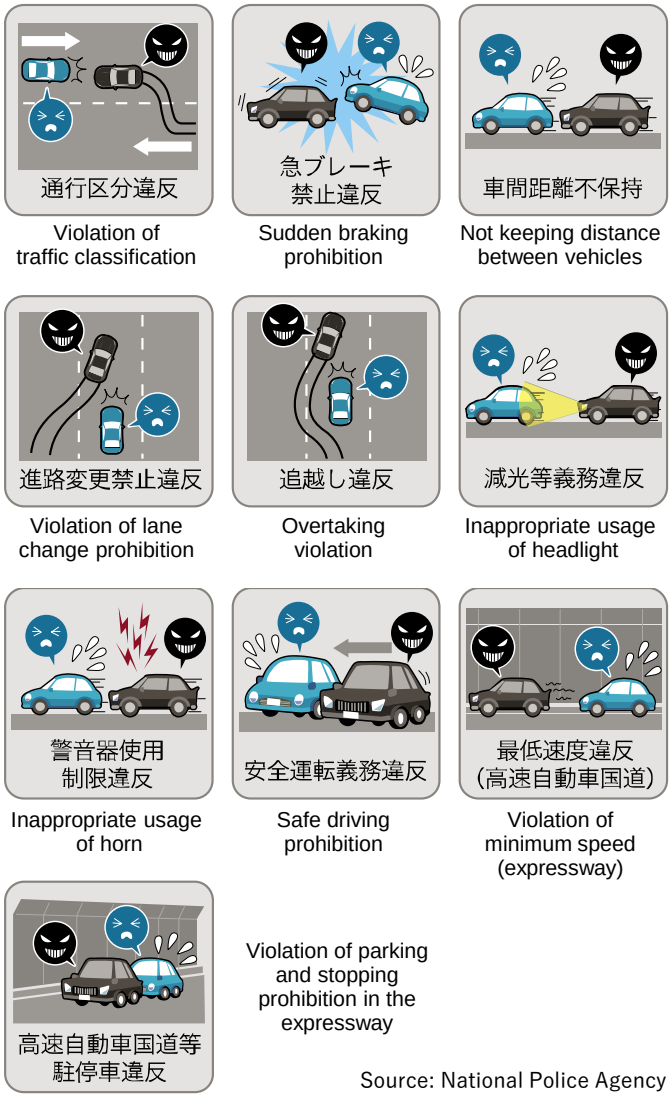
Source: National Police Agency

Figure 1 Establish New Legislation on Dangerous Driving

■ New legislation on dangerous driving was established on 10th June, 2020. Under this legislation, when a person drives dangerously, such as sudden breaking, or driving very close to the next car, he/she will be severely punished.

1. Obstruction of driving
- Imprisonment of up to 3 years or a fine of up to 500,000 yen.
- Revoke driver licenses for 2 years

2. Obstruction of driving caused danger situation
- Imprisonment of up to 5 years or a fine of up to 1,000,000 yen.
- Revoke driver licenses for 3 years



Source: National Police Agency

Table 3 Traffic Enforcement and Speed Regulation to Reduce Traffic Accidents Effectively

■ Recommendations to conduct traffic enforcement by utilizing the analysis of traffic accidents and to reconsider the principle to set the maximum speed were reported.

Recommendation to conduct traffic enforcement and to set maximum speed

Common understanding to organize recommendation
- Necessity to manage maximum speed

Maximum speed setting to avoid traffic accident
- Reconsideration of maximum speed at the road
- Share the concept to manage maximum speed
- Measures to lead to safe driving attitude
- Reconsideration of maximum speed at the expressway

Traffic enforcement to avoid traffic accident
- Traffic enforcement of speed violation to avoid traffic accident
- Inform the concept/contents of traffic enforcement

Measures to promote steadily to avoid traffic accident
- Strengthening traffic enforcement of hazardous violation and dangerous driving
- Cooperation with city planning
- Promote traffic education except drivers
- Evaluation of company's effort to avoid traffic accident

Source: National Police Agency

Figure 2 Prevent Head-on Accident at the Expressway with Two-way-two-lanes

■ At the two-way-two-lanes expressway, rubber poles were used to divide lanes. However, this could not avoid head-on accident because of its lower bearing power. By installing wire-rope instead of rubber pole, vehicle would not go opposite lanes.

Source: Ministry of Land Infrastructure and Transport

Figure 3 Prevent Wrong-way Driving in Expressways

■ Wrong-way driving in expressways can cause serious accidents. Various countermeasures such as antirollback system, road marking to show the traveling direction, and so on, were installed at the exit of the service area and the parking area.

Y-shaped junction with intersection
Source: Central Nippon Expressway Company

Lane dividing facilities inside of the toll plaza
Source: Ministry of Land Infrastructure and Transport

Figure 4 Countermeasure to Increase Pedestrian Safety

■ Many traffic accidents occurred at unsignalized intersection in the mid-section of the road. Two-step crossing method by utilizing the traffic island was demonstrated. Expected benefits include the ability of pedestrians to easily see approaching vehicles and shortened crossing distances.

Source: Yaizu City Office

2-4 Efforts toward Traffic Calming

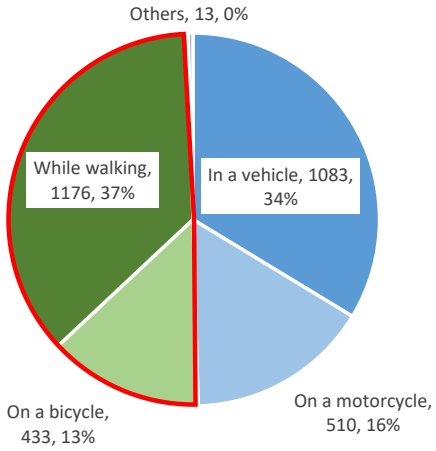
Professor, Okayama University
Seiji Hashimoto

Attention is being paid in Japan to the traffic safety in residential areas. A large number of pedestrian and bicycle fatalities is a characteristic of traffic accidents in Japan, and since many of them occur in places relatively close to home, traffic safety measures on residential roads are being promoted. Traffic calming devices such as speed humps and narrowings have not been used in Japan. However, in March 2016, the technical standards for speed humps and narrowings has been enacted, and it is expected that safety measures for living streets will be promoted in the future.

☐ The high number of fatalities caused by traffic accidents while walking or riding a bicycle is a characteristic of traffic accidents in Japan. Many of these pedestrians and cyclists did not violate the law, and it is necessary to create a safe traffic environment.

Figure 1 Number of Fatalities in Traffic Accidents by Condition

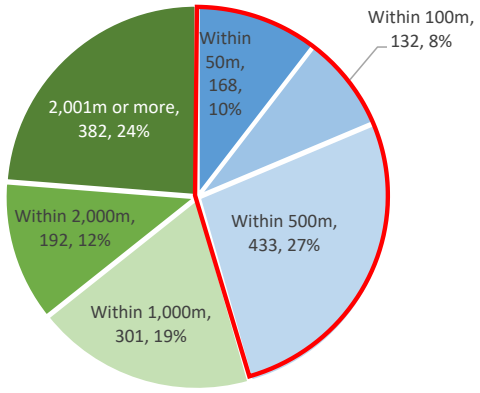
■ About half of the fatalities are while walking or riding a bicycle.



Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Figure 2 Number of Fatalities while Walking or Riding a Bicycle by Distance from Home

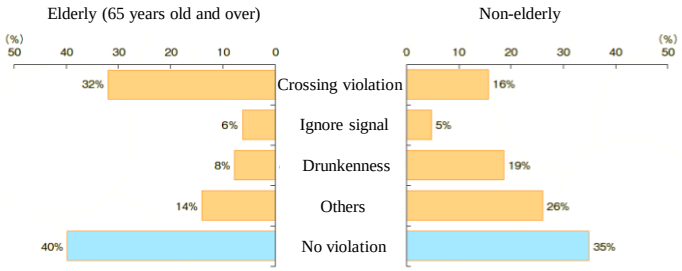
■ Approximately 45% of the fatalities while walking or riding a bicycle have an accident within 500 meters of their home.



Source: Traffic Statistics 2019 (Institute for Traffic Accident Research and Data Analysis)

Figure 3 Percentage of Fatalities while Walking by Law Violation (2019)

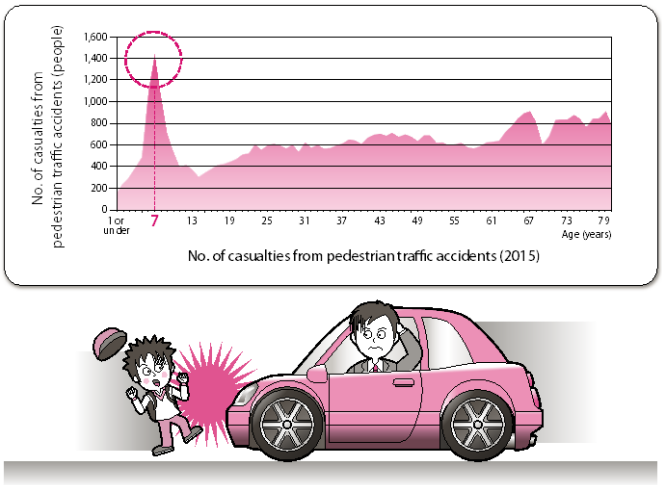
■ Focusing on legal violations of people who died while walking, "no violation" was the highest for both the elderly and non-elderly people.



Source: White Paper on Traffic Safety in Japan 2020

Figure 4 Number of Fatalities and Injuries by Age

■ By age, the number of 7-year-old fatalities and injuries is the highest.

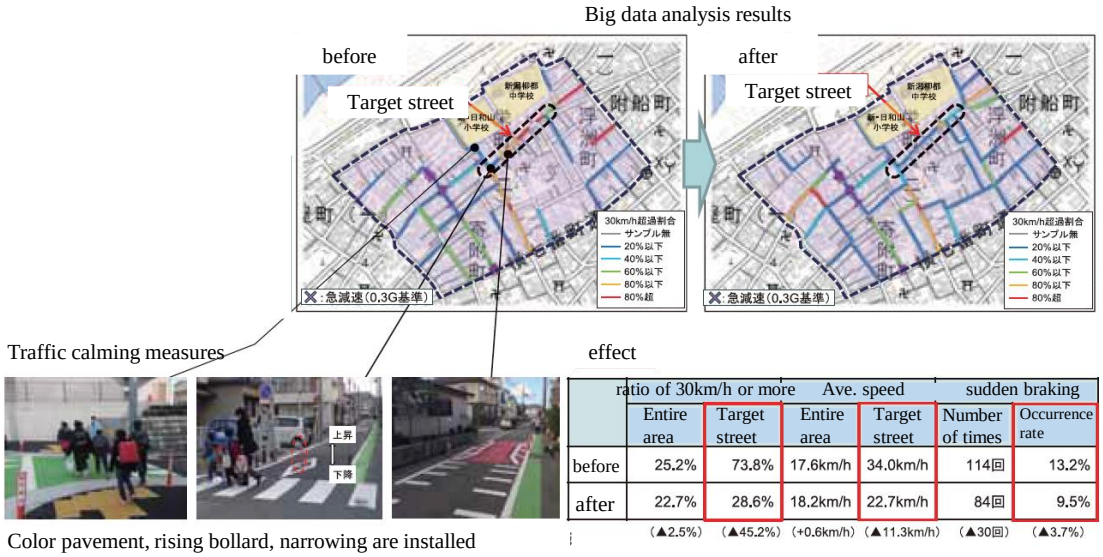


Source: ITARDA INFORMATION No.116 (Institute for Traffic Accident Research and Data Analysis)

☐ In recent years, based on probe data (driving history, behavior history) collected by ETC2.0 on-board equipment, etc., potential dangerous points such as over-speed and sudden braking have been identified and traffic safety measures have been taken. As specific speed control measures, in addition to the use of conventional traffic calming devices such as humps and narrowing, the introduction of rising bollards and speed camera on residential streets is being promoted.(Fig. 5-8)

Figure 5 Traffic Calming Measures and Effects by Utilizing Big Data

■ By using big data to visualize the vehicle running speed and sudden braking on each street, it is possible to deal with potential issues where accidents have not become apparent, and effective safety measures for the entire district.



	ratio of 30km/h or more		Ave. speed		sudden braking	
	Entire area	Target street	Entire area	Target street	Number of times	Occurrence rate
before	25.2%	73.8%	17.6km/h	34.0km/h	114回	13.2%
after	22.7%	28.6%	18.2km/h	22.7km/h	84回	9.5%
	(▲2.5%)	(▲45.2%)	(+0.6km/h)	(▲11.3km/h)	(▲30回)	(▲3.7%)

Source: White Paper on Traffic Safety in Japan 2020

Figure 6 Rising Bollard in the City (left: Geneva, right: Niigata City)

Photo: Seiji Hashimoto

Photo: Hisashi Kubota

Figure 7 Speed Reduction by Displaying the Running Speed

■ By clearly indicating the running speed of the vehicle, expecting speed control. (Photo is Ashford, England)

Photo: Seiji Hashimoto

Figure 8 Introduction of Speed Camera on Residential Streets

■ The speed camera has been downsized, and have installed on residential streets. It is expected to reduce accidents on residential roads.

Photo: National Police Agency

2-5 Progress of Bicycle Transport

Associate Professor, Osaka City University
Nagahiro Yoshida

In 2017, the Bicycle Use Promotion Act, which includes the principle of reducing the degree of dependence on automobiles, came into force, and the Cabinet endorsed the Bicycle Use Promotion Plan in 2018. The plan outlines 4 goals, 18 measures, and 83 actions to embody the 14 basic policies set out in the act. With regard to traffic accidents, although the number of bicycle-related accidents has been decreasing, the proportion of bicycle-related accidents to the total number of traffic accidents is large, around 20%, and the trend has shown a tendency to increase since 2016. Under new environmental, health, and tourism measures based on the promotion plan, an increasing number of cities have introduced bicycle sharing system, and the designation of National Cycle Route has also begun.

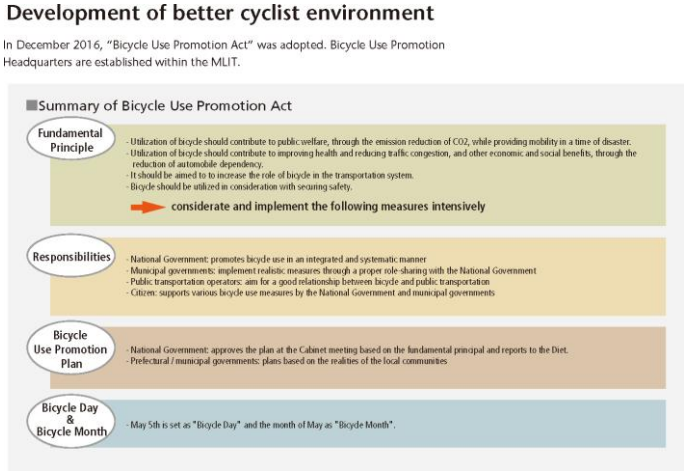
Table 1 Recent Changes in Relevant Bicycle Policies

■ Under the "Amendment of the Road Structure Ordinance" promulgated and enforced in April 2019, "bicycle traffic lanes" has been defined to ensure the safety and fluidity of bicycle traffic.

year	explanation
2007	Amendment of Road Traffic Act: Clarification of cases for riding standard bicycles on sidewalks.
2008	MLIT and NPA: Designation of 98 model areas across the country for improving bicycle traffic facilities.
2009	MEXT: the Amendment of the School Health Acts: Mandatory of school safety plans to ensure student transport including cycling.
2011	Amendment of the Ordinance on Road Signage and Marking: New "One-way Bicycle" signage allows one-way restrictions on bicycle paths and shared sidewalk. The NPA official notice: Promotion of Comprehensive Measures to Achieve Good Bicycle Traffic Order
2012	MLIT and NPA: Guideline for Creating a Safe and Comfortable Bicycle Environment
2013	Amendment of Road Traffic Act: For cyclists, riding on side strips is limited to the left-hand side of the road.
2015	Enforcement of amendment of Road Traffic Act：Providing bicycle driver training program for offenders. JSTE: A guideline to planning and designing intersections with consideration of bicycle traffic was published.
2016	MLIT and NPA: Revised Guideline for Creating a Safe and Comfortable Bicycle Environment. MLIT: Revised guideline for Bicycle Parking Facilities.
2017	Bicycle Use Promotion Act has come into force. MEXT: Cabinet approved the second school safety plan to promote safe transport.
2018	Cabinet approved Bicycle Use Promotion Plan.
2019	Amendment of Order for Road Traffic Act: Type of dangerous cycling has been defined. Amendment of the Road Structure Ordinance: Bicycle traffic lane has been defined and installation requirement for bicycle track has been clarified. The public-private partnership council for bicycle use promotion: Guideline on the introduction of bicycle commuting.
2020	JSTE: A guideline to planning and designing intersections with consideration of bicycle traffic is revised, Amendment of Road Traffic Act: Review of definition relating to the definition of the standard bicycles.

Figure 1 Bicycle Use Promotion Act

■ Bicycle Use Promotion Act came into effect in 2017.



Source: MLIT (2018)

Figure 2 Share of Bicycle Traffic by City Type (Commuting to Work)

■ The share of bicycles used for commuting to work on weekdays ranges from 6 to 16%, regardless of city type. The share tends to be higher in the central cities than in other cities.

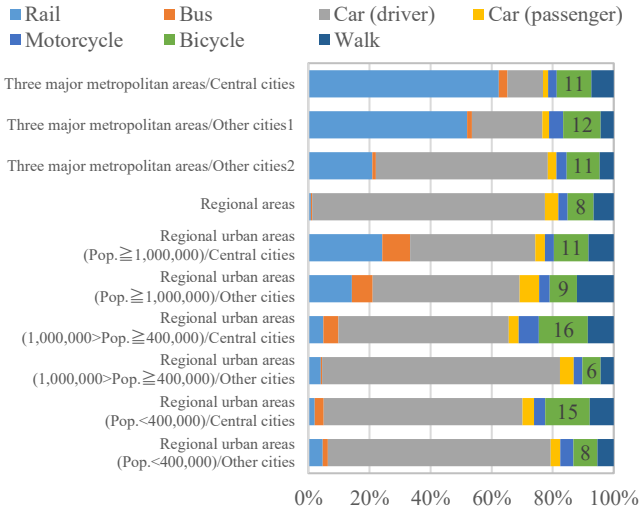
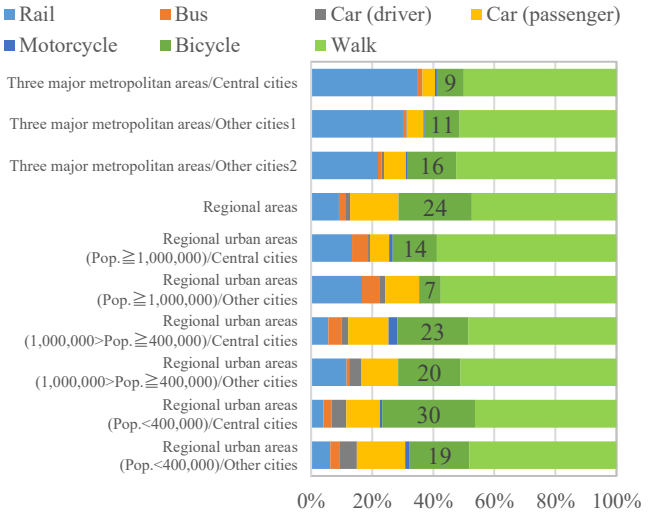


Figure 3 Bicycle Transportation Ratio by Urban Type (Commuting to School)

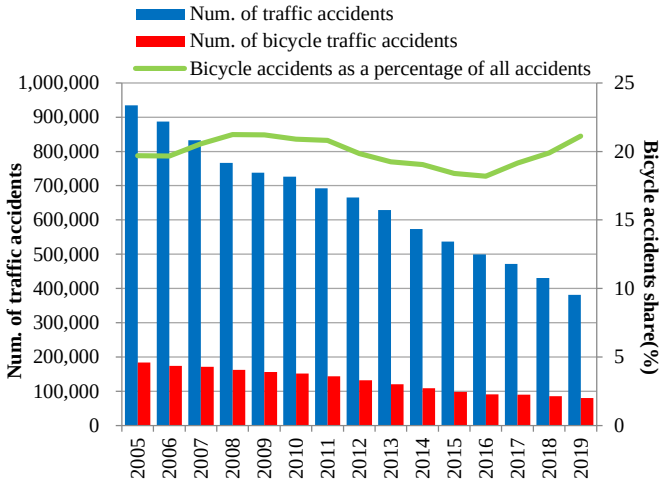
■ The share of bicycles used for commuting to school on weekdays ranges from 7 to 30%, with a high tendency in regional urban areas/central cities.



Source: Nationwide Person Trip Survey (2018)

Figure 4 Bicycle Related Accidents

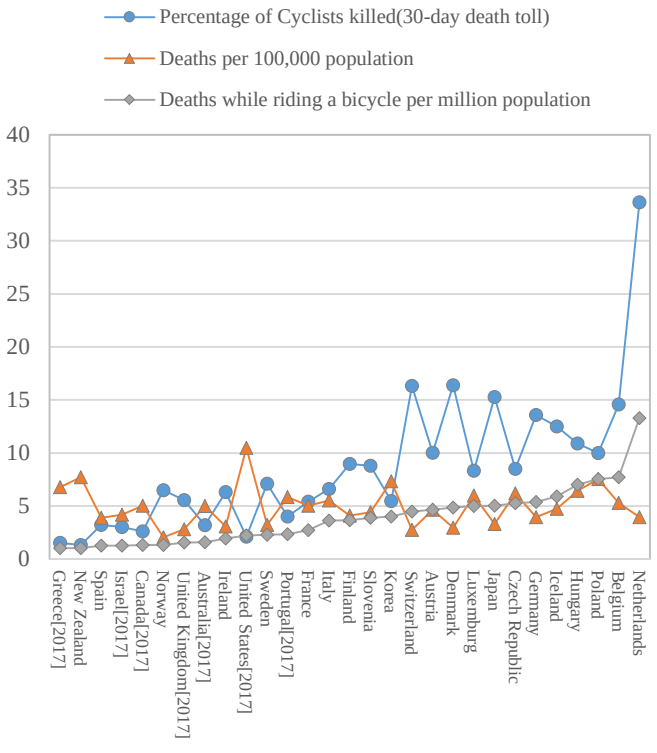
■ The number of bicycle accidents has been decreasing along with the number of all traffic accidents, decreasing to 53% and 56% respectively over the past 10 years. However, the proportion of bicycle-related accidents to the total number of traffic accidents is significant, at around 20%, and has been on an upward trend since 2016.



Source: NPA Bicycle related accidents etc.(2020)

Figure 5 International Comparison of Bicycle Related Accidents

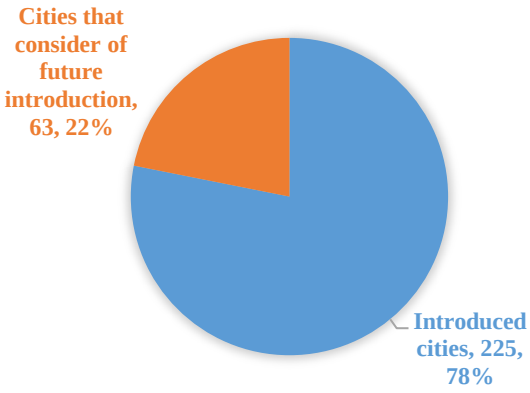
■ In terms of deaths per 100,000 population, Japan ranks among the safest countries in the world. However, percentage of cyclists killed in Japan account for a high proportion, and among the countries, deaths while riding a bicycle per million population is higher than in Switzerland and Denmark. This suggests that bicycle use in Japan is not safe enough.



Source: OECD etc.(2019)

Figure 6 Bicycle Sharing System

■ Many cities have introduced bicycle sharing system, reaching 225 by the end of March 2019. Electric assisted bicycles are also widely used. The main purposes for introducing shared bicycles are to promote tourism, supplement public transportation, and revitalize local communities. The number of ports as well as the density of these ports is increasing every year, especially in Tokyo.



Source: MLIT (2019)

Figure 7 Designation of National Cycle Route

■ The National Cycle Route, which designates routes that meet certain standards, was launched in 2019 in order to create new tourism value and to create new regions through the promotion of cycle tourism that organically links excellent local tourism resources.

Source: MLIT (2019)

2-6 Changes in Urban Parking Lot Policies

Professor, Nihon University
Masaharu Oosawa

The preparation for the quantity of parking lots has been continued actively so far. In the center of large cities whose modal share of public transport is high, the supply for parking lots exceeds the demand for them continuously. Therefore, Mandatory Parking Rules are reconsidered locally. On the other hand, the number of temporary parking on street does not come down and has remained constant. Recently, on-street parking spaces are recognized as important open space and how to utilize them in local circumstances results in a parking free street and green parking lots.

Table 1 Parking Lots by Type and Actor under the Parking Lot Act (Nationwide)

■ Parking both of cars and motorcycles are increasing in terms of lots and spaces.

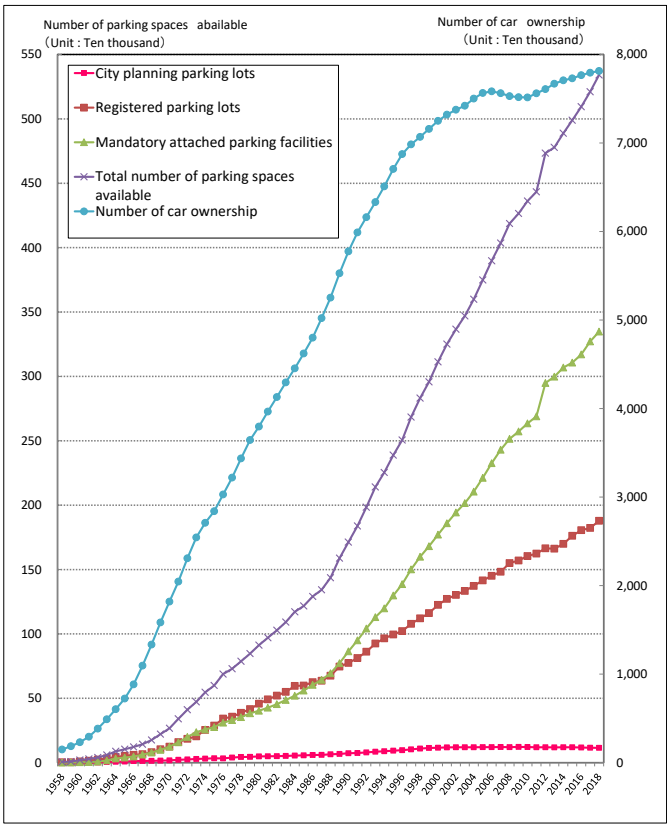
	Division	Parking lots	Rate	Year-on-year	Spaces	Rate	Year-on-year	Actor: Parking lots					Actor: Spaces				
								National and local governments	Municipalities	Investment organization	Tertiary sector	Private enterprise	National and local governments	Municipalities	Investment organization	Tertiary sector	Private enterprise
Cars	City planning parking lots	438	0.5%	−0.7%	114,835	2.1%	−2.8%	31	318	18	19	52	8,980	71,996	7,615	8,412	17,832
	Registered parking lots	9,869	11.9%	2.6%	1,878,182	35.2%	3.9%	233	1,290	47	196	8,103	77,248	246,703	20,576	54,067	1,479,588
	Mandatory attached parking facilities	72,908	87.6%	2.2%	3,347,922	62.7%	5.3%	973	1,230	303	262	70,140	76,875	93,816	26,434	41,358	3,109,439
	On-street parking lots	14	0.02%	0.0%	601	0.01%	0.0%	–	14	–	–	–	–	601	–	–	–
	Total	83,229	100%	2.2%	5,341,540	100%	4.6%	1,237	2,852	368	477	78,295	163,103	413,116	54,625	103,837	4,606,859
Motorcycles	City planning parking lots	132	5.6%	−3.0%	16,777	28.7%	1.5%										
	Registered parking lots	387	16.5%	8.8%	32,383	55.3%	9.6%										
	Mandatory attached parking facilities	1,829	77.9%	12.2%	9,359	16.0%	28.2%										
	Total	2,348	100%	10.8%	58,519	100%	10.3%										

City planning parking lots: Parking lot specified in the city planning
Registered parking lots: Parking lot of more than 500㎡ and collecting fee in the city planning area
Mandatory attached parking facilities: Parking lot required by a regulation, when a building beyond the pre-determined scale is built and enlarged
On-street parking lots: Parking lot installed on the road surface in the zone to provide parking place

Note 1: Motorcycles parking lots = Total of motorcycle-only, motorcycle and car parking lots.
Note 2: Investment organization = Only national and local governments.
Note 3: Private enterprise = Excluding tertiary sector.
Source: Created by the author using fiscal 2019 data from the 2019 Annual Report on Parking Lots (City Bureau, Ministry of Land, Infrastructure and Transport, 2020).

Figure 1 Nationwide Trend of Parking Spaces

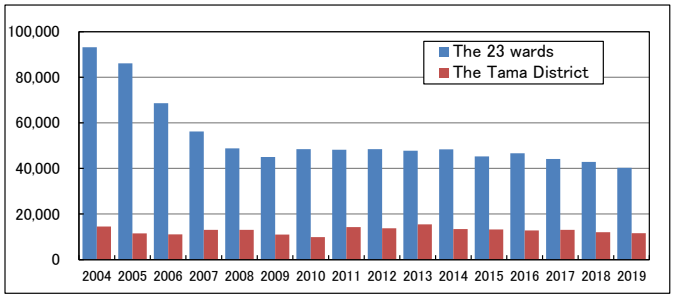
■ The number of parking spaces available has continued to increase. The number of parking spaces per 10,000 cars was 684 in 2018.



Source: Created by the author using fiscal 2019 data from the 2019 Annual Report on Parking Lots (City Bureau, Ministry of Land, Infrastructure and Transport, 2020).

Figure 2 Changes in the Momentary Number of Four-wheeled Vehicles Parked Illegally on the Streets in Tokyo

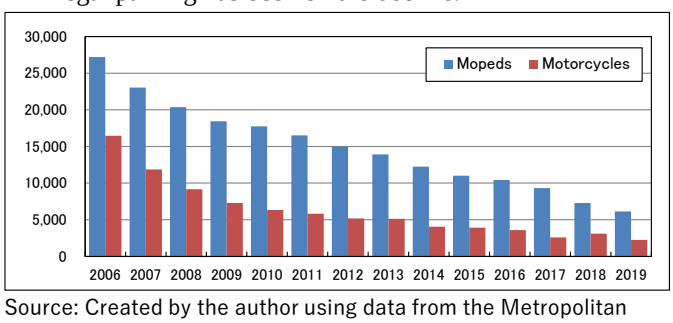
■ Illegal parking in the 23 wards has been flat since 2009, declining since 2016,and is the lowest at 40,312 spaces in 2019.



Source: Created by the author using data from the Metropolitan Police Department.

Figure 3 Changes in the Momentary Number of Motorcycles Illegally Parked on Streets in the 23 Wards of Tokyo

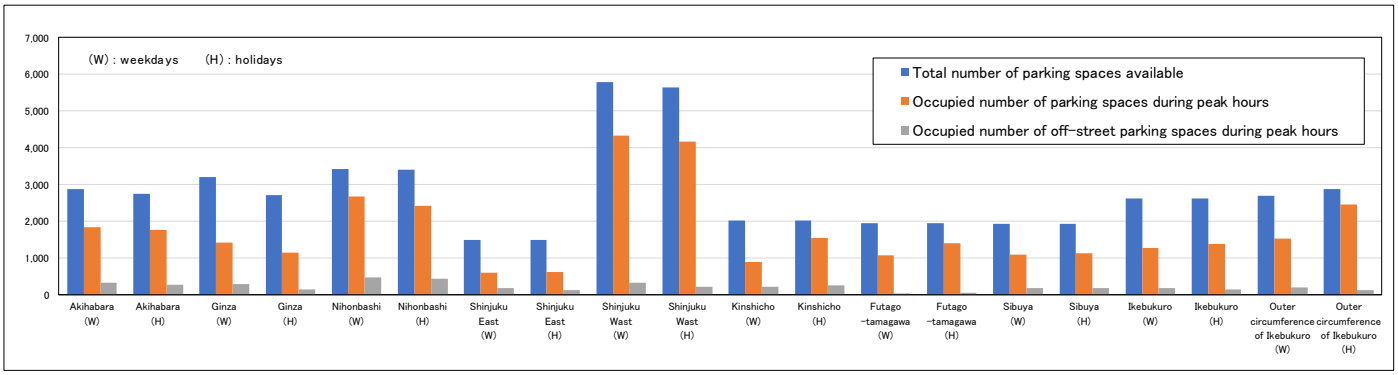
■ Illegal parking has been on the decline.



Source: Created by the author using data from the Metropolitan Police Department.

Figure 4 Parking Supply and Demand during Peak Hours in Tokyo

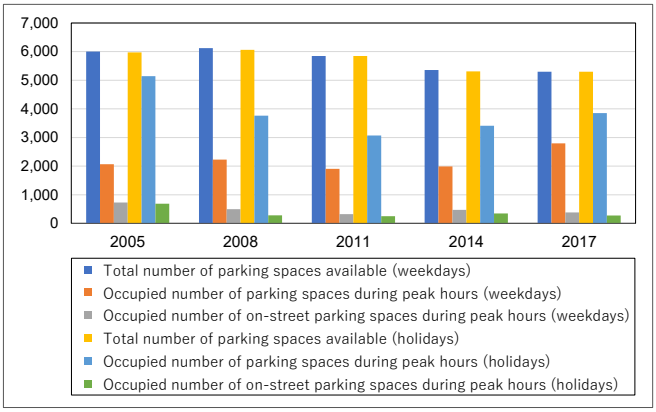
■ The Parking supply exceeds the parking demand even considering on-street parking demand around the rail stations both on weekdays and holidays.



Source: Created by the author using data from the 2017 Annual Report on Parking Lots (Tokyo Metropolitan Public Corporation for Road Improvement and Management, 2017).

Figure 5 Parking Supply and Demand during Peak Hours in Ikebukuro

■ The supply for parking lots exceeds the demand for them continuously.



Source: Created by the author using data from the 2017 Annual Report on Parking Lots (Tokyo Metropolitan Public Corporation for Road Improvement and Management, 2017).

Table 2 Building Floor Area per Parking Space and Allowable Distance for Remote Parking Lot

■ The Local rule has been introduced in many local governments.

	Department store,Store (㎡)	Office (㎡)	Specific use (Excluding department store,store, office) (㎡)	Non-specific use (㎡)	Remote distance (m)
Standard parking lot regulations	200	250	250	450	-
Sapporo	300	300	500	600	350
Sendai	350	350	550	900	200
Saitama	200	200	200	450	300
Chiba	200	200	200	300	200
The 23 wars	250	300	300	350	300
Yokohama	200	250	250	550	300
Kawasaki	300	350	350	600	300
Nagoya	350	500	650	900	300
Kyoto	300	350	450	600	500
Osaka	350	350	350	450	350
Kobe	200	350	350	550	350
Hiroshima	150	250	250	450	300
Kitakyushu	300	300	300	450	200
Fukuoka	300	300	300	450	300

Source: Created by the author using fiscal 2019 data from the 2019 Annual Report on Parking Lots (City Bureau, Ministry of Land, Infrastructure and Transport, 2020).

Figure 6 Sapporo City KITASANJYOU Square (AKAPLA)

■ The parking free street has implemented together with urban redevelopment.

Source: photo by Masaharu OOSAWA

Figure 7 Green Parking in Urban Areas

■ Green parking is one of measures against heat island effect.

Source: photo by Masaharu OOSAWA

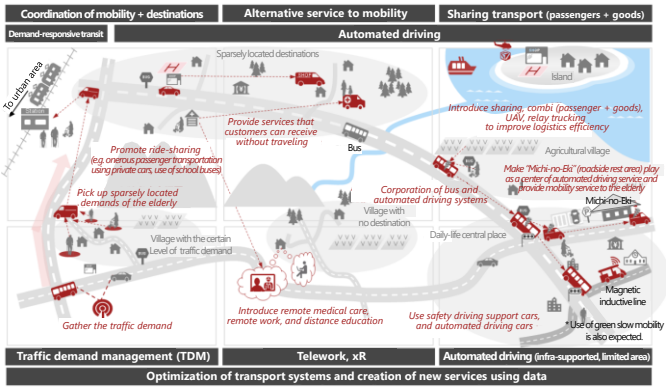
2-7 Recent ITS Research and Developments

Research Associate, The University of Tokyo
Azusa Toriumi
Professor, The University of Tokyo
Takashi Oguchi

"Public-Private ITS Initiative/Roadmaps" was first established in 2014 and have been updated every year by the IT Strategic Headquarters, describing the medium- and long-term goals of ITS developments which private companies and relevant ministries should address together. Their main targets are to develop and deploy safety driving support and automated driving systems, and to utilize various kinds of big data for transport. Furthermore, R&D of automated driving systems have been promoted as one of the Strategic Innovation Promotion Programs in the Cabinet Office since 2014, called as "SIP-adus". The second phase of SIP-adus started in 2018; currently field operational tests (FOTs) in the Tokyo Waterfront Area have been conducted since 2019.

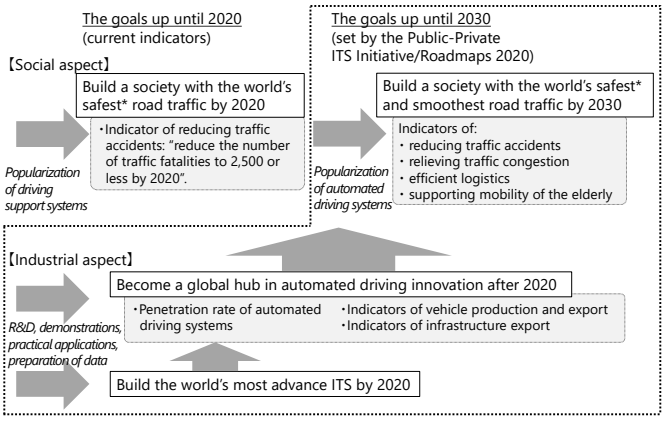
☐ "Public-Private ITS Initiative/Roadmaps 2020" delivers the visions for 2030 for the ITS development in rural areas, urban areas with private cars as major means of transport, and urban areas with public transport as major means of transport, based on their different mobility needs and problems. It also declares the goals on social and industrial aspects to realize the visions.

Figure 1 Vision of 2030 in Rural Areas



Source: Public-Private ITS Initiative/Roadmaps 2020 (translated by the authors)

Figure 2 Goals and Key Indicators

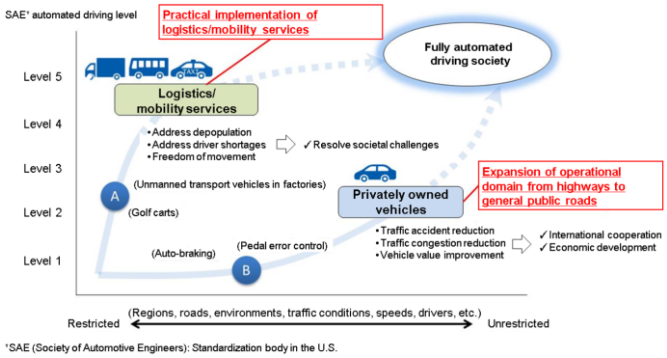


* To have the smallest number of traffic fatalities per population in the world.

Source: Public-Private ITS Initiative/Roadmaps 2020 (translated by the authors)

Figure 3 Two Approaches towards a Fully Automated Driving Society

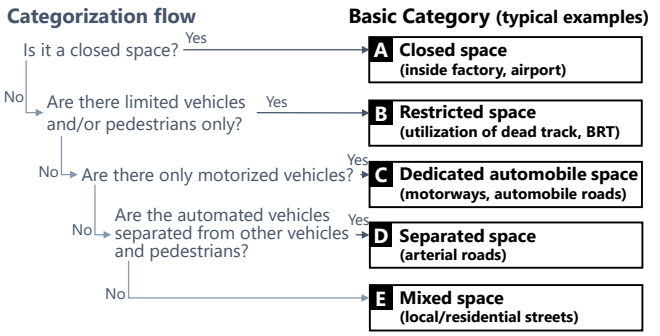
■ The aims of the second phase of SIP-adus, which started in 2018, are to implement logistics and mobility services using automated driving technologies in practice, and to expand the operational domain of automated driving systems from highways to general public roads. R&D are in progress from the two approaches: realizing "automation" of driving tasks under the limited conditions (for logistics and mobility services) and applying more sophisticated technologies for driving systems to deal with "various environments" (for private cars).



Source: SIP-adus

Figure 4 Driving Conditions for Automated Vehicles

■ Driving conditions of automated vehicles are determined by five basic categories and additional supplemental factors according to the Panel on Business Strategies for Automated Driving (METI and MLIT).



* Categories of A~E represent basic differences of their conditions, but other factors, typically shown below as the additional factors, also affects actual driving conditions. Therefore, A~E do not necessarily mean relative difficulties in realizing automated driving.

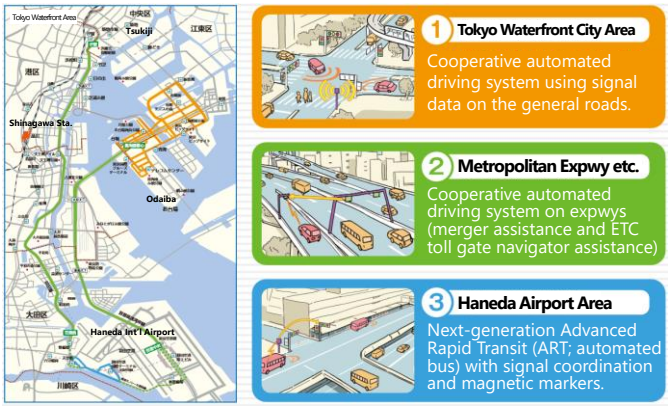
Additional major factors			
Speed	**Topography**	**Road**	
Automated driving speed (low/mid/high)	Area type (urban/ mountainous/...), Gradient, Curvature	Number of lanes, Presence of sidewalks, Pavement marking, Surface conditions (dry/wet/snow...)	
Environment	**Traffic condition**	**Time of day**	
Weather, Disaster impact, Lighting	Traffic volume, Congestion On-street parking volume, Obstacles on the road	Day-time/night-time	

Source: MLIT (translated and partially modified by the authors)

☐ FOTs in the Tokyo Waterfront Area were started in October 2019 in the second phase of SIP-adus. Validation of automated driving technologies based on the high-precision 3D map data (static information) as well as expressway merging conditions, traffic congestion, and traffic signal control information (dynamic and semi-dynamic information) will be done step by step.

Figure 5 FOTs in the Tokyo Waterfront Area

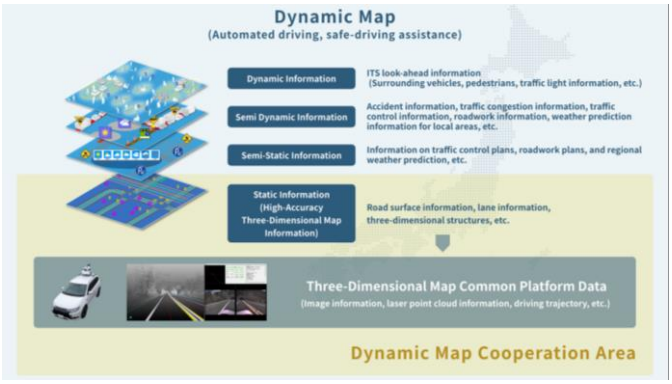
■ 29 organizations, including automobile manufacturers, suppliers, and universities in Japan and other countries take part in the FOTs.



Source: SIP-adus (translated by the authors)

Figure 6 Development of High-Precision 3D Map Data

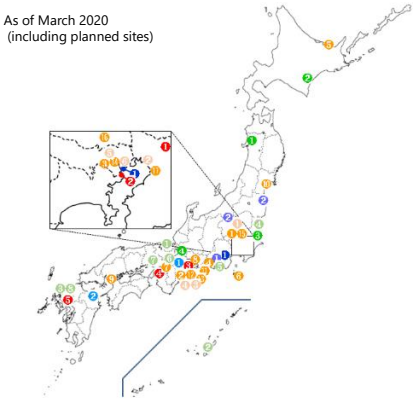
■ Initial preparation of the data for 29,205 km of the expressways and highways across Japan was completed in 2019. The data are now used for highly accuracy navigation, ADAS and automated driving applications.



Source: Dynamic Map Platform Co., Ltd.

Figure 7 FOTs of Automated Driving in Japan

■ FOTs are planned/under execution by relevant ministries, local municipalities, private companies, universities, etc., for different purposes such as technology validation, mobility services in depopulated and aging mountainous villages, mobility services for a last one-mile, improving logistics efficiency, etc.



Automated driving service around Michi-no-Eki (MLIT/SIP)
1Kamikoani, Akita 2Taiki, Hokkaido 3Hitachiota, Ibaraki 4Higashiomi, Shiga

Smart mobility challenge (METI & MLIT) 1Otsu, Shiga 2Oita, Oita

SIP projects (Cabinet Office) 1Tokyo Waterfront Area

Automated driving for last one-mile (MLIT & METI)
1Eiheiji, Fukui 2Kitadani, Okinawa

Automated middle-size bus (MLIT & METI)
3 8Kitakyushu and Kanda, Fukuoka 4Hitachi, Ibaraki 5Yokohama, Kanagawa 6Otsu, Shiga 7Mita, Hyogo

Truck platooning (MLIT & METI)
1Shi-Tomei Expwy (E1A) 2Joshin-etsu Expwy (E18) and Joban Expwy (E6)

Automated driving inside restricted area of an airport (MLIT)
1Narita airport 2Haneda airport 3Chubu airport 4Kansai airport 5Saga airport

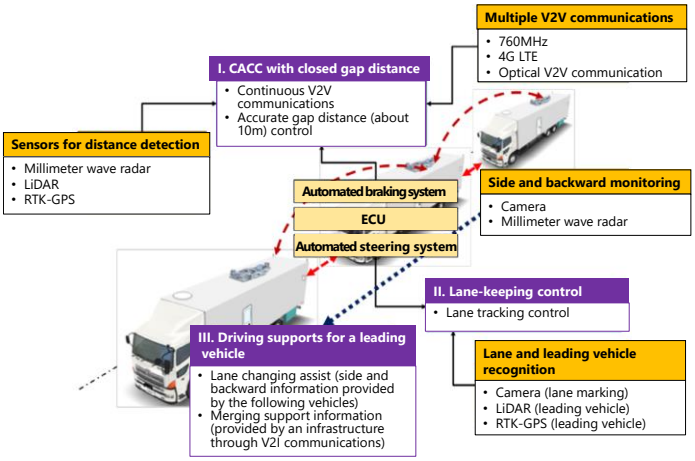
Smart city (MLIT)
1Utsunomiya, Tochigi 2Kashiwa, Chiba 3Shimoda, Shizuoka 4Kasugai, Aichi 5Chiyoda, Tokyo 6Koto, Tokyo

Major FOTs done by local municipalities, private organizations, and universities
1Kiryu, Gunma 2Kuwana, Mie 3Minato, Tokyo 4Iwata, Shizuoka 5Shari, Hokkaido 6Hachijo-island, Tokyo 7Sakai, Osaka 8Nagakute, Aichi 9Hiroshima, Hiroshima 10JR Kesennuma line 11Matsuzaki, Shimoda, and Fukuroi, Shizuoka 12Tobishima, Aichi 13Minamichita, Aichi 14Chuo and Chiyoda, Tokyo 15Maebashi, Gunma 16Kawaguchi, Saitama 17Chiba, Chiba

Source: Public-Private ITS Initiative/Roadmaps 2020 (modified and translated by the authors)

Figure 8 Truck Platooning on Expressways

■ Driverless truck platooning systems have been tested in the actual field, Shin-Tomei Expressway (E1A), since 2019.



Source: METI (translated by the authors)

Figure 9 Public-private Cooperative Platform for Smart Cities

■ A platform for smart cities, which incorporate AI and IoT technologies into urban development, was established by ministries, local municipalities, private companies, research institutes, etc.

Source: Public-private cooperative platform for smart cities

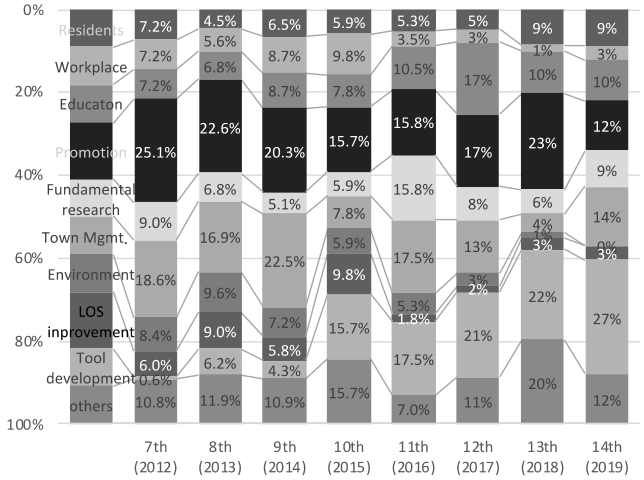
2-8 Recent Trends in TDM and Mobility Management Measures

National Institute of Technology, Kure College
Yusuke Kanda

Since the latter half of the 2000s, mobility management (MM) has been implemented in Japan, which emphasizes communication to promote socially preferable behavior. It has been developed in Japan as a measure against traffic congestion and a measure to promote the use of public transportation. Recently, it has been applied to various problems in transportation and city management, and along with discussions on the sophistication of IT and IoT and the introduction of MaaS, the development of MM tools is now progressing. In addition, MM is also applied to promote raise the travel demand, which is excessively shrinking due to the COVID-19.

Figure 1 Trends of MM Presentations in JCOMM

- In the latter half of the 2000s, when MM was positioned as a national and local government policy and began to be introduced, MM had been applied to residents and workplace to reduce car use. Recently, presentations related to updating digitalized MM tools, open-data and data-linkage, MM in overseas projects have increased.



Source: Japanese Conference of Mobility Management (JCOMM)

Table 1 Session Topics of Recent JCOMM Conferences

- In the discussions on MM in Japan, "strategy" and "subject" are continuously discussed, and recently, the possibility of integration with digital tools such as "MaaS", the basic approach of MM, and regional improvement are being discussed.

FY	Special and Oral session titles of JCOMM
2015	MM and Design // MM and IT MM and improvement of LoS of railway and bus
2016	MM and movement of socials MM and big data Past and future of MM
2017	MM and utilization of open-data QoL of Seniors and MM Rethinking the role of MM for improving local mobility
2018	Overview of future mobility service and MM Health, mobility and town management
2019	MM and MaaS Informatization, open-data and MM Rethinking MM's basic approach from overseas cases

Source: Japanese Conference of Mobility Management (JCOMM)

Table 2 Discussion of MM in ECOMM

- At the ECOMM (European Conference on Mobility Management), annual MM conference held in Europe, methodologies for the social implementation of new mobility systems such as electric vehicles, hardware development, and transportation policies are discussed. Also, at the latest meeting, the possibility of MM for better town development has been discussed. In 2020, it will be held online due to the influence of COVID-19. Main topics of discussions were MaaS and sharing, and the utilization of the "Nudge Theory", which won the Nobel Prize.

FY	Theme of ECOMM
2016	Smart Solutions for People and Cities
2017	Teaming up for liveable cities
2018	Mobility in disruption – fast-forward to smart and sustainable societies
2019	Cancelled
2020	New Mobility… New Governance… New Realities for People and Cities -

Figure 2 Overseas Expansion of Japanese MM Skills

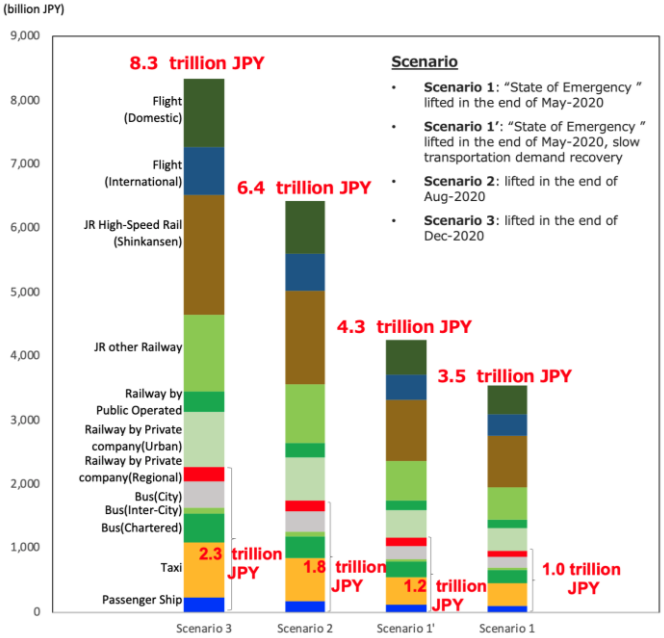
- Traffic congestion has been a big problem in Southeast Asian countries where economic development and modal shift to automobiles continue. As countermeasures, improvements in the attractiveness of public transportation such as buses (photo: utilization of buses donated by the Kyoto Municipal Transportation Bureau) and motivation for using public transportation utilizing MM measures are being conducted in various places.

Source: Japan International Cooperation Agency (JICA)

☐ In 2020, intercity and intracity transportation services throughout the country were significantly affected by COVID-19. In present, it is difficult to foresee convergence of COVID-19. However, MM have been introduced to mitigate the effects of excessive demand restraint.

Figure 3 Estimated Loss of Annual Fare Income Affected by COVID-19

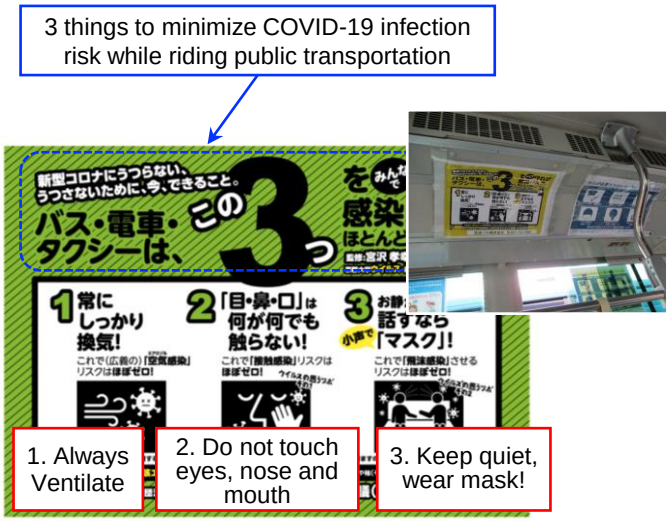
■ Due to the spread of COVID-19 and the government's request for going-out self-restriction, the travel demand has decreased significantly, with about 90% decrease for intercity transportation, and about 60% decrease for intracity transportation. As a result, management of public transportation is in a critical situation.



Source: Japanese Conference of Mobility Management (JCOMM)

Figure 4 Promoting to Use Public Transportation with Properly Understanding the Risks of COVID-19

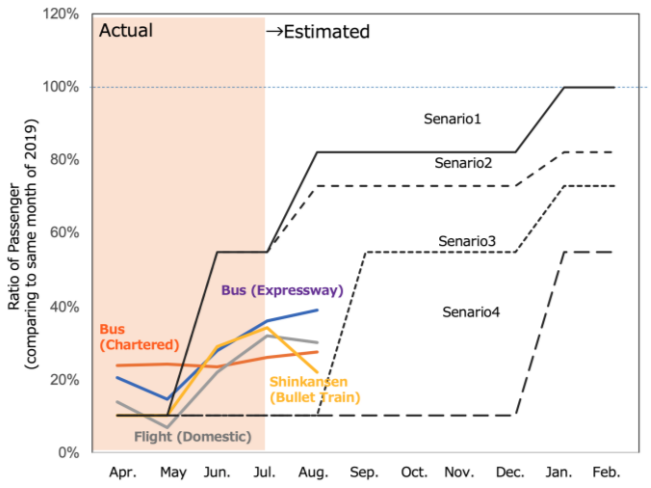
■ Due to the spread of COVID-19, people refrained from going out. In addition, public transportation, which many unspecified people use and a high density in the transit, has been shunned as one of the "three Cs", To address this issue, mobility management is being developed to properly understand the risks of COVID-19 and promote the use of public transport, with the supervision of virology experts.



Source: Japanese Conference of Mobility Management (JCOMM)

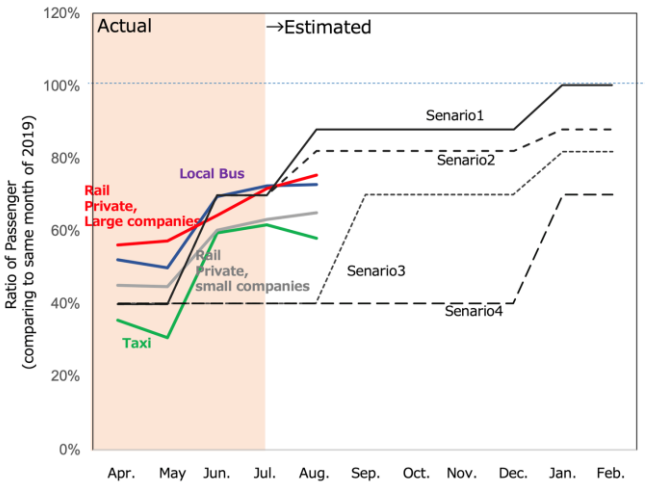
☐ Due to the spread of COVID-19, the government has adopted a going-out self-restriction policy for about a month from April 2020. After the policy was relaxed, the negative impact of this policy can still be observed. In particular, it has had a large impact on business and tourism travel demand, it has seriously affected the profitability of intercity transportation. It is not expected that the travel demand will return to pre-COVID-19 levels.

Figure 5 Decrease and Recovery for Intercity Transportation



Source: MLIT-Japan, JR-Tokai

Figure 6 Decrease and Recovery for Intracity Transportation



Source: MLIT-Japan

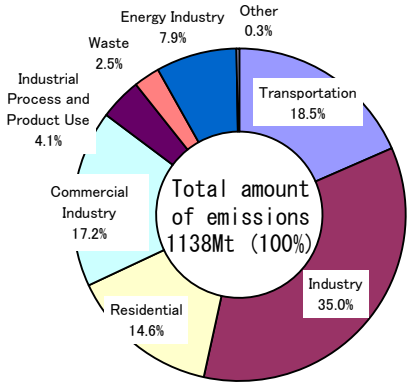
3-1 Mitigation of Climate Change

Associate Professor, Tokyo Institute of Technology
Yasunori Muromachi

Japan's total greenhouse gas emissions in fiscal 2018 were 1.240 billion tons, a 3.9% decrease from 2017 and a 12.0% decrease from 2013. The transportation sector's share of CO_2 emissions was 18.5%. The transportation sector's global warming countermeasure plan is in progress, and for most of these measures, target levels are expected to be achieved. However, the reduction rate in the transportation sector is -6% in 2018 compared the required -27% in 2030 under the Paris agreement. It is not easy to achieve the Paris Agreement and long-term goals, and necessary to strengthen measures.

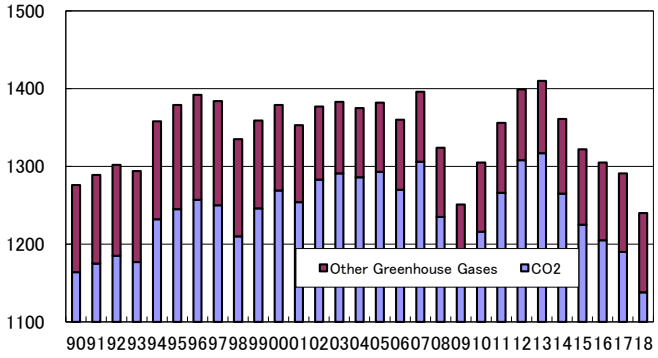
Figure 1 Breakdown of CO_2 Emissions by Sectors (FY2018)

■ About 18.5% of the total emissions derived from the transportation sector.



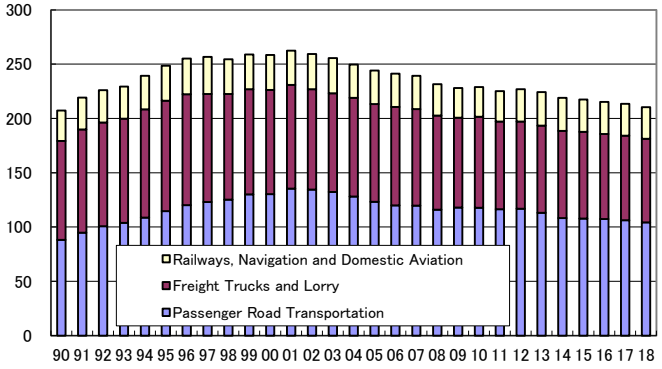
Source: Ministry of the Environment, 2020

Figure 2 Changes in the Amounts of Greenhouse Gas and CO_2 Emissions in Japan (Mt)



Source: Ministry of the Environment, 2020

Figure 3 Changes in the Amount of CO_2 Emitted from Transportation Sector (Mt)



Source: National Institute for Environmental Studies, 2020

Table 1 Long-term Strategy as a Growth Strategy Based on the Paris Agreement (Adapted Excerpt)

Chapter 1: Basic concept

2. Japan's long-term vision

・Japan will set a "decarbonized society" as the final goal and aim to achieve it with ambition as early as possible in the latter half of this century. To that end, we have set a long -term goal of reducing greenhouse gas emissions by 80% by 2050, and wi ll boldly implement measures to achieve that goal.

Chapter 2: Long-term vision of each sector and direction of measures and plans for it

Section 1: Emission reduction measures and plans

3. Transportation

(1) Current situation recognition

I. Status of the transportation sector
II. Structural changes in the automobile industry
III. Active contribution to climate change measures related to automobiles
IV. Trends in reducing greenhouse gas emissions in international shipping and aviation

(2) Vision to aim for

- It is important to evaluate CO_2 emissions from automobiles, including the process of manufacturing gasoline, electricity, etc., from the perspective of "Well to Wheel."
  The aim is to reduce greenhouse gas by 80% per Japanese automobile supplied worldwide compared to 2010.

(3) Direction of measures and plans for the vision

I. Basic policy of challenge for Well to Wheel Zero Emission
- Large vehicles (trucks/buses) are mainly used for commercial purposes, so there is a strong demand for "equal usability of existing vehicles" and "securing economic advantage", and given the current battery price and volume energy density, it is difficult to draw a sustainable diffusion model at this stage because it is not possible to secure economic efficiency simply by replacing the power source of existing vehicles with batteries.

II. Road/traffic system
- While recognizing that so-called induced/diverted traffic may occur with road construction, the efforts of strengthening the trunk road network such as ring roads that contribute to CO_2 emission control, and of taking pinpoint measures for congestion bottleneck locations based on scientific analysis of big data using ETC2.0 and AI cameras etc. are promoted for using roads wisely.

III. Long distance modes

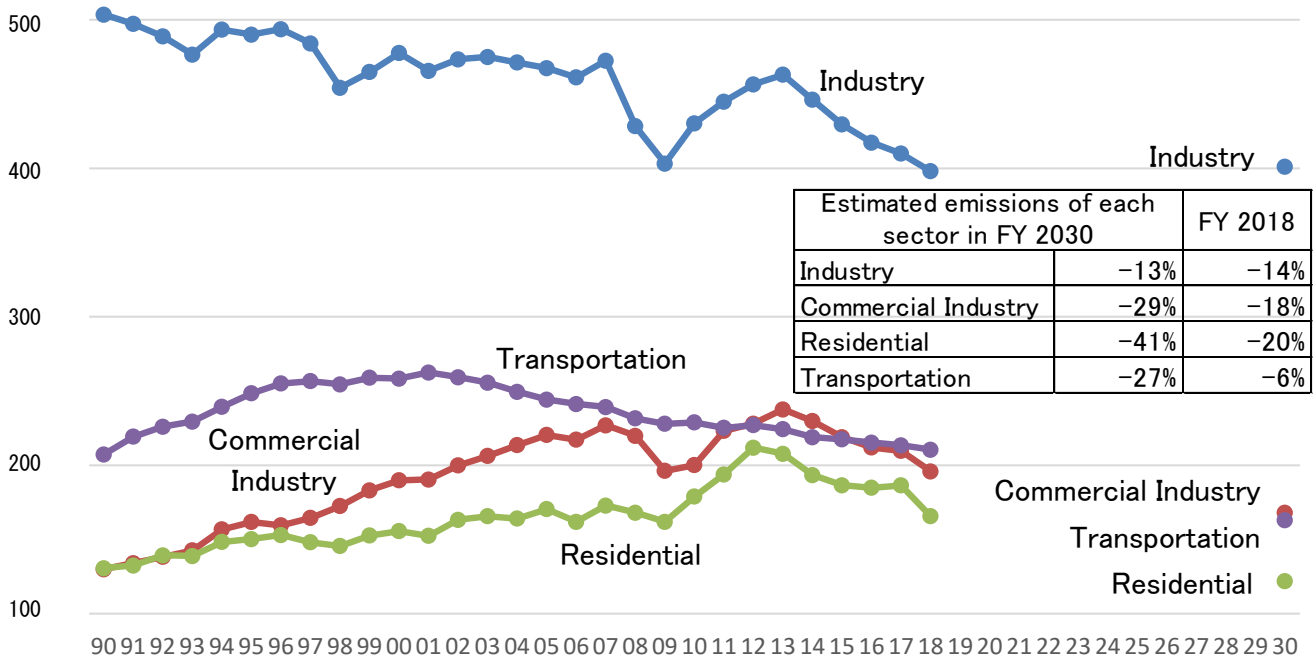
IV. Mobility revolution and compact city development
- The efforts for the improvement of services and convenience by promoting the development of public transportation such as railways, and new mobility services such as Mobility as a Service (MaaS), are promoted for realizing seamless public transportation.

V. Logistics revolution

Source: Global Warming Prevention Headquarters, 2019

Figure 4 Sector Targets for Paris Agreement and Current Status in Japan (Mt)

■ The transportation sector faces difficulty in attaining the sector target of Paris Agreement.



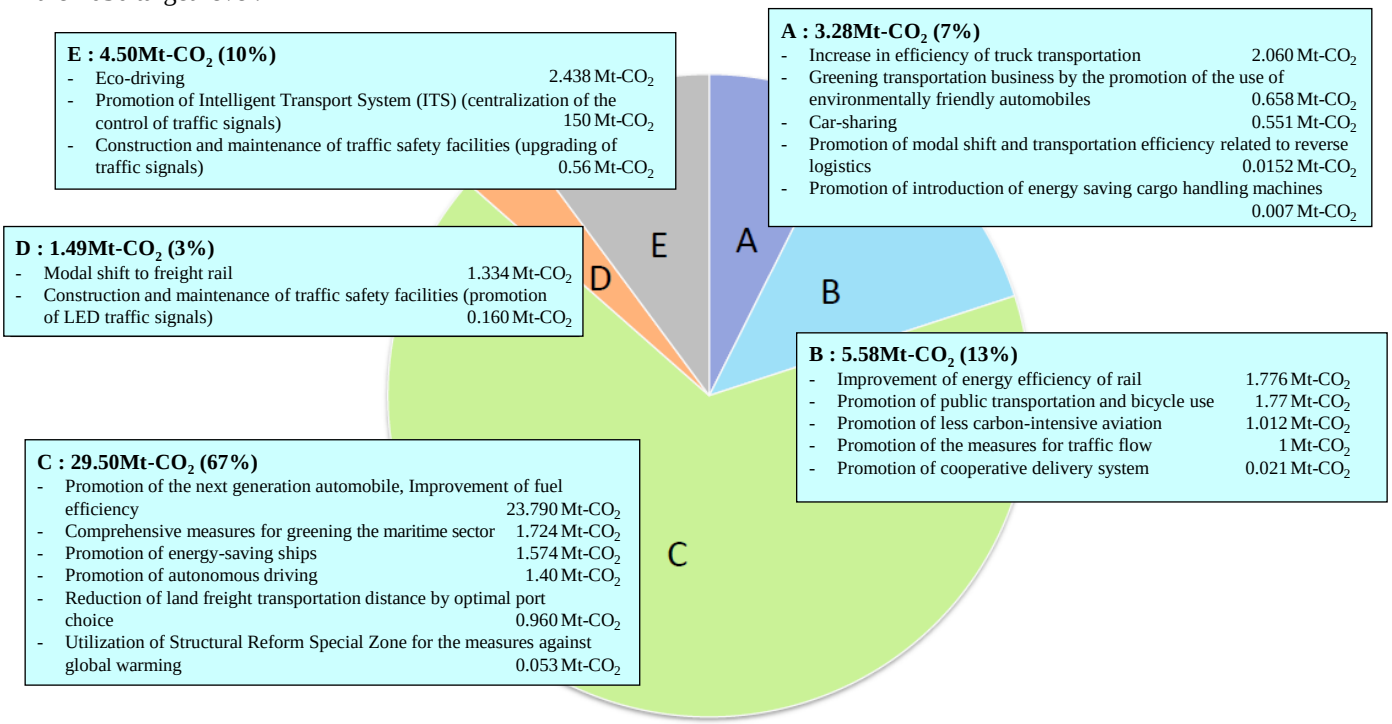
Estimated emissions of each sector in FY 2030		FY 2018
Industry	−13%	−14%
Commercial Industry	−29%	−18%
Residential	−41%	−20%
Transportation	−27%	−6%

Note: The figure is based on the Greenhouse Gas Emission Inventory in 2018.

Source: UNFCCC, Japan's Intended Nationally Determined Contribution, 2015, and Ministry of the Environment,, 2020

Figure 5 Transportation Sector Target for Paris Agreement and Current Status

■ The transportation sector's global warming countermeasure plan is in progress, and most of the measures are expected to reach the 2030 target level.



A. The target level for 2030 is likely to be exceeded, and the actual value for FY 2018 has already exceeded the target level for 2030
B. The target level for 2030 is likely to be exceeded.
C. The target level for 2030 is likely to be reached.
D. The target level for 2030 is unlikely to be reached.
E. Others (The quantitative data is not available, etc.)

Source: Global Warming Prevention Headquarters, The list of progress status of measures/plans related to emission reduction and absorption of greenhouse gases (for each evaluation), 2020

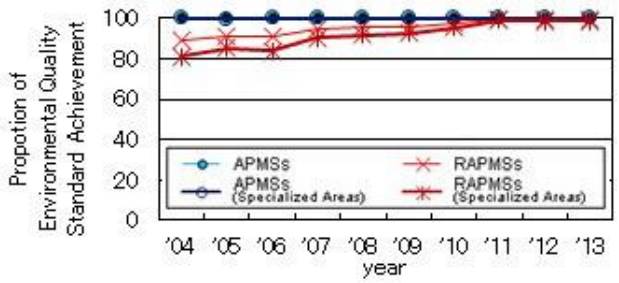
3-2 Current Status and Problems of Road Traffic Noise and Air Pollution

Professor, Tokyo Metropolitan University
Hiroyuki Oneyama

Due to the effects of vehicle emission regulations and vehicle type regulations such as Automobile NOx/PM Act, the achievement rate of environmental standards for nitrogen dioxide (NO_2), suspended particulate matter (SPM), and fine particulate matter ($PM_{2.5}$) is high. Although traffic noise condition has been improved, there are still many problems, especially under special road conditions such as complex road sections. For both air pollution and noise, comprehensive countermeasure promotion such as source measures, traffic flow measures, road structure measures, and roadside measures is necessary. Regarding vehicle exhaust gas and noise emission, regulations are being strengthened based on an international framework.

Figure 1 Environmental Quality Standard Compliance of Nitrogen Oxides (NOx)

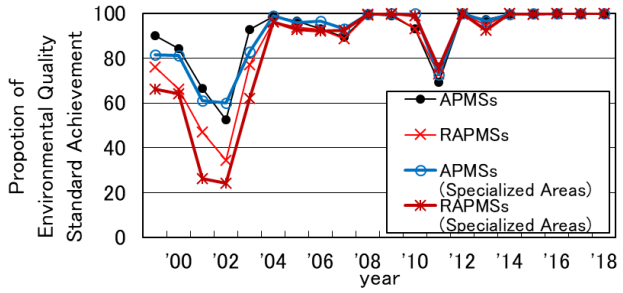
■ Environmental standards have been achieved at almost all locations in recent years.



Source: Transportation-related statistics (MLIT)

Figure 2 Environmental Quality Standard Compliance of Suspended Particulate Matter (SPM)

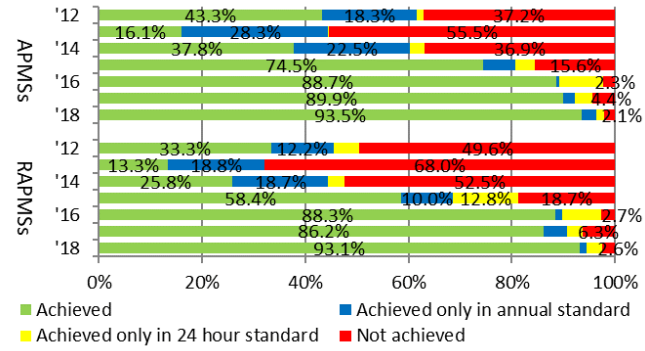
■ Environmental standards have been achieved at almost all locations in recent years.



Note: APMS: Air Pollution Monitoring Station. RAPMS: Roadside Air Pollution Monitoring Station. Specialized Area is designated for NOx and PM measures in “Automobile NOx and PM Act”, namely, a part of Tokyo, Kanagawa, Saitama, Chiba, Aichi, Mie, Osaka, Hyogo Pref.

Figure 3 Environmental Quality Standard Compliance of Fine Particulate Matter (PM2.5)

■ Dramatically improved from around 2015.



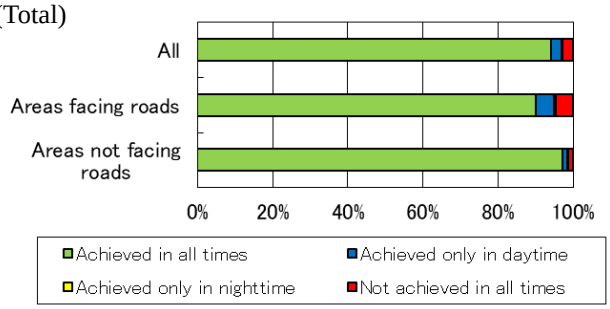
Note: The annual standard for $PM_{2.5}$ is less than or equal to 15.0 $\mu g/m^3$. The 24 hour standard, which means the annual 98th percentile values at designated monitoring sites in an area, is less than or equal to 35 $\mu g/m^3$.

Source of Figure 1, 2 and 3: "FY 2004 Status of Air Pollution", Ministry of Environment

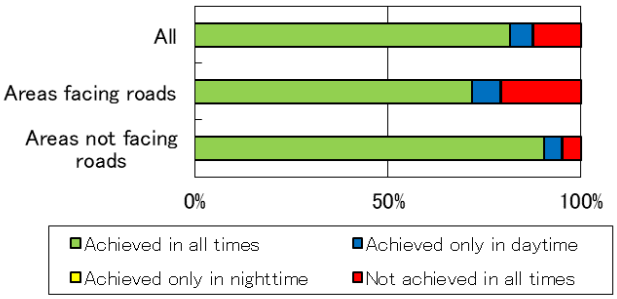
Figure 4 Environmental Quality Standard Compliance of Traffic Noise (2013)

■ Achievement of environmental quality standard in mixed road section is much lower than total.

(Total)



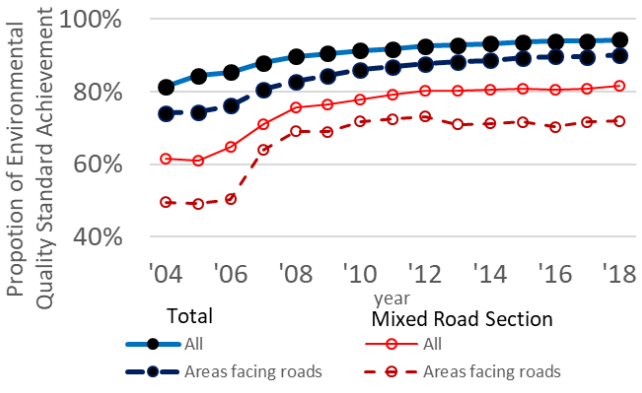
(Mixed Road Section)



Note: Evaluation of the number of dwellings in the area facing the road to be evaluated. The "space near the main road" is a certain distance (road Range of 15 to 20 m depending on the classification of the road) "Non-proximity space" refers to the area that faces the back ground of a section that is close to a road that carries highway traffic or a road other than a highway.

Figure 5 Trend in Proportion of Environmental Quality Standard Achievement of Traffic Noise

■ The status of achievement of environmental standards has been flat for the past 10 years. In particular, it is necessary to improve the achievement rate on complex section roads.



Source of Figure 4 and 5: "Status of Motor Vehicle Traffic Noise in FY 2018", Ministry of Environment

Table 1 Roadside Traffic Noise Measures

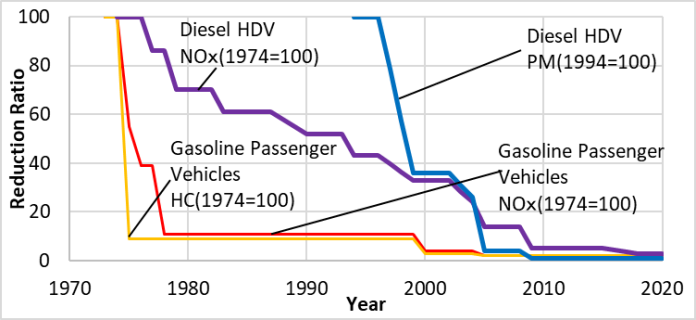
Classification of measures	Measures	Overview and achievements
Source measures	Vehicle exhaust noise measures	Reduction of vehicle exhaust noise by Improvement of vehicle structures - Harmonization with international standards (UN R41-04, R51-03) for acceleration noise test method - Move to relative regulations that require in-process vehicles to have the same proximity exhaust noise value as new vehicles - Introduction of noise regulation (UN R117-02) for automobile tires
Traffic flow measures	Traffic control and management	Sophistication of the traffic signal control, Effective traffic regulation, Traffic crackdown - Prohibition of large freight vehicles etc.: Within Ring 7 and part of Ring 8 (Saturday 22:00 to Sunday 7:00) - Regulations for center lanes of large freight vehicles etc.: Part of Ring 7 (all day) ・Part of National Route 43 (22-6) - Improvement of traffic signal control: 116,762 units (as of the end of 2018, total of centralized control, sensitive control, system control) - Maximum speed limit regulation : Part of Route 43/Route 23 (40km/h)
	Development of bypasses	Reduction of inner city heavy vehicles and dispersion of traffic by development of ring roads or bypass etc.
	Development of logistic centers	Reduction of inner city heavy vehicles by proper placement of logistics facilities, rationalization of logistics such as joint transport and delivery. - Development status of distribution business complex: 26 locations nationwide (number of planned districts for which city planning has been decided at the end of 2017) - Normal truck terminal development status: 3,354 berths (end of 2017)
Road structure measures	Installation of low-noise pavement	Installation of low-noise pavement in which there are a lot of voids. - Environmental improvement effect: about 3 dB on average
	Installation of noise barriers	Installation of high noise barrier with high sound insulation effect. This is effective in motorways with limited access. - Environmental improvement effect: Approximately 10 dB (calculated value at a height of 1.2 m above the ground, behind a sound insulation wall with a planar structure and a height of 3 m)
	Installation of environmental buffer zone	Securing of the buffer space for noise reduction of 10 or 20m between the roadside and roadway. - Environmental improvement effect (width about 10 m): 5-10 dB
Roadside measures	Development of roadside district plan	A roadside district plan is established in urban planning to promote the prevention of disorder caused by road traffic noise and the proper and reasonable land use. It promotes urban development worthy of the roadside of the main road. - Act on Improvement of Areas Along Trunk Roads - Roadside maintenance road designation requirements/night noise over 65 dB (LAeq) or daytime noise over 70 dB (LAeq), daily traffic volume over 10,000, etc. - Roadside maintenance road designation status / 11 routes 132.9 km designated by the prefectural governor (as of April 2016) National Road No. 4, National Road No. 23, National Road No. 43, National Road No. 254, Circular Road No. 7, 8 etc. - Roadside district plan formulation status / Roadside district plan formulated at 50 district 108.3km (as of April 2016)
Impact prevention measures	Implementation of grants for residential soundproofing	A reduction of the impact of road traffic noise by the soundproofing subsidies of housing such as emergency measures. ・House soundproof construction subsidy by road administrator ・Subsidy for soundproofing of houses around highways ・National interest-free loans for municipal land purchases ・Part of the cost of the buffer building by the road administrator
Development of promotion organization	Creating organization for road traffic pollution measures promotion	Work closely with related organizations to solve road traffic noise problems. - Promotion of road pollution countermeasures in close collaboration with the Ministry of the Environment/related ministries and agencies - Promotion of measures by councils with local governments/national departments, environment departments, road departments, city departments of prefectural governments, prefectural police, etc. (established by all prefectures)

Source: "White Paper for Environment, 2020", Ministry of Environment (modified)

Figure 6 Regulation of Vehicle Exhaust Gas and Noise

■ Vehicle emission regulations have been significantly strengthened.

■ Regulations based on the international framework of emission regulations and noise regulations are being strengthened.

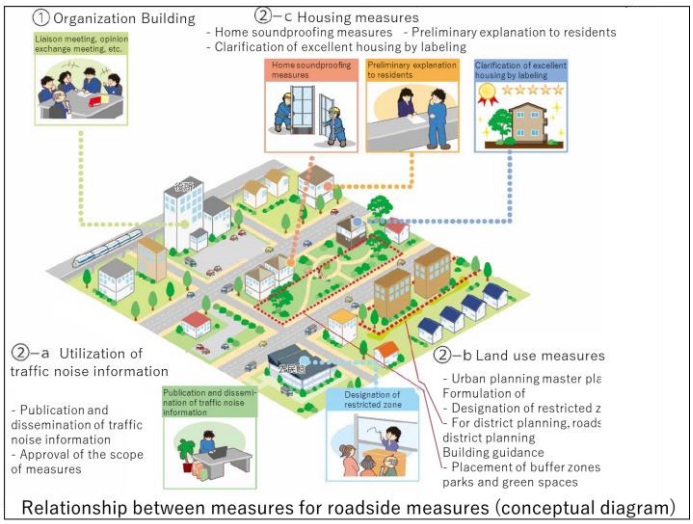


(Exhaust gas regulation)
Exhaust gas regulations using world-wide test modes (WHTC, WLTC) were applied from 2016 for diesel heavy vehicles, 2018 for passenger cars and light vehicles, and 2019 for light and medium-duty vehicles.
(Noise regulation)
Due to the revision of the vehicle safety standards in 2016, noise regulations have been strengthened by reviewing the standards for exterior noise of four-wheeled vehicles and clarifying the prohibition of modification to mufflers of unknown performance.

Source: "White Paper for Environment, 2020", Ministry of Environment and Document from Central Environment Council

Figure 7 Roadside Measures to Prevent Traffic Noise Problems

Guidelines for roadside/railway measures to prevent traffic noise problems
(background)
・As a result of residential land development in areas where people had not previously lived along the roadside of existing transportation facilities, there was a problem of traffic noise related to new residents.
・From the perspective of preventing traffic noise problems, there are still few cases where policy is sought to harmonize transportation facilities with land use along the roadside.
(Aim of guideline)
・ Organize options for various measures (roadside/railway measures) to harmonize transportation facilities with land use along the roadside/railway areas, and have the person in charge of the environment department of the municipality select appropriate roadside/railway measures. The guidelines that can be referred to are presented.



Relationship between measures for roadside measures (conceptual diagram)

Source: Guidelines for roadside/railway measures to prevent traffic noise problems, Ministry of Environment, 2017 (modified)

3-3 Improving Energy Efficiency

Japan Automobile Manufacturers Association
Masanari Meguro

In July 2015, the Japanese government launched the “long-term energy balance outlook”, which is based on the energy policy of Japan, assuming the policy objectives to be achieved, through the basic viewpoint of energy policy such as safety, stable supply, economic efficiency and environmental compatibility (3E+S). The expected primary energy reduction in 2030 is estimated about 50.3 million kilo-litter (about 13% compared to before measures) with the accumulation of all the feasible technologies and practical energy-saving measures. In this context, reduction of fuel consumption in transportation sector is expected about 16. million kilo-litter by improvements in fuel efficiency, deployment of next-generation vehicles and measures for smooth traffic flow.

Overview of Energy Balance Flow in Japan (FY2018)

- Energy passes through various stages before it reaches to end-consumers. Since there are losses in the process of power generation, during transportation, and self-consumption in power generation and in the conversion process, final energy consumption equals the primary energy input after deducting these losses. Final energy consumption in fiscal year of 2018 was approximately 66, if Japan's domestic primary energy input counts as 100.
- Much of the nuclear energy and renewable energy including hydro power is converted to electricity and consumed. Most of the oil is refined and consumed as various product as gasoline and light oil consumes in transportation sector, kerosene and heavy oil as petroleum products, and naphtha as a petrochemical raw material.

Table 1 Overview of Energy Consumption in Japan (FY2018)

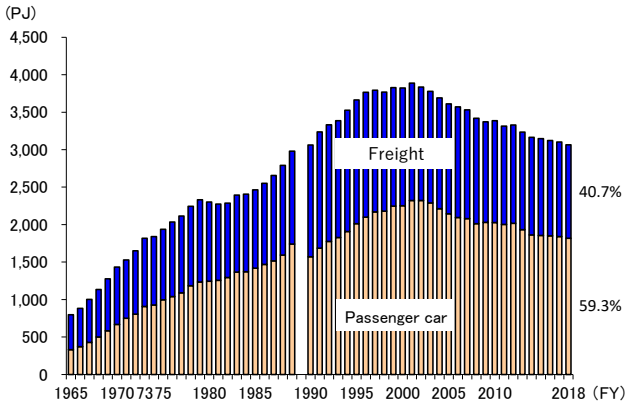
- Energy conservation is steadily progressing in each field, but further efforts are needed to realize the energy mix in FY2030.
- It is evaluated in governmental consultation that energy demand in transportation sector decreased mainly due to improved fuel efficiency of passenger vehicles.

	FY2013 (Actual)	FY2018	Saving	Major factor in Change
Total	363.8	338.9	▲24.9	[Note: Values are all in Mil. Kilo-litter basis]
Industrial Sector	168.3	158.0	▲10.3	Economic activity expanded moderately, but declined due to a decrease in steel and ethylene production and progress in energy conservation.
Business Sector	59.2	54.4	▲4.7	The efficiency of equipment such as lighting and air conditioning is improved, and the basic factor is improved.
Household Sector	52.8	47.3	▲5.5	The efficiency of equipment such as lighting and air conditioning is improved. At present, demand will decrease due to climate factors such as warm winter
Transportation Sector	83.6	79.2	▲4.4	Demand decreased mainly due to improved fuel economy of passenger vehicles (3.0 saving only by passenger vehicle sector)

Source：ANRE Energy Conservation subcommittee 2020 [in Japanese]

Figure 1 Passenger/Freight Consumption Ratio in Transport Sector

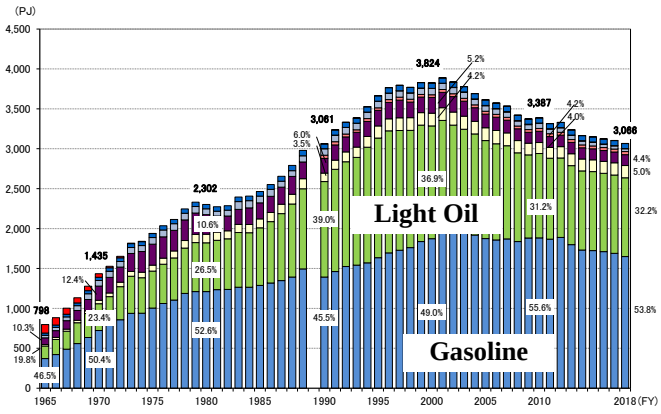
- Transportation sector in 2018 accounted for 23.4% of the total final energy consumption, of which the passenger sector energy consumption accounted for 59.3% and the freight sector 40.7%.



Source：ANRE Energy White paper 2020 [Fig. 212-3-1 in Japanese]

Figure 2 Changes in Consumption by Energy Source in the Transportation Sector

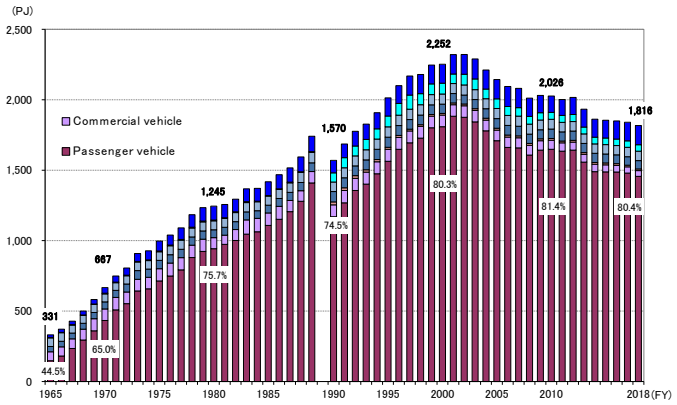
- Gasoline accounted for 53.8%, light oil 32.2%, jet fuel 5.0%, and heavy oil 4.4%, looking at the composition ratio by energy source in the transport sector in 2018.



Source：ANRE Energy White paper 2020 [Fig. 212-3-3 in Japanese]

Figure 3 Energy Consumption Trends in Passenger Sector

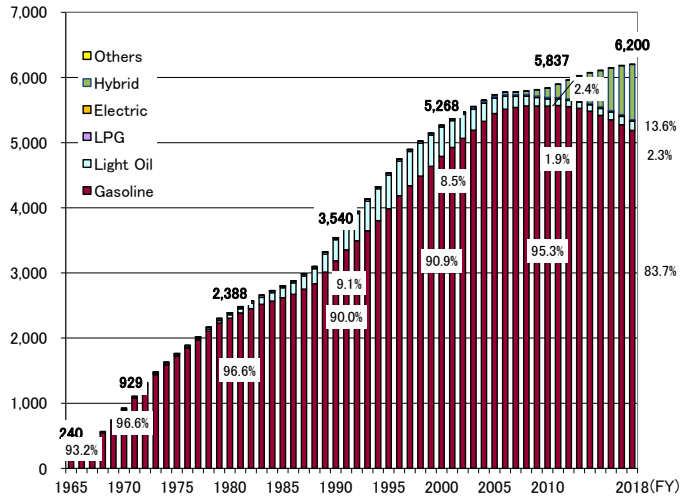
- Energy consumption in the passenger vehicle sector increased at a rate exceeding the GDP growth rate as the number of vehicles owned increased. Such tendency, however, peaked in fiscal 2001 and turned to a downward trend. In FY2018, it decreased by 20% compared to the peak period.
- This trend was achieved through the improvement of fuel efficiency of passenger vehicles and increasing share of fuel-efficient vehicle such as small size vehicle and hybrid vehicle. Spreading ETC system and deployment of advanced control in signal systems in traffic flow also contributed such improvement.



Source: ANRE Energy white paper 2020 [Figure 212-3-4 in Japanese]

Figure 4 Changes by Vehicle Type in the Number of Passenger Cars Owned

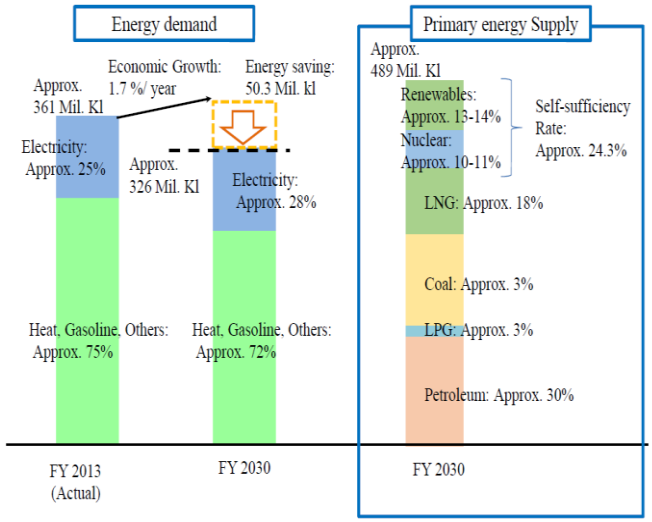
- 95.3% of all passenger vehicles at the peak, were gasoline vehicles. In 2011, hybrid vehicles accounted for 2.4% of all passenger vehicles, however, they have gradually increased since then to 13.6% in FY2018.
- As for the number of passenger cars owned (62million in total in FY2018), Gasoline vehicle accounted for 83.8%, light oil 2.3%, and hybrid vehicle 13.6%.



Source: ANRE Energy white paper 2020 [Figure 212-3-5 in Japanese]

Figure 5 Long-term Energy Supply and Demand Outlook

- Energy-saving in long-term energy balance outlook contains technologically feasible and realistic energy-saving values that can be at most achieved. It is expected the energy demand in final energy consumption in fiscal year of 2030 will be around 326 million kl of petroleum equivalent, by implementing energy savings of about 50.30 million kl.



Note: In the "Comprehensive Energy Statistics", the method of calculating numerical values has changed since 1990. For that reason, some discontinuity is observed in Figure 1, 2, 3 and 4.

Source: Long-term Energy balance outlook (METI July 2015)

Table 2 Energy Saving Measures

- In the transportation sector, a reduction of 16.07 million kl is expected by improvements in fuel efficiency and the deployment of next-generation vehicles such as Hybrid vehicles (HEV), electric vehicles (EV), plug-in hybrid vehicles (PHV), fuel cell vehicles (FCV), clean diesel vehicles (CD) and measures such as eco-driving and traffic flow improvement.

Industrial Sector	▲10.42 Million kl
Business Sector	▲12.26 Million kl
Household sector	▲11.60 Million kl
Transportation Sector	▲16.07 Million kl

Measures for improvement

- Improvements in fuel efficiency and the deployment of next-generation vehicles
  - ・Number of next generation vehicle: 50% of annual sales
  - ・Number of Fuel cell vehicles: more than 100,000 per year
- Traffic flow improvement and Automatic driving

Source: ANRI Long-term energy balance subcommittee [In Japanese]

3-4 Environmentally Friendly Institutional Measures

Associate Professor, Tokyo Institute of Technology
Yasunori Muromachi

Due to the need to promote safe and attractive urban development, the Act on Special Measures concerning Urban Reconstruction was amended, and the institution for safe and attractive urban development was strengthened. The former reflects the growing interest in adaptation to climate change as well as the adaptation plan developed in recent years. In addition, a new vision was published that proposes the picture of Japanese society and the direction of policy in 2040 to be realized through road policy. Furthermore, there is growing interest in green infrastructure with the diverse functions.

Figure 1 Attractive Urban Development by the Act on Special Measures Concerning Urban Reconstruction Amendment

■ In order to respond to the declining production-age population and socio-economic diversification, it is necessary to create a space in the urban area where various people can gather and interact, and to improve the attractiveness of the city. At the same time, the Act on Revitalization and Rehabilitation of Local Public Transportation Systems was amended to realize sustainable local public transport.

Creating urban areas where "people feel comfortable and want to walk"

Designation of an area to work on Machizukuri of urban areas where "people feel cozy and want to walk" in urban reconstruction and maintenance plan*) and promotion of the following efforts.

* Urban reconstruction and maintenance plan: A plan for Machizukuri formulated by municipalities

Car-oriented station plaza

Creation of a pedestrian space by making a transit mall in front of the station and constructing the plaza

○ Creation of a space where "people feel comfortable and want to walk"

- Creation of a lively space by the public and private partnerships
  Example) Designing a street as public square by public and an open space provided by private
  (Budget) Support by grants for public space renovation, etc.
  (Tax system) Reduction of property tax on private businesses that provided public space
- Introduction of parking lot entrance / exit regulations in urban areas

○ Promotion of area management to liven up urban areas

- Facilitation of road / park occupancy procedures coordinated by an urban reconstruction promotion corporation*)

* Urban reconstruction promotion corporation: A corporation that carries out Machizukuri activities in the area such as NPOs and Machizukuri companies (designated by municipalities)

(Budget) Support for formulation of Machizukuri plans through public-private partnerships
(Budget) Support by low-interest loan to budget urban reconstruction promotion corporation

Improving the environment in the living area

○ Improving the convenience of daily life

- Establishment of a system to promote the location of facilities necessary for daily life such as hospitals and stores in residential areas within the residential priority zone of the location adjustment plan

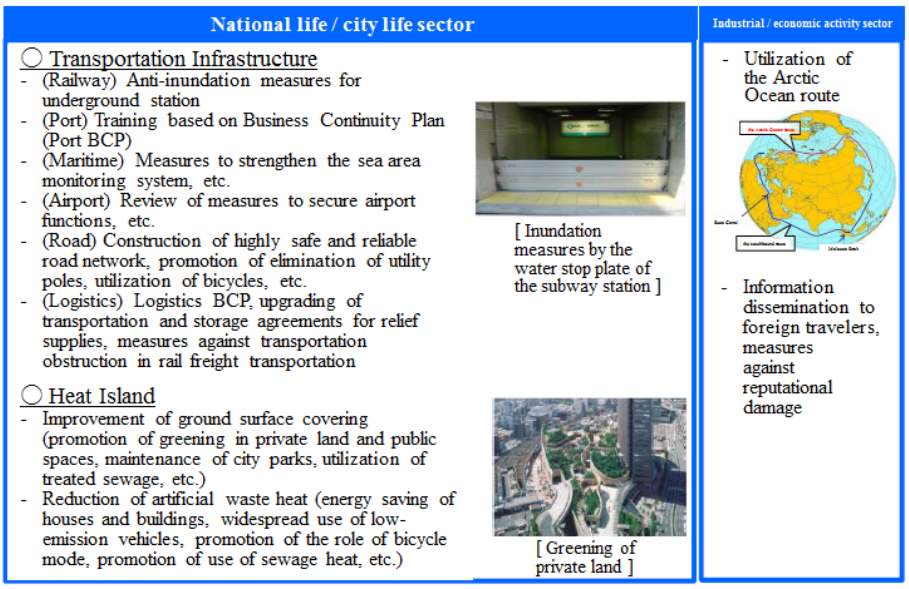
○ Measures against aging urban infrastructure

- Regarding the renovation of city planning facilities, it is positioned as a matter to be stated in the location adjustment plan.
  ⇒ Appropriation of city planning tax for the cost required for the renovation etc.

Source: MLIT, The bill of the amendments to the Act on Special Measures concerning Urban Reconstruction, 2020

Figure 2 Amendments to Climate Change Adaptation Plan

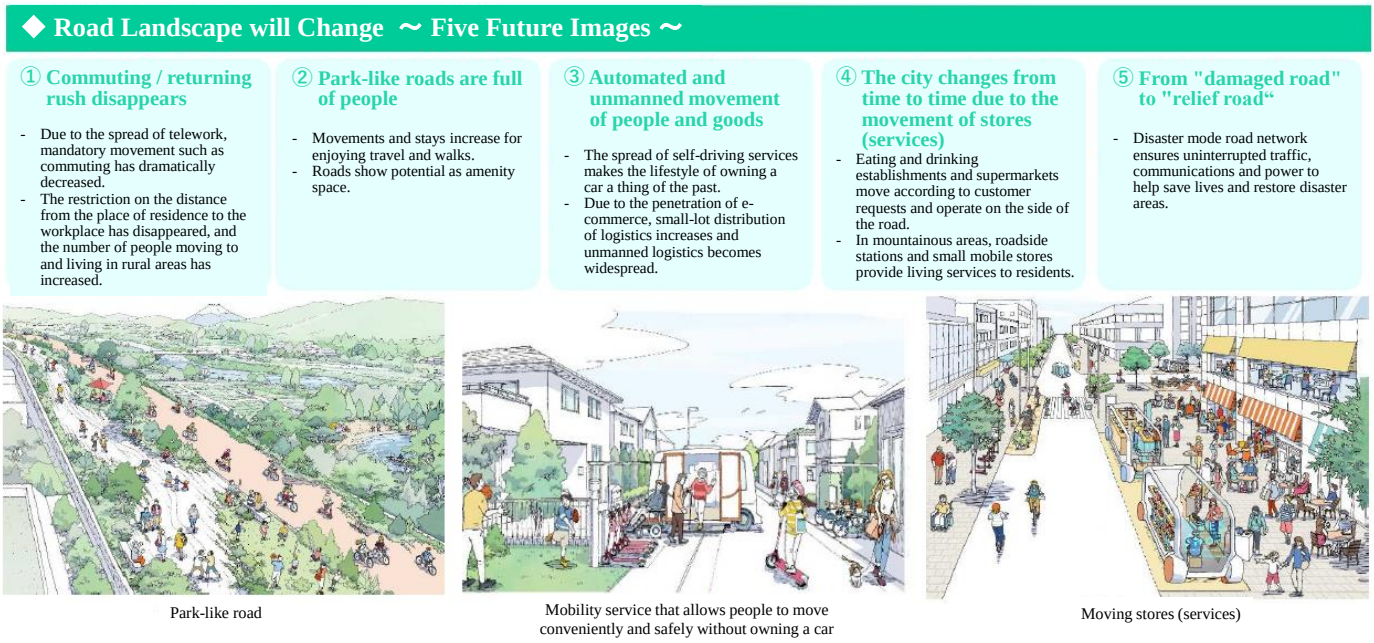
■ Based on the Climate Change Adaptation Act promulgated in June 2018, the Climate Change Adaptation Plan was approved by the Cabinet as a legal plan. In line with this, the Ministry of Land, Infrastructure, Transport and Tourism's (MLIT) climate change adaptation plan has also been revised to reflect the latest measures. According to the plan, some of the impacts on the land and transport sector concerned by climate change include increased risk of transport infrastructure, significant temperature rise in urban areas, and impacts on logistics and tourism due to wind and flood damages.



Source: MLIT, 2018

Figure 3 Road Landscape Will Change in 2040 -Roads that Lead to People's Happiness-

■ A vision was published that proposes the picture of Japanese society and the direction of policy in 2040 to be realized through road policy. As basic ideas, the origin of road policy is "realization of people's happiness", "evolution" of roads by making full use of digital technology to solve problems, and "return" to the function of roads as a communication space, are indicated.



Park-like road

Mobility service that allows people to move conveniently and safely without owning a car

Moving stores (services)

Source: MLIT, Road Landscape will Change in 2040 -Roads that Lead to People's Happiness-, 2020

Figure 4 Green Infrastructure Promotion Strategy

■ Green infrastructure is an initiative to promote sustainable and attractive national land, cities, and regional development by utilizing the various functions of the natural environment in terms of both hardware and software such as social infrastructure development and land use. An example of comfortable utilization of urban space is the formation of green infrastructure in line with urban regeneration and renewal.

Creation of a plaza space by abolishing 4-lane road in the city center (Kumamoto City)

- The plaza space is integrated with the adjacent park by abolishing roads in order to embody human-centered walkable and enjoyable urban development.
- Design guidelines for landscape harmony with Kumamoto Castle and planting are formulated, and new ordinances on public utilization and operation management are planned (under construction).

Creation of symbol road by land readjustment (Oita City)

- The 100m-wide road in front of the station, which was constructed by land readjustment, will be used as a lawn plaza full of greenery as a base for citizens' activities.

Integrated construction of parks, green roads, waterside spaces, etc. (Okazaki City)

- As one of the bases of the city's circulating walking paths, a lawn plaza, a green road, a promenade, etc. are constructed where citizens can relax on a daily life (under construction).

Source: MLIT, 2019

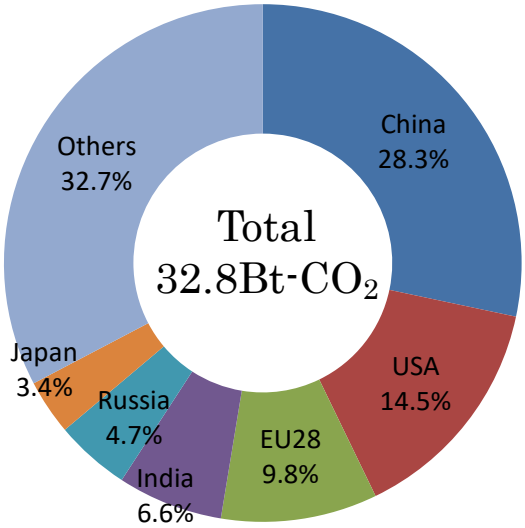
3-5 Actions for Sustainable Transport

Associate Professor, Tokyo Institute of Technology
Yasunori Muromachi

Global CO_2 emissions have reached 32.8 billion tons. By country, China's share of CO_2 emissions has expanded, almost doubling that of USA. GHG emissions in the transportation sector have been on the rise in recent years in some developed countries. Meanwhile, most developed countries have introduced several measures for attaining the target of the Paris Agreement and afterwards in the transportation sector. There is also a growing awareness that EVs can supply power in the event of a disaster due to climate change, and has attracted attention from the perspective of environment and disaster prevention.

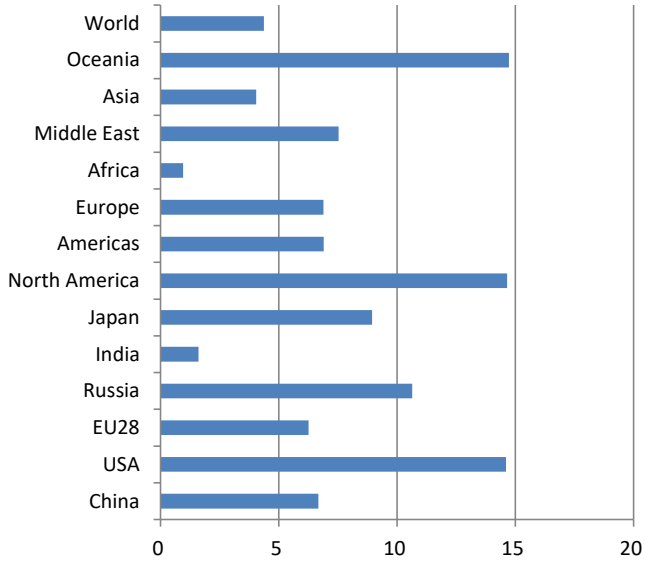
Figure 1 Share of CO_2 Emissions from Fuel Combustion in Major Countries and Regions (2017)

■ China's share of CO_2 emissions has expanded, almost doubling that of USA.



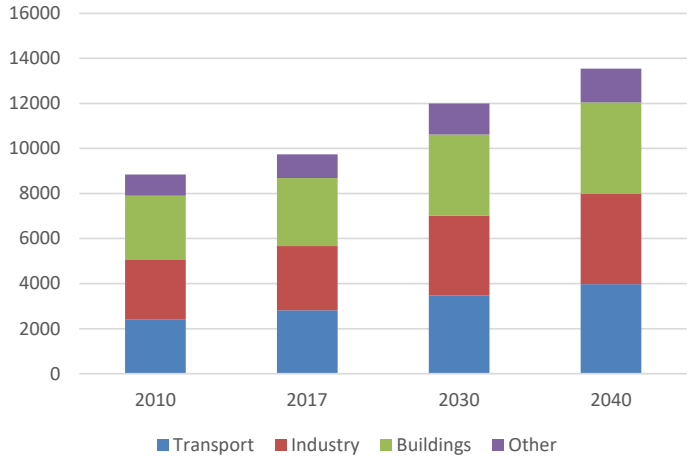
Source: IEA, CO_2 Emissions from Fuel Combustion Highlights 2019, 2019

Figure 2 CO_2 Emissions Per Capita in Major Countries and Regions (2017, t-CO_2)



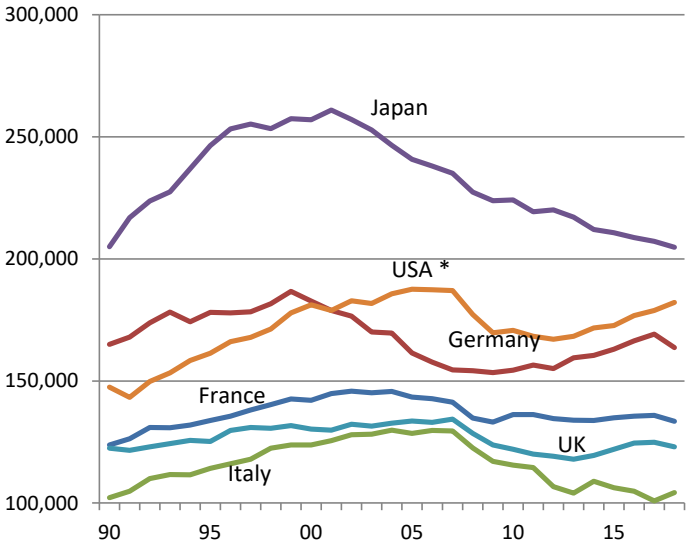
Source: IEA, CO_2 Emissions from Fuel Combustion Highlights 2019, 2019

Figure 3 Trend and Forecast of World Final Energy Consumption by Sector (Mtoe, Current Policies Scenario)



Source: IEA, World Energy Outlook 2019, 2019

Figure 4 Trend of GHG Emissions from Transportation Sector in Major Countries (1,000t-CO_2, except for USA, 10,000t-CO_2)



Source: UNFCCC, 2020

Figure 5 Promotion of the Use of EVs in the Event of a Disaster

- For the purpose of broadening the awareness that EVs can supply power in the event of a disaster due to climate change, etc., a reference manual is prepared for EV owners and local governments considering the use of EVs. For reference, the pictures of power supply from the EVs are also shown.

Power supply from FCV: Touring the area and using the FCV for lighting, microwave oven, etc. in private homes
Source: Toyota Motor Corporation

Power supply from EV: Using the EV for mobile phone charging, electric fans, refrigerators, etc. at evacuation shelters, etc.
Source: Nissan Motor Corporation

Power supply from FCV: Using the FCV for charging air conditioners and small storage batteries in old people's homes
Source: Honda Motor Co., Ltd.

Power supply from PHV: Using the PHV for washing machines and washer / dryers in old people's homes
Source: Mitsubishi Motors Corporation

Source: METI and MLIT, A reference manual for promoting the use of EVs in the event of a disaster, 2020

Table 1 Mitigation Measures in Transportation Sector in the United States

- On 1 June 2017, the United States announced its intention to withdraw from the Paris Agreement based on perceived costs to the US economy. The withdrawal will not take effect until next year as the United Nations Framework Convention on Climate Change (UNFCCC) rules dictate that the earliest a signatory can withdraw is four years following the Agreement's entry into force, or on 4 November 2020. Under the Paris Agreement, the United States in 2015 established a target to reduce GHG emissions by 26-28% below 2005 levels by 2025.
- In 2017, energy-related emissions amounted to 4,759 million tonnes of CO_2 ($MtCO_2$), a 17% reduction since the peak in 2005. Power generation accounted for 38% of energy-related emissions and transport for 36%. The rest was from industry (9%), residential (6%), commercial (5%) and other energy sectors (5%). If continuing on the current trajectory, the transport sector will soon surpass the power sector as the largest source of CO_2 emissions in the United States.
- In response to the 1973 Arab oil embargo, the United States has had Corporate Average Fuel Economy (CAFE) standards in place since 1975 to mitigate oil consumption growth. The EPA laid out standards for two periods, 2012-16 and 2017-25. The standards are supposed to reach 163 gCO_2-eq/mile for model year 2025 vehicles. In 2017, the administration reopened the review in conjunction with NHTSA, and in August 2018 announced a new proposal, the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks. The SAFE rule proposes to revise the standards on both economic and safety grounds, with the preferred option to freeze 2021 standards through 2026 at around 204 gCO_2-eq/m for passenger cars and 284 gCO2-eq/m for light-duty trucks.
- The main policy tool offered by the federal government is a tax credit for purchases of EVs. The United States also offers tax credits for EV charging stations. California has in place an Advanced Clean Cars Program to lower both GHG and particulate emissions from cars and light trucks. Part of the programme includes a Zero-Emission Vehicle (ZEV) programme, which mandates automakers to sell a growing share of ZEVs each year, starting with a 4.5% threshold in 2018 and reaching a 22% share in 2025. Nine other states have since adopted ZEV programmes.
- In 2017, ethanol accounted for 5.2% of total energy use in transport, which was by far the highest share among IEA member countries. Biodiesel consumption has also increased rapidly in recent years.

Source: IEA, Energy Policies of IEA Countries Review United States, 2019

3-6 Development and Popularization of Eco-Vehicle

Japan Automobile Manufacturers Association
Masanari Meguro

Automanufacturers have developed and applied various technologies for conventional gasoline passenger vehicle and freight vehicle not only as a measure against global warming but also effective use and utilization of the limited resources to ensure a sustainable economy. In addition, taking into account the demand for reduction of greenhouse gas emissions over the medium to long term and consistency with the energy mix in Japan, member companies are promoting the development and popularization of so-called next-generation vehicles consisting of hybrid vehicles (HEV), electric vehicles (EV), plug-in hybrid vehicles (PHVs), fuel cell vehicles (FCVs) and clean diesel vehicles (CDs). Next fuel efficiency standards for the passenger cars including EV and PHV targeting 2030 were compiled in June 2019.

Table 1 Fuel Consumption Standards for Gasoline Vehicles

- The target fuel efficiency of vehicles is set for passenger car, small freight car, and heavy vehicle respectively by the top runner method with the maximum fuel efficiency value when the next target values are examined.
- Currently, the target values are set for categories such as passenger cars, heavy vehicles, and small freight vehicles.

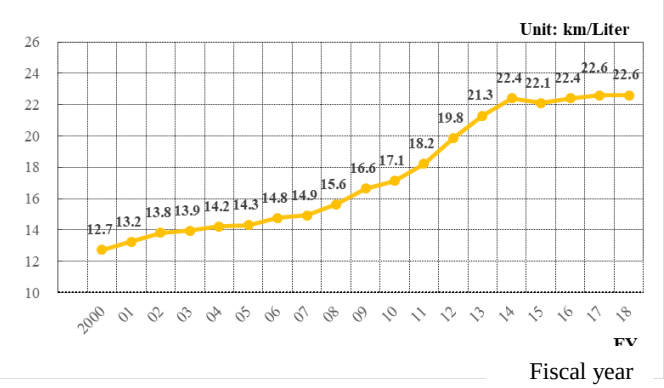
Fuel Efficiency Standards (FY2015)		
Passenger Vehicle	16.8km/L (Passenger vehicle mode: JC08)	29.2% up against FY2010 Standard 23.5% up against FY2004 actual
Freight Vehicle not more than 3.5tons (GVW)	15.2km/L (Passenger vehicle mode: JC08)	12.6% up against FY2004 actual
Bus not more than 3.5tons (GVW)	8.9km/L (Passenger vehicle mode)	7.2% up against FY2004 actual
Freight Vehicle more than 3.5tons (GVW)	7.09km/L (Heavy duty vehicle mode:JH15)	12.2% up against FY2002 actual
Bus more than 3.5tons (GVW)	6.30km/L (Heavy duty vehicle mode：JH15)	12.1% up against FY2002 actual
Fuel Efficiency Standards (FY2020)		
Passenger Vehicle	20.3km/L (Passenger vehicle mode:JC08)	19.6% up against FY2015 Standards 24.1% up against FY2009 actual
Fuel Efficiency Standards (FY2022)		
Freight Vehicle more than 3.5tons (GVW)	17.9km/L (Passenger vehicle mode: JC08)	26.1% up against FY2015 Standards
Fuel Efficiency Standards (FY2025)		
Freight Vehicle more than 3.5tons (GVW)	7.63km/L (Heavy duty vehicle mode：JH25)	13.4% up against FY2015 Standards (Calculation with FY2014 Sales mix)
Bus more than 3.5tons (GVW)	6.52km/L (Heavy duty vehicle mode：JH25)	14.3% up against FY2015 Standards (Calculation with FY2014 Sales mix)

※GVW：Gross Vehicle Weight

Source: Japan Automobile Manufacturers Association

Figure 1 Average Fuel Consumption of Passenger Car (Gasoline)

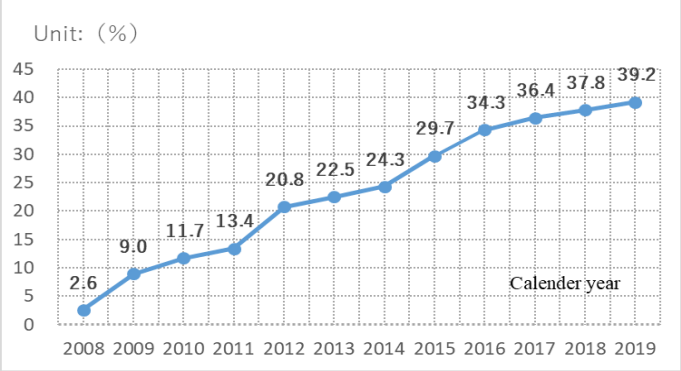
- Automobile manufacturers are improving fuel efficiency through technology development and introduction of next-generation vehicles.



Source: Japan Automobile Manufacturers Association

Figure 2 Next-generation Vehicle Sales Ratio

- The proportion of next-generation vehicles in automobile sales has greatly increased since 2009 when the government started promotion policies, with next-generation vehicles accounting for 39.2% of all the new passenger vehicle sold in 2019.
- While automobile manufacturers are working hard on various issues toward next-generation vehicles, installation of infrastructures such as charging stations and hydrogen stations with effective supporting measures for their deployment as well as various governmental support for promotion of next-generation vehicles is also indispensable.



Source: Japan Automobile Manufacturers Association

Table 2 "Automotive Industry Strategy 2014" Goal of Next-generation Automobiles

- As part of its revitalization strategy (2015), the Japanese government expects that between 50% and 70% of all new vehicle sales are next generation vehicles.
- In addition, in March 2016, the “EV/PHV Roadmap” was established setting a maximum target of 1 million vehicles in Japan by 2020.

		FY2019(Actual)	FY2030
Conventinal Vehicle		61.2%	30～50%
Next-Generation Vehicle		38.8%	50～70%
	Hybrid Vehicle (HEV)	34.1%	30～40%
	EV & PHV	0.46% 0.41%	20～30%
	FCV	0.02%	～3%
	Clean Diesel (CD)	4.0%	5～10%

Source: METI

Table 3 EV and PHV Roadmap (Outline)

- In March 2016, the Ministry of Economy, Trade and Industry (METI) launched a roadmap for popularization of EVs and PHVs after discussions with academic experts, automobile manufacturers, infrastructure companies, etc.
- Regarding the charging infrastructure, the following deployment policy was indicated.
- Regarding public chargers, the Japanese government and its parties concerned will fill up vacancy to eliminate anxiety against power shortages, and determine the policy regarding installation of charging facility in the locations such as Michi-no-Eki and SAs and PAs on highways. The locations of such installation will be chosen focusing on the number of visitors there.
- For non-public purpose, installation of chargers at apartment house is reconfirmed as the most effective way because approximately 40% of population who are the potential users for EVs and PHVs live in.

Items	Targets
Number of EV/PHV vehicles	**Up to 2020:** a million on stock basis (EV&PHV total) **Up to 2030:** 20-30% in New sales (EV&PHV total)
Quick charger en route (Public use)	**Up to 2020:** Fill up vacancy to eliminate anxiety against power shortages, and promote charging facility in Michi-no-Eki, SAs and PAs on highways
Quick chargers at destination (Public use)	**UP to 2020:** Approx. 20,000 locations focusing on large-scale commercial facilities and lodging facilities
Normal chargers in apartments	**Up to 2020:** Approx. 2,000 units at apartment to be newly constructed and large-scale repairment
Normal chargers at workplaces	**Up to 2020:** Approx. 9,000 units at office / Apartment

Source: METI EV/PHV road map

Table 4 Hydrogen/Fuel Cell Strategy Road Map

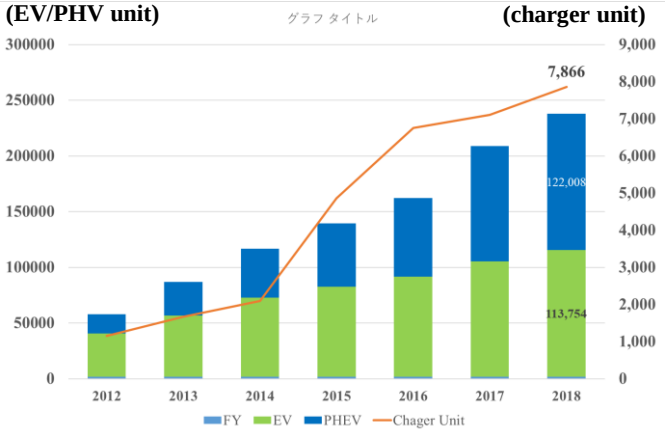
- METI set up the "Hydrogen/Fuel Cell Strategy committee" in December 2013, and members from industry, academia, and government have started to study how to utilize hydrogen energy in future. The “Hydrogen/Fuel Cell Strategy Roadmap” was released in June 2014 as a result, showing the activities of the parties involved in realizing a hydrogen society.
- This roadmap was revised again in March 2019 based on the latest situation in terms of the spread of house-use fuel cells, commercialization of fuel cell vehicles, the deployment of hydrogen station and setting of new goals.

Facility	Targets
Fuel Cell Vehicle	Up to FY2020： 40,000 units on a stock basis Up to FY2025：200,000 units on a stock Equivalent price level to Hybrid car Up to FY2030：800,000 units on a stock basis
Hydrogen station	Up to FY2020： • Hydrogen station: 160 locations • Hydrogen price: Not more than fuel price of HEV Up to FY2025：320 location UP to FY2030：900 location

Source: METI Hydrogen-Fuel cell strategy roadmap

Figure 3 The Spread of EV/PHV and Quick Chargers

- The number of EVs/PHVs sold and the number of quick chargers have been increasing year by year since the introduction of i-MiEV in September 2009.



Source: METI, Next-generation Vehicle Promotion center

Table 5 Introduction of Fuel Cell Vehicle

- FCV has been in the market since December 2014.

Vehicle	Current situation
FCV	**Toyota MIRAI（in Market Dec. 2014）** ■One filling mileage：Approx.650km (Note3)* ■H2 filling duration：3 min.  **Honda CLARITY FUEL CELL** （launched in lease market in Mar. 2016） ■One filling mileage：750km (Note3)* ■H2 filling duration：3min.  ＊In-house measurement with JC08 mode

Source: Toyota Website, Honda Website

Table 6 Status of Charging and Hydrogen Infrastructure Development in Japan

- Planned development is required for charging unit both en route and at-destination, when installing such public chargers/stations. Rapid chargers have been installed in approx. 7,500 facilities in Japan as of the end of FY2018.
- Commercial hydrogen stations are being installed nationwide to promote FCVs. 130 locations have been installed and 27 others are planned. (As of June 2020)

Facility	Deployment Target in number
Charging station for public use	● Every 10km interval: 18,400 in nationwide ● Every 30km interval：6,100 in nationwide ● Every 50km interval: 3,700 in nationwide
Hydrogen station for commercial use	● 160 Station: by FY2020 ● 320 Station: by FY2025 ● Installed: Over 130 in Nation wide (Planning at 27 location (June 2020)

Source: METI, FCCJ website

☐ New Fuel Efficiency Standards for Passenger Vehicles

METI jointly established the working group for fuel efficiency standards for passenger vehicles in March 2018 with Agency for Natural Resources and Energy (ANRI) and Ministry of Land, Infrastructure, Transport and Tourism (MLIT) and started the consultation for new standards toward 2030 to meet the energy policy in Japan and activities against global warming.

Table 7 Range of Vehicles Covered by the New Fuel Efficiency Standards

- When the current standard was considered, EV & PHV was decided not to be subject to the standard because the number was very small. It is, however, included this time, since it is expected to spread to a considerable extent.
- Fuel cell vehicles, on the other hand, are not subject to the new fuel efficiency standards due to the limited number of vehicles at the present time. Appropriate evaluation from a medium- to long-term perspective shall be necessary in future.

	Seating Capacity	GVW
Passenger Vehicle	Not more than 9	Not More than 3.5 ton
		More than 3.5 ton
	Not less than 10	Not More than 3.5 ton
		More than 3.5 ton
Cargo	－－	Not More than 3.5 ton
		More than 3.5 ton

※Excludes passenger vehicles other than type-certified

※With the introduction of WLTP, passenger vehicle with a seating capacity of 10 and GVW of more than 3.5 tons were excluded.

Source: Report of fuel efficiency standards for passenger vehicle

Table 8 Target Year, Energy Consumption Efficiency and Measurement Mode, etc.

- Since WtW(Well-to-Wheel) method is introduced instead of TtW(Tank-to-Wheel), energy consumption by EV/PHV can be compared with those of gasoline vehicle.
- And EVs and PHVs as well as gasoline vehicles are subject to evaluation with the Corporate Average Fuel Efficiency (CAFÉ) method under the new standards.
- In addition, WLTC mode is introduced as the evaluation index and calculate the TtW fuel consumption value, while the extra high phase of WLTC is eliminated in Japan.
- Since EV and PHV use electric power from the grid, energy efficiency of from the grid to vehicles becomes very important, “the value obtained in WtW divided by the energy efficiency of grid” is introduced as the new fuel efficiency in order to ensure continuity with the current standard and its unit is “km/L”.

Table 9 Fuel Efficiency Improvement with New Standards

- If the new fuel efficiency standard is achieved, the fuel efficiency improvement in FY2030 is estimated to be 32.4% compared to the actual value in FY2016 and 44.3% compared to the value in the current standards (FY2020 standard).

(i)Fuel efficienty improvement compared to FY2016 actual value

FY2016 Actual value※Note 1	FY2030 Standards Achievement※Note 2	Improvement
19.2（km/L）	25.4（ｋｍ/L）	32.4%

(ii)Fuel efficiency improvement against current standards

FY2020 Standards Calculated Value※Note 1	FY2030 Standards Achievement※Note 2	Improvement
17.6（km/L）	25.4（ｋｍ/L）	44.3%

※Note1 Fuel consumption value in WLTC mode converted from JC08 mode

※Note2 Calculated value based on the number and weight of passenger vehicles in FY2016

Source: Report of fuel efficiency standards for passenger vehicle

Table 10 Flexibility in Judgement of Achievement

- In Europe and the United States, so-called "credit system" has been introduced to judge the achievement of standards.
- The new fuel efficiency standards require manufacturers to make extremely ambitious efforts to improve fuel efficiency in widespread use of EVs and PHVs and therefore, flexibility for judgement shall be considered.

Outline of credit system in US and EU	
Off-cycle	• Introduction of fuel efficiency improvement technology that cannot be evaluated in mode test (LED lamp)
Promotion for introduction	• allowance for easing fuel consumption standards and raising CAFÉ for EVs and PHVs under certain conditions
Multiple years	• Allowing carry-over and carry-back to the target year in a certain period before and after the target year
Between corporations	• An unachieved corporation is allowed to take over the excess from an achieved corporation

Source: Report of fuel efficiency standards for passenger vehicle

Items	Decisions in fuel standard report
Target Year	•FY2030 (From the viewpoint of ensuring sufficient development period for improving fuel efficiency)
Method for judgement	•Corporate average fuel efficiency (CAFÉ) method is applied. EV and PHV are newly added. •Achievement of technical development that responses to strengthen safety and environmental regulations, and social demands (e.g. automatic driving) to be considered.
Indication of capability	•TtW value for energy consumption efficiency is newly added to the values in the catalog. •For EV & PHV, “Distance driven electrically by one charge" is added to the catalog.
Next-gen. vehicle	•The total spread of EV and PHV is considered to be 20%.
Others	•An appropriate method for indication for fuel efficiency based on the WtW concept shall be considered since it is important to enable the comparison of energy consumption efficiency between vehicles with different power sources and to encourage consumers to select a vehicle with higher performance.

Source: Report of fuel efficiency standards for passenger vehicle

Statistics and Data

1. Passenger and Freight Transport in Japan

1-1 Passenger transport in Japan

	Number of passengers transported x 1000 passengers (% in parentheses)					
	Motor Vehicles					
		Buses	Passenger cars total			
				Commercial use	Private use	
					Registered cars	Light cars
FY 1960	7 900 743 (38.9)	6 290 722	1 610 021	1 205 225	404 766	
1965	14 863 470 (48.3)	10 557 428	4 306 042	2 626 631	1 679 411	
1970	24 032 433 (59.2)	11 811 524	12 220 909	4 288 853	7 932 056	
1975	28 411 450 (61.5)	10 730 770	17 680 680	3 220 221	14 460 459	
1980	33 515 233 (64.8)	9 903 047	23 612 186	3 426 567	20 185 619	
1985	34 678 904 (64.4)	8 780 339	25 898 565	3 256 748	22 641 817	
1990	55 767 427 (71.6)	8 558 007	36 203 558	3 223 166	30 847 009	2 133 383
1995	61 271 653 (72.8)	7 619 016	43 054 973	2 758 386	35 018 454	5 278 133
2000	62 841 306 (74.2)	6 635 255	47 937 071	2 433 069	36 505 013	8 998 989
2005	65 946 689 (74.9)	5 888 754	52 722 207	2 217 361	37 358 034	13 146 812
2006	65 943 252 (74.6)	5 909 240	52 764 906	2 208 933	36 570 098	13 985 875
2007	66 908 896 (74.4)	5 963 212	53 729 659	2 137 352	36 625 025	14 967 282
2008	66 774 143 (74.2)	5 929 557	53 826 529	2 024 813	36 024 555	15 777 161
2009	66 599 647 (74.4)	5 733 474	54 171 896	1 948 325	35 724 780	16 498 791
2010	65 705 843 (74.2)	-	-	6 241 395	59 464 448	-
2011	64 991 077 (74.0)	-	-	6 073 486	58 917 591	-
2012	68 667 586 (74.7)	-	-	6 076 806	62 590 780	-
2013	67 245 001 (73.9)	-	-	6 152 915	61 092 086	-
2014	66 699 706 (73.7)	-	-	6 057 426	60 642 280	-
2015	67 061 710 (73.3)	-	-	6 031 303	61 030 407	-
2016	68 270 487 (73.4)	-	-	6 034 928	62 235 559	-
2017	69 402 303 (73.5)	-	-	6 084 966	63 317 337	-
2018	70 320 258 (73.5)	-	-	6 036 558	64 283 700	-

	Passenger-kilometers transported x 1 million passenger-kilometers (% in parentheses)					
	Motor Vehicles					
		Buses	Passenger cars total			
				Commercial use	Private use	
					Registered cars	Light cars
FY 1960	55 531 (22.8)	43 998	11 533	5 162	6 370	
1965	120 756 (31.6)	80 134	40 622	11 216	29 406	
1970	284 229 (48.4)	102 893	181 335	19 311	162 024	
1975	360 868 (50.8)	110 063	250 804	15 572	235 232	
1980	431 669 (55.2)	110 396	321 272	16 243	305 030	
1985	489 260 (57.0)	104 898	384 362	15 763	368 600	
1990	853 060 (65.7)	110 372	575 507	15 639	536 773	23 095
1995	917 419 (66.1)	97 288	664 625	13 796	594 712	56 117
2000	951 253 (67.0)	87 307	741 148	12 052	630 958	98 138
2001	954 292 (67.0)	86 351	752 529	11 802	633 326	107 401
2002	955 413 (67.0)	86 181	756 632	11 901	628 601	116 130
2003	954 186 (66.9)	86 391	755 062	11 968	620 698	122 396
2004	947 563 (66.8)	86 285	750 518	11 585	607 909	131 024
2005	933 006 (66.1)	88 066	737 621	11 485	587 657	138 479
2006	917 938 (65.4)	88 699	723 870	11 454	566 577	145 839
2007	919 062 (66.3)	88 969	724 591	11 100	559 533	153 958
2008	905 907 (64.9)	89 921	713 146	10 572	542 304	160 271
2009	898 721 (65.6)	87 402	588 248	10 155	533 499	44 594
2010	876 878 (65.1)	-	-	77 677	799 201	-
2011	866 347 (64.9)	-	-	73 916	792 431	-
2012	914 609 (65.3)	-	-	75 668	838 941	-
2013	889 795 (63.9)	-	-	74 571	815 224	-
2014	876 322 (63.5)	-	-	72 579	803 743	-
2015	879 935 (62.9)	-	-	71 443	808 492	-
2016	891 479 (63.1)	-	-	70 119	821 360	-
2017	904 967 (63.0)	-	-	69 815	835 152	-
2018	917 921 (63.1)	-	-	70 101	847 820	-

Source: Transportation-related Statistics Data Collection; Annual Statistical Report on Motor Vehicle Transport (Ministry of Land, Infrastructure, Transport and Tourism)

Note: 1. Starting from FY 1987, motor vehicles include light motor vehicles and trucks in private use

Note: 2. Regarding the number of passengers transported and passenger-kilometers for railways: figures from FY 1987 onward are not in sequence with those of the previous fiscal year and before because of overlaps between JR (Japan Railway) Companies

Note: 3. For passenger ship transport, figures for FY 1970 and before include only scheduled transport services; figures from FY 1975 onward are the total of scheduled and nonscheduled transport services. Passenger-kilometers transported in FY 1965 and before were estimated by multiplying the number of passengers by 27 kilometers (the average kilometers per person transported).

Note: 4. The car of the number after the FY 2010 is only the distinction between commercial use and private use

Trucks in private use		Railways	Passenger ships	Aircraft	Total	
Registerd trucks	Light trucks					
		12 290 380 (60.6)	98 887 (0.5)	1 260 (0.01)	20 291 270 (100.0)	FY 1960
		15 798 168 (51.3)	126 007 (0.4)	5 194 (0.02)	30 792 839 (100.0)	1965
		16 384 034 (40.3)	173 744 (0.4)	15 460 (0.04)	40 605 671 (100.0)	1970
		17 587 925 (38.1)	169 864 (0.4)	25 467 (0.06)	46 194 706 (100.0)	1975
		18 004 962 (34.8)	159 751 (0.3)	40 427 (0.08)	51 720 373 (100.0)	1980
		18 989 703 (35.3)	153 477 (0.3)	43 777 (0.08)	53 865 861 (100.0)	1985
3 454 128	7 551 734	21 938 609 (28.2)	162 600 (0.2)	65 252 (0.08)	77 933 888 (100.0)	1990
3 133 874	7 463 790	22 630 439 (26.9)	148 828 (0.2)	78 101 (0.09)	84 129 021 (100.0)	1995
2 484 914	5 784 066	21 646 751 (25.6)	110 128 (0.1)	92 873 (0.1)	84 691 058 (100.0)	2000
2 083 356	5 252 372	21 963 024 (24.9)	103 175 (0.1)	94 490 (0.1)	88 098 313 (100.0)	2005
2 021 509	5 247 597	22 243 472 (25.2)	99 168 (0.1)	96 971 (0.1)	88 382 863 (100.0)	2006
2 003 807	5 212 218	22 840 812 (25.4)	100 794 (0.1)	94 849 (0.1)	89 945 351 (100.0)	2007
1 906 546	5 111 511	22 976 100 (25.5)	99 032 (0.1)	90 662 (0.1)	89 939 937 (100.0)	2008
1 769 573	4 924 704	22 774 444 (25.4)	92 173 (0.1)	83 872 (0.1)	89 500 155 (100.0)	2009
-	-	22 669 011 (25.6)	85 047 (0.3)	82 211 (0.3)	88 542 112 (100.0)	2010
-	-	22 632 357 (25.8)	84 066 (0.1)	79 052 (0.1)	87 786 552 (100.0)	2011
-	-	23 041 825 (25.1)	87 134 (0.1)	85 996 (0.1)	91 882 541 (100.0)	2012
-	-	23 606 410 (25.9)	88 018 (0.1)	92 488 (0.1)	91 031 917 (100.0)	2013
-	-	23 599 851 (26.1)	85 859 (0.1)	95 197 (0.1)	90 480 613 (100.0)	2014
-	-	24 289 894 (26.5)	87 947 (0.1)	96 063 (0.1)	91 535 614 (100.0)	2015
-	-	24 598 362 (26.5)	87 461 (0.1)	98 124 (0.1)	92 966 945 (100.0)	2016
-	-	24 972 608 (26.4)	88 198 (0.1)	102 119 (0.1)	94 477 030 (100.0)	2017
-	-	25 269 594 (26.4)	87 625 (0.1)	103 903 (0.1)	95 693 755 (100.0)	2018

Trucks in private use		Railways	Passenger ships	Aircraft	Total	
Registerd trucks	Light trucks					
		184 340 (75.8)	2 670 (1.1)	737 (0.3)	243 278 (100.0)	FY 1960
		255 484 (66.8)	3 402 (0.9)	2 952 (0.8)	382 594 (100.0)	1965
		288 815 (49.2)	4 814 (0.8)	9 319 (1.6)	587 177 (100.0)	1970
		323 800 (45.6)	6 895 (1.0)	19 148 (2.7)	710 711 (100.0)	1975
		314 542 (40.2)	6 132 (0.8)	29 688 (3.8)	782 031 (100.0)	1980
		330 101 (38.5)	5 752 (0.7)	33 119 (3.9)	858 232 (100.0)	1985
74 659	92 523	387 478 (29.8)	6 275 (0.5)	51 623 (4.0)	1 298 436 (100.0)	1990
73 887	81 620	400 056 (28.8)	5 527 (0.4)	65 012 (4.7)	1 388 014 (100.0)	1995
59 431	63 366	384 441 (27.1)	4 304 (0.3)	79 698 (5.6)	1 419 696 (100.0)	2000
56 218	59 196	385 421 (27.0)	4 006 (0.3)	81 459 (5.7)	1 425 178 (100.0)	2001
54 619	57 980	382 236 (26.8)	3 893 (0.3)	83 949 (5.9)	1 425 491 (100.0)	2002
54 113	58 621	384 958 (27.0)	4 024 (0.3)	83 311 (5.8)	1 426 479 (100.0)	2003
51 736	59 023	385 163 (27.2)	3 869 (0.3)	81 786 (5.8)	1 418 381 (100.0)	2004
49 742	57 576	391 228 (27.7)	4 025 (0.3)	83 220 (5.9)	1 411 397 (100.0)	2005
48 461	56 908	395 908 (28.2)	3 783 (0.3)	85 746 (6.1)	1 403 375 (100.0)	2006
48 656	56 846	405 544 (28.7)	3 834 (0.3)	84 327 (6.0)	1 412 767 (100.0)	2007
46 910	55 930	404 585 (29.0)	3 510 (0.3)	80 931 (5.8)	1 394 933 (100.0)	2008
168 016	55 054	393 765 (28.7)	3 073 (0.2)	75 203 (5.5)	1 370 900 (100.0)	2009
-	-	393 466 (29.2)	3 004 (0.5)	73 750 (13.5)	1 347 098 (100.0)	2010
-	-	395 067 (29.6)	3 047 (0.2)	71 165 (5.3)	1 335 626 (100.0)	2011
-	-	404 394 (28.9)	3 092 (0.2)	77 917 (5.6)	1 400 012 (100.0)	2012
-	-	414 387 (29.8)	3 265 (0.2)	84 144 (6.0)	1 391 591 (100.0)	2013
-	-	413 970 (30.0)	2 923 (0.2)	86 763 (6.3)	1 379 978 (100.0)	2014
-	-	427 486 (30.6)	3 139 (0.2)	88 216 (6.3)	1 398 776 (100.0)	2015
-	-	431 799 (30.5)	3 275 (0.2)	90 576 (6.4)	1 413 854 (100.0)	2016
-	-	437 362 (30.4)	3 191 (0.2)	94 427 (6.6)	1 436 756 (100.0)	2017
-	-	441 614 (30.3)	3 364 (0.2)	96 171 (6.6)	1 455 706 (100.0)	2018

1-2 Freight transport in Japan

	Tonnage transported x 1000 tons (% in parentheses)						
	Motor Vehicle						
		Commercial use			private use		
			Registerd vehicles	Light vehicles		Registerd vehicles	Light vehicles
FY 1960	1 156 291 (75.8)	380 728	380 728		775 563	775 563	
1965	2 193 195 (83.8)	664 227	664 227		1 528 968	1 528 968	
1970	4 626 069 (88.1)	1 113 061	1 113 061		3 513 008	3 513 008	
1975	4 392 859 (87.4)	1 251 482	1 251 482		3 141 377	3 141 377	
1980	5 317 950 (88.9)	1 661 473	1 661 473		3 656 477	3 656 477	
1985	5 048 048 (90.2)	1 891 937	1 891 937		3 156 111	3 156 111	
1990	6 113 565 (90.2)	2 427 625	2 416 384	11 241	3 685 940	3 557 161	128 779
1995	6 016 571 (90.6)	2 647 067	2 633 277	13 790	3 369 504	3 230 135	139 369
2000	5 773 619 (90.6)	2 932 696	2 916 222	16 474	2 840 923	2 713 392	127 531
2005	4 965 874 (91.2)	2 858 258	2 840 686	17 572	2 107 616	1 983 974	123 642
2006	4 961 325 (91.4)	2 899 642	2 881 688	17 954	2 061 683	1 937 380	124 303
2007	4 932 539 (91.4)	2 927 928	2 908 987	18 941	2 004 611	1 883 959	120 652
2008	4 718 318 (91.7)	2 808 664	2 788 513	20 151	1 909 654	1 792 088	117 566
2009	4 454 028 (92.2)	2 686 556	2 666 521	20 035	1 767 472	1 652 982	114 490
2010	4 600 624 (91.8)	3 069 416	3 050 476	18 940	1 531 208	1 410 779	120 429
2011	4 619 486 (92.0)	3 153 051	3 133 872	19 179	1 466 435	1 343 904	122 531
2012	4 495 208 (91.7)	3 011 839	2 988 696	23 143	1 483 369	1 354 088	129 281
2013	4 481 702 (91.4)	2 989 496	2 967 945	21 551	1 487 624	1 356 256	131 368
2014	4 315 836 (91.3)	2 934 361	2 912 691	21 670	1 513 398	1 381 475	131 923
2015	4 289 001 (91.3)	2 916 827	2 895 373	21 454	1 501 082	1 372 174	128 908
2016	4 377 822 (91.4)	3 019 328	2 999 112	20 216	1 488 183	1 358 494	129 689
2017	4 381 246 (91.5)	3 031 940	3 011 702	20 238	1 476 940	1 349 306	127 634
2018	4 329 784 (91.6)	3 018 819	2 998 823	19 996	1 434 382	1 310 965	123 417

	Ton-kilometers transported x 1 million ton-kilometers (% in parentheses)						
	Motor Vehicle						
		Commercial use			private use		
			Registerd vehicles	Light vehicles		Registerd vehicles	Light vehicles
FY 1960	20 801 (15.0)	9 639	9 639		11 163	11 163	
1965	48 392 (26.1)	22 385	22 385		26 006	26 006	
1970	135 916 (38.8)	67 330	67 330		68 586	68 586	
1975	129 701 (36.0)	69 247	69 247		60 455	60 455	
1980	178 901 (40.8)	103 541	103 541		75 360	75 360	
1985	205 941 (47.4)	137 300	137 300		68 642	68 642	
1990	274 244 (50.2)	194 221	193 799	422	80 023	78 358	1 665
1995	294 648 (52.7)	223 090	222 655	435	71 558	69 911	1 647
2000	313 118 (54.2)	255 533	255 012	522	57 585	56 025	1 559
2005	334 979 (58.7)	290 773	290 160	613	44 206	42 752	1 455
2006	346 534 (59.9)	302 182	301 546	636	44 352	42 853	1 499
2007	354 800 (60.9)	310 185	309 496	689	44 615	43 135	1 480
2008	346 420 (62.1)	302 816	302 092	724	43 604	42 123	1 481
2009	334 667 (63.9)	293 227	292 520	707	41 440	39 954	1 486
2010	244 750 (54.9)	213 288	212 832	456	31 462	29 862	1 600
2011	232 693 (54.3)	202 441	201 984	457	30 252	28 620	1 632
2012	211 669 (51.5)	180 336	179 865	471	31 333	29 620	1 713
2013	215 885 (51.1)	184 840	184 360	480	30 990	29 252	1 738
2014	210 008 (50.6)	181 160	180 720	440	30 593	28 848	1 745
2015	204 316 (50.2)	175 981	175 558	423	30 044	28 335	1 709
2016	210 314 (50.9)	180 811	180 393	418	31 221	29 503	1 718
2017	210 829 (50.9)	182 526	182 114	412	29 996	28 303	1 693
2018	210 467 (51.3)	182 490	182 086	404	29 620	27 977	1 643

Source: Transportation-related Statistics Data Collection; Annual Statistical Report on Motor Vehicle Transport (Ministry of Land, Infrastructure, Transport and Tourism)

Note: 1. Starting from FY 1987, motor vehicles include light motor vehicles and trucks in private use

Note: 2. in FY 2010, research and aggregation methods have been changed. Therefore, the number of the before and after of 2010 is not continuous

Railways	Coastal shipping	Aircraft	Total	
229 856 (15.1)	138 849 (9.1)	9 (0.00)	1 525 005 (100.0)	FY 1960
243 524 (9.3)	179 645 (6.9)	33 (0.00)	2 616 397 (100.0)	1965
250 360 (4.8)	376 647 (7.2)	116 (0.00)	5 253 192 (100.0)	1970
180 616 (3.6)	452 054 (9.0)	192 (0.00)	5 025 721 (100.0)	1975
162 827 (2.7)	500 258 (8.4)	329 (0.01)	5 981 364 (100.0)	1980
96 285 (1.7)	452 385 (8.1)	538 (0.01)	5 597 256 (100.0)	1985
86 619 (1.3)	575 199 (8.5)	874 (0.01)	6 776 257 (100.0)	1990
76 932 (1.2)	548 542 (8.3)	960 (0.01)	6 643 005 (100.0)	1995
59 274 (0.9)	537 021 (8.4)	1 103 (0.02)	6 371 017 (100.0)	2000
52 473 (1.0)	426 145 (7.8)	1 082 (0.02)	5 445 574 (100.0)	2005
51 872 (1.0)	416 644 (7.7)	1 099 (0.02)	5 430 940 (100.0)	2006
50 850 (0.9)	409 694 (7.6)	1 145 (0.02)	5 394 228 (100.0)	2007
46 225 (0.9)	378 705 (7.4)	1 074 (0.02)	5 144 322 (100.0)	2008
43 251 (0.9)	332 175 (6.9)	1 024 (0.02)	4 830 478 (100.0)	2009
43 647 (0.9)	366 734 (7.3)	1 004 (0.02)	5 012 009 (100.0)	2010
39 886 (0.8)	360 983 (7.2)	960 (0.02)	5 021 315 (100.0)	2011
42 340 (0.9)	365 992 (7.5)	977 (0.02)	4 904 517 (100.0)	2012
44 101 (0.9)	378 334 (7.7)	1 016 (0.02)	4 905 153 (100.0)	2013
43 424 (0.9)	369 302 (7.8)	1 024 (0.02)	4 729 586 (100.0)	2014
43 210 (0.9)	365 486 (7.8)	1 014 (0.02)	4 698 711 (100.0)	2015
44 089 (0.9)	364 485 (7.6)	1 005 (0.02)	4 787 401 (100.0)	2016
45 170 (0.9)	360 127 (7.5)	999 (0.02)	4 787 542 (100.0)	2017
42 321 (0.9)	354 445 (7.5)	917 (0.02)	4 727 467 (100.0)	2018

Railways	Coastal shipping	Aircraft	Total	
53 916 (39.0)	63 579 (46.0)	6 (0.00)	138 302 (100.0)	FY 1960
56 678 (30.5)	80 635 (46.4)	21 (0.01)	185 726 (100.0)	1965
63 031 (18.0)	151 243 (43.2)	74 (0.02)	350 264 (100.0)	1970
47 058 (13.1)	183 579 (50.9)	152 (0.04)	360 490 (100.0)	1975
37 428 (8.5)	222 173 (50.6)	290 (0.07)	438 792 (100.0)	1980
21 919 (5.0)	205 818 (47.4)	482 (0.11)	434 160 (100.0)	1985
27 196 (5.0)	244 546 (44.7)	799 (0.15)	546 785 (100.0)	1990
25 101 (4.5)	238 330 (42.6)	924 (0.17)	559 002 (100.0)	1995
22 136 (3.8)	241 671 (41.8)	1 075 (0.19)	578 000 (100.0)	2000
22 813 (4.0)	211 576 (37.1)	1 075 (0.19)	570 443 (100.0)	2005
23 192 (4.0)	207 849 (35.9)	1 094 (0.19)	578 669 (100.0)	2006
23 334 (4.0)	202 962 (34.9)	1 145 (0.20)	582 241 (100.0)	2007
22 256 (4.0)	187 859 (33.7)	1 078 (0.19)	557 613 (100.0)	2008
20 562 (3.9)	167 315 (32.0)	1 043 (0.20)	523 587 (100.0)	2009
20 398 (4.6)	179 898 (40.3)	1 032 (0.23)	446 078 (100.0)	2010
19 998 (4.7)	174 900 (40.8)	992 (0.23)	428 583 (100.0)	2011
20 471 (5.0)	177 791 (43.3)	1 017 (0.25)	410 948 (100.0)	2012
21 071 (5.0)	184 860 (43.7)	1 049 (0.25)	422 865 (100.0)	2013
21 029 (5.1)	183 120 (44.1)	1 050 (0.25)	415 207 (100.0)	2014
21 519 (5.3)	180 381 (44.3)	1 056 (0.26)	407 272 (100.0)	2015
21 265 (5.1)	180 438 (43.7)	1 057 (0.26)	413 074 (100.0)	2016
21 663 (5.2)	180 934 (43.7)	1 066 (0.26)	414 492 (100.0)	2017
19 369 (4.7)	179 089 (43.7)	977 (0.24)	409 902 (100.0)	2018

2. Passenger and Freight Transport in Japan and Other Countries

2-1 Passenger transport in Japan and other countries (passenger-kilometers)

x 1 billion passenger-kilometers (% in parentheses)

	Survey year	Passenger cars	Buses	Railways	Coastal shipping	Aircraft	Total
Japan	2010	779.2 (58.7)	77.7 (5.9)	393.5 (29.6)	3.0 (0.2)	73.8 (5.6)	1 327.2 (100)
U.S.A	2010	6 359.9 (82.1)	470.4 (6.1)	10.3 (0.1)	—	908.9 (11.7)	7 749.5 (100)
U.K.	2009	680.2 (86.2)	38.5 (4.9)	62.5 (7.9)	—	8.3 (1.1)	789.5 (100)
France	2009	723.9 (82.1)	48.9 (5.5)	99.2 (11.3)	—	9.7 (1.1)	881.7 (100)
Germany	2009	886.8 (84.1)	62.4 (5.9)	98.9 (9.4)	—	6.5 (0.6)	1 054.6 (100)

Source: Transportation-related Statistics Data Collection (Ministry of Land, Infrastructure, Transport and Tourism)
Note: 1. Figures for passenger cars and buses for Japan is corrected by "Car Transport Statistical Yearbook"
Note: 2. Figures for passenger cars for the U.S.A. include motorcycles
Note: 3. Figures for buses for U.K. are those for public transport vehicles
Note: 4. Figures for buses for Germany are the total of all public transport including taxis and streetcars

2-2 Freight transport in Japan and other countries (ton-kilometers)

x 1 billion ton-kilometers (% in parentheses)

	Survey year	Trucks	Railways	Coastal shipping	Aircraft	Pipeline	Total
Japan	2010	244.8 (54.9)	20.4 (4.6)	179.9 (40.3)	1.0 (0.2)	—	446.1 (100)
U.S.A	2009	— (32.0)	2 237.0 (39.0)	696.6 (12.0)	17.6 (0.0)	— (16.0)	— (100)
U.K.	2009	131.6 (80.3)	21.2 (12.9)	0.2 (0.1)	0.7 (0.4)	10.2 (6.2)	163.9 (100)
France	2009	156.0 (72.3)	32.1 (14.9)	8.7 (4.0)	0.9 (0.4)	18.2 (8.4)	215.9 (100)
Germany	2009	245.6 (59.4)	95.8 (23.2)	55.7 (13.5)	0.6 (0.1)	16.0 (3.9)	413.7 (100)

Source: Transportation-related Statistics Data Collection (Ministry of Land, Infrastructure, Transport and Tourism)
Note: 1. Figures for passenger cars and buses for Japan is corrected by "Car Transport Statistical Yearbook"

3. Road Traffic in Japan and Other Countries

3-1 Vehicle kilometers traveled in Japan

(unit: 1 million kilometers)

	Passenger cars			Trucks			Total
	Passenger cars (excl. light vehicles)	Buses	Sub total	Commercial use (excl. light trucks)	Private use (excl. light trucks)	Sub total	
FY 1960	8 725	1 994	10 719	4 377	13 068	17 445	28 164
1965	34 002	3 590	37 592	8 465	36 098	44 563	82 155
1970	120 582	5 394	125 976	15 592	84 448	100 040	226 017
1975	176 035	5 451	181 486	17 922	86 938	104 859	286 345
1980	241 459	6 046	247 505	26 883	114 664	141 547	389 052
1985	275 557	6 352	281 908	34 682	111 851	146 533	428 442
1990	350 317	7 112	357 429	48 459	122 077	170 536	527 964
1995	407 001	6 768	413 769	60 341	122 253	182 594	596 363
2000	438 204	6 619	444 823	69 204	116 728	185 932	630 755
2005	417 537	6 650	424 187	70 829	97 473	168 302	592 489
2006	405 388	6 655	412 043	73 103	95 337	168 440	580 483
2007	398 579	6 726	405 305	74 271	94 229	168 500	573 805
2008	382 499	6 568	389 067	72 148	91 015	163 163	552 230
2009	382 740	6 549	389 289	69 488	86 265	155 753	545 042

	Gasoline		Light oil		LPG	CNG	Total
	Commercial	Private	Commercial	Private			
2010	7 668	564 084	66 309	55 963	12 161	429	706 614
2011	7 482	572 516	64 535	53 632	11 245	424	709 834
2012	7 809	602 209	58 021	52 814	10 689	401	731 943
2013	7 495	588 594	63 335	53 509	10 258	370	723 561
2014	7 613	583 984	63 297	52 973	9 802	347	718 016
2015	7 749	586 920	63 627	53 275	9 239	309	721 119
2016	7 815	597 642	63 118	52 430	8 493	260	729 758
2017	7 997	607 020	63 438	53 158	8 067	218	739 898
2018	8 361	614 108	63 542	54 374	7 365	179	747 929
2019	8 521	610 623	63 116	55 747	6 495	141	744 643

Source: Transportation-related Statistics Data Collection; Annual Report of Automobile Fuel Consumption Statistics (Ministry of Land, Infrastructure, Transport and Tourism)

Note: The survey method and aggregation method has been changed in FY 2010. Because the numbers are aggregated by fuel, also number of the light car is added, the number is not continuous in this year.

3-2 Vehicle kilometers traveled in Japan and other countries

(unit: 1 million vehicle-kilometers)

	Survey year	Passenger cars	Buses	Trucks	Total
Asia					
Japan	2017	—		—	739 898
Korea	2016	328 812	12 407	114 596	455 815
Chinese-Taipei	2017	89 356	1 860	17 605	108 821
China	2010	418 330	—	422 630	840 960
Hong-Kong	2017	8 470	1 324	3 511	13 305
Singapore	2014	10 904	558	5 371	16 833
India	2002	208 581	63 500	297 374	569 455
Turkey	2016	148 455	22 049	99 176	269 680
Europe					
U.K.	2017	409 408	3 880	108 685	521 973
Germany	2017	642 400	4 600	95 300	742 300
France	2017	458 130	3 745	130 240	592 115
Netherlands	2017	108 194	650	25 086	133 930
Bergium	2017	80 076	614	20 849	101 539
Spain	2017	100 303	835	24 426	125 564
Portugal	2017	—	455	—	—
Greece	2010	54 848	1 277	15 542	71 667
Switzerland	2017	58 735	136	6 634	65 505
Austria	2017	71 250	558	12 803	84 611
Norway	2016	34 140	369	9 608	44 117
Sweden	2017	68 305	998	13 923	83 226
Finland	2017	30 740	431	7 129	38 300
Denmark	2017	40 568	648	9 357	50 573
Russia	2017	—	—	57 148	—
Poland	2017	194 294	1 725	37 361	233 380
Hungary	2017	30 245	718	11 414	42 377
Ukraine	2017	—	2 016	6 031	—
America					
U.S.A.	2017	3 574 023	27 725	1 535 584	5 137 332
Canada	2009	213 734	—	119 147	332 881
Mexico	2017	136 500	4 852	36 196	177 548
Africa					
Morocco	2004	4 905	10 948	12 840	28 693
South Africa	2007	75 573	9 007	47 278	131 858
Oceania					
Australia	2017	184 596	2 504	70 766	257 866
New Zealand	2017	44 415	297	2 989	47 701

Source: World Road Statistics (IRF)
Note: Although Japan data differ from the figures published in Japan (Table 3-1),
these are listed according to the original source data.

4. Road Traffic in Japan

4-1 Traffic volume by type of road / average travel speed at peak hours

Type of road	FY	Length of road surveyed (km)	Vehicle-kilometers traveled in 12 hours (x 1000 vehicle-kilometers)					Estimated vehicle-kilometers traveled in 24 hours (x 1000 vehicle-kilometers)			Average travel speed at peak hours (km/h)
				Passenger cars	Small trucks	Buses	Ordinary trucks		Passenger cars	Trucks	
				Small vehicles (2010～)		Ordinary vehicles (2010～)			Small vehicles	Ordinary Vehicles	
National expressways	1980	2 698.8	38 933	15 424	9 590	1 130	12 789	55 512	21 352	34 160	82.95
	1990	4 675.3	80 526	34 973	16 838	2 256	26 460	121 629	55 180	66 449	84.99
	1999	7 094.9	128 829	69 668	22 972	2 692	33 498	187 687	94 167	93 521	79.11
	2005	8 513.1	140 500	82 193	20 092	2 660	35 406	202 400	108 180	94 220	78.20
	2010	7 807.6	149 665	110 153		39 512		214 564	138 596	75 968	71.10
	2015	8 687.2	158 515	116 342		42 173		230 694	148 066	82 629	83.90
Urban expressways	1980	250.8	12 316	5 638	3 943	102	2 632	17 118	8 638	8 480	42.27
	1990	421.0	20 820	9 750	5 766	235	5 068	32 172	15 322	16 850	51.28
	1999	604.1	28 032	16 578	5 107	335	6 012	41 262	25 283	15 979	44.31
	2005	675.4	29 786	16 919	5 570	447	6 881	42 931	25 302	17 629	40.40
	2010	738.7	31 239	25 126		6 113		44 142	34 635	9 507	41.70
	2015	786.6	32 268	25 866		6 581		45 581	35 340	10 241	39.90
Expressways total	1980	2 949.6	51 249	21 062	13 533	1 232	15 422	72 630	29 990	42 640	79.42
	1990	5 096.3	101 346	44 724	22 604	2 490	31 528	153 802	70 502	83 300	80.62
	1999	7 699.0	156 861	86 246	28 079	3 026	39 510	228 949	119 450	109 500	74.50
	2005	9 188.5	170 290	99 109	25 714	3 065	42 402	245 331	133 482	111 849	73.10
	2010	10 083.7	197 788	148 403		49 385		281 170	189 733	91 436	67.50
	2015	11 775.7	215 896	161 113		54 783		309 680	207 466	102 213	76.00
National roads (government management)	1980	19 025.0	191 007	91 783	59 238	3 457	36 530	254 878	130 363	124 515	40.86
	1990	20 052.3	242 582	119 468	72 413	3 365	47 336	336 002	169 790	166 212	36.92
	1999	20 837.4	279 297	164 875	58 869	2 867	52 685	389 786	234 203	155 583	34.62
	2005	21 280.9	281 099	174 282	53 409	2 530	50 598	390 137	243 649	146 488	34.70
	2010	21 874.0	266 801	220 098		46 702		364 001	291 259	72 743	36.50
	2015	22 563.0	264 288	218 935		45 353		356 307	288 896	67 411	34.70
National roads (other)	1980	20 920.9	93 836	46 721	31 900	2 048	13 167	119 232	65 154	54 078	38.01
	1990	26 672.3	148 720	74 334	50 639	2 366	21 381	194 672	100 544	94 128	37.63
	1999	32 558.2	202 744	123 706	47 695	2 433	28 911	266 163	170 278	95 885	38.21
	2005	32 954.6	204 714	132 859	42 581	2 457	27 022	267 896	180 855	87 041	38.20
	2010	32 450.1	203 166	176 179		26 987		263 489	226 923	36 566	38.10
	2015	33 121.9	204 811	177 402		27 409		266 688	226 668	40 020	35.60
National roads total	1980	39 945.9	284 843	138 504	91 137	5 505	49 697	374 110	195 517	178 593	39.37
	1990	46 724.6	391 302	193 802	123 052	5 732	68 717	530 674	270 334	260 340	37.32
	1999	53 395.6	482 041	288 581	106 565	5 299	81 596	655 949	404 481	251 468	36.72
	2005	54 235.5	485 787	307 018	95 700	4 858	77 726	658 032	424 503	233 529	36.70
	2010	54 324.1	469 967	396 277		73 690		627 490	518 181	109 309	37.40
	2015	55 684.9	469 100	396 337		72 762		622 996	515 565	107 431	35.30
Principal local roads	1980	43 582.3	156 748	79 204	54 995	3 079	19 470	201 848	114 493	87 355	36.22
	1990	49 710.0	216 726	110 233	75 183	3 191	28 119	287 033	150 468	136 565	35.63
	1999	56 377.4	284 268	177 061	67 562	3 137	36 508	377 036	250 254	126 782	33.83
	2005	57 718.3	289 169	190 851	60 725	3 181	34 411	383 419	265 774	117 646	34.20
	2010	56 512.7	279 402	246 035		33 367		365 228	320 821	44 407	33.60
	2015	57 824.2	279 235	246 315		32 919		363 132	314 996	48 137	31.10
General prefectural roads	1980	86 583.6	165 874	85 537	60 391	3 132	16 814	210 507	121 844	88 663	—
	1990	75 730.9	195 980	99 843	72 168	2 743	21 226	253 172	133 017	120 155	33.60
	1999	67 971.2	198 329	124 321	50 310	2 195	21 502	237 908	172 310	85 598	33.01
	2005	70 599.9	199 374	133 182	44 062	2 193	19 937	259 499	182 940	76 558	33.10
	2010	68 176.5	193 546	173 974		19 573		250 817	224 373	26 444	32.70
	2015	71 178.8	195 579	176 085		19 494		249 433	220 663	28 770	30.50
Local roads total	1980	130 165.9	322 622	164 741	115 387	6 211	36 284	412 355	236 337	176 018	36.22
	1990	125 440.9	412 706	210 077	147 351	5 934	49 345	540 205	283 485	256 720	34.19
	1999	124 730.0	482 597	301 383	117 872	5 332	58 010	634 944	422 564	212 380	33.38
	2005	128 318.2	488 507	323 880	104 541	5 374	54 713	642 918	448 714	194 204	33.60
	2010	124 689.2	472 948	420 008		52 940		616 045	545 194	70 851	33.10
	2015	129 003.0	474 814	422 401		52 514		612 565	535 659	76 906	30.80
Total of national roads and local roads	1980	170 111.8	607 466	303 245	206 524	11 716	85 981	786 466	431 854	354 612	37.74
	1990	172 165.5	804 008	403 879	270 403	11 665	118 061	1 070 879	533 819	517 060	34.41
	1999	178 125.6	964 638	589 964	224 437	10 631	139 606	1 290 893	827 045	463 848	34.32
	2005	182 553.7	974 289	631 339	200 704	10 717	132 503	1 300 950	873 217	427 733	34.50
	2010	179 013.3	942 915	816 285		126 629		1 243 535	1 063 376	180 160	34.30
	2015	184 687.9	943 914	818 738		125 176		1 235 561	1 051 223	184 338	32.00
Overall total	1980	173 061.4	658 715	324 307	220 057	12 948	101 402	859 115	461 863	397 252	39.15
	1990	177 261.8	905 351	448 602	293 007	14 156	149 586	1 224 681	624 321	600 360	34.41
	1999	185 186.7	1 115 622	672 885	251 516	13 504	177 718	1 511 810	942 060	569 750	35.04
	2005	190 607.6	1 134 687	725 065	224 668	13 616	172 472	1 532 720	998 947	533 773	35.30
	2010	187 559.6	1 123 819	951 564		172 255		1 502 241	1 236 607	265 635	35.10
	2015	194 161.7	1 134 696	960 766		173 930		1 511 836	1 234 629	277 207	33.00

Source: Road Traffic Census (Japan Society of Traffic Engineering)
Note: In FY 2010, Investigation methods for segmenting of car model have been changed from 4 classification to 2 classification.

4-2 Traffic volume in major cities / average travel speed at peak hours

(FY)

	Lengs of road Surveyer(km)	Vehicle-kilometers traveled in 12 hours (x 1000 vehicle-kilometers)						Average travel speed at peak hours (km/h)					
	2015	1980	1990	1999	2005	2010	2015	1980	1990	1999	2005	2010	2015
Sapporo City, Hokkaido	152.3	2 572	3 099	3 574	3 167	3 080	3 215	29.4	30.3	24.6	23.2	25.9	26.4
Sendai City, Miyagi Pref.	151.4	—	2 373	2 845	2 951	3 080	3 328	—	19.6	22.2	22.6	30.0	24.7
Special Wards of Tokyo	191.4	5 491	5 663	6 156	5 269	5 241	4 977	21.4	19.1	18.0	18.2	16.2	15.3
Yokohama City, Kanagawa Pref.	159.0	3 428	4 968	6 152	5 589	5 579	5 671	31.4	27.0	23.0	23.4	23.0	22.1
Kawasaki City, Kanagawa Pref.	54.6	444	861	1 219	792	1 231	1 322	24.6	19.3	20.0	22.7	21.1	18.6
Nagoya City, Aichi Pref.	130.7	3 181	3 629	3 671	3 616	3 953	3 971	25.6	19.3	19.6	20.6	17.6	17.7
Kyoto City, Kyoto Pref.	173.3	1 923	2 292	2 276	2 238	2 192	2 081	29.7	20.2	21.6	25.4	26.4	27.0
Osaka City, Osaka Pref.	114.1	2 177	2 945	3 216	2 779	2 986	2 809	21.5	18.3	17.0	15.9	16.5	15.8
Kobe City, Hyogo Pref.	137.5	2 463	3 340	3 458	2 854	3 184	3 188	38.6	30.4	33.6	32.0	27.5	27.1
Hiroshima City, Hiroshima Pref.	169.8	1 909	2 503	2 888	2 859	3 013	2 861	30.9	25.7	20.2	23.6	28.6	22.8
Kitakyushu City, Fukuoka Pref.	165.4	3 251	3 688	3 257	3 210	3 151	3 010	33.6	26.6	25.7	22.7	23.1	20.6
Fukuoka City, Fukuoka Pref.	108.0	1 673	2 223	1 954	2 006	2 208	2 390	24.5	22.2	18.4	18.7	17.7	18.4

Source: Road Traffic Census (Japan Society of Traffic Engineering)
Note: Figures are those measured on national highways.

5. Roads in Japan and Other Countries

5-1 Length of roads in Japan

(km, at beginning of each fiscal year)

	National expressway	National Highways	Prefectural roads	Principal local roads	General prefectural roads	Municipal roads	General roads total	Total
FY 1955	—	24 092	120 536	28 019	92 517	—	—	144 628
1960	—	24 918	122 124	27 419	94 705	814 872	961 914	961 914
1965	181	27 858	120 513	32 775	87 738	836 382	984 753	984 934
1970	638	32 818	121 180	28 450	92 730	859 953	1 013 951	1 014 589
1975	1 519	38 540	125 714	33 503	92 211	901 775	1 066 028	1 067 547
1980	2 579	40 212	130 836	43 906	86 930	939 760	1 110 808	1 113 387
1985	3 555	46 435	127 436	49 947	77 489	950 078	1 123 950	1 127 505
1990	4 661	46 935	128 782	50 354	78 428	934 319	1 110 037	1 114 698
1995	5 677	53 327	125 512	57 040	68 472	957 792	1 136 631	1 142 308
2000	6 617	53 777	128 182	57 438	70 745	977 764	1 159 723	1 166 340
2005	7 383	54 264	129 139	57 821	71 318	1 002 085	1 185 589	1 192 972
2006	7 392	54 347	129 294	57 903	71 390	1 005 975	1 189 616	1 197 008
2007	7 431	54 530	129 329	57 914	71 415	1 009 599	1 193 459	1 200 890
2008	7 560	54 736	129 393	57 890	71 502	1 012 088	1 196 217	1 203 777
2009	7 642	54 790	129 377	57 877	71 500	1 016 058	1 200 225	1 207 867
2010	7 803	54 981	129 366	57 868	71 499	1 018 101	1 202 449	1 210 252
2011	7 920	55 114	129 343	57 901	71 442	1 020 286	1 204 744	1 212 664
2012	8 050	55 222	129 397	57 924	71 473	1 022 248	1 206 867	1 214 917
2013	8 358	55 432	129 375	57 931	71 444	1 023 962	1 208 769	1 217 127
2014	8 428	55 626	129 301	57 872	71 429	1 025 416	1 210 344	1 218 772
2015	8 652	55 645	129 446	57 850	71 596	1 026 980	1 212 071	1 220 723
2016	8 776	55 565	129 603	57 898	71 705	1 028 375	1 213 543	1 222 319
2017	8 795	55 637	129 667	57 905	71 762	1 029 787	1 215 091	1 223 886
2018	8 923	55 698	129 721	57 913	71 808	1 030 424	1 215 843	1 224 766

Source: Annual Report on Road Statistics ((～2009)Japan Highway Users Conference, (2010～)Ministry of Land, Infrastructure, Transport and Tourism)

5-2 Length of roads in Japan and other countries

(km)

	Survey year	Expressways	Principal roads	Second-class roads	Other roads	Total	Road density (expressway & principal roads) by area (m/km2)	Road density (expressway & principal roads) by vehicle owned (m/vehicle)
Asia								
Japan	2017	8 795	51 923	93 345	197 499	351 562	160.6	0.8
Korea	2017	4 717	13 847	4 886	78 418	101 868	185.6	0.8
Chinese Taipei	2017	1 050	5 262	3 602	33 292	43 206	174.4	0.8
China	2017	136 449	105 224	380 481	4 151 316	4 773 470	25.2	1.1
Hong-Kong	2017	2 112	—	—	—	2 112	1 913.0	3.0
Thailand	2015	208	70 077	—	436 253	506 538	137.0	4.1
Malaysia	2017	—	19 951	217 072	—	237 023	—	—
Indonesia	2017	—	47 017	54 554	437 782	539 353	24.6	2.0
Singapore	2017	164	704	576	2 056	3 500	1 215.7	1.1
India	2017	114 158	175 036	586 181	5 022 296	5 897 671	53.2	3.8
Turkey	2017	2 657	31 066	33 896	179 895	247 514	43.0	2.0
Europe								
U.K.	2017	3 803	49 197	—	—	422 691	218.6	1.3
Germany	2017	13 009	38 018	178 876	413 000	642 903	142.7	1.0
France	2017	12 379	8 465	381 319	700 949	1 103 112	37.8	0.5
Netherlands	2017	7 403	5 863	3 583	168 515	185 364	355.1	1.4
Bergium	2015	1 763	13 229	1 349	138 869	155 210	491.1	2.3
Italy	2016	6 943	20 786	155 247	—	—	92.0	0.6
Spain	2017	17 164	14 419	134 103	501 053	666 739	62.4	1.1
Portugal	2017	3 065	6 457	4 791	—	—	103.3	1.6
Greece	2017	2 098	9 299	30 864	75 600	117 861	86.4	1.7
Switzerland	2017	1 855	17 843	51 859	—	71 557	477.1	3.8
Austria	2017	2 233	10 450	23 724	100 632	137 039	151.2	2.4
Norway	2017	983	9 700	44 622	39 457	94 762	30.0	2.9
Sweden	2017	2 132	6 357	90 069	—	—	18.9	1.5
Finland	2016	881	12 454	13 600	51 053	77 988	39.4	3.9
Denmark	2017	1 268	2 588	—	70 799	74 655	89.5	1.3
Russia	2017	1 089	53 071	510 970	943 710	1 508 840	3.2	1.0
Poland	2017	1 637	17 773	153 757	249 137	422 304	62.2	0.7
Hungary	2017	1 937	6 980	23 089	178 721	210 727	95.9	2.3
Ukraine	2017	15	46 937	53 996	68 795	169 743	77.8	4.7
America								
U.S.A.	2017	104 255	250 067	1 215 029	5 103 780	6 673 131	37.2	1.3
Canada	2009	17 000	86 000	115 000	1 191 000	1 409 000	10.3	4.3
Mexico	2017	10 274	40 746	133 227	144 533	328 780	26.0	1.2
Brasil	2017	—	76 259	1 504 706	—	1 580 965	9.0	1.7
Argentina	2013	1 090	38 847	198 289	—	238 226	14.4	2.8
Africa								
Egypt	2014	—	24 177	131 031	—	155 208	24.1	4.1
South Africa	2001	239	2 887	60 027	300 978	364 131	2.6	0.2
Oceania								
Australia	2017	51 805	181 900	—	642 209	875 914	30.4	12.8
New Zealand	2017	—	10 967	84 305	—	95 272	40.5	2.7

Source: World Road Statistics (IRF), World Road Statistics (Japan Road Association)
Note1: Only vehicles that have at least four wheels are counted as vehicles owned.
Note2: Although Japan data differ from the figures published in Japan (Table 5-1), these are listed according to the original source data.

5-3 Changes in the amount of investment for road construction in Japan

(x 100 million yen)

	General road construction		Toll road construction		Independent construction by local government		Total	
	Amount of investment	From the previous FY, increased by (%)	Amount of investment	From the previous FY, increased by (%)	Amount of investment	From the previous FY, increased by (%)	Amount of investment	From the previous FY, increased by (%)
FY 1960	1 243	8.4%	281	92.1%	589	26.5%	2 113	20.1%
1965	4 109	15.4%	1 254	2.7%	1 628	13.3%	6 991	12.4%
1970	7 784	17.9%	3 100	15.0%	5 095	31.9%	15 979	21.4%
1975	14 140	0.7%	7 517	7.6%	7 893	-3.1%	29 550	1.3%
1980	26 428	-1.6%	13 067	3.3%	18 795	10.5%	58 290	3.2%
1985	31 581	20.5%	18 819	7.1%	21 473	-3.9%	71 874	8.7%
1990	43 675	1.4%	27 339	6.3%	36 253	13.9%	107 328	6.6%
1995	66 131	31.9%	35 677	-2.2%	50 937	3.2%	152 745	12.3%
1996	54 572	-17.5%	34 236	-4.0%	53 342	4.7%	142 151	-6.9%
1997	51 873	-4.9%	33 729	-1.5%	50 958	-4.5%	136 560	-3.9%
1998	72 789	40.3%	32 590	-3.4%	48 687	-4.5%	154 066	12.8%
1999	63 550	-12.7%	28 496	-12.6%	42 956	-11.8%	135 002	-12.4%
2000	62 168	-2.2%	25 810	-9.4%	39 708	-7.6%	127 686	-5.4%
2001	60 690	-2.4%	25 725	-0.3%	36 527	-8.0%	122 942	-3.7%
2002	58 092	-4.3%	21 692	-15.7%	33 676	-7.8%	113 460	-7.7%
2003	50 916	-12.4%	21 035	-3.0%	30 521	-9.4%	102 471	-9.7%
2004	49 934	-2.0%	18 675	-11.2%	26 850	-12.0%	95 459	-6.8%
2005	48 343	-3.2%	16 201	-13.2%	23 986	-10.7%	88 530	-7.3%
2006	47 870	-1.0%	14 277	-11.9%	23 200	-3.3%	85 347	-3.6%
2007	46 198	-3.5%	14 343	0.5%	20 916	-3.9%	81 457	-2.9%
2008	43 631	-5.6%	13 563	-5.4%	19 386	-7.3%	76 580	-6.0%
2009	47 910	9.8%	10 776	-20.5%	18 027	-7.0%	76 713	0.2%
2010	39 851	-16.8%	9 081	-15.7%	17 941	-0.5%	66 873	-12.8%
2011	39 077	-1.9%	9 198	1.3%	18 040	0.6%	66 315	-0.8%
2012	38 094	-2.5%	10 727	16.6%	18 211	0.9%	67 032	1.1%
2013	46 969	23.3%	9 589	-10.6%	17 010	-6.6%	73 568	9.8%
2014	43 242	-7.9%	11 627	21.3%	18 224	7.1%	73 093	-0.6%
2015	38 862	-10.1%	12 906	11.0%	18 312	0.5%	70 080	-4.1%
2016	40 854	-5.5%	13 486	16.0%	18 697	2.6%	73 037	-0.1%
2017	42 422	9.2%	15 462	19.8%	19 274	5.3%	77 158	10.1%

Source: Road Handbook (Japan Highway Users Conference)

6. Number of Motor Vehicles Owned in Japan and Other Countries

6-1 Number of motor vehicles owned in Japan

(prior to 1999, vehicles were counted at the end of December; afterward, at the end of March)

	Passenger cars		Trucks		Buses	Vehicles for special use	Total
		Light four-wheeled passenger cars		Light four-wheeled trucks			
1950	42 588	-	152 109	-	18 306	12 494	225 497
1955	153 325	-	250 988	-	34 421	32 572	471 306
1960	457 333	37 530	775 715	36 648	56 192	64 286	1 353 526
1965	2 181 275	393 786	3 865 478	1 405 442	102 695	150 572	6 300 020
1970	8 778 972	2 244 417	8 281 759	3 005 017	187 980	333 132	17 581 843
1975	17 236 321	2 611 130	10 043 853	2 785 182	226 284	584 100	28 090 558
1980	23 659 520	2 176 110	13 177 479	4 527 794	230 020	789 155	37 856 174
1985	27 844 580	2 016 487	17 139 806	8 791 289	231 228	941 647	46 157 261
1990	34 924 172	2 584 926	21 321 439	12 535 415	245 668	1 206 390	57 697 669
1995	44 680 037	5 775 386	20 430 149	11 642 311	243 095	1 500 219	66 853 500
2000	52 449 354	10 084 285	18 064 744	9 958 458	235 550	1 431 162	72 180 810
2005	57 097 670	14 350 390	16 707 445	9 547 749	231 696	1 293 236	75 330 047
2006	57 510 360	15 280 951	16 490 944	9 476 686	231 758	1 272 655	75 505 717
2007	57 551 248	16 082 259	16 264 317	9 380 627	230 981	1 251 465	75 298 011
2008	57 682 475	16 883 230	15 858 749	9 291 247	229 804	1 202 242	74 973 270
2009	57 902 835	17 483 915	15 533 270	9 170 836	228 295	1 188 275	74 852 675
2010	58 139 471	18 004 339	15 137 641	8 922 794	226 839	1 175 676	74 679 627
2011	58 729 343	18 585 902	15 008 821	8 872 908	226 270	1 171 571	75 136 005
2012	59 357 223	19 347 873	14 851 666	8 783 528	226 047	1 654 739	76 089 675
2013	60 051 338	20 230 295	14 749 266	8 708 181	226 542	1 669 679	76 696 825
2014	60 517 249	21 026 132	14 652 701	8 622 311	227 579	1 683 313	77 080 842
2015	60 831 892	21 477 247	14 539 289	8 520 458	230 603	1 700 014	77 301 798
2016	61 253 300	21 761 335	14 451 394	8 420 858	232 793	1 720 030	77 657 517
2017	61 584 906	22 051 124	14 382 846	8 345 314	233 542	1 737 221	77 938 515
2018	61 770 573	22 324 893	14 384 930	8 321 590	232 992	1 751 502	78 139 997
2019	61 808 586	22 528 178	14 367 134	8 277 706	231 051	1 766 102	78 172 873

Source: (～1999) survey by Ministry of Transport; (2000～2011) Transportation-related Statistics Data Collection (Ministry of Land, Infrastructure, Transport and Tourism); (2012～)Automobile Inspection & Registration Information Association, Light Motor Vehicle Inspection Organization

Note: 1. For statistics for light passenger cars owned and light trucks owned: those that had not had a vehicle inspection were erased from the data in October, 1975; data from 1975 onward are not in sequence with data of 1970 and before. Figures for 1999 onward are those collected at the end of the fiscal year; they are not in sequence with figures from before 1999.

Note: 2. Since source of data are different, number of vehicle for special use are not continuous.

6-2 Number of motor vehicles owned in Japan and other countries (2017)

(vehicle)

	Passenger cars (×1000)	Number of cars per 1000 inhabitants	Buses, trucks, etc. (×1000)	Number of buses, trucks, etc. per 1000 inhabitants	Total (×1000)	Number of vehicles per 1000 inhabitants
Asia						
Japan	61 803	484.8	16 275	127.7	78 078	612.5
Korea	18 035	353.8	4 493	88.1	22 528	441.9
Chinese Taipei	6 763	286.3	1 121	47.4	7 884	333.7
China	184 644	131.0	30 956	22.0	215 600	153.0
Hong-Kong	553	75.1	160	21.7	713	96.8
Thailand	9 260	134.1	7 687	111.3	16 947	245.5
Malaysia	12 900	407.9	1 475	46.6	14 375	454.6
Indonesia	14 160	53.6	9 458	35.8	23 618	89.5
Singapore	635	111.2	185	32.4	820	143.6
India	35 890	26.8	10 630	7.9	46 520	34.7
Turkey	12 036	149.1	5 242	64.9	17 278	214.0
Europe						
U.K.	34 686	524.1	4 990	75.4	39 676	599.5
Germany	46 475	566.0	3 617	44.0	50 092	610.0
France	32 614	501.9	6 771	104.2	39 385	606.1
Netherlands	8 595	504.5	1 121	65.8	9 716	570.3
Bergium	5 735	501.8	853	74.6	6 588	576.4
Italy	38 520	648.9	5 078	85.5	43 598	734.5
Spain	23 624	509.6	5 020	108.3	28 644	617.9
Portugal	4 640	449.2	1 215	117.6	5 855	566.8
Greece	5 236	469.2	1 370	122.8	6 606	591.9
Switzerland	4 571	539.3	576	68.0	5 147	607.2
Austria	4 899	560.8	484	55.4	5 383	616.3
Norway	2 719	512.5	588	110.8	3 307	623.4
Sweden	4 846	489.0	661	66.7	5 507	555.6
Finland	2 988	541.0	428	77.5	3 416	618.5
Denmark	2 530	441.2	451	78.7	2 981	519.9
Russia	46 747	324.7	6 214	43.2	52 961	367.8
Poland	22 573	591.4	3 910	102.4	26 483	693.8
Hungary	3 472	357.1	481	49.5	3 953	406.6
Ukraine	8 639	195.4	1 341	30.3	9 980	225.7
America						
U.S.A.	124 141	382.6	151 878	468.1	276 019	850.7
Canada	22 678	619.2	1 168	31.9	23 846	651.1
Mexico	30 089	233.0	11 222	86.9	41 311	319.8
Brasil	36 190	172.9	7 407	35.4	43 597	208.3
Argentina	10 690	241.5	3 419	77.2	14 109	318.7
Africa						
Egypt	4 384	44.9	1 446	14.8	5 830	59.8
South Africa	7 810	137.7	5 579	98.4	13 389	236.1
Oceania						
Australia	14 275	583.8	4 038	165.1	18 313	749.0
New Zealand	3 314	704.2	756	160.6	4 070	864.9

Source: World motor vehicle statistics (Japan Automobile Manufacturers Association)

7. Number of People Who Hold a Driver's License in Japan (end of 2019)

(persons, %)

	Male		Female		Total	
		% of license holders		% of license holders		% of license holders
Age 15～19*	508 314	17.0	356 736	12.6	865 050	14.8
Age 20～24	2 531 713	76.7	2 140 939	69.3	4 672 652	73.1
Age 25～29	2 867 111	88.8	2 530 227	83.5	5 397 338	86.2
Age 30～34	3 239 191	94.4	2 908 120	88.4	6 147 311	91.5
Age 35～39	3 695 692	97.0	3 389 708	91.4	7 085 400	94.2
Age 40～44	4 256 783	97.0	3 927 731	92.0	8 184 514	94.5
Age 45～49	4 818 948	97.0	4 454 490	91.7	9 273 438	94.3
Age 50～54	4 177 627	96.7	3 850 087	90.2	8 027 714	93.5
Age 55～59	3 711 229	95.9	3 373 090	87.2	7 084 319	91.5
Age 60～64	3 490 170	94.3	3 078 885	81.0	6 569 055	87.6
Age 65～69	3 793 321	91.2	3 105 198	69.9	6 898 519	80.2
Age 70～74	3 598 414	86.9	2 528 031	54.5	6 126 445	69.8
Age 75～79	2 329 766	71.9	1 211 247	30.3	3 541 013	48.9
Age 80～84	1 232 337	55.8	430 319	13.7	1 662 656	31.1
Age 85 and over	528 080	28.2	94 924	2.3	623 004	10.5
Total	44 778 696	72.9	37 379 732	57.7	82 158 428	65.1

Source: Driver's License Statistics (License Division, Traffic Bureau, National Police Agency); Monthly General Statistics Data (Ministry of Internal Affairs and Communications)

* A driver's license can be obtained only from the age of sixteen up. However, because population statistics are calculated over five-year intervals, the first item is shown as "Age 15-19".

8. Traffic Accidents in Japan

8-1 Number of traffic accidents, fatalities, and injuries

(person)

	Number of traffic accidents		Number of fatalities	Number of injuries	The number of all traffic accidents, that occurred on expressways (National & designated expressways)		
		Number of fatal accidents				Number of fatal accidents	Number of Fatalities
1950	33 212	—	4 202	25 450	—	—	—
1955	93 981	—	6 379	76 501	—	—	—
1960	449 917	—	12 055	289 156	—	—	—
1965	567 286	11 922	12 484	425 666	—	—	—
1970	718 080	15 801	16 765	981 096	—	—	—
1975	472 938	10 165	10 792	622 467	—	—	—
1980	476 677	8 329	8 760	598 719	3 623	155	175
1985	552 788	8 826	9 261	681 346	4 741	223	250
1990	643 097	10 651	11 227	790 295	9 060	401	459
1995	761 789	10 227	10 679	922 677	11 304	375	416
2000	931 934	8 707	9 066	1 155 697	14 325	327	367
2005	933 828	6 625	6 871	1 156 633	13 775	249	285
2006	886 864	6 147	6 352	1 098 199	13 803	234	262
2007	832 454	5 587	5 744	1 034 445	12 674	222	244
2008	766 147	5 025	5 155	945 504	10 965	174	193
2009	737 474	4 773	4 914	911 108	11 113	161	178
2010	725 773	4 726	4 863	896 208	12 200	166	188
2011	691 937	4 481	4 612	854 493	11 708	188	214
2012	665 138	4 280	4 411	825 396	11 299	196	225
2013	629 021	4 278	4 373	781 494	11 520	208	227
2014	573 842	4 013	4 113	711 374	10 202	189	204
2015	536 899	4 028	4 117	666 023	9 842	200	215
2016	499 201	3 790	3 904	618 853	9 198	176	196
2017	472 165	3 630	3 694	580 850	8 758	155	169
2018	430 601	3 449	3 532	525 846	7 934	159	173
2019	381 237	3 133	3 215	461 775	7 094	150	163

Source: Traffic Statistics (Institute for Traffic Accident Research and Data Analysis)

8-2 Number of fatalities by age group and by circumstances of accident (2019)

(person)

Age group	Situation	in a vehicle			on a motorcycle				Total	On a bicycle	While walking	Other	Total
					motorcycles			Mopends					
		Driver	Passenger	Subtotal	Driver	Passenger	Subtotal						
15 and under	Fatalities	0	20	20	0	1	1	0	1	8	23	0	52
	increased/decreased by*	0	3	3	-2	0	-2	-2	-4	-11	-15	0	-27
Age 16～19	Fatalities	12	23	35	45	4	49	9	58	7	11	0	111
	increased/decreased by*	-7	9	2	-3	2	-1	-11	-12	-6	6	0	-10
Age 20～24	Fatalities	49	20	69	53	0	53	7	60	14	22	0	165
	increased/decreased by*	2	2	4	9	-1	8	-1	7	0	-1	0	10
Age 16～24	Fatalities	61	43	104	98	4	102	16	118	21	33	0	276
	increased/decreased by*	-5	11	6	6	1	7	-12	-5	-6	5	0	0
Age 25～29	Fatalities	31	9	40	18	0	18	4	22	5	18	0	85
	increased/decreased by*	1	2	3	-14	0	-14	-7	-21	-3	6	0	-15
Age 30～39	Fatalities	65	10	75	33	0	33	11	44	11	50	1	181
	increased/decreased by*	-14	2	-12	-15	-3	-18	3	-15	2	-4	-1	-30
Age 40～49	Fatalities	82	9	91	74	1	75	17	92	20	77	1	281
	increased/decreased by*	-29	-5	-34	-5	0	-5	-2	-7	1	5	-1	-36
Age 50～59	Fatalities	111	18	129	83	0	83	18	101	47	94	0	371
	increased/decreased by*	-13	6	-7	8	0	8	-5	3	-2	10	-1	3
Age 60～64	Fatalities	64	8	72	22	0	22	9	31	22	62	0	187
	increased/decreased by*	9	-3	6	-7	0	-7	-11	-18	-6	-9	-1	-28
Age 65～69	Fatalities	70	23	93	14	0	14	15	29	42	102	1	267
	increased/decreased by*	-22	3	-19	-1	0	-1	-6	-7	-1	-20	0	-47
Age 60～69	Fatalities	134	31	165	36	0	36	24	60	64	164	1	454
	increased/decreased by*	-13	0	-13	-8	0	-8	-17	-25	-7	-29	-1	-75
Age 70～74	Fatalities	90	23	113	5	0	5	12	17	65	125	3	323
	increased/decreased by*	-25	0	-25	-3	0	-3	-11	-14	6	-9	3	-39
Age 75 and over	Fatalities	225	121	346	8	0	8	47	55	192	592	7	1192
	increased/decreased by*	-35	0	-35	-5	0	-5	-10	-15	0	-51	3	-98
Age 70 and over	Fatalities	315	144	459	13	0	13	59	72	257	717	10	1515
	increased/decreased by*	-60	0	-60	-8	0	-8	-21	-29	6	-60	6	-137
Total	Fatalities	799	284	1083	355	6	361	149	510	433	1176	13	3215
	increased/decreased by*	-133	19	-114	-38	-2	-40	-63	-103	-20	-82	2	-317

Source: Traffic Statistics (Institute for Traffic Accident Research and Data Analysis)
* Compared with previous year

9. The Number of Traffic Fatalities in Japan and Other Countries

	Survey year	Population (×1000)	Number of fatalities	Number of fatalities per 100,000 inhabitants	Number of fatalities per 10,000 motor vehicles owned	Number of fatalities per 100 million vehicle-kilometers
Asia						
Japan	2017	127 484	4 431	3.5	0.57	0.6
Korea	2017	50 982	4 185	8.2	1.86	0.9
Chinese Taipei	2017	23 626	1 517	6.4	1.92	1.4
China	2017	1 409 517	63 772	4.5	2.96	7.6
Hong-Kong	2017	7 365	108	1.5	1.51	0.8
Thailand	2016	69 038	8 433	12.2	4.98	
Malaysia	2017	31 624	6 740	21.3	4.69	
Indonesia	2017	263 991	30 568	11.6	12.94	
Singapore	2017	5 709	121	2.1	1.48	0.7
India	2017	1 339 180	147 913	11.0	31.80	26.0
Turkey	2017	80 745	7 427	9.2	4.30	2.8
Europe						
U.K.	2017	66 182	1 793	2.7	0.45	0.3
Germany	2017	82 114	3 180	3.9	0.63	0.4
France	2017	64 980	3 448	5.3	0.88	0.6
Netherlands	2017	17 036	613	3.6	0.63	0.5
Bergium	2017	11 429	615	5.4	0.93	0.6
Italy	2016	59 360	3 283	5.5	0.75	
Spain	2017	46 354	1 830	3.9	0.64	1.5
Portugal	2017	10 330	630	6.1	1.08	
Greece	2017	11 160	731	6.6	1.11	1.0
Switzerland	2017	8 476	230	2.7	0.45	0.4
Austria	2017	8 735	414	4.7	0.77	0.5
Norway	2017	5 305	106	2.0	0.32	0.2
Sweden	2017	9 911	253	2.6	0.46	0.3
Finland	2017	5 523	238	4.3	0.70	0.6
Denmark	2017	5 734	175	3.1	0.59	0.3
Russia	2017	143 990	19 088	13.3	3.60	
Poland	2017	38 171	2 831	7.4	1.07	1.2
Hungary	2017	9 722	625	6.4	1.58	1.5
Ukraine	2017	44 223	3 432	7.8	3.44	
America						
U.S.A.	2017	324 459	37 132	11.4	1.35	0.7
Canada	2017	36 624	1 841	5.0	0.77	0.6
Mexico	2017	129 163	2 919	2.3	0.71	1.6
Brasil	2017	209 288	6 245	3.0	1.43	
Argentina	2016	44 271	5 582	12.6	3.96	
Africa						
Egypt	2017	97 553	3 747	3.8	6.43	
South Africa	2016	56 717	14 071	24.8	10.51	10.7
Oceania						
Australia	2017	24 451	1 222	5.0	0.67	0.5
New Zealand	2017	4 706	378	8.0	0.93	0.8

Source: World Road Statistics (IRF); World Population Prospects (United Nations)
Note: 1. The number refers to those who died within 30 days.
Note: 2. The population are estimates in 2013 by UN.

10. Implementation of Traffic Safety Facilities in Japan

(at the end of each fiscal year)

				FY 1985	FY 1990	FY 1995	FY 2000	FY 2005	FY 2010		FY 2015	FY 2016	FY 2017	FY 2018
Traffic control centers			(number of cities)	74	74	75	75	75	75	(spot)	163	163	163	162
Traffic information devices	Traffic information boards			-	1 604	2 175	-	Optical Beacon		(unit)	55 849	55 891	55 798	55 586
	Roadside communication terminals			-	192	274	-	Trafic Imformation Boards		(unit)	3 598	3 578	3 542	3 510
Trafic Signals	Centralized control units			32 585	43 019	50 556	57 908	66 037	72 211	→	73 702	73 684	73 471	73 400
	Synchronized control system	Automatic traffic-actuated units		5 576	4 682	4 585	4 023	2 293	481	→	0	0	0	0
		Programmed multi-stage units		12 814	14 355	17 340	20 218	22 653	23 382	→	25 717	26 010	26 438	26 787
		Push-button units		1 164	801	1 213	963	1 106	1 168	→	960	914	909	884
	Independent control system	Traffic-actuated control	Full traffic-actuated units	1 120	984	959	867	802	739	→	786	778	793	798
			Semi traffic-actuated units	6 640	7 788	10 110	11 535	13 032	14 533	→	15 275	14 864	14 763	14 709
			Bus-actuated units	238	101	165	154	127	116	→	32	31	35	31
			Train-actuated units	228	162	180	177	183	184	→	148	131	150	153
		Fixed-cycle units (including programmed multi-stage units)		35 577	41 200	45 282	48 802	51 087	52 059	→	52 531	55 018	55 304	55 498
		Push-button units		23 113	20 713	23 083	25 696	28 200	30 599	→	32 507	30 772	30 800	30 765
		Single flashing units		465	1 829	4 319	5 670	6 250	6 406	→	6 080	5 859	5 563	5 226
	Total units			119 520	135 634	157 792	176 013	191 770	201 878	→	207 738	208 061	208 226	208 251
Lights	For vehicles			-	720 725	885 383	1 001 623	1 125 659	1 222 359	→	1 262 112	1 265 822	1 268 233	1 269 476
		(LED lights)						144 013	390 561	→	653 669	695 490	733 073	768 638
	For pedestrians			-	524 122	634 959	764 976	869 188	942 451	→	999 086	1 006 283	1 012 279	1 019 470
		(LED lights)						46 461	214 243	→	450 218	497 342	529 978	559 819
Traffic signs	Variable signs			23 089	24 109	23 259	30 186	27 526	19 816	(piece)	12 901	12 116	11 829	11 297
	Fixed signs	Large signs		420 640	500 347	582 255	617 279	642 270	614 753	(piece)	351 329	335 651	325 697	321 274
		Roadside signs		9 705 165	10 020 616	10 379 062	10 183 538	9 422 368	9 416 920	(piece)	5 950 131	5 835 025	5 833 148	5 827 157
Road markings	Crosswalks		(number of)	719 548	801 464	890 723	967 355	1 054 219	10 031 673	→	1 142 663	1 146 201	1 149 977	1 155 687
	Solid lines		(km)	110 465	116 248	115 898	125 838	131 141	124 129	→	122 386	122 713	120 451	119 193
	Graphic markings		(number of)	3 238 374	3 913 961	3 995 149	3 945 511	4 506 671	4 637 370	→	4 649 172	4 648 731	4 635 741	4 352 846

Source: Traffic Statistics (Institute for Traffic Accident Research and Data Analysis)
Note: Programmed multi-stage units also include single-stage units.

11. Parking Facilities in Japan

11-1 Changes in parking capacity

(vehicles; at fiscal year's end)

	Urban planning parking facilities	Officially designated parking facilities	Mandated parking facilities	On-street parking areas	Total	Parking spaces per 10,000 vehicles
FY 1960	1 313	9 908	2 830	6 576	20 627	89.5
1965	8 948	53 597	39 448	2 189	104 182	143.7
1970	18 120	124 429	123 997	750	267 296	147.0
1975	33 781	287 457	276 285	2 400	599 923	211.2
1980	48 627	458 053	403 355	2 339	912 374	240.3
1985	56 535	598 808	559 709	2 033	1 217 085	263.3
1990	73 092	774 504	863 955	1 417	1 712 968	296.6
1995	93 431	995 735	1 297 958	1 381	2 388 505	356.1
2000	115 696	1 225 194	1 771 028	1 275	3 113 193	429.4
2005	120 091	1 415 252	2 212 069	1 386	3 748 798	495.5
2006	120 575	1 450 858	2 325 538	1 216	3 898 187	514.1
2007	121 336	1 482 645	2 429 997	1 100	4 035 078	533.6
2008	120 775	1 549 878	2 514 807	1 357	4 186 817	556.0
2009	122 574	1 570 013	2 571 884	1 361	4 265 832	567.4
2010	121 651	1 604 463	2 634 973	1 032	4 362 119	580.5
2011	119 317	1 623 951	2 689 925	785	4 433 978	586.4
2012	119 214	1 664 443	2 949 036	775	4 733 468	622.1
2013	118 877	1 661 432	3 004 444	775	4 785 528	623.8
2014	119 943	1 699 455	3 068 737	606	4 888 741	631.9
2015	119 872	1 762 050	3 106 853	601	4 989 376	645.4
2016	118 009	1 805 432	3 171 713	601	5 095 755	656.2
2017	116 332	1 823 115	3 271 052	601	5 211 100	668.6
2018	114 835	1 878 182	3 347 922	601	5 341 540	683.6

Source: Annual Report of Motor Vehicle Parking (Ministry of Land, Infrastructure, Transport and Tourism)
Note: 1. Urban planning parking facilities that are also officially designated parking facilities are included in the number of urban planning parking facilities. Mandated parking facilities that are also officially designated parking facilities are included in the number of mandated parking facilities.
Note: 2. The number of vehicles owned includes light vehicles.

11-2 Number of parking meters and parking permit ticket devices installed

(at the end of March)

	Parking meters	Parking permit ticket dispensing devices		Total	
		Number	Number of vehicles allowed to park	Number	Number of vehicles allowed to park
1986	14 157	0	-	14 157	14 157
1990	19 039	1 333	10 793	20 372	29 832
1995	27 627	1 635	13 043	29 262	40 670
1996	27 682	1 642	12 926	29 324	40 608
1997	27 636	1 630	12 748	29 266	40 384
1998	27 561	1 602	12 467	29 163	40 028
1999	27 488	1 587	12 329	29 075	39 817
2000	26 988	1 574	12 320	28 562	39 308
2001	26 341	1 540	12 216	27 881	38 557
2002	25 828	1 520	11 931	27 348	37 759
2003	24 308	1 416	10 684	25 724	34 992
2004	23 284	1 381	10 409	24 665	33 693
2005	22 929	1 329	9 976	24 258	32 905
2006	22 453	1 321	9 421	23 774	31 874
2007	22 453	1 321	9 421	23 774	31 874
2008	21 930	1 291	9 168	23 221	31 098
2009	21 589	1 291	9 147	22 880	30 736
2010	21 533	1 290	9 123	22 823	30 656
2011	21 040	1 339	9 349	22 379	30 389
2012	20 772	1 431	9 459	22 203	30 231
2013	18 211	1 194	7 746	19 405	25 957
2014	17 338	1 187	7 584	18 525	24 922
2015	16 742	1 135	7 229	17 877	23 971
2016	16 064	1 143	7 209	17 207	23 273
2017	15 730	1 126	7 057	16 856	22 787
2018	15 392	1 119	6 992	16 511	22 384
2019	15 056	1 112	6 910	16 168	21 966

Source: Annual Report of Motor Vehicle Parking (Japan Parking System Manufacturers Association Incorporated)

11-3 Parking Facilities in Major Cities

2013	Urban planning parking facilities		Officially designated parking facilities		Mandated parking facilities		On-street parking areas		Total	
	Number of facilities	Number of parking spaces	Number of facilities	Number of parking spaces	Number of facilities	Number of parking spaces	Number of facilities	Number of parking spaces	Number of facilities	Number of parking spaces
Sapporo City, Hokkaido	2	596	194	32 264	3 516	201 947	-	-	3 712	234 807
Sendai City, Miyagi Pref.	3	900	92	16 928	1 044	87 066	-	-	1 139	104 894
Saitama City, Saitama Pref.	2	601	120	21 277	173	22 084	-	-	295	43 962
Special Wards of Tokyo	47	16 361	665	95 938	22 314	648 984	-	-	23 026	761 283
Yokohama City, Kanagawa Pref.	7	3 351	240	41 978	7 177	362 829	-	-	7 424	408 158
Kawasaki City, Kanagawa Pref.	1	347	101	13 911	1 305	67 215	-	-	1 407	81 473
Nagoya City, Aichi Pref.	14	4 853	332	88 085	3 048	162 653	-	-	3 394	255 591
Kyoto City, Kyoto Pref.	4	1 017	113	33 387	863	36 103	-	-	939	70 606
Osaka City, Osaka Pref.	10	4 290	825	68 183	7 614	285 384	-	-	8 449	350 856
Kobe City, Hyogo Pref.	12	3 649	251	53 285	1 090	64 337	-	-	1 353	121 271
Hiroshima City, Hiroshima Pref.	6	2 280	182	26 569	1 730	62 681	13	533	1 880	89 766
Fukuoka City, Fukuoka Pref.	7	2 838	349	60 927	3 224	124 473	-	-	3 580	188 238

Source: Annual Report of Motor Vehicle Parking (Ministry of Land, Infrastructure, Transport and Tourism)

12. Travel Time in Daily Activities of Japanese People

12-1 Changes in time spent for daily activities of Japanese People (average of whole nation, average of doers)

(hours : minutes)

			Sleep	Personal care	Eat	Going to work or school	Work	Study	Housework	Medical treatment / recuperation	Childcare	Shopping	Other travel	Mass media contact	Rest	Learning, self-development and training	Leisure	Sports	Volunteer and social interactions	Dating, socializing	Consultation, medical treatment	Other / unknown
1991	Weekday	Male	7:41	1:00	1:33	1:24	8:53	6:43	1:43	2:23	1:21	1:05	1:32	2:51	1:47	2:18	2:33	2:02	2:34	2:48	3:02	1:40
		Famale	7:27	1:19	1:40	1:15	7:01	6:53	3:51	2:47	3:14	1:05	1:13	2:48	1:53	2:11	2:15	1:47	2:34	2:17	2:28	1:33
	Saturdays	Male	7:52	1:02	1:36	1:17	8:08	5:11	2:09	2:30	1:52	1:24	1:46	3:24	2:08	2:39	3:18	2:41	3:04	3:33	3:04	2:10
		Famale	7:35	1:20	1:43	1:08	6:29	5:11	3:54	2:44	3:17	1:18	1:25	3:03	2:06	2:17	2:37	2:09	2:43	2:56	2:36	1:49
	Sundays	Male	8:36	1:08	1:41	1:09	7:22	5:05	2:16	2:25	2:38	1:36	1:49	4:11	2:35	2:55	3:53	3:18	3:29	3:58	5:11	2:25
		Famale	8:10	1:24	1:46	1:05	6:15	4:49	3:47	2:51	3:19	1:33	1:34	3:15	2:19	2:36	3:03	2:58	3:03	3:28	5:07	2:09
1996	Weekday	Male	7:45	1:03	1:35	1:18	8:56	6:34	1:39	2:35	1:20	1:09	1:30	2:59	1:48	2:04	2:32	1:57	2:27	2:46	2:33	1:21
		Famale	7:31	1:24	1:42	1:06	6:58	6:35	3:45	2:47	3:06	1:05	1:14	2:55	1:52	2:02	2:12	1:40	2:26	2:16	2:08	1:21
	Saturdays	Male	8:03	1:06	1:38	1:09	8:13	4:47	1:49	2:23	2:06	1:28	1:47	3:40	2:13	2:27	3:36	2:55	3:07	3:43	2:20	1:59
		Famale	7:48	1:24	1:44	1:00	6:25	4:44	3:47	2:33	3:08	1:24	1:33	3:15	2:07	2:16	2:40	2:16	2:43	3:07	2:10	1:47
	Sundays	Male	8:40	1:11	1:42	1:05	7:16	4:32	1:53	2:16	2:25	1:38	1:51	4:20	2:31	2:35	3:55	3:31	3:30	3:59	3:42	2:09
		Famale	8:18	1:28	1:47	1:00	6:06	4:32	3:40	2:37	3:05	1:36	1:39	3:28	2:18	2:24	2:56	3:02	3:00	3:28	3:33	1:59
2001	Weekday	Male	7:42	1:07	1:35	1:17	8:56	6:14	1:29	2:01	1:23	1:02	1:29	3:03	1:49	2:14	2:42	1:47	2:31	2:36	2:28	1:27
		Famale	7:29	1:27	1:40	1:05	6:52	6:17	3:35	2:18	3:11	1:03	1:15	2:55	1:52	2:09	2:10	1:32	2:28	2:12	2:08	1:21
	Saturdays	Male	8:05	1:10	1:38	1:08	8:04	4:32	1:42	2:12	2:05	1:25	1:46	3:42	2:10	2:42	3:29	2:35	3:17	3:25	2:19	1:53
		Famale	7:50	1:28	1:44	0:57	6:13	4:24	3:36	2:08	3:10	1:21	1:34	3:08	2:03	2:26	2:36	1:55	2:50	2:52	2:10	1:41
	Sundays	Male	8:36	1:14	1:41	1:05	7:16	4:02	1:43	1:59	2:13	1:30	1:52	4:21	2:26	2:49	3:44	3:04	3:51	3:44	3:27	2:01
		Famale	8:16	1:31	1:47	0:58	6:01	3:49	3:25	2:14	2:57	1:30	1:41	3:22	2:11	2:43	2:49	2:22	3:07	3:05	3:32	1:49
2006	Weekday	Male	7:38	1:11	1:35	1:19	9:08	6:46	1:38	2:14	1:32	1:04	1:28	3:05	1:56	2:13	2:42	1:56	2:30	2:39	2:37	1:40
		Famale	7:26	1:30	1:41	1:06	7:06	6:46	3:37	2:11	3:14	1:04	1:15	2:58	1:59	2:06	2:17	1:32	2:31	2:15	2:17	1:29
	Saturdays	Male	8:05	1:16	1:31	1:11	8:12	4:43	1:50	2:06	2:22	1:26	1:51	3:52	2:27	2:48	3:38	3:03	3:22	3:38	2:23	2:09
		Famale	7:50	1:32	1:46	0:59	6:28	4:40	3:31	2:22	3:25	1:24	1:40	3:16	2:17	2:30	2:50	2:13	3:10	3:03	2:20	1:55
	Sundays	Male	8:33	1:19	1:44	1:05	7:24	4:16	1:50	2:08	2:34	1:37	1:53	4:22	2:43	2:54	3:55	3:10	3:52	3:40	3:37	2:16
		Famale	8:11	1:35	1:49	0:57	6:19	4:08	3:29	2:19	3:09	1:34	1:42	3:26	2:23	2:41	2:59	2:20	3:10	3:11	2:46	1:58
2011	Weekday	Male	7:37	1:14	1:35	1:19	9:10	7:05	1:40	2:00	1:31	1:08	1:32	3:20	2:07	2:19	2:54	1:55	2:25	2:42	2:28	1:45
		Famale	7:26	1:34	1:41	1:07	7:04	7:25	3:36	2:03	3:15	1:08	1:16	3:06	2:05	2:04	2:20	1:33	2:25	2:18	2:07	1:28
	Saturdays	Male	8:10	1:18	1:40	1:11	8:14	4:28	1:41	2:05	2:37	1:32	1:45	4:13	2:46	2:57	3:48	2:46	3:25	3:41	2:16	2:03
		Famale	7:55	1:36	1:45	1:00	6:36	4:23	3:25	2:04	3:25	1:28	1:34	3:33	2:29	2:34	2:53	2:02	3:03	3:03	2:09	1:53
	Sundays	Male	8:27	1:23	1:44	1:08	7:36	4:04	1:47	2:14	2:51	1:37	1:53	4:35	2:55	2:59	4:02	3:03	3:52	3:43	3:39	2:13
		Famale	8:06	1:38	1:48	1:00	6:20	3:48	3:28	2:10	3:21	1:37	1:43	3:38	2:31	2:39	3:01	2:16	3:10	3:12	3:07	1:56
2016	Weekday	Male	7:34	1:19	1:37	1:25	9:08	6:53	1:39	2:10	1:49	1:06	1:32	3:30	2:15	2:15	3:03	1:53	2:23	2:41	2:26	2:00
		Famale	7:25	1:29	1:42	1:11	7:10	6:14	3:31	2:01	3:34	1:08	1:19	3:09	2:11	1:58	2:24	1:31	2:21	2:21	2:21	1:41
	Saturdays	Male	8:04	1:26	1:44	1:15	8:09	4:34	1:47	1:54	3:10	1:32	1:54	4:09	2:58	2:43	4:08	2:56	3:31	3:39	2:14	2:25
		Famale	7:52	1:41	1:48	1:07	6:34	3:57	3:26	2:06	3:48	1:30	1:41	3:29	2:37	2:27	3:03	2:07	3:03	3:15	2:13	2:14
	Sundays	Male	8:25	1:30	1:48	1:12	7:37	4:08	1:49	1:58	3:09	1:42	1:58	4:37	3:15	2:56	4:17	3:05	3:39	3:41	3:12	2:27
		Famale	8:09	1:44	1:52	1:06	6:23	3:22	3:26	2:04	3:47	1:40	1:45	3:40	2:45	2:27	3:08	2:20	3:03	3:14	3:14	2:14

Source: Social Life Basic Survey (Ministry of Internal Affairs and Communications Statistics Bureau)

Note: 1. Total hours of all activities don't add up to 24 hours because they don't include the people who didn't make the activity.

Note: 2. Item "Medical treatment / recuperation" was applied from 1991 survey.

12-2 Travel time by different population segments (weekdays, average time spent by the doer, total of both)

(hours : minutes)

		1990		1995		2000		2005		2010		2015	
		Going to work	Going to school	Going to work	Going to school	Going to work	Going to school	Going to work	Going to school	Going to work	Going to school	Going to work	Going to school
Whole nation		1:07	1:06	1:15	1:11	1:16	1:05	1:16	1:05	1:16	1:12	1:19	1:16
By gender	Male	1:13	1:05	1:23	1:10	1:21	1:06	1:21	1:06	1:23	1:13	1:27	1:17
	Female	:57	1:08	1:02	1:12	1:09	1:04	1:09	1:04	1:06	1:12	1:08	1:14
Male: by age group	10～15	:35	:50	:51	:54	:15	:52	:15	:52	-	-	-	-
	16～19	:56	1:22	1:02	1:31	:43	1:31	:43	1:31	-	-	-	-
	10s	-	-	-	-	-	-	-	-	0:53	1:09	:47	1:14
	20s	1:09	1:38	1:18	1:45	1:16	1:46	1:16	1:46	1:16	2:00	1:24	1:53
	30s	1:10	:46	1:20	:44	1:18	1:17	1:18	1:17	1:17	1:15	1:27	1:08
	40s	1:16	:46	1:22	1:22	1:20	:40	1:20	:40	1:33	:33	1:25	:48
	50s	1:17	:42	1:30	:31	1:26	:51	1:26	:51	1:27	:39	1:31	:54
	60s	1:16	1:48	1:25	:32	1:28	:49	1:28	:49	1:22	-	1:30	:39
	70s and over	1:00	1:50	1:20	1:15	1:10	:15	1:10	:15	1:39	-	1:23	:47
Female: by age group	10～15	:34	:52	:39	:55	-	:50	-	:50	-	-	-	-
	16～19	1:02	1:29	:59	1:34	:57	1:26	:57	1:26	-	-	-	-
	10s	-	-	-	-	-	-	-	-	1:16	1:11	1:08	1:14
	20s	1:13	1:40	1:14	1:42	1:20	1:05	1:20	1:05	1:17	1:54	1:25	1:51
	30s	:50	:31	1:00	:53	1:14	1:02	1:14	1:02	1:09	:49	1:11	:40
	40s	:48	:35	:55	:48	1:01	:40	1:01	:40	1:02	:39	1:07	:43
	50s	:55	:51	:59	:55	1:03	:39	1:03	:39	:56	:20	1:01	:35
	60s	:56	:31	1:05	:47	1:12	:35	1:12	:35	1:13	:49	1:00	:52
	70s and over	:55	1:00	:55	1:10	:58	-	:58	-	1:14	:45	1:03	1:04
By occupation	Farmer / fisher / forest worker	:46	:29	1:12	:35	1:04	-	1:04	-	:48	-	1:27	:35
	Self-employed	:53	1:05	1:09	:42	1:18	1:00	1:18	1:00	1:09	:50	1:18	:45
	Sales or service person	1:02	:51	1:09	1:11	1:17	:37	1:17	:37	1:12	:42	1:13	1:07
	Blue-collar worker (skilled / unskilled)	1:02	:48	1:10	:45	1:12	:36	1:12	:36	1:17	:31	1:14	:43
	Office worker / technical expert	1:15	:46	1:21	:49	1:20	:53	1:20	:53	1:19	:59	1:26	:46
	Management & administration	1:28	1:27	1:37	1:17	1:23	1:15	1:23	1:15	1:23	:55	1:28	:43
	Professional or free-lance worker, or other	1:12	:58	1:13	:48	1:18	1:00	1:18	1:00	1:19	:36	1:19	:30
	Housewife	:51	:48	:58	:50	1:03	:25	1:03	:25	1:19	:35	:49	:50
	Unemployed	1:11	:58	1:12	1:10	1:27	1:15	1:27	1:15	1:44	:39	1:11	1:06
By size of city	Tokyo area	1:32	1:17	-	-	1:39	1:13	1:42	1:19	1:37	1:25	1:42	1:27
	Osaka area	1:20	1:09	-	-	1:28	1:11	1:25	1:24	1:28	1:05	1:26	1:18
	City of a half million or more	1:03	1:04	-	-	1:11	:55	1:12	1:07	1:09	1:00	1:09	1:08
	City of 100,000 or more and less than 500,000	:59	:59	-	-	1:05	1:02	1:05	0:58	1:05	1:10	1:11	1:14
	City of less than 100,000	:55	1:03	-	-	:55	:54	1:03	0:58	1:10	1:04	1:11	1:11
	Town / village	:56	1:06	-	-	1:05	1:13	1:06	1:06	1:03	1:27	1:08	1:12

Source: National Time Use Survey (NHK Broadcasting Culture Research Institute)

Note: 1. The survey method was changed starting from 1995 so that the data of 1995 onward cannot be directly compared with the data of 1990 and before.

Note: 2. Size of city in 2010 are "City of 300,000 or more", "City of 100,000 or more", "Cities, towns and villages of 50,000 or more", "Cities, towns and villages less than 50,000".

13. Transport and Communications Expenditures of Japanese Households

13-1 Transport and communications expenditures of households (monthly average; working-class, nationwide)

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	
Consumption expenditures	331 595	349 663	341 896	296 790	283 401	276 567	268 289	271 136	275 706	280 531	100.0%
Food	79 993	78 947	75 174	64 282	63 031	66 217	65 523	65 136	66 950	67 342	24.0%
Housing	16 475	23 412	21 716	23 713	22 479	21 757	21 783	21 159	20 855	21 783	7.8%
Utilities	16 797	19 551	21 282	18 004	18 400	19 150	17 233	17 671	18 471	18 225	6.5%
Funiture / housework supplies	13 103	13 040	11 268	8 634	8 725	8 913	8 916	8 884	9 366	9 831	3.5%
Clothing & shoes	23 902	21 085	17 195	13 374	12 343	12 192	11 175	11 403	11 286	11 208	4.0%
Health maintenance / medical expenditures	8 670	9 334	10 901	10 240	9 655	9 472	9 505	9 926	10 267	10 827	3.9%
Transport / communicatuons	33 499	38 524	43 632	43 296	42 916	43 080	41 672	42 079	45 505	46 679	16.6%
Transport & motor vehicle related expenditures	27 072	31 419	33 118	31 372	30 173	29 257	27 625	27 879	30 943	33 032	11.8%
Transport	7 543	8 064	7 873	8 090	6 747	7 461	6 858	6 979	7 093	7 849	2.8%
Railway fares	2 730	2 654	2 453	2 533	2 164	2 491	2 165	2 203	2 318	2 565	0.9%
Railway passes	1 877	2 269	2 198	2 311	2 041	2 188	2 116	2 153	2 198	2 135	0.8%
Bus fares	423	356	326	342	373	401	364	370	388	424	0.2%
Bus passes	463	474	395	400	250	220	173	176	189	261	0.1%
Taxi fares	671	545	460	406	445	516	466	474	433	510	0.2%
Airplane fares and other	1 379	1 766	2 041	2 099	1 473	1 646	1 575	1 602	1 566	1 954	0.7%
Vehicle related expenditures	19 529	23 355	25 245	23 282	23 426	21 796	20 767	20 900	23 850	25 183	9.0%
Purchace of motor vehicle, etc.	6 842	7 734	8 847	6 187	6 462	5 701	5 725	5 725	6 516	7 437	2.7%
Purchace of bicycle	369	337	342	199	272	249	333	333	455	411	0.1%
Maintenance of motor vehicle	12 319	15 284	16 055	16 896	16 692	15 846	14 709	14 709	16 879	17 334	6.2%
Communication	6 426	7 104	10 514	11 924	12 744	13 824	14 047	14 200	14 112	13 647	4.9%
Education	16 827	18 467	18 261	13 934	13 707	13 083	13 749	13 503	13 573	12 873	4.6%
Cultural matters / entertainment	31 761	33 221	33 796	31 332	31 575	27 486	27 497	27 034	27 160	28 219	10.1%
Other expenditures	90 569	94 082	88 670	69 979	60 569	55 218	51 237	54 342	52 721	53 542	19.1%

Source: Family Income And Expenditure Survey: Annual Report (Ministry of Internal Affairs and Communications)

Note: Individual transport expenditures are estimated by dividing total transport expenditures (monthly average) by the annual share for each item.

13-2 Changes in consumer prices for transport and communications

(annual average; figures for 1995 are set as 100)

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019
Overall consumer prices	93.5	100.0	101.5	99.3	98.9	101.7	102.3	102.9	103.8	104.3
Transport / communication	99.0	100.0	97.8	96.6	95.1	98.5	96.5	96.8	98.1	97.5
Transport	93.5	100.0	105.6	106.1	105.4	114.6	114.5	114.4	114.5	115.3
Railway fees (excl. Japan Railway)	86.8	100.0	110.7	111.2	111.8	114.5	114.7	115.1	115.1	115.8
Railway fees (Japan Railway)	100.0	100.0	103.2	102.8	102.8	105.6	105.6	105.6	105.6	106.2
General route bus fares	88.8	100.0	105.5	105.3	106.1	109.6	109.8	109.8	110.4	111.2
Taxi fares	82.2	100.0	106.3	106.2	113.1	117.1	117.5	117.9	118.5	119.3
Air fares	100.3	100.0	102.4	108.3	109.4	119.4	116.4	112.2	113.0	114.4
Toll road fares	95.2	100.0	103.7	104.4	92.5	132.9	133.4	134.4	134.9	135.4
Motor vehicle related expenditures	100.1	100.0	95.2	98.5	99.1	103.4	100.3	102.8	106.0	106.1
Motor vehicles	100.4	100.0	101.0	99.7	98.4	101.1	101.3	101.3	101.9	102.7
Maintenance of motor vehicles	100.0	100.0	93.1	98.1	99.1	103.7	99.4	102.7	106.8	106.6
Gasoline	110.4	100.0	91.0	107.4	115.2	119.3	104.6	116.0	130.2	127.2
Rent for parking spaces	82.0	100.0	101.6	100.3	98.5	96.9	96.9	96.9	97.3	97.5
Parking fees	87.7	100.0	99.1	95.4	92.1	92.3	91.6	93.2	94.4	94.8
Communications	105.8	100.0	93.4	79.5	74.2	73.8	73.1	70.3	69.2	67.1
Postage	81.0	100.0	100.0	100.0	100.0	104.0	104.0	115.6	124.0	124.5
Fixed telephone charge**	110.0	100.0	93.7	75.0	75.2	77.6	78.8	78.8	78.8	79.1
Shipping fees	89.8	100.0	101.8	101.8	95.3	97.9	97.9	100.1	109.5	110.2

Source: Annual Report on Consumer Price Index (Ministry of Internal Affairs and Communications)
* The "General route Bus fares" for 1990 and 2010 means the "bus fares".
** The "Fixed telephone charge" for 1990 and 1995 means the charge per telephone call.

13-3 Monthly transport / communications expenditures per household by size of city or by city area

(average of all households, 2019)

	All Cities	City size				Metropolitan areas				
		Big Cities	Middle-size cities	Small cities A	Small cities B & towns / villages	Kanto (Tokyo area)	Tokai (Nagoya area)	Kinki (Osaka area)	Chugoku (Hiroshima area)	Kyushu (Fukuoka area)
Consumer expenditures	249 704	245 309	252 741	251 970	249 963	268 389	255 551	237 645	242 717	232 068
Food	63 482	64 336	64 207	62 425	61 511	68 603	63 966	63 453	59 902	57 219
Housing	18 356	22 427	18 208	14 863	14 532	21 788	16 133	16 496	18 834	16 389
Utilities	18 485	16 497	18 819	19 311	21 330	18 155	18 629	17 302	17 257	16 556
Funiture / housework utensils	9 402	8 543	9 658	9 759	10 383	10 064	10 565	8 438	9 613	9 252
Clothing & shoes	9 074	9 457	9 138	8 935	8 203	10 105	9 340	8 707	8 372	8 788
Health maintenance / medical treatment	11 820	11 790	11 918	11 897	11 537	13 047	12 088	11 084	11 300	11 225
Transport / communication	36 005	31 349	36 475	38 031	43 117	36 289	39 805	30 846	39 957	34 050
(Ratio to the total consumption expenditure)	14.4%	12.8%	14.4%	15.1%	17.2%	13.5%	15.6%	13.0%	16.5%	14.7%
Transport	5 732	7 596	5 263	4 962	3 412	7 841	4 894	5 517	4 298	3 854
(Ratio to the total consumption expenditure)	2.3%	3.1%	2.1%	2.0%	1.4%	2.9%	1.9%	2.3%	1.8%	1.7%
Vehicle related expenditures	13 603	19 811	21 170	26 752	24 143	17 332	22 959	14 506	24 536	18 934
(Ratio to the total consumption expenditure)	5.4%	8.1%	8.4%	10.6%	9.7%	6.5%	9.0%	6.1%	10.1%	8.2%
Purchase of motor vehicles, etc.	3 340	5 550	4 296	7 691	6 010	4 413	5 783	2 845	7 914	4 596
Purchace of bicycle	389	263	229	184	140	368	387	348	205	131
Maintenance of motor vehicle	9 875	13 999	16 645	18 877	17 993	12 551	16 789	11 313	16 416	14 207
Communication	10 150	11 401	11 899	12 952	12 641	11 116	11 952	10 822	11 123	11 261
(Ratio to the total consumption expenditure)	4.1%	4.6%	4.8%	5.2%	5.1%	4.5%	4.8%	4.3%	4.5%	4.5%
Education	8 149	8 059	7 548	5 479	4 722	9 679	8 683	7 322	5 929	5 777
Cultural matters / entertainment	26 915	25 817	25 864	22 602	21 379	29 468	25 777	25 747	23 406	21 130
Other expenditures	45 845	50 443	53 337	51 269	52 243	51 191	50 566	48 250	48 146	51 682

Source: Annual Report of Family Income and Expenditure Survey (Ministry of Internal Affairs and Communications)
[City size] Big city: population of one million and over
Middle-size city: population between 150,000 and less than one million
Small city A: population between 50,000 and less than 150,000
Small city B: population is less than 50,000

14. Energy Consumption in Japan and Other Countries

14-1 Energy consumption by transport modes in Japan

(10 billion kcal)

	FY 1975	FY 1980	FY 1985	FY 1990	FY 1995	FY 2000	FY 2005	FY 2010	FY 2015	FY 2016	FY 2017	FY 2018
Passenger transport	23 805	29 728	34 016	44 922	54 192	58 100	59 041	54 873	49 213	48 667	48 053	47 171
Railways	1 456	1 513	1 520	1 847	1 947	1 941	2 007	1 987	1 959	1 971	1 990	1 992
Buses	1 414	1 339	1 297	1 530	1 505	1 378	1 503	1 623	1 589	1 559	1 539	1 508
Passenger cars	19 129	24 385	28 764	38 537	46 903	51 104	51 419	47 110	41 283	40 898	40 495	39 639
Commercial passenger cars	2 089	1 870	2 113	2 384	1 735	1 532	1 494	1 284	1 006	942	896	826
Private passenger cars	17 040	22 515	26 651	36 153	45 168	49 572	49 925	45 826	40 277	39 956	39 599	38 813
Passenger ships	140	130	99	167	140	208	173	144	149	150	152	151
Aircraft	1 665	2 360	2 336	2 840	3 697	3 469	3 940	4 007	4 234	4 090	3 877	3 881
Freight transport	22 491	25 274	24 864	29 464	32 448	32 639	31 459	28 251	27 596	27 253	27 377	27 154
Railways	407	320	198	160	154	134	140	124	125	126	127	127
Passenger cars	15 690	18 901	19 574	25 278	27 977	26 657	25 970	24 371	24 951	24 584	24 788	24 624
Coastal shipping	6 268	5 833	4 769	3 613	3 794	5 279	4 792	3 245	2 010	2 052	1 990	1 967
Aircraft	126	221	323	414	523	570	557	511	509	492	472	436
Total (Passenger & Freight)	46 296	55 002	58 880	74 386	86 640	90 739	90 500	83 124	76 809	75 920	75 430	74 325

Source: EDMC Handbook of Japan's & World Energy & Economic Statistics (The Institute of Energy Economics)

14-2 Energy consumption in Japan and other countries (2017)

	Japan	U.S.A.	Germany	U.K.	France	China	Russia
Energy consumption per person (oil-equivalent; tons / person)	3.41	6.63	3.77	2.66	3.70	2.21	5.07
Oil consumption per person (oil-equivalent; tons / person)	1.39	2.43	1.25	0.92	1.09	0.41	1.07
Total energy consumption (oil-equivalent; x 1 million tons)							
As primary energy	432	2 155	311	176	247	3 063	732
As final consumption	293	1 520	227	127	154	1 995	488
Breakdown of final energy consumption (oil-equivalent; x 1 million tons)							
Industrial sector	86	261	56	23	28	986	150
(%)	(29.5)	(17.2)	(24.8)	(18.0)	(18.2)	(49.4)	(30.7)
Transport sector	71	625	58	42	45	310	96
(%)	(24.2)	(41.1)	(25.4)	(32.7)	(29.5)	(15.5)	(19.7)
Commercial & residential sector	101	488	90	56	67	537	173
(%)	(34.5)	(32.1)	(39.6)	(43.7)	(43.4)	(26.9)	(35.5)

Source: EDMC Handbook of Japan's & World Energy & Economic Statistics (The Institute of Energy Economics)

15. Travel in Japan

15-1 Number of trips made per person by trip purpose

(unit: number of trips per person per day / weekdays)

Purpose / City area	Going to work / school	Going home	Business	Other	Total
Tokyo metropolitan area	0.56	1.00	0.23	0.61	2.41
Keihanshin (Kyoto-Osaka-Kobe) metropolitan area	0.46	0.90	0.20	0.64	2.18
Chukyo (Nagoya) metropolitan area	0.64	1.19	0.24	0.78	2.85

Note: Data for Tokyo are from the fifth survey (2008); for Keihanshin (weekdays & holidays), from the fifrth survey (2010); and for Chukyo, from the fifth survey (2011).

15-2 Number of trips made per person by trip purpose and by automobile ownership

(unit: number of trips per person per day)

	Three major metropolitan area			local city area		
	Owning a car	Family shared a car	Not owning a car	Owning a car	Family shared a car	Not owning a car
1992	2.85	2.61	2.24	3.12	2.70	2.16
1999	2.59	2.58	2.17	2.63	2.50	1.99
2005	2.52	2.49	2.11	2.65	2.44	1.93
2010	2.73	2.56	2.20	2.78	2.58	2.07

Source: Movement of people in the City (Ministry of Land, Infrastructure and Transport)

15-3 Comparison of trip purposes by city type (%)

(Unit: %)

			Going to work	Going to school	Business	Going home	Personal matters
Weekdays	Nationwide	1987	13.3	9.5	12.6	40.6	24.0
		1992	14.3	8.5	10.4	40.9	25.9
		1999	15.7	7.2	9.3	41.5	26.2
		2005	15.8	7.1	8.3	41.7	27.1
		2010	15.4	6.3	8.4	40.6	29.3
	Three major metropolitan area	1987	13.9	10.1	10.9	41.3	23.7
		1992	14.7	8.8	9.1	41.5	25.9
		1999	15.8	7.0	8.7	41.9	26.5
		2005	16.3	6.9	7.2	42.3	27.2
		2010	15.8	6.3	7.9	41.1	28.9
	Local city areas	1987	12.6	8.9	14.1	40.0	24.3
		1992	13.9	8.3	11.7	40.2	25.9
		1999	15.6	7.4	10.0	41.2	25.8
		2005	15.3	7.3	9.4	41.0	27.0
		2010	15.0	6.3	9.0	40.2	29.6
Holidays	Nationwide	1987	3.4	2.3	4.3	41.9	48.2
		1992	3.0	2.0	1.7	41.8	51.5
		1999	3.9	0.7	1.8	41.5	52.1
		2005	4.0	0.9	2.9	41.1	51.2
		2010	3.9	0.8	2.7	40.3	52.3
	Three major metropolitan area	1987	3.2	2.2	3.5	42.4	48.7
		1992	2.8	1.9	1.3	42.3	51.7
		1999	3.6	0.5	1.6	41.6	52.7
		2005	3.8	0.6	2.5	41.6	51.4
		2010	3.7	0.6	2.4	40.7	52.6
	Local city areas	1987	3.6	2.3	4.9	41.4	47.8
		1992	3.2	2.0	2.1	41.3	51.4
		1999	4.2	1.0	1.9	41.3	51.5
		2005	4.1	1.2	3.3	40.5	50.9
		2010	4.1	1.1	2.9	39.9	52.0

Source: Movement of People in the City (Ministry of Land, Infrastructure and Transport)

15-4 Comparison of transport mode by city type

(Unit: %)

			Railways	Buses	Motor vehicles	Motorcycles	Walking & other
Weekdays	Nationwide	1987	11.6	3.9	34.0	23.2	27.4
		1992	13.6	3.9	39.0	19.4	24.0
		1999	13.4	3.3	42.5	19.4	21.4
		2005	13.2	2.8	45.2	18.5	20.3
		2010	14.9	2.9	45.7	16.8	19.7
	Three major metropolitan area	1987	22.3	3.3	26.4	19.8	28.2
		1992	25.5	3.2	29.1	16.9	25.2
		1999	23.8	2.8	33.6	18.2	21.7
		2005	23.1	2.5	33.9	18.5	22.0
		2010	26.0	2.7	33.0	16.8	21.5
	Local city areas	1987	2.5	4.5	40.4	26.0	26.7
		1992	2.9	4.6	48.0	21.6	22.9
		1999	3.3	3.8	51.2	20.5	21.1
		2005	3.5	3.0	56.3	18.6	18.5
		2010	3.9	3.1	58.2	16.8	18.0
Holidays	Nationwide	1987	7.3	3.2	45.9	21.9	21.7
		1992	7.6	2.6	53.8	17.6	18.4
		1999	7.5	2.1	60.0	15.8	14.6
		2005	7.1	1.7	63.5	13.1	14.5
		2010	8.6	1.9	61.3	12.9	15.3
	Three major metropolitan area	1987	14.4	3.0	37.7	20.7	24.2
		1992	15.0	2.4	44.5	16.8	21.4
		1999	13.2	2.1	52.3	16.0	16.3
		2005	12.5	1.6	54.1	14.2	17.6
		2010	15.1	1.9	50.1	14.4	18.4
	Local city areas	1987	1.9	3.3	52.3	22.8	19.7
		1992	1.9	2.8	61.0	18.2	16.2
		1999	2.2	2.1	67.0	15.6	13.1
		2005	2.0	1.7	72.5	12.0	11.7
		2010	2.3	1.8	72.0	11.6	12.4

Source: Movement of People in the City (Ministry of Land, Infrastructure and Transport)

15-5 Number of trips per person by city type

		Weekdays			Holidays		
		Nationwide	Three major metropolitan area	Local city areas	Nationwide	Three major metropolitan area	Local city areas
Gross* (unit: trips)	1987	2.63	2.52	2.74	2.13	1.94	2.32
	1992	2.51	2.46	2.56	2.03	1.84	2.22
	1999	2.34	2.37	2.32	1.90	1.86	1.93
	2005	2.31	2.31	2.31	1.85	1.82	1.88
	2010	2.44	2.42	2.46	2.08	2.02	2.13
Net** (unit: trips)	1987	3.04	2.91	3.17	3.06	2.94	3.18
	1992	2.94	2.84	3.04	3.01	2.86	3.16
	1999	2.77	2.75	2.79	2.84	2.78	2.90
	2005	2.76	2.72	2.81	2.86	2.79	2.93
	2010	2.84	2.80	2.88	2.91	2.84	2.98
Percentage of travelers** (%)	1987	86.3	86.3	86.2	69.3	65.9	72.8
	1992	85.4	86.6	84.2	67.2	64.2	70.2
	1999	84.6	86.0	83.1	66.6	67.0	66.3
	2005	83.6	85.0	82.1	64.6	65.1	64.2
	2010	85.8	86.5	85.2	71.3	71.2	71.4

Source: Movement of People in the City (Ministry of Land, Infrastructure and Transport)
Note: 1. Gross: Trips per person (persons = both those who went out and those who did not)
Note: 2. Net: Trips per person (of persons who went out)
Note: 3. Percentage of travelers: Percentage of people who made a trip on that day

15-6 Percentage of the main transport mode by trip purpose(nationwide)

(Unit: %)

			Railways	Buses	Motor vehicles	Motorcycles	Walking & othes
Weekdays	Going to work	1987	24.3	5.7	40.9	20.9	8.2
		1992	26.3	5.2	45.1	16.7	6.7
		1999	24.6	3.8	47.6	16.6	7.5
		2005	24.8	3.0	47.4	17.6	7.2
		2010	27.4	3.4	44.9	17.2	7.2
	Going to school	1987	13.2	3.2	5.4	19.6	58.6
		1992	17.6	3.4	7.2	19.0	52.8
		1999	17.0	2.7	7.8	19.2	53.3
		2005	18.3	2.4	8.6	19.9	50.8
		2010	16.5	2.6	8.8	18.5	53.7
	Business	1987	7.0	1.6	71.0	12.8	7.6
		1992	8.3	1.1	76.3	8.2	6.1
		1999	9.3	1.2	75.1	8.4	6.0
		2005	8.3	1.0	75.8	8.2	6.8
		2010	11.2	1.0	71.6	8.6	7.7
	Going home	1987	12.5	4.1	28.7	24.8	29.9
		1992	15.0	4.2	34.2	20.8	25.8
		1999	14.5	3.5	38.8	20.7	22.6
		2005	14.5	2.9	41.6	19.7	21.3
		2010	15.3	3.1	42.9	18.2	20.6
	Private matters	1987	6.9	4.0	29.6	27.6	32.0
		1992	7.5	3.8	37.5	22.5	28.7
		1999	7.6	3.4	41.7	22.5	24.8
		2005	6.8	3.0	47.7	19.8	22.8
		2010	7.7	2.9	51.2	16.5	21.6
	All purpose	1987	12.1	3.9	33.6	22.9	27.4
		1992	14.2	3.9	38.7	19.2	24.1
		1999	14.0	3.2	42.1	19.3	21.4
		2005	13.8	2.8	44.7	18.5	20.3
		2010	14.9	2.9	45.7	16.8	19.7
Holidays	Going to work	1987	16.7	5.9	44.7	22.5	10.2
		1992	16.3	5.1	51.4	19.3	7.8
		1999	15.6	3.8	52.9	18.9	8.7
		2005	16.7	2.7	53.4	18.4	8.8
		2010	17.5	2.9	51.8	18.9	8.9
	Going to school	1987	9.6	3.7	5.8	23.2	57.7
		1992	11.4	1.7	7.0	23.5	56.3
		1999	12.3	3.3	17.5	34.4	32.4
		2005	17.9	3.1	17.9	33.2	27.9
		2010	14.3	2.7	11.3	36.3	35.4
	Business	1987	5.5	1.7	62.0	19.5	11.4
		1992	4.7	0.6	80.4	8.4	6.0
		1999	6.8	0.9	72.3	12.4	7.6
		2005	6.8	1.3	67.1	13.2	11.6
		2010	8.1	1.3	67.7	11.6	11.2
	Going home	1987	7.9	3.4	43.0	23.4	22.3
		1992	8.1	2.9	50.7	19.2	19.0
		1999	8.0	2.3	57.5	17.3	14.9
		2005	7.7	1.8	61.1	14.5	14.9
		2010	8.5	1.9	59.7	14.3	15.7
	Private matters	1987	7.0	2.9	48.4	20.4	21.3
		1992	7.3	2.3	56.6	16.1	17.8
		1999	7.0	1.9	61.9	14.2	15.0
		2005	6.4	1.5	65.9	11.3	14.9
		2010	7.6	1.7	64.3	11.0	15.5
	All purpose	1987	7.7	3.2	45.6	21.8	21.8
		1992	8.0	2.6	53.4	17.5	18.6
		1999	7.8	2.1	59.6	15.8	14.7
		2005	7.5	1.7	63.0	13.2	14.7
		2010	8.6	1.9	61.3	12.9	15.3

Source: Movement of People in the City (Ministry of Land, Infrastructure and Transport)

15-7 Transport used by trip purpose (percentages of of the main transport mode)

(Unit: %)

City area	Transport / Purpose	Railways	Buses	Motor vehicles	Motorcycles	Walking & other	Total
Tokyo metropolitan area (weekdays)	Going to work	53	2	24	13	7	100
	Going to school	31	2	7	11	49	100
	Going home	31	3	27	17	22	100
	Home to place of business	32	2	39	16	11	100
	Between workplace and place of business	26	1	58	7	8	100
	Home to private destination	12	4	34	23	27	100
	Other private matters	21	3	32	15	29	100
	All purposes	30	3	29	16	22	100
Keihanshin metropolitan area (weekdays)	Going to work	38	2	30	23	7	100
	Going to school	26	3	4	15	52	100
	Going home	21	3	29	23	24	100
	Business	16	2	51	18	13	100
	Personal	10	3	35	24	28	100
	All purposes	20	3	31	22	24	100
Chukyo metropolitan area (weekdays)	Going to work	22	2	59	12	5	100
	Going to school	19	1	8	15	57	100
	Going home	13	1	56	13	17	100
	Business	5	0	87	4	4	100
	Personal	5	1	69	11	14	100
	All purposes	12	1	59	12	16	100
Chukyo metropolitan area (holidays)	Going to work	16	1	63	14	6	100
	Going to school	21	1	13	32	33	100
	Going home	7	1	75	8	9	100
	Business	4	0	84	7	5	100
	Personal	5	1	80	6	8	100
	All purposes	6	1	77	7	9	100

Source: Data for Tokyo are from the fifth survey (2008); for Keihanshin (weekdays & holidays), from the fifth survey (2010); and for Chukyo, from the fifth survey (2011).

16. Basic Transport Data for Major World Cities (2015, 57 Cities)

Cities	Population	Gross product of the area per person	Motor vehicle Ownership		Annual average distance traveled by private cars	Shares of transport modes			Average number of trips	Average travel time for private cars
			Passenger Car	Motorcycles		Public transport	Walking & bicecles	Private cars		
	(x1000persons)	(euro/person/Year)	(vehicles/1000persons)	(vehicles/1000persons)	(km/vehicle/year)	(%)	(%)	(%)	(trips/person/day)	(min.)
Abu Dhabi	913	78,700	528	6.0	12,618	4.9	11.8	83.3	2.06	22.0
Addis Abeba	3,384		35	3.8	4,637	48.2	42.7	9.1	1.11	60.0
Amsterdam	1,450	36,100	371	29.5						
Ankara	4,606	8,700	195	8.1	8,999					
Athens	3,828	26,200	718							
Barcelona	3,220	23,500	383	106.8		23.8	51.7	23.9	3.22	
Beijing	20,693	11,500	209							
Berlin	3,375	27,900	339	29.4		26.0	43.0	31.0	3.00	22.0
Birmingham	2,762	21,300	450	12.1	8,813	12.2	23.9	63.8	2.38	24.0
Brisbane	2,880	48,000	624	36.6	10,900	6.4	10.5	83.1	3.00	
Brussels	1,154	30,300	441	26.4	4,718	26.9	40.5	33.6	2.77	19.0
Budapest	1,727	22,300	327	13.4		37.0	24.7	38.3	2.13	
Casablanca	4,055	3,700	369			13.0	53.0	34.0	2.71	
Chicago	8,444		391	27.7	27,945	6.9	11.5	81.6	3.11	22.0
Copenhagen	1,691	57,700	360	18.8						
Delhi	16,753	2,900	147	296.2		21.5	45.0	25.1	1.43	
Dubai	2,003	32,100	461	10.0	17,937	10.9	13.2	75.9	1.81	32.0
Dublin	1,804	39,900	396	8.9		12.0	13.0	75.0	2.00	21.0
Geneva	470	81,400	467	110.1		16.0	42.0	41.0	3.40	27.0
Glasgow	2,162		440	8.3	14,182	12.1	25.0	62.9	2.80	
Gothenburg	1,600	36,800	453	30.6	14,442	10.6	28.1	59.7	2.74	
Hamburg	3,327	35,900	452	36.5		13.4	40.4	51.7	2.87	23.0
Helsinki	1,165		391	30.0		26.1	33.8	40.0	2.95	
Hong Kong	7,071	29,400	70	8.1	11,400	52.2	36.9	11.5	2.39	
Jerusalem	1,130		190	10.4		15.3	37.3	42.2	2.49	14.0
Johannesburg	4,434		171	6.5	8,134	10.0	30.9	57.0	1.10	
Lagos	20,621	4,800	75	1.5	6,867	48.0	40.0	12.0	1.07	60.0
Lisbon	2,800	20,100	433							
London	8,310	44,300	307	14.9	8,950	35.0	26.1	38.8	3.13	
Madrid	6,498	26,900	506	45.3		28.6	30.4	40.8	2.45	
Melbourne	4,194		593	24.4		7.5	18.0	73.7	2.85	19.0
Milan	2,123	43,000	570	111.5	3,747	42.3	13.1	44.5	2.47	22.0
Montreal	3,772		573			17.9	12.3	69.1	2.32	
Moscow	12,197	23,700	319	6.1	6,000					
Mumbai	20,748		28	50.4		45.0	33.0	22.0	1.66	
Munich	1,439	51,900	452	38.4		21.0	42.0	37.0	3.40	27.0
Nairobi	4,500		72			7.6	47.8	15.2	1.32	
Oslo	1,169	71,500	450	51.0	10,700	23.5	28.1	48.4	2.76	
Paris	11,978	45,800	414	41.8		20.3	40.4	39.2	3.40	23.0
Phoenix	4,087	36,700	584	22.5	15,641	1.4	10.1	84.3	3.76	14.0
Portland	1,489		840	28.4	8,873	4.2	12.0	83.7	3.70	17.0
Prague	1,246	27,300	538	63.9	9,898	52.8	21.8	25.4	2.95	14.0
Rome	2,913	42,800	641	142.2		25.7	14.0	60.2	1.97	
Seoul	24,734		271	33.4		36.9	23.7	39.3	2.37	30.0
Singapore	5,312	39,400	116	27.1	18,183	44.0	23.1	33.2	2.45	26.0
Stockholm	2,127	52,000	389	19.0	14,691	20.9	35.1	44.1	2.53	
Stranbourg	473	49,400	545			12.2	41.4	46.4	3.82	19.0
Sydney	4,676	47,900	500	20.9	13,088	5.9	19.1	72.9	3.48	19.0
Taipei	2,673		283	411.5		32.0	19.0	48.0	2.67	
Tallinn	416	16,200	378	16.0		40.0	34.0	26.0		
Tehran	8,400		370	38.0		12.7	36.2	51.1	2.76	25.0
Tokyo	37,239	39,600	329	30.6	7,742	33.0	36.0	29.0	2.45	
Turin	1,515	27,200	661			18.9	26.3	54.6	2.44	18.0
Vancouver	2,410		439	21.2		14.0	13.0	73.0	2.52	
Vienna	1,741	40,500	390	47.9	5,908	39.4	33.8	26.9	2.66	
Warsaw	1,715	25,600	575	19.2						
Zurich	1,406	71,400	484	72.2		21.4	29.6	49.1	3.47	

Source: MOBILITY IN CITIES DATABASE 2015

Annual supply of public transport	Length of roads	Average travel spped			Annual use		Population density in city		Urbanization rate
		Private cars	Railways	Buses	Private cars	Public transport	Population	Employment	
(Capacity: person kilometers /person)	(km/1000 persons)	(km/hour)	(km/hour)	(km/hour)	(person kilometers/person)	(person kilometers/person)	(persons/ha)	(persons/ha)	(%)
3,548	8.9	58.0		18.0	9,676	128	5.3	3.0	81.9
	1.4				654				
	3.6						42.8	26.2	33.7
6,949	12.9	29.0	38.5	22.2		2,502	26.4	9.6	25.1
	4.7						64.4		15.6
16,476		20.9	40.5	12.1	3,274	2,196	145.7	59.1	34.7
	1.0	24.8					164.0		10.3
13,678	1.6	24.9	34.0	19.5	3,224	1,968	53.9	19.1	70.1
3,694	2.8	21.3	39.7	19.0	6,284	1,084	55.5	25.6	55.8
6,093	10.9	41.2	43.0	28.0	7,471	721	6.8	2.8	20.1
9,342	1.6				2,794	2,046	86.2	53.4	83.3
10,314	2.5	25.0	19.9	15.8		3,008	63.2	27.5	52.0
	0.2						178.0	55.0	14.1
4,354	5.7		39.6	16.4	12,038	802	13.9	6.5	58.4
	3.2					2,246	22.9	12.3	28.7
3,206		23.5					238.7	75.5	47.3
4,129	1.9		42.1	15.5	11,595	789	19.6	12.9	24.8
6,451	0.3		46.4	19.4	3,730	730			
7,450	3.9	31.1	21.2	15.6		1,017	49.9	26.4	38.8
	6.8								
	17.2				11,153	1,536	10.6	5.2	6.5
10,690					8,439	2,196	21.6		17.7
8,279			42.8	27.1	4,024	1,909	18.8	10.3	41.1
22,029	0.3	28.4	31.9	18.6	1,230	4,606	255.2	102.6	25.0
4,161	2.1				2,402		88.3	27.4	26.0
3,839	2.0								
106	0.4	22.0			718	168	216.9	44.3	81.1
6,676				14.7		1,414	36.1	15.1	25.8
16,454	1.8	29.0			4,481	2,841	58.1	32.2	89.6
					2,838		80.2	37.3	10.0
					6,912		21.5		22.0
11,756	1.0	25.4			2,564		72.0	59.5	53.4
3,802			35.0	16.8		1,140	42.1	27.8	23.3
30,161	0.5	35.0	42.7	17.5		4,867	92.2	51.8	51.6
		16.0							
12,336			36.2	18.6		2,825	61.2	31.2	75.6
130									
9,887	5.1	25.6	47.5	16.8	4,269	2,091	28.0	16.7	8.3
12,443	3.1		37.7	17.0	2,907	2,497	40.1	20.3	24.8
		46.7			11,250	139	13.9	5.9	12.2
	11.7		22.8	19.1	9,864	514	15.0	7.6	81.6
18,641	3.2	25.7	27.7	16.7	2,521	4,827	53.5	27.8	46.9
8,607	2.7		37.1	15.4		2,856	100.4	41.1	22.5
	1.0				1,912		125.5	62.8	17.3
12,324	0.6	28.6	38.5	17.8	2,611	2,659	104.6	63.6	70.8
	5.2		43.4	25.2		2,482	24.1	12.9	13.5
6,572	3.8	21.7			4,393		106.8	55.4	14.0
			37.9	21.0	8,993	1,155	10.0	4.6	37.4
14,120	0.6		33.5	15.2		3,772	205.7	94.1	47.8
7,278	2.4		21.9	18.1		1,118	34.1	16.9	77.0
4,050	0.3	26.5	44.3	14.0	3,188	1,648			
	4.5	32.7	45.1	13.5	3,516	5,684			
4,418			26.0	17.1	4,425	1,221	61.6		29.3
4,944			37.7	19.9	6,270	1,222	26.8	13.9	31.1
13,523	1.6	25.0	30.8	17.3	2,725	1,733	75.0	41.6	55.8
12,456	1.1						53.7	41.9	61.6
12,195	5.2		48.9	17.8	6,457	2,189	37.2	20.0	23.0

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