Chapter 3 Cultivating and Expanding New Markets, Securing Leaders, and Adopting New Technologies

In Section 1: Cultivating and Expanding New Markets of Chapter 3: Cultivating and Expanding New Markets, Securing Leaders, and Adopting New Technologies, we will introduce initiatives relating to the overseas development of infrastructure systems and examples of the incorporation of inbound visitors based on the use of infrastructure from the standpoint of the importance of the incorporation of overseas growth fields into Japan, a country that is undergoing depopulation.

In Section 2: Securing Leaders for the Development of Infrastructure, Improving On-Site Productivity, and Adopting New Technologies, we will introduce various initiatives, including one that consists of the establishment of Japan Infrastructure Management Council (tentative name) for the purpose of leading the world in cultivating and activating a maintenance sector and promoting local industrialization in connection with measures to deal with securing and cultivating leaders in the construction industry who will serve as leaders in the development of infrastructure (such as by improving working conditions; ensuring steady, ongoing reviews; and promoting actions taken by young people and women) and measures to deal with the pressing issue of the superannuation of infrastructure. On the part on *Improving On-Site Productivity*, we will introduce the i-Construction initiative for enhancing productivity through the incorporation of ICT into the various processes involved in developing infrastructure and the latest trends in the development and adoption of next-generation robots for societal infrastructure, which are used to inspect infrastructure.

Section 1 Cultivating and Expanding New Markets

1 Overseas development of infrastructure systems

As we saw in chapter 1, Japan's domestic market is expected to shrink as the population declines due to the aging of the population and falling birthrates. At the same time, the infrastructure needs of the world are huge and are expected to continue growing. Against this backdrop, it is important that we proactively respond to the huge global demand for infrastructure by proceeding with the overseas development of infrastructure systems in order to support Japan's economic growth. We will analyze and look into the state of the overseas development of infrastructure systems below.

(1) Global demand for infrastructure and international competition

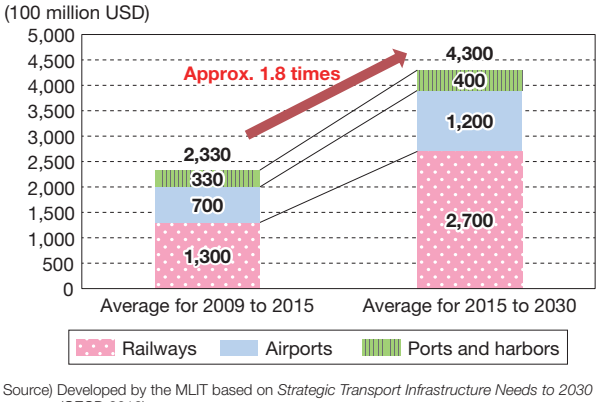
(Vigorous global demand for infrastructure)

As we saw in chapter 1, the global demand for infrastructure in 2030 will exceed USD 2,326 billion per year according to the Organization for Economic Co-operation and Development (OECD).

If we examine the demand for the development of railways, airports, ports, and harbors, we see that the average annual amount of demand for the years between 2015 and 2030 (USD 430 billion) is expected to be approximately 1.8 times greater than the average annual amount of demand for the years between 2009 and 2015 (USD 233 billion) (Figure 3-1-1).

If we focus on demand for infrastructure in Asia, it is estimated that approximately USD 8.2 trillion (annual average of approximately USD 750 billion) will be needed

Figure 3-1-1 Increasing global demand for the development of railways, airports, and ports and harbors



Source) Developed by the MLIT based on *Strategic Transport Infrastructure Needs to 2030* (OECD 2012)

in the eleven-year period between 2010 and 2020 [Note 57].

This data point establishes that the global demand for infrastructure is huge and growing.

(Shortage of funds for infrastructure investments)

At the same time, the gap in funding supplied in response to soaring demand (in other words, the infrastructure gap) is recognized as an international issue [Note 58]. In emerging and developing countries, it is estimated that there is an infrastructure gap of USD 452 billion per year [Note 59]. Just dealing with a lack of funds would be difficult given the dire fiscal situation that arises from any attempt to cover costs with only domestic funds, such that the use of private funds is believed to be necessary.

(Significance of the overseas development of infrastructure systems)

While the above describes what is happening in terms of the global demand for infrastructure, the overseas development of Japanese infrastructure systems would be advantageous for both (i) the seller (Japan) and (ii) buyers (other countries).

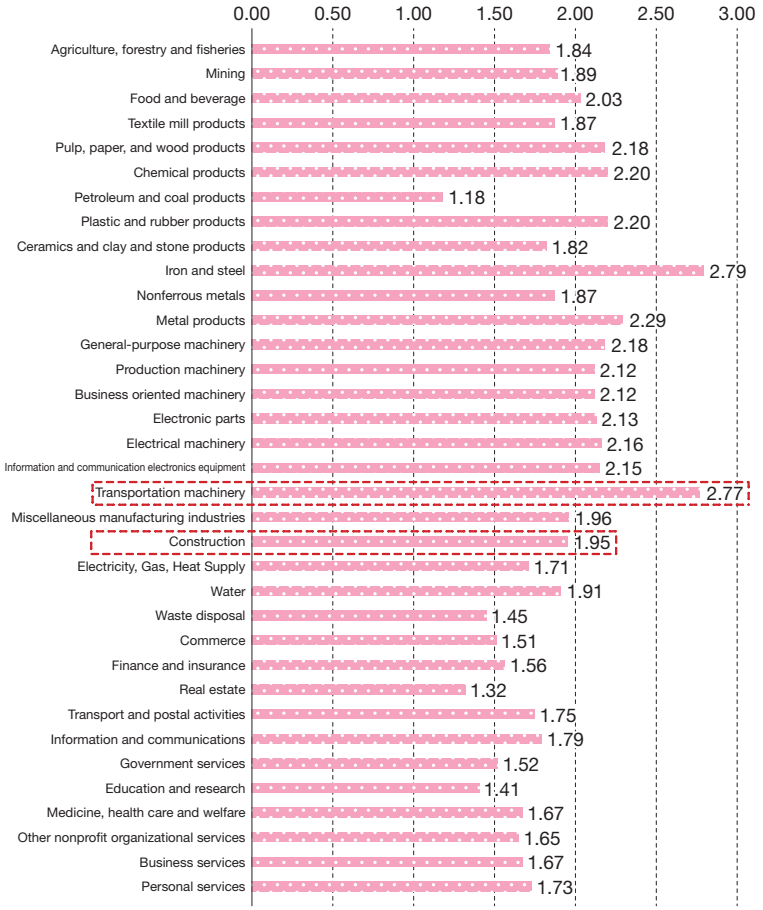
(i) Achieving Japan's economic growth

The overseas development of infrastructure systems will, as indicated in chapter 1, boost GDP and GNI and contribute to Japan's economic growth. By demonstrating the stock effects of developed infrastructure in local areas, we believe that the overseas development of infrastructure systems will also help in terms of the overseas expansion of Japanese companies.

By cultivating markets utilizing the IoT and other new technologies and otherwise proactively capturing the soaring overseas demand for infrastructure, outcomes that can help reinforce Japanese corporate structures and fortify price competitiveness and productivity can be expected.

If we look at the magnitude of the production spillover effect by industrial sector [Note 60], we see that transportation machinery (2.77) is second only after steel (2.79) (Figure 3-1-2) [Note 61]. Outside of the manufacturing industry, construction (1.95) also rates highly. While these

Figure 3-1-2 Magnitude of effect on production by industry



Source) Developed by the MLIT based on the 2011 Inter-Industry Relations Table as provided by the Ministry of Internal Affairs and Communications

Note 57 *Infrastructure for Asian Connectivity*, Asian Development Bank (ADB) (2012).

Note 58 PENSION FUNDS INVESTMENT IN INFRASTRUCTURE: POLICY ACTIONS, OECD (2011); "Toward an effective PPP business model: An eight-point for closing the infrastructure gap", World Bank.

Note 59 "Infrastructure Investment Demands in Emerging Markets and Developing Economies," World Bank (2015).

Note 60 Refers to the vertical sum of the inverse matrix coefficient table for an inter-industry relations table. An inverse matrix coefficient is a coefficient that expresses how much production will take place in the given category through demand for funds or services (subject to intermediate inputting) required for production in the given category where one new unit of final demand for the given category is generated.

Note 61 Steel has a large impact on its own category (impact of steel on its own category accounts for 2.19 out of the 2.79 figure indicated here).

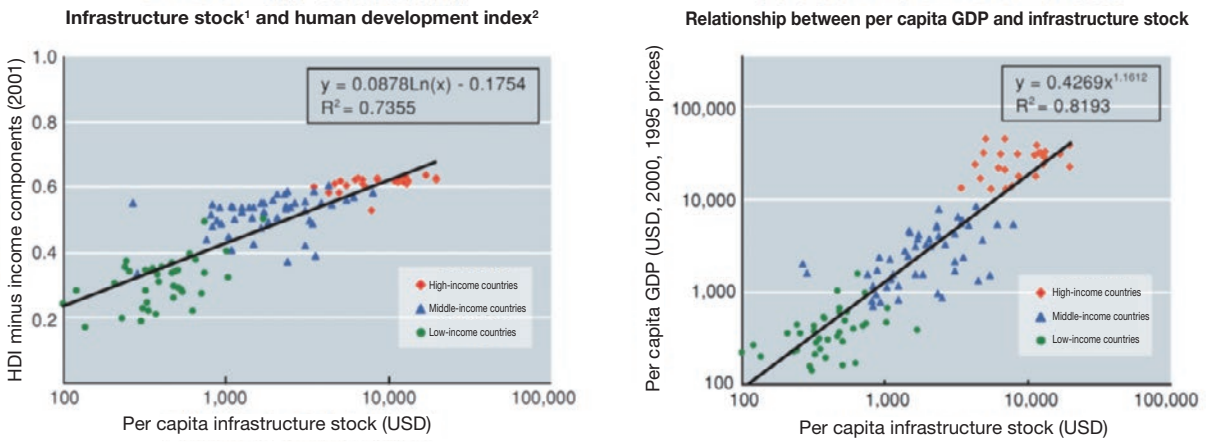
figures correspond to domestic increases in demand, it should be noted that a significant spillover effect is also likely to spread to other domestic industrial sectors as the size of the market for each of these sectors grows through the overseas development of infrastructure.

(ii) Contributing to partner countries and the international community

The text in (i) above sets forth the significance of development for the seller, in other words Japan. However, the abundant lives of people in partner countries through the realization of stock effects by developed infrastructure is also exceedingly important.

As indicated in Figure 3-1-3, both the human development index (HDI) and GDP relate proportionally to the stock of infrastructure.

Figure 3-1-3 Correlations between infrastructure and social development/economic development



(Notes) 1 Per-capita infrastructure stock is calculated by multiplying the amount of infrastructure stock related to electricity, roads, railways, water supply and sewerage systems, landline telephones, and mobile telephones in each country in 2000 by average prices divided by population.
2 HDI minus income components: Sum of three measures: average life expectancy (number of years), adult literacy rate (15 years of age and older) (%), and combined primary, secondary and tertiary gross enrolment ratio (%). With 0.67 constituting the highest attainable value, the higher this value the better. Equal to HDI minus income components.
3 Source: UNDP (2002), Human Development Report, M. Fay & T. Yepes (2003)
Source) Japan International Cooperation Agency (JICA)

Infrastructure fundamentally belongs to the location where it is situated. Proposals for optimal infrastructure systems based on needs that reflect the climate and culture of the partner countries are required.

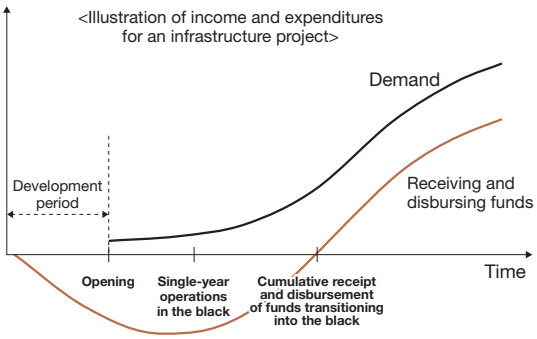
In addition to generating win-win outcomes in terms of growth for Japan and our partner countries, we believe that the act of contributing to the formulation of solutions to problems on a global scale—including those that concern urban issues, the environment, and disaster prevention—through the overseas development of quality infrastructure will also help to raise the profile of Japan on the global stage.

(Overseas infrastructure project risks)

Even as overseas infrastructure projects are meaningful as explained above, they also carry specific risks.

First, as outlined in the left-side illustration in Figure 3-1-4, infrastructure projects—both domestic and overseas—require huge amounts of investments, the return on which may correspond to a very long timeline. Additionally, as outlined in the right-side illustration in Figure 3-1-4, risks can be broadly divided as follows: political risks, commercial risks, and natural disaster risks. For example, many infrastructure projects involve a significant contribution on the part of the government of the partner country. In emerging countries, contractual violations by the government and unilateral rule changes made once the project is underway occur frequently (breach-of-obligation risk and systematic (revision) risk). There is also a demand risk in that we might not know whether users will increase in number over time as expected.

Figure 3-1-4 Main risks associated with overseas infrastructure projects



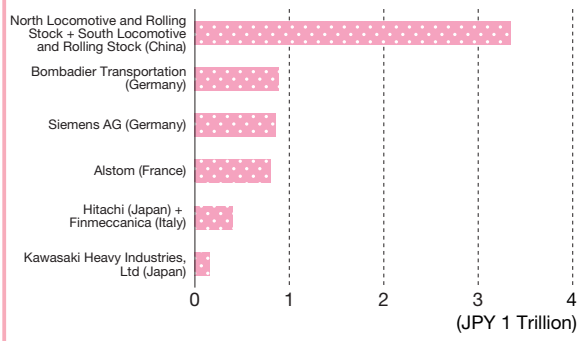
Political risks	Risk of political violence	- Riots, civil war, revolution, terrorism, labor strikes, and more.
	Risk of expropriation	- Assets are nationalized without appropriate compensation.
	Risk that the government of the partner country breaches its obligations	- The government of the host country or governmental bodies as the contractual counterparty breaches the contract in question.
	System (change) risks	- Legal system is underdeveloped or does not function adequately. - Legal system undergoes changes before the project is completed.
Commercial risks	Funding risk	- Expected amounts of funds cannot be procured when needed under the expected conditions.
	Completion risk	- Facilities are not completed in the expected period, under the expected budget, or in accordance with the expected level of performance.
	Operating risk	- The managerial capabilities or skills of the operating company are inadequate.
	Demand risk	- Sufficient demand at the expected price cannot be secured.
Natural disaster risks	Earthquakes, typhoons, fires, and more	- Affected by natural disasters.

Source) MLIT

(Fierce international competition in the infrastructure market)

International competition over the soaring global demand for infrastructure is exceedingly fierce. For example, if we look at sales figures posted by rail car manufacturers around the world, we see that, thanks to soaring domestic demand, a superior cost-competitive edge, and an effective foreign policy in China, Chinese enterprises are presently crushing European companies ("Big 3") that have long dominated the market (Figure 3-1-5).

Figure 3-1-5 Global sales posted by railway vehicle manufacturers (2013)



Source) MLIT

(2) Overseas development of quality infrastructure

The biggest advantage offered by Japanese infrastructure is quality. As captured by the traditional proverb in Japan that can be translated into "penny-wise and pound-foolish", there is a willingness in this country to choose items that are easier to use, last longer, and are of good quality even at the cost of paying a little more for such items.

In May 2015, Prime Minister Abe introduced Partnership for Quality Infrastructure in Japan. In November of the same year, an expansion of a program to accelerate procedures for futher acceleration of Japanese ODA loans to facilitate quality infrastructure investments was announced. In these and other ways, the government is spearheading the promotion of quality infrastructure investments.

Japanese concepts of 'quality' in the overseas development of infrastructure is embodied in the ease of use, longevity, and low lifecycle costs of infrastructure, in adherence to deadlines, in the consideration paid to environmental and disaster-prevention concerns, and in other values. In addition, superior technological strengths as seen in structural elements combined with efforts concerning non-structural elements, such as the establishment of systems and the provision of support for the development of human resources, also contribute to the enhancement of quality. In accelerating the process of supporting the provision of ODA loans to partner countries, competitiveness is reinforced through the expansion of systems pertaining to the aforementioned *quality infrastructure partnerships*.

The promotion of quality infrastructure investments that harness Japanese strengths is not only linked to the stimulation of the Japanese economy when Japanese companies receive new orders for infrastructure systems from overseas clients but also significant for promoting the development of infrastructure that is easy to use and long-lasting for our partner countries. For this reason, it is important that Japan continues to engage further in such efforts.

(Technological excellence of structural aspects and the advantages conferred by non-structural elements: Shinkansen [bullet trains] Lines—a high-speed rail system that is the pride of Japan)

The Shinkansen, Japan's high-speed rail system, was launched with the opening of the Tokaido Shinkansen line in 1964. Since then, this system has compiled an extensive track record of excellence and can rightfully be described as one of Japan's proudest achievements in terms of quality infrastructure. The Shinkansen's main claims to superiority consist of the following (Figure 3-1-6):

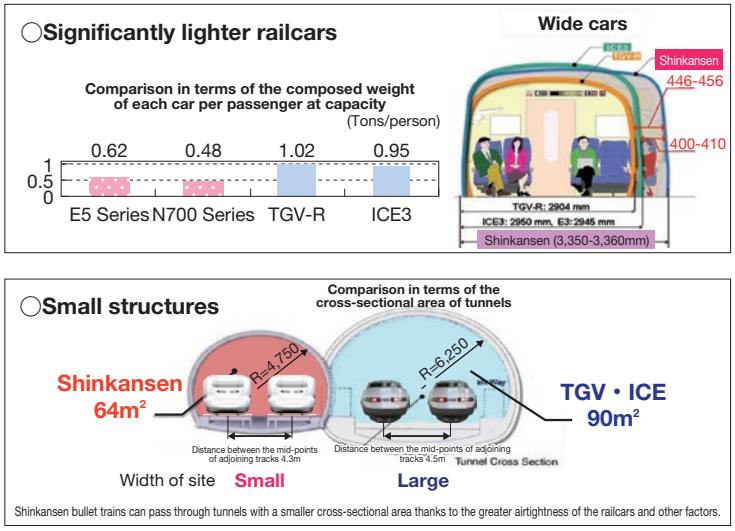
(i) Safety: Over the course of fifty-one years of operations, there have been exactly zero incidents giving rise to passenger deaths. An earthquake-detection system has also been adopted.

(ii) Reliability: The Tokaido Shinkansen operates at a peak frequency of fifteen trains per hour; irrespective of this high frequency of operations, the average delay time is less than one minute.

(iii) Efficiency: Significantly, lightweight cars are employed. At the same time, tunnels and other civil engineering structures are small, which means that construction costs can be kept low.

It is understood that the superiority of the Shinkansen can be attributed to the technological excellence of trains, signal systems, and other structural elements. Superior expertise with respect to non-structural elements, such as operations and maintenance, has also contributed a great deal to the positive reputation earned by the Shinkansen.

Figure 3-1-6 Comparative advantages of Shinkansen bullet trains



Source) MLIT

In addition, the task of cleaning the interior sections of Shinkansen cars has drawn much attention in recent years. Shinkansen trains are given about twelve minutes to turn around at Tokyo Station. If we deduct the time needed by passengers to board and disembark, there are only seven minutes left to prepare a train for turning around while it remains at a standstill. During this time, each staff member takes over a car containing at least one hundred seats and proceeds to rotate the seats; clean the windows, tables, and aisles; change seating covers; and check for lost items. Furthermore, before a train arrives at a station, staff members line up in a single queue at the edge of the platform. They bow to each incoming train and never fail to bow yet again to passengers getting on or off the train [Note 62]. The accuracy, speed, and decorum of such work were featured and lauded in a CNN feature entitled *Tokyo's seven-minute miracle*.

Japan's Shinkansen system was first adopted overseas as a high-speed rail system traveling the length of Taiwan. Since operations began in 2007, high levels of safety and reliability have been maintained. The adoption of a Shinkansen system as a high-speed rail option for a national project is an expression of the trust that others place in Japanese infrastructure. In light of the large earthquake that struck Taiwan in 1999 and other considerations, the safety and robustness of Japan's railway system were points that were taken into account by Taiwan when orders were being placed for Taiwan's high-speed rail system. For the inauguration of this system, technical instructions were provided to Taiwanese workers and follow-up action was taken with respect to non-structural elements. By earning trust in Japan in such a cumulative manner, an agreement was reached in December 2015 between Japan and India that called for the introduction of a Shinkansen system for a high-speed rail line between Mumbai and Ahmadabad [Note 63]. Japanese companies have been earning the trust of clients and successfully receiving orders in not just the field of high-speed railways but also in various other fields, including those that consist of urban railways, bridges, and other civil engineering projects.

Note 62 *The Cleanup Angels of the Shinkansen: How Did the World's Best On-Site Capabilities Emerge?* Isao Endo (2012).
Note 63 Details are provided in the accompanying column piece.

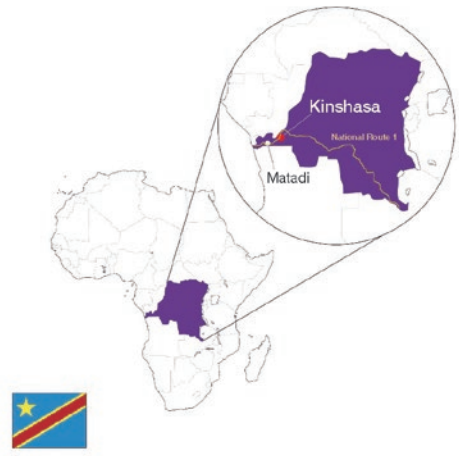
(The development of human resources capable of inheriting Japanese know-how: Matadi Bridge—a friendship bridge linking Japan and the Congo)

The Matadi Bridge was built with Japanese yen loans and has continued to support the economy of the Democratic Republic of the Congo as the only bridge crossing the Congo River for over thirty years since its completion (Figure 3-1-7). Although there was a time partway through that period when Japanese officials were forced to be repatriated due to political strife in that country, it was the staff members of the Organisation pour l'Equipement de Banana-Kinshasa (OEBK) who continued to protect the Matadi Bridge during this time. Relying on a maintenance manual that was left behind, these staff members managed to maintain the bridge through their own self-help efforts while receiving advice through channels of communications established with officials who had returned to Japan. The staff members of OEBK were spurred to action by a sense of responsibility that arose out of a belief that they had to maintain the bridge themselves after the Japanese officials with whom they had worked together and from whom they had received technologies and a proper mindset for maintenance left the country.

In June 2013, a ceremony to commemorate the thirtieth anniversary of the completion of the Matadi Bridge was held. At this time, the original Japanese officials who had worked on the bridge returned to the area at their own expense, cried tears of joy upon reuniting with the staff members of OEBK atop the bridge, and were struck with wonder at how well the bridge had been maintained to look as if it had just been completed.

Japanese infrastructure development enjoys a competitive edge in that proposals can be made on a packaged basis incorporating initiatives concerning non-structural elements in the form of human resources development and the provision of support for the establishment of systems. The utility of the infrastructure in question can be maximized and the long-term growth of the partner country can also be boosted by not just focusing on aspects involved in the development of a business environment for Japanese companies but also performing various examples of after-sales service, such as by operating established systems and maintaining the infrastructure in question after it is completed or by transferring technology to enable the partner country to independently maintain and operate the infrastructure in question. The story of the Matadi Bridge teaches us that the overseas development of Japanese infrastructure does not simply involve the infrastructure itself but is meaningful in a long-term sense in that it helps to cultivate human relationships, fosters pride in a job well done, and allows Japanese infrastructure to take root in local settings around the world.

Figure 3-1-7 Matadi Bridge and a map showing its location



Source) Image provided by the Japan International Cooperation Agency (JICA)

(3) Strategies and plans of the government and the MLIT

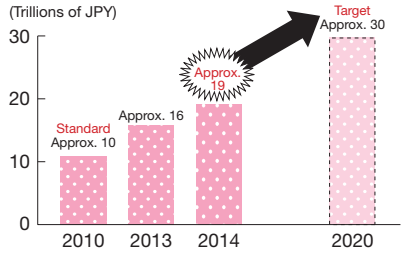
What will be needed to engage in the overseas development of infrastructure in the face of fierce international competition are the autonomous efforts of the private sector, as well as the strategic capturing of markets through private-public partnerships that also include the involvement of top sales executives.

(Infrastructure system export strategy: government strategy)

The government formulated the "Infrastructure System Export Strategy" in May 2013, through which it aims to increase orders for infrastructure systems, which came in at approximately JPY 10 trillion in 2010, to approximately JPY 30 trillion by 2020. Orders increased to approximately 19 trillion yen in 2014 (Figure 3-1-8).

Figure 3-1-8 Record of received orders for Japanese infrastructure and a breakdown by category

◎Statistically based record of infrastructure orders (Note)



(Reference) Breakdown by major categories (rounded, trillions of JPY)

Category		2010	2014
Energy		3.8	5.6
Transportation		0.5	1.0
Information and communications	Communications businesses	1.0	5.7
	Communications equipment	3.0	3.4
Infrastructure development		1.0	1.8
Living environment		0.3	0.4

(Note) Comprehensive totals tallied based on statistical values and responses to questions posed to industrial groups. Includes amounts of revenue derived from business investments.
Source) Materials compiled at the twenty-fourth conference of the Economic Cooperation Infrastructure Strategy Council

(MLIT action plan for the overseas development of infrastructure systems)

In light of the major role played by the MLIT in the overseas development of infrastructure, the MLIT action plan for the overseas development of infrastructure systems was formulated in March 2016.

This action plan specifically sets forth a plan for the fields of land, infrastructure, transport, and tourism in accordance with the Infrastructure System Export Strategy, an overall strategy of the government, and clarifies the following points, which will be important as the MLIT further seeks to reinforce the overseas development of infrastructure.

Point 1 Formulating policies for initiatives by region and country

Projects for the overseas development of infrastructure, which will constitute MLIT-related focal points in different regions and countries, shall be organized and strategic approaches inclusive of the role played by effective top sales officials shall be carried out accordingly. Thorough, maximum efforts shall be expended for the ASEAN region, where economic growth is expected to expand further in the future thanks to the establishment of the ASEAN Economic Community (AEC) and the Trans-Pacific Partnership (TPP) Agreement and which is regarded as both a market that we simply cannot afford to lose and a key battleground. Policies on actions to be taken according to region and country have been stated and key projects that should be placed under scrutiny over the next three to four years have been identified in particular from the standpoint of securing new orders from each country.

Point 2 Reinforcing initiatives concerning non-structural elements

As the competitive advantages enjoyed by Japan comprise not just the structural elements that consist of low lifecycle costs, ease of use, and long service lives, but also the provision of support through non-structural elements, we will combine the development of structural elements with the attainment of international standards, the provision of support for the establishment of systems in partner countries, and the provision of support for the development of human resources to man the operations of such systems, and otherwise promote a package of initiatives concerning non-structural elements.

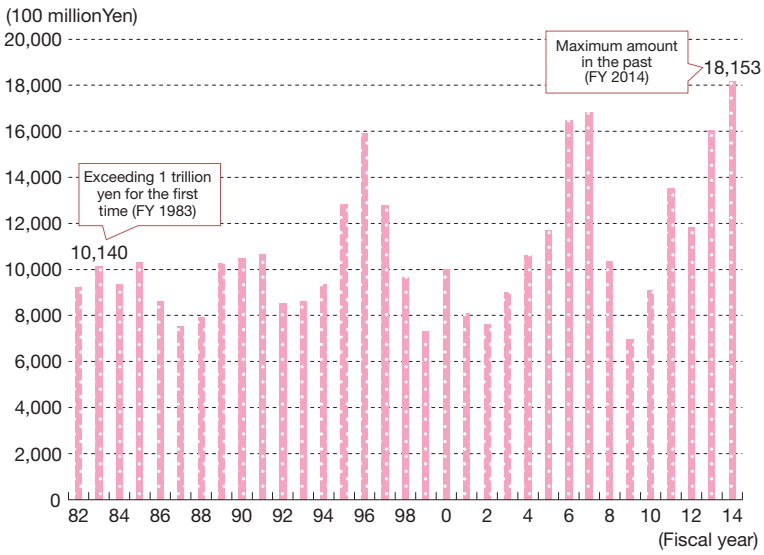
Point 3 Promoting participation in PPP projects

It would be difficult for the staggering amount of demand for infrastructure around the world to be met with just public investments. We are seeing more and more examples of the use of private funds in infrastructure projects, which have come to represent huge business opportunities. For this reason, the MLIT established the Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development (JOIN), a public-private partnership fund, in October 2014. JOIN will be used to maximum effect to proactively provide support for the overseas development of private sector companies.

Point 4 Promoting the overseas development of the construction sector

In FY 2014, Japanese construction companies posted a record-high JPY 1,815.3 billion in orders from overseas clients (Figure 3-1-9) as a key industry for the overseas development of Japanese infrastructure. In light of expectations that the construction sector will continue to play a significant role, initiatives in terms of the development of a business environment and troubleshooting will be implemented.

Figure 3-1-9 Transition in Orders Received in Overseas Countries by Japanese Construction Companies



Source) Developed by the MLIT based on materials provided by the Overseas Construction Association of Japan, Inc

Point 5 Reinforcing support for small and medium businesses with ties to the MLIT and the overseas development of their technologies

It is important to unlock latent demand and otherwise proactively provide support, such as by endeavoring to stimulate overseas development on the part of small to medium-sized enterprises and creating opportunities for making forays into overseas markets. Business-matching initiatives shall be carried out in conjunction with the provision of opportunities to engage in top-level sales activities for technologies belonging to small and medium-sized companies in connection with large-scale infrastructure projects.

Point 6 Enhancing competitiveness in terms of price and the speed at which client needs are accommodated

The perspectives of partner countries will be thoroughly considered, system-expansion measures as they relate to the deployment of quality infrastructure partnerships will be utilized to the fullest extent possible, and initiatives to reinforce competitiveness in terms of price and speed will be pursued.

Point 7 Reinforcing promotional activities to effectively elevate the profile of quality infrastructure

In engaging in the overseas development of infrastructure, it will be essential to proactively elevate the profile of quality infrastructure from which Japan derives a competitive advantage for top-level government leaders, high-level public officials, and the citizens of partner countries. Effective, strategic public relations activities shall be undertaken accordingly.

Point 8 Initiatives for new overseas development projects based on the use of information communication technology and other new technologies

Proactive endeavors by Japan to highlight original, superior infrastructure systems, such as by promoting the Internet of things, artificial intelligence, sensors, and other elements of information communication technology; utilizing big data and otherwise deploying new technologies; and harnessing new transportation systems and engaging in advanced forms of urban development, are important.

Point 9 Initiatives to enable Japanese companies to undergo further evolution as global enterprises

In order to further incorporate the huge overseas demand for infrastructure, it is important that Japanese companies reinforce corporate structures and business-promotion systems tied to globalization and clarify more powerful overseas

strategies. The MLIT shall move to implement an action plan and engage in the development of an environment to enable more private companies to embark on overseas development.

Column India's high speed railway

In the Japan-India summit meeting in Delhi, India, on December 12, 2015, both governments signed the memorandum of cooperation regarding the introduction of the Shinkansen system into the high-speed railway between Mumbai and Ahmedabad.

Since the Indian government announced the plan for a high-speed railway in 2009, we had energetically worked, while cooperating with relevant ministries for top-to-top selling through working level jobs in partnership with the private sector, toward the introduction of the Shinkansen system to India. Specifically, we had conducted the Joint Feasibility Study for Mumbai—Ahmedabad High-Speed Railway Corridor, research of the business aspect of this plan, as a cooperative project between Japan and India from December 2013 to June 2015 and had held seminars on high-speed railways four times in India since 2012 while inviting key Indian government officials to Japan in order to promote their understanding of Japan's railway technology, including the Shinkansen system (Figure 3-1-10). In particular, at the International Railway Equipment Exhibition (IREE2015) in October in 2015, Japan participated as a partner country and promoted our high-quality railways, including the Shinkansen system of greater safety and accuracy.

As the results of our continuous and vigorous approaches in the past, and the formation of the public opinion that appreciates Japan's railway technology in the relevant regions, we reached an agreement on the introduction of the Shinkansen system to the high-speed railway system between Mumbai and Ahmedabad. From now on as well, we will work together with the relevant ministries in partnership with the private sector toward realization of the first route for a high-speed railway in India.

Figure 3-1-10 Prime minister Modi of India visits Japan

Source) Website of the Prime Minister of Japan and His Cabinet (http://www.kantei.go.jp/jp/97_abe/actions/201512/12india.html)

2 The incorporation of inbound visitors and infrastructure

(1) Analyzing trends concerning inbound foreign tourists

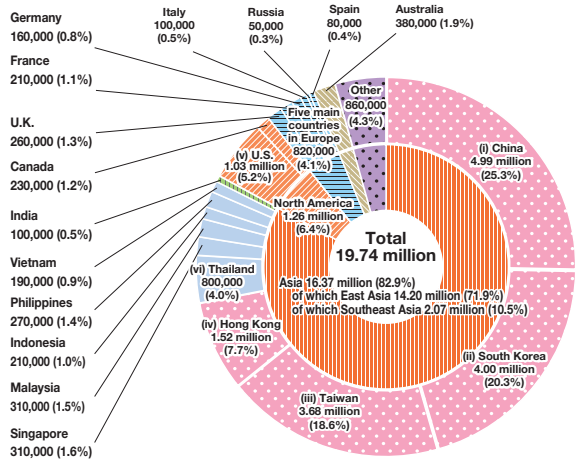
(Trends in terms of inbound visits and the status of consumption by country)

According to the UN World Tourism Organization (UNWTO), the number of overseas tourists to Japan in 2015 rose by 4.4 percent on a year-on-year basis (approximately 50 million tourists) to approximately 1,184 million tourists. This number has been rising rapidly since 2010. With respect to the Japanese economy, the domestic market is expected to shrink due to the reduction in the size of the population. It is thus important to integrate demand for inbound tourism from overseas and harness tourism as a trump card for regional revitalization and as a key pillar for a growth strategy designed to enable GDP to reach JPY 600 trillion.

As described in chapter 1, a record number of inbound foreign tourists, 19.74 million, flocked to Japan in 2015 (a year-on-year increase of forty-seven percent) and a record amount of spending by foreign visitors to Japan, JPY 3,477.1 billion, was posted in the same year (a year on-year increase of seventy-one percent).

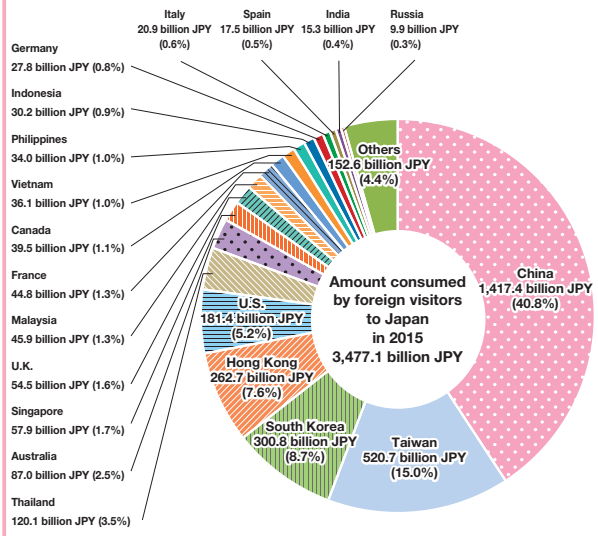
In particular, demand on the part of inbound tourists from Asia has increased, with the number of inbound foreign tourists and the amount of spending in 2015 both accounting for approximately eighty percent of their respective totals (Figure 3-1-11 and 3-1-12).

Figure 3-1-11 Number of foreign visitors to Japan and their percentage distribution (by country/region) (provisional figures for 2015)



(Notes) 1 Values in parentheses indicate share as a percent of all international visitors to Japan.
2 "Other" is Asian, European or other countries/regions not otherwise shown in the pie chart.
3 Values may not add up to totals because their fractions are rounded.
Source) Developed by the Japan Tourism Agency based on materials provided by the Japan National Tourist Organization (JNTO)

Figure 3-1-12 Amounts consumed by foreign visitors to Japan and their percentage distribution (by country/region) (confirmed figures for 2015)

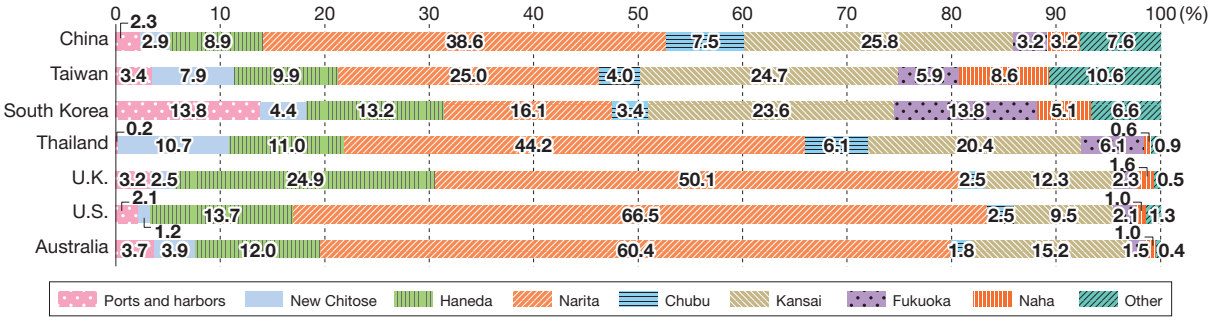


Source) Japan Tourism Agency

(The state of entries and departures)

If we look at the percentages relating to the utilization of airports, ports, and harbors as ports of entry for inbound foreign tourists by airport of entry for major countries, we can see that Narita Airport welcomes the biggest numbers of inbound foreign tourists regardless of nationality, with the exception of tourists from South Korea. Tourists from the United Kingdom, the United States, and Australia overwhelmingly chose to arrive at airports in the Tokyo metropolitan area, namely Haneda Airport and Narita Airport. In contrast, many tourists from the Asian region—namely China, Taiwan, South Korea, and Thailand—also chose to arrive at Kansai International Airport. As tourists from South Korea and Taiwan often take regular flights to regional airports, airports of entry have become diversified. With many tourists from South Korea in particular also arriving at ports and harbors, modes of entry are varied. The regions within Japan that welcome foreign tourists from nearby Asian countries are likewise diversifying. For example, more Thai visitors arrive at New Chitose Airport than tourists from other countries.

Figure 3-1-13 Breakdown of foreign visitors to Japan from major countries by port of entry (2014)



(Note) For China and the United Kingdom, only visitors entering and leaving Japan whose nationality matches their area of residence are counted.
Source) Developed by the MLIT based on the Ministry of Justice's *Immigration Control Statistics*.

Column

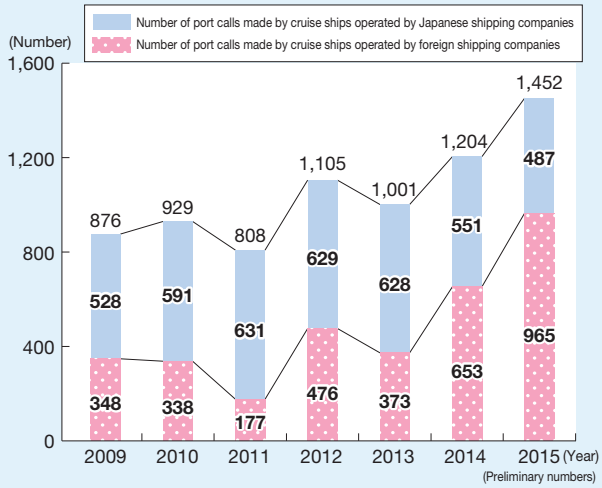
Realization of the era of welcoming one million foreign visitors by cruise ships

MLIT has accelerated improvement of the environment for reception of cruise ships and tried to realize the era of welcoming one million foreign visitors by cruise ships in 2020, in order to revitalize regions through

travels to Japan by cruise ships under the Action Program toward Realization of Japan as a Tourism-Oriented Country.

For this purpose, we set up a one-stop counter in the Harbors Bureau, responded to inquiries from cruise shipping companies in a unified manner, and advanced initiatives in cooperation with the National Cruise Vitalization Conference and in partnership with the private sector, such as promotions through meetings for business negotiations involving the participation of cruise shipping companies and port administrators, enhancement of websites that integrate data from port facilities and the tourist information around ports of call, improvements to the piers that accept large cruise ships, and establishment of the notification system for temporary tax-free shops at the piers for cruise ships.

Figure 3-1-14 Number of port calls made by cruise ships at Japanese ports



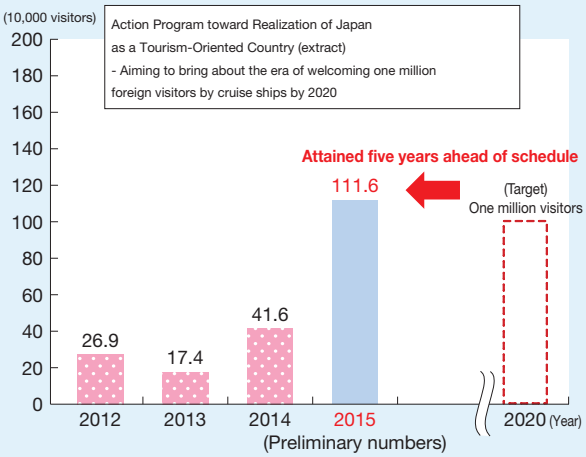
(Note) Figures for 2015 constitute preliminary numbers obtained by asking port administrators and are subject to revision in the future.
Source) MLIT

Partly because of these efforts, the number of calls at ports hit a record high 1,452 (preliminary numbers) in 2015 (Figure 3-1-14). In addition, the foreign visitors to Japan by cruise ships exceeded one million a year in December of the same year, achieving the target number five years earlier than we planned (Figure 3-1-15 and 3-1-16).

Cruise ships have called at ports throughout Japan, bringing high tourism consumption and prosperity to each region and contributing to the vitalization of local districts. Furthermore, when the ships have visited ports, local high school students have guided the foreign tourists to sightseeing places, so the calls of cruise ships have provided opportunities for young human resources in Japan to rediscover the attractiveness in local districts and for cultural exchanges between the residents and foreign visitors.

In the Tourism Vision Design Council for supporting the tomorrow of Japan held on March 30, 2016, a new goal to achieve five million foreign visitors by cruise ships in 2020 has just been set. From now on as well, MLIT will aggressively take the initiative in both non-structural and structural elements in order to vitalize the local districts through cruise promotion.

Figure 3-1-15 Number of Foreigners Who Enter Japan by a Cruise Ship (rounded figures)



(Notes) 1 For the years up to 2014, rounded figures are based on numbers of foreign visitors as derived from totals supplied by the Ministry of Justice's Immigration Bureau (excluding the crews).
2 Where a cruise ship on a single cruise trip makes port calls at multiple ports, the number of foreign visitors is calculated by deeming that each visitor enters the country once (rather than deeming that a visitor enters the country every time a port call is made at a different port).
Source) MLIT

Figure 3-1-16 Ceremony to commemorate of welcoming one million foreign visitors to Japan by cruies ships (held in the Central Pier Cruise Center at Hakata Port on December 8, 2015)

Source) MLIT

(Modes of travel undertaken by visitors to Japan from the Asian region)

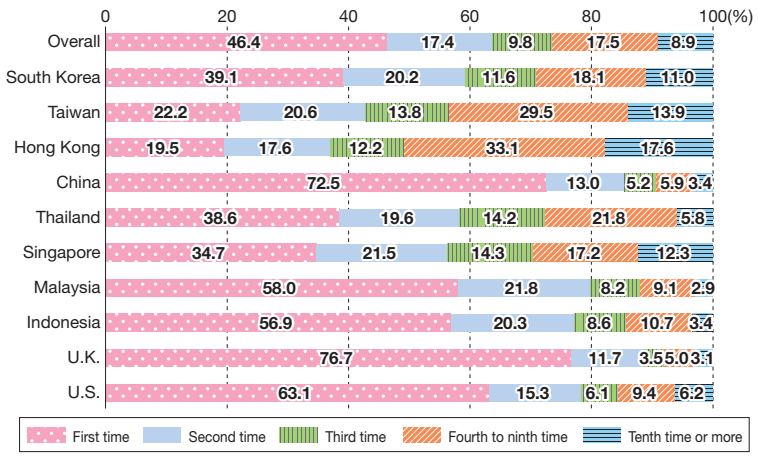
Next, let us examine, by focusing on the top eight countries in Asia in terms of the number of tourists to Japan, the characteristics, in terms of purpose of travel and the locations that are visited, of inbound foreign tourists from Asia whose numbers are expected to continue rising.

According to a 2015 Consumption Trend Survey for Foreigners Visiting Japan, there are many countries whose tourists indicated that they were visiting Japan at the time for the first time. Just over seventy percent of tourists from China, the country that accounts for the most number of visitors to Japan, indicated for this survey that they were visiting Japan for the first time. On the other hand, approximately half of all tourists from Hong Kong reported that they were visiting Japan for at least the fourth time, such that one can conclude that many travelers from Hong Kong make repeated trips to Japan (Figure 3-1-17).

If we examine the methods by which trips were arranged, we see that Chinese tourists (56.2 percent) tended to participate in group tours the most followed by tourists from Taiwan (44.7 percent). In all other countries, tourists choosing to arrange trips on their own outnumbered tourists choosing to arrange trips by any other means (Figure 3-1-18). In tying these figures to the number of visits made to Japan, we believe that there is a meaningful correlation between the high percentage of Chinese tourists who indicated that they were visiting Japan for the first time and the high percentage of Chinese tourists who were participating in packaged tours.

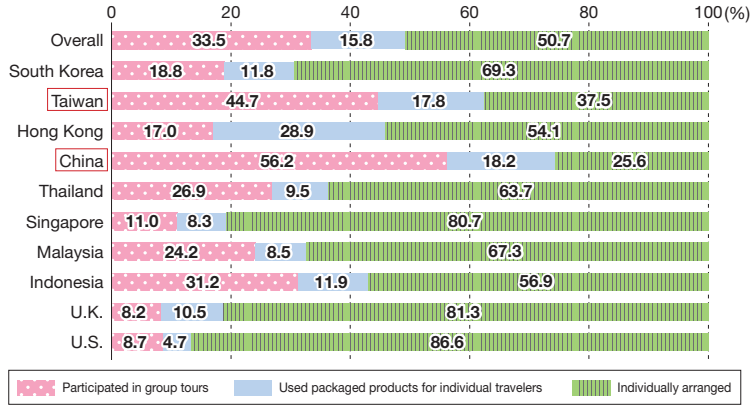
According to a survey on the intentions of inbound foreign tourists from eight regions across Asia that was conducted by the Development Bank of Japan jointly with the Japan Travel Bureau in July 2015 [Note 64], many tourists indicated that they would like to freely engage in tours when asked about their general attitude

Figure 3-1-17 Number of visits to Japan by foreign visitors to Japan from major countries (for tourism and pleasure)



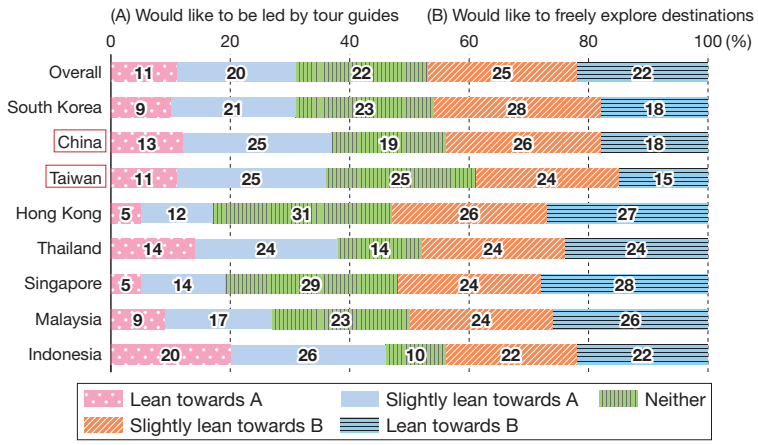
Source) Developed by the MLIT based on the 2015 Consumption Trend Survey for Foreigners Visiting Japan (Japan Tourism Agency)

Figure 3-1-18 Methods by which trips were arranged by foreign visitors to Japan from major countries (for tourism and pleasure)



Source) Developed by the MLIT based on the 2015 Consumption Trend Survey for Foreigners Visiting Japan (Japan Tourism Agency)

Figure 3-1-19 Tour styles desired for overseas trips



Source) *Survey on the Intentions of Inbound Foreign Tourists from Eight Regions Across Asia (2015)* (Development Bank of Japan/Japan Travel Bureau)

Note 64 An online survey administered to male and female individuals aged between twenty and fifty-nine years who have previously traveled overseas residing in eight regions across Asia (South Korea, China, Taiwan, Hong Kong, Thailand, Singapore, Malaysia, and Indonesia). Approximately 500 respondents from each country gave valid responses for a total of 4,111 respondents who gave valid responses. (This survey was administered in China only to residents of Beijing and Shanghai, with half of respondents residing in Beijing and half of respondents residing in Shanghai.)

concerning overseas travel, such that the number of individual travelers to Japan is expected to increase (Figure 3-1-19).

Tourists who have previously been to Japan also indicated a high degree of desire to visit tourist destinations in local regions. In particular, we can see that tourists are exposed to the appeal of regional areas once they visit tourist destinations in local regions and are likely to be more eager to visit such destinations in the future (Figure 3-1-20). In terms of what tourists would like to do at tourist destinations in local regions, responses show that tourists wish to engage in experiences that are unique to the given location, such as by consuming locally grown foods and visiting hot springs and enjoying a nature-based experience.

Figure 3-1-20 **Survey as to whether or not visits have been made to local regional tourism destinations in Japan and on intentions to visit in the future (administered to people who have previously visited Japan)**

(Single choice)

Respondents→		Overall	South Korea	China	Taiwan	Hong Kong	Thailand	Singapore	Malaysia	Indonesia
Sample size		2,153	329	335	366	388	242	228	127	138
Have visited previously	I have visited previously and would definitely like to visit again.	35%	21%	44%	33%	39%	40%	35%	29%	42%
	I have visited previously and would like to visit again if an opportunity arises.	32%	37%	31%	37%	28%	33%	26%	28%	32%
	I have visited previously but do not really wish to visit again.	4%	6%	2%	2%	5%	3%	4%	6%	2%
	I have visited previously but cannot see myself visiting again.	2%	4%	1%	1%	1%	2%	3%	2%	4%
	(Subtotal) Have visited previously	73%	67%	78%	74%	73%	77%	68%	66%	80%
Have not visited previously	I have not visited previously but would definitely like to visit someday.	16%	18%	16%	16%	12%	13%	21%	21%	14%
	I have not visited previously but would like to visit someday if an opportunity arises.	10%	14%	6%	9%	13%	8%	8%	11%	6%
	I have not visited previously and do not really wish to visit someday.	1%	0%	0%	0%	1%	1%	2%	1%	0%
	I have not visited previously and cannot see myself visiting someday.	1%	1%	0%	1%	2%	0%	2%	1%	0%
	(Subtotal) Have not visited previously	27%	33%	22%	26%	27%	23%	32%	34%	20%
(Subtotal) Definitely would like to visit		51%	39%	60%	49%	51%	53%	55%	50%	57%
(Subtotal) Definitely would like to visit + would like to visit if an opportunity arises		93%	89%	97%	96%	92%	94%	89%	90%	94%

(Notes) 1 Questions regarding local regional tourist destinations were asked in terms of areas situated at a distance from the Tokyo metropolitan area and other metropolitan areas.
2 Questions were posed to people who have previously visited Japan as to whether or not they visited a local regional tourism destination during their most recent visit to Japan and as to their intentions to visit a local regional tourism destination in the future.
Source) *Survey on the Intentions of Inbound Foreign Tourists from Eight Regions Across Asia (2015)* (Development Bank of Japan/Japan Travel Bureau)

Stimulating the economy through the development of a system of accepting tourists and the establishment of tourism destinations that reflect the unique appeal of the locations in which they are situated in order to accommodate such diversification in the actions and needs of foreign travelers is important.

Column Global Power City Index

Global Power City Index 2015 was published, ranking Tokyo fourth. This index has been reported by the Institute for Urban Strategies of the Mori Memorial Foundation every year since 2008, evaluating 40 main cities in the world from the viewpoints of economy, culture, and environment under the concept that in the global-scale competition among cities, the "magnetic force" of a city attracting appealing and creative people and enterprises around the world as the comprehensive strength of the city.

Ranked at the top is London, second New York, and Tokyo comes in fourth for the eighth consecutive year following Paris in third. Although in first place in Asia, let's think about the strengths and weaknesses of Tokyo.

Looking to each category, one of the strengths of Tokyo is the economy, as Tokyo has maintained a ranking at the top in the world. Another is research and development where Tokyo is ranked second. In culture and exchanges, Tokyo moved up one notch to fifth due to the tendency for a depreciation of the yen, and the increases in foreign visitors and students studying in Tokyo from around 2012. Toward the Tokyo Olympics in 2020, the city is expected to attain a higher rank in this category.

As for the weaknesses, one is the environment where evaluations on the reduction of CO_2 emissions,

recycling, and renewable energies, are relatively low. Other weaknesses are transportation and access in which insufficient infrastructures link Japan and overseas, such as the small numbers of cities that are serviced by nonstop international flights from Tokyo, fewer international air passengers, and living conditions due to the higher average rent of residential houses and the price level, all of which lower the evaluation.

Japan has been selected as the No. 1 country in Asia that people most want to visit for the fourth consecutive year [Note], and Tokyo is regarded as especially popular among the regions. In order to strengthen the comprehensive force of this city, it is important to heighten its attractiveness as a city while understanding the strengths and weaknesses shown above.

Figure 3-1-21 Global Power City Index

Source) Institute for Urban Strategies of the Mori Memorial Foundation

Note Development Bank of Japan Inc. and Japan Travel Bureau Foundation [Survey on the intentions of inbound foreign tourists from eight regions across Asia (2015)]

(2) Initiatives and infrastructural elements to promote tourism to every corner of the country

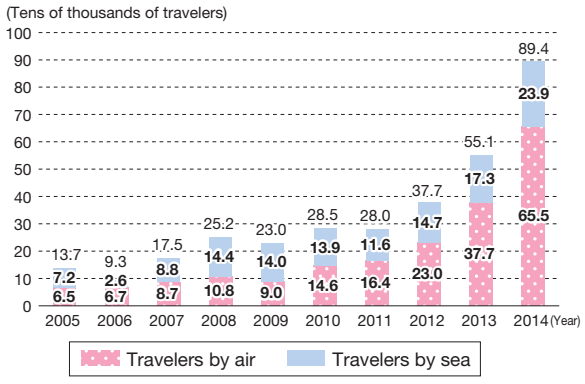
(Developing a system of accepting tourists)

In order to accept increasing numbers of foreign travelers, ports of entry for arrivals by sea and air will need to be developed. Let us showcase areas that have integrated the revival of tourism with the development of infrastructure to incorporate demand for inbound tourism.

■ Naha Port and Naha Airport (Okinawa)

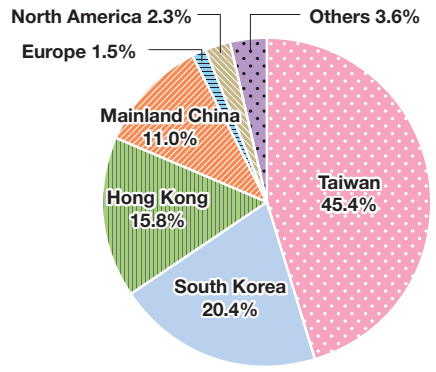
Okinawa is Japan's foremost prefecture of remote islands and comprises thirty-nine remote islands spread across a broad maritime area. Each remote island is blessed with extensive amounts of attractive tourism resources, including island culture and history, emerald-green seas, and white sandy beaches. These islands are visited by large numbers of domestic and overseas tourists. Approximately 890,000 foreign tourists, a record high figure, visited these islands in 2014 (Figure 3-1-22). Thanks to their proximity to Asia, these islands are a favored destination for many travelers from Taiwan and South Korea (Figure 3-1-23).

Figure 3-1-22 Changes in the number of foreign travelers visiting Okinawa



(Note) Does not include foreigners arriving via a domestic route.
Source) Developed by the MLIT based on Okinawa Prefecture's *2014 Tourism Catalog*

Figure 3-1-23 Breakdown of foreign travelers by nationality (2014)



Source) Developed by the MLIT based on Okinawa Prefecture's *2014 Tourism Catalog*

In Okinawa, tourism is regarded as a sector that acts as an engine for the prefectural economy. With a goal of receiving 10 million tourists (of whom 2 million shall consist of foreign tourists), the prefecture is engaged in the development of a system for accepting rapidly rising numbers of tourists and in the development of tourist facilities for these tourists.

At Naha Port, a port of entry for arrivals by sea, quays and cruise ship terminals were developed in order to accommodate increasing numbers of port calls by foreign vessels and the enlargement of vessels; these facilities began operations in April 2014. In addition to establishing screening booths and customs inspection stands at these facilities to receive foreign travelers, operators have also developed settings to allow visitors to obtain a sense of the local culture, such as by setting

up space where local traditional craftwork can be exhibited. With welcoming ceremonies being held and private hospitality initiatives being carried out whenever cruise ships call, 2015 saw a record number 105 port calls made by foreign cruise ships to smash the figure of sixty-eight such port calls made the preceding year (according to preliminary numbers).

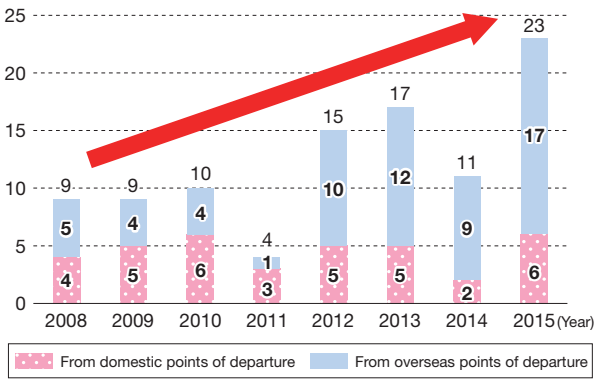
A port of entry for arrivals by air, Naha Airport is a hub within Okinawa that is used by twenty-three domestic routes (exclusive of flights taking place only within the prefecture), ten international routes, and six routes linking Naha to remote islands within the prefecture (as of March 2016). Owing to increasing numbers of foreign travelers, the number of arriving international flights has been increasing since around FY 2010. In FY 2014, three new routes were added and the number of flights was increased for three existing routes. For this reason, construction work on second runway was commenced in January 2014 as part of efforts to expand the system for accepting foreign travelers (set to begin operating in March 2020).

The revival of tourism is inextricably linked to the development of infrastructure in Okinawa, a prefecture surrounded on all sides by the sea.

■ Sakai Port (Tottori)

Sakai Port is situated in the San-in area, an area blessed by natural beauty and an ancient legacy of Japanese history and culture. It has long been a center of commerce as a port used for trade with the continent. To the rear stands Izumo-taisha shrine and numerous other examples of historical sites, as well as hot springs and varied examples of tourism resources, including plenty that have been featured in works of manga and anime (such as *GeGeGe no Kitaro*). Sakai Port is expected to serve as an important node of local commerce.

Figure 3-1-24 Number of port calls made by cruise ships at Sakai Port

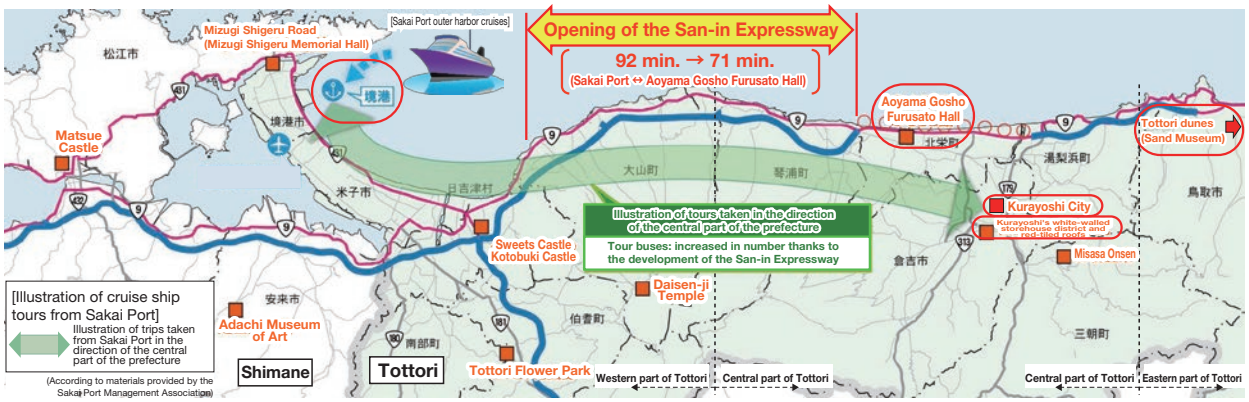


Source) MLIT

At Sakai Port, the number of foreign travelers has been rising rapidly thanks to the launching of the operations of international ferries in 2009 and increasing numbers of port visits by large cruise ships (Figure 3-1-24). In order to accommodate further increases in the number of port visits by large cruise ships, work to develop the environment for accepting foreign travelers is proceeding. The Sakai Port Management Association is also holding workshops for administrative and tourism officials and business enterprises and other initiatives are being carried out through public-private partnerships in order to study ideal ways in which port functions should work for a site through which people and goods flow and measures for stimulating activities with the port as a hub for such activities.

The opening of the San-in Expressway has allowed the cruise-ship effect to spread across a wide area within the prefecture. With cruise passenger ship tours, options that enable travelers to visit a large number of spots in a short period of time on excursions that take no more than ninety minutes to complete before they have to head back to port are favored.

Figure 3-1-25 Impact of the development of Sakai Port and the San-in Expressway



Source) MLIT

The number of tourist sites that can be accessed within a ninety-minute range has increased thanks to the opening of the San-in Expressway. Four tours that take passengers towards the central-eastern part of Tottori that had not existed in FY 2011 were planned in FY 2014.

Accordingly, it is expected that a system for accepting foreign travelers will be developed in and around Sakai Port and that a system for enabling spillover effects to spread throughout all areas of the prefecture will be established.

(Attractive travel proposals based on the use of infrastructure in various locations)

■ Setouchi Shimanami Kaido (Ehime and Hiroshima)

Setouchi Shimanami Kaido links Onomichi City in Hiroshima with Imabari City in Ehime through nine large and small islands in the Seto Inland Sea. Suspension bridges connecting these islands to one another also feature passageways that can be used by motorized bicycles and regular bicycles and are visited by cycling enthusiasts from overseas and across Japan.

Both prefectures are endeavoring to revive tourism through cycling and have developed many examples of bicycle-friendly infrastructure. Roads used for a main cycling course feature blue painted lines (known as the 'blue line') and destination signs to allow cyclists to arrive at their desired destinations without having to carry a map on their persons. Trains and buses that have been outfitted to enable bicycles to be transported by passengers have been developed and fees charged for carrying bicycles as levied on passengers riding vessels linking islands to one another have been kept low. In these and other ways, cyclists can travel freely with their bicycles and can choose to take any combination of various courses made available to them.

Peripheral facilities have also been developed, such that facilities from which visitors can rent bicycles and services for repairing bicycles in the event of an accident or breakdown can be found everywhere. Cycling stands have been set up by convenience stores and commercial establishments along routes as so-called 'cycling oases', facilities that give cyclists a change to interact with locals while maintaining their bicycles and replenishing supplies of water. In both Ehime and Hiroshima, ordinances have been amended to legalize the riding of two-person tandem bicycles on Shimanami Kaido and other general roads.

Figure 3-1-26 Setouchi Shimanami Kaido

Source) Ehime Local Promotion Association (left), Ehime Prefecture

The Honshu-Shikoku Bridge Expressway Company, with the cooperation of local private-sector companies, abolished bicycle tolls on the Setouchi Shimanami Kaido in July 2014 and organized Cycling Shimanami, an international cycling meet, in October of the same year in hopes of further promoting cycling in the area (Figure 3-1-27). This event was attended by 7,281 participants from overseas and across Japan thanks to awareness of the fact that this was the only expressway in Japan in operation that permits cyclists to use it and to the establishment of ten different types of courses for their benefit. Five hundred and twenty-five participants from thirty-one different countries and regions also attended. This event helped generate economic effects amounting to approximately JPY 1,500 million in both Ehime and Hiroshima [Note 65]. Through such initiatives, forty-two percent more rental bicycles were used on the Setouchi Shimanami

Note 65 Stated in materials provided by Ehime.

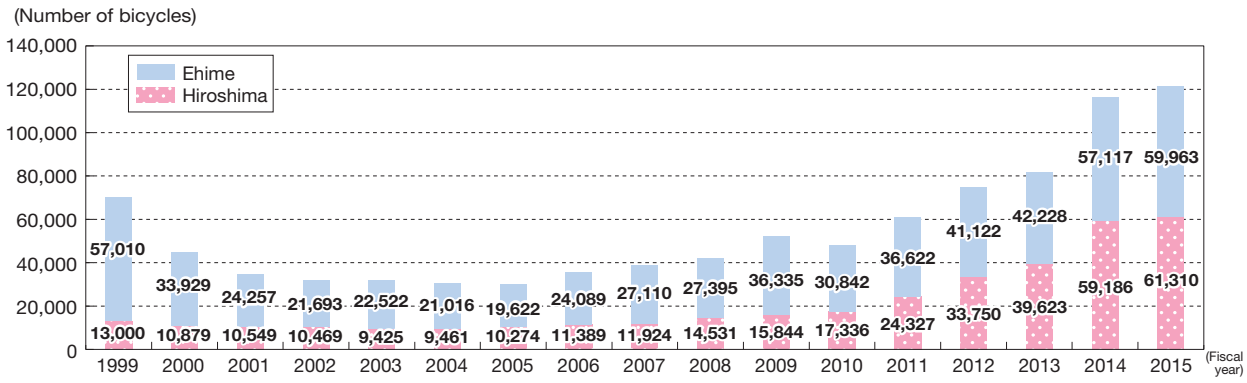
Kaido in FY 2014 than in the preceding year (Figure 3-1-28). Even in areas surrounding the Setouchi Shimanami Kaido, demand for tourism and accommodation facilities is on the rise, the economic effects of which are gradually spreading.

In Ehime, efforts are also being made to popularize cycling across all of Shikoku, such that tourism is expected to undergo a revival through the continued use of local scenic attractions and infrastructure.

Figure 3-1-27 Cycling Shimanami, an international cycling meet

Source) Ehime Prefecture

Figure 3-1-28 Use of rental bicycles on the Setouchi Shimanami Kaido



(Note) Figures for FY 2015 correspond to an eleven-month period that ended in February 2016.
Source) Ehime Prefecture

Column

Utilization of dams as tourist resources for regional revitalization ~dam tourism~

In recent years, more attention has been paid to the effectiveness of dams as tourist resources. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is promoting dam tourism to guide sightseers through dam sites as a part of a tour in cooperation with private travel agencies. At some dam sites, some twists are added to tours, such as visiting a dam site under construction and seeing extra-large construction machines, entering the inside of a dam, which is usually forbidden, and experiencing in person the impact of discharges or the scale of a dam. (Figure 3-1-29).

While creating and distributing Dam cards in 460 dam sites around the nation, MLIT also have prepared a pamphlet “Damu wo mini iko (Let’s go to see dams)” quarterly, and now is posting them on the website. At the same time, in the regions of water resources, efforts to create souvenirs associated with the dams, such as

Figure 3-1-29 Sites where ideas for guidance have been fully worked out

<Oitagawa Dam: Dam Safari Park>

<Naramata Dam: discharging of water for inspection purposes>

Source) MLIT

Dam Curry, etc. (Website for reference http://www.mlit.go.jp/river/dam/dam_tourism.html).

Figure 3-1-30 *Damu wo mini iko (Let's go to see dams)*, a series of pamphlets promoting dam tourism

Source) MLIT

Figure 3-1-31 Dam cards and Dam Curry

<Miyagase Dam> <Tsugaru Dam>

Source) MLIT

■ Boat tours on the Sumida River (Tokyo)

Triggered in part by the approach of the Tokyo Olympic Games in 2020, efforts to revive tourism through the use of rivers (cruise tourism) have come to garner attention in recent years. Flowing through Tokyo, the Sumida River is regarded as having considerable potential in this sense in that it is surrounded by plenty of tourist spots that are highly popular among foreign travelers, namely Tokyo Station, Ginza, Tsukiji, Akihabara, and Asakusa. However, since both banks of the Sumida River largely feature high levees that were built for disaster-prevention purposes, this river could not previously be described as being appealing in terms of scenic attractions since only some of the cityscape could be seen from a vessel traveling on this river.

In this connection, Tokyo Cruise Ship Co., Ltd, an operator of water buses on the Sumida River, studied the idea of converting vessels themselves into a source of amusement and proceeded to introduce the HIMICO and HOTALUNA, a pair of passenger ships produced by Leiji Matsumoto, a manga artist renowned for such works as *Ginga Tetsudo 999* (Figure 3-1-32). The unique shapes of both passenger ships have drawn attention from people overseas and across Japan. The wide windows and glass-paned roofs allow passengers to glance up at the bridges spanning the Sumida River from positions directly below these bridges as they pass underneath. Having also been featured in European media, these ships have been visited by anime fans from Europe and other foreign travelers.

Figure 3-1-32 HOTALUNA water bus

Source) Tokyo Cruise Ship Co., Ltd

The Metropolis of Tokyo is engaged in efforts to expand the use of waterways. From November to December 2015, multiple free waterway tours were held for the benefit of residents and tour operators in collaboration with Sumida-ku, Ota-ku, ship operators, and other concerned parties. As concerns international conferences and other examples of MICE [Note 66], companies that organize such events have been invited to consider options in the area by being given tours of exhibition sites and commercial facilities alongside Tokyo Bay from vantage points on the water. The construction of new disaster-purpose wharfs and the expansion of efforts to open them up for private-sector operators are being studied. The continued promotion of tourism based on the use of rivers is expected.

In promoting inbound tourism as outlined above, the development of a system for accepting foreign travelers and initiatives for inducing them to travel to regional destinations are important. It is also important to harness various types of infrastructural elements constituting regional resources to draw the diversifying interests of inbound travelers.

Note 66 MICE is an acronym that collectively refers to corporate meetings (meetings), corporate incentives and training trips (incentives), international conferences (conventions), and exhibitions and events (exhibitions/events).

Column

Full enjoyment of the attractiveness in waterfronts while traveling from Haneda to the city center comfortably and waveringly by ship

For the purpose of transmitting the attractiveness of waterfronts in Tokyo, around the world, MLIT carried out social experiments of transportation by ship that links Haneda Airport and Akihabara in September 2015.

This is the first sea route from the airport to the city center. Into this route, the attractiveness of waterfronts in Edo and Tokyo is condensed: the atmosphere of Edo, such as houseboats and inns for sailors, and historic bridges constructed about 90 years ago, and new waterfronts in Tokyo.

In the social experiment in September, although the cost of a one-way ticket for a two-and-half-hour trip between Haneda and Akihabara was about 3,000 yen, not inexpensive, the tickets were almost sold out on the first day, and a total of approximately 1,500 passengers (the load factor was 93%) enjoyed the voyage over the seven-day period. This experiment showed that sufficient profitability and demand could be prospected, and thus, in 2016, another social experiment is underway in expectation of several tens of thousands of participants [Note]. For this experiment, the private sector side has built a new ship *Jetsailor*, and many local private enterprises, such as Tokyo Dome Corporation and Mansei Co., Ltd., have been involved as local supporters, fostering momentum for transportation by ship. Ships are now under operation between Yokohama, Haneda and central Tokyo, carrying a passion to convey the attractiveness of waterfronts in Tokyo. It is expected that the experiment will be successful and the transportation by ship will become regular services.

Figure 3-1-33 Vessels that have been operated since May 2016 to test the idea of developing a water transportation-based society

Jet Sailor, a new vessel (KMC Corporation)

Ruku (Zeal)

Sky Hope (Tokyo Waterways)

Dream (Funasei)

Tamonmaru (Galleon)

Source) MLIT

Note Website for reference: http://www.mlit.go.jp/sogoseisaku/region/sogoseisaku_region_tk_000022.html

Section 2 Securing Leaders for the Development of Infrastructures, Improving On-site Productivity, and Adopting New Technologies

1 Securing leaders for the development and maintenance of infrastructures

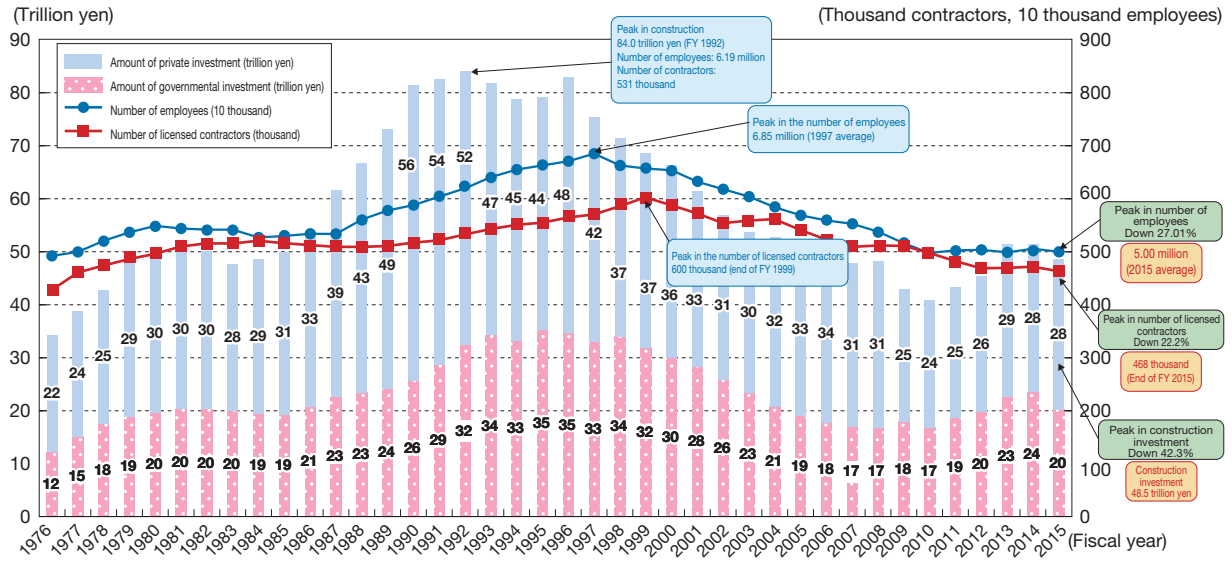
(1) Status of the labor force in the construction industry

(Current state of the construction industries)

In order to continue to endeavor to ensure the quality and maintain the appropriate functionality of infrastructure amid projections of shrinkage in the working age population for all of Japan, it is important that we smoothly secure leaders for

this purpose. However, construction investment peaked in 1992 and the number of employees peaked in 1997 before declining in the years up to 2010 (Figure 3-2-1).

Figure 3-2-1 Changes in construction investment, number of licensed contractors and number of employees in the construction industry

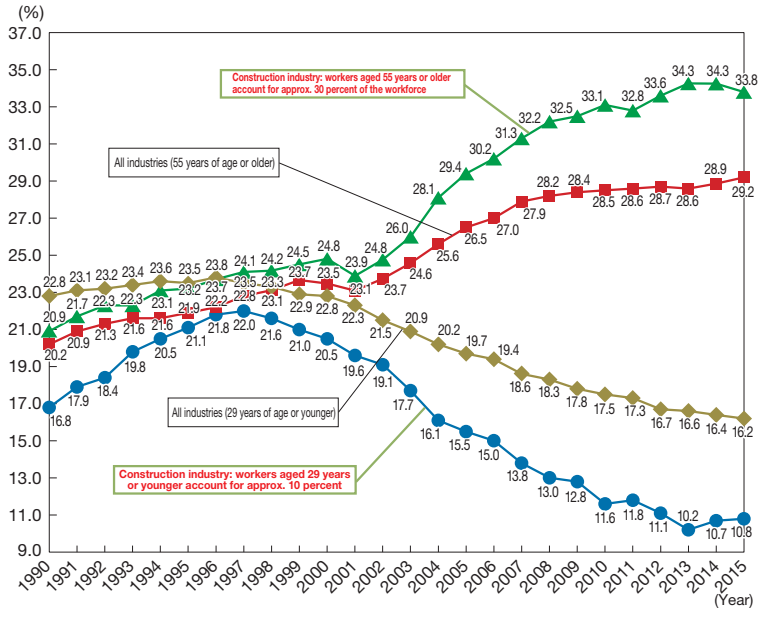


(Notes) 1 The amount of investment is the actual results up to FY 2012, estimates for FY 2013 and FY 2014 and a forecast for FY 2015.
2 Number of licensed contractors at the end of each fiscal year (end of March of the next year)
3 The number of employees is a yearly average. Supplementary estimates for the three quake-stricken prefectures (Iwate, Miyagi, Fukushima) in 2011 have been calculated by retrospectively correcting the estimated population based on the findings of the 2010 National Census.
Source) "Construction Investment Forecasts" and "Licensed Constructor Count Survey" by the MLIT and "Labor Force Survey" by the Ministry of Internal Affairs and Communications

(Shrinking pool of young workers joining the work force and an aging population)

Local construction companies are suffering in terms of their management environment thanks to deficit orders attributable to excessively low bids and are facing numerous problems, including declining wages for skilled workers and a shrinking pool of young workers joining the labor force. If we break down workers in the construction industry by age bracket, we see that those aged fifty-five-years or older account for approximately thirty percent of all workers while young workers aged twenty-nine years or younger account for approximately ten percent of all workers. In contrast to the overall situation for all industries, workers are aging at a greater pace and the ratio of young workers to the total work force is declining more rapidly in the construction industry (Figure 3-2-2).

Figure 3-2-2 Declining percentages of young people in the labor force and the progression of aging



(Note) Data for 2011 consist of estimated values due to the impact of the Great East Japan Earthquake.
Source) Developed by the MLIT based on the "Labor Force Survey" (MIC)

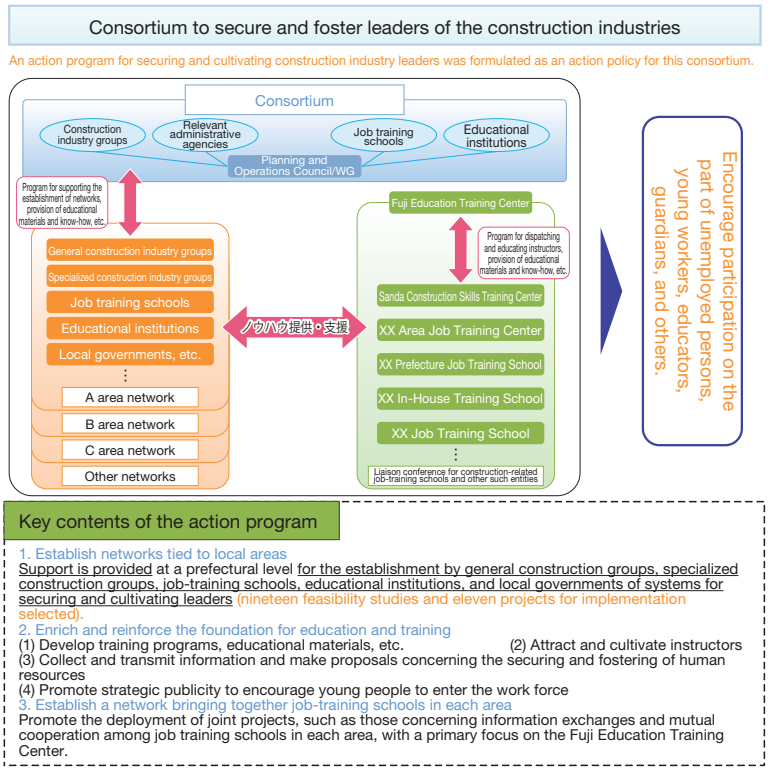
(Initiatives through public-private partnerships)

In light of the need to start studying measures that should be taken across both short-term and medium- to longer-term timelines by fostering a shared awareness of the current situation surrounding leaders of the construction industries and of future perspectives and other important issues, meetings of the Construction Industry Revitalization Council as chaired by the State Minister of Land, Infrastructure, Transport and Tourism were held in January 2014. This council has engaged in various forms of initiatives as comprehensive measures to secure and foster human resources through public-private partnerships. Examples include the implementation of measures to limit principal contractors and certain primary sub-contractors for government construction projects to businesses enrolled in social insurance schemes and the formulation of a construction industry action plan to enable women to play a bigger role in August of the same year and the launch of a consortium to secure and foster leaders of the construction industries (secretariat: Construction Business Promotion Fund) in October of the same year (Figure 3-2-3).

In conjunction with these initiatives, construction industry groups have been steadily carrying out various initiatives in accordance with their salient features. Examples include the formulation of Action Guidelines for Securing and Cultivating Future Local Construction Industry Leaders by the National Construction Industry Association (February 2015) and the formulation of a Long-Term Vision for the Construction Industry With a View to Revitalization and Evolution by the Japan Federation of Construction Contractors (March of the same year).

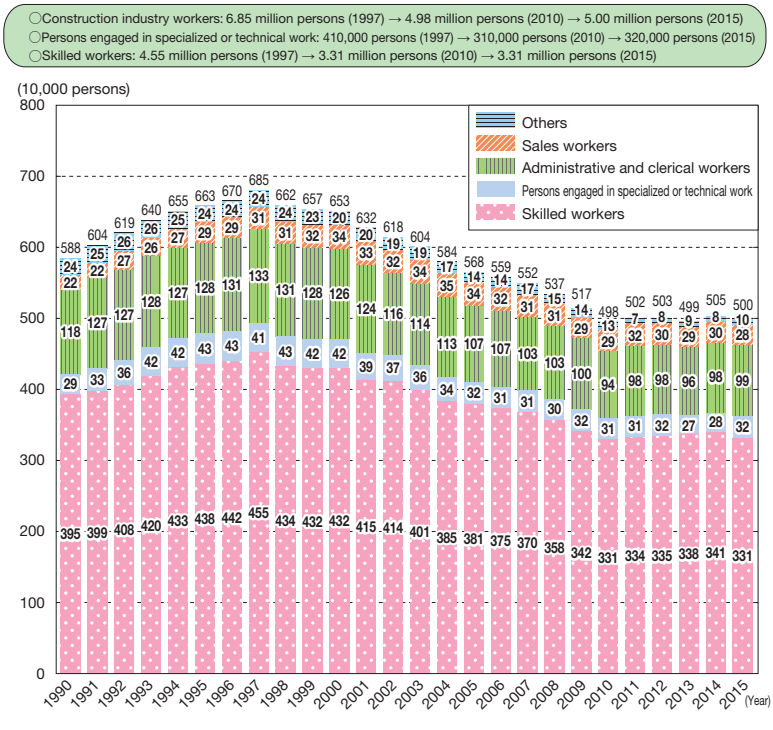
Thanks to these sorts of public-private initiatives, the number of skilled workers has stayed firm in recent years to keep pace with the stability of public investments[Note67] (Figure 3-2-4).

Figure 3-2-3 Consortium to secure and foster leaders of the construction industries



Source) MLIT

Figure 3-2-4 Changes in the number of construction industry workers



(Note) Data for 2011 consist of estimated values due to the impact of the Great East Japan Earthquake.
Source) Developed by the MLIT based on the "Labor Force Survey" (MIC)

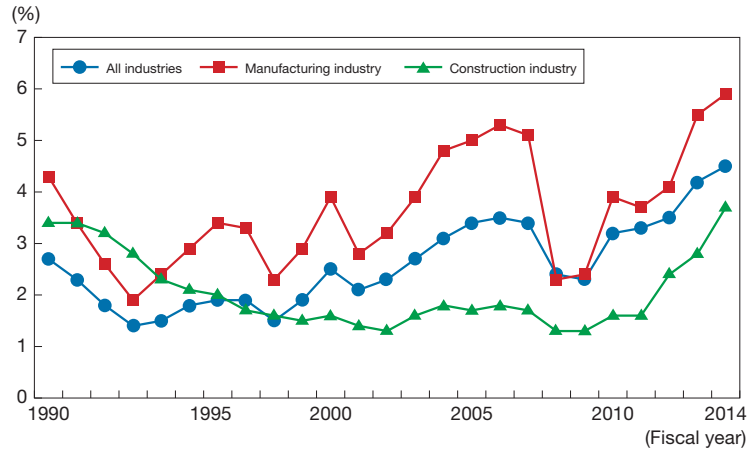
Note 67 As indicated in Figure 3-2-1, government construction investments remained stable between FY 2010 and FY 2014.

However, it is expected that skilled workers will leave the construction business in droves due to aging and other factors. The most important issues to address in order to maintain the quality and appropriate functionality of infrastructure will be the promotion of efforts to attract and keep young people to take over the future of the construction industry and the securing of human resources. From this perspective, an agreement between public and private entities to take on the task of securing future leaders with resolute determination by endeavoring to further reinforce measures to secure and cultivate leaders with a focus on improving job conditions and by improving productivity within the framework of the construction production system through public-private partnerships was reached at the tenth meeting of the Construction Industry Revitalization Council held in May 2015.

(2) Making thorough improvements to working conditions

Declining wages (low earnings) is conceivably a factor behind the shrinkage in the construction industry workforce. If we look at the trend in the recurring profit margin of the construction industry, we can see that the profitability of construction industry was higher than the average of all industries combined in the first half of the 1990's. However, since the economic bubble burst, the declining trend has continued, and since 2000's has remained at a low level in the 1% range. Since FY2011, it has started to recover due to the reconstruction demand, but still remains below the profit rate of the manufacturing industry and of all the industries combined (Figure 3-2-5).

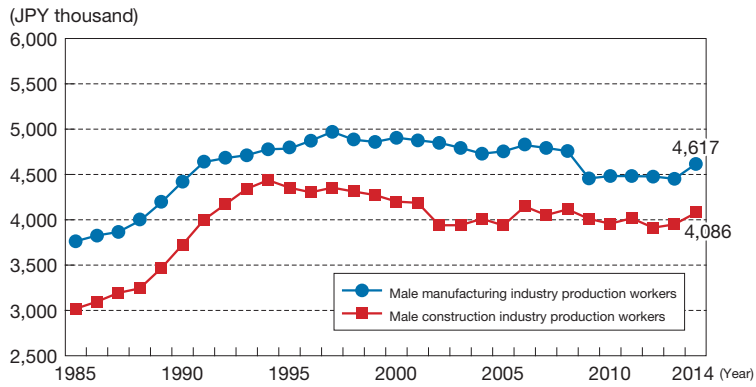
Figure 3-2-5 Changes in the Recurring Profit Margins of the Construction Industry



Source) Developed by the MLIT Ministry of Finance "Corporate Annual Report of Statistics"

In regards to the wage of skilled workers, if we look at the trend in the total annual wage amount paid to male production workers in the construction industry, there is a large increase continuing into the first half of the 1990's, and the difference between their wage and that of male production workers in the manufacturing industry shrak significantly. However, since then the wage of the construction industry started to decrease, the difference has again widened (Figure 3-2-6).

Figure 3-2-6 Changes in Total Annual Wages



(Notes) 1 Annual wages = set amount of cash salary x 12 + annual bonuses and other special salary
Set amount of cash salary= amount of cash salary paid for June (amount before deducting income tax, social insurance fees, etc.), and includes base salary, duty allowance, perfect attendance allowance, travel allowance, family allowance, overtime etc.
Annual bonuses and other special salary = any bonuses paid out between January and December of the year previous to survey year, special salary like year-end allowance, etc.
2 Production workers refers to workers engaged in the production of goods being carried out mainly at work sites (construction site, etc.)
3 Survey conducted on private establishments that employ over 10 permanent workers.
Source) Developed from Ministry of Health, Labour, and Welfare "Basic Survey on Wage Structure"

The fact that an environment for social insurance and other welfare programs has not been developed and the fact that improvements in job conditions have otherwise lagged behind those of other industries are key factors behind the loss of highly skilled workers and the difficulties young people have in finding and keeping work in the construction industry. It is essential that efforts be undertaken to thoroughly improve working conditions if we are to secure leaders in this industry. To this end, the MLIT is carrying out the following initiatives:

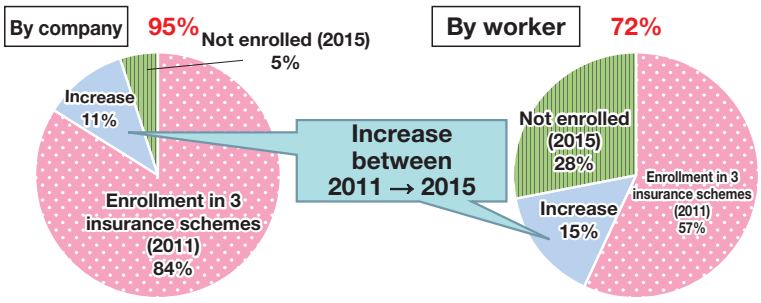
(Promoting the appropriate payment of wages and enrolment in social insurance schemes)

In order to secure appropriate wage levels for on-site workers, a fourth round of increases in the unit price of labor for

public works and design jobs was carried out based on actual conditions in February 2016. Efforts will be made to link such increases in the unit price of design labor to a virtuous cycle in terms of increases in the wage levels of on-site skilled workers.

Measures to attain 100 percent enrolment in social insurance schemes on the part of licensed contractors at an enterprise level by FY 2017 have been implemented. Steady results have been achieved, such as in terms of a fifteen percent increase in the rate of enrolment in three insurance schemes [Note 68] by workers over a four-year period from 2011 to 2015 (Figure 3-2-7).

Figure 3-2-7 Social insurance enrollment rates

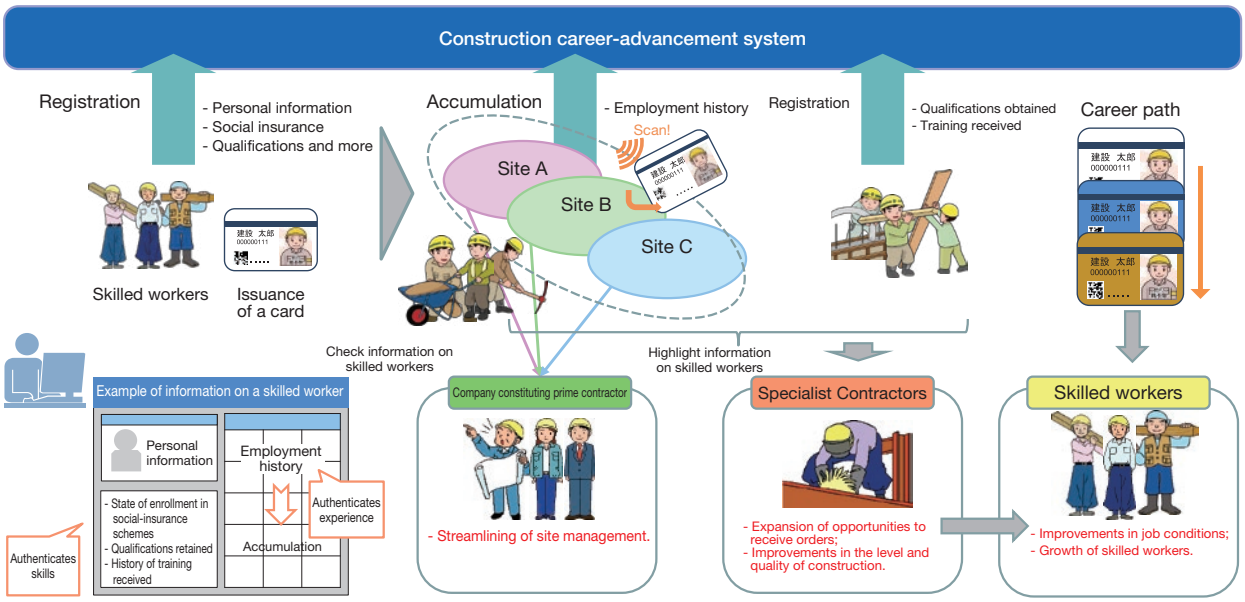


(Note) Cases in which there is enrollment in only one or two of the three insurance schemes are still included in "Not enrolled."
Source) Developed by the MLIT based on a public works labor costs survey (conducted in October 2015)

In order to further reinforce initiatives, briefings to publicize measures to address non-enrolment ("caravan" sessions) were held at ten locations nationwide and actions to promote social-insurance enrolment were accelerated [Note 69]. In addition, a public-private consortium was established in August 2015 with the aim of setting up a construction career-advancement system through which information concerning the skills and experience of skilled construction workers is accumulated according to standard rules, appropriate evaluations are performed and improvements in job conditions are granted in accordance with skills and experience, the level of construction quality is improved, and on-site efficiency is achieved (Figure 3-2-8). In April 2016, a second meeting of this public-private consortium was held in hopes of establishing a career-advancement system, with the result that a basic plan was drafted.

Figure 3-2-8 Construction career-advancement system

○Studies will be carried out through public-private collaborations with a view to establishing a career-advancement system to induce improvements in job conditions for skilled workers.
○The establishment of this system will enable the realization of the following: (i) improvements in job conditions based on an appropriate evaluation of a skill worker's skills and experience, (ii) the efficient allocation of human resources according to skills and experience.
○Applications for registration will begin to be accepted in April 2017 with a view to commencing full-scale operations in August 2017.



*Accumulated data are accessed by concerned parties in the construction industry according to the purpose for which they are used.

Source) MLIT

Note 68 Employment insurance premiums, health insurance premiums, and welfare pension insurance premiums.
Note 69 Guidance provided when licenses are renewed was provided on an accelerated basis prior to the deadline for license renewal to licensed operators whose licenses were set to expire in or after January 2016.

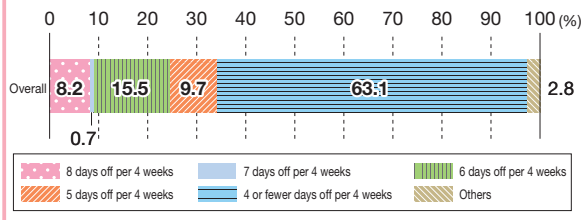
(Reinforcing anti-dumping measures and eliminating actions that unlawfully undercut target prices)

Initiatives to reinforce anti-dumping measures and eliminate actions that unlawfully undercut target prices [Note 70] are being implemented in accordance with the amended Act on Promoting Quality Assurance in Public Works (amended Quality Assurance Act), which came into full force in April 2015, the amended Construction Business Act, and the amended Act for Promoting Proper Tendering and Contracting for Public Works (amended Tendering and Contracting Act). With respect to the elimination of actions that unlawfully undercut target prices in particular, surveys on actual conditions and on the reasons why actions that unlawfully undercut target prices are carried out have been administered to local governments four times to date in collaboration with the Ministry of Internal Affairs and Communications. Local governments engaged in this practice have been asked to reexamine their stance as soon as possible through various opportunities. Consequently, all (459) local governments engaged in this practice as of January 2015 as a matter of convention or for the soundness of fiscal administration at a local-government level agreed to abolish it as of April 2016.

(Increasing the number of holidays in the construction industry (to realize two days off each week))

One factor that can explain why young people choose not to find and keep jobs in the construction industry is the lack of holidays. According to a survey on shorter working hours as conducted by the Council of Japan Construction Industry Employees' Unions, approximately sixty percent of construction worksites incorporate schedules that offer no more than four holidays every four weeks (Figure 3-2-9). Efforts to improve on-site working conditions to enable workers to take two days off a week after setting up an appropriate schedule by taking into account the nature of the construction project in question, local conditions, natural conditions, the number of days on which construction work will not be performed due to the conferring of holidays on construction workers, and other factors will be needed.

Figure 3-2-9 Construction industry holidays



Source) 2014 Outline of Short Questionnaires (Council of Japan construction industry employees' unions)

Since FY 2014, the MLIT has been carrying out model construction projects that provide workers with two days off a week. In FY 2015, initiatives were carried out through public-private partnerships to secure two days off a week for fifty-six construction projects.

Issues have been ascertained through model construction projects and solutions are being studied with a view to securing two days off a week as stated in the guidelines on the amended Quality Assurance Act, which called for securing and cultivating leaders.

(3) Securing prospects for a stable, sustainable construction industry

Rapid increases and decreases in public investment amounts in the past gave rise to various adverse effects, including the emergence of non-conforming operations in the construction industry, frequent occurrences of dumping, and loss of human resources. With significant reductions in public investment, the environment surrounding the management of Japanese construction companies is worsening, the pool of young workers is shrinking, the workforce is aging, and other structural issues are arising. In recent years, wage levels have recovered along with a recovery in public investment amounts and the size of the skilled workforce has also remained somewhat firm. Nevertheless, it will be necessary to engage in the development of an environment that will allow construction business operators to believe that future prospects, such as in terms of a sustainable, reliable flow of public works funding, are bright in order to secure leaders who will bolster the future development of infrastructure.

Note 70 Refers to actions to set predetermined prices by deducting part of the amount indicated in written design specifications that have been drafted in accordance with a correct estimate. These actions are not to be carried out given that they contravene the provisions of paragraph (1)(i) of Article 7 of the amended Quality Assurance Act, predetermined prices are meant to be prescribed by taking example prices of transactions into account based on the Cabinet Order concerning Budgets, Auditing and Accounting and Financial Regulations and Rules, and there is a risk that the securing of the quality of public works and the safety of construction will be compromised and that the sound growth of the construction industry will be impeded.

(4) Giving young people and women more opportunities to participate

(Promoting earlier participation on the part of young people and enhancing education and training for young people)

As the workforce ages, the development of an environment to get young people to find jobs with the specific aim of working in the construction industry and encourage them to keep these jobs going forward is a pressing issue. Specifically, we will work on significantly expanding the requirements for undergoing technical qualifications testing, expanding the scope of institutions subject to briefings ('caravan' sessions) from industrial high schools to primary and junior high schools and regular academic high schools, continuing the provision of support for the establishment of an education and training scheme by locally connected networks, and developing programs and educational materials required for education and training.

According to a questionnaire-based survey administered to children (by Kuraray), the percentage of boys entering the first year of primary school who indicate "carpenter or craftsperson" for their preferred future career has remained more or less constant, such that these occupations consistently rank in the top ten among all job categories (Figure 3-2-10).

Figure 3-2-10 Future Dream Occupation Survey (Boys)

(%)

	2011		2012		2013		2014		2015	
1	Athlete	(29.8)	Athlete	(26.7)	Athlete	(27.2)	Athlete	(22.6)	Athlete	(26.1)
2	Firefighter/rescue team member	(6.8)	Police officer	(8.2)	Police officer	(9.6)	Police officer	(10.9)	Police officer	(11.4)
3	Police officer	(6.3)	Driver	(7.8)	TV/anime character	(7.0)	Driver	(7.7)	Driver	(7.8)
4	Driver	(6.0)	Firefighter/rescue team member	(7.0)	Driver	(6.2)	TV/anime character	(6.7)	Firefighter/rescue team member	(5.9)
5	Chef	(4.6)	TV/anime character	(6.3)	Firefighter/rescue team member	(6.0)	Firefighter/rescue team member	(5.7)	TV/anime character	(4.7)
6	Patisserie/baker	(4.2)	Carpenter/ craftsperson	(4.2)	Carpenter/ craftsperson	(4.4)	Patisserie/baker	(5.0)	Carpenter/ craftsperson	(4.4)
7	Carpenter/ craftsperson	(3.8)	Chef	(3.2)	Patisserie/baker	(3.5)	Pilot	(3.5)	Patisserie/baker	(3.7)
8	Researcher	(3.7)	Patisserie/baker	(3.1)	Medical doctor	(3.0)	Medical doctor	(3.3)	Medical doctor	(3.4)
9	Entertainer	(3.5)	Researcher	(3.1)	Chef	(2.8)	Carpenter/ craftsperson	(3.1)	Pilot	(3.1)
10	TV/anime character	(3.4)	Self-employed (___)	(3.0)	Researcher	(2.7)	Researcher	(2.8)	Researcher	(2.5)

(Note) This survey was administered to children attending primary school.
Source) Developed by the MLIT based on Kuraray's "Desired occupations as indicated by newly enrolled first-year primary school students."

For boys entering primary school, the construction industry is regarded as an attractive industry (occupation). Transmitting that appeal to them so that they will continue to be interested in a construction profession could become a factor in increasing the number of young people entering this profession. For this reason, we need to continue to work on forming young people's motivation for occupation choice, and promote the occupation by having skilled workers conduct visiting lectures for students that tells them about the fun and joy in creating things, by holding construction site tours, and by giving on-site training.

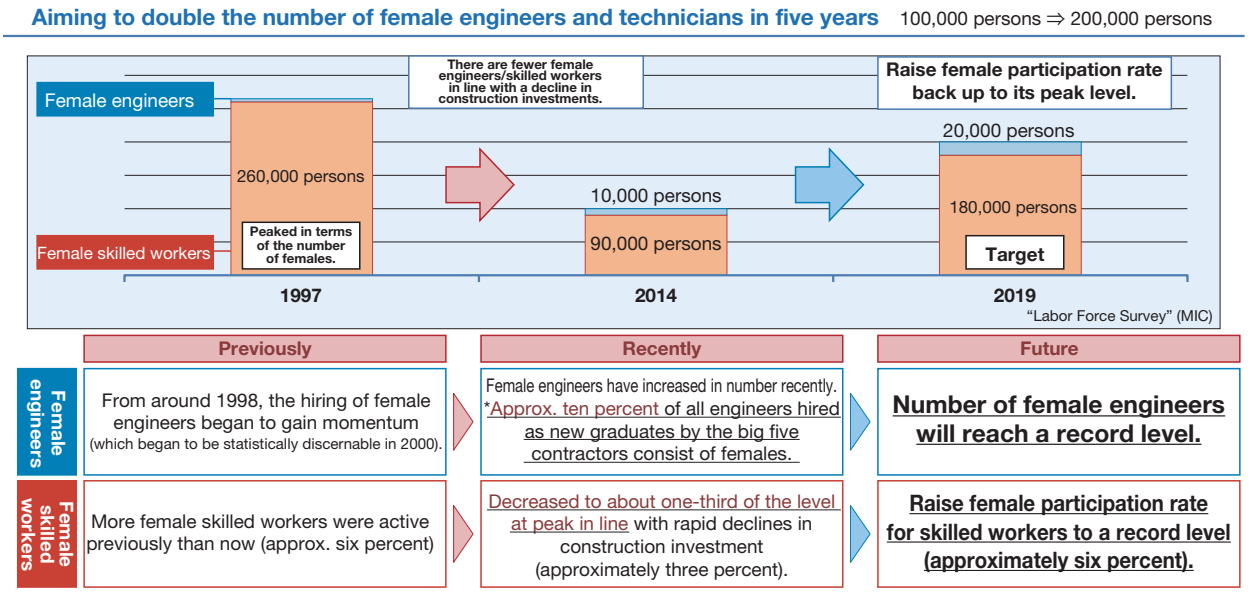
(Promoting greater participation on the part of women in the construction industry)

Aiming to increase the number of women engineers and skilled workers two-fold in five years (Figure 3-2-11), the MLIT has been elevating opportunities for female participation by pursuing specific initiatives prompted by an action plan to enable greater female participation in the construction industry as formulated jointly by public and private entities in August 2014. Examples of such initiatives include support for programs to promote female participation with community involvement, the steady implementation of model construction projects to advance the recruitment of female engineers and construction projects undertaken on a trial basis to establish quality washroom facilities at construction sites, the production of compilations of case studies involving the provisional establishment of washroom facilities at construction sites, and the launching of a portal site ("Women working in the construction industry are cool") to comprehensively back female participation (Figure 3-2-12). Specifically, we are at the stage where we seek to change the workplace in order to facilitate more participation and involvement by women in the construction industries.

In FY 2015, progressive cases in support of female participation were collected, a case book in support of female participation in the construction industry was produced according to theme (Figure 3-2-13), and the first questionnaire-

based survey on the actual state of and opinions regarding initiatives concerning female participation was conducted as examples of new initiatives undertaken to promote greater participation on the part of women in the construction industry.

Figure 3-2-11 Aiming to double the number of female engineers and skilled workers in five years



Source) MLIT

Figure 3-2-12 Portal site providing comprehensive support for female participation in the labor force

Source) MLIT

Figure 3-2-13 Case Book in Support of Female Participation in the Construction Industry

Source) MLIT

Column

Expectation for KidZania to develop people who shoulder responsibilities for the future

"KidZania", a facility originated in Mexico, where children can experience various jobs in society, now enjoys high popularity.

In Japan, there are two KidZanias, "KidZania Tokyo" (Koto City, Tokyo) opened in October 2006, and "KidZania Koshien" (Nishinomiya City, Hyogo) opened in March 2009, both are targeted for children ages 3 to 15 with the concept of edutainment combining education and entertainment.

Although the facility is for children to experience jobs in society, the contents are realistic, and about 100 kinds of jobs and services are in place. Each job or service is sponsored by a major company that supervises

the activity (job or service to be experienced) and provides uniforms, technical tools, and equipment.

The activities offer experiences, for example, as a driver in operating a subway train, as a train maintenance or track workman in doing the work, and as a carpenter at a house construction site in building a house that can satisfy a customer's requests while cooperating with other people (Figure 3-2-14 and 3-2-15).

KidZania serves as a valuable space providing opportunities for children to learn the meaning of work, the fulfillment and value of money, and think of their futures.

While the population decline and the decreasing productive-age population are topics, and the shortage of the workforce is an issue, various regions around the nation are implementing programs to experience jobs specific to each region as a local version of KidZania.

It is hoped that children will deepen their interest in and concern about jobs through such experiences of manufacturing and commerce and become bearers of the future.

Figure 3-2-14 Children replacing rails as track workers using specialized equipment and tools

Source) KCJ GROUP

Figure 3-2-15 Child engaged in exterior wall work as a carpenter

Source) KCJ GROUP

(5) Creating a maintenance industries

As stated in chapter 1, Japanese social infrastructures was intensively developed during the period of high economic growth. There is concern that such elements of social infrastructures will rapidly degenerate in the years to come. The maintenance and renewal of social infrastructures are a huge issue for the entire country, such that these matters concern not just the national government but also the local governments that manage a considerable portion of the social infrastructures that is in existence today.

Over the next twenty years, it is projected that the percentage of facilities that are fifty years of age or older will rise on an accelerated basis [Note 71], such that it is hoped that we can strategically maintain infrastructure that is set to become superannuated en masse. For this reason, it is important that we conduct systematic inspections and repairs and steadily provide financial and technical support to local governments in accordance with a plan for extending the service life of infrastructure and help to cultivate and stimulate the maintenance industries.

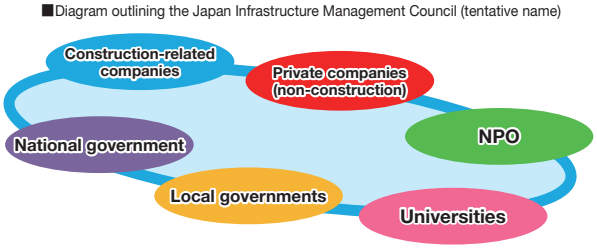
With the Sasago Tunnel ceiling board fall accident in December 2012 acting as a major catalyst for change, initiatives are being undertaken within Japan with interest in the maintenance of infrastructure expressed by a wide range of industries. The size of the domestic market is expected to grow. The MLIT will proactively engage in the following measures:

Note 71 Costs of maintaining and renewal social capital and the state of superannuation as outlined in chapter 1 (Figure 1-2-45).

(i) Establishing Japan Infrastructure Management Council (tentative name)

The MLIT has determined that Japan Infrastructure Management Council (tentative name) shall be established in FY 2016 as a platform to allow industrial, academic, and governmental parties to collectively engage in full-scale efforts in order to disseminate a maintenance mindset and cultivate and stimulate the maintenance industry (Figure 3-2-16).

Figure 3-2-16 Establishment of the Japan Infrastructure Management Council (tentative name)



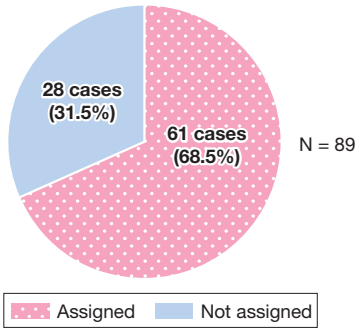
Source) MLIT

At a meeting held at the end of 2015 where companies and organizations interested in the maintenance of infrastructure could exchange opinions, technology was shared with officials from other industrial sectors, new business models were investigated, and various opinions calling for the establishment of an awards program and other such measures were exchanged. Accordingly, we would like to see the discovery of new private-sector technologies and the entry of new participants from a broad range of industrial sectors promoted through the establishment by the National Council of a framework for the provision of support to accompany initiatives undertaken by companies and organizations.

(ii) Harnessing a system for registering private-sector qualifications for fostering and securing maintenance engineers

By evaluation existing private qualifications and harnessing a system for registering qualifications that satisfy technical standards required for maintenance, we can promote the cultivation and utilization of private-sector engineers and ensure the quality of inspections, diagnostic actions, and other such operations. Registered engineers were allocated for approximately seventy percent of inspections and diagnostic actions involved in early-order placements made in FY 2015 (Figure 3-2-17).

Figure 3-2-17 State of the use of qualifications registered ahead of time



(Note) This survey was administered to eighty-nine cases that involved the performance of inspections and diagnostic actions on bridges and other structures coming within the scope of the registered qualifications of engineers and that were contracted between April 1 and 25, 2015.
Source) MLIT

(iii) Promoting the spread of and providing education on good practices

In order to promote the spread of and provide education on the philosophy of infrastructure maintenance, the MLIT called for the submission of case examples of ideas and good practices supporting the maintenance and renewal of infrastructure and held panel exhibitions on good practices for the maintenance of infrastructure for approximately one month beginning in December 2015. This information has been posted to an information portal site [Note 72] (Figure 3-2-18). Visitors to this information portal site can check the status of infrastructure inspections in different areas, including roads, rivers, and ports and harbors, as well as apprise themselves of measures and initiatives concerning the strategic maintenance and renewal of infrastructure.

Figure 3-2-18 Portal site for Infrastructure Maintenance Information

Source) MLIT

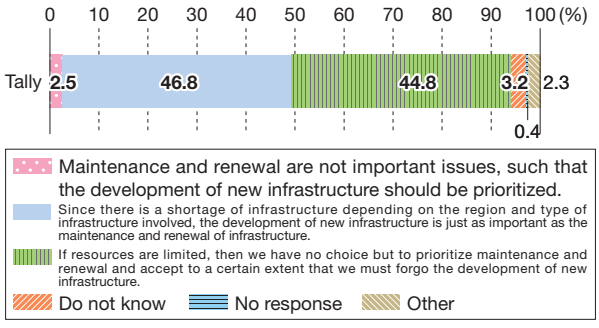
(iv) Studies concerning the adoption of Comprehensive Work Consignment to Private-sector to access the technology and expertise that can be offered by private-sector companies

In order to carry out efficient maintenance by harnessing the technology, expertise, and economies of scale that private-sector companies can offer, specific studies are being conducted in collaboration with local governments on the means by which functions for maintaining multiple areas or facilities across multiple years can be comprehensively outsourced to the private sector while utilizing local construction firms.

Through such initiatives, we will promote the use of multi-year contracting and Comprehensive Work Consignment Private-Sector outsourcing with respect to maintenance and renewal.

Questions on awareness with respect to the balance between the development of new infrastructure and the maintenance and renewal of infrastructure were asked in a monitoring survey administered to members of the general public in February 2016 by the MLIT. Approximately forty-five percent of respondents indicated that we should prioritize maintenance and renewal work, such that the way in which the public perceives these issues also suggests that prospects for the maintenance industry are quite bright (Figure 3-2-19).

Figure 3-2-19 Awareness with respect to the balance between the development of new infrastructures and the maintenance and renewal of infrastructure



Source) "Monitoring Survey" (MLIT)

Note 72 The MLIT has set up Infrastructure Maintenance Information, an information portal site (http://www.mlit.go.jp/sogoseisaku/maintenance/), in order to enable various types of information concerning the maintenance of infrastructure by the national government and local governments and other entities to be easily accessed and verified.

2 Improving on-site productivity

(1) i-Construction

As we saw in 1 above, the construction industry labor force continues to shrink. In light of the fact that the on-site labor force is getting smaller, we are faced with the knowledge that we cannot avoid having to improve construction site productivity to offset this trend.

At the same time, the construction industry is expected to play an important role in supporting safety and growth, such as in terms of disaster prevention and mitigation measures in response to intensifying disasters, the strategic maintenance and renewal of aging infrastructure, and the development of infrastructure and improvements in productivity for which stock effects for realizing a strong economy have been emphasized.

As performance in the construction industry undergoes a recovery and a stable management environment is secured, favorable opportunities for fully engaging in efforts to improve productivity can be said to have arrived. The time has come for us to engage in i-Construction through links among industrial, academic, and governmental circles in order to enable Japanese construction sites to stand on the global leading edge. The MLIT established the i-Construction Committee, which is made up of numerous key figures (and is chaired by Hiroshi Komiyama; the executive head of the Mitsubishi Research Institute), for the purpose of achieving the goals of i-Construction and drafted a report in April 2016.

For initiatives concerning i-Construction, the MLIT has decided to pursue the comprehensive utilization of ICT (ICT-based Earthwork), the adoption of overall optimization (involving such measures as the standardization of specifications governing Concrete work), and the standardization of construction periods as top-priority measures. Through these initiatives, we seek to enhance the productivity of all construction site processes, ranging from surveys and measurements to design work, construction, checks, maintenance, and renewal functions.

(Full-fledged utilization of ICT)

The MLIT has heretofore been engaged in various verification and testing projects across two pillars of focus: computer-aided construction [Note 73] and CIM [Note 74]. Upon having ascertained, with a more global and comprehensive approach, construction processes that include the foregoing for the i-Construction initiative that consists of the comprehensive use of ICT on construction sites, we are promoting a broader use of technology—including drones (unmanned aerial vehicle), three-dimensional survey data, and unmanned automated construction technology—than before [Note 75].

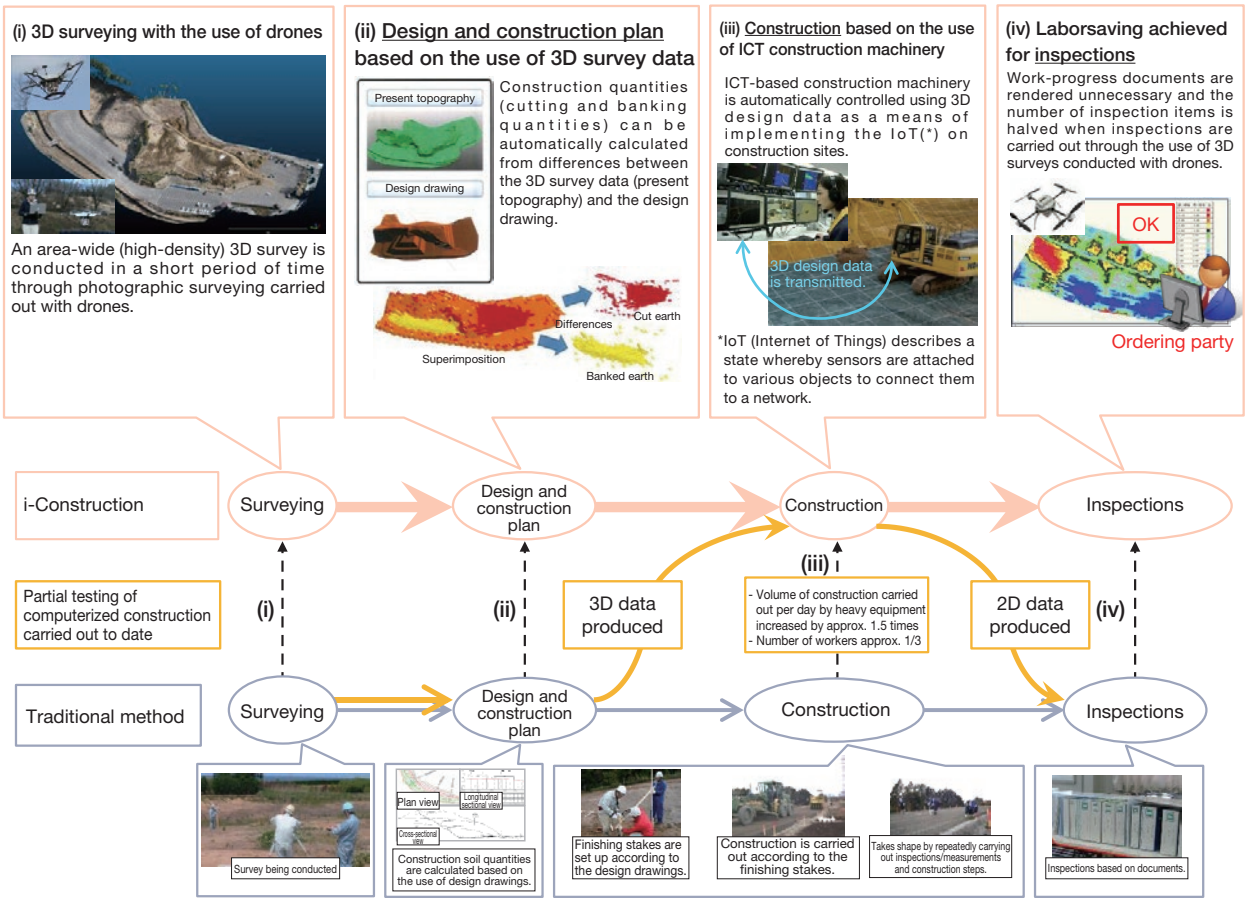
As outlined in Figure 3-2-20, we expect that the comprehensive use of ICT on construction sites will facilitate or lead to the following: (i) three-dimensional surveys conducted with drones, (ii) design and construction plans based on three-dimensional survey data, (iii) construction with ICT-based construction machinery, and (iv) significant labor savings through the use of three-dimensional inspection data.

Note 73 A system that aims to enhance productivity and ensure quality across all construction production processes by focusing on construction out of all construction production processes (surveys, design, construction, supervision and inspections, and maintenance) carried out by construction businesses and accordingly realizing highly efficient, highly precise construction based on the use of electronic data that can be derived from processes through the utilization of ICT and harnessing electronic data derivable from construction for other processes.

Note 74 A system that aims to streamline and upgrade a battery of construction production systems by adopting three-dimensional models from the planning, surveying, and design stage, expanding subsequent construction and maintenance stages by linking them to three-dimensional models, and sharing relevant information pertaining to the overall project in any given case with concerned parties.

Note 75 We aim to improve productivity through the use of integrated three-dimensional data by incorporating the spread of drones and ever-improving three-dimensional measuring techniques and data-processing technologies and applying computerized construction, for which the application of the use of three-dimensional data to MC/MG construction equipment (such as machine-controlled and machine-guided bulldozers) and TS-based work-progress control (in addition to current methods of work-progress control applied to civil engineering projects concerning roads and rivers (surveys, leveling, transiting, and more), includes work progress control techniques based on the use of total stations (which are currently used most on all sorts of survey sites as a type of survey equipment; combining electro-optical distance meters with angle-measuring theodolite, Total Stations can measure both distances and angles—tasks that had to be undertaken separately in the past—at the same time)) had been discontinued, to all processes consisting of surveys and measurements, design work, construction, checks, maintenance, and renewal functions.

Figure 3-2-20 Illustration of the use of ICT at an i-Construction-based construction site

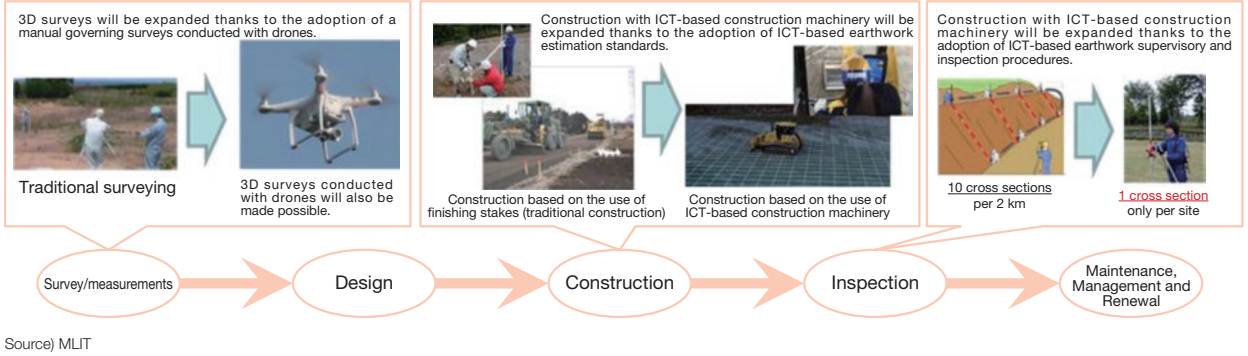


Source) MLIT

■ Adopting fifteen new standards

In order to comprehensively adopt ICT for all construction site processes, ranging from surveys and measurements to design work, construction, checks, maintenance, and renewal functions, new standards will need to be introduced to enable the integration and use of three-dimensional data. To this end, the MLIT developed fifteen new standards and adopted them in April 2016 for projects under its direct control (Figure 3-2-21). By comprehensively adopting ICT-based construction machinery and robot technologies for compliance with these standards, significant improvements in productivity are expected.

Figure 3-2-21 Examples of key new standards to be adopted from FY 2016



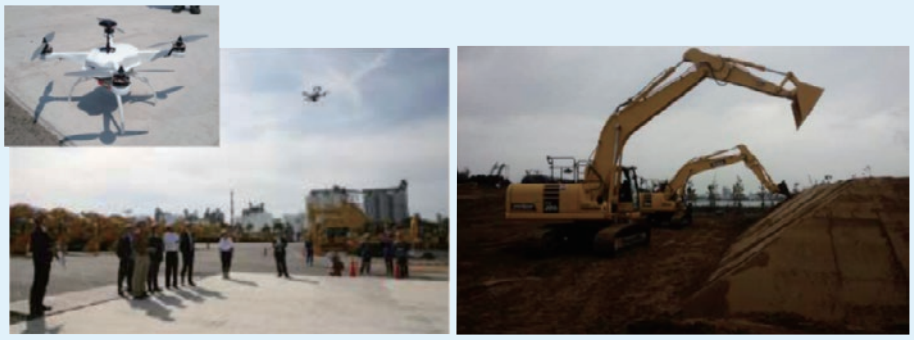
Source) MLIT

Column

Reform in construction work sites in Japan

Figure 3-2-22 i-Construction-related on-the-spot investigation (Komatsu IoT Center)

Survey conducted with a drone | Construction using ICT-based construction machinery



Source) MLIT

i-Construction Committee visited the Komatsu IoT Center and inspected demonstrations of surveying by drones and construction by ICT construction equipment. (Figure 3-2-22). Since 2015, Komatsu Ltd. has provided services where it surveys the construction sites through pictures taken by drones, creates 3D models, calculates the soil volume, and utilizes the results in construction management. The company is trying to reform domestic construction worksites that suffer from a chronic shortage of workers by providing surveys by drones and other services. By combining its ICT construction equipment, the company is promoting more efficient construction work.

The service using drones can survey several million points while flying a drone for ten and several minutes, and complete detailed 3D data of the construction site in a single day. Currently, the ICT equipment has been introduced into 1,000 sites in Japan.

(Adopting overall optimization (such as by standardizing specifications governing concrete work))

Cast-in-place concrete is noted for making planned construction work difficult depending on weather conditions. For projects involving bridges and other such structures for which high-elevation work is required, technicians working on these projects also need to have a certain level of skills given that work is being performed in a working environment that carries risks and given that work can be complex due to differences in how retaining molds are placed and reinforcing steel bars are assembled from one worksite to the next. On the other hand, even in cases in which pre-cast products are used [Note 76], opportunities for using same-sized products in large quantities are limited, such that it is difficult to effectively obtain economies of scale. The environment is also one that does not easily facilitate cost reductions since there is no choice but to carry out processes from the receipt of orders to production.

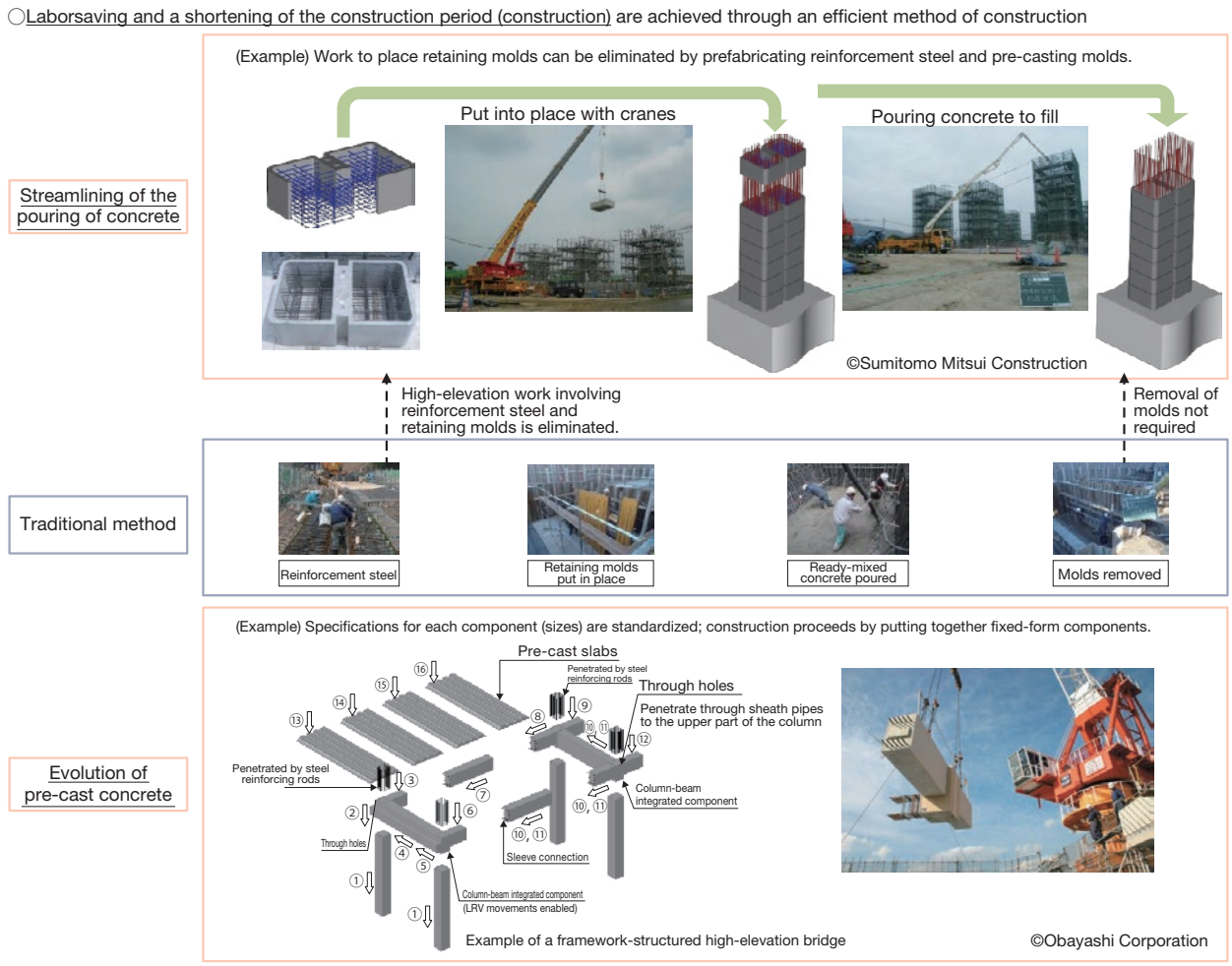
In this connection, we will carry out studies with a view to adopting overall optimization [Note 77] and popularizing underlying technologies and introducing supply-chain management according to the attributes of cast-in-place concrete and pre-cast concrete [Note 78] (Figure 3-2-23) in order to improve the overall productivity of concrete work. With respect to cast-in-place concrete, we will also carry out studies on popularizing technologies with a view to improving methods of coupling and fixing reinforcing steel bars as they relate to the streamlining of such on-site work as that which involves the assembly of reinforcing steel bars and the pouring of concrete.

Note 76 Where concrete structures are built, it is typical to have concrete poured into retaining molds set up on-site. However, the use of pre-cast products is a method by which concrete components are produced ahead of time in a factory and then shipped to and assembled at the construction site.

Note 77 According to the i-Construction Committee report, "By incorporating the concept of overall optimization into concrete work, we can endeavor to streamline supply chains and improve productivity with the aim of optimizing all processes, including the designing of structures, the placement of orders, the procurement of materials, construction work, assembly work, and other elements in the sequence of production processes, as well as maintenance functions."

Note 78 Specifically, by standardizing component specifications (such as in terms of size), we can expect to see cost reductions and productivity improvements achieved as in-plant production is promoted and equipment and materials are diverted. Thus, pre-cast products shall be studied with a focus on expanding the scope of their application to large structures.

Figure 3-2-23 Example of an initiative to enhance the productivity of concrete works

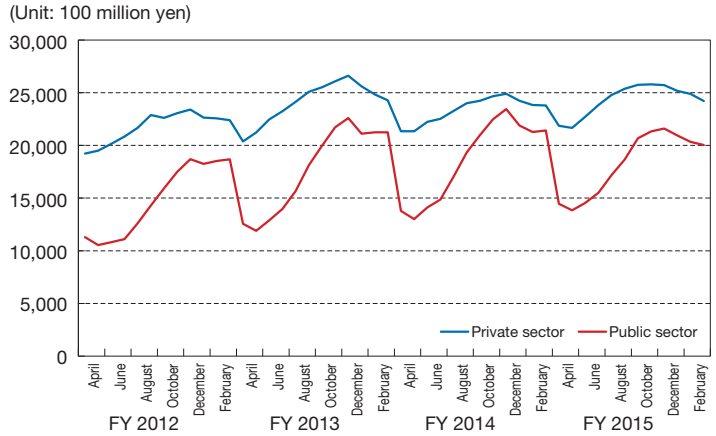


Source) MLIT

(Leveling construction timings and maintaining fair construction periods)

Since public works projects are essentially carried out according to yearly budgets, the volume of such projects being carried out between April and June is low while the busy season for such projects extends from autumn to the end of the fiscal year [end of March], such that the volume of such projects at this time of year tends to be high. If we look at the volume of projects in terms of output on a monthly basis, the project volume during the busy season was nearly 1.8 times as great as the project volume during the slack season in FY 2014 (Figure 3-2-24).

Figure 3-2-24 Changes in the volume of construction work in terms of output by month (Estimate of Construction Investment)



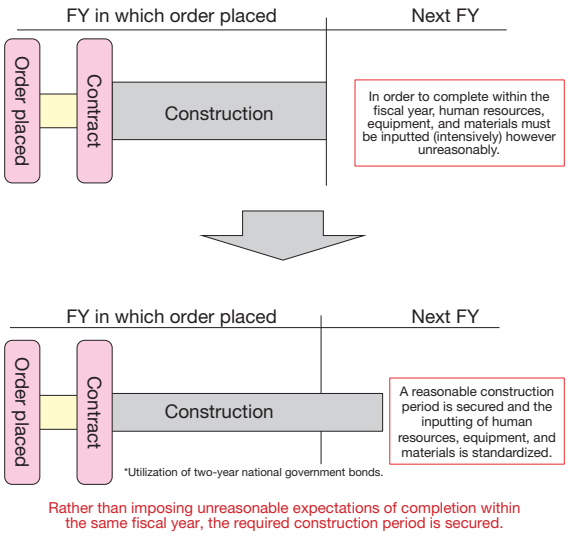
(Note) Output base (national)
Source) MLIT

In order to efficiently use limited amounts of human resources, construction periods should ideally be standardized to stabilize project volumes throughout the year. Since this measure can be accommodated by changing the way in which the work of ordering parties is carried out and does not require new investments, it is a measure that should be proactively

undertaken by ordering parties. Standardization can also be expected to restore the health of the management of Japanese construction companies, improve job conditions for workers, and help promote ownership of equipment and machinery by Japanese construction companies thanks to higher operating rates.

Standardization entails the systematic placement of orders after the standardization of construction periods and the end of construction periods is taken into account through the appropriate use of early order placement and the assumption of debts where required after the period required for each construction project is secured. It also helps to eliminate the busy season at the end of each fiscal year by discouraging the practice of forcefully finishing jobs before the end of the fiscal year and by appropriately utilizing the system of carrying forward debts where necessary (Figure 3-2-25).

Figure 3-2-25 The illustration multi-year contracting



Source) MLIT

It is also important to note that initiatives for standardization should be engaged in collectively by not just the national government but by all ordering parties, including local governments that account for approximately seventy percent of all public works. For this purpose, the national government, local governments, and other ordering parties shall collaborate in promoting standardization through local councils of purchasers (whose members include the national government, prefectural governments, and all municipalities and which are set up in each prefecture). It has been decided that the national government shall, where required, submit requests to local governments to promote standardization in accordance with the Act for Promoting Proper Tendering and Contracting for Public Works and other relevant laws.

(2) Promoting "Japan's Robot Strategy"

The government formulated "Japan's Robot Strategy" (finalized by the Japan Economic Revitalization Taskforce on February 10, 2015) in accordance with "the Japan Revitalization Strategy". This strategy aims to achieve a new Industrial Revolution driven by robots for an advanced country dealing with a dwindling birthrate and an aging population. Against the backdrop of a shortage of leaders, the progression of superannuation, and the frequent occurrence of disasters, an action plan (outlining goals and priority implementation areas) for the years until 2020 has been indicated. Goals indicated for the construction sector include the bold introduction of computerized construction technology, an example of robot technology, to construction sites and the promotion of improvements in productivity and laborsaving efforts based on the notion that all processes, including front-end and back-end processes, form a system. To attain these goals, the promotion of integrated measures through (i) the development of technology, (ii) the adoption of technology in the field, and (iii) the

Figure 3-2-26 Examples of robots in different areas: general construction, infrastructure maintenance, and disaster responses

Source) MLIT

development of a market environment is required.

Japan manufactures and uses more robots than any other country in the world; the nation boasts of shipping industrial robots worth JPY 340 billion each year and of having approximately 300,000 operating units in the country. It is said that Japanese models of hydraulic shovels found on construction sites account for at least eighty percent of the global market while ICT construction equipment embedded with three-dimensional design data-based machine-controlling technology constitutes construction technology that is—along with unmanned construction processes and computerized construction processes—the pride of Japan.

The new robot strategy sets forth three areas—general construction, infrastructure maintenance, and disaster responses—as priority areas for the advancement of robots (Figure 3-2-26).

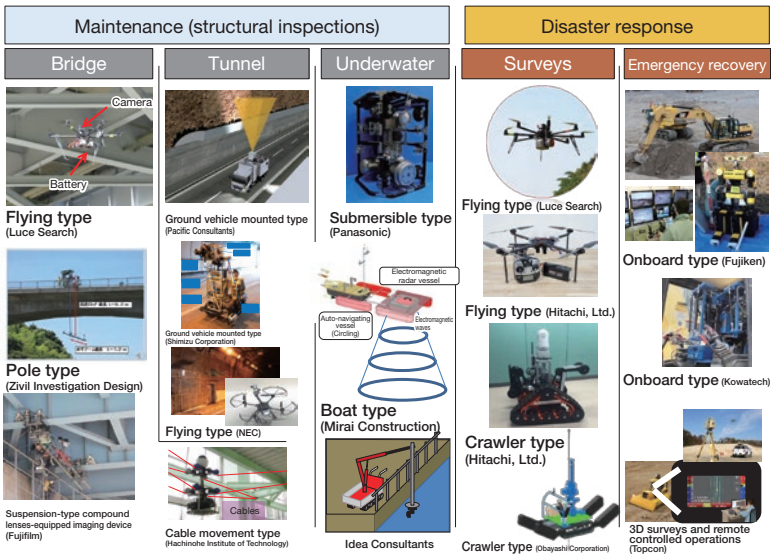
The MLIT will, in collaboration with leading experts in various fields in which contributions will be made to bring about technological innovations, promote the realization of the aforementioned i-Construction in the area of construction production and the development and introduction of next-generation infrastructure robots for societal infrastructure in the areas of infrastructure maintenance and disaster responses.

(Development and Introduction of Robots for the Next Generation Social Infrastructure)

While the cognitive power of robots is presently still far from being complete when compared to that of humans, it is expected that the day will come when they can replace humans performing inspection work.

The MLIT is promoting the development and adoption of next-generation robots for societal infrastructure in order to effectively and efficiently conduct inspections of massive infrastructural elements and rapidly and precisely survey disaster sites that are difficult for humans to access and carry out emergency recovery work. Over a two-year period between FY 2014 and FY 2015, highly practical robots were invited to conduct field investigations and evaluations in order to verify practicality in terms of introduction on a trial basis (Figure 3-2-27). This information, including video clips of the status of validation, has been released through our disclosure site (Figure 3-2-28) [Note 79]. Since FY 2016, the introduction of robots on a trial basis based on the results of field investigations has been progressively pursued. There are plans to properly arrange usage steps and other matters through trial runs performed with actual on-site operations.

Figure 3-2-27 Examples of testing with next-generation robots for societal infrastructure (non-comprehensive)



Source) MLIT

Figure 3-2-28 Portal site for publicly disclosed field tests conducted by next-generation robots for societal infrastructure

Source) MLIT

Note 79 http://www.c-robotech.info/http://www.c-robotech.info/

Column

Efforts toward practical use of automatic driving (automatic cruising)

In order to realize the safest road traffic society (in the world), various measures have been taken to put automatic driving technology to practical use in Japan. If the technology is fully realized, it will bring about various social advantages, such as reduction in traffic accidents, alleviation of traffic congestion, responses to the aging society, relief of overpopulation in urban cities, and reduction in environmental loads.

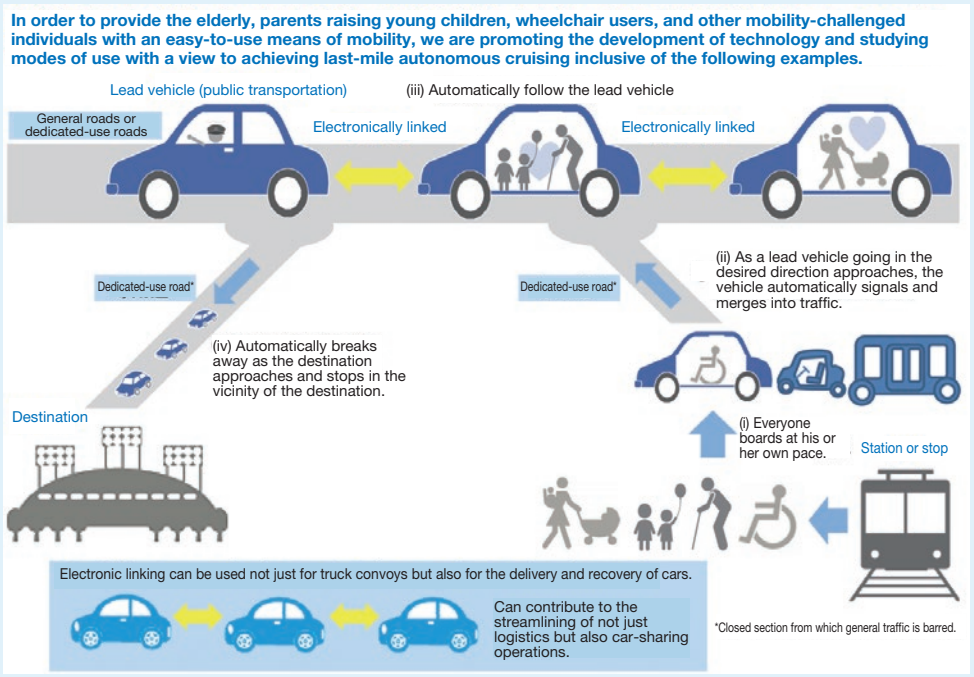
As efforts toward next-generation vehicles in Japan, the Cabinet Office and other government offices associated with automobiles established the Cross-ministerial Strategic Innovation Promotion Program (SIP), which states that the realization and dissemination of automated driving system are to be gradually promoted from the late 2010s, and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) has also participated in the program. In addition, with the cooperation of the Ministry of Economy, Trade and Industry, the MLIT held a review meeting on the automatic cruise business in February 2015, began consideration, and put together future action policies in a report in March 2016, for the purpose of enhancing Japan's international competitiveness in the automatic driving technology and acquiring the international standards beneficial to Japan.

Automobile manufacturers in Japan, aiming to market cars that can automatically cruise on expressways from 2018 to 2020, has been conducting driving tests on public roads.

In advanced nations where society is aging, including Japan, how the elderly and persons with disabilities, who cannot drive cars, obtain means of transportation for their lives is an issue. The automated cars are expected to be one solution to this issue. Creation of an environment for safe ingress, egress, and driving will be necessary.

In the rural areas, the provision of the last one-mile of mobility suited to local needs can improve the quality of life in those areas (Figure 3-2-29).

Figure 3-2-29 Illustration of last-mile autonomous cruising



Source) Ministry of Economy, Trade and Industry