Chapter 3   Prospects for the Future Generated by Innovation
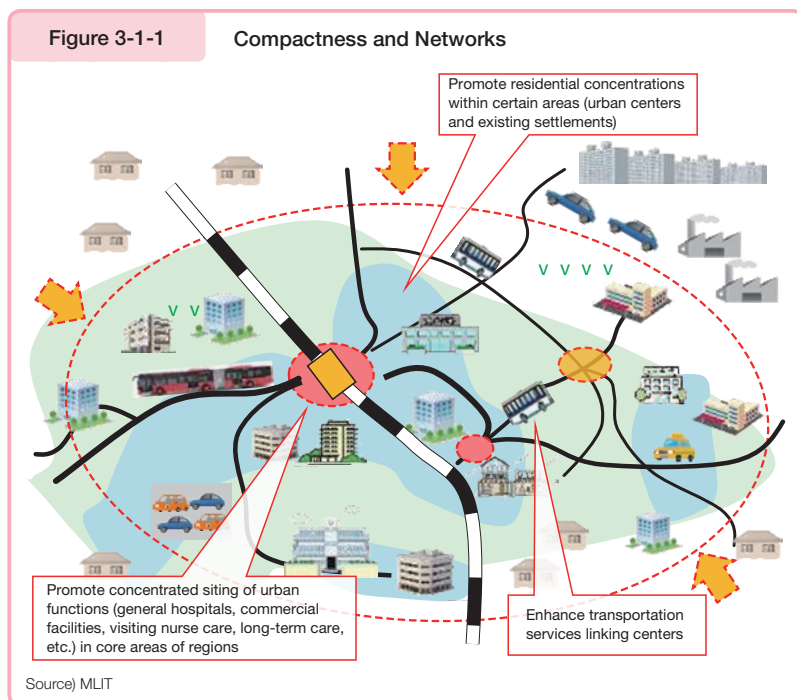
Chapter 3 will first present a projection up to the year 2050, with an overview of a future social environment in which advances have been made in the implementation in society of new technology and new services in the land, infrastructure, transport and tourism sectors. Then, in light of the future social environment, the chapter will present lifestyles and issues together with an examination of the future society in terms of community development undertaken by corporations and local communities as well as of future-oriented innovation activities. This chapter will further refer to the results of national attitude survey[Note 66] of the Japanese public conducted by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) to determine the Japanese people's ideal image of a future society.

Section 1   Predictions of the Future Social Environment

(1) National Land and Regional Development with a View to 2050

In order for the MLIT to respond to the kinds of drastic changes in the circumstances surrounding the national land, including rapidly declining population, low birth rates, and a possibly imminent large-scale disaster, which were summarized in Chapter 1, the ministry published the "Grand Design of National Spatial Development Toward 2050" in July 2014. This document shares the public sense of crisis and sets forth principles of national land and regional development from a medium- to long-term perspective (generally with a view to the year 2050). Taking this into consideration, changes to the National Spatial Strategies (National Plan) for a plan period of roughly 10 years starting in 2015 were adopted by a Cabinet decision in August 2015.

The second phase of the National Spatial Strategies (National Plan) presents a basic framework for building a "convection-promoting national land" that creates vigorous interactive movements of people, goods, money, and information back and forth between regions (convection) by refining the varied and distinctive individual characteristics of those regions. The plan describes the kind of national structure and regional structure that will create this convective movement in terms of compactness and networks. That is, medical, commercial, and other such life service functions, as well as other types of functions, are consolidated within certain defined regions in a compact manner and the regions are tied into a connecting network (Figure 3-1-1).

Figure 3-1-1   Compactness and Networks

Promote residential concentrations within certain areas (urban centers and existing settlements)

Promote concentrated siting of urban functions (general hospitals, commercial facilities, visiting nurse care, long-term care, etc.) in core areas of regions

Enhance transportation services linking centers

Source) MLIT

(2) Advancing the Development of Transportation Infrastructure

Support for the foundation of national land development by compactness and networks includes transportation infrastructure. Major advances in the development of key transportation infrastructure are anticipated by the year 2050. These include three

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Note 66   Survey coverage and so on are the same as those of the public opinion poll cited in Section 3 of Chapter 2.

ring roads in the Tokyo Metropolitan Area, the Linear Chuo Shinkansen[Note 67], and the new Shinkansen lines to be developed.
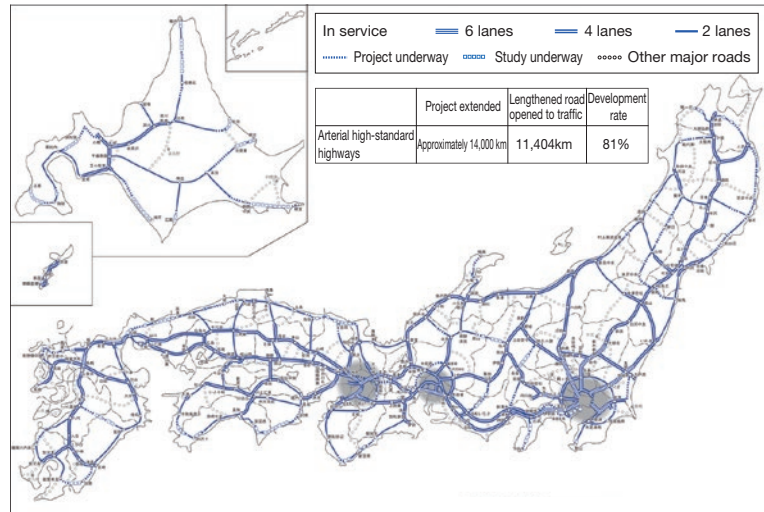
(Arterial high-standard highways)

When adjacent metropolitan areas collaborate through the use of expressway networks, they will be able to secure a certain scale of population even under the circumstances of a declining population. Furthermore, the development of trunk road networks of arterial high-standard highways and other such roads (Figure 3-1-2) contributes significantly to vitalization of local economies by encouraging the siting of factories and large distribution facilities near expressway interchanges, for example, and by increasing employment and tax revenues. At the same time, this also contributes greatly to improving the quality and safety of the lives of the Japanese people by making it possible, for example, to receive wide-area medical services in rural areas and to ensure detour routes over wide areas in the event that trunk roads are made impassable by disaster or other such reason.

| Figure 3-1-2 | Arterial High-Standard Highways, etc. |

In service — 6 lanes — 4 lanes — 2 lanes
······· Project underway ∘∘∘∘∘ Study underway ∘∘∘∘∘ Other major roads

	Project extended	Lengthened road opened to traffic	Development rate
Arterial high-standard highways	Approximately 14,000 km	11,404km	81%

As of March 31, 2017

(Notes) 1 Names of interchanges and junctions in sections where projects are underway include provisional names.
2 The "Other major roads" on this route map indicate major regional road plans (including where projects are underway and sections that are open to traffic) and do not indicate the necessity or otherwise of individual routes or the order of priority assigned to them.
Source) MLIT

(Forming a super mega-region)

Opening the Linear Chuo Shinkansen for service[Note 68] to connect Tokyo, Nagoya, and Osaka is very likely to dramatically heighten the convenience of access between major metropolitan areas and rural areas and to have as great an impact on the national land as the Tokaido Shinkansen did. Opening the Linear Chuo Shinkansen for service will link the three major metropolitan areas within one hour. This will make that travel much the same, in a sense, as travel within a city, so that the three major metropolitan areas will become integrated even as they function in their individually distinctive ways. This can be expected to form a super mega-region that takes the lead globally by providing access
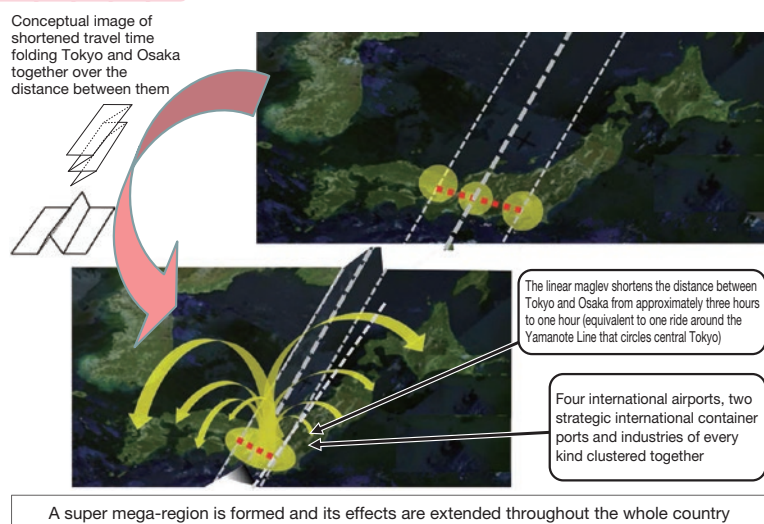
| Figure 3-1-3 | Conceptual Image of the Multiplier Effect of Linear Chuo Shinkansen Development |

Conceptual image of shortened travel time folding Tokyo and Osaka together over the distance between them

The linear maglev shortens the distance between Tokyo and Osaka from approximately three hours to one hour (equivalent to one ride around the Yamanote Line that circles central Tokyo)

Four international airports, two strategic international container ports and industries of every kind clustered together

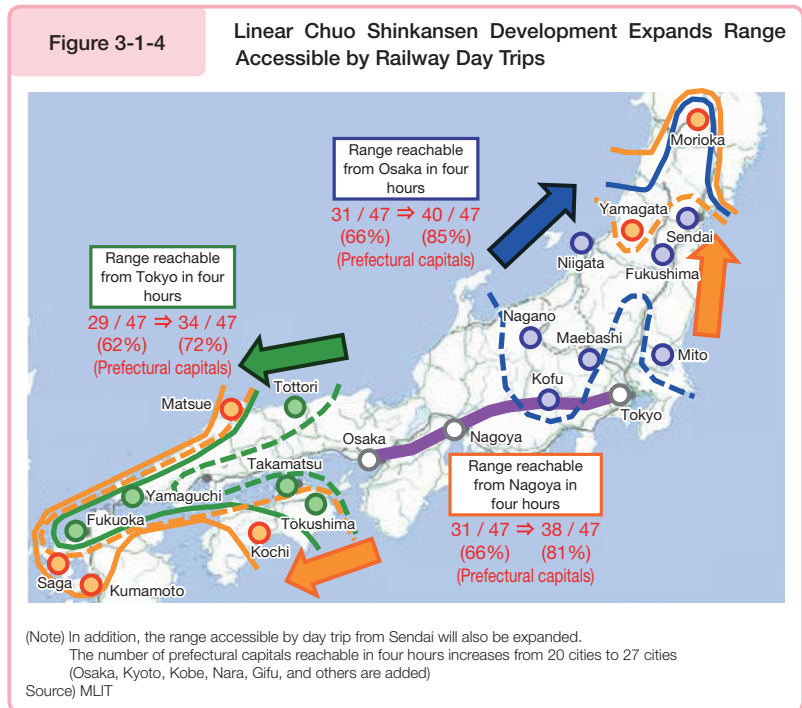A super mega-region is formed and its effects are extended throughout the whole country

Source) MLIT

Note 67 Shinkansen train that runs at a top speed of 505 km/h using a conducting magnetic levitation (superconducting maglev) system. It will travel between Tokyo and Nagoya in 40 minutes, and between Tokyo and Osaka in 67 minutes.

Note 68 The Minister of Land, Infrastructure, Transport and Tourism has designated the Central Japan Railway Company as the entity of operation and construction. Service between Shinagawa in Tokyo and Nagoya is scheduled to begin in 2027. Construction is presently underway at Shinagawa Station and the Southern Alps tunnels. The Fiscal Investment and Loan Program is to be used for construction of the section between Shinagawa and Nagoya, thus bringing forward the opening of the entire length to Osaka by a maximum of eight years from 2045.

to four major international airports and two strategic international container ports while attracting people, goods, money, and information from around the world (Figure 3-1-3). This will form an enormous metropolitan area that is the largest in the world, with a population of 70 million. Tokyo and Osaka will serve as giant hubs for the mega-region, which will make it possible to develop a "regional economic development corridor" that integrates the whole country in a single economic sphere. This will facilitate steps to improve Japan's international competitiveness, while also spreading that capacity for growth throughout the country and causing the Japanese economy as a whole to expand.

Intermediate stations along the Linear Chuo Shinkansen will also be used. This will stimulate the "convective" flow between major cities and local communities that have found it difficult so far to obtain rapid access to those cities, and will raise the possibility of new lifestyles (including people having residences in two regions) when urban living and environments surrounded by nature are brought closer together in terms of travel time as well as possibilities for promoting corporate siting outside the major urban areas (Figure 3-1-4).

| Figure 3-1-4 | Linear Chuo Shinkansen Development Expands Range Accessible by Railway Day Trips |

Range reachable from Osaka in four hours
31 / 47 ⇒ 40 / 47
(66%)   (85%)
(Prefectural capitals)

Range reachable from Tokyo in four hours
29 / 47 ⇒ 34 / 47
(62%)   (72%)
(Prefectural capitals)

Range reachable from Nagoya in four hours
31 / 47 ⇒ 38 / 47
(66%)   (81%)
(Prefectural capitals)

(Note) In addition, the range accessible by day trip from Sendai will also be expanded.
      The number of prefectural capitals reachable in four hours increases from 20 cities to 27 cities
      (Osaka, Kyoto, Kobe, Nara, Gifu, and others are added)
Source) MLIT

(3) Technological Innovation Advanced by Dramatic Progress in ICT

Technological innovations have already brought major changes and progress to people's lives and to society. The evolution in recent years has been particularly conspicuous in AI, robots, IoT, and other such sectors that are predicted to bring significant impact to the economy and society. According to research conducted by Nomura Research Institute, Ltd., into the effects of computerization on employment, 49% of the working population in Japan could be replaced by technological means (Figure 3-1-5). The robot market in Japan is also predicted to grow to 5.3 trillion yen in 2025 and to 9.7 trillion yen in 2035. Outside the manufacturing sector, particularly conspicuous growth in the service sector is predicted (Figure 3-1-6).

Figure 3-1-5 | Percentages of Working Population Replaceable by Artificial Intelligence, Robots, etc. (Comparison of Japan, U.K., and U.S.)
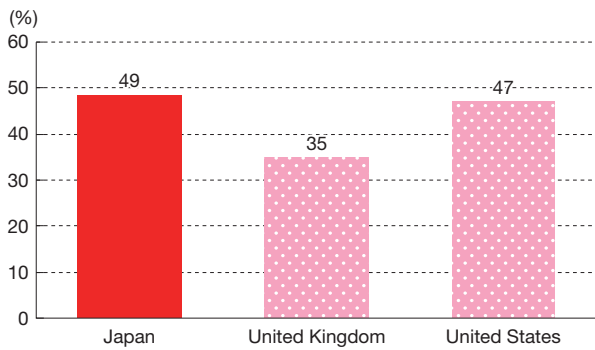
(Note) Data for the United States is from Frey and Osborne, "The Future of Employment" (2013), while data for the United Kingdom is from Frey and Osborne and also from report results (2014) from Deloitte Tohmatsu Consulting, LLC.
Source) Nomura Research Institute, Ltd.

Figure 3-1-6 | Estimated Scale of the Robot Market in Japan

(Unit: 100 million yen)
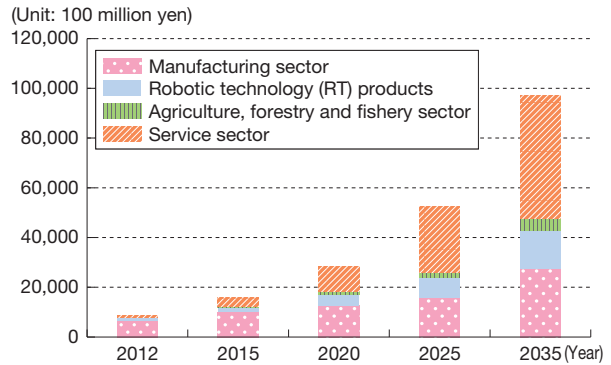
| (Unit: 100 million yen)	Current estimated values	2015	2020	2025	2035
Manufacturing sector	Approximately 6,600	10,018	12,564	15,807	27,294
Robotic technology (RT) products	Approximately 1,400	1,771	4,516	8,057	15,555
Agriculture, forestry and fishery sector	Approximately 10	467	1,212	2,255	4,663
Service sector	Approximately 600	3,733	10,241	26,462	49,568
Total	Approximately 8,600	15,990	28,533	52,580	97,080

(Note) Figures for 2015-2035 are from New Energy and Industrial Technology Development Organization (NEDO) and Ministry of Economy, Trade and Industry, "FY2010 Future Market Survey on the Robot Industry."
Source) Ministry of Economy, Trade and Industry, "Results of a Trend Survey on the Robot Industry Market" (released July 18, 2013)

(Advances of technological innovation in the construction sector)

The situation of the construction industry with regard to skilled workers is that as those workers age, the industry faces the possibility that they will leave their employment in large numbers due to retirement. It is projected that maintenance and management of deteriorating infrastructure and responses to disaster will increasingly be carried out by remotely operated monitoring and surveys conducted by robots. The conspicuous improvement in monitoring technology makes it a simple matter to identify locations that need repair, making it possible for small numbers of workers to carry out highly efficient work, and also significantly shortening construction time (Figure 3-1-7).
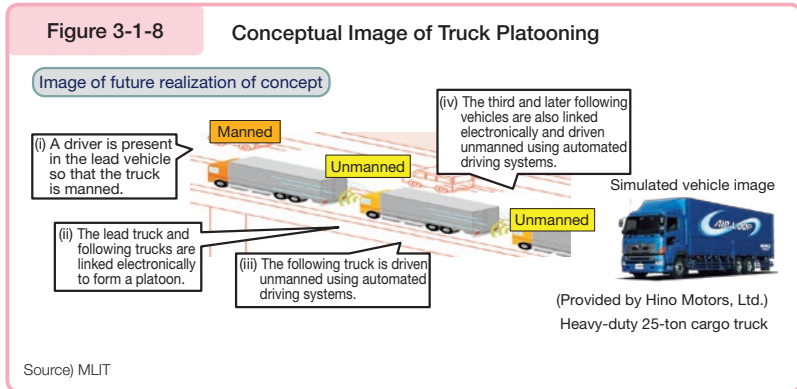
Figure 3-1-7 | Conceptual Image of Prospects for Utilization of Tunnel Inspection Robot Technology
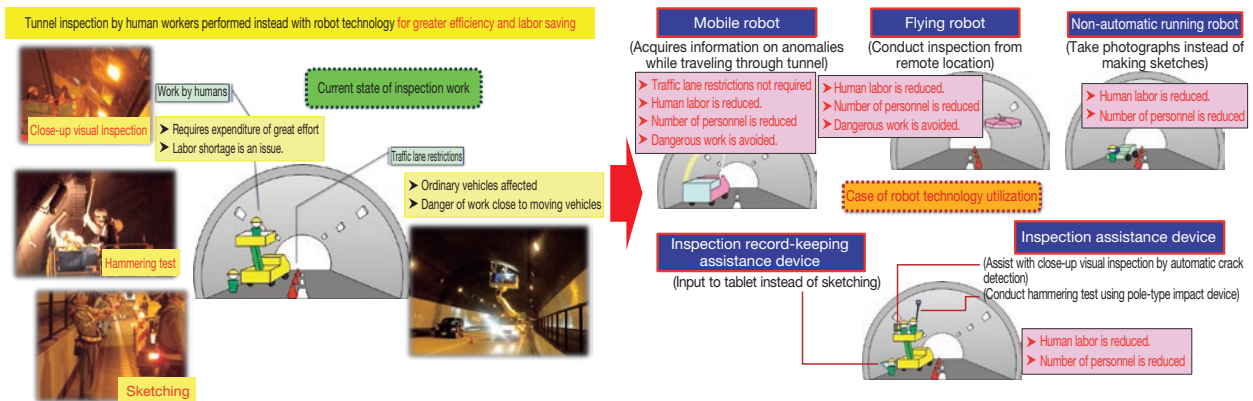
Source) MLIT

(Advances of technological innovation in the transportation and logistics sectors)

Automated driving technology, if it is applied to practical use, will assure a level of safe driving that equals or exceeds that of accomplished safe drivers. This will realize a society in which traffic accidents almost never happen. In regions that have feared that public transportation will decline as birthrates drop and the population ages, this technology will ensure that elderly people and other who need it will have a means of transportation. Public transportation networks that make use of automatic driving will also be developed as necessary at junction points and regional cities in the essential transportation infrastructure. This can be expected to realize an environment in which even people who are unable to drive an automobile can receive the life services they need. The use of automated driving technology can also realize truck platooning, thereby increasing the amount of cargo that can be transported by a single truck driver. This will contribute to a resolution of the driver shortage (Figure 3-1-8).

Figure 3-1-8   Conceptual Image of Truck Platooning

Image of future realization of concept

(i) A driver is present in the lead vehicle so that the truck is manned.

Manned

Unmanned

(iv) The third and later following vehicles are also linked electronically and driven unmanned using automated driving systems.

Unmanned

Simulated vehicle image

(ii) The lead truck and following trucks are linked electronically to form a platoon.

(iii) The following truck is driven unmanned using automated driving systems.

(Provided by Hino Motors, Ltd.)
Heavy-duty 25-ton cargo truck

Source) MLIT

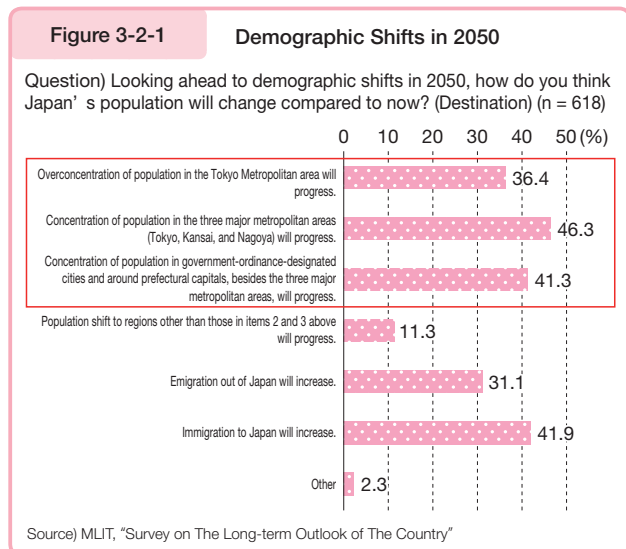## Section 2   Japan in 2050 as Envisioned with Innovation

1   The Future Envisioned Based on the Present and the Ideal Future

(1) Envisioned Future

(The future envisioned based on the present)

According to the "Survey on The Long-term Outlook of The Country" given by the Ministry of Land, Infrastructure, Transport and Tourism to specialists and knowledgeable people in a wide range of fields, including population, socioeconomics, national infrastructure, and industry[Note 69], Japan in the year 2050 is envisioned as described below.
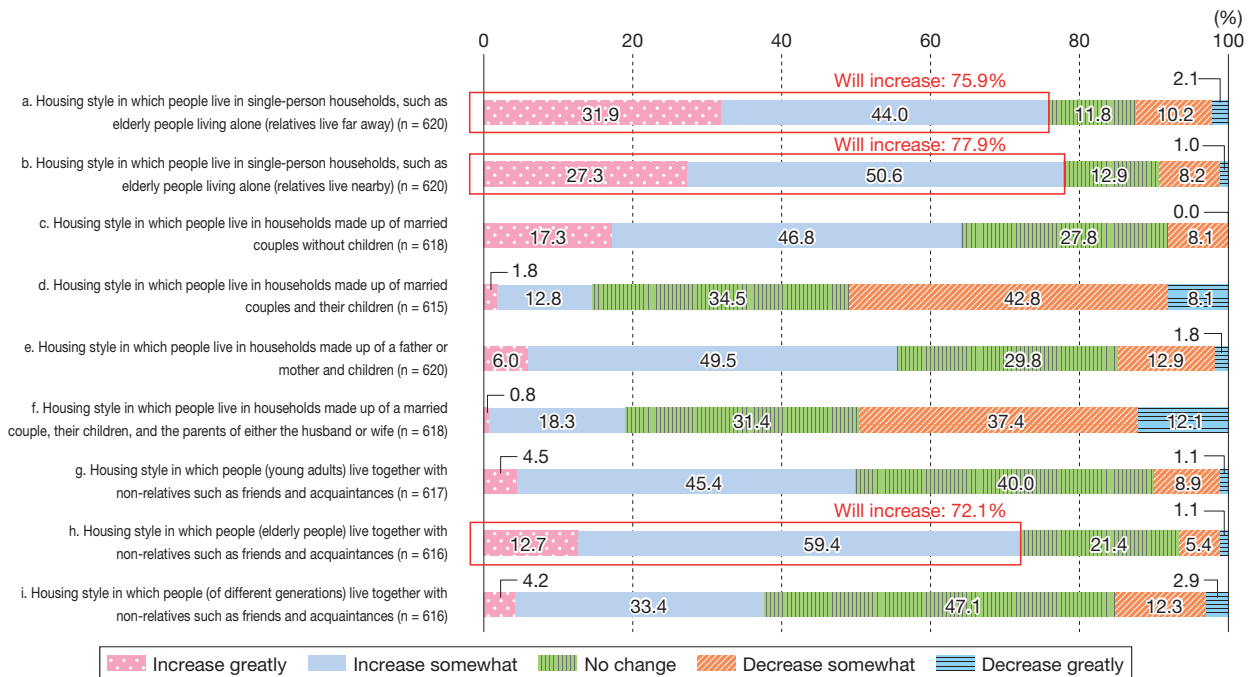
With respect to demographic shifts, many replies imagine the population will concentrate in urban areas. As for housing style, 75% or more of respondents predicted an increase in a "housing style in which people live in single-person households, such as elderly people living alone," and 72.1% predicted an increase in a housing style in which the elderly live together with other elderly people who are not relatives. Thus, they forecast changes in housing style (Figures 3-2-1 and 3-2-2).

Figure 3-2-1   Demographic Shifts in 2050

Question) Looking ahead to demographic shifts in 2050, how do you think Japan's population will change compared to now? (Destination) (n = 618)

	%
Overconcentration of population in the Tokyo Metropolitan area will progress.	36.4
Concentration of population in the three major metropolitan areas (Tokyo, Kansai, and Nagoya) will progress.	46.3
Concentration of population in government-ordinance-designated cities and around prefectural capitals, besides the three major metropolitan areas, will progress.	41.3
Population shift to regions other than those in items 2 and 3 above will progress.	11.3
Emigration out of Japan will increase.	31.1
Immigration to Japan will increase.	41.9
Other	2.3

Source) MLIT, "Survey on The Long-term Outlook of The Country"

Note 69   Given to the members of around 30 associations related to national planning, such as the Science Council of Japan and the Architectural Institute of Japan. The survey was conducted from July 7 to 28, 2010, and a total of approximately 620 responses were received.

Figure 3-2-2　　Housing Styles in 2050

Question) Even though the population is forecast to decline, the number of households is expected to change little by 2030. Housing not confined to the conventional "family" unit, such as group homes for the elderly and room sharing, especially among young adults, is attracting interest, mainly in the cities. It is thought that the form that "families" take will change with the times. How do you predict that housing styles will change in Japan by 2050? (Three major metropolitan areas)

a. Housing style in which people live in single-person households, such as elderly people living alone (relatives live far away) (n = 620) — Will increase: 75.9% — 31.9 / 44.0 / 11.8 / 10.2 / 2.1

b. Housing style in which people live in single-person households, such as elderly people living alone (relatives live nearby) (n = 620) — Will increase: 77.9% — 27.3 / 50.6 / 12.9 / 8.2 / 1.0

c. Housing style in which people live in households made up of married couples without children (n = 618) — 17.3 / 46.8 / 27.8 / 8.1 / 0.0

d. Housing style in which people live in households made up of married couples and their children (n = 615) — 1.8 / 12.8 / 34.5 / 42.8 / 8.1

e. Housing style in which people live in households made up of a father or mother and children (n = 620) — 6.0 / 49.5 / 29.8 / 12.9 / 1.8

f. Housing style in which people live in households made up of a married couple, their children, and the parents of either the husband or wife (n = 618) — 0.8 / 18.3 / 31.4 / 37.4 / 12.1

g. Housing style in which people (young adults) live together with non-relatives such as friends and acquaintances (n = 617) — 4.5 / 45.4 / 40.0 / 8.9 / 1.1

h. Housing style in which people (elderly people) live together with non-relatives such as friends and acquaintances (n = 616) — Will increase: 72.1% — 12.7 / 59.4 / 21.4 / 5.4 / 1.1

i. Housing style in which people (of different generations) live together with non-relatives such as friends and acquaintances (n = 616) — 4.2 / 33.4 / 47.1 / 12.3 / 2.9

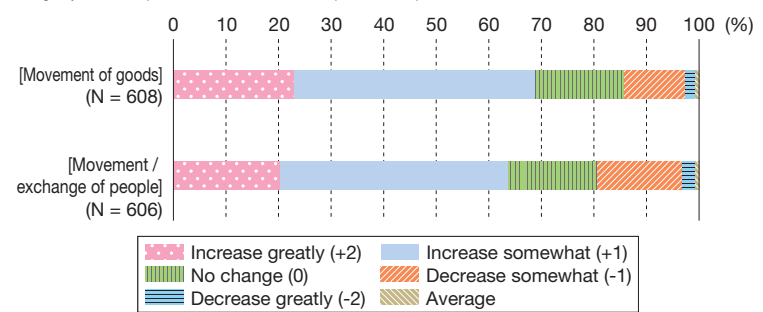Legend: Increase greatly　Increase somewhat　No change　Decrease somewhat　Decrease greatly

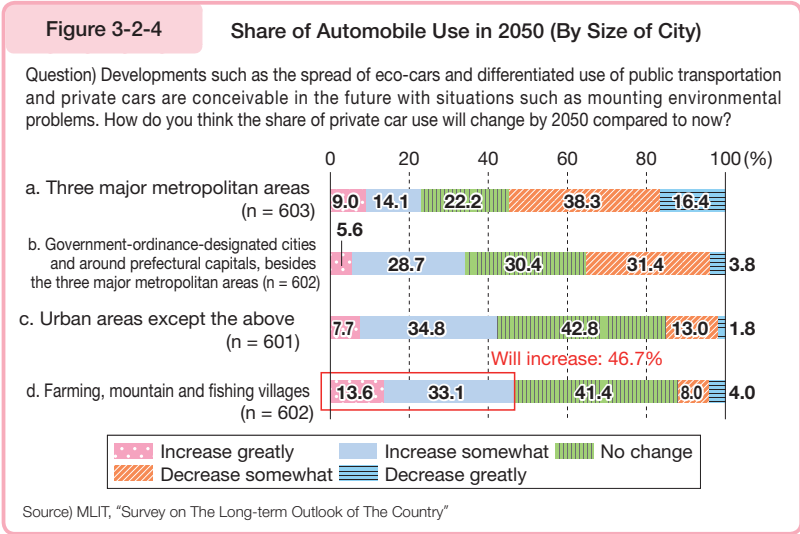Source) MLIT, "Survey on The Long-term Outlook of The Country"

Regarding transportation and the movement of people and goods, although it is thought that activities that do not require the movement of people and goods will increase with progress in the application of information and communications networks in various fields, such as work and medical care, the movement of people and goods is predicted to increase even if information and communications networks develop and spread (Figure 3-2-3). Looking at the predicted use of automobiles in 2050, 46.7% of respondents in farming, mountain and fishing villages replied that the use of private cars would increase (Figure 3-2-4). In such rural villages, dependence on cars will increase further on the back of reductions in public transportation networks, and there is concern that the shortage of means of transport for elderly people who cannot drive will become more serious.

Figure 3-2-3　　Movement of People and Goods in 2050

Question) It is expected that new social systems that make use of information and communications networks will be established in the future. How do you think the movement and exchange of people and the movement of goods will change by 2050 compared to now with the development and spread of information and communications networks?

[Movement of goods] (N = 608)

[Movement / exchange of people] (N = 606)

Legend: Increase greatly (+2)　Increase somewhat (+1)　No change (0)　Decrease somewhat (-1)　Decrease greatly (-2)　Average

Source) MLIT, "Survey on The Long-term Outlook of The Country"

Figure 3-2-4   Share of Automobile Use in 2050 (By Size of City)

Question) Developments such as the spread of eco-cars and differentiated use of public transportation and private cars are conceivable in the future with situations such as mounting environmental problems. How do you think the share of private car use will change by 2050 compared to now?

a. Three major metropolitan areas (n = 603)
9.0 14.1 22.2 38.3 16.4

b. Government-ordinance-designated cities and around prefectural capitals, besides the three major metropolitan areas (n = 602)
5.6 28.7 30.4 31.4 3.8

c. Urban areas except the above (n = 601)
7.7 34.8 42.8 13.0 1.8

Will increase: 46.7%

d. Farming, mountain and fishing villages (n = 602)
13.6 33.1 41.4 8.0 4.0

Legend:
- Increase greatly
- Increase somewhat
- No change
- Decrease somewhat
- Decrease greatly

Source) MLIT, "Survey on The Long-term Outlook of The Country"

Regarding infrastructure development, a variety of problems are anticipated to emerge if investment remains at the current level. Particularly with respect to existing infrastructure, around 70% of respondents forecast that maintenance and updating will become difficult, that safety will decline, and that population decline and changes in the socioeconomic situation will lead to the serious problems of increase in and neglect of unused infrastructure (Figure 3-2-5).

Figure 3-2-5   Problems with Infrastructure Development in 2050

Question) With respect to national infrastructure (social infrastructure that makes up the nation), such as roads and water supply and sewerage systems, by 2050, what problems do you think could emerge regarding the following items, assuming the current level of investment continues?

a. Maintenance and updating of existing infrastructure will become difficult, causing a decline in safety. (n = 604)
34.8 37.4 20.7 7.1

Will be a serious problem: 72.2%

b. Measures against anticipated disasters will still not be sufficiently implemented. (n = 602)
23.3 39.7 29.6 7.5

c. A wide gap will appear between the states of development of urban versus rural infrastructure. (n = 601)
20.3 35.1 28.5 16.1

d. Population decline and changes in the socioeconomic situation will lead to an increase in and neglect of unused infrastructure. (n = 600)
28.3 38.0 27.8 5.8

Will be a serious problem: 66.3%

e. Infrastructure (e.g., stations for electric cars) that can cope with new demands, such as next-generation means of transportation and movement (e.g., electric cars), will not be sufficiently developed. (n = 603)
9.0 28.0 39.1 23.9

f. There will be a shortage of human resources such as technicians to handle infrastructure development and management. (n = 604)
23.5 32.8 27.8 15.9

Legend:
- Will be a problem (very serious)
- Will be a problem (serious)
- Will be a problem (minor)
- Will not be a problem

Source) MLIT, "Survey on The Long-term Outlook of The Country"
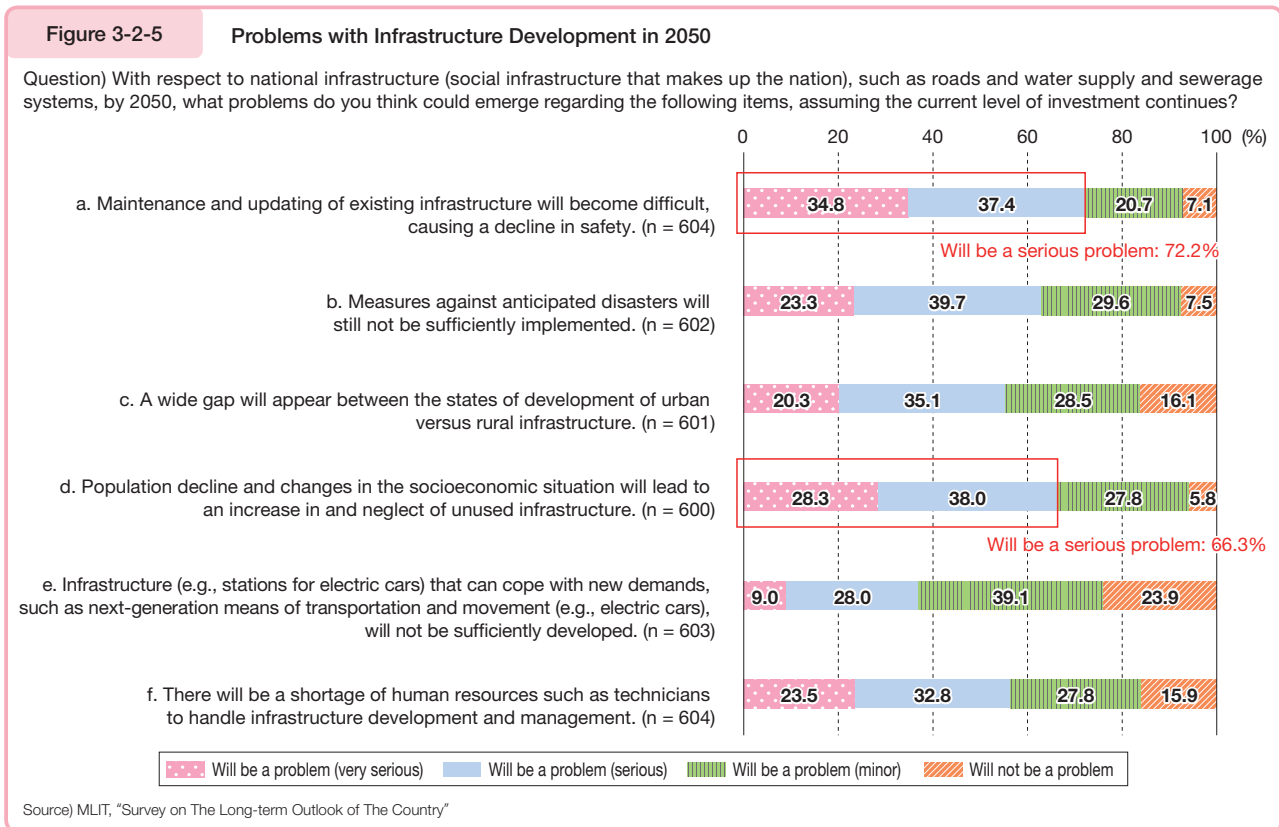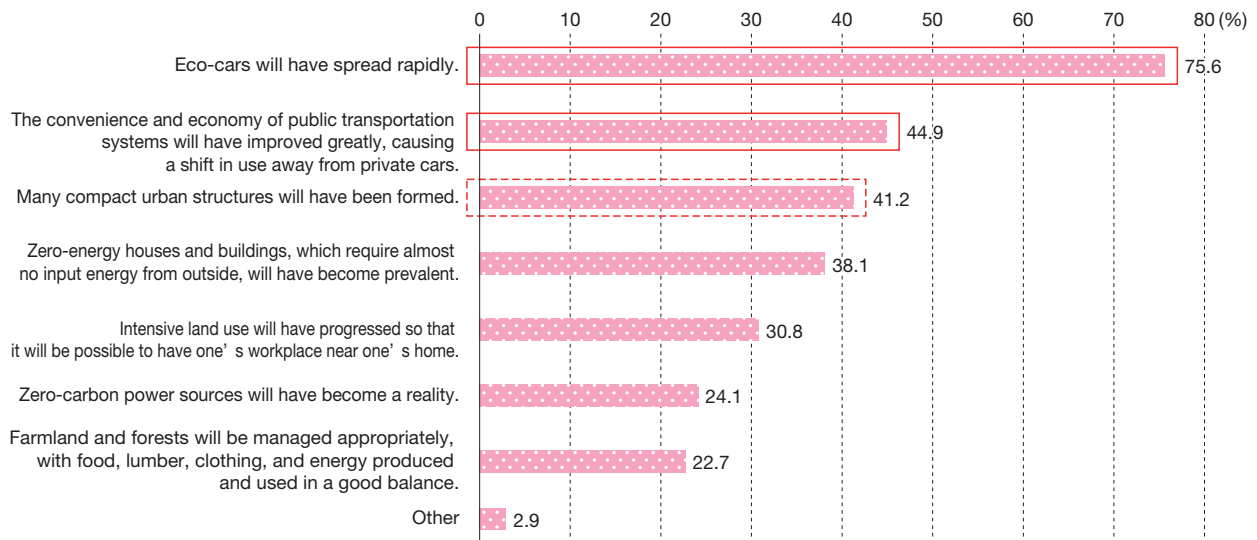
Figure 3-2-6   Social Changes Toward a Low-carbon Society in 2050

Question) How do you think society will have changed by 2050 in terms of a low-carbon perspective? (n = 590)

	(%)
Eco-cars will have spread rapidly.	75.6
The convenience and economy of public transportation systems will have improved greatly, causing a shift in use away from private cars.	44.9
Many compact urban structures will have been formed.	41.2
Zero-energy houses and buildings, which require almost no input energy from outside, will have become prevalent.	38.1
Intensive land use will have progressed so that it will be possible to have one's workplace near one's home.	30.8
Zero-carbon power sources will have become a reality.	24.1
Farmland and forests will be managed appropriately, with food, lumber, clothing, and energy produced and used in a good balance.	22.7
Other	2.9

Source) MLIT, "Survey on The Long-term Outlook of The Country"

In terms of responses to social issues toward the realization of a low-carbon society, there were more replies predicting changes in the field of transportation, such as the rapid spread of eco-cars, great improvement in the convenience and economy of public transportation, and a shift in use away from private cars, than there were other replies (Figure 3-2-6). Moreover, it is thought that the formation of compact cities will progress as an urban structure that encourages low-carbon lifestyles.

As described above, when imagining the year 2050 based on the current situation, it becomes clear that there is a need to address global-scale social issues such as environmental problems, as social issues in Japan related to such topics as population and infrastructure become more serious and apparent. There is also a need for environmental development suited to lifestyle changes such as housing styles.

(The future envisioned by companies and communities)

Next, we look at future-oriented town development and innovation initiatives by companies and communities.

■ Town development creating the future

"Smart city" initiatives, which utilize ICT throughout society to maximize the use of renewable energy, are attracting attention inside and outside Japan, driven by environmental problems and energy problems that are anticipated for the future. New town development efforts that attempt to add a little something extra to such smart city initiatives are taking place in different locations.

The Fujisawa Sustainable Smart Town (Fujisawa SST), which is being developed on an old Panasonic Corporation factory site in Fujisawa City, is a joint public-private project between private sector companies including Panasonic and Fujisawa City. Residential areas (with low- and mid-to-high-rise housing), lifestyle support areas, and welfare, health, and educational areas are located in a town covering an area of about 19 ha. There will be around 1,000 households. People started moving into some units in March 2014 and the town should be completed after 2020 (Figure 3-2-7).

Figure 3-2-7　　Overall View of Fujisawa SST

The town covers 19 hectares, the size of four Tokyo Domes.　*The above is a conceptual image.

Source) Fujisawa SST website
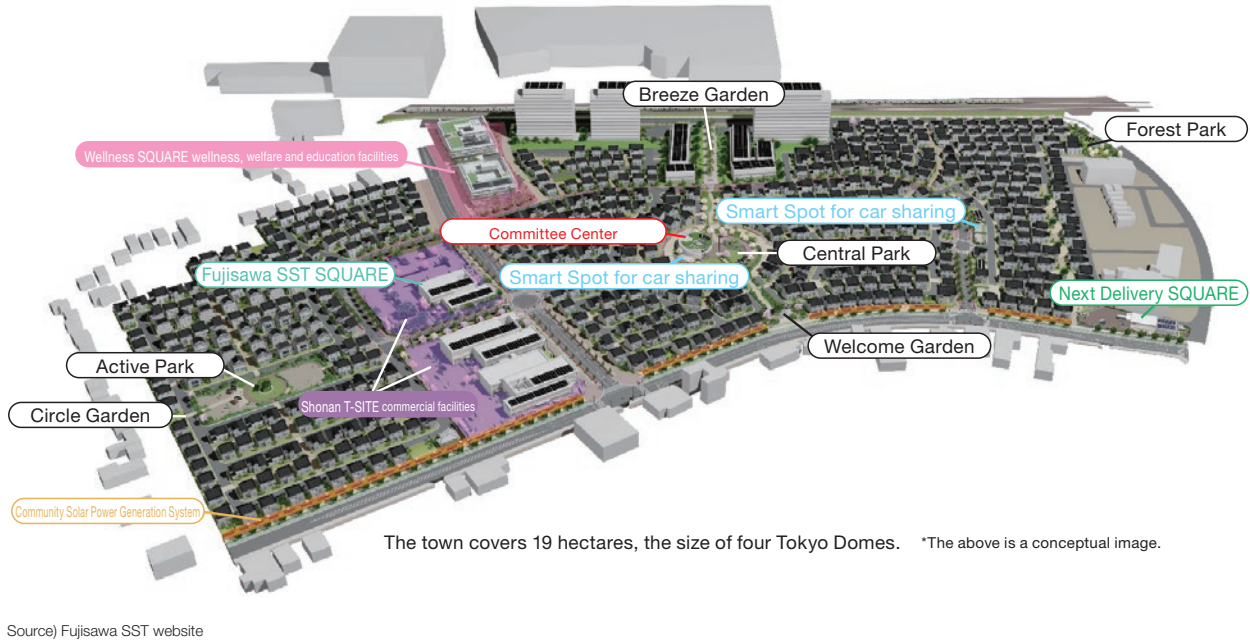
All detached houses in the community are equipped with solar power generation systems and storage batteries. Environmentally friendly initiatives are implemented community-wide, including visualization of electricity use for each household and facility and the establishment of energy goals such as a reduction of CO_2 by 70% for the town as a whole.

A feature of the town development at Fujisawa SST is that it is making efforts to establish a green and smart lifestyle by adopting cutting-edge technologies and services in a variety of fields such as mobility, not just energy, taking daily living as the starting point.

In terms of mobility, for instance, the town has developed a mobile-friendly environment for residents by providing a variety of means of transportation within the community, such as a sharing service for electric cars and power-assisted bicycles, a rental car service, and the provision of a mobility concierge service to suggest the best means of transportation according to the destination and situation (Figure 3-2-8).

Also, through the Town Portal, which uses smart TVs installed in every house, in addition to getting energy information on each household and the town as a whole, notices and event information can be sent out from the town management company and each facility, so that users can check the town's latest information. Residents can also post messages, provide information on club activities, and share objects and skills that they have. The system thereby acts like a town bulletin board for sharing various kinds of daily life information in real time.

Figure 3-2-8　　Fujisawa SST Mobility Services

Source) Fujisawa SST website

In this way, Fujisawa SST has created a system for individuals and groups that are active in the community to proactively participate in community activities, and makes use of community feedback in town development. Also, aiming to create a new, future-oriented town and society, Fujisawa SST has become a place that adopts and conducts proof-of-concept tests on cutting-edge technology and services. In October 2016, a system was started to improve the efficiency of deliveries by collecting packages from different delivery companies at the community's distribution center, from which Yamato Trans-

port Co., Ltd., then makes batch deliveries to each household. This is the first approved proposal of a general efficiency improvement plan based on the amended Act on General Improvement of Efficiency of Distribution.

As described above, town development through public-private collaboration and a focus on daily life is a new initiative to create a future society. It is hoped that from here on, such initiatives will turn town development into opportunities for creating innovation. Also, in the lifestyles of the future, efforts will be made to enhance and improve the convenience of functions related to community living, and it is hoped that a community-focused society with connections and relationships will be built.

■ Weather information business of the future

With progress in technologies such as AI, weather data is being used in a wide range of industries. Weathernews Inc., a major weather information company in Japan, works at providing new services by using new technologies and understanding customer needs. Looking ahead to new issues that climate change, anticipated for the future, and technological innovation will produce, the company is also working to create a new weather information business.

In response to climate change, the company measures and makes forecasts about sea ice and provides a support service for ship operation, since sea ice in the Arctic Ocean has been decreasing in the summer due to global warming in recent years, resulting in the Northeast Passage attracting the attention of the marine transportation industry as a third sea route connecting Asia and Europe[Note 70]. As heavy use of this sea route is anticipated in the future, the company is even planning to launch a satellite to perform its own observations.
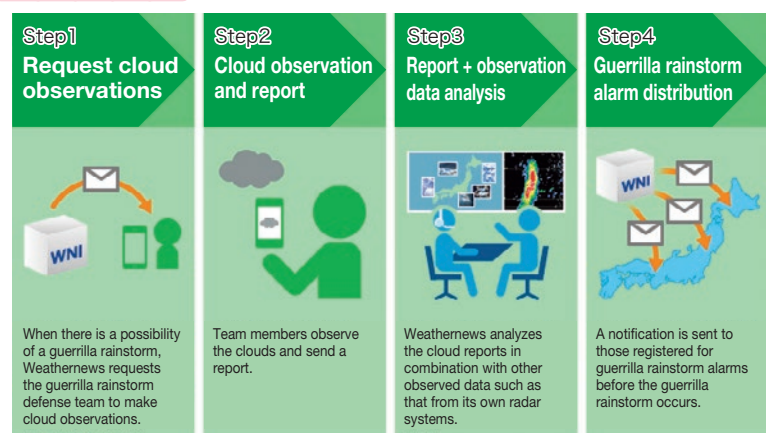
In terms of new issues created by technological innovation, in making automatic driving practical, for example, on-board sensors must recognize the lane by detecting boundaries of the road surface and the white lines, but that becomes difficult when it is snowing. Accordingly, the company supports the practical application of new technologies by providing high-quality information about snow, for instance.

In order to reduce damage caused by sudden localized torrential rain ("guerrilla rainstorms"[Note 71]), which is difficult to predict and has been increasing in recent years, the company has adopted new technologies such as AI in its services in an effort to more quickly notify users of weather forecasts of guerrilla rainstorms. The service uses AI technology and algorithms to analyze observed weather data as well as reports of sky changes and sensations from users who have registered for the service, and then notifies users as quickly as possible of the possibility of a guerrilla rainstorm (Figure 3-2-9).

Figure 3-2-9   "Guerrilla Rainstorm" Notification System

Step 1
Request cloud observations
When there is a possibility of a guerrilla rainstorm, Weathernews requests the guerrilla rainstorm defense team to make cloud observations.

Step 2
Cloud observation and report
Team members observe the clouds and send a report.

Step 3
Report + observation data analysis
Weathernews analyzes the cloud reports in combination with other observed data such as that from its own radar systems.

Step 4
Guerrilla rainstorm alarm distribution
A notification is sent to those registered for guerrilla rainstorm alarms before the guerrilla rainstorm occurs.

Source) Weathernews

As described above, initiatives to overcome social issues and technological innovation, with a view toward the future, have begun at the level of individual companies. Moreover, as initiatives move forward to protect daily life from weather disasters using new technology and information shared by people, disaster forecasting will become increasingly accurate, and disaster information and damage situations will be shared in a timely manner. It is hoped that this information will be useful for rapid evacuation activities and disaster responses.

Note 70   The sea routes that connect Asia and Europe are, in addition to the Northeast Passage, the route through the Suez Canal and the route around the Cape of Good Hope.

Note 71   Weathernews Inc. uses the expression "guerrilla rainstorm."

■ Ultra small mobility vehicles created in response to social issues

   Given mounting worldwide environmental awareness, the problem of means of transportation for the elderly, increasing urban populations, traffic congestion, and other problems, the spread of environmentally friendly, compact ultra small mobility vehicles[Note 72] is expected.

   According to the Road Traffic Census, many people who use cars use them mainly for transportation over short distances and most often drive alone (Figure 3-2-10). Given this kind of usage, efforts are being made to use small mobility vehicles as: (i) a means of daily transportation; (ii) a means of commercial transportation, such as small deliveries in the city; and (iii) a means of transportation for sightseeing (Figure 3-2-11).

Figure 3-2-10   **Actual Condition of Car Use in Local Transportation (Weekdays)**

[Percentage of trips by distance]

Light motor vehicles
Passenger vehicles
Light motor vehicles
Passenger vehicles

Car use distance (km)

Source: Aggregated from Road Traffic Census data for 2010

Driving alone most common

Light motor vehicles
Passenger vehicles

Number of people (private cars)

Source: Aggregated from Road Traffic Census data for 2010

Source) "Road Traffic Census" by the MLIT

Figure 3-2-11   **Examples of Ultra Small Mobility Vehicle Use**

Types of ultra small mobility vehicle use

Private and public business

More efficient deliveries (Japan Post, 7-Eleven)

Making house calls (Kumamoto Prefecture, Misato Town in Miyagi Prefecture, Takamatsu City, etc.)

Sightseeing

Excursions around remote islands and nature sightseeing spots
(Koshikijima Islands, Himeshima Island in Oita Prefecture, Kobe City, etc.)

Better navigability around resorts such as hot-spring areas
(Kaga City in Ishikawa Prefecture, Shikano Town in Tottori Prefecture, etc.)

Daily use

Daily use sharing in the city (Toyota City, Anjo City, etc.)

Daily use rentals in mountainous areas and on remote islands
(Satsumasendai City, Himeshima Island in Oita Prefecture, etc.)

Source) MLIT

Note 72   An ultra small mobility vehicle is defined as "a vehicle that is more compact than a car, can make tight turns, has excellent environmental performance, and can provide simple transportation within the community for one or two people."

Small mobility vehicles are useful as a future means of transportation suited to social issues. We are studying how to develop the environment to meet this technological innovation, including various kinds of infrastructure development (driving lanes, parking spaces, charging, etc.), ways to ensure safety, and other measures toward their full-scale application. These kinds of initiatives will enhance the means of community transportation within future lifestyles and enable stress-free transportation for all people, including the elderly and travelers, hopefully further boosting the movement of people and goods.

(2) The Future Hoped for by the Public

A "National Attitude Survey" conducted by the MLIT asked people what kind of lifestyle they hoped to have in a future society that will be changed greatly by innovation. As in Section 3 of Chapter 2, we consider the future society hoped for by the public, divided into three areas: land and infrastructure development, transportation, and lifestyle.

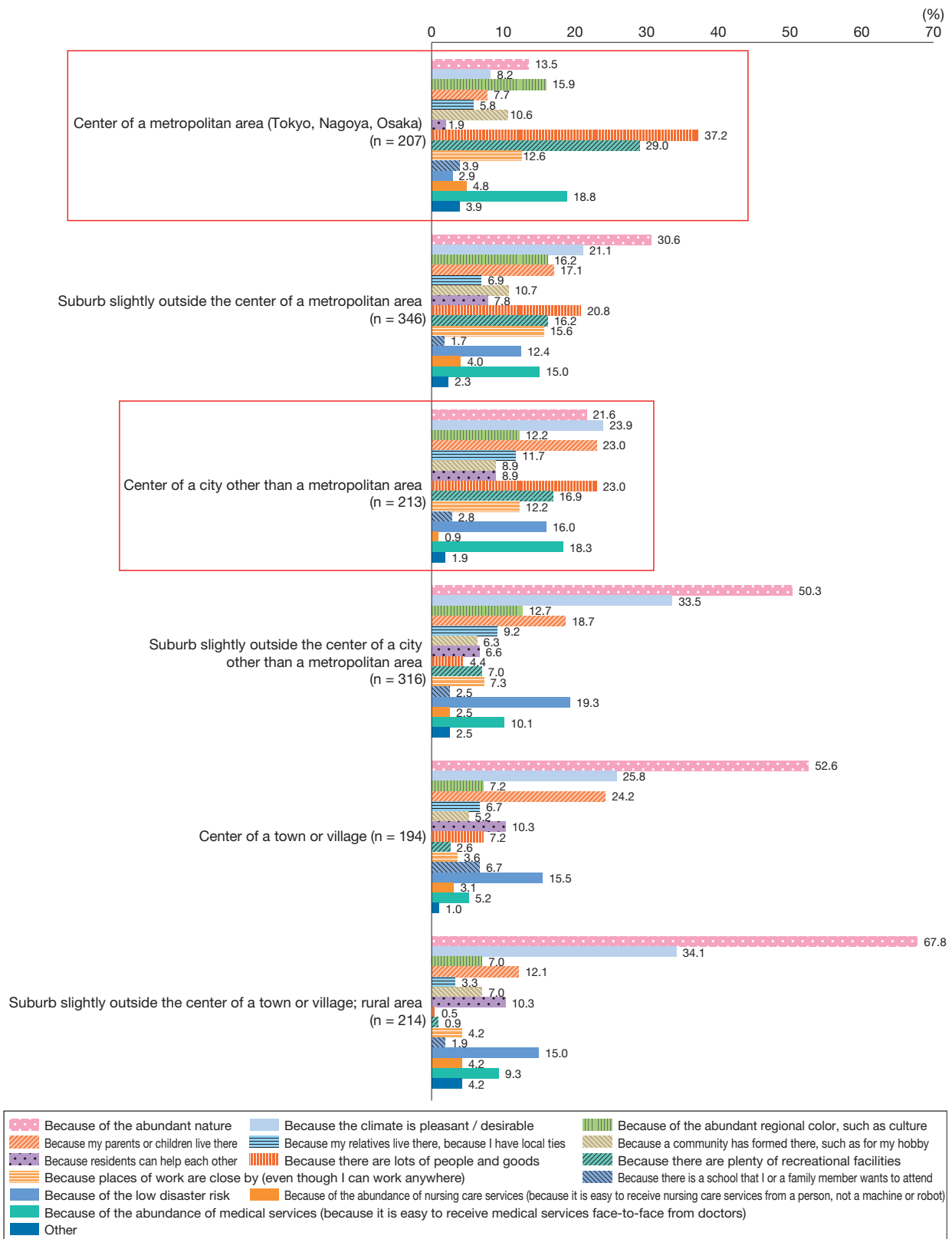### (Land and infrastructure development: Demographic shifts)

Society in 2050 is envisioned as having developed transportation infrastructure, providing fast and convenient transportation between cities with the development of high-speed networks. Within communities, compact city initiatives will have put all functions needed for daily life within reach by walking or public transport. It is also envisioned that the spread of working styles such as telework will reduce restrictions on location and time of working. When asked where they would choose to live in such a society, around half of people responded that they would hope to live in a different place than now[Note 73] (Figure 3-2-12).

Figure 3-2-12 Place of Residence Hoped for in 2050

Source) MLIT, "National Attitude Survey"

As for the reasons for choice of place of residence, people who hope to live in the "center of a metropolitan area" place a premium on conveniences such as the concentration of people and goods and the large number of facilities: "Because there are lots of people and goods," and "Because there are plenty of recreational facilities." People who hope to live in the "center of a city other than a metropolitan area," in addition to the concentration of people and goods, also stressed nature and a good climate as well as conditions related to family, such as "Because my parents or children live there" (Figure 3-2-13). Among those who hope to live in a place other than the above, on the other hand, in addition to nature, a good climate, and conditions related to family, comparatively more people indicated "low disaster risk" as a reason for their choice of place of residence.
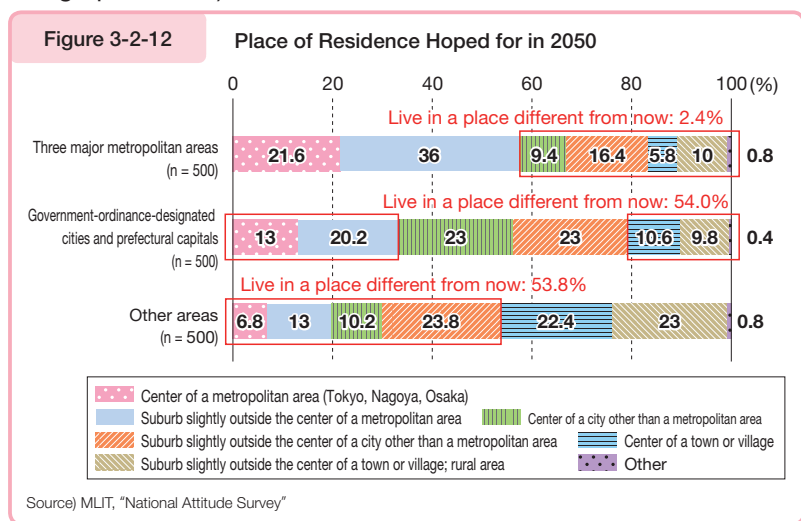
Note 73   This is the trend when the three major metropolitan areas are taken to be the "center of a metropolitan area" and "suburb slightly outside the center of metropolitan area," government-ordinance-designated cities and prefectural capitals are taken to be the "center of a city other than a metropolitan area" and "suburb slightly outside the center of a city other than a metropolitan area," and other areas are taken to be the "center of a town or village" and a "suburb slightly outside the center of a town or village; rural area." "Other areas," for example, include regional cities that are not a metropolitan area, government-ordinance-designated city, or prefectural capital, and so could be different in a narrow sense.

**Figure 3-2-13**　**Reasons for Choice of Place of Residence**

Center of a metropolitan area (Tokyo, Nagoya, Osaka) (n = 207): 13.5, 8.2, 15.9, 7.7, 5.8, 10.6, 1.9, 37.2, 29.0, 12.6, 3.9, 2.9, 4.8, 18.8, 3.9

Suburb slightly outside the center of a metropolitan area (n = 346): 30.6, 21.1, 16.2, 17.1, 6.9, 10.7, 7.8, 20.8, 16.2, 15.6, 1.7, 12.4, 4.0, 15.0, 2.3

Center of a city other than a metropolitan area (n = 213): 21.6, 23.9, 12.2, 23.0, 11.7, 8.9, 8.9, 23.0, 16.9, 12.2, 2.8, 16.0, 0.9, 18.3, 1.9

Suburb slightly outside the center of a city other than a metropolitan area (n = 316): 50.3, 33.5, 12.7, 18.7, 9.2, 6.3, 6.6, 4.4, 7.0, 7.3, 2.5, 19.3, 2.5, 10.1, 2.5

Center of a town or village (n = 194): 52.6, 25.8, 7.2, 24.2, 6.7, 5.2, 10.3, 7.2, 2.6, 3.6, 6.7, 15.5, 3.1, 5.2, 1.0

Suburb slightly outside the center of a town or village; rural area (n = 214): 67.8, 34.1, 7.0, 12.1, 3.3, 7.0, 10.3, 0.5, 0.9, 4.2, 1.9, 15.0, 4.2, 9.3, 4.2

Legend: Because of the abundant nature; Because the climate is pleasant / desirable; Because of the abundant regional color, such as culture; Because my parents or children live there; Because my relatives live there, because I have local ties; Because a community has formed there, such as for my hobby; Because residents can help each other; Because there are lots of people and goods; Because there are plenty of recreational facilities; Because places of work are close by (even though I can work anywhere); Because there is a school that I or a family member wants to attend; Because of the low disaster risk; Because of the abundance of nursing care services (because it is easy to receive nursing care services from a person, not a machine or robot); Because of the abundance of medical services (because it is easy to receive medical services face-to-face from doctors); Other

Source) MLIT, "National Attitude Survey"

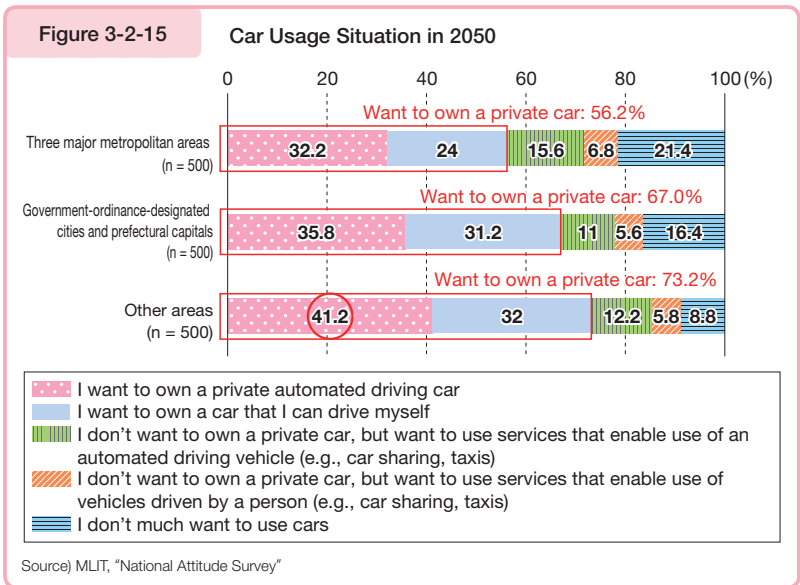**(Land and infrastructure development: Action during disasters)**

It is envisioned that the accuracy of forecasts related to disasters will increase as we head toward the society of 2050. The National Attitude Survey asked: Supposing that the accuracy of disaster forecasting improved to the same level as the accuracy of weather forecasting, what would you do if you knew accurately the type, size, and timing of a disaster that would occur at your current place of residence within five years?

Looking at the actions of the public by place of residence, the highest response among those in the metropolitan areas was that they would "consider changing my place of residence" at 34.4%, followed by "evacuate temporarily to another region" (Figure 3-2-14). In government-ordinance-designated cities and prefectural

| Figure 3-2-14 | Disaster Prevention / Reduction Actions Using Highly Accurate Disaster Forecasting |

Source) MLIT, "National Attitude Survey"

capitals and in other areas, the most common response was "prepare disaster prevention goods," at 34.8% and 38.0%, respectively. Based on these responses, we see that people who live in cities intend to change their place of residence or evacuate and that they would be inclined to use disaster forecasting to ensure safety by leaving their place of residence.
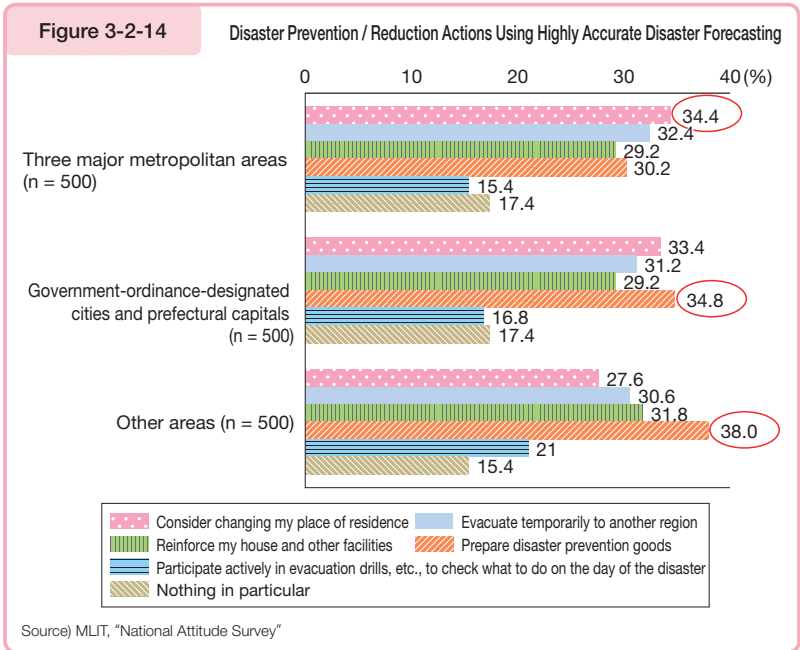
(Transportation: Cars)

At present, a variety of initiatives are being carried out through collaboration among government, industry and academia toward the practical implementation of automatic driving technology, and it is even envisioned that automatic driving will become the rule rather than the exception in society by 2050. As with the case above, we conducted a survey on the car use environment that the public hopes for, assuming progress in transportation infrastructure development. Looking at inclinations by place of residence, the percentage of people who wish to own a car accounts for more than half in all regions (Figure 3-2-15). Also, the percentage of people who wish to own was the highest, at 73.2%, in

| Figure 3-2-15 | Car Usage Situation in 2050 |

Source) MLIT, "National Attitude Survey"

the other areas, where the percentage who wish "to own a private automated driving car" was also the highest, at 41.2%.

(Transportation: Movement of people and goods)

It is envisioned that in society by 2050, such things as transportation infrastructure development will result in faster and more advanced transportation technology for people and goods. In such a society, how will views of the transportation of people and goods change? Taking perishable foods, in which value is placed on freshness, as an example, we surveyed people's willingness to buy and found that 41.7% of people thought that opportunities to buy perishable foods from inside and outside Japan using distribution would increase, and 18.1% of people thought that opportunities to buy them by going directly to the source would increase. It is therefore clear that faster and more advanced transportation technology would result in the increased movement of people and goods (Figure 3-2-16).

| Figure 3-2-16 | Movement of People and Goods in 2050 |

n=1,500

I would like more opportunities to buy "local foods" from inside and outside Japan if they were in my local stores: 24.3%

Want more opportunities to buy "local foods" : 41.7%

No particular change 30.5%

I want to buy perishable foods from my own area, not "local foods" from somewhere else: 9.8%

I would like more opportunities to go and eat "local foods" where they are produced: 18.1%

I would like more opportunities to buy "local foods" from inside and outside Japan by ordering directly from the source: 17.4%

Source) MLIT, "National Attitude Survey"

(Lifestyle: Way of working)

It is envisioned that the spread of new working styles, such as telework, will reduce restrictions on location and time of working. When asked where they would like to work in such a society, 51.5% of people said that they would like to work at home (Figure 3-2-17). Changing the place where work is performed from places of employment to people's homes or other locations could result in changes in the locations of daily consumption and could also change the features sought in housing as places of work.

Also, looking at inclinations by occupation, 73.7% of "full-time housewives and stay-at-home dads" chose their homes and, where assuming that they would newly perform office work, there was an inclination to prefer one's home (Figure 3-2-18). On the other hand, 59.2% of "regular salaried and other full-time employees" chose a worksite, and most people who are already working in a company imagine that they would prefer to keep working at their worksite.

| Figure 3-2-17 | Main Places of Work in 2050 |

A relaxing place such as a cafe or restaurant 1.9%

Transportation facility / train station 1.5%

Other 1.4%

n=1,500

Facility equipped with an environment for work, such as a satellite office for teleworking or a library 5.3%

One's home 51.5%

Worksite 38.4%
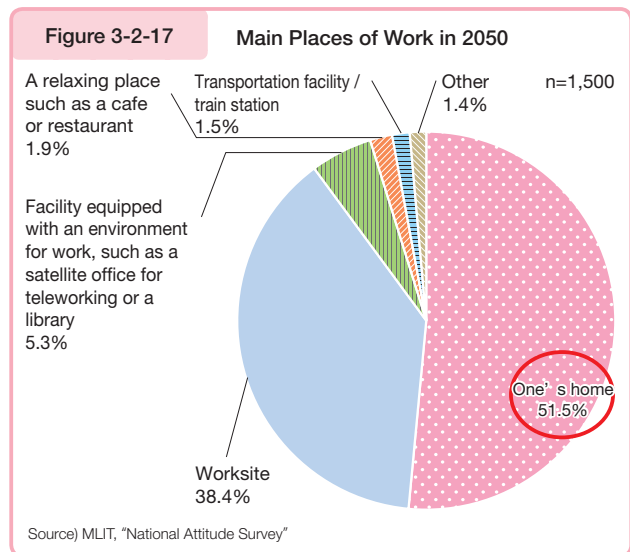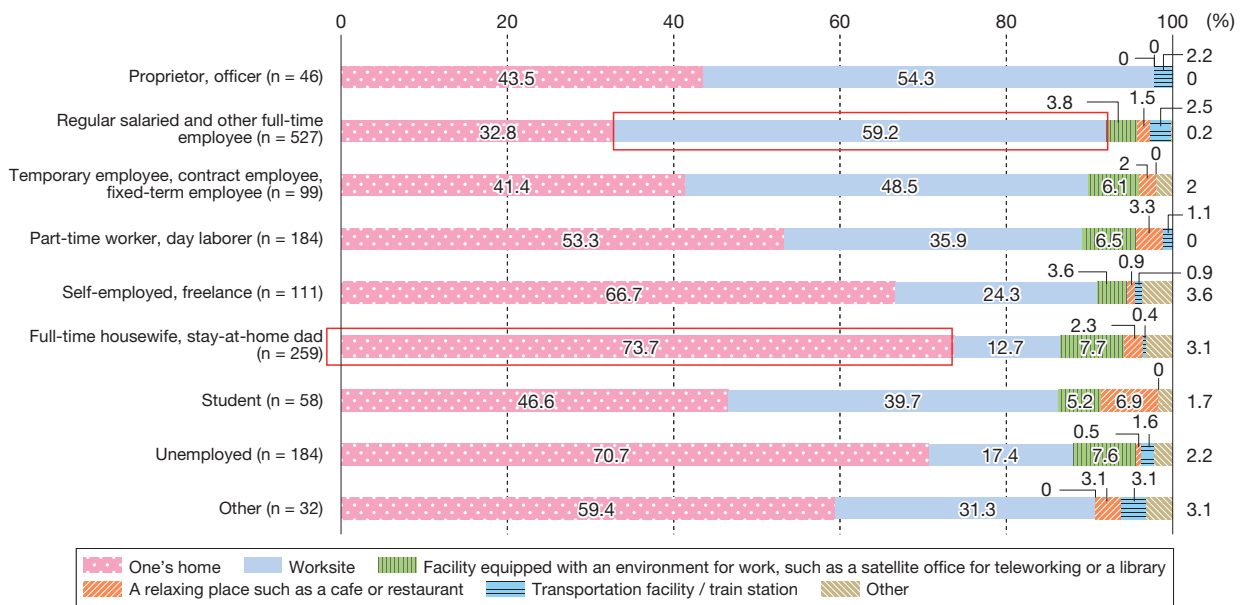
Source) MLIT, "National Attitude Survey"

Figure 3-2-18   Main Places of Work in 2050 (By Occupation)

Source) MLIT, "National Attitude Survey"

Based on the above, we see that innovation in the land, infrastructure, transport, and tourism sectors would spark changes in the public's behavior and consciousness, and that changes in the national consciousness and lifestyles could come with new needs in these sectors.

2   Forecasts of the Future in the Land, Infrastructure, Transport, and Tourism Sectors in 2050

Below, we paint a picture of forecasts of Japan's future, focusing on the land, infrastructure, transport, and tourism sectors, based on the kind of future society hoped for by the public, as obtained in the discussion in 1 above and in the National Attitude Survey.

(1) Land and Infrastructure Development

In society by 2050, core transportation infrastructure such as expressway networks and a Linear Chuo Shinkansen bullet train will have shortened the temporal distance between cities. Also, with the development of such express transportation infrastructure as well as public transportation and infrastructure connecting areas within communities, transportation will have become dramatically fast and convenient. Within communities, initiatives such as compact cities will put all functions needed in daily life within reach via walking or public transportation. Additionally, with ICT development, working styles with fewer restrictions on place and time, such as teleworking, will have spread and made it possible to receive medical exams by a doctor in one's own home, greatly changing the conditions sought in places of residence. Although many people will still like the capital region with its concentration of people and goods, we will be able to choose places of residence that suit our lifestyles and preferences, such that places of residence will have become more diverse than in the past.

There will be more diverse kinds of disasters happening at a greater frequency due to such factors as climate change. However, with observation using satellites and sensors that detect such things as landslides and with analyses by AI and other developments, forecasting of disasters such as torrential rain and sediment disasters will become more accurate and infrastructure for communicating information to people will also be developed. This will make it possible to get a grasp on situations much faster, enabling disaster prevention and disaster reduction responses. Under basic disaster prevention and disaster reduction policies for each region, people will each choose concrete actions such as evacuation in advance and preparation of disaster prevention goods. Everyone will have greater disaster awareness and implementation of measures such as evacuation drills using VR (virtual reality) and AR (augmented reality) will be strengthened. As a result, people

will have a concrete grasp of what to do during each stage of a disaster and disaster prevention will become more familiar.

The development of compact cities will make efficient maintenance and management possible with the development of infrastructure that gives priority to maintenance and management and with the use of AI-equipped drones and robots for daily infrastructure inspections and data collection. With decisions such as the timing of performing repairs being made quantitatively and appropriately, infrastructure in all regions will be maintained in good condition.

(2) Transportation

The development of express transportation networks as described above will reduce restrictions related to transportation, making travel faster and more convenient, enabling people to easily visit family and friends far away without hesitation. Also, with the development of VR technology, it will be possible to enjoy the scenery and atmosphere of different places without actually visiting them, but the desire for travel will be aroused through VR's simulated experiences, increasing opportunities to actually travel. Highly accurate translation and interpretation services will be provided through the use of AI technology, breaking down the language barrier between Japan and the world, increasing opportunities for Japanese to travel abroad and for foreign travelers to come to Japan.

Automated driving technology will contribute greatly to the maintenance of regional transportation networks. Such data as the number of users and transportation needs will be gathered and analyzed by AI, and using automated driving cars will make it possible to create the most suitable transportation networks according to the number of users and transportation needs. Many different kinds of mobility (means of transportation and vehicles) suited to individuals' lifestyles will exist, not bound by the conventional concept of a car, and the ways of use will also vary, including ownership and sharing. With automated driving technology, traffic accidents will decrease substantially, making vehicles highly safe and convenient.

With the realization of complete automated driving, people will seek enrichment time and other functions in mobility vehicles during transportation, which will lead to the provision of new value such as "private comfortable spaces" and "customization." Moreover, with mobility available continuously, the optimum number of mobility vehicles will be running according to demand such that, especially in the cities, there will be no need for parking spaces at such places as private houses and facilities that attract customers, resulting in efficient utilization of land.

(3) Lifestyle (Living Environment and Working Style)

With respect to working style, telework will have spread and it will be possible, for example, to attend meetings even while far away, using VR technology. It will therefore become possible to work without worrying about location or time. Since the place to perform work will change from conventional worksites to places such as one's own home or a satellite office near one's home, places for consuming activities will also change, such as an increase in doing daily shopping close to home. Also, with many people working from home, more and more people will create the spaces they prefer, such as setting up an environment in which they can switch clearly between work and private life. People will be relatively free to choose when to work, and less time will be needed for commuting, increasing the time that can be spent with family and on hobbies, enabling balance between work and family life and fulfilling leisure time.

Also, driven by environmental problems and energy problems that are anticipated in the future, houses and communities will be fully equipped with power generation and storage facilities that use renewable energies such as solar light. The amount of energy generated and used will be managed on a community-wide basis, and energy will also be shared. Mobility vehicles owned by each household will also function as storage batteries and will be used as emergency power sources during disasters.

Housing styles will change and more young adults and elderly people will be living alone or in shared housing. However, communities will be formed around things such as locality and personal interests, forming a society with connections not limited to family, such as sharing of community information in real time, as well as individuals' skills and goods, using ICT.

The above is one vision of the future. As our consciousness and lifestyles change, new demands will arise, and many different futures are possible.

As we know from examples of corporate and community initiatives, as well as from the National Attitude Survey, innovation in the land, infrastructure, transport, and tourism sectors has a major connection to the day-to-day life of the people,

and the growth of innovation will change our consciousness. Land, infrastructure, transport, and tourism administration must constantly re-examine past initiatives aimed at the creation and social implementation of innovation. In addition, it must steadily implement initiatives according to the demands of the times. It is therefore important for administration to boldly attempt to develop its own innovation in order to create forward-looking initiatives.