Public-Private ITS Initiative/Roadmaps

Past initiatives and the basic concept of the future ITS Initiative

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Background to Formulation of the Public-Private ITS Initiative/Roadmaps

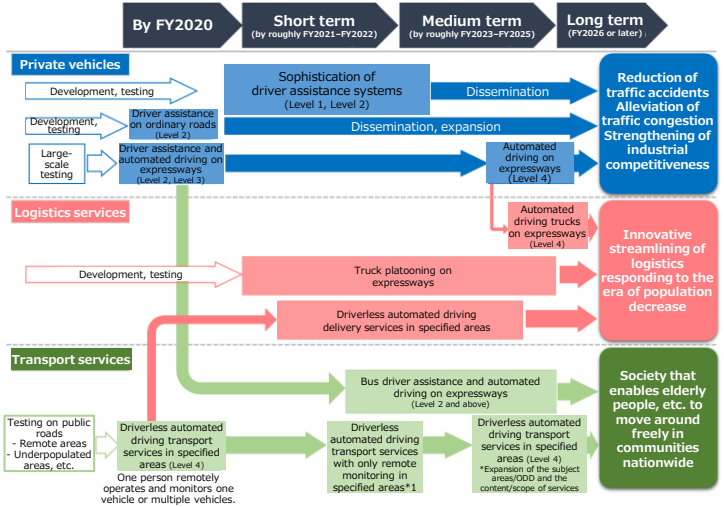
- In 2014, the IT Strategic Headquarters decided on the "Public-Private ITS Initiative/Roadmaps" as government-wide strategies on intelligent transport systems (ITS) and automated driving. Since then, the Roadmaps have been revised annually based on the latest changes in circumstances and other factors.
- The public and private sectors have promoted initiatives in concert toward a major goal of realizing automated driving by 2020.

Fiscal year	Government efforts (IT Strategic Headquarters, ministries, and agencies)	Others (efforts by the Prime Minister, the private sector, and others)
2013	"Declaration to Be the World's Most Advanced IT Nation" (June 2013) • "An inter-ministerial roadmap will be adopted" "Driving Support System Advancement Plan" (interagency liaison meeting: October 2013) IT Strategic Headquarters Road Traffic Subcommittee (October 2013 to March 2014) Council for Science, Technology and Innovation: selected 10 individual programs for the SIP (September 2013) Policy advisors selected (December 2013)	• Nissan, Toyota, Honda, and others: announced initiatives related to automated driving (August 2013 to October 2013) Testing on public roads, test ride by the Prime Minister (November 2013) ITS World Congress in Tokyo (October 2013) • First full-fledged testing on an ordinary road in Japan
2014	"Public-Private ITS Initiative/Roadmaps" (June 2014) • National strategy on ITS and automated driving, including related legal systems (first in the world) • Expected timing of commercialization identified clearly as roughly 2030 Full-fledged start of SIP automated driving • Issues, program directors, and budget allocation decided (May 2014) • Program directors appointed (June 2014) IT Strategic Headquarters Road Traffic Subcommittee (started September 2014) SIP 1st Phase Automated Driving Promotion Conference Joint conference	
2015	"Public-Private ITS Initiative/Roadmaps 2015" (June 2015) IT Strategic Headquarters Road Traffic Subcommittee (started December 2015) MEXT/MLIT "Automated Driving Business Investigative Council" (started February 2015) National Police Agency study meeting (started October 2015) Joint conference	• Nissan, Toyota, Honda, and others: announced measures such as practical application of automated driving on expressways by 2020 (October 2015) • National Strategic Special Zone Project (October 2015) Public-private dialogue (November 2015) Tokyo Motor Show (October 2015) • Statement by the Prime Minister
2016	"Public-Private ITS Initiative/Roadmaps 2016" (May 2016) IT Strategic Headquarters Road Traffic Working Team (started December 2016) Various other study meetings (automobile liability, etc.) Joint conference	 Council on Investments for the Future (February 2017)
2017	"Public-Private ITS Initiative/Roadmaps 2017" (May 2017) IT Strategic Headquarters Road Traffic Working Team (started December 2017) Sub-working Team on the Charter for Improvement of Legal System and Environment (started October 2017) Joint conference	Tokyo Motor Show (October 2017)
2018	"Charter for Improvement of Legal System and Environment for Automated Driving Systems" (April 2018) "Public-Private ITS Initiative/Roadmaps 2018" (June 2018) IT Strategic Headquarters Road Transport Working Group (started December 2018) Sub-working Group on the Charter for Improvement of Legal System and Environment (started November 2018) SIP 2nd Phase - Automated Driving System for Universal Service	 Council on Investments for the Future (March 2018)
2019	"Public-Private ITS Initiative/Roadmaps 2019" (June 2019) IT Strategic Headquarters Road Transport Working Group (started September 2019) Sub-working Group on the Charter for Improvement of Legal System and Environment (started December 2019)	Tokyo Motor Show (October 2019)
2020	"Public-Private ITS Initiative/Roadmaps 2020" (July 2020)	• Honda: acquired authorization for a Level 3 automated driving vehicle (first in the world) (November 2020)

Government's Realization Goals

- The government aims to realize "commercialization of vehicles which are able to drive themselves on expressways" and "driverless automated driving transport services in specified areas (such as depopulated areas)" by 2020.
- With regard to transport services, driverless automated driving transport services with only remote monitoring may be introduced by around FY2022, and may be offered in 40 or more areas by around FY2025.

<Scenarios for realization of commercialization and services of automated driving>



*1: The timing of realization of driverless automated driving transport services depends on various conditions in the actual driving environment, such as weather and the traffic volume. The relevant ministries and agencies will develop the environment for realization of those services, after considering the appropriate timing and the ideal forms of services, while taking into account future technological developments, etc.

<Expected timing of realization of commercialization and services of automated driving systems*1>

	Level	Technology expected to be realized (example)	Expected timing of commercialization, etc.*2
Private vehicles	Level 2	Driver assistance on ordinary roads	By 2020
	Level 3	Automated driving on expressways	By around 2020
	Level 1, Level 2	Sophistication of driver assistance systems	By the first half of the 2020s
	Level 4	Automated driving on expressways	By around 2025
Logistics services	- *3	Driver-assistive truck platooning on expressways	By 2021
		Truck platooning with the trailing truck unmanned on expressways	FY2022 or later
	Level 4	Automated driving of trucks on expressways	2025 or later
Transport services	Level 4	Driverless automated driving transport services in specified areas	By 2020
	Level 2 and above	Driver assistance and automated driving of buses on expressways	2022 or later

*1: The expected timing of commercialization, etc. will be reviewed based on the domestic and overseas industrial and technology trends, including overseas trends in the development of automated driving systems.
*2: The timing is set as a target time by which the government should make efforts to enable commercialization by private companies.
*3: No level is indicated for truck platooning since it involves operation by the driver of the lead truck under certain conditions (ODD), with the other trucks connected electronically to the lead truck.

Past Initiatives

Assessment of Major KPIs for Realization of Automated Driving

	Level	Technology expected to be realized (example)	Expected timing of commercialization, etc.	Assessment (○: Achieved △: Partially achieved ×: Yet to be achieved)
Private vehicles	Level 2 (driver assistance)	Driver assistance on ordinary roads	By 2020	・Although driver assistance functions (ACC＋LKA) that enable vehicles to drive straight-ahead have been achieved on major arterial roads (national highways and main local roads), under the circumstances of passing traffic signals or crossroads, assistance functions have yet to be achieved. △
	Level 3 (automated driving)	Automated driving on expressways	By around 2020	・The amended Road Transport Vehicle Act came into effect (April 2020). ・The amended Road Traffic Act came into effect (April 2020). ・An automated driving system (Level 3) to be used upon congestion on expressways was commercialized (March 2021; Honda LEGEND) ○
	Level 1, Level 2 (driver assistance)	Sophistication of driver assistance systems	By the first half of the 2020s	・Driver assistance systems (Level 2) that enable drivers to take their hands off the steering wheel while keeping their eyes straight ahead on expressways were commercialized (OEM manufacturers). ・Vehicles equipped with higher-performance sensors and cameras are planned to be commercialized in the future. ○
	Level 4 (automated driving)	Automated driving on expressways	By around 2025	・The private sector is promoting development of vehicle technology, and is considering the business value at Level 4. ・Systems for providing information from the road at expressway junctions, etc. are under consideration. Progressing as planned
Logistics services	-	Driver-assistive truck platooning on expressways	By 2021	・Announcement was made to commercialize "introduction-type" driver-assistive platooning systems (ACC＋LKA) within FY2021. Thereafter, efforts will be made to develop and commercialize "development-type" driver-assistive platooning systems with more sophisticated lane keeping functions (response to cutting-in vehicles, uphill lanes, lane changes, etc.). Progressing as planned
		Truck platooning with the trailing truck unmanned on expressways	FY2022 or later	・Technology of truck platooning with the trailing truck unmanned was realized on the Shin-Tomei Expressway (Hamamatsu SA – Enshu Morimachi PA) with the driver seat of the trailing truck actually being unmanned. Progressing as planned
	Level 4 (automated driving)	Automated driving of trucks on expressways	2025 or later	・A specific timetable for the realization was prepared for the first half of FY2020. ・The private sector is promoting development of vehicle technology. Progressing as planned
Transport services	Level 4 (automated driving)	Driverless automated driving transport services in specified areas	By 2020	・A driverless automated driving transport service (equivalent to Level 4 in a traveling space dedicated to automated driving vehicles) was achieved in specified areas (November 2019). (After providing the service without accidents for more than a year and confirming its feasibility, the service was operated at Level 2 on public roads as of April 1, 2021.) ・A driverless automated driving transport service using a remotely controllable system (1:3) at Level 3 (with no safety operator onboard) began to be operated in specified areas (started March 2021). (The operation started after completing a pilot operation using a remotely controllable system (1:3) at Level 2 (with a safety operator onboard), which started in December 2020.) ・Institutional issues involved in automated driving at Level 4, which does not assume the presence of a conventional "driver," are under consideration. ○
	Level 2 and above (driver assistance / automated driving)	Driver assistance and automated driving of buses on expressways	2022 or later	・Testing was conducted starting January 2021 in a part of the dedicated road section (with no intersection) of the Miyagi Prefecture Kesennuma BRT of approx. 4.8 km. Efforts will be made to start operation at Level 3 in the future. Progressing as planned ・Testing was conducted in the dedicated road section of the Hitachi BRT of approx. 7 km. With the dedicated road section having multiple intersections, the testing was conducted at Level 2, combining vehicle-to-infrastructure cooperation.

Past Achievements (Practical Application of Automated Driving)

- As a result of public-private joint initiatives for realizing automated driving (technological development, improvement of legal systems, infrastructure development, etc.), the world's first-ever acquisition of authorization for a Level 3 automated driving vehicle and its commercialization, as well as driverless automated driving transport services, were realized.

Technological development (public *SIP projects, etc.)

- High-precision 3D maps
- Cyber security
- Safety assessment technology, etc.

Technological development (private)

- Risk-minimization
- Onboard sensor
- Information transmission technologies, etc.

Commercialization of a Level 3 automated driving vehicle

Honda LEGEND

The Honda SENSING Elite system features the Traffic Jam Pilot function, which qualifies for Level 3 automated driving. Instead of drivers, the system drives the vehicle under certain conditions, such as traffic congestion on expressways.

Realization of driverless automated driving transport services

A driverless automated driving transport service (equivalent to Level 4 in a traveling space dedicated to automated driving vehicles) was achieved in specified areas.

Traveling in a traveling space dedicated to automated driving vehicles
*Operated at Level 2 on public roads as of April 1, 2021.

A driverless automated driving transport service using a remotely controllable automated driving system (Level 3) began to be operated in specified areas.

One remote driver operates three Level 3 automated driving vehicles (with no safety operator onboard) by using a remotely controllable system. The system controls the automated driving vehicle at normal times.

Traveling on roads dedicated to bicycles and pedestrians (public roads)

Infrastructure development

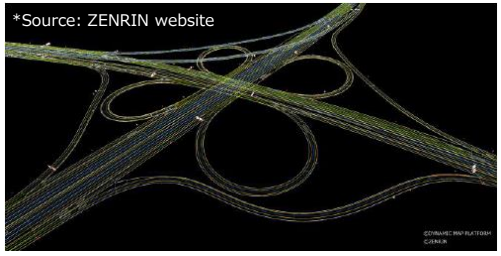
- Electromagnetic induction lines, magnetic markers, etc.
- Designation of traveling space

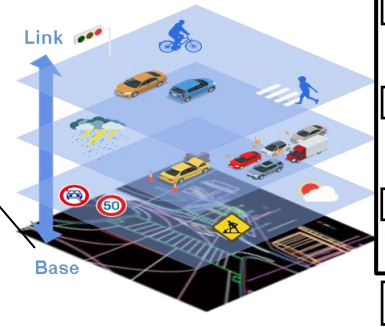
Improvement of legal systems

- **Amendment of the Road Traffic Act** (rules to be observed by drivers, etc.) (came into effect in April 2020)
- **Amendment of the Road Transport Vehicle Act (safety standards)** (came into effect in April 2020)
- **Standards for road usage permission**
- **Amendment of the Road Act**

Past Achievements (Mobility Data Strategy)

- The government promoted the development of high-precision 3D maps, which serve as basic technology for automated driving, as well as global standardization and commonization of specifications and updating methods of traffic environmental information, and contributed to automobile-related companies in Japan by accelerating their business expansion in Japan and overseas, and to strengthening industrial competitiveness.





Traffic environmental information

Dynamic information

ITS look-ahead information (peripheral vehicles, pedestrian information, traffic signal information, etc.)

Quasi-dynamic information

Accident information, traffic congestion information, traffic regulation information, road construction information, narrow-area weather information, etc.

Quasi-static information

Information on planned traffic regulation, information on planned road construction, wide-area weather forest information, etc.

Static information
= high-precision 3D map information

Road surface information, lane information, 3D structures, etc.

Dynamic Map Platform Co., Ltd., which was established under an all-Japan framework, developed high-precision 3D maps for approx. 30,000 km of expressways and limited highways combined nationwide, and started their commercial distribution by the end of FY2018. It updates and provides data as needed, and for ordinary roads, it works on developing the map data for mainly national highways under direct jurisdiction of MLIT. In 2019, Dynamic Map Platform acquired Ushr Inc., a U.S. company affiliated with U.S. General Motors Company and developing high-precision 3D maps in North America, and pushed forward the global commonization of map specifications. High-precision 3D maps also came to be used in driver assistance systems, and private enterprises are commercializing sophisticated driver assistance systems in Japan. Japan leads the world in terms of the traffic environmental information shown on dynamic maps, through such actions as promoting activities for international standardization of data specifications in the 2nd Phase of Cabinet Office Cross-ministerial Strategic Innovation Promotion Program - Automated Driving System for Universal Service (SIP-adus).

Basic Concept of the Future ITS Initiative

Basic Concept of the Future ITS Initiative

Approach so-called "future pull," which is breaking away from the method of extending the current trend, and identifying the necessary actions based on the ideal future and the challenges of transport of people and goods.

Transformation of mobility

- **Emergence of automated driving**
  Commercialization of Level 3 vehicles, R&D of Level 4 technology, operation of Level 4 transport services in limited areas, development of traffic infrastructure, improvement of legal systems
- **From demonstration testing to social implementation of mobility service businesses**
  Establishment of business models, improvement of legal systems
- **Response to electrification**
  Development of electric vehicles, improvement of energy infrastructure

2030 vision of mobility society
(continuously visualizing the future of mobility and cities based on the ideal form of future transport)

Priority initiatives

- ✓ **Creation of a digital platform for realizing a new mobility society**
- ✓ **Further advancement of automated driving, etc.**
- ✓ **Dissemination and use of diverse mobility**

Automated driving / mobility | Energy management | Mobility services | Traffic infrastructure services

Digital mobility platform

The Digital Agency's new initiative

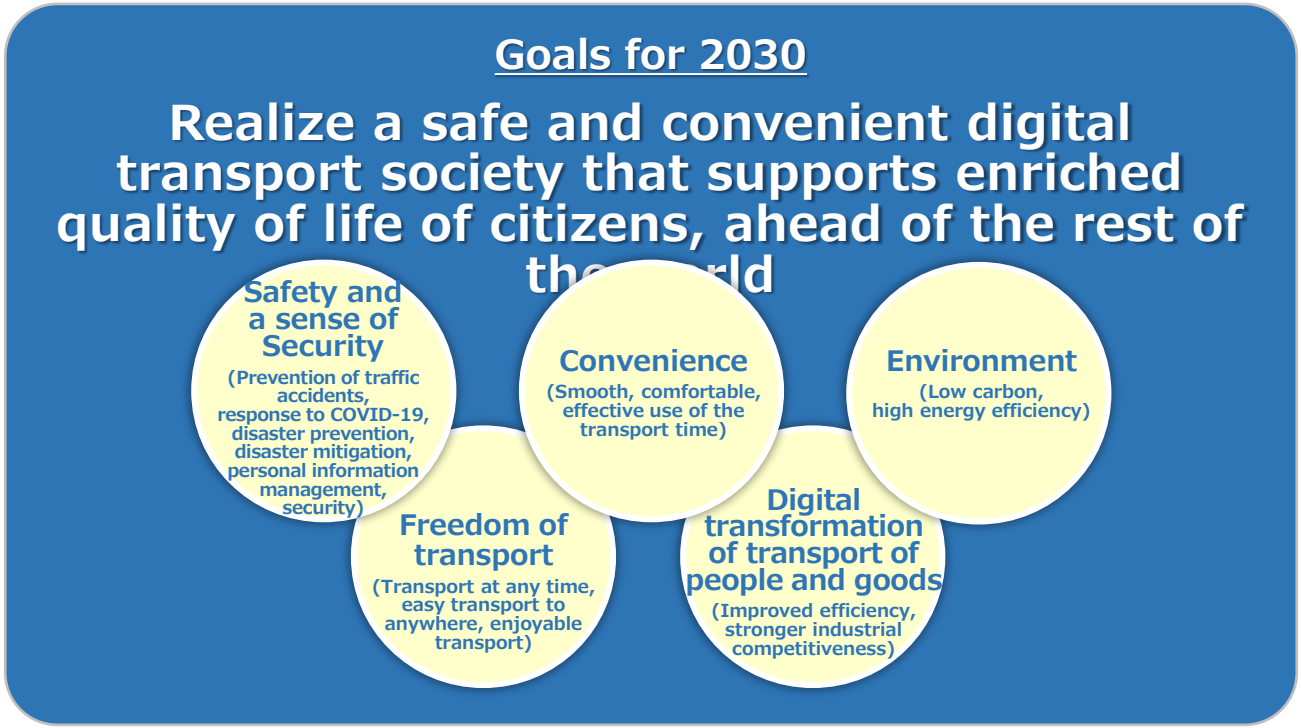
Changes in the social environment

- **Realization of Society 5.0**
  Promotion of cross-sectoral mobility data linkages, such as smart cities, etc.
- **Aggravation of social issues concerning transport**
  Securing freedom of transport, strengthening industrial competitiveness, solving the shortage of human resources, etc.
- **Changes in transport/consumption awareness in the post-COVID-19 era**
- **Green growth associated with becoming carbon neutral by 2050**

Priority measures

	1. Technological development	2. Traffic infrastructure development and implementation of connected cars	3. Improvement of legal systems	4. Platform construction / data linkage	5. Social implementation / social acceptance
Provincial cities Urban areas in which transport depends on private vehicles Urban areas in which public transportation is widely used	1.1 R&D on technology for collecting and distributing traffic environmental information 1.2 Safety assessment in a virtual space 1.3 Cyber security 1.4 Development of diverse mobility-related technology 1.5 Testing for using EV, etc. as energy resources	2.1 Provision of expressway merging support information 2.2 Development of traveling space 2.3 Provision of traffic signal information 2.4 Development of communications infrastructure and others	3.1 Ideal traffic rules for Level 4 vehicles 3.2 Streamlining of regulations for demonstration testing and commercialization 3.3 Mobility-related data distribution (legal systems, rules) 3.4 Development of personnel who will lead the realization of a digital transport society and others	4.1 Construction of a digital mobility platform 4.2 Public-private data linkage (use of probe information, etc.) 4.3 Asset development (bird's eye view of systems and data, etc.) 4.4 Establishment of operation of the platform and others	5.1 Dissemination and use of automated driving and diverse mobility (people/goods) 5.2 Development of traffic-related services (traffic environment, disaster management, traffic safety, MaaS, logistics, battery charging, etc.) 5.3 Fostering of social acceptance and others

Realization Goals for Mobility Society in 2030



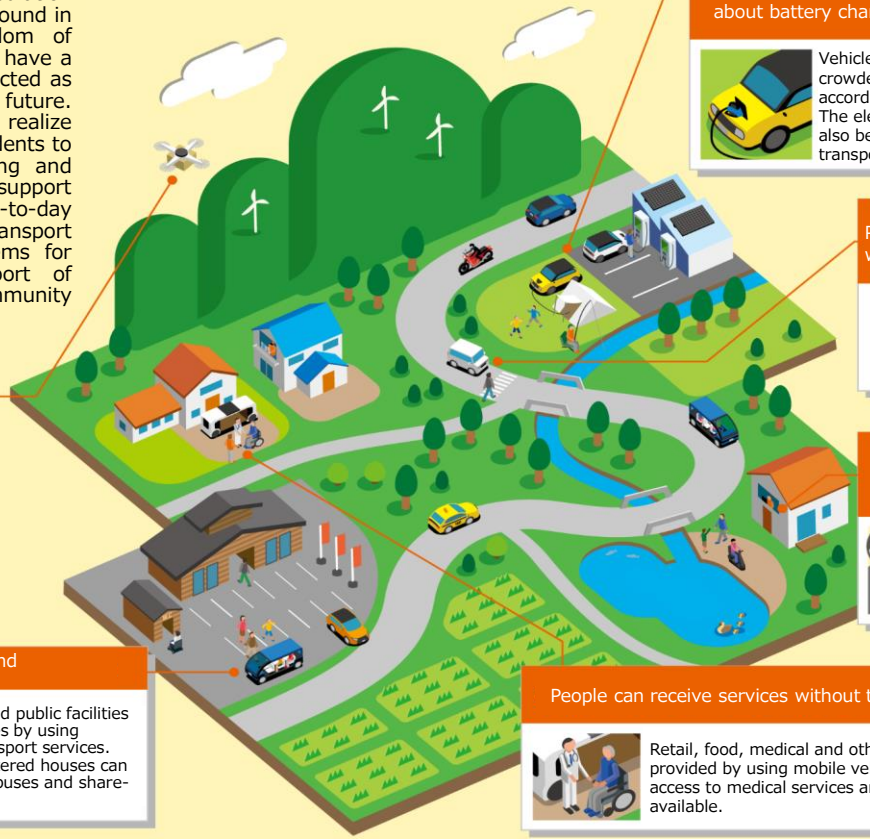
* **Digital transport society**: an innovative transport society realized by various mobility services (including transport services) and the mobility of automated driving, etc. achieved through an information linkage using technology such as AI and IoT

Definition: a transport society in which creative and vigorous development is enabled by using information and telecommunications technologies and other advanced technologies to appropriately and effectively utilize the wide variety and large amount of information recorded as an electronic or magnetic record (applying the definition of digital society to transport society)

Provincial cities

Society that enables various residents to move around freely

In provincial cities which have come to face difficulty maintaining self-sufficient local communities due to a population decrease, many residents move around in private vehicles, and the freedom of transport of residents who do not have a driver's license may become restricted as the aging progresses in the future. Therefore, efforts will be made to realize a society that enables various residents to move around freely by expanding and disseminating means that support transport that is essential in day-to-day life and alternative means of transport using new technology and systems for sufficiently securing the transport of people who are needed for community vitalization.



Transport is possible without being concerned about battery charging or energy refilling.

Vehicles can search and move to non-crowded battery charging stations according to the remaining battery level. The electricity charged in vehicles can also be used for purposes other than transport.

People can move around safety with a sense of security.

Vehicles support safe driving by sensing the peripheral environment and the physical conditions of the driver.

Goods can be conveniently delivered to mountainous areas where land transport is difficult.

With the use of new mobility, such as drones, goods can be delivered efficiently even to places where the delivery had been difficult in the past.

People can choose various working styles according to their lifestyles.

People can do day-to-day work from home through teleworking.

Anyone can move around freely and the community has been vitalized.

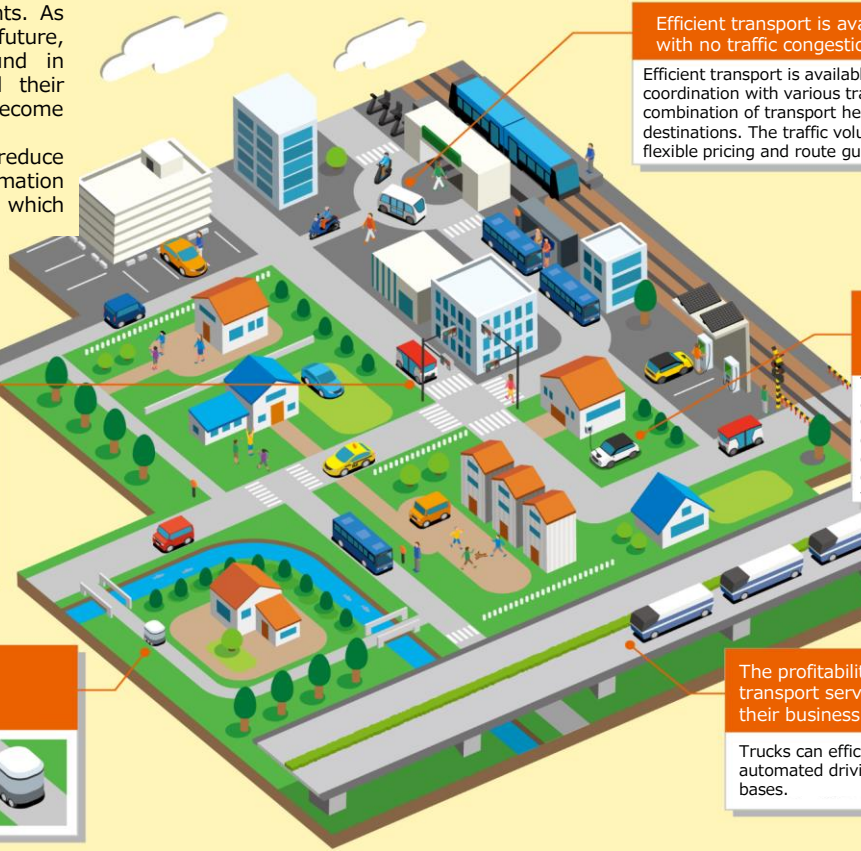
People can move around public facilities and commercial facilities by using automated driving transport services. Residents living in scattered houses can use circuit community buses and share-ride taxis.

People can receive services without transport.

Retail, food, medical and other services are provided by using mobile vehicles, and remote access to medical services and community events is available.

Urban areas in which transport depends on private vehicles

Many areas face serious traffic congestion, causing longer transport/commuting time and shorter private time for residents. As the aging progresses in the future, residents who cannot move around in private vehicles may increase and their freedom of transport may become restricted.
Therefore, efforts will be made to reduce traffic congestion by fully using information technology, and to realize a society in which safe transport is available.



Efficient transport is available with no traffic congestion.

Efficient transport is available through seamless coordination with various traffic means and effective combination of transport heading to the same destinations. The traffic volume is optimized through flexible pricing and route guidance.

Low-carbon lives with an optimally balanced energy supply and demand

The energy supply and demand are balanced by using the electricity charged in vehicles as electricity for day-to-day life during the daytime, and storing electricity in the vehicle during the nighttime.

The transport time can be effectively used for other purposes.

As people can reach the destination by automated driving, they can freely use the transport time for other purposes, such as conversation with family or friends or work.

People can receive services without transport.

Goods can be delivered without manpower by using automated delivery robots and drones.

The profitability of logistics and transport services, etc. improves and their business continuity is secured.

Trucks can efficiently transport goods by automated driving between distribution bases.

Urban areas in which public transportation is widely used

Convenient society in which transport is available according to needs

The population density is high, and although many people use public transport services, the transport and logistics demands concentrate, causing serious traffic congestion and crowdedness, and leading to shorter private time for residents. Therefore, efforts will be made to realize a society in which convenient transport is available according to individual needs through use of transport means that combine mass transport means, such as railways, and other transport means, with the utilization of new technology and systems, such as automated driving.

People can receive services without transport.

Retail, food, and other services can be provided according to needs by using mobile vehicles.

There is no traffic congestion, and the transport time can be used effectively.

As people can reach their destination by automated driving, they can freely use the transport time for other purposes, such as conversation with family or friends or work.

Low-carbon lives with an optimally balanced energy supply and demand

The energy supply and demand are balanced by using the electricity charged in vehicles as electricity for day-to-day life during the daytime, and storing electricity in the vehicle during the nighttime.

People can move around safety with a sense of security.

Vehicles support safe driving by sensing the peripheral environment and the physical conditions of the driver.

Efficient transport is available without being crowded.

By identifying the state of crowdedness in public transport real-time, the transport can be seamlessly coordinated with various transport means according to needs, such as on-demand transport. The transport demand is distributed by measures such as flexible pricing.

Digital Space Realizing the Mobility Society

Thank you for your attention.