INTELLIGENT TRANSPORT SYSTEMS

1 Introduction

Intelligent transportation systems (ITS) use communication between people, vehicles, and the roadside to exchange necessary information and address a variety of issues such as accidents, congestion, or environmental measures. These days, ITS is not limited to offering mobility systems that support the everyday life of people through the development and commercialization of road traffic-related technological breakthroughs and new mobility services such as the electrification of vehicles, or to information and communication technology (ICT), and artificial intelligence (AI) and other advanced technologies that underpin automated driving and mobility as a service (MaaS). The scope of ITS has expanded into opening new markets that involve building communities and revitalizing regions, as well as activities targeted at decarbonization.

This article introduces ITS trends in and outside Japan based on information concerning the Japanese government ITS initiatives contributed by the Cabinet Office, National Police Agency, Digital Agency, Ministry of Internal Affairs and Communications (MIC), Ministry of Economy, Trade and Industry (METI), and Ministry of Land, Infrastructure Transport and Tourism (MLIT) for the 2023 edition of the annual report published by ITS Japan, as well as the results of surveys by that organization.

2 ITS Strategy and Future Course of the Japanese Government (Digital Agency)

2. 1. Government IT Strategy and ITS History to Date

In 2000, the Japanese government established the *Basic Act on the Formation of an Advanced Information and Telecommunications Network Society* (Basic IT Act) that establishes the basic IT vision for the nation. The objective of that law is to enable the government to swiftly and strategically advance policies concerning the creation of an advanced information and telecommunications network society. Consequently, the act served as the basis for the formation of the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society (IT Strategic Headquarters). It is headed by the Prime Minister, and its membership consists of all national ministers as well as experts. The *Public-Private ITS Initiatives/Roadmap* has been discussed as part of those IT policies.

2. 2. Public-Private ITS Initiatives/Roadmap: Initiatives to Date and Approach to Future ITS Concepts

The automated driving systems that will be crucial to solving the social issues faced by Japan have been the subject of development guided by clear objectives for the introduction to market of the three focus areas of building more sophisticated automated driving systems for private cars, establishing efficient logistics services that address the shortage of drivers, and offering automated driving services in rural areas and for the elderly. Pursuing these objectives will move Japan toward its goals of being the first country in the world to realize automated driving systems and of boosting its global industrial competitiveness. Public–private sector initiatives to achieve automated driving have led to the certification and commercialization of the world's first type approval for Level 3 automated vehicles and, in turn, to realizing driverless automated driving services. At the same time, the core concepts of upcoming ITS roadmaps have been defined by drawing a future vision and setting the targets that will realize the mobility society of 2030 to establish an approach that identifies what must be done immediately based on the desired ideals and current issues. The *Public-Private ITS Initiatives/Roadmap: Initiatives to Date and Approach to Future ITS Concepts* was approved by the IT Strategic Headquarters in June 2021.

2. 3. Vision of Mobility and Society 2022

The *Public-Private ITS Initiatives/Roadmap*, a Japanese government-wide strategy regarding ITS and automated driving formulated annually since 2014, has led to public-private sector initiatives between the ministries and agencies involved and the private sector. The 2022 amendment of the *Road Traffic Act* to lay the legislative groundwork for Level 4 automated driving is one example of the steady progress achieved based on the roadmap. However, a closer look at the progress of introducing initiatives in the regions brings to light many issues, including a large number of cases that never move past the field operational test stage. It will be necessary to work on the further deployment of the roadmap to achieve complete social implementation. Consequently, the Study Group on Digital Transportation Society was established to understand communities and lifestyles from the perspective of individual citizens in the context of the progress of the digital transportation society. This was followed up with backcasting to identify the forms mobility should take, with a broad range of viewpoints and opinions informing the process. In August 2022, the Director-Generals' Meeting for the Digital Society finalized the *Vision of Mobility and Society 2022*, which succeeds to, and expands upon, the *Public-Private ITS Initiatives/Roadmap*.

2. 4. Future Initiatives

The public and private sectors have been collaborating on developing technology, setting up infrastructure, conducting field operational tests, and other initiatives aimed at further advancing ITS and realizing automated driving. The declining birth rate and aging of the population in Japan is setting high social expectations on more advanced ITS and the realization of automated driving as a means of securing mobility for the elderly or others with limited access to transportation, reducing the number of tragic traffic accidents resulting from mistakes made by elderly or impaired drivers, and solving issues such as the shortage of drivers in the regions or heavy congestion in the center of cities. Accordingly, the public and private sectors are working together toward a more efficient use of space offering significant added value that encompasses people and goods, as well as means of transportation ranging from walking to flying. They are doing so by both defining a future vision, and drawing up rules for sharing, linking, and using data, while taking day-to-day matters and energy issues into account. At the same time, they are evaluating an overall digital transportation society that will make the future vision a reality. This will make it necessary to define a clear vision of everyday life matters along with their initiatives and timelines, and establish, implement, and deploy a plan for the social implementation of the technologies involved. Solution providers will also have to approach their own initiatives from a broader, even more comprehensive perspective. The *Vision of Mobility and Society 2022* is only a snapshot of the current situation, and it will be continuously updated.

3 ITS Trends in Japan

3. 1. VICS

The Vehicle Information and Communication System (VICS) transmits the road traffic information compiled and processed at the Vehicle Information and Communication System Center using (a) FM multiplex broadcasting, (b) radio wave beacons, and (c) infrared beacons for display in three forms (text, simple graphics, and maps) on navigation systems and other onboard devices. Traffic information such as travel times, congestion conditions, and traffic restrictions are sent to navigation systems in real-time, offering not only greater convenience for drivers, but also contributing to smoothing traffic flow and improving fuel efficiency through appropriate route guidance. Nationwide spread of the system was completed in February 2003.

The new VICS WIDE system launched in April 2015 offers route guidance with high-precision avoidance of congestion based on travel times provided by links on ordinary roads, more detailed traffic information relying on taxi probe data, pop-up advisories for all special weather, tsunami, or volcanic eruption warnings, and information on areas struck by heavy rains (50 mm/h or more).

Since 2019, work on integrating all probe data from civilian probes, infrared beacons, and ETC 2.0 to significantly reduce congestion, build a precise, automated driving-ready road traffic information network, and offer stable and accurate information in the event of a disaster has been conducted jointly with the Japan Road Traffic Information Center (JARTIC) in the context of realizing the world's most reliable road traffic information network. Field operational tests on road traffic information services making use of probe data were initiated in Tokyo and six other prefectures in the Kanto region in

April 2020, and expanded to the Sapporo area, as well as Aichi and Osaka prefectures in January 2022, and then to all of Japan in July 2022.

3. 2. UTMS (National Police Agency)

The aim of the Universal Traffic Management System (UTMS) is the realization of a safe and comfortable traffic environment with a low environmental burden. It achieves this through sophisticated use of information communication technology, including two-way communication between individual vehicles and traffic management systems using infrared beacons. This enhances the safety and smooth flow of road traffic, and also alleviates traffic pollution.

(1) Main Applications of UTMS

(a) Advanced Mobile Information Systems (AMIS): These are systems that aim to naturally disperse traffic streams and alleviate congestion by complementing information from sources such as traffic information signs and radio broadcasts with traffic information sent to onboard devices via infrared beacons. As of the end of March 2021, all prefectures in Japan had implemented AMIS.

(b) Fast Emergency Vehicle Preemption Systems (FAST): These systems use infrared beacons to detect emergency vehicles in areas where call outs are frequent and control traffic signals to give priority to those vehicles. The aim of FAST is to shorten the time required for emergency vehicles to reach an incident scene or medical facility and to help prevent traffic accidents involving emergency vehicles. As of the end of March 2021, 16 prefectures had implemented FAST.

(c) Public Transportation Priority Systems (PTPS): These systems control traffic signals to give priority to buses and other public transportation. They aim to reduce journey times and increase user convenience. As of the end of March 2021, 40 prefectures in Japan had implemented PTPS.

(d) Traffic Signal Prediction Systems (TSPS): These systems aim to reduce driving stress and prevent traffic accidents due to sudden braking and sudden starts by providing advance information such as what color the signal will be when drivers reach a signalized intersection. As of the end of March 2021, 46 prefectures in Japan had implemented TSPS.

(e) Pedestrian Information and Communication Systems (PICS): Aiming to support the safety of pedestrians, (particularly the elderly and people with visual impairment), these systems use approaches such as audio notification of traffic signal states and extending the duration of green lights to prevent accidents. As of the end of March 2021, 34 prefectures in Japan had implemented PICS.

(f) Driving Safety Support Systems (DSSS): These systems aim to prevent traffic accidents and otherwise enhance road safety by providing drivers with visual and auditory information on surrounding traffic conditions, alerting them to potential dangers and creating an environment that reduces driving stress. As of the end of March 2021, 10 prefectures had implemented DSSS.

(g) Help system for Emergency Life saving and Public safety (HELP): These emergency response systems aim to reduce the time it takes for emergency vehicles to reach the scene of an accident and enable the prompt rescue of injured people, as well as rapid clean-up of the site by transmitting information such as where the accident occurred via an on-board device or mobile phone in the event of an emergency. As of the end of March 2021, all prefectures in Japan had implemented HELP.

3. 3. Smartway (Road Bureau of MLIT)

The aim of the Smartway Project is to enhance traffic safety and to develop measures for improving congestion and the environment. In this project, a Smartway is defined as a next-generation road that uses ITS technology to link people, vehicles, and roads through information.

(1) Progress of ITS Propagation

(a) Extensive provision of road traffic data and effectiveness: The number of vehicle navigation systems in Japan exceeded roughly 108.41 million units at the end of December 2022. Of these, approximately 76.64 million were compatible with real-time VICS road traffic information (a service launched in 1996) as of March 2022.

(b) ETC popularization and effectiveness: ETC has gained widespread acceptance since its full-scale introduction in March 2001. As of the end of February 2023, 81.8 million on-board units had been set up, and 24 nationwide expressway and public road management companies use a single nationwide ETC system, which has a utilization rate of roughly 90%. ETC has virtually eliminated congestion at toll booths, which accounted for about 30% of expressway congestion throughout Japan. Consequently, ETC also helps lower the burden on the environment by reducing CO_2 emissions.

(2) Nationwide Spread of ETC 2.0 Services

(a) Start of ETC 2.0 services: The Road Bureau of the MLIT set roadside devices at roughly 10 to 15 km intervals on inter-city expressways, and at roughly 4 km intervals on inner city expressways, and launched the world's first infrastructure-vehicle cooperative ITS spot service in August 2011 (by April 2022, roadside units had been set at approximately 1,800 locations along expressways throughout Japan).

The name of the services was changed from ITS spot services to ETC 2.0 in October 2014, and the introduction of services making use of route data, along with a well-rounded lineup of private services, are being promoted. Full-scale sales of ETC 2.0 on-board units began in August 2015, and new installations of such units had reached a cumulative total of approximately 9.05 million at the end of February 2023.

(b) Initiatives in the fields of transportation and logistics: Although the use of ETC in the fields of transportation and logistics has been limited to the payment of tolls, the initiatives below are being promoted to optimize transport by truck via the application of data on routes traveled and usage times collected with ETC 2.0.

- Streamlining of passage procedures for ETC 2.0-equipped special vehicles
- ETC 2.0 support services for vehicle operations management

3. 4. Automated Driving Systems

Many ministries and agencies are pursuing initiatives to commercialize automated driving systems.

(1) ITS Initiatives in the Strategic Innovation Promotion Program (Cabinet Office)

This comprehensive strategy, and the Japan Revitalization Strategy approved by the Cabinet in June 2013, led to establishing the Strategic Innovation Promotion Program (SIP) to enable the Council for Science, Technology and Innovation to fulfill its role as a control center and realize scientific and technological innovation. Benefiting from a budget that extends beyond ministerial and industry boundaries allocated directly by the Council for Science, Technology and Innovation, the SIP program fosters research and development that promotes everything from basic research to forward-looking end results (application and commercialization).

Research and development on automated driving systems, one of the SIP challenges, began in June 2014 with the aim of achieving the early commercialization and popularization of automated driving. The initiatives carried out over five years during the first phase of SIP–Automated Driving for Universal Services (SIP-adus) led to the formulation of unified cross-industry specifications for dynamic maps and other high-accuracy three-dimensional maps required for automated driving. Investments by electronics, maps, and measurement corporations, as well as automakers, led to the launch of Dynamic Map Platform Co., Ltd. This new company started preparing and commercially distributing high-accuracy three-dimensional maps for approximately 30,000 kilometers of expressway in March 2019.

For the second phase of SIP initiated in 2018, one of the 12 challenges tackled was a new Automated Driving (Expansion of Systems and Services) project in recognition of the need for automated driving development that will help resolve social issues such as reducing traffic accidents and congestion, securing transportation in depopulated regions, and alleviating driver shortages. In the context of SIP-adus, efforts focused on taking advantage of the results of the first phase of SIP to both expand automated driving from highways to general roads, and to market distribution and transportation services that make use of automated driving technology. As in the first phase, the program seeks to promptly realize a society in which all people enjoy a high quality of life through the promotion of research and development, as well as field operational tests, in cooperative areas best tackled through government-industry-academia collaboration Intense efforts have been made to both coordinate with the international community while obtaining government-industry-academia collaboration to combine the Tokyo Rinkai area field tests and the development of basic technologies, as part of initiatives to surmount the three obstacles presented by technology, legal systems, and the fostering of social acceptance.

(2) Assessment the Legal System and Other Issues (National Police Agency)

A partial amendment of the *Road Traffic Act* came into force on April 1, 2022. With respect to automated driving with no driver present, the amendment establishes a permission system designed with limited-area, remote monitoring only driverless transportation services in mind. Under the revised legislation, appropriately operating a vehicle using an automated driving system that immediately and safely brings the vehicle to a stop when the usage requirements stipulated for individual

devices are no longer met is defined as "specified automated operation". Excluding that operation from the definition of driving opens the door to implementing systems that satisfy some of the permission criteria for a subset of automated driving corresponding to automated driving equivalent SAE Level 4 driving that does not assume the presence of a driver.

Providers who want to carry out specified automated operation must submit a specified automated operation plan presenting the route, response in the event of an accident, and other details of the operation to the Public Safety Commission of the prefecture with jurisdiction over the location where the operation will be carried out. Upon being granted authorization, the provider (special automated operation provider) must assign special automated operation supervisors either in the vehicle or at a predetermined remote monitoring location outside the vehicle. The provider then bears the obligation of conducting the operation in accordance with the special automated operation plan, and the assigned supervisors must take the necessary measures to respond to a traffic accident.

In a similar vein, the National Police Agency (NPA), which is responsible for enforcing the *Road Traffic Act* that stipulates the rules of the road, has set up a study committee to address various issues involving the realization of automated driving, including those concerning the legislative system. The *Public-Private ITS Initiatives/Roadmap 2020* anticipated the commercialization of vehicles equipped with Level 4 automated driving systems for expressways around 2025, as well as the introduction of autonomous Level 4 trucks on expressways in or after 2025. In 2022, the study committee used those objectives as a basis to identify upcoming *Road Traffic Act* issues that must be studied in preparation for further advances in Level 4 automated driving.

(3) Advanced Mobility Service Research, Development and Social Implementation Project for L4 AD (*Road to the L4*) (METI)

Given the changing conditions surrounding the automotive industry exemplified by CASE and carbon neutrality, September 2021 saw the launch of *Road to the L4*, a project to pursue initiatives starting with research and development and following through with field operational tests and social implementation. The initiatives aim to realize remote monitoring-only (Level 4) driverless automated driving services in limited regions around 2022, expand those services to 50 locations around 2025, and achieve Level 4 automated driving on expressways beginning in 2025. This project has established a coordinating organization (the National Institute of Advanced Industrial Science and Technology (AIST)) to carry out the overall investigation and study, and manages progress and other metrics according to four themes.

There has also been progress in establishing administrative systems related to automated driving. As illustrated by Level 4 automated driving being permitted as of April 2023, automated driving services are transitioning to the social implementation phase. In that light, the 14th Subcommittee on Business Discussions on Autonomous Driving Technologies meeting held in March 2023 discussed new government targets and KPI concepts, as well as a course of action for future initiatives with respect to realizing driverless automated driving services in limited areas at some 50 locations in 2025. The subcommittee defined the KPI concepts from the standpoints of compliance with the relevant regulations, the type of vehicle operated, as well as the public nature and sustainability of the project. Those concepts will then inform studies of the service models in demand, as well as evaluations of the appropriateness of existing policies, while also forming a basis to establish various policies centered around the four challenges of continued technical development, environment building, enhancing social acceptance, and accelerating commercialization.

(4) Roadside Support to Promote and Spread Automated Driving (MLIT)

The goal of encouraging the spread automated driving services that provide the elderly and others reliable day-to-day transportation and contribute to more efficient logistics will primarily be pursued through the use of general infrastructure development subsidies to support local government systematic initiatives aimed at establishing the necessary supporting infrastructure for automated driving, and at building towns and communities that make use of automated driving.

The higher volume of traffic than in semi-mountainous regions and the confusing road layout in town centers also mean that realizing Level 4 automated driving services will require an accurate understanding of ordinary vehicles, pedestrians, cyclists, and other surrounding traffic conditions. However, detection using on-board sensors is difficult at intersections and curves with poor visibility. Consequently, studies and field operational tests of road-

side-to-vehicle cooperative systems that use sensors to detect the position, speed, and other information concerning oncoming vehicles or pedestrians that is difficult to acquire using on-board sensors are currently underway in various regions in coordination with pilot projects.

November 2021 marked the beginning of joint research collaboration between automakers, expressway companies, and on-board sensor manufacturers concerning guidelines for managing demarcation lines, techniques for transmitting predictive data, and other factors involved in realizing automated driving on expressways. These collaborative efforts remain ongoing. Using the results of that research, the provision of merging support and of lookahead information will form the object of field operational tests on Level 4 autonomous trucks to be conducted in coordination with vehicle development by METI and the MLIT Road Bureau.

(5) Assessment of New Communication Technologies for Automated Driving Systems (MIC)

With respect to the topics in the Automated Driving (Expansion of Systems and Services) project represented by Phase 2 (fiscal 2018 to 2022) of the Strategic Innovation Promotion Program (SIP) of the Council for Science, Technology and Innovation, the Ministry of Internal Affairs and Communications (MIC) is focusing on wireless communications systems as it collaborates with other government agencies involved in ITS to pursue research and development aimed at realizing automated driving.

In 2022, the latest trends in the systematization and standardization of 5.9 GHz band V2X communication in regions such as Europe, the U.S., and China were surveyed and analyzed. The results and those of the previous fiscal year served as the basis to study 5.9 GHz band V2X system communication requirements that take coordination with existing 700 MHz driving safety support systems into account. The results of communication simulations were then used to design a communication protocol for these systems and propose wireless device specifications for the development and manufacturing of on-board devices and roadside units.

3.5. Promotion of ITS That Uses Radio Beacons (MIC)

The Ministry of Internal Affairs and Communications has already allocated frequencies and formulated technical standards for technologies such as VICS, ETC, on-board radar systems, and 700 MHz band intelligent transport systems. It has also been working to spread the adoption of those systems.

Efforts to validate and implement automated driving are currently underway throughout the world. Vehicle-to-everything (V2X) communication enabling the exchange of information between nearby vehicles, roadside infrastructure, and other road users is anticipated to complement on-board sensors such as cameras or radars in playing a critical role in the realization of advanced automated driving functionality such as support for branching and merging. Based on technical assessments and research and development of 5.9 GHz V2X communication systems carried out to date, MIC launched the Study Group on Next-Generation ITS Communications for Cooperative Automated Driving in February 2023. This group has been laying the groundwork for new frequency allocations.

(1) Technical Studies on 5.9 GHz Band V2X Communication Systems

Japan was a global pioneer in V2X communication systems with the commercialization of 700 MHz band driving safety support systems in 2011. In contrast, Europe, the U.S., and other countries have been validating and implementing V2X communication systems that use the 5.9 GHz band.

This makes it necessary for Japan to assess the introduction of V2X communication that uses the frequency band under consideration at the international level (5.9 GHz) in addition to the existing ITS frequency bands (e.g., 760 MHz). Evaluations of the allocation of the 5.9 GHz band were set to start during the 2022 fiscal year in the *Frequency Reorganization Action Plan* (released in November 2022). In the wake of that decision, MIC established the Study Group on Next-Generation ITS Communications for Cooperative Automated Driving, which consists of experts, operators, as well as ministries and agencies involved in automated driving, to visualize the use of next-generation ITS communications in the context of automated driving and assess what communication supporting such use should look like in preparation for an interim report to be presented in the summer of 2023.

(2) Initiatives to Spread 700 MHz Band Driving Safety Support Systems

In December 2011 the MIC revised ministerial ordinances concerning the 700 MHz band driving safety support systems and laid the legal groundwork for the intro-

duction of an ITS wireless communication system designed to support safety. In October 2015, the world's first vehicles equipped with that system were commercialized. Those vehicles make use of vehicle-to-vehicle and vehicle-to-infrastructure communication to offer driving safety support services such as crossing collision prevention, right- or left-turn collision prevention, rear-end collision prevention, and the provision of information on emergency vehicles.

Anticipating that Japanese ITS technologies could help reduce or otherwise mitigate traffic accidents in other Asian countries with traffic conditions and frequency band allocations similar to those of Japan, MIC started deploying the 700 MHz band driving safety support and other systems to such countries in 2018.

In India, studies and coordination on running cooperative pilot projects with local governments and automakers were initiated in 2022 for the purpose of facilitating the introduction of driving safety support systems that use the 700 MHz band. One example of a pilot system aims to shorten arrival times for emergency vehicles or buses in a bus rapid transit system (BTRS) through the use V2X communication to notify traffic lights or road signs of the approach of such vehicles, and promptly transition to green lights or have road signs advise vehicles ahead to change lanes. In February 2023, workshops and simple demonstrations introducing V2X communication domestic administrative systems, technology and field operational tests were carried out in the cities of Delhi and Ahmedabad for the purpose of deepening ties with the Indian Ministry of Communications and observing the field operational tests on site.

3. 6. Promotion of International Standardization

(1) International Standardization Activities Concerning the Enhancement of Smart Mobility Systems (METI)

The reduction of CO_2 emissions in the automotive sector is a necessary aspect of measures to address global warming, and a decrease in CO_2 is expected to result from the more efficient traffic flow achieved by the spread of automated driving. The need to reduce traffic accidents and provide assistance to vulnerable road users also means that automated driving systems are growing in importance year after year. ISO/TC 204 (Intelligent transport systems) has been working on international standards for automated driving systems. Japan has played a leading role in the related field of vehicle control technologies in its capacity as convener for WG 14 (Vehicle/Roadway Warning and Control Systems), which is in charge of international standardization activities in that field. However, standardization efforts aimed at the early adoption of various automated driving systems gaining more momentum in the U.S. and Europe year after year, along with the rapid rise of vigorous standardization activities in China, South Korea, and other Asian countries, are expected to further intensify the jockeying to take the lead in international standardization efforts.

Consequently, based on the progress of regional standards in the U.S. and Europe and of the formulation of consortium standards and taking global interoperability into account, this project has focused on international standardization activities with respect to control systems related to automated driving and advanced driving support systems. These activities involve preparing drafts of international standards, as well as reaching consensus at international conferences with other countries concerning both standardization items proposed by Japan at ISO/TC 204 via private sector experts and important standardization items proposed by other countries.

(2) Standardization Activities Concerning Technologies to Support the Safety of Automated Driving Systems (METI)

Automated driving systems will help realize safe and smooth road traffic, and offer the promise of solutions such as reducing traffic accidents, alleviating congestion, and decreasing the burden on the environment, for the various road traffic problems faced by society. Various forms of technological development and field tests targeting social implementations of automated driving systems are gaining in intensity year after year, both in and outside Japan. However, this also means that in automated driving, the recognition, decision-making, and operation tasks previously performed by humans will be entrusted to machines, making it vitally important to determine how to enhance safety performance and to convey that information to administrations, corporations, and the general public in an easy-to-understand manner (foster social acceptance). Standalone vehicles capable of driving autonomously will also make it vital to implement cybersecurity measures that preempt malicious uses for terrorist purposes.

Among the ISO/TC 22 (Road Vehicles) standardization efforts concerning the safety technologies on which auto-

mated driving systems are built, Japan has primarily supported international standardization activities for test methods and performance requirements in areas related to vehicle-side safety and reliability. The areas involved include cybersecurity, safety validation scenarios (e.g., for vehicle systems), software updates, safety of the intended functionality (SOTIF), and HMI. Those activities will support the formation of international rules compatible with the automated driving technology developed in Japan. The public and private sectors will continue to work hand-in-hand to allow Japan to collaborate with other countries involved and play a leading role in critical cases and fields.

(3) International Standardization Activities Concerning the Field of Information and Communication (MIC)

To promote the international standardization of ITS, MIC actively contributes documents and participates in meetings, mainly at the ITU-R and AWG, to ensure that Japanese technologies, specifications, and other items are appropriately included in the various draft recommendations and reports.

At ITU-R, WP 5A (Land mobile service) meetings were held in May and November to advance the formulation of a new ITU-R M.[CAV] draft report based on SG 5 Question 261 *Radiocommunication requirements for connected automated vehicles (CAV)*. That draft report consolidates use cases, purposes, communication requirements, communication technology, initial frequency needs, interoperability conditions and other matters regarding CAVs. Japan contributed three documents and incorporated information such as SIP results and the uses cases for truck platoon driving carried out by MIC in the draft report. The M.[CAV] report is scheduled for completion in 2023, and Japan will continue to promote ITS by participating in meetings and working in coordination with organizations in various countries. The World Radiocommunication Conference (WRC-23) and Radiocommunication Assembly 2023 (RA-23) will be held in November 2023, and include discussions on issues and research topics for 2024 and beyond. Japan will therefore continue to vigorously carry ITS international standardization activities.

One AWG meeting was held in September 2022. The new *APT Report on cellular based V2X for ITS applications in APT countries* and *APT Report on millimetre wave ITS applications in APT countries* draft reports were submitted for consideration at the meeting of TG-ITS, which is responsible for ITS wireless technology. Japan submitted two documents to contribute to the completion of the *APT Report on cellular based V2X for ITS applications in APT countries*. In 2023, Japan will work to boost ITS standardization activities in the Asia-Pacific region though initiatives such as submitting the new APT draft reports.

4 ITS Trends outside Japan

4. 1. Overview of the 28th ITS World Congress 2022: Los Angeles

This 28th ITS World Congress, the first on U.S. soil in eight years since it was hosted in Detroit in 2014, was held over five days from Sunday, September 18 to Thursday, September 22, 2022 in Los Angeles, the second largest city in the U.S., under the theme "Transformation by Transportation". It attracted 6,500 participants from 64 countries and regions.

The keynote address reacquainted the world with the top priority of traffic safety and the expectations placed on ITS. At the same times, discussions on carbon neutrality, a high interest topic especially in Europe, carried over from the 2021 Hamburg Congress. In addition, discussions on equity, a topic that has garnered more interest in the U.S., have also expanded to Europe.

With COVID-19 measures lifted in the U.S., Congress operation returned to normal. However, participation from China was almost nonexistent due to that country's ongoing restrictions on traveling abroad.

The 2023 ITS World Congress will be held in Suzhou, China.

4. 2. Automated Driving Technology Trends

In Japan, second phase of SIP-adus initiated in 2018 and carried out over five years came to a close. Conversely, the initiatives concerning the four themes for driverless automated driving services carried out under the *Advanced Mobility Service Research, Development and Social Implementation Project for L4 AD* (*Road to the L4*) project launched in 2021 are still in progress. The revised *Road Traffic Act* coming into effect on April 1, 2023 legally allows Level 4 automated driving on public roads.

In the U.S., Waymo and other IT businesses or start-ups continue to take the lead in technical development. Legislation permitting automated driving has already been passed in 40 states, and there are as many as 50

companies licensed to conduct automated driving tests in California.

In Europe, the development of automated driving centers around projects involving research institutes and OEMs, with projects such as Hi-Drive in the field of privately owned vehicles, and SHOW in the field of service vehicles, respectively gathering many partners from various countries and conducting research and development.

China is advancing the development of vehicle-infrastructure cooperative automated driving, referred to as intelligent connected vehicles (ICVs) as part of the Made in China 2025 national strategy. Seventeen regions throughout the country are carrying out field operational tests. Some commercial vehicle automated driving services have also been launched, with Baidu operating robotaxis in limited areas inside 11 cities, including Beijing and Shanghai.