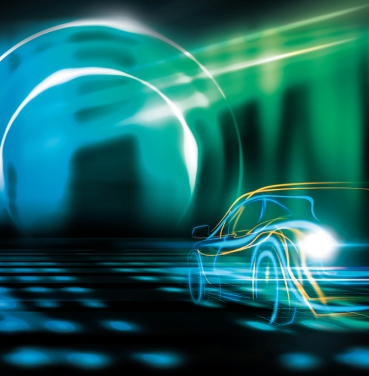


1 Overview of the Second Phase of SIP- Automated Driving for Universal Services



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The Cross-Ministerial Strategic Innovation Promotion Program (SIP) of the Cabinet Office is a national project to realize scientific and technical innovation, with the Council for Science, Technology and Innovation acting as its control center. In the field of automated driving, where results are expected from SIP, initiatives aimed at reducing traffic accidents and congestion, and securing mobility in sparsely populated regions are being pursued to realize a society offering safe and secure transportation for all its citizens. With its sights firmly set on facilitating the realization of Society 5.0, the second phase of SIP-Automated Driving for Universal Services (2018 to 2022) is using the achievements of the first phase (2014 to 2018) as a springboard to carry out research and development, field operational tests (FOTs), and other activities in cooperative areas to build a vehicle-infrastructure cooperative driving automation system that will expand the scope of automated driving commercialization

1 Background and Policy Standing

As interest in automated driving grows in leaps and bounds, automobile and auto parts manufacturers are actively investing in research and development. Moreover, the national government is also encouraging participation in one research and development project or FOT after another. At the same time, Japan, the U.S., and Europe have taken the lead in making tangible progress toward establishing the necessary legislation and environment.

These efforts have been spurred not only by the need to solve social issues such as reducing traffic accidents and congestion, and securing mobility for the elderly and other vulnerable road users, but also by strong expectations that automated driving will bring along a social revolution in areas such as new logistics and transportation services or the creation of new business.

The automotive industry is said to have entered a once-in-a-century period of transformation and is being swept by a wave of innovation exemplified by automated driving, electrification, connectivity, and sharing. Winning the development race means more than just maintaining and strengthening the wide-ranging automotive industry currently playing a central role in Japanese industry. A ripple effect on the digital infrastructure, sensor, communication, and other industries necessary to automated driving is anticipated, and expectations for the creation of new industries and services have been raised, presenting tremendous potential for the growth of the Japanese economy in the future.

In that context, (then) Prime Minister Abe declared at the Council on Investments for the Future (March 2018) that “automated driving would be achieved at the 2020 Tokyo Olympic and Paralympic Games”. Following additional remarks such as “transmitting signal information to vehicles, the establishment of a field operational test location in Tokyo waterfront area, and other wide-ranging efforts to deploy various businesses will be further intensified”, Public-Private ITS Initiative/Roadmaps 2020 (July 2020) stated that Japan would “aim to build and maintain ‘the world’s safest and smoothest road traffic society’ by 2030 through the development and deployment of automated driving systems,

and the establishment of a data infrastructure”. In addition, the Integrated Innovation Strategy 2020 (July 2020) espoused the establishment of both cross-field and field-specific data linkage platforms, and the building of an architecture, to prepare a data linkage platform for Society 5.0.

The SIP initiative targets the realization Society 5.0 espoused in the 5th Science and Technology Basic Plan (January 2016) that, as of the 6th Science, Technology, and Innovation Basic Plan (March 2021), seeks to advance research and development and social implementations, and make use of convergence of knowledge, to solve various social issues and aim for a robust and sustainable society that guarantees its citizen safety and security and ensures the well-being for each and every person in various forms.

2 Trends Outside Japan

In other countries, efforts to commercialization automated driving are moving away from the inordinate expectation of realizing the fully automated driving, level 5 of the Society of Automotive Engineers (SAE)-define automated driving levels (SAE levels) and shifting toward more realistic initiatives, and engaging in deeper discussions concerning safety, reliability, and ethical issues. As automated driving FOTs are conducted throughout the world, there are growing discussions on formulating a common evaluation method and creating a common data format to enable the sharing of information. The rapid global spread of COVID-19 since early 2020 has had a tremendous impact on both the global and local flow of goods and people. Research and development and other activities related to automated driving have also been partially delayed, but are nevertheless still actively pursued.

In the U.S., the White House and Department of Transportation (USDOT) jointly released Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0 (AV 4.0) report in January 2020. AV 4.0 establishes Federal principles for the development and integration of automated vehicles, consisting of three core focus areas: Prioritize safety and security, promote innovation, and ensure a consistent regulatory approach. Although

AV 4.0 was released before the transition to the new administration, the Automated Vehicles Comprehensive Plan, which builds on the principles stated in AV 4.0, has been released. The plan defines the three goals of promoting collaboration and transparency, modernizing the regulatory environment, and preparing the transportation system to achieve USDOT’s vision for automated driving systems.

In Europe as well, various countries are promoting research projects on automated driving, including PEGASUS and VIVALDI in Germany, and DRIVEN and HumanDrive in the U.K. In the context of the European Commission Horizon 2020 program, the EU is promoting many research projects concerning connected and automated driving. Horizon Europe, the program succeeding Horizon 2020, was agreed upon in December 2020, sets Climate, Energy and Mobility as one of the six clusters under the pillar for solving social issues.

3 Initiatives in the First SIP Phase and Achievements to Date

In Japan, the first phase of SIP-Automated Driving for Universal Services led the way in research and development in the cooperative areas of automated driving through industry-academia-government collaboration, as well as cross-ministerial, collaboration, setting milestones such as the 2020 Tokyo Olympic and Paralympic Games.

Large-scale FOTs initiated in fiscal 2017 have produced results such as validating the effectiveness of dynamic maps, advancing the formulation of integrated specifications, and establishing a baseline structure for maps. Using those results, Dynamic Map Platform Co., Ltd. started the commercial distribution of high-precision 3D maps for all 30,000 kilometers of the highways in Japan at the end of fiscal 2018.

On the regulatory front, the Charter for Improvement of Legal System and Environment for Automated Driving Systems (April 2018, IT Strategic Headquarters of the Cabinet Secretariat) has been evaluated by various ministries. The revisions to the Road Transport Vehicle Act and Road Traffic Act, which were passed in May 2019 and came into effect in April 2020, provide a legislative system enabling automated vehicles equivalent to SAE level 3 to drive on public roads. The world’s first type designation for a vehicle equipped with an automated driving system based on the revised Road Transport Vehicle Act was carried out in November 2020, and in March 2021, that vehicle became the first commercial automated vehicle on the planet. Starting with that automated vehicle, the high-precision 3D maps by Dynamic Map Platform Co., Ltd. were used in many vehicles.

Similarly, a partial revision to the Road Traffic Act concerning road areas for facilities supporting the operation of automated driving was passed in May 2020 and came into effect in November of the same year. Clear progress has been made in reforming the legislative system to enable the social implementation of transportation services making use of automated driving technologies

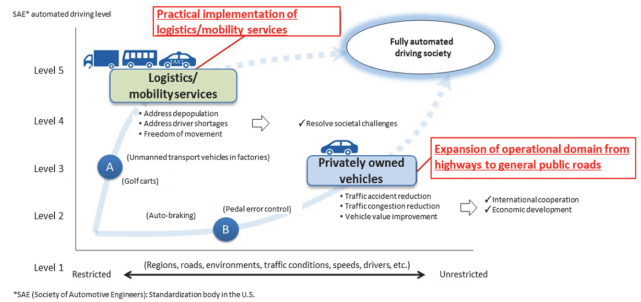


Fig. 1: Overall Vision for Automated Driving (Research and Development Plan)

4 Launch of Second SIP Phase

The importance of automated driving development has also been recognized in the second phase of SIP, leading the launch of a new project. In March 2018, after the Cross-Ministerial Strategic Innovation Promotion Program determined the basic policy for the second phase of SIP, the Cabinet Office started formulating a research and development and released the Cross-Ministerial Strategic Innovation Promotion Program Automated Driving for Universal Services R&D Plan in July of the same year.

The social implementation of automated driving requires overcoming the three challenges of technology, legislative systems, and public acceptance. In cooperation with government agencies such as the National Police Agency and the ministries of Internal Affairs and Communications, Economy, Trade and Industry, and Land, Infrastructure, Transport and Tourism, SIP-adus has enlisted the participation of industry, academic and other organizations in cooperating on cross-ministerial, industry-academia-government initiatives that include research and development and FOTs.

The second phase of SIP is pursuing research and development, FOTs and other activities in cooperative areas to build a vehicle-infrastructure cooperative driving automation system that will expand the scope of automated driving commercialization.

Research and development focuses on the four pillars of I) developing and validating automated driving systems (FOTs), II) developing basic technologies for the commercialization of automated driving, III) fostering public acceptance of automated driving, and IV) intensifying international cooperation. International cooperation in research and development and discussion on standardization are being encouraged through the use of the opportunity provided by FOTs to hold events and transmit information, as well as by providing an open discussion forum that welcomes manufacturers from outside Japan. At the same time, we are collaborating with the IT Strategy Headquarters of the Cabinet Secretariat to integrate technology and the establishment of legislative system, and coordinating with the initiatives of the various ministries with respect to the latter.

As for the international standardization, we are strengthening our collaboration with standardization bodies to smoothly and quickly bring products and services to global markets. We are also working with organizations such as the Japan Automobile Manufacturers Association (JAMA) and the Society of Automotive Engineers of Japan (JSAE), as well as the Japan Auto Parts Industries Association (JAPIA), the Japan Electronics and Information Technology Industries Association (JEITA), the UTMS Society of Japan, the Association of Radio Industries and Businesses (ARIB), and the ITS Info-communications Forum (ITS Forum) to advance stan-

standardization based on both ISO, IEC, ITU and other de jure standards and, through coordination with globally influential industry standardization bodies, de facto standards.

5 Objectives and Deployment Milestones

At SIP-adus, we are following the milestone fiscal years of achievement laid out in Public-Private ITS Initiative/Roadmaps 2020 with respect to the specific period for commercializing and spreading automated driving. In addition to establishing the cooperative area technologies deemed necessary to achieve the objectives, we are confirming the validity of technologies and services through FOTs and other activities involving various local operators and authorities. We intend to define targets for social implementation by the end of the second phase of SIP through the creation of several examples of commercialization.

- Mobility services: Realize driverless automated driving (SAE level 4) in specific regions by 2020.
- Logistics services: Realize fully automated driving (SAE level 4) on highways for trucks by 2025.
- Privately owned vehicles: Realize fully automated driving (SAE level 4) on highways around 2025.
- Privately owned vehicles: Further advance driver assistance technologies for general roads (SAE level 2 or higher on general roads).

The social implementation of research and development calls not only for technological development in cooperative areas, but also for the integration of initiatives by various stakeholders, including technological development, in competitive areas such as vehicle development. Consequently, we have set and worked toward milestones such as the 2020 Tokyo Olympic and Paralympic Games. Due to the COVID-19 pandemic, the joint test-ride event with JAMA intended as one of the activities to foster public acceptance has been postponed. However, technological development is essentially progressing on schedule.

Moving forward, we plan to work on the transfer of technology to the private sector and other forms of social implementation. This will be done by building upon the last three years of research and development outcomes, strengthening coordination between SIP-adus policies, and combining Tokyo waterfront area and other FOTs with the development of basic technologies to maximize outputs, make commercialization possible, and define guidelines.

6 Research and Development Details

Research and development in SIP-adus focuses on the four pillars of I) developing and validating automated driving systems (FOTs), II) developing platform technology for the commercialization of automated driving, III) fostering public acceptance of automated driving, and IV) intensifying international cooperation.

The main topics of research and development break down as follows. Pillar I, the FOTs, include (a) FOTs in Tokyo waterfront area and (b) social implementation of mobility and logistics services in local regions and other areas. Pillar II, the development of platform technology, focuses on (a) technologies for using the traffic environment data, (b) safety assurance technologies, (c)

cybersecurity, and (d) creation of an architecture for geographical data for automated driving. Pillar III, fostering public acceptance, involves (a) information dissemination to citizens, etc. and promotion of understanding, and (b) surveys and research to solve social issues by using automated driving technologies (clearly identifying socioeconomic impacts). Lastly, Pillar IV consists of (a) spreading information globally through activities such as holding international workshops, and (b) joint research conducted with research institutes outside Japan.

Within the above, we have defined (1) building and distributing traffic environment data, (2) building a safety assurance environment in virtual space, (3) establishing a cybersecurity evaluation method, and (4) building a geographic data distribution portal as the four crucial themes for the second phase of SIP, and are actively working on their realization and commercialization.

7 Framework for Initiatives

A SIP-adus Steering Committee has been established and begun operations. It is chaired by Program Director (PD) Seigo Kuzumaki, and consists of members from the National Police Agency, Ministry of Internal Affairs and Communications, the Road Bureau and Road Transport Bureau of the Ministry of Land, Infrastructure and Transport, experts, and related industries and industry organizations. The Committee holds joint industry-academia-government discussions concerning the basic research and development policy and deployment milestones. The System Implementation Working Group, Business Promotion Working Group, and International Cooperation Working Group have been set up under the Steering Committee. In addition, discussions are underway within the respective task forces established for the building of traffic environment information, the conducting of FOTs in Tokyo waterfront area, and the study of communication protocols for cooperative autonomous driving. The New Energy and Industrial Technology Development Organization (NEDO) serves as the management agency responsible for promoting SIP-adus, implementing its research and development policies, and managing outcomes. It has been implementing the policies in a timely and flexible manner, and carried out appropriate administration.

- 【 Reference 】**
- (1)Public-Private ITS Initiative/Roadmaps, IT Strategy Headquarters of the Cabinet Secretariat, revised July 15, 2020.
 - (2)Cross-Ministerial Strategic Innovation Promotion Program Automated Driving for Universal Services R&D Plan, Director-General for Science, Technology and Innovation, Cabinet Office, revised May 14, 2020.