Public-Private ITS Initiative / Roadmaps 2020

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Environmental changes in the mobility field in Japan, and eight topics for the future

Issues will arise in Japan regarding social challenges to be resolved in the future and economic value creation against a backdrop of structural changes to society such as an aging population, low birth rates, and centralization of population in urban areas.

(Social issues)

(i) Ensuring freedom of mobility: Freedom of mobility in everyday living is limited due to successive reductions in and discontinuation of public transportation services
(ii) Community vitalization: Reductions in infrastructure or living (retail, schools, hospitals), particularly in rural areas, Steady growth in inbound tourism demand
(iii) Reducing traffic accidents: While traffic accidents are in a decreasing trend, the share of accidents involving elderly drivers is increasing from year to year.
(iv) Improving transit efficiency: Increasingly severe congestion on roads and public transportation due to factors such as population inflows to urban(i) areas and increasing logistics demand
(v) Lessening environmental impact: While CO2 emissions from the transport sector are decreasing, further improvements are necessary to achieve reduction targets
(vi) Solutions to labor shortages: Increasingly severe shortages of drivers for tucks, taxis, and buses, due to growing demand for logistics and aging of the workforce

(Economic value creation)

(vii) More convenient living: Congestion of roads and public transportation lengths commuting times and restricts time for personal life
(viii) Strengthening industrial competitiveness: The structure of added value in the auto industry will change with the rise of MaaS and other developments

Future issues and needs in Japan's mobility field

At right, Japan's urban centers are grouped into the three categories "provincial cities," "urban areas in which transport is depending on private vehicles," and "urban areas in which public transportation is widely used," based on their populations, rates of using public transportation, etc., and their mobility needs with regard to the above future topics are sorted from the perspectives of individuals and businesses.

<table>
<thead>
<tr>
<th>Urban</th>
<th>Outline</th>
<th>Ex.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suburban, underpopulated areas</td>
<td>• Provincial suburban areas</td>
<td>Ehime</td>
</tr>
<tr>
<td></td>
<td>• Smaller urban areas</td>
<td>Hakata</td>
</tr>
<tr>
<td></td>
<td>• Medium-sized urban areas</td>
<td>Yabo</td>
</tr>
<tr>
<td>Medium-sized urban areas in which public transportation is widely used</td>
<td>• Provincial prefectural capitals</td>
<td>Tokubu</td>
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<td></td>
<td>• Company towns</td>
<td>Aki</td>
</tr>
<tr>
<td></td>
<td>• Bedroom communities for nearby cities, etc.</td>
<td>Yokohama</td>
</tr>
<tr>
<td>Medium-sized urban areas in which public transportation is widely used</td>
<td>• Bedroom communities in the suburbs of the three largest urban areas</td>
<td>Nishinomiya</td>
</tr>
<tr>
<td></td>
<td>• Larger provincial cities etc.</td>
<td>Niigata</td>
</tr>
<tr>
<td>Larger cities</td>
<td>• Ordinance-designated major cities</td>
<td>Special wards of Osaka</td>
</tr>
<tr>
<td></td>
<td>• Special wards</td>
<td>Osaka</td>
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</tbody>
</table>

Analytical definition 1) of Private vehicle shares 2)

<table>
<thead>
<tr>
<th>Population</th>
<th>Private vehicle shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000 or fewer</td>
<td>71.3%</td>
</tr>
<tr>
<td>50,001 – 1 million</td>
<td>59.6%</td>
</tr>
<tr>
<td>50% or more</td>
<td>26.5%</td>
</tr>
<tr>
<td>Less than 50%</td>
<td>18.5%</td>
</tr>
</tbody>
</table>

<p>| National share 1) of Number of local governments |</p>
<table>
<thead>
<tr>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>50,000 or fewer</td>
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<td>50% or more</td>
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<tr>
<td>Less than 50%</td>
</tr>
</tbody>
</table>

1) Analytical definition: Percentage of private vehicle owners among household heads.
2) Private vehicle shares: Percentage of household heads owning a private vehicle.
The ideal form of mobility for 2030

As issues arise with regard to social challenges to be resolved in the future and economic value creation against a backdrop of structural changes to society such as an aging population, low birth rates, and centralization of population in urban areas, future mobility needs are outlined below:

**Provincial cities**

- Ability to move freely within and between regions and to live a life free from inconvenience even without a car.

<Securing means of transit even in suburban regions where it is difficult to maintain public transportation>
Mobilizing diverse means of transit, such as community buses and taxi sharing, to secure mobility to support living in the community
Linking route buses and automated vehicles to deliver door-to-door services such as automated vehicles traveling on routes around dispersed senior residences.

<Proposing alternative means of transit for isolated regions and remote islands>
Enabling remote working and learning and provision of vehicles for access to convenience stores, restaurants, healthcare facilities, post offices, government services, etc.
Providing transport to meet both cargo and personal transportation needs, transporting agricultural produce, mail, deliveries, and people (mixed use), and using automated vehicles, drones, etc. in delivery and other services, to improve the efficiency of deliveries even under conditions of limited logistics demand.

**Urban areas in which transport is depending on private vehicles**

- Resolving traffic congestion and improving transport efficiency through means such as use of multiple means of transit and dispersion of transport demand.

<Resolution of traffic congestion>
Alleviating traffic congestion through demand forecasting and distributing demand for transit and services while optimizing transit flows.
In cooperation with retail facilities, medical institutions, and other facilities, comprehensively meeting transit demand through automated-driving buses running routes around residential districts, to improve transit efficiency.

<Realizing safe automotive transportation>
Spreading of vehicles equipped with support functions will enable even seniors to drive vehicles with peace of mind.
Improving safety for both vehicles and pedestrians through means such as use of infrastructure to detect and warn of the presence of nearby vehicles and pedestrians.

<Improving efficacy of logistics and resolving labor shortages>
As means of transit between factories and logistics facilities, or within communities, operating automated-driving service vehicles at low speeds to improve logistics efficiency and resolve labor shortages in trucking and other industries.

**Urban areas in which public transportation is widely used**

- Improving convenience while lessening congestion through optimization of use of means of transit, utilizing on-demand transportation, etc.

<Resolving conjugations and improving convenience in urban centers>
Promoting multi modal transportation, combining multiple means of transit to enable seamless transportation in accordance with needs.
Improved convenience through use of on-demand transportation to enable people to get on and off when and where they like.

<More convenient living through service mobility (mobile shops)>
Making living more convenient through flexible provision of various services (mobile shops) event suited to the needs of event attendees in line with having an event.

<Improving logistics efficiency through use of new mobility services etc.>
Improving delivery efficiency in office districts by using underground spaces for transportation of deliveries.
Use of logistics robots and other technologies for the last mile from the logistics relay point to the delivery destination, to improve delivery efficiency.
Setting targets related to commercialization of automated-driving technologies and development of related services. Specifically, realizing market introduction for vehicles able to drive themselves on expressways and driverless automated driving transport services in specified areas (such as depopulated areas) by FY2020. Promoting future feasibility studies in accordance with changing social conditions.

With regard to transport services, driverless automated driving transport services employing remote monitoring only may be introduced by roughly FY2022, and services may spread to 40 or more areas by the rough target of FY2025.

### Expected timing of commercialization of automated driving systems

<table>
<thead>
<tr>
<th>Level</th>
<th>Technology expected to be realized (example)</th>
<th>Expected timing of commercialization*2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Private vehicle</strong></td>
<td></td>
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</tr>
<tr>
<td>Level 2</td>
<td>Driver Assistance on ordinary roads</td>
<td>By 2020</td>
</tr>
<tr>
<td>Level 3</td>
<td>Automated driving on expressways</td>
<td>Circa 2020</td>
</tr>
<tr>
<td>Level 1,2</td>
<td>Sophistication of driver assistance system</td>
<td>Early 2020s</td>
</tr>
<tr>
<td>Level 4</td>
<td>Automated driving on expressways</td>
<td>Circa 2025</td>
</tr>
<tr>
<td><strong>Logistics service</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 4</td>
<td>Driver-assistive truck platooning on expressways</td>
<td>By 2021</td>
</tr>
<tr>
<td></td>
<td>Truck platooning with the trailing truck unmanned on expressways</td>
<td>FY2022 and later</td>
</tr>
<tr>
<td><strong>Transportation Service</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 4</td>
<td>Driverless automated driving transport services in specified areas</td>
<td>By 2020</td>
</tr>
<tr>
<td>Level 2 and above</td>
<td>Driver Assistance and automated driving of buses on expressways</td>
<td>From 2022</td>
</tr>
</tbody>
</table>

*1 When driverless automated-driving transport services are to come true depends on various conditions in the actual cruising environment, such as weather and traffic volume. With regard to the creation of an environment for the realization of those services, each government agency will consider the appropriate timing and the way it should be and take measures, taking into account future technological developments, etc.

*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.
In April 2020, the amended Road Transport Vehicle Act and Road Traffic Act were enacted, resulting in major progress on efforts to develop laws based on the general framework for systemic development related to automated driving.

**<Main initiative items based on the institution-development outline>**

- **Notions on securing the safety of vehicles**
  - i. Safety-related requirements etc. established as guidelines around summer 2018
  - ii. Formulation of international standards related to vehicle safety, with Japan leading discussions
  - iii. We will investigate the ideal approach to be taken in formulating measures to ensure the safety of vehicles in current use.

- **Traffic rules**
  - iv. Study of measures required to ensure that automated driving systems comply with norms set forth in road traffic act and regulations. Domestic legal and regulatory systems developed swiftly set forth matters such as the progress of international discussions (Geneva Convention), in which Japan continued to demonstrate leadership in cooperation with related countries, and technological developments.
  - v. With respect to unmanned autonomous driving transport services, the current framework for field operational testing used for remote automated driving systems will also be rendered usable for commercialization for the time being.

- **Ensuring safety on an integrated basis** (through the setting of conditions applicable to driving environments)
  - vi. Study and formulation of driving environmental conditions for ensuring the safety of automated driving (e.g., low speed, limited routes, daytime only)

- **Liability**
  - vii. Realizing swift aid to victims in the event of an accident
  - viii. Clarification of the roles and obligations expected of related parties and considering criminal liability
  - ix. Considering requirement of drive recording equipment

**<Progress through now>**

- (i)(ii)(iii)(vi)(ix) Amended Road Transport Vehicle Act enacted, intended to secure safety uniformly from the design and manufacturing processes through usage of automated-driving vehicles etc. (enacted April 2020)

- (iv)(ix) The amended Road Transport Vehicle Act establishes provisions related to liability of drivers and others in accordance with commercialization of automated-driving technologies (enacted April 2020)

- (v) Standards on permission to use public roads were revised in connection with feasibility testing of automated driving on public roads (September 2019) Commercialization is possible under frameworks of remote testing and testing of vehicles equipped with designated equipment

- (vii) Under the Act on Securing Compensation for Automobile Accidents, the operator remains liable for accidents arising while using automated driving systems

- (viii) To be studied based on related laws and regulations and the roles and duties expected of related actors
Social implementation

Main feasibility testing of automated driving

As of March 2020 (including plans)

- Last-mile automated driving (MUT and METI)
  - April to December 2019, FY2020
  - Ehime, Fukuoka Prefecture
  - Town of Ehime, Fukuoka Prefecture, AIST, Meikoboku Zen Company Ltd., etc.
- Truck platooning (MUT and METI)
  - December 2019 to February 2020, FY2020
  - Shimane, Tottori Prefecture
  - Toyota Tsusho, Advanced Smart Mobility, and others

- Medium-sized automatic driving feasibility study (MUT and METI)
  - FY2020: Medium-sized automatic driving bus
  - Kitakyushu, Fukuoka Prefecture

- Driveless platooning
  - June 2019 to February 2020, FY2020
  - Shimane, Tottori Prefecture
  - Toyota Tsusho, Adv. Smart Mobility, and others

- Driver platooning
  - November 2020 to March 2021
  - Oita, Fukuoka Prefecture
  - Toyota Tsusho, Adv. Smart Mobility, and others

- Local governments, private sector, or universities (* Only main feasibility testing is indicated)
  - City of Toyohashi, Gifu University, Nippon Steel
  - City of Saijo, Ehime Prefecture
  - City of Nishinomiya, Hyogo Prefecture
  - City of Yonezawa, Yamagata Prefecture
  - Hokuriku, Nippon Express, UD Trucks
  - October to November 2015
  - Aka Kanka, NTT East
  - October to November 2015
  - Oita, Oita Prefecture
  - October to November 2015
  - Oita City Hall, Oita Bus, Sumita University
  - SIP project etc. (Cabinet Office)
- Automated driving in restricted airport zones (MUT)
  - October 2019 to March 2020, July 2020 Naha Airport
  - Japan Air Lines

- Smart City (MUT)
  - 2019.8 Aioi City, Aichi Prefecture
  - City of Aioi
  - U-Smart Promotion Council
  - November 2018 to March 2020
  - Kashiwa, Chiba Prefecture
  - Kashiwakamachi Smart City Consortium
  - December 2019 to December 2020
  - Shimeda, Shizuoka Prefecture
  - Virtual Shizuoka Data-driven Smart City Consortium
  - February 13 to December 2019
  - Kokosai-cho, Kyoto Prefecture
  - Kozoji Smart City Promotion Council
  - Autumn 2019
  - Chiba Ward, Tokyo
  - Otobuki, Kanto: UNIX, Yurikamome Area Smart City Planning Consortium
  - October 2019
  - Kita Ward, Tokyo
  - Tayoi Smart City Council

- December 2019 to February 2020
  - Osaka, Nara, and others
  - January 2020
  - Matsuzaki, Shimoda, Fukuoka, Shizuoka Prefecture
  - Shizuoka Shinkansen Project Promotion Committee, Shizuoka Prefecture Future-Forward Technological Society Implementation Committee, Future Creation in Urban Development, Urban Innovation Committee
  - January 2020
  - Asahikawa, Hokkaido
  - March 2020
  - NTT Osaka, NTT Osaka, Nippon Kogaku, Nippon Steel, Osaka University, Nippon Kogaku
  - January to February 2020
  - Honmura-kita, Oita
  - March 2020
  - City of Hachioji, Gifu Prefecture, Nippon Club Bus
  - City of Chiba, Chiba
  - March 2020
  - City of Chiba, Chiba
  - March 2020
<table>
<thead>
<tr>
<th>Technological level</th>
<th>Technological development</th>
<th>Establishment of laws, regulations, and other systems</th>
<th>Infrastructure development</th>
<th>Other matters</th>
</tr>
</thead>
</table>
| **Level 3**         | <Automobile manufacturers, etc.>  
• Technological development satisfying Level-3 requirements (onboard sensors, dynamic maps, etc.)  
• <SIP Phase 2: through FY2022>  
  • Technologies related to use of transit environmental information  
  • Development of safety evaluation environments in virtual space  
  • Security technologies suited to software updates etc.  
  • Development of HMI requirements suited to advances in automated driving etc.  
  • <MLIT>  
    • Amended Road Transport Vehicle Act (promulgated May 24, 2019)  
    → Addition of "automated driving equipment" to the equipment subject to safety standards, formulation of safety standards for such equipment, etc. (completed)  
    • Maintenance of the transport provider's liability for accidents arising while using automated driving systems under the Act on Securing Compensation for Automobile Accidents (completed)  
  • <The National Police Agency>  
    • Amended Road Traffic Act (promulgated May 28, 2019)  
    → Development of provisions on liability and other matters related to drivers using "automated driving equipment" (completed)  
  • <METI >  
    • Commercialization of driverless automated driving transport services such as small carts in restricted areas  
    • Formulation of safety evaluation methods needed for automated vehicles  
|                      |                           | <MLIT>                           | <MLIT>                      |               |
|                      |                           | <SIP Phase 2: through FY2022>    | <MLIT>                      | <SIP Phase 2: through FY2022> |
|                      |                           | • Infrastructure support for self-identification of location  
|                      |                           | • Securing driving spaces for automated driving  
|                      |                           | • Securing exclusive driving spaces in promotion of commercialization  
|                      |                           | • Support for countermeasures to the reduced GPS measurement precision  
|                      |                           | • Development of logistics facilities  
|                      |                           | • Development of merging support facilities  
|                      |                           | • From the interim summary of the Study Group on Road Spaces Suited to Automated Driving of the Ministry of Land, Infrastructure, Transport and Tourism  
|                      |                           | • These developments will support not only Levels 3-5 but traffic safety as well.  
|                      |                           | <Telecommunications carriers, etc., MIC>  
|                      |                           | • Development and promotion of information and telecommunications infrastructure (e.g., 5G) suited to automated-driving needs  
|                      |                           | <METI >  
|                      |                           | • Increasing social receptivity (e.g., promoting understanding through dialogue with residents in test areas)  
|                      |                           | <MLIT>                           | <METI >                      |               |
|                      |                           | • Amended Road Transport Vehicle Act (promulgated May 24, 2019)  
|                      |                           | → Addition of "automated driving equipment" to the equipment subject to safety standards, formulation of safety standards for such equipment, etc. (completed)  
|                      |                           | • Maintenance of the transport provider's liability for accidents arising while using automated driving systems under the Act on Securing Compensation for Automobile Accidents (completed)  
|                      |                           | <The National Police Agency>  
|                      |                           | • Road-use Permit Standards for Feasibility Testing of Automated Driving on Public Roads (September 5, 2019) (completed)  
|                      |                           | • Study of forms to be taken by rules under the Road Traffic Act in cases in which there is not necessarily a driver present  
|                      |                           | <METI >  
|                      |                           | • Commercialization of driverless automated driving transport services such as small carts in restricted areas  
|                      |                           | • Formulation of safety evaluation methods needed for automated vehicles  
| **Level 4**         | <Automobile manufacturers, etc.>  
|                      | • Development of risk-minimized transport technologies, such as automatic safe stopping when an abnormality or other issue has arisen  
|                      | • Other technological development satisfying Level 4 requirements  
|                      | <MLIT>                           |                           |               |               |
| **Level 5**         |                           |                           |               |               |
Initiatives toward realization of the future vision
(MaaS and other new mobility services)

• To ensure that initiatives targeting new mobility services will lead to solutions to community social challenges, it is essential both to provide backing for new community initiatives through public-private partnership and to develop an environment in which various stakeholders related to mobility can share and utilize information mutually.

• It also is important to promote social implementation of automated driving, including driverless automated driving transport services.

1. Ensuring the business potential of mobility services
Supporting public-private initiatives in communities intended to realize sustainable services, such as cooperation among different industries and overlapping of multiple means of transport.

2. Enhancing alternative transit services
Supporting new initiatives to provide services that themselves have been mobilized in areas where it is difficult to maintain retail and public facilities.

3. MaaS infrastructure development
To realize "Japanese-style MaaS" linking multiple fields, supporting initiatives through cooperation with public transportation businesses, service providers, and others in the communities.

4. MaaS-related data coordination
Prompting data coordination among related parties based on the Guidelines, including development of systems to promote use of data by public transportation businesses and opening up data.

5. Linkage of physical-space initiatives and MaaS platforms
Promoting initiatives such as development of transit hubs and improvements to driving spaces, reflecting urban plans and other factors, through linkage with MaaS platforms.

6. Data linkage and utilization in the logistics field
Advancing studies toward improvements in logistics efficiency, including sharing of truck data and using it in management of driving, through cooperation among shippers, shipping companies, and commercial-vehicle manufacturers.

Synergy effects of MaaS and automated driving

MaaS and automated driving
Realizing a mobility society in which anybody can move safely and freely with convenience and low cost, through using automated driving to transport people and things as a service. It is important to promote utilization of new mobility services and social implementation of automated-driving vehicles as integral parts of realizing the vision for the future.
Realization of Society 5.0 (coordination with smart cities)

- Contributing to solutions to community challenges and the economic cycle through coordination and use of various data across various fields including mobility. Through coordination of data with non-mobility services in areas such as retail, tourism, healthcare, and disaster prevention, creating new services and realizing sustainable mobility services.
- For this purpose, securing mutual usability and expandability in data collection and use is an important issue.

Source: Documents submitted by the Cabinet Office to the 28th Joint Economic/Financial Reforms Promotion Committee meeting
Courses of action on initiatives toward realization of the vision for the future

• Referring to the Society 5.0 Reference Architecture, formulating a reference architecture for mobility as a whole, to help realize the future vision.
• Using this architecture to realize the future vision and a framework modeled in detail, organizing future initiatives and promoting development of flexible mobility systems in coordination with other fields.
• Using this as reference in discussions with diverse stakeholders in the future.
Thank you