

# SIP-adus Workshop 2018

## SIP-adus National R&D Project for Connected and Automated Driving in Japan

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# SIP-adus Workshop 2018

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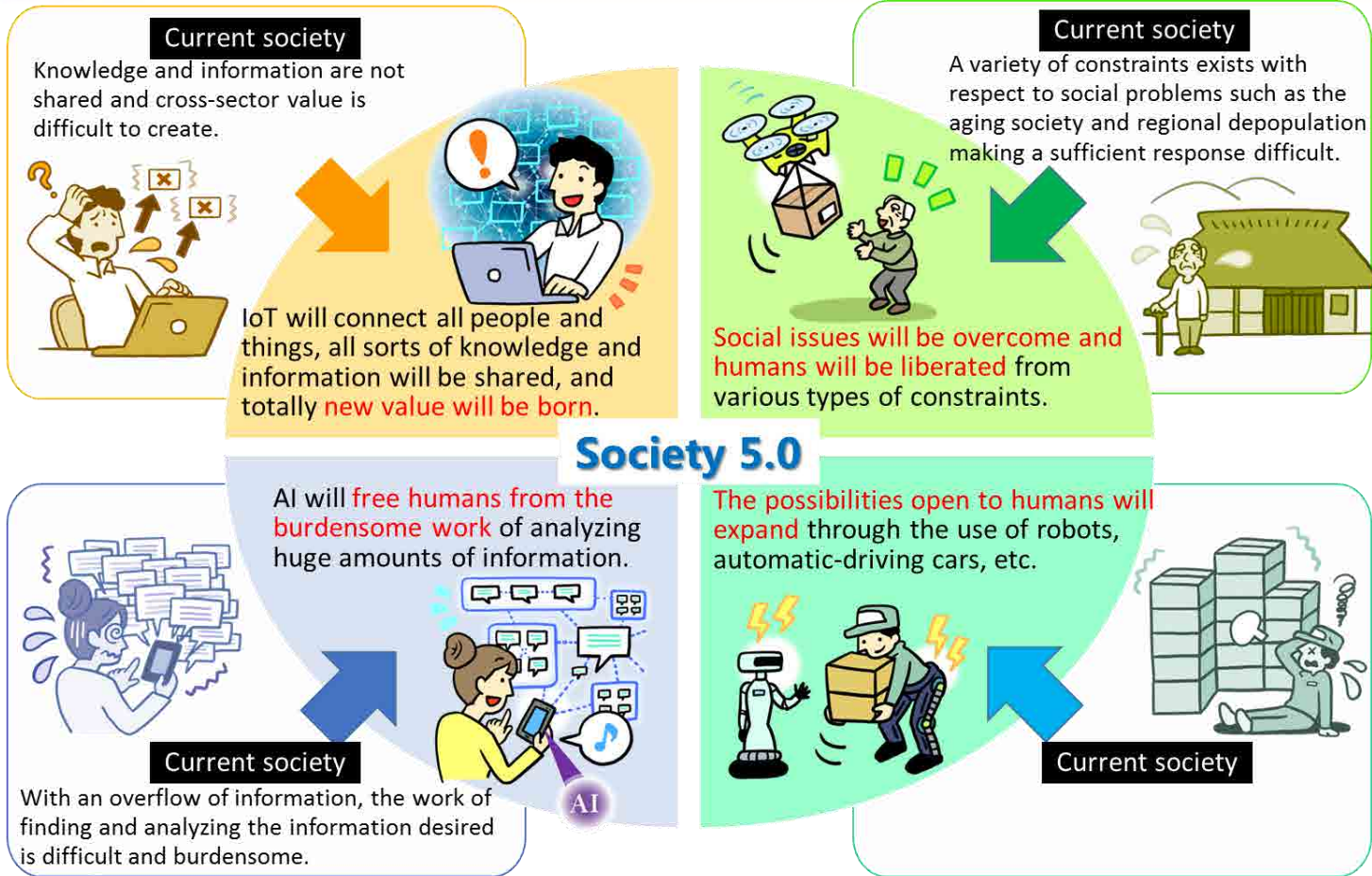
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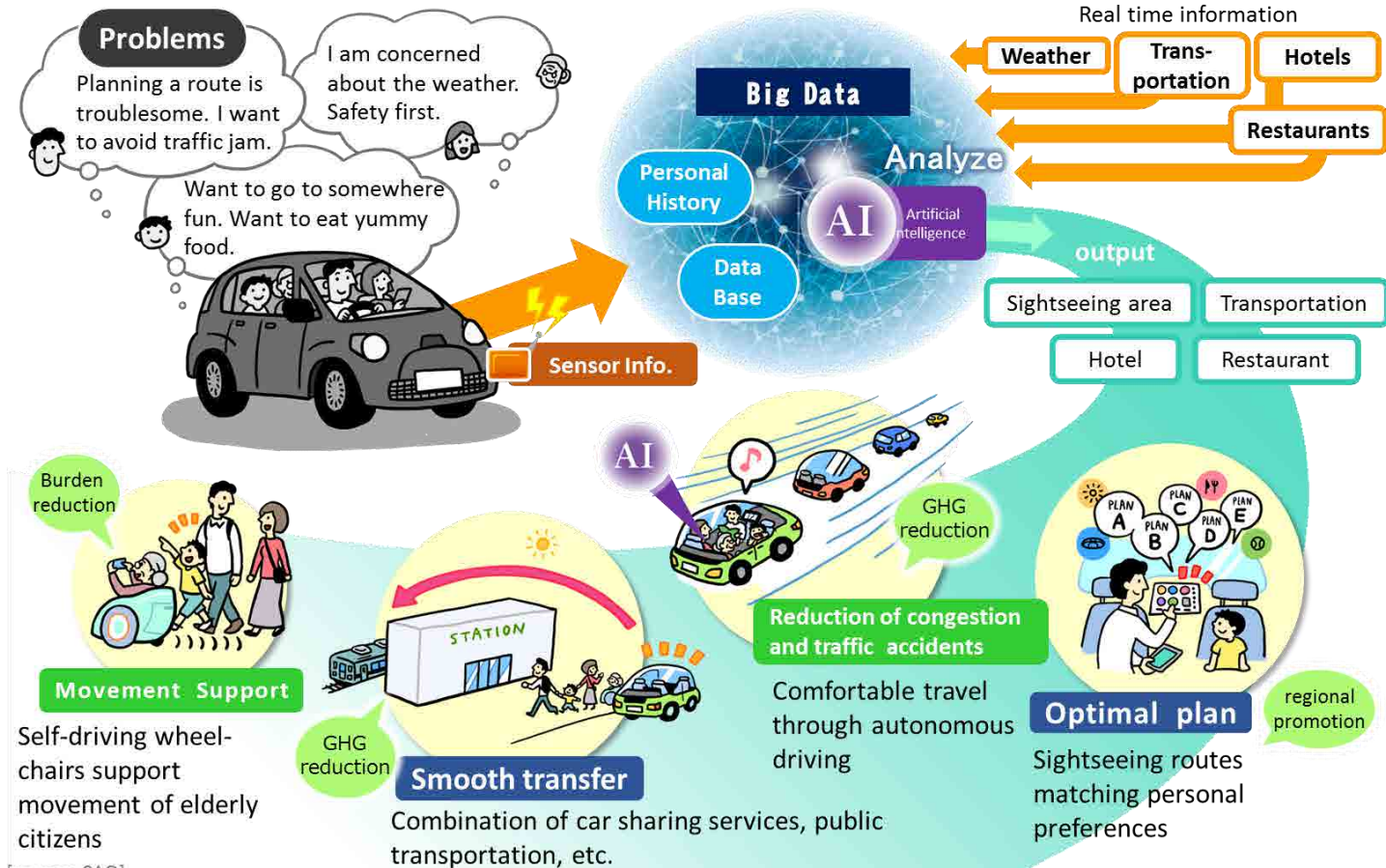
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**Society 5.0**

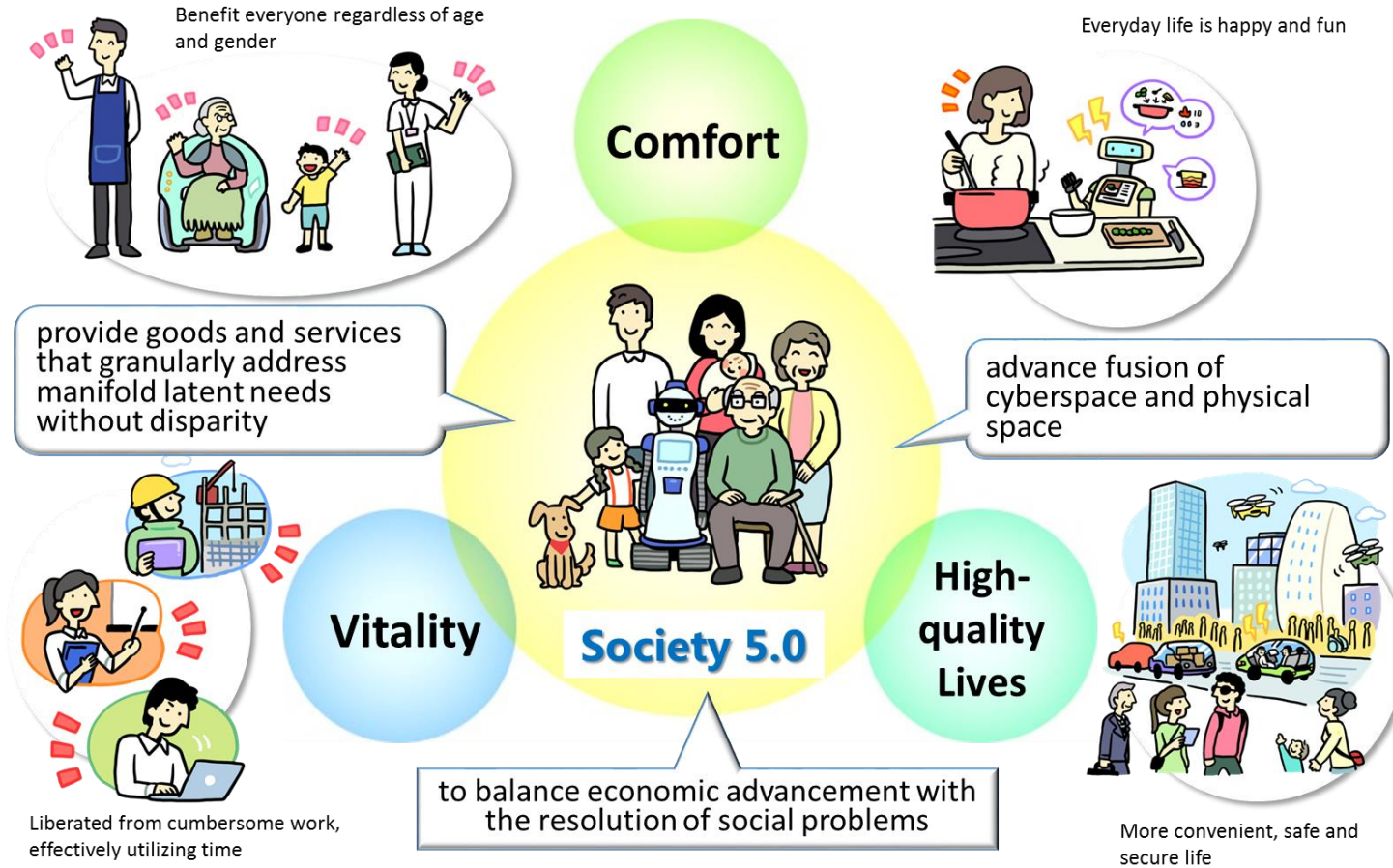
# A society realized with "Society 5.0"



# Example of creating new value (Mobility)



# “Society 5.0” bring about a human-centered society



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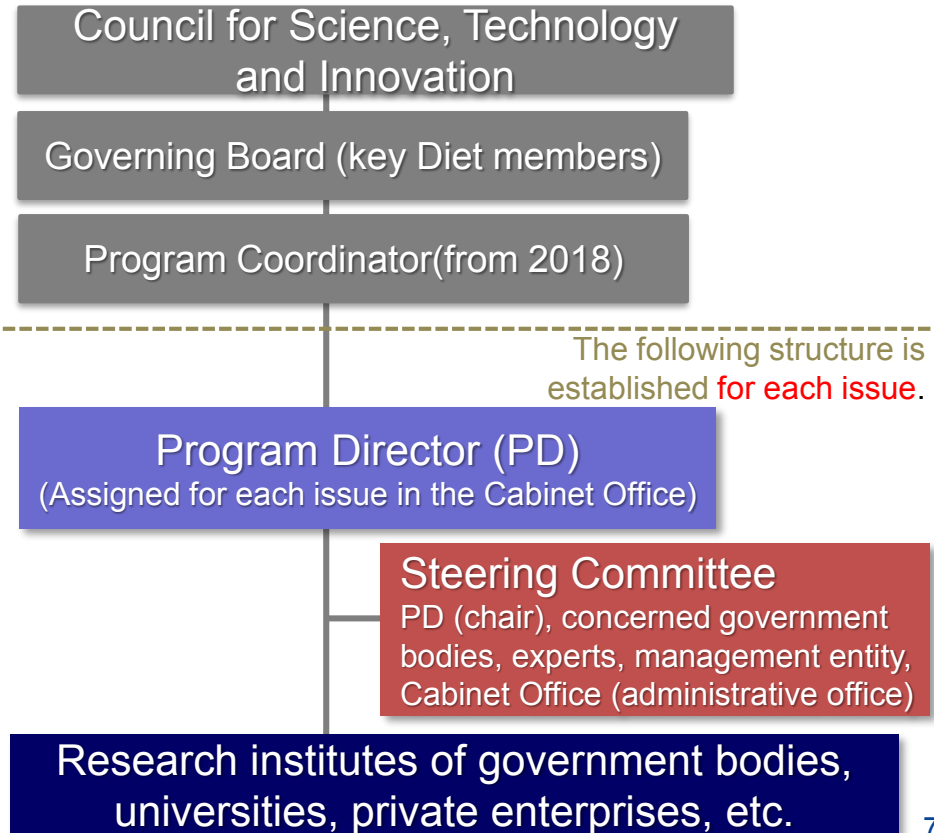
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## SIP-adus (Automated Driving for Universal Services)

# SIP (Cross-Ministerial Strategic Innovation Promotion Program)

## Implementation structure

- Realizing Science, Technology and Innovation through promoting R&D overlooking **from fundamental research to practical application and commercialization by cross-ministerial cooperation.**
- **Regulatory reform, special economic/deregulation zones, and government procurement** are considered as well as **international standards.**
- Council for Science, Technology and Innovation(CSTI) **defined the subjects to solve social issues** and achieve economic growth.
- CSTI **appoints Program Directors (PDs) for each project and allocates the budget.**
- The PDs promote programs from a cross-ministerial standpoint aimed at breaking down the vertical barriers that exist among concerned government bodies. For this reason, **the PDs serve as chairpersons of Steering Committees that are attended by concerned government bodies.**





# Vision and Development Goals of automated driving

## Vision for social aspects

### Safer and more comfortable transport system

- Reduce traffic accidents  
Target reduction in traffic fatalities  
2017: 3,694 → 2,500 or less
- Reduce traffic congestion



### For a society with a declining birth rate and aging population, and productivity revolution

- Ensure means of mobility in local areas
- Alleviate the shortage of human resources (drivers)

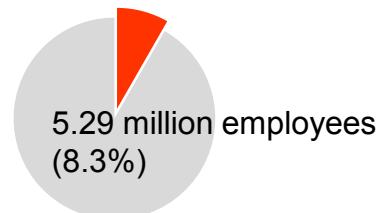


## Vision for industrial aspects

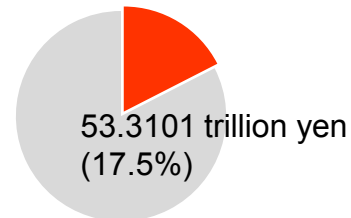
### More competitive in auto industry

Shipment value of the auto manufacturing industry:  
accounts for 20% of major manufacturing industries

Persons employed



Value of manufactured goods shipped



### Creation of new industries



Sensor-equipped vehicle  
(e.g., cameras, radar sensors)

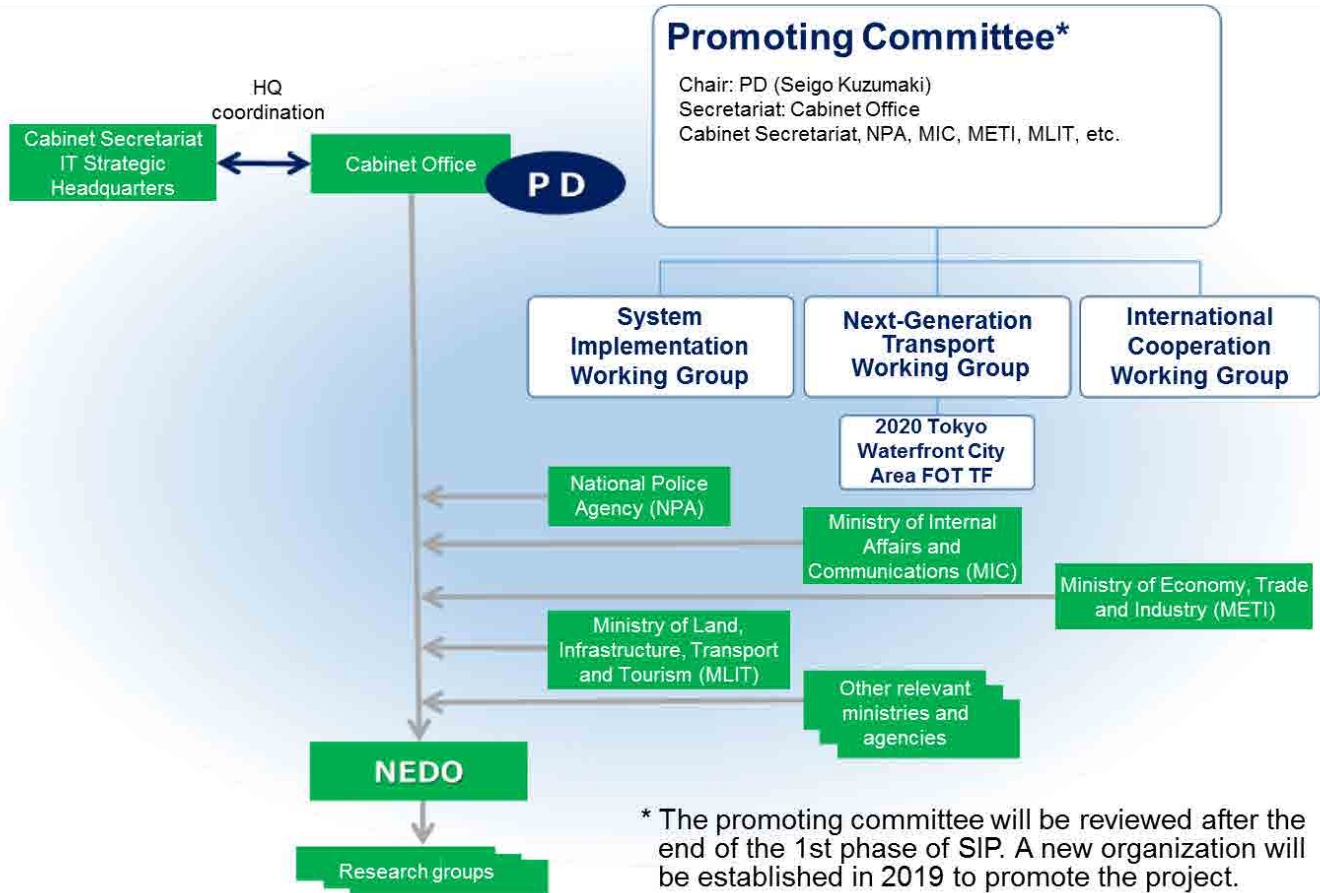


Communication device



Digital infrastructure

# Implementation Organization



# 1st Phase of SIP-adus in Japan: Overview

## Objective

- Reduction of traffic accidents and congestion
- Early realization and deployment of automated driving systems
- Realization of an advanced public bus transport system that is easy to use by elderly people and vulnerable road users in road transport system

Budget for FY 2018

2.8Bil. yen.

## Vehicle



Recognition

Maps, ITS info, sensors



Judgment

Control, artificial intelligence

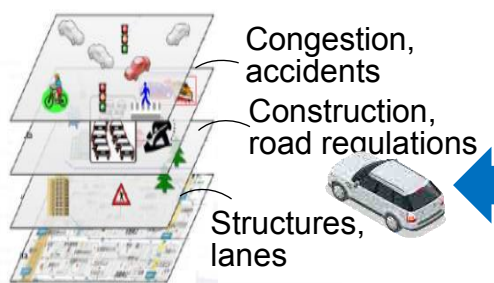


Operation

Hydraulics, electric motor

⇒ Development based on competition among manufacturers

⇒ Dynamic Map (high-precision 3D map + changes over time)



Congestion, accidents  
Construction, road regulations  
Structures, lanes

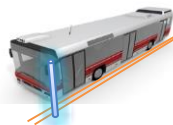


Delivery of updated data on construction, congestion, etc.

Tying together information that changes with time (e.g., construction, congestion, etc.) on a highly-precise 3D map for car localization

## Next Generation Transport

Application of automated driving technologies to buses, etc.



Precise stopping at bus stops with almost no space between the bus and the curb to make getting on/off easier for wheelchair users and elderly passengers



Improved express performance and on-time operation through enhancement of Public Transportation Priority Systems (PTPS) Etc.

## HMI

### Human Machine Interface



The transition time required, depending on driver's readiness, to safely switch from automated driving to human driving



Interfaces with other traffic participants



Instruction method concerning the operating condition of the automated driving system, etc.

## Base technologies

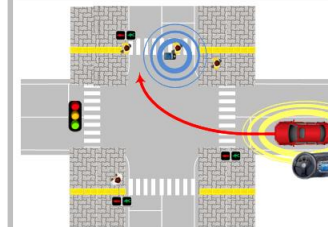
### Cyber Security

Guidelines for protection against cyber attacks on vehicles, etc.



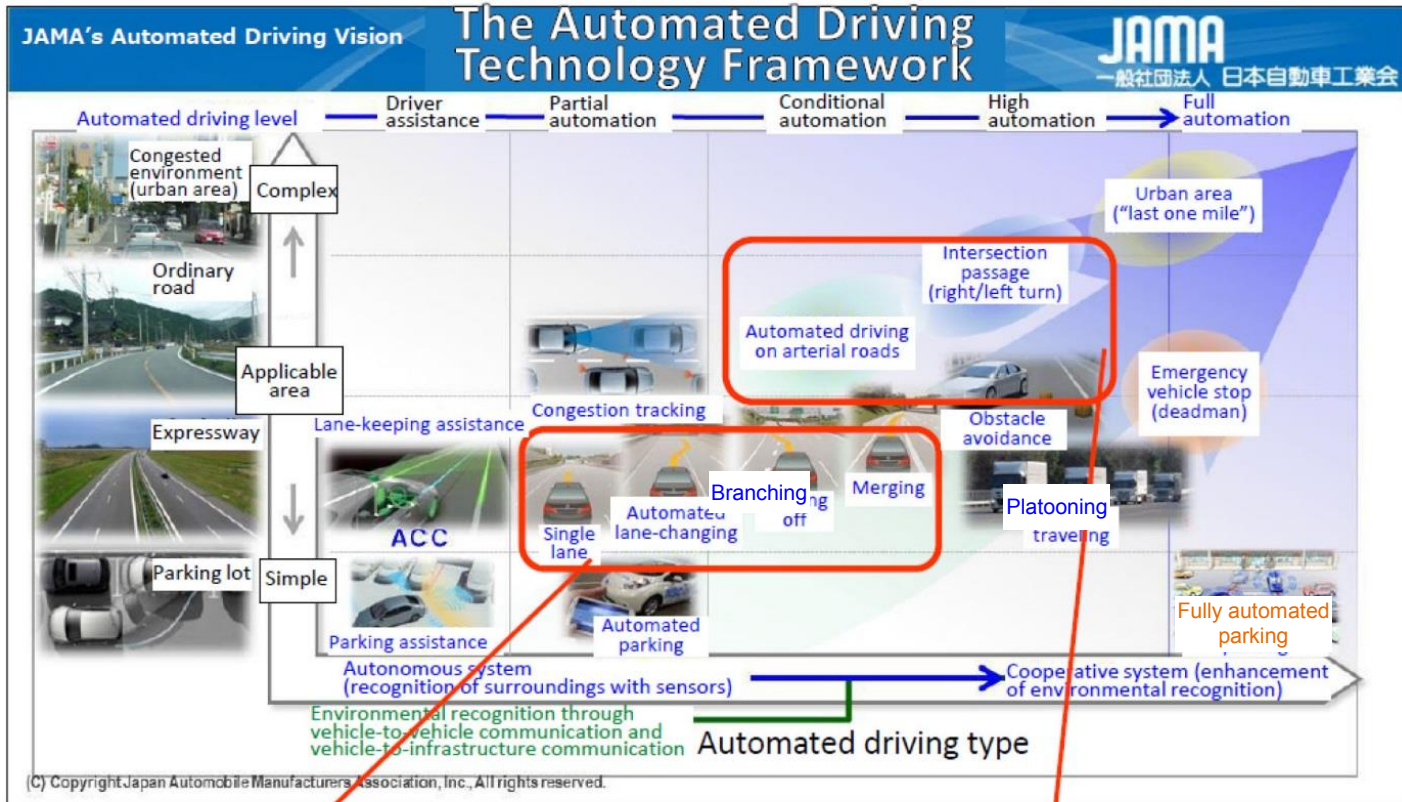
In Red: "Cooperative area" in which SIP is involved

## Pedestrian traffic accident reduction



Verification of the accident-reduction effects of wireless communication between cars and pedestrians' devices and use of radar, etc.

# 1st Phase of SIP-adus in Japan: Objectives



(1) Practical application of a high-end partial driving automation system (Level 2) by 2020

(2) Clarification of functional expandability requirements and priority for next step and scheduling of its implementation

# 1st Phase of SIP-adus in Japan: Schedule

2014

2015

2016

2017

2018

- ◆ System development
- ◆ R&D on specific themes

Steering Committee

System Implementation Working Group

International Cooperation Working Group

Next Generation Transport Working Group

- ◆ Integration into 5 key issues

- ① Dynamic Map
- ② Information security
- ③ HMI (Human Machine Interface)
- ④ Pedestrian Traffic Accident Reduction
- ⑤ Next Generation Transport

- ◆ Large-scale field operational tests



- ◆ Field Operational Test of Automated Bus Driving in Okinawa

# FOTs of automated bus driving in OKINAWA

Dates	March 2017	June and July 2017	November and December 2017	November, January, and February 2019(Planned)
Sites, etc.	<p>Area of “Azama Sun Beach,” Nanjo City, Okinawa</p> <ul style="list-style-type: none"> <li>○ Public road (low traffic volume)</li> <li>○ Driving route of approx. 2 km round trip</li> </ul>	<p>Ritoh Terminal ⇔ New Ishigaki Airport, Ishigaki City, Okinawa</p> <ul style="list-style-type: none"> <li>○ Public road (traffic volume of approx.. 10,000 cars/day)</li> <li>○ Driving route of approx. 32 km round trip</li> <li>○ Regular operation on an actual local bus route</li> </ul>	<p>Aeon Mall Okinawa Rycom ⇔ Ginowan Marina, Ginowan City and Kitanakagusuku Village, Okinawa</p> <ul style="list-style-type: none"> <li>○ Urban arterial road with heavy traffic volume (approx.. 58,000 cars/day)</li> <li>○ Driving route of approx. 20 km round trip</li> </ul>	<p>Naha City and Tomigusuku City</p> <p>Details are in now consideration</p>
Purpose	<p>Technical test Automated driving performance evaluation, system behavior verification, etc.</p>	<p>Social test The first trial operation of its kind in Japan, conducted with the participation of ordinary passenger monitors (total of 368, including residents and tourists [200 signed up in advance, 168 joined on the day of the test])</p>	<p>Technical test (Step II) Verification of possibilities for automated bus driving and technical challenges in an actual traffic environment with relatively heavy traffic volume in an urban part of Okinawa’s main island</p>	<p>Integrated test</p>



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**2<sup>nd</sup> phase of SIP-adus  
(System and Service expansion)**

# 2nd phase of SIP-adus (System and Service Expansion)

Budget for FY 2018 3.0Bil. yen.

## Objective

Reduce traffic accidents and traffic congestion, provide depopulated areas with transportation, contribute to solve social challenges such driver shortages in logistics industry, and finally ensure safe and secure mobility for everyone in society, by expanding of automated driving from expressways to general public roads and implementing automated driving-based logistical and mobility services.

## R&D overview

### [I] Development & validation (FOTs) of automated driving systems

- (1) Delivering traffic signal data
- (2) Supporting V2I coordination and vehicle merging assistance.
- (3) Gathering and utilizing vehicle probe data
- (4) Next-generation public transportation systems
- (5) Road environment suited to the practical implementation of mobility services...etc.

### [II] Development of core technologies for the practical implementation of automated driving

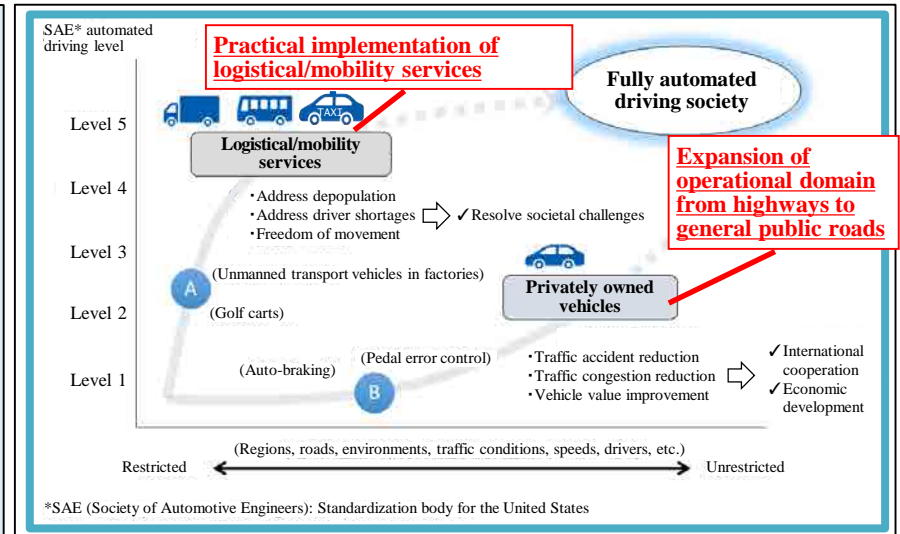
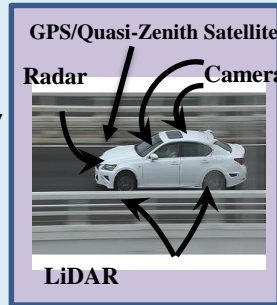
- (1) Creation of a safety assessment environment in virtual space
- (2) Development of technologies for efficient data gathering, analysis and distribution...etc.

### [III] Fostering social acceptance of automated driving

- (1) Planning and hosting events that promote social acceptance
- (2) Clarification of the impacts of automated driving
- (3) Research on support for vulnerable road users...etc.

### [IV] Enhancement of international cooperation

- (1) Dissemination of the outcomes of the project at international conferences
- (2) Implementation of joint research with oversea research institutions



Relevant government bodies (partial list): Cabinet Secretariat; National Police Agency; Ministry of Internal Affairs and Communications; Ministry of Economy, Trade and Industry; Ministry of Land, Infrastructure, Transport and Tourism Management agency: NEDO



# FOTs (Tokyo Waterfront City–Haneda Area)

## 1. Schedule

### Around January 2019:

Participation will be solicited.

### Around latter half of FY2019 to the end of FY2022:

FOTs will be conducted

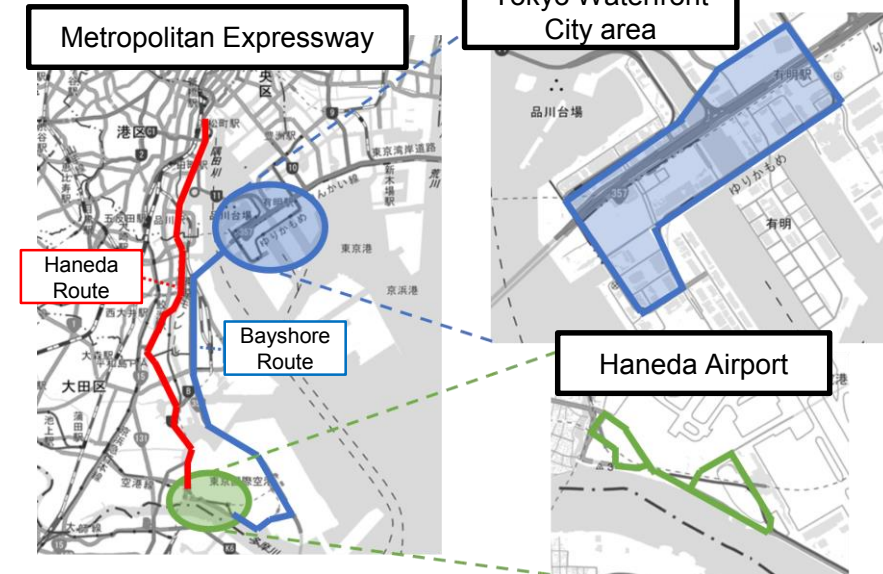
## 2. Participants (expected)

Automakers, components manufacturers, universities, research institutions, etc. **in and outside Japan**

## 3. Environments for the FOTs (planned)

- An environment to provide traffic signal information from traffic signals (roadside wireless communication equipment)
- High-definition 3D maps linked with traffic signal information
- An environment that provides merging support information
- An environment that provides traffic regulation information for each lane
- Onboard equipment (e.g., traffic signal information, merging support information) (only for applicants)

## Planned areas



Source: maps of the Geospatial Information Authority of Japan

# FOTs (Tokyo Waterfront City–Haneda Area)

## Details of FOTs (draft)

### Providing traffic signal information

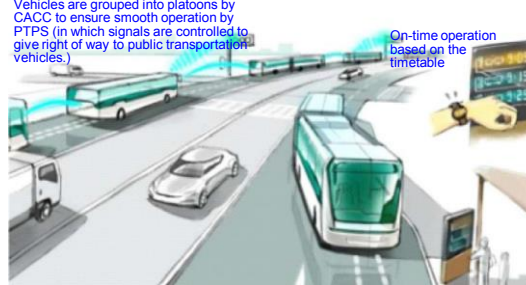
Vehicles are allowed to pass through intersections safely and smoothly based on **the signal display and change timing information** even in environments where recognition is difficult using in-vehicle cameras.



### Public transport system (self-driving buses)

Vehicles are grouped into platoons by CACC to ensure smooth operation by FTPS (in which signals are controlled to give right of way to public transportation vehicles.)

On-time operation based on the timetable



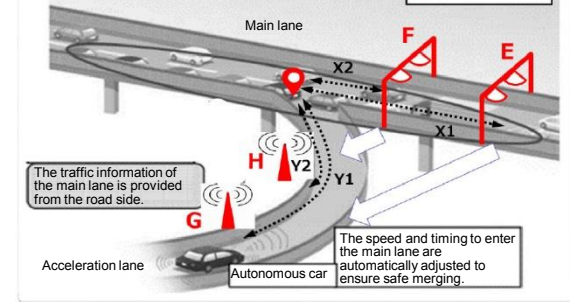
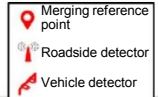
FOTs for the next-generation ART will be implemented on public roads by using automated driving technology in **mixed traffic flow**.

### Merging assistance on the main lane of highways

### Providing vehicle information on the main lane

A **vehicle detector** is installed at two locations before the merging reference point on the main lane (E and F).

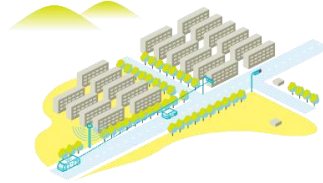
A **roadside detector** is installed at two locations before the merging reference point on the acceleration lane (G and H).



# FOTs (Local Transportation)

## Details of FOTs (draft)

Mobility/logistics services in underpopulated areas, etc.



FOTs for technologies



FOTs for implementation and commercialization

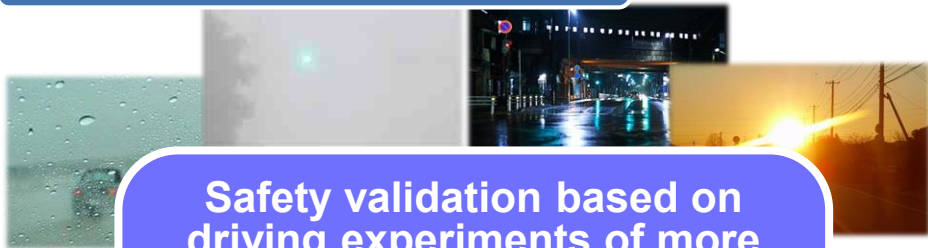
**Long-term FOTs on public roads toward commercialization** as means of local logistics and mobility services for citizens

Ensuring means of mobility in areas where many elderly persons live or that are not easily accessible



# Build a Virtual Environment for Safety Evaluation

Various weather conditions



Safety validation based on driving experiments of more than 10 billion km



Various traffic environments

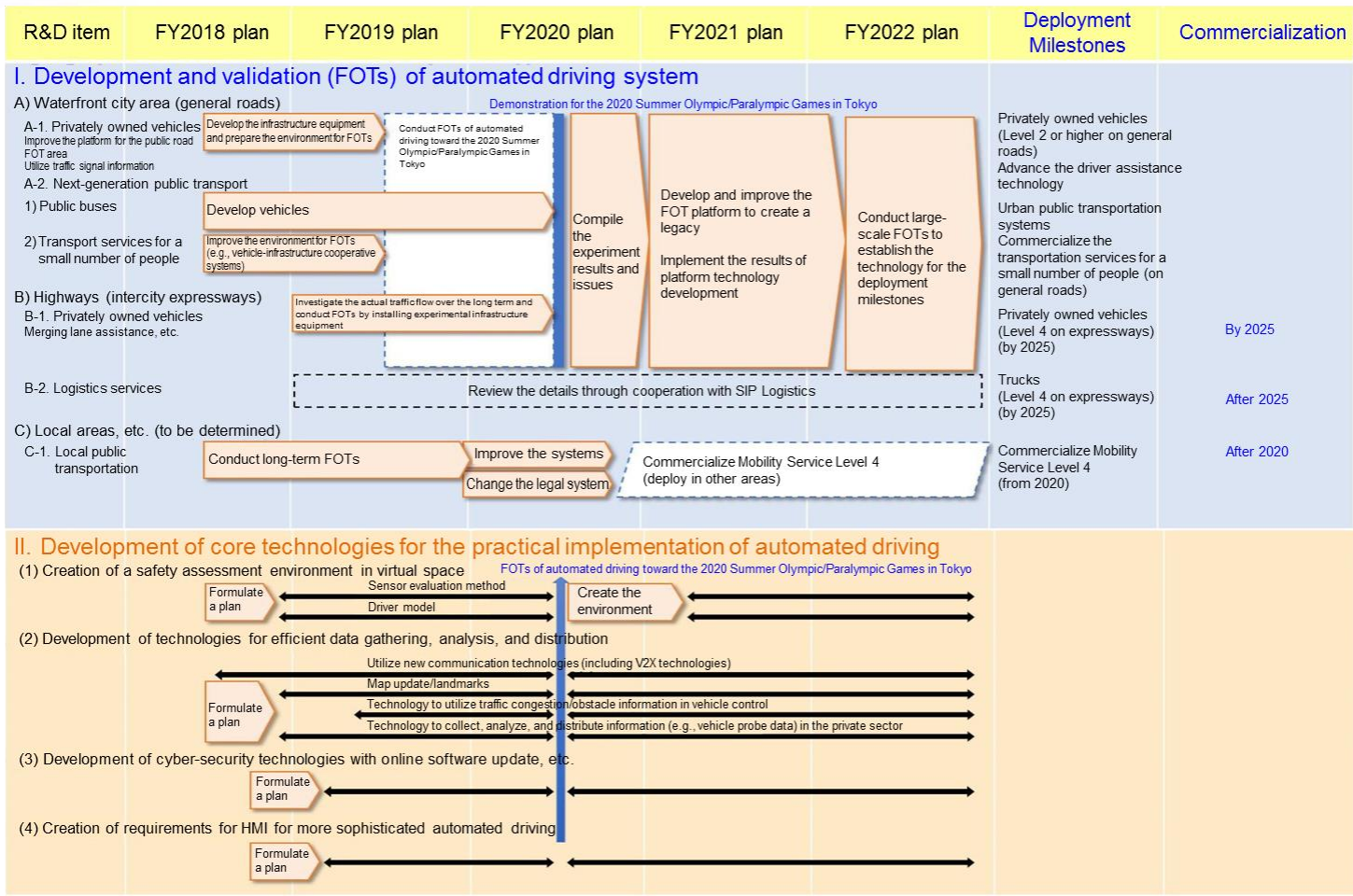


Virtual safety assessment



**Simulation tools** that can reproduce and combine various environments will be developed for performing safety assessments based on automatic assessment by repeating critical situations.

# 2nd Phase of SIP-adus in Japan: Schedule



A long-exposure photograph of a road at night, showing light trails from cars and streetlights in various colors like yellow, blue, and purple, creating a sense of motion and depth.

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**Thank you**