SIP-adus Next Generation Transport Activity Update
- Automated Transit Services for the 2020 Tokyo Olympics -

SIP: *Cross-Ministerial Strategic Innovation Promotion Program*
Adus: *Innovation of Automated Driving for Universal Services*

Shinya TSUCHIDA

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

➢ **Intensive R&D program**

✓ promote 5-years R&D (FY2014 - FY2018)
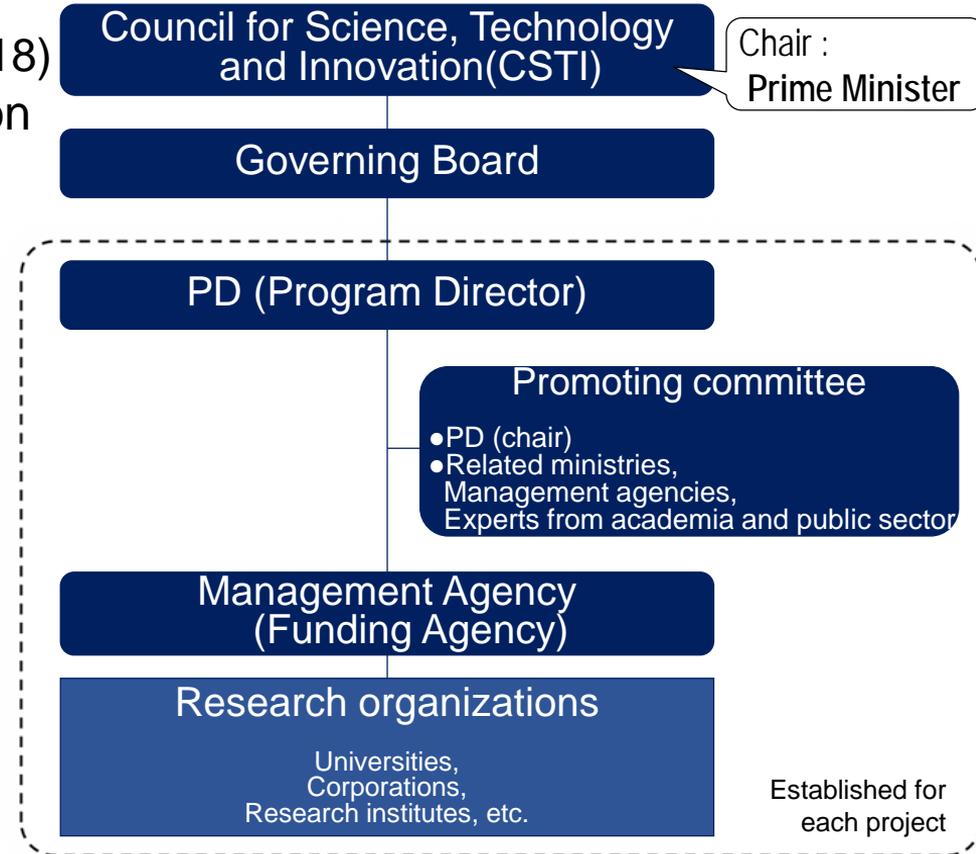✓ enhancing cross-ministerial cooperation

➢ **11 research themes**

From societal issues such as Energy, Next-Generation Infrastructures and Local Resources, including R&D for AD

➢ **Leadership and total Budget**

CSTI appointed Program Directors (PDs) and allocates the budget every year for each research theme. *

* ¥50bil in total per year
(65% for SIP 11 themes, 35% for medical R&D)

- Governance Structure -

Council for Science, Technology and Innovation(CSTI)

Chair :
Prime Minister

Governing Board

PD (Program Director)

Promoting committee
●PD (chair)
●Related ministries,
 Management agencies,
 Experts from academia and public sector

Management Agency
(Funding Agency)

Research organizations
Universities,
Corporations,
Research institutes, etc.

Established for
each project

SIP Cross-ministerial Strategic Innovation Promotion Program

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

Societal Issues	Themes	FY2016 budget
Energy	Innovative combustion technology	¥1.9bil
	Next-generation power electronics	¥2.4bil
	Innovative structural materials	¥3.8bil
	Energy carrier	¥3.5bil
	Next-generation ocean resources development technologies	¥4.7bil
Next-Generation Infrastructures	**Automated Driving System**	**¥2.7bil**
	Technologies for maintenance/upgrading/ management of infrastructures	¥3.2bil
	Reinforcement of resilient function for preventing and mitigating disasters	¥2.3bil
	Cyber-Security for Critical Infrastructure	¥2.6bil
Local Resources	Technologies for creating next-generation agriculture, forestry and fisheries	¥2.9bil
	Innovative design/manufacturing technologies	¥2.2bil

Automated Driving System in SIP

SIP-adus
(*Innovation of Automated Driving for Universal Services*)

- ✓ Intensive R&D program supporting development of future advanced ADS

- ✓ Industry-academia-government collaboration

- ✓ Working with the Japan Automobile Manufacturers Association (JAMA) and going along with its vision for ADS

- ✓ Especially focusing on what we should cooperate with, including digital map, wireless communication, HMI, security

Budget for SIP-adus : JPY 2.7 Billion (FY2016)

Program Director

Seigo Kuzumaki
Chief Safety Technology Officer Secretary,
Toyota Motor Corporation

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Mobility Bringing Everyone a Smile

1. **Ensuring safety and traffic jam reduction on the road**

2. **Development and deployment of Automated Driving System**

3. **Realization of advanced next generation public bus service good for elderly and handicapped people.**

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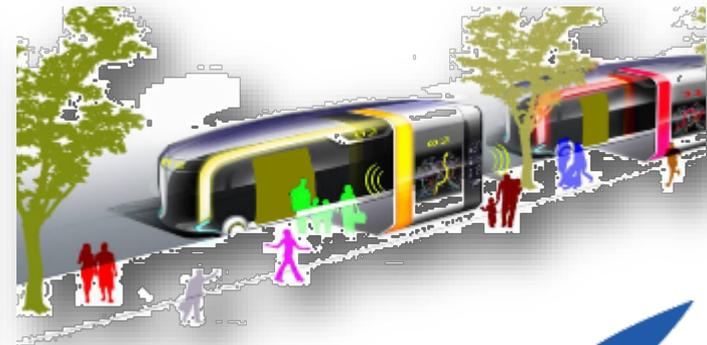
Technologies for Automated Driving

On-board Technologies

Perception

Decision

Operation

HMI

Coordination

Precise 3D digital map

V to X

GNSS

Camera · Lider · Rader
Built-in sensors
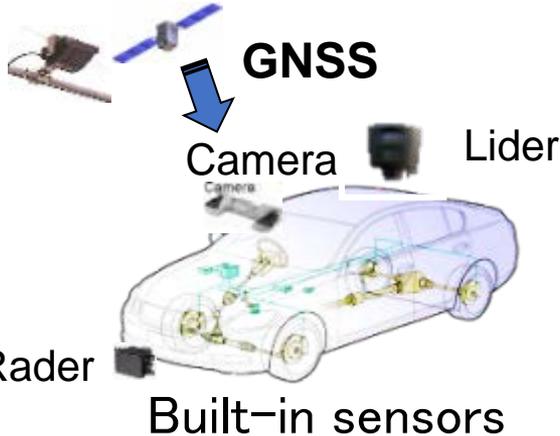
Human Machine Interface

Platform — **Security, Simulation, Shared database, etc.**

Structure of SIP-adus

SIP-adus R&D activities are reviewed in the Promoting Committee. Currently, 3 Working Groups and 2 Task Forces have been established to cover wide variety of the topics.

SIP-adus Promoting Committee ───── **FOT planning TF**

System Implementation WG ───── **Map structuring TF**
- ◆ Dynamic map (precise 3D digital map with information changing over time)
- ◆ Micro and macro data analysis and simulation technology
- ◆ Prediction based on information from ITS
- ◆ Sensing capability enhancement
- ◆ Human Factors
- ◆ System security

International cooperation WG
- ◆ Open research facility
- ◆ Social acceptance

Next Generation Urban Transportation WG
- ◆ Local traffic management enhancement
- ◆ Next-generation public road transport system

Consistent Accessibility

**Remove Physical and Information barriers
by utilizing Automated Driving Technologies
and Information/Communication Technologies**

System Control Center

Airplane/Ship
(Long Distance)

Advanced Rapid Transit(ART)
(Short/Middle Distance)

Small Accessible Transport
(First/Last Mile)

*Automated Precise Docking
*Smooth Acc./Dec. Control

ART mini

Multimodal real-time travel information

Consistent Accessibility for all from first to last

EasyMile (France)

Navya (France)

Conexxon (Netherlands)

DeNA Robot Shuttle

Global Automated Driving Challenges for Bus & Truck

But International Regulation of Unmanned Vehicle restriction

Truck Platooning
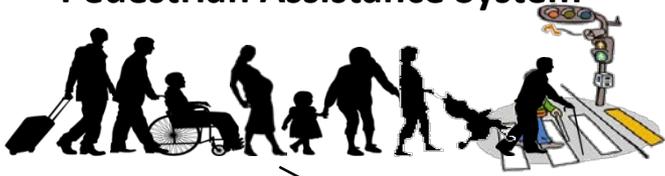(Volvo, Scania, Mercedes)

Future Bus
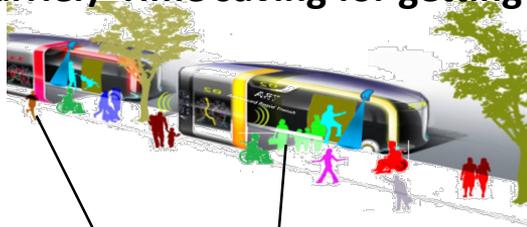(Mercedes)

Advanced Rapid Transit(ART)

Consistent Accessibility for all people including elderly and handicapped person

Improve accessibility to ART
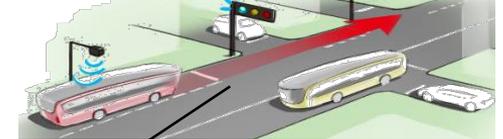**(Remove barrier/ Time saving for getting on/off)**

Pedestrian Assistance System

Stress free Public Transport
(Secure Rapidness and On-time)

Advanced Pedestrian Information Communication System

Precise Docking,
Smooth Acceleration/Deceleration

Advanced Public Transport Priority System

ART Information Center

Application Examples
* Congestion Prediction
* Dynamic Connection Guidance
* Remote Diagnostics

Information Open Platform for ART related applications

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Needs of Precise Docking

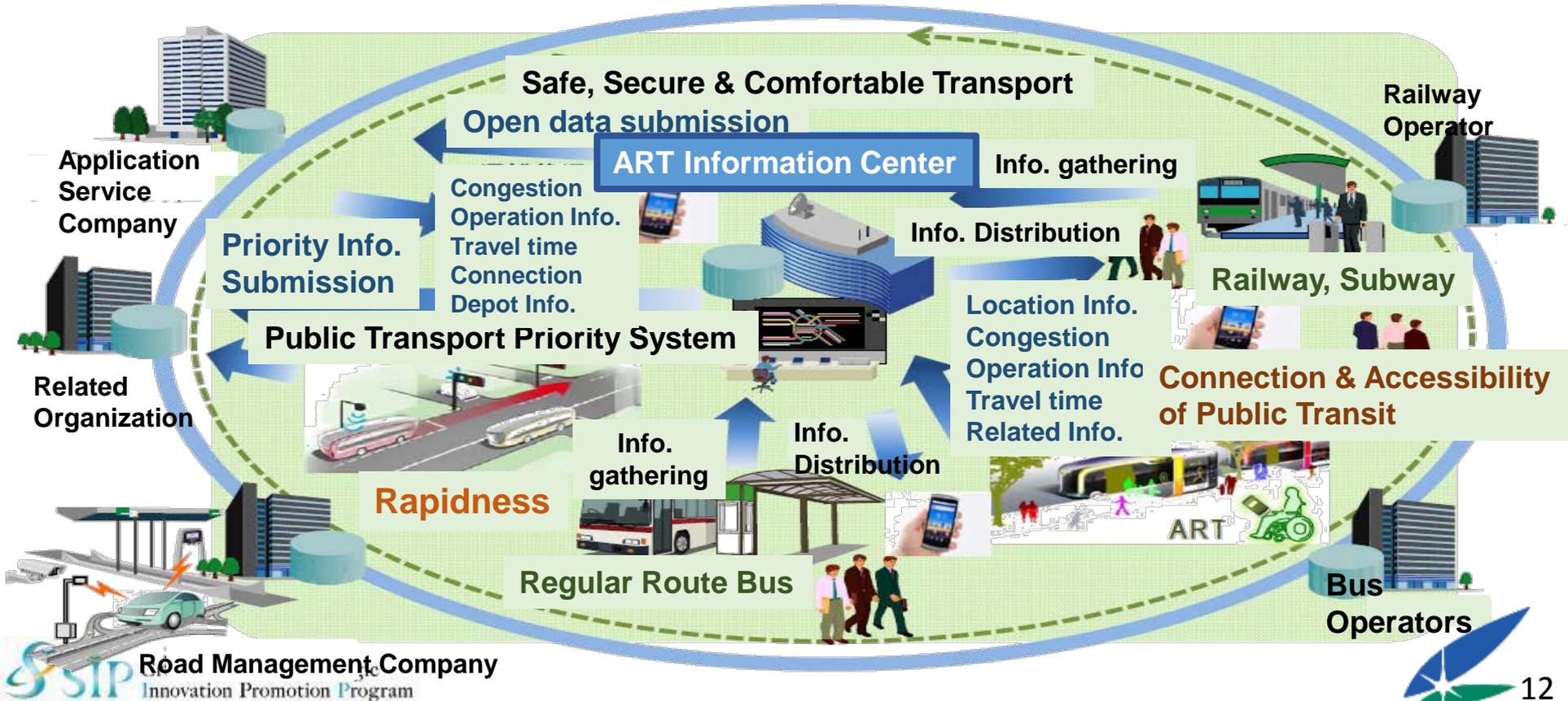For People who use Wheelchair, People who is totally blind,
Gap is "awful valley"

Precise Docking can fill up the awful valley

ART Information Center

Core of Information in ART Operation

Safe, Secure & Comfortable Transport

Open data submission

ART Information Center

Info. gathering

Railway Operator

Application Service Company

Congestion
Operation Info.
Travel time
Connection
Depot Info.

Info. Distribution

Railway, Subway

Priority Info. Submission

Public Transport Priority System

Location Info.
Congestion
Operation Info
Travel time
Related Info.

Connection & Accessibility of Public Transit

Related Organization

Rapidness

Info. gathering

Info. Distribution

Regular Route Bus

ART

Bus Operators

Road Management Company

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Initiatives and Partners

initiatives	Cooperating Organizations	Details
Research and Development		
For SIP-adus R&D ・Precise Docking Control Technology ・Enhanced PTPS (Public Transportation Priority System)　etc.	SIP-adus	In order to establish ART (Advanced Rapid Transit) as the next generation urban transport system, it is necessary to improve accessibility using technologies such as smooth acceleration control, and precise docking control to accurately align the buses at bus stops to enable easy access for wheelchair or elderly passengers. R&D efforts are also underway to control traffic lights to give priority to public transportation and ensure reliable, timely operation.
ART System Integration Development	SIP-adus Project operators, etc.	
Verification Tests		
Public road test	SIP-adus Tokyo Metropolitan Government, Project operators, etc	Possible staging of verification test of the SIP-adus from FY 2017, to identify problems and provide feedback to R&D as part of efforts towards social application of the system. Improve social awareness and consider extending the system to cities other than Tokyo.
Creating and Operating Project Structure		
Planning	Tokyo Metropolitan Government, Project operators, etc.	The Tokyo Metropolitan Government is aiming to implement the BRT system by the end of 2019. The Basic Plan was drawn up in April 2015, after thorough review by the newly formed Waterfront BRT council Keisei Bus Co. was chosen as the operator following public selection procedures based on the Basic Plan The Waterfront BRT Project Plan was laid out in April 2016 Development of infrastructure, vehicles, and systems will be conducted with the cooperation of the operator, partners, and relevant local governments
Developing infrastructure and procuring vehicles for BRT (Bus Rapid Transit system)		
Enhancing Project Promotional Framework		
Signing of MOU regarding cooperation for the Waterfront BRT project	CAO, Tokyo Metropolitan Government Project operator, Bus manufacturers	Signing of the Memorandum of Understanding in April 2016, by the CAO, the Tokyo Metropolitan Government, and relevant parties Promoting cooperation in areas including technological development and verification tests to develop the ART system

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Timeline

Agenda	2015 (FY)	2016	2017	2018	2019	2020	Legacy of Tokyo 2020
Research and Development	For SIP-adus R&D ・Precise Docking Control Technology ・Enhanced PTPS (Public Transportation Priority System) etc. / Implementation of ART elemental technologies, management systems		Cooperate with the Tokyo Metropolitan Government to conduct verification tests and develop technology for a working system			Tokyo 2020 Olympic And Paralympic Games	Wider application of the system according to different needs and city sizes, and further development of the automation system with the introduction of AI
Institutionalization	Taking measures as necessary						
Creating and Operating Project Structure	Materializing the Basic Plan		Building infrastructure / Procuring vehicles		Starting operation		Operation of ART as a highly convenient next-generation public bus system that serves both local people and tourists on a daily basis

SIP-adus Field Operation Test

Press Release <November 15, 2016>
Large-scale Field Operation Test (FOT) on public roads will start in around September 2017.

➢ Objectives of the FOT

1. Clarify technical and institutional issues with variety of OEMs
   - Promote development of each technology such as Dynamic Map or HMI
   - Investigate social system and legislation

2. Acquire new viewpoints through participation of various players from outside of the SIP-adus

3. Enhance International cooperation and harmonization through open participation to the overseas OEMs

4. Build Social acceptability by involving ordinary citizens and maximize effect

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Outline of the SIP-adus FOT

Test sites
- ✓ Expressways (relatively controlled environment)
- ✓ Arterial roads (with pedestrians and bicycles)
- ✓ Test facilities (separated from general traffic)

## Expected participants (open to both domestic and international)
- ✓ Auto manufacturers and parts suppliers
- ✓ Universities, Research institutes, Government agencies, etc.

Expressway

some part of the following expressway
- JOBAN expressway
- Metropolitan expressway
- TOMEI expressway
- SHIN-TOMEI expressway
<u>Total : app.300km.</u>

Test facility

JARI* Test course
New test facility for
ADS evaluation
(Apr. 2017 open)

*JARI : Japan Automotive Research Institute
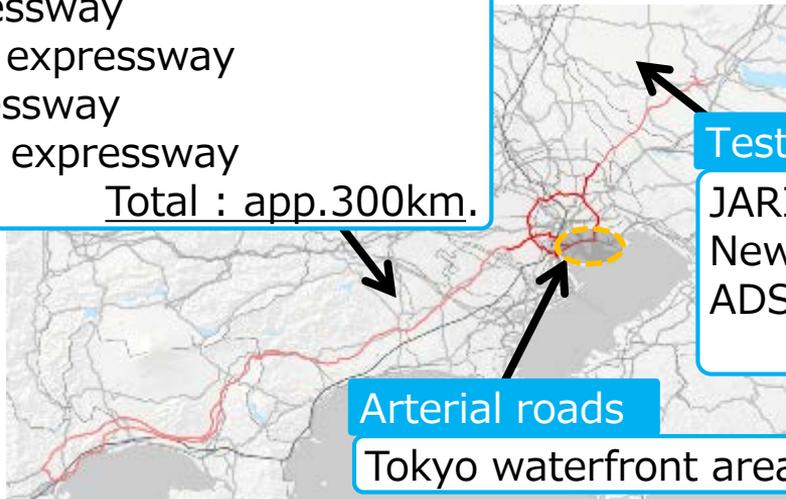
Arterial roads

Tokyo waterfront area

(There is a possibility of partial change.)

Focus areas

✓ **Dynamic Map**
  - ➢ 3D high-resolution digital map validation
  - ➢ Validation of semi-dynamic information etc.

✓ **Human Machine Interface**
  - ➢ Measurement of a driver's condition under real-world
  - ➢ Study and validation of decision index of driver's condition etc.

✓ **Cyber Security**
  - ➢ Evaluation of simulated cyber attack from outside the vehicle by using test equipment etc.

✓ **Pedestrian Assistance**
  - ➢ Validation of a pedestrian mobile terminal (smartphone) etc.

✓ **Next Generation Public Transportation**
  - ➢ Validation of service level improvement for public transport etc.

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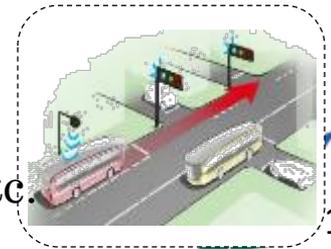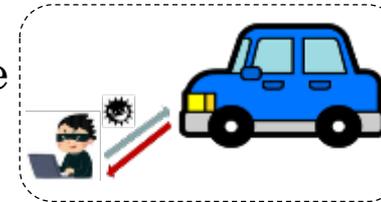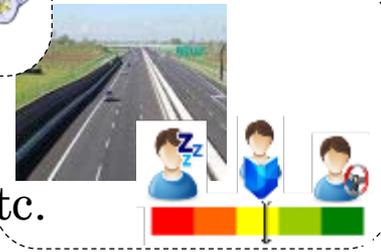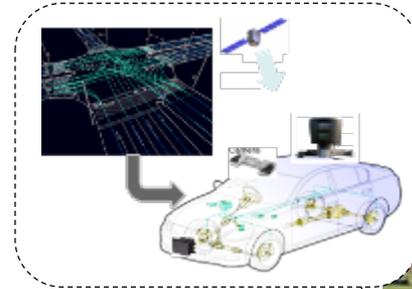
SIP-adus FOT in Okinawa

Press Release <December 26, 2016>

FOT of Automated Driving Bus will be conducted in Okinawa from March 2017.
(now planning for subsequent FOTs)

Expected to be deployed as local community bus

Okinawa Island

Arterial roads — Around "Azama Sun-Sun Beach", Nanjo City, Okinawa prefecture

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<Problem consciousness>
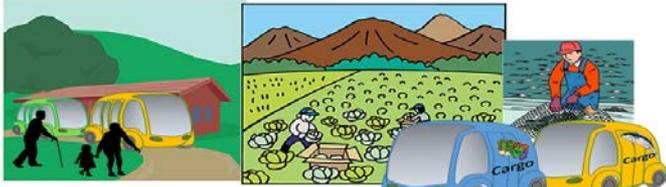
Traffic jams；16 km/h (The vehicle speed at Peak time)

Private car dependence；3.2% (Public traffic utilization rate)

A surge in tourists；1.5 times(Tourism income, 2012 → 2015)

Progressive aging of society; 22.9 % (population aging rate in 2020)

< Measures that respond to the needs of each region >

 For example ……

Cargo transportation that supports business model in depopulated areas

Short-distance public transportation that can be carried on wet swimming suit

Drink cold beer or tropical cocktail at the beach(Although I came by car)

For More Information…

Cabinet Office:

    http://www.cao.go.jp/index-e.html

CSTI (Science and Technology Policy):

    http://www8.cao.go.jp/cstp/english/index.html

SIP (Cross-Ministerial Strategic Innovation Promotion Program)

    http://www8.cao.go.jp/cstp/panhu/sip_english/sip_en.html

SIP-adus (Workshop and other information):

    http://en.sip-adus.jp/ *Summary Report and all presentations of the workshop have been uploaded with permission from the speakers.*

Thank you for your attention

Accessibility for all people

4th SIP-adus Workshop

Date : November 14-16, 2017
Venue : Tokyo International Exchange Center

Please join us!!