

Review and evaluation of planning regarding 2020 Tokyo Waterfront City Area Field Operational Test

March 2019
Summary of Report

Purpose

To promote the development for societal implementation and commercialization of autonomous driving, SIP Phase Two has decided to newly sets up “2020 Tokyo Waterfront City Area Field Operational Test Task Force”. It will operate the following field tests to utilize cooperative infrastructure technologies to autonomous driving;

- ① **Traffic signal information provision technologies**
- ② **Autonomous driving support technologies that use road-to-vehicle integration on highways**
- ③ **Infrastructure collaboration next-generation public transport systems**

Since the technologies regarding traffic signal information provision and next-generation public transport systems, and the ones in review in the joint study by National Institute for Land and Infrastructure Management regarding the technical development for commercializing next-generation cooperative ITS, will be utilized, **many stakeholders are required to coordinate on the implementation of above tests.**

In this study, we have **interviewed stakeholders involved in these tests to draw up the proposed plan** of field tests and, on the basis of information acquired through the recruitment of participants, **evaluated the above plan and proposed the improvement ideas.**

Flow of operation

This outsourced operation was conducted on the basis of the following flow.

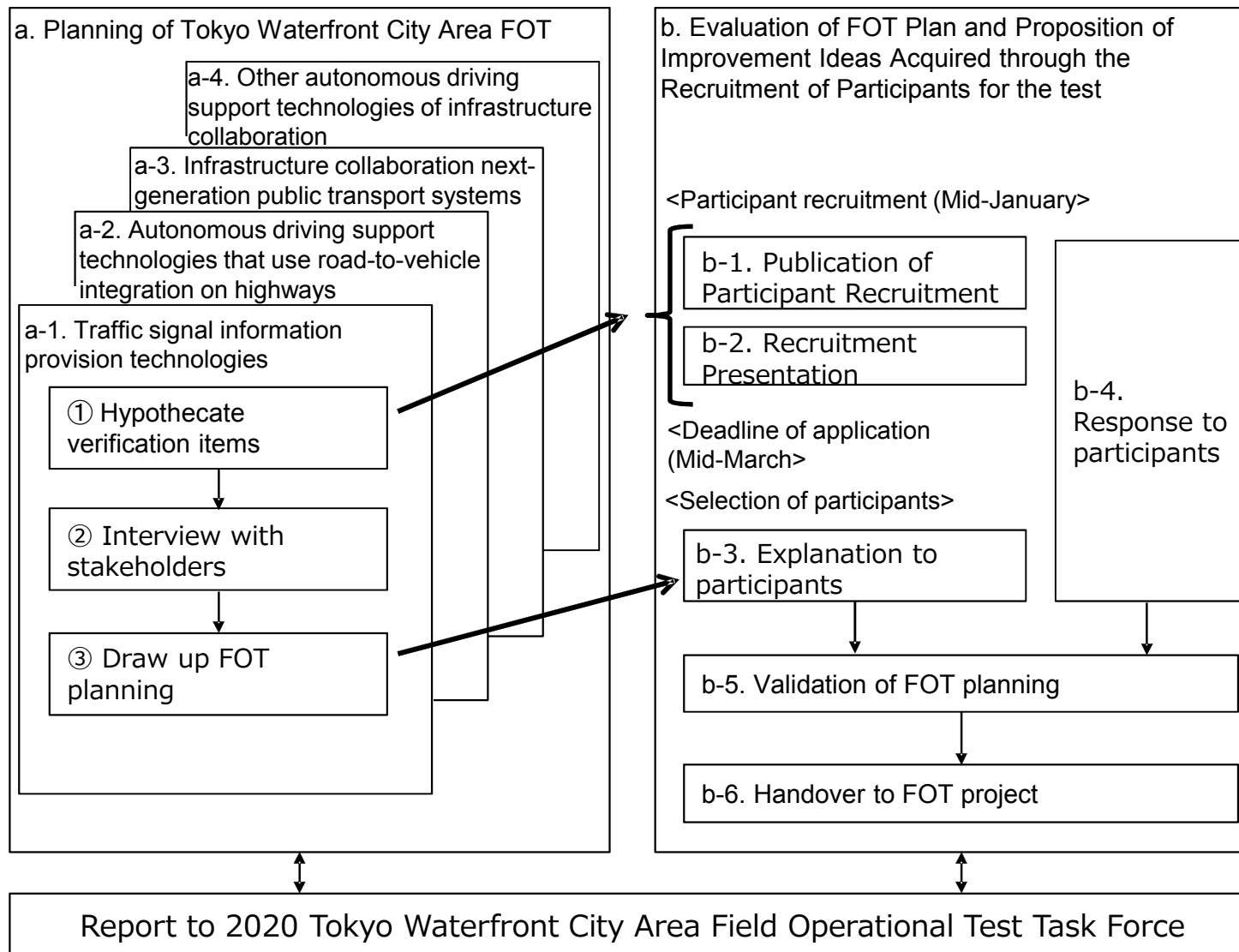


Figure: Flow of operation

**a. Planning of Tokyo Waterfront City Area
Field Operational Test**

1. Tokyo Waterfront City Area FOT - Significance & Target Results

[Significance of the Field Operational Test]

- Confirm the results of traffic infrastructure features on public roads and **in actual driving conditions**
- Perform tests and acquire data **from many participants in identical fields** and provide a place for open discussions
- Appeal of Japanese advanced technologies to a domestic and international societies
- Increase awareness by having citizens participate and by disclosing information, and cultivate a sense of acceptability in society

【Target Results】

- **Agree upon** cooperative infrastructure system specifications based on the assessment results **with participants in Japan and abroad**
- **Clarify the advantages** of installing the infrastructure
- Achieve a driving level equivalent to **level 4 autonomous vehicles** in the test zone
- **The positive and negative impact** autonomous vehicle and its infrastructure will have on road traffic and **clarify acceptability in society**

2. Overview of Participant Recruitment

[Test Participants]

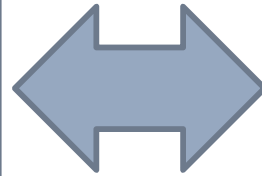
For a wide variety of people including overseas OEM, parts and system suppliers, universities, research organizations and venture companies

Contractor (Role)

- ✓ Provide test location
- ✓ Prepare and loan test equipment
- ✓ Analyze test results

(Advantages)

- ✓ Obtain verification results
- ✓ Consensus on cooperative regions



Participants (Role)

- ✓ Prepare test vehicle and personnel
- ✓ Report test results

(Advantages)

- ✓ Tests performed in developed environments
- ✓ Opportunities for proposals and discussions in cooperative regions
- ✓ Opportunity for in-house development (competitive regions)

[Test Period]

1st stage FOT : Oct 2019 – FY2020 – Target of this recruitment period

2nd stage FOT : FY2021 – FY2022

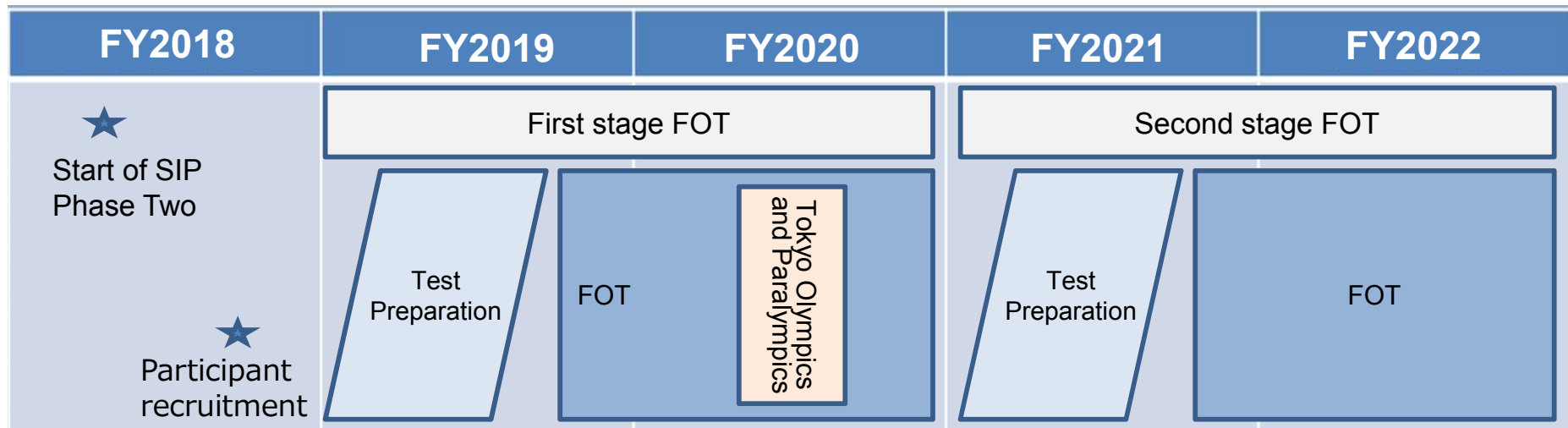
*Currently planning the next steps based on the results of the 1st stage Field Operational Test, etc.
A new recruitment process is expected to take place once the details are determined.

[Test Zone]

- Ordinary roads in Ariake and Odaiba, and water front freeway originating between the Haneda Airport zone and city center
- Ordinary roads in the redevelopment zone surrounding Haneda Airport

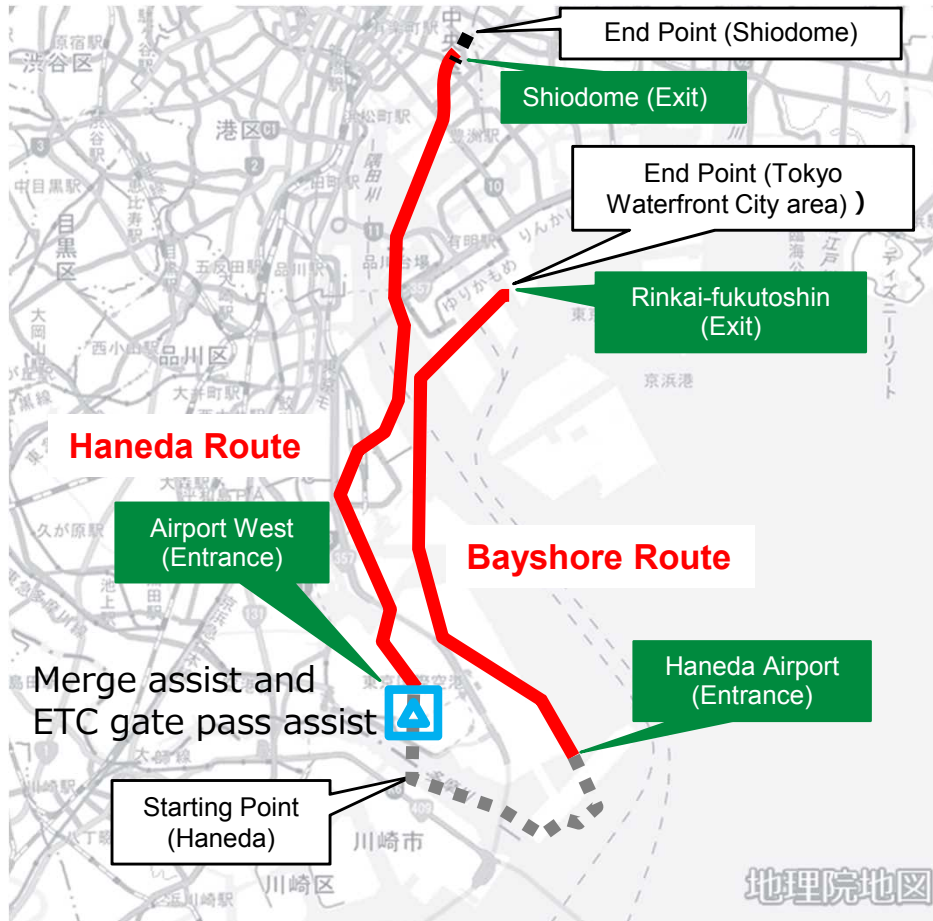
3. SIP Phase two Tokyo Waterfront City Area FOT Schedule

- Active during the first stage FOT comprising the two years between 2019 and 2020 which make up the 2020 Tokyo Olympic and Paralympic Games and the second stage comprising the two years between 2021 and 2022.
- During the first stage efforts will go toward field tests of necessary cooperative infrastructure technologies to achieve level 4 autonomous driving on freeways and ordinary roads.
- Second stage FOT will work on modifications to the cooperative infrastructure technologies that came to light in the first stage FOT and field operational testing for new R&D issues in preparation to establish a test environment for the legacy cooperative infrastructure system.

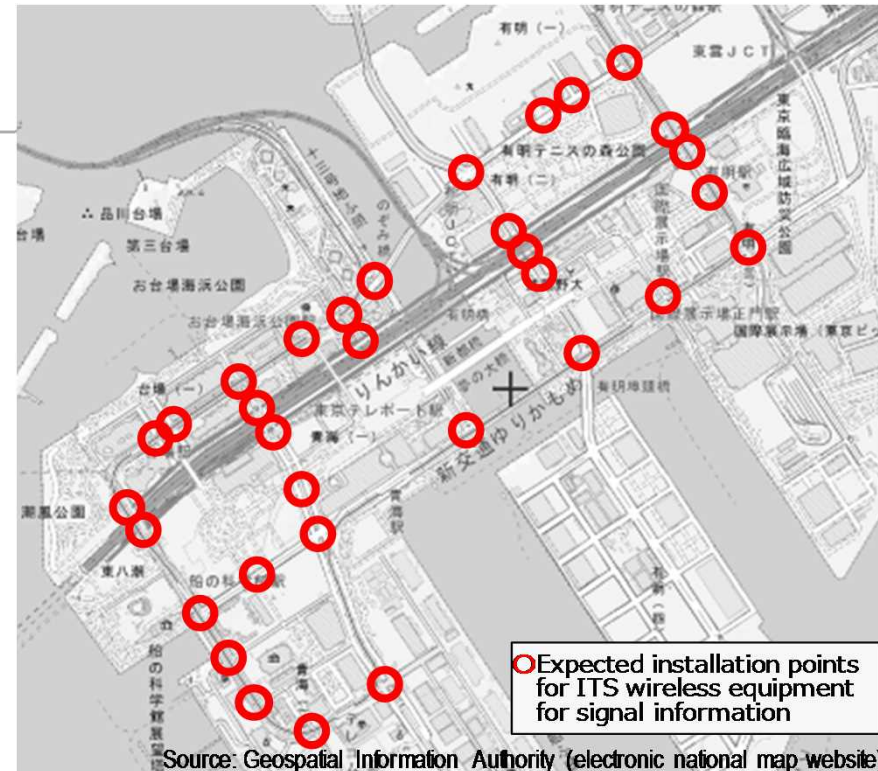


4. Detailed Test Zone

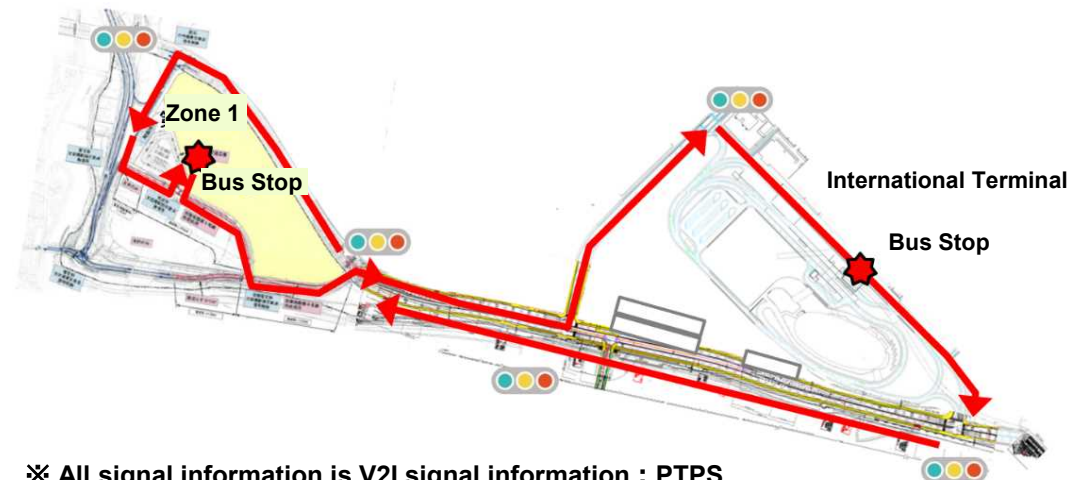
[Test Zone]



[Expressway Connecting Haneda Airport with the Tokyo Waterfront City, etc.] (Proposal)



[Tokyo Waterfront City area] (Proposal)

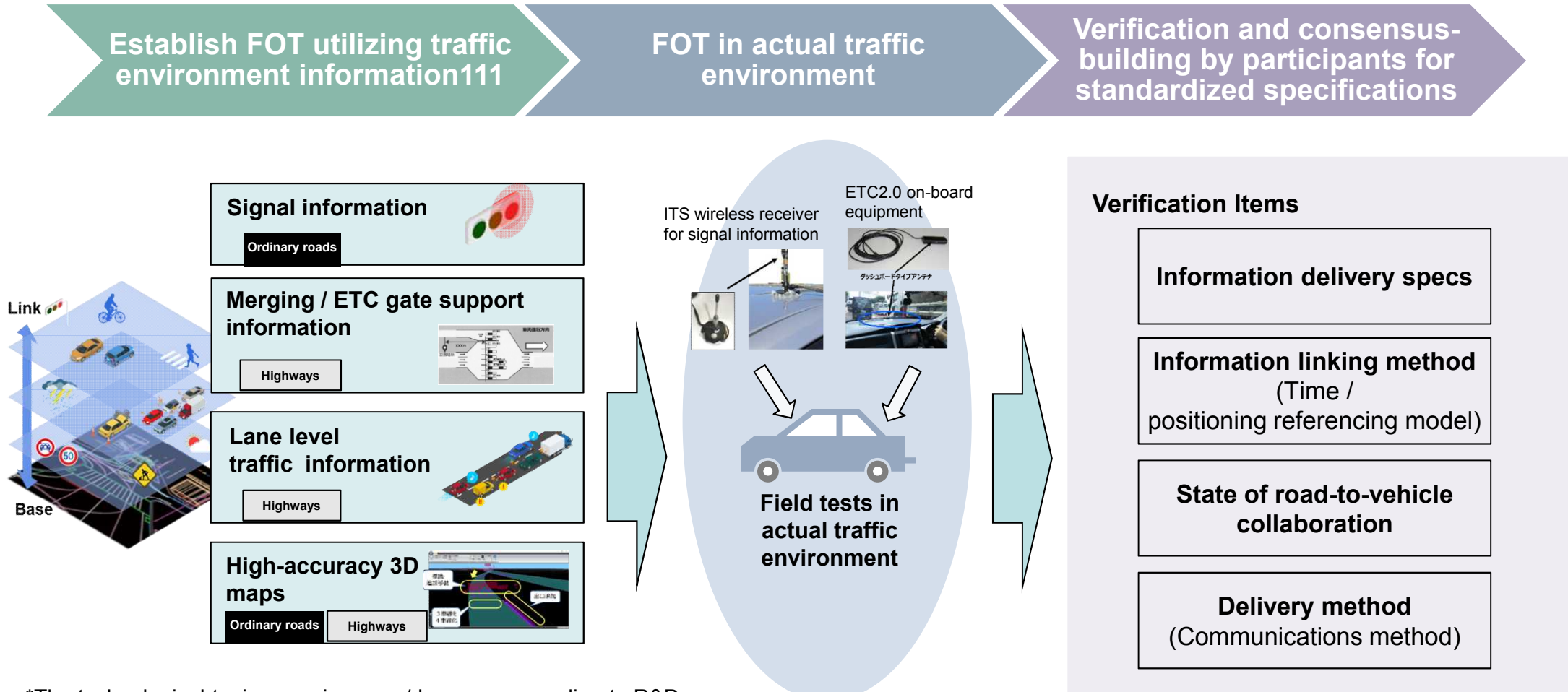


※ All signal information is V2I signal information : PTPS

[Haneda Airport Zone] (Proposal)

5. Aim of Cooperative Infrastructure System Field Tests

- The purpose of the FOT and consensus-building is to create standardized specifications for how information is delivered, how to link information and information delivery specifications by establishing a test environment utilizing traffic environment information.



*The technological topics may increase/decrease according to R&D progress

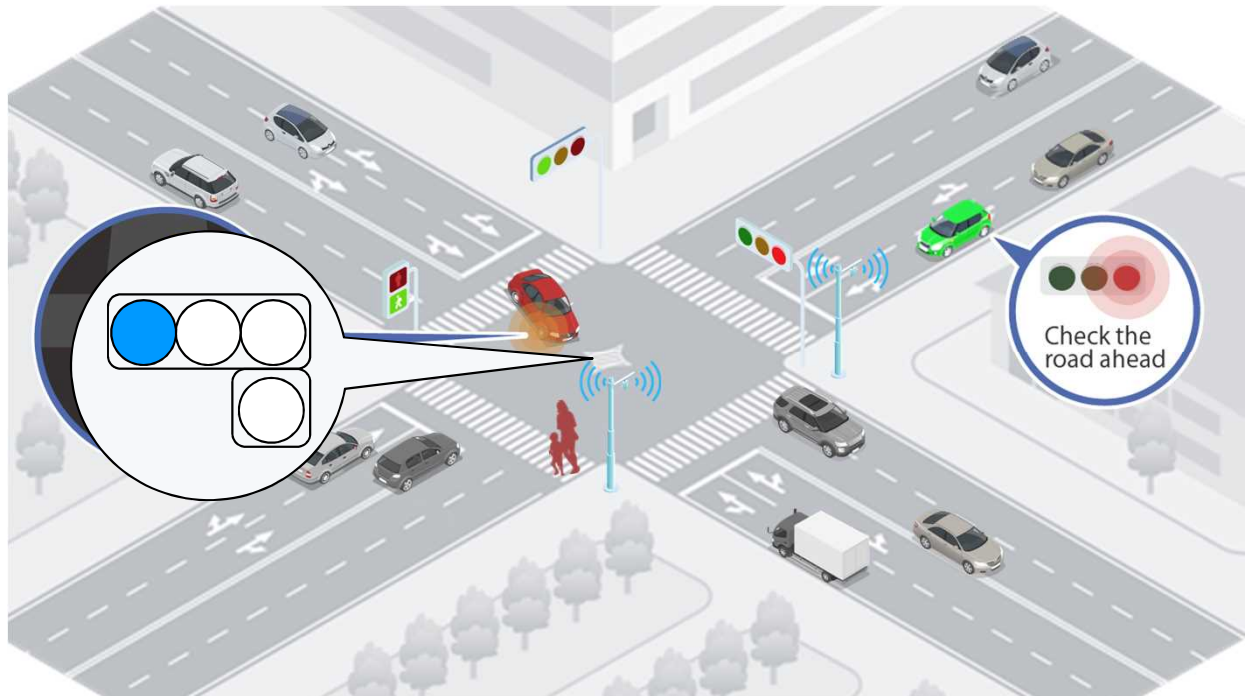
6. Technologies to be Verified (Waterfront City Area)

Impact assessment of cooperative infrastructure system field test on Ariake and Odaiba ordinary roads using a level equivalent to SAE level 2 – 4 autonomous vehicles and road traffic

[Technologies to be Verified]

- Signal information to aid driving through intersections
- Driving based on high-accuracy 3D map information
- Impact assessment on road traffic due to autonomous vehicles using a cooperative infrastructure system

Actual driving assessment using participating vehicles in actual road environment, ascertaining commercial viability using gathered data and analysis, agreement on specifications with participants and build a consensus on a concept of infrastructure development



SIP Preparations

Infrastructure	On board Test Equipment
<ul style="list-style-type: none"> • ITS wireless infrastructure • High-accuracy 3D maps 	<ul style="list-style-type: none"> • ITS wireless receiver • High-accuracy 3D map and signal information overlap display viewer • Output function to vehicle control

6. Technologies to be Verified (Haneda Airport Zone)

Impact assessment of cooperative infrastructure system field test in the Haneda Airport zone with next-generation city traffic ART (a level equivalent to SAE level 2 / 4) using autonomous driving technology and road traffic

[Technologies to be Verified]

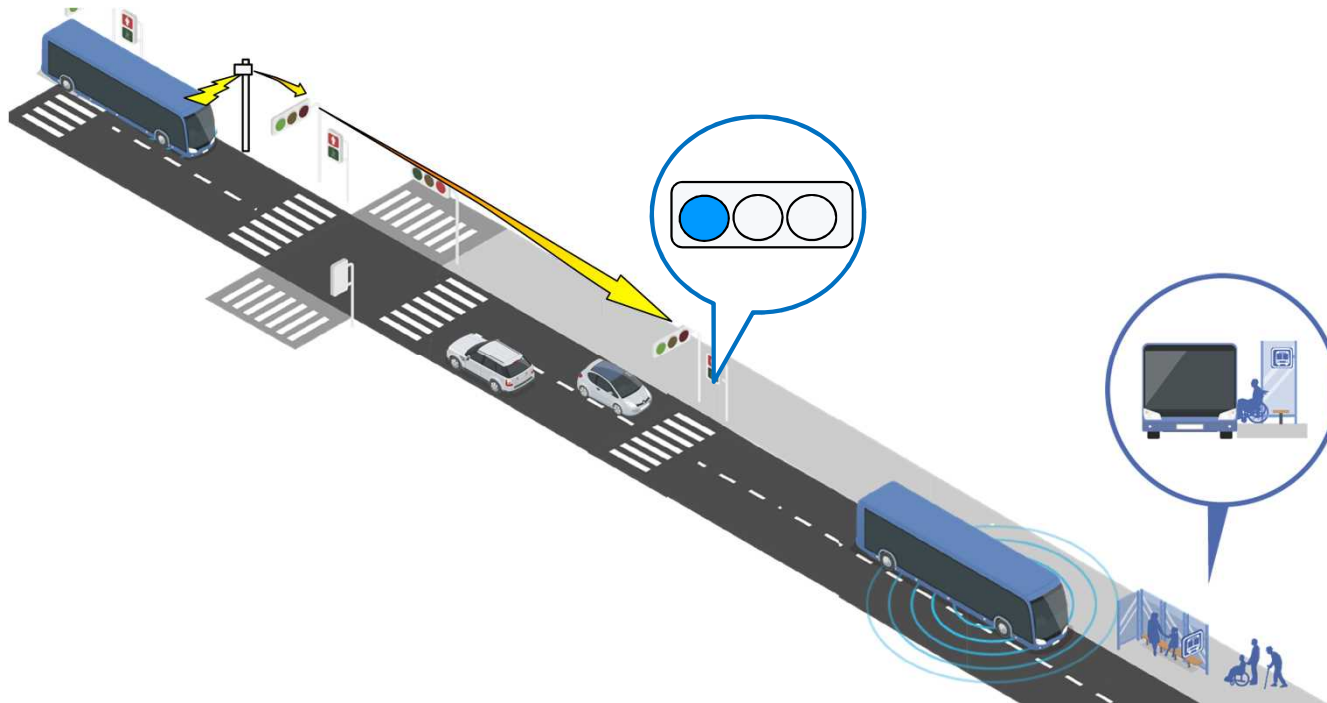
- Achieving accessibility and comfort utilizing autonomous driving technology
- Bus speedy transportation and regularly scheduled transport support using PTPS*
- Signal information to aid driving through intersections

(*PTPS : Public Transportation Priority Systems)

Actual driving assessment in a mixed traffic environment, ascertain ART commercial viability from data gathering and analysis and build a consensus on a concept of infrastructure development

SIP Preparations

Infrastructure	On board Test Equipment
<ul style="list-style-type: none"> • ITS wireless infrastructure(PTPS adaptive) • Bus dedicated lane • Track induced magnetism marker • Curb docking bus stop • High-accuracy 3D maps 	<ul style="list-style-type: none"> • ITS wireless / light beacon (PTPS adaptive)



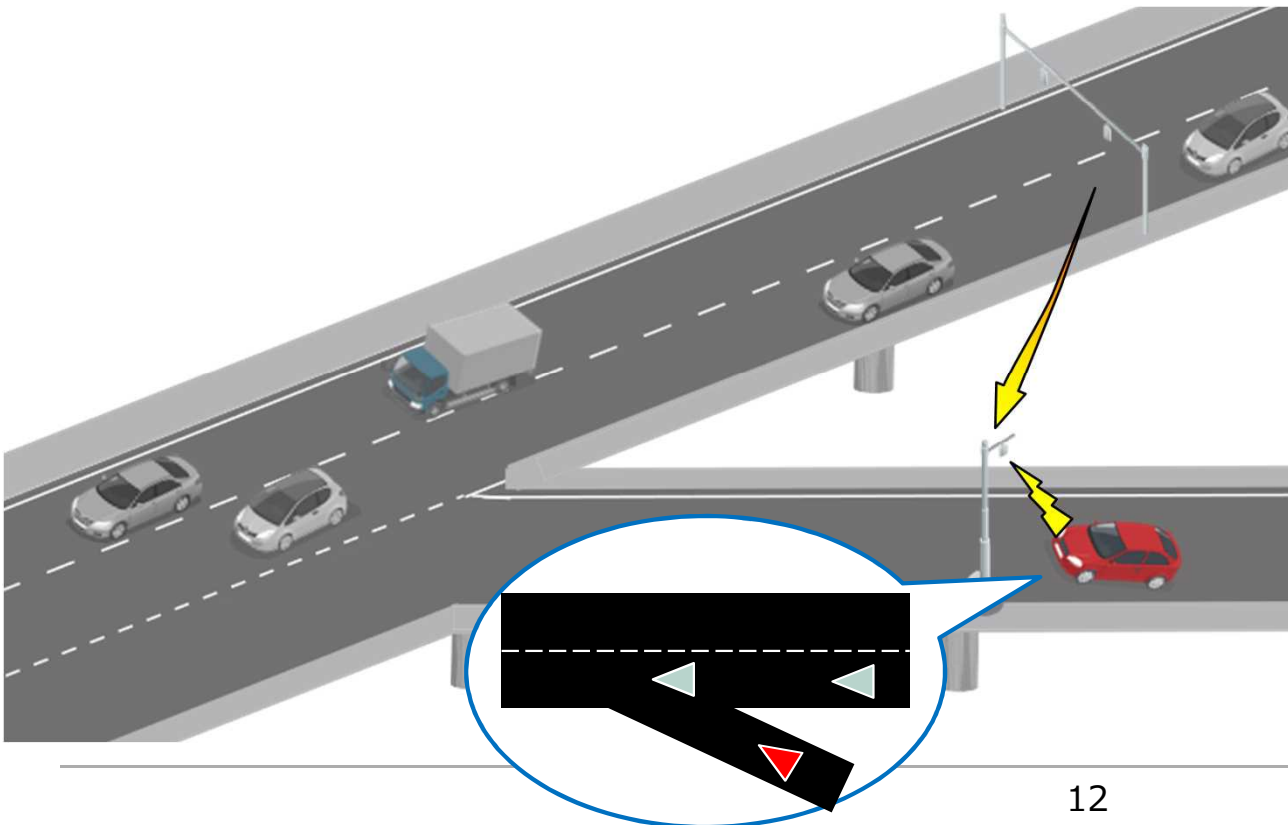
6. Technologies to be Verified (Expressway Connecting Haneda Airport with the Water Front City, etc)

Field operational test of cooperative infrastructure system (merge assist and ETC gate pass assist) on water front highway using a level equivalent to SAE level 2 – 4 autonomous driving cars and impact assessment of road traffic

[Technologies to be Verified]

- Assisted driving by linking the road to vehicles on expressways
- Delivery of traffic environment information on a lane level on expressways
- Driving based on high-accuracy 3D map information

Actual driving assessment using participating vehicles in actual road environment, ascertaining commercial viability using gathered data and analysis, agreement on specifications with participants and build a consensus on a concept of infrastructure development¹¹¹¹



SIP Preparations

Infrastructure	On board Test Equipment
<ul style="list-style-type: none"> • ETC2.0 road equipment (provides merge assist information and ETC gate pass assist) • High-accuracy 3D maps 	<ul style="list-style-type: none"> • ETC2.0 vehicle equipment • High-accuracy 3D map and signal information overlap display viewer • Output function to vehicle control

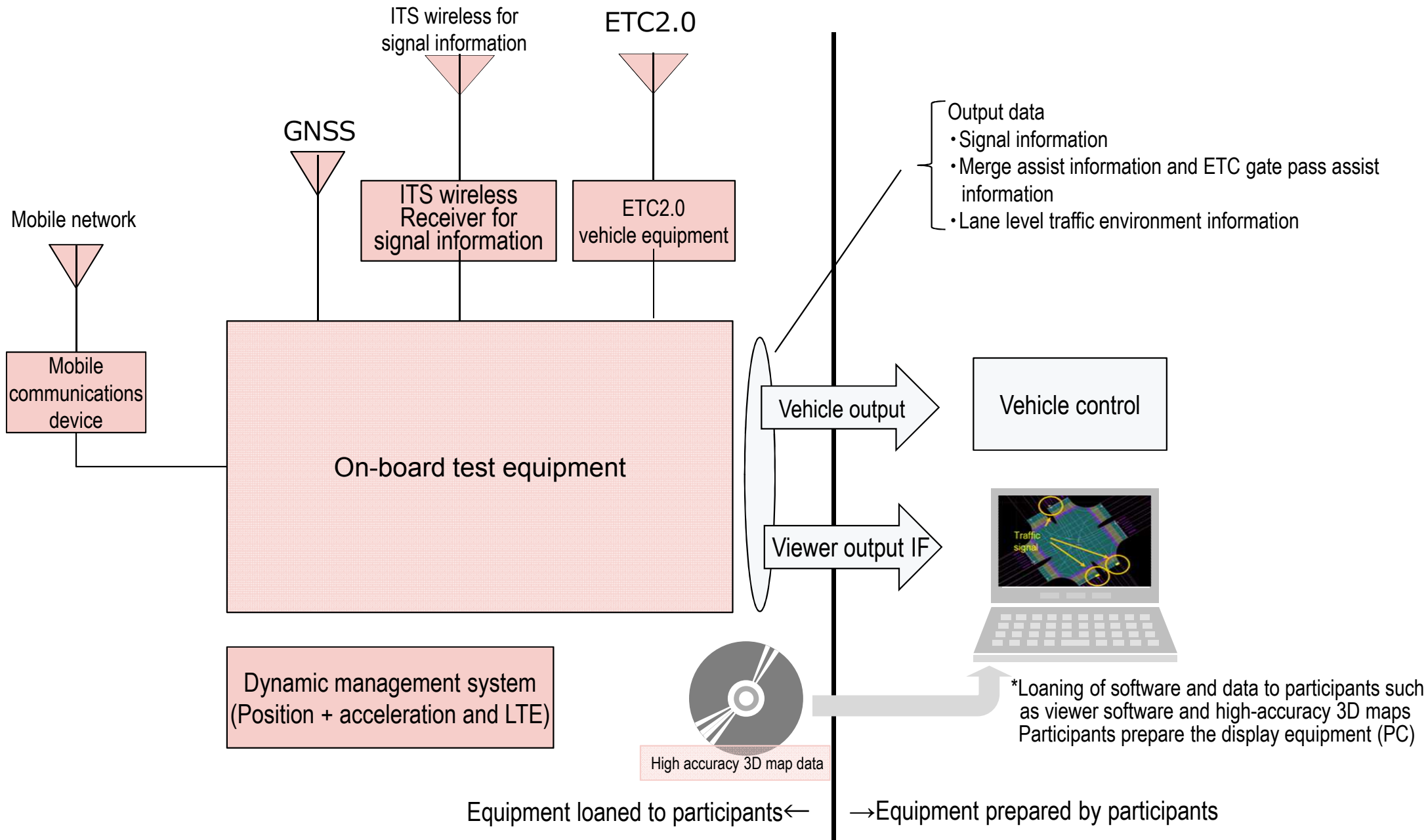
7. Implementation Schedule

- In October 2019 on-board equipment is expected to be loaned out to be used for the ITS wireless receiver, maps, etc.
- In the FOT working group (to be held every other month), an explanation of the CAN output IF of on-board equipment, how to handle the on-board equipment, status of infrastructure development, etc. will be shared with participants.

	FY2018	FY2019				FY2020			
	Jan. - March	April - June	July - Sept.	Oct. - Dec.	Jan. - March	April - June	July - Sept.	Oct. - Dec.	Jan. - March
Recruit Participants	★★ Start accepting participants (During Jan.) ★ Stop accepting participants (During March) ★ Selection of test participants (End of March)	Field test participating WG (Scheduled to meet every other month)							
Test Prep	Infrastructure development (IT wireless road equipment, etc.) Prepare test equipment (on-board equipment, etc.)	▼ Initial map data delivery (1st stage SIP map)	Loan of test equipment (Around October) ▼ Updated map data delivery (Currently coordinating)	▼ Updated map data #2 delivery (Currently coordinating)	Prepare data delivery of traffic environment data	Data delivery			
FOT	Cooperative infrastructure autonomous driving test				Impact assessment		Utilize Traffic environment	※In review	
					▲ Progress report	▲ End data submission	▲ Data submission		
Event, etc.			● SIP-adus Workshop			Tokyo Olympics and Paralympics		● SIP-adus Workshop	

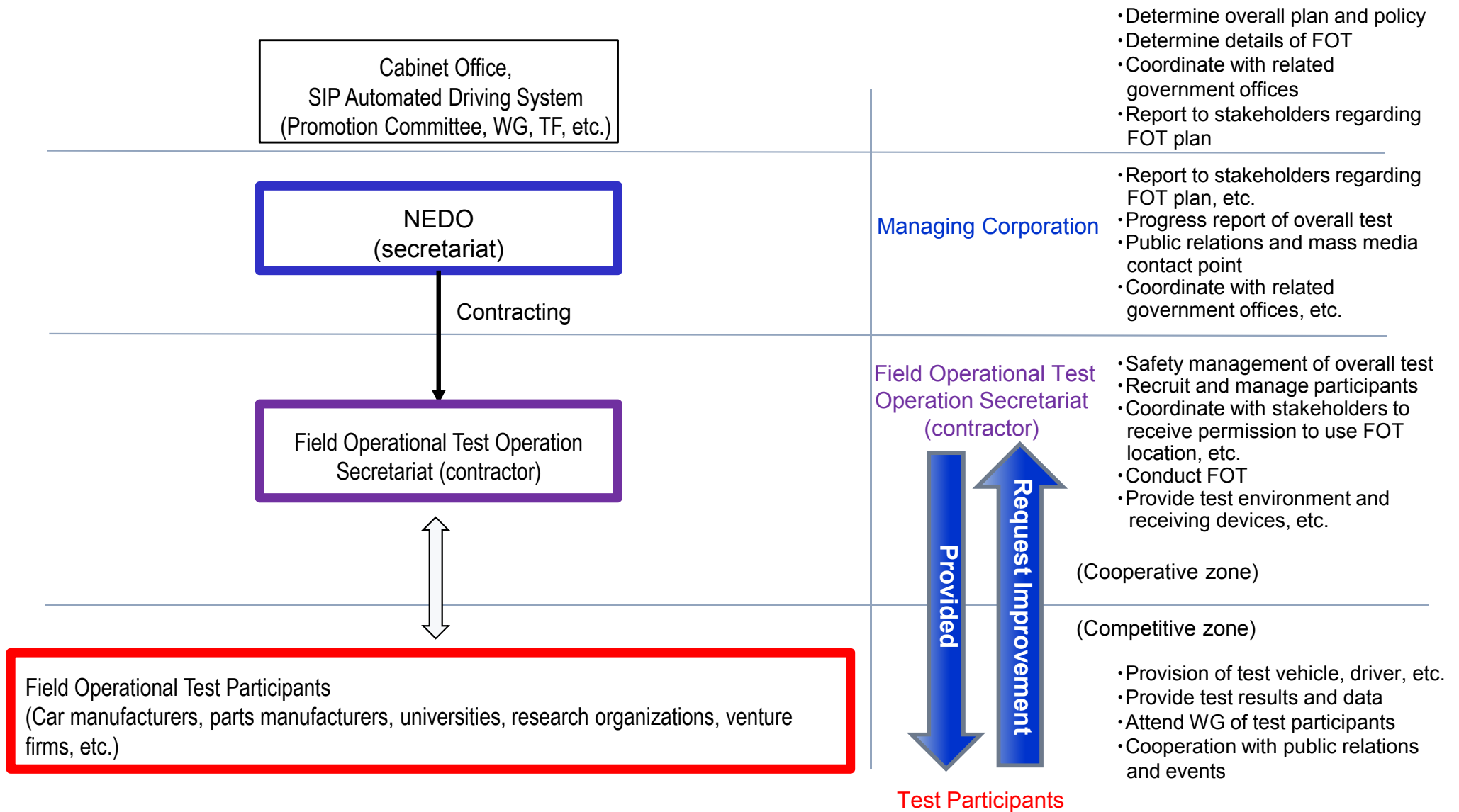
*There is the possibility the field operational test will not take place during the Tokyo Olympics and Paralympics.

8. Overview of Test Equipment



b. Evaluation of Field Operational Test Planning and proposition of improvement ideas acquired through the recruitment of participants for the test

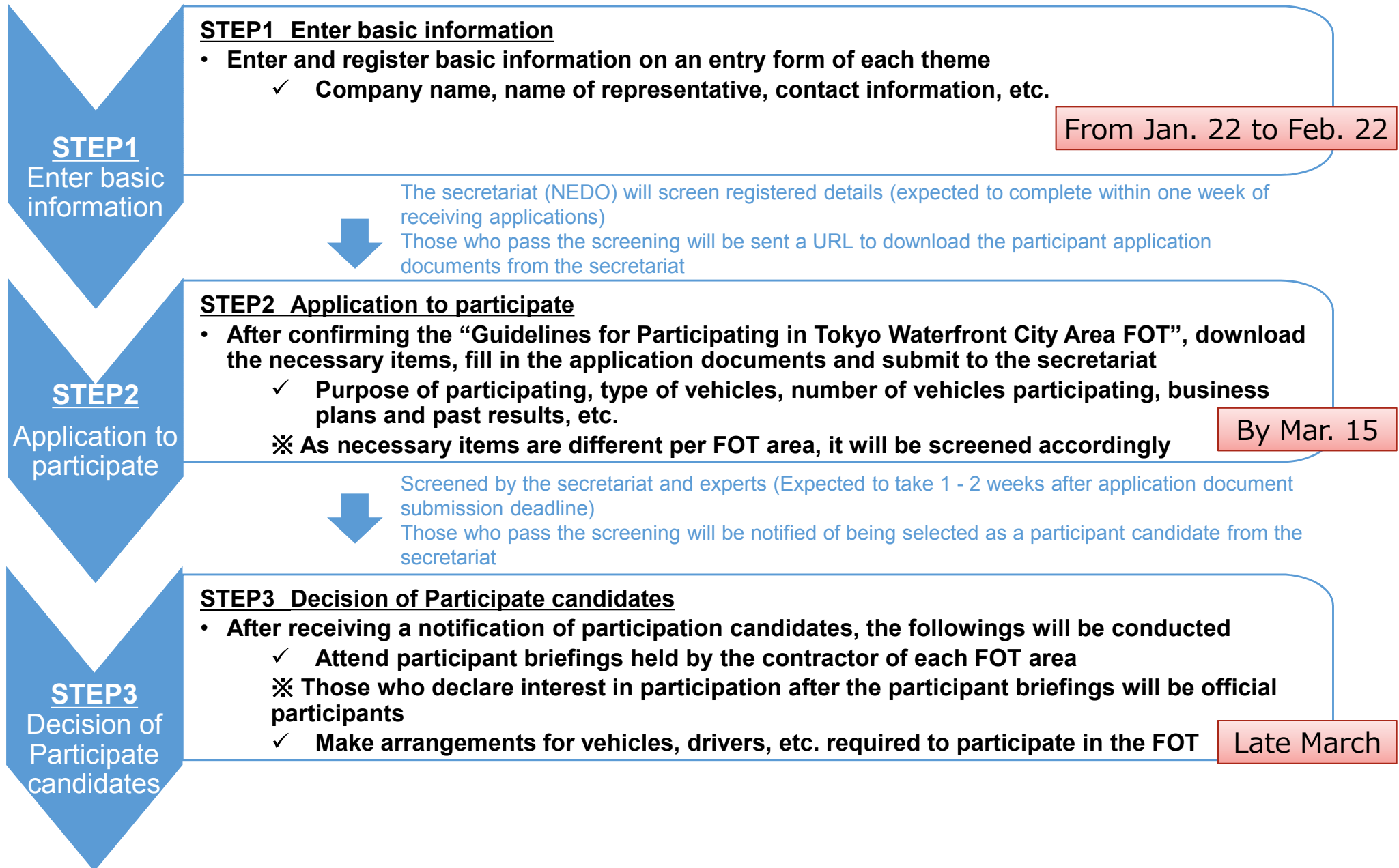
1. System Overview



2. Role assignment between Participant and Contractor

Item	Equipment, Software, Work, etc.	Contractor	Participant
Provide cooperative infrastructure system	Prepare communications equipment (ITS wireless receivers, ETC 2.0 vehicle equipment, mobile communications devices), HDD costs, and communication equipment transportation charge	○	—
	Building cost of CAN output function for delivery data (quasi-static and quasi-dynamic data)	○	—
	Preparation costs for various related hardware (PCs, etc.)	○	—
	Build information delivery function	○	—
	Viewer software (Delivered data is superimposed on maps)	○	—
Evaluate and confirm delivered data	Cost to confirm and evaluate delivered data	—	○
	PC for confirming delivered data	—	○
Prepare test vehicle and systems	Preparation costs for vehicle and systems (Used to provide cooperative infrastructure system delivery data to vehicle control and drivers)	—	○
	Vehicle transport and storage costs	—	○
	Convert map data to company format	—	○
	Convert when using CAN message	—	○
Prepare vehicle drivers	Cost of drivers	—	○
Assess and confirm quasi-static and quasi-dynamic data	Cost to evaluate data (vehicle fuel costs, highway toll fee, etc.)	—	○
	Cost of evaluation result report	—	○
Dynamic management of test vehicles	Cost of operating dynamic management system (including GPS and acceleration sensor)	○	—
	Cost to prepare drive recorder	—	○
	Cost of installing equipment (equipment for impact assessment, etc.) for dynamic management system and other requested installations	—	○

3. Participant Recruitment Process



4. Publication of Participant Recruitment

We have prepared the website of “2020 Tokyo Waterfront City Area Field Operational Test” of SIP-adus (2nd Phase) to make public through open server provided by NEDO.

Structure of web content

<STEP1: Enter basic information >

Top page for Application Process

- |_ Apply here
- |_ Guidelines for Participating in Tokyo Waterfront City Area FOT (digest version)
- |_ Participation Rules for Tokyo Waterfront City Area FOT

<STEP2 : Application to participate >

Top page for Application to participate

- |_ Material 1: Guideline for participating in Tokyo Waterfront City Area Field Operational Test (appendix)
- |_ Material 2: Research and Development Plan
- |_ Material 3: Implementation policy for SIP Phase Two - (FY2017 supplementary budget provisions)
- |_ Material 4: Basic Policy on Expenses for Promotion of Science, Technology and Innovation Creation
- |_ Material 5: Operational Guidelines for Strategic Innovation Creation Program
- |_ Appendix 1: Application documents
- |_ Appendix 2: Information disclosure regarding the contract
- |_ Appendix 3: Notice of receipt of proposal
- |_ Recruitment presentation documents

5. Recruitment Presentation

We supported recruitment presentation documents hosted by NEDO on January 28, 2019 for recruiting participants by preparing the explanatory materials and participation rules for Field Operational Test.

【Draw-up of participation rules】

We have drawn up participation rules included into the guidelines for participating in the Tokyo Waterfront City Area Field Operational Test of “Strategic Innovation Promotion Program (SIP) Phase Two - Automated Driving (Expansion of Systems and Services)”.

【Draw-up of application guidebook】

On the basis of review results of “a. Planning of Tokyo Waterfront City Area Field Operational Test”, we have drawn up the guidelines for participating in the Tokyo Waterfront City Area Field Operational Test of “Strategic Innovation Promotion Program (SIP) Phase Two - Automated Driving (Expansion of Systems and Services)”.

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