

Activities relating to automated driving

Masamitsu Waga

ITS Policy and Program Office
Road Bureau

Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

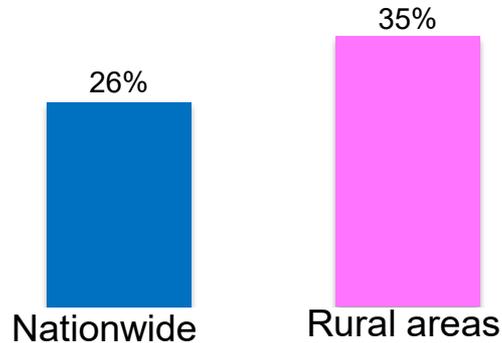
1. Automated driving services in rural areas

- 1—1 Current status of rural areas and issues to be resolved
- 1—2 Automated driving services in rural areas
- 1—3 Full-fledged introduction of automated driving services based at Michi no Eki

2. Automated driving support from the road infrastructure

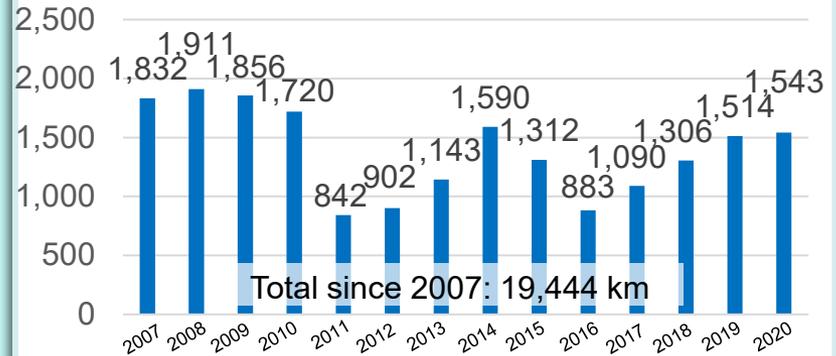
- 2—1 Automated driving support facilities
- 2—2 Lane markings compatible with automated driving
- 2—3 Provision of road traffic information

Comparison of aged population (2015)



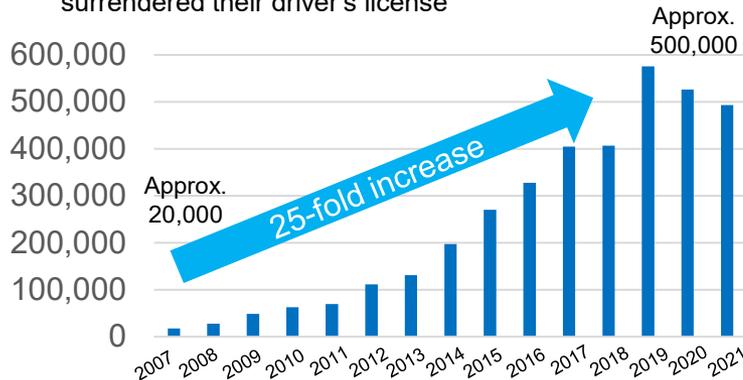
Total length of discontinued regular bus routes

It is difficult to go shopping or to the hospital because of a lack of adequate public transport.

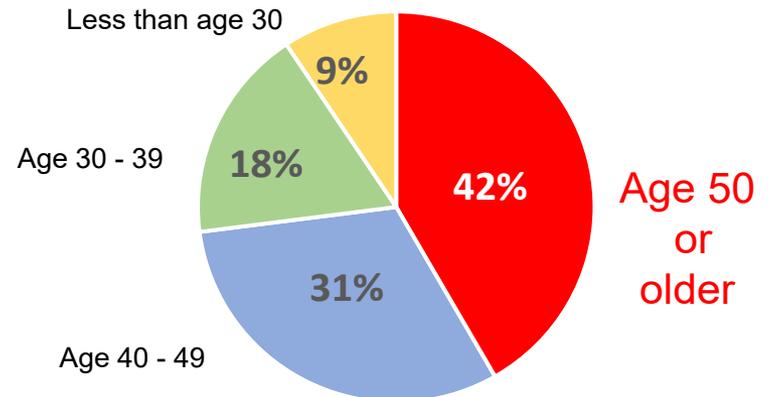


Rapid increase in senior citizens who cannot drive

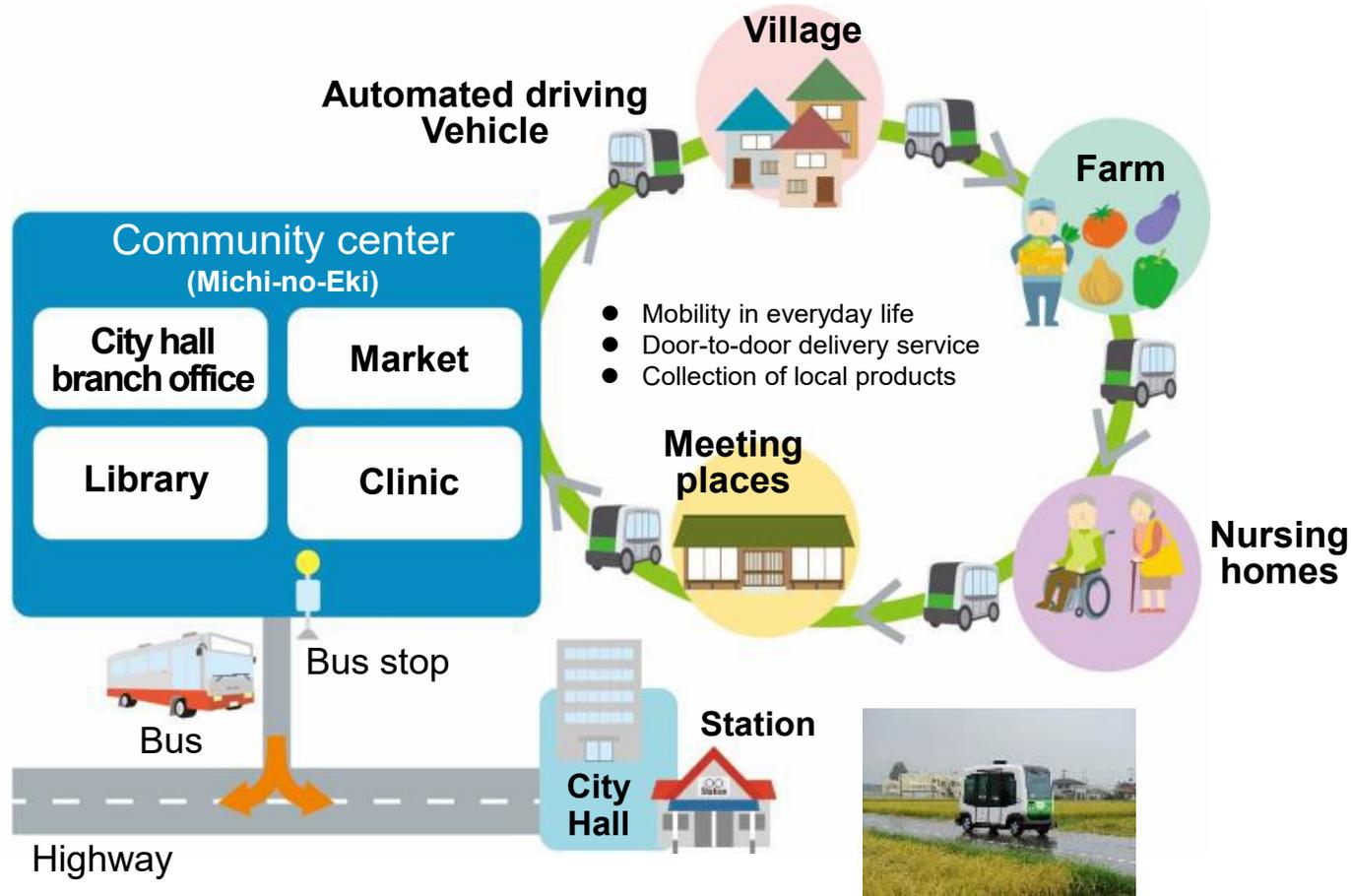
Number of drivers (age 65 or over) who have voluntarily surrendered their driver's license



Lack of home deliveries due to truck driver shortage



- Expected to sustain transport of both people and goods, and to contribute to further local revitalization.
- A series of FOTs of automated driving services based at Michi-no-Eki started in 2017.



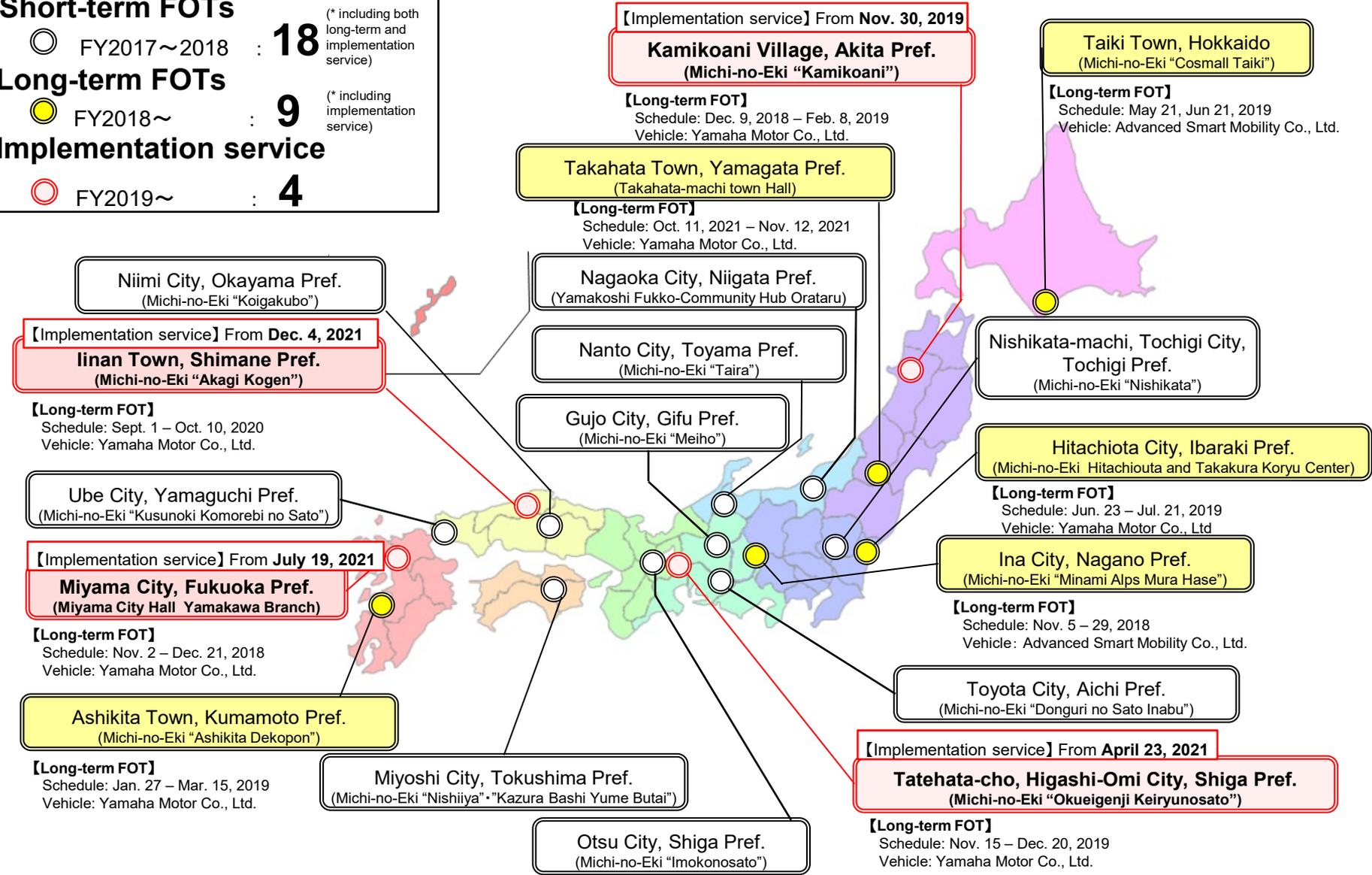
FOTs have been deployed in rural areas

As of September 2022

Short-term FOTs
 ○ FY2017~2018 : **18** (* including both long-term and implementation service)

Long-term FOTs
 ● FY2018~ : **9** (* including implementation service)

Implementation service
 ○ FY2019~ : **4**



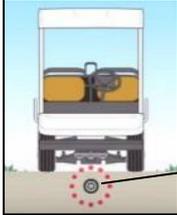
Full-scale introduction of automated driving service based at Michi no Eki "Okueigenji Keiryunosato"

■ automated driving vehicle

Vehicle



Automated driving mechanism



Electromagnetic induction line

Electromagnetic induction lines are placed to guide vehicles.

- Development: Yamaha Motor Co., Ltd.
- Capacity: Max. 6 persons (4 passengers)
- Speed: Approximately 12 km/h (during automated driving)
- Driver: Paid local volunteers (Volunteers are on board for monitoring purposes only; they do not steer or otherwise operate the vehicle.)

■ Operational organization

Operating entity

Higashi-omi City Office (for-profit cooperative private sector entity with Higashi-omi City taking the lead)

Services

Senior citizen pick-up and drop-off
Tourist use (hiking, camping)
Delivery of agricultural products, sundries and so on, etc.

Fares / shipping charges

Fare: JPY 150 / trip
*sale of commuter passes and coupon tickets
Shipping charge: JPY 100 / trip

Route

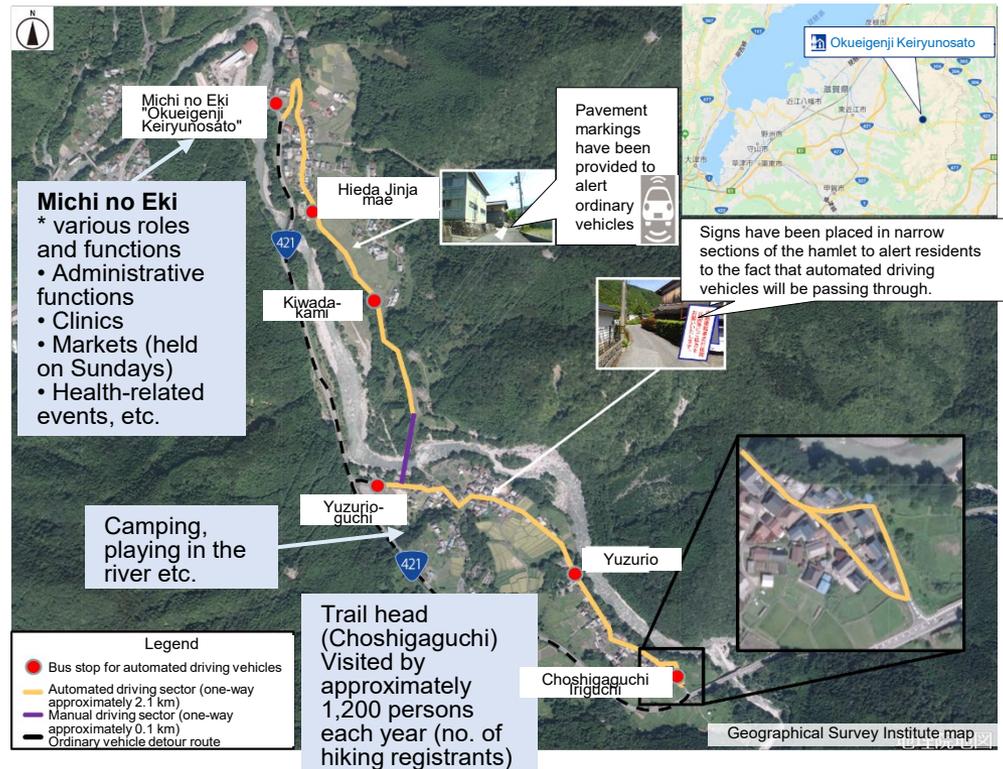
Michi no Eki "Okueigenji Keiryunosato" - Choshigaguchi Iriguchi (total round-trip distance approximately 4.4 km)

Schedule

Days of operation: 4 days a week (Saturday, Sunday, Wednesday, Friday)
Regular trips: Total 6 trips (2 trips in the morning, 4 trips in the afternoon)

■ Route

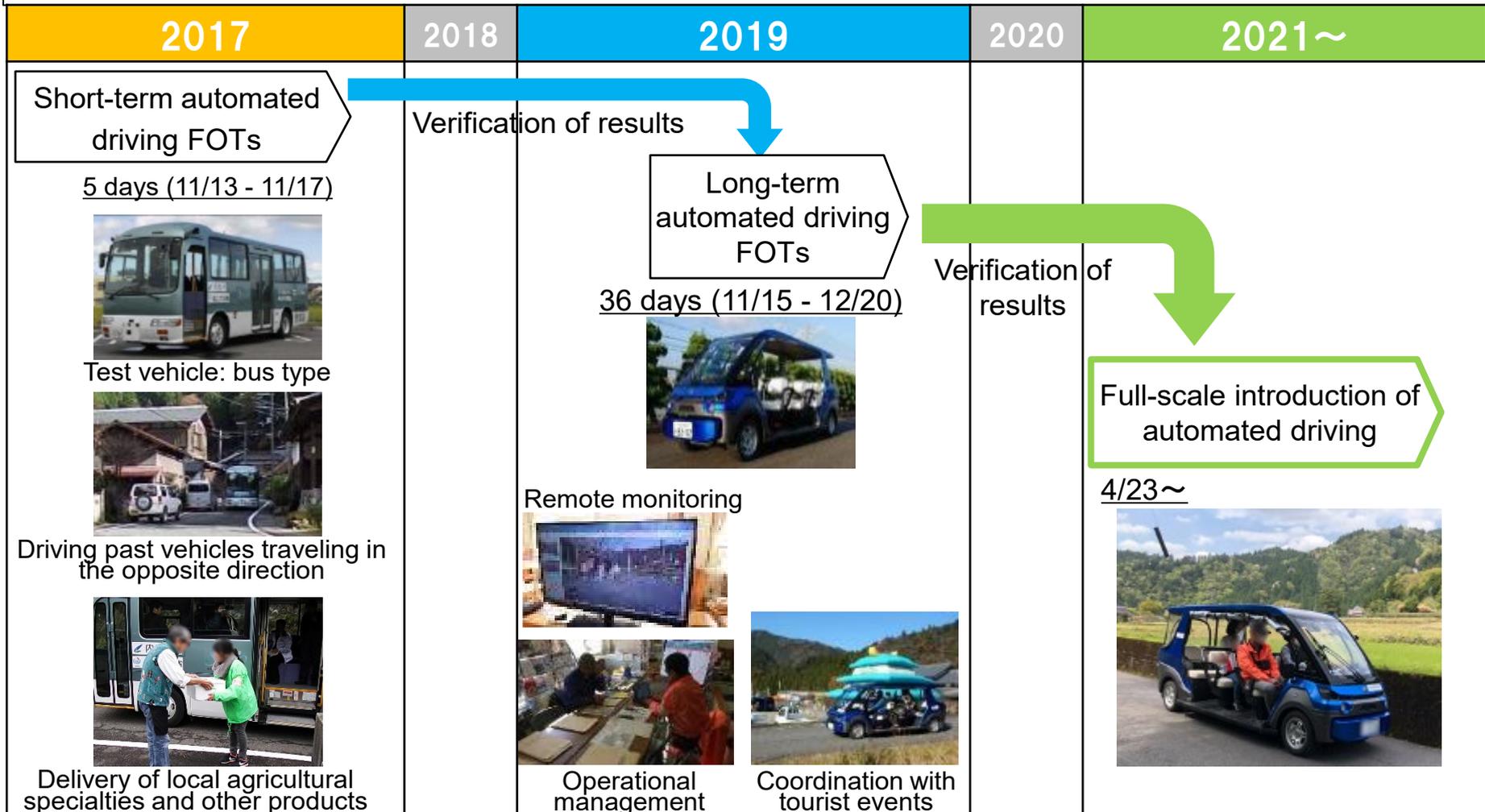
- Route based at Michi no Eki "Okueigenji Keiryunosato" (round-trip total length approximately 4.4 km)
- Signs and pavement markings have been placed along the route, and the local community has been made aware and is cooperating to ensure that automated driving vehicles are able to drive smoothly.



Automated driving service began on April 23, 2021 (Friday)

Overview of past activities: Short-term FOTs, long-term tests, full-scale introduction

- 2017 (short-term FOTs): Conducted to verify impact on driving environment, social acceptance, impact on the region etc.
- 2019 (long-term FOTs): Conducted to verify operational management, organization for project implementation, coordination measures etc.
- 2021 and thereafter: Start of full-scale introduction based on results of tests relating to technical aspects, business models etc.



- Mobility services using automated driving vehicles are provided to enable a variety of activities.
- Agricultural products are delivered to morning markets.



Doctor's visits at clinics located at Michi no Eki



Visits to citizen salons, etc. at Michi no Eki



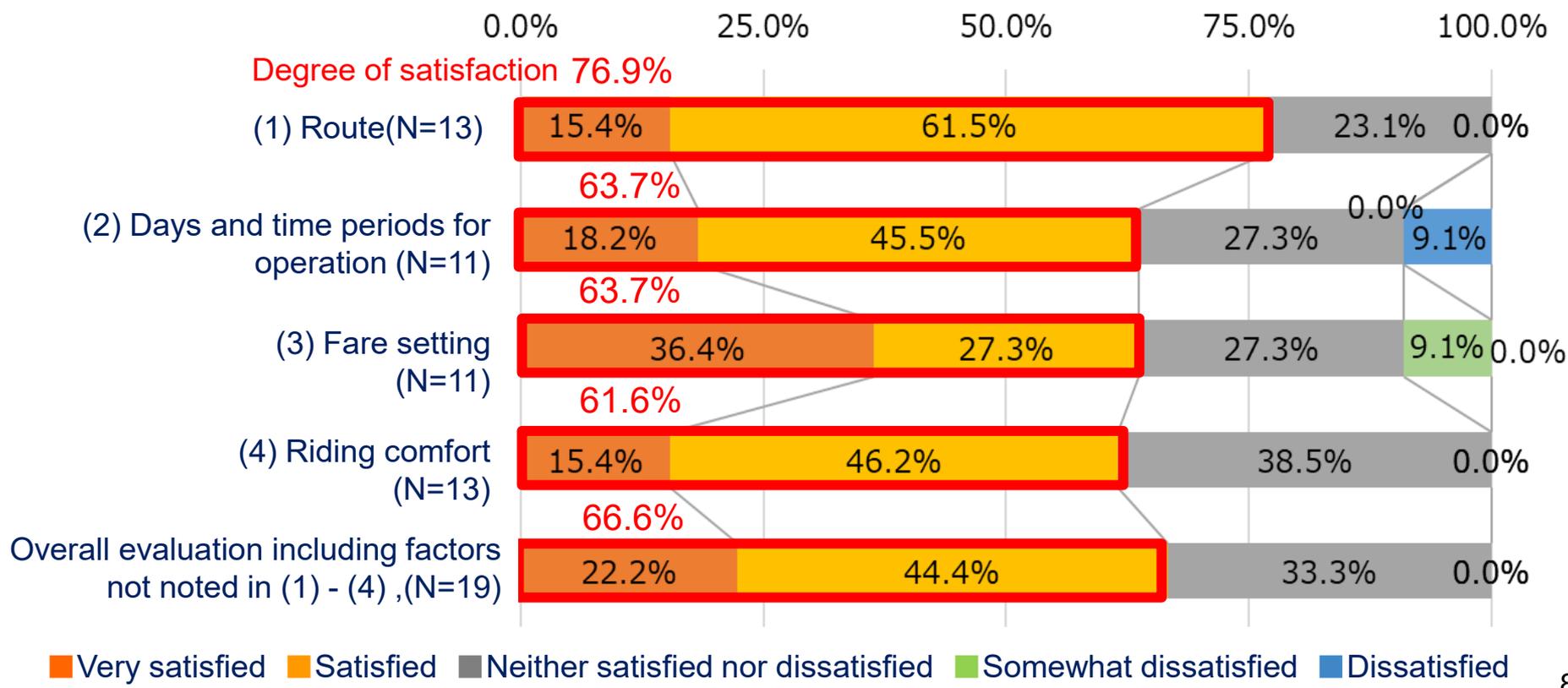
Hiker transport to and from trail heads

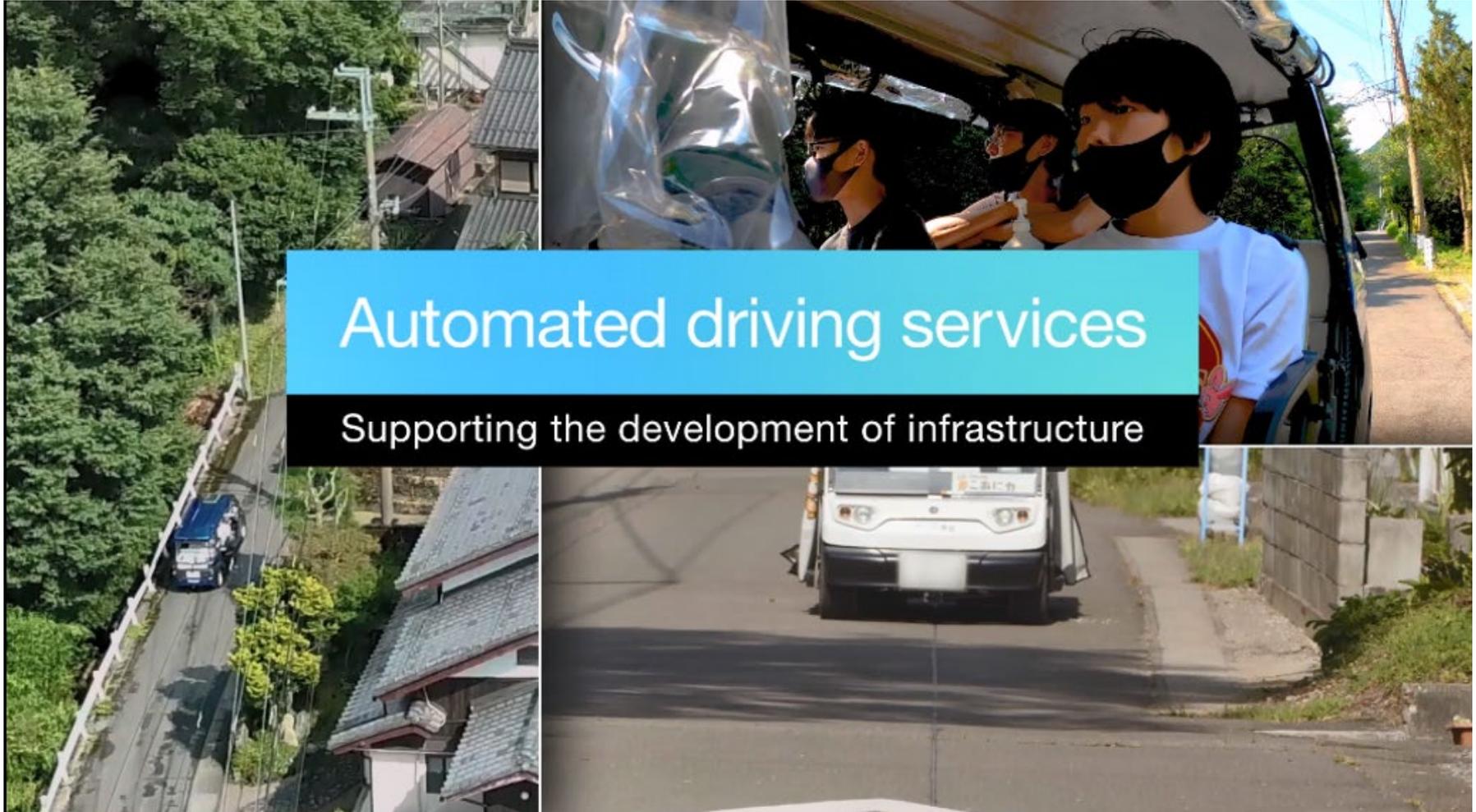


Delivery of agricultural products to morning markets at Michi no Eki

An opinion survey of users who live along the route found that 60% - 70% or more were satisfied with the automated driving service.

■ Degree of satisfaction with automated driving service (by item)





1. Automated driving services in rural areas

- 1—1 Current status of rural areas and issues to be resolved
- 1—2 Automated driving services in rural areas
- 1—3 Full-fledged introduction of automated driving services based at Michi no Eki

2. Automated driving support from the road infrastructure

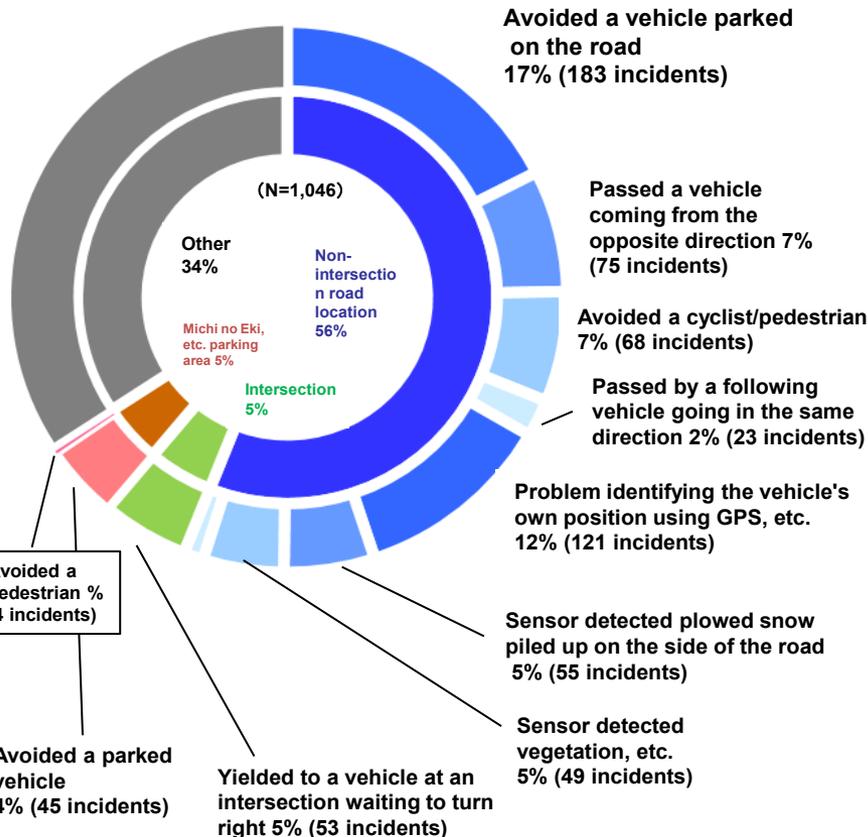
- 2—1 Automated driving support facilities
- 2—2 Lane markings compatible with automated driving
- 2—3 Provision of road traffic information

Automated driving services in rural areas based at "Michi no Eki" etc.

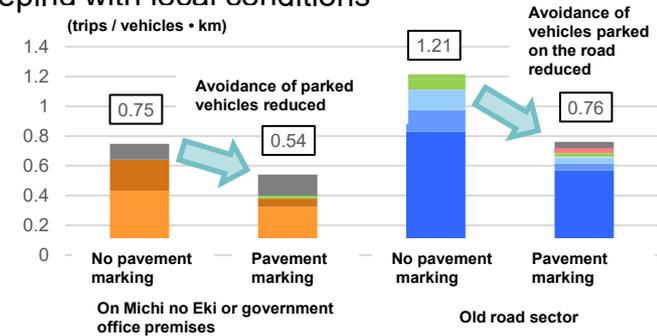
- In FOTs, there were cases in which automated driving could not be continued and manual intervention was needed.
- Various mechanisms are being put into place in keeping with local conditions to create a safe driving environment

■ Issues identified in FOTs

(frequency of occurrence, categorized in terms of road structure and the reason that manual intervention was needed)

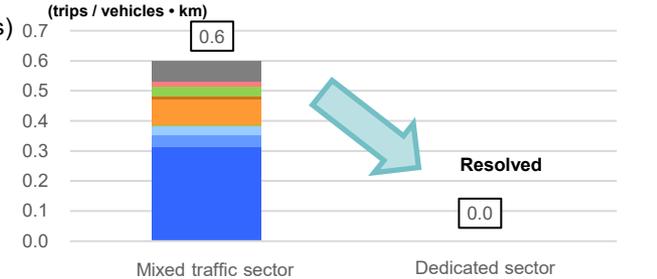


■ Various efforts in keeping with local conditions



▲ No. of manual interventions before and after placement of pavement markings (Akagi Kogen)

Notes:
 - Survey period (with no pavement markings): July 17 and 20-22, 2020 (weekdays), July 18, 2020 (weekend)
 - Survey period (with pavement markings): September 1 - October 10, 2020 (weekdays), July 18, 2020 (weekend)



▲ No. of manual interventions in mixed traffic sector and dedicated sector (Akagi Kogen)

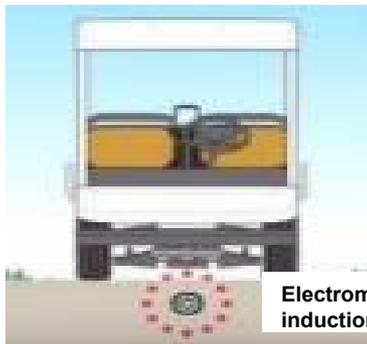
Note Survey period: September 1 - October 10, 2020

[Legend]

- Avoided a vehicle parked on the road
- Passed a vehicle coming from the opposite direction
- Avoided a cyclist/pedestrian
- Passed by a following vehicle going in the same direction
- Avoided a parked vehicle at a Michi no Eki, etc.
- Avoided a pedestrian at a Michi no Eki
- Yielded to a vehicle at an intersection waiting to turn right
- Detected and avoided a fallen object on road
- Other

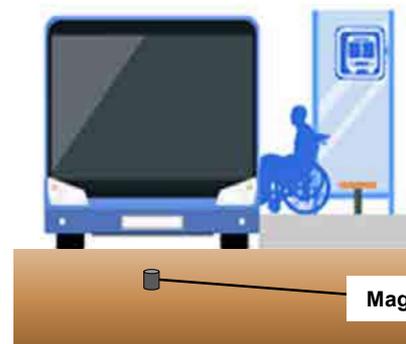
- The Road Act, etc. was revised in 2020 to stipulate facilities (magnetic markers, etc.) to support automated driving vehicle operation as road facilities.
- For private companies (transport companies, etc.), regulations were established to enable these to be placed as occupancy facilities with permit from road administrators.

<Automated driving support facilities>



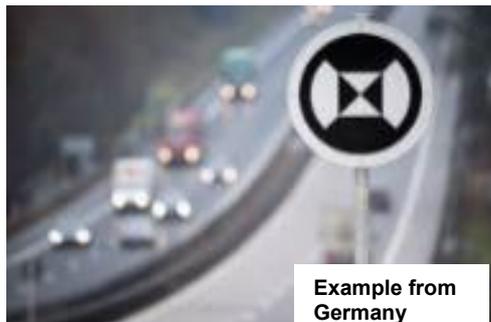
Electromagnetic induction line

▲ Assistance for operation through identification of own vehicle position by means of electromagnetic induction lines



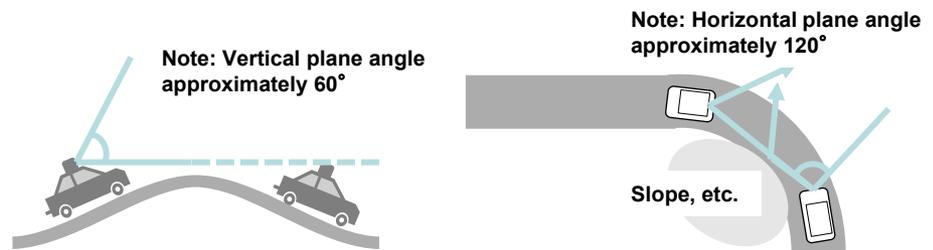
Magnetic marker

▲ Assistance for operation through identification of own vehicle position by means of magnetic markers



Example from Germany

▲ Assistance for correction of own vehicle position by means of positional information display facilities



▲ Assistance for determination of road status at locations that vehicle sensor signals do not reach

○ Joint research with private sector companies and the like is underway regarding management standards for the lane markings needed to ensure that automated driving vehicles stay within lanes, etc.

[Difficult for vehicle on-board sensors to detect (example: faded demarcation lines)]

[Management standards will be established for lane markings to ensure that they can be detected by vehicle on-board sensors.]



Level	Example of abrasion status
1 Low	
2	
3	
4	
5 High	



- Joint research with private sector companies and the like is underway, with the aim of developing methods to provide automated driving vehicles on expressways, etc. with road traffic information on road conditions ahead that are difficult for on-board sensors to detect.

