Cross-ministerial strategic innovation promotion program
Innovation of automated driving for universal services

Field operational tests for automated driving services in rural areas aiming for the improvement of the social environment

FY2018-FY2019 Final Report (Overview)

Highway Industry Development Organization
Oriental Consultants Co., Ltd.
Docon Co., Ltd.
Nippon Koei Co., Ltd.
Pacific Consultants Co., Ltd.

1. Project summary

○ Project name: Field Operational Tests for Automated Driving Systems in Rural Areas

○ Contractors: Highway Industry Development Organization; Oriental Consultants Co., Ltd.; Docon Co., Ltd.; Nippon Koei Co., Ltd.; Pacific Consultants Co., Ltd.

○ Period: From October 2018 to August 2019

○ Number of field operational test area: 6 areas

○ Verification items:

1. Technical challenges

(1) How to handle road structures which are unique to rural areas; (2) How to handle obstacles including intersections without traffic lights; (3) How to manage roads which are specialized for automated driving;
(4) How to handle mixed traffic of automated and general vehicles;
(5) How to set up bus stops.

2. Operational-system challenges, etc.

(1) What an ideal operational body should be; (2) How to secure profitability;
(3) How to cooperate with other businesses; (4) How to utilize the operating control system

3. Challenges in creating local-level effects

(1) How to increase opportunities for local residents to go out;
(2) How to support smooth logistics within a community; (3) How to cerate an influx of tourists

2. How to proceed with the field operational tests

	Field operational tests
FY 2017	**Short-term field operational tests (Period: About 1 week)** ○ The tests focused mainly on technical verification and business model study. ○ Conducted at 13 areas nationwide. (Total travel distance: About 2,200 km; participants: About 1,400)
From FY 2018	**Long-term field operational tests (Period: About 1 to 2 months)** ○ The tests focused mainly on business model creation ○ Among the 13 field operational test areas in FY 2017, we took the following factors into consideration to pick up areas: 1. Respective areas' outlook for vehicle procurement, 2. Respective areas' conditions of their business model study, 3. Other factors. Then, we picked up areas which were ready and conducted the long-term tests sequentially. ○ Automated driving services are expected to be implemented in real society in FY 2019 at the earliest. Note: Other than the above-mentioned tests, short-term field operational tests were conducted at areas where feasibility studies (FSs) had been conducted in FY 2017.

We aim to <u>implement automated driving services which set hubs in locations including roadside rest areas (called "Michi no Eki" in Japan) by 2020.</u>

3. Features of long-term field operational tests

Basic approaches

Technology

(1) Rural areas' characteristics were utilized to secure space

Traffic sections which can be substituted with other roads with little traffic volume (footpaths, etc.)	• In such sections, roads dedicated for automated driving services should be provided. • One sides of roads in such sections should be dedicated for automated driving services. • One-way traffic system should be applied to such sections.
Traffic sections in which securing of ADS-exclusive spaces is difficult (housing areas, etc.)	• Set up signs to clearly indicate that the traffic sections are automated driving service routes.

(2) Verification of the operating control systems

- On-demand operation which utilizes smartphones and other medium.
- Set up operating control centers and monitor traveling conditions and vehicles' interior conditions.

Business

(1) Charge fuel expenses for automated driving services.

- Charge fuel expenses.
- Conduct tests to promote daily utilization for 1 to 2 months. Based on the results, verify profitability.

(2) Tests conducted while assuming future operational structures

- Future operational bodies including municipalities form operational plans.
- Local residents work as ADS attendants on a voluntarily basis.

Local-level approaches (Industry-university-government cooperation)

○ Logistics -Industrial development/life support-

- Use automated driving vehicles to collect farm products just in front of each farmer's house; the collected farm products are sold at roadside rest areas or are shipped to urban areas via highway buses or other transportation methods.
- Deliver a cargo (home-delivery parcels, etc.) to an addressee just in front of his/her house.

○ Welfare -Livelihood support for the elderly-

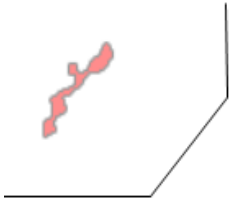
- Provide care services at local hubs.
- Take the elderly to and from roadside rest areas via automated driving.
- Use automated driving vehicles to support the elderly's lives and to provide shopping support for the elderly.

○ Sightseeing -Creation of an influx of tourists-

- Use automated driving vehicles to tour sightseeing spots.
- Regarding the sightseeing tour, local volunteers get on automated driving vehicles to work as guides.

etc.

4. Field operational test areas



"Michi no Eki Kamikoani"
Kamikoani Village, Akita Prefecture

Period: From 9th December, 2018 to 8th February, 2019
Used vehicle: cart type
Contractor: Nippon Koei Co., Ltd.

"Yamakawa branch of Miyama City Hall"
Miyama City, Fukuoka Prefecture

Period: From 2nd November to 21st December, 2018
Used vehicle: cart type
Contractor: Pacific Consultants Co., Ltd.

"Michi no Eki Cosmall Taiki"
Taiki Town, Hokkaido Prefecture

Period:From 18th May to 21st June,2019
Used vehicle: bus type
Contractor: Docon Co., Ltd.

"Michi no Eki Hitachiota"
Taiki Town, Hokkaido Prefecture

Period:From 6th June to 21st July,2019
Used vehicle: cart type
Contractor: Nippon Koei Co., Ltd.

"Michi no Eki Minami Alps Mura Hase"
Ina City, Nagano Prefecture

Period: From 5th to 29th November, 2018
Used vehicle: bus type
Contractor: Oriental Consultants Co., Ltd.

"Michi no Eki Ashikita Dekopon"
Ashikita Town, Kumamoto Prefecture

Period: From 27th January to 15th March, 2019
Used vehicle: cart type
Contractor: Oriental Consultants Co., Ltd.

◎: Field operational test areas

5. Minami Alps Mura Hase (Test overview)

■ Overview of the field operational tests

Period	From 5th to 29th November, 2018 Note: Daily operation was provided except for Tuesdays.
Object	• Provide transportation supports for the elderly in shopping, hospital visits, and other activities. • By accepting passengers and cargo on one automated driving vehicle, support delivery of daily necessaries and other items (transport foods/daily necessaries/other items to hubs).
Population in areas along the ADS route	About 1,260 households, About 2,970 persons (as of February 2019)
Test route	A route connecting daily-life hubs including the roadside rest area “Minami Alps Mura Hase”, Hase general branch office, supermarkets, JA
Travel distance	About 12 km in total (about 120 minutes/tour)
Running method	Mixed traffic of automated and general vehicles (on public roads); Automated driving level 2 (A driver rode on the automated driving vehicle.)
Operational pattern	Regular operation: 3 tours/day Roadside rest area: At 10:00, 12:00, and 14:00

■ Vehicle used in the tests

○ Bus type(capacity: 10 persons, by Advanced Smart Mobility)

○ Driving speed: About 35 km/h
Note: 40 km/h at maximum

■ Hub for ADS operation

○ Michi no Eki Minami Alps Mura Hase

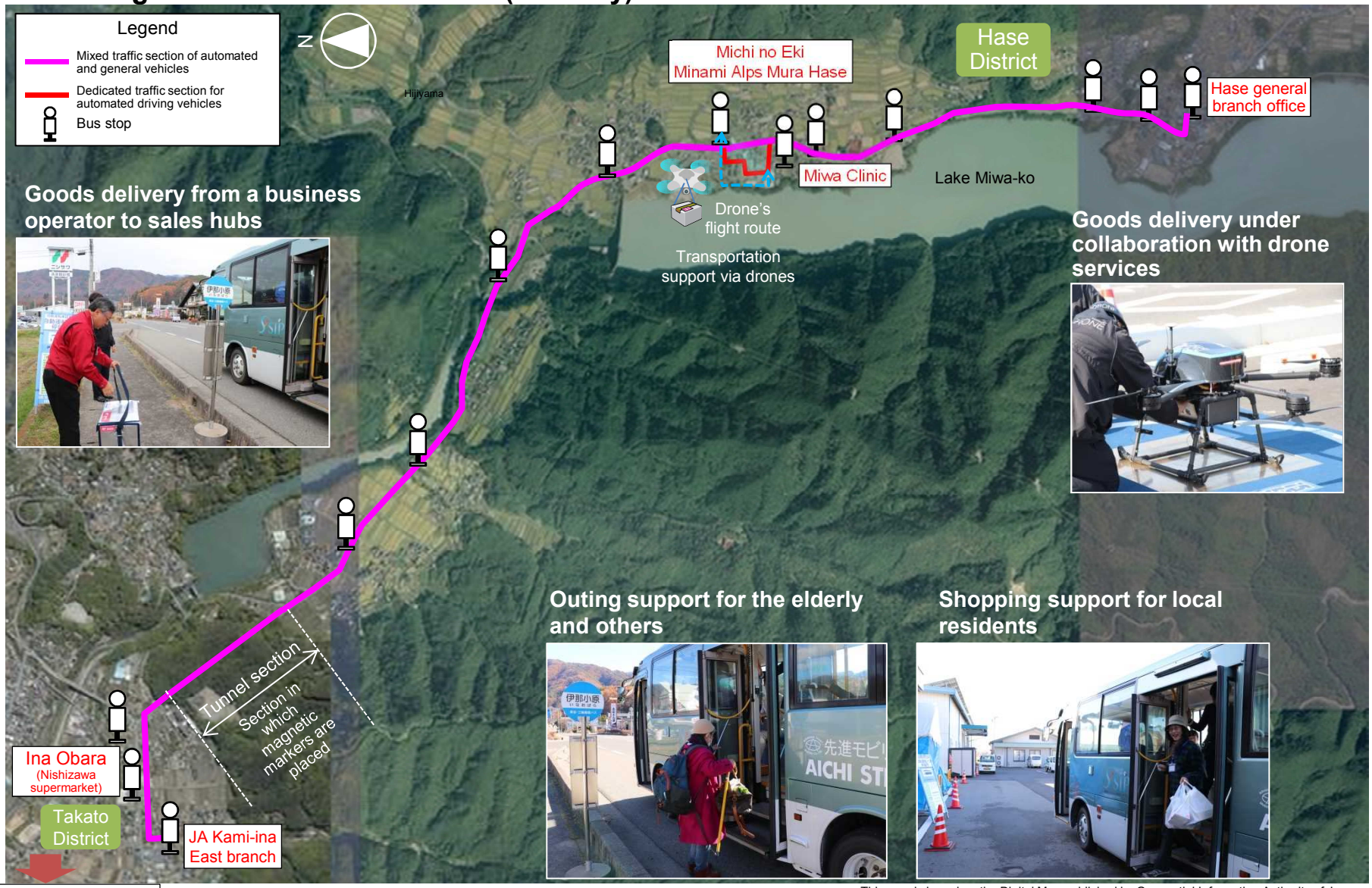
- Gate station to Minami Alps (trailhead of Mt. Senjogatake/Mt. Kai-Komagatake) (along Japan National Route 152)
- Located near Miwa Clinic and the community development facility; Functions as a local hub

Sightseeing spots along the ADS route

This map is based on the Digital Map published by Geospatial Information Authority of Japan

5. Minami Alps Mura Hase (Traveling route)

■ **Traveling route: About 6 km in total (one way)**



This map is based on the Digital Map published by Geospatial Information Authority of Japan

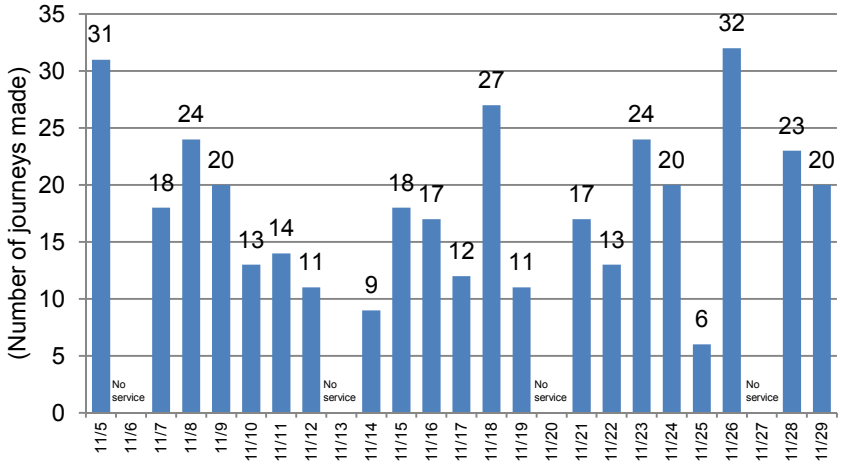
5. Minami Alps Mura Hase (test result)

<Use statistics>

○ A total of 380 journeys were made (27 people used the service more than once).

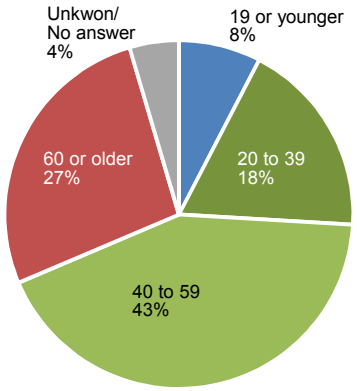
Note: General users only.

○ Approximately 47% of the users were Ina City residents (findings from the post-use questionnaire).



Note: Service was off on Tuesdays.

■ Age groups of users



■ Purpose of use and the ride sections traveled

○ Shopping at the supermarket or Michi no Eki
<Ride sections traveled>
・Elementary school - Takato High School
・Ina Obara - Michi no Eki

○ Hospital visits

○ Recreational
<Ride sections>
・Michi no Eki - Ina Obara

and others

Note: From user registration information

<Mixed human-and-cargo transportation>

○ One tour a week offered mixed human-and-cargo transportation service to deliver goods.

Goods were transported between the local supermarket and the Michi no Eki.

Delivered goods were sold at the respective destinations they were received.

● Supermarket (in the Takato District) ⇔ Michi no Eki (Hase District) (approx. 4 km)

Food items such as buckwheat noodle, miso pastes and confectionery were transported.

○ Part of the goods (confectionery) transported by the bus have been reloaded into a drone at the Michi no Eki for delivery to users.

● Supermarket ⇒ Michi no Eki ⇒ senior housing complex

Transporting confectionery to users

Note: The field operational test included delivery of items to the senior housing complex, a location where a significant demand for drone-assisted delivery service is expected in the future.
Ina City is planning to run drone-assisted transportation services in the future where drones fly along a river. In this field test, the drone transportation path to the senior housing complex was designed to include a similar river path to evaluate service feasibility.

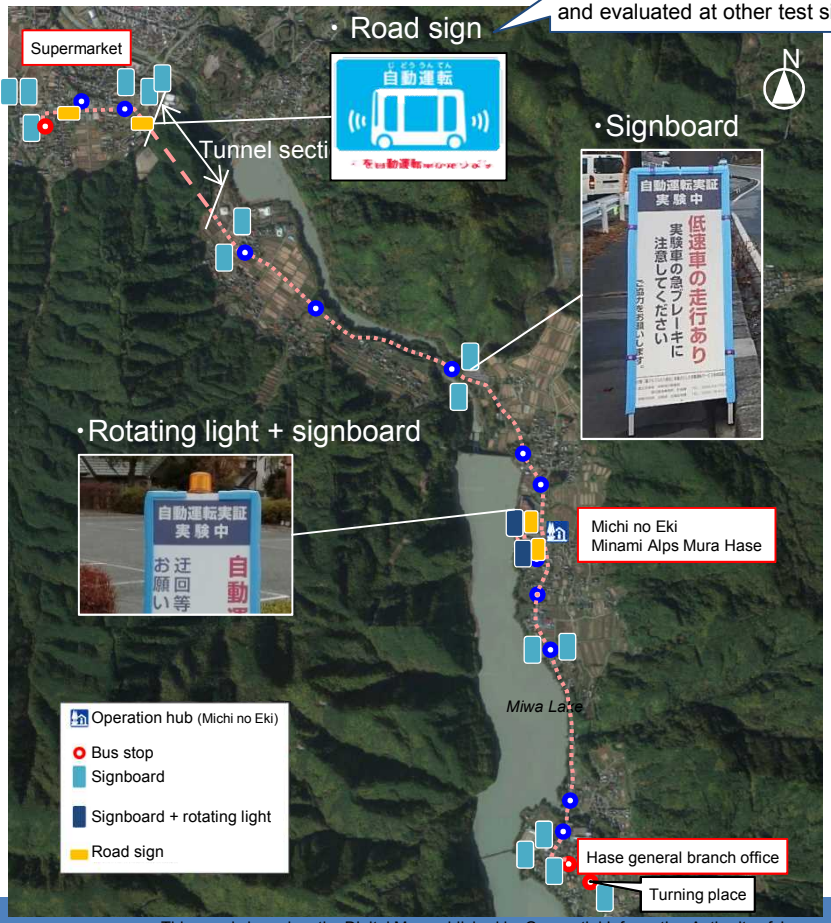
5. Minami Alps Mura Hase (test result)

Test result 1 (securing a drivable route for the automated vehicle)

- ○ To best accommodate mixed traffic, efforts were made, by **distributing leaflets and installing rotating lights, signboards and road signs**, to let the public know that automated vehicles will be traveling in the area.
- ○ The automated bus was programmed to stop for approximately 1 minute at each scheduled stop so that any subsequent vehicle can easily pass the bus.

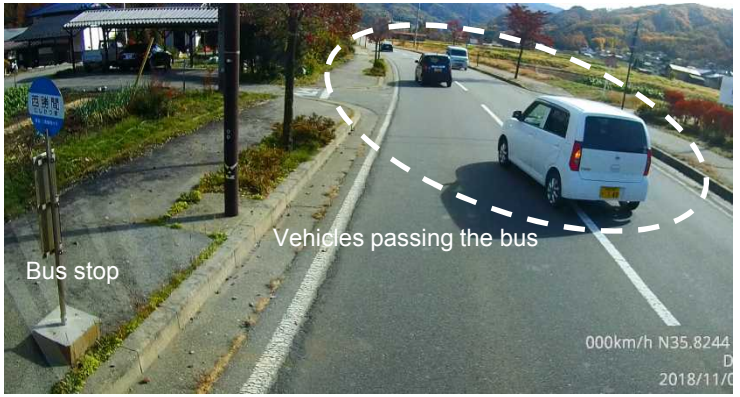
■ **Positions where signboards and other notification features were installed**

The perceived level of recognition was not sufficient. Improvements should be sought and evaluated at other test sites.



This map is based on the Digital Map published by Geospatial Information Authority of Japan

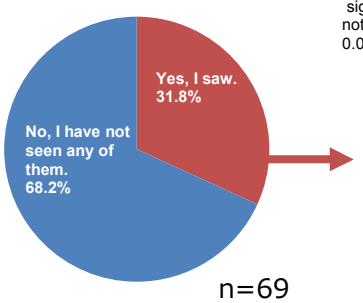
■ **Subsequent vehicles passing the bus at a scheduled stop**



Note: From dashcam recording

■ **Findings from road user questionnaire**

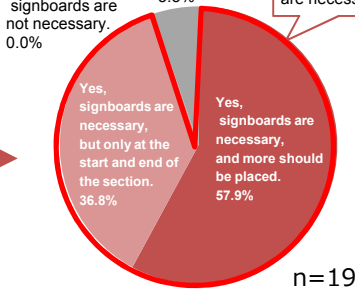
・Have you seen the signboards?



n=69

・Do you think signboards are necessary?

Users think that notification efforts by signboards, etc. are necessary.



n=19

Note: Findings from Michi no Eki visitor questionnaire

5. Minami Alps Mura Hase (test result)

Test result 2 (technical and operational aspects of automated driving service)

○ An operation control center was set up to receive, process and monitor ride reservations and also to track the vehicle position and provide remote in-cabin monitoring.
(A fuel charge of 20 yen per ride was collected. An IC card-type ride pass was issued to users (at a price of 100 yen for 5 rides). The pass was held over the reader to be scanned when the user gets on and off the bus.)

⇒ Approximately 80% replied that the IC card-type pass is convenient (the existing public transportation service provided in the area does not provide IC card-based toll collection).

<Operation control center and reservation processing>

Operation control center

User registration and ride reservation processing
(Reservations were received by telephone and managed on the web.)

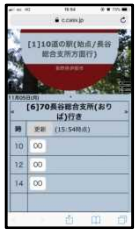
<Vehicle monitoring>

Remote in-cabin monitoring
Voice call to speak with the driver

Voice calls can be made to cope with situations such as the reserved user not showing up at the bus stop.

Real-time vehicle position information

<Reservation and ride management for the automated driving service>



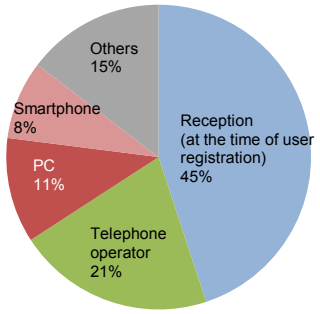
Reservation system
(smartphone)

Reservation management screen
(monitoring reservations and bus operating status)

Web reservation system (PC or smartphone)

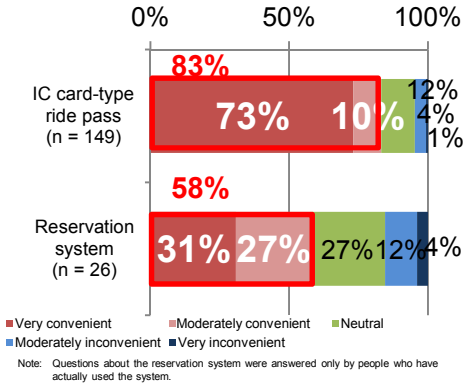
IC card-based ride management

・Ride reservation method



n=134
(multiple answers may be given)

・How convenient did you think the system was?



Note: Questions about the reservation system were answered only by people who have actually used the system.

5. Minami Alps Mura Hase (test result)

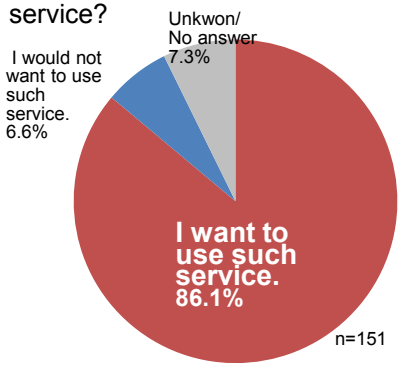
Test result 3 (business model building)

○ Approximately 86% of the user questionnaire respondents answered that they are willing to use automated driving service. Approximately 25% answered that they are willing to pay “About 200 yen” for the service, which was the answer given by the largest number of respondents. These results show that we can reasonably hope that the automated driving service will encourage elderly residents to go out more.

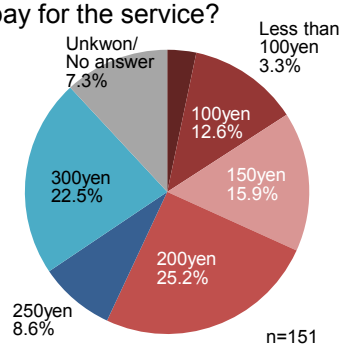
○ Approximately 67% answered that they are willing to use the service for sightseeing. Approximately 35% answered that they are willing to pay “About 200 yen” for the service, which was the answer given by the largest number of respondents. At the same time, about 40% of the respondents answered that they are willing to pay 300 yen or more.

Automated driving service users

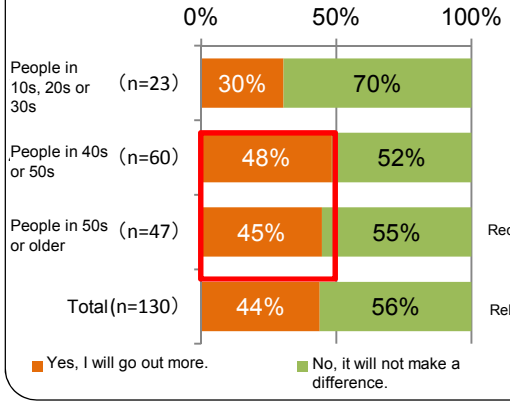
・Would you want to use the service?



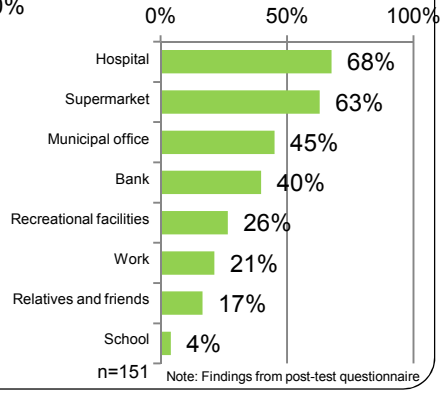
・How much are you willing to pay for the service?



・Do you think that you will go out more if you can use the service?



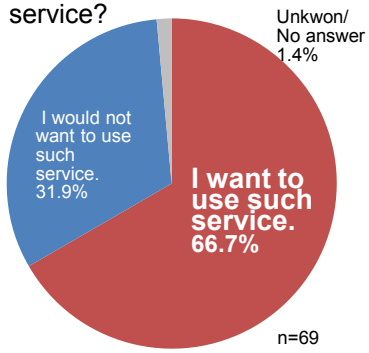
・Where would you go using the service?



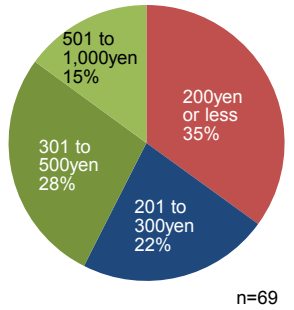
Note: Findings from post-test questionnaire

Tourists visited the Michi no Eki Minami Alps Mura Hase

・Would you want to use the service?



・How much are you willing to pay for the service?



Note: Findings from Michi no Eki visitor questionnaire

Operating system

○ Operation control
・Local residents were hired for reservation receiving duties.
・City office employees tried out vehicle monitoring duties.
⇒ Advance training will enable people without advanced computer skills to serve as operators for the reservation management system. **Local residents can play active roles in processing ride reservations and running the operation management system.**

Reservation processing by local residents

○ Operation control
・“Outstanding issues include how to support the initial cost including vehicle preparation cost, how to build the vehicle maintenance system and how to handle insurance cost. Once the initial cost is reduced by government subsidiaries and other issues are somehow resolved, there would be a reasonable ground for us to consider entering the business.” (comment from the field test operating body)

6. Yamakawa branch of Miyama City Hall (Test overview)

■ Overview of the field operational tests

Period	From 2nd November to 21st December, 2018 Note: Automated driving service was provided only on weekdays in November (service was provided on 16th November and, due to setting up, service was not provided from 21st to 24th November). Note: From 26th November, service was provided everyday (except for 2nd December).
Object	1. Add values to the automated driving services. 2. Investigate/verify how to make the mobility service flexible in order to accommodate characteristics of local industries (farming, etc.) and in order to handle challenges including aging society. 3. Investigate how to make the mobility service into business.
Population in areas along the ADS route	About 420 households, 1,386 persons (As of January 2019)
Test route	A route connecting hubs (including Yamakawa branch of Miyama City Hall, JA Yamakawa branch, Genki-kan, and citizen center), Kamigoinoki District, and Sano District
Travel distance	About 6 km in total (about 50 minutes/one-way tour)
Running method	Mixed traffic of automated and general vehicles (on public roads); Automated driving level 2 (Partially, automated driving vehicles were controlled manually); A driver rode on the automated driving vehicle.
Operational pattern	From 2nd to 20th November : Regular operation 6 tours/day Sano community center: At 10:00, 13:00, and 15:00 JA Yamakawa branch: At 11:00, 14:00, and 16:00 From 26th November to 21st December: On-demand operation, about 6 tours/day (Operation number was changed depending on ride-reservation conditions.) Note: Regular service was provided when there was no ride reservation.

■ Vehicle used in the tests

Human transportation

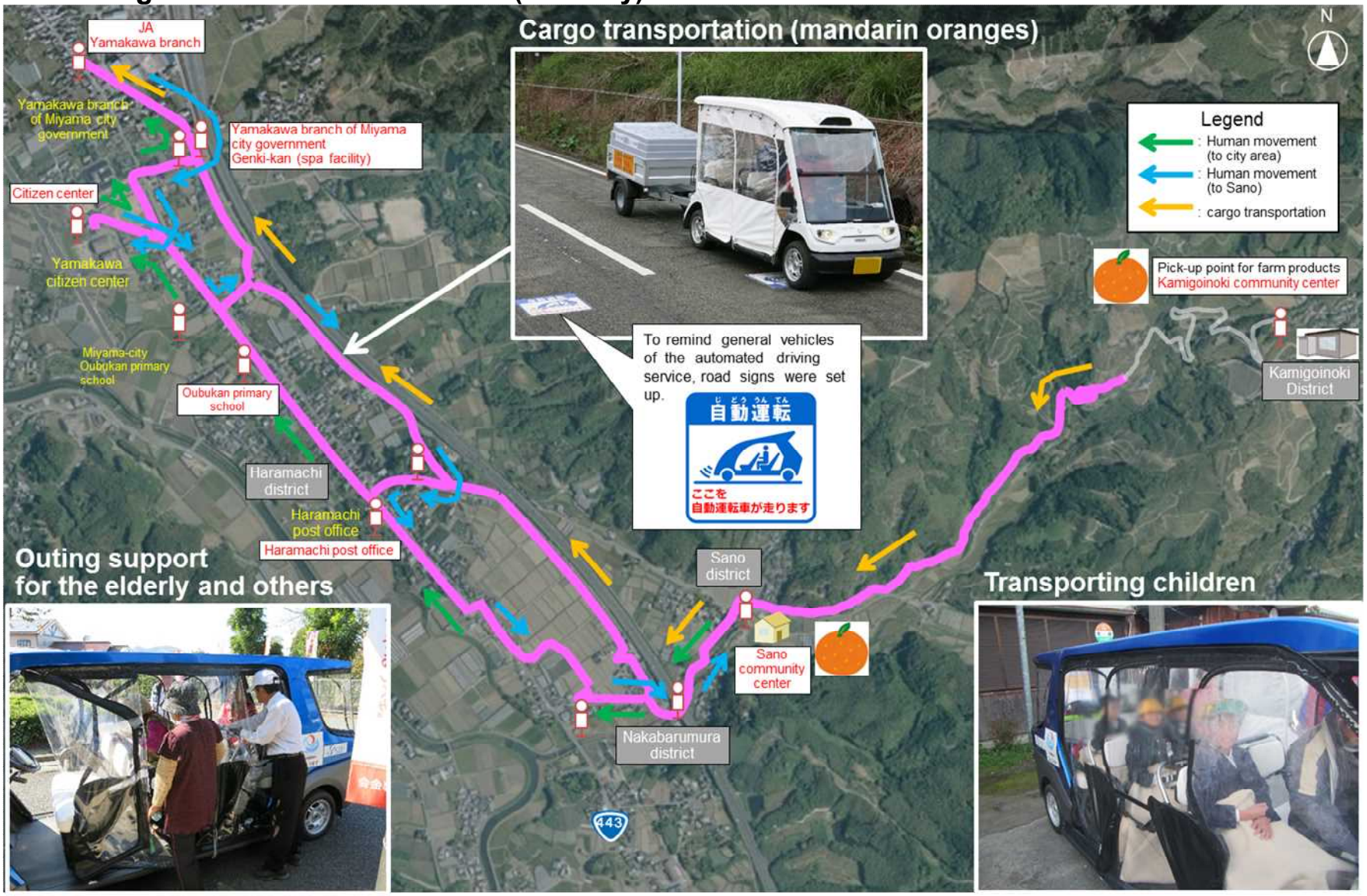
- ○ Cart (capacity: 6 persons, by Yamaha Motor)
- ○ Driving speed:12 km/h (at automated driving)

Cargo transportation

- ○ Cart (capacity: 4 persons, by Yamaha Motor), tow car (load capacity: Up to 300 kg)
- ○ Driving speed:12 km/h (at automated driving)

6. Yamakawa branch of Miyama City Hall (Traveling route)

■ **Traveling route: About 6 km in total (one way)**

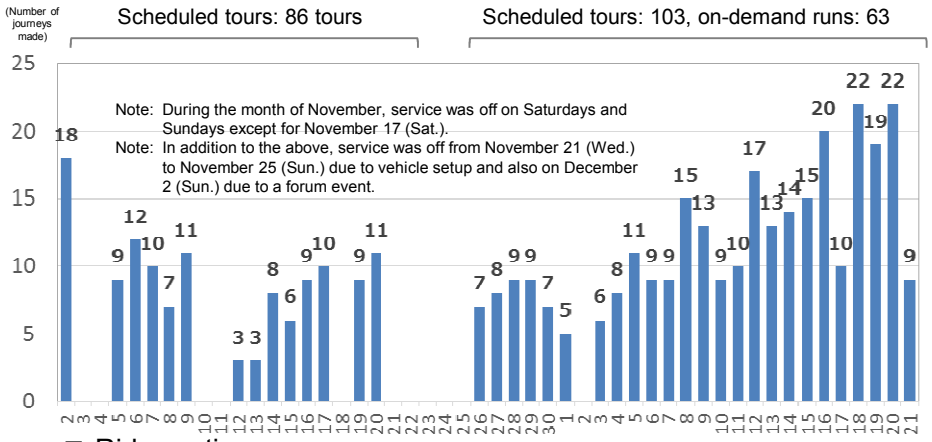


This map is based on the Digital Map published by Geospatial Information Authority of Japan

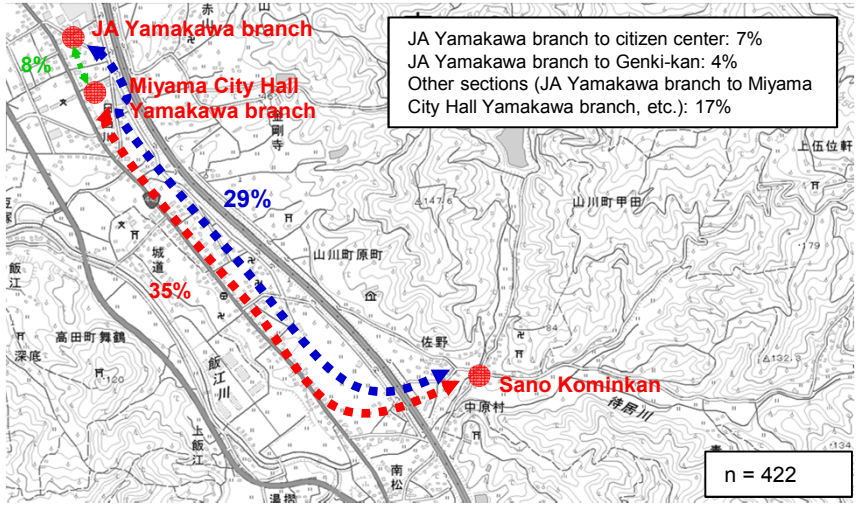
6. Yamakawa branch of Miyama City Hall (test result)

<Use statistics>

○A total of 422 journeys were made (an average of 1.8 passengers per tour).
○1/3 of the journeys were made between the Miyama City Hall Yamakawa branch and the Sano Kominkan (community center).



■ Ride sections



This map is based on the Digital Map published by Geospatial Information Authority of Japan

<Travel support for the elderly and orange transportation assistance>

○ The bus service provided travel support for the elderly.
The automated vehicle provided transportation during the hours that the existing community bus service is not operating.

- Kamigoinoki Kominkan (community center)
  ⇒ JA Yamakawa branch (approx. 6 km)
  Conducted from November 2 to December 21
  (up to eight tours a day were provided).

○Human-and-cargo mixed transportation service was offered to transport mandarin oranges.
Mandarin oranges were transported from farms to JA Yamakawa branch.

- Kamigoinoki Kominkan
  ⇒ JA Yamakawa branch (approx. 6 km)
  Conducted from December 12 to December 14
  (two tours a day).
- Sano Kominkan
  ⇒ JA Yamakawa branch (approx. 3 km)
  Conducted from December 17 to December 19
  (2 tours a day).

12 containers (approx. 200 kg) were transported per tour.

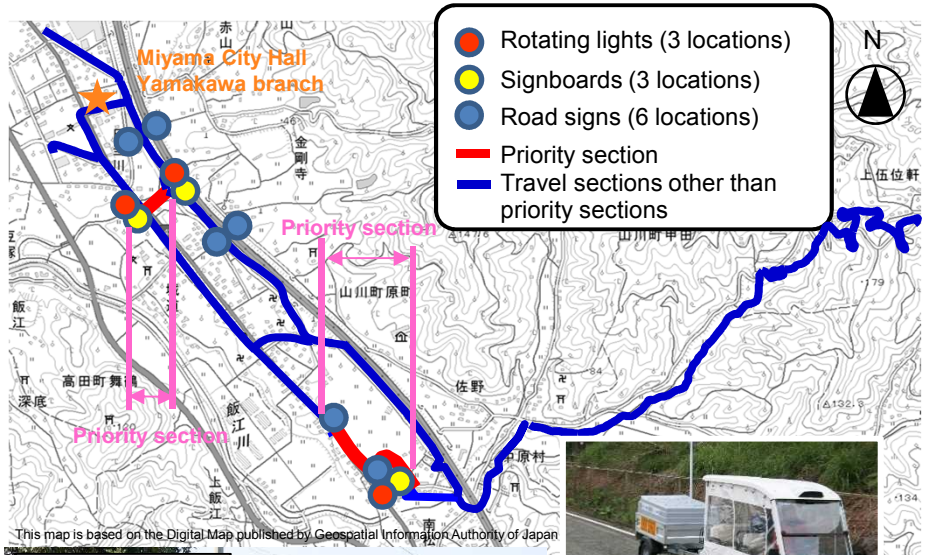
6. Yamakawa branch of Miyama City Hall (test result)

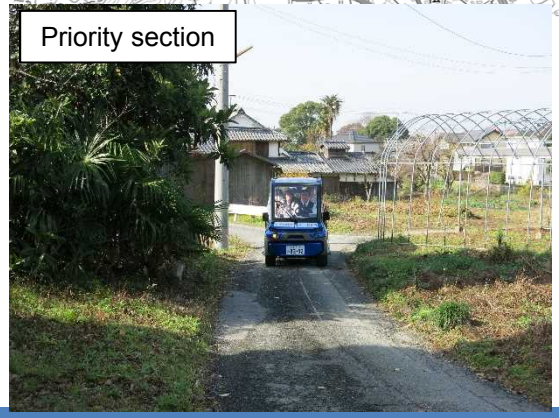
Test result 1 (securing a drivable route for automated driving)

○ To best accommodate mixed traffic, efforts were made, by **distributing leaflets and installing rotating lights, signboards and road signs**, to let the public know that automated vehicles will be traveling in the area.

○ Efforts to secure a drivable route for the service with consideration for regional characteristics specific to mountainous areas.

■ **Installation of rotating lights, signboards and road markers**





▲ Road sign

■ **Securing a drivable route for automated driving (road management)**

Issue	Verification detail	Immediate findings
Subsequent vehicles passing the cart on National Route 443	Analysis was made on whether the number of manual interventions increased or decreased as a result of having roadside turnouts (to allow the cart to pull over) along National Route 443.	・The cart pulled over approximately 100 times to let subsequent vehicles pass (over a period of 25 days).
Inclusion of electromagnetic guide wire installation in future road paving projects	Based on findings from interviews with the Prefectural Civil Engineering Office, electromagnetic guide wire depth was doubled from the standard 4 cm to 8 cm from the ground surface.	The automated vehicle was correctly guided even with the guide wire buried deeper at 8 cm below the ground surface.
Safe driving through steeply inclined sections of mountainous areas (orange transportation route).	Evaluation was done with safety measures including regulating the vehicle speed at 6 km/h through sharp curves and other poor visibility sections.	No “close-call” incident was experienced between the automated vehicle and cars driven by orange farmers while transporting mandarin oranges harvested in the Kamigoinoki District through sharply winding sections.
Operational aspects of the automated vehicle	・Evaluation of the condition of agricultural products that have been transported in a trailer hitched to the automated vehicle. ・Survey of whether any hard-braking or other close-call incident was perceived while the automated vehicle maneuvered through tight locations (including the priority sections) (post-test questionnaire).	・No product damage due to cargo collapse was experienced. ・13% answered “Yes, I have experienced a close-call incident”. 87% answered “No, I have never experienced a close-call incident”.

6. Yamakawa branch of Miyama City Hall (test result)

Test result 2 (technical and operational aspects of automated driving service)

○ Electromagnetic guide wires that establish the vehicle travel route and RFIDs* that allow the vehicle to identify its own position were buried under the ground.
*Microchips with radio communication function that output “stop”, “decelerate” or other signals while the automated vehicle is traveling.

○ An operation control center was set up to receive, process and monitor ride reservations and also to track the vehicle position and provide remote in-cabin monitoring.

○ Approximately 80% of on-demand reservations were made on the web (from PC, smartphone, etc.) and the remaining 20% was made by telephone.

<Operation control center>

Operation control center set up inside the Yamakawa branch

(How the operation control center works)

- Staffed by the field test operating body’s employees plus volunteer workers
- Responding to inquiries made by people on board the automated vehicle
- Receiving and processing reservation calls from local residents and other users
- Generating the vehicle operation timetable based on on-demand reservations received

<Vehicle monitoring>

Remote in-cabin monitoring
Voice call to speak with the driver

Voice calls can be made to cope with situations such as the reserved user not showing up at the bus stop.

Real-time vehicle position information

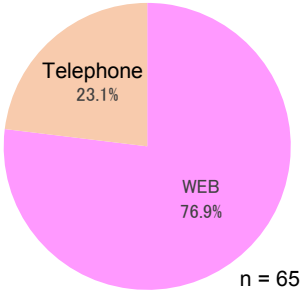
<Reservation and ride management for the automated driving service>

Reservation system
Web reservation system (PC or smartphone)

Reservation management screen
(monitoring reservations and bus operating status)

Ride coupon
1 stamp was pressed upon each ride.

■ On-demand reservation method



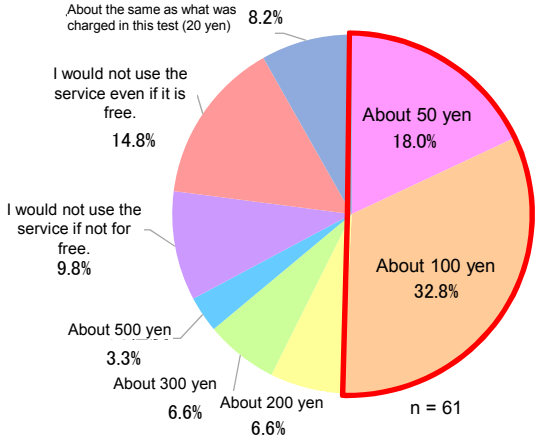
Note: Calculated from the actual reservation records.

6. Yamakawa branch of Miyama City Hall (test result)

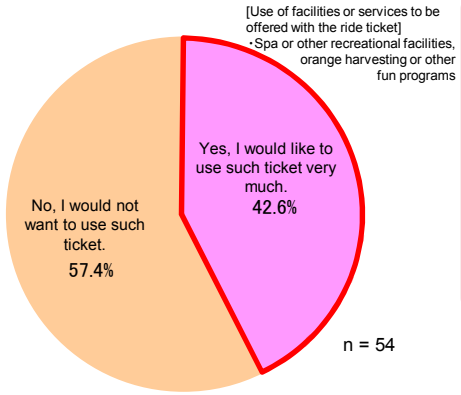
Test result 3 (business model building)

- ○ Approximately 30% answered that they are willing to pay “About 100 yen” for the service, which was the answer given by the largest number of respondents, or almost half the total number of respondents.
- ○ More than 40% answered that they are willing to purchase a ride ticket that also offers the use of local facilities (at present, community bus service is used for transportation to those facilities).
- ○ To start up a full-scale operation, **4 volunteer workers (2 drivers and 2 control center operators, to be rotated on a daily basis) must be secured**.

■ How much are you willing to pay for the service?



■ Would you want to use a ride ticket that also offers use of the local spa or other recreational facilities?



- **Of the approximately 4,600 community bus service users along the test route, about 3,200 used the service to go to Genki-kan (69% of the total).**
- **“I would like to go to the facilities, but it is difficult to go there because there are too few buses running.”**

■ **Findings from interviews with orange farmers**

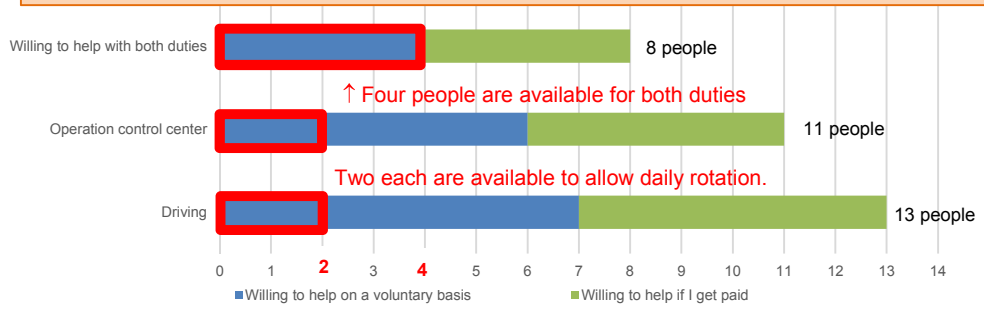
[Positive effects that can be obtained from the harvest transportation service]

- Time and work saving, which can be important for aging farmers (the average age of household heads in Kamigoinoki is 70).
- If the same amount of cargo as what the farmers currently transport by themselves (by mini-trucks, etc.) can be transported by the automated vehicle service, they can concentrate more on harvesting work.
- Complete shipping of all harvested oranges can be attained with fewer amounts of leftover fruits, which in turn will contribute to more revenue for orange farmers.
- Workers that are now hired for transportation can be allocated to harvesting duties (labor cost reduction).

Current shipping support by JA	Service offered in the test	Orange farmers' wishes
About 50 containers can be transported at a time.	12 containers (approx. 200 kg) were transported per tour.	Would like a greater per-tour transportation capacity.
Direct pick up from the harvest storage	Must be carried to the harvest collection point.	Would like the harvest to be picked up directly from the storage.

■ Securing manpower for driving and operation control center duties

Questionnaire findings indicate that the required manpower for both driving and operation control center duties can be secured by recruiting volunteer workers. 4 respondents answered that they are willing to help with both duties on a voluntary basis. This is sufficient to staff the driving crew and the operation control center.



Comments from volunteer drivers

- It was different from the cars I usually drive, but advance training helped me to get familiar with driving the car very quickly.
- When the full-scale service begins, I would like very much to help on a voluntary basis in order to help the local community.

■ **Leftover oranges**

7. Kamikoani (Test overview)

■ Overview of the field operational tests

Period	From 9th December, 2018 to 8th February, 2019 Note: ADS was out of service during Year-end and New Year holidays (from 22nd December to 9th January).
Object	• Secure transportation for daily life (especially the elderly) and logistics. • Verify ADS's applicability in using facilities including roadside rest areas as connection hubs to offer the locals opportunities to use various services (small freight transport, health business for villagers, and others).
Population in areas along the ADS route	223 households, 520 persons (As of end of December, 2018)
Test route	Automated driving service was provided in 3 go-around routes, each of which connects hubs (Michi no Eki Kamikoani, clinic, etc.) to each 1 of the 3 village communities; Kosawada, Fukudate, and Dogawa.
Travel distance	About 4 km in total (Kosawada route: About 20 min., Fukudate route: About 35 min., Dogawa route: About 40 min.)
Running method	Mixed traffic of automated and general vehicles (on public roads); Automated driving level 2 (A driver rode on the automated driving vehicle.)
Operational pattern	Regular operation: 6 tours/day (6 tours in total; For each of the 3 routes, one tour was provided between 8:00 and 10:00 and one tour was provided between 14:00 and 16:00). Regarding the time window between 10:00 and 14:00, service was provided when demand reservation was made. (Service was stopped between 12:00 and 13:00 for recharging.) From 10th to 24th January: Two vehicles were used for operation under the same schedule as above. (The 2nd vehicle was used for demand operation at all time ranges.)

■ Vehicle used in the tests

Human transportation

○ Cart (capacity: 6 persons, by Yamaha Motor)

○ Driving speed:12 km/h (at automated driving)

Human/cargo transportation

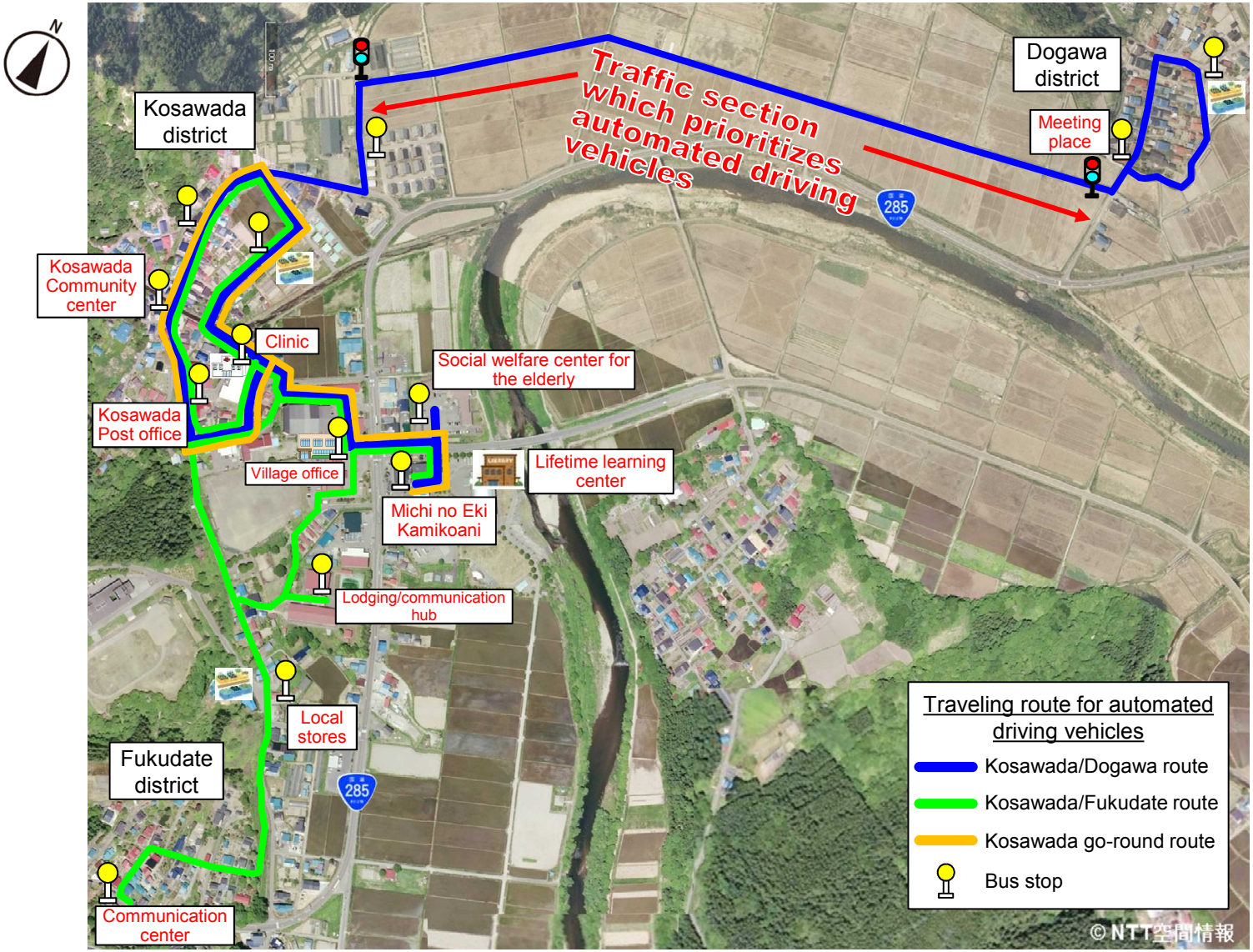
○ Cart (capacity: 4 persons, by Yamaha Motor)

○ Towed vehicle (load capacity: Up to 300 kg)

○ Driving speed:12 km/h (at automated driving)

7. Kamikoani (Traveling route)

■ **Traveling route: About 4 km in total (one way)**



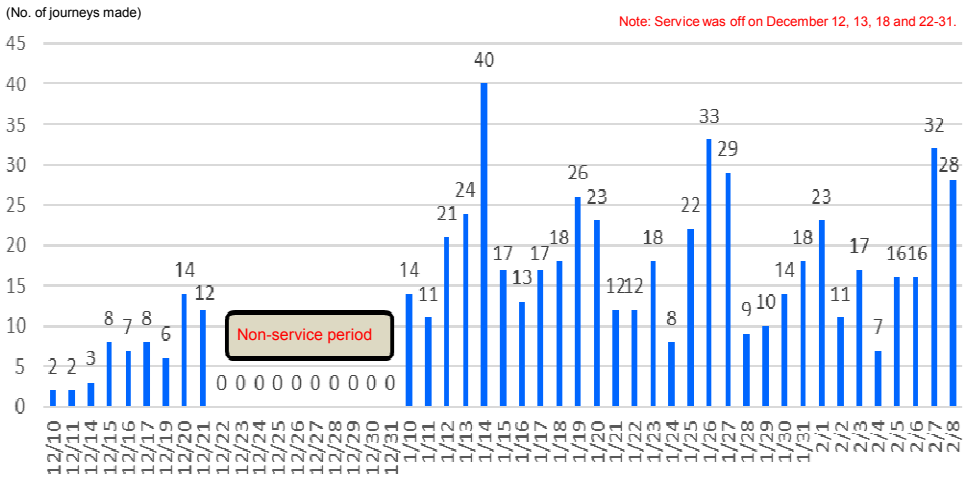
This map is based on the GEOSPACE published by NTT GEOSPACE

7. Kamikoani (test result)

<Use statistics>

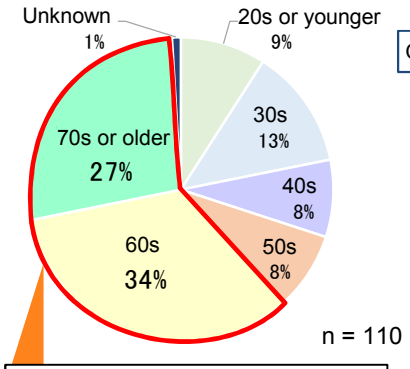
○ A total of 621 journeys were recorded. 46% of the journeys were made by local residents.

○ An average of seven or more journeys a day were made by local residents.



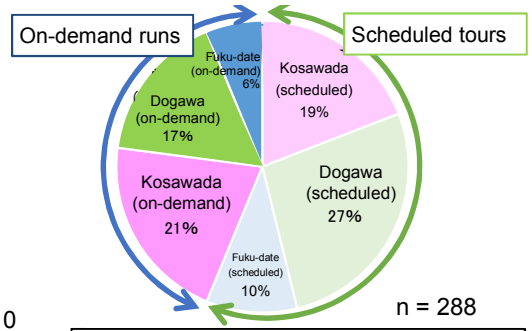
■ Age groups of users

・Village residents: Age groups



Approx. 60% of users were in their 60s or older.

・Village residents: Type of tour used and sections traveled



○ The ratio between scheduled tours and on-demand runs was 6 : 4.

○ Largest number of journeys were made from and to the Dogawa community, which is farthest away from the village hub.

<Mixed human-and-cargo transportation service to carry agricultural products and merchandise>

○ Mixed human-and-cargo transportation service to carry agricultural products and merchandise
Rice, vegetables and other agricultural products were carried to the Michi no Eki and then delivered to end users.
Heater fuel is transported from the gas station (adjacent to the Michi no Eki) to homes.

● Farms ⇒ Michi no Eki
Shipping of rice and vegetables

● Michi no Eki ⇒ homes
Gas station Heater fuel and merchandise are transported.

<Coordination with social welfare programs and village-run spa facility>

○ Transportation of the elderly from and to welfare events, coordination with various social welfare programs

○ Coordination with shuttle bus service for the village-run spa facility

Village communities ⇒ Michi no Eki → Village-run spa facility → Michi no Eki ⇒ Village communities
(Automated vehicle) (Spa shuttle bus) (Spa shuttle bus) (Automated vehicle)

7. Kamikoani (test result)

Test result 1 (securing a drivable route for automated driving)

○ Temporary signal lights were installed at both ends of the priority section to block general vehicles from entering the section while the automated vehicle passes. Other notification efforts were made including a pre-test explanation meeting and the distribution of safety map leaflets to let the residents know that automated carts will be traveling in the area. Signboards showing the automated vehicle travel route were installed along the route.

○ As snow on the ground has sometimes necessitated manual interventions and automated stops, assistance of the village's snow removal contractor was obtained to secure a drivable route for the automated vehicle.

<Securing a drivable route for the automated vehicle>

○ Safety map was distributed in the area to let the residents know where the automated vehicle will be traveling and where the tight road sections are.

○ Signboards showing the travel routes and temporary signal lights were installed to mark the priority section and segregate it from general vehicle traffic.

Standardized-logo markers were installed along the mixed-traffic section to let people know that automated vehicle will be traveling in the area.

Priority sections were protected with temporary signal lights.

⇒ Throughout the test period, no accidental entry of a general vehicle was observed while the automated cart was traveling through the section.

○ When snow on the ground or snow drift impeded automated driving, assistance of the village's snow removal contractor was obtained. Snow-impeded locations were surveyed with the contractor for efficient snow removal to secure a drivable route.

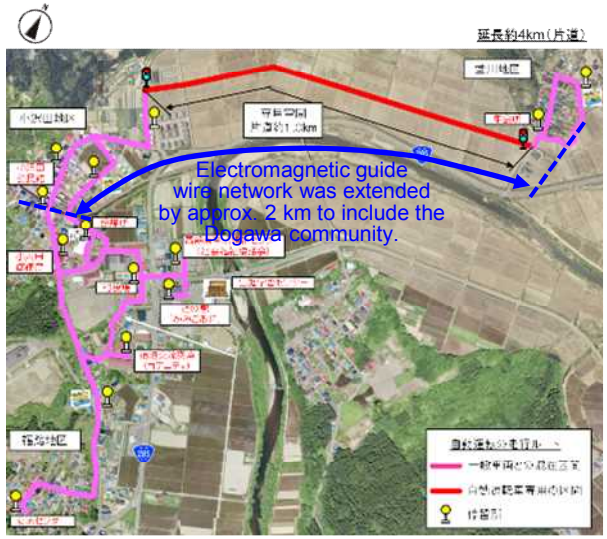
⇒ Electromagnetic guide wire positioning in deep-snow areas should be reviewed for more dependable wintertime operation.

On-site survey with the snow removal contractor

Removing snow above the guide wire position

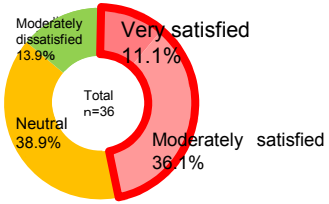
<Installation of new underground electromagnetic guide wire>

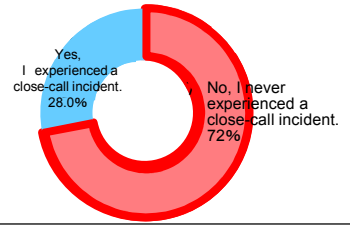
○ The electromagnetic guide wire network was extended to include an additional village community for greater convenience for elderly residents.



This map is based on the GEOSPACE published by NTT GEOSPACE

○ Questionnaire findings indicate that half the local residents along the test travel route were satisfied with the test result. Concerning safety aspects, more than 70% of the respondents answered that they did not experience any close-call incidents.





7. Kamikoani (test result)

Test result 2 (technical and operational aspects of automated driving service)

○ An operation control center was set up to receive, process and monitor ride reservations and also to track the vehicle position and provide remote in-cabin monitoring.
(A fuel charge of 20 yen per ride was collected in exchange of a ride ticket to be valid for the whole day on the day.)

○ An online reservation system was set up, but most of the reservations were made by phone.

○ User preference about the type of service was equally split between scheduled tours and on-demand runs.

<Remote operation monitoring from the operation control center>

○ Remote operation monitoring from the control center was provided by obtaining real-time in-cabin images and tracking the vehicle position.

Operation control center
(set up inside the information service center in Michi no Eki)

In-cabin images and sound were monitored from the operation control center on a real-time basis.

In-cabin monitoring (image and sound)

In-cabin monitoring image

Vehicle position tracking

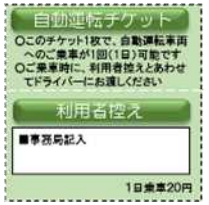
<Reservation and ride management for the automated driving service>

○ Users purchased a 20 yen ticket at the Michi no Eki before getting on the cart.

○ Reservation can be made online from smartphone, etc. or by telephone.

○ In the test, more reservations were made by telephone than via online system. System usability improvement and other efforts should be pursued for more active use of online reservation system in the future.

Operation control center inside the Michi no Eki

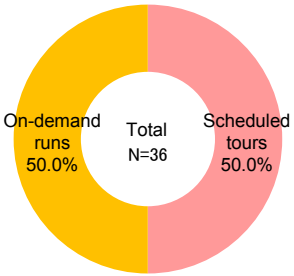


Ride ticket

[Bus stop selection screen]
Smartphone-based reservation system

Evaluation of the types of tours

User preference for scheduled tours and on-demand (reserved) runs was equally split between the two.



7. Kamikoani (test result)

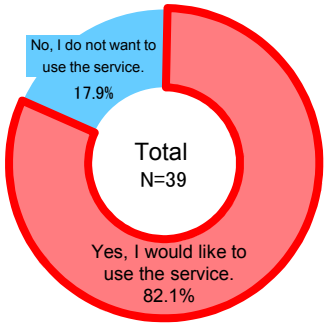
Test result 3 (business model building)

○ Approximately 82% of the user questionnaire respondents answered that they are willing to use automated driving service. Approximately 43% of the respondents answered they are willing to pay “About 100 yen”, which was the answer given by the largest number of respondents. Approximately 30% answered that they are willing to pay “About 200 yen”.
Approximately 43% of the respondents answered they are willing to pay “About 1000 yen” for monthly subscription, which was the answer given by the largest number of respondents. Approximately 35% answered that they are willing to pay “About 2000 yen” for monthly subscription.

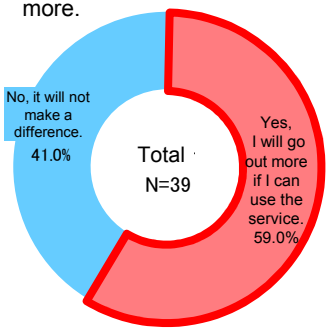
○ These results show that we can reasonably hope that the automated driving service will encourage local residents to go out more.

<Post-test questionnaire conducted on residents along the test route>

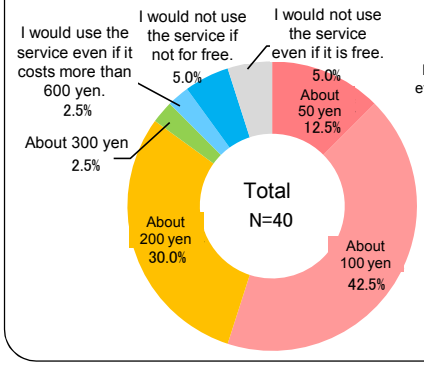
・More than 80% of the respondents answered that they are willing to use automated driving service in the future.



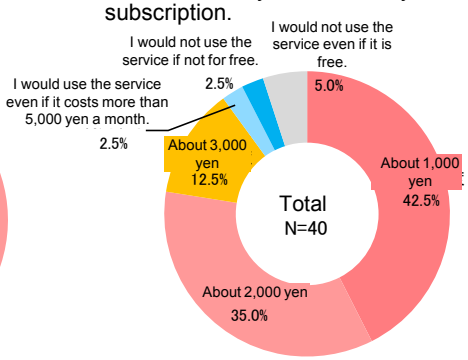
・We can reasonably hope that the automated driving service will encourage local residents to go out more.



・The largest number of respondents answered that they are willing to pay about 100 yen for a single ride.

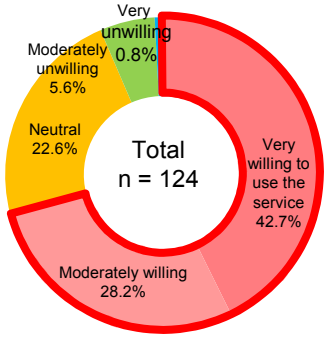


・The largest number of respondents answered that they are willing to pay 1,000 to 2,000 yen for monthly subscription.

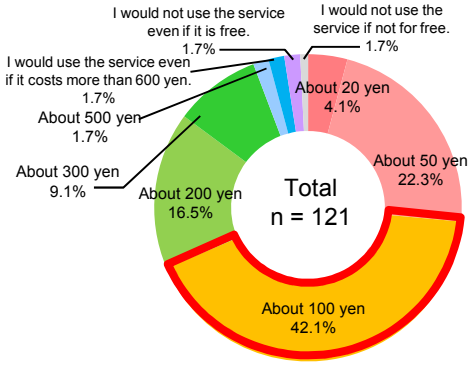


<Questionnaire conducted on passengers immediately after ride (including both local residents and visitors>

・More than 70% of the respondents answered that they are willing to use automated driving service in the future.



・The largest number of respondents answered that they are willing to pay about 100 yen for the service.



<Operating system>

○ Operation staffing
- The operating team of eleven drivers and 2 reservation operators was staffed by local volunteers, most of whom are people in 60s or older.
- Many commented that the automated vehicle can be safely manned by elderly drivers because it travels at low speed.
- Reservations were mostly received by telephone and entered into the reservation system by operators.
- There is a reasonable hope that operation control duties can be remotely performed from the Michi no Eki in a future service (based on comments by Michi no Eki staffers).

8. Michi no Eki Ashikita Dekopon (Test overview)

■ Overview of the field operational tests

Period	From 27th January to 15th March, 2019 Note: Service was provided everyday except for Sundays.
Object	• Provide transportation supports for the elderly and others in shopping, hospital visits, and other activities. • Support farm product collection.
Population in areas along the ADS route	883 households, 2,116 persons (As of 1st April, 2018)
Test route	Routes connecting life hubs including Michi no Eki Ashikita Dekopon, Ashikita town office, Sashiki Station (Hisatsu Orange Railway), and hospitals.
Travel distance	About 8 km in total Michi no Eki route: About 4 km, about 50 minutes/tour Town office route: About 3 km, about 40 minutes/tour; When Sashikigawa route is reserved, the automated driving vehicle runs on Town office route plus Sashikigawa route (about 4 km/tour).
Running method	Mixed traffic of automated and general vehicles (on public roads); Automated driving level 2 (A driver rode on the automated driving vehicle.)
Operational pattern	Regular operation: 15 tours/day (Michi no Eki route: 7 tours, Town office route: 8 tours) Michi no Eki route at around 9:00, 10:00, 11:00, 12:00, 13:00, 14:00, and 15:00 Town office route at around 8:00, 9:00,10:00, 11:00, 12:00, 13:00, 14:00, and 15:00 Note: Regarding farm product collection, service is provided when there is demand. In the case, the automated driving vehicle starts from Michi no Eki at around 8:00.

■ Vehicle used in the tests

Human transportation

○ Cart (capacity: 6 persons, by Yamaha Motor)

○ Driving speed:12 km/h (at automated driving)

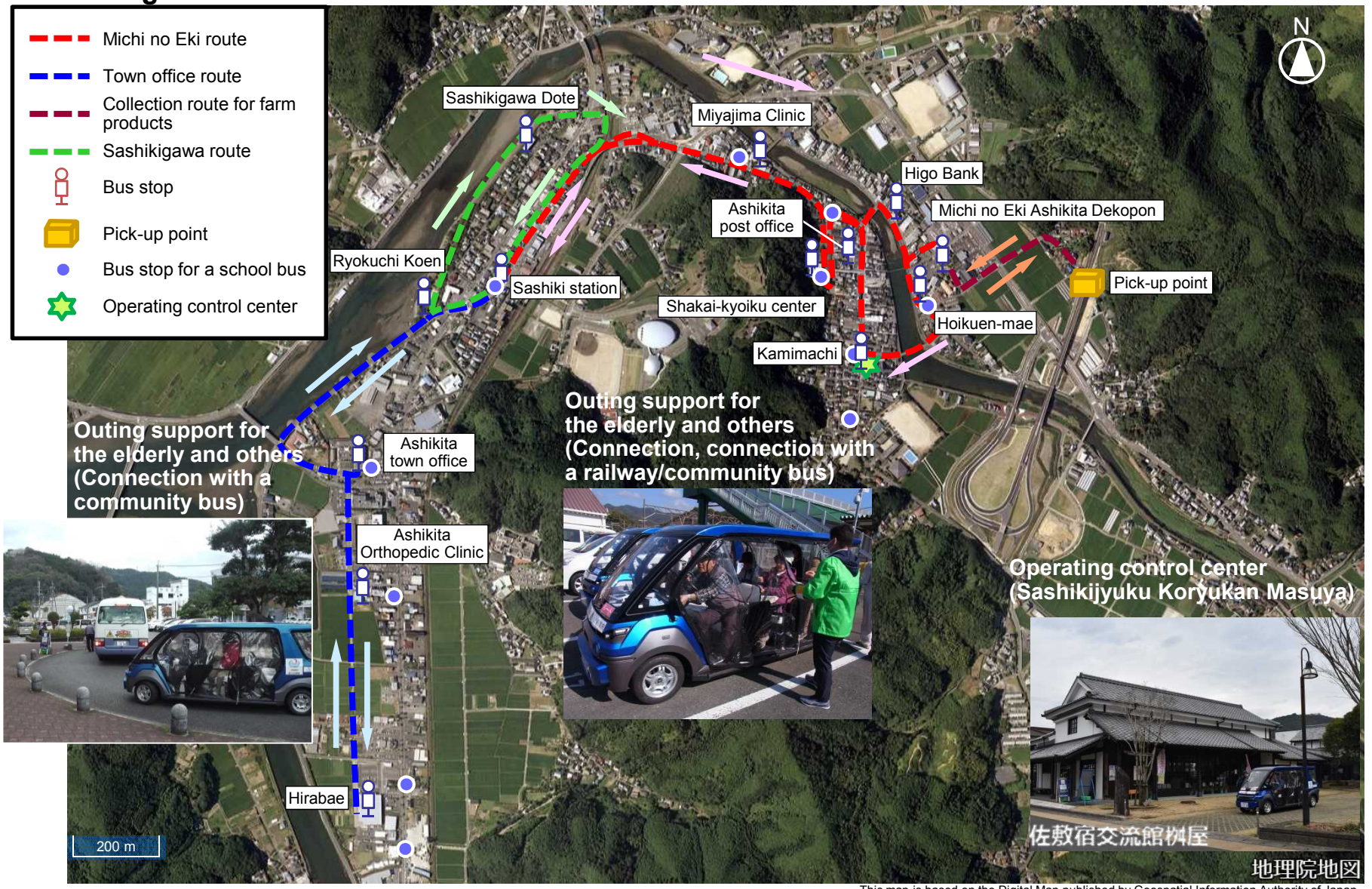
Cargo transportation

○ Cart (capacity: 4 persons, by Yamaha Motor), towed vehicle (load capacity: Up to 300 kg)

○ Driving speed:12 km/h (at automated driving)

8. Michi no Eki Ashikita Dekopon (Traveling route)

■ **Traveling route: About 8 km in total**

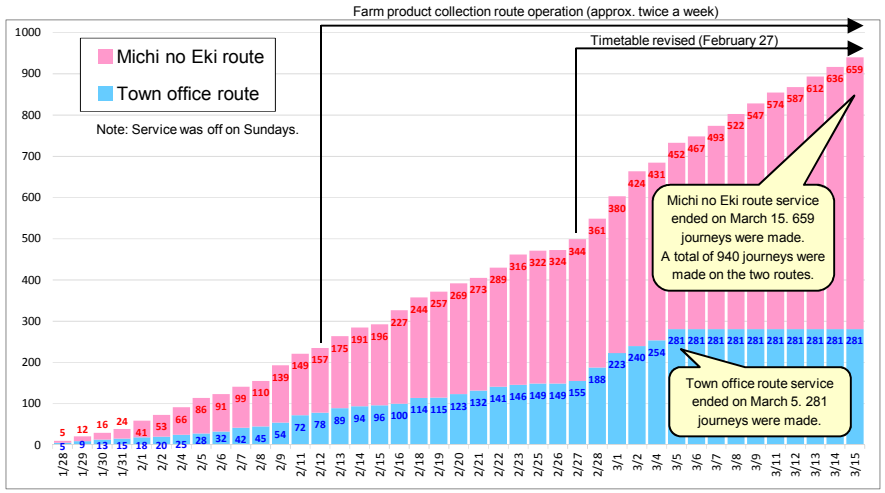


This map is based on the Digital Map published by Geospatial Information Authority of Japan

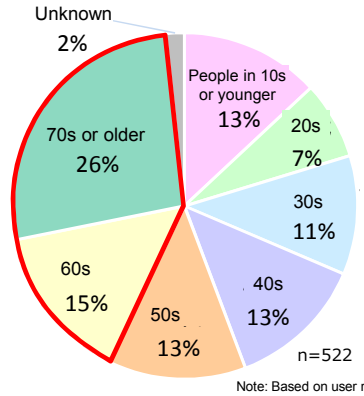
8. Ashikita Dekopon (test result)

<Use statistics>

○ A total of 940 journeys were made (782 by general users and 158 by test organizers and observers).
659 journeys made on the Michi no Eki route (41 days)
281 journeys made on the town office route (32 days)



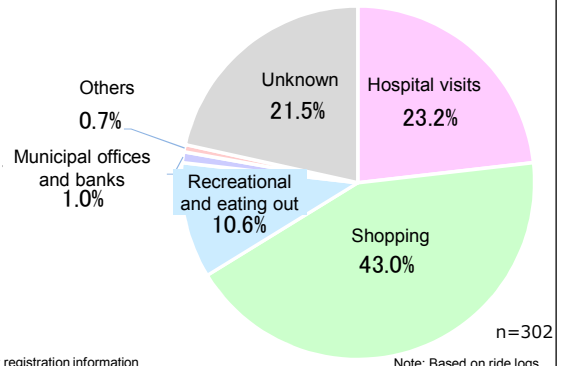
・Age groups of registered users (general users only)



Note: Based on user registration information

Approx. 40% of registered users were in their 60s or older.

・Composition of non-business service uses (General users only)



Note: Based on ride logs

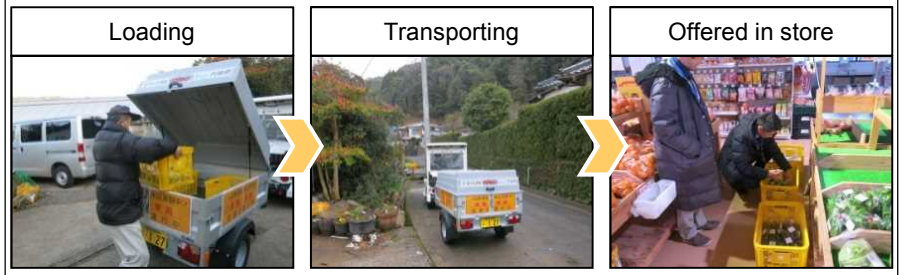
Approx. 40% of the journeys were made for shopping.

<Operation along farm product collection route>

○ One round trip a day was made to collect farm products along the route (free of charge).

● Transportation from the Hashimoto Farm to the Michi no Eki Ashikita Dekopon

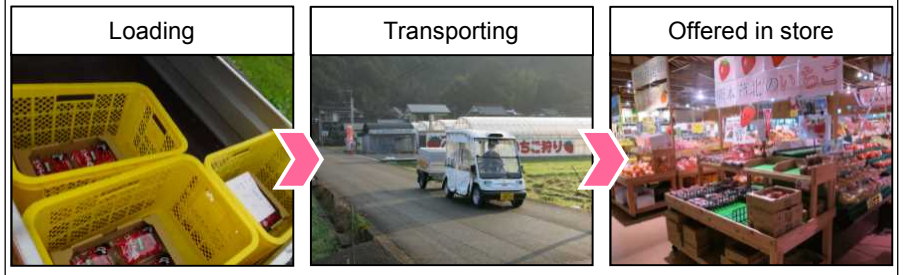
・Collection service was provided on February 12, 16, 19, 23 and March 2 and 5.
・Cucumbers (two containers) and green bell peppers (one container) were transported.



3 containers were transported per tour.

● Transportation from the Takamine Farm to the Michi no Eki Ashikita Dekopon

・Collection service was provided on February 20, 22 and 27 and March 1 and 6
・Strawberries (3 cartons) were transported.



3 containers were transported per tour.

8. Ashikita Dekopon (test result)

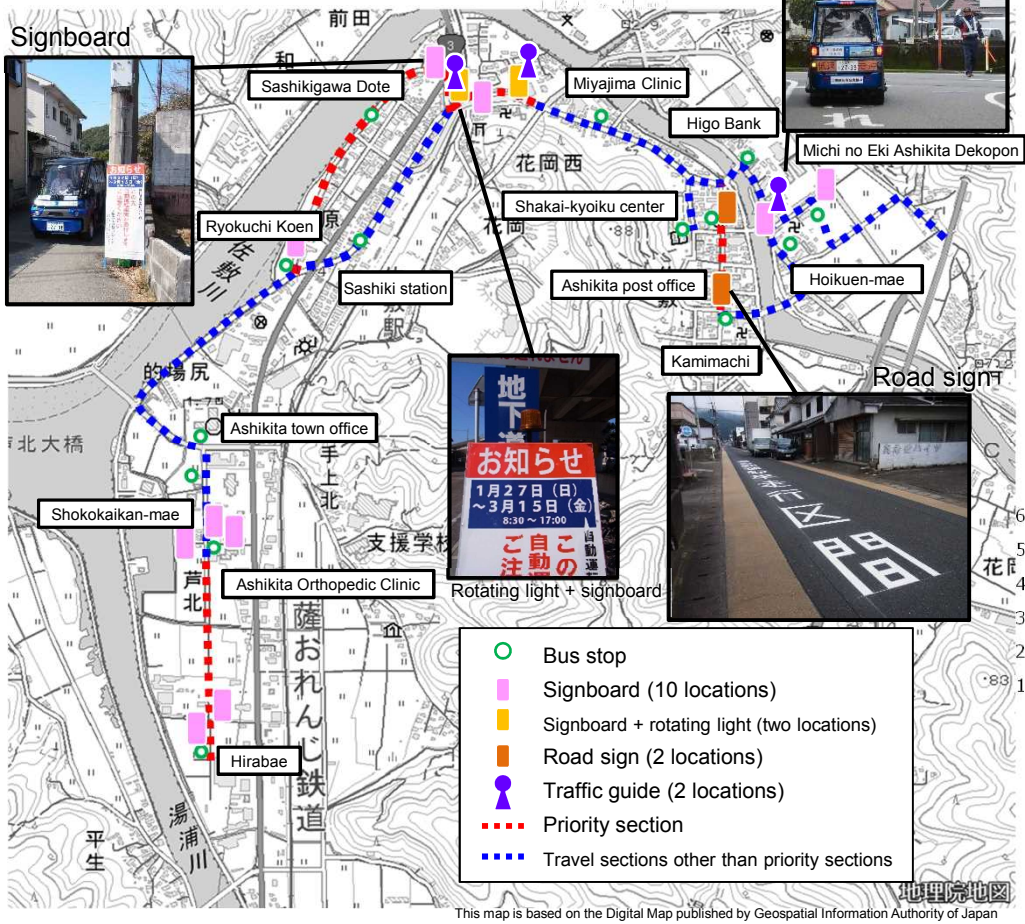
Test result 1 (securing a drivable route for automated driving)

○ To best accommodate mixed traffic, efforts were made, by **installing rotating lights, signboards and road signs**, to let the public know that automated vehicles will be traveling in the area.

➡ Manual operation interventions were frequently required in residential areas to pass a vehicle parked on the road.

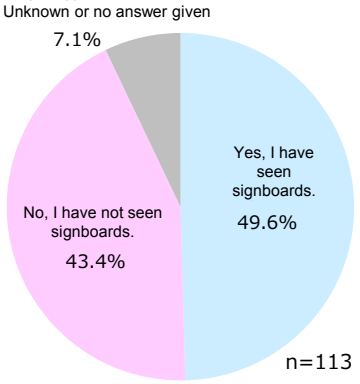
➡ Road sign installation decreased the number of manual operation interventions to pass parked vehicles.

■ **Positions where signboards and other notification features were installed**

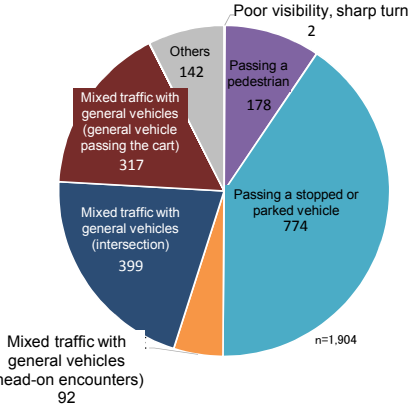


This map is based on the Digital Map published by Geospatial Information Authority of Japan

■ **Have you seen the signboards?**

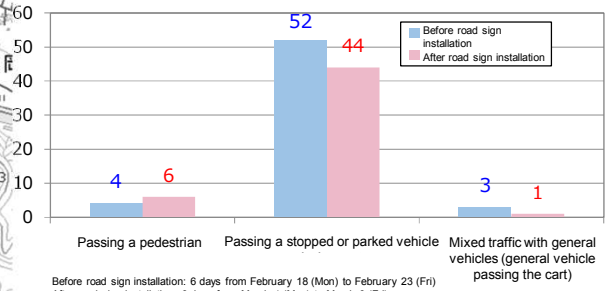


■ **Composition of the number of manual interventions by reason**



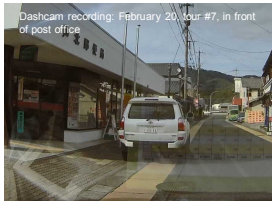
■ **Changes in the number of manual interventions before and after road sign installation**

・Number of manual interventions

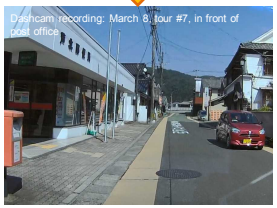


Before road sign installation: 6 days from February 18 (Mon) to February 23 (Fri)
After road sign installation: 6 days from March 4 (Mon) to March 9 (Fri)
Section: Town route Hana Higashi Motomachi line

Road sign installation decreased the number of manual operation interventions that are required to pass parked vehicles.



Before road sign installation



After road sign installation

8. Ashikita Dekopon (test result)

Test result 2 (technical and operational aspects of automated driving service)

○ An operation control center was set up to receive, process and monitor ride reservations and also to track the vehicle position and provide remote in-cabin monitoring.
(A fuel charge of 10 yen per ride was collected. An IC card-type ride pass was issued to users (at a price of 50 yen for five rides). The pass was held over the reader to be scanned when the user gets on and off the bus.)

○ Approximately 20% of on-demand reservations were made by telephone. About 80% of the reservations were made by asking a staffer at the Michi no Eki.

<Operation control center and reservation processing>

Operation control center
(Reservations were received by telephone and managed on the web.)

User registration and ride reservation processing
(Registrations were received by telephone. An IC card-type ride pass was issued to the user.)

Note: User registration and reservation were also received at the Michi no Eki, town office and other locations.

<Vehicle monitoring>

Transmitting the position information

Tablet device

In-cabin monitoring camera
(Webcam)

In-cabin monitoring and vehicle position tracking
(using a webcam and voice call functionality)

<Reservation and ride management system for the automated driving service>

Reservation system
(from PC or smartphone)

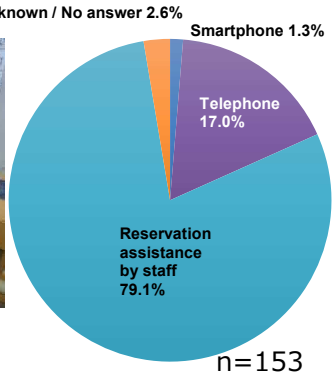
Reservation management screen
(monitoring reservations and vehicle operating status)

Web reservation system (from PC or smartphone)

IC card-based ride management

A staffer providing reservation assistance using a tablet

・Ride reservation method



Note: Findings from the questionnaire conducted immediately after test

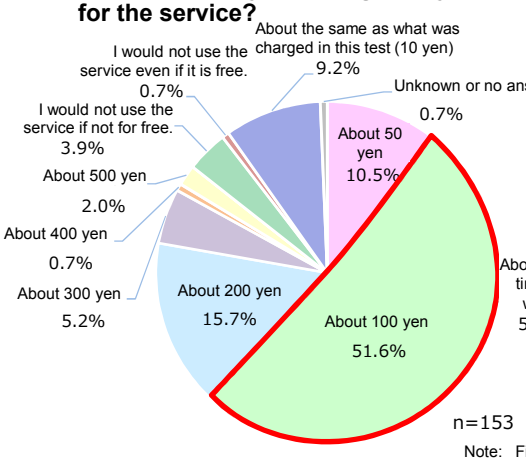
8. Ashikita Dekopon (test result)

Test result 3 (business model building)

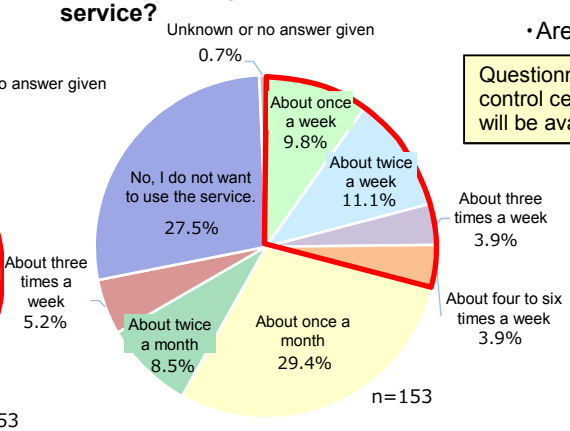
○ Approximately 50% of the user questionnaire respondents answered that they are willing to pay “About 100 yen” for a single ride of automated driving service, which was the answer given by the largest number of respondents. Approximately 30% answered they would use the service “several times a week” if a full-scale service commences.

○ To start up a full-scale operation **(with 2 vehicles as an estimate), 6 volunteer workers (4 drivers and 2 control center operators, to be rotated on a daily basis) must be secured.**

■ **How much are you willing to pay for the service?**



■ **How often will you use the service?**

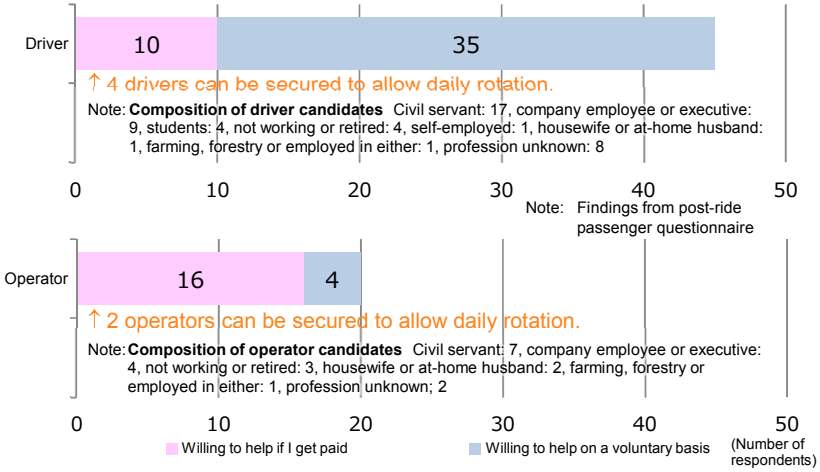


Note: Findings from the passenger questionnaire conducted immediately after ride

■ **Securing manpower for driving and operation control center duties**

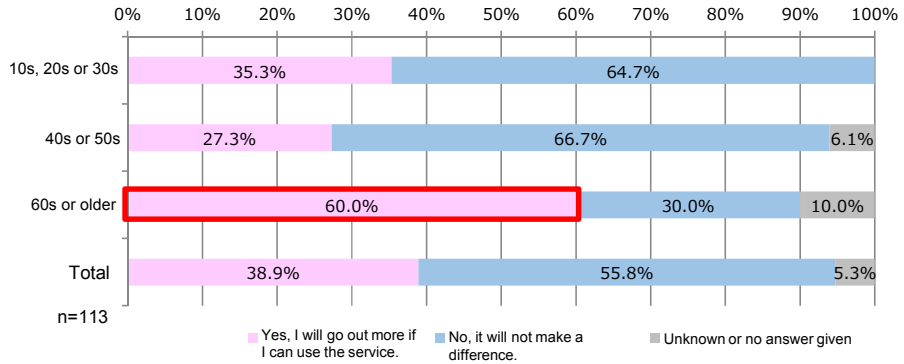
・Are you willing to help with driving or operation control center duties?

Questionnaire findings indicate that the required manpower for both driving and operation control center duties can be secured by recruiting volunteer workers. 6 volunteer workers will be available, which is sufficient to staff the driving crew and the operation control center.



Note: Findings from post-test questionnaire

■ Do you think that you will go out more if you can use the service?



Note: Findings from post-test questionnaire

・Operation by paid volunteer workers

・Automated driving service by **paid volunteer workers from the local community**.
・I felt uneasy to drive the vehicle at first because it was different from the cars I usually drive and also the travel speed was very slow, but I eventually got used to it and was able to pilot the vehicle smoothly. I would like to ride the vehicle again with my children.
(Comments from a paid volunteer worker)

9. Cosmall Taiki (test overview)

■ Overview of the field operational tests

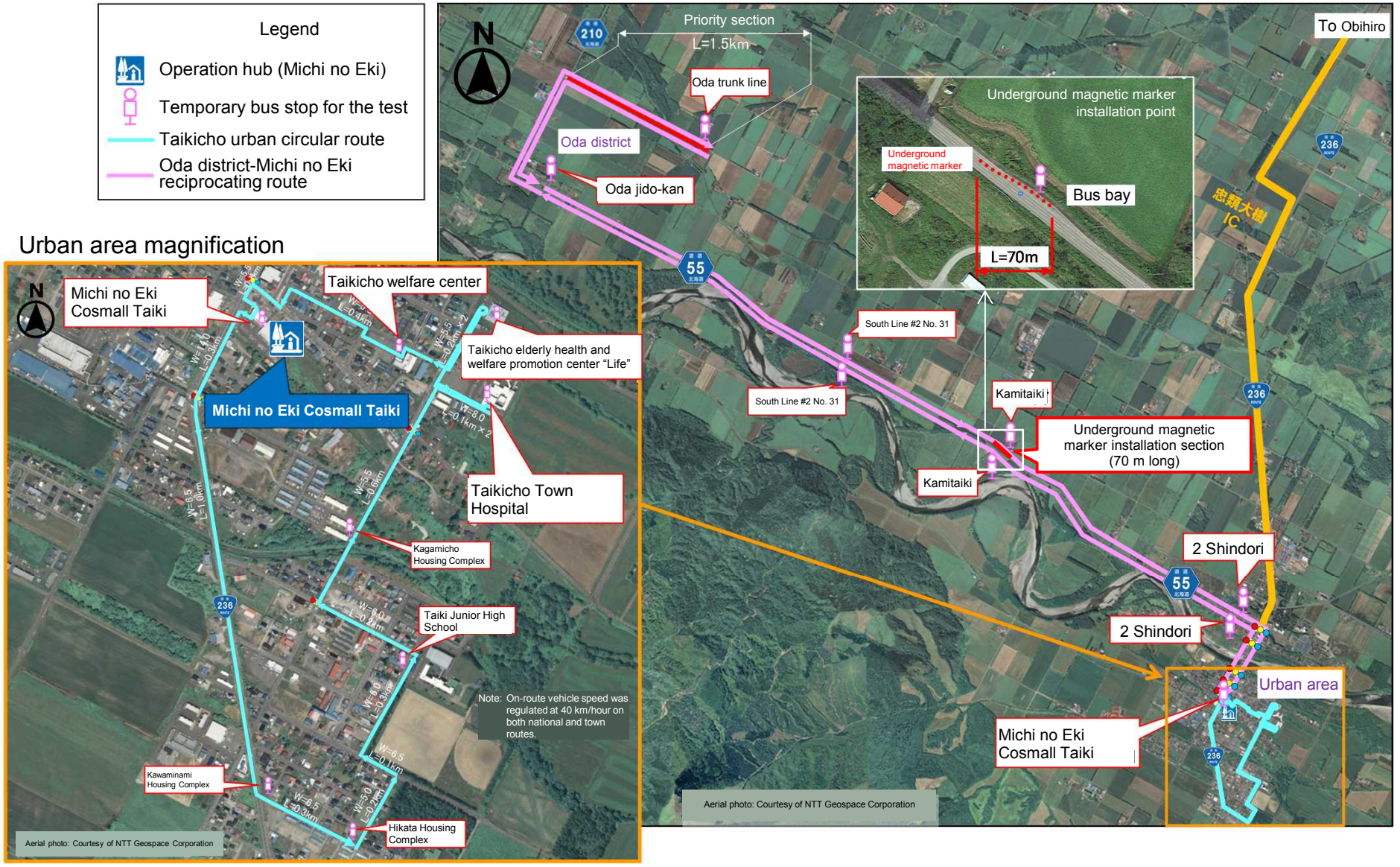
Period	May 18 (Sat) to June 21 (Fri), 2019　　Note: Service was offered every day except on Sundays.
Objects	・Determine what criteria and requirements should be established to secure a drivable route for the automated driving service, and how to design the operation control system and what business model should be built to suit the local characteristics of the region. Note: The municipality has conducted the nation's first long-term validation test of onerous passenger transportation with private vehicles.
Population in areas along the ADS route	Along the urban circular route: 2,026, reciprocating route from Michi no Eki route in Oda district: 511 (from the 2015 National Census data)
Test routes	Urban circular route: Starts from the Michi no Eki Cosmall Taiki and connects residential clusters and medical and social welfare facilities in a circular manner. Oda district-Michi no Eki reciprocating route: Connects the Oda district and the Michi no Eki Cosmall Taiki.
Travel distance	Approx. 16.5 km Urban circular route: Approx. 4 km, completed in about 25 minutes Oda district-Michi no Eki reciprocating route: Approx. 12.5 km, completed in about 30 minutes
Running method	An Automated Driving Level 2 vehicle (backup driver is on board) drives through mixed traffic (open road).
Operational pattern	Scheduled tours: 15 tours a day (increased to 17 tours a day during the final week) Urban circular route: 12 tours (increased to 14 tours a day during the final week) Oda district-Michi no Eki reciprocating route: 3 tours a day Note: 2 additional tours a day were run on the urban circular route during the final week of the test period. Urban circular route operation time table: After 6 o'clock (final week only), 8 o'clock (two tours), 9 o'clock, 10 o'clock, 11 o'clock, 13 o'clock (two tours), 14 o'clock, 15 o'clock, 16 o'clock, 17 o'clock (two tours) and 18 o'clock (final week only) Oda district-Michi no Eki reciprocating route: After 9 o'clock, 11 o'clock and 14 o'clock

■ Vehicle used in the tests

- ○ Bus type (capacity: 10 persons, by Advanced Smart Mobility)
- ○ Driving speed: About 35 km/h
  Note: 40 km/h at maximum

9. Cosmall Taiki (test overview)

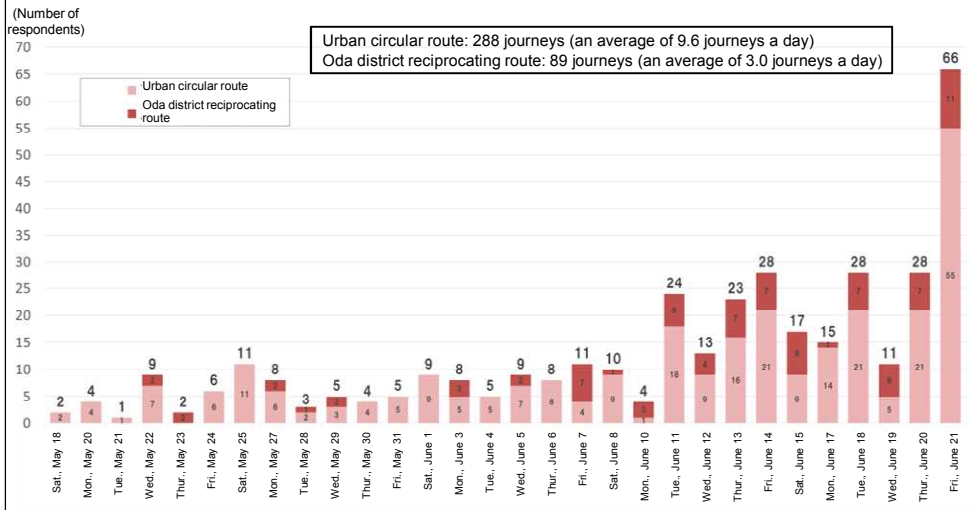
■ **Travel routes: A total of 16.5 km**



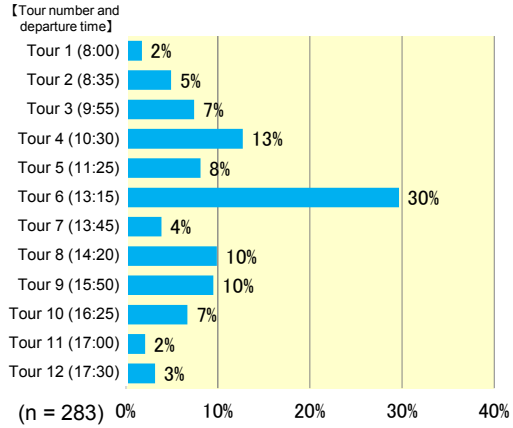
9. Cosmall Taiki (test result)

<Use statistics>

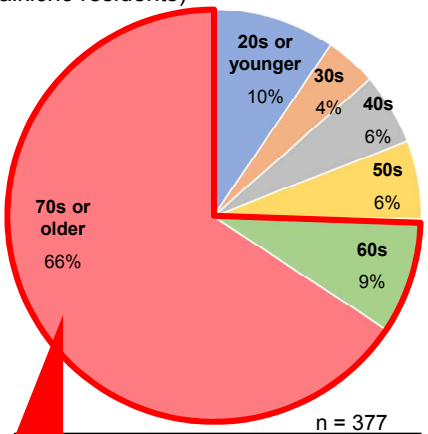
○ A total of 377 journeys were made by Taikicho residents.
(An average of 13 journeys a day were made excluding those made by outside test observers.)



・Number of journeys by nth tour
(Urban circular route, Taikicho residents)



・Age groups of registered users
(Taikicho residents)



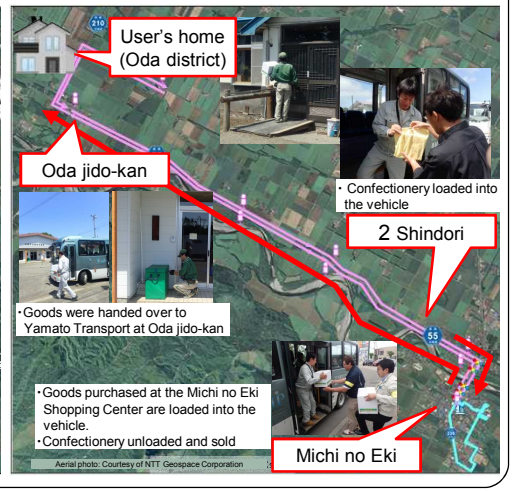
3/4 of the users were people in 60s or older.

<Mixed human-and-cargo transportation to carry processed products; coordination with home delivery services>

○ A total of 10 tours were run for mixed human-and-cargo transportation.

• Taikicho urban circular route (2 tours)
Processed products (ice cream) were transported by the automated vehicle to the Michi no Eki and were sold there.

• Oda district-Michi no Eki reciprocating route (8 tours)
Processed products (confectionery) were transported by the automated vehicle to the Michi no Eki (2 tours). Goods purchased at the Michi no Eki were transported to buyers using the automated vehicle through collaboration with Yamato Transport Co., Ltd.



<Coordination with the wide-area intercity bus service>

○ This field test linked the automated vehicle service with the wide-area intercity bus service connecting Obihiro and Taiki on a trial basis for coordinated service.

Michi no Eki → Michi no Eki ⇒ Obihiro Hiroo Line・Churui Taiki IC ⇒ Kawanishi IC ⇒ Obihiro station area

Automated vehicle

Users can transfer from the automated bus to the intercity bus at the Michi no Eki.

Intercity express bus

Commercial complex near Obihiro station

Obihiro station bus terminal

9. Cosmall Taiki (test result)

Test result 1 (securing a drivable route for automated driving)

○ To best accommodate mixed traffic, signboards and pictographs were installed along all the routes to let the people know that automated vehicles will be traveling in the area.

○ An automated vehicle priority section was set up in part of the Oda district-Michi no Eki reciprocating route. The section was marked with signboards with rotating light.

○ Underground magnetic markers were installed along the Oda district-Michi no Eki reciprocating route for vehicle-to-infrastructure integration. Vehicle stop control accuracy was compared with that of GPS-based control.

<Securing a drivable route for the automated vehicle>

○ Signboards and pictographs were installed along the automated vehicle travel route to notify the public.

○ Rotating lights were installed to mark and segregate the priority section from the general vehicle traffic.

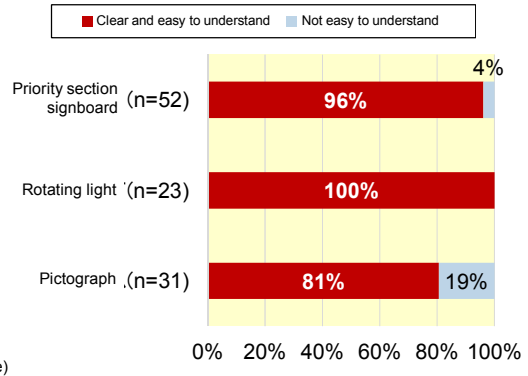
Type of signboard	Type of location	Number of locations	
		Circular route	Oda route
Guide signboard	Near a temporary bus stop	8 locations	14 locations
Guide signboard with rotating light	At the start and end of a priority section	-	2 locations
Pictograph	At the start and end of a priority section, National Route 236	4 locations (attached to roadside fixtures)	2 locations (affixed to road surface)

Guide signboard

Pictograph

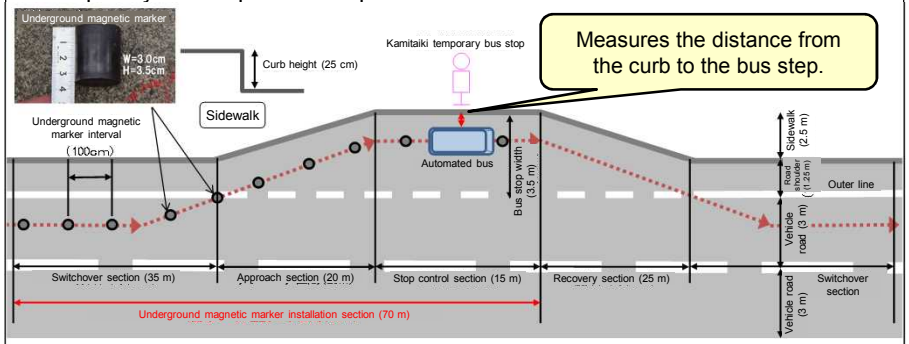
(attached to roadside fixtures) (affixed to road surface)

○ Questionnaire findings indicate that more than 80% of the respondents thought that the signboard features were “clear and easy to understand”.



<Underground magnetic marker installation>

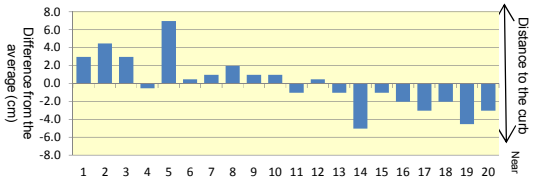
○ Underground magnetic markers were installed inside the bus bay where a temporary bus stop was set up.



○ Comparison of vehicle stop control accuracy between GPS-based control and magnetic marker control based on distance measurement revealed that magnetic marker control is more accurate and allowed smaller variation than GPS-based control.

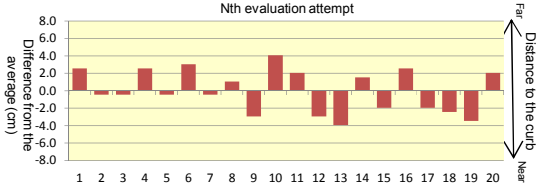
◆ RTK-GPS

- Average: 78.0 cm
- Range: -5.0 cm to 7.0 cm
- Standard deviation: 2.9
- Number of measurements: 20



◆ Magnetic marker control

- Average: 70.5 cm
- Range: -4.0 cm to 4.0 cm
- Standard deviation: 2.4
- Number of measurements: 20



【Reference】 Vehicle stop control accuracy in SIP Phase I
Stop control accuracy evaluation result
(Surveyed in Okinawa with 20 measurements)

	GPS(RTK)	Underground magnetic marker
Vehicle stop control accuracy	±10cm	±8cm

9. Cosmall Taiki (test result)

Test result 2 (technical and operational aspects of automated driving service)

○ An operation control center was set up to receive and process user registration and receive process and monitor ride reservations, and also to track the vehicle position and provide remote in-cabin monitoring. (A charge of 100 yen was collected for a single ride on the urban route and the same of 200 yen was collected on a single ride on the Oda route. Coupons for the anticipated number of rides were sold in advance.) A QR code-printed ride pass was issued to users (the user held the pass over the reader to be scanned when getting on and off the bus).

○ Most reservations were made by the phone with only 3% made via online system. Approximately 70% of the respondents answered that the IC card-type pass was “convenient”. (However, IC card system was not actually used for toll collection in the test.)

<Operation control center and reservation processing>

Operation control center

Coupon and ride pass issued to a registered user

Receiving transportation request for goods purchased at the Michi no Eki Shopping Center

<Vehicle monitoring>

Remote in-cabin monitoring

(Signage)

(Smartphone)

Real-time vehicle position information

<Reservation and ride management for the automated driving service>

・Reservation management system

Reservation system (smartphone)

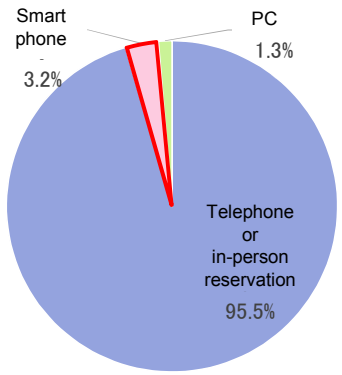
Reservation management screen (monitoring reservations and vehicle operating status)

Web reservation system (from PC or smartphone)

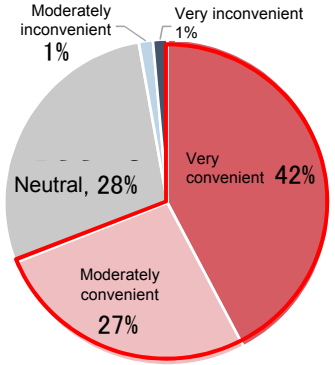
・Ride management

QA code-printed ride pass for ride management

・Reservation method



・How convenient did you think the QR code-printed pass was?



(n=70)

9. Cosmall Taiki (test result)

Test result 3 (business model building)

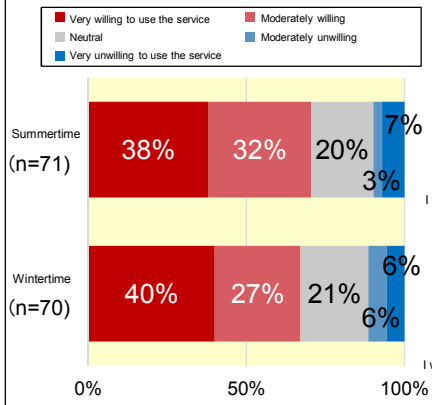
○ Building on the experience of onerous passenger transportation with private vehicles, a charge of 100 yen was collected for a single ride on the urban route and the same of 200 yen was collected on a single ride on the Oda route.

○ Approximately 50% of the respondents answered they are willing to pay 100 yen for an urban route ride, which was the answer given by the largest number of respondents. Approximately 40% answered they are willing to pay 150 yen or more. Approximately 40% answered that they will go out more if a full-scale service commences.

○ Approximately 40 to 50% the respondents answered they are willing to help the service (as a driver, conductor or control center operator) on a voluntary basis.

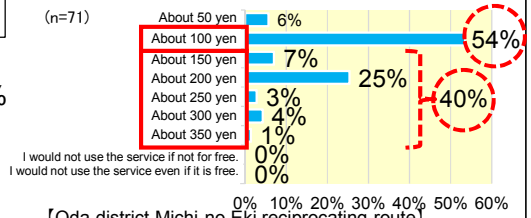
<Willingness to use the automated driving service in the future>

・Are you willing to use the service? (post-test questionnaire)

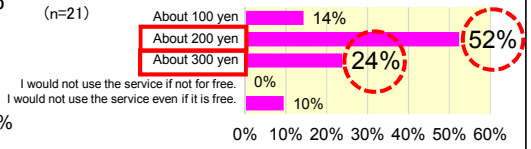


・How much are you willing to pay for the service (post-test questionnaire)

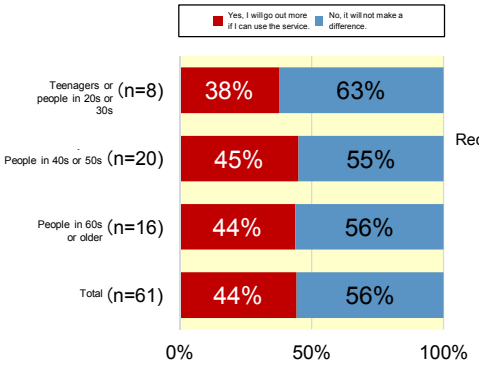
【Urban circular route】



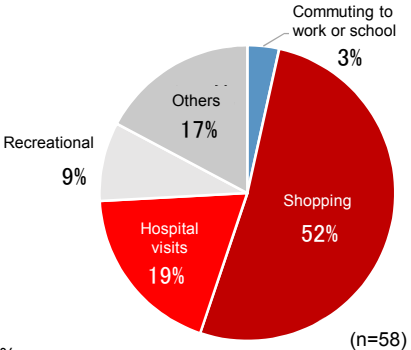
【Oda district-Michi no Eki reciprocating route】



・Do you think that you will go out more if you can use the service?

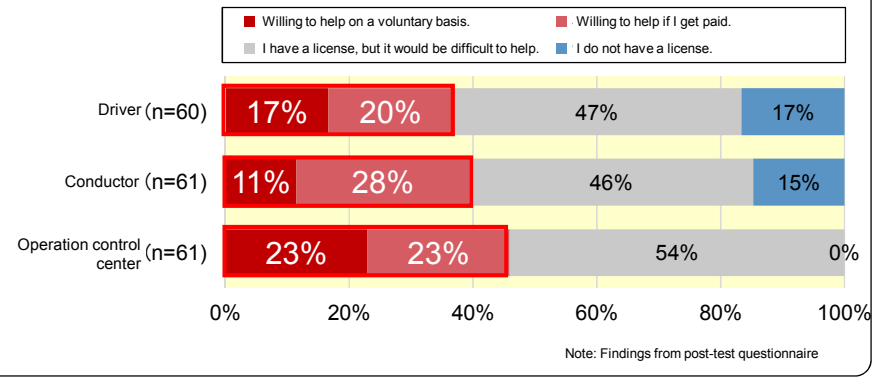


・Intercity express bus service



<Willingness to help the service on a voluntary basis>

・Are you willing to help the service as a driver/conductor/control center operator on a voluntary basis?



Note: Findings from post-test questionnaire

<Operating system>

○ Operation staffing

・Two drivers and four reservation operators from the local community were secured on a voluntary basis to operate the test. In addition, two full-time employed staffers helped with the reservation duties.

○ Driver availability

・Serving as a backup driver on the automated vehicle requires the person to constantly stand by and remain alert with his or her hands held close to the steering wheel at all times so as to be ready to provide manual intervention in the event of emergency. This is mentally and physically demanding and is not easy to do. Backup drivers for a bus-type vehicle used in this test should preferably be people with a professional experience of large bus operation.

○ Securing manpower for the operation control center

・Having voluntary workers from the local community as user registration/ride reservation receptionists to provide person-to-person service is desirable as it will lead to greater personal and information exchanges between town residents and will encourage active use of the service.

10. Hitachi Ota (test overview)

■ Overview of the field operational tests

Period	29 days from June 23 (Sun) to July 21 (Sun) 2019
Objects	・Providing convenient means of everyday transportation by linking the existing local bus network and automated bus service. ・Securing safe transportation in areas with significant height differences.
Population in areas along the ADS route	Number of households along the test route: 30 households, population: 80 people (according to the Hitachi Ota City Office information)
Test route	Circular route connecting the Takakura Regional Exchange Center, Kubota Bashi bus stop and the post office.
Travel distance	Approx. 1.8 km (completed in about 20 minutes)
Running method	An Automated Driving Level 2 vehicle (a backup driver is on board) drives through mixed traffic (open road).
Operational pattern	Scheduled tours: 6 tours (weekdays), 3 tours (Sundays and holidays). On-demand runs are available as required.

■ Vehicle used in the tests

Human transportation

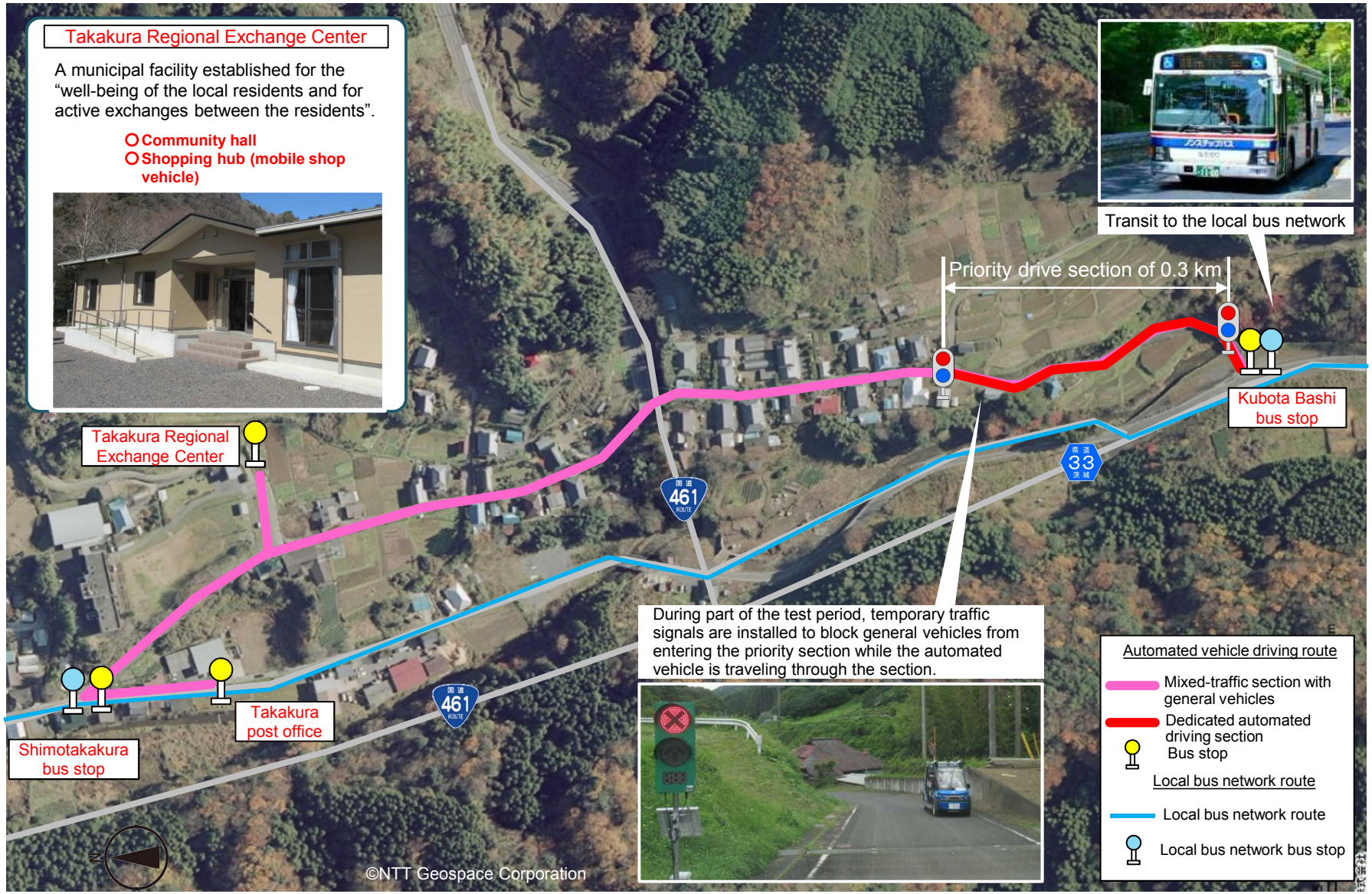
○ Cart (capacity: 6 persons, by Yamaha Motor)
○ Driving speed:12 km/h (at automated driving)

Cargo transportation

○ Cart (capacity: 4 persons, by Yamaha Motor), towed vehicle (load capacity: Up to 300 kg)
○ Driving speed:12 km/h (at automated driving)

10. Hitachi Ota (test overview)

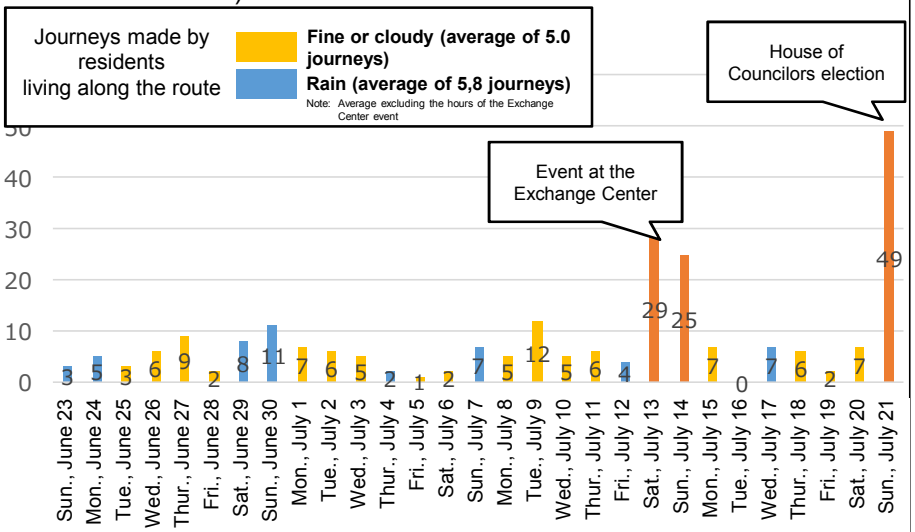
■ **Traveling route: About 0.9 km (one way)**

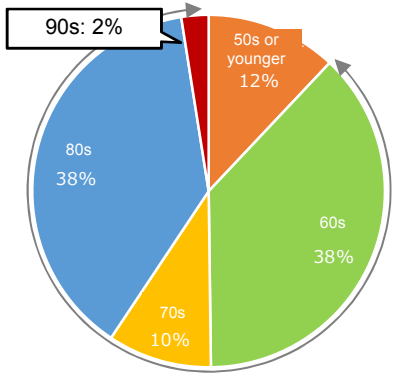


10. Hitachi Ota (test result)

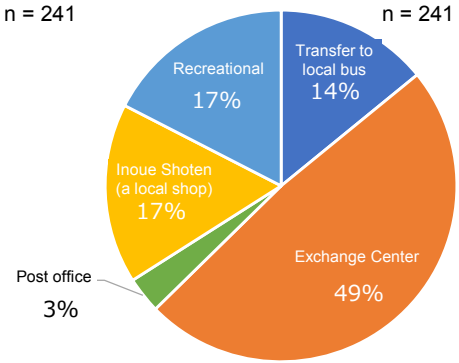
<Use statistics>

○ A total of 241 journeys were made
(a daily average of 8.5 journeys excluding those made by riders from outside the area).





Approximately 90% of the users are in their 60s or older.

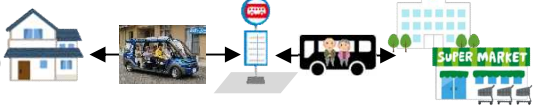


Approximately 14% of the journeys were made for transfer to the local bus network. The largest number of journeys, or about 50% of the total, is for transportation to the Exchange Center.

<Transfer to and from the local bus network>

○ Typically, a user can travel from home to the local network bus stop by the automated vehicle service and then transfer to the local network bus to travel to the center of the city for shopping or hospital visits.

● Home ⇔ bus stop ⇔ center of the city
(for shopping, hospital visits, etc.)



Transfer to local bus network

← Shopping using the service

→ Visiting a hospital using the service

<Coordination with the mobile shop and the local shops>

○ Transportation to and from the mobile shop operating at the Takakura Regional Exchange Center

○ Transportation to and from the local shops and the post office

Transportation to and from the mobile shop and human-and-cargo mixed transportation service

Transportation to and from local shops

10. Hitachi Ota (test result)

Test result 1 (securing a drivable route for automated driving)

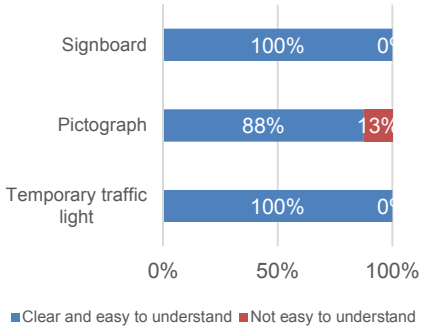
- ○ Priority section was marked and protected with temporary traffic signals and standardized-logo markers on the road. These marking features are positively rated in the questionnaire, that they are “clear and easy to understand”.
- ○ The largest number of manual interventions were made in order to pass oncoming vehicles.
- ○ The largest number of “close-call” incidents perceived by riders were associated with hard-braking maneuvers.

<Securing a priority driving section>

- ○ Safety map was distributed in the area to let the residents know where the automated vehicle will be traveling and where the tight road sections are.
- ○ Signboards, road signs and temporary traffic lights were installed along the route to mark and protect the priority section.

Road signs with a standard logo to mark the travel route (pictograph)

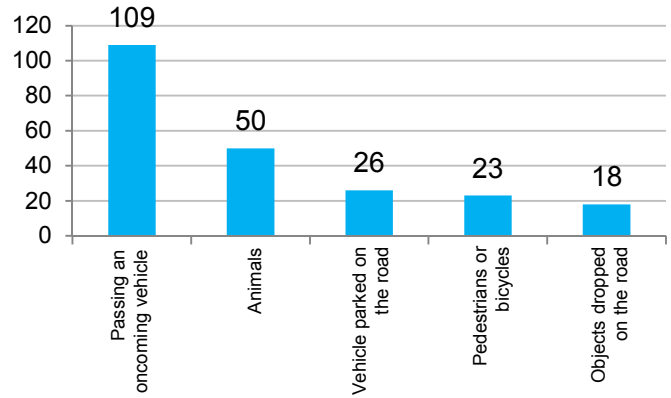
Priority section control with temporary signal lights.



Post-test questionnaire result (conducted on local residents)

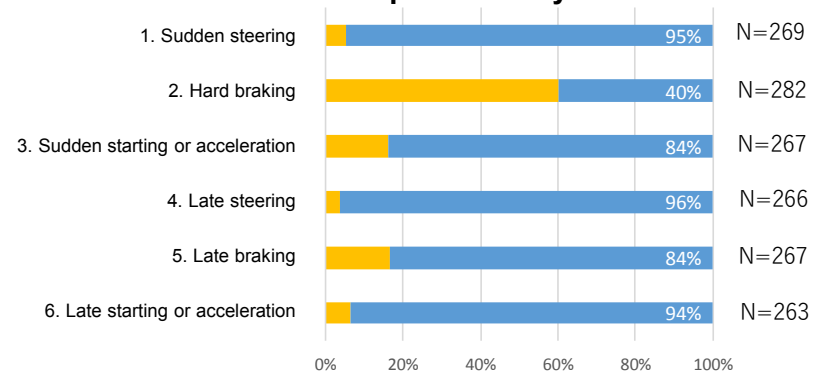
<Reasons for manual intervention (five most frequent ones)>

N = 500



(Total travel distance covered during the test: Approx. 678.6 km)

<“Close-call” incidents perceived by the riders>



Post-ride passenger questionnaire (including residents living along the route, Hitachi Ota City residents and test observers)

10. Hitachi Ota (test result)

Test result 2 (technical and operational aspects of automated driving service)

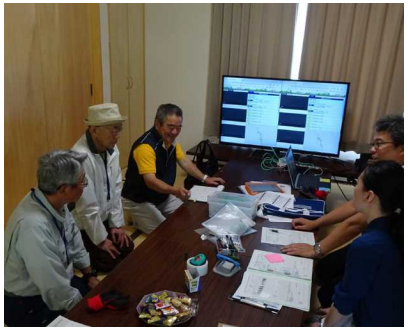
○ An operation control center was set up inside Ibaraki Kotsu to receive, process and monitor ride reservations and also to track the vehicle position and provide remote in-cabin monitoring.

○ A ride reservation tablet terminal was distributed to residents living along the route. Post-test questionnaire revealed that approximately 40% of the residents used this tablet to make ride reservations. Only one person made reservation by telephone, indicating that the tablet reservation system was actively used by the resident.

<Remote operation monitoring from the operation control center>

○ Remote operation monitoring from the control center was provided by obtaining real-time in-cabin image and tracking the vehicle position.

○ Vehicle inspection and ride management assisted by ICT technology.



Operation control centers (set up in Ibaraki Kotsu and in the Takakura Regional Exchange Center)

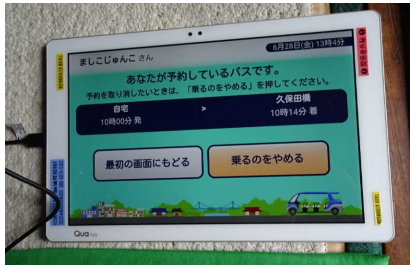
Smartphone-assisted vehicle inspection

Ride management with face recognition technology

<Reservation and ride management for the automated driving service>

○ As a general rule, reservation was made using the dedicated tablet device or by operating the reservation terminal at the bus stop.

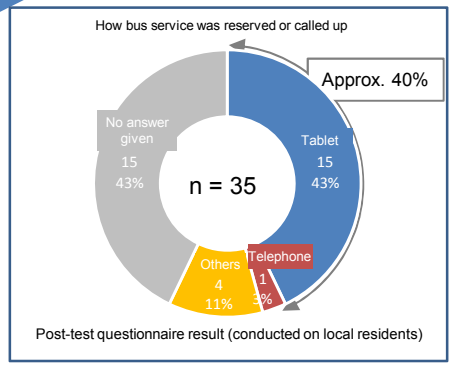
○ Reserved users were allowed to get on or off at any designated location other than the regular bus stops.
(The user was picked up from and driven to the front of his or her home.)



Reservation system using a dedicated tablet

Calling a bus from the smart bus stop

Reservation data is immediately reflected
(at the control centers and on board the vehicle).



Post-test questionnaire result (conducted on local residents)

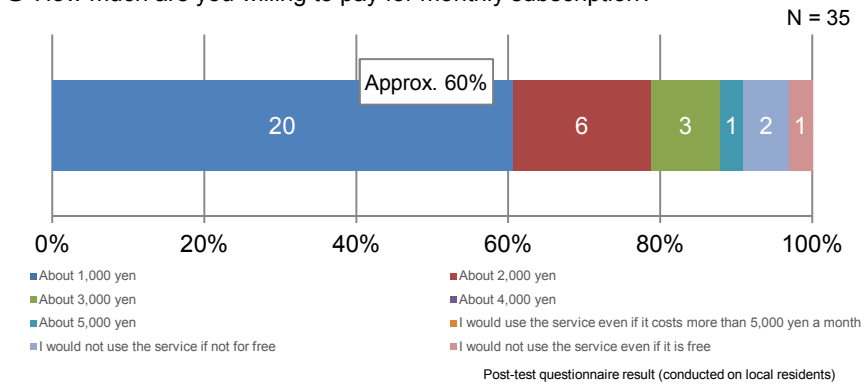
10. Hitachi Ota (test result)

Test result 3 (business model building)

- ○ The largest number of respondents answered that they are willing to pay “About 1,000 yen” for monthly user subscription. 70% of respondents answered they are willing to use the service, and 50% answered they would use the service for about once a week or more.
- ○ Approximately 40% answered they will go out more if they can use the service.
- ○ Approximately 30% answered they are willing to help the service as a conductor or operator on a voluntary or paid basis. Of those, the largest number of people cited “social contribution” as the reason or condition to help.

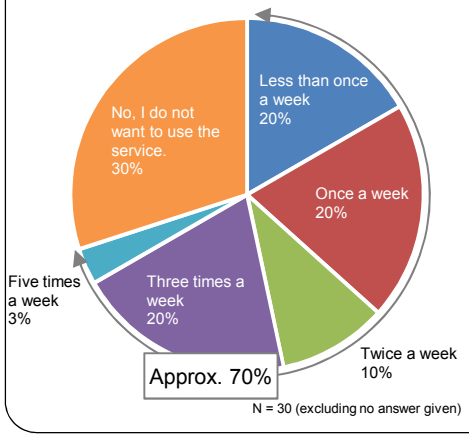
<How much users are willing to pay for the service and how often they will use the service>

○ How much are you willing to pay for monthly subscription?



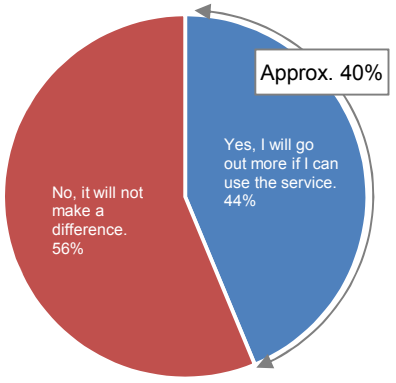
Post-test questionnaire result (conducted on local residents)

○ Would you want to use the service and how often (times/week)?



N = 30 (excluding no answer given)

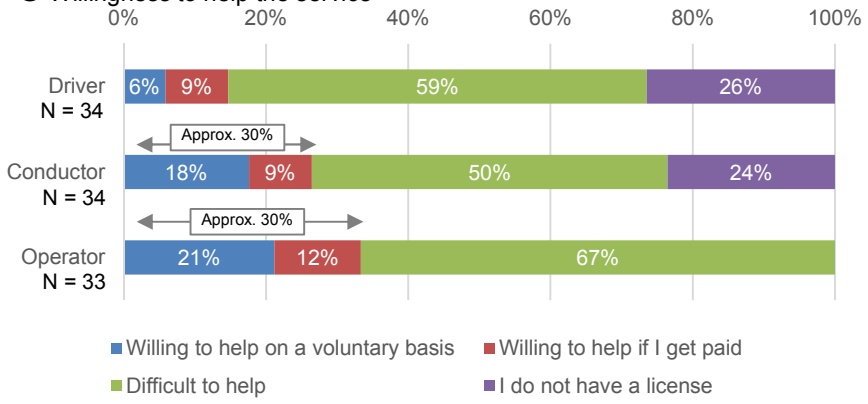
○ Do you think that you will go out more if you can use the service?



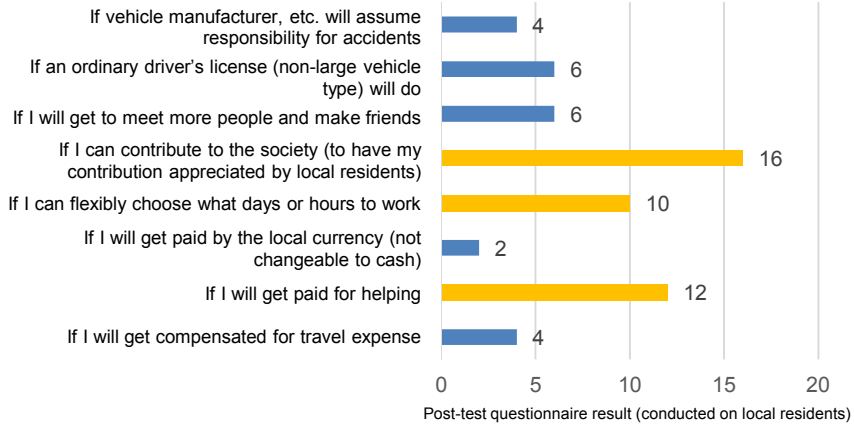
N = 32 (excluding no answer given)
Post-test questionnaire result (conducted on local residents)

<Willingness to help the service on a voluntary or paid basis>

○ Willingness to help the service



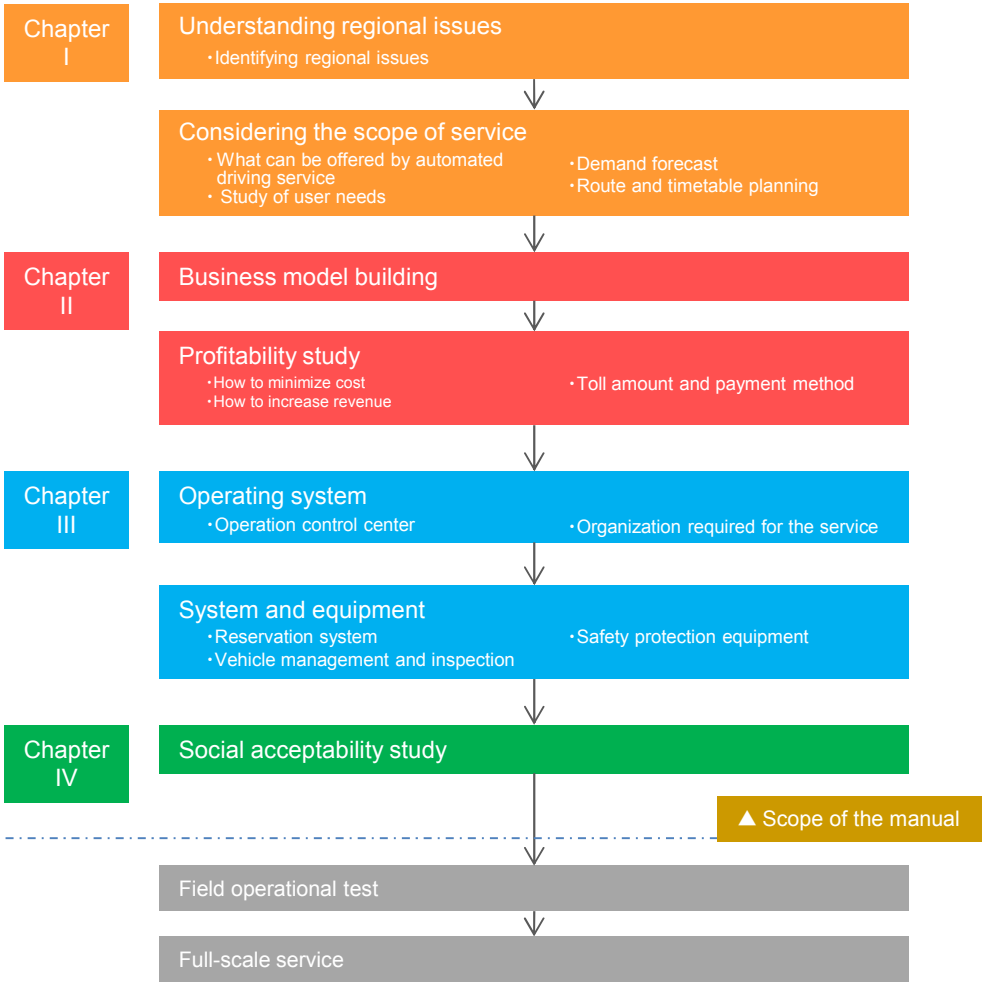
○ Reason or condition to help as a conductor or operator



Post-test questionnaire result (conducted on local residents)

11. Automated-driving transportation service introduction manual (proposed)

○ The manual will be intended for the use by employees of a municipality or traffic service provider that is considering transportation service using automated vehicles.
○ Findings and learning from the field operational tests will be utilized to provide insights in the chapters about “understanding regional issues” and “business model building”.



Study flow and manual organization