

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

FY2019-FY2020 Annual Report (Overview)

Highway Industry Development Organization  
New Civil Engineering Co., Ltd.  
Oriental Consultants Co., Ltd.  
Nippon Koei Co., Ltd.  
Fukken Co., Ltd.

# 0. Contents

1. Project summary, Objectives of Project
2. Test Sites
3. On-going Status of Social Implementation at “Kamikoani”
4. Long-term FOT Results at “Okueigenji”
5. Long-term FOT Results at “Akagi-Kogen”
6. Summary

# 1-1 Project summary

- Project name: Field operational tests for automated driving services in rural areas aiming for the improvement of the social environment
- Contractors: Highway Industry Development Organization; New Civil Engineering Co., Ltd.; Oriental Consultants Co., Ltd.; Docon Co., Ltd.; Nippon Koei Co., Ltd.; Fukken Co., Ltd.
- Period: From October 2019 to December 2020
- Number of field operational test area: 3 areas
- Verification items:
  1. Requirements for the early stages of social implementation of automated transport services
    - (1) Route and timetable setting based on user history and other information;
    - (2) Fee collection methods;
    - (3) A self-sustaining operational structure with a future operational entity;
    - (4) Standard infrastructure for fleet management and related systems;
    - (5) Business feasibility study;
    - (6) Legal compliance
  2. Requirements for securing driving space for automated vehicles
    - (1) Securing driving space through the use of V2I technology and road infrastructure;
    - (2) Ensuring road safety in areas where it is difficult to drive with sensors, GNSS etc. alone;
    - (3) The appropriate balance of roles between car and road for implementation;
    - (4) Effective communication methods to harmonise with surrounding traffic (HMI);
    - (5) Evaluation of the driving environment

# 1-2 Objectives of Project

## Background

**Growth Strategy 2019**  
(Innovative Business Activity  
Action Plan for FY2019)

“Long-term field operational tests (FOTs) in focused areas, and promotion of further advanced FOTs toward commercialization” “KPI: Starting automated driving services on open roads in rural areas by 2020”

**Public-Private ITS  
Initiative/  
Roadmaps 2019**

“<Vision of the automated driving implementation in 2020 - automated driving services using the field operational testing framework>” “we will work on realizing a society that enables the elderly to freely move around respective areas in the country by around 2025 by expanding driverless automated driving services across the country”

## Objective

**Objective of  
this project**

To support social implementation at a location for “**social implementation verification**”

To implement long-term FOTs at a level similar to commercialization at two locations for “**long-term FOTs**”

To compile “**introduction manual for social implementation**” for automated driving services based on the results obtained.

## Implementation goals

**Implementation goals**

To **establish a sustainable service model and promote its penetration**

# 1-3 Implementation System

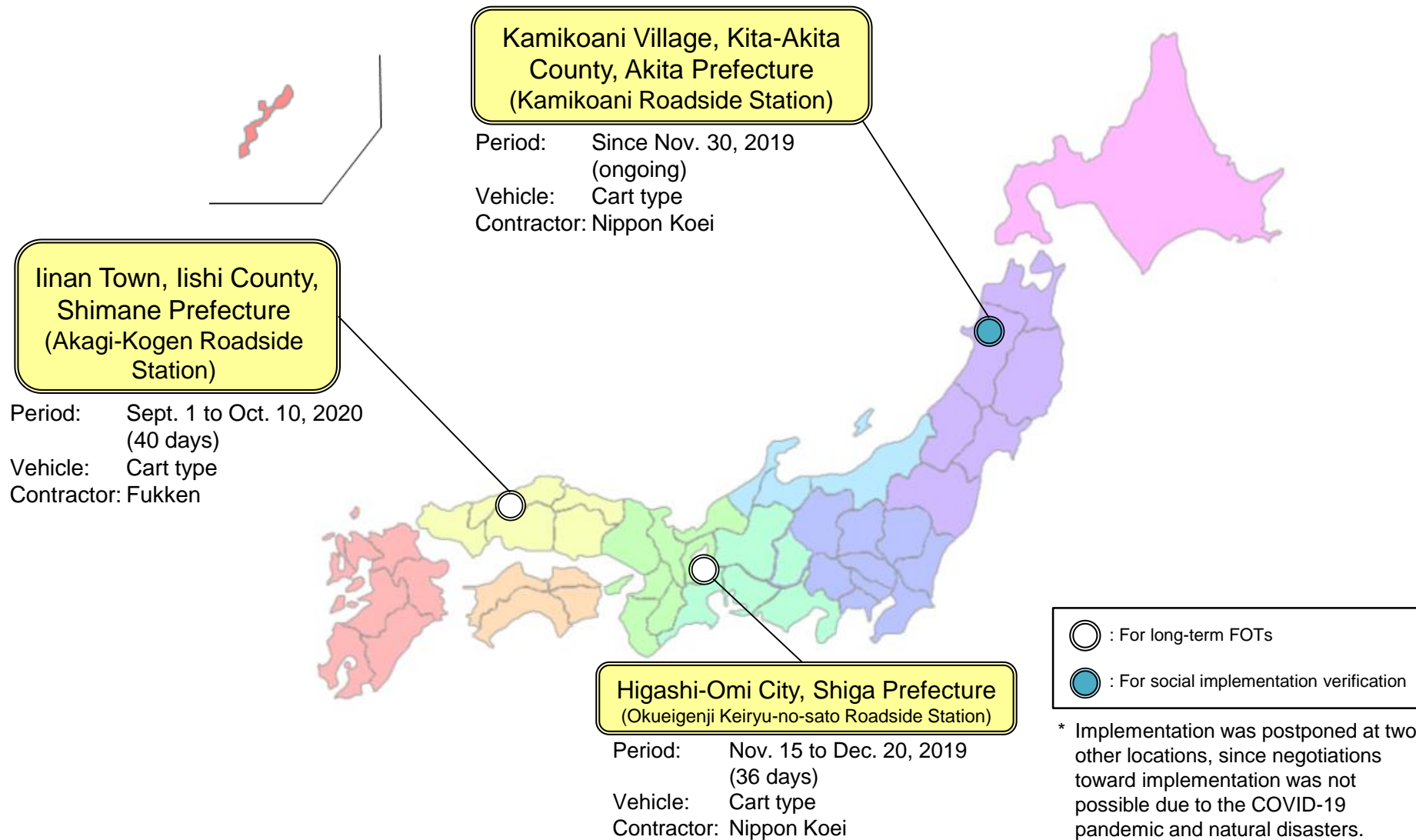
○Highway Industry Development Organization (HIDO), New Civil Engineering (NCE), Oriental Consultants, Nippon Koei and Fukken formed a consortium for this project which performed FOTs and evaluation/verification to establish a sustainable service model of automated driving services in rural areas.



Consortium for FOTs for automated driving services in rural areas aiming for the improvement of the social environment

## 2 FOT Locations

○ In this project, social implementation was performed at a location (Kamikoani Village, Akita Prefecture), while FOTs were conducted at two locations (Higashi-Omi City, Shiga Prefecture and Iinan Town, Shimane Prefecture).



## On-going Status at Kamikoani



# 3-2 Verification Items in Social Implementation Verification

- The following shows verification items and implementation statuses at Kamikoani, where social implementation verification is being performed.
- In the future, requirements for social implementation will be established, based also on the verification results at Ashikita Dekopon.

Major items	Detailed items	Implementation status at Kamikoani
Plan	Route/timetable	• Constitutes of a scheduled tour and on-demand tours (9:00 to 16:00) for 3 routes (2 to 4 km each)
	Services provided	• Supports travels of the elderly, tourists transfer, etc.
Preparation (materials and equipment)	Vehicle	• Cart by Yamaha (1 vehicle for 7 persons with the automated driving speed at about 0 km/h to 12 km/h)
	Infrastructure (electromagnetic guide wires)	• To be placed in the entire route (locations for additional placement is under review)
	Establishment of stops and related facilities	• Able to get on or off at any designated location for all lines, but stops will be placed at 14 locations as a guide (future elimination and other plans are under review), while depots and charging facilities will be placed on the roadside station.
Preparation (operation)	Establishment of system	• The operating organization is NPO Kamikoani Iso Service Kyokai (transportation service association). • Two staff (fee-based volunteers) are stationed (as a driver and receptionist).
	Driving system	• Introduced a reservation/operation management system built by the SIP architecture project.
	Driving	• Operation manager, operation supporters and drivers all completed trainings for fee-based transportation with private vehicles (at total of 10 persons).
	Vehicle checking	• Checked as per daily inspection lists, and a communication system for abnormality has been also established.
	Safety measures	• Communicating nearby vehicles and walkers with signboards, leaflets, etc. Road marking will be considered as a future safety measure in seasons other than winter.
	Emergency response	• An emergency communication system has been established, and a maintenance contract has been concluded with YMC for vehicle troubles.
	PR/utilization promotion	• Held explanatory meetings to the residents, tied up with roadside station events, while providing trial use by other community residents. • In the future, cooperation measures will be reviewed while also considering the survey results for “shopping cyclic bus operation” by the village government.
Verification	Business model	• Plans to cover labor cost for drivers by fares, while also reviewing personal shopping services and charging transport costs • Reviews to offset costs by other subsidies or sponsoring funds
	User feedback	• Collecting opinions from new users, while implementing interviews with heavy users in a timely manner



# 3-3 Overview of Social Implementation Operation at Kamikoani

## ■ Overview of social implementation operation

Start date of social implementation operation	Saturday, November 30, 2019 *Operated every day excluding new year holidays
Objective	To support transportations of mainly the elderly and regional revitalization through automated driving services implemented in areas centered around the roadside station * Automated driving services are being implemented as fee-based passenger transportation with private vehicles for the first time in the nation.
Population in areas along the ADS route	Kamikoani Village: 2,246, Kosawada Area: 323, Fukudate Area: 115, Dogawa Area: 88 (as at the end of February 2020)
Driving route	Kosawada circulation route, Kosawada-Dogawa route, Kosawada-Fukudate route
Travel distance	Total length: Approx. 11 km Kosawada circulation route: approx. 2 km in roundtrip taking about 20 minutes Kosawada-Dogawa route: approx. 5 km in roundtrip taking about 40 minutes Kosawada-Fukudate route: approx. 4 km in roundtrip taking about 40 minutes
Traveling method	Driving through mixed traffic (open road) Automated Driving Level 2 (backup driver is on the driver seat, while wheeling, acceleration, braking, blinking and abnormality detection are automatically handled). In a special section of approx. 1 km, automated driving is performed while a driver is seated on the passenger seat.
Driving pattern	Weekdays: One regular tour/day for Kosawada-Dogawa route, leaving the Dogawa Community Center at 8:30 am. Also running on-demand in other hours. Holidays: Running on-demand throughout the day. The vehicle is charged from 12:00 to 13:00 on both weekdays and holidays.

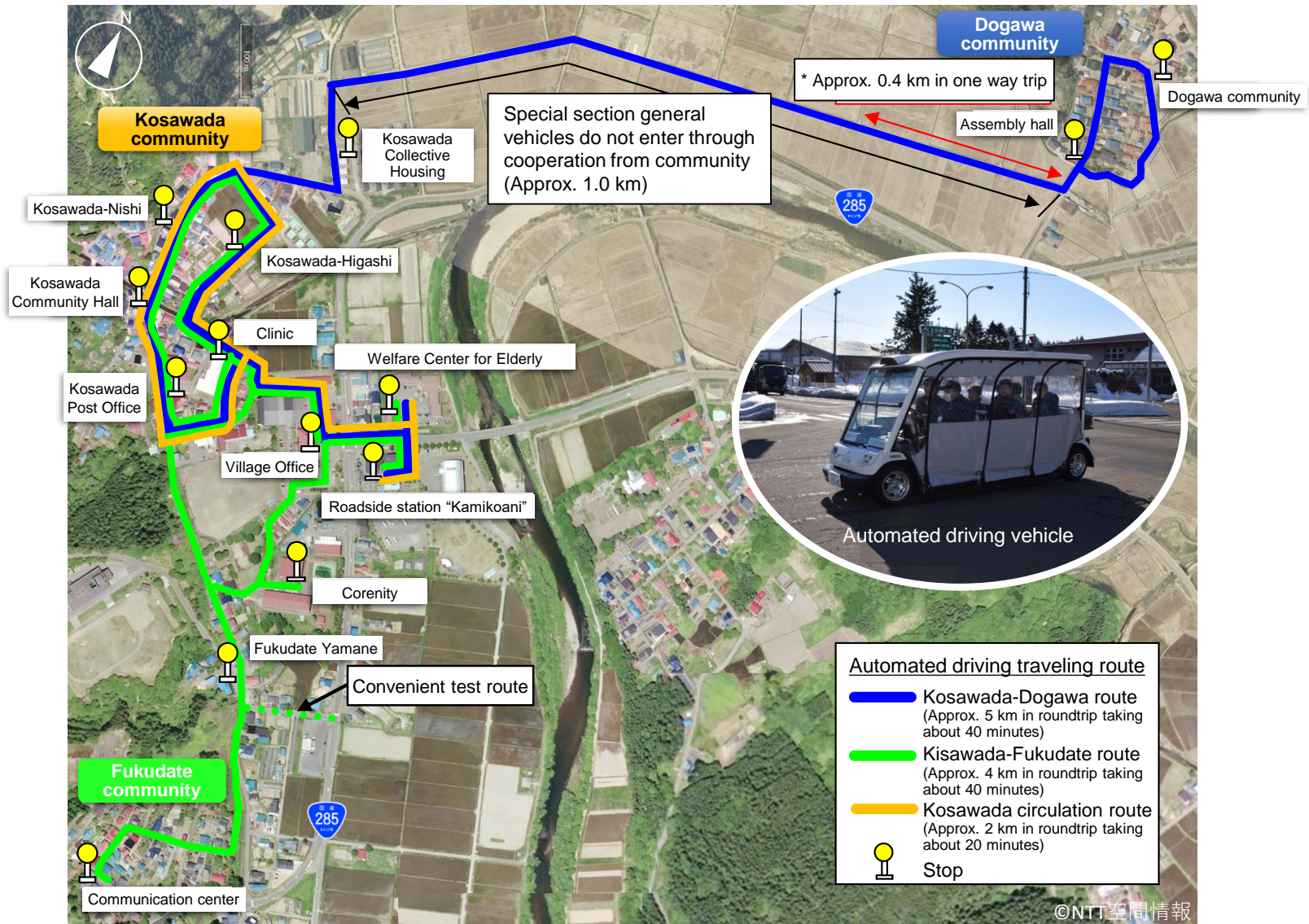
## ■ Vehicle used

- Cart (capacity: 7 persons, made by Yamaha Motor)
- Driving speed: approx. 12 km/h in automated driving



# 3-4 Traveling route at Kamikoani

## Traveling route

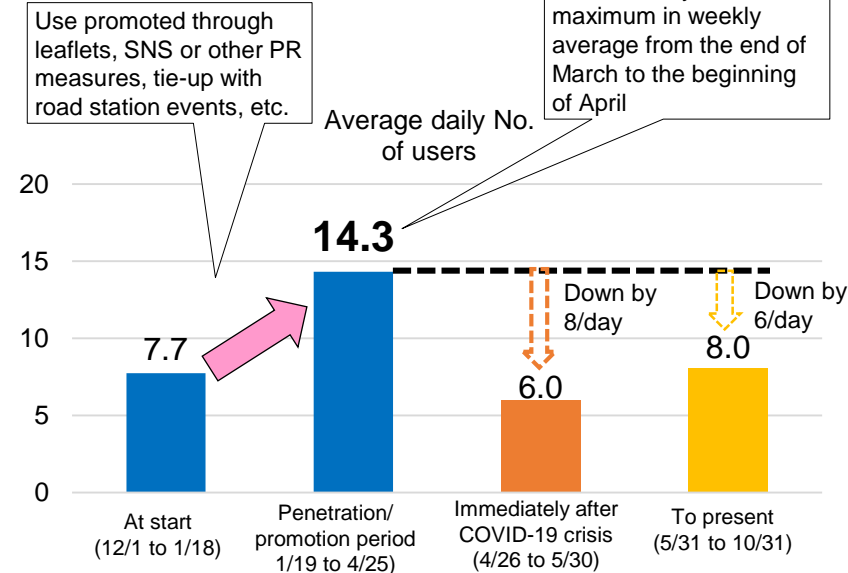


\* A part of routes will be temporarily changed due to area conditions.

# 3-5 Report on On-going Status of Social Implementation at Kamikoani

## Overview of on-going status of social implementation (details being adjusted, based on unpublished material)

### Changes in use



- At the start of implementation, the use was promoted through leaflets placed on roadside stations along nearby roads, other PR measures, tie-up with roadside station events, etc.
- The use dropped immediately after the COVID-19 crisis to a half of that at the promotion period, but is expected to gradually recover

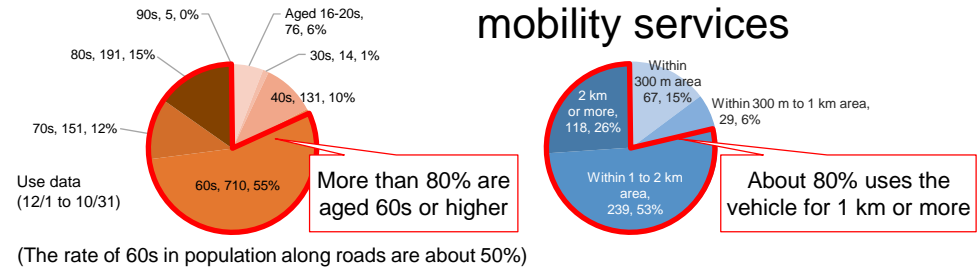


← Placing leaflets at nearby roadside stations

Invites local elementary/junior high school students to nickname the vehicle →



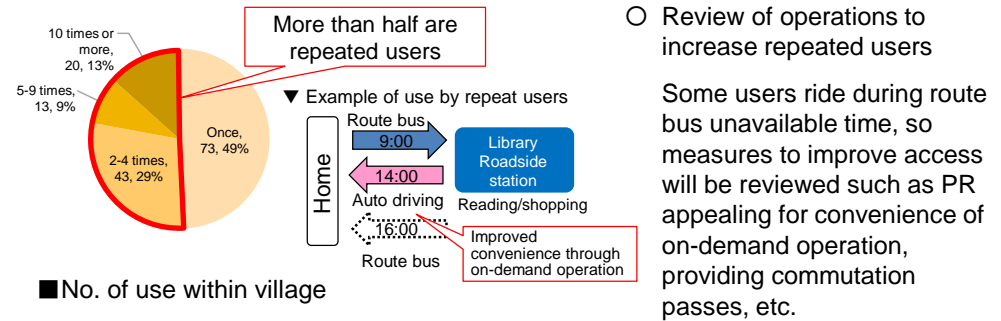
### Use status analysis ①: Need characteristics of mobility services



■ Rate of users within the village by age ■ Rate of users within the village by range

- Needs high as a mobility measure for the elderly who have a difficulty in walking a little long distance (1 km or more)
- An issue is to stimulate needs in short-distance move

### Use status analysis ②: User characteristics



■ No. of use within village

- 80% of the elderly living along ADV routes have not used yet
- But half of users are repeaters.

- Let them try first
- Then increasing repeated users is important.

# 3-6 Report on On-going Status of Social Implementation at Kamikoani

## Review of management system

**Under negotiation due to local circumstances (election of village head due to death of preceding head)**

- If the current system continues, an issue remained in labor costs as those for receptionist/driver will be added to existing costs.
- If the management is transferred to roadside stations, the labor cost issue will be solved as station staff also act as a receptionist/driver.

### Current system

Support for motivation of the elderly for going out/shopping

Community residents



Fare  
Annual fee

Transport of persons/luggage

NPO Kamikoani Iso Service Kyokai



Existing volunteer driver



Newly hired  
Automated driving staff

Under negotiation



Donation, etc.

Supporter

Luggage carrying



Fee

Producer

Reducing burdens/  
improving productivity

Under negotiation

luggage carrying



Fee  
(fare)

Roadside station

Increase sales

### New system (proposal)

Support for motivation of the elderly for going out/shopping

Community residents



Fare

Transport of persons/luggage

Roadside Station Kamikoani

Station staff



Concurrent

Automated driving staff

Reducing labor cost by roadside station staff concurrently acting as receptionist/driver

Under negotiation



Donation etc.

Supporter

Sales of local products

luggage carrying



With/without fee  
→ Contributes to sales at roadside station

Producer

Reducing burdens/  
improving productivity

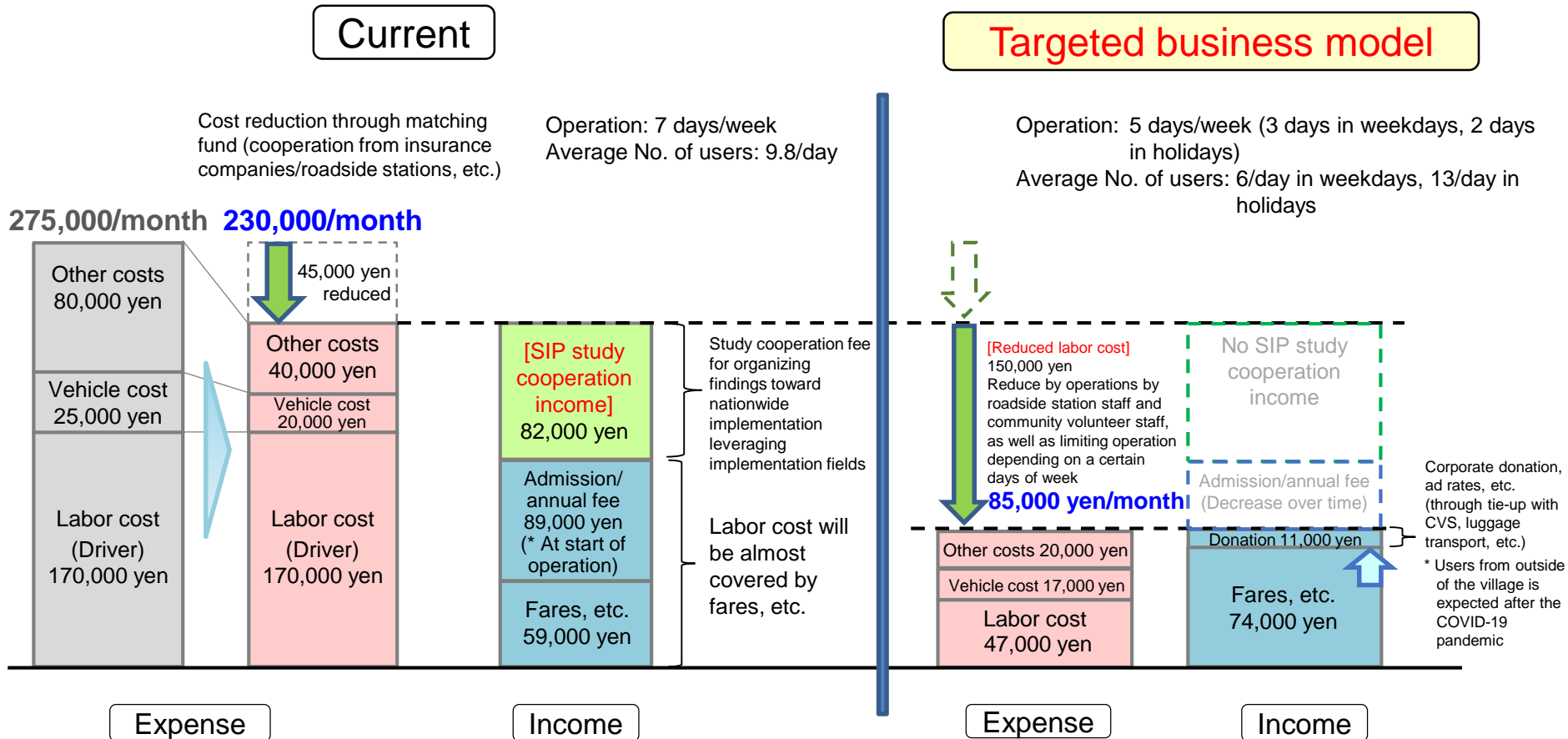
Under negotiation

Synergy can be expected due to increased roadside station users

# 3-7 Report on On-going Status of Social Implementation at Kamikoani

## Review of business profitability after change of management system

- The problem in the current system is not sharing of costs with existing staff at NPO
- For the new management system (proposal), negotiation is underway for management by roadside station where existing staff can concurrently act as receptionist/driver.



# 3-8 Report on On-going Status of Social Implementation at Kamikoani

## ■ Review of various types of fees

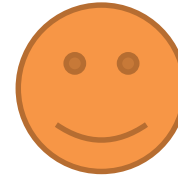
Based on long-term FOT results in other areas, currently the following matters are being reviewed, though requiring a change in terms of use by NPO and agreement by the local public transportation committee.

- Setting child fares (student pass, those for Corenity users)
- Setting fares for users from outside of the village (through sightseeing tours, necessity of setting package fares)



Resident in Dogawa area

Elementary and junior high school students use route buses in the winter season, but commuting is a little bit burdensome and dangerous as bus stops, located along national routes, are far from their schools.



Resident in Kosawada area

Swan come in fields along the special section for wintering every year. It may be rare for people living in other prefectures to watch them such a close distance.



\* Current terms of use by NPO stipulate that users shall be 16 or older.

# 3-9 Report on On-going Status of Social Implementation at Kamikoani

## ■ Verification of special section (L=1 km)

- Operating for more than 1 years without accident
- No concerns for the absence of a driver voiced
- Excessively high space managing cost including fees for traffic guides, etc.



Stable driving without driver confirmed. No users being concerned about driving were found.

## ■ Review of maintenance management of vehicles and infrastructure

- Management/repair works for infrastructure/vehicles confirmed
- Organizing methods to achieve operation solely by the local community



Operation of driving management equipment solely by volunteer drivers



Guiding by traffic guides is necessary right now to operate special section.



Detector for disconnection



Recording infrastructure repair works to organize procedures

## 4-1 Report on Long-Term FOT Results

Test Results

Okueigenenji





# 4-2 Overview of Long-Term FOT at Okueigenji

## ■ Overview of FOT

Period	From Friday, November 15 to Friday, December 20, 2019 (36 days)
Objective	<ul style="list-style-type: none"><li>• Securing mobility measures at the “last one mile” to regional centers from home in rural areas</li><li>• Responding to sightseeing needs within areas such as hiking or autumn-leaf viewing</li></ul>
Population in areas along the ADS route	No. of households along FOT areas: 76, population: 181 (from the 2015 National Census data)
Test routes	Roundtrip route from Roadside Station “Okueigenji Keiryu-no-sato” to Choshi-ga-kuchi Iriguchi routing communities in Kiwada Town and Yuzurio Town.
Travel distance	Approx. 4.4 km (approx. 30 minutes)
Traveling method	Automated Driving Level 2 (backup driver is on board), driving through mixed traffic (open road).
Driving pattern	Regular tours: 7 (Sundays), and 6 (other days) Others: Operates irregular tours or on-demand tours depending on needs.

## ■ Vehicle used in the tests

### Transport of personnel/luggage

- Cart (capacity at 6 persons, made by Yamaha Motor)
- Towed car (maximum load at 300 kg)
- Driving speed: 12 km/h in automated driving



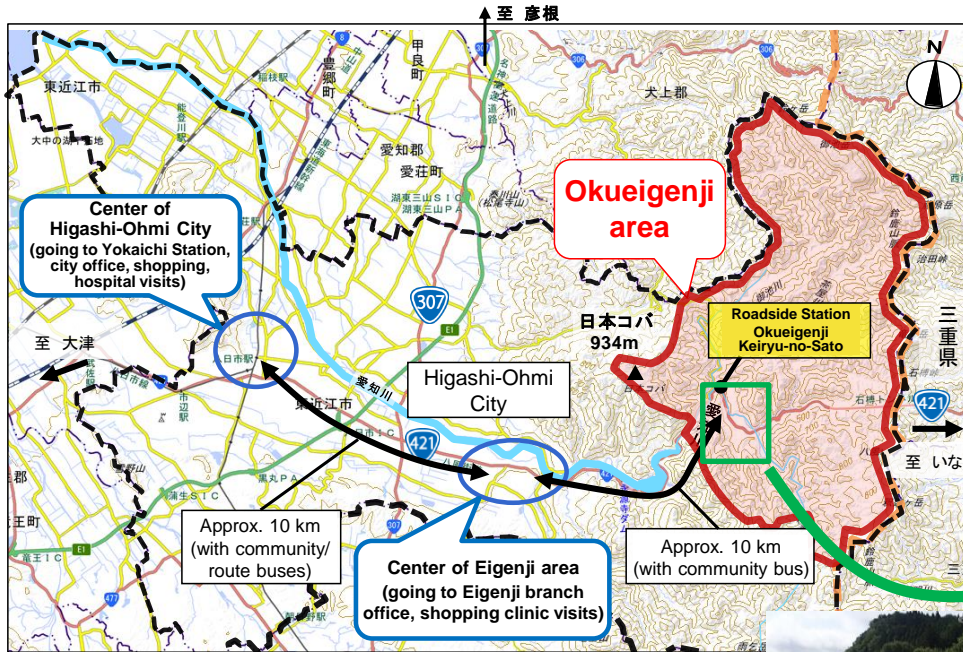
## 4-3 Verification Items for FOT at Okueigenji

Item	Main verification details
<b>Securing driving space</b>	<ul style="list-style-type: none"> <li>○ <b>Securing driving space leveraging characteristics of hilly and mountainous areas</b> <ul style="list-style-type: none"> <li>▪ Measures to secure space where automated driving vehicles are prioritized</li> <li>▪ Measures for general vehicle drivers and walkers to appropriately recognize spaces for automated vehicles</li> </ul> </li> </ul>
<b>Driving management system</b>	<ul style="list-style-type: none"> <li>○ <b>Establishing a driving management center</b> <ul style="list-style-type: none"> <li>▪ Possibility of practical use of drive monitoring system</li> <li>▪ Convenience of the reservation system utilizing smartphones and wired phones</li> </ul> </li> </ul>
<b>Operation implementation system</b>	<ul style="list-style-type: none"> <li>○ <b>Implementing an experiment assuming the future operation system</b> <ul style="list-style-type: none"> <li>▪ Implementing tests after securing a management system mainly operated by community, and clarification of ways of involvement in management and needs for management</li> <li>▪ Review for reducing operation costs assuming use of community volunteer staff as drivers and receptionists for the operation management center</li> </ul> </li> </ul>
<b>Versatile cooperation measures</b>	<ul style="list-style-type: none"> <li>○ <b>Improving the convenience for the elderly, increasing opportunities for them to go out</b> <ul style="list-style-type: none"> <li>▪ Possibility of using services for shopping at the roadside station, going to branch clinics, going to the town office for administrative procedures, etc.</li> <li>▪ Effective measures to promote use (tie-up with roadside station events, etc.)</li> <li>▪ Securing convenience in moving to town areas using transits to existing public transportation measure (Chocotto Bus)</li> </ul> </li> <li>○ <b>Improving the convenience for tourists</b> <ul style="list-style-type: none"> <li>▪ Possibility of responses to sightseeing needs by providing automated transportation services at the route connecting the trailhead of the Suzuka Juza (Choshi-ga-kuchi) and the roadside station</li> </ul> </li> <li>○ <b>Feasibility of delivery of agricultural products (root vegetables, processed foods, etc.) to road side stations and product transportation</b></li> </ul>
<b>Business profitability</b>	<ul style="list-style-type: none"> <li>○ <b>Profitability and sustainability as a business (feasibility of the service)</b> <ul style="list-style-type: none"> <li>▪ Verification of profit/loss assuming implementation based on the use results in FOTs, possibility of cost reduction through local operation</li> <li>▪ Way of collecting fares based on transportation characteristics of community residents for continued operation</li> </ul> </li> </ul>

# 4-4 Route in Okueigenji

## Traveling route

- Using the roadside station “Okueigenji Keiryu-no-Sato” located in the Okueigenji area near the prefectural border, eastern part of Higashi-Omi City as a base, long-term FOT were implemented for a route traveling **Kiwada and Yuzurio Town in the Eigenji area** (round trip of approx. 4.4km).
- The Okueigenji area is approx. 20 km from the town center of the Higashi-Ohmi city, and approx. 10 km from the center of the Eigenji area, where **only community buses (Chocotto Bus)** are operated by the Higashi-Ohmi City as public transportation to the town center.



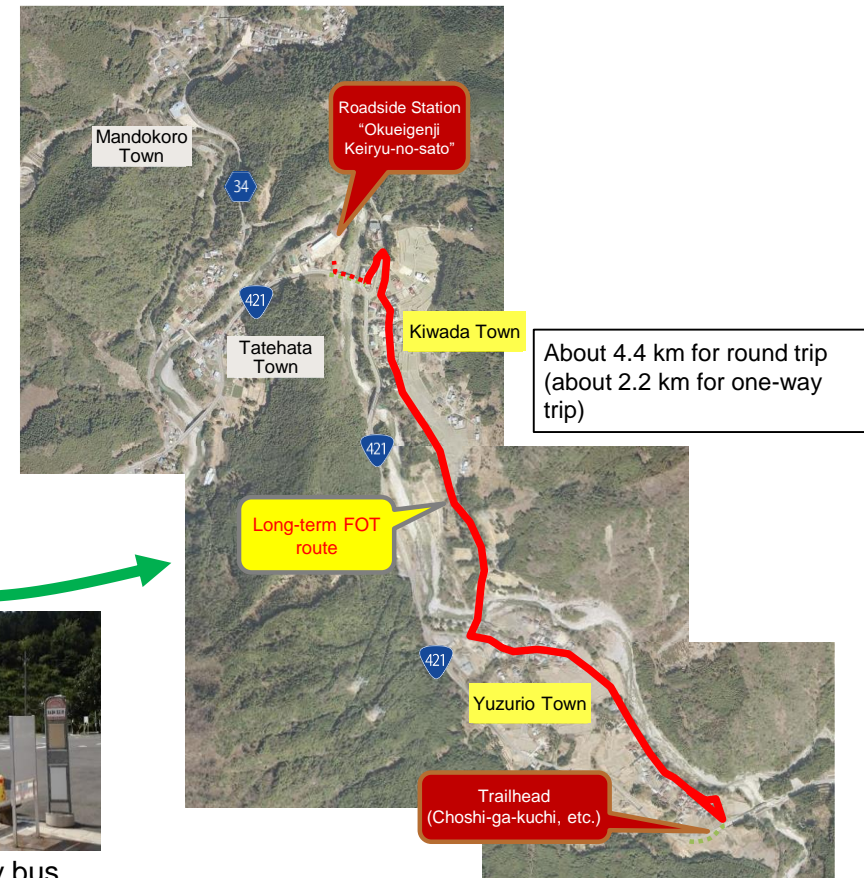
▲ Map of entire Higashi-Ohmi City

### [Community bus (Chocotto Bus)]

- Operated on consignment from Higashi-Ohmi City. A total of 9 routes within the city.
- The Mandokoro route connecting the Okueigenji area and the center of the Eigenji area is operated on consignment by a taxi company (Eigenji Taxi) in the area.
- The Mandokoro route has 4 tours per day, taking about 30 minutes to travel from the roadside station to Eigenji Branch.



▲ Community bus (Chocotto Bus)



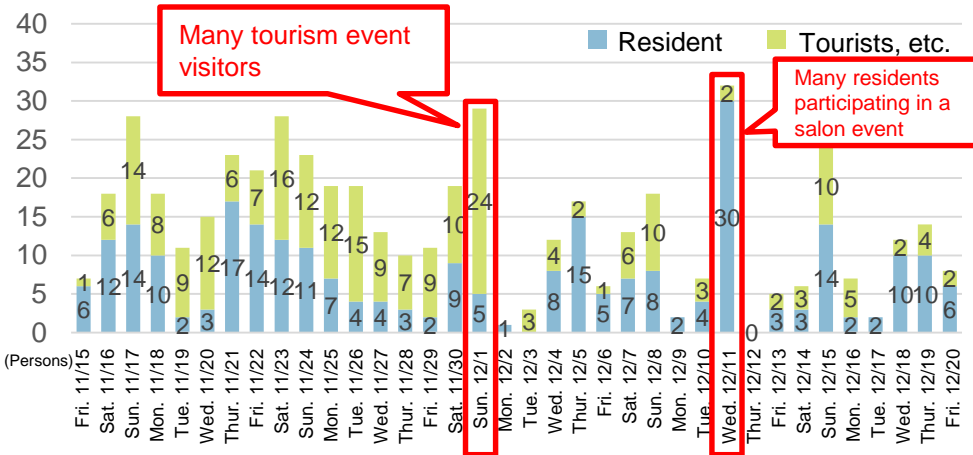
▲ Route for long-term FOTs

# 4-5 Results of Long-term FOT at Okueigenji

## Overview of FOT results

### <Use status>

- A total of 216 tours with a cumulative total of 501 users (265 community residents)
- \* Excluding people related site visits/FOTs and from mass media



### <Use by community residents>

- For delivery of products to morning markets at the roadside station, going to branch clinics or community salon in the roadside station facilities
- For transit at the roadside station to a community bus to go for shopping in the town center

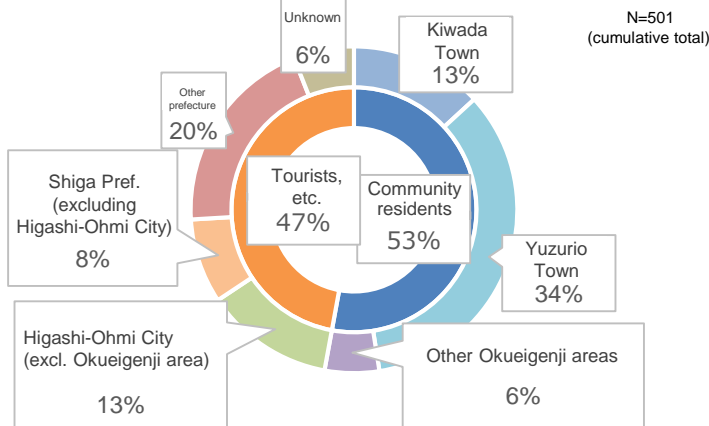


For delivery of products for morning market (Yamasato Market held on Sundays)



Attending community salons for residents near roadside station (on 12/11)

## Breakdown of users by residence



### <Use by tourists>

- For autumn leave viewing (use when visiting events) and as a mobility measure to the trailhead of Suzuka Juza Mountains (Choshi-ga-kuchi)



Tourist event (on 12/1)



Move to the trailhead of Choshi-ga-kuchi

# 4-6 Results of Long-term FOT at Okueigenji

## ■Securing driving space

- As a result of preliminary communications using leaflets, etc., **community residents were cooperative during long-term FOT, like avoiding vehicles while they were walking.**
- Intervention/detection caused by driving environments were smaller than other areas (Ave. 1.7 times/tour, or once per about 2.5 km driving)
- On the other hand, there were **a lot of intervention caused by visitors, such as walking or parking on the route**, posing issues in implementation.

### <Safety measures taken>



Advance notice of approach by automated vehicle on information board



Road Sign



Indication of waiting position (possible crossing position)



Communication leaflet

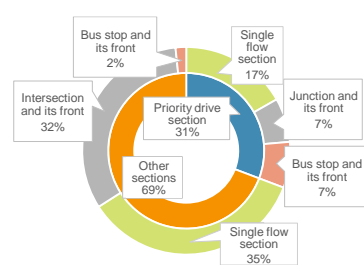


Signboard

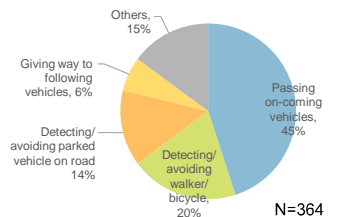
Distributed to residents along roads and nearby facilities for preliminary communications

Notifying by setting the board in and front of the route

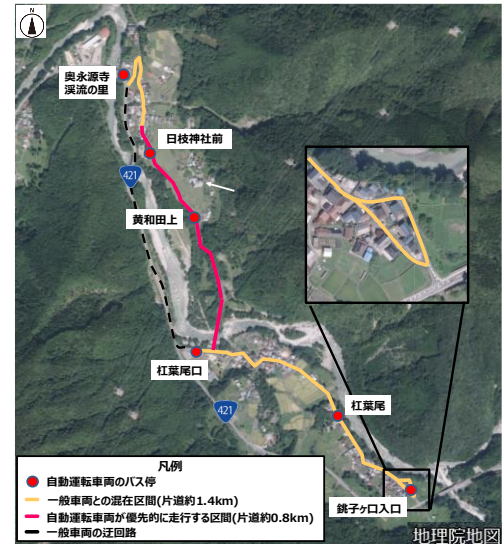
### <Intervention occurrence status>



▲Intervention occurrence section



▲Cause of intervention/detection occurred



▲Route map (priority section)

### <Driving space status>



▲Community residents (avoiding the driving route while walking)



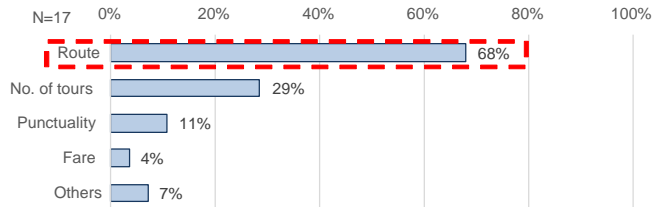
▲Tourists (walking on the route, causing subsequent intervention)

# 4-7 Results of Long-term FOT at Okueigenji

## ■ Operation implementation system

- In the long-term FOT, community residents handled the management system (as drivers and receptionists). They actively recommended tourists visiting the roadside station to use such mobility services, in addition to responding to telephone calls at the roadside station office, which contributes to an increase in tourist users.
- Needs for mobility services to access the roadside station and other areas were high, so it is necessary to link automated driving and other mobility measures.
- Based on the fact that residents are highly willing to cooperate in their free time, and users were less in roadside station's holidays, the management system suited to community characteristics (such as operation geared to specific needs) may be established.

### <Conditions to use automated vehicle>

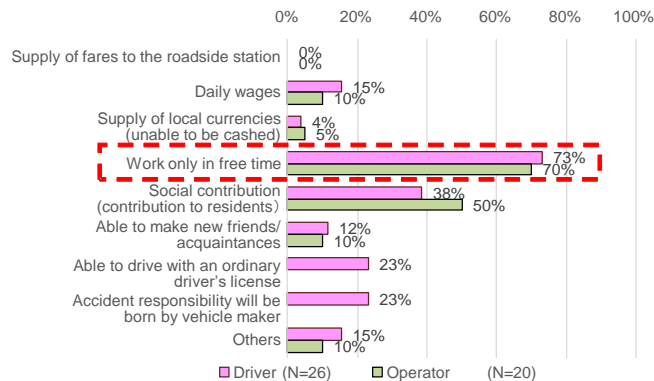


Source: Survey results after FOTs

### Places desired to be stopped

- Front of the facilities for the roadside station
- Route bound for Mandokoro Post Office/Mandokoro Town
- Entrance to the community hall in Yuzurio Town

### <Conditions for cooperating operation>



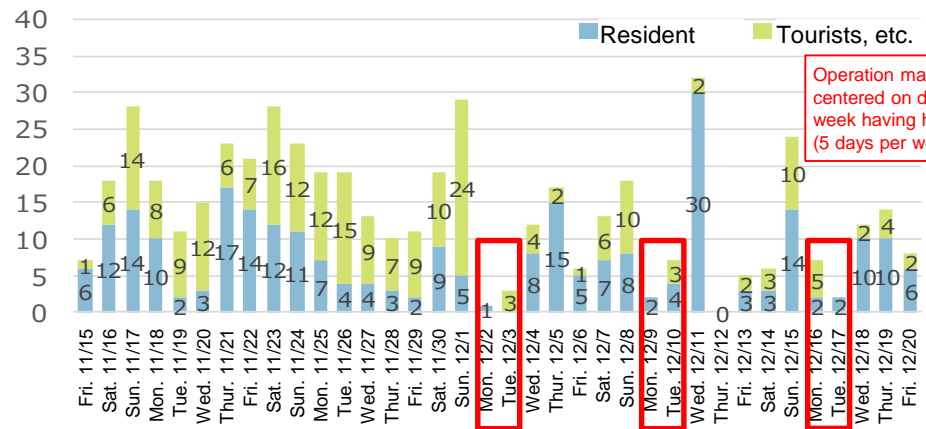
Source: Survey results after FOTs



▲ Residents receiving calls



▲ Residents recommending tourists to use the services



Operation may be centered on days of the week having high needs (5 days per week)

\* The roadside station opens without holidays in November.

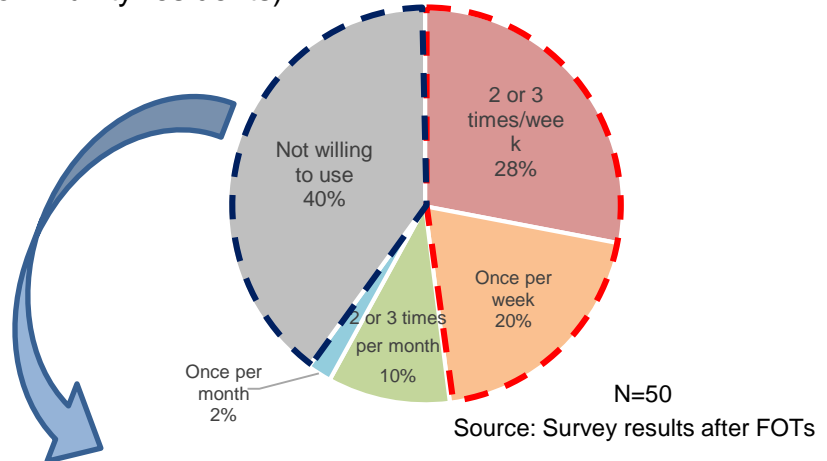
Mondays (after Sundays) and Tuesdays (roadside station holidays) had a fewer users

# 4-8 Results of Long-term FOT at Okueigenji

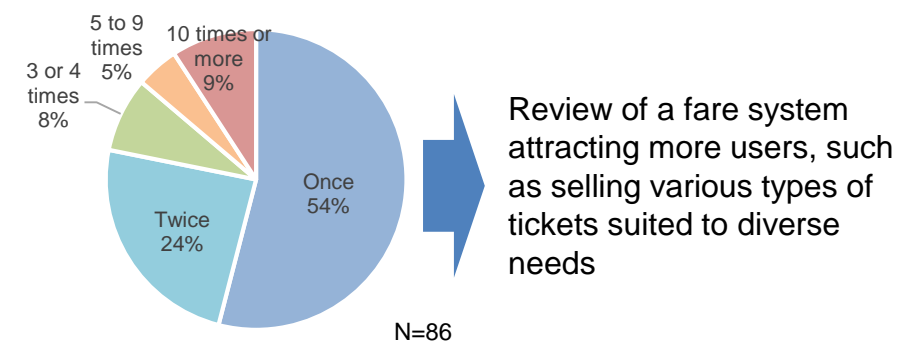
## Business profitability: review of fare systems

- Since about the half of residents have an intention to use the services, certain needs exist. Also, most people who do not want to use the services currently chose “I can drive a car by myself at now” as the reason, which indicates that the service is expected to be used by them when they return their driver’s license in the future.
- Toward implementation, it is useful to sell various types of tickets targeting residents frequently using the services, and introduce a fare system geared to needs.

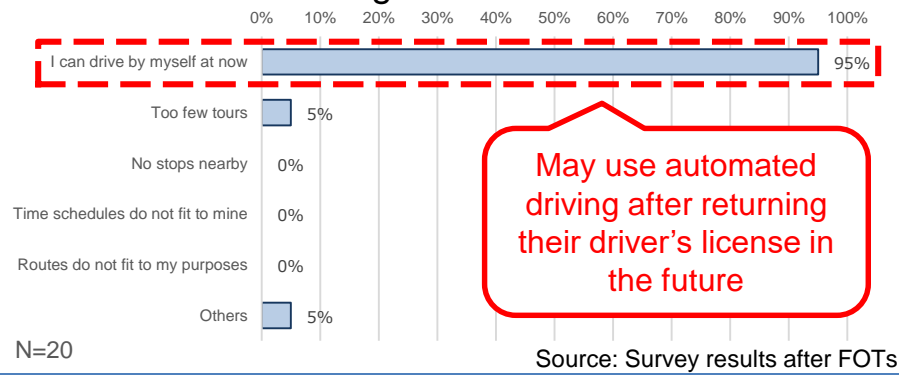
<Intention to use services when implemented (community residents)>



<No. of times of use (community residents)>



<Reason for not willing to use>



<Tickets mainly sold in tests>

Type	Main target
Commuter pass	<ul style="list-style-type: none"> <li>● Those who use services multiple times per week (such as shoppers)</li> <li>● Assuming about 4 persons within the area</li> </ul>
One-day ticket	<ul style="list-style-type: none"> <li>● Those who take two or more round trips a day (shippers for morning markets)</li> <li>● Assuming about 3 persons within the area</li> </ul>
Coupon ticket	<ul style="list-style-type: none"> <li>● Those who use services about once per week (visitors to the branch hospital, etc.)</li> <li>● Assuming about 5 persons within the area</li> </ul>

## 5-1 Report on Long-Term FOT Results



FOT Results

Akagi-Kogen



# 5-2 Overview of Long-Term FOT at Akagi-Kogen

## ■ Overview of FOT

Period	Tuesday, September 1, 2020 to Saturday, October 10, 2020 (40 days)	
Objective	<ul style="list-style-type: none"> <li>• Securing mobility measures friendly to the elderly in the Akana area, and contributing to promoting tourism</li> <li>• Transit to existing public transportation services (route buses/community buses)</li> <li>• Verification of a business model with a fee-based passenger transportation with private vehicles</li> <li>• Establishing a special section in national roads</li> </ul>	
Population in areas along the ADS route	Number of households along the ADS routes: 178, population: 397 (from the 2015 National Census data)	
Traveling method	Automated Driving Level 2 (backup driver is on board), driving through mixed traffic (open road) and special section	
	① Akanajuku route	② Apple orchard route
Test route	A route circulating the roadside station Akagi-Kogen, town office, post office, housing complex, and supermarket	A route to transport visitors to/from apple orchards, and to support delivery of bread from the processing facility to the road station Akagi-Kogen
Travel distance	Approx. 2.7 km/tour, completed in about 30 minutes/tour	Approx. 1.5 km/tour, completed in about 15 minutes/tour
Driving pattern	Scheduled tour: 9 (weekdays) and 4 (holidays)	Scheduled tour: 2 (holidays)

## ■ Vehicle used in the tests

- Cart (6 persons, made by Yamaha Motor)
- Driving speed: 12 km/h in automated driving



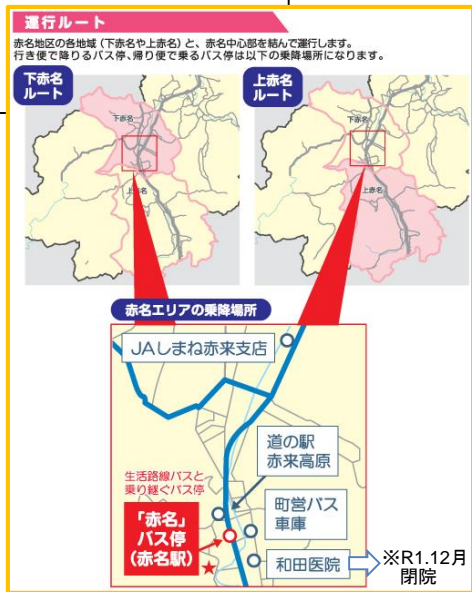
# 5-3 Verification Items for FOT at Akagi-Kogen

Item	Main verification details
<b>Securing driving space</b>	<ul style="list-style-type: none"> <li>○ <b>Securing driving space leveraging characteristics of hilly and mountainous areas</b> <ul style="list-style-type: none"> <li>▪ Technical verification on road-vehicle linkage technology (electromagnetic guide wires)</li> <li>▪ Method of accommodating mixed traffic</li> <li>▪ Change in responses among community residents (change in awareness)</li> </ul> </li> </ul>
<b>Driving management system</b>	<ul style="list-style-type: none"> <li>○ <b>Establishing a driving control center</b> <ul style="list-style-type: none"> <li>▪ Establishing a driving control center at an office for the tourism association and verifying real-time monitoring, etc.</li> <li>▪ Confirming the possibility of practical use of drive monitoring system</li> <li>▪ Convenience of the reservation system utilizing smartphones and wired phones</li> <li>▪ Seamless transition to existing route buses, etc.</li> </ul> </li> </ul>
<b>Operation implementation system</b>	<ul style="list-style-type: none"> <li>○ <b>Implementing an experiment assuming the future operation system</b> <ul style="list-style-type: none"> <li>▪ Roll sharing and sustainability of public transport/regional development led by the tourism association of Iinan Town</li> <li>▪ Community cooperation system like participated by community volunteers (as drivers, receptionists, etc.)</li> </ul> </li> </ul>
<b>Versatile cooperation measures</b>	<ul style="list-style-type: none"> <li>○ <b>Improving the convenience for the elderly and other community residents, increasing opportunities for them to go out</b> <ul style="list-style-type: none"> <li>▪ Residents living in houses lined up along the Akanajuku route are expected to use the services to do administrative procedures at the town office or post offices, as well as other financial services.</li> <li>▪ Moreover, they will use the services for shopping at the roadside station, A-Coop and community stores, and for improving community activities at the Fukushima house (community facility)</li> </ul> </li> <li>○ <b>Improving the convenience in mobility through cooperation with existing public transport systems</b> <ul style="list-style-type: none"> <li>▪ Reviewing measures to facilitate mutual use through transits with route buses and linkage of reserve information with on-demand buses in Iinan Town</li> </ul> </li> </ul>
<b>Business profitability</b>	<ul style="list-style-type: none"> <li>○ <b>Profitability and sustainability as a business (feasibility of the service)</b> <ul style="list-style-type: none"> <li>▪ To estimate and compare future demand and costs, etc., estimate labor, infrastructure, vehicle and other costs required for implementation based on field operation test results, thereby devising ways to improve profits.</li> <li>▪ Verification of results from applying for licenses for fee-based passenger transportation with private vehicles and small freight transport, etc.</li> </ul> </li> </ul>

# 5-4 Routes at Akagi-Kogen

## Traveling route

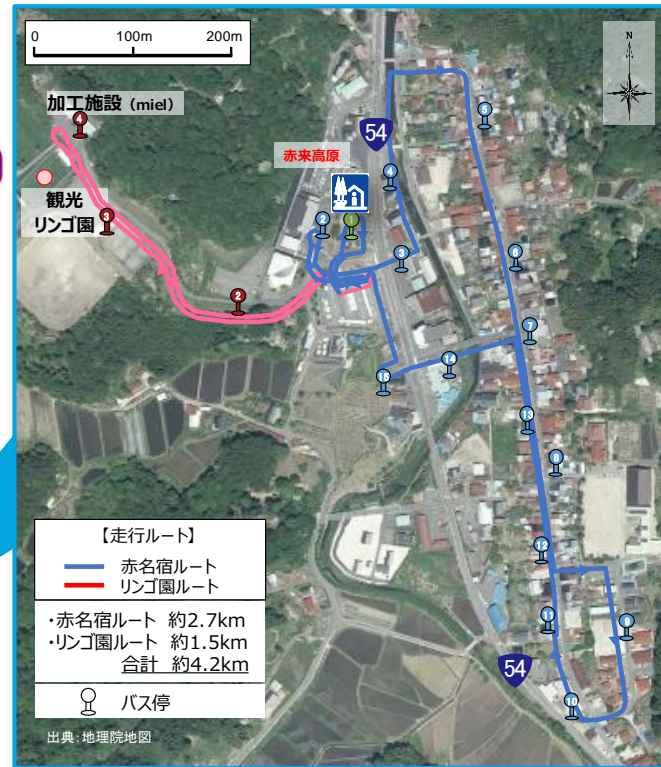
- Implemented in the Akanajuku route in the Akana area, linan Town, and the apple orchard route of roundtrip to apple orchards for tourists.
- In linan Town, town-operated community buses run in the town, centering on the town office and roadside station, while on-demand buses are operated for other areas.



▲ Areas for on-demand buses



▲ Routes of community buses at linan Town



▲ Long-term FOT route map

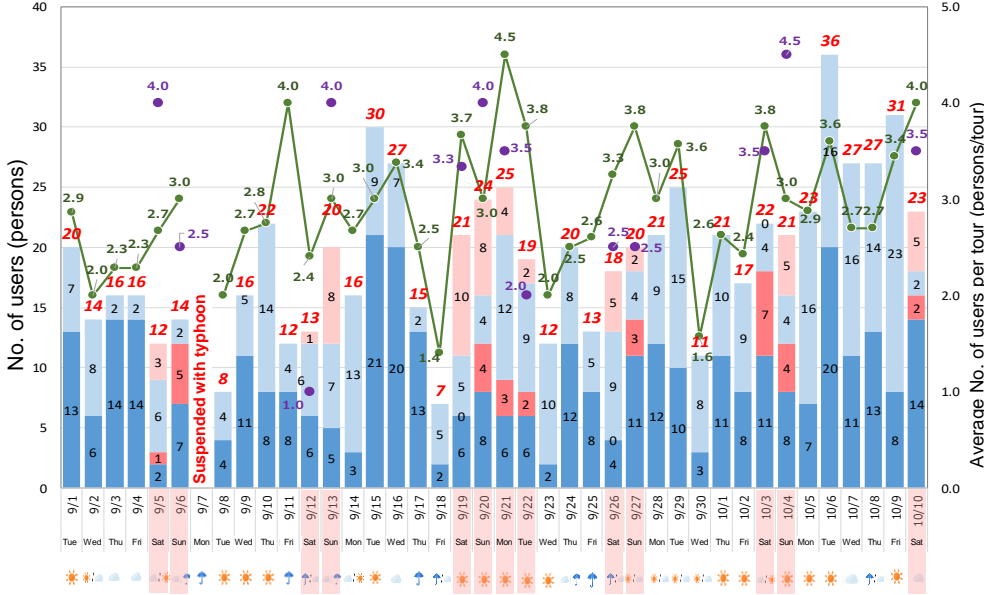
# 5-5 Results of Long-term FOT at Akagi-Kogen

## Overview of FOT results

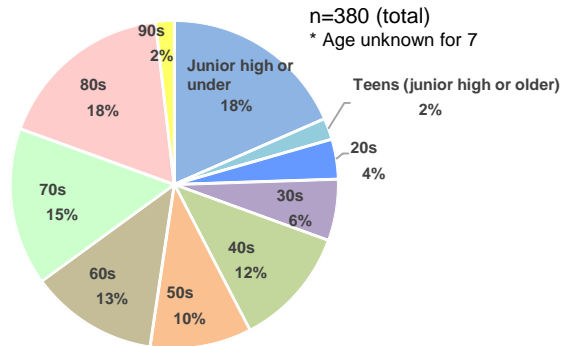
### <Use status>

○ A cumulative total of 755 (387 community residents) use 262 tours in total

- : Akanajuku (inside of town)
- : Akanajuku (outside of town)
- : No. of users per tour in Akanajuku
- : Apple orchard (inside of town)
- : Apple orchard (outside of town)
- : Apple orchard (No. of users per orchard)



### ■ Town users by age



### <Use by community residents>

- Use for transit to the next tour at the roadside station when going back home from shopping
- Use for transit from the route bus to the automated driving vehicle at the Akana station to go home after a visit to the linan Hospital



For shopping to supermarkets



For transit from route bus

### <Use by community businesses>

- Use for transport of small-lot cargos from the Akagi Apple or linan Town agricultural product processing facility to the roadside station



Carrying from Akagi Apple (ride with general users)



Unloading at Botan-no-Sato (local product market) (by test staff)

# 5-6 Results of Long-term FOT at Akagi-Kogen

## ■ Securing driving space

- As a result of establishing a **special section (L=80 m)** on the national road to separate from general vehicles, community residents **applauded its safety**.
- As a result of **marking on the road in mixed transport spaces** on the town road, residents **applauded its understandability**, as a result of which they cooperated in waiting for automated driving vehicles.
- A **detection and intervention occurred due to vehicles parked on the street** in a narrow route with houses lined up, which indicates the necessity of obtaining further cooperation from residents toward implementation.

### <Safety measures implemented>



Securing special section



Special section for automated driving vehicles



Calling for attention in travelling route by marking on road

Marking on road



Calling for attention with a pictogram

Pictogram



Calling attention with a digital signboard indicating "travelling" and rotating lights illuminating to indicate a approach of automated driving vehicles.

Preliminary notice of automated driving vehicle approaching with digital signboard and rotating lights

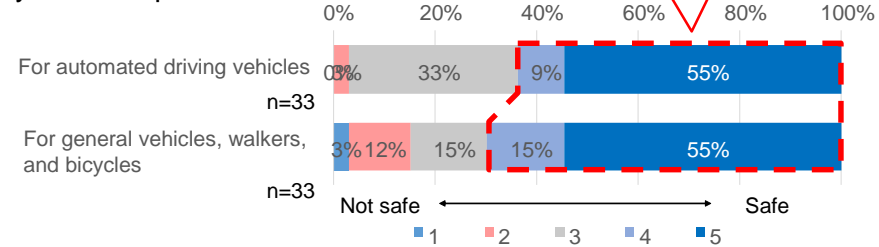


Calling attention by establishing it on the route

Signage

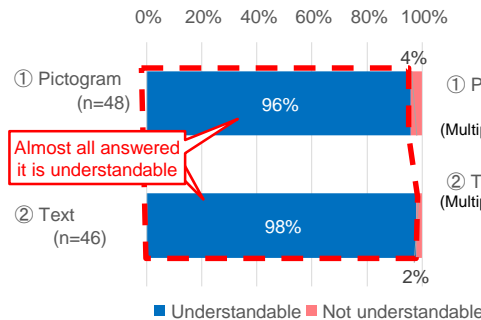
### Special section

<Do you think special section is safe?>

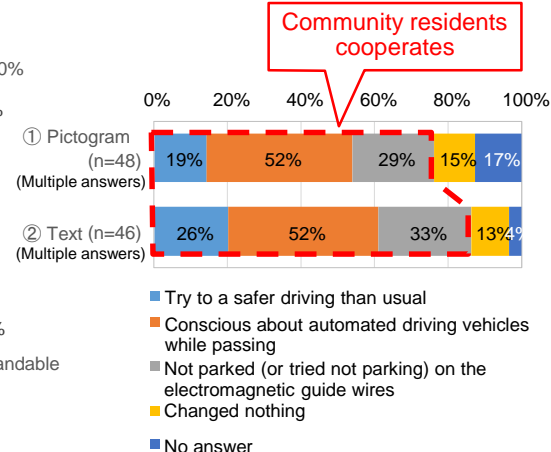


### Marking on road in mixed traffic

<Understandability of marking>



<Action when seeing marking>



Source: Resident survey results (after tests)

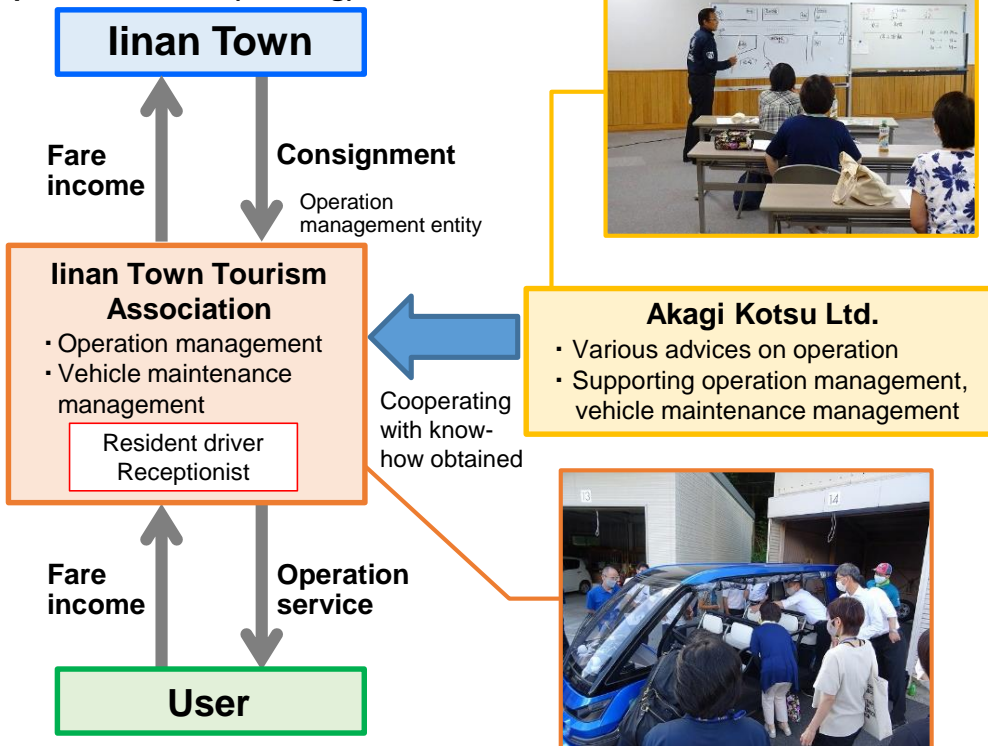
# 5-7 Results of Long-term FOT at Akagi-Kogen

## ■ Operation implementation system

- In the long-term FOT, Iinan Town operated fee-based transportation with private vehicles, while consigning to the tourism association operation management.
- Local traffic service provider cooperated as an advisor to provide safety driving training and teach know-how on operation management.
- Toward full-scale operation, they confirmed willingness to cooperate from about 10 persons, those who had a professional driver experience and people living along the ADV route.
- As a condition for cooperating operation, the highest expectation is placed on “work only in free time”. Thus operation costs (such as labor cost) may be curtailed if the system to match their free time and work such as allowing a short-time work by allocating works in driving time units.

### <Business scheme (during test)>

Operator of fee-based transportation with private vehicles (existing)

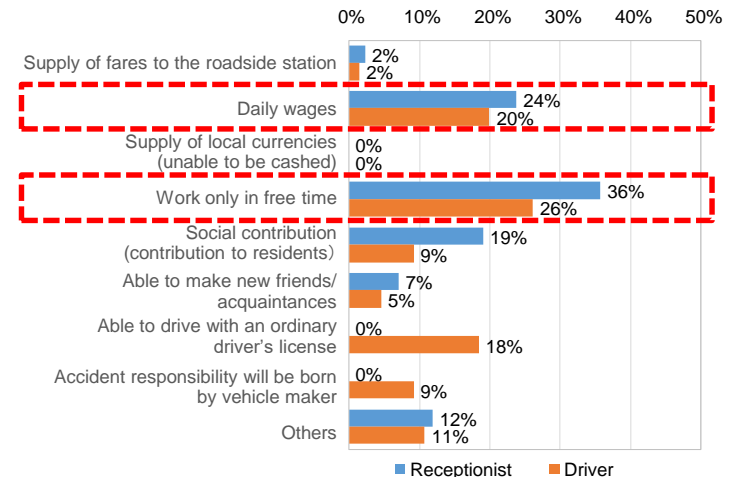


▲ Receiving reservation by residents



▲ Resident driver

### <Condition for cooperating operation>



Source: Resident survey results (after tests)

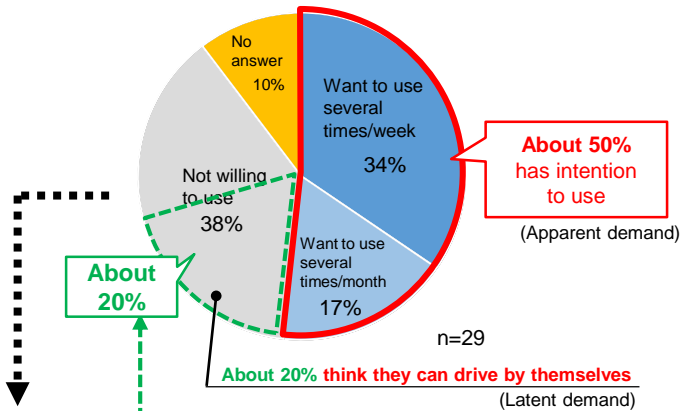
# 5-8 Results of Long-term FOT at Akagi-Kogen

## Business profitability/review of fare system

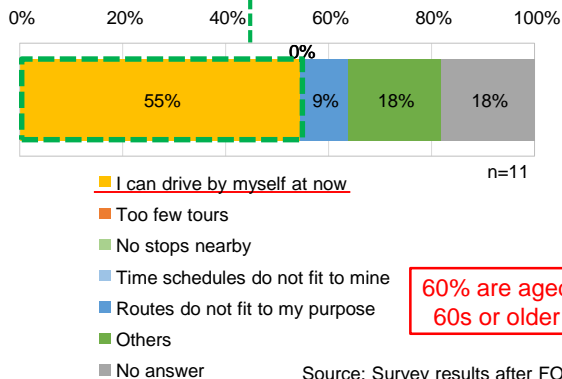
- About 50% of resident users (once per month: 20%, more than once per week: 30%) confirmed their intention to use the services when implemented.
- A half of people who do not want to use the services chose "I can drive a car by myself at now" as the reason. More than 60% of them are 60s or older, indicating a potential demand, especially as mobility measures when they return their driver's license in the future (apparent demand 50% + latent demand 20% = future demand 70%)
- Needs for purchasing a monthly commuter pass allowing free ride among residents were high, indicating a possibility of a future fare system with stable profits.

### <Intention to use services when implemented (community residents)>

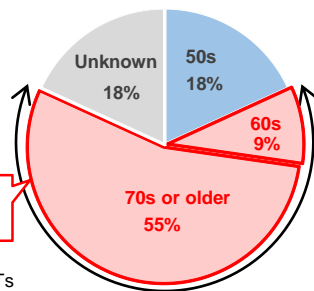
\* Intention of residents using the services at least once



### <Reason of not willing to use (38%)>

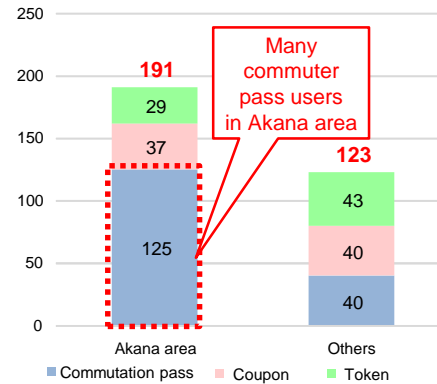


### <Age>



Source: Survey results after FOTs

### <Use status by ticket type (actual use)>



Residents in Akana area  
 A total of 125 times of using "commuter pass"  
 ⇒ About 70% of total use (125/191=65%)

\* Regional community organizations such as Akana autonomy promotion association cooperated the tests by purchasing tokens as an organization utilizing a salon for the elderly.

Source: Operation management system data

### <Main tickets sold in tests>

Type	Main needs
Commuter pass	● A fixed-rate service for people frequently move in the Akana area for commuting, business purposes, or shopping.
Token	● A service at a normal fare for users at a unchanged use frequency or trial users
Coupon ticket	● A service for people going out 1 or 2 times a week to go to a hospital outside the area, or the salon regularly held for the elderly

# 6-1 Summary 1

## – Establishing Framework for Improvement of Social Environment

- In operations in past fiscal years, we prepared the Automated Driving Services Introduction Manual summarizing basic matters to be reviewed in introducing automated driving services in mountainous areas.
- In this fiscal year, we **updated/added the contents of the manual based on findings newly obtained through FOTs.**
- We added such contents as **diverse fare setting, proposals on methods to promoting use (package tours, linking to events, etc.), COVID-19 infection control measures, addition of new cases (of areas where FOTs were performed in this fiscal year).**



**目次** 地方部における自動運転移動サービス導入マニュアル

地域の課題把握	● P1 1) 地域の課題把握
サービス内容	● P2 2) 提供するサービス ● P3 3) ルートの設定方法
ルート運行計画	● P4 4) 走行空間確保の必要性 ● P5 コラム 初期投資
走行空間	● P6 5) 乗客予約 ● P7 6) 事業採算性の検討
乗客予約採算性	● P8 7) 売出し料見直し ● P9 8) 対価の設定 ● P10 コラム 自家所有乗客客運施設とは
実施体制	● P11 9) 運行に必要な体制 ● P12 10) 予約と運行管理 ● P13 11) 車両の仕様 ● P14 12) 危機管理（事故等対応）
社会受容性	● P15 13) 社会受容性 ● P16 14) 利用促進
参考資料	● P17 参考資料 乗客について ● P18 参考資料 高齢運転の車両と地車運送施設の連携 ● P19 参考資料 高齢運転の対策 ● P20 参考資料 高齢者運転者に対する支援 ● P21 参考資料 高齢者運転者に対する支援 ● P22 参考資料 高齢者運転者に対する支援 ● P23 参考資料 高齢者運転者に対する支援 ● P24 参考資料 高齢者運転者に対する支援

**14) 利用促進**

● 地域の人達に上手く使ってもらう継続的な取組が必要  
● 地域外の人達にも受け入れられる取組が必要  
● その他（新型コロナウイルス感染拡大防止対策）

**地域をどう取り込むか**

地元・地域住民への周知・PRや理解醸成のため以下のような取り組みを実施することが重要。  
【一例を示す】  
● 地元住民による車両の登録の公募・乗客命名式及び乗員採算式（乗客向上）  
● 試乗会、ツアーなどのイベント体験  
● 地域の集いで周知と意見交換

▲ 乗客命名式及び乗員採算式（ひまわり）  
▲ 地域の集いで周知と意見交換（ひまわり）

**利用者をどのように確保するか**

利用者（高齢・ハイユーザー、観光客等）を確保するため以下のような取り組みを実施することが重要。  
【一例を示す】  
● 映画（道の駅、店舗、路線バスなど）とのタイアップによる利用方法の提案  
⇒ 乗客パックツアーサービス、買物バスツアーサービス、産物物品等の出向支援サービス、イベントと連携した利用促進、物品定期配達サービスなど  
● 移動距離の拡大による利便性向上（既存公共交通とのシームレスな連携等）

▲ 道の駅とタイアップイメージ（ひまわり、ひまわりツアー）  
▲ 路線バスとタイアップイメージ（ひまわり、買物バスツアー）

**コラム** 安心して利用していただくための対策

● 新型コロナウイルス感染拡大防止対策

**新型コロナウイルス感染拡大防止対策**

多くの方に利用いただくため、新型コロナウイルス感染拡大防止対策を実施した。  
● 乗客関係スタッフは、毎日、朝ミーティング、点呼時に検温を実施。  
● 受付窓口には、飛沫防止のクリアパーテーションを設置。  
● 手洗いや消毒のアルコールを常設し、小まめに消毒を実施。  
● 毎便運行後に車両の手すりを消毒スプレーで除菌。  
● 車内の座席の前後の間にビニールシートを設置。  
● 利用者の乗車は、「町内」「県内（町外）」「県外」に分散した乗車を基本ルールとする。  
⇒ 予約時に属性に配慮し、乗車を分散させるように配慮。

▲ 点呼時の検温  
▲ 受付窓口の様子（クリアパーテーション、アルコール常設）  
▲ 車内のビニールシート  
▲ 利用者乗車の分散のお知らせ

▲ Update version of Automated Driving Services Introduction Manual (excerpt)

⇒ In the next fiscal year onward, we plan to establish a point of contact to provide various information on findings, and receive inquiries, through the website, for further improvement of the social environment.



# 6-2 Summary 2

## ○ Activities toward permanent system

### ■ Review of maintenance/management of space/infrastructure/vehicles

- No-accident operation have continued for 1 year by securing a special section for level 4 driving. However, alternative measures to securing space by guides shall be established, as it involves a high cost.
- It is confirmed that daily control of vehicles can be done by community residents. Future review is required for securing replacement vehicles during regular inspections or repair due to defects caused by continuous use.
- Infrastructure has been clearly positioned as road attachments. In the future, application of efficient maintenance/management method to other areas is required.

### ■ Review of activities related to business profitability

- For sustainable operation, activities focusing on “side business”, “cooperation with roadside stations” and “cargo transport” are required.
- We will review full-scale implementation, such as reducing management costs by transferring reception or other works to staff in roadside stations or others, development of diverse services linked with activities to promote use within communities, and cargo transport through cooperation with stores, etc.
- We will aim to further implement activities to reduce costs and increase profits through implementation of the services, aiming to linkage with other businesses and development of new services suited for community.