Cross-ministerial Strategic Innovation Promotion Program(SIP)3rd Period /
Building a Smart Mobility Platform /

# Construction of a Digital Twin for mobility society experiments incorporating diverse geographical spatial information and Nationwide Pseudo-People-Flow data

## FY2025 Annual Report

Center of Spatial Information Science at University of Tokyo (CSIS)
Association for Promotion of Infrastructure Geospatial Information Distribution(AIGID)
Softbank Corp.
CTI Engineering Co.,Ltd.

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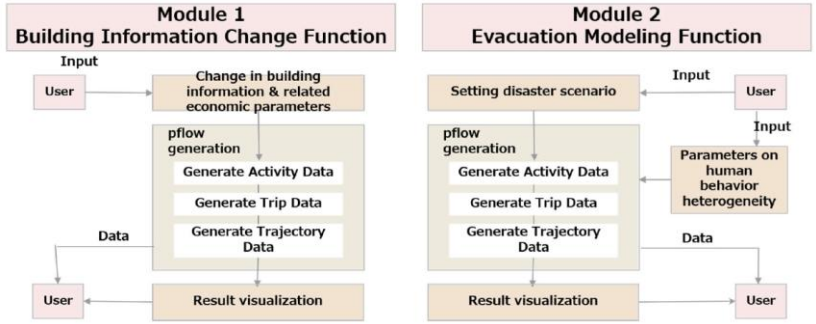
# Overview

# Overview

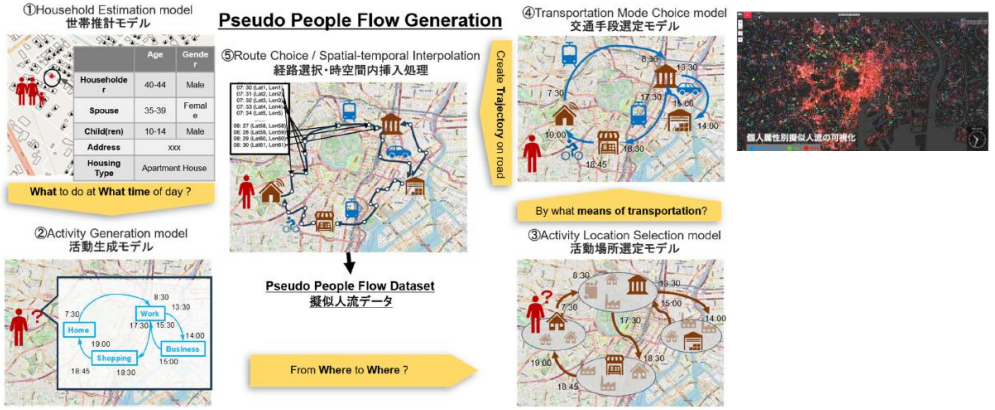
| | | | | | |
|---|---|---|---|---|---|
| **①Development Objectives** | • Hypothesis testing and impact evaluation of behavioral changes resulting from social experiments<br>• Deployment as an explanatory tool for the general public | | | | |
| **②Purpose** | Focusing on the newly redefined mobility and vibrant urban development, there is a growing demand to realize a "safe, comfortable, rich, and lively new form of mobility" where pedestrians, micro-mobility, various vehicles, and public transport smoothly mix and coexist. To efficiently and effectively plan this, and to facilitate consensus-building among stakeholders and streamline administrative processes, the goal is to establish a "Digital Sandbox" system. This system will embody street spaces, incorporating diverse geospatial information, nationwide pseudo-people-flow data, vehicles and other mobility forms, as well as virtual spaces, and simulate them in the digital space. | | | | |
| **③Implementation Structure** | Center of Spatial Information Science at University of Tokyo (CSIS), Association for Promotion of Infrastructure Geospatial Information Distribution（AIGID）, Softbank Corp., CTI Engineering Co.,Ltd. | | | | |
| **④Work schedule** | Year 1: Organize examples of social experiments and discuss system requirements<br>Year 2: Develop the prototype Year 3: Apply to 3 social experiment cases Year 4: Apply to 6 social experiment cases (cumulative) Year 5: Apply to 10 social experiment cases (cumulative) | | | | |
| **⑤Progress Status** | FY2023: Organized 257 social experiment cases and discussed system requirements<br>FY2024:  Released Pseudo-People-Flow Data ver. 2.0, established research workshops, and currently building the prototype<br>FY2025: Refinement of Pseudo-People-Flow Data, refinement of the Mobility Digital Twin, and consideration of eight experimental cases | | | | |
| **⑥Exit Strategy** | **The party responsible for Social implementation** | **At the End of SIP** | Center of Spatial Information Science at University of Tokyo (CSIS), Association for Promotion of Infrastructure Geospatial Information Distribution（AIGID）, Softbank Corp., CTI Engineering Co.,Ltd. | **At the Time of Social Experiment** | Association for Promotion of Infrastructure Geospatial Information Distribution（AIGID） |
| | **Provided Resources※** | | Digital city services and associated simulation services (approximately 10 social experiment cases). | | Digital City Services and Associated Simulation Services (Expansion of the Number of Cases) |
| | **Target Users** | | Municipalities belonging to the research workshops (for trial implementation). | | Municipalities (Full Implementation)<br>Municipalities will fully implement the services, integrating them into their operations. |
| | **Convenience and Value Provided to Users** | | Users can perform mobility simulations in digital space without making significant investments, allowing for hypothesis testing and impact evaluation. | | Traditionally, when examining policies, significant investments were required to conduct real-world social experiments in order to verify their effectiveness and impact. However, it is now possible to conduct simulations in a digital space, allowing for hypothesis testing and impact evaluation without the need for such substantial investments. |

# Structure of the Research and Development

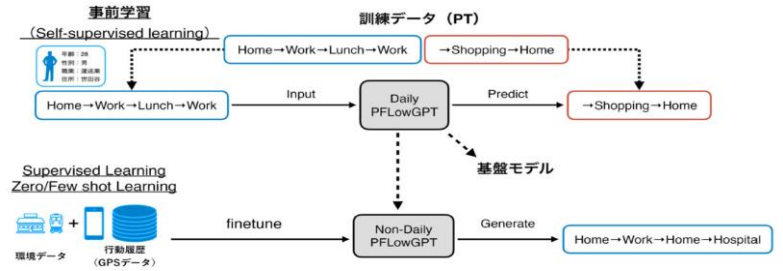
## （1） Categorization of Mobility Simulations and Design of Digital Sandbox Platform



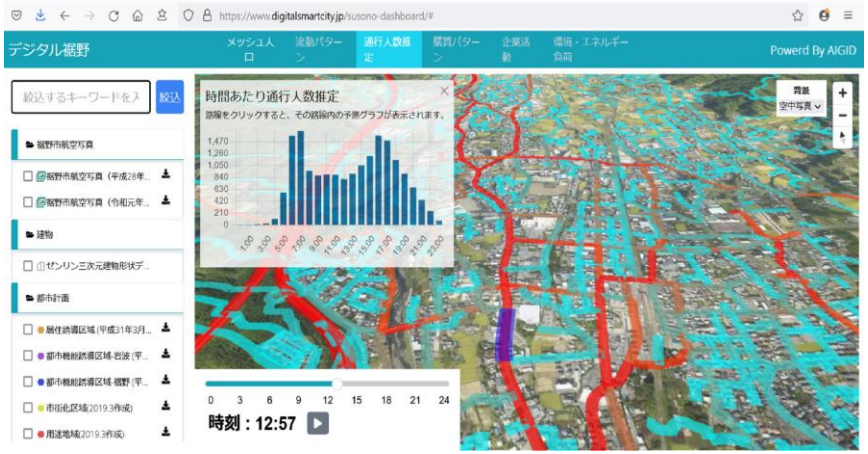

## （2） Construction of Simulation Elements for Various Cases and Acceleration of Pseudo-People-Flow Generation Processing




## （3） Enhancement of Accuracy and Quantification of Uncertainty in Pseudo-People-Flow Models through the Integration of Fragmented real Human Mobility data




## （4）Implementation of the Digital Sandbox Platform and its application to social experiments, as well as the creation of user communities



# Work schedule

| | 2023 | 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|
| モビリティシミュレーションの類型化とデジタルサンドボックス基盤の設計 | 類型化と設計 | タイプの追加・設計改良 | | | |
| 各ケースのシミュレーション要素の構築と擬似人流生成処理の高速化 | 設計 | 実装 | 要素の追加・改良 | 高速化や入出力の多様化 | |
| 断片的な実人流を組み合わせた擬似人流モデルの高精度化と不確実性の定量化 | 生成型モデルの構築 | 実人流による高精度化 | 不確実性の定量化 | 推定モデルの改良・高精度化・高速化 | |
| デジタルサンドボックス基盤の実装と社会実験への適用 | プロトタイプ設計 | プロトタイプ実装 | 試験利用改良 | 複数の社会実験等で利用・適宜改良 | |

# Development & Refinement of Pseudo-People-Flow Data

## Enhancement of Accuracy and Quantification of Uncertainty in Pseudo-People-Flow Models through the Integration of Fragmented real Human Mobility data

# Data Overview

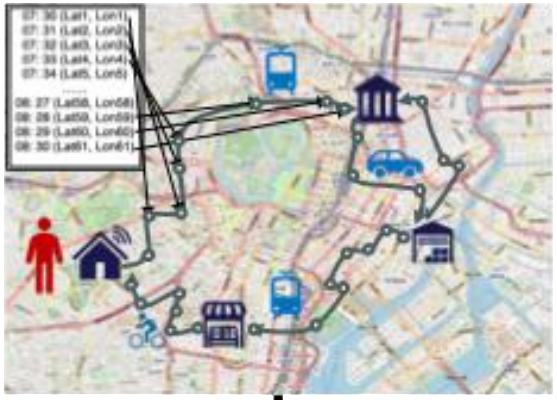
- Based on open statistical data and agent models using common learning parameters, estimate people's typical daily activities, locations, modes of transportation, and travel routes at any given moment, and create synthetic data that can represent these behaviors in a pseudo manner.

①Household Estimation model
世帯推計モデル


What to do at What time of day?

②Activity Generation model
活動生成モデル


⑤Route Choice / Spatial-temporal Interpolation
経路選択・時空間内挿入処理



Pseudo People Flow Dataset
擬似人流データセット

From Where to Where?

Create Trajectory on road

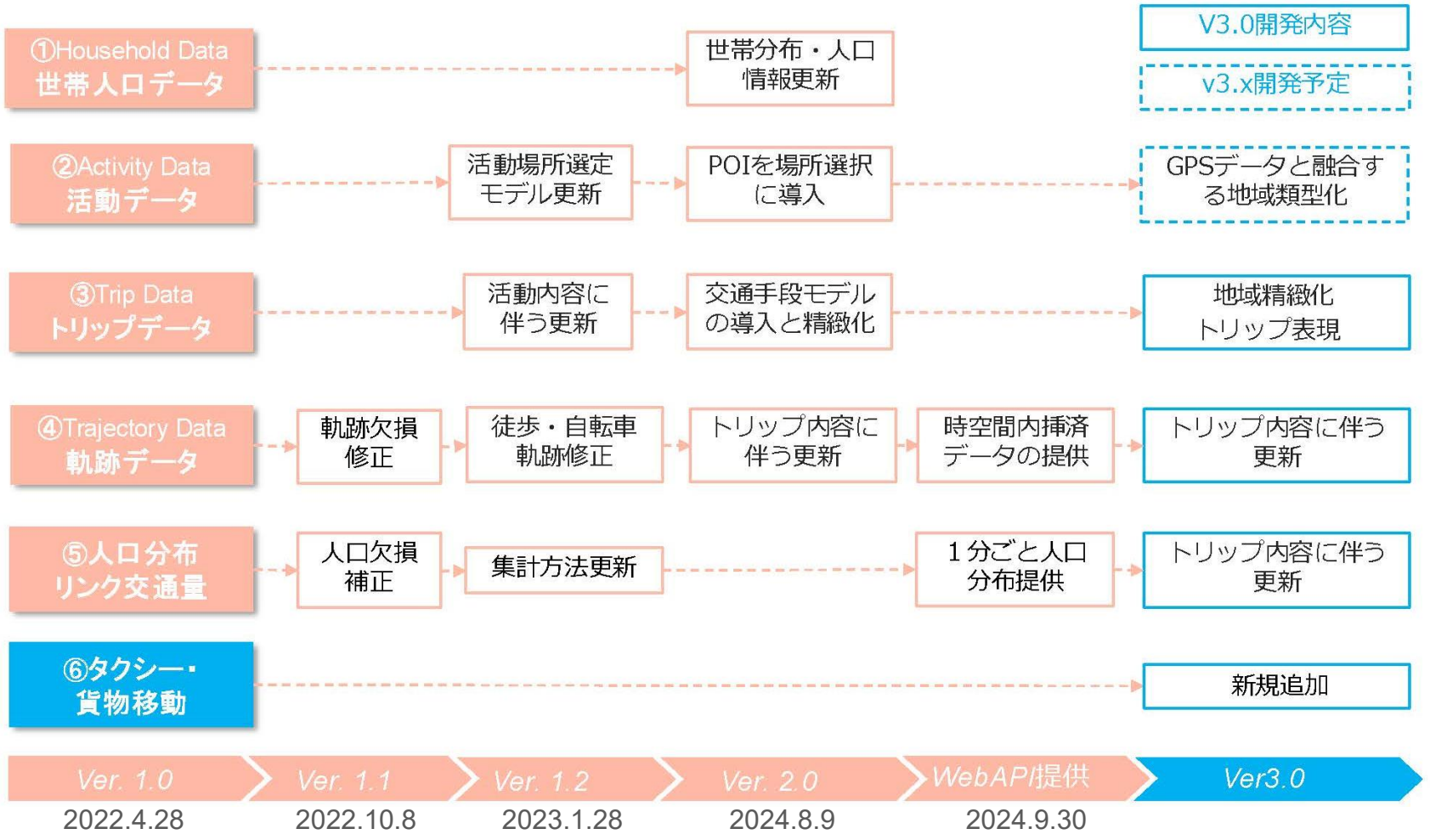
④Transportation Mode Choice model
交通手段選定モデル


By what means of transportation?

③Activity Location Selection model
活動場所選定モデル

# Data Provision & Update Status

- After releasing Ver 1.0 in April 2022, Versions 1.1 and 1.2 were released, followed by the release of Ver. 2.0 in August 2024. Ver. 3.0 is scheduled for release by May 2026.



# Accuracy Evaluation

- Although accuracy has been gradually improving through various efforts, business trips (such as logistics operations and taxi services, including trips conducted after arriving at offices) and low-frequency trips (such as shopping and hospital visits that do not occur on a daily basis) remain significantly underrepresented.

| | ver1.2 | ver2.0 | Considerations |
|---|---|---|---|
| **Mesh Population** | Correlation coefficient with mobile data: 0.78 at 500m resolution, 0.90 at 1000m resolution. | Improved correlation coefficient: 0.83 at 500m resolution. By introducing POI data, more rational locations were selected. 0.90 at 1000m resolution. | At the 1km resolution, there was only slight improvement in accuracy due to insufficient improvement in destination selection model. |
| **OD Volume** | Confirmed correlation of 0.78 or higher with SoftBank's motion statistics data at the municipal level. | Confirmed correlation of 0.75 or higher with motion statistics data. (Some areas had no OD volume due to insufficient POI data, but this was fixed.) | Further adjustment is needed in the behavior patterns, activities, and the frequency of incidental activities. |
| **Cross-Sectional Traffic Volume** | There were differences in correlation rates with observation points, with the overall traffic volume tending to be underestimated. | By using vehicle ownership rates by prefecture, a model replicating vehicle-centered rural areas and public transport-centered urban areas was created. Cross-sectional traffic volume decreased compared to Ver 1.2. | Quantitative evaluation of traffic volume from logistics is necessary, and the deficit in pseudo-people-flow data should be confirmed. |
| **Trip Count** | The total OD volume in motion statistics is 9,820,973. Ver 1.2 had 5,400,525 trips. | Ver 2.0 had 4,994,246 trips, an 8% decrease compared to Ver 1.2. | PT survey data suggests the number of trips per person per day has decreased from 2.8 in 2008 to 2.6 in 2018. This is believed to be the cause. |
| **Traffic Mode Share** | The model was uniform nationwide, resulting in a car-centered movement pattern where bus usage could not be reproduced. | The model was refined to more accurately replicate regional differences, especially between the three major metropolitan areas and rural areas. Bus usage was also successfully reproduced. | Compared with traffic characteristic values for cities in FY2021, there is still room to further improve the share of cars, buses, and trains. |

# Improvements in Ver. 3.0

- Improvements were implemented to address the main issues identified in Ver. 2.x (the five items listed below).

## Main Issues in the Conventional Version (Ver. 2.x)

- Business-related traffic (freight vehicles and taxis) was not represented, resulting in insufficient traffic volumes on road links
- The mode choice model was uniformly applied nationwide, making it difficult to represent differences in modal share across prefectures
- Activity generation relied on a limited set of parameters, making it difficult to capture regional behavioral differences (e.g., central versus peripheral areas)
- Destination choice was strongly constrained by distance, and could not sufficiently account for points of interest (POIs) or travel time, particularly for rail transportation.
  → As a result, trips within municipalities tend to be overestimated, while trips across municipalities tend to be underestimated.
- The Web API supported only one nearest station and a single route, resulting in unstable reproduction of route-specific public transport usage.

## Main Improvements in Ver. 3.0

Item 1: Addition of business agents (taxis and freight vehicles)
Item 2: Refinement of the prefecture-specific mode choice models
Item 3: Cross-cutting application of the activity generation model based on urban typologies
Item 4: Improvement of the destination choice model
Item 5: Update of the Web API (extension of public transportation route search)

# Item 1: Addition of Business Agents (Freight Vehicles and Taxis)

- Business-related traffic (freight vehicles and taxis), which had not been represented in previous versions, has been added.
- This enhancement is expected to compensate for approximately 80% of the previously insufficient link traffic volumes.

**Agent Configuration in Ver. 3.0 (Conceptual Diagram)**

**Individuals (Residents)**
**Commuters, students, unemployed persons, etc.**
＋ Activity location choice
＋ Mode choice
＋ Route choice

**Business (Commercial) Agents**
**Freight / Taxi, etc.**
＋ Vehicle-type-specific operation rates
＋ Vehicle-type-specific travel distance / number of trips
＋ Destination distribution (delivery and pickup locations)
＋ Time-of-day trip generation rates

## Freight Agent

- Freight vehicle behavior is reproduced based on the Metropolitan Freight Flow Survey
  - Travel distance / number of trips by vehicle type
  - Destination distribution (delivery and pickup locations)
  - Output: Freight vehicle trips and trajectories (same format as Pseudo-People-Flow Data)

## Taxi Agent

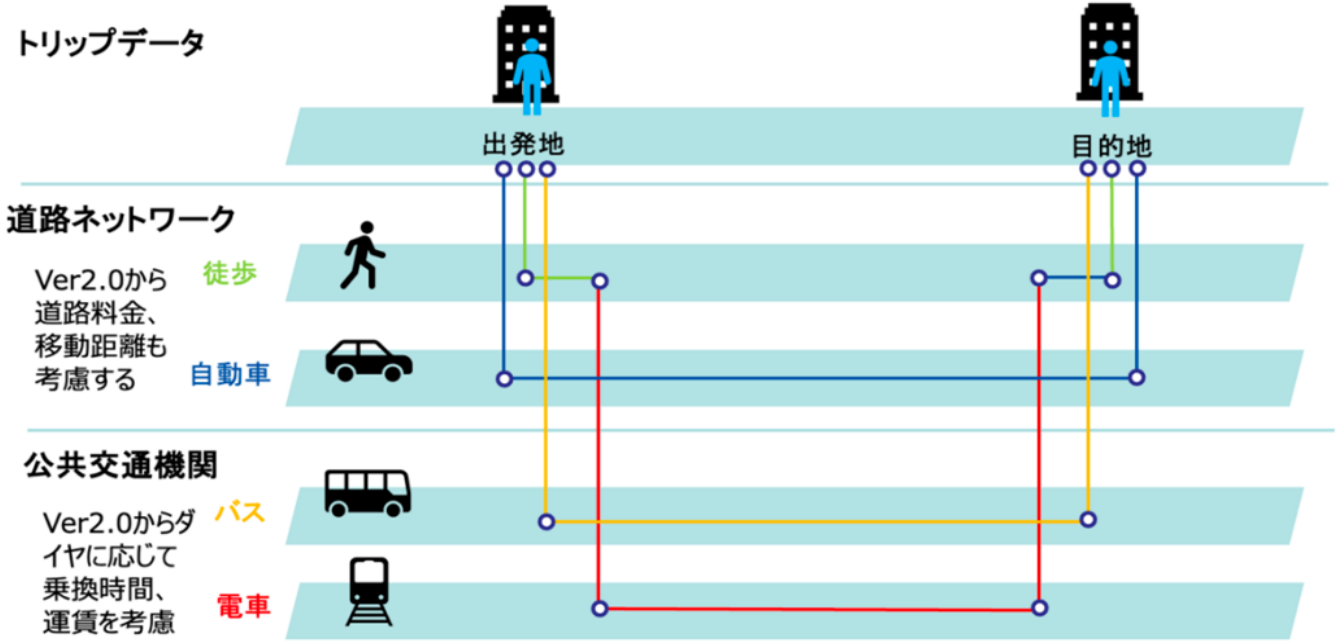
- Operational statistics and daily log data (Company A)
  - Tokyo Metropolitan Area: approx. 40,000 vehicles
  - Number of trips: average ≈ 27 trips per day (clipped to a range of 20–30 trips)
  - Within 3 km of the previous alighting point (70%), or Hotspots (30%)
  - Trip distance: average ≈ 9 km (range: 0.5–30 km)
  - Output: Occupied and vacant trips with trajectories

# Item 2: Refinement of the Prefecture-Specific Mode Choice Models

- Model parameters were adjusted for each prefecture to ensure consistency with observed modal shares (e.g., automobiles, railways, buses, and walking).

Reference data : Ministry of Land, Infrastructure, Transport and Tourism (MLIT), "Nationwide Urban Transportation Characteristics Survey (FY2021): City-Level Indicators"

Target parameters: Region-specific parameters such as automobile and bicycle ownership rates, automobile usage costs, walking impedance factors, and value of time




時空間内挿WebAPIサービス*により、道路・鉄道・バスの経路探索を一括して実施した

# Item 3: Cross-Cutting Application of the Activity Generation Model Based on Urban Typologies

- Regions were classified in accordance with the MLIT urban typologies (National PT Survey categories a–j), and typology-specific parameters were tuned in coordination with GeoTech GPS.

  Target: Improving the accuracy of the activity generation model, with a particular focus on shopping and other activities
  → Estimated results are shared within each typology to compensate for regions with insufficient data.

| 都市類型 | | | 調査対象都市 |
|---|---|---|---|
| a | 三大都市圏 | 中心都市 | さいたま市、千葉市、東京区部、横浜市、川崎市、名古屋市、京都市、大阪市、神戸市 |
| b | | 周辺都市※1 | 取手市、所沢市、松戸市、稲城市、堺市、豊中市、奈良市 |
| c | | 周辺都市※2 | 青梅市、小田原市、岐阜市、豊橋市、春日井市、津島市、東海市、<br>四日市市、亀山市、近江八幡市、宇治市、泉佐野市、明石市 |
| d | 地方中枢都市圏 | 中心都市 | 札幌市、仙台市、広島市、北九州市、福岡市 |
| e | | 周辺都市 | 小樽市、千歳市、塩竈市、呉市、大竹市、太宰府市 |
| f | 地方中核都市圏（中心都市 40 万人以上） | 中心都市 | 宇都宮市、金沢市、静岡市、松山市、熊本市、鹿児島市 |
| g | | 周辺都市 | 小矢部市、小松市、磐田市、総社市、諫早市、臼杵市 |
| h | 地方中核都市圏（中心都市 40 万人未満） | 中心都市 | 弘前市、盛岡市、郡山市、松江市、徳島市、高知市 |
| i | | 周辺都市 | 高崎市、山梨市、海南市、安来市、南国市、浦添市 |
| j | 地方中心都市圏 その他の都市 | ― | 湯沢市、伊那市、上越市、長門市、今治市、人吉市 |

Source:https://www.mlit.go.jp/common/001241794.pdf

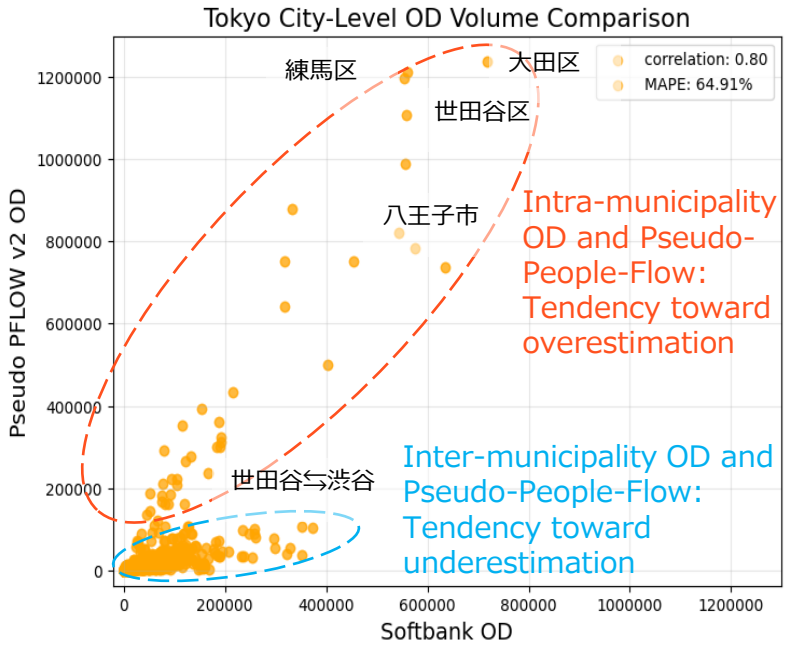
# Item 4: Improvement of the Destination Choice Model

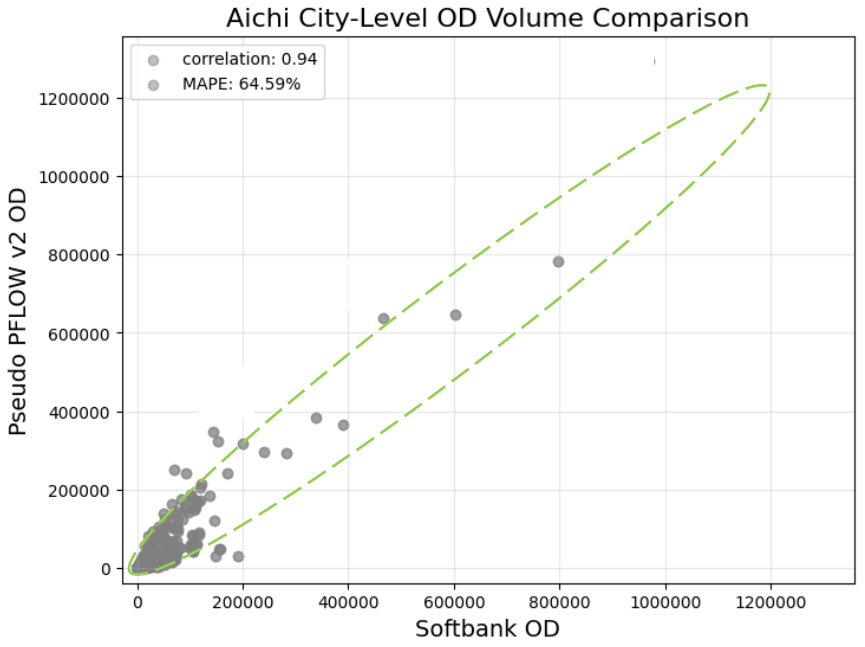
- A destination choice model that relaxes constraints on candidate generation and incorporates points of interest (POIs) and travel time.

Cause: Strong distance-based restrictions in destination candidate generation have limited the consideration of POIs (attractiveness) and travel time, particularly for public transportation such as railways.

→ This improvement aims to enhance the accuracy of OD volumes across distance bands and for intra- and inter-municipality trips.

Ver. 2.x: Current Status → Ver. 3.0: Target



# Item 5: Update of the Web API (Extension of Public Transportation Route Search)

- Multiple nearest stations (1–3) are identified for both origins and destinations.
- Route search is performed for all combinations (e.g., up to nine routes when three stations are selected for each).
- All routes are sorted by travel time in ascending order and output in full.

Effects

- User volumes by route were reproduced with improved accuracy.
- Consideration of alternative routes enhanced the robustness of route choice.
- Flexible API design became possible according to use cases, such as limiting the number of returned results (top N).

# Community Building Through Hands-On Workshops and Challenges

- At the 33rd GIS Conference, a workshop (hands-on + discussion) was held, where methods for utilizing the data and the code for generating it were openly shared. Over 30 participants (both in-person and online) deepened their understanding through live demonstrations and coding exercises, and shared feedback.
- However, a challenge emerged: knowledge sharing among researchers has not progressed sufficiently, and communication has largely been one-way from the administrative office. Efforts are underway to build an active online community using Slack.


Community-Building Framework

Hands-On Workshop

# Prototyping of a Mobility Digital Twin

## Simulation Elements for Various Cases

# Positioning of This System

- There are existing transportation simulation packages and dispatch management services for buses and taxis. However, the former requires specialized knowledge and extensive data preparation, while the latter comes at a considerable cost and can only be used once a budget is secured.
- This system focuses on enabling municipalities and practitioners to perform simulations using only a Web UI (no coding required), with results available quickly (within a few minutes).
- While the system concentrates on a set of typical use cases, it also aims to gradually expand customization features to some extent. However, non-standard or irregular tasks are envisioned as optional commissioned services.

| | Transportation Simulation Packages | Taxi/Bus Dispatch Management Services | This System |
|---|---|---|---|
| Function ality / Usability | Offers many features, but requires high expertise. Also needs preparation of data and programming, resulting in a high barrier for general users. | Easy to use as it is tailored for specific purposes. | Focuses on a few typical use cases. Simple Web UI enables results within minutes. Includes customizable features and continues to improve. |
| Cost | Some are open-source. | Often expensive. | Aims to be low-cost and subscription-based, usable by municipalities nationwide. |

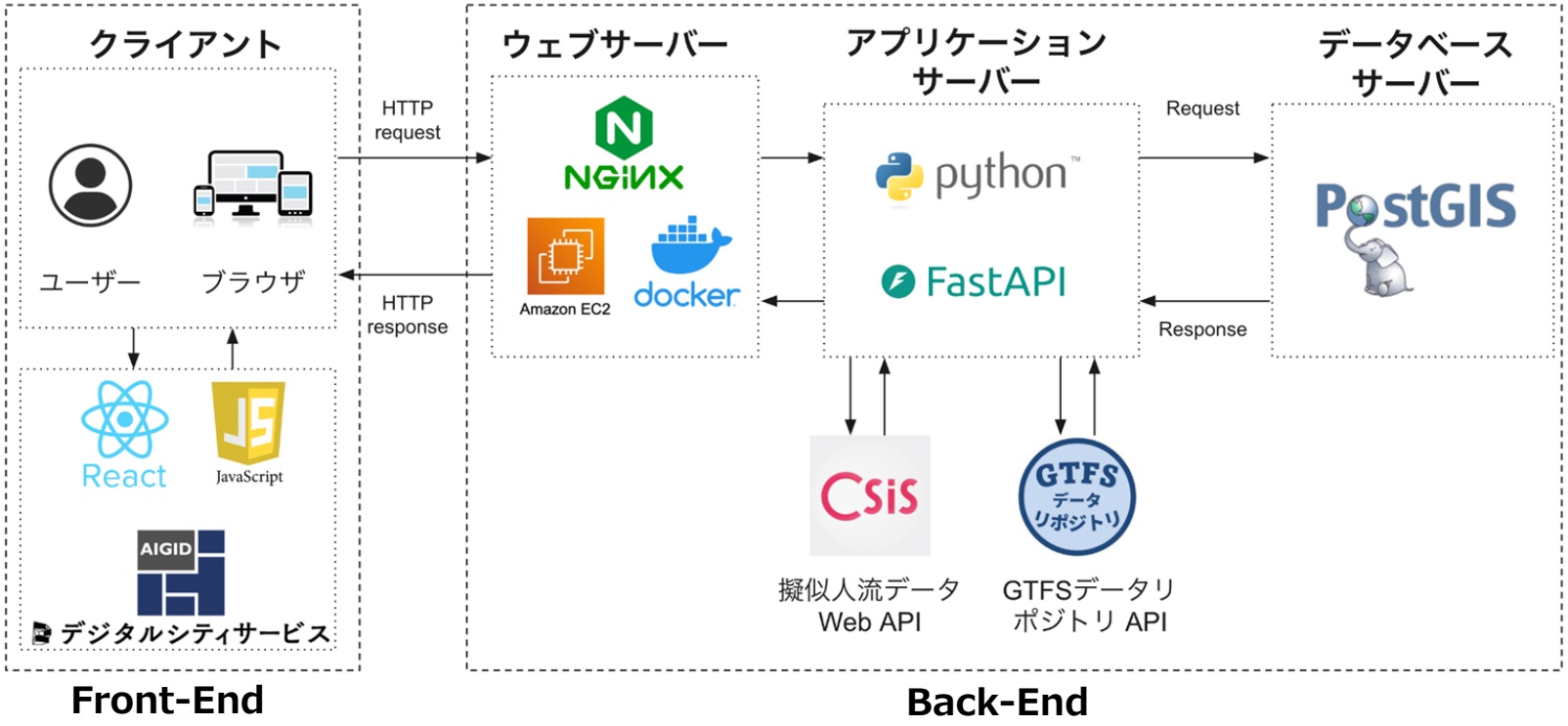
# Use Case Scenarios Overview

- Demonstration Scenarios (5 Typical Patterns) and Processing Flow

| ①Scenario Selection | ②Parameter setting | ③formation process | ④Data output and visualization |
|---|---|---|---|
| **a. Forecast number of public transportation users**<br>Estimation of user increase due to enhanced public transport services | The user selects public transport GTFS data and configures increased service frequency | Re-select the mode of transportation from Pseudo-People-Flow trip data using a spatio-temporal interpolation service | The total number of users before and after the simulation, as well as the number of users at each bus stop, is output |
| **b. Implementation of on-demand transportation**<br>Introduction of on-demand transport in response to public transport reductions | The user specifies the area for service reduction and inputs parameters for on-demand transport | Calculate demand based on the trip data from the Pseudo-People-Flow | Fare comparison results between public transport and on-demand transport are output, and on-demand demand is visualized on a background map |
| **c. Estimates of visitors to specific areas**<br>Visitor estimation resulting from events held in specific areas | The user designates the event area and enters event-related parameters | Future enhancement: Use a visitor estimation model built from GPS data together with Pseudo-People-Flow activity data | Total visitors with and without the event and time-segmented inflow results are displayed, along with a map-based visualization of origin distribution |
| **d. Flow changes due to redevelopment**<br>Changes in surrounding flow due to the construction of large shopping centers or redevelopment of shopping districts | The user selects the redevelopment area and inputs development parameters | Re-select destinations based on Pseudo-People-Flow activity data | Mobility change results are output and visualized on a background map within the tool |
| **e. Flow impact of tourism promotion**<br>Changes in tourism flow caused by strengthened dissemination of event information | The user designates both the event and promotion areas and enters parameters for event and promotional reach | Re-select destinations based on Pseudo-People-Flow activity data | Mobility change results are output and visualized on a background map within the tool |

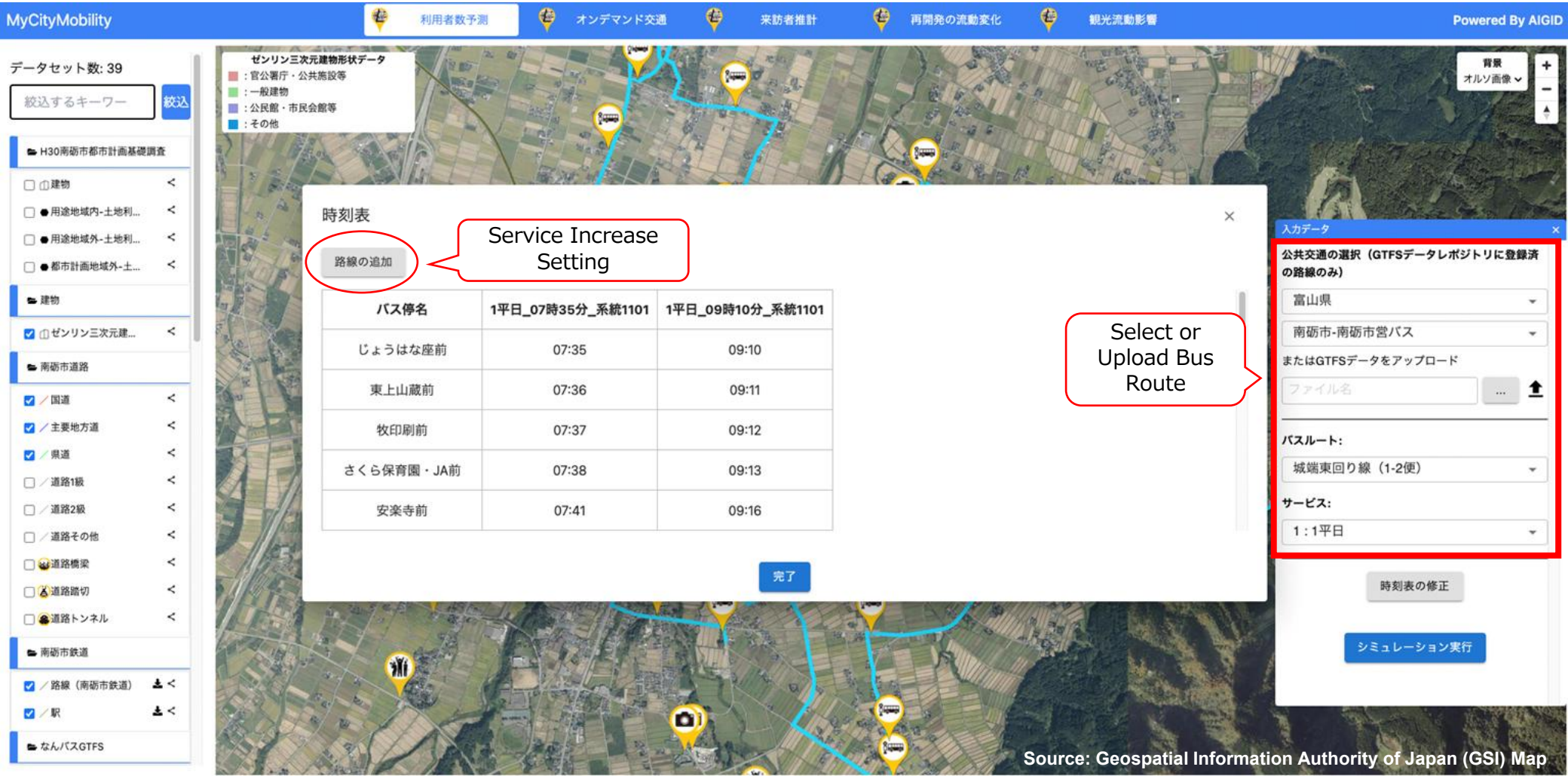
# System Configuration Diagram (Server)

- The frontend system, including digital maps, is built upon the Digital City Service platform, with input/output user interfaces developed using React and JavaScript.
- On the backend, key data sources include:GTFS data, which is retrieved via the GTFS Data Repository API, Pseudo people flow data, obtained and utilized from the "Human Flow Project" of CSIS, the University of Tokyo.



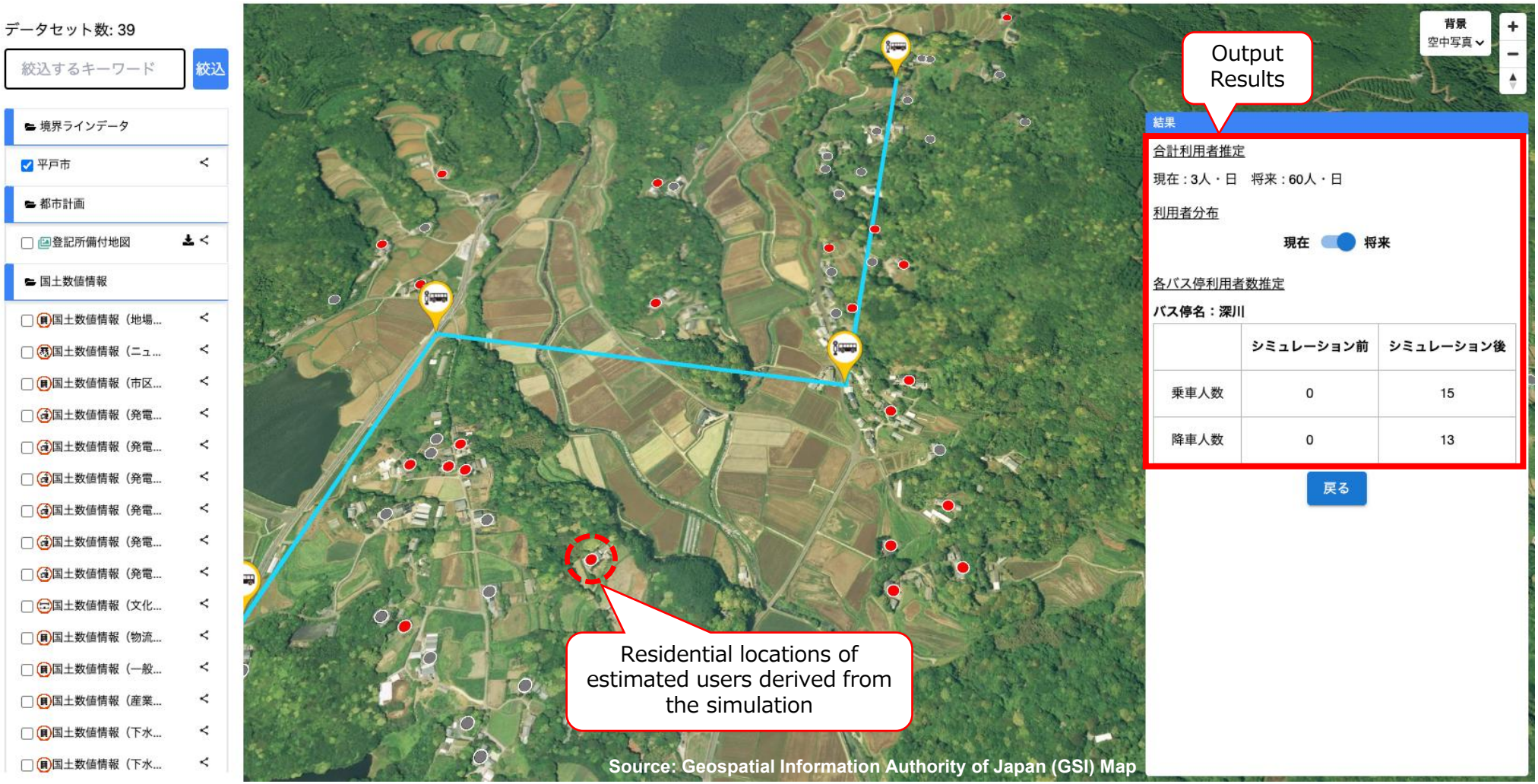
# [Alpha Version]
# a) Forecast of public transportation users (Input)

- Users can choose or upload public transport bus routes and add additional schedules.



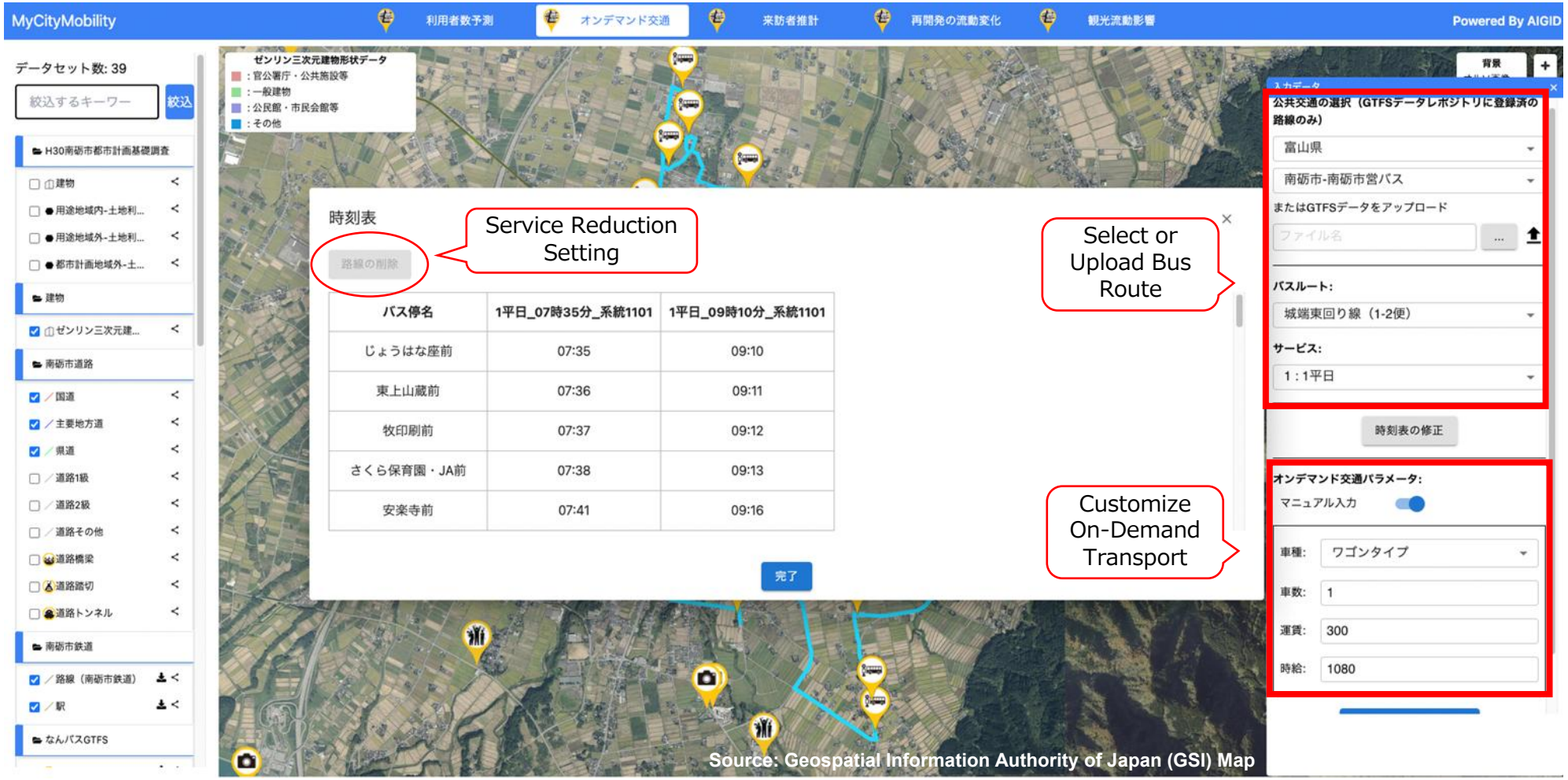
# [Alpha Version]
# a) Forecast of public transportation users (Output)

- Outputs include total ridership before and after simulation and user counts per bus stop.



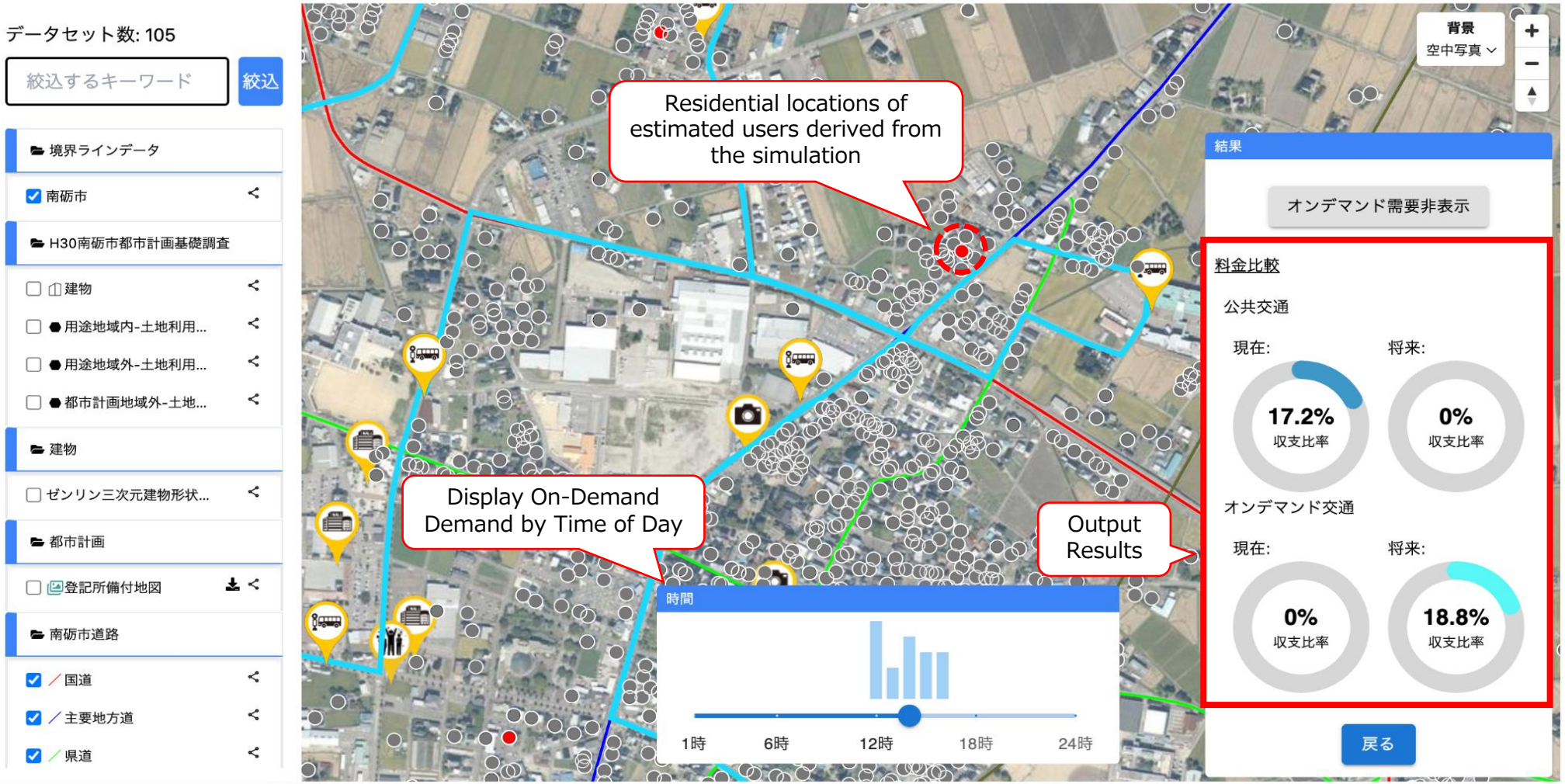
# [Alpha Version]
# b) Implementation of On-Demand Transportation (Input)

- Users could select or upload a public bus route, decide service reductions, and customize on-demand transportation parameters (vehicle type, fleet size, fare structure, etc.).



# [Alpha Version]
# b) Implementation of On-Demand Transportation (Output)

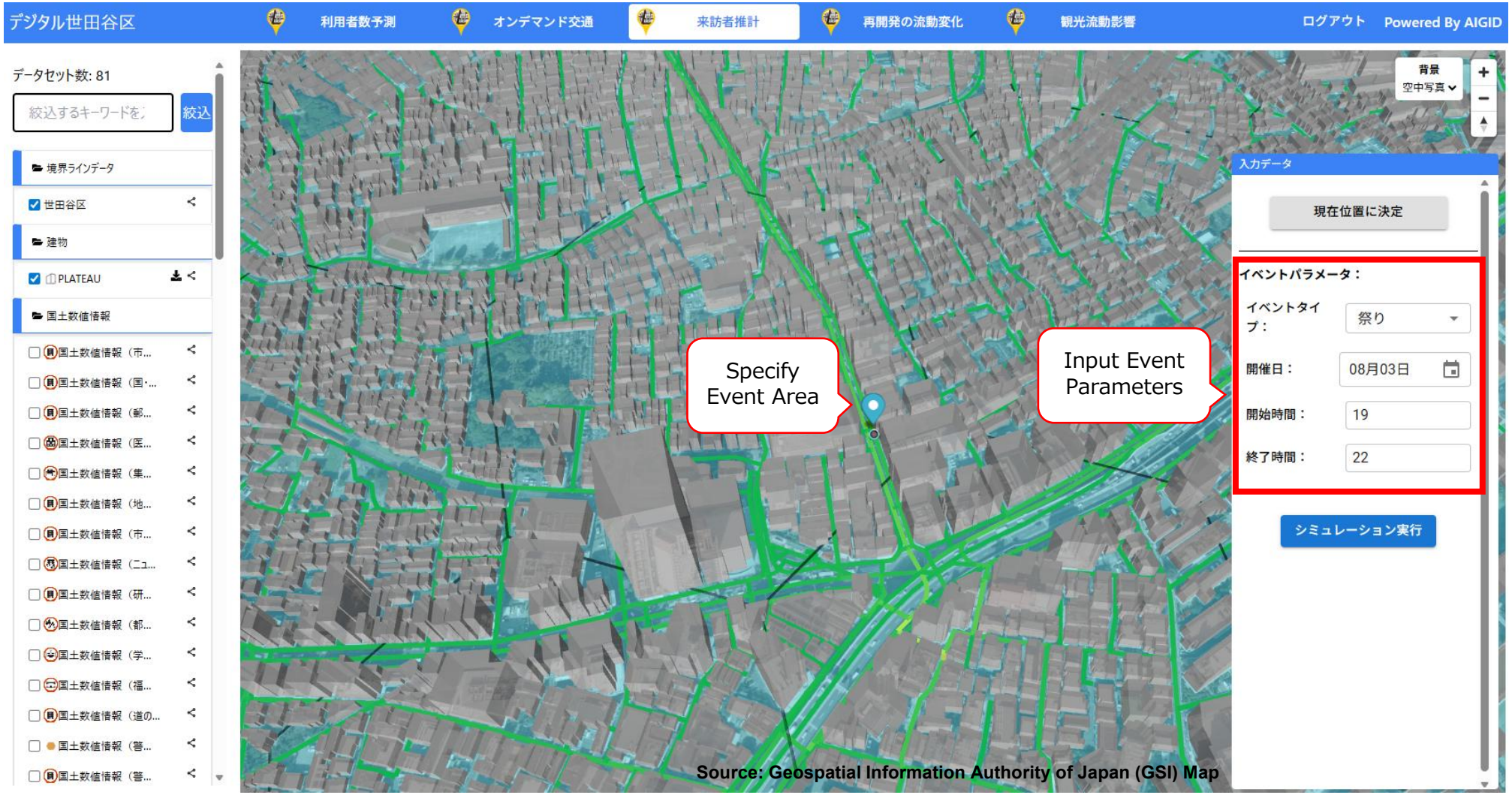
- The system visualizes before-and-after budget comparison results for public transport versus on-demand services, as well as potential demand by time of day.




Source: Geospatial Information Authority of Japan (GSI) Map

# [Alpha Version]
# c) Estimates of visitors to specific areas (Input)

- The function to appoint the event area and input parameters related to the event (such as event type, date and time, number of booths, etc.) has been implemented.



# [Alpha Version]
# c) Estimates of visitors to specific areas (Output)

- Visualize total visitors with and without an event for the Sangenjaya shopping district, the inflow by time of day (including commuting hours), and the distribution of visitor origin locations.


Source: Geospatial Information Authority of Japan (GSI) Map

# Prototype-Based Questionnaire Survey (Scenarios a and b)

- An initial (alpha) version of the scenarios a and b of “Mobility Digital Twin Prototyping – MyCityMobility” was released to members of the research workshop.Feedback was collected regarding usability, visualization, and displayed content.Responses were obtained from 12 participants (conducted in October 2025).

## Questionnaire Survey Results

- Survey period: October 2025
- Number of respondents: 12
  - The University of Tokyo: 3
  - CTI Engineering Co., Ltd.: 3
  - Setagaya Ward, Susono City, Kobe City, Okazaki City, Iyo City, and Nanto City: 1 each (total of 6)

# Prototype-Based Questionnaire Survey (Scenarios a and b)

## 【Feedback Based on Questionnaire Results】

### ■ Positive Feedback

- Multiple respondents indicated that the system is “smooth and easy to operate.”
- The distribution of users was considered intuitive and easy to understand.

### ■ Issues and Suggestions Identified

| Key points raised: | | Number of respondents |
|---|---|---|
| Information Transparency | There is no clear display of execution conditions, such as routes, time schedules, or details of scenario changes. | 4 |
| Insufficient Navigation and Explanatory Guidance | At the startup screen and during scenario selection, it is difficult to understand what functions and analyses the tool provides. | 4 |
| | The purpose of the simulation and the meaning of the results are not sufficiently communicated. | 4 |
| Concerns Regarding Computation Time | Users expressed a desire for an estimated indication of processing or waiting time. | 4 |
| | The lack of such information makes trial-and-error usage difficult. | 2 |
| Development-Related Issues | Notification emails for simulation results are unclear and may be filtered as spam. | 2 |
| | Computation failures occurred in some cases. | 2 |

# Prototype-Based Questionnaire Survey (Scenarios a and b)

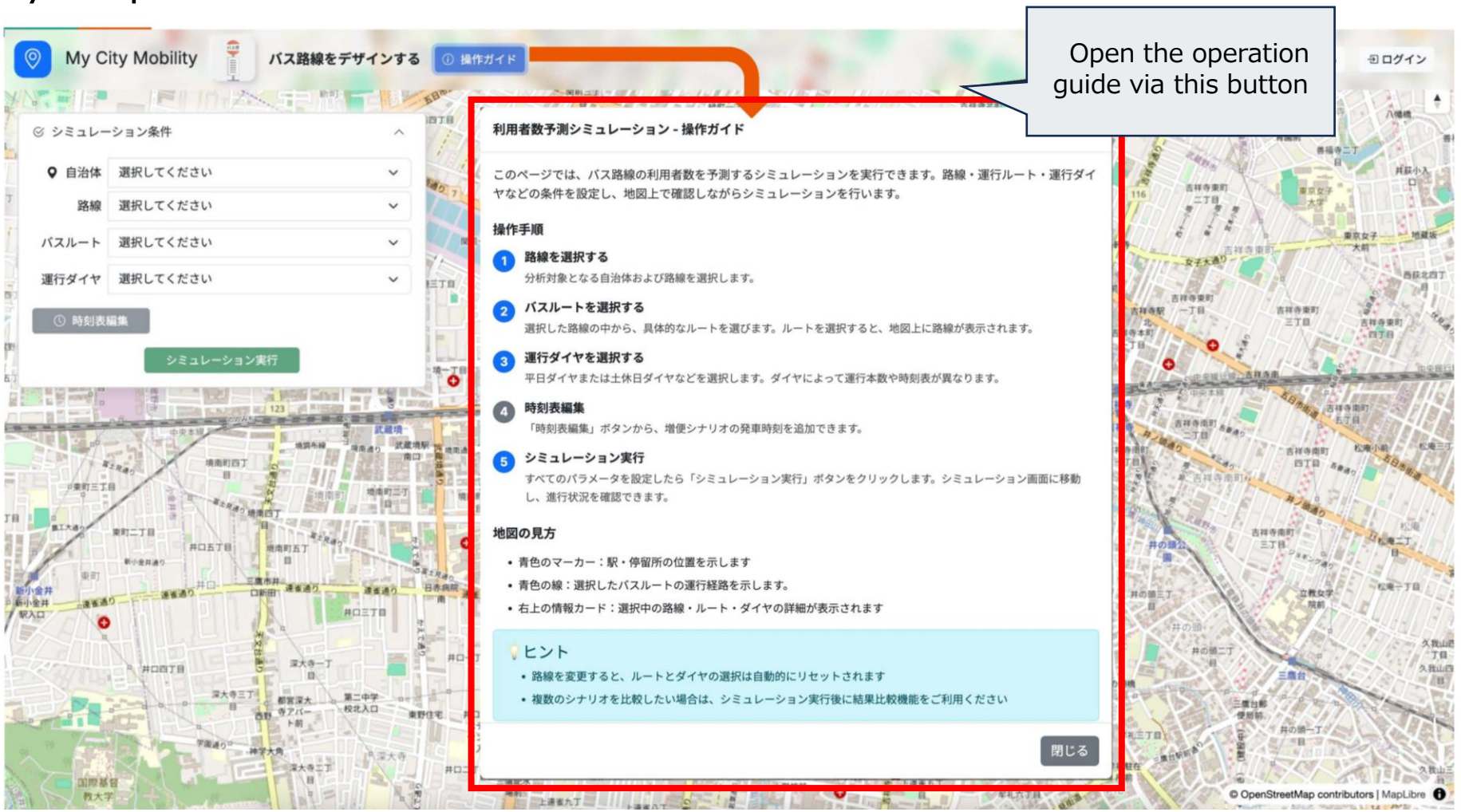
- Overall improvements are being made to explanations, transparency, and operational flow. The addition of new functions is under consideration, and an improved version is currently under development as a beta version.

## Main Functional Requests

- Scenario a:
  - Visualization of where users board and alight.
  - Ability to understand usage conditions by service (trip) and by time period.
  - Capability to run simulations by importing virtual routes and GTFS files.
- Scenario b:
  - Ability to rapidly evaluate multiple revenue and cost scenarios.
  - Simplified bulk deletion of multiple services.
  - Capability to export results in CSV or similar formats.
  - Ability to conduct revenue and cost simulations using actual input data.

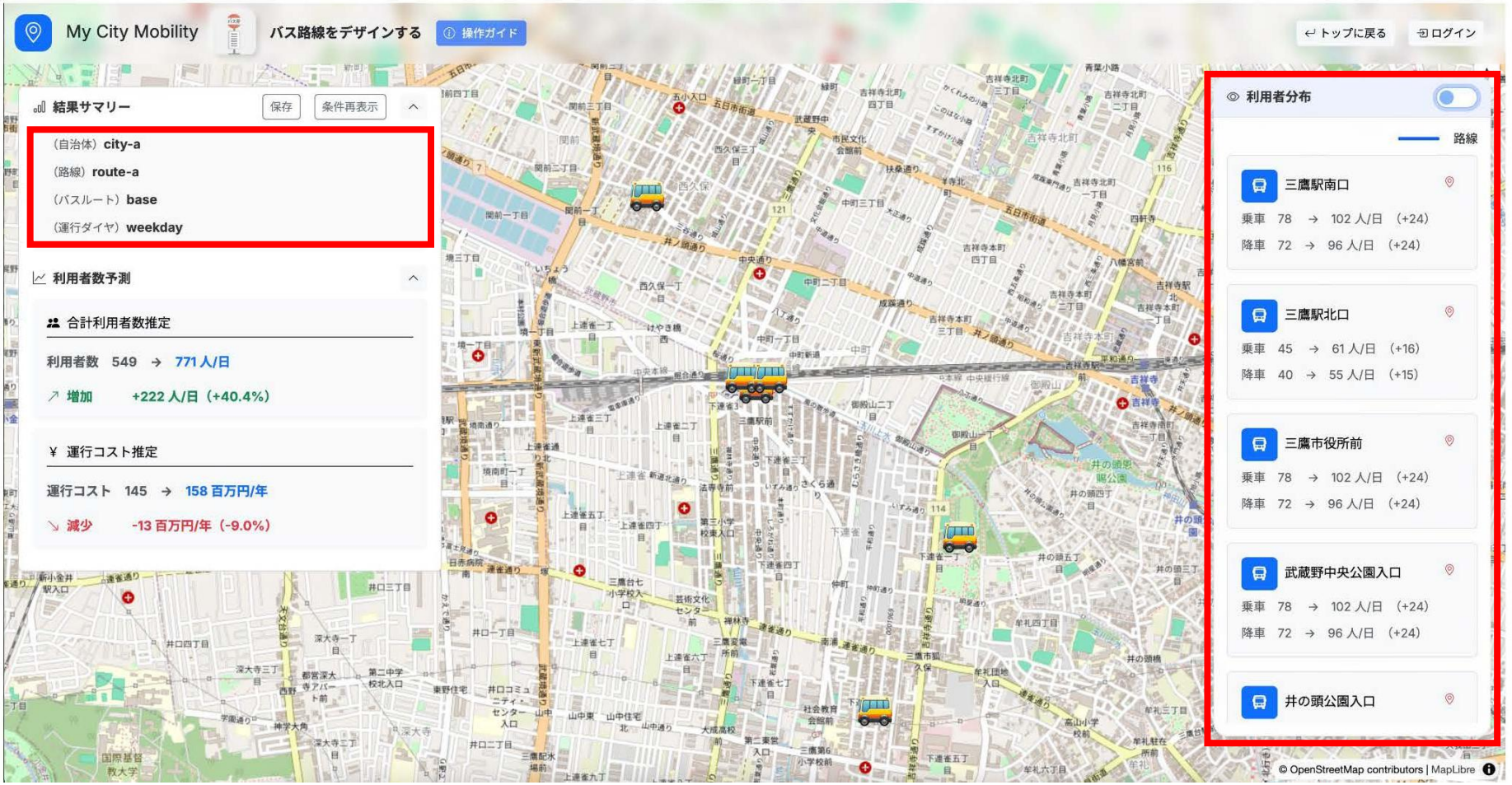
# [Beta Version Mock-up]
# a) Forecast of Public Transportation Users (Input)

- A new operation guide screen has been added for first-time users.
- The operational steps up to simulation execution are displayed in a step-by-step format.



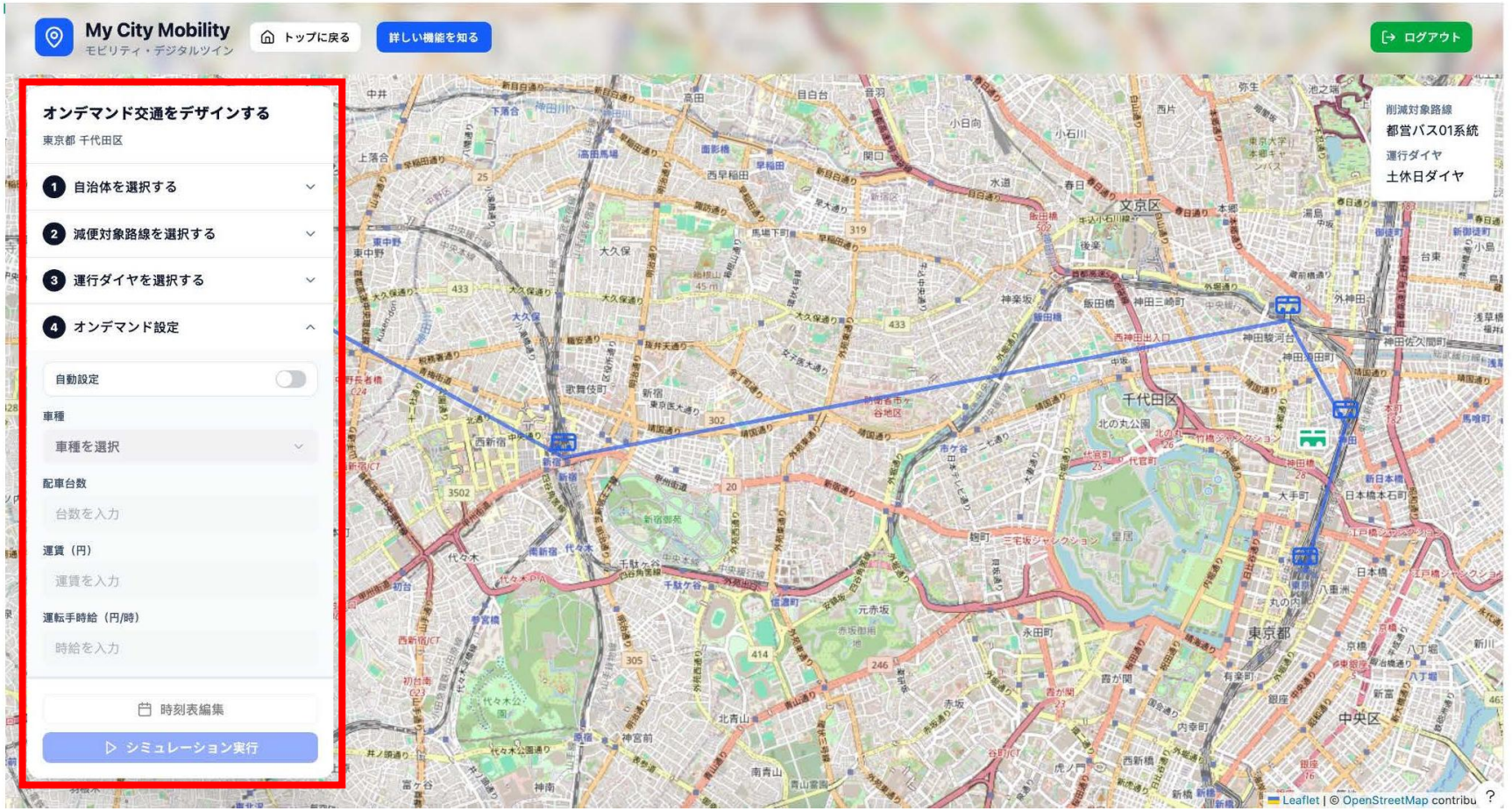
# [Beta Version Mock-up]
# a) Forecast of public transportation users (Output)

- Input parameters are also displayed on the results screen, allowing users to interpret the results while confirming the configured conditions.
- Clicking on a bus stop displays changes in the number of users in a pop-up window.



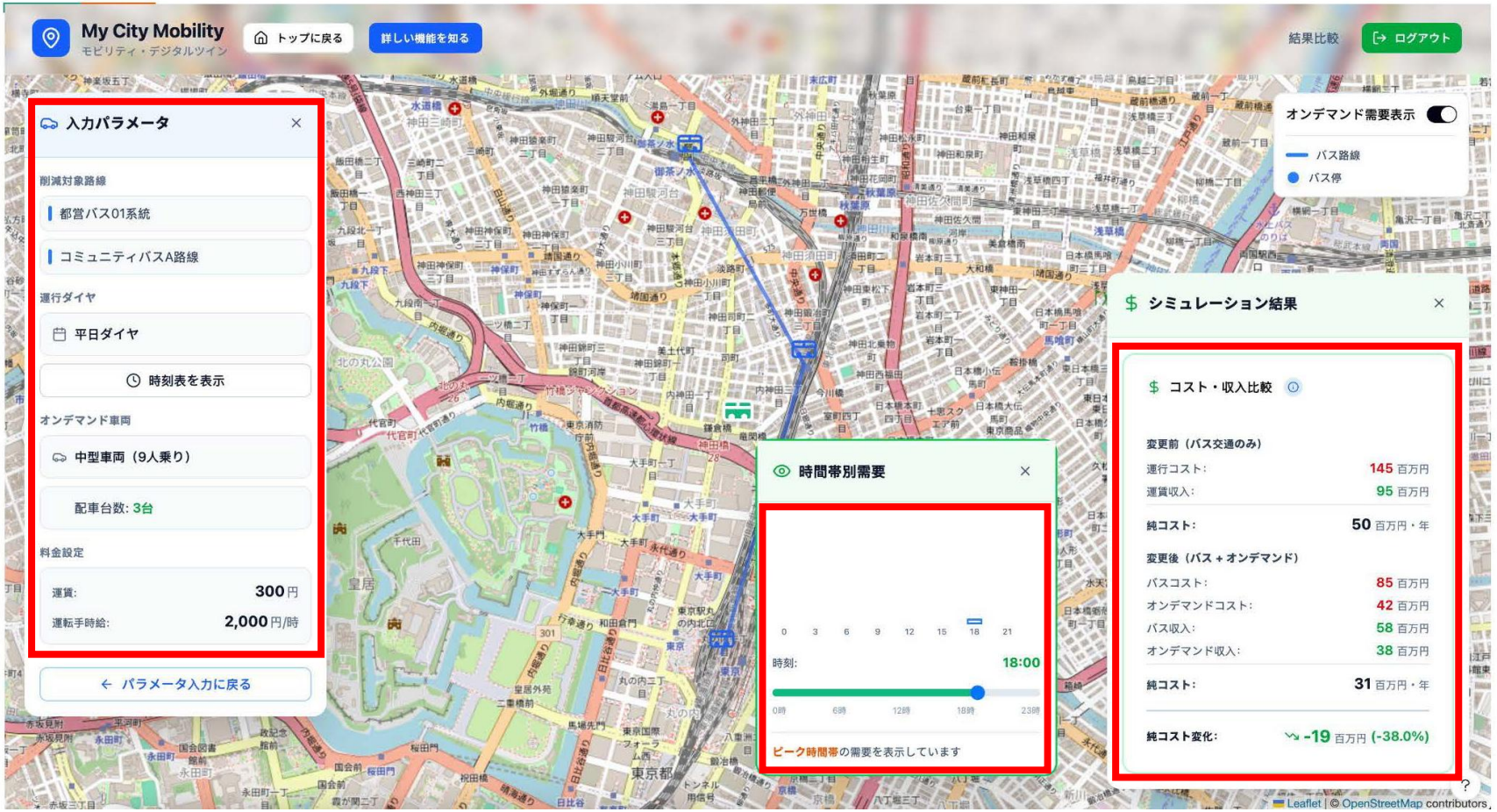
# [Beta Version Mock-up]
# b) Implementation of On-Demand Transportation (Input)

- The parameter input flow, including municipality selection, route selection, and timetable settings, has been streamlined.
- The UI has been improved with a side-panel layout, enabling users to input parameters in a sequential manner.



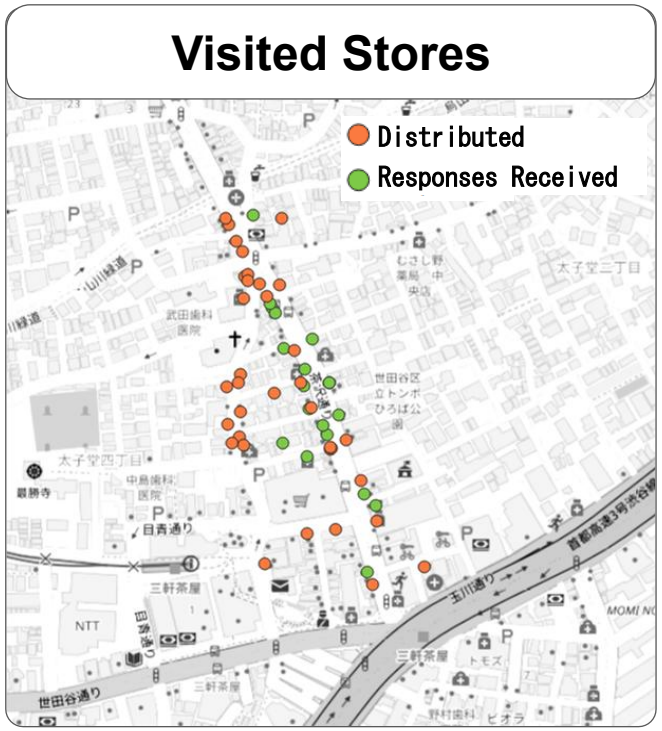
# [Beta Version Mock-up]
# b) Implementation of On-Demand Transportation (Output)

- Input parameters are also displayed on the results screen, allowing users to interpret the results while confirming the configured conditions.
- Key indicators, such as operating costs, are displayed in a dashboard format.

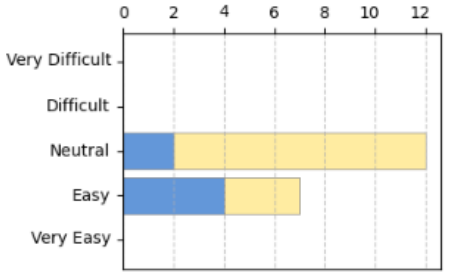


# Prototype-Based Questionnaire Survey (Scenarios c)

- The questionnaire survey for Scenario c of “Mobility Digital Twin Prototyping – MyCityMobility” was distributed to retail, food and beverage, and lifestyle service stores in the Sangenjaya-Ginza shopping street. Number of stores visited: 54, Number of responses: 19 (response rate: 35%)
- Many respondents evaluated the system as intuitive and useful.

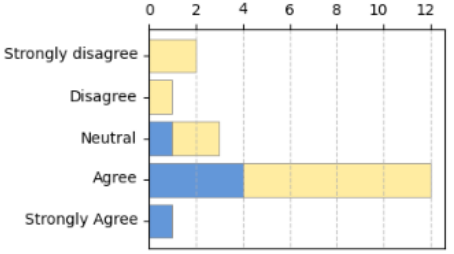



● Question: Was the flow of simulation operations and the result screens easy to understand?




The system was evaluated as intuitive (No respondents rated it as “Difficult”)

● Question: Did understanding the overall sales of the shopping street and the position of your own store make it easier to plan events and sales strategies, and increase your attachment to the shopping street?




69% of respondents found it useful for event planning

# Implementation of the Digital Sandbox Platform and its application to social experiments, as well as the creation of user communities

# Organizing Study Groups for Social Implementation

- Starting in FY2024, a research workshop composed of experts from industry, government, and academia has been established. It is held quarterly to discuss the validity of the research and development as well as its social implementation.

Past Research Workshops:
1st Session: June 21, 2024
2nd Session: September 20, 2024
3rd Session: December 20, 2024
4th Session: March 17, 2025
5th Session: June 19, 2025
6th Session: September 25, 2025
7th Session: December 18, 2025
8th Session: March 19, 2026

**【Committee Composition】**

| Panel Status | Name | Affiliation |
|---|---|---|
| Chairman | Yoshihide Sekimoto | Center for Spatial Information Science, The University of Tokyo |
| Committee Members | Yuno Shibuya | Interfaculty Initiative in Information Studies, The University of Tokyo |
| | Toshikazu Seto | Department of Geography, Faculty of Letters, Komazawa University (Regional Culture Studies) |
| | Mayumi Mizobuchi | Center for Spatial Information Science, The University of Tokyo |
| | Fuko Nakai | Center for Spatial Information Science, The University of Tokyo |
| | Ryuichi Matsushima | Center for Spatial Information Science, The University of Tokyo |
| | Shinya Hirata | Institute of Industrial Science, The University of Tokyo |
| | Naoya Sugimoto | Center for Spatial Information Science, The University of Tokyo / Shizuoka Prefectural Digital Strategy Bureau |
| | Gen Hayauchi | Institute of Innovation for Future Society, Nagoya University (Mobility Innovation Lab) |
| | Kohei Ota | Traffic Brain Corporation |
| | Yoshinori Chiba | SoftBank Corp. |
| | Michihisa Tsuchiya | Traffic Systems Division, Tokyo Head Office, CTI Engineering Co.,Ltd. |
| | Koichiro Kato | Tokinosumika Tours Co., Ltd. |
| | Seiji Takehira | Business Promotion Division, Smart Mobility Promotion Office,Oriental Consultants Co., Ltd |
| | Yuya Uchiyama | Information Policy Division, Mobility Services Promotion Division, Policy Bureau, MLIT |
| | Kenji Nakamura | Industrial Promotion, Tourism & Sports Division, Susono City, Shizuoka Prefecture |
| | Seiko Ikeda | Policy Promotion Section, Policy Planning Department, Nanto City, Toyama Prefecture |
| | Hitoshi Yoneyama | Planning Policy Division, General Affairs Department, Oyama Town, Shizuoka Prefecture |
| | Miwako Matsumi | Commerce Section, Economic and Industrial Department, Setagaya Ward, Tokyo |
| | Kyohei Yasunaga | Planning and Promotion Division, Iyo City, Ehime Prefecture |
| | Masayuki Suzuki | Digital Promotion Division, Comprehensive Policy Department, Okazaki City, Aichi Prefecture |
| | Kohei Shimoda | Transportation Policy Division, Urban Development Bureau, Kobe City |
| Advisors | Tosei Ishida | University of Tsukuba |
| | Noboru Koshizuka | Interfaculty Initiative in Information Studies, The University of Tokyo |
| | Shoo Ishiguro | Interfaculty Initiative in Information Studies, The University of Tokyo |
| | Ryo Ariyoshi | Mobility Innovation Lab, Institute of Innovation for Future Society, Nagoya University |
| | Kenjiro Taura | Graduate School of Information Science and Technology, The University of Tokyo |
| | Hikaru Kouda | Research Administrator Promotion Office, The University of Tokyo |

# Coordination with Participating Municipalities and Implementation Use Cases

- Several municipalities were selected from the 257 social experiment sites surveyed in the previous fiscal year.
- Among the participating municipalities, implementation use cases are currently under consideration in five municipalities, with Kobe City already having completed implementation.

**【Key Initiatives of Participating Municipalities in the Research Workshops】**

| Participating Municipality | Features / Use Cases Related to This Study | Implementation Status |
|---|---|---|
| Susono City, Shizuoka Prefecture | Comprehensive agreement with the University of Tokyo DSS; (Use Cases a, d) | Under Consideration |
| Nanto City, Toyama Prefecture | Comprehensive agreement with the University of Tokyo DSS on digital transformation; Mayor Tanaka is the chairperson of the Municipal Rideshare Council | Under Consideration |
| Oyama Town, Shizuoka Prefecture | Enhancing local mobility using a demand bus with a reservation and boarding system (DigiDen Koshien Summer 2022); (Use Case b) | Under Consideration |
| Setagaya Ward, Tokyo | Implementing a shopping street digital twin project in collaboration with Sekimoto Lab (University of Tokyo) and Sangenjaya Shopping District Federation; (Use Case c) | Under Consideration |
| Iyo City, Ehime Prefecture | Selected as an outstanding example in FY2022 Cabinet Office social experiment (Use of autonomous buses in mountainous areas to achieve health-oriented MaaS); (Use Case a) | – |
| Okazaki City, Aichi Prefecture | Selected as an outstanding example in FY2022 Cabinet Office social experiment (Project to encourage human flow from key facilities to downtown through wide-area app integration); (Use Case c) | Under Consideration |
| Kobe City, Hyogo Prefecture | Conducting research using simulated human flow data to predict increased service demand for the city community bus “Hamachidori”; (Use Case a) | Implemented |

# Study on the Utilization of Pseudo-People-Flow Data in Nishio City, Aichi Prefecture

- The Nagoya University Consortium (hereinafter referred to as the “Nagoya University Consortium”) is working to improve the usage environment of “Ikomai-Car,” a public transportation service introduced by Nishio City, in areas where residents’ evaluation of public transportation services remains low (Higashi-Hazucho and Nishi-Hazucho, Nishio City, Aichi Prefecture).
- Our consortium is currently working on forecasting the number of users of “Ikomai-Car” using Pseudo-People-Flow Data, and is examining the potential for collaboration with the Nagoya University Consortium.

## ■Overview of “Ikomai-Car”

| | |
|---|---|
| Number of Vehicles | ● One taxi vehicle (stationed at Higashi-Hazucho Station) |
| Fare | ● A flat fare of 300 yen per trip, regardless of the number of passengers.。<br>● For round-trip use, the fare is 300 yen each way (600 yen in total).<br>● Passengers holding a Community Bus Discount Pass are eligible for a discounted fare of 200 yen.<br>● If a settlement ticket is not available, the regular taxi fare applies. |
| Service Hours | ● From 8:00 a.m. to 5:00 p.m. (17:00), a total of nine hours per day |
| Pick-up and Drop-off Locations | ● Residences within the designated elementary school districts<br>● Designated facilities (47 locations) |

Source: Compiled based on information from the Nishio City website

## ■いこまいか一目的地一覧（吉良地区・幡豆地区）

| 小学校区 | 目的地 駅・金融機関 | | 商業施設 | 医療機関 | 公共施設 | 老人憩の家 |
|---|---|---|---|---|---|---|
| 吉田 | 吉良吉田駅<br>吉良吉田郵便局<br>JA 西三河吉田支店<br>西尾信用金庫吉田支店<br>JA 西三河荻原支店 | | Aコープ吉良店<br>NEGA ドン・キホーテ<br>UNY 吉良店<br>ゲンキー吉良吉田店<br>スギ薬局吉良店 | 秋山歯科医院<br>石川医院<br>太田歯科<br>大竹歯科医院<br>岡田歯科医院<br>おぎわら歯科<br>さら歯科クリニック<br>吉良内科<br>すずき歯科医院<br>判治歯科医院<br>みずとり歯科医院<br>宮崎医院<br>山川医院<br>横須賀歯科診療所<br>れん内科クリニック<br>ムラマツ薬局 | 吉良支所<br>吉良図書館<br>吉良保健センター<br>横須賀ふれあいセンター | 白浜<br>老人憩の家 |
| 白浜 | | | | | | |
| 荻原 ※1（吉良吉田エリア） | | | | | | 荻原<br>老人憩の家 |
| 荻原 ※1（上横須賀エリア） | 上横須賀駅<br>吉良町郵便局<br>西尾信用金庫横須賀支店<br>JA 西三河荻原支店<br>JA 西三河横須賀支店 | | クスリのアオキ吉良店<br>ドミー吉良店 | | | |
| 横須賀 | | | | | | 横須賀<br>老人憩の家 |
| 津平 | | | | | | |
| 幡豆（鳥羽町） | 三河鳥羽駅 | 幡豆郵便局<br>西尾信用金庫<br>幡豆支店<br>岡崎信用金庫<br>幡豆支店<br>蒲郡信用金庫<br>幡豆支店 | Aコープ幡豆店<br>ゲンキー西幡豆店<br>スギ薬局幡豆店<br>ポートタウンミュー | いそがい歯科<br>井立歯科<br>大須賀歯科<br>おのだクリニック<br>くろべ歯科<br>黒部眼科<br>酒井クリニック<br>徳永外科内科<br>幡豆クリニック<br>宮嶋薬局 | 幡豆支所<br>幡豆公民館 | 鳥羽<br>老人憩の家 |
| 幡豆（西幡豆町・寺部町） | 西幡豆駅 | | | | | 幡豆<br>老人憩の家 |
| 東幡豆① ※2 | 東幡豆駅<br>東幡豆郵便局 | | | | 幡豆支所<br>東幡豆小学校<br>幡豆公民館 | 東幡豆<br>老人憩の家 |
| 東幡豆②（洲崎地区）※2 | こどもの国駅<br>西浦駅 | 幡豆郵便局<br>西尾信用金庫<br>幡豆支店<br>西尾信用金庫<br>形原支店<br>岡崎信用金庫<br>幡豆支店<br>蒲郡信用金庫<br>西浦支店 | ゲンキー西浦店<br>Aコープ形原店 | 鳥居歯科医院<br>柳沢内科<br>稲吉歯科医院<br>酒井歯科医院<br>鈴木歯科医院<br>トリイクリニック<br>平野内科医院 | | |
| 東幡豆③（鹿川地区）※2 | 形原駅 | | | | | |
| 東幡豆④（大沢地区） | 三ヶ根駅、幡豆郵便局<br>西尾信用金庫幡豆支店<br>岡崎信用金庫幡豆支店<br>蒲郡信用金庫三ヶ根支店 | | トライアル幸田店 | いちかわ歯科<br>日高医院 | | |

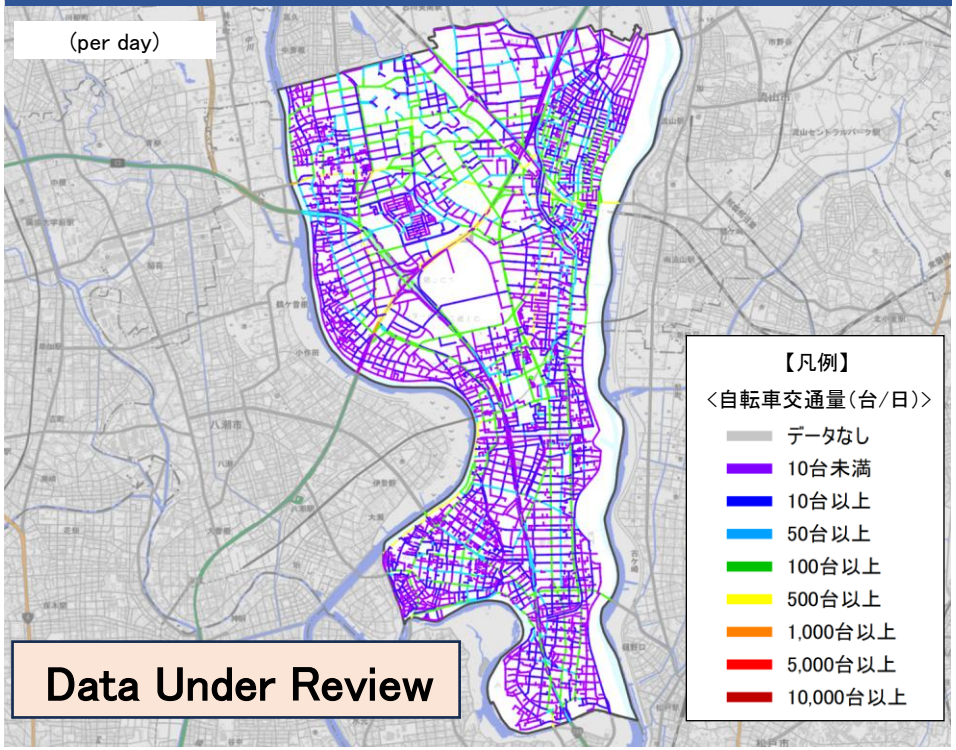
※1 荻原小学校区の方は、自宅から吉良吉田駅または上横須賀駅までの車の経路の距離が短いエリアとなります。差が 200m以内の場合は選択できます。

※2 東幡豆小学校区の洲崎地区の方は東幡豆①または②を、鹿川地区の方は東幡豆①または③を選択できます。地区の変更は、年度内に1回までできます。

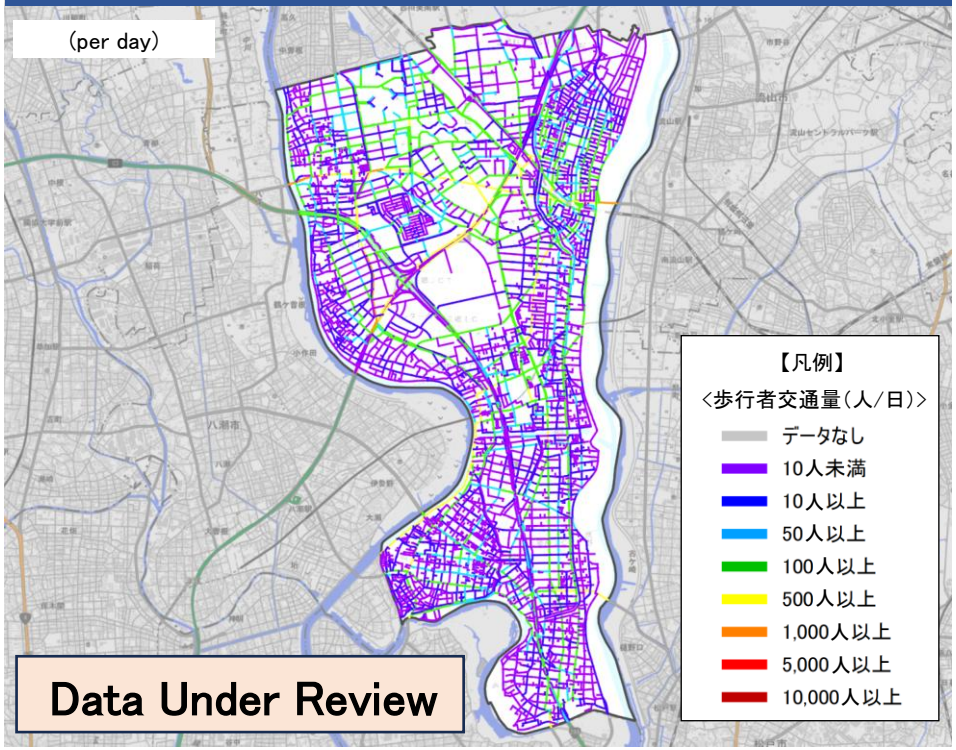
# Study on the Utilization of Pseudo-People-Flow Data in Misato City, Saitama Prefecture

- The Oriental Consultants Consortium (hereinafter referred to as the “Oricon Conso”) is considering the deployment of a dashboard that can accurately capture information on local roads while remaining easy for municipal staff to use.
- Our consortium is exploring the potential for collaboration with the “Oricon Conso” by utilizing Pseudo-People-Flow Data, with Misato City, Saitama Prefecture, as the target area.

## Pseudo-People-Flow Data (Bicycles)



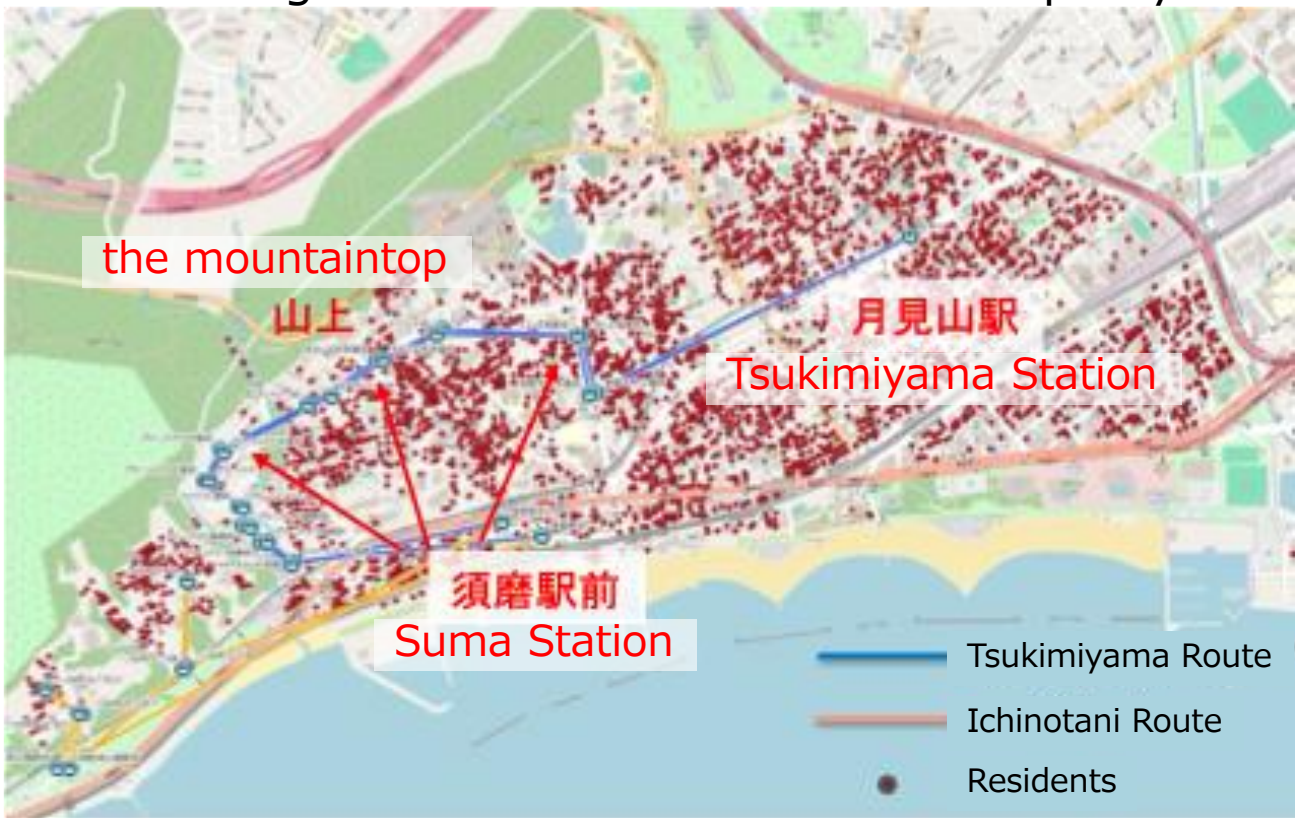

## Pseudo-People-Flow Data (Pedestrians)




Source: Materials from the 7th Research Workshop (December 18, 2025)

# Case Study – Hama-Chidori Bus in Kobe City

- To assess the feasibility of increasing community bus services in Kobe City, Pseudo-People-Flow data was utilized to conduct demand forecasting based on real-world conditions that conventional surveys could not fully capture. This approach not only helps improve the convenience for bus users but also demonstrates new possibilities for making swift and effective short-term policy decisions.




Hama-Chidori Bus Route and Local Resident Distribution

## 1.Current Settings

- Operation Hours: 9:00 AM to 5:00 PM
- Frequency: One bus operating once per hour

## 2.Increased Service Scenario

- Add one more bus to operate every 30 minutes

## 3.Usage Considerations

- The most frequent usage is from Suma Station to the mountaintop
- Due to the hilly terrain, pedestrian burden is weighted: 1.2× for general users and 1.5× for elderly users

## 4.Regional Characteristics Considered

- Vehicle ownership rate in Suma Ward is set at 0.42

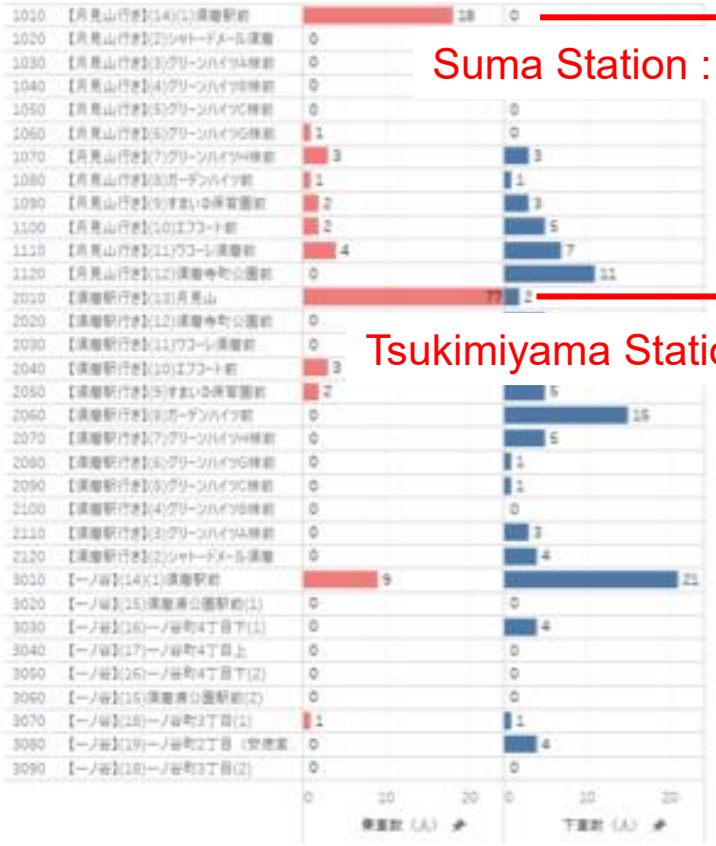
## 5.Transport Mode Selection Criteria

- The cost of each transportation mode (car, walking, bus, others) is compared, and the mode with the lowest cost is selected
- Cost is calculated as:Travel Time × Value of Time (1,000 yen/hour) + Fare + Physical Burden

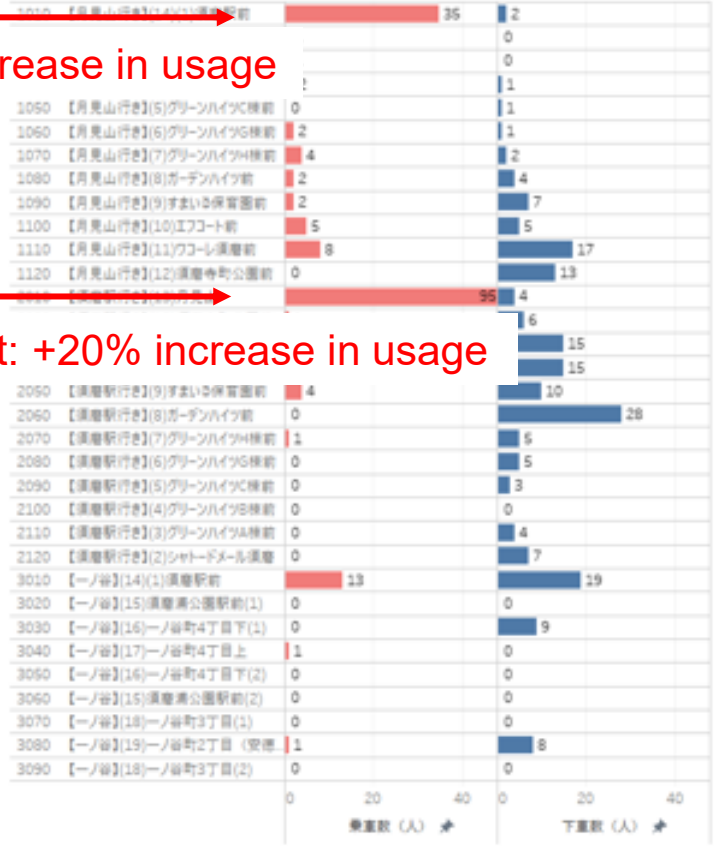
# Bus Usage Simulation: Comparison Before and After Service Increase

- Before the service increase, the actual average daily ridership was about 100 passengers. The simulation using Pseudo-People-Flow data estimated 123 passengers per day—slightly overestimated but closely aligned with actual boarding numbers at each stop.
- In the post-increase scenario, the average waiting time was reduced from 60 minutes to 30 minutes, and the final bus was extended to 6:00 PM. As a result, ridership increased by approximately 1.5 times. This demonstrated a sustainable balance between revenue and operating costs, highlighting the necessity of increasing service frequency.

Simulation (Before Increase)



Simulation (After Increase)



Suma Station : 2× increase in usage

Tsukimiyama Station Front: +20% increase in usage

# Press Release by Kobe City and the University of Tokyo

- In Kobe City, based on simulation results after service increases using Pseudo-People-Flow Data, the city has begun increasing the frequency of community bus services and introducing additional vehicles.
- Regarding this initiative, a joint press release was issued by Kobe City and the University of Tokyo on July 15, 2025.

KOBE

検索 | 問い合わせ | Language | メニュー

ホーム > 市政情報 > 記者発表資料 > 記者発表2025年7月 > 神戸市須磨区西須磨地域コミュニティ交通「はまちどり」２台目運行開始について

## 神戸市須磨区西須磨地域コミュニティ交通「はまちどり」２台目運行開始について

記者資料提供（2025年7月15日）
都市局交通政策課、須磨区役所地域協働課


西須磨地域では、幅の狭い坂道が多く路線バスが運行していないため、買い物や通院、最寄りの須磨駅とのアクセスが課題となっています。こうした地域の交通課題の解決のため、西須磨地域における地域コミュニティ交通（愛称：はまちどり）が2023年 10月 1日から本格運行しておりますが、利用者が多くなり、乗り切れない方が出てきておりました。

現在の運行状況に加え、東京大学空間情報科学研究センター／生産技術研究所・関本研究室（以下、関本研究室）と神戸市との共同研究により、疑似人流を用いた増便後の需要予測の結果、2台目の導入後も利用者の増加が見込まれることが分かりました。これを受けて、2025年8月1日より「はまちどり」に2台目の車両を導入することとなりましたので、お知らせいたします。

また、2台目導入にあたり、1台目同様、神戸市と包括連携協定を締結している兵庫トヨタ自動車株式会社から運行車両の提供など支援をいただきます。

### 東京大学との共同研究

本取り組みは、SIP 第3期「スマートモビリティプラットフォームの構築」における採択テーマの一つである、関本研究室が推進する「多様な地理空間情報と全国擬似人流データを組み込んだモビリティ社会実験デジタルツインの構築」の一環として、関本研究室と神戸市が共同で実施したものです。神戸市から関本研究室へ派遣された職員と研究チームが連携し、須磨区内を走るコミュニティ交通「はまちどり」の増便を想定したシミュレーションを行いました。このシミュレーションでは、神戸市が保有する既存のバス乗車データを活用し、関本研究室が路線周辺の地形の傾斜や通勤・通学・買い物などの移動パターンを想定した「擬似人流」を生成して、増便による利用者数の変化や交通への影響を予測しました。この取り組みにより、住民の移動ニーズを事前に可視化し、効果的な運行計画や関係者間の合意形成を支援する仕組みの実証が進みました。

Source: Excerpted from the Kobe City website(https://www.city.kobe.lg.jp/a80014/762218397451.html)

# Activity Plan and Outlook for the Next Fiscal Year

【Pseudo-People-Flow Data】
- Ver. 3.0 will be released, with the target date set for around May 2026.
- As observed OD volumes and those derived from Pseudo-People-Flow Data are diverging, the effects of irregular events will be incorporated, together with further accuracy improvements toward Ver. 3.x.
- Since Pseudo-People-Flow Data is currently generated only for locations within Japan, a global pseudo people-flow model will be developed to enable data generation for arbitrary regions overseas.

【Mobility Digital Twin】
- Based on feedback from users regarding insufficient presentation of execution conditions, limited navigation, and long processing times, improvements will be made to the user interface and processing speed. In addition, a beta version of MCM incorporating these improvements is scheduled to be released around June–July 2026.
- LLM support will be implemented to enable usage through natural language interaction.
- To facilitate information sharing among users and provide a platform for active communication, a public–private user community will be established.

【Research Workshops and Implementation Use Cases】
- A questionnaire survey will be conducted among municipalities nationwide to assess their intention to use the system.
- For municipalities that express interest, interviews will be conducted to explore potential participation in research workshops and opportunities for implementation use cases.