Cross-ministerial Strategic Innovation Promotion Program -Phase 3
Development of Smart Mobility Platform

Development of a new mobility-oriented city with an agglomeration of places for social exchange

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Hiroshima University
Vital Lead Corporation
Pacific Consultants Co., Ltd.
National Institute of Technology, Kure College
The University of Tokyo

Contents

Our Goals

We aims to achieve a society without a mobility divide, where all people, all things, and all service can move freely and independently in a safe and comfortable manner, being environmentally friendly and considerate to others and the community. It represents the ideal form of urban spaces and mobility services. To realize such society without a mobility divide, from the perspective of people, things, and services in motion, the mission of this project is to dynamically integrate both hard and soft infrastructure. This infrastructure will enable the utilization of a wide range of mobility resources, including traditional public transportation, personal vehicles, and freight vehicles, as well as new modes of mobility. We will dynamically integrate the region and create a platform (Smart Mobility Platform) that ensures safe, environmentally friendly, equitable, and seamless mobility.

Overview

R&D Technical Issues	#2 Development of local (regional) mobility diagnostic guidelines and mobility re-design simulation model #6 Tactical mobility re-design practices #10 Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility #12 Extraction of requirements for vehicles, infrastructure that contribute to re-design
Project Overview	This research and development will redefine public transport from local (regional) mobility resources by developing mobility diagnostic guidelines and simulation models for the redefinition and implementation of local (regional) mobility, and promote the actual deployment of tactical mobility re-design through the introduction and use of new mobility services. Furthermore, this project aims to realize a mobility-oriented city with an agglomeration for social exchange through the mobility re-design by building a digital twin sandbox as a cyber-physical road space digital system, evaluating the effectiveness and economic efficiency of introducing new mobility in cyberspace, and studying requirements for the re-design of new vehicles for public transport and infrastructure.
Target issues to be resolved	• Local mobility resources are not fully utilised. • Lack of status of manifestation of results in pilot tests. • Lack of human resources responsible for mobility re-design • No progress about building consensus with residents for new mobility-oriented development • Lack of legislations and operational rules suitable for cooperative systems for public transport and infrastructure

Objectives

#2: Development of local (regional) mobility diagnostic guidelines and mobility re-design simulation model

Develop a simulation model and develop mobility diagnostic guidelines for identifying barriers and and improving mobility services, enabling evaluation of the introduction of new mobility services without field experiment, and helping to improve the field experiment design.

#6: Tactical mobility re-design practices

Implement processes where the results of demonstration experiments lead to solving urban challenges and creating value, establish a strategy for promoting the social acceptance of re-design, and start operating a talent development program.

#10: Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility

Develop "Digital Sandbox" simulation technology in digital space to efficiently and effectively advance the planning stage of mobility realization and facilitate consensus building among stakeholders and smooth administrative procedures.

#12: Extraction of requirements for vehicles, infrastructure that contribute to re-design

Organize requirements for new vehicles and collaborative technologies that contribute to re-design promotion and extract requirements for applying these to diverse mobility resources for future societal implementation.

Overview Diagram

Redefinition of public transportation through regional mobility resources.

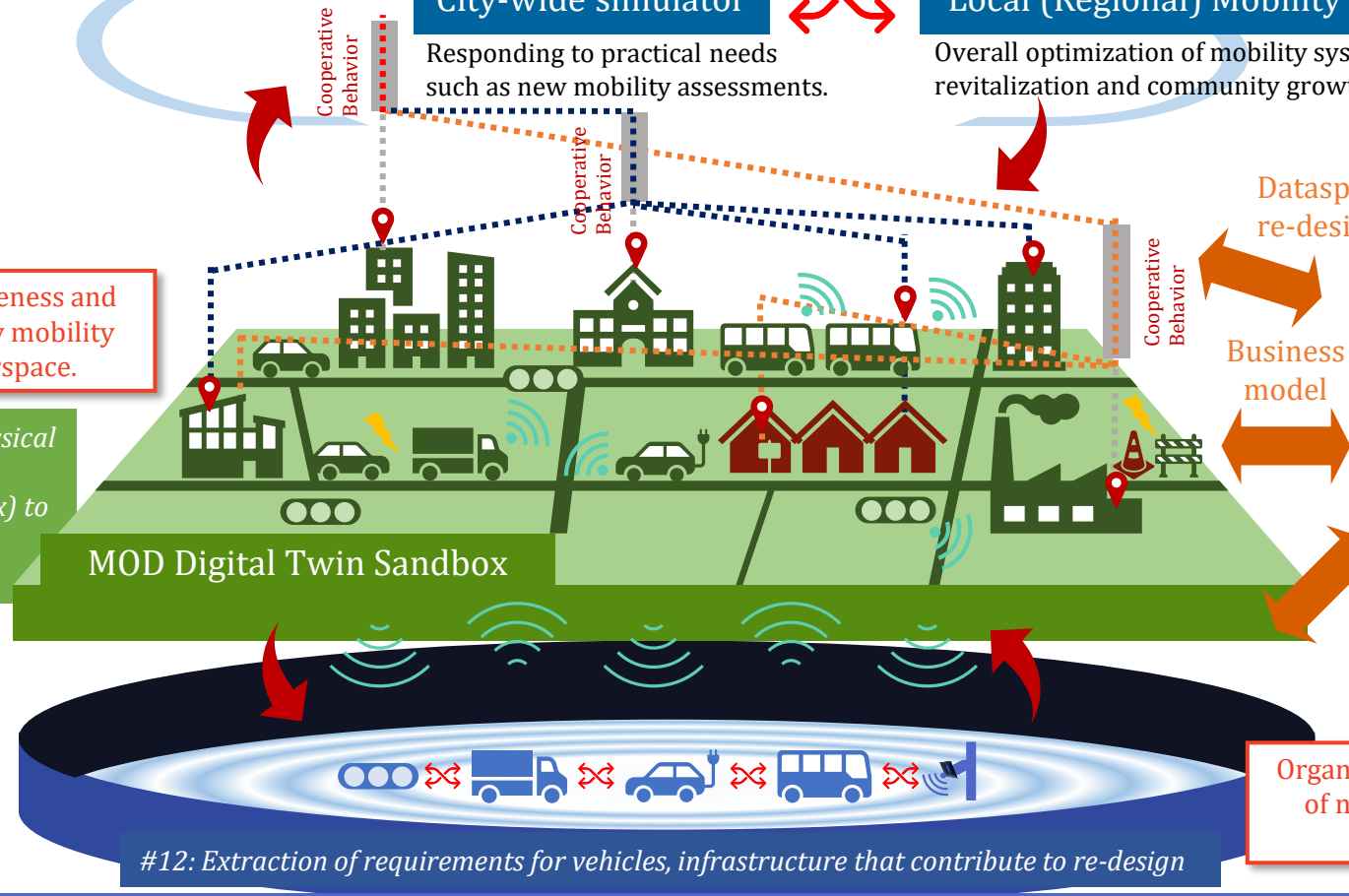
#2: Development of local (regional)mobility diagnostic guidelines and mobility re-design simulation model

City-wide simulator

Responding to practical needs such as new mobility assessments.

Local (Regional) Mobility Diagnostic Guidelines

Overall optimization of mobility systems to achieve local economic revitalization and community growth through exchange.



Evaluation of the effectiveness and economic viability of new mobility introductions in cyberspace.

#10: Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility

Effective operation of the MOD
Facilitation of consensus building

Dataspace re-design

Business model

Practical deployment of Tactical Mobility Re-Design through the introduction and utilization of new mobility services.

#6: Tactical mobility re-design practices

Re-design for MOD

Regional problem solutions and value creation human resource development to manage tactical mobility re-design.

Road space/traffic rule re-design

Organizing requirements for the re-design of new vehicles and infrastructure for public transportation.

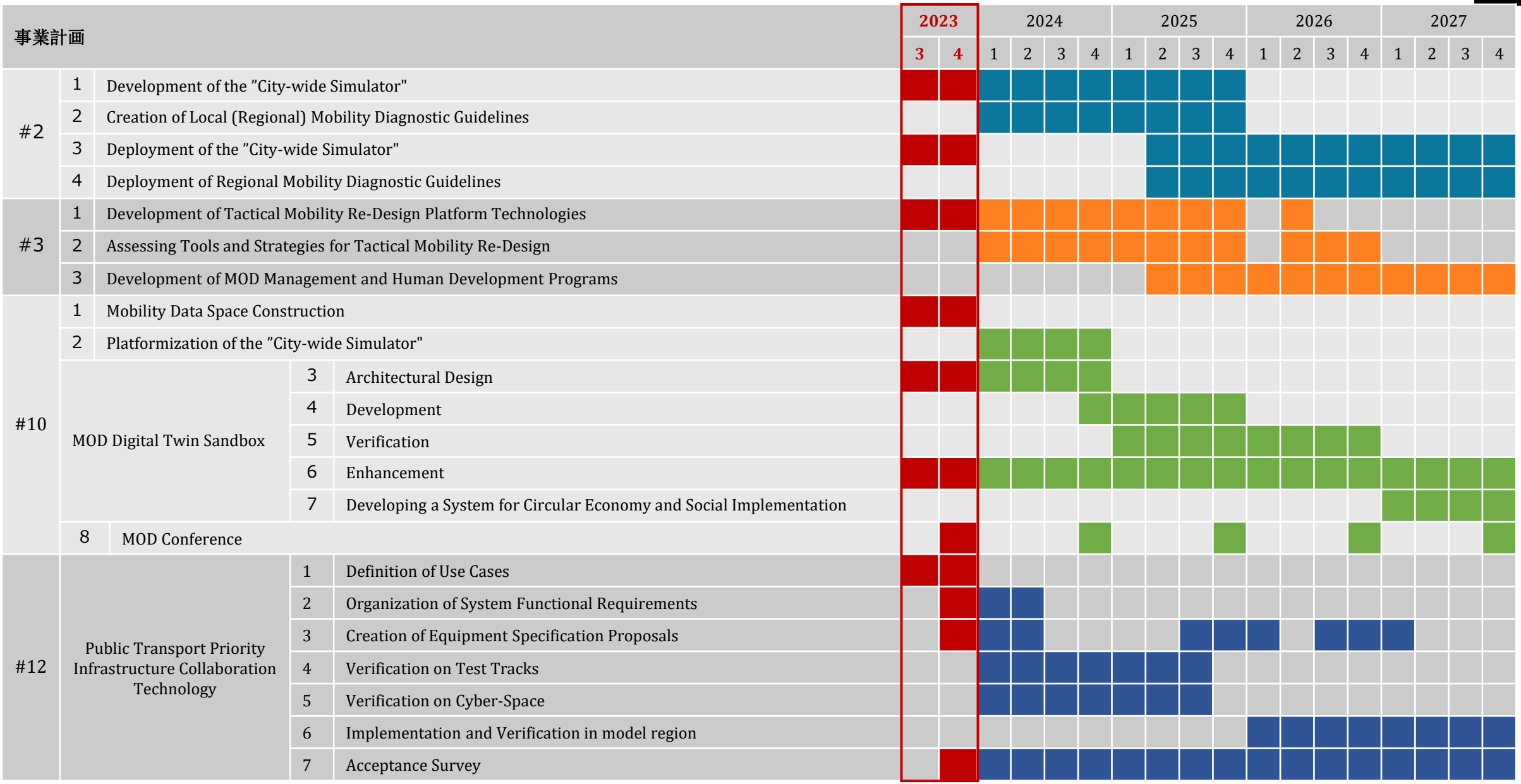
#12: Extraction of requirements for vehicles, infrastructure that contribute to re-design

Examination of specifications for Cooperative Technology to prioritize public transportation

Application to public transport and various mobility resources

Creating a Mobility-Oriented City through Redesign, Agglomeration for Exchange

Schedule


事業計画
2023
2024
2025
2026
2027
3
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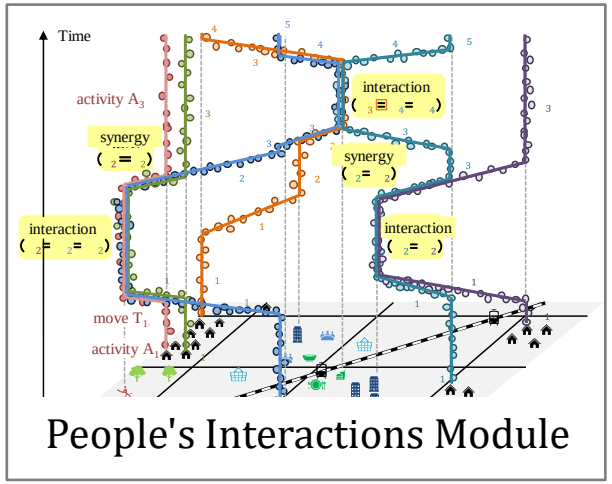
#2
1 Development of the "City-wide Simulator"
2 Creation of Local (Regional) Mobility Diagnostic Guidelines
3 Deployment of the "City-wide Simulator"
4 Deployment of Regional Mobility Diagnostic Guidelines
#3
1 Development of Tactical Mobility Re-Design Platform Technologies
2 Assessing Tools and Strategies for Tactical Mobility Re-Design
3 Development of MOD Management and Human Development Programs
#10
1 Mobility Data Space Construction
2 Platformization of the "City-wide Simulator"
MOD Digital Twin Sandbox
3 Architectural Design
4 Development
5 Verification
6 Enhancement
7 Developing a System for Circular Economy and Social Implementation
8 MOD Conference
#12
Public Transport Priority Infrastructure Collaboration Technology
1 Definition of Use Cases
2 Organization of System Functional Requirements
3 Creation of Equipment Specification Proposals
4 Verification on Test Tracks
5 Verification on Cyber-Space
6 Implementation and Verification in model region
7 Acceptance Survey

#2: Development of local mobility diagnostic guidelines and mobility re-design simulation model

Development City-Wide Simulator

- Development of the following modules:
  - People's interactions modules (Zoom + GPS movement trajectory survey)
  - Transportation vehicle modules, and mobility re-design modules
- Integrated scenario examines:
  - Road development, BRT (Bus Rapid Transit) system implementation, and pedestrian space organization



People's Interactions Module

Conceptual design of a local (regional) mobility resource dashboard

Supply Data
- **Networks**
- ✓ Road
- ✓ Public Transit
- ✓ Pedestrian
- **Mobility Resource Survey Data**

Local (Regional) Mobility Resource

SHORT-term

Core component of simulator — MATSim Multi-Agent Transport Simulation

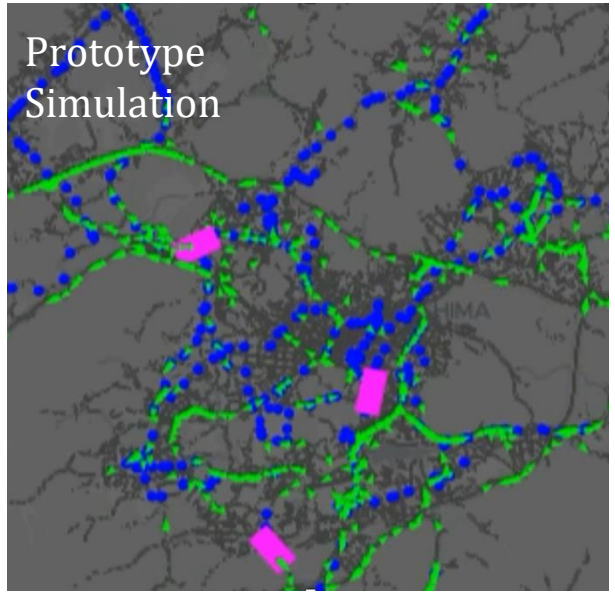
Mobility Resources
Auto
BRT
Sharing
Transport Supply
Co-evolutionary
Transport Demand
Service Design Transportation Mgmt
Social Network Generator
Joint Decision
Pedestrian Flow
Activity Model

LONG-term

Housing-Mobility Choice Education and Job Choices
Firms' location Choices
Emergence of Organizations Startups/NPOs/NGOs/etc..

Demand Data
- Landuse
- Travel/Activity diary
- Population Census
- Cordon Count
- SN structure
- Joint Activity

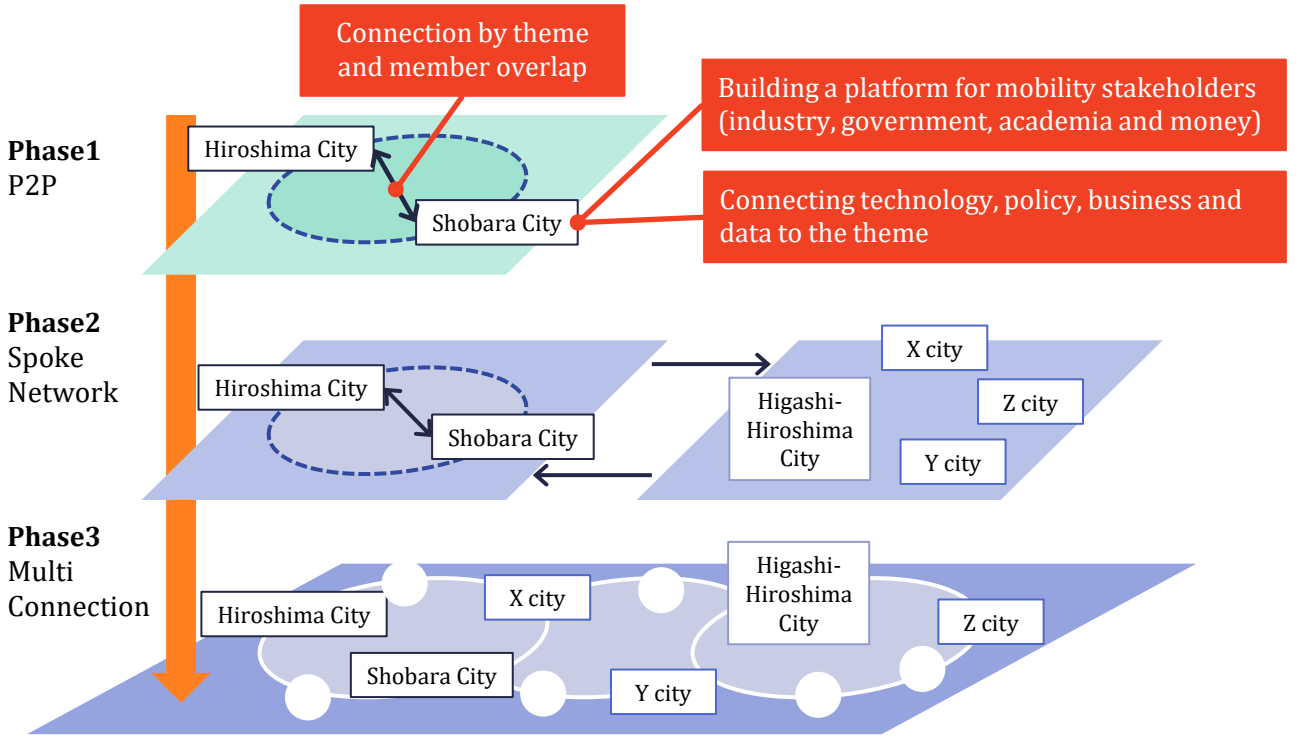
Semi-Automatic Data Collection Scheme



#6: Tactical mobility re-design practices

Sharing of value and vision for Mobility Re-Design by a collaboration across industry, government, academia, and finance:

- New project planning cycle for solving regional issues
- Creation Human Resource Development Opportunities
- Regional transport communities collaborate through overlapping people and themes.



Development Vision for the Tactical Mobility Redesign Platform

Launching the Hiroshima City Mobility Platform

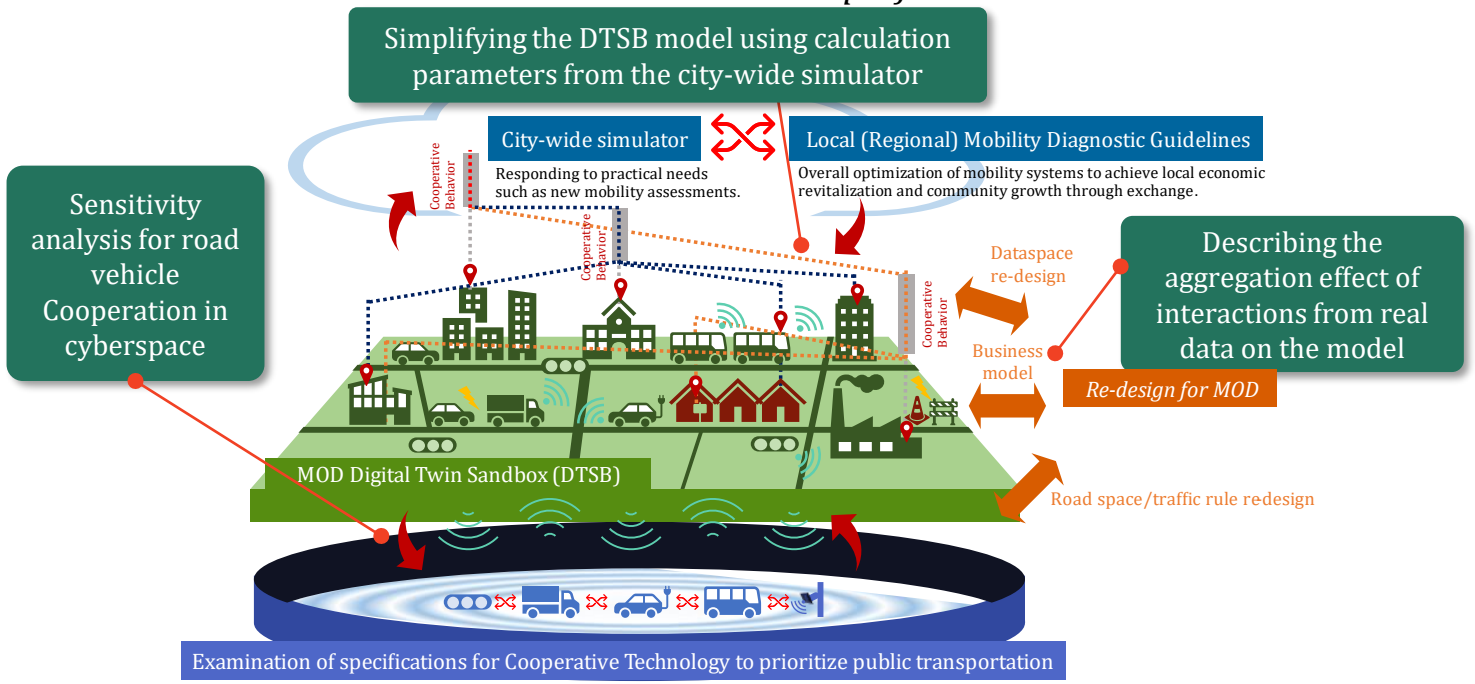
- Holding Community Meetings on technology (seeds) and issue (needs), and field (3 sessions)
- Peer-to-peer connection between the mobility communities of Hiroshima City and Shobara City (Phase1)

#10: Construction of a cyber-physical road space digital system infrastructure (digital sandbox) to realize safe, comfortable, and affluent mobility

Construction of Mobility Data Space

- Identifying the data items and spatial granularity necessary for data collection within the data space
- Developing methodologies for data acquisition to ensure future versatility

Collaboration between research projects



Architecture Design of MOD Digital Twin Sandbox

- Identifying the necessary data and parameters for collaboration with other R&D projects
- Configuring the model to accelerate data linkage and computation

Examples

R&D Project #2
Calculation Accuracy: High ↗ (Theoretically rigorous)
Calculation Cost: High ↗

R&D Project #10
Conducting sensitivity analysis by preparing multiple policy scenario cases

Reducing Calculation Costs:
Simplifying the simulation model by reducing calculation steps and setting parameters as given

#12: Extraction of requirements for vehicles, infrastructure that contribute to re-design

Definition of Use Cases

#	Use case name	Summary
1	Driver assistance (pre-deceleration) through signal information	Communicate and display signal information (signal light information, cycle information including remaining time, etc.) to public transit vehicles approaching a signalized intersection to assist drivers in driving more safely with less pre-deceleration/acceleration/deceleration.
2	Automatic driving system support by signal information (pre-deceleration)	By transmitting signal information (signal light information, cycle information including remaining time, etc.) to a public transportation vehicle with automatic driving function approaching a signal intersection, the system assists the automatic driving system to perform safer driving with less pre-deceleration/acceleration/deceleration.
3	Support for smoother passage through intersections by changing traffic signal indications (extending green time)	Support smooth passage through signalized intersections by receiving information (location, future run/stop schedule, length of vehicle/formation, etc.) from public transit vehicles approaching the intersection and extending the green time of the signal appropriately according to the schedule of the approaching vehicle and the length of the vehicle/formation, etc.
4	Improve user accessibility by changing traffic signal indications (reducing the green time)	By receiving information about public transit vehicles approaching or passing through a signalized intersection (location, future run/stop schedule, length of vehicle/formation, etc.), the green time of the signal is reduced, allowing users to wait less time to cross the roadway and reducing congestion at the tram stop, thereby improving accessibility.
5	Support for smoother passage through intersections by changing traffic signal indications (extending/reducing green time)	Receives information (location, upcoming run/stop schedule, length of vehicle/formation, etc.) of multiple public transport vehicles approaching a signalized intersection, and appropriately extend/shorten the green time of the signal according to the run schedule of the approaching vehicle that should have priority and the length of the vehicle/formation, etc., to support smooth passage through the signalized intersection.
6	Assistance for safe driving while sharing dedicated lanes and tram stops	When buses equipped with an automated driving system share a tram stop and a track bed as a dedicated running space, information about each vehicle (position, future run/stop schedule, vehicle/formation extension, etc.) is shared through inter-vehicle communication and used for control, thereby assisting public transportation vehicles that should be given priority to run safely and This system assists public transportation vehicles that should be prioritized to run in a safe and preferential manner.

- Survey of existing infrastructure coordination technology specifications
- Sharing information and exchanging opinions with various stakeholders in telecommunications administration, road administration, transport administration, police agency, local governments, etc. (February 20, 2024 @ Hiroshima City)

MOD Conference AY2023

Mod Conference（Mobility HINT Series #2）

Date and Time: January 26, 2024, 14:00-16:30
Location: Mirai Crea (Hiroshima University)
Organizer: Hiroshima University
Co-organizers: Institute of Industrial Science, the University of Tokyo; Kure National College of Technology; Vital Lead; Pacific Consultants
Supporters: Higashi-Hiroshima City, West Japan Railway Company (JR West)

Expansion of Collaboration and Outreach

- Collaboration among the four consortia: Hiroshima University Consortium, University of Tsukuba Consortium, Nagoya University Consortium, and IBS Consortium
- Participation from citizens, companies, and local governments
- Total Attendance: Approximately 200 (about 90 on-site, around 110 online)

Keynote Speech
Dr. ISHIDA Haruo
Project Director, SIP3-Smart Mobility
Professor Emeritus, Tsukuba Univ.

MOD Project Overview
Dr. FUJIWARA Akimasa
Chief R&D, MOD Project
Professor, Hiroshima Univ.

Panel discussion

Report：https://its.hiroshima-u.ac.jp/news/2024/02/hint2-mod-conf/

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