Cross-Ministerial Strategic Innovation Promotion Program (SIP), 3rd Term

Development of Smart Mobility Platforms

Development of a technology and policy package for redesigning urban road traffic

March 2024

Oriental Consultants Co., Ltd.

Japan Institute of Country-ology and Engineering

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Project outline

Background and purpose of this Project

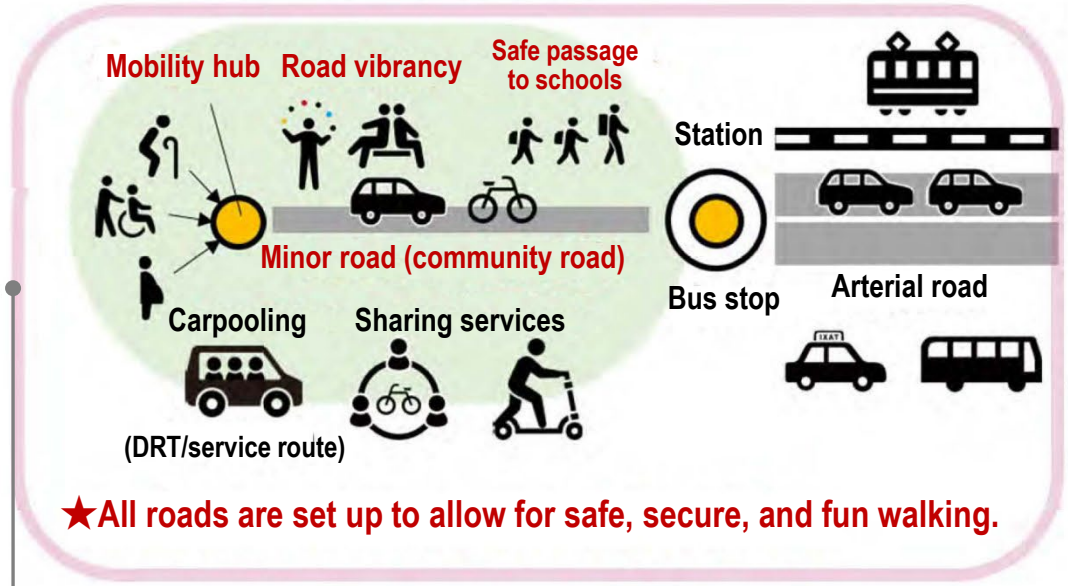
Background

- In order to provide appropriate mobility services, it is important to re-design not only the physical existence but also the transportation infrastructure in a broader sense.
- In order to realize smartness in smart mobility, it is essential to optimize based on a variety of data, and it is necessary to build a data platform to support such optimization.

Purpose

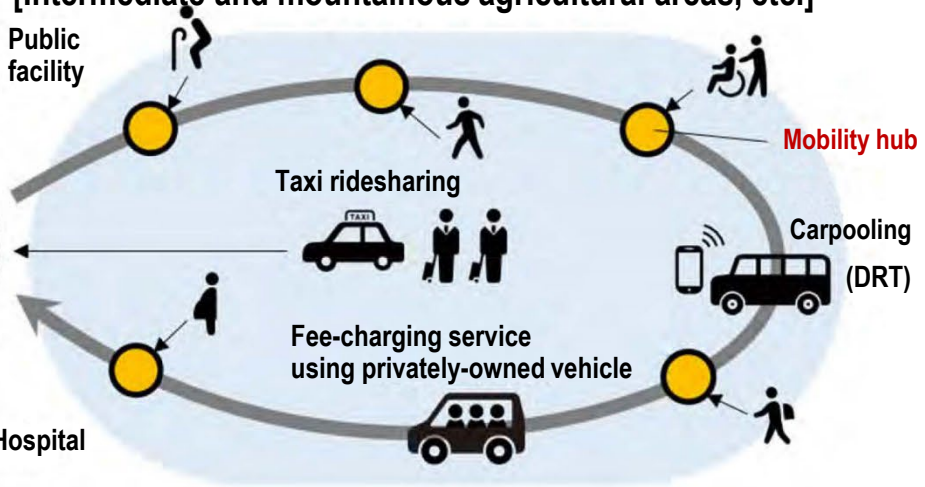
The Project aims to achieve **a society devoid of any mobility divide, where all persons, things, and services can move safely and comfortably, in a free and independent manner, without negatively impacting the environment, other people, and cities,** realizing the optimal forms of urban spaces and mobility services.

[Regional cities / Major cities' suburbs]



★All roads are set up to allow for safe, secure, and fun walking.

[Intermediate and mountainous agricultural areas, etc.]



★ Access to public transport is made available to all citizens within five minutes of walking.

① Major reform involving minor roads × ② Redesign of regional public transport

Outline of the Project

Execution structure

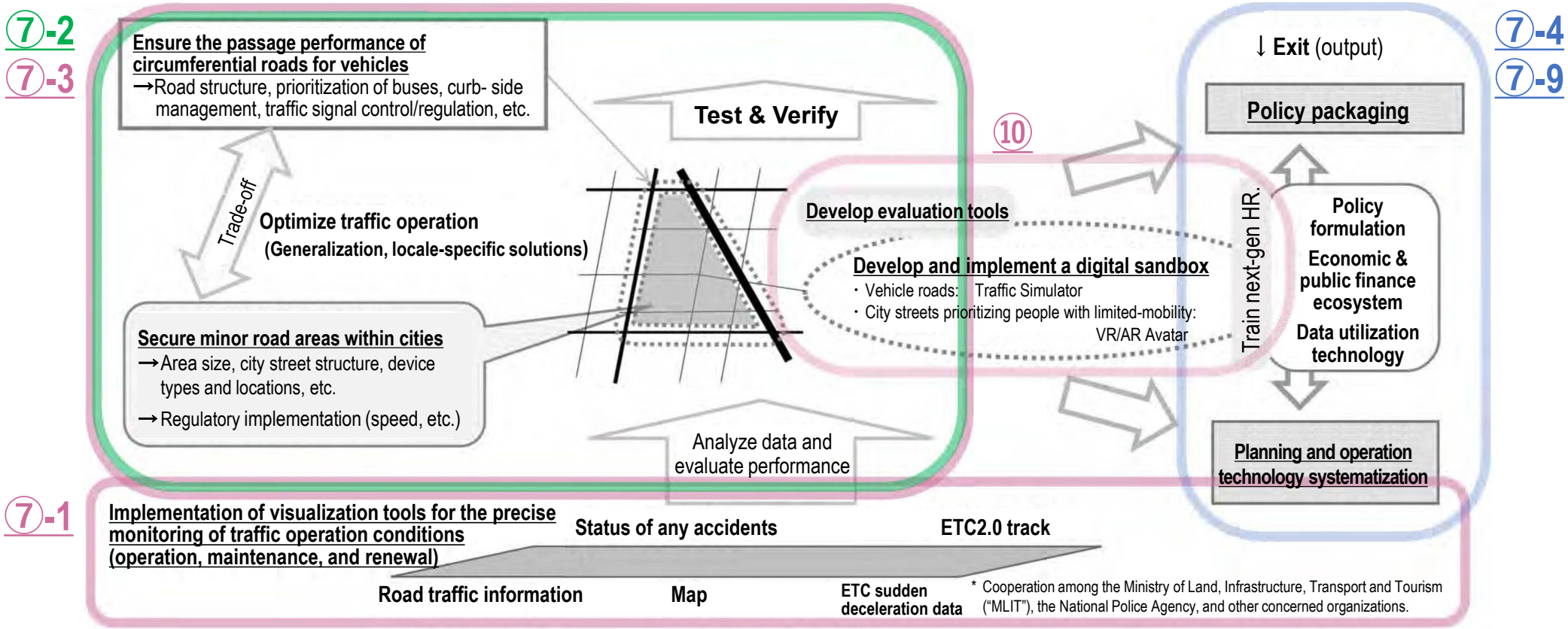
ORIENTAL CONSULTANTS (ORICONSUL) Global Consulting for Sustainable Development

JICE 一般財団法人 国土技術研究センター Japan Institute of Country-ology and Engineering

UTokyo

R&D objectives

- ⑦-1 Understanding the current state of minor roads in cities and development of a public policy monitoring system
- ⑦-2 Theory formulation for the planning of city street network configurations for existing urban areas
- ⑦-3 Formulation and social implementation of specific accident-prevention measures mainly involving speed restriction
- ⑦-4 Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules
- ⑦-9 Proposal of legislation and rules
- ⑩ Development of a digital sandbox for realizing safe, comfortable, and sufficient mobility

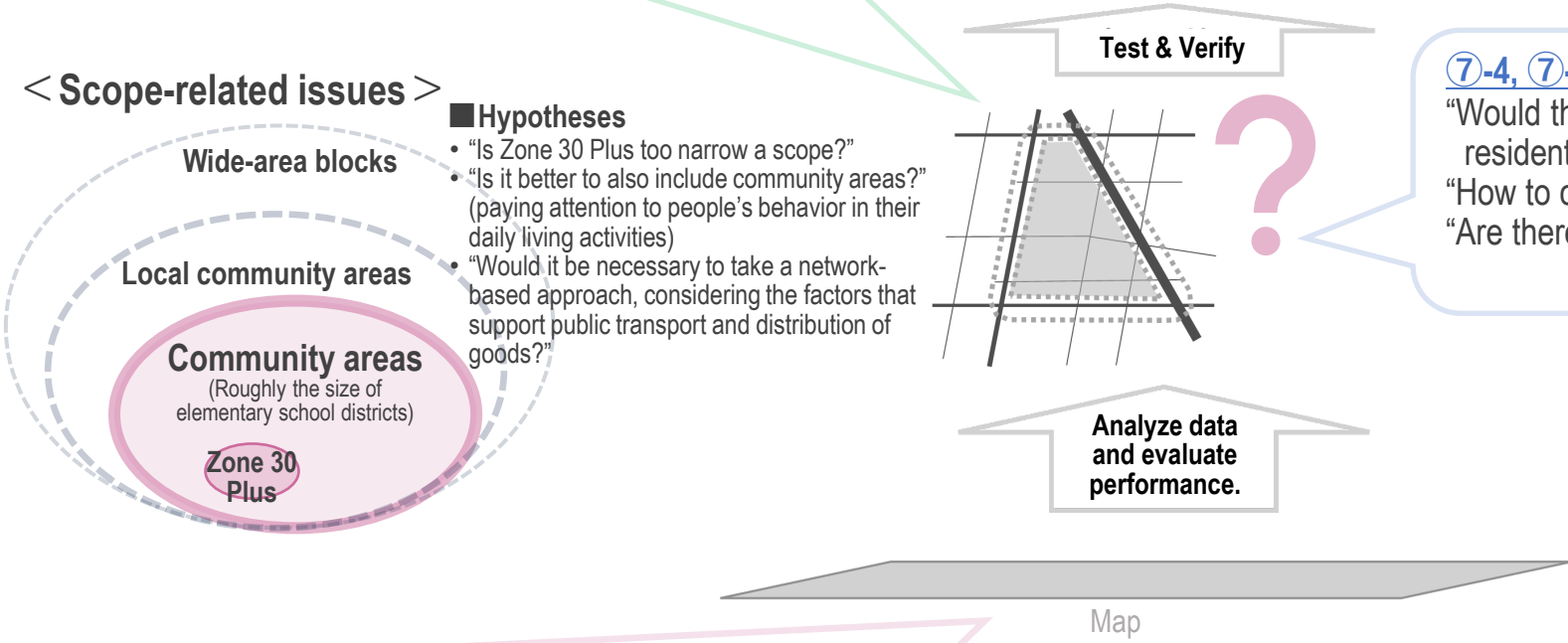


Outline of the Project

[Examples of issues being experienced in operations concerning minor roads within cities]

⑦-2, ⑦-3
"What is the scope to be considered?"
"What countermeasures are available?"
"How to examine and decide countermeasure execution? What is the procedure involved?"
"What are the (numerical) targets for goal achievement?" etc.

⑩
"What changes would transpire when the measures are actually implemented?"
"How much improvement could be made?"
"Actual research (i.e., questionnaire surveys, information sessions) would be quite costly…" etc.



⑦-4, ⑦-9
"Would the proposed measures be accepted by local residents?"
"How to coordinate with concerned parties?"
"Are there any issues with administrative systems and rules?" etc.

⑦-1
"What are the actual circumstances of the particular areas being targeted?" "Where can we find the data we need? What kinds of data are available?" "How current or outdated are the data? Are they reliable?" "Where do the specific (quantifiable) problems and issues lie?"
"What are the progresses having been made on the previously executed measures?" etc.

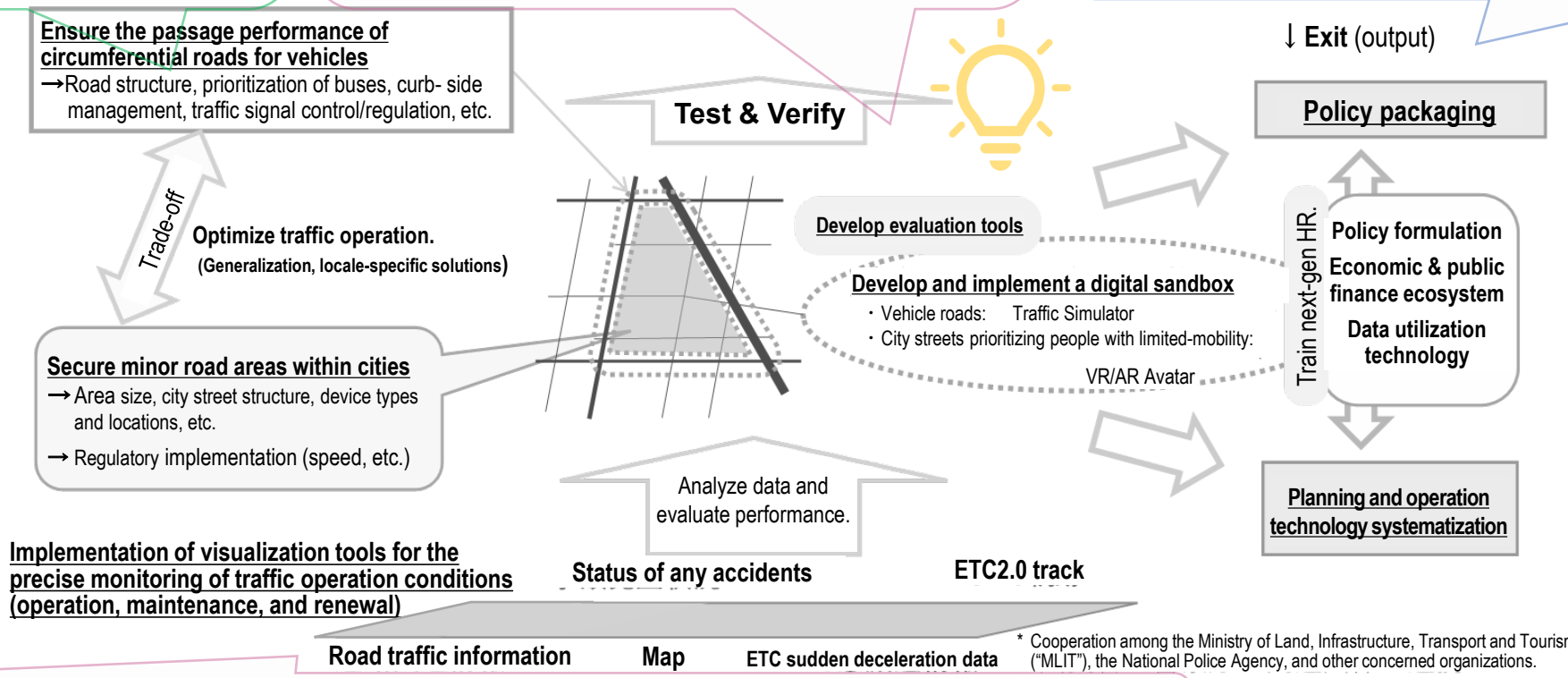
Outline of the Project

[Approach to solving issues]

⑦-2, ⑦-3
- Evaluation of traffic functions' performance and quality, spatial network arrangement theory
- Characteristics of the rules and necessary places for implementing speed suppression measures

⑩
- Virtual evaluation system modeled from the perspective of pedestrians, etc. and what evaluation metrics to be used
- Traffic simulator technology that can evaluate planar traffic flows

⑦-4, ⑦-9
- Direction of public policy for mobility implementation and achieving the intended effects of traffic safety measures
- Issues concerning administrative systems and rules, and improvement measures



⑦-1 ・Database and platform that can be used by any parties such as municipalities and consultants
・Securement of data freshness, accuracy, and reliability, sustainable operation protocols

Project schedule

Items	Detailed items	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
⑦-1	Theoretical research, examination of social implementability					
	Development of a monitoring system for model areas					
	Improvement and supportive use of the system, examination of its operation structure					
⑦-2	Research on concerned network theories					
	Generalization and organization of city street network configuration planning theories					
⑦-3	Investigation of technological trends and case studies relating to speed suppression measures					
	Examination on decision methods and implementation processes					
	Preparation, examination, and improvement of public policy package proposal					
⑦-4	Organization of information on the current conditions and key issues, investigation of mobility trends					
	Organization of information on the Project's direction, creation of guidelines (preliminary draft)					
	Examination in model areas, organization of information on the direction of how improvements should be made					
⑦-9	Organization of information on statutory significance, regulation, safety standard, etc.					
	Examination of issues concerning administrative systems and rules, improvement measures					
	Discussion on the feasibility of improvement, proposal of a future direction					
⑩	Organization of information on necessary functions, evaluation metric structure					
	Development of evaluation system, case study					

The goals of the Project

⑦-1 Understanding the current state of minor roads in cities and development of a public policy monitoring system

- Conduct monitoring of model areas such that the progress and effectiveness of safety policies and vibrancy-promoting measures can be evaluated.
- Develop a public policy monitoring system and prepare a (draft) proposal on its sustainable operation structure.

⑦-2 Theory formulation for the planning of city street network configurations for existing urban areas

- Examine a stratified network theory wherein medium- to low-speed modes of transport are added to bicycles, pedestrians, and public transport, and conduct its empirical analysis.
- Systematize a fundamental theory for achieving such stratified traffic mix and prepare a (draft) proposal of it, presented as optimal urban design.

⑦-3 Proposal and social implementation of specific accident-prevention measures mainly involving speed restriction

- Define requirements for the implementation and operation of speed suppression measures relating to road infrastructure.
- Identify a public policy package conducive to accident prevention across all traffic systems, and prepare a (draft) proposal of it.

⑦-4 Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

- Prepare a preliminary proposal of results that could serve as guidance or guidelines for examining possible revision of existing roads as community roads or vibrancy roads, in conjunction with concerned government agencies, etc.
- Revise the preliminary proposal based on concerned results and aim for its social implementation in the form of guidance or guidelines.

⑦-9 Proposal of administrative systems and rules

- Conduct a primary identification of key issues that are subject to future revision, while also attending to the intents of concerned government agencies, etc.
- Present a (draft) proposal on the enhancement, improvement, and revision of existing administrative systems, and public policy package implementation methods, etc.

⑩ Development of a digital sandbox for realizing safe, comfortable, and sufficient mobility

- Develop a digital sandbox and make it usable in actual operations such as case studies of model areas and under certain other conditions.

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

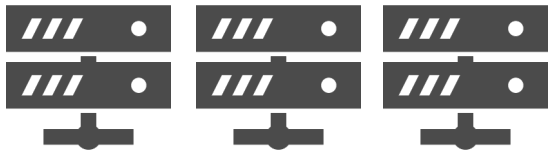
[System configuration, tentative ver. for 1st FY]

Data temporarily gathered in a single place

While a wide variety of data-owning parties exist, all data are temporarily gathered in a single place for easier handling for system development purposes.

Data input

***All types of data covering entire Japan will be handled except school routes.**



Management of data is each owner company's responsibility.
* Entities indicated in the parentheses "[ ]" are the owners of data.

Types	Data description
Road	DRM [Japan Digital Road Map Association]
Traffic restriction	Specification of allowed road users [Prefectural Police, JARTIC]
Traffic restriction	Speed restriction [Prefectural Police, JARTIC]
School routes	School routes (specified by law) [Public Safety Commission, MLIT]
Accidents	Traffic accident statistics [National Police Agency]
Other	Areas (national land statistics) [MLIT, Ministry of Internal Affairs and Communications ("MIC")]

Output viewing + tallying system (platform)

*SIP3FS results are used tentatively.

Types	Data description
Safety (area-specific)	Accidents (incidence, density)
Measure progress rate	List of all regulations and associated information

* These data outputs are possible, by municipality, road width, etc.

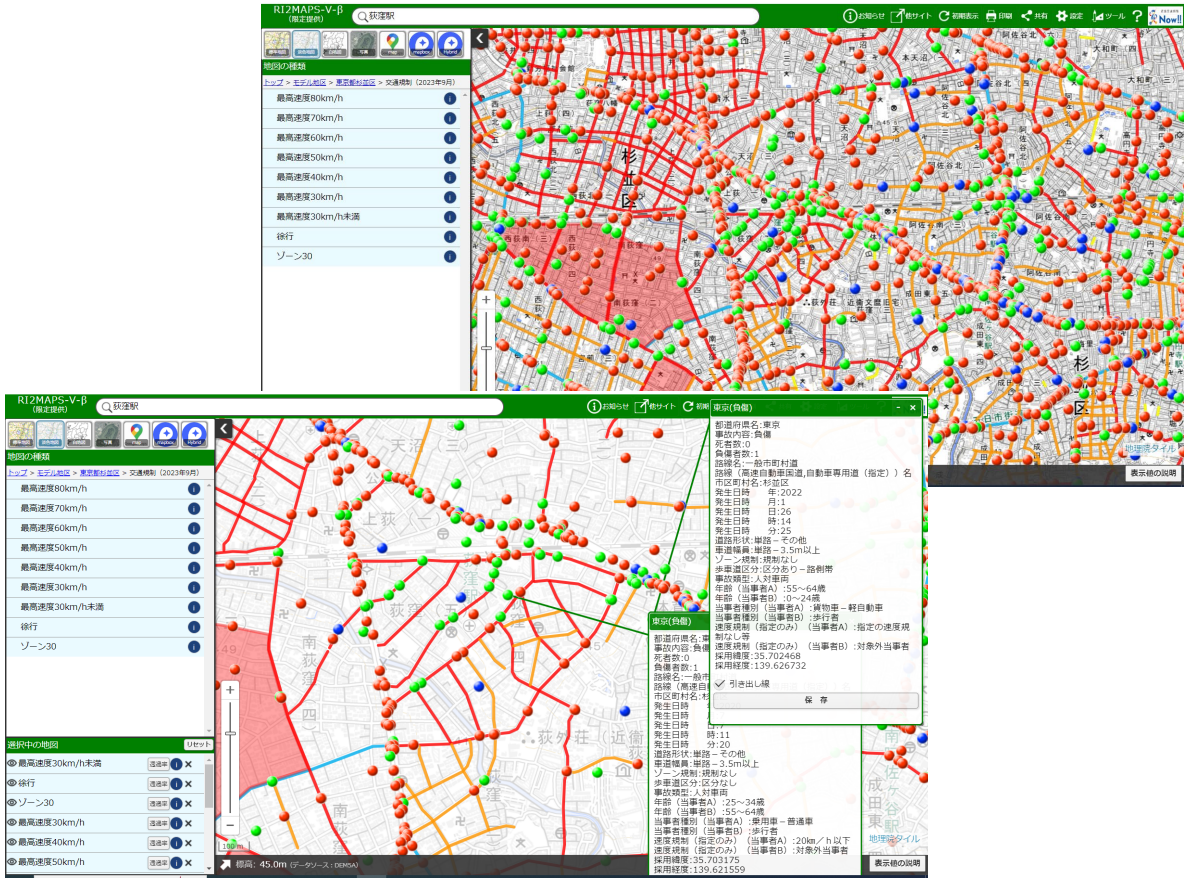
Outcome:
- Area-specific overview
- Accident reduction, safety improvement
- Improved measure progress rate

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

[Output viewing＋tallying system (platform), tentative ver. for 1st FY]

Output viewing system

(Sample data display: Ogikubo Station and its surrounding area in Suginami-ku)

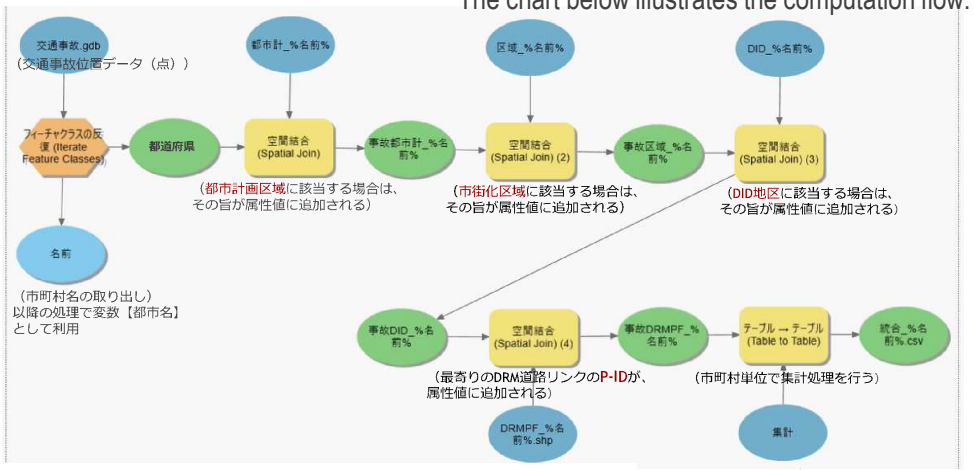


*JARTIC, RI2MAPS-V-β

Output tallying system

*The chart below illustrates the computation flow.

System configuration chart



Output result (Excel data)

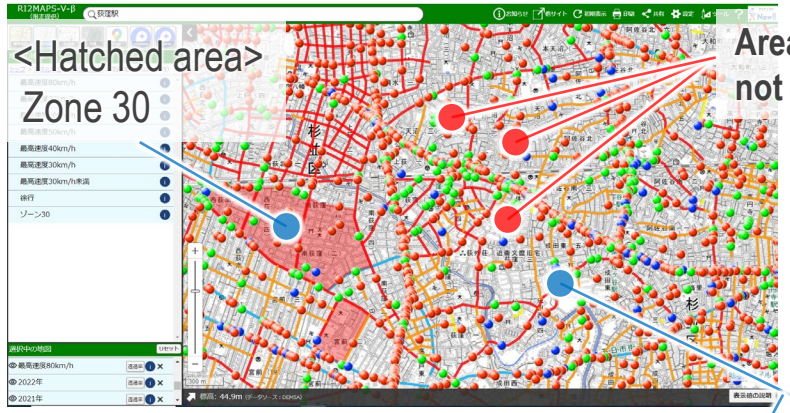
		1	2	3	4	0
		13.0m以上	5.5m以上13.0m未満	3.0m以上5.5m未満	3.0m未満	未調査
速度規制（調査結果）	28 最高速度100km/h	0	0	0	0	0
	29 最高速度80km/h	37	95,999	1,128	0	0
	30 最高速度70km/h	0	5,299	134	0	0
	31 最高速度60km/h	522	266,099	21,530	0	0
	32 最高速度50km/h	83,788	193,677	14,350	0	0
	33 最高速度40km/h	113,872	451,323	44,959	0	0
	34 最高速度30km/h	13,432	268,716	151,579	10,111	0
	35 最高速度30km/h未満	522	10,597	59,757	0	0
	36 最高速度可変(法)－(50)km/h	0	0	0	0	0
	37 最高速度可変(法)－(40)km/h	0	0	0	0	0
	38 最高速度可変(法)－(30)km/h	0	0	0	0	0
	39 最高速度可変(60)－(50)km/h	0	0	0	0	0
	40 最高速度可変(60)－(40)km/h	0	0	0	0	0
	41 最高速度可変(60)－(40-30)km/h	0	0	0	0	0
	42 最高速度可変(50)－(30)km/h	0	0	0	0	0
	43 最高速度可変(50)－(60)km/h	0	0	0	0	0
	44 最高速度可変(40)－(50)km/h	0	0	0	0	0
	45 最高速度可変(30)－(40)km/h	0	0	0	0	0
	46 最高速度区域40km/h	0	0	0	0	0
	47 最高速度区域30km/h	0	0	0	0	0
	48 最高速度区域20km/h	0	0	0	0	0
	49 最低速度	0	0	0	0	0
	61 徐行	0	77	549	0	0
	99 ゾーン30	425	30,868	50,957	0	0
	規制データなし	43,072	423,034	381,329	4,744	0

単位：m

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

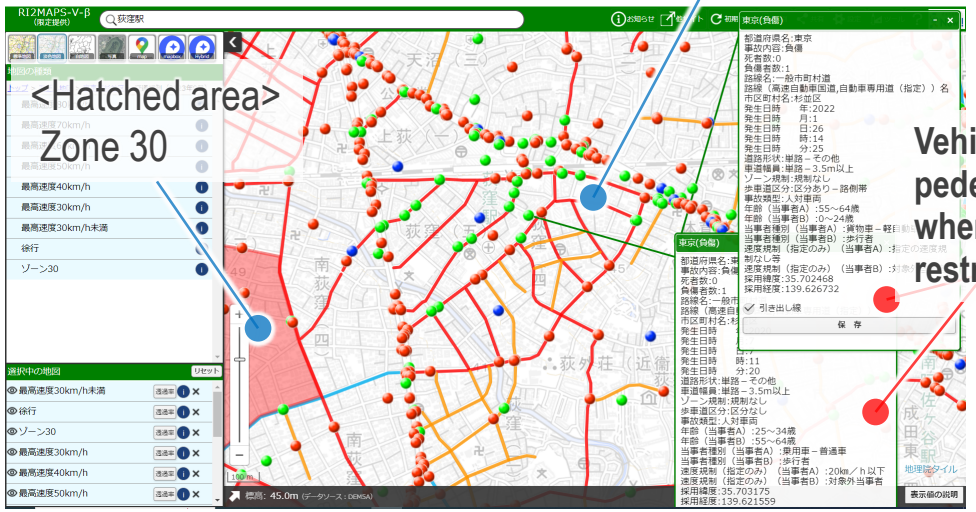
[Sample evaluation using the system]

- Concerning minor roads in this urban district, there are **several sections where there is no speed restriction**, specific to certain routes or zones. They are where **vehicle collisions with pedestrians tend to occur**.



Areas without speed restriction are not uncommon!!

<Solid lines>
Roads with speed restriction



Roads near accident sites

Vehicle collisions with pedestrians occur in areas where there is no speed restriction!!

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

[Sample evaluation using the system]

- **Incidence of vehicle collisions with pedestrians is high** on **roads that are less than 5.5 m wide and do not have speed restriction.**

＜Tallied statistical data of vehicle collisions with pedestrians in Suginami-ku, Tokyo by speed restriction and road width＞

東京都杉並区
【速度規制・道路幅員毎の事故件数（人対車両）】

			幅員　r22_005				
			1	2	3	4	0
			13.0m以上	5.5m以上 13.0m未満	3.0m以上 5.5m未満	3.0m未満	未調査
速度規制（調査結果）	28	最高速度100km/h	-	-	-	-	-
	29	最高速度80km/h	-	-	-	-	-
	30	最高速度70km/h	-	-	-	-	-
	31	最高速度60km/h	-	2	1	-	-
	32	最高速度50km/h	0	2	0	-	-
	33	最高速度40km/h	9	11	1	-	-
	34	最高速度30km/h	-	14	21	-	-
	35	最高速度30km/h未満	-	0	36	-	-
	36	最高速度可変(法)－(50)km/h	-	-	-	-	-
	37	最高速度可変(法)－(40)km/h	-	-	-	-	-
	38	最高速度可変(法)－(30)km/h	-	-	-	-	-
	39	最高速度可変(60)－(50)km/h	-	-	-	-	-
	40	最高速度可変(50)－(40)km/h	-	-	-	-	-
	41	最高速度可変(50)－(40･30)km/h	-	-	-	-	-
	42	最高速度可変(50)－(30)km/h	-	-	-	-	-
	43	最高速度可変(50)－(60)km/h	-	-	-	-	-
	44	最高速度可変(40)－(50)km/h	-	-	-	-	-
	45	最高速度可変(30)－(40)km/h	-	-	-	-	-
	46	最高速度区域40km/h	-	-	-	-	-
	47	最高速度区域30km/h	-	-	-	-	-
	48	最高速度区域20km/h	-	-	-	-	-
	49	最低速度	-	-	-	-	-
	61	徐行	-	-	0	-	-
	99	ゾーン30	-	0	2	-	-
		規制データなし	11	9	42	-	-

単位：件

(Only the restriction types with which the incidence of accidents is not zero are indicated.)

Unit: accident

			Road width r22_005				
			1	2	3	4	0
			13.0 m and above	5.5 m - below 13.0 m	**3.0 m - below 5.5 m**	**below 3.0 m**	**Data not obtained**
Speed restriction (Survey result)	31	Max. speed 60 km/h	-	2	1	-	-
	32	Max. speed 50 km/h	0	2	0	-	-
	33	Max. speed 40 km/h	9	11	1	-	-
	34	Max. speed 30 km/h	-	14	21	-	-
	35	Max. speed below 30 km/h	-	0	36	-	-
	61	Proceed slowly	-	-	0	-	-
	99	Zone 30	-	0	2	-	-
		No restriction data	11	9	42	-	-

The incidence of vehicle collisions with pedestrians is quite high on roads that are less than 5.5 m in width and do not have speed restriction!!

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

[System configuration Image of the completed system in the final FY]

Road administrator's system

The administrator loads any necessary data it needs in each use.

Each time a new measure, etc. is implemented, it must be registered into the system.

(Temporary data gathering)

* The plan is to own and manage the system within the consortiums until the end of SIP 3rd term. However, it is necessary to coordinate among the concerned parties during the PJ period to decide how the system will be managed, etc. thereafter.

* It is expected that the government agencies and other organizations directly responsible for such measure implementation as described above will take over the lead with the investigation, while coordinating with other concerned government agencies.

Data are temporarily gathered, as there are many different entities holding data. This also improves the sustainability of the system's continuous operation.

The companies that own the data are individually responsible for managing their own data.

(If API coordination is required, estimate and apply for the necessary cost.)

Data input (servers)

JMDS

* The PJ will be facilitated in parallel with JMDS for the foreseeable future, monitoring the progresses being made at their end.

DRM-DB, traffic accidents/traffic restriction, school route data + ETC2.0 probe data, traffic safety measure implementation status, etc. → Examine all these data.

Output viewing + tallying system (platform)

With the system that will be developed, the user can view the data on digital media and also perform certain types of tallying tasks.

*** As for the final version of this viewing + tallying system, the Project team will consider creating a supportive system to complement the existing system or developing a new system altogether, while reflecting on the UI and the specifics of the types of data that will be handled by the system.**

Outcome

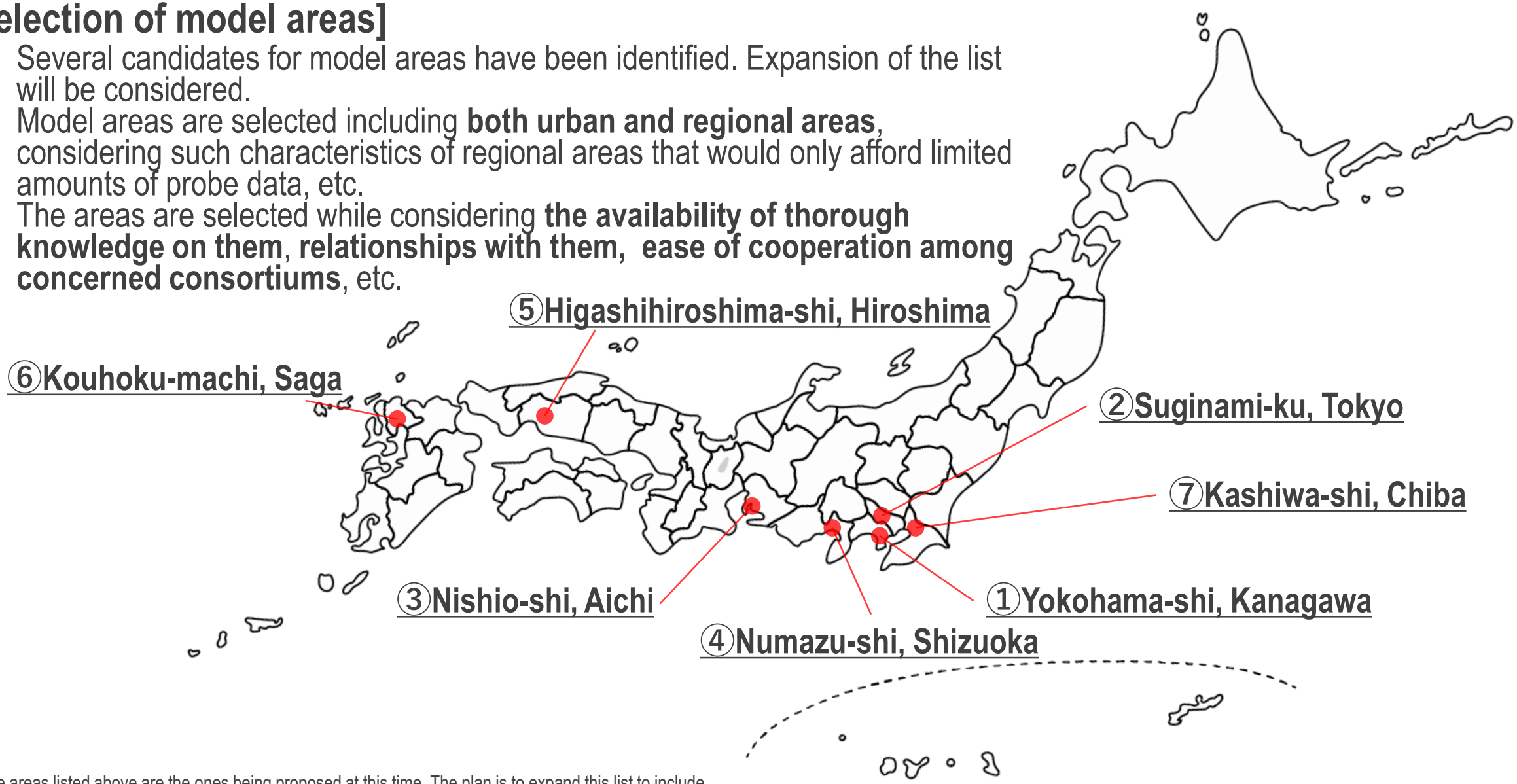
(Detailed analysis that might be necessary will be performed with the support of the Road Bureau, etc.)

* In this connection, the plan is to coordinate such initiatives involving "minor roads" with the Next-Generation ITS Investigation Conference (secretariat: MLIT's Road Bureau).

⑦-1. Understanding the current state of minor roads in cities and development of a public policy monitoring system

[Selection of model areas]

- Several candidates for model areas have been identified. Expansion of the list will be considered.
- Model areas are selected including **both urban and regional areas**, considering such characteristics of regional areas that would only afford limited amounts of probe data, etc.
- The areas are selected while considering **the availability of thorough knowledge on them**, **relationships with them, ease of cooperation among concerned consortiums**, etc.



*The areas listed above are the ones being proposed at this time. The plan is to expand this list to include other candidate areas, narrow them down, and examine them in more detail.

⑦-2. Theory formulation for the planning of city street network configurations for existing urban areas

⑦-2. Theory formulation for the planning of city street network configurations for existing urban areas

[Review of city street network plans that consider diverse road users in urban areas]

I. Road planning, design guidelines, etc. in the U.S. and Europe

- ✓ Definition of the functions considered essential to city streets in urban areas
- ✓ Method of categorizing and configuring city streets based on the defined functions
- ✓ Approach to addressing the conflicting needs of various city street users (e.g., ease of walking vs. vehicle speed maintenance)
- ✓ Approach to scoping of the areas where speed suppression will be implemented
- ✓ Method of evaluating the needs of various users, and metrics used in such evaluation

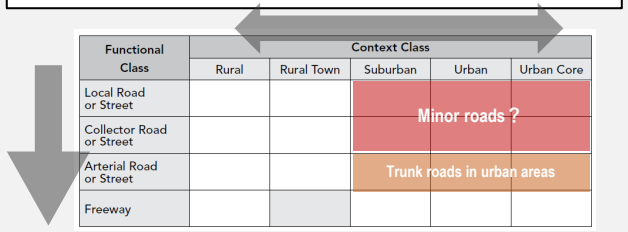
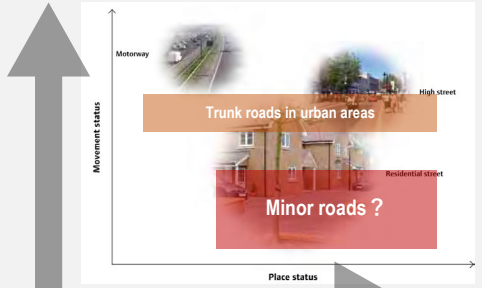
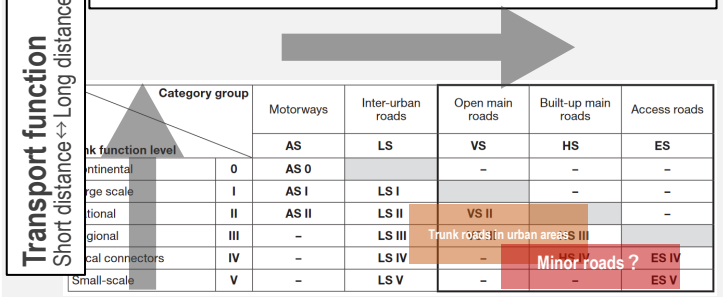
Countries	Targets	Guidelines, etc.
U.S.	Mainly automobiles	• A Policy on Geometric Design of Highways and Streets (AASHTO, 2018)
	Public transport	• Guide for Geometric Design of Transit Facilities on Highways and Streets (AASHTO, 2014), etc.
	Pedestrians	• Guide for the Planning, Design, and Operation of Pedestrian Facilities (AASHTO, 2021) • Designing Walkable Urban Thoroughfares: A Context Sensitive (ITE, 2010) • Walkable city rules (J. Speck, 2018), etc.
	All users	• Highway Capacity Manual the 7th edition (TRB, 2022), etc.
U.K.	All users	• Manual for Streets (2007), Manual for Streets 2 (2010), etc.
Germany	All users	• Richtlinien für integrierte Netzgestaltung RIN (FGSV, 2010) • Richtlinien für die Anlage von Stadtstraßen RASt 06 (FGSV, 2006), etc.

II. Academic research papers (academic journals, etc. published in Japan and other countries)

- ✓ Method of evaluating cases of city street space reconfiguration and improvement, and metrics used in such evaluation
- ✓ Method of evaluating road services being offered to different road users (pedestrians, buses, trams, etc.) and metrics used in such evaluation
- ✓ Quantification of trade-offs made between different users and functions, etc.

⑦-2. Theory formulation for the planning of city street network configurations for existing urban areas

[Review of road planning, design guidelines, etc. in the U.S. and Europe (summary)]

	U.S.	U.K.	Germany
City street **functions**	**Catering to the needs of diverse road users (also inclusivity), and the importance of city streets' role in community formation and strengthening** are clearly stated.		
City street **categorization method**	**Functional tiers of motor vehicles** Passing traffic vs. Traffic in and out of sideroads **Context categorization** (relations to surrounding environments, road-adjacent communities) Reflect the following factors: ・Speed expected by drivers ・Expectations of pedestrians and cyclists ・Roadside characteristics/constraints, etc. 	**Transport function** Short distance↔Long distance per unit area No. of persons being transported  **Places' function** (City streets comprise places along with adjacent buildings and spaces)	**Road categorization** ・Surrounding environments (in and outside urban areas, etc.) ・Passing traffic vs. Traffic in and out of sideroads **Transport function** Short distance↔Long distance  ＋ Indicate model city street categorization based on roadside locations, etc.
Approach to dealing with **conflicting needs**	• It's important to **balance** the needs. • Differentiate the service standard for each user category by city street type (e.g., service standard for community roads: pedestrians B, privately-owned automobiles C, trucks F)	• **Pedestrians are** considered **the highest priority, and privately owned automobiles the lowest.** • Speed limit on community roads is 20 mph or less, unless there is a special circumstance.	• It's important to **balance** the needs. • It's necessary to reduce automobile traffic in urban areas, or at least their priority. • Consideration is given first to **the roadsides (pedestrians)** before shifting toward **the center.**
Scope of speed suppression	• Intersection interval: approx. below 120 m ~ max. 200 m	• (Under investigation)	• Decision is expected to be made considering living places' sphere of activity.

Universal trends seen across the U.S. and Europe: Move away from such city street categorization and design standards that originate from automobiles ＝Essential perspective on city streets
Japan's unique challenge: As Japanese cities have large urban areas, the need to ensure a certain level of vehicle passage function can't be ignored. There's no clearly established theoretical method of achieving optimal balance between the two opposing needs (how to specify areas with speed restriction, city street connection interval, rules, etc.)

⑦-3. Proposal and social implementation of specific accident-prevention measures mainly involving speed restriction

⑦-3. Proposal and social implementation of specific accident-prevention measures mainly involving speed restriction

[Investigation of technological trends and case studies relating to speed suppression measures]

Zone 30 Plus

Source: MLIT, National Police Agency
https://www.mlit.go.jp/road/road/traffic/sesaku/syokai.html

- Conduct (domestic) case studies of speed suppression measures, which involves gathering and organizing information on the status of Zone-30-Plus initiatives being implemented across Japan, sample countermeasures adopted by different areas, and exemplary cases of efficacy studies.

  -Status of Zone-30-Plus initiatives: 122 cases

  -Sample countermeasures adopted by different areas: 37 cases

  -Efficacy studies: 35 cases

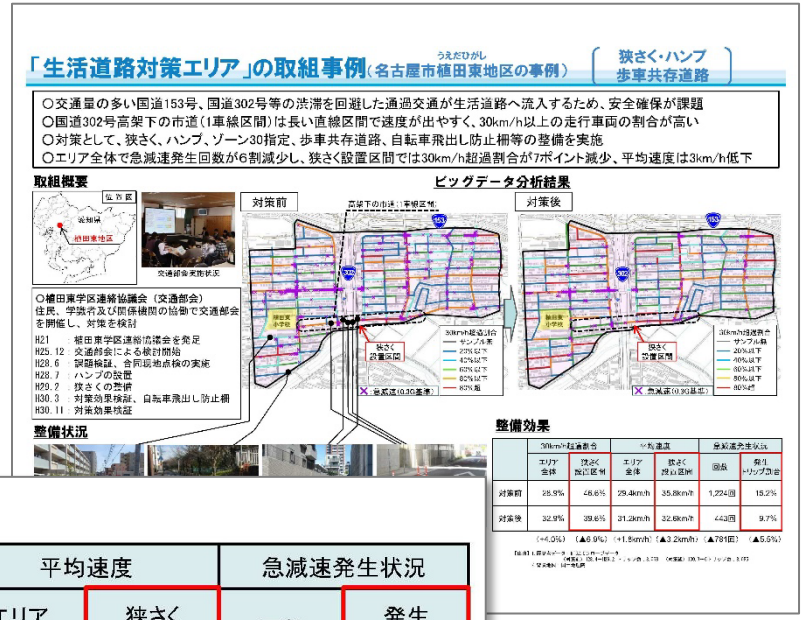
Source: MLIT https://www.mlit.go.jp/road/road/traffic/sesaku/syokai.html

⑦-3. Proposal and social implementation of specific accident-prevention measures mainly involving speed restriction

[Sample cases of Zone 30 Plus evaluation]

- In terms of how the effects of the zoning are evaluated, **the ratio of vehicles exceeding the speed limit of 30 km/h** and **the average speed** were the most commonly used metrics, while the incidences of sudden deceleration and driving in the wrong direction were also used but **only in limited instances**.
- The parameters used in calculating each of the metrics for evaluation were widely varied across different **entire areas, spots and sections of roads where measures were implemented, specific routes, sections, spots, etc.**

Metrics	No. of locations *Redundancies exist
Ratio of vehicles exceeding 30 km/h	29 locations
Average speed	31 locations
Incidence of sudden deceleration or ratio of trips occurring	11 locations
Incidence of driving in the wrong direction	1 location



整備効果

	30km/h超過割合		平均速度		急減速発生状況	
	エリア全体	狭さく設置区間	エリア全体	狭さく設置区間	回数	発生トリップ割合
対策前	28.9%	46.6%	29.4km/h	35.8km/h	1,224回	15.2%
対策後	32.9%	39.6%	31.2km/h	32.6km/h	443回	9.7%
	（+4.0%）	（▲6.9%）	（+1.8km/h）	（▲3.2km/h）	（▲781回）	（▲5.5%）

【出典】1. 履歴点データ：ETC2.0プローブデータ
（対策前）H28.4～H29.2 トリップ数：8,068 （対策後）H30.3～6トリップ数：8,055
2. 背景地図：国土地理院

Source: MLIT https://www.mlit.go.jp/road/road/traffic/sesaku/syokai-torikumi.html

➔ **It is also necessary to have assumptions and views on what the suitable evaluation methods might be and how the goals of multifaceted measures could be achieved.**

⑦-3. Proposal and social implementation of specific accident-prevention measures mainly involving speed restriction

[Other issues]

- Concerning the physical devices used in evaluation, it is likely that some of them were **installed in locations that were highly feasible (i.e., where they could be installed)** in some of the cases reviewed. This point must be kept in mind when evaluating in the form of case studies. *There are cases where positive effects might not be always produced.
- Review of the cases has revealed there are **not always clear links between the locations where near misses, sudden braking, and over-speeding occurred** and **the locations where countermeasures were implemented**.

➔ **When examining the efficacy of speed suppression measures based on actual case studies, it is necessary to investigate the specificity of each locale and the circumstantial factors that led to having those measures implemented.**

[Examination method for the next and subsequent FYs]

- Examination of area-specific characteristics and evaluation metrics
- Acquisition of data on areas targeted in case studies for the computation of countermeasure implementation methods (=spatial frequency data).
- Organization of data on spatial frequency and characteristic metrics relating to case study locations
- Analysis of data gathered for analysis and evaluation and summary of findings

*All items above will be examined in conjunction with the theoretical research (⑦-2 Theory formulation for the planning of city street network configurations for existing urban areas).

⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

[R&D overview]

- Hold comprehensive discussion on how to achieve social acceptance and collaboration relating to community roads and vibrancy roads, what rules might be necessary for the purpose, possibly including those on speed limits and lane categories. Also examine these topics in coordination with concerned government agencies.

[R&D goals (to be achieved by FY 2027)]

- Interim goal for **FY 2025: Produce deliverables in the form of such guidelines that would enable examining of the feasibility of revising** existing minor roads in cities as community roads and vibrancy roads **in a manner that suits the unique characteristics of each local, in consultation with concerned organizations, etc.**
- Final goal for **FY 2027**: **Implement** the proposed guidelines **in both real and virtual spaces**, and organize information on their applicability, points to be improved, etc. Then **put together a proposal** reflecting the results with a view to **revising the current statutory structure** as needed.

[Issues relating to community roads and vibrancy roads]

◆Organize information on the issues that must be addressed to make minor roads in cities such spaces where pedestrians, etc. are given priority, by categorizing them into the three groups as described below. Also do the same about applicable laws, regulations, etc.

Group III
〔Initiatives concerning traffic rules, etc.〕

- Facilitation of zone measures
- Occupation and use of roads
- Method of passage, etc. on pedestrian-prioritizing roads (tentative name)
- Speed restriction
- Demarcation lines
- Effective use of social experiments

Group II
〔Initiatives concerning road structure, etc.〕

- Setting up of mobility hubs
- Demarcation between driving lanes and sidewalks prioritizing pedestrians
- Physical devices prioritizing pedestrians
- Definition of pedestrian-prioritizing roads (tentative name) and their legal significance
- Updating of technical standards
- Flexible use of pedestrian roads
- Signs and markings for prioritizing pedestrians

Group I
〔Topics on which further improvements need to be made under the current system〕

- Planning theory for community roads
- Demarcation between driving lanes and sidewalks prioritizing pedestrians
- Data platform development
- Raising public awareness (including education)
- Co-existence with new mobility modes
- Physical devices prioritizing pedestrians
- Utilization of simulation models
- Significance of implementing pedestrian-prioritizing roads
- Passing traffic
- Non-statutory signs and markings
- Utilization of new technologies
- Development of process for spreading their use
- Promotion of Zone 30 Plus

⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

[Sample overseas case: Outline of the EVQ initiative implemented in Paris, France]

EVQ=*Embellir votre quartier* (Project for beautifying your community)

- ◆This initiative has been implemented since 2020 as one of the measures to realize the 15-minute city concept.
- ◆It consists of comprehensive action components such as planting trees, traffic regulation, etc. conducive to improving the city's road environment.

EVQ's features

Objectives	・Planting of trees ・Simplification of roads ・Traffic control ・Comfort of pedestrians ・Consensus building with city residents
Target areas	• Each of the areas has a population of approx. 30,000. • While there are 17 Arrondissements in Paris, they are divided into six areas. The initiative plans on implementing its measures on all of those areas in six years. • Larger budgets have been allocated for areas with high crime rates.
Process flow	Current situation analysis (Diagnotic)→Prior discussion (Concertation)→Preliminary plan formulation (Etudes de pre)→Consultation among concerned parties (Restitution)→Detailed examination (Etudes)→Work commencement (Travaux)
Resident participation	• Resident assemblies have been held at least three times (announcement of the diagnostic result; explanation of the plan formulated by the municipal Arrondissements; and introduction of the finalized plan) • Exploratory walking tours for residents were held. This was designed to communicate their suggestions and opinions to the municipal governments in the initial stage. • Internet-based voting and collection of opinions have been held from time to time as needed.
Schedule	• All processes up to detailed examination (i.e., formulation of development plans) are executed in the initial year, while requiring 12 to 18 months until the first construction work starts. • It requires two to three years until all construction works are completed.

Road spaces developed by EVQ
(12th arrondissement)

Information obtained by interviewing the officials of Paris City's Department of Road Works and Mobility and the municipal Arrondissements (conducted in Feb. 2024)

⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

[Sample overseas case: Current situation analysis for the EVQ initiative implemented in Paris, France]

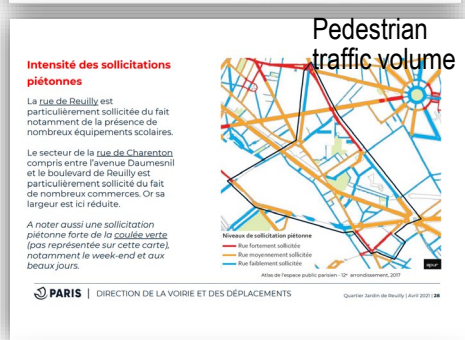
- ◆Its process of incorporating residents' opinions and suggestions into the overall plan is by such design that views resident participation as an integral part of how the entire project is run.
- ◆The result of the current situation analysis that was shared with residents consisted of multi-faceted and detailed data that had been well organized and visualized.

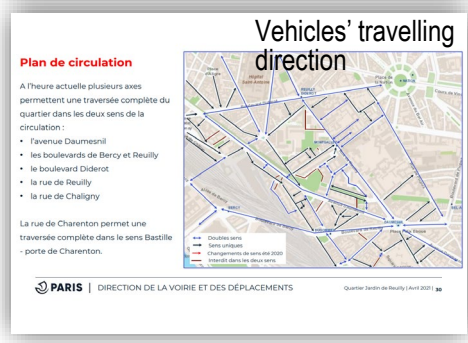
Chapter titles	Diagnostic items
01 Map-based review	Population statistics and socioeconomic indexes (population density, employment, demography, poverty ratio, occupational categories, etc.)
02 Community vitality and living	Commercial facilities, retailer types, public facilities (childcare and educational facilities, etc., sports and cultural facilities, etc., medical, welfare, and community facilities, etc.)
03 Mobility and public space	Refer to the table on the right→
04 Living environment	District history, geographical features, urban environment, architectural legacy
	Greenification (of public squares, parks, etc.), status of greenification and heat islands, green networks and biodiversity, street trees
	Thermal comfort, air pollution (nitrogen dioxide and benzene, ozone and PM2.5)
	Road noise, street lights, waste disposal sites, status of beautification
05 Recent, current, and future trends	Recently executed development projects, projects already scheduled
06 Summary of action guidelines	Diagnosis for district improvement, development possibilities, summary of action guidelines

Source: Excerpted from the EVQ diagnosis of the Reuilly Park district of Paris.

03 Diagnostic items on mobility and public space

Automobile ownership	Ratio of households owning automobiles
Public transport	Means of transport afforded by public transport services
	Convenience of public transport services
Roads	Road width
	Road traffic volume
	Sidewalk width
	Non-barrier-free roads, narrow sidewalks
Traffic	Pedestrian traffic volume
	Vehicle traffic volume
	Bicycle paths and their continuity
	Vehicles' travelling direction
	Road management bodies
	Traffic regulations, etc. being implemented (meeting zones, footpaths, etc.)
	Intersections with traffic signals
Accidents	Accident sites
	No. of traffic accidents and accident sites by transport mode
Parking space	Status of on-road vehicle parking space supply
	Parking space for goods delivery (periodical delivery zones, permanent delivery zones)
	Parking space for people with disabilities
	Charging stations
	Service stations for car sharing, etc.
Bicycle parking space	Parking space for shared bicycles
	Dedicated e-bicycle parking space
	Mixed parking space
	Bicycle parking space
Other vehicle / bicycle parking	Status of on-road vehicle parking space abuse
	Parking space run by businesses (privately owned)





⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

[Trends concerning electric kickboards (Europe)]

◆ London bans operation of all individual-owned electric scooters on public roads

■ **The number of Santander electric bicycles in the capital is set to increase by more than 200% this summer as a result of Transport for London (TfL) investment.(BBC News, 23, Jan, 2024)**

- A new £3 day pass will be introduced, allowing an unlimited number of journeys under 30 minutes in a day, and £1 for extra half-hours
- £20-a-month membership scheme, with 6.75m in 2023

Transport for London (TfL) Announcement(9th, Dec, 2021)

■ TfL has announced that all privately-owned electric scooters unicycles(foldable or carriable) will be banned on London's transport network from Monday 13 December. This is the result of safety concerns about these items following recent fires on TfL premises & services.

- Foldable electric bicycles are permitted.

■ Privately owned electric scooters are prohibited to ride on public road.

➢ (TfL comment) Electric scooters are not subjected to declarations of conformity (and UKCA approval). Can's make general principal decision on the safety of them whilst transported on the network

■ Electric bicycles are legal to use on public roads(Including privately owned)

➢ Electric bicycles are legal to use on public roads and are subject to the regulations set out in the Electrically Assisted Pedal Cycles Regulations 1983 and the Electrically Assisted Pedal Cycles (Amendment) Regulations 2015

■ TfL will start Electric scooter rental trial. Data is being collected for the purpose of future regulation formulation and reflection of safety standards.

- Since June, 2021.Operators are Dott, Lime, Voi
- Speeds below 19.5 mph (31 km/h). Lights on when in use.
- GPS controlled parking and exclusion zones
- Identification number plate
- Adaptation of high safety standards to batteries for disaster prevention.

Source: TfL's official website, from news releases and Q&A sections.

⑦-4. Achievement of social acceptance and collaboration relating to community roads and vibrancy roads, and formulation of rules

[Trends concerning autonomous delivery robots (U.S.)]

◆ Issues encountered by FedEx and Amazon

■ **FedEx and Amazon still haven't figured out sidewalk delivery robots. Will mass adoption ever come?**
(SupplyChain Dive, 12th/April/2023)

- **FedEx** is taken their leave. The service was discontinued in October 2022, four years after Roxo's launch.
- **Amazon scout** had been deployed in four states (Washington, California, Tennessee, and Georgia), but has **completed practical testing**.

■ Sep, 2019, FedEx Roxo hit the street of NYC this week, Mayor Eric Adfamis tweeted, "FirsFirst of all, @FedEx, never get a robot to do a New Yorker's job. We have the finest workers in the world".

- ➢ New York DOT sent a letter to FedEx "ordering a suspension of robotic delivery operations. Vehicle and Traffic Law prohibits motorized vehicles on sidewalks and ROXO is in violation of this law."

FedEx's robot delivery
"ROXO"

Source: CNN Business, 2019.11.26
News WorkingNation, https://workingnation.com/nyc-sends-fedex-delivery-robots-packing

■ Triggered by an order to suspend the experiment in Kirkland, Washington, Amazon reviewed its robotic deliveries and suspended all services in October 2022.

- ➢ The City of Kirkland stated in its letter the reasons for the shutdown are "Scout safety, dispenser zoning and the psychological reaction of surrounding residents."

Amazon's robot delivery
"SCOUT"

"Dispensers"
Stores 20 scouts.5m-2.6m. Electricity, tele-communication capabilities. once a day, van driver loads Scouts.

Source: Memorandum Autonomour Personal Delivery Devices, File No.. CAM22-00195, City of Kirkland, Planning and Building Department

⑦-9. Proposal of legislation and rules

⑦-9. Proposal of legislation and rules

[R&D outline]

- Examine what suggestions to make on target-specific administrative systems and rules (legal system, business practices, social acceptability, etc.) based on the strategic consideration resulting from the sub-topic I [Redefinition of mobility services and formulation of strategy for social implementation].

[R&D goals (to be achieved by FY 2027)]

- Interim goal for **FY 2025: Comprehensively identify all issues and topics** that must be reviewed and possibly revised in the future, while reflecting the intentions of concerned government bodies, etc.
- Final goal for **FY 2027:** Select from among the identified issues and topics which ones to target for social implementation. Then formulate a proposal (draft) on **how to improve and enhance the existing systems, how to implement the public policy package**, etc.

[Definition of pedestrian-and-vehicle joint-use roads, etc. in Japan]

◆The term “Street designed for traffic calming, etc.” is **only stated in the publication entitled *Explanation and Application of Road Structure Ordinance*.**

7-3 Street Designed for Traffic Calming, etc.

7-3-1 Overview

> Street designed for traffic calming, etc. are such streets that aim to help create comfortable living environments by eliminating passing traffic on community roads. They are streets that implement measures to suppress the speed of automobiles, prevent traffic accidents, and serve as safe and secure traveling space for pedestrians.

7-3-3 Types of street designed for traffic calming, etc.

> There are two types of street designed for traffic calming, etc., namely street designed for traffic calming and community roads, the difference between the two being whether there is any physical object separating the pedestrians’ traveling space from that of automobiles, bicycles, etc.

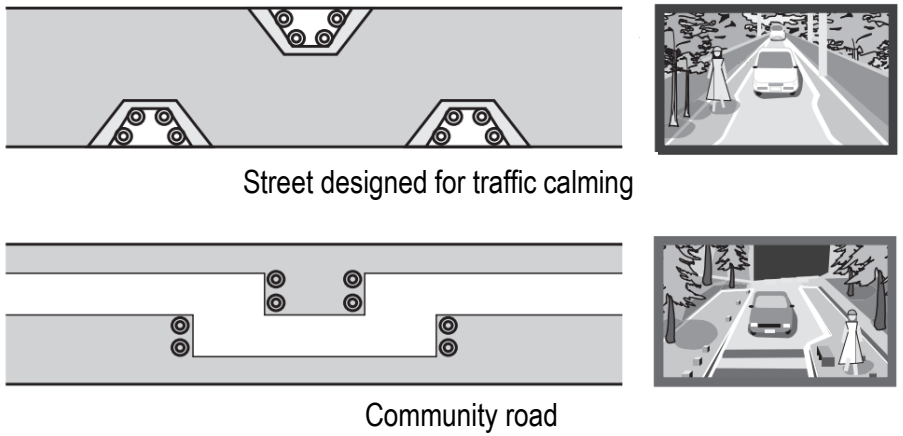


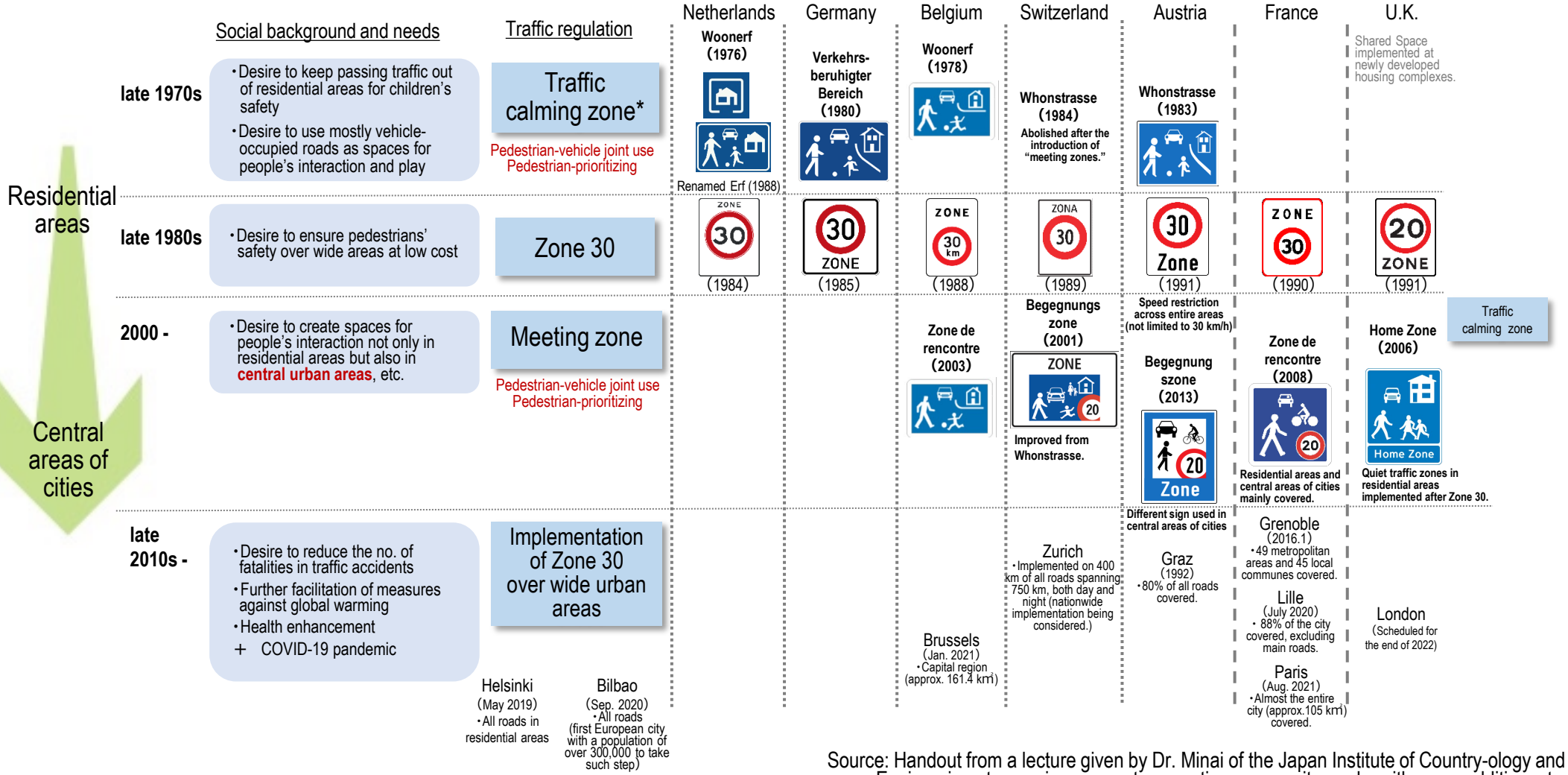
Figure 7-4: Examples of street designed for traffic calming, etc.

Source: Explanation and Application of Road Structure Ordinance, Japan Road Association, March 2021.

⑦-9. Proposal of legislation and rules

[Timeline of traffic measures adopted in Europe prioritizing pedestrians]

- ◆The initiative to implement pedestrian-prioritizing roads in Europe was initially implemented in residential areas in the late 1970s and spread to the central areas of cities, etc. in recent years.
- ◆In cities, Zone 30 has been implemented over increasingly wider urban areas.



Source: Handout from a lecture given by Dr. Minai of the Japan Institute of Country-ology and Engineering at a seminar on next-generation community roads, with some addition, etc.

⑦-9. Proposal of legislation and rules

[Travel spaces for new mobility modes (Japan)]

◆Electric kickboards, etc.⇒While they are technically a type of motorized bicycles, traffic rules similar to those for standard motor vehicles are applied.

◆Electric wheelchairs, autonomous delivery robots, etc.⇒**Travel spaces equivalent to those for pedestrians are allocated.**

Categories of vehicles, etc. under the Road Traffic Act

		Max. speed on ordinary roads	Travel spaces								Remarks		
			Vehicle road			Bicycle path	Sidewalk	Sidewalk where bicycles are also allowed to travel	Curb-side lane	Road not distinguished for use between pedestrians and vehicles	Operator's license	Helmet	Other
			Vehicle road (2nd lane, etc.)	Vehicle road (1st lane)	Lane for exclusive use by standard motor vehicles								
Vehicles	Motor vehicle (excluding special small motor vehicle)	60 km/h	○	○	×	×	×	×	×	○	Required	Required (motorcycle)	
	Special small motor vehicle	15 km/h	×	○	×	×	×	×	×	○	Required	Not required	
	Motorized bicycle	30 km/h	×	○	×	×	×	×	×	○	Required	Required	
	Specified small motorized bicycle (electric kickboard, etc.)	20 km/h (Special specified small motorized bicycle: 6 km/h)	×	○	○	○	×	△ (Special specified small motorized bicycle: max. 6 km/h)	△ (Special specified small motorized bicycle: max. 6 km/h)	○	Not required (age 16 and above)	Not required (Obligation to make effort)	If △, it should be visible to third parties.
	Light road vehicle: Light road vehicle excluding standard motor vehicle	-	×	○	○	△ (bicycle, etc. allowed)	×	×	△ (Obligation to slow down)	○	Not required	Not required (Partial obligation to make effort)	
	Light road vehicle: Standard motor vehicle	-	×	○	○	○	△ (Young children, infant, etc.)	△ (Obligation to slow down)	△ (Obligation to slow down)	○	Not required	Not required (Partial obligation to make effort)	
Pedestrians	Pedestrian	-	×	×	×	×	○	○	○	○	Not required	Not required	
	Wheelchair, wheeled walking aid, etc. for persons with disabilities (electric wheelchair, etc.)	6 km/h	×	×	×	×	○	○	○	○	Not required	Not required	
	Remote-controlled small vehicle (autonomous delivery robot, etc.)	6 km/h	×	×	×	×	○	○	○	○	Not required (registration-based system)	Not required	Business operators must obtain the permission of the Public Safety Commission

[Legislative adaptation relating to autonomous delivery robots (U.S.)]

◆As of the end of 2022, 23 states in the North American market have enacted laws and regulations regarding robotic delivery, with most having speed limits of approximately 16 km/h, although some states have their own laws and regulations of approximately 10 km/h or 19 km/h.

■ **Speed restriction**
- **Most states set under 10 mph (16 km/h)**
- Louisiana and Pennsylvania set under 12 mph (19 km/h)

■ **Permitted max. load**
- Most states set under 10 mph (16 km/h)
- Louisiana and Pennsylvania set under 12 mph (19 km/h)

■ **Travelling space**
- Usually on the sidewalk
- Use the shoulder if it is difficult to pass on the sidewalk, etc.
- In Texas, there is a dispute about allowing delivery robot ride in bike lanes.

Table: U.S. legislation on robot delivery services by state

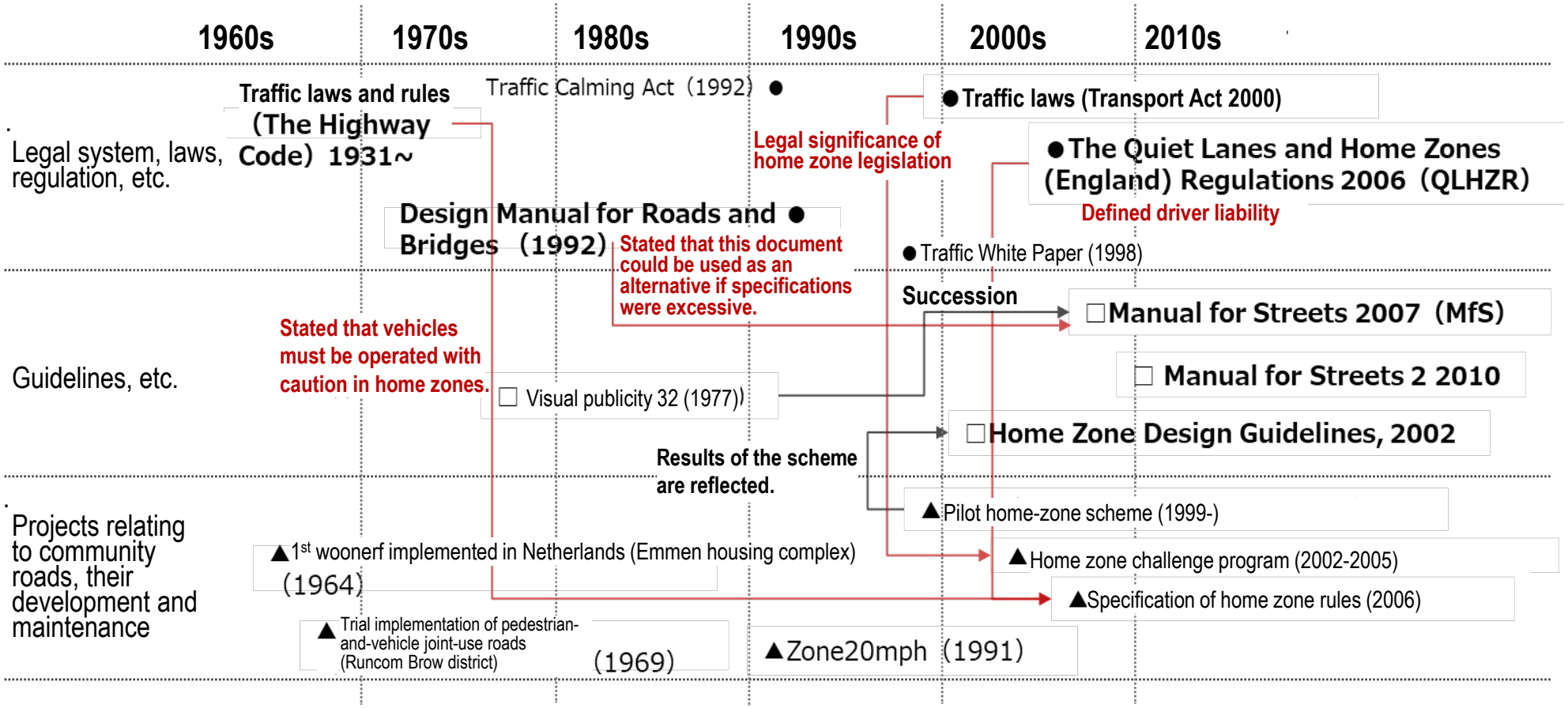
	State	Latest bill passed	Weight Limit (pounds)	With or without cargo	Max Sidewalk Speed (Mph)	Liability Coverage (USD)
1	Arizona	16/05/2018	100	Without	10	100000
2	Arkansas	26/04/2021	500	Without	10	100000
3	Florida	29/06/2021	Unspecified	Unspecified	10	100000
4	Idaho	24/03/2017	80	Without	10	Unspecified
5	Indiana	01/04/2021	500	Without	Unspecified	100000
6	Iowa	20/05/2021	550	Without	6	500000
7	Louisiana	11/06/2021	500	Without	12	100000
8	Maryland	18/05/2021	200	Without	7	100000
9	Michigan	10/09/2020	1000	Unspecified	10	100000
10	Missouri	22/06/2021	750	With	10	100000
11	North Carolina	01/07/2020	750	Without	10	100000
12	Ohio	29/06/2017	90	Without	10	100000
13	Oklahoma	05/05/2021	550	Without	10	100000
14	Pennsylvania	01/11/2020	550	Without	12	100000
15	Tennessee	02/07/2020	Unspecified	Unspecified	10	100000
16	Texas	10/06/2019	Unspecified	Unspecified	10	100000
17	Utah	12/05/2020	Unspecified	Unspecified	10	100000
18	Virginia	22/04/2020	500	Without	10	100000
19	Washington	30/04/2019	120	Without	6	100000
20	Wisconsin	22/06/2017	80	Without	10	Unspecified

Source: TECH MONITOR website

⑦-9. Proposal of legislation and rules

[U.K. legislation, guidelines, etc. on the home zone policy]

◆To implement its home zone policy, the U.K. government instituted necessary systematic rules by formulating legislation on the authority to designate home zones, liabilities when accidents occur and how to operate vehicles there, etc., creating manuals, etc. on the road design, and specifying the significance of the manuals, etc.



Source: Excerpted from Namiko Minai, Wakana Hara. *Transition of residential street use as Woonerf (Living Street) in the U.K.*, Figure 2, 335-340. Reports of the City Planning Institute of Japan 16 (4). March 2018, with some addition

⑦-9. Proposal of legislation and rules

[Travel spaces designated for electric kickboards]

Countries		Speed limits	Travel spaces	Remarks
Singapore		25 km/h	•Bicycle paths •Shared paths, park connectors	• Due to regulatory tightening in 2019, they are no longer allowed to travel on sidewalks.
U.S. (San Francisco, California)		approx. 24 km/h (15 miles/h)	•Vehicle roads*1 •Bicycle paths •Bicycle lanes •Sidewalks*2	*1: Only if there is neither a bicycle path nor a bicycle lane. *2: Only to go over into and out of adjacent facilities.
Germany		20 km/h	•Vehicle roads*3 •Bicycle paths •Bicycle lanes	*3: Only if there is neither a bicycle path nor a bicycle lane.
France	Urban areas	25 km/h Congested areas: 8 km/h	•Vehicle roads*4 •Bicycle paths •Bicycle lanes	*4: Only if there is neither a bicycle path nor a bicycle lane, excluding vehicle roads where the speed limit is above 50 km/h.
	Non-urban areas		•Bicycle paths •Bicycle lanes	
Austria		25 km/h*5	•Vehicle roads •Bicycle paths •Bicycle lanes •Sidewalks*6	*5: Pedestrian-only zones, residential streets, and shared spaces may be traveled but only at a speed close to pedestrians' movement. *6: Travel on sidewalks are possible only where ordinances allow it (e.g., Vienna does not allow it).

Source: Adapted from presentations, etc. given at the 3rd Conference on the Promotion of Diverse Mobility Implementation hosted by the Ministry of Economy, Trade and Industry (Oct. 16, 2019), etc.

⑩. Development of a digital sandbox for realizing safe, comfortable, and sufficient mobility

⑩. Development of a digital sandbox for realizing safe, comfortable, and sufficient mobility

[Status of examination]

- Examination of **the functions essential to a virtual evaluation system**, and organization of related information:

  Reviewed previously conducted research studies, etc., organized information on the effects that road structures and traffic operations tend to have on pedestrians' psyche, and examined what metrics might be effectively used for the evaluation.

Sample evaluation case 1: Discomfort felt by pedestrians when crossing intersections

- ✓ Developed a model that explains the mental load of crossing by such factors as intersection delays, encounters with right- and left-turning vehicles, and a sense of being hurried by yielding vehicles and flashing green lights.
- ✓ Compared to youth, older adults tend to be less sensitive to discomfort that arises during encounters with vehicles.

Sample evaluation case 1
Adachi, Iryo (2024)

Sample evaluation case 2: Pedestrians' ease of walk in an environment where they must navigate through other people remaining stationary

- ✓ Developed a multivariate linear regression model of evaluating people's perception of difficulty of walking, and determined that it was affected by the number of lateral movements required to circumvent, the density of pedestrians and stationary people in the space, and the distance from the walls nearby.
- ✓ While the CG-based model tended to underestimate the difficulty of walking perceived in actual environments, it could still accurately explain the varying degrees of such difficulty in relative terms. (CG-based evaluation⇔Actual footage evaluation)

Sample evaluation case 2
Iryo, Watanabe (2022)

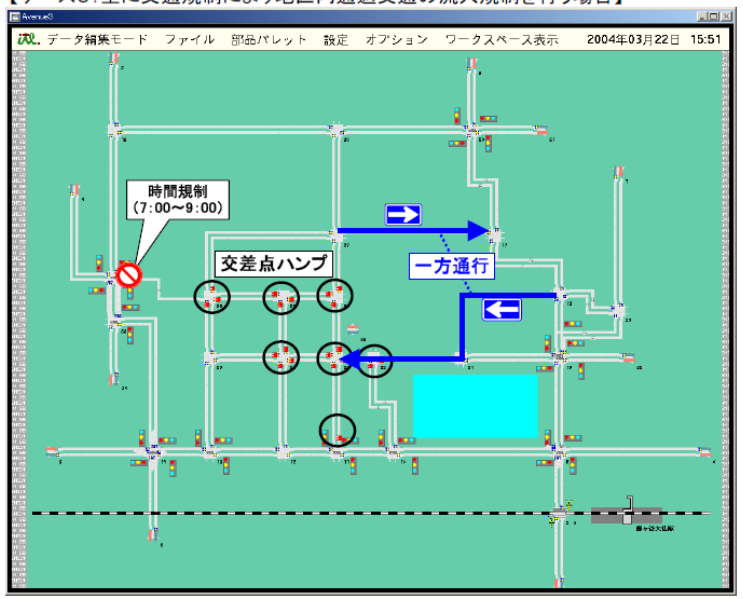
⑩. Development of a digital sandbox for realizing safe, comfortable, and sufficient mobility

[Status of examination]

- **Investigated some relevant simulator and VR/AR cases, summarized the key issues being faced in evaluating vehicle and pedestrian data** on actual roads and in virtual spaces, and organized **main views on VR-enabled evaluation.**

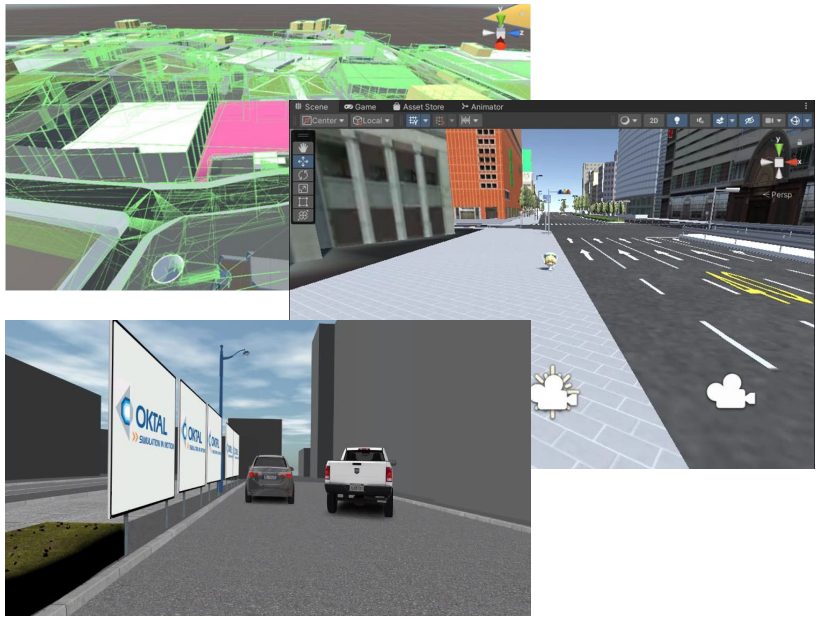
Sample traffic simulation case

【ケース3：主に交通規制により地区内通過交通の流入規制を行う場合】



International Association of Traffic and Safety Sciences (FY 2003)

VR simulation building and evaluation case



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