Basic Policy on Results Reporting and Exit Strategy
Realizing infrastructure that enables safe, comfortable, and vibrant cities

The Challenge of Redesigning Residential Roads

Supporting the Promotion of “Zero Accidents” Through Data Utilization

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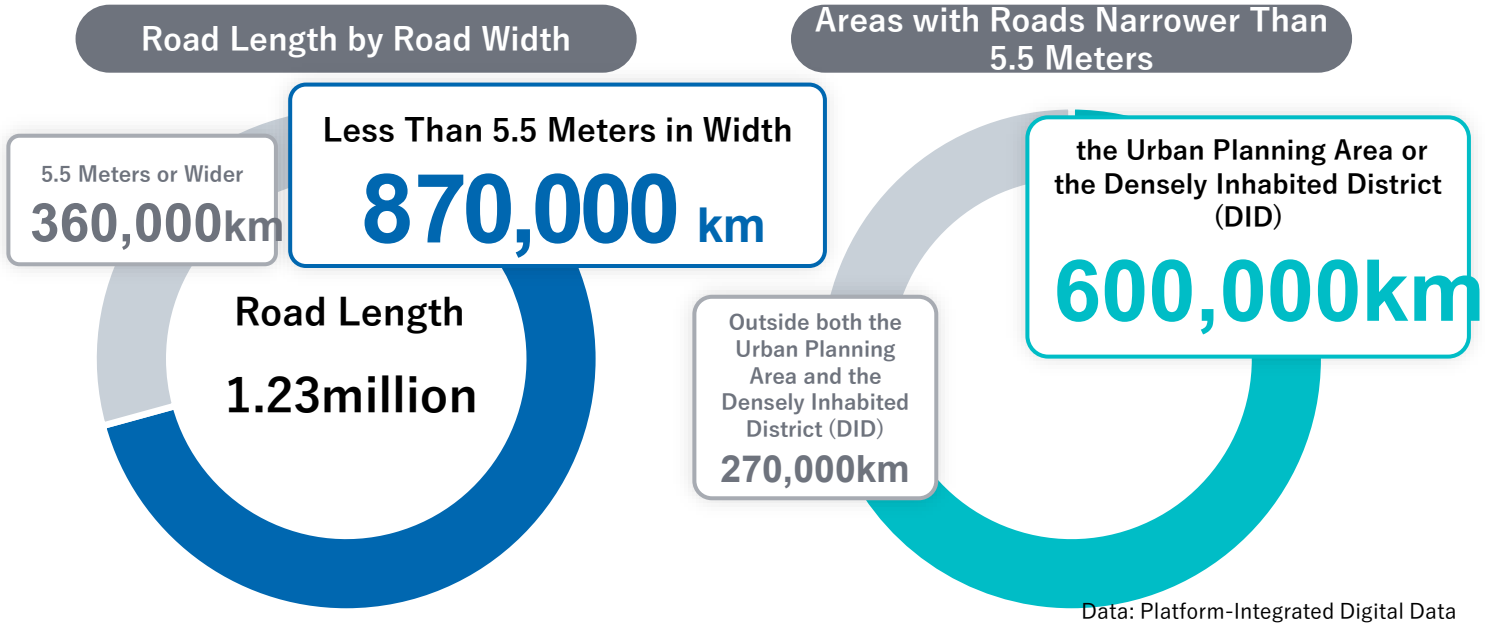
Contents

Improving safety on residential roads is required

- The total length of roads in Japan is approximately 1.23 million kilometers, about 70% of which—roughly 870,000 kilometers—are roads with a width of less than 5.5 meters.
  ※ Residential roads refer to roads narrower than 5.5 m without a centerline.
  ※ In this project, such roads are also defined as “Chiisana Michi” (“small roads”).
- Roadside conditions and utilization differ greatly from place to place.

Improving the safety of diverse road spaces is required.



Data: Road Statistics Annual Report

Data: Platform-Integrated Digital Data

A heavy vehicle is passing through a narrow road.

Source: Photographed by the consortium

elementary school children commute to school on their own, even among many cars.

Source: "Shizuoka Prefecture School Road Safety Program (July 2014)"

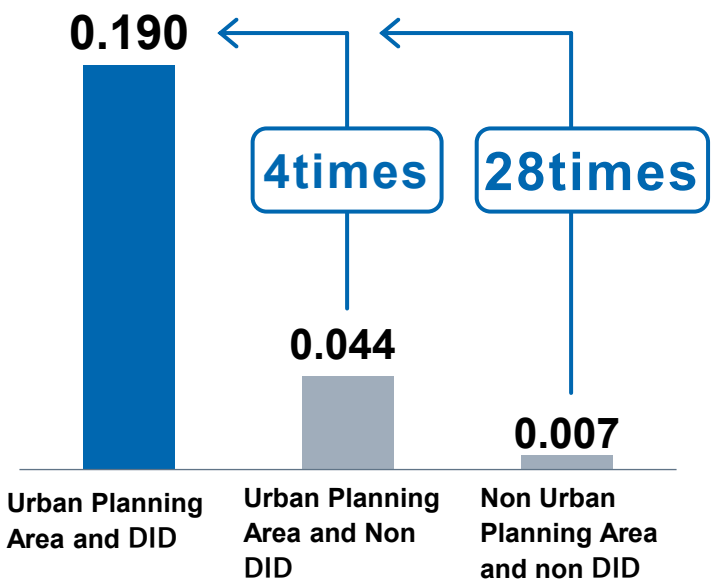
More accidents occur on residential roads in urban areas, with a higher accident rate.

New Developments !

Characteristics of Accidents on Residential Roads

Higher risk of traffic accidents in city planning zones and DID districts compared to other areas!

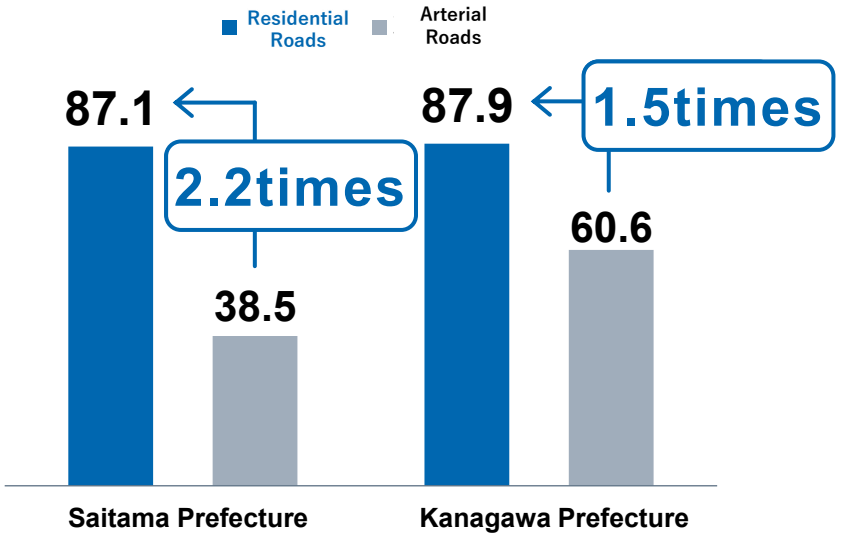
Accident Density by Region on Residential Roads [cases/km]



Note: Data – Platform-integrated digital data (Accident data for the year 2022 integrated with DRM and National Land Numerical Information)

The accident rate on residential roads is higher than that on arterial roads!

Accident Rate on Residential and Arterial Roads [cases per 100 million vehicle-kilometers]



Note: Data – Platform-integrated digital data (Accident data for the year 2022 integrated with DRM) (Traffic volume data [vehicle-kilometers]: Road Traffic Census for FY2021 (FY2021 Road Traffic Census) and ETC 2.0 probe data as of October 4, 2023)

Study on the Framework for Advancing Improvements on residential road through Problem Identification and Analysis

Scope of the study

Development of an environment for data driven decision-making

Implementation strategy and Policy package development

Implementing initiative support

Achieving these visions, we aim to support the initiatives of government and its agencies

Implementation strategy

Local Authorities

Identify and analyze local issues , and promote improvements on residential roads

Government

Promote various policy related to residential roads

Our vision for society

Safe School Journey for Children

Residential roads build a sense of community

Residential roads serve as public space creating lively atmosphere

Keywords : lingering・resting、Zone30、Vehicle restriction、barrier-free accessibility …

1. Project oveview

- **Work with local goverments to support safe school route initiatives**
- **Encourage nationwide sharing of effective residential road safety practices**

Collaboration with Policy Initiatives

- Expand related initiatives through dialogue with relevant ministries and agencies

Safety Measures for School Routes

2025	2026	2027
Zone 30・Zone 30 Plus	Pedestrian-Priority Roads (JAPIC Proposal)	Lowering the Legal Speed Limit to 30 km/h on Roads Without Center Lines
Pilot Trials in Two Model Areas	To Be Utilized in Traffic Safety Promotion Areas	Building an Environment that Local Governments Can Utilize

Completion of SIP Phase 3

The Challenge of Redesigning Residential Roads

Achieving Zero Accidents in Terms of Safety

Local Implementation

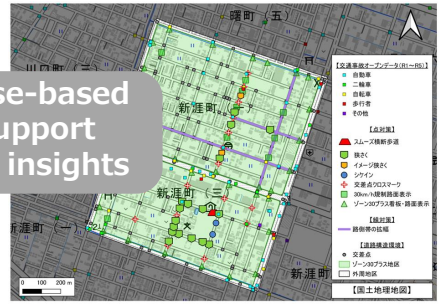
- Refine the policy package for use in traffic safety measures
- Continue dialogue with relevant ministries and provide information to local governments to expand its application

Developmening “Support Tools” based on PDCA cycle.

①Traffic Issue Visualization Tool

② Effect Simulation Tool

③ Database construction



To develop a case-based database to support evidence-driven insights

Flow of Countermeasures

(e.g., during Zone 30 Plus initiatives or joint inspections of school routes)

- STEP 00 — Start Planning Countermeasures
- STEP 01 — Identify Issues
- STEP 02 — Develop Ideas Countermeasures
- STEP 03 — Implement Countermeasures
- STEP 04 — Evaluation

Tool ③ Policy Package Implementation Guide

- How to Interpret Data
- Know-how for Consensus Building
- Support for Subsidy Applications

A Visualization Tool that integrates and overlays multiple types of road traffic data

Input

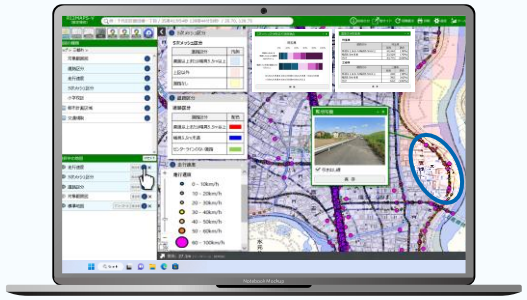
- Input various types of road traffic data
- Some datasets are linked with JMDS via API
- Can be customized

Base map
Elementary school districts
Road widths
Traffic regulations
Traffic accidents
Sudden braking
Volume
Speed
School routes
Requests

Tool

On Residetial Roads

Visualization Tool



- Upload data with coordinate information in GeoJSON or GeoTIFF format
- Manage menu settings and data updates with user ID and password
- Includes simple map creation and printing functions

Output

Overlay various information and data on a single map

Check at any scale or category via the web interface

Evaluate regional safety and risk levels

Propose specific high-risk locations
(to be expanded in future)

How to Utilize

- Identifying Hazardous Locations
- Selection of Countermeasure Locations
- Confirmation of Requested Locations
- Explanation of Necessity

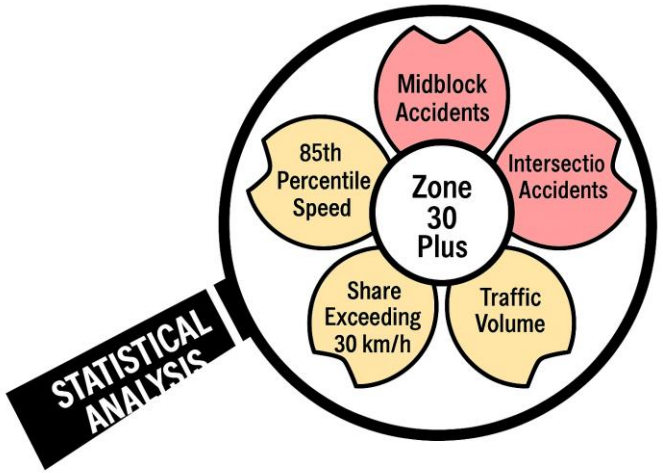
Traffic Issue Visualization Tool on Residential Roads

Background

- Traffic fatalities on residential roads (less than 5.5m wide) tend to remain high
- As a countermeasure, Zone 30 are popular. However, the effects of the zone measures are not clearly understood
- The legal speed of residential roads will be changed to 30 km/h from September this year.
- Nationwide analysis/analysis using big data is rare

Purpose

- Although the impact of individual devices is understood in Japan,zone measures remain unclear.
- It is to understand the effectiveness of zone measures

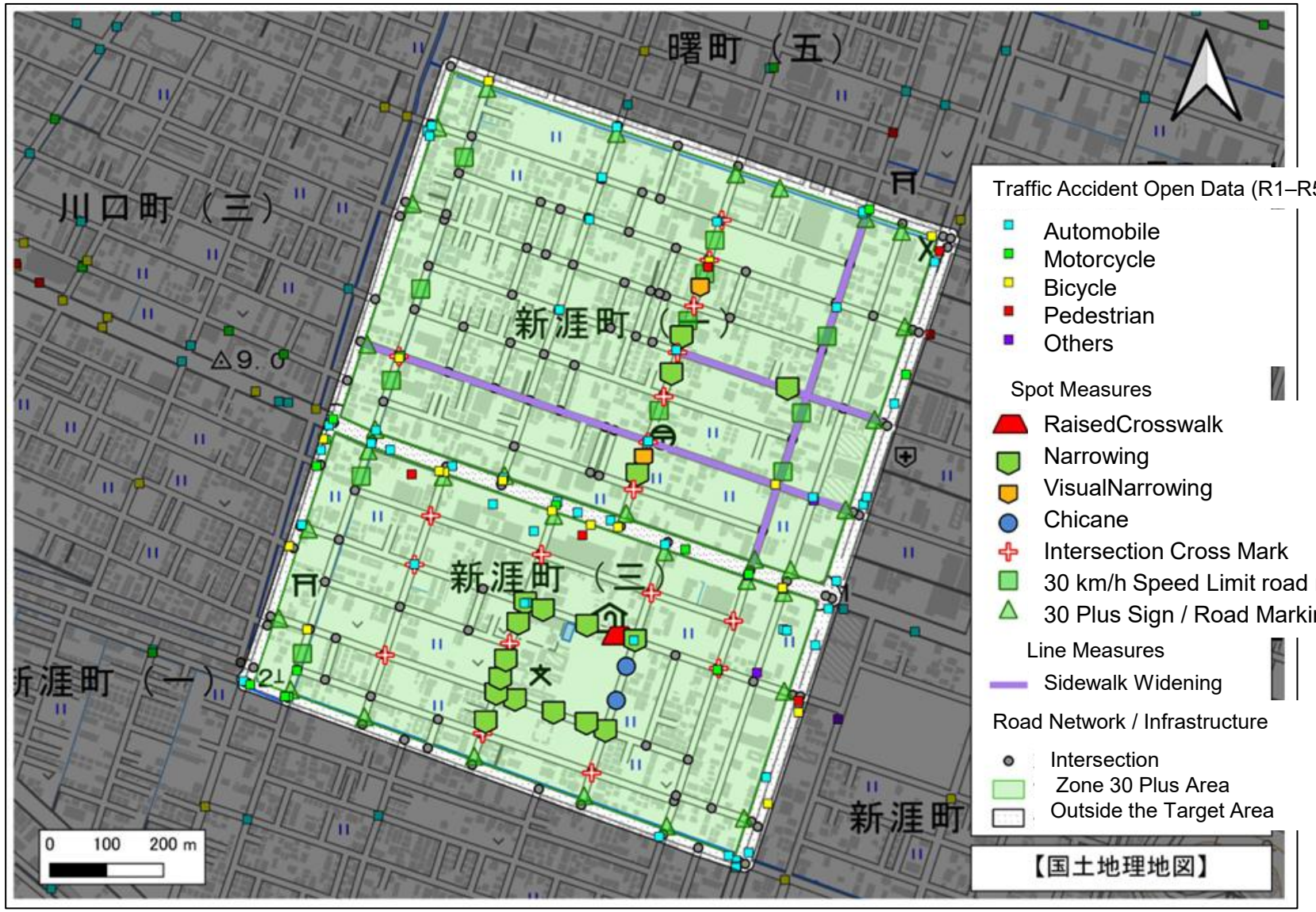


3.Study

About zone 30 plus

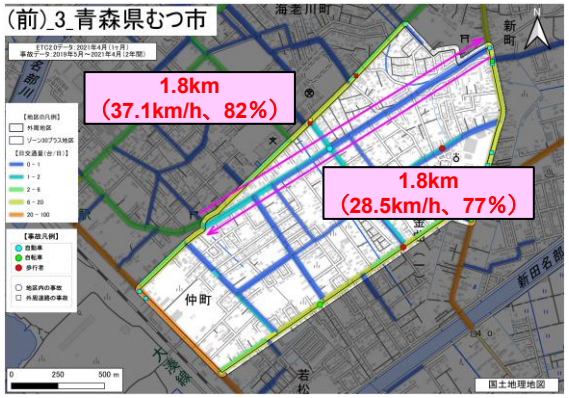
- **A Japanese program enforces a 30 km/h speed limit with features like humps and narrow lanes to improve safety for pedestrians and cyclists and reduce through-traffic on residential roads.**

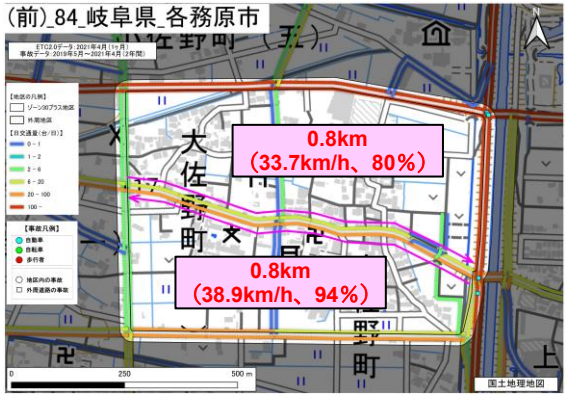
Constructing database and analyzing to get data driven insights

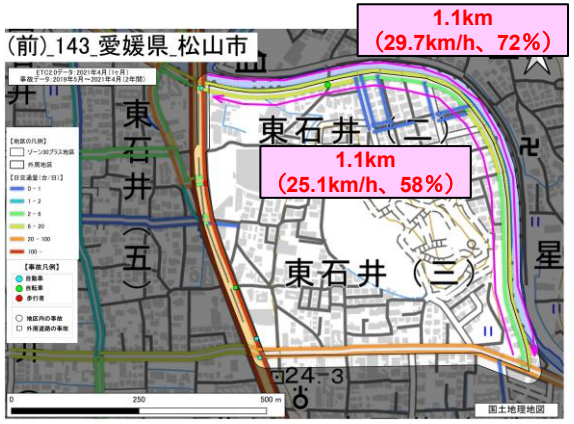


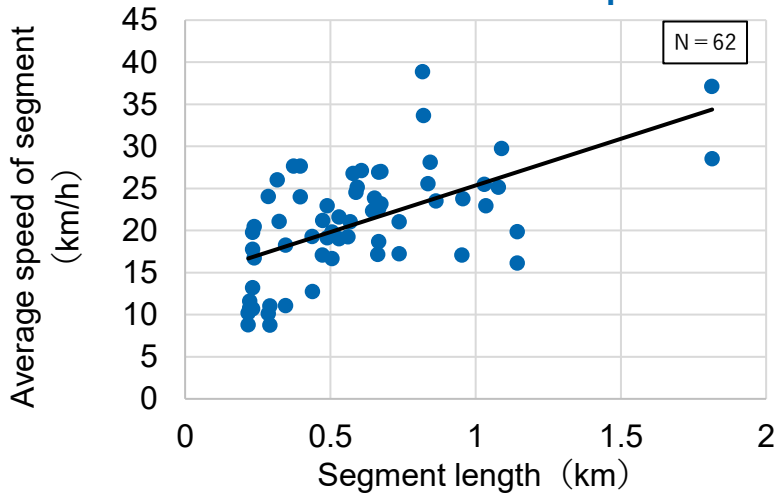
The longer the segment, the higher the average speed tends to be.

New Developments !

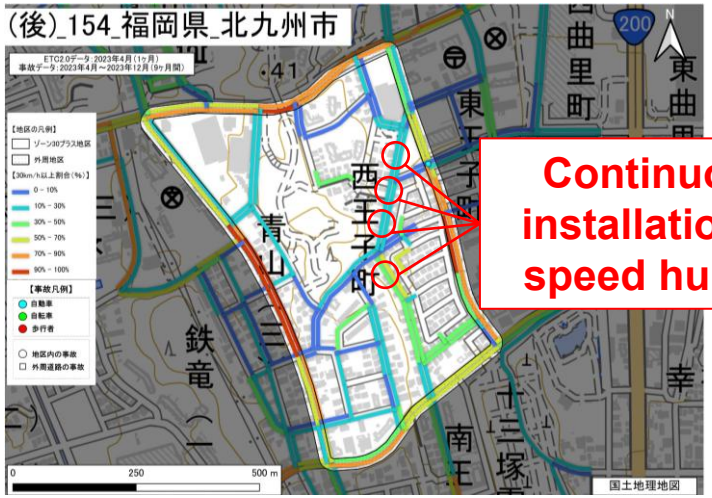


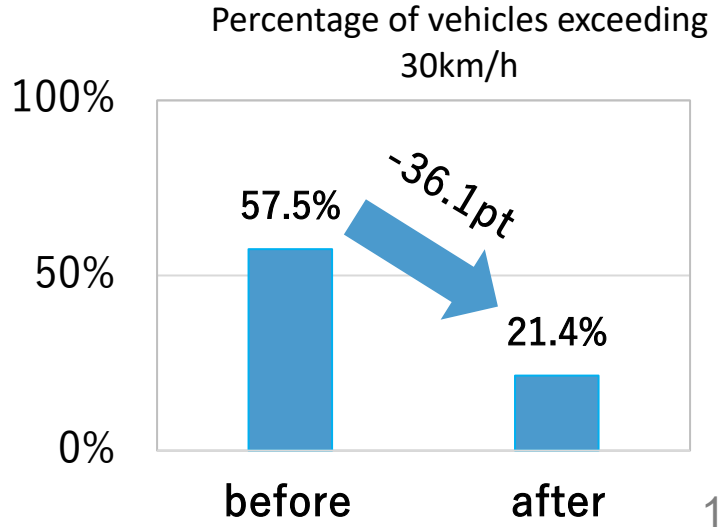




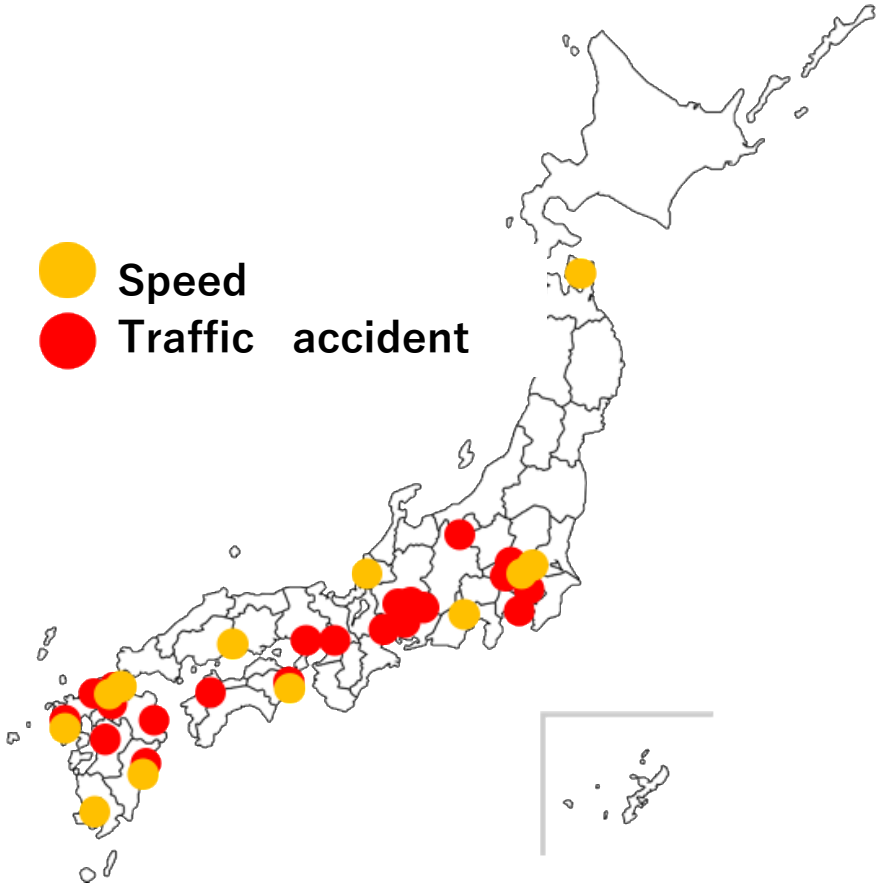


Installing countermeasures at higher density tends to reduce vehicle speeds.





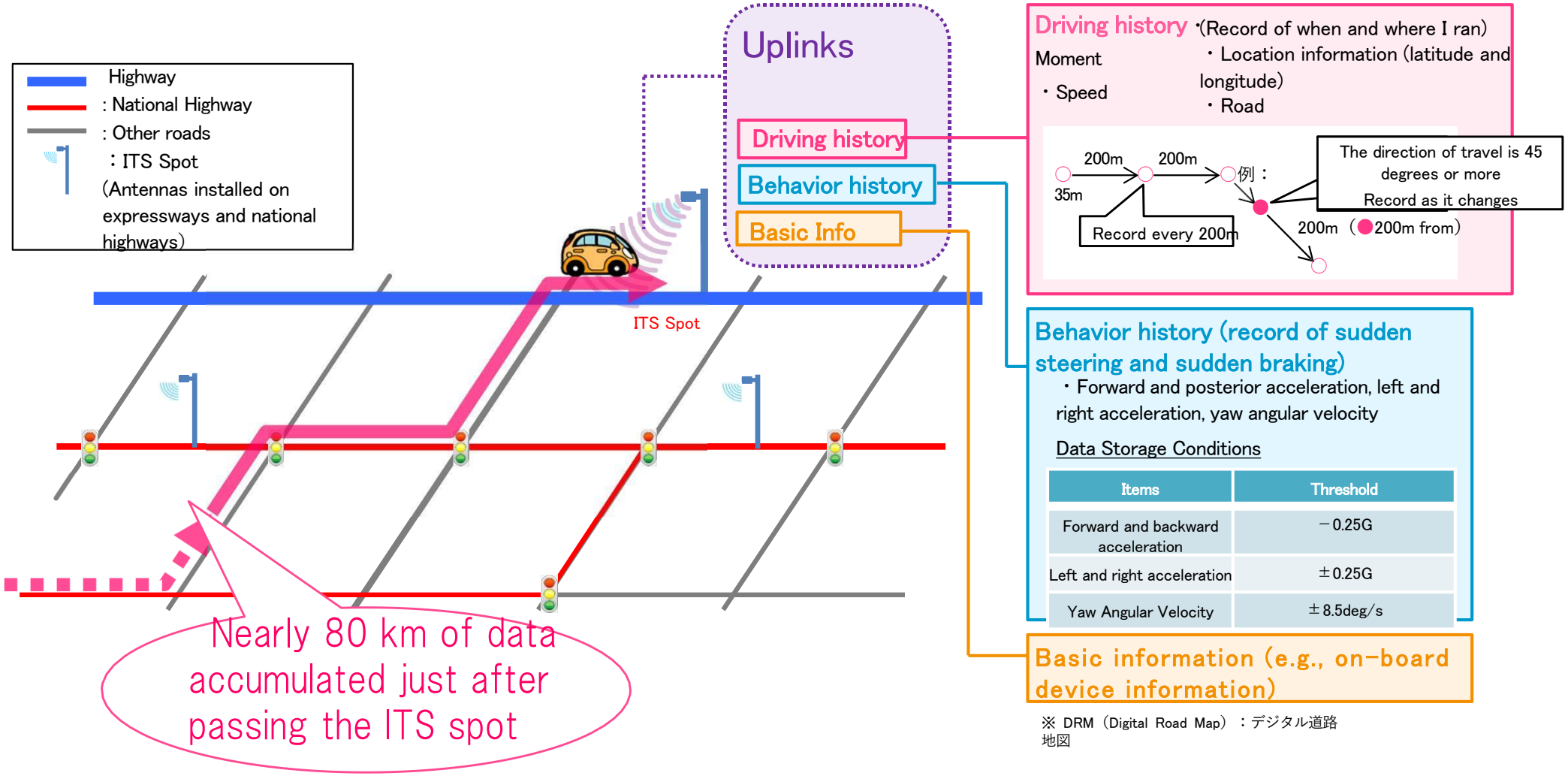
- ETC 2.0 probe data
- Accident data



Category	Indicator
Accident Data	Number of midblock accidents on local roads (cases/year)
	Number of intersection accidents on local roads (cases/year)
ETC 2.0 Data	Average traffic volume (vehicles/month)
	Average speed (km/h)
	Share exceeding 30 km/h (%)
	85th percentile speed
Regional Characteristics	Number of links outside the zone
	Total length of links outside the zone (m)
	Number of links inside the zone
	Total length of links inside the zone (m)
	Area (m²)
	Shape index
	Number of three-leg intersections
	Number of four-leg intersections
	Number of blocks
Physical device	Number of physical traffic-calming devices installed (units/km)

How ETC 2.0 probes work

- ○ ETC 2.0 probe data = "basic information" + "driving history" + "behavior history"
- ○ Uplink ⇒ pass through ITS spot (data acquisition)
- ○ Collects driving history information (80 km minutes) to ITS spots, etc.



Considering the characteristics and limitations of the acquired data, two statistical analysis methods were adopted.

Mann–Whitney U test
A non-parametric test for assessing whether the distributions of two independent groups are the same
Tests the null hypothesis that the two groups come from the same distribution
Useful for small sample sizes or when the data are biased or non-normally distributed

Exact probability test
A method used to determine whether a statistically significant difference exists in small-sample data
Allows exact calculation of the probability without relying on large-sample approximations

Result Comparative analysis focusing on the number of traffic accidents (39 districts)

New Developments !

- **Accidents in single-way sections of residential roads (left table): Number of physical devices**
- **Accident at the intersection of residential roads (table on the right): area, shape index**

Number of Accidents on Residential Roads	With Effect (n = 12)	Without Effect (n = 27)	p-value
Outside: Number of Links	33.917	32.667	0.708
Outside: Total Link Length (m)	2651.583	2739.593	0.776
Residential: Number of Links	83.667	67.815	0.199
Residential: Total Link Length (m)	5722.833	4779.63	0.245
Area (m²)	274941.369	282106.827	0.685
Shape Index	0.239	0.229	0.62
Three-leg Intersections	27.25	21.852	0.358
Four-leg Intersections	15.75	13.222	0.233
Number of Blocks	37.667	29.667	0.259
Physical Devices (units/km)	0.9	0.475	0.091†

: †<0.10, *<0.05

Number of Accidents at Residential Road Intersections	With Effect (n = 19)	Without Effect (n = 20)	p-value
Outside: Number of Links	35.895	30.35	0.322
Outside: Total Link Length (m)	3001.684	2437.8	0.184
Residential: Number of Links	80.632	65.15	0.27
Residential: Total Link Length (m)	5848.526	4330.1	0.127
Area (m²)	337905.883	224798.448	0.095†
Shape Index	0.227	0.237	0.021*
Three-leg Intersections	23.947	23.1	0.851
Four-leg Intersections	16.842	11.3	0.121
Number of Blocks	35.684	28.75	0.273
Physical Devices (units/km)	0.632	0.581	0.647

: †<0.10, *<0.05

Comparative analysis focusing on transit traffic (16 districts)

The percentage of exceeding 30 km/h decreases in all districts with an average speed of 20 km/h or more
Variables that were statistically significant

- Number of vehicles traveled (left table): No variables
- 85% tile speed (right table): total link length, area, number of three-branch intersections

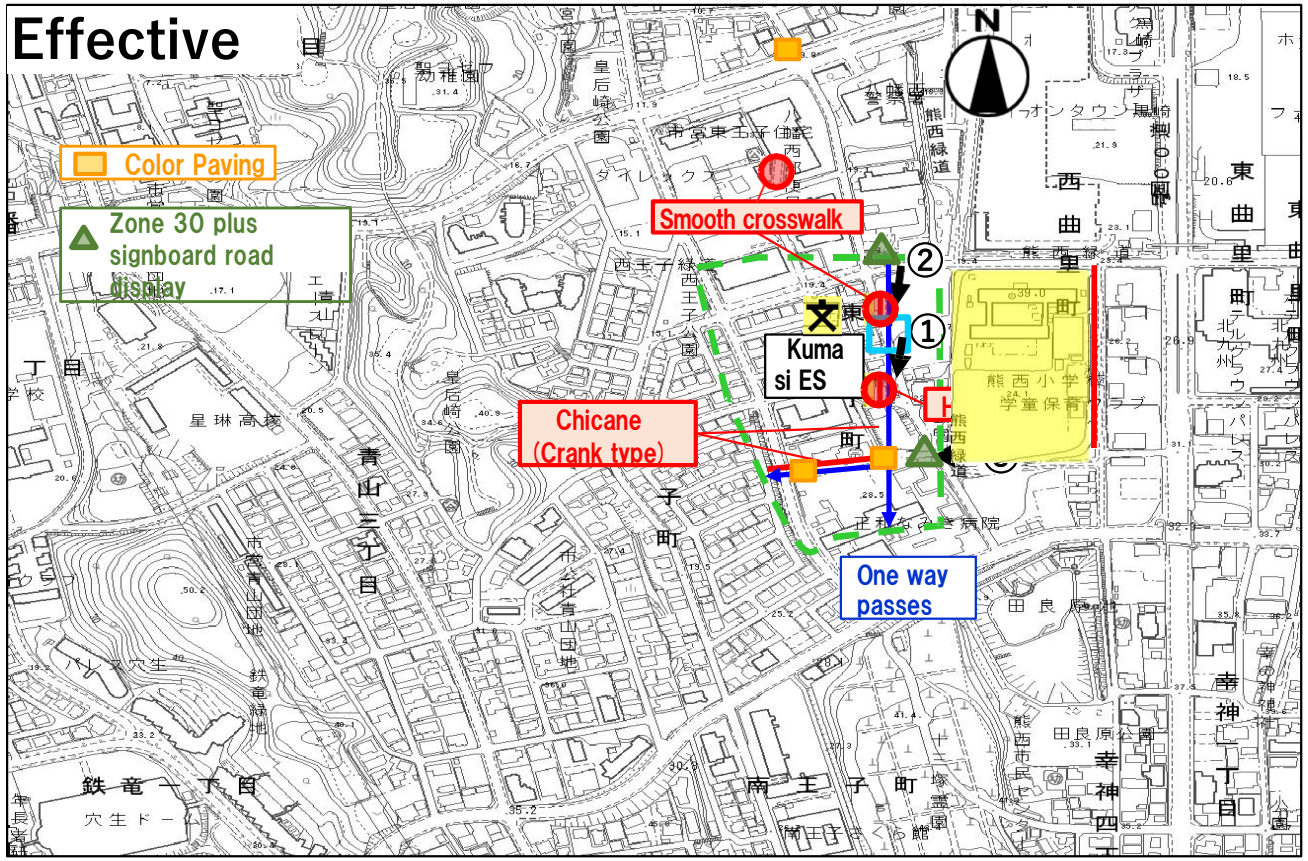
Traffic Volume	With Effect (n = 5) Average	Without Effect (n = 3) Average	p-value
Outside: Number of Links	22.333	34.6	0.571
Outside: Total Link Length (m)	2198	3408	0.25
Residential: Number of Links	66.667	112.4	0.393
Residential: Total Link Length (m)	4605.667	8564.4	0.393
Area (m²)	263995.999	467950.974	0.393
Shape Index	0.21	0.221	0.571
Three-leg Intersections	23.667	33.8	0.786
Four-leg Intersections	12.667	26.2	0.393
Number of Blocks	26.333	49.4	0.393
Physical Devices (units/km)	0.124	0.568	0.25

: †<0.10, *<0.05

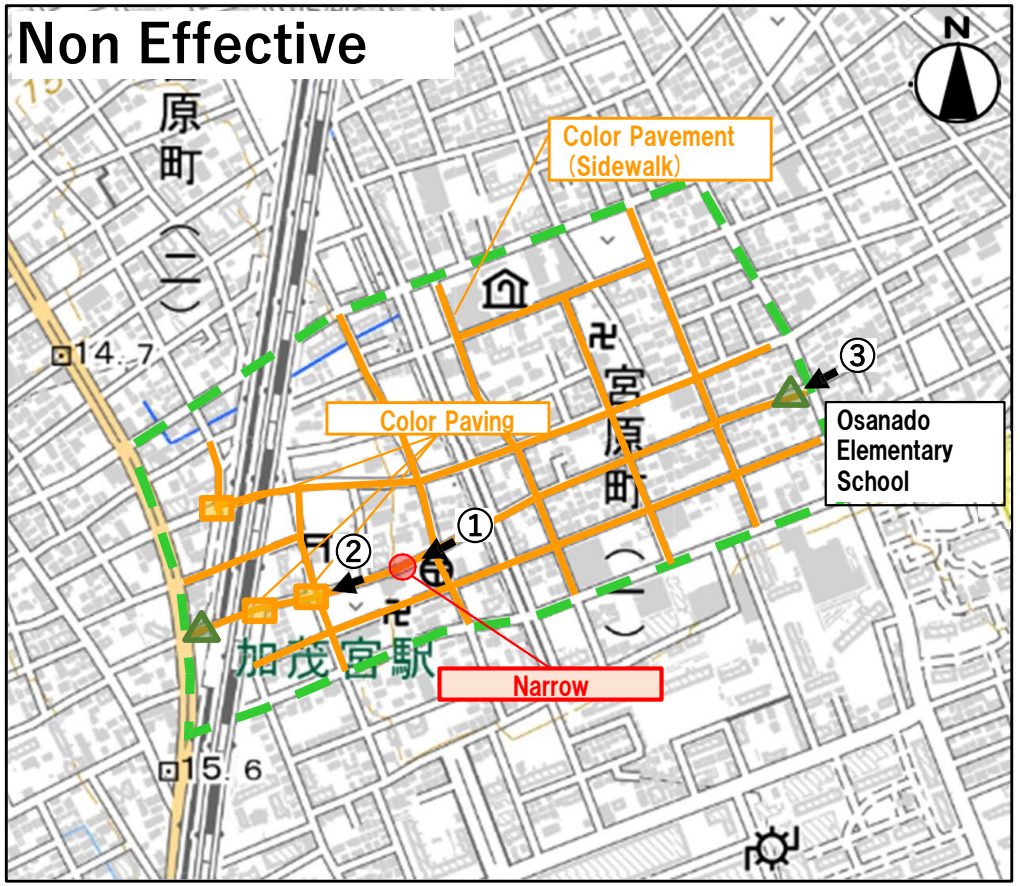
85th Percentile Speed	With Effect (n = 5) Average	Without Effect (n = 3)	p-value
Outside: Number of Links	32.6	25.667	0.393
Outside: Total Link Length (m)	3492.6	2057	0.143
Residential: Number of Links	121.4	51.667	0.25
Residential: Total Link Length (m)	9196.2	3552.667	0.071†
Area (m²)	516705.745	182736.548	0.071†
Shape Index	0.213	0.223	0.571
Three-leg Intersections	42.6	9	0.036*
Four-leg Intersections	25.4	14	0.393
Number of Blocks	51.2	23.333	0.25
Physical Devices (units/km)	0.472	0.285	0.786

: †<0.10, *<0.05

A higher density of devices tends to reduce the number of accidents on single roads



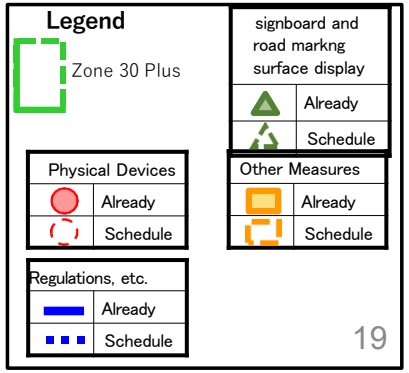
Source : Kitakyushu City City Basic Planning Map 2 1/1 1,000



Implementation status of measures

Hump

Smooth crosswalk, chicane (crank type)



Result

1)Traffic accidents:

1)In areas with a large amount of physical devices, accidents are reduced in single-way sections.

2)In areas with large zone area and irregular shapes, accidents are reduced in intersections.

2)Speed

1) In areas with high average speeds, the rate of exceeding 30 km/h decreases

2) The total link length is long,
The area is large,
and the number of three-branch intersections is many
85% tile speed reduced

Futute work

- other speed ranges (average speed, 30 km/h exceedance rate,)
- Regional characteristics characterized by street network shape
- Effects of countermeasure location on speed reduction
- the differences between ETC 2.0 probe data and private probe data

Conclusion

- We will continue to work toward improving residential streets.

- We will proceed with research to verify the effectiveness of Zone 30 Plus.

- This study will continue in order to implement appropriate countermeasures.

  - the theory of street network composition (the University of Tokyo)
    +
  - the results of effective residential road countermeasures (Oriental Consultants).

Thank you very much for your kind attention.

This presentation partially includes the results of Cross-ministerial Strategic Innovation Promotion Program (SIP) 3rd Phase, “Development of Smart Mobility Platform” promoted by Council for Science, Technology and Innovation, Cabinet Office.
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