SABRINA use of data for improving the cycling infrastructure in Danube area

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Content

- **Short project Summary**
- **Data collection process**
- **Outcomes and conclusions**
- **Use of collected data**

SHORT SUMMARY OF THE PROJECT

Project co-funded by European Union funds (ERDF, ENI)

Safer Bicycle Routes in Danube Area – SABRINA

The SABRINA Project aims to tackle cycling infrastructure safety issues on existing, planned and missing cycling corridors crossing the Danube region.

SABRINA

Inspection and Safety Ratings

Best practice analysis

Strategic decision-making toolkit

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SABRINA project structure

Participants

B.1 List of Project Partners

Role	Name	Acronym	Country
LP	The European Institute of Road Assessment - EuroRAP	EIRA - EuroRAP	SI, SLOVENIJA
PP	University of Zagreb, Faculty of Transport and Traffic Sciences	FPZ	HR, HRVATSKA
PP	Austrian Road Safety Board	KfV	AT, ÖSTERREICH
PP	West Pannon Regional and Economic Development Public Nonprofit Ltd.	WPRED	HU, MAGYARORSZÁG
PP	Partnership for Urban Mobility	PUM	CZ, ČESKÁ REPUBLIKA
PP	Green Revolution Association	GRA	RO, ROMÂNIA
PP	Municipality Ilirska Bistrica	OIB	SI, SLOVENIJA
PP	AGILE TRANSPORT ANALYSIS S.R.L	ATA	RO, ROMÂNIA
PP	Automobile Club of Moldova	ACM	MD, MOLDOVA
PP	Club "Sustainable Development of Civil Society"	CSDCS	BG, БЪЛГАРИЯ (BULGARIA)
PP	Ekopolis Foundation	Ekopolis	SK, SLOVENSKO
AP	Ministry of the sea, transport and infrastructure		HR, HRVATSKA
AP	Minsitry of Regional Development CZ		CZ, ČESKÁ REPUBLIKA
AP	Ministry of Transport		CZ, ČESKÁ REPUBLIKA
AP	Ministry of Infrastructure of the Republic of Slovenia		SI, SLOVENIJA

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SABRINA: No fears about safety on two wheels.

11 Project Partners

4 Associated Strategic Partners

9 Danube Area Countries

■ Danube Transnational Programme area
Project co-funded by European Union funds (ERDF, ENI)

SABRINA main tasks

- **SABRINA surveys EUROVELO routes in Danube area and produces STAR RATING MAPS using iRAP methodology that identifies safety risk on existing infrastructure.**

- **Using collected data and video images SABRINA will integrate ECS methodology into results and create conditions for INTEGRATION of METHODOLOGIES and compatibility of results.**

- **Based on methodologies integration, transfer of know-how and BEST PRACTICE DATABASE (created by collection of best practices by project partners), a new SAVE CYCLING ROUTES TOOLKIT will be developed.**

DATA COLLECTION

Inspection and Safety Ratings

Approx. **5000** km of bicycle routes are inspected using specially equipped **vehicles**, **software** and **trained** analysts.

Legend
— SABRINA Routes
National Borders

0   100   200 km

Inspection and Safety Ratings

Survey car

Survey bicycle
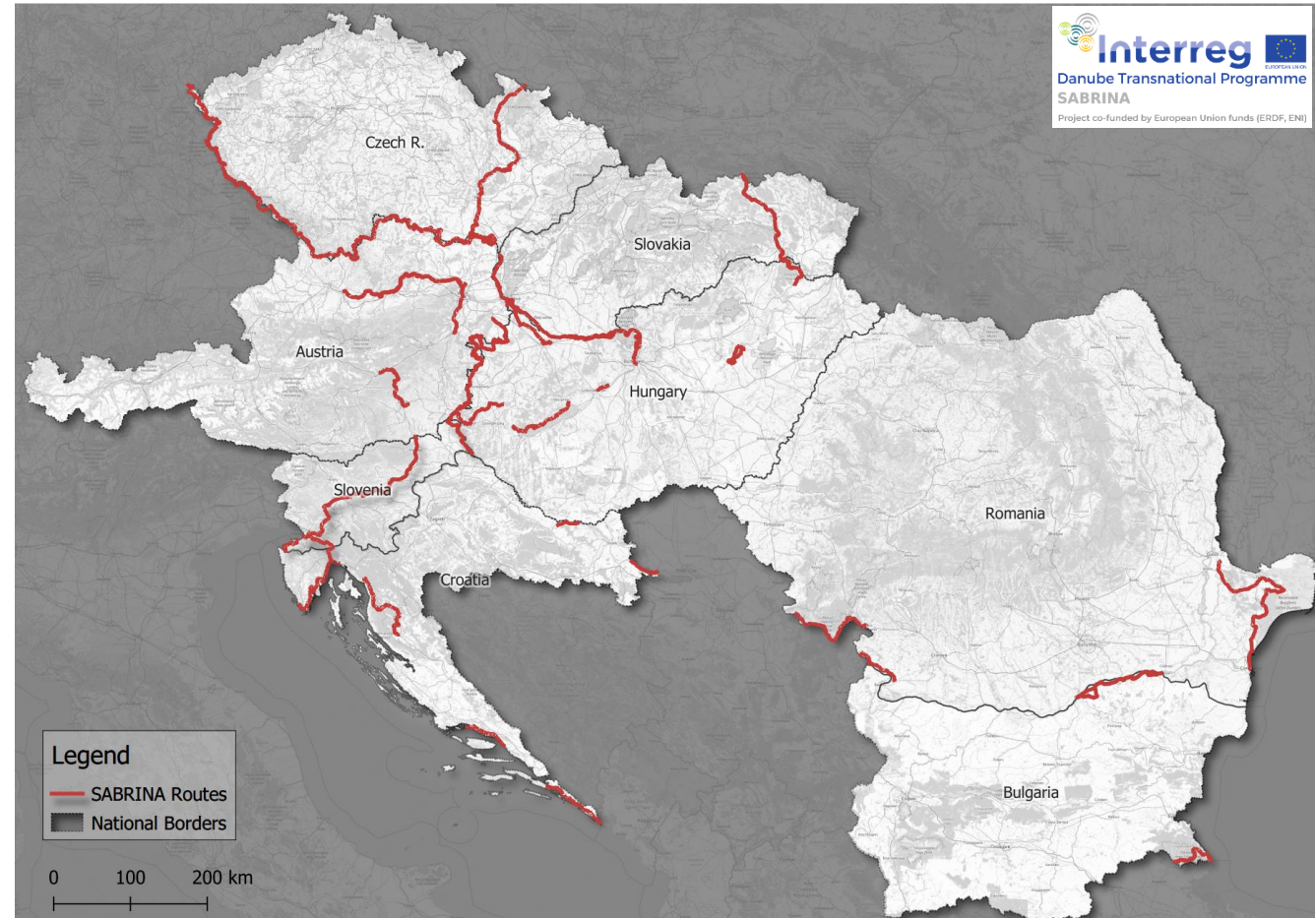
Inspection and Safety Ratings – iRAP methodology

- **iRAP assessment model gives an insight on the state of infrastructure safety, presented in an easy to understand format, i.e. Star Rating.**
- **Alongside Risk maps, it is a valuable tool for targeted infrastructure investment.**
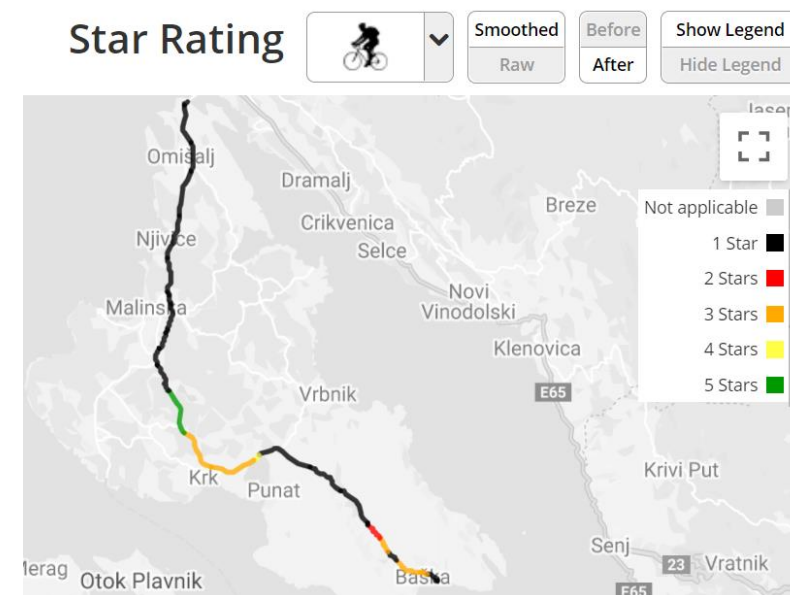
Best practice analysis

The objective of Best practice analysis is to collect and collate best practices relevant to cycling infrastructure and safety improvement measures.

The best practices are collected with the following methods:

1. Collected data analysis. Images representing best practice examples with a description of its benefits to cycling safety.
2. Consultation with stakeholders. National consultations with local and national stakeholders aiming at the collection of best practices.
3. Desk research. Identifying current state-of-the-art for cycling route assessment methodologies and their advantages and restrictions.

Based on the collected data, Case Study Factsheets will be drafted.

EuroVelo Route number: 6
Type of example: Lack of space/Bad infrastructure

Silistra - Chervena voda
The same route without any markings (second class road) for motorized traffic is used by cyclists. This creates a risk of collisions, especially since visibility is reduced by differences in road height.

Malak preslavets
The bike path passing through an old paved and wrecked road in a wooded area has poor visibility due to the abundant vegetation. The pavement of ordinary soil is stony and uneven and creates a risk of falling, especially in wet weather.

EuroVelo Route number: 6, 13
Type of example: Bad infrastructure – holes/ Mixed traffic

EV6: City of Ruse

A large hole in the bike path, which creates a risk of accidents because cyclists move in two directions and it is assumed that their speed will be significant.

EV13: Dragoman-Gaber

The EV13 coincides with the main road connecting Serbia with Bulgaria. There is no separate bike path and cyclists have to move on the road, which is especially dangerous in fog and poor visibility.

EuroVelo Route number: 13
Type of example: Mixed spaces / Missing signs

EV13: Tran
This part of EV13, designed as a cycle path, is also used by cars and trucks. The mixed traffic poses a danger to cyclists, especially when cornering the road.

EV13: Gaber
There is no signal in this section indicating where the bike path continues - straight or left. Cyclists can get lost in the woods and take the wrong path.

EuroVelo Route number: 13
Type of example: Mix spaces-speed differences/
Surface – poor pavement

Nevestino

In this settlement, where the streets are used by both cars and bicycles, the bridge poses a danger to cyclists due to the uneven pavement and the climb, which will dramatically reduce their speed.
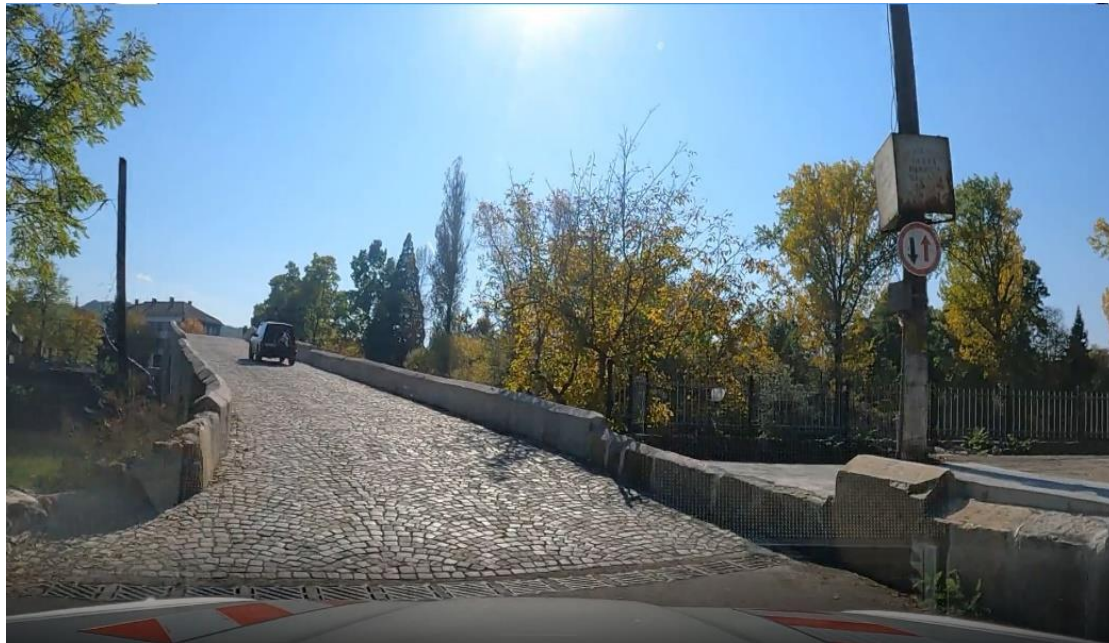
Near Nevestino

The pavement is in very poor condition and makes cycling difficult, and when turning right you can slip and fall off the bike.

Boboshevo

Here you can see how in the forest area of EV13 the roots of the trees surrounding the road can pose a danger to cyclists. The soil is soft and loose and cycling in this rugged terrain is quite difficult.

Near Boboshevo

The two-way bike path near Boboshevo suddenly ends and goes directly to the main road. This poses a great risk to cyclists because the road connecting the Serbian border with the capital Sofia is very busy.

EuroVelo Route number: 13
Type of example: Missing links

Kjustendil

We see a cycling lane, passing EV 13 route, which is only marked along the river, but is not used by cyclists. The lane starts and ends without particular purpose, so no one uses it even as part of EV13
Cyclists continue to use the mixed traffic road which is a major problem for the road safety on the route

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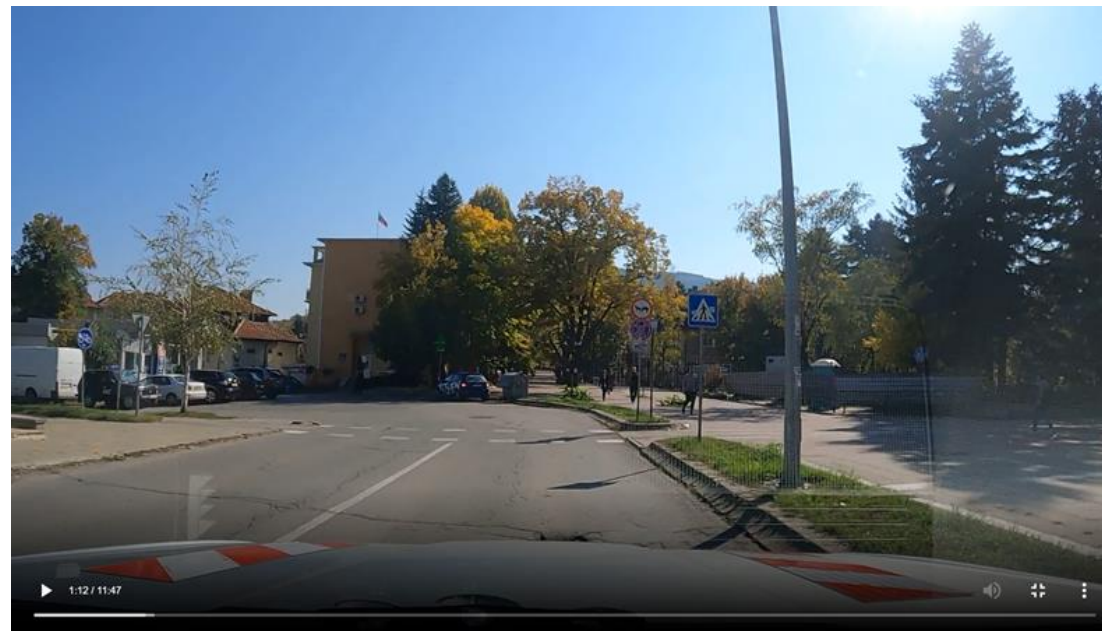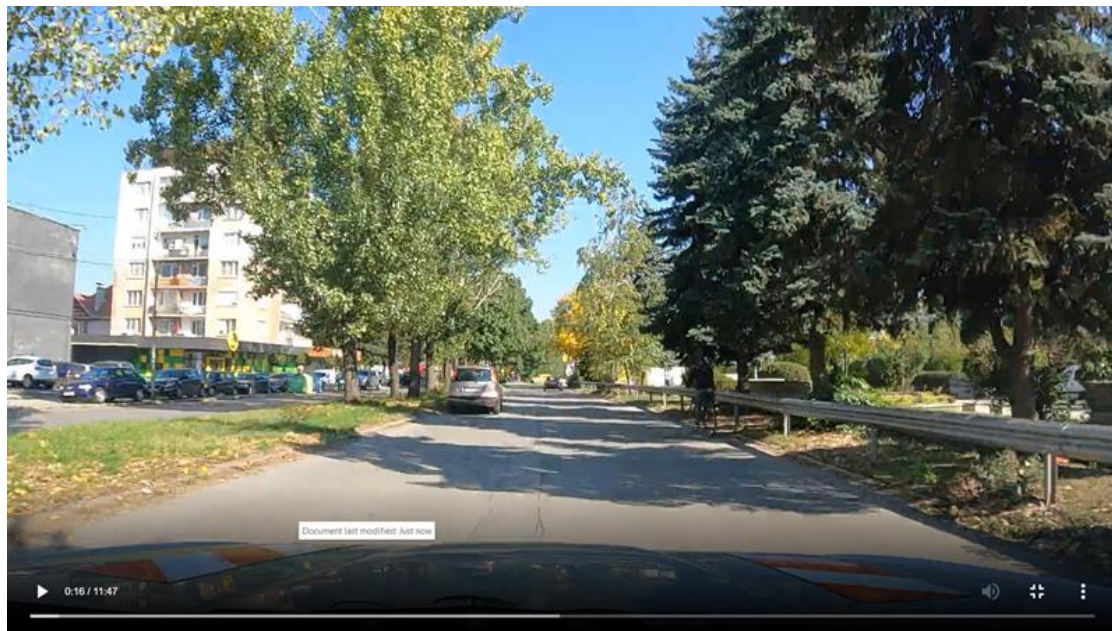
City of Ruse

The bike path and the pedestrian alley are not divided, which creates a danger of collision between pedestrians and cyclists.
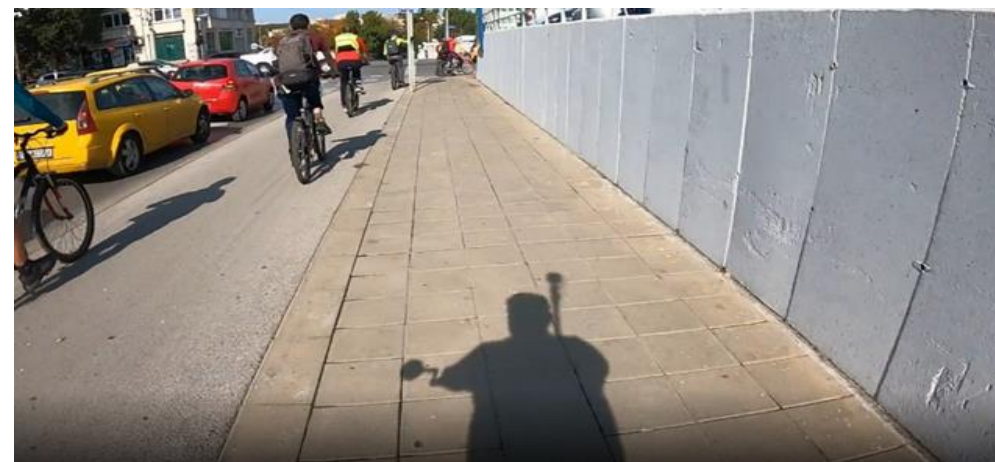
Ruse - Pozharevo

This cycling section near Ruse is used only by cyclists. Although slightly cracked, the asphalt surface is flat and comfortable for cycling, visibility is good and the terrain is suitable. The path is well maintained and traditionally the Green Marathon along Danube is organized there.

Ruse

The pictures represent good examples of pedestrian and cycle lane along the traffic lane and under the roundabout. The lanes are wide enough and are not mixing, which is a prerequisite for good road safety.
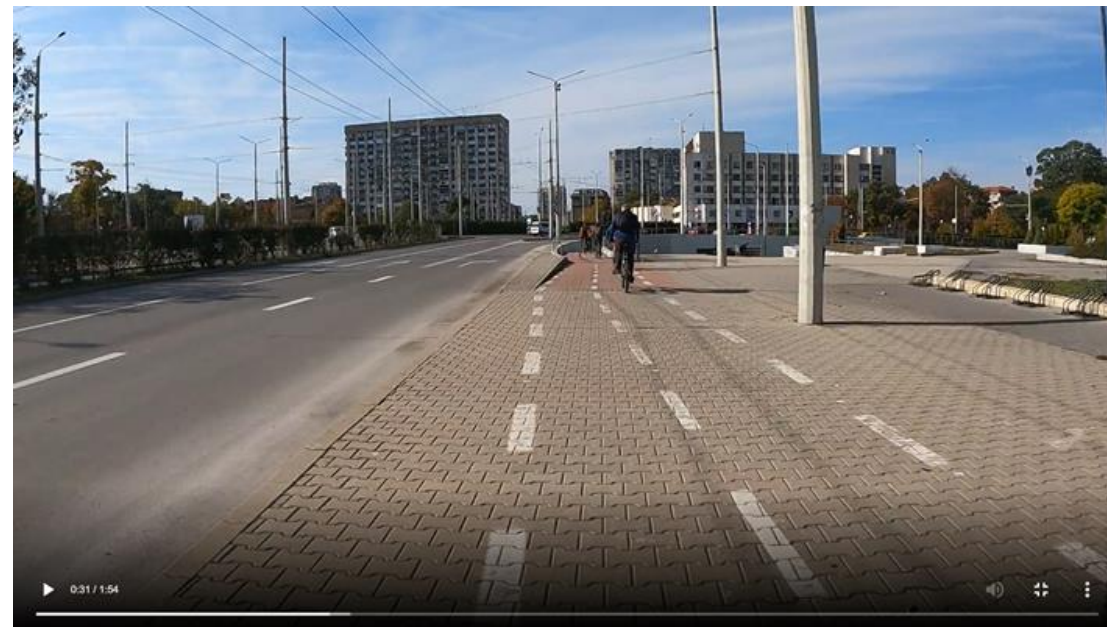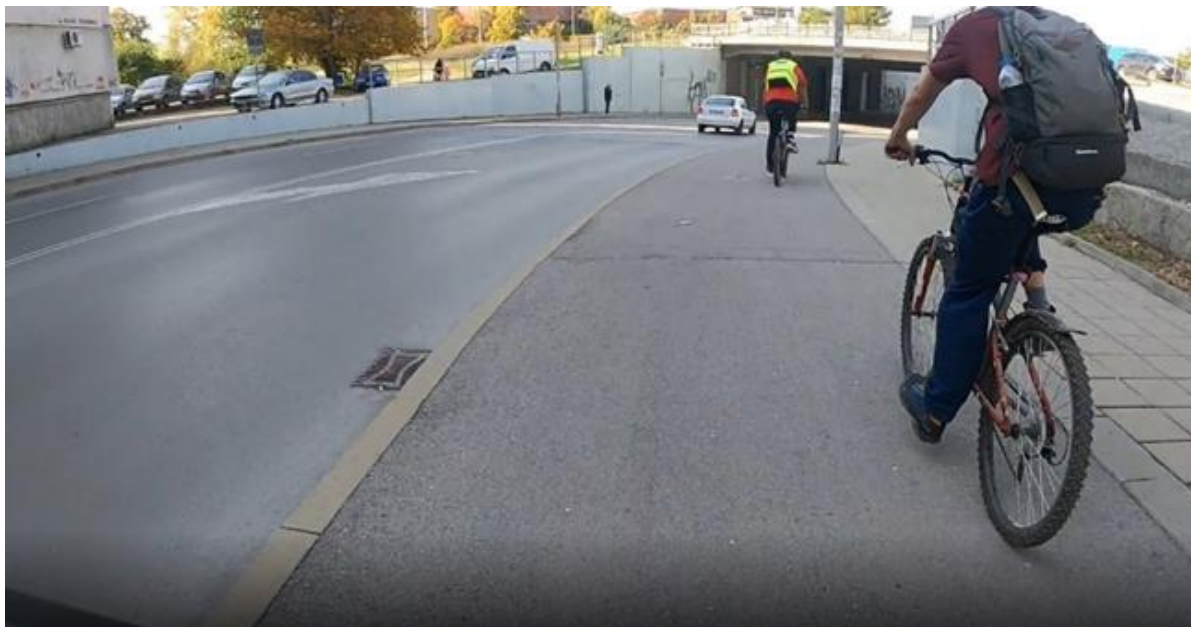
EuroVelo Route number: 6
Type of example: New cycling infrastructure

Ruse

This new cycling infrastructure was built in 2020 as a pilot in the frames of the H2020 CIVITAS ECCENTRIC project (CSDCS and Ruse Municipality were the Bulgarian partners in the project). The cycling path of 2 km connects the central part of Ruse with Druzhba neighbourhood thus leading cyclists from the outskirts of the city to EV6.

EuroVelo Route number: 13
Type of example: New cycling infrastructure

Kjustendil

This picture shows the new cycling alee recently opened by the mayor. It is situated along the river crossing the city as part of EV13. The construction was funded by the Operational program "Regions in growth 2014-20" laid by the Ministry of Regional Development and Public Works (MRDPW).

OUTCOMES AND CONCLUSIONS

Results of the analysis

The analysis shows that in Bulgaria the bad examples are significantly more than the good ones. There is still no equality between bicycles and vehicles within the roadway. The placement of bicycle signposts is not regulated and no distinction is made between the signposts for cyclists and other signs. Poor condition of the pavements in some sections is observed. Out-of-town cycling routes are rarely integrated with urban cycling infrastructure and signaling.

The good examples are mainly related to the implementation of European projects and less often to the municipal plans. In most cases, they concern only a specific locality and have a limited scope due to limited funding. Unfortunately, such "piecework" does little to improve the overall condition of cycling routes.

Conclusion

In summary of the analysis of the collected data we estimate that the proposed use of EuroVelo routes in Bulgaria has significant potential to offer a full tourist trip by bicycle, but before that it is necessary to improve the characteristics of the road infrastructure.

Depending on the current state of the roads, the necessary measures should be determined to improve the safety and comfort of travel.

Unfortunately, due to the lack of the necessary organizational structure, analysis and control of the cycling infrastructure in Bulgaria has never been done by the state or municipal authorities. In this regard, we can say that the SABRINA project is a pioneer.

USE OF COLLECTED DATA

The Safe Cycling Routes Toolkit (SCRT)

- **A strategic decision-making toolkit that will increase stakeholders' capacity, build knowledge and cooperation at different levels, thus preventing development of killer cycling infrastructure in an early stage.**

The Safe Cycling Routes Toolkit - (SCRT)

Increasing stakeholder capacity

Building knowledge

Improving infrastructure
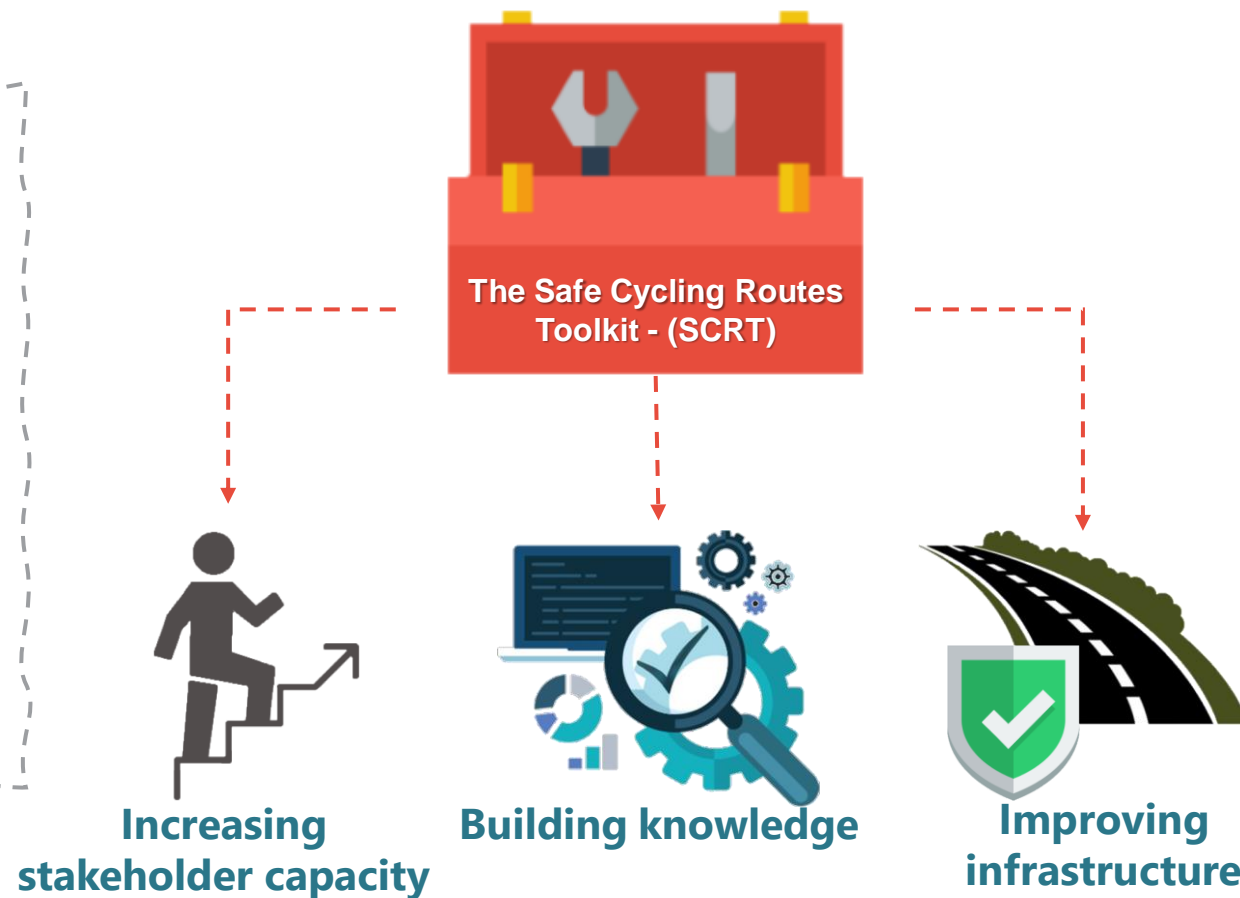
The Safe Cycling Routes Toolkit (SCRT) - Features

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User defined infrastructure layouts

Algorithm-based recommendations

Star rating based risk maps

Document repository

Result viewer module

Performance evaluation tool

Project co-funded by European Union funds (ERDF, ENI)

Thank you for your attention

Simulated Bicycle Flows from Mobile Network Data

ECOMM 2022
Teemu Sihvola & Martijn Hollestelle & Ruiwei Chen

Introduction

Traffic models are important tools in transport planning and forecasting to understand how people travel and the situation on the road network.
But..

Traditional models are made for analysing **car traffic** and anonymous, aggregated flows between large zones.

Often only larger metropolitan areas and regions meet the **data requirements** for developing a traffic model.

Traffic model **deployment is costly** and only a few smaller regions have resources for acquiring a model even if its benefits are clearly seen.

Traffic model **deployment takes time** while modelling results are often needed now or "yesterday".

Other data products such as GPS data from sports trackers or other apps can help to understand bicycle flow.
But...

Are often strongly anonymized, **compromising on resolution and granulation.**

Provide solely **static results**, which limits the possibility to use such tools to study the potential of new policies.

Results are not driven by quantitative understanding of how people travel, but **only by observations**.

Overrepresents certain **socio-demographic groups**.

BRUTUS Lite for Cycling enables detailed cycling flow and route analysis in an instant.

Detailed **cycling flow and route analysis** based on full BRUTUS methodology and multimodal modelling.

Use of **widely available and standardised data** makes application possible virtually anywhere.

Smaller regions without a traffic model and larger regions with only a traditional traffic model obtain cycling flow analysis capabilities.

BRUTUS Lite is almost **instantly deployable** and enables utilization of modelling results even in ad hoc project cases.

BRUTUS Lite Methodology

OD matrices based on available data sources such as mobile network data.

Temporal variability based on real-time data sources such as mobile network data and/or GPS data.

Origin-Destination Matrices

Seasonality information

Spatially detailed cycling matrix extracted from other modes

Cycling flows on the detailed cycling network

Transport networks

BRUTUS Lite

Widely available and standardised datasets such as OpenStreetMap for route simulation.

Mobile Network Data

Method 1: Split postcode zone demand to grid resolution

Postcode zone level:
Total production and attraction
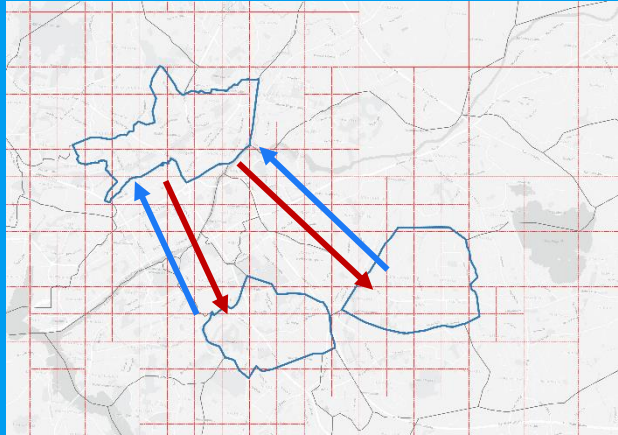
Postcode zone level:
Total activity reduction and increase
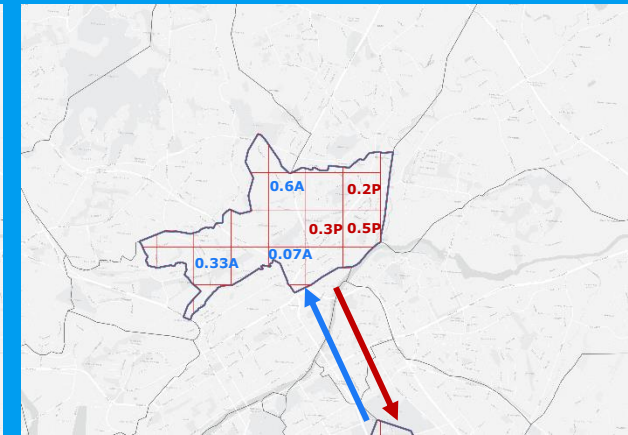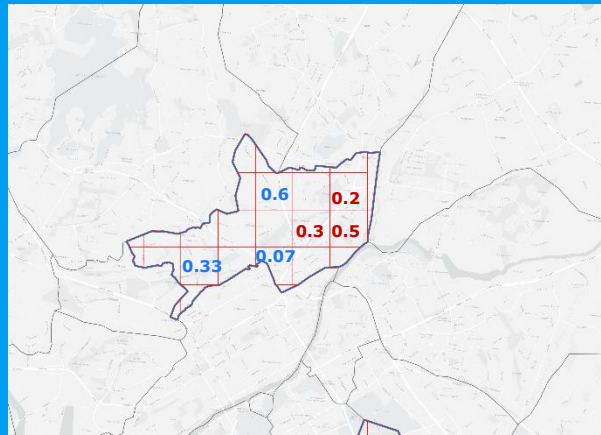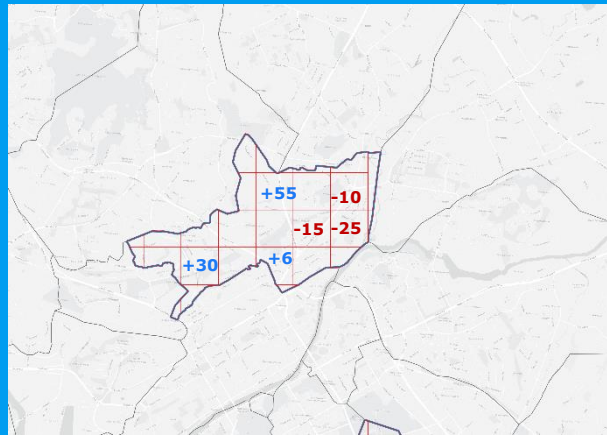
Grid level:
Number of activity reduction and increase.

Grid level:
Weight of production and attraction with regards to postcode zones

Grid level:
Production and attraction & Trip distribution

Productions and attractions
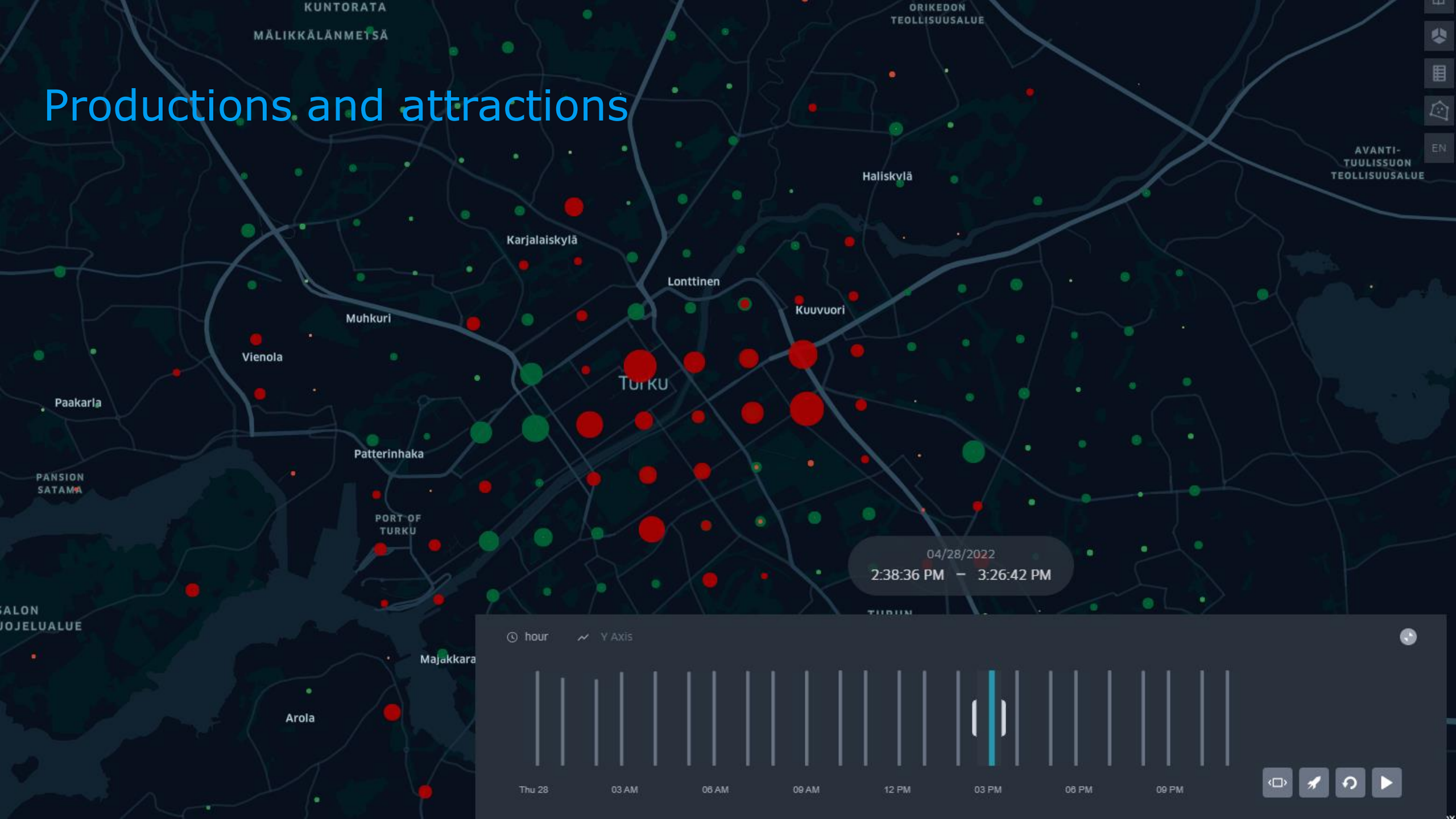
Method 2: Determine the share of bicycle trips

- Share of bicycle trips over travel time is determined with help of deterrence functions.
- Allows to evaluate network improvements
- Deterrence functions are based on travel survey data.
- Easy to transfer to other locations due to simple mathematical definitions.

Regression of deterrence function of mode: bicycle

Combined function: density = $x^{1.05} * \exp(-45.45*x)$

x: Travel time / maximum travel time

Ramboll
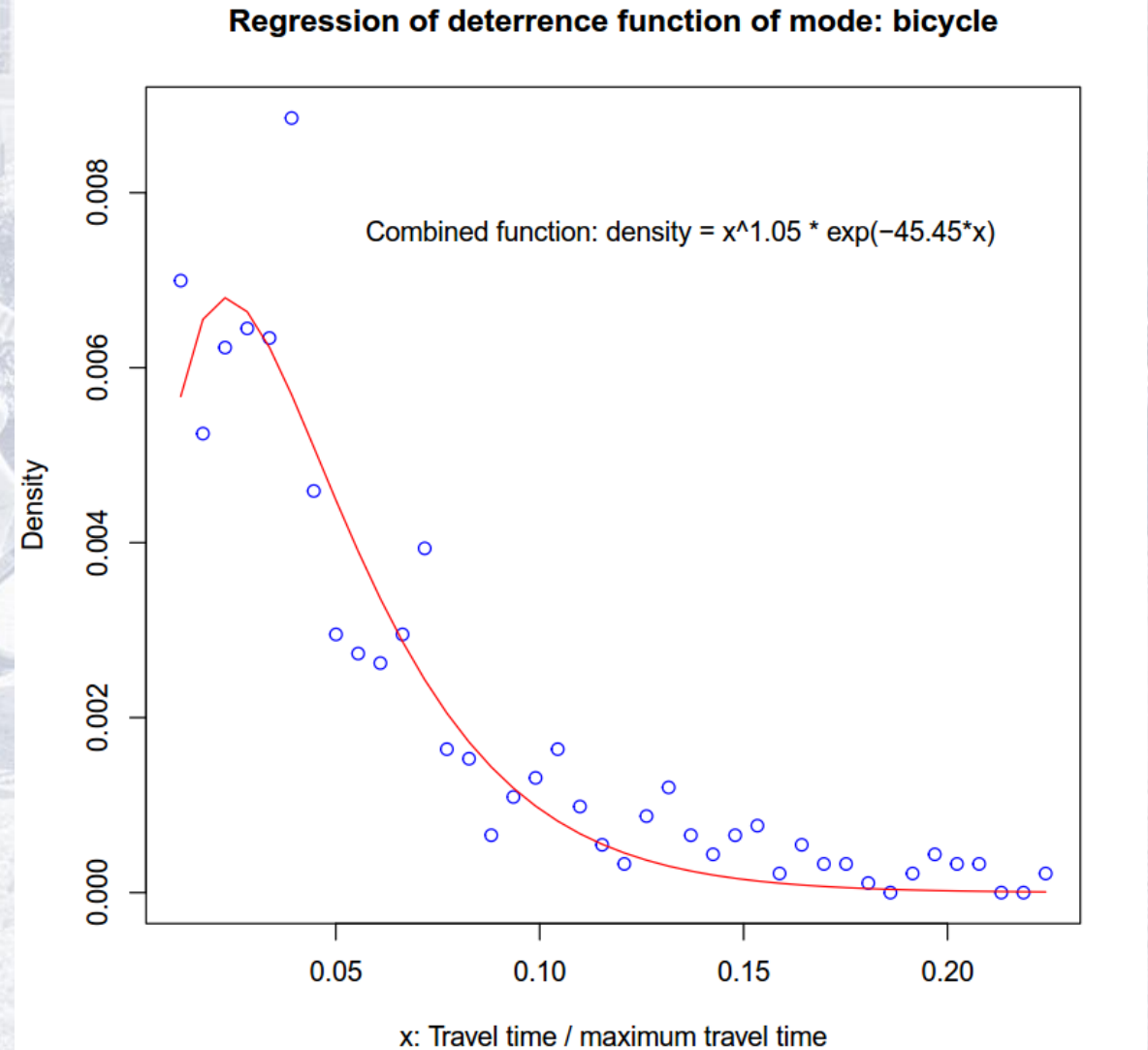
Bicycle OD trip visualization: Brutus Lite v.s. Travel Survey

Average daily bicycle trips estimated by: (i) left: BrutusLite, (ii) right: Travel Survey
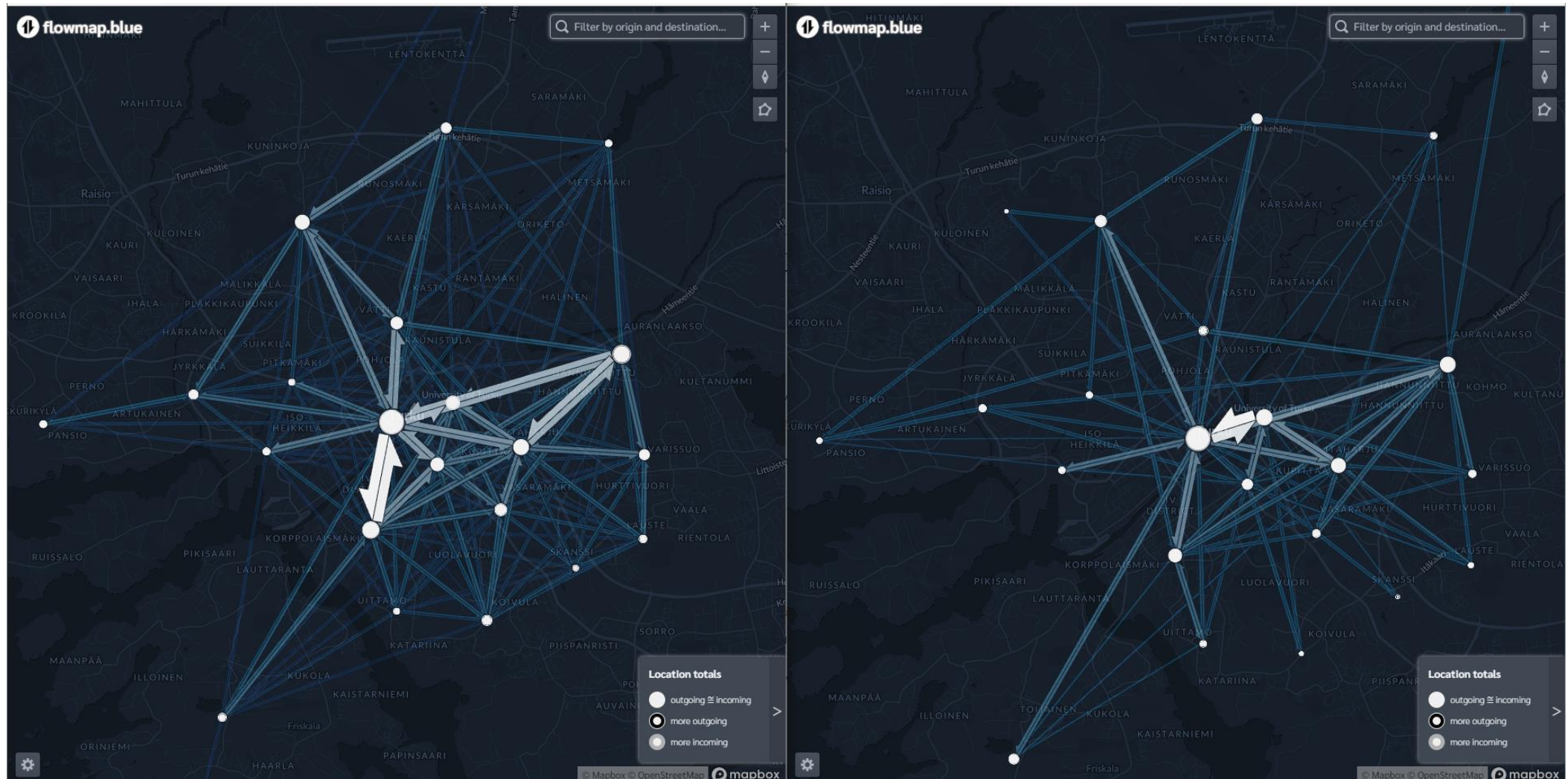
Discussion and Conclusions

Mobile Network Data can be applied to analyze cycling flows

- Benefits against traditional data sources and models.
- Shortcomings of data are there, but can be overcome given the relatively simple approach
- Increasing spatial resolution is crucial making the approach feasible for cycling.

Developed BRUTUS Lite methodology works and provides great platform for future applications.

Modelling is fast and scalable enabling cost-efficient piloting with interested parties.

OD matrices based on available data sources such as mobile network data.

Temporal variability based on real-time data sources such as mobile network data and/or GPS data.

Origin-Destination Matrices

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BRUTUS Lite

Widely available and standardised datasets such as OpenStreetMap for route simulation.

Regression of deterrence function of mode: bicycle

Combined function: density = x^1.05 * exp(−45.45*x)

x: Travel time / maximum travel time

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RAMBOLL

Bright ideas. Sustainable change.

RAMBØLL

USING WEATHER OBSERVATION DATA FOR DESIGNING PROACTIVE COMMUNICATION ABOUT WINTER MAINTENANCE OF CYCLE PATHS

In Helsinki, winter maintenance is fully prepared from October to April… what's the most common weather condition?

In Helsinki, winter maintenance is fully prepared from October to April… what's the most common weather condition?

What do people need to know about "winter cycling" in Helsinki?

Photo: Benjamin Suomela / Yle

Content

1. Aims
2. Target groups
3. From reactive to proactive communication
4. Typical and exceptional weather conditions based on data
5. Outcomes:
   - Maintenance set-up from user perspective
   - What to communicate in typical and exceptional weather situations?

Helsinki SWECO

Photo: Roni Rekomaa

Aims

- Key question: how, when and what to communicate about the condition of cycle paths to make the travel decision easier?

  - Communicating to users about predictable condition of cycle paths based on weather forecast.

  - Promoting cycling year-round by informing, when conditions to bike are good.

Helsinki SWECO

Photo: Roni Rekomaa

Who are the target groups?

- Based on Helsinki's cycling barometer,

  A. 71% of Helsinkians cycle between May and September

  B. 41 % cycle when there's no snow

  C. 13% cycle year-round.

- Group B was identified as a realistic target group to continue also year-round, as long as cycling conditions are pleasant.

- Of course, this requires that service standard of winter maintenance is high enough and predictable.

Helsinki SWECO

Photo: Roni Rekomaa

From reactive to proactive communication

- Currently, communication consists of basic information on winter maintenance methods, press releases on burning topics, reacting to questions in social media and occasionally reacting to opinion pieces in newspapers.

  ➤ Setup is reactive. However, by acting proactively, cities can initiate the topics and tone of discussion.

Photo: Martti Tulenheimo

What and why to communicate proactively?

- Commuting decisions are usually made the night before.

- Condition of cycle paths can be predicted based on forecast.

- Proactive communication, in which quality level deviations are clearly highlighted, can significantly increase users' satisfaction with the service.

  ➢ These highlight the need to proactively communicate about the realistic outcome of maintenance actions in various weather conditions.

Photo: Martti Tulenheimo

Data

- To determine typical and exceptional weather conditions, data from the Finnish Meteorological Institute's weather station in central Helsinki was analysed.

- Analysis was made from the years 2016-2021, from October to April (when cycling amounts drop and winter maintenance is prepared).

Photo: Kimmo Brandt

Data

- **Based on data, five typical winter weather situations were identified in Helsinki.**

    1. no rain & temperature ≥ 0°C

    2. no snow & temperature < 0°C

    3. snow & temperature < 0°C (snowing under 10 mm, when converted to water*)

    4. rain & temperature ≥ 0°C

    5. temperature variation ± 0°C

        *= about under 10 cm snowfall.

Photo: Aki Antinkaapo

Data

- Based on contractor interviews, **three exceptional and particularly hard weather situations for cycle path maintenance** became apparent:

    1. snowstorm (snowing over 10 mm, when converted to water*)

    2. frost

    3. freezing rain

    *= about over 10 cm snowfall.

Helsinki   SWECO

11

Photo: Petteri Nisula

Maintenance set-up from user perspective

Local street

Photo: Susa Junnola

Normal maintenance

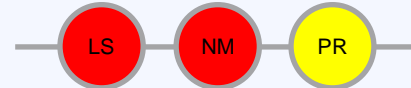Photo: Susa Junnola

Priority routes
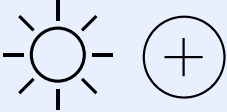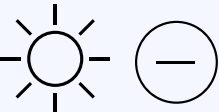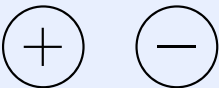
Photo: Aki Antinkaapo
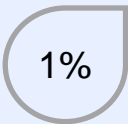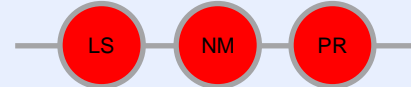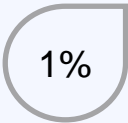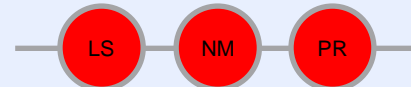
Maintenance set-up from user perspective: Cycle trip from door to door

Local street
(LS)

Normal maintenance
(NM)

Priority routes
(PR)

= normal conditions

= conditions requiring caution

= dangerous conditions

Weather conditions	General communication concept for weather condition	Proactive communication concept for weather condition
no rain & temperature ≥ 0°C — 45%	• regardless of the season, cycling in Helsinki is usually smooth and safe	• cycling conditions are good — LS NM PR
no snow & temperature < 0°C — 22%	• "everyday practises of maintenance of cycle paths"	• risk areas where slipperiness is more likely to occur • differentiated communication based on several threshold of snowfall (for example if streets running out of space for piled snow) — LS NM PR
snow & temperature < 0°C — 7%	• describing snow removal measures • the challenge of snow removal increases as the amount of snowfall increases and according to the composition of the snow	• differentiated communication based on several threshold of snowfall (for example if streets running out of space for piled snow) — LS NM PR	LS NM PR
rain & temperature ≥ 0°C — 26%	• rain is typical winter weather condition in Helsinki	• no special proactive communication concept — LS NM PR
temperature variation ± 0°C — 30%	• days when temperature are below and over zero are a characteristic winter weather circumstance in Helsinki and can produce both easy-to-manage and very challenging maintenance situations	• a warning of a dangerous situation if the sludge is freezing into a grooved ice surface — LS NM PR	LS NM PR

Weather conditions	General communication concept for weather condition	Proactive communication concept for weather condition
snowstorm 1%	• equipment and personnel run out in the event of a storm	• snow on cycle paths and cycling is difficult • a realistic estimate of time frame when the bike paths will return to normal, winter-like condition LS — NM — PR
frost 1%	• proper care of a few mornings save from an early-onset salting cycle	• a significant proportion of cycle paths are slippery, and intersections are particularly slippery • the situation is momentary LS — NM — PR
freezing rain 0,5%	• a very exceptional weather phenomenon for which there is not always even an effective means of maintenance	• bike paths are very slippery, and cycling (as well as walking) should be avoided • a time frame, when slippage is projected to be brought under some control • a realistic estimate of time frame when the bike paths will return to normal, winter-like condition LS — NM — PR

No rain & temperature ≥ 0°C

45%

LS — NM — PR
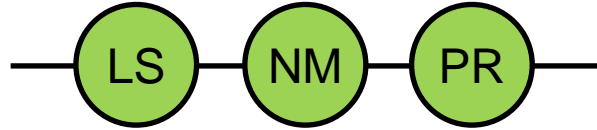
- Regardless of the season, cycling in Helsinki is usually smooth and safe.

- Cycling conditions are good on all streets and bike paths.

Snowstorms

(LS)—(NM)—(PR)
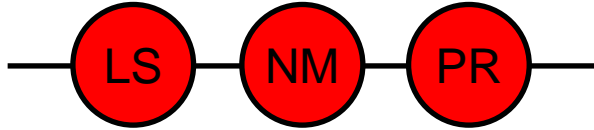
- Equipment and personnel run out in the event of a storm.

- There's snow on cycle paths, partly even in priority routes, and cycling is difficult.

- Need to communicate a realistic estimate of time frame when the bike paths will return to normal, winter-like condition.

Helsinki   SWECO

Photo: Benjamin Suomela / Yle

Thank you!

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Photo: Martti Tulenheimo

MOBILITY
LAB
HELSINKI

Digital twin enabling smarter mobility management
ECOMM 2022, Turku, Finland
Janne Rinne, Forum Virium Helsinki
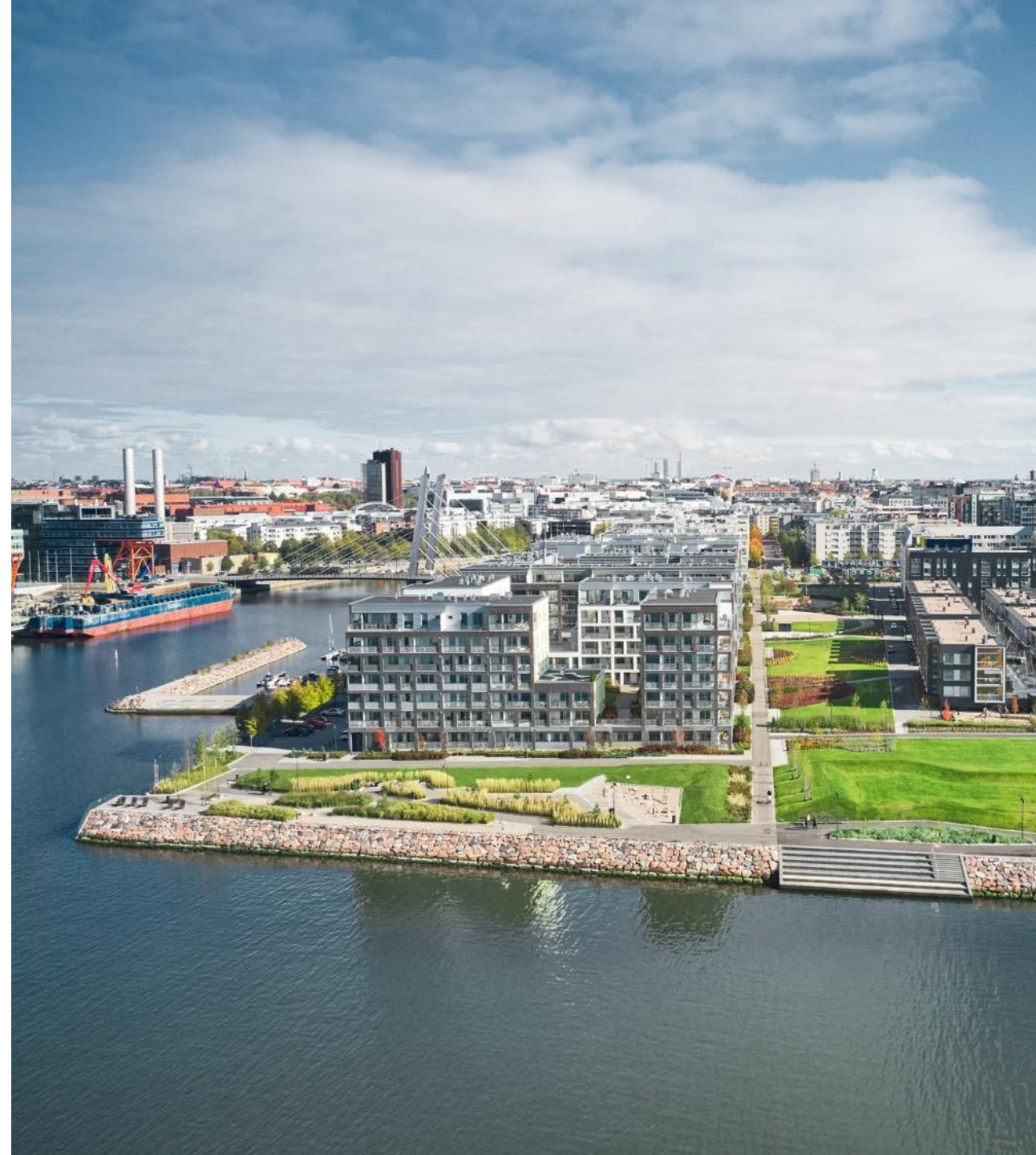
Content

- What is Digital Twin?
- Applications for mobility
- On-going activities

What is Digital Twin for Mobility?

What is a digital twin?
- *The "traditional" definition*
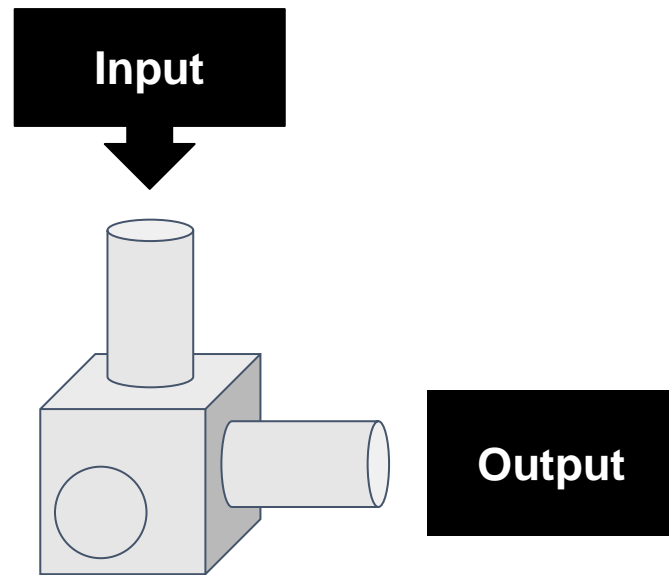
An industrial component
Pumps, drives, valves, meters...
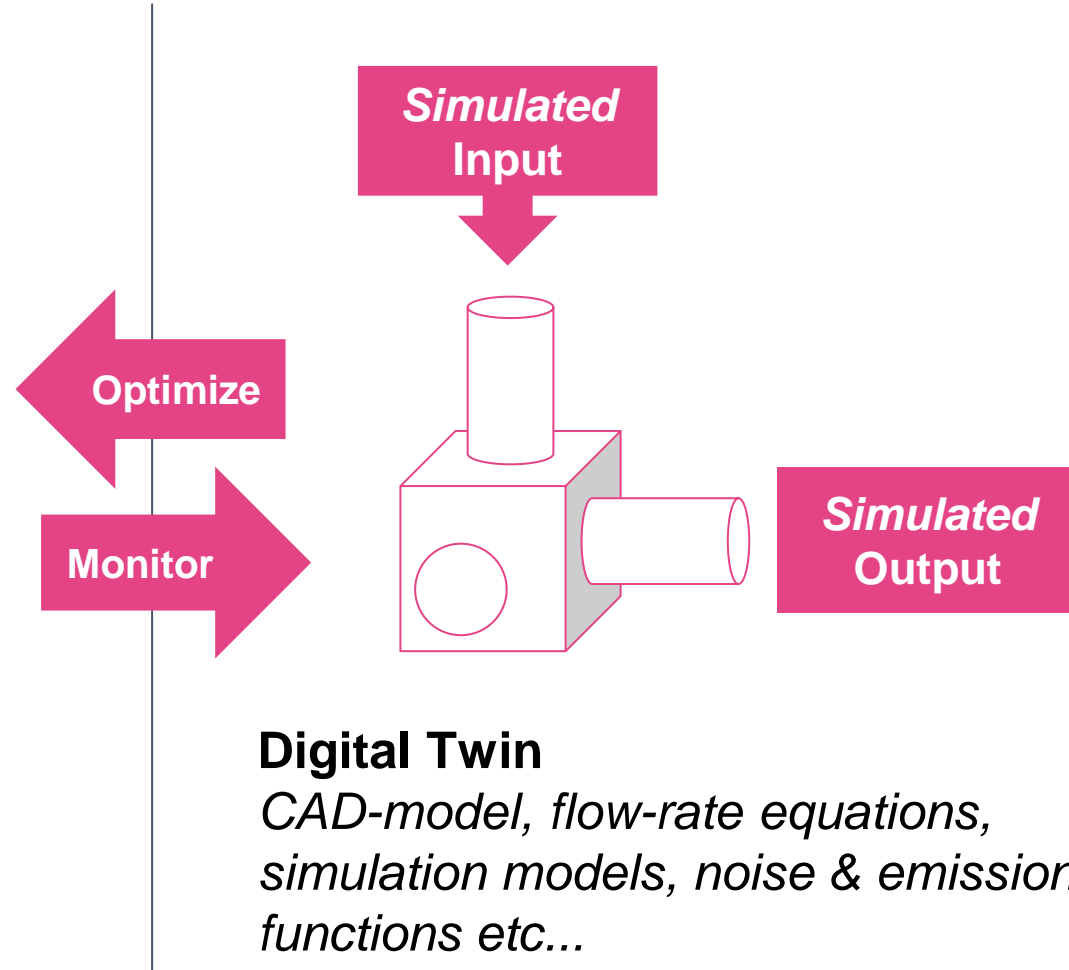
Digital Twin
CAD-model, flow-rate equations, simulation models, noise & emission functions etc...

Digital twin for a city

In industry, the digital twin reflects physical entities in a digital form

Digital

Social

City

Physical
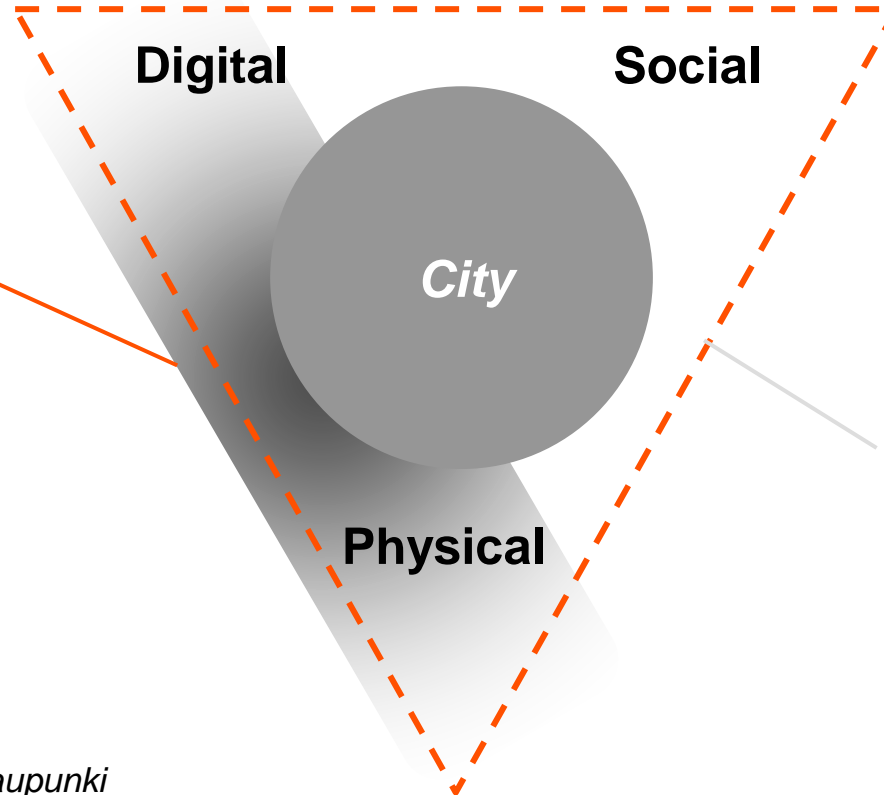
The digital twin of the city should also include urban processesses and human behaviour

Adapted from: Suomisto & Autio, Helsingin kaupunki

The city digital twin contains a wide collection of different object types.

City Digital Twin

Digital Twin for Mobility

Digital twin for mobility offers a view to a collection of objects relevant to traffic and mobility…

...but can also include data that is not included in the city digital twin.
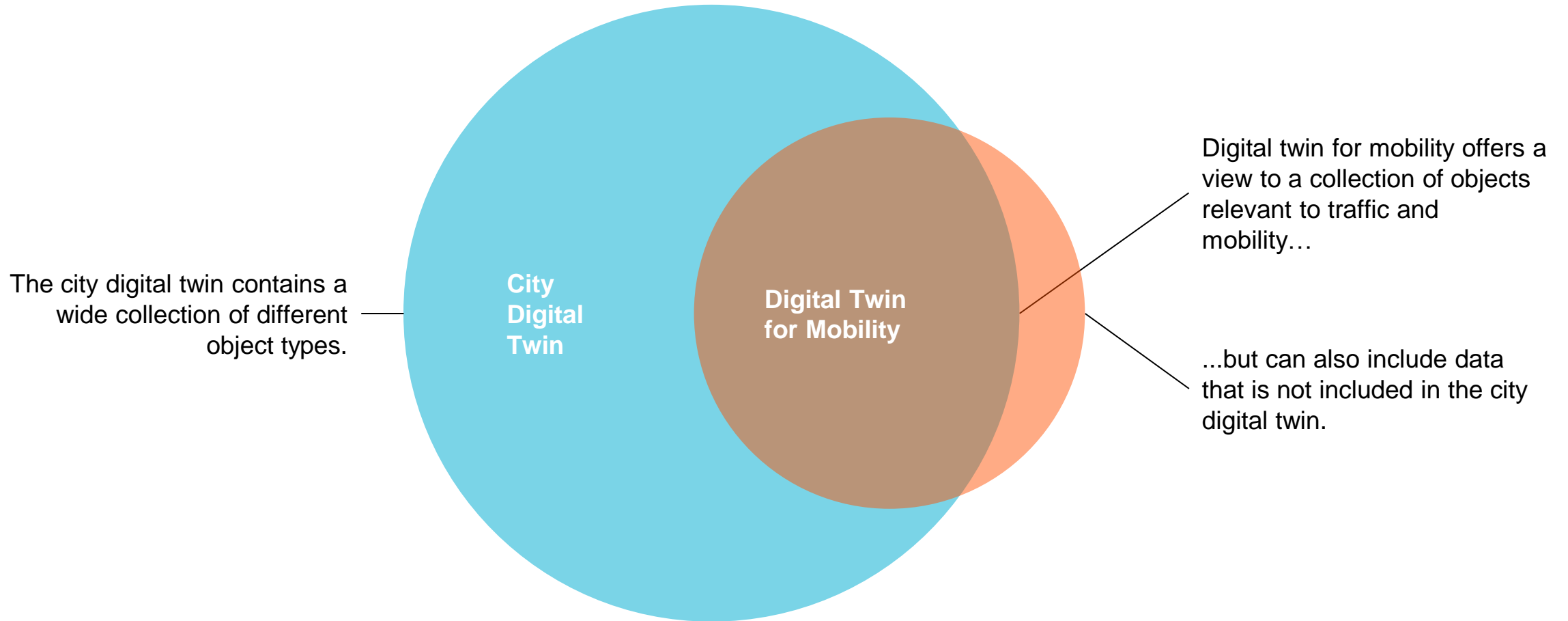
Different views to Digital Twin

Visualization

Information, sematics, analytics
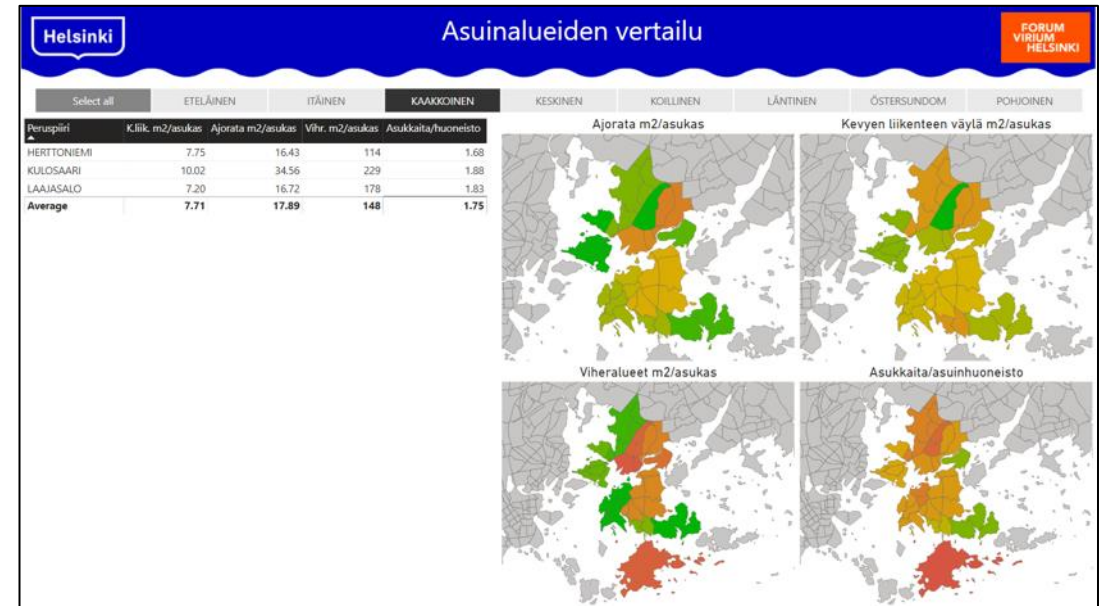
Dashboard by: O-E Lappi

Digital Twin

Data

- Infrastructure and traffic environment
  - E.g. detailed street structure, traffic signs, accessibility
- Traffic
  - E.g number of vehicles, cyclists, pedestrians
- Conditions and context
  - E.g. air quality, roadworks, maintenance needs, resident feedback

Infrastructure

Digital Twin for Mobility

Traffic

Context & Conditions

Conceptual overview

Application areas	**Development of digital services**	**Management of traffic services**	**Maintenance of traffic environment**	**Urban planning**

Digital Twin for Mobility
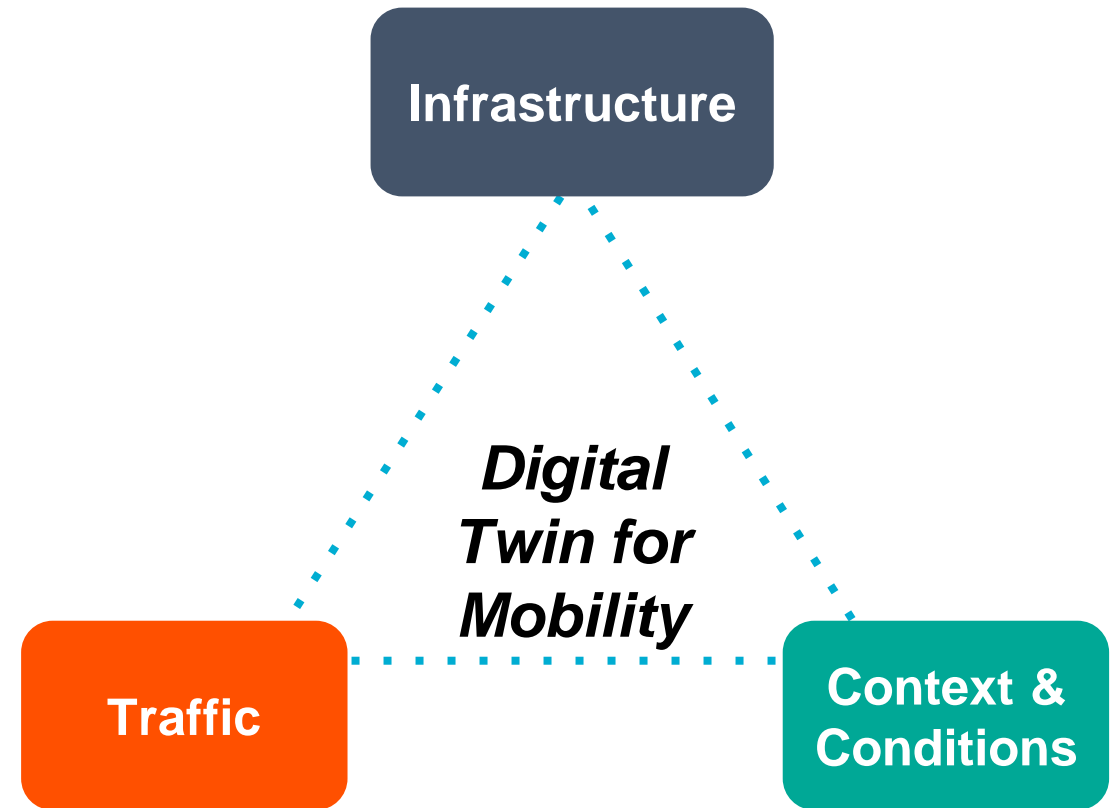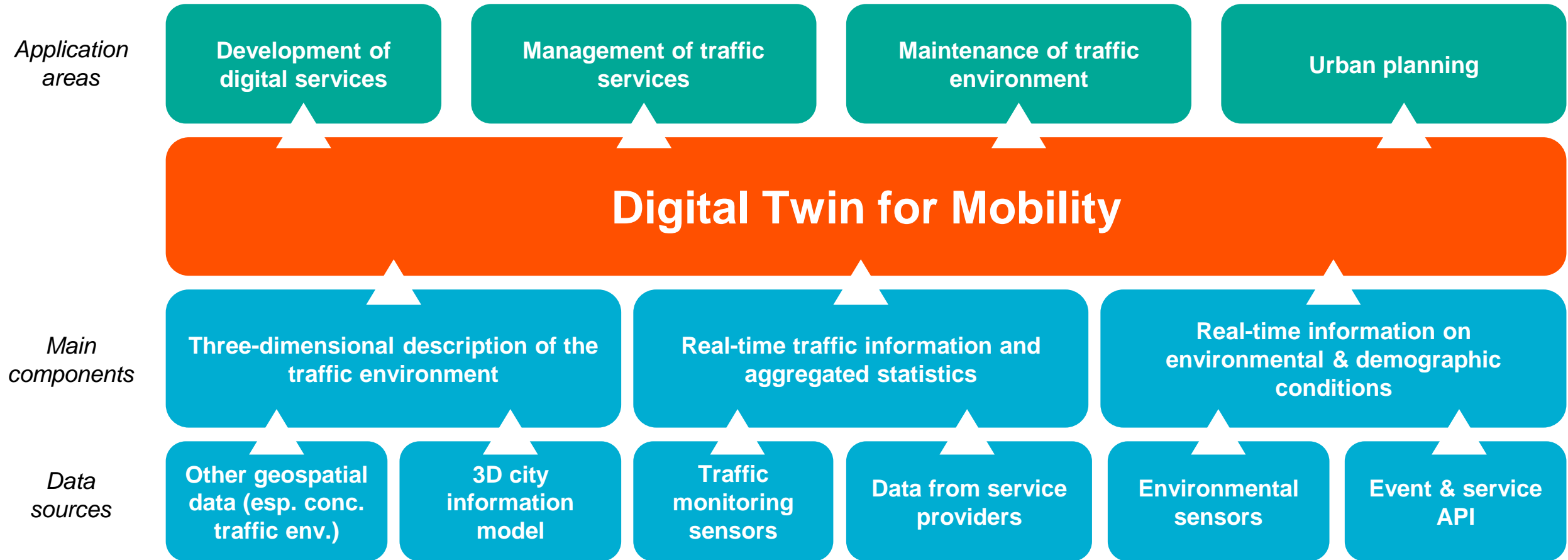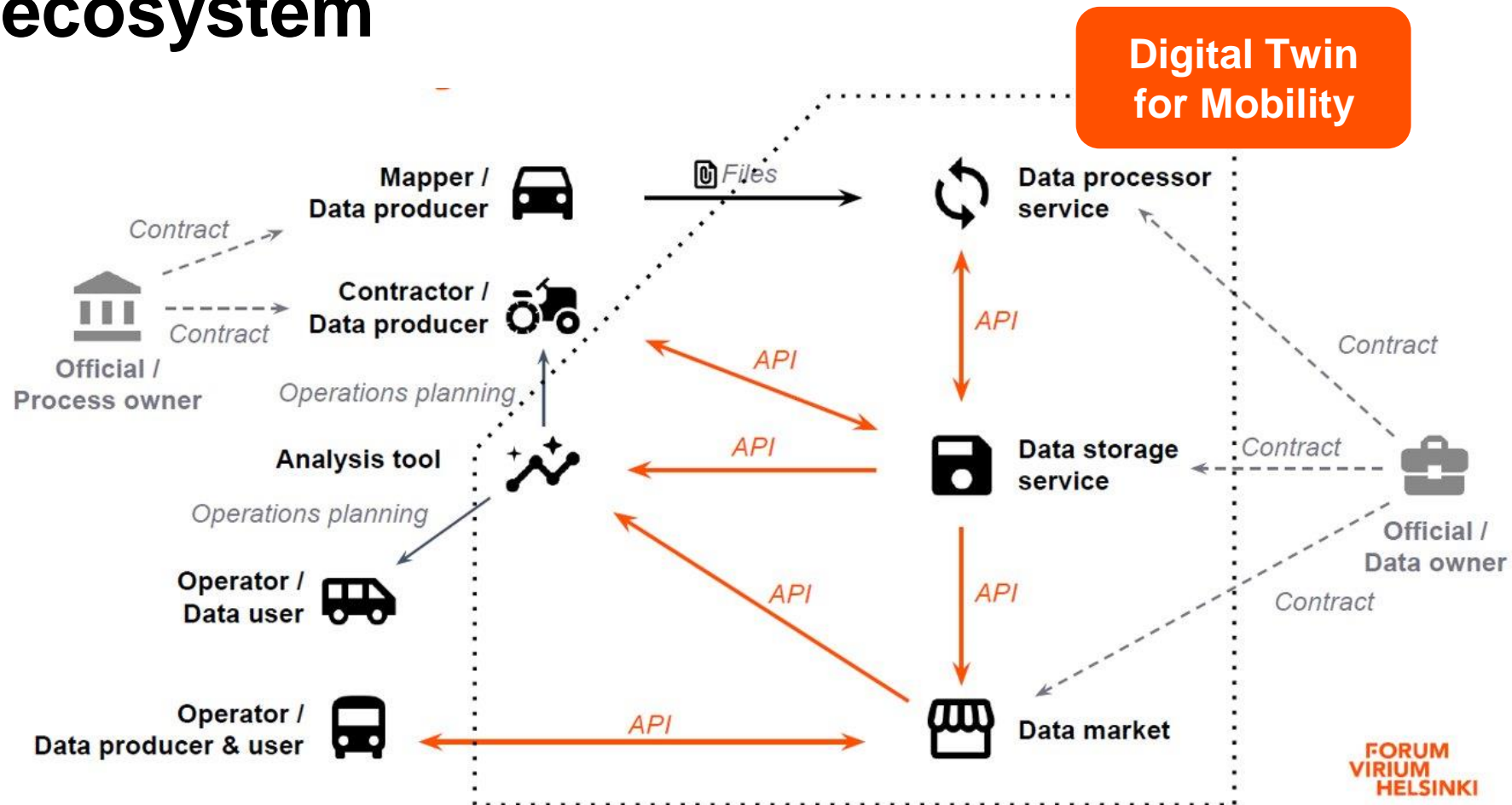
Main components	**Three-dimensional description of the traffic environment**	**Real-time traffic information and aggregated statistics**	**Real-time information on environmental & demographic conditions**

Data sources	**Other geospatial data (esp. conc. traffic env.)**	**3D city information model**	**Traffic monitoring sensors**	**Data from service providers**	**Environmental sensors**	**Event & service API**

Data ecosystem

Digital Twin for Mobility
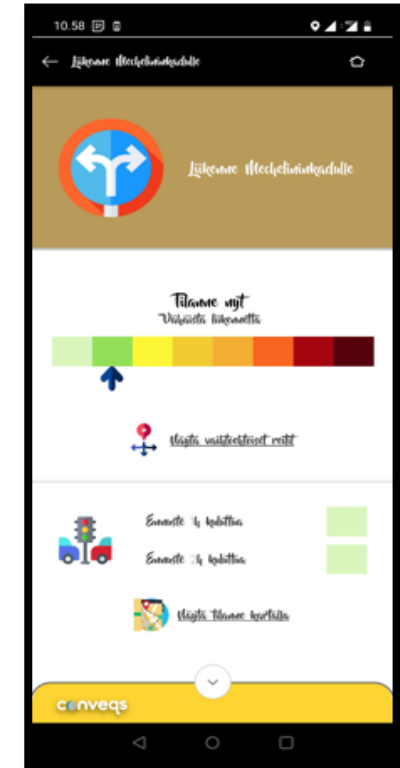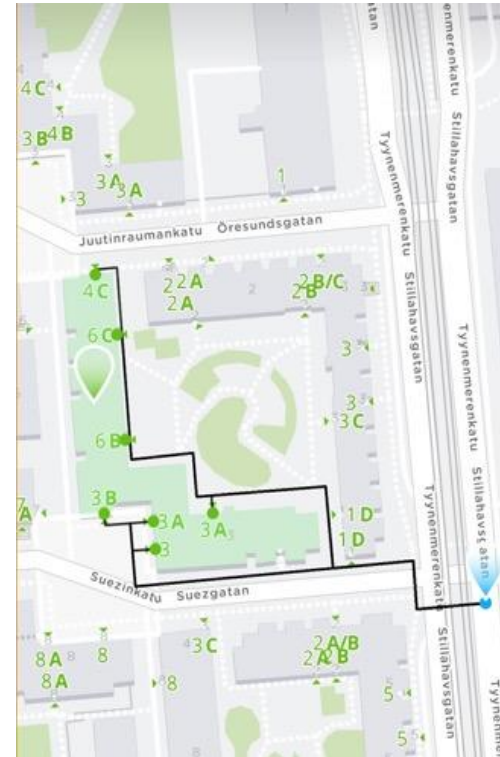
Applications in Mobility

Applications

- Traffic planning and regulation by the City

- Optimized maintenance of infrastructure

Applications

- Better logistics for couriers
- Improved accessibility
- Tailored navigation

- New mobility services!

On-going projects

testbed.helsinki/en/

Helsinki Testbed Helsinki

Search   EN ⌄

EdTech   **Smart Mobility**   Built Environment   Circular Economy   Health & Wellbeing   Open Applications   Present Your Idea   FAQ   Contact

Welcome to explore the testing opportunities in Helsinki!

Through the Testbed Helsinki website you can comprehensively find development and testing opportunities for new products and services offered by the City of Helsinki. The site is specifically aimed at companies and RDI actors. The key content areas of our testing platform activities are EdTech, Built Environment, Health & Wellbeing, and Smart Mobility.

Welcome to explore the testing opportunities in Helsinki!

Read more

MOBILITY LAB HELSINKI

Objectives

1. **Ecosystem**:
   Collaboration with different stakeholders, development and innovation community and creating new projects and pilots.
2. **Digital twin:**
   Improving the usability and usefulness of data and APIs, developing tools for a mobility digital twin.
3. **Testbed:**
   Enabling and supporting testing and developing new smart mobility solutions in practice, in the real urban environment.

MOBILITY
LAB
HELSINKI

LiiDi2 – Digital twin for mobility enabling better services

- Partners: Forum Virium Helsinki ja Stara
- Duration: 08/2021 – 08/2023
- Funding: (EAKR, REACT-EU)
- Key activities
  - Co-defining Digital Twin for Mobility
  - Data collection pilots
  - Hackathon
  - Standardised hardware for sensor installments
  - Data platform development
  - Innovative procurements for data collection
  - Events, networking, collaboration

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