SOTERIA

Systematic and orchestrated deployment of solutions in complex urban environments for ageing and vulnerable societies

How can we use data to enhance road safety? The SOTERIA approach

SOTERIA aims to accelerate the attainment of Vision Zero goals for VRUs

A consortium of **16 partners** from **7 European countries** joined forces towards the co-creation of a **holistic framework** of innovative models, tools and services that:

→ Enable data-driven urban safety intelligence

→ Facilitate safe travelling of Vulnerable Road Users

→ Foster the safe integration of micro-mobility services in complex environments

soteria at the operational level

🎯 **Uncover little explored behaviours of VRUs** from different demographic segments, their perceptions on road safety and mobility needs

🎯 Build a Big Data architecture for processing and storing **historic and streamed data from heterogeneous sources** to identify safety hazards for VRUs and improve the predictive capabilities of road safety models

🎯 Assemble a **data-driven modelling and simulation suite** for micro-level accident analysis, causes taxonomy and dynamic definition of accident and near-miss hotspots

🎯 **Leverage explainable Artificial Intelligence** for enhancing trustworthiness of accident and micro-mobility demand predictions before infusing interconnected services that support VRUs in safe and clean day-to-day travelling

Main achievements so far

- **Updated review of the state-of-the-art** and **knowledge base of best practices**, **lessons learnt and impacts**

- **First round of co-creation workshops** engaging:
  - **More than 90 participants** across the 4 Living Labs
  - **Participants profile:** VRUs groups, local authorities, urban transport operators, mobility and safety experts, policymakers, micro-mobility operators, representatives of vulnerable groups, etc.

- **Definition of the Use Cases**

- **Definition of the technical architecture of SOTERIA**
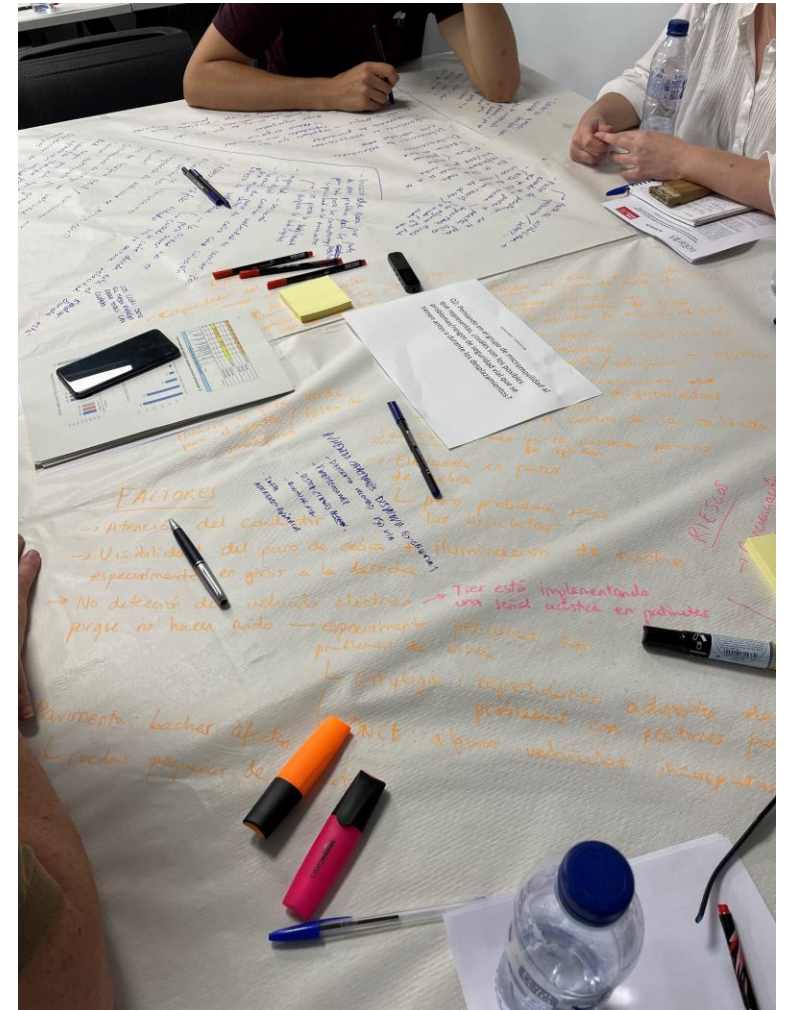
soteria — tapping into classic and novel data sources

VRU Behaviour Data

Best Practices Knowledge Base

Infrastructure Data

Police Accident Reports

GIDAS Accident Database

Traffic Data

Micro-mobility Data

Near-Miss Data

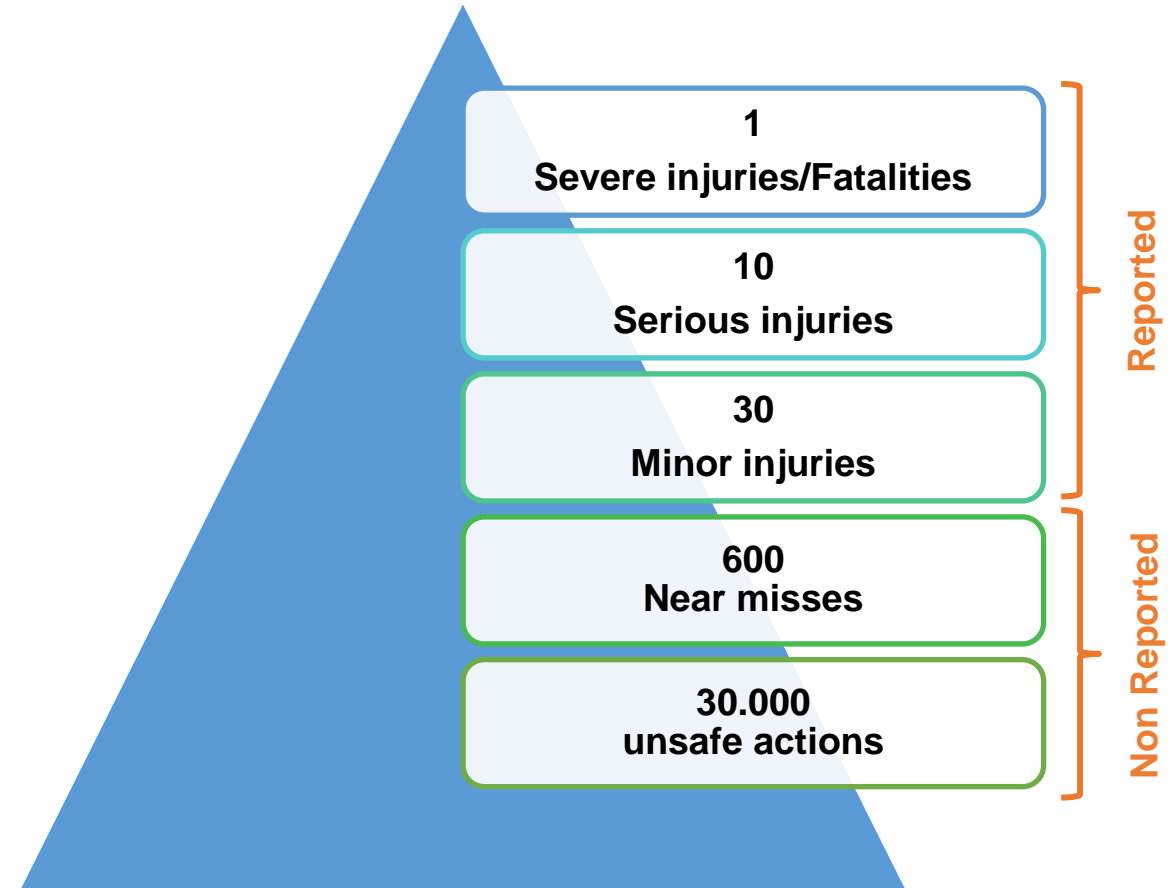Connected Vehicle Data

Cellular Network Data

What we will do with the data

The safety triangle

- Accidents are the **confluence of risk and "bad luck"**

- **A road, a path or a location with no severe accidents or fatalities is not necessarily safe**

Research question

- Can we **identify near misses and unsafe actions** with novel data sources?

- Can we **identify potentially unsafe road sections or intersections for VRUs** by learning from those locations with reported accidents?

| Pyramid	Reported / Non Reported
1 Severe injuries/Fatalities	Reported
10 Serious injuries	Reported
30 Minor injuries	Reported
600 Near misses	Non Reported
30.000 unsafe actions	Non Reported

What we will do with the data

Leveraging Connected Vehicle Data to identify near misses and unsafe actions

- **Connected Vehicle Data** encompasses the information produced by vehicles equipped with internet connectivity and onboard sensors (e.g. vehicle's location, speed, acceleration)

- This data will be used to **detect harsh events** that can serve as a **proxy for near misses and unsafe actions**

Leveraging novel data sources to infer explanatory variables for VRU safety analysis

- **Cellular network data and micro-mobility** data will be used to **understand how accidents and near-missed events affect certain population groups** depending on their contexts.

Harsh Events from Connected Vehicle Data provided by VIANOVA)
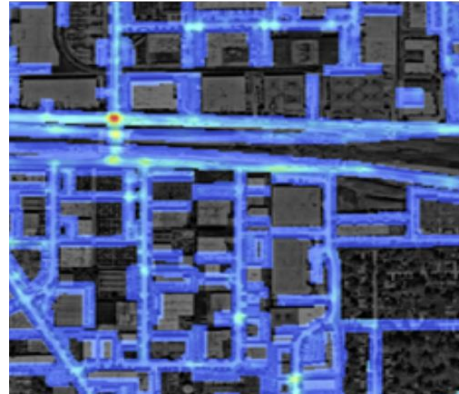

Road accidents

What we will do with the data
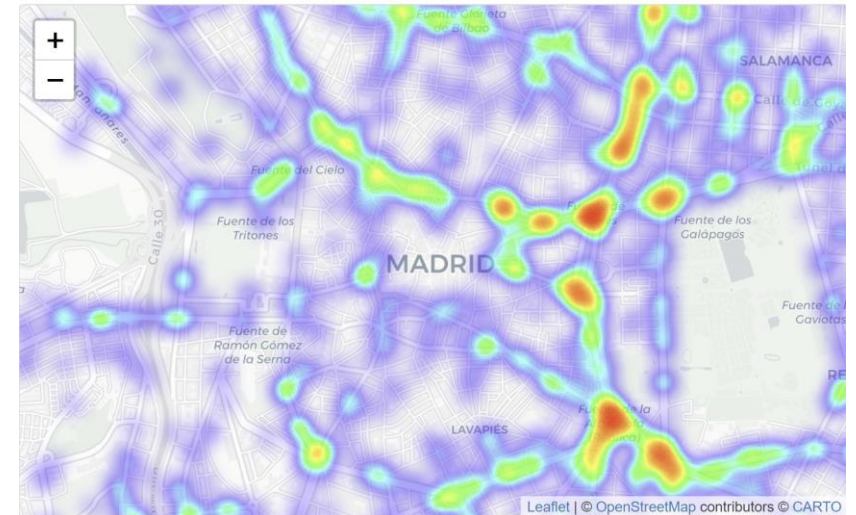
Safe Mobility Data Space

- Comprehensive and extendible **EU wide data space**
- Able to **host static and streamed heterogeneous data**
- Data integration and harmonization based on **smart data models**

(*) AI generated image

Accident Modelling and Analysis

- **Estimation and visualization of accident frequency and severity and hotspots** at the network level
- **Simulation-based impact analysis module** for the quantitative evaluation of accident countermeasures.

Travel Demand Prediction

- Based on **big geolocated data sources**
- **Travel demand patterns** of VRUs and specific groups
- Demand **estimation at the road section level**

(*) AI generated image

What we will do with the data

Accident Prediction

- **Estimation of accident risk at network level** and not only at network parts with available georeferenced accident data
- **Two different approaches:**
  - Generalize linear models (classic)
  - Deep learning (novel)

Explainable AI

- Make the **Deep Learning accident prediction models more trustworthy and fair**
- **Extract useful insights from the Deep Learning models** that might help to understand what are the **relevant factors involved in VRU safety** and their relations

Historical Accidents (2 years)

Accident Risk Prediction

Future Accidents (2 years)
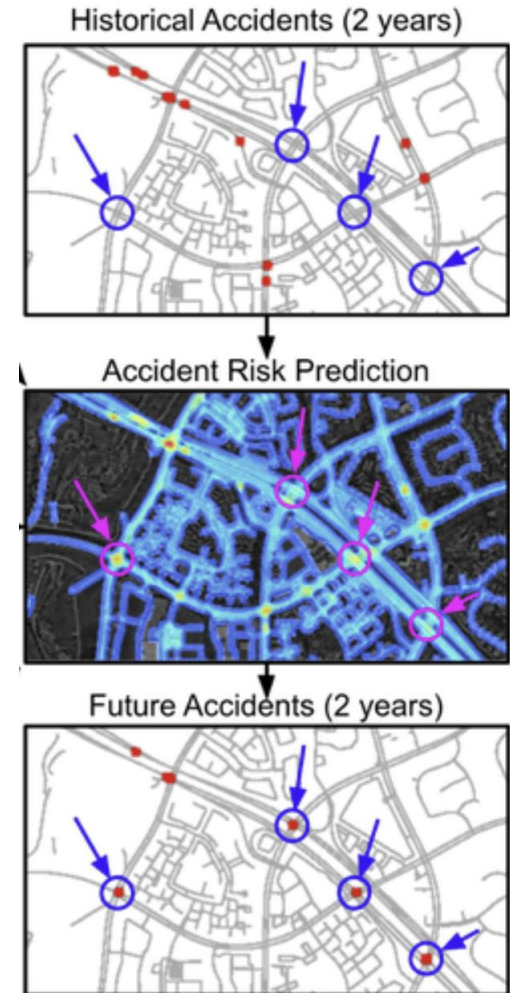
Source: He et al. 2021 Inferring high-resolution traffic accident risk maps based on satellite imagery and GPS trajectories

Stay tuned for upcoming milestones in 2024!!

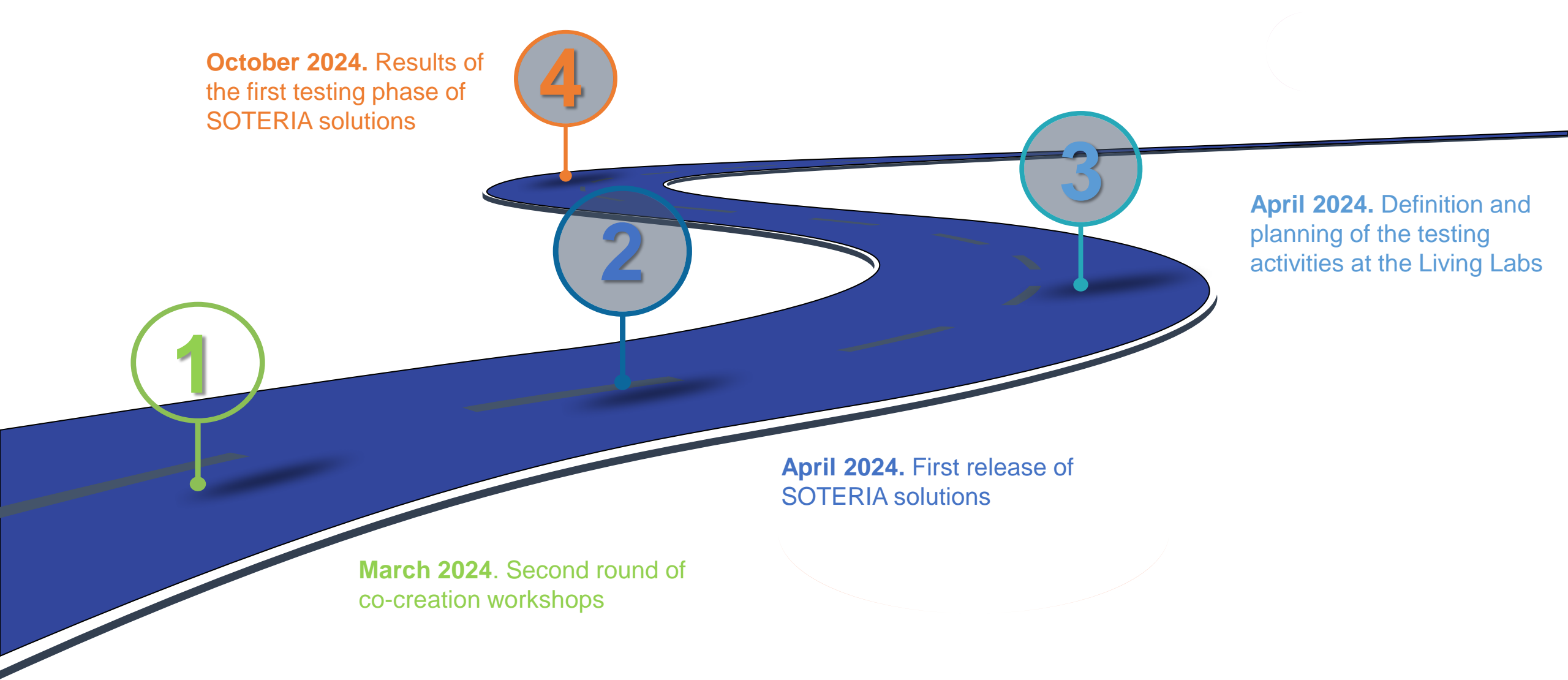**October 2024.** Results of the first testing phase of SOTERIA solutions

April 2024. Definition and planning of the testing activities at the Living Labs

April 2024. First release of SOTERIA solutions

March 2024. Second round of co-creation workshops

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Find out more: www.soteriaproject.eu

Co-funded by the European Union

UK Research and Innovation