MOVEWISE

Micromobility Optimization through Vehicle, Environment & Wellbeing-centred Integrated Safety Engagement

What we are looking for?

In order to meaningfully advance our proposal we are looking for high-profile partners covering the following expertise:

Public sector: Magdeburg, Valencia (requested) + one Eastern EU city for piloting and co-creation.

Social sciences: Sociologists, disability NGOs, gender/age mobility experts for inclusive design.

Design & technology: UX/interface designers, and planning consultancies for co-developing safe, sensor-equipped vehicles and infrastructure.

Industry & policy: Insurance partners (risk modelling) and a standardisation body (KPIs, taxonomy).

Stress sensing: Experts in biometric monitoring and wearable stress data integration for field deployment.

1. Motivation & policy context

Micromobility, including cycling and e-scooters, has rapidly expanded in European cities, enhancing urban mobility and sustainability. Despite these benefits, vulnerable road users (VRUs) still represent over 40% of EU road fatalities. Particularly concerning is a 20% rise in severe injuries from e-scooter incidents, despite reduced injury rates per kilometre travelled (Micro-Mobility for Europe). Addressing these challenges, the Horizon Europe call HORIZON-CL5-2026-01-D6-13 aims specifically at enhancing safety for pedestrians, cyclist, and users of electrically assisted small vehicles and other micromobility devices and users (MMUs).

Current EU-level accident data reveals significant data and knowledge gaps at the EU that currently prevent effective safety assessments and interventions:

- **Mode differentiation gap**: CARE/Eurostat collapse e-bikes, e-scooters & mopeds into "other two-wheelers," preventing mode-specific risk analysis.
- **Exposure data gap**: No systematic data on usage intensity, distances, fleet sizes or user counts from private/sharing operators.
- **Reporting inconsistency gap**: Non-harmonized definitions for injury severity, vehicle classes and accident causes across member states.
- **Infrastructure/context gap**: Missing harmonized data on cycle-path quality, intersection layout, lighting, and pavement condition.
- **Behavioural data gap**: Lack of indicators for risk perception, rider awareness, and social norm adherence that drive safety-critical decisions.

MOVEWISE addresses these gaps through a stepwise framework:
1) Close the data gaps through novel sensing and data integration tools;
2) Develop and integrate structural and technological solutions
3) Evaluate the road safety impact of these solutions in large-scale field pilots;
4) Derive EU-level KPIs, reporting standards, and policy guidance.

2. Research objectives

MOVEWISE follows an integrated, impact-oriented structure that builds on and extends past EU projects (e.g., AsPeCSS, PROSPECT, XCYCLE, InDeV):

1) **Close the data gaps through novel sensing and data integration tools**
Address missing exposure, behavioral, and infrastructure-related data by generating harmonized, high-resolution, multi-source micromobility safety data.

Methodology:
- **Multimodal sensor integration:** Equip e-scooters and e-bikes with cost-efficient embedded sensors (e.g., GNSS, gyroscope, IMU, camera) and biometric stress trackers (e.g., wristband sensors) to capture evasive manoeuvres, sudden braking, and stress reactions in risky contexts.
- **Mobile infrastructure sensing:** Develop safety and stress heatmaps by fusing sensor and smartphone camera data with MMU2X communication to identify high-risk zones, poor infrastructure, or environmental hazards.
- **Exposure and usage data:** Colaborate with fleet operators and public authorities to to access anonymized usage data and harmonize GNSS trajectory data, usage patterns, and fleet characteristics (owned vs. shared, personal vs. delivery).
- **Behavioural data collection**: Helmet usage will be detected via AI-based image classification using smartphone or vehicle-mounted cameras, optionally confirmed by user input.
    - Rule compliance (e.g., riding direction, red-light adherence) will be inferred by comparing GNSS traces with local traffic regulations and infrastructure.
    - Smartphone distraction will be captured via screen activity logs (opt-in).
    - Risk perception and subjective safety will be measured using in-app micro-surveys and gamified feedback, asking users to rate perceived safety or tag hazards in real-time.
    - These inputs will be combined with biometric stress signals to validate and weight reported perceptions.
- **Data fusion and harmonization:** Integrate crash, exposure, behavioural, and contextual infrastructure data into a common EU-wide taxonomy and open data framework.
- **User and technology acceptance:** Implement a structural evaluation of user acceptance, usability, and privacy perceptions of the sensing technologies. Findings will inform iterative design improvements and support long-term integration across cities and operators.

2) **Developing technical and structural innovations for improving road safety fur MMUs**
Demonstrate and validate the effectiveness of technological and infrastructure interventions to improve micromobility safety.

Methodology:
- **Technological modules for micromobility devices**: Develop and implement advanced safety features such as turn-assist technology and V2X collision-warning modules for e-scooters/e-bikes, plus road-condition monitoring via embedded sensors and stress biometrics.
- **Infrastructure co-creation:** Partner with municipalities (e.g., Magdeburg, Valencia, EasyPath-NL) to co-design and implement safety-enhancing infrastructure such as protected bike lanes, geo-fenced parking and slow zones, smart adaptive signage
- **Integration phase:** Practical integration of the developed innovations on the test sites and test micromobility devices. Initial tests to ensure the functionality in preparation of the large scale demonstration
- **Evaluation:** Use mixed-method approach to assess impact (e.g. before-after comparisons, behavioural logs, spatial risk clustering, and rider interviews).

3) Evaluate these innovations in large-scale field pilots
Demonstrate and validate the effectiveness of technological and infrastructure interventions to improve micromobility safety.
Methodology:

- **Technological modules for micromobility devices**: Develop and implement advanced safety features such as turn-assist technology and V2X collision-warning modules for e-scooters/e-bikes, plus road-condition monitoring via embedded sensors and stress biometrics.
- **Infrastructure co-creation:** Partner with municipalities (e.g., Magdeburg, Valencia, EasyPath-NL) to co-design and implement safety-enhancing infrastructure such as protected bike lanes, geo-fenced parking and slow zones, smart adaptive signage
- **Setup of living labs:** Conduct **demonstrations** in three diverse urban contexts (Western/Eastern European cities, mixed modal shares); **100+ micromobility users** participate per city over multiple months; **measure** behavioral adaptation, safety outcomes, and acceptance.
- **Technical evaluation:** Use mixed-method approach to assess impact (e.g. before-after comparisons, behavioral logs, spatial risk clustering, and rider interviews).
- **User and technology acceptance:** We will conduct a structured evaluation of the gathered data to analyse patterns in user behaviour, acceptance, and interaction with the solutions. The aim is to derive insights that support continuous improvement and long-term integration of technology.

4) Derive EU-level KPIs, reporting standards, and policy guidance
Translate pilot insights into harmonized, scalable instruments for safety governance at EU and city level.
Methodology:

- **EU-level data model:** Define a harmonized micromobility-specific crash classification, injury severity scale, and exposure taxonomy, building on CARE and Eurostat but extending for new modes (e-scooters, e-bikes, delivery).
- **Behavioral KPIs:** Define and validate indicators (e.g., helmet use rates, compliance behavior, incident precursors, stress levels).
- **SUMP integration toolkit:** Develop city-friendly dashboards and simulation modules (e.g., what-if scenarios based on exposure-adjusted risk maps); provide easy-to-apply procedures for local authorities to integrate micromobility safety into planning tools and SUMPs.
- **Policy guidelines:** Develop recommendations for accident reporting (bottom-up improvement), V2X integration, and micromobility data sharing with cities.

3. Contact

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