# CONNECTED AND ADAPTIVE MAINTENANCE FOR SAFER URBAN AND SECONDARY ROADS

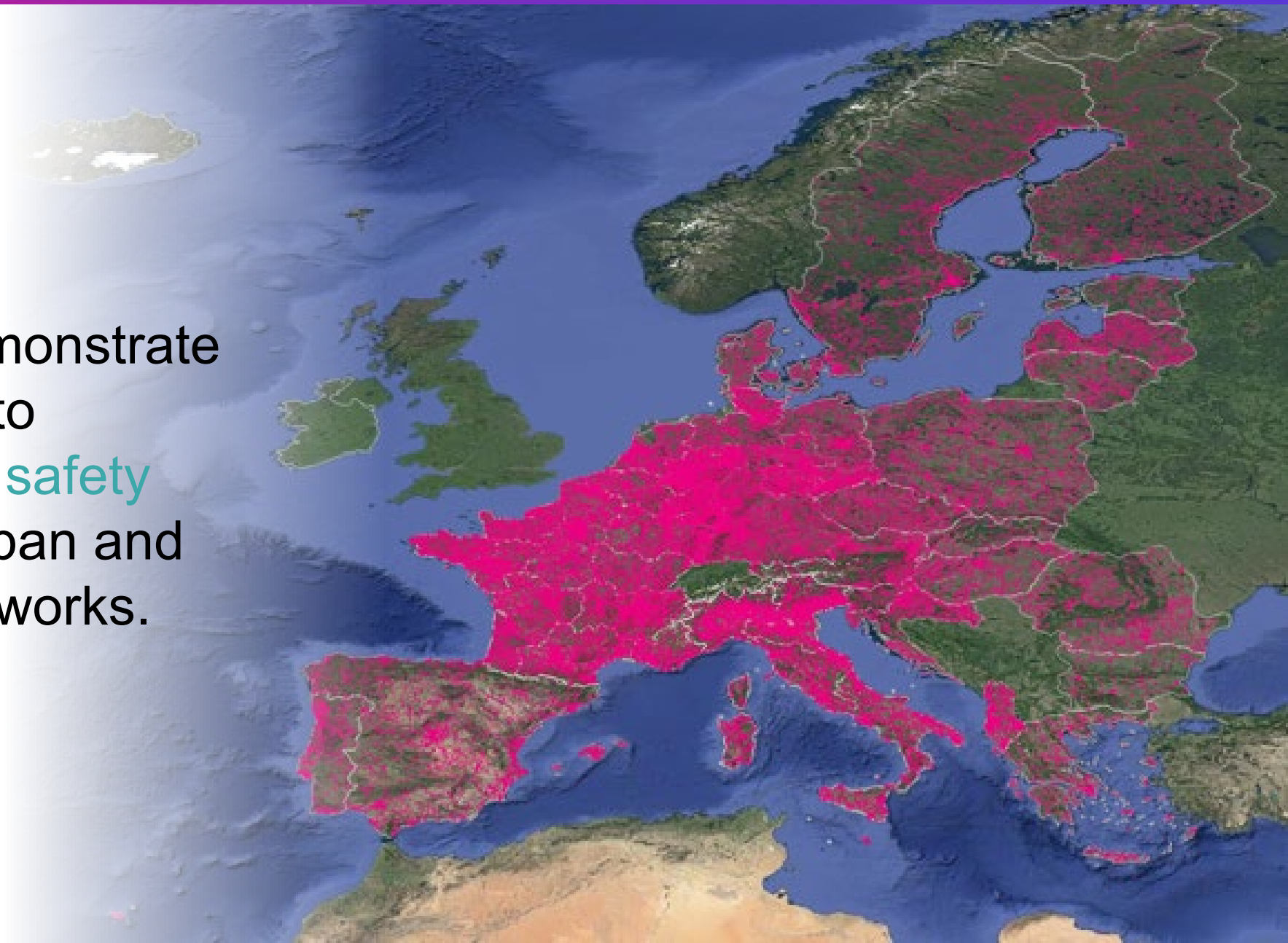
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Funded by the European Union

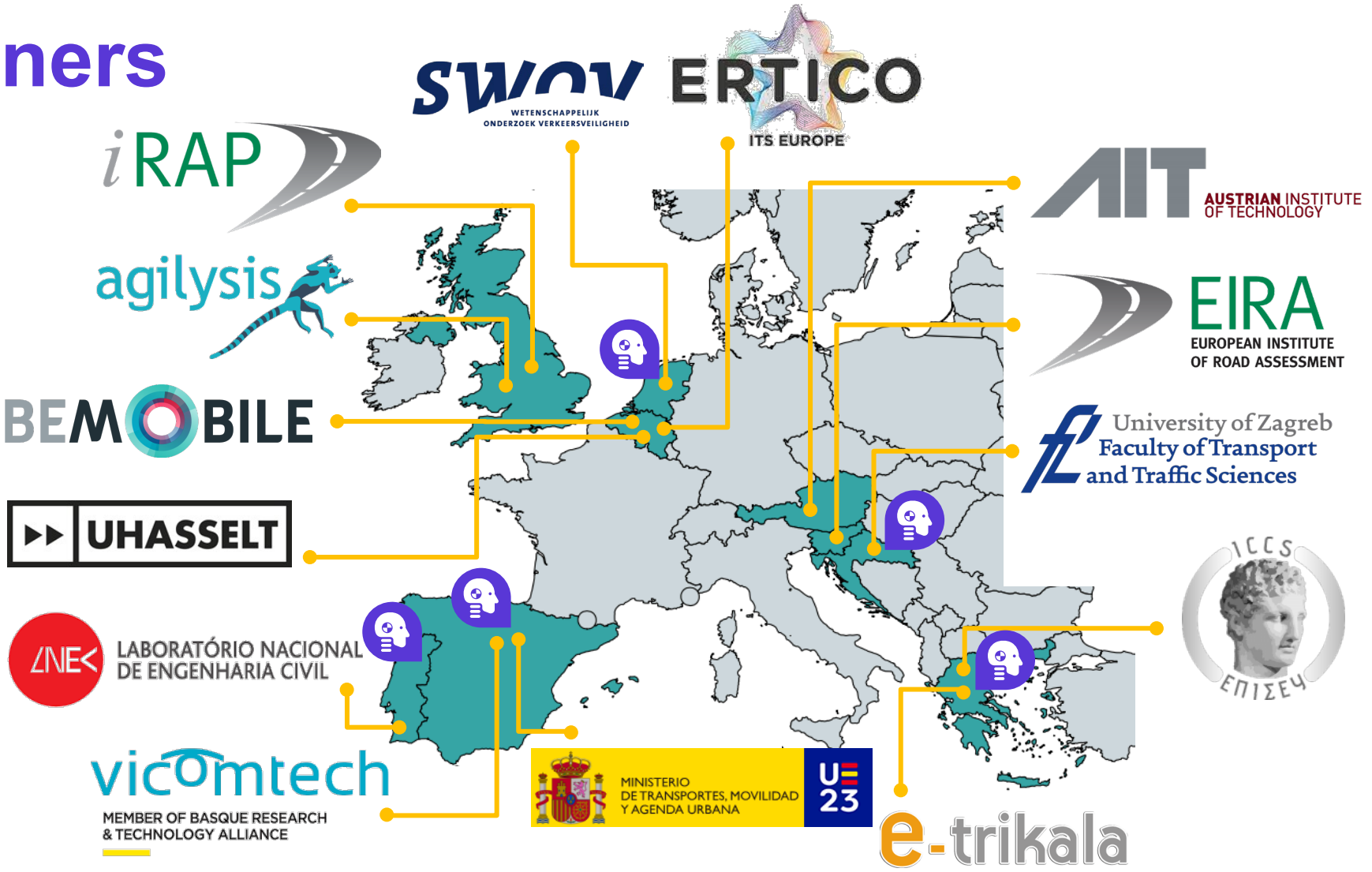
Innovate UK

To develop and demonstrate workable solutions to integrate asset and safety management for urban and secondary road networks.

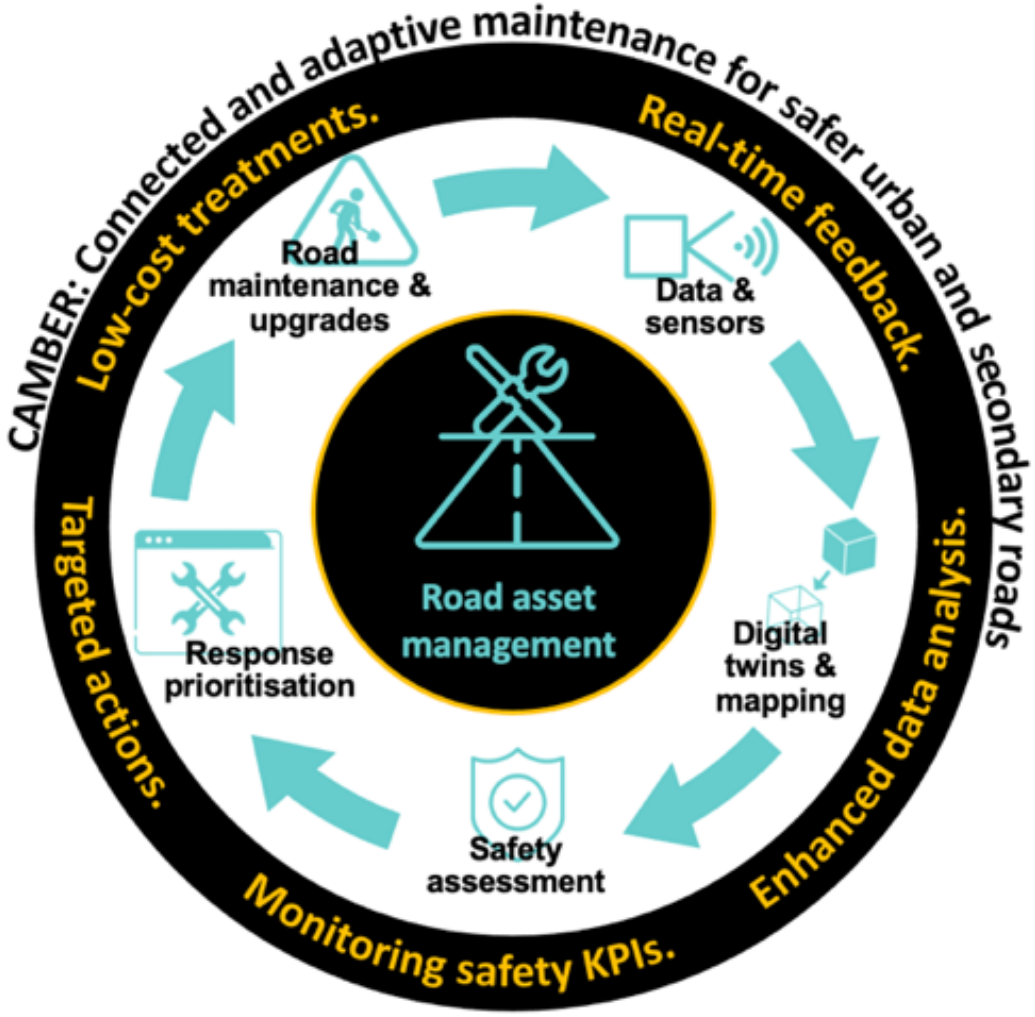


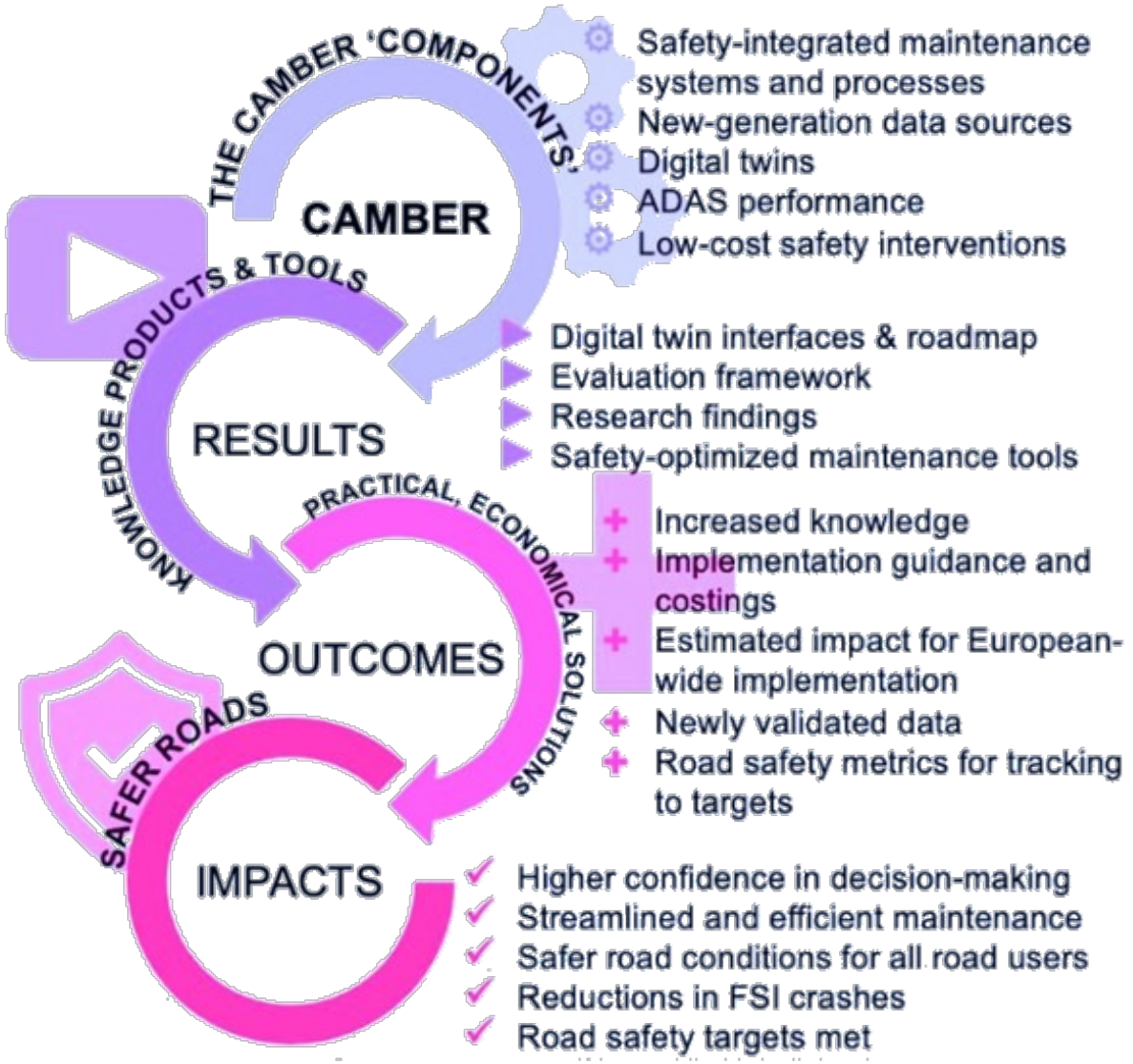
# 14 Project Partners
# 5 Pilot sites

- Cascais, Portugal
- Trikala, Greece
- North Holland, The Netherlands
- Croatia
- Spain



# APPROACH, OUTCOMES & IMPACTS



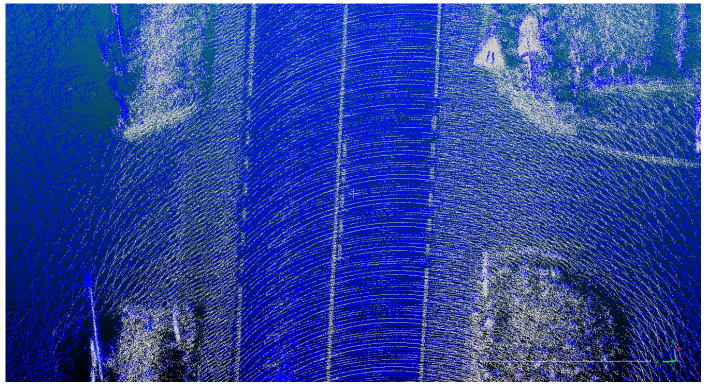
# PROJECT OBJECTIVES & QUANTIFIED TARGETS

| | Objectives | Targets |
|---|---|---|
| Digital connectivity | Establish digital connections between road infrastructure elements and management systems | Deploy digital twin interfaces<br>Validate new-generation data sources<br>Enable exchange through APIs |
| Safety performance criteria | Develop safety performance criteria and cost-effective upgrade solutions. | Provide an enhanced maintenance planning tool |
| Low-cost safety measures | Develop low-cost infrastructure measures for safer behavior and reduced crash severity. | Design & validate low-cost safety measures in real-world<br>Generate scientific research outputs |
| V2I data integration | Use vehicle-to-infrastructure data to support safer automated and non-automated mobility. | Assess passive and active V2I devices<br>Integrate V2I data into asset and road safety mgt processes |
| Smart maintenance | Discover and refine maintenance practices to reduce crashes across the road lifecycle. | Test and refine road maintenance techniques<br>Deliver practical maintenance guidelines |
| Real-world validation | Demonstrate and validate integrated road safety and asset management solutions. | Implement pilot demonstrations<br>Carry out EU-wide impact evaluation |

# DIGITAL TWINS DEVELOPED

## Digital Twin Concepts for Pilots

- Development of digital twin concepts for secondary and urban roads, tested in CAMBER pilots
- Concepts adapted to network size, data availability, user needs, and existing road authority systems
- Based on SoA review, best practices, expert input, and WP3 data availability
- Initial and final concepts delivered through D4.1 and D4.2



## Digital Twin Roadmap

- Creation of a practical roadmap for deployment and uptake of road network digital twins
- Guidance on data sources, technical implementation, and cost–benefit considerations
- Supports replication across European road networks



# EXPECTED IMPACTS ALIGNED WITH EU PRIORITIES

| Road Users & Services |
| --- |
| Road users become data providers and end-users via platforms (e.g. Waze, Flitsmeister) and improved navigation systems |
| Enhanced road user information services |
| Reducing road crashes and fatalities while strengthening transport system resilience. |

| Road Authorities & Operations |
| --- |
| Accelerating the deployment of innovative CCAM technologies for passenger and freight transport. |
| Improved traffic management techniques |
| AI systems for road authorities and public administrations |
| At least 25 European road authorities routinely use one or more CAMBER outcomes in their maintenance systems. |

| Policy & Governance |
| --- |
| Data-driven road safety policymaking |
| Full integration of CAMBER outcomes into secondary road management |
| Improved knowledge, protocols and guidelines for RSM, asset management and maintenance |

# EU policy alignment

**Vision Zero & EU Road Safety Policy**
*proactive safety management on urban and secondary roads*
**Sustainable & Smart Mobility Strategy**
*integration of safety, maintenance and digitalisation*
**Green Deal & Digital Europe**
*low-impact interventions and data-driven decision-making*
**CCAM / ADAS readiness**
*infrastructure support for assisted and automated driving*

# Long-term benefits

Fewer fatalities and serious injuries, especially on secondary roads

Lower maintenance costs through preventive, targeted interventions

Better use of public budgets via cost–benefit-based prioritisation

Scalable and replicable solutions for road authorities across Europe

Enabling more cost-effective road safety investments and data-driven policymaking, while supporting sustainable transport modes and reduced $CO_2$ emissions.

# THANK YOU!

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CAMBER Project

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