

Mobility network infrastructure

Rationale/Challenge:

All industrial sectors in Europe will require rapid decarbonisation to meet net-zero targets set for 2040 - 2050, depending on the EC member state. The requirement for decarbonisation in the mobility sector is clear given that transport represents around 25% of carbon emissions, of which road transport comprises around 70% of that proportion. Already, around 1 in 5 road vehicles sold are either hybrid or fully electric, with proposed bans on the sale of new internal combustion engine (ICE) light vehicles in European countries from 2025 – 2035. Whilst no firm target is set, a notional date of 2040 has been suggested for the transition of heavy vehicles targets for the transition of heavy vehicles to zero-emission fuels.

Whilst ICE vehicles will be part of the highways sector for many years to come, particularly heavy vehicles, the production and use of fossil fuels will decrease over the next 20 years. This poses two issues, namely, how to fuel vehicles in the future (including heavy goods vehicles) and how to construct and maintain highway infrastructure, given that bitumen is produced as a product of fossil fuel refinement, meaning that the existing bitumen needs to have its life extended and reused multiple times, whilst alternatives binders need to be developed for new asphalt product production.

Scope Proposals should address one or more of the following:

The scope will cover the implications and opportunities resulting from the energy transition and depletion of fossil fuels in transport infrastructure.

Given that the energy transition will have implications across both vehicles and construction, the scope needs to cover all aspects of the transport cycle from the design, construction, operation and maintenance. This will include construction materials, construction techniques, energy options for plant, light and heavy vehicles and business models. Given the wide range of actors involved, R&I activities will also need to include industry, urban councils, national infrastructure operators, academia and research organisations.

The following R&I activities are proposed:

CSA

1. Develop a catalogue of monitoring systems for infrastructure, together with case studies to examine the potential for life extension and carbon savings.
2. Production of a definitive guide on whole-life carbon costs for a variety of mobility infrastructure options to cover construction and maintenance across the infrastructure cycle. This should include options for the circular economy.
3. Detailed study of options and opportunities for the electrification of heavy vehicles, considering various types of electric road systems, research around battery technology or hydrogen fuel options, considering required infrastructure, investment and timeframe and contribution to 2040 – 2050 targets. This should also consider options for decarbonisation of the 'yellow fleet' of construction and maintenance equipment.
4. Review of infrastructure requirements for light vehicles based on proposed targets for electrification, including understanding the transition to electrification and future static or dynamic charging options, potential options around hydrogen and the requirement for fossil fuel equivalents such as biofuels and efuel (synthetic fuel) as part of the transition away from ICE and for ongoing legacy requirements (for example historic vehicles and motorsport).

RIA

1. Trials around bitumen alternatives, including bio-bitumen potential and risk-based assessments for the use of existing bitumen over multiple lifecycles at the highest level of

utility. This should consider likely ongoing bitumen production based on ongoing improvements to the refinement process which already results in less bitumen production and future trends based on the move away from fossil fuel production. Trials of various solutions should be undertaken to produce case studies to validate the risk-based assessment framework.

2. Decarbonisation of concrete production and use to include the development of technologies for reuse, recycling and remanufacturing, along with trials of alternative cementitious binders.
3. Monitoring of transport infrastructure using big data technologies from a variety of traditional monitoring techniques and new sources including mobile phone data, prob vehicle data and data collected from connected vehicle data. Understand the potential of V2I and I2V capability and infrastructure owner data. Development of validation models to assess how the data can be used together to determine trends in infrastructure deterioration.

IA

1. Large-scale trials of asphalt rejuvenators and life extension binders on a range of highways.
2. Development of a resource exchange mechanism for reuse, repair and recycling of all types of transport infrastructure. This will consider the optimum position of facilities and mechanisms including blockchain to track materials entering, being stored, processed and leaving the facility.

Expected Impact

R&I activities need to deliver practical solutions for the future of mobility in a fossil fuel-free or fossil fuel reduced future. Specifically, it should deliver the following outcomes:

- Roadmap for the future energy mix of light vehicles and required fuelling infrastructure.
- An assessment of options for the electrification of the heavy vehicle (trucks / buses / coaches) fleet, specifically around the viability of electrical road systems or battery options.
- Decarbonisation options for the electrification of construction and maintenance plant and equipment.
- Opportunities for improvement of construction efficiency and decarbonisation from job site optimisation and connected and automated plant.
- An assessment of options for the replacement of bitumen in transport infrastructure, including business models promoting the circular economy to keep what already exists in use at the highest level of utility over multiple lifecycles.
- Monitoring solutions and technical processes or materials to extend the lifetime of existing assets and those to be constructed in the future.
- Solutions for predictive maintenance of transport infrastructure to minimise risk of failures.
- Low / zero emission concrete and concrete replacements, including technologies to disassemble existing concrete products into their constituent parts.
- Longer-lasting infrastructure that considers the whole lifecycle carbon for construction and maintenance operations.
- Business models and procurement methods for new solutions such as infrastructure as a service.

Relevant Clusters: Cluster 5

Project Type: CSA (€2 million) + RIA (€13 million)
+ IA (€20 million)

Budget: €35 million