



European
Commission

SCIENCE FOR POLICY BRIEF

TRIMIS insights

Research and innovation in urban mobility and logistics in Europe



HIGHLIGHTS

- **331 EU-funded research and innovation projects** related to **urban mobility and logistics** have been identified since the start of the Horizon 2020 Framework Programme, aligning with the EU Urban Mobility Framework^a ambitions. Their total budget is nearly **€2 billion**.
- **Leading themes** include **urban mobility planning** and **cross-stakeholder collaboration, multimodality and active mobility**, improving the **sustainability of urban logistics** through electrification and intermodal optimisation, and established (Mobility as a Service) and evolving (Connected, Cooperative and Automated Mobility and Urban Air Mobility) **mobility concepts**.
- Throughout leading themes, **digitalisation** and **digital innovation** act as enablers.
- **Future initiatives** should continue fostering collaborative efforts and innovative mobility concepts. They should expand on **knowledge management**, harmonisation and standardisation of best practices, improve **safe mobility** in a safe-system approach, and increase the impact of **citizen engagement** in urban mobility planning.

INTRODUCTION

The European Green Deal^b has set an ambitious target of 90% reduction of greenhouse gas (GHG) emissions in the EU by 2050. This translates in equivalent requirements for the transport sector which is responsible for a quarter of total GHG emissions.

To engage the necessary changes, the Sustainable and Smart Mobility Strategy^c and the recently established Climate-Neutral and Smart Cities Mission^d, put urban areas at the centre of sustainability actions. Furthermore, the new EU Urban Mobility Framework^a emphasises the importance of public transport, active mobility and zero-emission urban

logistics, as well as the need for effective sustainable urban mobility planning for achieving both climate goals and increased quality of life in cities.

331 out of around 2700 Horizon 2020 research projects included in the Transport Research and Innovation Monitoring and Information System (TRIMIS) project database^e are related to urban mobility and logistics^f. They were financed mostly through the Research and Innovation Actions (RIA) funding scheme (98 projects with total EU contribution over €463 million) and the Innovation Actions (IA) funding scheme (64 projects and nearly €885 million of EU contribution).

Interaction with other policy initiatives

Trans-European Transport Network urban nodes including multimodal hubs for passenger and freight transport and park & ride solutions.

- Co-design of urban main radial roads, dynamic allocation of road and kerb space.
- Synchro modal logistics and cargo flow optimisation.

Sustainable Urban Mobility Plans (SUMP) including urban mobility and logistics integration and stakeholder involvement.

- Models and software tools for SUMP design.
- Sustainable Urban Logistics Plans (SULP) development.
- Data-driven identification, tracking and deployment of urban mobility innovations.

Sustainable urban mobility indicators (SUMI) including initiatives on harmonised mobility indicators, development and implementation of indicator benchmarking tools.

- Policy and governance tools, and transport planning actions for sustainable urban mobility indicators.
- Use of sustainable urban mobility indicators within projects in extension to their sustainable urban mobility plans scope.

Tools and digitalisation

Digitalisation, innovation and new mobility services including (real-time) data collection and analysis, digital twins, artificial intelligence, urban vehicle access regulations, free-floating car and bike sharing, urban air mobility and supportive digital applications.

DIGITAL TOOLS FOR TRANSPORT PLANNING

- Cloud-based cooperative system for integrated traffic and transport management.
- Smartphone application for optimising door-to-door journeys.

INNOVATION IN CITIZEN ENGAGEMENT

- Digital and in person citizen involvement in co-creation of local mobility.
- Co-design methodology with focus on disabled users.

SAFE URBAN MOBILITY

- Alert systems for accident-prone locations and cyclist detection.
- Self-diagnostic systems and fail-safe components for connected and automated vehicles.
- Novel mixed traffic road markers.

SHARED MOBILITY SERVICES

- New business opportunities and impact assessment of car sharing on other transport modes.
- Software platform for carpooling and solutions for multimodal integration.

MOBILITY AS A SERVICE

- ICT validation in living labs and pilot demonstrations in cities.
- Network models to study emerging patterns.
- Stand-alone digital services and IT solutions for smartphones.

TRAFFIC MANAGEMENT

- Big-data analytics for mobility and traffic forecasting.
- Internet of everything platform for collaboration between city authorities.
- Toolbox for heterogeneous data collection.

ICT SOLUTIONS FOR URBAN RAIL

- Automated obstacle detection and track intrusion systems.
- Railway signalling, automation and supervision for intelligent traffic control management.

URBAN AIR MOBILITY

- Navigation in complex environments and integration with other airspace users.
- Intelligent and fail-safe guidance-navigation-control and models for drone testing.
- Concepts for safe operations in densely populated areas.
- Governance, regulatory and interoperability framework for urban air mobility.

COOPERATIVE, CONNECTED AND AUTOMATED MOBILITY

- Safety and efficiency testing of connected and automated vehicles on public roads.
- Testing of autonomous and conventional vehicle in mixed traffic.

Objectives for urban mobility

Safe and active mobility including modal shift towards active modes, micromobility, e-bikes and e-cargo bikes, cycling infrastructure, road safety and citizen co-creation.

PROMOTING ACTIVE MOBILITY FOR ALL

- Including cycling into multidisciplinary planning culture.
- Active modes modelling and impact evaluation for reducing congestion.
- Best practices for the promotion of active modes.

TECHNOLOGIES FOR CYCLING AND MICROMOBILITY

- Lightweight and micro-vehicles for people with reduced mobility.
- Innovations in cycling safety, self-charging bikes and parking infrastructure.

SUSTAINABLE URBAN NEIGHBOURHOODS

- Upscaling of traffic management and infrastructure monitoring.
- Optimal neighbourhood geographical scale for citizen and local business engagement.

Towards climate-neutral cities focusing on efficient, interoperable and user-friendly recharging and alternative fuels refuelling infrastructure, clean fuels, electromobility and hydrogen.

ELECTRIC VEHICLE CHARGING, GRID INFRASTRUCTURE AND TECHNOLOGY

- Embedment of automated charging system in parking spaces.
- Light electric vehicles integration.
- Online checking and reservation of a charging station.
- Electric vehicle bi-directional charging, grid optimisation and stabilisation.

HYDROGEN IN THE URBAN CONTEXT

- Fuel cells with a higher lifespan.

Zero-emission city freight logistics and last-mile delivery including sustainable urban logistic plans, new distribution models, dynamic routing, multimodal connectivity of urban rail and inland waterways.

- Integration of logistics in living labs and deployment in lighthouse cities.
- Multi-level governance models and multi-stakeholder cooperation.
- Cargo bikes and light sustainable cargo vehicles for last-mile delivery.

Research and innovation in urban mobility and logistics contributes to reaching policy objectives and addressing societal needs, both by innovation in transportation technologies, planning tools and evidence gathering, and, by fostering cross-stakeholder collaboration and citizen engagement. To achieve the targets set out in the New EU Urban Mobility Framework, future initiatives should build upon the existing experience and achievements summarised in this brief, while introducing and building momentum with new ideas.

Effective policy implementation will build upon cross-stakeholder planning tools and collaboration networks. Then it will increasingly rely upon knowledge management and the governance and use of mobility data and indicators, and a mix of living labs and virtual experimentation.

- In planning and collaboration, the **sustainable urban mobility plans** will continue to be the central point of reference. It is worthwhile to clarify the vision ahead by providing plausible implementation scenarios. This will build momentum, e.g. in mobility management plans whose potential needs to be further explored.
- **Simulation-based decision making** will increasingly be used. With modern modelling approaches, such as digital twins and agent-based modelling, hypothetical scenarios can be built, where best practices are implemented in scale and challenges are factored in, to choose the most adequate one for a particular use case.
- This allows to investigate the future sustainability and economic benefits and trade-offs for cities and stakeholders. Such approaches will allow to handle complex use cases such as the operation of multimodal mobility hubs in Trans-European Transport Network (**TEN-T**) **urban nodes**, with the joint consideration of multimodal passenger and freight flows, and facilities planning, including park & ride and recharging.

Knowledge management and data governance and analytics are the transversal methods adapted to the systemic complexity of mobility systems. They will need to be further relied upon for both effective policy implementation and solutions in the field.

- With the accumulation of experience in pilot programmes and living labs, **knowledge management** will be of increasing importance for the identification, harmonisation, and standardisation of best practises to promote their further take up, scale-up and diffusion. Provisions will have to be made for the **integration of citizens' and mobility users' perspective into planning**, such as related to electric vehicles and their charging, or disruptive technologies such as urban air mobility. Further initiatives should encourage, study, and improve the ways citizens engage in co-creating sustainable mobility solutions and nudging mobility behavioural change.
- **Data governance**, including collection, fusion, pooling and sharing, **and analytics**, will be needed to translate

the increasing amount of mobility data available into an accurate picture of mobility and its evolution across EU cities, to plan and act accordingly. In this context, further facilitating the elaboration and monitoring of **sustainable urban mobility indicators**, will increase the evidence base for SUMP planning and implementation.

Improving the sustainability, safety and quality of mobility and life in general in cities and neighbourhoods will rely in a mix of **technological, planning, infrastructure, and participative solutions**, with an increased emphasis on **social and behavioural aspects**.

- Developing and improving **user-centric technologies** will help make multimodal trips seamless, comfortable, and safe, through an intuitive planning process, while, at the same time, **accessibility-centric planning tools** will further promote the position of active- and micro-mobility in transport and urban planning.
- Fleet renewal with low-impact vehicles will need confidence in the availability of **recharging and alternative fuel refuelling infrastructure**, both for passenger and freight vehicles. Further works are necessary to improve the maturity of solutions, and to reduce installation and operational costs in order to achieve sufficient scale.
- **Reducing the impact of urban logistics towards zero-emission** will rely on the progressive electrification of fleets, and also on intermodal optimisation. The latter is expected to increase shift of freight transport towards minimal impact modes, such as waterborne and rail, and towards zero-emission means for last mile delivery.
- Catering to the safety of **vulnerable road users**, and **mobility safety** in general, will be enhanced with the implementation of holistic safe system approach, encompassing planning, infrastructural, technological, and behavioural aspects, and is expected to act as a further enabler for modal shift.
- The combination of measures is expected to reduce the size of the fleets and public space occupation due to transport flows and parking, leading to a virtuous loop of increased safety and confidence in multimodality, less nuisance and pollution, and increased public space

available to all citizens. Combined with the efforts in other sectors, this will be a concrete step towards **climate-neutral cities**.

Concluding, to tackle **future opportunities and challenges**, initiatives should also focus on:

- Fostering the early adoption of innovative mobility concepts, such as **autonomous vehicles** and **urban air mobility**, integrating them in sustainable planning, integrating operational aspects and testing autonomous operation in real life conditions.
- Studying and future proofing the **resilience of urban mobility and logistics** against climate and extreme weather events, health hazards, cyber threats, and other potential disruptions.

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DISCLAIMER

This document is based on the JRC Science for Policy Report: Gkoumas, K. et al. 2022⁹.

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