STREnGth_M
Strengthening EU
Road Transport R&I

Deliverable 3.1

Visualisation of the sustainable RTR landscape at EU Member States level

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List of abbreviations and acronyms

Acronym	Meaning
2Zero	Towards Zero Emissions (co-programmed partnership)
ADAS	Advanced Driver Assistance Systems
AV	Autonomous Vehicle
CCAM	Connected, Cooperative and Automated Mobility
CEDR	Conference of European Directors of Roads
CINEA	European Climate, Infrastructure and Environment Executive Agency
CSA	Coordination and Support Action
D	Deliverable
DoA	Description of Action (STREnGth_M Grant Agreement)
EC	European Commission
EDIH	European Digital Innovation Hubs
EMDS	European Mobility Data Space
ERTRAC	European Road Transport Research Advisory Council
EU	European Union
EV	Electric Vehicle
HDV	Heavy Duty Vehicle
KDT	Key Digital Technologies
LCA	Life-Cycle Assessment
MaaS	Mobility as a Service
NCP	National Contact Point (for Horizon Europe)
R&I	Research and Innovation
RTR	Road Transport Research
SDGs	Sustainable Development Goals
SRIA	Strategic Research and Innovation Agenda
TRIMIS	Transport Research and Innovation Monitoring and Information System
UN	United Nations

Acronym	Meaning
V2X	Vehicle-to-Everything
WP	Work Package

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1 Introduction

1.1 STREnGth_M project overview

STREnGth_M (Stimulating road Transport Research in Europe and around the Globe for sustainable Mobility) is an EU-funded Coordination and Support Action contributing to the planning of research and innovation in Europe by:

- Identifying future research needs in the field of road transport;
- Updating and supporting the coordination of strategic research agendas and roadmaps in the field; and
- Facilitating continuous exchange between road transport research related Horizon Europe partnerships and platforms.

Furthermore, it analyses research, innovation and cooperation capacities in EU Member States, explores funding instruments on national and regional levels and assesses the potentials of national and regional roadmaps.

In particular, STREnGth_M plays a key role in supporting ERTRAC, the European Road Transport Research Advisory Council, in terms of strategic support and dissemination, as well as liaising with other key European partnerships and technology platforms.

1.2 STREnGth_M WP3, task description and objectives of this report

This Deliverable is part of Work Package 3 (WP3) “Member States and International alignment”. This WP fosters links between European, national and international roadmaps and strategies for sustainable and competitive road transport research. Subsequent tasks (covered in other deliverables) identify strategic links between funding programmes of Horizon Work Programmes and Partnerships and those addressing cities and regions and will create a toolbox to support alignment of sustainable RTR activities of the EU with Member States and internationally.

The specific task covered by this Deliverable is T3.1 “Map the research, innovation and cooperation capacities in Member States”. The purpose of this task was to look at cooperation capacities in EU Member States from two perspectives:

- Firstly, the institutional cooperation: identify existing research and innovation strategy plans, roadmaps and programmes at national and regional level with relevance to road transport and mobility, including the extent to which they link to, reflect or complement policies, roadmaps and R&I programmes at the EU level with a particular focus on ERTRAC, CCAM, 2Zero.
- Secondly, it covers the level of cooperation on the ground, in particular the degree of involvement of the Member States in relevant EU programmes.

1.3 Report structure

Following this introduction, Chapter 2 describes the approach and methodology concerning the data collection and analysis as well as the scope, identifying the key road transport research topics covered in this deliverable, in relation to the ERTRAC roadmaps.

Chapter 3, organised by alphabetical order of EU Member State, describes their research, innovation and cooperation capacities including the main programmes and themes covered, including known relations between them and EU roadmaps and strategies. This information is based primarily on online research, supplemented by survey responses for some countries.

Chapter 4 then provides a cross-country comparison in terms of EU Member State participation in road transport research themes in Horizon 2020 and Horizon Europe as well as in 2Zero projects (under Horizon Europe) by theme and in demonstration activities within CCAM Partnership projects.

General conclusions are given in Chapter 5.

In the two annexes are, firstly, the questionnaire form used to collect programme data at EU Member State level and, secondly, an example of a factsheet describing the national RTR landscape in Germany (see end of section 2.3 for more details).

2 Approach, scope and methodology

The approach to this task (reported in Chapter 3) required the collection of information on national programmes and other funding streams/mechanisms regarding road transport research, including topics covered, types of projects, organisations involved, links with strategies or roadmaps at national or EU level, and funding.

The data collection process was supported by desktop research and by a survey directed at national R&I stakeholders.

The scope of the data collection was the main ongoing programmes (or other funding streams) in EU Member States concerning Road Transport Research (RTR). These include:

- Significant groups of projects that are not part of a formal programme
- Research programmes covering wider topics (all transport/mobility, or related topics like energy, environment, urban/spatial planning, inclusivity) if road transport is a significant part; and
- Programmes which are ongoing, ones which have formally finished but some projects are still ongoing, and ones which are starting in 2024.

We exclude:

- EU or other trans-national programmes (EU programmes are covered in Chapter 4)
- Road transport funding/programmes which are not research, such as road infrastructure construction and maintenance programmes
- Programmes which are fully completed (no projects still running in 2024)
- Programmes expected to start in 2025 or later.

2.1 Desktop research

Initial information was gathered from Internet sources, including TRIMIS, national programme websites and some assistance of AI tools as a first step to identifying programmes and themes at national level. At first a list of mobility and transport research items was established and brought in relation with ERTRAC roadmaps. The analysis reveals a list of institutes and their research topics. The list can then be liaised with the roadmaps, giving an idea on overall progress of roadmap interest and deployment. Information was also collected from websites of national research programmes and funding bodies.

2.2 Survey

A self-completion survey was created by the project team using MS Word forms in order to supplement/validate desktop research. This survey asked a range of questions for each relevant research programme or equivalent group of projects or funding stream in a given country. It was initially directed at 75 organisations in EU-27 including National Contact Points (NCPs) for Horizon Europe and managers of major programmes and research bodies The full questionnaire is replicated in the Annex. The response rate was however low, with most of those who did respond either stating that there were no such programmes in their country (for smaller countries) or providing links or alternative contacts. Some of the STREnGth_M

partners also contributed data for their respective countries, most notably for Austria (AVL) and Germany (VDI/VDE-IT).

2.3 Approach to analysis

The general approach has been to use information available online for those countries where direct responses were not provided, in order to complete a first issue of this deliverable. Chapter 3 identifies key national R&I programmes in the road transport sector per EU Member State, from questionnaire responses as well as web-based research. The key research providers in each country are also given, with a summary of their main road transport research focus areas. This is followed (where possible) by the relation between these and EU level roadmaps and strategies. This part is mainly a mapping exercise between the topics covered by national programmes and the six ERTRAC Working Groups (Urban mobility, Freight transport, Energy and environment, Road transport safety and security, Circularity and competitiveness, Connectivity and Automated Driving [CAD/CCAM]), as well as any other European roadmap or plan mentioned by national stakeholders.

It is recognised that national programmes and activities are in constant evolution and the breadth of the scope makes it inevitable that there will be comments, corrections and additions proposed for this report. In the event of significant additional information, the current deliverable may be revised and an updated version released on the STREnGth_M web page.

In order to provide a more user-friendly overview of the national RTR landscape in each EU Member State, the project is preparing a factsheet for each one, based on the information in this deliverable. A first example of this factsheet, covering Germany, is provided in Annex 2. These factsheets will be made available on the project's web page, hosted on the ERTRAC website and can be updated where required. The format of the factsheets may differ for smaller countries which less national level research, comparted with the German example shown.

2.4 Identified research topics and ERTRAC roadmaps

Research and Innovation programmes for mobility and transport cover a wide range of topics aimed at improving transportation systems, enhancing efficiency, sustainability, safety, and accessibility. The key areas of focus are those represented by the six ERTRAC Working Groups and their respective roadmaps[1]:

- **Urban mobility**, including multimodal passenger and intermodal urban logistics transport to provide seamless and efficient journeys and to better manage urban road space. Mobility-as-a-Service (MaaS) is included, which aim to offer integrated mobility solutions, combining various transportation services into a single accessible and user-friendly platform. Research last-mile solutions includes micro-mobility (e.g., e-scooters, bike-sharing, etc.), last-mile delivery systems, traffic management, pricing and urban planning strategies to reduce congestion and improve accessibility. This Working Group has produced "Urban Mobility Resilience" and "New Urban Mobility Services" roadmaps.

[1] https://www.ertrac.org/ertrac-working-groups

- **Long distance freight transport**, including intermodal transport, truck design and operation, driving regulations, alternative propulsion systems for trucks, optimization of logistics networks, ITS for logistics, and the development of sustainable freight transport solutions. This Working Group developed the “Long Distance Freight Transport” roadmap (adopted in 2019), the document “Decarbonizing Freight Transport with available green energy” (2024) and “Paving the way for infrastructure and LDFT cooperation” (2024).
- **Energy and environment**, including research into reducing emissions (CO_2 and pollutants) from all sources, as well as developing electric vehicles (EVs) to provide more efficient and environmentally friendly mobility. Research includes battery technology, charging infrastructure and vehicle-to-grid integration, as well as alternative fuels such as hydrogen, biofuels, and synthetic fuels aims to reduce dependence on fossil fuels and lower emissions in the transport sector. This includes developing production methods, storage systems, and distribution networks for these fuels.
- **Road transport Safety and security**, including regulations, education, safety equipment and features, and ITS and enhanced physical infrastructure for safer roads. In 2022, this Working Group finalised the document “Mapping of technology options for Sustainable Energies and Powertrains”. This group produced the latest version of its roadmap in 2021.
- **Circularity and competitiveness** (formerly Global competitiveness): this addresses the challenges of circular economy and life cycle approach, including the resiliency of critical resources, and substitution of fossil-based resources.
- **Connectivity and automated driving**, covering Autonomous Vehicles, with research aiming to develop more efficient and user-friendly transport options. This includes connectivity, such as the development of Advanced Driver Assistance Systems (ADAS), as well as automation (self-driving technologies), all using Vehicle-to-Everything (V2X) Communications. Most recently, in 2024, this Working Group produced an update of the ERTRAC CCAM Roadmap.

Cross-cutting themes include:

- **Smart Infrastructure**: This area focuses on developing ITS and infrastructure, including smart roads, traffic management systems and sensor networks.
- **Data Analytics and Predictive Maintenance:** Utilising big data analytics and machine learning techniques to analyse transportation data can provide insights into traffic patterns, optimise routes, and enable predictive maintenance of vehicles and infrastructure, leading to cost savings and improved reliability.
- **Cybersecurity and Privacy**: As transport and mobility systems and networks become more connected and reliant on digital technologies, ensuring cybersecurity and protecting user privacy become critical concerns. Research in this area focuses on developing secure communication protocols, intrusion detection systems, and privacy-preserving algorithms.
- **Policy and Regulation**: Research into transport and mobility policy and regulation examines the societal impacts of new transportation technologies and develops frameworks to ensure equitable access, safety, and sustainability.

3 Research, innovation and cooperation capacities in EU Member States

This chapter is organised by alphabetical order (in English) of EU Member State, based on online research and (for Austria, Germany, Ireland and Sweden) on survey responses received.

3.1 Austria

Transport research at national level in Austria is highly developed with the largest share of projects (approximately 41% from all funding sources) covering the road mode, followed by multimodal projects. Nationally funded projects make up around a third of the Austrian research landscape, with EU funding covering the other two-thirds. ITS is a key focus area, with smart mobility and network management related projects being prevalent, but also a strong sector in infrastructure development, vehicle design and electrification.

Organisation and funding of national RTR principally comes under the Federal Ministry of Science, Research and Economy (BMWFW) and the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK).

3.1.1 Key national RTR activities in Austria

Zero-Emission Mobility (2022-2026)

This programme covers both road and rail transport, but around 95% of it concerns the road sector. This includes electric vehicles, systems and services for a holistic and interoperable mobility system (technology development, integrated mobility solutions). The main focus areas are urban mobility and freight transport.

Average annual public funding is in the order of €9 million, with funding depending on participating organisations. Private companies cover between 45-65% of their own budget, research institutions between 15 and 40%. It is funded by the Austrian Climate and Energy Fund and approximately ten projects per year are awarded.

It is linked to the national R&I Mobility Strategy – Mobility Transition (https://fti-mobilitaetswende.at/en)

Website: www.klimafonds.gv.at

Mobiltätswende / Mobility Transition (2022-2026)

This programmes also covers road and rail transport, with approximately 90% of it focusing on road transport research into Automated mobility, Electrified propulsion systems, vehicle emissions, and Key Digital Technologies (KDT) for mobility.

Average annual public funding is in the order of €10.3 million, with funding depending on participating organisations with similar percentage funding to the Zero-Emission Mobility

programme above. The programme is funded by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology.

It is linked to the national R&I Mobility Strategy – Mobility Transition (https://fti-mobilitaetswende.at/en) and to the EU Mobility Transition Pathway.

Website: www.ffg.at/thema/mobilitaetswende

Digitale Transformation in der Mobilität / Digital Transformation of Mobility (2022-2026)

This programme covers automated mobility and information systems for multimodal travel. The annual average public funding is €3.2 million, from the Austrian Climate and Energy Fund, and is estimated that around three quarters of funding concerns road transport. There are currently three projects running, which cover CCAM, urban mobility and freight themes.

It is linked to the EU Mobility Transition Pathway.

Klimaneutrale Stadt / Climate-Neutral City (2023-)

This focuses on urban mobility solutions but also non-transport aspects such as energy efficiency and emission reduction (from other sources) and social innovation. Only a relatively small proportion is dedicated to research in the road transport domain (estimated 5%).

Average annual public funding is €23 million, from the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology and the Austrian Climate and Energy Fund.

It is linked to the Climate Neutral City Mission (Mission Klimaneutrale Stadt, https://open4innovation.at/de/schwerpunkte/klimaneutrale-stadt) at national level and to Horizon Europe Mission Climate-neutral & smart cities at EU level.

Website: www.ffg.at/klimaneutrale-stadt

VIF Verkehrsinfrastrukturforschung, D-A-CH Verkehrsinfrastrukturforschung / Transport Infrastructure Research (VIF and German-Austrian-Swiss) (2012-2026)

This programme covers road and rail infrastructure research, with an annual budget of €2.4 million from the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, ÖBB Infrastruktur AG (rail) and ASFINAG (highways). It is a trilateral programme with funding also from the German and Swiss Federal authorities.

It is linked to the national Mobility Transition strategy and to the EU's Mobility Transition Pathway.

Website: www.ffg.at/dach/projekte

Mobilität der Zukunft / Mobility of the Future (2012-2021)

This deals with the mobility of people and goods, transport infrastructure and vehicle technologies, covering rail as well as road transport research. It is funded by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology. It

covers passenger and freight transport roughly equally, also with a focus on environmental and energy efficiency aspects.

Website: www.ffg.at/mobilitaetderzukunft

Vorzeigeregion Energie / Energy Model Region (2015-)

This programme covers green mobility, including H2 (hydrogen) fuel cell components and systems for fuel cell EVs, including HDVs, as well as H2 Infrastructure and CO2-free logistics.

In addition to road transport (approximately 15% of the programme), it includes green energy and industry.

It has a total programme budget of €400 million, of which €120 million is public funding from the Austrian Climate and Energy Fund, and 21 projects have been awarded.

Website: www.klimafonds.gv.at/vorzeigeregion-energie

#upperVISION2030 - Wirtschafts- & Forschungsstrategie OÖ / Upper Austria's business and research strategy (2020-2030)

This regional programme deals with connected and efficient mobility, including digital transformation, efficient and sustainable industry and manufacturing, systems and technologies for people, as well as RTR.

It is funded by the Provincial Government of Upper Austria (Oberösterreich, centred on Linz) and is closely aligned with the UN Sustainable Development Goals (SDG).

Website: www.uppervision.at/en/

3.1.2 Relation with EU level roadmaps and strategies

Key national strategies in Austria include the R&I Mobility Strategy – Mobility Transition, the Road Safety Strategy, Roadmap for Personal Mobility, Mobility of the Future and the R&I Roadmap for Automated Vehicles. There is also an overall Strategy for Research, Technology and Innovation (RTI Strategy 2030).

These are strongly aligned with EU priorities such as the EU Mobility Transition Pathway and the ITS Directive. There is strong Austrian participation in 2Zero projects under Horizon Europe (ranked fifth in Europe in terms of numbers of partners in 2Zero projects).

3.2 Belgium

As a Federal State, road transport and related research in Belgium is generally handled at the level of the three regions: Flanders, Wallonia and Brussels. National (federal) level programmes including road transport topics have existed in the past, although at present, research at national level is mostly commissioned on an ad hoc basis.

National and regionally funded RTR is relatively low in comparison to Belgian participation in EU research programmes. Transport research at federal (national) level, generally organised by Belspo, the Federal Public Planning Service Science Policy, is mostly in the aviation and space sector rather than road transport, which is a regional competence.

In addition, the three language communities (French-, Flemish- and German-speaking communities) have competence in relation to research policy for universities and higher education institutes.

In Flanders the Flemish Government merges the territorial region and the Flemish language community. In the French speaking community, the body Wallonia-Brussels International (WBI) has a Research and Innovation (R&I) Department is to support the internationalisation of players in the R&I sector in Wallonia-Brussels, for example by facilitating contact and cooperation with foreign R&I bodies, strengthening the presence and visibility of operators in the regions, facilitating scientific and technological monitoring, etc. But it does not directly commission or fund projects.

3.2.1 Key national RTR activities in Belgium

Although there are no formal road transport research programmes in Belgium, several organisations conduct nationally funded research as well as EU projects.

Flanders Make

Flanders Make is a strategic research centre for the manufacturing industry, including transportation. It was established in 2018 and currently has an ongoing government agreement from 2023 to 2027.

The main topics are technological innovations in areas such as vehicle dynamics, lightweight structures, and automation in transportation systems. It deals with electric and hybrid powertrains, smart materials, lightweight structure and clean vehicle technologies, energy efficiency and manufacturing optimisation.

Flanders Make includes the “Motion Products competence cluster” which comprises research in all kinds of moving parts in vehicles and machines.

The average annual funding for Flanders Make and affiliated university laboratories is €106 million (2023 revenues), coming from VLAIO, the Flanders government department economy, science and innovation and innovation funding agency VLAIO. Approximately 40% of this goes to the cluster ‘Motion Products’.

It is aligned with the Flemish Government’s long-term strategy Vision 2050, in particular the transition priority “Industry 4.0”, as well as EU industrial policy (net zero), smart and sustainable mobility strategy, and Europe’s digital and green Twin Transition.

Website: https://www.flandersmake.be

Mobilidata 2 Proloog

Starting in 2024, this Flemish programme works on the testing of autonomous driving and automated freight transport on highways. It has a total budget of just under half a million euro, funded by the agency VLAIO – Flanders Innovation and Entrepreneurship. The main themes covered are CCAM, safety and security, and freight transport.

It is linked to Flemish CCAM strategies and at European level to the Smart and Sustainable mobility strategy (CCAM) and the EU data strategy (EDIH, EMDS).

Website: https://www.mobilidata.be

VIL Vlaamse Logistieke Cluster / Flemish Logistics Cluster

VIL is appointed by the Flemish government as the single point of contact for its logistics sector. Its Logistics Cluster encompasses digitalisation of the Flanders logistic sector, alternative fuels, renewable energy, circular economy, multimodality, last mile delivery, data sharing, hyperloops, automated cars and ships, as well as warehousing.

It receives around €6.2 million regional project funding per year, from VLAIO, and has around nine projects.

Website: https://vil.be

Digitaal Vlaanderen / Digital Flanders

Digital platform of the Flanders Government, providing support for a wide variety of research and innovation projects.

Website: https://www.vlaanderen.be/digitaal-vlaanderen

VLEVA

This is a research platform bridging the gap between Flanders and Europe, to open up European policy to Flemish governments and civil society. This way they can promote their European interests in a timely and informed manner.

Website: https://www.vleva.eu/about-vleva-en

Flanders Innovation & Entrepreneurship (VLAIO)

VLAIO supports stakeholders to connect to EU innovation processes and financing. This network is the point of contact of the Flemish Government for all entrepreneurs in Flanders. It stimulates and supports innovation and entrepreneurship and contributes to a positive business climate that strengthens sustainable economic growth and job creation.

Website: https://www.vlaio.be

Service public de Wallonie / Wallonia Region (SPW)

The Walloon Government is responsible for roads, public transport and waterways through its directorate SPW Mobilité et Infrastructures. The directorate SPW Économie, Emploi, Recherche is responsible for research through its Department of Research and Technical Development. This department manages the support mechanisms for applied research and technological innovation, as well as calls for research projects from the Competitiveness Clusters and supports companies during their participation in federal, European and international programmes.

The clustering policy of the Walloon Region is supported by two structures: clusters and competitiveness clusters (pôles de compétitivité). The six clusters are funded to develop economic activity and promote innovative partnerships, and award project funding. Although none deal directly with road transport, two have relevance: INFOPOLE Cluster TIC, dealing

with ICT, and Le Cluster TWEED: (Technologie Wallonne Energie – Environnement et Développement Durable), dealing with green energy and sustainable development.

The competitiveness clusters are mainly supported for the implementation of investment, R&D or training projects in line with the competitive positioning strategy that they themselves have defined. There are six, with the one directly relevant to RTR being Logistics in Wallonia, while MechTech (mechanical engineering) also relevant to the road transport sector. See below for further details.

Websites: https://spw.wallonie.be and https://recherche.wallonie.be/en/home.html

Logistics in Wallonia

This competitiveness cluster is a collaborative hub for research and innovation in the field of transport, logistics, supply chain and mobility in region of Wallonia. Its members comprise many logistics actors in the region (logistics and supply chain operators, distribution centres, technology providers, infrastructure managers, research sector, training providers, etc.)

It approves projects for funding (40-80% for companies, 85% for research centres and 100% for universities) through a labelling process. Projects are associated with different research stakeholders (universities and research centres) and falling within one of the four following strategic activity areas:

- Sustainable logistics and mobility
- Intelligent and efficient means of transport
- Intelligent transport infrastructures and systems
- Efficient logistics and production processes.

It participates in the programme MultiModal Wallonia, encouraging the use of alternative and complementary modes of transport to road transport, such as river and rail, by helping companies to effectively combine different modes of transport and optimise their transport volumes. It also helps its members (transport, logistics, supply chain and mobility companies) as part of Lean & Green Europe to reduce their carbon footprint.

Website: https://www.logisticsinwallonia.be

MecaTech

This is a competitiveness cluster in the engineering sciences, focusing on advanced and circular materials, advanced design and manufacturing technologies, mechatronics and micro-technologies, and data technologies. As with Logistics in Wallonia (above) it comprises a wide membership and labels research and innovation projects for funding. Renewable energy, defence and security is also included in its scope.

Website: https://www.polemecatech.be

Brussels Capital Region / Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest

In the Brussels Capital Region, **Brussels Mobility** (Bruxelles Mobilité / Brussel Mobiliteit) manages regional mobility, including public transport, traffic management, and road

infrastructure improvements. Focuses on sustainable mobility and traffic safety. **Brussels Environment** (Bruxelles Environnement / Leefmilieu Brussel) researches and promotes sustainable development, including transportation-related environmental impact. Both these organisations are agencies of the Brussels Region (regional government), but they do not currently have any RTR programme

Innoviris finances and supports research and innovation in the Brussels-Capital Region, which are aligned with the Smart Specialization Strategy and the Regional Innovation Plan 2021-2027. Themes include digital innovation, social innovation and circular economy. Currently, one project (urbike, dealing with last-mile logistics by bicycle) falls into the RTR domain.

Websites: https://be.brussels/en/transport-mobility, https://environnement.brussels and https://www.innoviris.brussels

KEY RESEARCH PROVIDERS

Belgian Road Research Centre (BRRC / OCW / CRR)

This is an independent research centre operating at operates at the national level, serving contractors and public authorities. Its main areas of expertise and activity are geotechnics and (sub)base layers, water and roads, road surfacing (asphalt roads and other bituminous applications; concrete roads; paving), mobility, road safety, road management and the environment.

Website: https://brrc.be

VUB Mobility Research Group (MOBI)

Based at the Vrije Universiteit Brussel (VUB), MOBI is a research group dedicated to sustainable mobility solutions. It conducts research on electric vehicles, intelligent transportation systems, and mobility management.

Website: https://mobi.research.vub.be

Vlaamse Instelling voor Technologisch Onderzoek / Flemish Institute for Technological Research (VITO)

VITO is a research organisation focusing on technological innovations for sustainable development. It conducts research on renewable energy, air quality, and mobility solutions, with a focus on environmental sustainability.

Website: https://vito.be

University research in Wallonia

Université Catholique de Louvain (UCLouvain) has research expertise in transportation engineering and urban mobility, including traffic management, public transport, and sustainable mobility solutions.

Université de Liège (ULiège) has research activities in transport and mobility, including traffic flow modelling, transportation network optimisation, and the impact of transportation on the environment and society.

University research in Flanders

The KU Leuven Institute for Mobility (LIM) is an interdisciplinary research network addressing the technological developments, societal trends, and individual needs related to mobility and supply chains. LIM aims to build bridges between KU Leuven departments and to foster interdisciplinary research on mobility subjects such as transport infrastructure and public space, supply chains, and environment and health. The Universities of Ghent (UGent) and Antwerp (UAntwerpen) also conduct RTR.

The Transportation Research Institute (IMOB) at Hasselt University conducts research on various aspects of mobility and transportation, including traffic safety, sustainable mobility, and transport planning.

CeREF Technique

Formerly CERISIC (Centre de Recherches et d'Etudes Interdisciplinaires de la Sécurité Civile / Center for Interdisciplinary Research and Studies in Civil Security), this conducts interdisciplinary research on various topics related to civil security, including transportation safety and emergency management. Research domains include optimisation, telecommunications, IoT and AI.

Website: https://ceref.helha.be/technique

Brussels Studies Institute (BSI)

Conducts multidisciplinary research on urban issues in Brussels, including mobility, public transportation, and urban planning.

Website: https://bsi.brussels

Interuniversitair Microelectronica Centrum / Inter-university Micro-electronics Centre (imec)

The imec works on smart mobility automotive technologies, including advanced tailor-made chip technologies, sensor fusion (radar, lidar and camera sensors), energy efficiency, hard and software integration. Outside the RTR domain, it also covers the topics Industry 4.0, wireless network technologies, digital twins, AI and data technologies, quantum computing, physical internet for logistics, and decarbonisation.

Public funding is around €150 million per year, from the Flemish Government department Economy, Science and Innovation.

At European level, it is aligned with the Chips for Europe (Chips Act) / Chips Joint Undertaking.

Website: https://www.imec-int.com

3.2.2 Relation with EU level roadmaps and strategies

Although there are no formal research programmes in the road transport domain at federal or regional level, there are regional strategies that align with EU strategies.

In Wallonia, the Regional Mobility Strategy (Stratégie Régionale de Mobilité, SRM) includes personal (passenger) and freight transport, feeding into the FAST 2030 vision (Fluidité Accessibilité Sécurité Santé Transfert modal / Fluidity, accessibility, safety, health, modal transfer): https://mobilite.wallonie.be/home/politiques-de-mobilite/politique-de-mobilite-regionale-wallonne/strategie-regionale-de-mobilite.html

In Flanders, the Department Mobility and Public Works has transport strategies (road, water, public transport and cycling) covering four main directions:

- Road safety
- Sustainable and smooth transportation
- High-performance infrastructure
- Dealing with climate change.

This includes regional plans for cycling, sustainable logistics and clean power for transport, as well as strategies for data (Mobilidata), digital twins (BIM) and Mobility as a Service (MaaS). See: https://www.vlaanderen.be/en/mobility/flanders-together-in-motion

The Flemish digital strategy encompasses the domains of data, information security and digital services. This is prepared by Digital Flanders (https://www.vlaanderen.be/digitaal-vlaanderen), monitored by the Steering Committee for Flemish Information and ICT Policy, and ratified overall by the Flemish Government.

A brief analysis has been made of the domains of activity of the above-mentioned bodies with respect to RTR. This is in terms of a simple count of whether an institute or other body deals with a given topic or not. This gives an approximate level of interest/ importance of the sub-topics at national level.

Most of the institutes deal with urban mobility and last-mile solutions, topics closely aligned with ERTRAC's Urban Mobility roadmap, as well as smart infrastructure (including ITS). Seven of the bodies checked deal with intermodal transport and Mobility-as-a-Service (MaaS), which also aligns with ERTRAC's Urban Mobility theme. Six deal with policy and regulatory aspects, whereas lower numbers (3 or 4 each) deal with EVs, CCAM, alternative fuels, sustainable freight, V2X, data and analytics, and cyber-security.

There is strong alignment in Belgium to European roadmaps and strategies, including to CCAM, 2Zero, EMDS, EDIH and Chips JU.

3.3 Bulgaria

Transport research in Bulgaria principally covers multimodal and road transport, but with an important waterborne sector. There are no national research programmes dedicated to roads or transport in Bulgaria. However, transport has moved up the agenda priority in recent years, with the country having an Integrated Transport Strategy and a National Plan for the Development of Combined Transport in Bulgaria (both for the period up to 2030).

Research is generally determined by the Ministry of Education and Science, through the National Science Fund and the National Innovation Fund. The Ministry of Transport and Communications (https://www.mtc.government.bg) is the main body dealing with road transport matters, as well as its executive agency the Road Transport Administration. The Ministry of Regional Development and Public Works (https://www.mrrb.bg/en) is responsible for overseeing national road infrastructure projects in Bulgaria. Through its National Road Infrastructure Fund and Directorate-General for National Construction Control, it supports research into road construction, maintenance, and transport planning. Funding at state level currently focuses mostly on network management and infrastructure, complemented by EU programmes such as INTERREG and Transnational Cooperation Programmes.

Transport policy is guided by the Transport Connectivity Programme and the Environment Programme, both of which are operational programmes financed under the European Regional Development Fund (ERDF) or EU Cohesion Funds. The Transport Connectivity Programme deals primarily with infrastructure funding, including rail and waterborne, but notably includes funding for EV charging infrastructure along the national road network and at ports.

3.3.1 Key national RTR activities in Bulgaria

The National Reform Programme (NRP) was prepared in line with the Europe 2020 strategy. This programme includes transport as a critical area for development and reform.

Website: https://www.minfin.bg/en/867

Bulgaria has invested significantly in transport infrastructure. But despite these investments, the quality of infrastructure remains a challenge, highlighting the need for ongoing research and development.

KEY RESEARCH PROVIDERS

Bulgarian Academy of Sciences (БАН / BAS)

The BAS comprises 42 autonomous scientific units, including the Institute of Mechanics and the Institute of Transport. are involved in research on road transport systems, vehicle dynamics, and transportation engineering. It accounts for about half of the total scientific research in the country.

Website: https://www.bas.bg

Institute of Transportation Engineering (ИТИ / ITE)

Focuses on road and railway infrastructure design (including technical laboratories relating to, e.g., construction materials) and road safety audits.

Website: https://www.institute-tsi.com/en

Technical University of Sofia / Технически университет-София

One of the leading engineering institutions in Bulgaria, with faculties and research groups that focus on road transport engineering, traffic systems, vehicle safety, and ITS. The university also collaborates with industry and government on transport-related research.

Research groups relevant to RTR include, firstly, Mechatronics, clean technologies, circle economics and resource management, and secondly, New technologies for green energy and energy efficiency. There are also several research laboratories, e.g. Organisation and management of automobile transport.

Website: https://tu-sofia.bg/university/173

Todor Kableshkov University of Transport / Висше училище по транспорт "Тодор Каблешков"

Originally a Railway School with a military organisation, this is now a civil university covering different transport modes. It conducts research covering transport management, machinery and construction technologies in transport, and telecommunications and electrical equipment in transport.

Website: https://www.vtu.bg

The above are complemented by consultancy companies, e.g. the Transport Research Institute (TRI).

3.3.2 Relation with EU level roadmaps and strategies

Although nationally funded research into RTR is limited, and the main theme being road infrastructure and construction, some other themes mirror EU level strategies, such as traffic management and control (particularly for urban mobility solutions), road safety and accident prevention (accident analysis, vehicle safety, driver behaviour), environmental impact and sustainability, and ITS including smart roads, automation and electromobility. Transportation planning and policy, transport economics and financing, climate and resilience, public transport integration and legal and regulatory framework are other key focus areas.

3.4 Croatia

There are no national research programmes dedicated to roads or transport in Croatia, but with funding at national level mainly focused on network and traffic management and on transport infrastructure. National funding for research is provided by the Croatian Science Foundation (HRZZ). Road transport comes under the Ministry of the Sea, Transport and Infrastructure (MMPI).

The Transport Development Strategy of the Republic of Croatia (2017-2030) is a key policy document but it largely deals with infrastructure investment needs and research on capacity issues, rather than pure RTR. It does however stress the role of ITS, which is relatively well developed in Croatia, and references the country's Action Plan on the implementation of the EU's ITS Directive.

3.4.1 Key national RTR activities in Croatia

Environmental protection of infrastructure, road safety and the harmonisation of motorway toll payment systems are other key research priorities identified in Croatia. Croatia also funds lo-

gistics research, focusing on Croatia's position in this domain and reflecting the country's efforts in reconstructing and developing its transport infrastructure since gaining independence in 1991.

The National Transport Model, developed by the Croatian Ministry of the Sea, Transport and Infrastructure, analyses current transport conditions and forecasts future scenarios. It identifies bottlenecks and issues in the transport system and supports the development of strategies and measures to improve it.

Hrvatske ceste / Croatian Roads

This is a government-owned company responsible for the construction, maintenance, and management of the national road network in Croatia. It is involved in research related to road infrastructure, maintenance technologies, and sustainable development of the road network.

Website: https://hrvatske-ceste.hr

KEY RESEARCH PROVIDERS

University of Zagreb - Faculty of Transport and Traffic Sciences (FPZ)

The Faculty of Transport and Traffic Sciences at the University of Zagreb is one of the leading research institutions in Croatia for road transport and related fields. It offers programmes and conducts research in areas like road safety, traffic engineering, transport systems management, ITS, and sustainable mobility. The faculty is involved in both theoretical and applied research and collaborates on projects with national and international partners.

Website: https://www.fpz.unizg.hr/oms

Građevinski fakultet u Rijeci / University of Rijeka Faculty of Civil Engineering

Involved in research related to infrastructure, including road and transport systems. It collaborates on projects concerning road construction, maintenance, and the environmental impact of transport infrastructure.

Website: https://gradri.uniri.hr

3.4.2 Relation with EU level roadmaps and strategies

The key research domains in road transport in Croatia generally link to EU priorities, including traffic safety, ITS, environmental impact and sustainability, urban mobility and multimodal transport.

There is also a focus on infrastructure development and maintenance and on transport policy and regulation.

3.5 Cyprus

There are no national research programmes dedicated to roads or transport in the Republic of Cyprus. The Government's Innovation Fund and the Cohesion Policy Programme THALIA 2021-2027 is able to include road transport research but currently there is very little other than infrastructure improvements and local traffic studies. The National Board for Research and

Innovation defines Cyprus' R&I strategy. Key research priorities identified by the Board's National R&I Strategy, which can potentially include RTR, are communication and digital transformation.

3.5.1 Key national RTR activities in Cyprus

Institutes such as the **University of Cyprus (UCY)** carry out transport research, although largely within EU programmes. The KIOS Research and Innovation Centre of Excellence within UCY is a key actor in this respect, conducting multidisciplinary research and innovation in the area of Information and Communication Technologies (ICT), including for transport systems. KIOS develops innovative technological methods in collaboration with the Cyprus Ministry of Transport Communications and Works to achieve a more efficient monitoring and management of Cyprus' transport network, focusing on congestion, fuel use, emissions and also related area such as telecommunications, energy systems and emergency response. UCY also has a Laboratory of Transport Engineering, while the **University of Nicosia** has a Tourism & Transport Research Centre, an independent research centre in the field of sustainable tourism and transport.

3.6 Czechia

RTR in the Czech Republic is quite diverse, with Network and Traffic Management being a major area, but also with significant research in the automotive sector and in infrastructure and smart mobility/ITS.

The Innovation Strategy for the Czech Republic (2019-2030)[2] identifies technology, digitalisation and smart infrastructure as key themes where RTR can be included. Key goals include integrated public transport, ITS and smart mobility services, intermodal freight, logistics centres, alternative fuels, CCAM and smart cities.

Research at national level is largely conducted for the Ministry of Transport (MDČR) on the advice of the Research, Development and Innovation (RDI) Council.

One of the main research providers is CDV – the Transport Research Centre which is under the control of the MDČR.

3.6.1 Key national RTR activities in the Czech Republic

National RTR is primarily conducted by the Transport Research Centre (CDV).

KEY RESEARCH PROVIDERS

[2] https://vyzkum.gov.cz/FrontClanek.aspx?idsekce=867922

Centrum dopravního výzkumu / Transport Research Centre (CDV)

This institution focuses on a wide range of transport-related topics, addressing the key needs of transport development at national, regional, and local levels. Some of the main areas of research are:

- Road safety, including road safety evaluations, strategies, and in-depth road accident analysis.
- Transport infrastructure, covering construction technology, maintenance, repairs, and reconstruction of transport infrastructure, including geotechnical aspects and diagnostics of transport structures.
- Environmental Impact: studies on the impacts of transport on the environment and strategies to mitigate these impacts.
- Transport economy and multimodal transport, researching the economic aspects of transport and the integration of different transport modes to improve efficiency.
- Traffic psychology and education, including travel behaviour.
- Intelligent Transport Systems (ITS): Development and implementation of ITS to enhance traffic management and safety.
- Autonomous driving: Research on autonomous driving technologies and their integration into the existing transport system.
- Hydrogen Technologies: exploring the use of hydrogen as a sustainable energy source for transport.

CDV also operates specialised laboratories for various aspects of transport research, including environmental, psychological, and traffic accident laboratories.

Website: https://www.cdv.cz

České vysoké učení technické v Praze / Czech Technical University in Prague (ČVUT)

The Faculty of Transportation Sciences of ČVUT conducts road transport research including digital twins, applied mathematics in transport and logistics, transportation analysis, dynamic testing of materials and structures, and research using a vehicle simulator.

Website: https://www.cvut.cz/en/faculty-of-transportation-sciences

Univerzita Jana Evangelisty Purkyně v Ústí nad Labem / Jan Evangelista Purkyně University in Ústí nad Labem (UJEP)

The Faculty of Social and Economic Studies includes a transport and mobility research team, with a focus on social science and interdisciplinary aspects of sustainable mobility in cities and rural/tourist areas. Research includes transport behaviour, mobility management, strategic transport planning, promotion of public and sustainable transport modes, sustainable tourism, innovative transport services and smart technologies in transport.

Website: https://www.mobilita-ieep.cz/en/home

3.7 Denmark

Although having an advanced transport infrastructure and several leading players in the research field, nationally funded RTR is at a relatively low level compared to EU programmes and is largely ad hoc funding under different government ministries and agencies, notably the Danish Road Directorate (Vejdirektoratet). The Ministry of Higher Education and Science (Uddannelses- og Forskningsministeriet) provides the overall research framework.

In Denmark, national road research is primarily funded by several key organisations and initiatives.

The Danish Agency for Higher Education and Science oversees various funding programs for research and innovation, including those related to transport infrastructure. The National Fund for Research Infrastructure allocates significant resources to support research infrastructure projects, including those focused on transport. The Danish National Research Foundation (DNRF) funds high-level basic research across various fields, including transport research.

3.7.1 Key national RTR activities in Denmark

Although there are no formal RTR programmes in Denmark, several research and innovation institutes focus on mobility and transport.

KEY RESEARCH PROVIDERS

Danmarks Tekniske Universitet / Technical University of Denmark (DTU)

DTU is a leading technical university in Denmark with various departments conducting research related to mobility and transport. The Department of Transport focuses on research areas such as traffic engineering, transportation planning, and sustainable mobility solutions.

Website: https://www.dtu.dk

Teknologisk Institut / Danish Technological Institute (DTI)

A research and technology institute that offers consultancy and testing services across various industries, including transportation. It conducts research on topics such as alternative fuels, energy efficiency in transportation, and intelligent transportation systems.

Website: https://www.dti.dk

Syddansk Universitet / University of Southern Denmark (SDU)

SDU conducts research on transportation and mobility-related topics through its various departments, including the Department of Technology and Innovation. Research areas include electric and autonomous vehicles, sustainable transportation systems, and mobility technologies.

Website: https://www.sdu.dk

Aalborg Universitet / Aalborg University (AAU)

AAU is known for its multidisciplinary research approach and offers programs in engineering, social sciences, and humanities. The Department of Civil Engineering conducts research on transportation engineering, urban mobility, and transportation policy and planning.

Website: https://www.en.aau.dk

3.7.2 Relation with EU level roadmaps and strategies

An analysis has been made of the domains of activity of the above-mentioned bodies with respect to RTR. This is in terms of a simple count of whether an institute or other body deals with a given topic or not. This gives an approximate level of interest/ importance of the sub-topics at national level.

The main topics of interest (at least three institutes dealing with them) are electro-mobility and automated vehicles, integrated transport and MaaS, and urban mobility and last-mile solutions. Smart infrastructure, alternative fuels and data analytics also feature strongly.

3.8 Estonia

The key Estonian government organisation for all transport modes is the Republic of Estonia Transport Administration. Long-term strategies and policy priorities are determined by this administration, which was created in 2021 by merging the National Road Administration and equivalent state bodies for other transport modes.

Strategic Planning for 2021-2035 sets out the country's research strategy, with an Estonian Research Infrastructure Roadmap every 3 to 4 years. Most research funding comes from the Ministry of Economic Affairs and Communications and the Ministry of Education and Research. There is also a National Road Transport Safety Programme (2016–2025) aiming to reduce the number of road fatalities and serious injuries in traffic accidents. The Estonian Science Foundation also administers grants in order to support high-level research.

3.8.1 Key national RTR activities in Estonia

Although national and regional research programmes include road transport topics, these are mostly infrastructure assessment, feasibility studies, etc. rather than pure research.

The Estonian Transport and Mobility Master Plan is a key policy document up to 2030, with priorities including transport modelling capacity to support policy making, risk analysis, infrastructure procurement, a cautious and strategic approach to the use of Public-Private Partnerships for transport projects, user charging for transport infrastructure, and incentives for sustainable mobility and transport system efficiency.

The Fare-Free Public Transport in Tallinn (free PT For residents) has been studied extensively to understand its impacts on travel patterns, equity, and public transport usage.

Programme for Cohesion Policy Funds 2021-2027

This administers EU funding, contributing to the achievement of climate and digital goals, creating jobs, increasing competitiveness of the economy and improving quality of life. This includes fostering green and sustainable transport.

TeaMe+ programme

This is a European Regional Development Fund financed programme for popularising STEM fields (natural sciences and engineering). TeaMe+ partners include the Estonian Academy of Sciences and the Estonian Newspaper Association.

Website: https://etag.ee/en/funding/programmes/closed-programmes/science-communication-programme-teame

National Environmental Monitoring Programme

This is a programme to develop the tools necessary for the administration, publication and use of monitoring data, according to user needs.

Website: https://kliimaministeerium.ee/en/climate-and-environment-protection/environmental-monitoring

KEY RESEARCH PROVIDERS

Tallinna Tehnikaülikool / Tallinn University of Technology (TalTech)

TalTech is one of the leading institutions in transport research in Estonia. The university offers programmes in transport engineering and conducts research in areas like ITS, mobility management, transportation infrastructure, logistics, and urban transport planning. Its Institute of Transport and Logistics focuses on various aspects of transport systems, from vehicle technology to logistics and environmental impacts.

The Centre for Transport and Logistics (CTTL) at TalTech focuses specifically on issues like the future of mobility, logistics, and urban transport, and it conducts collaborative research with other European institutions. It has a strong emphasis on interdisciplinary research and sustainable transport.

Website: www.taltech.ee

Tartu Ülikool / Tartu University

Tartu University is also involved in research related to ITS, mobility data, and transport modelling. The university collaborates with other European research groups on projects related to autonomous vehicles, transportation network optimisation, and environmental impacts of transport systems.

Website: www.ut.ee

Eesti teaduste akadeemia / Estonian Academy of Sciences

While not specifically a transport research provider, the Academy supports a wide range of interdisciplinary scientific research, including studies related to transportation and infrastructure.

Website: https://www.akadeemia.ee

3.9 France

France has a highly developed national research infrastructure in the RTR domain, with a key focus on vehicle design and manufacturing. Research policy is set and coordinated by the Ministry of National Education, Higher Education and Research, but the Ministry of Ecological Transition and Territorial Cohesion (MTECT) oversees most research in the road transport sector.

The former inter-ministerial Predit research programme in land transport (Programme de Recherche et d'Innovation dans les Transports Terrestres), which ended in 2012, has been succeeded by several initiatives and changes in the French research landscape.

One of the significant changes was the transformation of the country's national research institutes into "programme agencies." This transformation aimed to streamline and better coordinate research efforts across various themes. Additionally, new research programs such as the "Networks of the Future" initiative, led by CNRS, CEA, and Institut Mines-Télécom (IMT), were launched to focus on emerging technologies like 5G.

3.9.1 Key national RTR activities in France

The key focus areas of RTR in France are:

- Road Safety: This is a major priority, with research aimed at understanding accident factors such as speed, alcohol, illegal drugs, and driver behaviour. Efforts also focus on protecting vulnerable road users and improving driver training and education.
- Intelligent Transport Systems (ITS): Research in this area includes the development of smart technologies for traffic management, vehicle-to-infrastructure communication, and automated driving systems.
- Sustainable Transport: This involves promoting electric vehicles, developing green infrastructure, and finding ways to reduce emissions from road transport.
- Infrastructure Development and Maintenance: Research focuses on using innovative materials and construction techniques to improve the durability and sustainability of road infrastructure.
- Behavioural Studies: Understanding the behaviour of road users, including factors like driver fatigue, attention, and compliance with traffic rules, is crucial for developing effective safety measures.

KEY RESEARCH PROVIDERS

Université Gustave Eiffel

This is a research centre covering civil engineering, infrastructure, urban risks and resilience, environmental impacts, digital urban systems, IoT, communication, transport systems and infrastructure (including autonomous vehicles, security, safety, etc.), mobility of people and goods, urban dynamics, etc. It incorporates the former IFSTTAR research institute focused on transport, infrastructure, urban planning, and environmental sustainability.

Institut national de l'information géographique et forestière / National Institute of Geographic and Forest Information (IGN)

While IGN primarily focuses on geographic and forest information, it also contributes to transportation research, particularly in areas related to geospatial analysis, mapping, and location-based services that are crucial for transportation planning and management.

Agence de la transition écologique / French Environment and Energy Management Agency (ADEME)

ADEME is a government agency responsible for promoting sustainable development and energy transition. It conducts research and provides support for projects related to sustainable mobility, alternative fuels, energy-efficient transportation systems, and environmental impact assessments in the transport sector.

XD ADEME (eXtreme Défi / the eXtreme Challenge) is a programme and innovation course in co-opetition whose objective is to create new travel solutions to replace the car in everyday travel in peri-urban and rural areas. It includes working groups on understanding markets, vehicle production and industrialisation, and education.

Websites: https://www.ademe.fr and https://xd.ademe.fr/

Pôle Véhicule du Futur

This is one of the main RTR programmes is the Pôle Véhicule du Futur, which enhances synergies through industrial, academic, and training actors in the domain of future vehicles and mobility, including electro-mobility, safety and CCAM.

Website: https://www.vehiculedufutur.com

EVE – Engagements Volontaires pour l'Environnement / Voluntary Commitments for the Environment

This is a programme of actors in the logistics chain and passenger transport. It provides methodological support for companies in their policy of reducing their greenhouse gas and pollutant emissions. There is a promotion of synergy between all actors in the logistics chain and transport in order to strengthen the effectiveness of actions to control fossil energy consumption.

Website: https://www.eve-transport-logistique.fr

Ecole des Ponts et Chaussées

This is one of six prestigious French engineering Schools which are part of the Institut Polytechnique de Paris. The research carried out by this School focuses on four main socio-economic issues: City and mobility systems, Management of risks, resources and milieus, Industry of the future, and Economy, practices and society.

Website: https://ecoledesponts.fr

IFP Energies nouvelles (IFPEN)

IFPEN is a major research and training player in the fields of energy, transport and the environment. From research to industry, it focuses on technological innovation to increase energy efficiency, reduce CO2 and pollutant emissions and improve the environmental footprint of industry and transport, while meeting the global demand for mobility and energy.

Website: https://www.ifpenergiesnouvelles.com

Fabrique des Mobilités

This is an association that brings together actors in order to build solutions together that meet the challenges of ecological and social transition. It works around mobility, providing support and advice, and also operational participation (projects, digital/technical development, dissemination). Areas of activity include car-pooling, mobility accounts and mobility diagnostics.

Website: https://lafabriquedesmobilites.fr/

Most other ongoing programmes are on a **regional** basis, with the reorganisation of French regions in 2016 (reduced in number from 22 to 13 in mainland France) having been accompanied by greater powers for these new larger regions, including in the area of scientific research. Many regional programmes are supported by the European Regional Development Fund and/or the European Social Fund.

3.9.2 Relation with EU level roadmaps and strategies

France has several key road research roadmaps and initiatives aimed at enhancing its transport infrastructure and sustainability. These include:

- National Research Infrastructure Roadmap: This comprehensive strategy, published by the Ministry for National Education, Higher Education, and Research, outlines the priorities and goals for national research infrastructures, including transport and road research.
- French Road Safety Observatory (ONISR): This observatory provides detailed data and analysis on road safety, including accident rates, fatalities, and safety measures. It plays a crucial role in informing road safety policies and research.
- 2030 Agenda for Sustainable Development: France's roadmap for the 2030 Agenda includes goals related to sustainable transport and infrastructure. This roadmap emphasizes ecological and sustainable development, aligning with broader European and global sustainability goals.

3.10 Finland

Research in Finland follows the National Roadmap for Research, Development and Innovation (RDI) adopted in 2020, as well as the National Transport Plan (2021-2032).

The main levels of research funding are firstly the Parliament and national government (at high level), secondly the ministries, including the Ministry of Education and Culture, the Ministry of Transport and Communications and the Ministry of Economic Affairs and Employment. Then the R&D funding agencies are the Academy of Finland, the Research Council of Finland (Suomen Akatemia) and Tekes (the Finnish Funding Agency for Technology and Innovation).

3.10.1 Key national RTR activities in Finland

RTR in Finland covers the following major areas:

- **Road Safety**: This is a major focus, with efforts aimed at reducing road traffic accidents and improving overall safety. Research includes studying accident causes, developing safety measures, and implementing new technologies to enhance road safety.
- **Intelligent Transport Systems (ITS)**: Finland is investing in ITS to improve traffic management and efficiency. This includes the use of smart technologies for traffic monitoring, vehicle-to-infrastructure communication, and automated driving systems.
- **Sustainable Transport**: Research in this area focuses on reducing the environmental impact of road transport. This includes promoting electric vehicles, developing green infrastructure, and finding ways to reduce emissions.
- **Infrastructure Development and Maintenance**: This involves the use of innovative materials and construction techniques to improve the durability and sustainability of road infrastructure. Research also looks at optimizing maintenance practices to extend the lifespan of roads.
- **Road Weather Conditions:** Given Finland's challenging weather conditions, research is conducted on how different weather scenarios affect road safety and infrastructure. This includes studying the impact of snow, ice, and temperature variations on road surfaces.

Uudistuva ja osaava Suomi / Innovation and Skills in Finland

This programme forms the main tool for long-term development of Finland's regions and focuses on Just Transition, a smarter Europe, enhancing research and innovation, digitisation, energy efficiency, climate change and the environment, circular economy, connectivity and sustainable transport.

Website: https://rakennerahastot.fi/en/innovation-and-skills-in-finland-2021-2027

Väylävirasto / Finnish Transport Infrastructure Agency (FTIA)

FTIA is responsible for the planning, construction, and maintenance of Finland's transport infrastructure, including roads, railways, and waterways. It conducts research and development activities related to transportation infrastructure, traffic management, and sustainable transportation solutions.

Website: https://vayla.fi/en/frontpage

KEY RESEARCH PROVIDERS

Teknologian tutkimuskeskus VTT

VTT – Technical Research Centre of Finland Ltd – is the largest multidisciplinary research organisation in Finland and one of Europe's leading research institutions. It is owned by the Finnish state and conducts research in various fields, including transportation and mobility. VTT's research addresses topics such as intelligent transportation systems, electric and autonomous vehicles, sustainable mobility solutions, battery technologies, hydrogen technologies and fuel cells, vehicle emissions, road safety, smart cities and impact assessment.

Website: https://www.vttresearch.com

Tampereen yliopisto / Tampere University

Tampere University hosts the Smart and Sustainable Transport and Logistics Centre of Excellence, which focuses on research and innovation in smart transportation systems, urban mobility, intelligent transport infrastructure, and Mobility-as-a-Service (MaaS) solutions.

Website: https://www.tuni.fi/en/research/smart-and-sustainable-transport-and-logistics-sstl

Aalto-yliopisto / Aalto University

Aalto University's Department of Built Environment conducts research in transportation planning, traffic engineering, urban mobility, and sustainable transportation systems. Researchers at Aalto University collaborate with industry partners and government agencies to address transportation challenges and develop innovative solutions.

Website: https://www.aalto.fi/en/department-of-built-environment

Turun yliopisto / University of Turku

The University of Turku has several research infrastructures including a Logistics and Transport Research Group. This group focuses on developing new information and operating environments, as well as new transport models. The University is also part of the Finnish project CLIMATE-NUDGE which applies behavioural sciences, especially nudge theory, to help individuals to make climate friendly decisions.

Website: https://www.utu.fi

LUT-yliopisto / LUT University

LUT, a technology university in Lappeenranta, is a leading expert of electrification. It works to harness the most recent research data for corporate use. It works in energy systems, digital design and manufacture of machinery and equipment. In cooperation with ABB, its activities focus on demanding, long-term research and product development activities related to electric machinery, electric drives and energy-efficiency.

Website: https://www.lut.fi

3.10.2 Relation with EU level roadmaps and strategies

Intermodal transport (including MaaS) is dealt with by all the main research providers in Finland. Electric and Automated vehicles, smart infrastructure, urban mobility and freight transport are also widely covered. VTT, as the state technical research centre, is active in all areas of transport and mobility research. Finnish research is strongly aligned to European roadmaps and strategies, including all ERTRAC roadmaps.

3.11 Germany

RTR in Germany is highly developed but also widely distributed across numerous programmes and funding streams, including at regional (Länder / federal states) level. There is a strong focus on CCAM, electrification and network management. The Future Strategy for R&I (Zukunftsstrategie Forschung und Innovation) directs overall policy at Federal level. The Climate Action Plan 2050, indicating the principles and goals of the German government's climate policy also includes concrete measures for climate action and mobility.

3.11.1 Key national RTR activities in Germany

Digitalisierung kommunaler Verkehrssysteme / Digitalisation of municipal transport systems

This programme of the Federal Ministry for Digital and Transport (BMDV) runs from 2018 to 2026 and covers digital and automated mobility solutions, public transport (e-tickets, on-demand services), digital infrastructure, ITS, traffic management and multimodal transport. This programme is not strictly speaking research related, but also covers the deployment of digitalisation in municipal transport systems. Public funding over the entire programme duration is €750 million and it is estimated that around 20% of this covers purely road transport topics but a much greater portion includes road together with other modes, including multimodal digital solutions. Funding is provided to German municipalities and their associated mobility companies and is focused on implementation of digital mobility solutions rather than pure research.

The breakdown of this programme by ERTRAC theme is shown in Figure 1.

The DkV programme is linked to the national strategies and programmes for clean air and climate protection (Sofortprogramm "Saubere Luft" and Klimaschutzprogramm). At EU level, it is linked to the Clean Air Directive.

Website: https://www.bmdv.bund.de/dkv

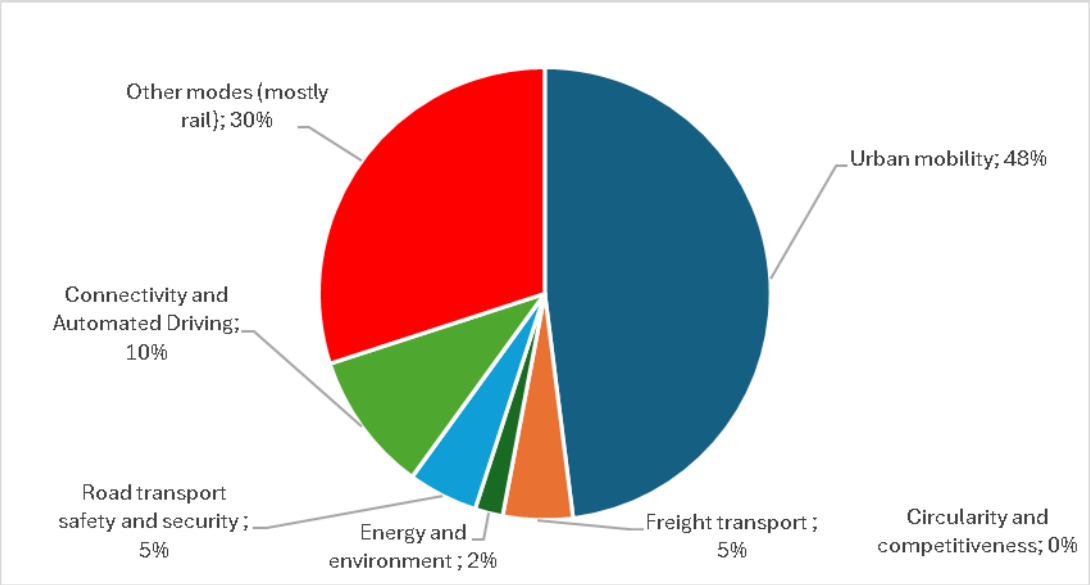


Figure 1: German DkV programme (Digitalisation of municipal transport systems): Split of projects by theme

Autonomes und vernetztes Fahren in öffentlichen Verkehren / Autonomous and connected driving in public transport

The programme of the Federal Ministry for Digital and Transport is intended to promote application-oriented research projects in the field of autonomous and networked driving in road traffic, including consideration of interfaces with other modes of transport. The projects contribute to an increase road safety and to the efficient and emission-reduced mobility as well as societal inclusion and broader acceptance of autonomous and connected mobility. A related "Handbook with suggestions for implementation in municipal practice" for autonomous driving in public transport has been published under the Urban Transport Research Program (FoPS - https://fops.de/).

Website: https://bmdv.bund.de/SharedDocs/DE/Artikel/StV/Strassenverkehr/foerili-autonomes-fahren.html

mFUND – Modernitätsfonds / Modernisation fund

This programme of the Federal Ministry for Digital and Transport, supports R&D of digital data-based applications for the mobility of the future since 2016. mFUND provides funding and supports networking between actors from politics, industry and research as well as access to BMDV data portals. Topics include data access, data-based application, data governance.

mFUND has two main funding lines: the first being an open call for smaller research projects, preliminary studies as well as developments of project proposals with a focus on data, up to two years and maximum €200k. The second funding line specifically supports applied research and experimental development.

Website: https://bmdv.bund.de/DE/Themen/Digitales/mFund/Ueberblick/ueberblick.html

NIP - Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie Phase II / National Innovation Programme Hydrogen and Fuel Cell Technology Phase II

The Federal Ministry for Digital and Transport (BMDV) supports projects in hydrogen and fuel cell technology across road, rail, water, and air transport, as well as special applications. Funding is provided for open-technology individual or collaborative projects focused on demonstrating, innovating, and preparing vehicle technologies, systems, and the necessary fuel infrastructure for market readiness.

Website: https://www.bmwk.de/Redaktion/DE/Wasserstoff/Foerderung-National/0040-brennstoffzellen.html

Maßnahmen zur Entwicklung regenerativer Kraftstoffe / Measures for the development of renewable fuels

This programme of the Federal Ministry for Digital and Transport (BMDV) focuses on developing regenerative fuels for heavy duty traffic and special vehicles as well as technologies for the production of these fuels. It runs from 2021 to 2026 with a total budget of approximately €131.5 million, 89% of which comes from public funding. A total of 19 projects have been awarded.

In addition to road transport (which accounts for around 12% of the programme), it covers the development of regenerative fuels for aviation and shipping, as well as accelerating technology and innovation transfer to advance innovative production processes for advanced biofuels and electricity-based fuels.

It is linked to the national strategy for climate protection (Klimaschutzprogramm) and the Mobility and Fuel Strategy (Mobilitäts- und Kraftstoffstrategie, MKS).

Website: https://erneuerbarekraftstoffe.de

Neue Fahrzeug- und Systemtechnologien / New vehicle and system technologies

This programme of the Federal Ministry for Economic Affairs and Climate Action (BMWK) aims to strengthen innovation and competitiveness of the German automotive industry. In diverse projects, manufacturers, suppliers, IT companies and research institutions are developing new vehicle technologies with a high degree of application relevance. Focus is on progress in automated, networked, energy-efficient and at the same time low-emission driving on roads and railways, innovative concepts for drive trains as well as system technologies that focus on the entire automotive industry with different topics. The pre-competitive cooperation creates the basis for the future application of the technologies in products and processes in the automotive industry.

Website: https://www.bmwk.de/Redaktion/DE/Textsammlungen/Technologie/fahrzeug-und-systemtechnologien.html

IKT für Elektromobilität: wirtschaftliche E-Nutzfahrzeug-Anwendungen und Infrastrukturen / ICT for electromobility: economical e-commercial vehicle applications and infrastructures

The Federal Ministry for Economic Affairs and Climate Action (BMWK) supports projects on economic e-commercial vehicle applications and infrastructures. Funding focuses on ICT-

based system approaches linking commercial electromobility with advanced energy, logistics, and property infrastructures, as well as automated passenger and cargo concepts, vehicle communication and data platforms, new charging solutions for heavy e-commercial vehicles, and ICT-based hydrogen and fuel cell applications.

Website: https://www.foerderdatenbank.de/FDB/Content/DE/Foerderprogramm/Bund/BMWi/e-nutzfahrzeug-anwendungen-infrastrukturen.html

Forschung und Entwicklung im Bereich der Elektromobilität / Research and development in the field of electromobility

The Federal Ministries for Economic Affairs and Climate Action (BMWK) and for the Environment (BMUV) support research and development projects on electromobility. Funding focuses on field trials in specific vehicle segments, pilot studies on the environmental and climate impacts of automated electric vehicles, improving charging convenience and infrastructure utilization, ecological standards for market introduction, resource availability and recycling, and strengthening value chains in electromobility production. Website: https://www.foerderdatenbank.de/FDB/Content/DE/Foerderprogramm/Bund/BMWi/forschung-entwicklung-elektromobilitaet.html

Erneuerbar Mobil - Richtlinie zu einer gemeinsamen Förderinitiative zur Förderung von Forschung und Entwicklung im Bereich der Elektromobilität / Renewable Mobil - Directive on a joint funding initiative to promote research and development in the field of electromobility

This programme, funded by the Federal Ministry of Economic Affairs and Climate Action (BMWK), runs from 2021 to 2024 and aims is to achieve the greatest possible leverage in terms of greenhouse gas savings. This currently applies to road-based heavy goods transport sector, among others. It has an average annual budget of €20 to 30 million, with around ten projects awarded per year.

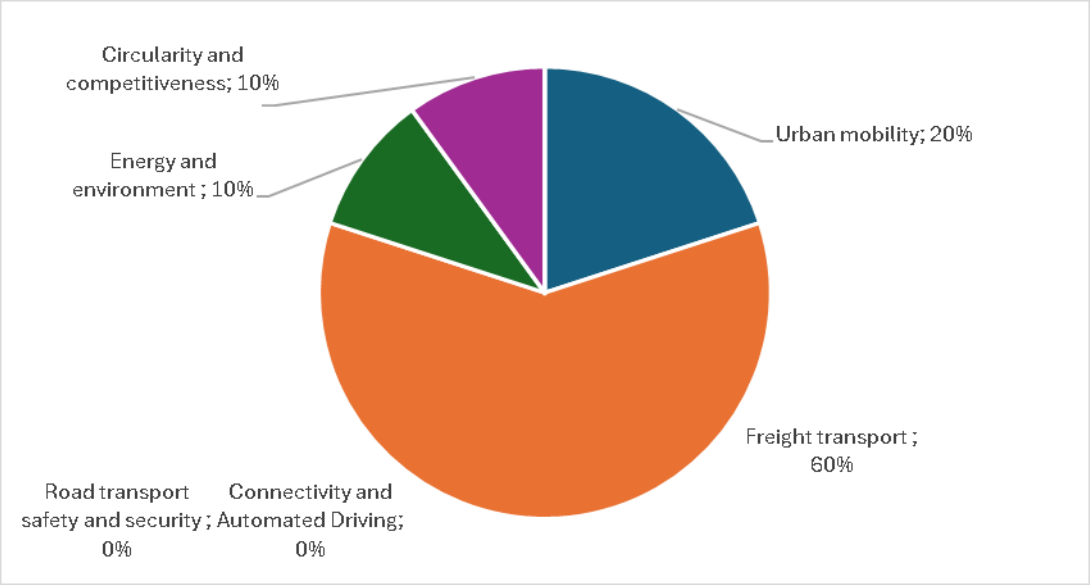


Figure 2: German Erneuerbar Mobil programme (Renewable Mobil): Split of projects by theme

Erneuerbar Mobil is linked to the national climate protection strategy (Klimaschutzprogramm).

Forschung und Entwicklung an Batterietechnologien für technologisch souveräne, wettbewerbsfähige und nachhaltige Batteriewertschöpfungsketten / Research and development of battery technologies for technologically sovereign, competitive and sustainable battery value chains

The Federal Ministry of Education and Research (BMBF) supports research and development on new battery cell technologies across the entire value chain, including processes and production tools. Funding is available for projects that address one or more of the following focus areas:

The first focus area is material and production process research, which involves developing manufacturing and processing methods for battery materials and the auxiliary substances used in these processes. The second area is scaling and digitalization, which focuses on research to develop scalable, series-production-ready processes or process steps. The third focus area is resource-efficient battery cycles and raw material security, supporting projects that improve recycling processes, design battery cells optimized for recycling, recover critical raw materials, and reuse secondary raw materials. The fourth area is promising future technologies, which includes the development of solid-state batteries, sodium-ion batteries, and other alternative battery technologies. Finally, the fifth focus area is the battery research ecosystem, which aims to connect stakeholders along the value chain in Germany, Europe, and internationally to establish a sustainable, competitive, and technologically advanced battery value chain.

KMU-innovativ: Elektronik und autonomes Fahren/High Performance Computing / SME-innovative: Electronics and autonomous driving/high performance computing

The Federal Ministry of Education and Research (BMBF) supports high-risk projects in the fields of electronics, autonomous driving, and high-performance computing. Funding is available for technology-agnostic, application-oriented research led by industry, including pre-competitive development projects. Projects must be significant for the future market positioning of participating small and medium-sized enterprises (SMEs).

The BMBF provides support for individual projects by SMEs as well as collaborative projects involving one or more SMEs, universities, research institutions, and local authorities. Potential application areas include mechanical and plant engineering, automation technology, the electrical industry, ICT, medical technology, energy technology, automotive electronics, including autonomous and connected driving, and high-performance computing..

Website: https://www.foerderdatenbank.de/FDB/Content/DE/Foerderprogramm/Bund/BMBF/kmu-innovativ-elektronik-autonomes-fahren-bund.html

KEY RESEARCH PROVIDERS

In addition to the above programmes, a wide range of **research providers** exist in Germany. The following lists a small selection of the main research institutes active in the RTR field. There are many others with activities in this field, including also private companies.

DLR (German Aerospace Center) is Germany's national research centre for aviation and space exploration. In the field of mobility and transport, it conducts research on aviation, aerospace engineering, transportation systems, and sustainable mobility solutions.

Fraunhofer Gesellschaft includes several institutes involved in RTR. One of the key ones is Fraunhofer Institute for Transportation and Infrastructure Systems (Fraunhofer IVI), which specialises in applied research in transportation and infrastructure systems. Its focus areas include traffic management, intelligent transportation systems, sustainable mobility, and alternative fuels.

The Institute for Mobility Research (ifmo) is a research institute associated with the BMW Group, dedicated to mobility research. It conducts interdisciplinary research on future mobility trends, such as electric vehicles, autonomous driving, urban mobility solutions, and digitalization in transportation.

The Urban Electric Mobility Initiative (UEMI) is a key research actor in creating cleaner, more equitable cities through electric transportation solutions.

The German Research Center for Artificial Intelligence (DFKI) is the leading research institute in the field of artificial intelligence in Germany. While not solely dedicated to mobility and transport, it conducts research on AI applications for transportation systems, including autonomous vehicles, traffic management, and predictive maintenance.

Very relevant academic RTR is also done by several (technical) universities, including those of TU Munich, RWTH Aachen, TU Braunschweig, TU Dresden, TU Darmstadt, University Stuttgart and KIT Karlsruhe.

3.11.2 Relation with EU level roadmaps and strategies

The automotive industry is a key player in the German research ecosystem, with a major focus being on EVs and automated vehicles as well as innovative vehicle technologies and the integration into the transport system, hence alignment with 2Zero and CCAM Partnership as well as Chips JU and DUT Partnership have key priorities.

3.12 Greece

Greek R&I in road transport at the national level is quite modest compared to the active and high profile of the country’s research providers in EU-funded RTR. Main themes at national level are network and traffic management, smart mobility/ITS and logistics solutions. Greece has a National Strategy for Research, Technological Development and Innovation (RTDI Strategy) and RTR is also guided by the National Transport Plan for Greece (2019) which provides the basis for sustainable transport infrastructure and service development in the country over the medium (2027) to long-term horizon (2037). Other sectoral plans guide also RTR activities like the Greek National Road Safety Plan and the National Strategic Plan for Greek Ports.

The Greek Ministry of Infrastructure and Transport (YME) plays a key role in shaping transport policies, conducting studies, and fostering innovation in the transport sector. It also works in collaboration with research institutions and private sector organisations on projects related to road safety, rail infrastructure, public transport, and digitalisation.

Greece has a Transport Programme which includes investments in sustainable urban transport, the rail network and the main road network, multimodal transport, continental and island connectivity, and transport safety. However this is oriented toward infrastructure development rather than applied research.

3.12.1 Key national RTR activities in Greece

During the last decade, transport research was always one of the main pillars of the various research programmes issued by the General Secretariat for Research and Innovation. These research programmes funded several RTR projects, which were mostly cooperations between research/academia and the industry, with focus on applied research and in some cases on transport research infrastructure. National research funding was significantly increased after 2020. These RTR projects focused on the following topics:

- **Road Safety**: This is a major focus, with efforts aimed at reducing road traffic fatalities and injuries. The National Technical University of Athens (NTUA) has a dedicated Road Safety Observatory that conducts extensive research on factors contributing to road accidents and effective prevention strategies.
- **Traffic Management: Research** in this area includes the development of advanced traffic management systems to optimize traffic flow and reduce congestion. The Traffic Engineering Laboratory at NTUA is heavily involved in this field.
- **Intelligent Transport Systems (ITS)**: Greece is investing in ITS to enhance the efficiency and safety of road transport. This includes the use of smart technologies for traffic monitoring and management. ITS Hellas together with the Institute of Communication and Computer Systems (ICCS) of NTUA and the Hellenic Institute of Transport (HIT, within CERTH) play a pivotal role in national and European research.
- **Sustainable transport**: Research is being conducted by several public and private entities to promote sustainable transport solutions, such as the integration of electric vehicles, shared mobility schemes and the development of green infrastructure.
- **Infrastructure Development and Maintenance**: includes the use of innovative materials and construction techniques to improve the durability and sustainability of road infrastructure, which are tested and used by the motorways concessionaires.

KEY RESEARCH PROVIDERS

Centre for Research and Technology Hellas (EKETA / CERTH)

CERTH is a multidisciplinary research centre conducting research on a variety of transport-related topics. Research projects cover topics such as autonomous vehicles, urban mobility solutions, smart grids, and the integration of new technologies into transportation infrastructure. The **Hellenic Institute of Transport (HIT)** is part of CERTH and focuses on applied research in the transport sector, including the development of ITS, freight and logistics optimisation, road safety, and sustainable mobility.

Websites: www.certh.gr and www.hit.certh.gr

National Technical University of Athens (ΕΜΠ / NTUA)

NTUA is one of Greece's leading institutions in transport research. The university's Department of Transportation Engineering is involved in research on various aspects of transportation, including road safety, traffic management, sustainable mobility, and ITS. NTUA is also a key player in European transport research projects and often collaborates with other universities and research institutions globally. The Institute of Communication and Computer Systems (ICCS) is affiliated with NTUA and conducts research on smart mobility, ITS, and the integration of advanced technologies in transportation systems.

Websites: www.ntua.gr and https://www.iccs.gr

Aristotle University of Thessaloniki (ΑΠΘ / AUTh)

AUTh is involved in a wide range of transport research, particularly in the areas of traffic engineering, transportation planning, transportation safety, and infrastructure. The university collaborates with national and international research projects on sustainable transport and logistics. The Transport Systems Research Group at AUTh focuses on transport system modelling, optimisation of traffic flows, and public transport planning. The Laboratory of Applied Thermodynamics is active in research into thermodynamics, internal combustion engines, pollution control technology and greenhouse gas reduction technologies in transport.

Websites: www.auth.gr, https://tsrg.gr and https://lat.eng.auth.gr

University of Piraeus (ΠΠ / UP)

While the University of Piraeus has a strong emphasis on maritime transport research, it also has a Research Centre for Transportation and Logistics. This works on projects related to logistics and supply chain optimisation.

Websites: www.unipi.gr and https://www.kep.unipi.gr

University of Thessaly (ΠΘ / UTh)

The Department of Planning and Regional Development of UTh focuses on urban transport planning, mobility studies, and the development of sustainable and smart transportation systems in urban areas. Research at the institute addresses issues such as traffic congestion, public transport optimisation, and urban mobility policies.

Websites: https://www.uth.gr, http://www.prd.uth.gr/en/

University of Macedonia (ΠΜ / UoM)

The University of Macedonia's University Research Institute of Applied Economics and Social Sciences includes research on transport economics, logistics and ITS. Research in this institute is also oriented towards improving efficiency in freight transport and public transportation systems.

Website: www.uom.gr

3.13 Hungary

Road transport research takes a smaller place in Hungary than some other modes such as aviation and multimodal transport.

Hungary has a long-term national transport strategy including a Platform for Road Transport and a Transport Development Plan, as well as an ITS Strategy.

The Ministry for Innovation and Technology plays a significant role in promoting and funding research initiatives in transport and infrastructure development in Hungary. The National Transport Authority (NKH) is a government agency, responsible for road, railway, aviation and water transport.

The Hungarian government supports transport research through various national programmes and initiatives. Key documents like the New Hungary Development Plan and the Research, Development and Innovation Strategy of Hungary (2021-2030) outline the priorities and funding allocations.

3.13.1 Key national RTR activities in Hungary

The main focus area in Hungary are:

- **Autonomous Vehicles**: The RECAR (Research Centre for Autonomous Road Vehicles) is a significant initiative in Hungary. It focuses on developing and testing autonomous vehicle technologies, with collaboration between academic institutions and industry partners. Website: https://recar.bme.hu/eng
- **Intelligent Transport Systems (ITS)/Smart mobility**: Research aims to improve the efficiency and safety of road transport through the use of advanced technologies. This includes network and traffic management systems, smart infrastructure, and vehicle-to-everything (V2X) communication.
- **Sustainable Transport**: Efforts are being made to develop more sustainable road transport solutions, including the promotion of electric vehicles, the development of green infrastructure, and the reduction of emissions from road transport.
- **Road Safety**: Enhancing road safety through better road design, improved traffic regulations, and the use of new technologies to prevent accidents is a key research area.
- **Infrastructure Development and Maintenance**: Research is also focused on the development and maintenance of road infrastructure, including the use of new materials and construction techniques to extend the lifespan of roads and reduce maintenance costs.

KEY RESEARCH PROVIDERS

Hungarian Institute for Transport Sciences and Logistics (KTI)

KTI is the leading research institute in Hungary dedicated to transport science and engineering. It conducts extensive research and provides consultancy services in areas like road transport, logistics, urban mobility, infrastructure planning, and transport safety. Focus areas are road safety, traffic management, environmental impact, sustainable transport, vehicle technology, and ITS.

Website: https://www.kti.hu/en

Budapesti Műszaki és Gazdaságtudományi Egyetem / Budapest University of Technology and Economics (BME)

BME is one of Hungary's top technical universities, with a significant focus on transport research through its Department of Transport Economics and Logistics. The department conducts research on various aspects of road transport, including transportation systems, logistics, traffic modelling, sustainable urban mobility and transport policy.

Website: https://www.bme.hu/en

Magyar Tudomány Akadémiai / Hungarian Academy of Sciences (MTA)

The MTA Centre for Economic and Regional Studies conducts interdisciplinary research, including in the field of transport. Their research on transportation focuses on regional development, infrastructure networks, and transport systems in Hungary. It focuses on infrastructure development, regional transport planning, economic impacts of transportation, and sustainability.

Websites: https://mta.hu/english, http://www.rkk.hu/en

SZTAKI / HUN-REN Institute for Computer Science and Control

SZTAKI is a major research institute in Hungary that focuses on applied research in areas such as robotics, automation, and ITS. It is involved in developing solutions for automated driving, traffic management systems, and smart mobility infrastructure.

Website: https://sztaki.hun-ren.hu/en

Pannon Egyetem / University of Pannonia

Pannon University in Veszprém also conducts research in transport and infrastructure, particularly focusing on sustainable transport solutions and regional transport network planning.

Website: https://www.gtk.uni-pannon.hu/en/research-centre/

3.14 Ireland

Ireland does not have specific transport research programmes but has several State agencies which commission research on an ad hoc basis, as well as research providers. It has a Research and Innovation Strategy named Impact 2030 and a National Sustainable Mobility Policy which aims to deliver at least 500 000 additional daily active travel and public transport journeys by 2030.

3.14.1 Key national RTR activities in Ireland

Road Transport Research in Ireland is principally carried out by Government Agencies (notably Transport Infrastructure Ireland and the National Transport Authority). The remainder is generally carried out by university institutions with ad-hoc government funding or as part of EU-funded projects.

NATIONAL GOVERNMENT BODIES

TII - Transport Infrastructure Ireland / Bonneagar Iompair Éireann

TII is responsible for managing and developing Ireland's national road network. They operate a research programme to support evidence-based decision-making, develop innovative solutions, and improve the efficiency and safety of road transport.

Website: https://www.tii.ie/technical-serveices/research

Main themes:

- Materials
- Standards and specifications
- Environment/Sustainable construction
- Safety
- Value for money
- Transportation and land use
- Heritage

NTA - National Transport Authority / Údarás Náisiúnta Iompair

Website: https://www.nationaltransport.ie/planning-and-investment/transport-modelling/research-and-publication/

SEAI - Sustainable Energy Authority of Ireland / Údarás Fuinnimh Inmharthana na hÉireann

While not focused solely on road transport, the SEAI conducts research and development activities related to sustainable energy, including transportation. Their work encompasses areas such as electric vehicles (EVs), alternative fuels, energy-efficient transport, and renewable energy integration into transportation systems.

Website: https://www.seai.ie/grants/research-funding/research-development-and-demonstration-fund

KEY RESEARCH PROVIDERS

University College Dublin / An Coláiste Ollscoile, Baile Átha Cliath (UCD)

The Transport Research Hub (TREAH) at UCD is involved in various research initiatives related to road transport, particularly in the context of smart and sustainable cities. The Smart Dublin Transport project focuses on using data analytics and technology to optimize traffic management, reduce congestion, and enhance transportation efficiency.

Website: https://transportresearchhub.ucd.ie

Insight Centre for Data Analytics

The Insight Centre, with locations at multiple Irish universities, conducts research in data analytics across various domains. They collaborate with industry partners on projects related to transportation and mobility, utilising data-driven approaches for optimizing traffic flow, improving road safety, and enhancing transport operations.

Website: https://www.insight-centre.org

National University of Ireland Galway / Ollscoil na Gaillimhe (NUIG)

NUIG's Ryan Institute conducts interdisciplinary research in areas such as transportation planning, sustainable mobility, and transport policy. They explore topics like active travel (walking and cycling), public transport, infrastructure development, and transport behaviour.

Website: https://www.universityofgalway.ie/ryaninstitute

University College Cork / Coláiste na hOllscoile Corcaigh (UCC)

UCC's Environmental Research Institute (ERI) conducts research on sustainable transport, including road transport, with a focus on exploring environmentally friendly solutions and reducing the environmental impacts of transportation. Their work encompasses aspects like emissions reduction, low-carbon transport options, and integrated transport planning.

Website: https://www.ucc.ie/en/eri

Trinity College Dublin / Coláiste na Tríonóide

TRIP - The Trinity Centre for Transport Research and Innovation for People, is an interdisciplinary centre working on research on a range of RTR topics: electric vehicles, cycling, environmental impacts of transport, reducing traffic congestion, health impacts of transport, quality of life, and safety.

Website: https://www.tcd.ie/transport-research/

3.14.2 Relation with EU level roadmaps and strategies

Currently ongoing projects that have been identified in the above programmes and institutions contribute to the following ERTRAC themes:

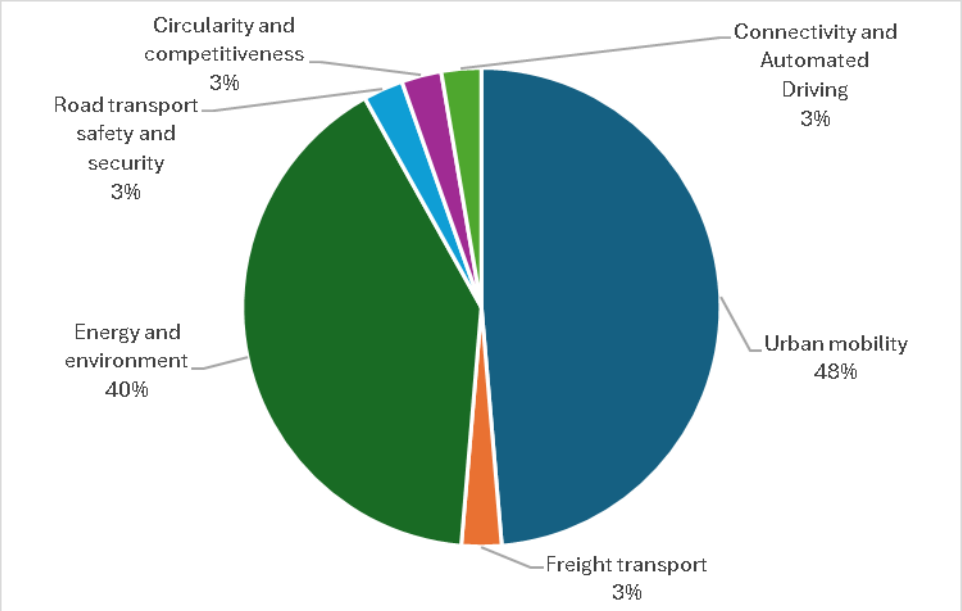


Figure 3: Ireland: Split of identified current national RTR projects by theme

3.15 Italy

Italy is a major participant in EU transport and mobility research programmes. At national level, there is a National Research Programme (2021-2027) including nine system priorities at a general level (governance, internationalisation, knowledge management, etc.)

The Ministry for Education, University and Research (MIUR) coordinates national and international scientific activities, including providing funding to research providers. The Ministry of Infrastructures and Transport (MIT) determines policy for RTR.

3.15.1 Key national RTR activities in Italy

The main research areas in Italy are:

- **Sustainable Mobility**: Italy is investing heavily in green local transportation and rapid mass transportation. The National Recovery and Resilience Plan (PNRR) allocates about 8.4 billion euros to these initiatives.
- **Road Safety**: A major goal is to achieve zero road accident victims by 2050. This includes implementing stricter regulations and fines for dangerous behaviour, improving vehicle inspections, and ensuring roads are accessible to everyone.
- **Innovation and Research**: Italy is focusing on innovation in transport technologies to reduce dependence on imports and enhance local capabilities. This includes research into new materials, smart infrastructure, and sustainable practices.
- **Digital Infrastructure**: Enhancing digital infrastructure to support intelligent transport systems (ITS) and improve traffic management and safety.
- **Energy Efficiency**: Improving the energy efficiency of transport systems and integrating renewable energy sources into the transport infrastructure.

The key national research structure in Italy is MOST (see below). ENEA is a key government agency and CNR is a key public research institution. Several other organisations in the academic and research sector contribute to national RTR in Italy.

Centro Nazionale per la Mobilità Sostenibile / National Centre for Sustainable Mobility (MOST)

MOST was formed in 2023 and brings together 24 universities and research centres and 24 private companies to plan and conduct research activities in the domains of sustainable road vehicles (including light vehicles), making the mobility system greener and digitalising its management. It includes lightweight solutions, electric and hydrogen propulsion systems; digital systems for the reduction of accidents; more effective solutions for public transport and logistics; a new model of mobility as a service, accessible and inclusive.

MOST is organised in a dynamic Hub and Spoke model, with 14 Spoke Leaders who, in their interaction, foster cooperation with the national and local ecosystem. While the MOST Hub performs coordination functions, defines strategic lines, promotes transversal initiatives, collects market inputs, directs projects and promotes startup intelligence initiatives, the Spokes develop research programmes at a high TRL (Technology Readiness Level). The Spokes cover different topics as follows: 1. Air mobility; 2. Sustainable road vehicles; 3. Waterways; 4. Rail transport; 5. Light vehicles and active mobility; 6. Connected autonomous vehicles; 7.

CCAM and smart infrastructure; 8. MaaS and innovative services; 9. Urban mobility; 10. Logistics and freight; 11. Innovative materials and lightweighting; 12. Innovative propulsion; 13. Electric traction system and batteries; and 14. Hydrogen and new fuels.

Over the three-year period 2023 to 2025, MOST has a total budget of €378 million, with the main public funder being the Ministry of Universities and Research (MUR).

Website: https://www.centronazionalemost.it

Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile / Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)

ENEA is a government agency responsible for research and innovation in various fields, including transportation and mobility. It conducts research on alternative fuels, electric vehicles, sustainable transportation systems, and energy-efficient mobility solutions.

Website: https://www.enea.it

KEY RESEARCH PROVIDERS

In Italy R&D providers in the road transport sector include a considerable number of private and public stakeholders. When referring to the MOST National Centre for Sustainable Mobility, the following stakeholders are leading the R&D activities of private and public stakeholders on road transport as reported hereafter. It should be noted that MOST integrates in its activities road, air, waterborne and rail transports.

- Politecnico di Milano is leading the MOST Hub and is leading the activities in MOST Spoke 13 on electric traction system and batteries.
- Politecnico di Torino is leading the activities in MOST Spoke 2 on sustainable road vehicles.
- Università degli Studi di Bergamo is leading the activities in MOST Spoke 5 on light vehicles and active mobility.
- Università degli Studi di Modena e Reggio Emilia is leading the activities in MOST Spoke 6 on connected and autonomous vehicles.
- Università degli Studi di Napoli Federico II is leading the activities in MOST Spoke 7 on CCAM and smart infrastructure and is leading MOST Spoke 10 on freight and logistics.
- Politecnico di Bari is leading the activities in MOST Spoke 8 on Mobility as a Service (MaaS) and is leading MOST Spoke 14 on hydrogen and new fuels.
- Università di Roma La Sapienza is leading the activities in MOST Spoke 9 on urban mobility.
- Università di Bologna Alma Mater Studiorum is leading the activities in MOST Spoke 11 on innovative materials and lightweighting.
- CNR Consiglio Nazionale delle Ricerche is leading the activities in MOST Spoke 12 on innovative propulsion.

3.15.2 Relation with EU level roadmaps and strategies

There is a good degree of alignment between Italian national RTR activities and EU strategies, in particular with 11 of the 14 Spokes in MOST including road transport aspects and aligning with European activities, such as:

- Spoke 2: **Sustainable road vehicles (led by the Polytechnic of Turin) and Spoke 5: Light vehicle and active mobility** (led by the University of Bergamo). Spoke 2 is developing new small, lightweight, reconfigurable vehicle concepts integrated into data and charging networks, to achieve environmentally, economically and socially sustainable transport. A key focus is on concepts of reconfigurable and safe lightweight electric cars for urban mobility integrated. This links to the ERTRAC document “LEVs in Urban Mobility – Research and Innovation Priorities”, as well as 2Zero projects, notably ZEV-UP and GIANTS, which both include Italian partners. Spoke 5 focuses on intelligent pedal-assisted vehicles, and also enabling communication between vehicles and infrastructure. This links to the ERTRAC Integrated Urban Mobility Roadmap as well as EU initiatives such as CIVITAS.
- Spoke 6: **Connected autonomous vehicles** (led by the University of Modena and Reggio Emilia) and Spoke 7: **CCAM and smart infrastructure** (led by Naples University – Federico II): These develop, respectively, autonomous and connected driving systems aims to reduce road accidents and improve safety (including use of AI and virtual reality), and advanced Cooperative Connected and Automated Mobility (CCAM) technologies and Intelligent Infrastructure. These are strongly aligned with the European CCAM Partnership priorities and the ERTRAC CCAM Roadmap.
- Spoke 8: **Mobility-as-a-Service and innovative services** (led by the Polytechnic University of Bari) and Spoke 9: **Urban mobility** (led by Sapienza University of Rome) focus on MaaS: transforming access to transport through digital integration and innovation and on innovative solutions to improve urban mobility (including use of AI and big data to optimise public transport and reduce traffic congestion, and development of ITS, as well as e-bikes and scooters). These aim to make transport more efficient and sustainable, and are aligned with European objectives, e.g. ERTRAC’s Integrated Urban Mobility Roadmap.
- Spoke 10. **Logistics and freight** (led by Naples University – Federico II) is dedicated to freight transport and logistics within the mobility centre and focuses on innovation and optimisation of supply chains and logistics systems. It aligns with the Long Distance Freight Transport Working Group in ERTRAC, the ALICE technology platform, as well as several EU projects dealing with logistics.
- Spoke 11. **Innovative materials and lightweighting** (led by the University of Bologna) identify innovative and/or alternative materials to traditional ones that can lead to the lightening of vehicles with a particular focus on sustainability, recyclability and reuse, through the implementation of more efficient production processes, in compliance with the rules of Life Cycle Assessment and through the development of design methodologies based on structural optimisation aimed at weight reduction. This is aligned to the work of the Circularity and Competitiveness Working Group in ERTRAC.
- Spoke 12. **Innovative propulsion** (led by CNR); Spoke 13. **Electric traction system and batteries** (led by the Polytechnic of Milan); and Spoke 14. **Hydrogen and new**

fuels (led by the Polytechnic University of Bari) look respectively at large-scale demonstration environments and full-scale prototype applications of innovative propulsion (for all modes), advanced and sustainable solutions in the field of electric traction and energy storage technologies, and to develop innovative approaches to produce hydrogen, biofuels, e-fuels, as well as sustainable aviation fuels. The work of these three spokes of MOST align to those of ERTRAC's Energy and Efficiency Working Group and the 2Zero Partnership.

3.16 Latvia

There are no national research programmes dedicated to roads or transport in Latvia.

In Latvia, road research is funded by several key entities:

Latvian Science Council (LZP): This council provides funding for fundamental and applied research projects, including those related to road infrastructure.

Ministry of Transport: This ministry oversees national transport policies and allocates funds for road research and development.

Latvian State Roads (Latvijas Valsts ceļi): This state joint-stock company is responsible for the maintenance and development of Latvia's state road network. While its primary role is operational, it also engages in research activities related to road infrastructure and transport systems to enhance the efficiency and safety of the national road network.

3.16.1 Key national RTR activities in Latvia

Latvia's main road research priorities focus on improving and modernising its transport infrastructure. Some key areas are:

- **Reconstruction and Upgrading of Worn Road Networks**: A significant priority is the reconstruction and upgrading of Latvia's aging road infrastructure to ensure safety and efficiency.
- **Deployment of Intelligent Transport Systems (ITS)**: Latvia is actively working on deploying ITS applications and services. This includes the implementation of the National Access Point (NAP) for multimodal travel information, real-time traffic information, and road safety-related information.
- **High-Speed Roads**: The Latvian government has backed a plan to develop over 1,000 km of high-speed dual carriageways by 2040. This initiative aims to improve connectivity and reduce travel times across the country.
- **Sustainable and Safe Transport: Emphasizing sustainability and safety**, Latvia is focusing on integrating environmentally friendly practices and enhancing road safety measures.

KEY RESEARCH PROVIDER

Transporta Un Sakaru Institūts / Transport and Telecommunication Institute (TSI)

TSI is a prominent private technical higher education and scientific establishment in Riga. It focuses on electronics, telecommunications, information technology, computer science,

economics, management, and transport logistics. TSI actively engages in connecting business and research communities, facilitating innovation and knowledge transfer in the transport sector.

Website: https://tsi.lv

3.17 Lithuania

There are no national research programmes dedicated to roads or transport in Lithuania.

In Lithuania, national RTR is funded by several the following main entities:

- Research Council of Lithuania: This is the main national institution providing funding for research and development, including road research.
- Ministry of Transport and Communications: This ministry oversees national transport policies and provides funding for infrastructure and road research.

3.17.1 Key national RTR activities in Lithuania

Below are the main RTR priorities aimed at improving Lithuania's transport infrastructure and sustainability:

- **Reconstruction and Upgrading of National Roads**: A significant priority is the reconstruction and upgrading of Lithuania's national road network, particularly those in poor condition. This includes major projects like the reconstruction of a Via Baltica road section in the country. However such projects aim at infrastructure development and are not pure research.
- **Sustainable Mobility and Green Deal Objectives**: Lithuania is committed to promoting sustainable mobility and aligning with the European Green Deal objectives. This involves integrating environmentally friendly practices and innovations into road maintenance and development.
- **Intelligent Transport Systems (ITS)**: The deployment of ITS applications and services is important, including real-time traffic information, road safety-related information, and the implementation of the National Access Point (NAP) for multimodal travel information.
- **Long-Term Strategic Planning**: The Strategic Guidelines for National Road Maintenance and Development for 2022–2035 outline long-term priorities and actions to improve traffic conditions, safety, and promote sustainable mobility.

KEY RESEARCH PROVIDERS

Vilnius Gediminas Technical University (VILNIUS TECH)

The Road Research Institute at Vilnius Tech focuses on various aspects of road engineering, including the development of new materials and technologies for road construction and maintenance. It plays a significant role in advancing Lithuania's road infrastructure through research and innovation.

The Competence Centre of Intermodal Transport and Logistics (CCITL) at Vilnius Tech enhances the intramodality of Lithuania's transport system by integrating different transport

modes into a single competitive transport and logistics chain. It serves as a collaborative platform for researchers and industry professionals.

Websites: https://vilniustech.lt, https://vilniustech.lt/environmental-engineering/departments/road-research-institute/344769, https://vilniustech.lt/research-and-innovation/research-departments/competence-centre-of-intermodal-transport-and-logistics/61401

Kauno technologijos universitetas / Kaunas University of Technology (KTU)

The Department of Transport Engineering at KTU conducts research in transport and aeronautics, focusing on areas such as vehicle structures and sustainable mobility systems.

Website: https://en.ktu.edu

3.18 Luxembourg

There are no national research programmes dedicated to roads or transport in Luxembourg.

In Luxembourg, road research is funded by several key entities, two of which a national level:

Luxembourg National Research Fund (FNR): This is the main body responsible for funding research activities in Luxembourg, including infrastructure and road research.

Ministry of Mobility and Public Works: This ministry oversees national policies on infrastructure and provides significant funding for road research and development.

3.18.1 Key national RTR activities in Luxembourg

Hereafter are some of the main road research projects Luxembourg , addressing key RTR priorities aimed at enhancing the country's transport infrastructure and sustainability:

- **Sustainable and Responsible Development**: This emphasises the integration of sustainable practices in road construction and maintenance, aiming to reduce environmental impact and promote ecological balance.
- **Intelligent Transport Systems (ITS)**: Luxembourg is investing in ITS to improve traffic management, enhance road safety, and provide real-time information to road users.
- **Infrastructure Resilience**: Research is focused on making road infrastructure more resilient to climate change and other environmental challenges.
- **Innovation in Materials and Construction**: Developing new materials and construction techniques to improve the durability and efficiency of road infrastructure.

KEY RESEARCH PROVIDERS

Luxembourg Institute of Science and Technology (LIST)

LIST conducts mission-driven research in materials, environment, and IT, with a focus on mobility, transport, and logistics. It develops technologies to reduce road traffic congestion and offer quicker, greener, and less expensive mobility options. Their solutions encompass complex environment modelling, multimodal transport considerations, scenario testing, and data visualization for better decision-making.

Website: https://www.list.lu

MobiLab – Transport Research Group at the University of Luxembourg

MobiLab focuses on advanced traffic and transport data analysis, transport planning and control, mobility and traffic modelling, sustainable transport services optimisation, and supply chain and logistics management. Their interdisciplinary approach integrates engineering, computer science, human sciences, and economics.

Website: https://mobilab.lu

Luxembourg Institute of Socio-Economic Research (LISER)

LISER's Urban Development and Mobility department examines urban life, mobility patterns, and the sustainability of cities. Their research includes studies on housing, spatial development, cross-border metropolitan integration, local and cross-border mobilities, public health, and smart cities, contributing to a comprehensive understanding of urban mobility challenges.

Website: https://www.liser.lu

3.19 Malta

There are no national research programmes dedicated to roads or transport in Malta. In Malta, road research is funded by several entities:

- Infrastructure Malta: This government agency is responsible for the planning, development, and maintenance of Malta's road infrastructure. They manage significant investments, including a recent €700 million road improvement project.
- European Union: Malta receives substantial funding from the EU for various infrastructure projects, including road research and development.
- Malta Council for Science and Technology (MCST): This council oversees research and innovation funding, including road research, often through EU programmes like Horizon Europe.

3.19.1 Key national RTR activities in Malta

- Malta has several notable transport research projects and initiatives aimed at improving its transport infrastructure and sustainability, such as:
- Malta-Gozo Tunnel Project: This major infrastructural investment aims to establish a permanent link between Malta and Gozo. The project includes extensive studies, such as environmental impact assessments, to ensure the most sustainable and safest tunnel route.
- Intelligent Transport Systems (ITS) Plan: Transport Malta has implemented a National ITS Action Plan, which includes deploying intelligent transport systems to improve traffic management and road safety.
- Decarbonated Airport Regions (D-Air): This project calculates the carbon footprint of airport commercial operations, including land transportation to and from the airport, to promote more sustainable practices.

- Greening the Maritime Port (PORT-PVEV): This initiative aims to make ports more energy-efficient and reduce their carbon footprint through new forms of electric mobility and power generation.
- Traffic Modelling and Intelligent Traffic Systems: The University of Malta's Department of Systems & Control Engineering is developing advanced traffic models and intelligent traffic light systems to optimise traffic flow and reduce congestion.

3.20 Netherlands

In the Netherlands, national road research is largely funded by the following:

Dutch Research Council (NWO): This is the main governmental body that funds a wide range of research projects, including those related to infrastructure and road research.

Ministry of Infrastructure and Water Management: This ministry is responsible for national policies on infrastructure, including roads, and provides significant funding for related research and development.

3.20.1 Key national RTR activities in the Netherlands

SmartwayZ.NL programme

SmartwayZ.NL is an innovative mobility programme in the south of the Netherlands, aiming to improve accessibility and encourage innovation. It develops smart solutions as well as improving physical infrastructure. It promotes innovations, works to improve traffic flow and to achieve good operational processes. Its secondary objectives are to improve liveability and traffic safety.

The programme includes over 200 collaborating partners, including the Ministry of Infrastructure and Water Management, Rijkswaterstaat, the provincial governments of Noord-Brabant and Limburg, municipalities, companies and knowledge institutions.

Website: https://www.smartwayz.nl

Duurzaam Veilig Wegverkeer / Sustainable Road Safety

This programme, coordinated by SWOV – the National Scientific Institute for Road Safety Research – focuses on creating a safe road transport system by adapting infrastructure to human limitations, improving vehicle safety, and educating road users. It aims to drastically reduce or eliminate the risks of crashes and serious injuries.

Website: https://sustainablesafety.nl

KEY RESEARCH PROVIDERS

Many research institutes and universities in the Netherlands participate in RTR and have their own internal research programmes:

TRAIL Research School

TRAIL is a collaborative initiative of six Dutch universities, focusing on scientific and applied research in mobility, transport, logistics, traffic, infrastructure, and transport systems. They also train Ph.D. candidates in these fields.

Website: https://www.tudelft.nl/en/rstrail

Delft University of Technology (TU Delft)

TU Delft is a prominent technical university known for its research in various fields, including mobility and transport. It conducts research on electric and autonomous vehicles, smart infrastructure, urban mobility solutions, and policy and regulation.

Website: https://www.tudelft.nl

Netherlands Organization for Applied Scientific Research (TNO)

TNO is an independent research organization that focuses on applied research and innovation. It conducts research on electric and autonomous vehicles, smart infrastructure, alternative fuels, mobility services, sustainable freight transport, and policy and regulation.

Website: https://www.tno.nl

Eindhoven University of Technology (TU/e)

TU/e is another leading technical university in the Netherlands. While its primary focus is on technology and engineering, it also engages in research related to mobility and transport, including electric and autonomous vehicles, smart infrastructure, and data analytics.

Website: https://www.tue.nl

Rotterdam School of Management (RSM), Erasmus University

RSM at Erasmus University focuses on business and management research. While not solely dedicated to mobility and transport, it conducts research on policy and regulation related to transportation, as well as cybersecurity and privacy issues in the context of transportation systems.

Website: https://www.rsm.nl

Netherlands Institute for Transport Policy Analysis (KiM)

KiM is a governmental research institute that provides analyses and evaluations of mobility and transport policy in the Netherlands. It provides scientific research and knowledge inputs for the preparation of mobility policy at the Ministry of Infrastructure and Water Management. It conducts research on various aspects of transportation, including policy and regulation, mobility services, and sustainability.

Website: https://english.kimnet.nl

3.21 Poland

National RTR in Poland is mostly funded through the following:

National Centre for Research and Development (NCBR)

The National Centre for Research and Development plays a crucial role in supporting innovations in business and science in Poland. In 2020, NCBR announced 73 calls for proposals with a total allocation amount of PLN 6.9 billion.

Ministry of Infrastructure

The Ministry of Infrastructure in Poland develops road programs and investments. For instance, a draft of a new road program outlines investments on national roads planned by the government for the third decade of the 21st century.

General Directorate for National Roads and Highways (GDDKiA)

This organisation is responsible for national road projects and has initiatives like the Safe Road Infrastructure Programme (see below).

Government Road Construction Fund (GRCF)

This fund provides significant financial support for the construction, reconstruction, and renovation of district and municipal roads.

3.21.1 Key national RTR activities in Poland

The RTR programmes in Poland are as below:

Safe Road Infrastructure Programme 2021-2024

Poland’s General Directorate for National Roads and Highways (GDDKiA) has established this programme, which is the first independent, long-term initiative focused on road safety infrastructure at a large scale in the country. Over $650 million from the National Road Fund has been allocated for this purpose, aiming to enhance road safety and improve infrastructure.

Transport of the Future: Road Transport in Poland 2020–2030:

While not a specific research programme, this report by PwC highlights the challenges and prospects for road transport in Poland. It discusses the dynamic changes in tonnage and transport performance, the shortage of drivers in the labour market, and legal and technological challenges that Polish carriers must address.

Strategic R&D Programmes

Poland’s strategic R&D programmes serve the social and economic development of the nation. Transport-related topics are integrated into the research areas of ‘Energy and Infrastructure’ and 'New Technologies for National Economy’.

Transport of the Future: Road Transport in Poland 2020–2030:

While not a specific research programme, this report by PwC highlights the challenges and prospects for road transport in Poland. It discusses the dynamic changes in tonnage and transport performance, the shortage of drivers in the labour market, and legal and technological challenges that Polish carriers must address.

KEY RESEARCH PROVIDERS

Instytut Badawczy Dróg i Mostów / Road and Bridge Research Institute (IBDiM)

The Road and Bridge Research Institute is the leading scientific research institute in Poland dealing with issues of transport infrastructure. Their activities focus on the development of science and practical applications of research results. It conducts research related to the construction and maintenance of transport facilities, especially roads, road bridges, and underground structures. Key areas of their work include material testing, technological advancements, economic considerations, and ecological aspects related to road infrastructure.

IBDiM also offers solutions for construction, road management systems, traffic telematics, and maintains road and engineering structure databases.

Website: https://www.ibdim.edu.pl

Instytut Transportu Samochodowego / Motor Transport Institute (ITS)

The ITS conducts scientific research and implementation activities focused on road transport. Their work encompasses environmental protection against harmful effects of pollution from road transport, engine and vehicle emissions testing, and the development of connected and autonomous vehicle technologies.

Website: https://www.its.waw.pl

Polską Sieć Instytutów Badawczych Transportu / Polish Transport Research Institutes Network (POLTRIN)

Established through the collaboration of the Motor Transport Institute, the Road and Bridge Research Institute, and the Railway Research Institute, POLTRIN coordinates and promotes research activities in the field of transport, fostering innovation and knowledge exchange among its members

Website: https://www.poltrin.pl

Politechnika Śląska / Silesian University of Technology

With a Faculty of Transport and Aviation Engineering, this university conducts research in various aspects of transport engineering, including road transport systems, traffic management, and logistics.

Website: https://www.polsl.pl/rt/en

Politechnika Krakowska im. Tadeusza Kościuszki / Cracow University of Technology

The university's research activities encompass civil engineering and transport, contributing to advancements in road transport infrastructure and technologies.

Website: https://www.pk.edu.pl

3.22 Portugal

The Foundation for Science and Technology (FCT) plays a significant role in funding research in Portugal. It operates under the Ministry for Science, Technology, and Higher Education.

FCT supports various research areas, including transport, by providing grants, scholarships, and funding for research projects.

Research carried out in institutions associated with FCT has received substantial funding from the European Research Council (ERC), particularly through Consolidator Grants.

3.22.1 Key national RTR activities in Portugal

KEY RESEARCH PROVIDERS

Instituto Superior Técnico (IST) - Centro de Estudos de Gestão e Economia / Centre for Management Studies (CEGE)

CEGE is part of the Instituto Superior Técnico (IST) in Lisbon. It conducts research on transportation economics, management, and policy, addressing issues such as sustainable mobility, transportation planning, and the economics of transport infrastructure.

Website: https://cegist.tecnico.ulisboa.pt

Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência / Institute for Systems and Computer Engineering, Technology and Science (INESC TEC)

INESC TEC is a research institute located in Porto, associated with the University of Porto. It conducts research in various areas, including intelligent transportation systems, urban mobility, and autonomous vehicles.

Website: https://www.inesctec.pt

Laboratório Nacional de Engenharia Civil / National Laboratory for Civil Engineering (LNEC)

LNEC is a national research laboratory focused on civil engineering, including transportation infrastructure and mobility solutions. It conducts research on topics such as transportation planning, traffic engineering, and sustainable transportation.

Website: https://www.lnec.pt

Instituto de Telecomunicações (IT)

The IT is a research institution with several locations in Portugal, including Lisbon and Porto. It conducts research in telecommunications and networking, with applications in areas such as vehicle-to-vehicle communication, sensor networks for transportation, and mobile communications for smart transportation systems.

Website: https://www.it.pt

Instituto Pedro Nunes (IPN)

IPN is a technology transfer organisation located in Coimbra. While it covers various technology areas, it also engages in research related to mobility and transport, particularly in the context of innovation and entrepreneurship in the transportation sector.

Website: https://www.ipn.pt

3.23 Romania

Ministry of Transport

The Ministry of Transport in Romania plays a significant role in financing transport research. It supports initiatives related to road infrastructure, traffic management, and environmental aspects. Notably, the ministry oversees the Institute of Transport Research (ITR), which conducts applied research, design, and consultancy studies in the field of transport, traffic, and the environment.

Ministry of Research and Innovation

This is another key funding source for transport research. It supports scientific research, technological development, and innovation across various domains, including transport.

National Strategy for Research, Technological Development, and Innovation 2021-2027 (SNCDI)

Although the SNCDI is yet to be approved, it will set out the research strategy in Romania. This document encourages local economic development through new instruments and regulates their organisation and funding.

The previous instrument, the National Plan for Research, Development, and Innovation 2015-2020 (PNCDI III), ensured the coordination and implementation of R&D policies across different research areas.

In summary, transport research in Romania is funded by a combination of national ministries, EU programmes, and strategic planning initiatives.

3.23.1 Key national RTR activities in Romania

Road Freight Transport: Romania's road freight transport sector is crucial for the European Union, with significant investments and support schemes, such as the €60.7 million scheme approved by the European Commission to support haulage and bus companies.

KEY RESEARCH PROVIDERS

Institutul de Cercetări in Transporturi / Institute of Transport Research (INCRETRANS)

Operating under the Ministry of Research and Innovation, INCRETRANS is the government body responsible for applied research, design, and consultancy in the field of transport.

Website: https://incertrans.ro

Centrul de Studii Tehnice Rutiere și Informatică / Road Research and Informatics Studies (CESTRIN)

As a member of the Forum of European National Highway Research Laboratories (FEHRL), CESTRIN focuses on research related to road infrastructure, including construction, maintenance, and safety.

Website: https://www.cestrin.ro

Universitatea Transilvania din Brașov / Transilvania University of Brașov

The university's Research and Development Institute includes a Centre for Design of Mechanical Elements and Systems, contributing to advancements in transport engineering.

Website: https://www.unitbv.ro

Universitatea Tehnică din Cluj-Napoca / Technical University of Cluj-Napoca

With its programmes in transportation engineering, the university engages in research and development activities aimed at improving transport systems and infrastructure.

Website: https://www.utcluj.ro

3.24 Slovakia

There are no national research programmes dedicated to roads or transport in Slovakia. However, in 2022, approximately €412 million was spent on R&D in Slovakia). 46,8 % came from private sources, 40,5 % from governmental sources, 2,1 % from other national and 10,7 % from foreign sources.

The system of R&D funding at a national level is governed by Act No. 172/2005 on Organisation of State Support for Research and Development. Subsidies for solving research tasks are granted to entitled applicants through grant agencies (in particular the Slovak Research and Development Agency) and state programmes for R&D support.

Agentúra na podporu výskumu a vývoja / Slovak Research & Development Agency (APVV)

This is the major R&D grant agency in Slovakia. It was established in July 2005 and it is a successor of the previous agency running since 2001. In 2014 – 2020, the expenditure on operations and programmes of APVV is planned for €316 million. The Agency acts in compliance with the long-term objective of the S&T policy and its programmes are approved by the Government of the Slovak Republic.vThe Agency supports R&D (basic and applied research and experimental development).

Since 2014, the **Research and Innovation Strategy for Smart Specialisation of the Slovak Republic** for 2014 – 2020 is in force (RIS3 SK). Its overall goal is to contribute to the strengthening of the key industry anchoring and to the diversification of the economy by a strong increase of research, innovation and creativity usage. Other aims and principles include strengthening of excellence and of internationalisation of science and technology, research and development capacity building, innovation capacity in economic practice building, and promoting a business environment favourable for innovation and its internationalisation. The RIS3 SK strategy also defines priorities of research and development to be funded in the forthcoming years via national funding schemes but also via EU structural funds.

3.24.1 Key national RTR activities in Slovakia

Main research and Development priorities are (potential road transport topics in bold):

- **Material Research and Nanotechnology**
- **Information and Communication Technologies**
- Biomedicine and Biotechnology
- **Industrial Technologies**
- **Sustainable Energy**
- Environment and Agriculture
- **Selected areas of social sciences** (with respect to the most pressing problems of the Slovak society)
- **Bilateral scientific and technological cooperation**..

Research and development projections are included in the national goals of the Slovak Republic arising from the Europe 2020 strategy.

KEY RESEARCH PROVIDERS

Výskumný ústav dopravný / Transport Research Institute (VÚD)

Based in Žilina, VÚD is a prominent research organization focusing on various transport modes, including road transport. Their expertise encompasses engineering and technology, operation, economy, legislation, transport management, etc.

Website: https://www.vud.sk

Slovenská technická univerzita / Slovak University of Technology in Bratislava

The university's Faculty of Civil Engineering includes the Laboratory of Traffic Engineering, which conducts research on road building materials, design of road mixtures, road mechanics, diagnostics, safety, and planning in transportation engineering.

Website: https://www.stuba.sk

Žilinská Univerzita v Žiline / University of Žilina

This university houses the Department of Road and Urban Transport, which specializes in road transport technologies, traffic engineering, vehicle dynamics, logistics, and ITS. The department is known for its contributions to road safety and collaboration with industry stakeholders.

Website: https://www.uniza.sk

3.25 Slovenia

The **Slovenian Research Agency (ARRS)** is the principal body responsible for funding transport research (and all other research) in Slovenia.

As an independent public funding organisation, ARRS implements tasks related to the National Research and Development Programme and contributes to the creation of a European Research Area.

3.25.1 Key national RTR activities in Slovenia

Public funding for transport research in Slovenia is channelled through Research Programmes. These programmes support specific research areas and projects. Researchers and institutions working on transport-related topics can access funding through these programmes.

These include **Infrastructure Programmes**, covering indirect research and infrastructure costs incurred by public research institutes. Funding streams cover indirect research and infrastructure costs incurred by public research institutes.

KEY RESEARCH PROVIDERS

Prometni Institut Ljubljana / Traffic Institute Ljubljana

As part of Slovenske železnice (Slovenian Railways), this institute focuses on transport technology, infrastructure, smart IT systems, and economic studies related to transport.

Website: https://prometni-institut.si

Urbanistični inštitut Republike Slovenije / Urban Planning Institute of the Republic of Slovenia (UIRS)

As a leading national research institution in spatial, regional, and urban planning, UIRS has over 25 years of experience in sustainable urban mobility planning, integrating land-use planning with mobility solutions.

Website: https://knjiznica.uirs.si

Zavod za gradbeništvo Slovenije / Slovenian National Building and Civil Engineering Institute (ZAG)

ZAG is the leading Slovenian institute in building and civil engineering, recognised for its research, including in transport infrastructure.

Website: https://www.zag.si

3.26 Spain

Public administrations in Spain follow the multi-annual **Spanish Science, Technology and Innovation Strategy (EECTI)**. Government R&D policy is coordinated by the Ministry of Science, Innovation and Universities, with public funding managed by National Research Agency (AEI).

Spain's Ministry of Transport has announced the provisional distribution of the first €1 billion from the European Recovery Plan to improve urban mobility. This funding will benefit 170 Spanish municipalities, enabling investments in 650 electric buses, 500 kilometres of new urban bicycle lanes, and 62 new low-emission zones.

Centro para el Desarrollo Tecnológico Industrial (CDTI)

This public organisation supports technological development and innovation across various sectors, including transport. It provides funding for research and development projects, particularly those that enhance technological capabilities.

Ministerio de Transportes, Movilidad y Agenda Urbana (MITMA)

The Ministry of Transport, Mobility, and Urban Agenda funds various transport research projects, focusing on sustainable mobility, infrastructure improvement, and urban planning.

3.26.1 Key national RTR activities in Spain

KEY RESEARCH PROVIDERS

Universitat Politècnica de Catalunya (UPC)

UPC conducts research on various aspects of transport, including urban mobility, logistics, and sustainable transport systems. It has research groups covering Innovative transportation, Engineering science, and Construction materials and roads.

Website: https://deca.upc.edu/en/PhD_studies-research/research-groups

Centro de Investigación del Transporte / Centre for Transportation Research (TRANSyT)

Affiliated with the Universidad Politécnica de Madrid (UPM), TRANSyT focuses on transportation planning, traffic engineering, and mobility management. It collaborates with public and private entities to address transport challenges.

Website: https://transyt.upm.es

Universitat Politècnica de València

The Transport and Territory Research Institute at Valencia specialises in research related to road safety, sustainable mobility, and transport economics. It works closely with local governments and organizations to develop innovative solutions.

Website: https://www.upv.es/entidades/ITT/index-en.html

Centre for Automation and Robotics (CAR/CSIC)

CAR, a joint venture between the Spanish National Research Council (CSIC) and the Technical University of Madrid (UPM), conducts research in automation and robotics applied to various sectors, including transportation. It explores autonomous vehicle technologies and intelligent transportation systems.

Website: https://www.car.upm-csic.es

Centro Tecnológico de Automoción de Galicia / Automotive Technology Centre of Galicia (CTAG)

CTAG is a private, non-profit research and development centre located in Galicia. Established in 2002, CTAG supports the automotive industry by focusing on research, development, and innovation in various fields related to mobility. CTAG is active in electric powertrains, mobile

robotics, and digital transformation. It is also recognised as a Knowledge Transfer Office by the Spanish Ministry of Science, Innovation, and Universities.

Website: https://ctag.com

Applus+ IDIADA

This is a leading company in Spain that specializes in providing design, engineering, testing, and homologation services to the automotive industry. It has one of Europe's leading testing grounds.

Website: https://www.applusidiada.com/global/en

3.26.2 Relation with EU level roadmaps and strategies

Spain has several transport research roadmaps and initiatives aimed at improving and innovating its transport infrastructure, including:

Observatory of Transport and Logistics in Spain, providing comprehensive data and analysis on transport and logistics in Spain. It publishes annual and topical reports that cover various aspects of transport, including mobility, competitiveness, operational safety, environmental sustainability, and logistics.

Public Transport Strategies in Spain work to develop effective strategies in this domain, comparing and analysing key transport policy choices, and identifying successful decision-making practices. It is strongly aligned to the EU Urban Mobility roadmap.

Economic Impact of Autonomous Vehicles: This study examines how the introduction of autonomous and electric vehicles will impact transport in Spain, linking to the 2Zero partnership and providing data on different transport sub-sectors.

3.27 Sweden

Sweden's National Plan for Transport Infrastructure 2022–2033, produced by the Swedish Transport Administration (Trafikverket), proposes a national plan for infrastructure that covers state-owned transport infrastructure. The plan includes operation and maintenance of state-owned roads and railways, investment in state-owned roads, railways, fairways, and locks, measures to reduce the environmental impact of infrastructure, and support for municipalities to promote sustainable urban environments (urban environment agreements).

The proposed plan allocates significant funding, for example SEK 197 billion for maintenance and renewals of the state-owned road network, including load-bearing capacity and frost-proofing and SEK 437 billion for overall transport system development.

The Swedish Research Council (Vetenskapsrådet) is the largest government research funding body in Sweden, providing grants for a wide range of research areas, including transport.

VINNOVA (Swedish Governmental Agency for Innovation Systems) distributes significant funding for needs-driven research in technology, transport, communications, and working life. It aims to promote sustainable growth by improving the conditions for innovation.

Trafikverket (Swedish Transport Administration) funds various transport research projects, focusing on sustainable transport solutions and infrastructure improvements.

3.27.1 Key national RTR activities in Sweden

FFI, Fordonsstrategisk forskning och innovation / Strategic Vehicle Research and Innovation (2009-)

FFI promotes and finances research and innovation to sustainable road transport. There are five subprogrammes:

- Circularity;
- Safe-automated driving;
- Zero emissions;
- Transport-and mobility services;
- Accelerate (major system demonstrations)

FFI finances research and development activities for approximately SEK 1 billion per year (€88 million), where the State accounts for almost half of the funding. It is a joint programme between the State and the automotive industry, with partners being AB Volvo, Swedish Energy Agency, FKG, Scania CV AB, Swedish Transport Administration, Vinnova (Sweden's innovation agency), Volvo Car Group and (as a co-opted party), Mobility Sweden. There are approximately 100 new project per year.

The approximate thematic split of projects is shown in the figure below.

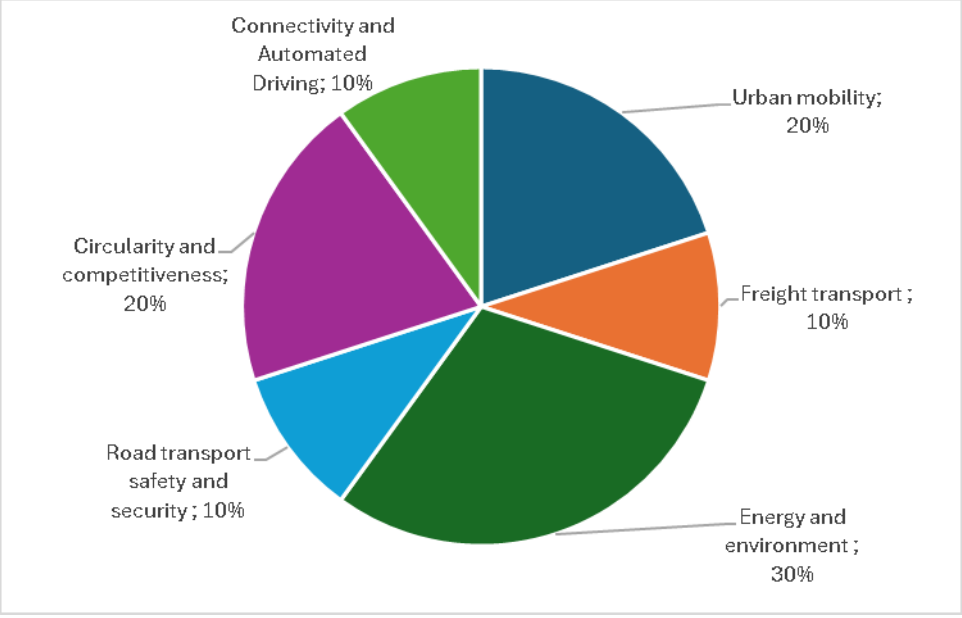


Figure 4: Sweden: Approximate thematic split of FFI projects (Strategic Vehicle Research and Innovation)

This programme relates to the Climate Policy framework for Sweden, adopted by the Riksdag (Swedish Parliament) in 2017. The framework includes climate goals, a Climate Act and the Swedish Climate Policy Council. It is also linked to UN Sustainable Development Goals.

Drive Sweden

Drive Sweden is a national initiative for more sustainable transportation systems. The programme started in 2015 and brings together over 200 stakeholders from business, academia, and the public sector. By financing innovations, Drive Sweden contributes to making new solutions in shared, connected and automated mobility not only technically, commercially, and legally feasible but also creates benefits for society, individuals, and businesses.

Drive Sweden is one of Sweden's 17 Strategic Innovation Programmes, with funding from Vinnova, The Swedish Energy Agency and Formas. The actor-driven Innovation Programmes work together in areas that are strategically important for Sweden and shall contribute to creating sustainable solutions to global societal challenges and increased international competitiveness. The Swedish government invests a total of eight billion SEK for the programmes that can receive funding for up to twelve years, with business and other actors mirroring this investment.

KEY RESEARCH PROVIDERS

Statens väg- och transportforskningsinstitut / Swedish National Road and Transport Research Institute (VTI)

VTI is a national research institute focused on transportation, traffic safety, and road infrastructure. It conducts research on various aspects of mobility, including transportation planning, traffic management, intelligent transport systems, and sustainable transportation. VTI's main task is to conduct research and development across all modes of transport, including roads, railways, aviation, and shipping, and it is a key player in conducting transport research.

Website: https://www.vti.se

RISE Research Institutes of Sweden

RISE is a network of research and technology organizations in Sweden, encompassing various sectors, including mobility and transport. Within RISE, institutes such as RISE Viktoria and RISE Mobility & Systems conduct research on topics such as autonomous vehicles, connected mobility, electric vehicles, and urban mobility solutions.

Website: https://www.ri.se

KTH Royal Institute of Technology - Integrated Transport Research Lab (ITRL)

ITRL is a research lab at KTH Royal Institute of Technology in Stockholm. It focuses on integrated transport research, including topics such as future mobility concepts, sustainable transportation systems, and human-centred design of transport solutions.

Website: https://www.itrl.kth.se/integrated-transport-research-lab-itrl-1.1081637

Lunds Universitet / Lund University - Centre for Transportation Studies (CTS)

CTS is a research centre at Lund University specialising in transportation research. It conducts interdisciplinary research on various aspects of mobility and transport, including transportation planning, logistics, public transport, and sustainable mobility.

Website: https://www.lunduniversity.lu.se/lucat/group/v1000257

Chalmers Tekniska Högskola / Chalmers University of Technology - Transport Area of Advance

Chalmers University of Technology in Gothenburg has a research area dedicated to transport, addressing topics such as transportation systems analysis, vehicle technology, traffic safety, and sustainable urban mobility. Chalmers hosts the collaborative platform SAFER Vehicle and Transport Research Centre at SAFER, and SEC (Swedish Electromobility Centre), the national competence centre for electromobility that gathers leading academia and industry. The centre's research covers all aspects of electromobility from the intelligent vehicles and systems, electric drives and charging, and energy storage to environment and society and vehicle-grid interaction.

Websites: https://www.chalmers.se/en/collaborate-with-us/collaborate-in-research-and-innovation/research-related-contacts/transport-area-of-advance, https://www.chalmers.se/en/centres/safer

K2 – National Centre for Research and Education on Public Transport

K2 is a key institution in Sweden for public transport research, receiving funding to support its initiatives.

Website: https://www.k2centrum.se

4 Member States' implication in EU-level RTR

4.1 EU funding per Member State in relevant Horizon 2020 and Horizon Europe calls

This section draws upon data from the EU's Horizon Dashboard to analyse the implication of EU Member States in EU-funded road transport research in terms of EU financial contribution by country.

The Horizon Dashboard does not allow a specific search on this topic, without analysing each project separately to ascertain whether it includes road transport. Therefore, as an approximation, the following sub-programmes were analysed as the most relevant to this theme:

- Horizon 2020, Smart, green and integrated transport theme. This includes Calls on:
    - Mobility for Growth
    - Digitising and Transforming European Industry and Services: Automated Road Transport
    - Building a low-carbon, climate resilient future: Green Vehicles.

  To exclude older projects, only projects with call deadlines in 2020 and 2021 were included in the analysis. While most were focused on road transport, these calls also included some projects dealing with rail, aviation and waterborne transport, as well as multimodal and cross-cutting projects.
- Horizon Europe Cluster 5 (Climate, Energy and Mobility):
    - Destination 5 (Clean and competitive solutions for all transport modes), D5-01.
    - Destination 6 (Safe, Resilient Transport and Smart Mobility services for passengers and goods), D6-01, D6-02.

  Again, both of these Destinations cover other modes as well as road transport but the data does not allow disaggregation without the need to analyse each call separately. Data was analysed for Calls from 2021 to 2023 inclusive.
- Horizon Europe, Cities Mission (calls from 2021 to 2023 inclusive).

Figure 5 shows the EU financial contribution per EU Member State for the Smart, green and integrated transport theme of Horizon 2020. Germany and France dominate, with €101.2m and €85.5m of EU funding for this theme respectively. Countries in third to seventh places were Spain, the Netherlands, Belgium, Italy and the United Kingdom (the latter still eligible for H2020 funding at the time).

Figure 6 then shows the EU financial contribution per EU Member State for the three Horizon Europe elements listed above (CL5-D5, CL5-D6 and the Cities Mission). The UK is not included as it was not an EU Member State or beneficiary during this period. Germany still dominates with €234.6m of EU funding, some distance ahead of the second placed country: the Netherlands, followed by Spain, then Italy, then France. The high placement of the Netherlands in this total is due to it being the single biggest funding recipient in the Cities Mission calls, with €84.9m, ahead of Germany with €53m and Sweden with €35.8m.

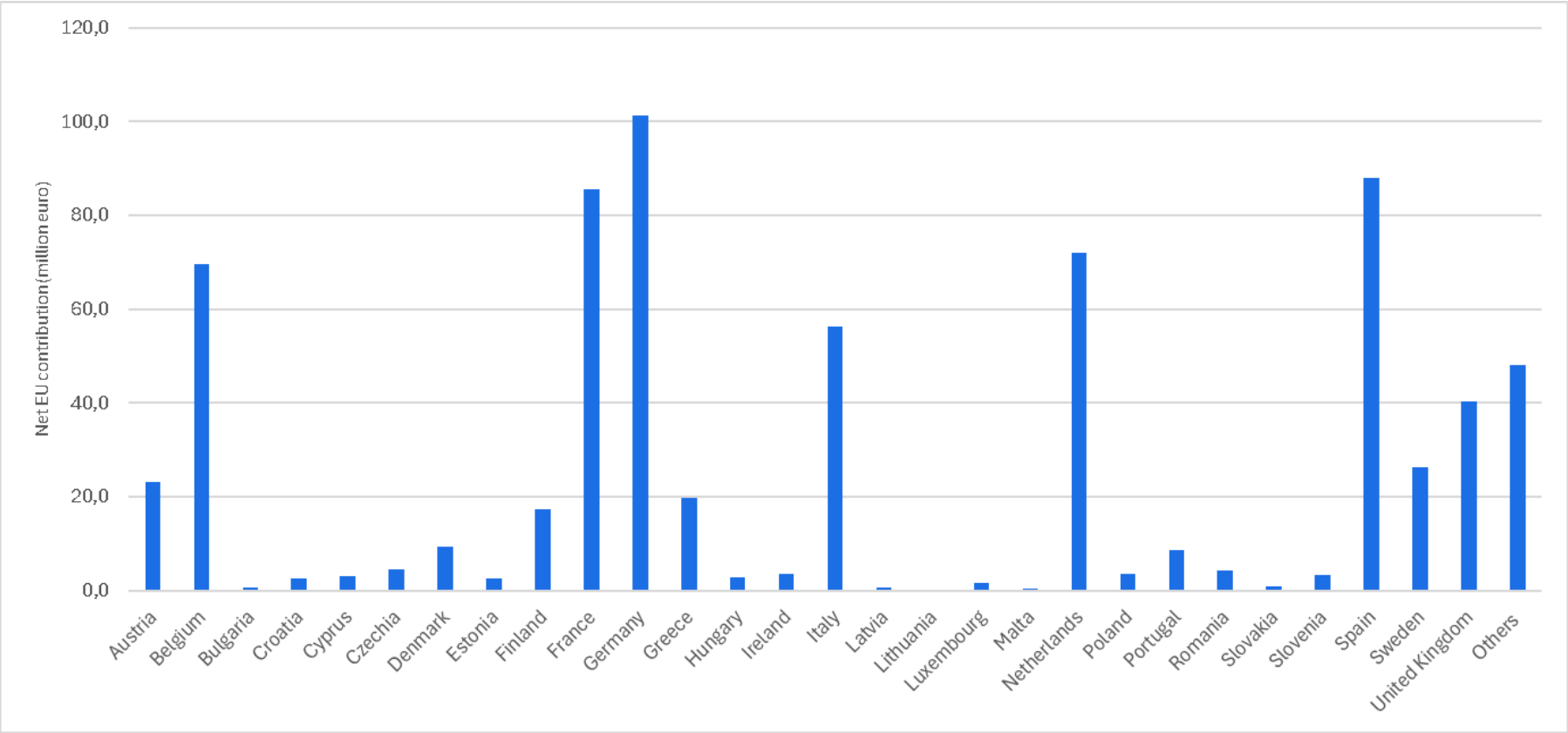


Figure 5: EU funding per Member State for Horizon 2020, Smart, green and integrated transport (Calls with deadlines in 2020 and 2021 only)[3]

[3] Data source: EU Horizon Dashboard. Notes: Data for Malta was not available at this level of granularity, so was estimated from the following data: Total EU funding for this theme to Malta during entire H2020 duration: €2.9M. Percentage of entire H2020 funding awarded in 2020 and 2021 Calls: 11.86%. Applying this percentage gives an estimated €0.34M EU funding for this topic to Malta for 2020 and 2021 Calls. "Others" = EU funding for H2020 beneficiaries in all other participating countries.

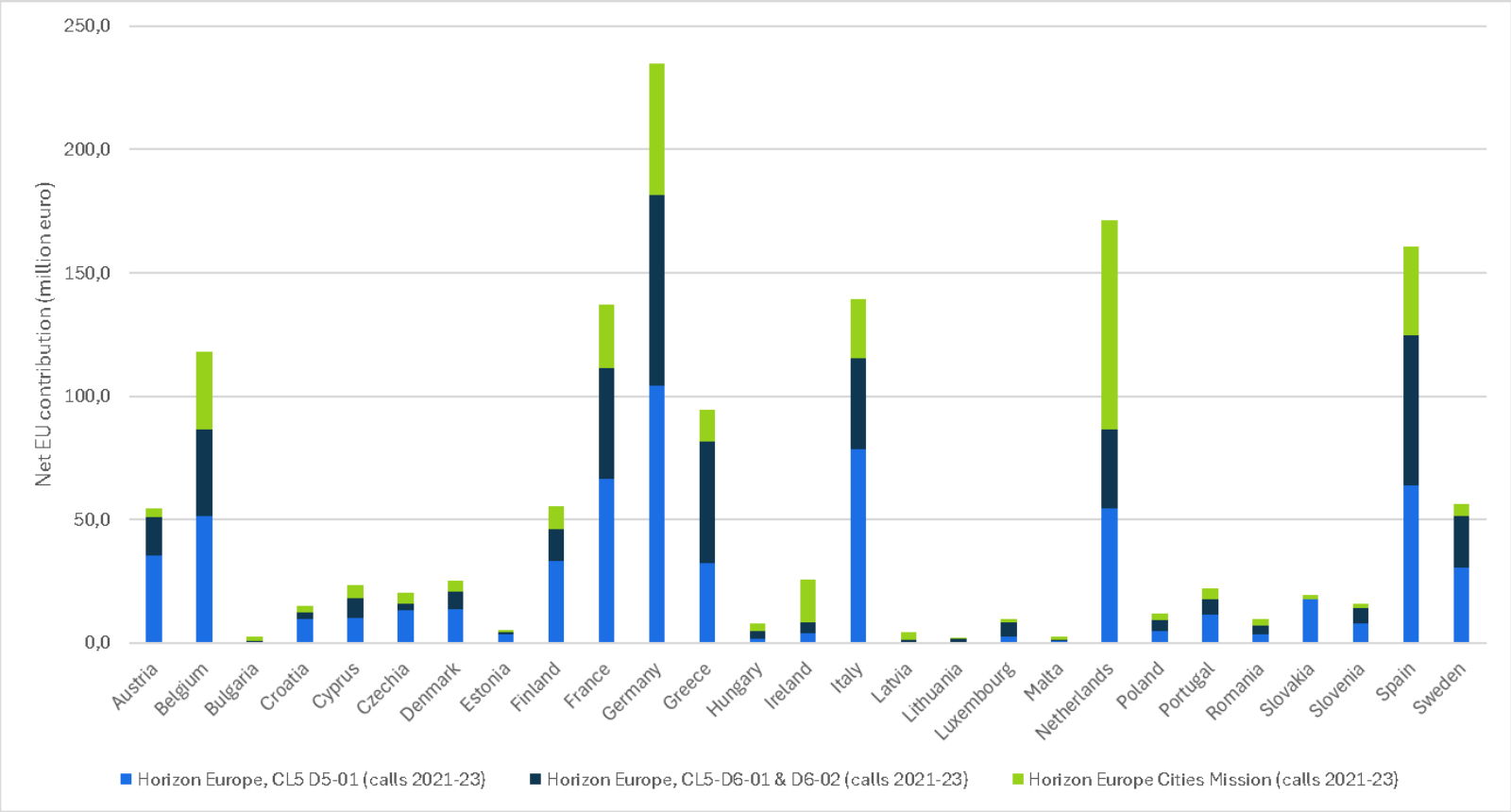


Figure 6: EU funding per Member State for Horizon Europe Cluster 5 (Destinations D5-01, D6-01, D6-02) and Cities Mission[4]

[4] Data source: EU Horizon Dashboard

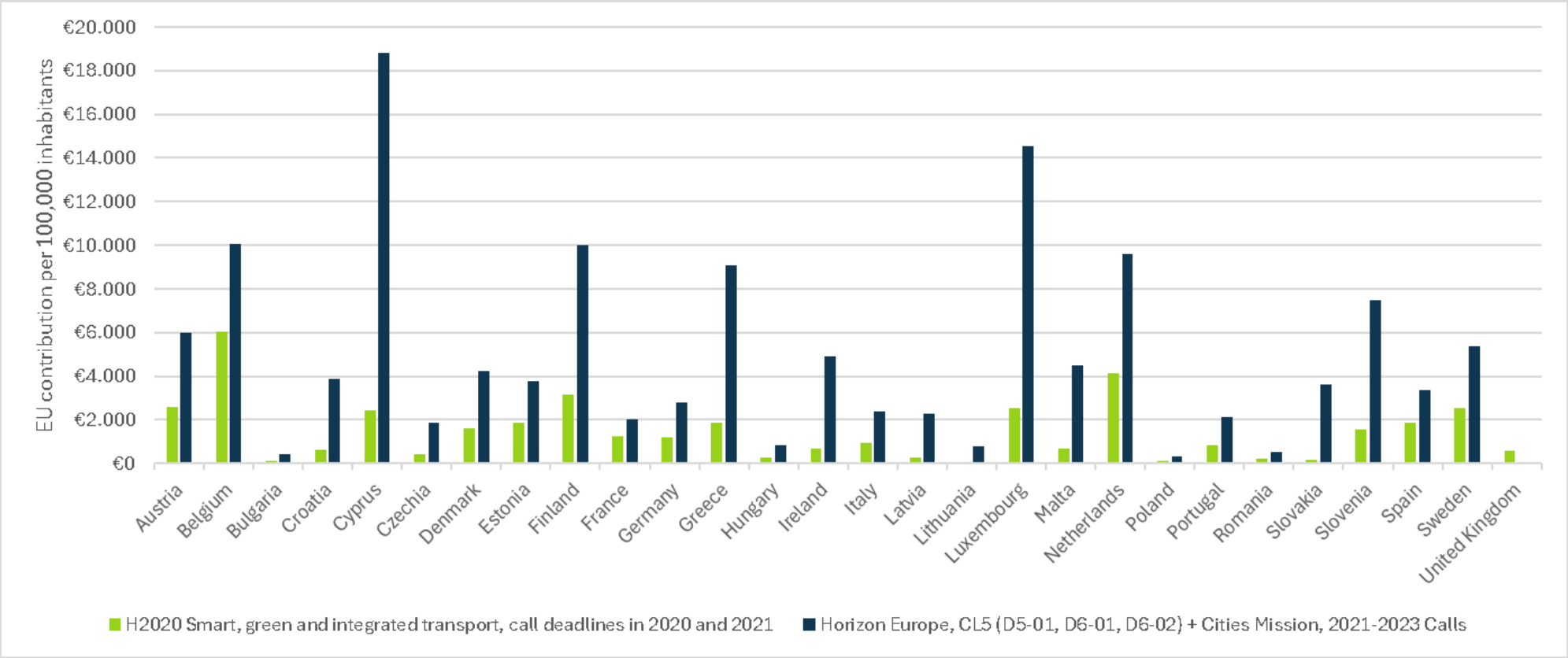


Figure 7: EU funding per 100,000 inhabitants by Member State for Horizon 2020, Smart, green and integrated transport (2020 and 2021 Calls) and Horizon Europe Cluster 5 (selected calls)/Cities Mission[5]

[5] Data source: EU Horizon Dashboard. Population years were 2020 for H2020 programme and 2023 for Horizon Europe programme.

Figure 7 compares the Horizon 2020 and Horizon Europe funding illustrated in Figures 5 and 6 with the national population. For the H2020 calls covered, the funding per 100,000 inhabitants was highest in Belgium, unsurprising given the high degree of involvement in research programmes of Brussels-based organisations. However for the Horizon Europe calls analysed, Cyprus had by far the highest funding in relation to its population, followed by Luxembourg, Belgium, Finland, the Netherlands, Greece and Slovenia.

Notably, large Horizon Europe funding recipients like Germany, France and Italy were below average in terms of their funding per 100,000 inhabitants. Of the big EU Member States, only Spain had a per-capita Horizon Europe funding rate for the topics covered that was (slightly) above the EU-27 mean.

The EU Member State with the lowest engagement to these H2020 topics in relation to its population was Lithuania, followed by Poland and Bulgaria. For the more recent Horizon Europe topics, the lowest engagement in relation to its population is Poland, followed by Bulgaria and Romania.

4.2 National implication in Horizon Europe 2Zero projects

An analysis was made of the 32 ongoing Horizon Europe projects within the 2Zero partnership in terms of participation by EU Member States and Associated countries. This was broken down by the eight clusters as defined by 2Zero and was a simple tally of numbers of partners per country contributing to each cluster (regardless of the amount of budget or funding).

These projects counted 91 partners from Germany and 61 from Spain. Altogether, five countries (these two plus Italy, Belgium and Austria) account for approximately half the partners in these 32 projects contributing to 2Zero, as shown in the figure below. Turkey was the biggest non-EU participant. Note that Associated Partners were included, which made up some of the UK total.

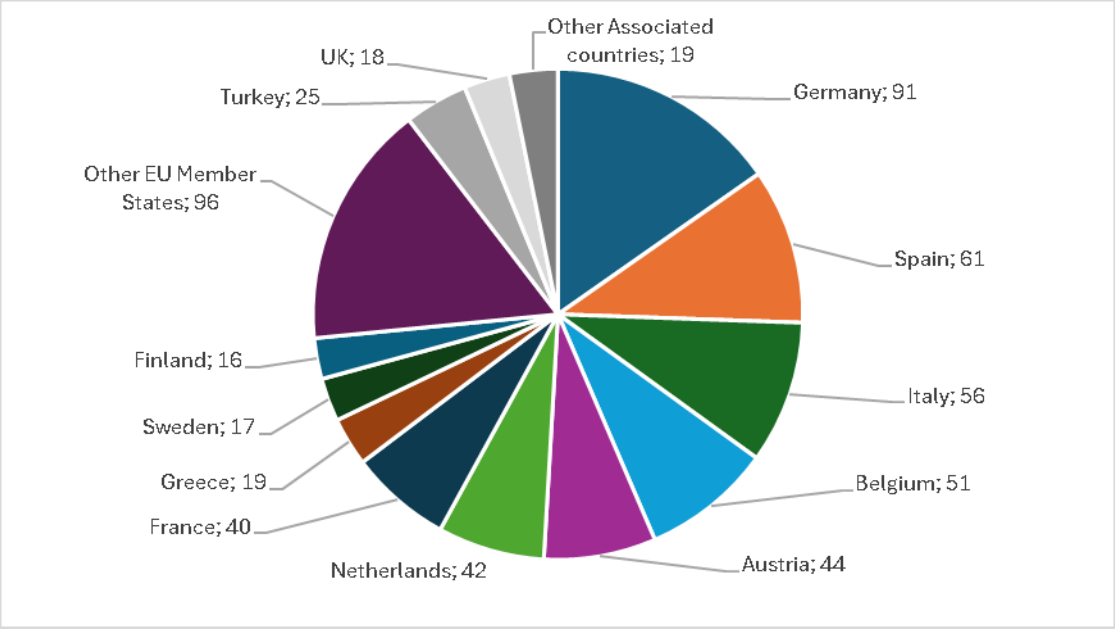


Figure 8: Participation in 2Zero projects by country (count of number of projects)

The following table breaks down these figures by the eight 2Zero thematic clusters. There are some notable differences by theme: while Germany has the highest participation overall and in the clusters of Cities Mission, LCA (Life Cycle Analysis) and circularity, and Next generation HDV (Heavy Duty Vehicle), Austria has the most partners in Energy efficiency projects and the Netherlands has the most in Charging projects. Belgium has the greatest involvement in urban and suburban mobility projects (in terms of partner numbers) and Spain has the most in the Battery management and integration cluster.

Note that in Figure 8 and Table 1, a given organisation can be counted more than once if it a partner in more than one project. So the figure of, e.g., 91 for Germany does not mean there are 91 different organisations in Germany participating in 2Zero, nor that they are in 91 different projects (there are only 32 projects in 2Zero), but rather that these 32 projects count 91 German partners among them (with an organisation that is in, say, 5 different projects, being counted 5 times). It does not give any indication of the funding for each partner or their role (in some cases it will not be a technical research role, but perhaps management or dissemination).

Table 1: 2Zero projects by cluster and national participation (count of partners)

Country	Total number of partners in 2Zero	Type of project (cluster, as defined by 2Zero)							
		Urban and suburban mobility	Energy efficiency	Cities Mission	LCA and circularity	Charging	Battery management and integration	Next generation HDV	Monitoring and assessment
Germany	**91**	6	19	15	17	13	3	13	5
Spain	**61**	8	13	13	2	7	6	11	1
Italy	**56**	7	16	5	4	15	2	7	
Belgium	**51**	11	17	1	3	5	1	11	2
Austria	**44**	5	22			4	2	10	1
Nether-lands	**42**	8	1	5	2	17	1	8	
France	**40**	9	6	4	9	4		7	1
Turkey	**25**	6	5		2		2	10	
Greece	**19**	6		4		4		2	3
UK	**18**	1	5		1	3	1	7	
Sweden	**17**	5	3		4	3		2	
Finland	**16**	1	3	4	1	1		6	
Slovenia	**14**	1	7			5	1		

Country	Total number of partners in 2Zero	Type of project (cluster, as defined by 2Zero)							
		Urban and suburban mobility	Energy efficiency	Cities Mission	LCA and circularity	Charging	Battery management and integration	Next generation HDV	Monitoring and assessment
Czechia	**13**	5	2		1	4		1	
Portugal	**11**					9	1	1	
Denmark	**10**		2			6	1	1	
Hungary	**8**	1		3	1	3			
Switzer-land	**7**		1	2		1	1	2	
Cyprus	**6**		1	5					
Poland	**6**		2	2				2	
Malta	**5**	1		4					
Norway	**4**				2	2			
Ireland	**3**		1			2			
Romania	**3**		2				1		
Croatia	**2**		2						
Luxem-bourg	**2**			1				1	
Slovakia	**2**			2					
Philip-pines	**2**	2							
Estonia	**1**							1	
Bosnia-H	**1**			1					
Kenya	**1**	1							
Pakistan	**1**	1							
Serbia	**1**						1		
South Africa	**1**	1							
Ukraine	**1**		1						

Country	Total number of partners in 2Zero	Type of project (cluster, as defined by 2Zero)							
		Urban and suburban mobility	Energy efficiency	Cities Mission	LCA and circularity	Charging	Battery management and integration	Next generation HDV	Monitoring and assessment
Bulgaria	**0**								
Latvia	**0**								
Lithuania	**0**								

4.3 National implication in Horizon Europe CCAM demonstrations

A short analysis of the implication of EU Member States and Associated countries in Connected, Cooperative and Automated Mobility (CCAM) demonstration and validation projects was performed from project data from the CCAM Association[6]. This does not include all country participants but rather those countries hosting a demonstration, pilot or validation site. The following table shows the relative weights of participation by country in this type of activity. Note that the sites are of different sizes and importance and no weighting is given to these.

Table 2: CCAM projects under Horizon Europe: Demonstration and validation sites by country

Country	Total number of demo or vali-dation sites	Type of project (cluster)					
		Key enabling technologies	Vehicle technologies	Integrating vehicle in transport system	Large-scale demonstrations	Societal aspects and user needs	Validation
Germany	**7**	1	1	1	4		
Spain	**6**	1		3	1		1
Finland	**4**		1	1	2		
France	**4**	1		2	1		
Greece	**4**			2	2		
Nether-lands	**4**			1	2	1	

[6] Source: https://www.ccam.eu/projects

Country	Total number of demo or vali-dation sites	Type of project (cluster)					
		Key enabling technologies	Vehicle technologies	Integrating vehicle in transport system	Large-scale demonstrations	Societal aspects and user needs	Validation
Italy	**3**			2	1		
Poland	**3**				2	1	
Cyprus	**2**				1	1	
Norway	**2**				2		
Bosnia & Hercego-vina	**1**				1		
Hungary	**1**				1		
Latvia	**1**			1			
Portugal	**1**			1			
Slovakia	**1**				1		
Slovenia	**1**			1			
Sweden	**1**				1		
Switzer-land	**1**				1		
Turkey	**1**		1				
TOTAL	**48**	**3**	**3**	**15**	**23**	**3**	**1**

Germany and France appear to be the most active countries in CCAM projects in terms of hosting demonstration, pilot or validation activities. Large-scale demonstration sites and integrating the vehicle into the transport system are the most common types of pilot activity (23 and 15 sites respectively). Twelve EU Member States (Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Ireland, Lithuania, Luxembourg, Malta and Romania) do not currently host any such CCAM demonstration sites in Horizon Europe projects under the CCAM Partnership.

5 Conclusions

Several European countries have significant and successful road transport research programmes.

An outstanding example is Germany. With its major automotive industries, there is significant German Federal investment in road transport research, focusing on autonomous driving, electric mobility, and sustainable transport solutions and in many cases covering the entire value chain from academic research through industrial development up to first deployment. Although the German funding programmes in this domain are highly similar to the European ones in terms of objectives and scope, the level of practical alignment is only limited. This may be a reason why Germany, which is benefitting the most from EU funding in absolute terms compared to the other Member States, ranks rather in the middle if it comes to EU funding per capita.

France, which also allocates substantial funds to transport research (major national and regional programmes linked to the Forever Open Road programme and those dealing with automated and connected vehicles), appears to be quite similar to Germany in terms of national research priorities.

Austria is another interesting example. Their public funding in road transport research is substantial and reflective of the specific academic and industrial landscape of their economy. The level of alignment with EU programmes is quite high, with the objectives of national funding programmes being developed with the strategic planning processes at EU level in mind. This may explain why their per capita EU-funding in this domain is in the top level.

The rather high per-capita benefits from EU RTR funding in the Netherlands, Finland, and Spain can probably be explained in a similar way like for Austria. They all have significant while well EU-aligned activities at national level in all major fields such as urban mobility, safety and automation, as does Sweden, another leader in transport innovation, investing in research on sustainable transport, smart mobility (country known for its Vision Zero initiative), and infrastructure development.

Also, Belgium, Luxembourg, Cyprus, Greece, the Netherlands and Slovenia receive relatively high EU funding in relation to their populations; the first two unsurprising given the number of Europe-wide and international organisations located in those countries. Countries like Greece, Cyprus and Slovenia have well-developed academic and research structures but relatively low research activity or funding at national level, hence their reliance on EU programmes.

Several of the newer EU Member States have low participation at both national and EU-funded transport research, including Bulgaria, Romania, Croatia, Slovakia and Poland. In these countries, most investment is in infrastructure rather than pure research.

Outside the EU, the United Kingdom invests significantly in transport research, with a focus on smart transport systems, electric vehicles, automation, and reducing emissions.

In 2Zero and CCAM, while Germany is expectedly the biggest country in terms of participation slightly more surprisingly are the next countries: Spain, Italy, Belgium, Austria and the

Netherlands, which come before France in terms of number of partners involved. Non-EU countries Turkey and the UK are also very active in 2Zero projects.

At the EU level, in addition to Horizon Europe and its predecessors, the Connecting Europe Facility (CEF) funds projects that improve transport infrastructure and connectivity across Europe. It supports the development of the Trans-European Transport Network (TEN-T), which aims to ensure efficient and sustainable transport across the EU. Main TEN-T themes are innovative technologies, sustainable transport, safety and resilience, and multimodal transport.

Nordic countries, Alpine countries, the Netherlands, France, Germany and the UK in particular are investing in research into the resilience of their road infrastructure, particularly in response to climate change and extreme weather events such as harsh winter weather and flooding.

While the alignment between EU and national RTR programming turns out to be an important success factor for the country's level of participation in EU funding schemes, it should be noted that many successful project initiatives are arising from stakeholder networks independently of the alignment efforts. Automotive research is planned and conducted among members of ACEA and EUCAR, as well as CLEPA, and increasingly initiated within the ecosystems of the respective European Partnerships CCAM and 2Zero. On the infrastructure side, the CEDR (Conference of European Directors of Roads) Transnational Research Programme addresses the needs of European road authorities and contributes to a safe, sustainable, and efficient road network across Europe. This programme operates through a series of annual transnational calls on topics that address the needs of European road authorities, with recent topics being Climate Change resilience, Intelligent road access and management, Resource efficiency and circular economy.

Research in Intelligent Transport Systems takes furthermore place within the Network of ITS National Associations and ERTICO – ITS Europe and POLIS, mostly in Horizon projects including those in the 2Zero and CCAM clusters.

To summarise, the varying degrees of alignment between national and EU road transport research programmes underscore the importance of strategic collaboration to maximize funding efficiency and foster innovation, as exemplified by countries like Austria and the Netherlands. While national priorities and industrial landscapes shape the research focus in each country, transnational cooperation through European Partnerships, stakeholder networks, and initiatives such as TEN-T and CEDR plays a crucial role in achieving shared goals. Strengthening the alignment between national and EU programmes, alongside fostering independent stakeholder-driven initiatives, will be essential for building a resilient, sustainable, and innovative road transport sector across Europe.

6 References

Note that the following list includes only references used at the European level. In addition, information on national research from many sources was used. These are given under the country sub-sections in Chapter 3.

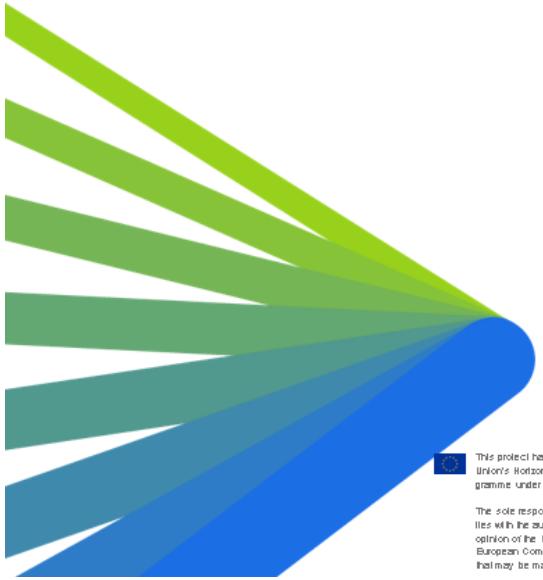
1. 2Zero (including EGVIAfor2Zero), website accessed 2024: https://www.2zeroemission.eu/
2. CCAM Partnership (Connected, Cooperative and Automated Mobility), website accessed 2024: https://www.ccam.eu/
3. CEDR Research and Innovation, website accessed 2024: https://cedr.eu/research-and-innovation
4. ERTRAC – Working Groups, website accessed 2024: https://www.ertrac.org/ertrac-working-groups/
5. EU - CORDIS, website accessed 2024: https://cordis.europa.eu
6. EU Funding and Tenders Portal, Horizon Dashboard, website accessed 2024: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-dashboard
7. EU Just Transition Platform, website accessed 2024: https://ec.europa.eu/regional_policy/funding/just-transition-fund/just-transition-platform_en
8. EU - Transport Research and Innovation Monitoring and Information System (TRIMIS), website accessed 2024: https://trimis.ec.europa.eu/front
9. GREENET - Network of NCPs for Cluster 5, website accessed 2024: https://horizoneuropencpportal.eu/cluster-5
10. National Contact Points (NCPs) for Horizon Europe, EU Funding and Tenders portal, accessed 2024: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/support/ncp
11. Network of National ITS Associations, website accessed 2024: https://www.itsnetwork.org
12. Transport Community, website accessed 2024: https://www.transport-community.org

Annex 1: Expert survey questionnaire form

STREnGth_M
Strengthening EU
Road Transport R&I

Questionnaire on RTR at national level

Visualisation of the sustainable Road Transport Research (RTR) landscape at EU Member States level



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101056253.

Brief overview of STREnGth_M

STREnGth_M is a European Union funded Coordination and Support Action, under the Horizon Europe research and innovation programme. It runs for three years, from February 2023 to January 2026. It comprises 23 partners and is coordinated by AVL-List (Austria).

STREnGth_M stands for "Stimulating road Transport Research in Europe and around the Globe for sustainable Mobility". It has a key role in supporting ERTRAC, the European Road Transport Research Advisory Council, contributing to the planning of research and innovation in Europe by identifying future research needs in the field of road transport.

This includes updating and supporting the coordination of strategic research agendas and roadmaps in the field and by facilitating exchange between Road Transport Research (RTR) related Horizon Europe partnerships and platforms. It also has the role of analysing research, innovation and cooperation capacities in the EU Member States regarding road transport.

Purpose and content of this questionnaire

This questionnaire is part of a Work Package in STREnGth_M entitled "Member States and international alignment", the purpose of which is to foster links between European, national, regional and international roadmaps and strategies for sustainable and competitive road transport research. It works to identify strategic links between funding programmes of Horizon Work Programmes and Partnerships and those at national and sub-national level.

The specific task to which this questionnaire contributes is "Map the research, innovation and cooperation capacities in Member States". This task is led by ERTICO – ITS Europe, which is the main author and manager of this questionnaire process.

This relates to National research programmes (or other funding streams) in EU Member States which include Road Transport. One of the purposes of this task is to map national-level RTR to the topics of the six ERTRAC Working Groups (see: https://www.ertrac.org/ertrac-working-groups).

Data protection / Privacy statement

Personal information will be retained purely for the purposes of analysing survey results. Contact details will be retained for the lifetime of the project in case of the need for further follow-up questions. Respondent who become member of the Multiplier Group will also be informed of STREnGth_M activities and be invited to consult on other project aspects.

Data will be stored according to the Data Management Plan of the STREnGth_M project (available on request). Results of the survey will be presented in an anonymous manner, unless we obtain separate written approval from you.

We treat any opinions as your own and not necessarily representative of your organisation.

Contact / Organisational information

1. Your name (first name, family name)
   Click or tap here to enter text.
2. Your email address
   Click or tap here to enter text.
3. Name of your organisation and type of organisation (national government department / ministry, other public authority, national or regional agency, institution, company, etc.)
   Click or tap here to enter text.
4. Country
   Click or tap here to enter text.
5. Website of your organisation (if one is available)
   Click or tap here to enter text.
6. Your main role or interest in Road Transport Research (e.g. funding, communication, undertaking research, evaluation, etc.)
   Click or tap here to enter text.

Questionnaire

The following questions are about the main ongoing programmes (or other funding streams) in your country concerning road transport research.

There is a section for each one (5 sections in total). If there are more than five relevant programmes in your country for which you can give details, please make a copy of this questionnaire and fill in a separate form for the rest of the programmes. It does not matter which order they are listed in.

Please include:	Please do not include:
✓ Significant groups of projects that are not part of a formal programme.	⊗ EU or other trans-national programmes (only include ones coordinated and funded by your country's authorities).
✓ Research programmes covering wider topics (all transport/mobility, or related topics like energy, environment, urban/spatial planning, inclusivity) if road transport is a significant part.	⊗ Road transport funding/programmes which are not research, such as road infrastructure construction and maintenance programmes.
✓ Programmes which are ongoing, ones which have formally finished but some projects are still ongoing, and ones which are starting in 2024.	⊗ Programmes which are fully completed (no projects still running).
	⊗ Programmes expected to start in 2025 or later.

Programme 1

1. Full name (and acronym/short name if appropriate) of programme in original language
   Click or tap here to enter text.
2. Programme name in English (if different from above)
   Click or tap here to enter text.
3. If it is a *formal programme* with a fixed term
   - Start year: Click or tap here to enter text.
   - End year (or expected end year): Click or tap here to enter text.
4. If it is *not* a formal programme (for example ad hoc projects funded by a ministry or government agency)
   - Start year: Click or tap here to enter text.
5. Programme website (if available): Click or tap here to enter text.
6. Main road transport research topics covered in the programme
   Click or tap here to enter text.
7. Other research topics covered in the programme (e.g. other transport modes or non-transport topics)
   Click or tap here to enter text.
8. Budget of the programme (from all sources: public and private). Please give in euro if possible, or if in another currency please state which.
   Click or tap here to enter text.
   Is this figure...? Choose an item.
9. Public funding of the programme (from national or regional authority/government/agency). You can either express this in euro or another currency, or as a percentage of the total budget above.
   Click or tap here to enter text.
   Is this figure...? Choose an item.

10. Please estimate the percentage of the above budget or funding which covers road transport research topics

Click or tap here to enter text. %

11. Which organisation(s) is/are the main funder(s) of the programme?

Click or tap here to enter text.

12. How many projects are in the programme? (either total number or average number awarded or running per year)

Number: Click or tap here to enter text. Is this number the...? Choose an item.

13. Please estimate the average number of projects per year which contribute to the following topics

If possible, base this on projects running either in 2024 or 2023.

Alternatively, you can estimate the percentage of the entire programme that covers each of these topics (adding up to 100%).

- Urban mobility Click or tap here to enter text.
- Freight transport Click or tap here to enter text.
- Energy and environment (including 2ZERO Partnership goals) Click or tap here to enter text.
- Road transport safety and security Click or tap here to enter text.
- Circularity and competitiveness Click or tap here to enter text.
- Connectivity and Automated Driving (including CCAM Partnership goals) Click or tap here to enter text.
- Other road transport research topics (please also specify which ones) Click or tap here to enter text.
- Other modes of transport (please also specify which ones, for example rail, air, waterborne, inter/multimodal) Click or tap here to enter text.
- Non-transport/mobility topics (please also specify which ones) Click or tap here to enter text.

Questionnaire on RTR at national level

14. Is the programme linked to any roadmaps or strategies (at national or EU level)?

Choose an item.

15. If yes, which one(s)? (Please give name of roadmap or strategy and web link if available)
    - National: Click or tap here to enter text.
    - EU: Click or tap here to enter text.

16. Is there any collaboration between this programme and: (select all that apply)

- ☐ Programmes of other EU Member States
- ☐ Programmes of non-EU countries
- ☐ EU programmes
- ☐ Programmes of international bodies (such as UN, OECD, World Bank, etc.)

17. Do you have any other comments or relevant information? (e.g. on funding conditions, types of organisations eligible, etc.)

Click or tap here to enter text.

Annex 2: Example factsheet on RTR landscape: Germany

RTR landscape at EU Member States level: GERMANY

STREnGth_M
Strengthening EU Road Transport R&I

Version 1.0, September 2024.

RTR Policy Goals

What policy goals drive RTR in the country? What is the reference document for each goal? (more goals per category are possible)

RTR Programmes

What national/regional programmes have been conducted in the last 5 years? (more programmes per category are possible)

Policy Goal: Reduce violation of NOx-limits in residential areas **Document:** - Ad-Hoc Programme Clean Air - Climate Action Plan2050 - Mobility and Fuel Strategy	Energy & Environment	**Programme:** *Measures for the development of renewable fuels, 2021-2026 (BMDV)* **Objective:** *Regenerative fuels production for heavy duty traffic & special vehicles* **Link to EU-programmes/partnerships:**	**Programme:** *Nat. Innovation Programme Hydrogen and Fuel Cell Technology Phase II (NIP), 2016-2026 (BMDV)* **Objective:** *vehicle technologies & systems for H2 & fuel cell technologies* **Link to EU-programmes/partnerships:** Clean Hydrogen, 2Zero
Policy Goal: 15 Mio. and one million public chargers by 2030 **Document:** - Climate Action Programme	Electrification	**Programme:** *Renewably Mobile, 2021-2024* **Objective:** *Electrification of road-based heavy goods transport* **Link to EU-programmes/partnerships:** 2Zero	**Programme:** *R&D of battery technologies for technologically sovereign, competitive and sustainable battery value chains, 2023-2027 (BMWK)* **Objective:** *Material & production process, Digitalisation, Technologies, ecosystem* **Link to EU-programmes/partnerships:** BATT4EU
Policy Goal: Accompanying the CCAM implementation phase **Document:** - Action Plan for Automated Driving of the German Federal Government	Automation & Connectivity	**Programme:** *Autonomous and connected driving in public transport, 2022-2025 (BMDV)* **Objective:** *Autonomous & connected mobility in public transport & logistics, Use of AI & ML* **Link to EU-programmes/partnerships:** CCAM	**Programme:** *New vehicle and system technologies, 2024-2027 (BMWK)* **Objective:** *Automated driving, Innovative vehicles, System technologies* **Link to EU-programmes/partnerships:** 2Zero, CCAM
Policy Goal: Transform urban mobility to be more sustainable, efficient, inclusive, and technological advancements **Document:** - Future R&I Strategy (BMBF)	Urban Mobility	**Programme:** *Digitalisation of Municipal Transport System, 2018-2026 (BMDV)* **Objective:** *Digital & automated mobility solutions, Public & multi-modal transport, Digital infrastructure, ITS, Traffic management* **Link to EU-programmes/partnerships:** *Ambient Air Quality Directive*	
Policy Goal: Adapt to challenges like sustainability, digitalization, and increasing freight volumes **Document:** - Freight Transport and Logistics Action Plan	Freight & Logistics	**Programme:** *Modernisation fund, 2021-2025* **Objective:** *Data access, Data-based applications, Data governance* **Link to EU-programmes/partnerships:** ?	

Value chain structure

Which parts of the automotive value chain are represented most in the country? What are strong competence areas? In which competence areas does the county aim to catch up with?

Germany's economy is covering complete value chains in all road transport sectors by:

- OEMs
- Suppliers
- Research Institutes
- Mobility Service Providers
- Public Transport Operators

Strong competence areas include vehicle design, E/E architecture, electric drivetrains, sensor development, advanced driver assistant systems

Weak competence areas: Big-Data and AI-based decision making, ...

Socio-economic trends related to mobility:

Which trend drive mobility in the country (e.g. climate crisis, tech sovereignty, aging society, favour for public transport, etc.)

- Automotive industry struggling with transformation and worldwide competition
- City areas experiment with new mobility schemes, intermodal transport and traffic calmed zones
  Aging society drives ADAS development
- Remote areas suffer from a lack or insufficient coverage of public transport
- Decreasing numbers of driving licences and own cars

Conclusion

- New government expert councils for the transformation of automotive industry and for climate protection in mobility define action areas to progress electrification and automated driving while automotive associations (VDA , eNOVA) perform raodmapping activities
- Broad value chain in Germany covers almost entire value chain, except AI
- Automotive industry crisis
- Diverse value chain increases innovation
- Shift from vehicle technologies to key enabling technologies and data
- Programmes for electrification expire
- Focus on sustainable freight transport & urban mobility
- No clear alignment with European funding

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