



Deliverable D1.2

European Rail Research Themes and Funds

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Abbreviations and acronyms

ERRAC	European Rail Research Advisory Council
ERJU	Europe’s Rail Joint Undertaking
EC	European Commission
EU	European Union
EURNEX	EUropean Rail Network of EXcellence
KPIs	Key Performance Indicators
MM	Man Month
R&I	Research and Innovation
TRL	Technology Readiness Level

1 Executive Summary

This document presents the methodology which was followed in order to complete Task 1.2 “*Mapping European (including national) rail research themes and funds*” as well as its results. The aim of this Task is to create an online inventory of the rail research topics that are currently under further investigation by European countries as well as the European Commission. To achieve this goal, first, a dedicated template was created and shared among project partners, each of whom was asked to search and complete relevant information for specific countries. The template was completed for each EU country and for the European Commission separately. Finally, this document presents the main output of this Task which is the [online Academics4Rail Tool](#) that includes the collected information per country. A complete user guide is included here, in order for the user to be able to search using different criteria.

1.1 Overview of National and European Rail Research Funding

Rail transport research in Europe is funded through a combination of national and European initiatives. The primary objective is to foster innovation, enhance efficiency, and ensure sustainability across the rail sector. This narrative provides an overview of the major themes and trends in national rail research funding across European countries and compares them with the overarching goals and budget of the European program, Europe's Rail.

1.1.1 Common Research Themes

Sustainable Transportation: One of the most prevalent themes across national rail research programs is the focus on sustainable transportation. This includes the development of eco-friendly rail infrastructure, energy-efficient transport systems, and the reduction of environmental impacts such as noise and emissions. Countries like Austria, Belgium, Germany, and Spain have dedicated significant resources to sustainable rail initiatives. For instance, Austria's national program emphasizes innovative, eco-friendly solutions, while Belgium's funding through the DUT Call 2023 supports projects aimed at transitioning to renewable energy sources and improving urban mobility.

Digitalization and Automation: The digital transformation of the rail sector is another critical area of focus. This includes the integration of digital technologies to enhance operational efficiency, safety, and passenger experience. Germany is at the forefront of this trend with the German Centre for Rail Traffic Research (DZSF) driving numerous digitalization projects. Similarly, Sweden's Vinnova funds projects that leverage sensor data to optimize decision-making and improve energy efficiency in rail operations.

Infrastructure Modernization: Upgrading and maintaining rail infrastructure to meet modern standards is essential for ensuring the reliability and safety of rail transport. Countries like Bulgaria, Estonia, and Finland have significant projects underway to modernize their rail networks. Estonia's transport strategy for 2021-2035 includes substantial investments to increase rail speed and safety, supported by EU structural funds.

Safety and Security: Improving rail safety and security is a priority across many national programs. Research in this area focuses on enhancing signaling systems, developing new safety protocols, and integrating advanced monitoring technologies. Switzerland, for example, through the Federal Office of Transport (FOT), funds projects aimed at maintaining high safety standards in rail operations.

Connectivity and Interoperability: Enhancing connectivity within the European rail network and ensuring interoperability with other transport modes are key objectives. This is particularly important for countries with extensive international rail connections, such as Poland and the Netherlands. Poland's BRIK initiative, funded by the National Centre for Research and Development (NCBR) and Polish Railway Lines (PKP PLK), aims to integrate the Polish rail network more closely with European

standards and improve overall connectivity.

High-Speed Rail: The development of high-speed rail technologies is another area of focus, although less common compared to other themes. Austria and the Czech Republic are notable for their investments in high-speed rail projects, which aim to reduce travel times and enhance the competitiveness of rail transport against other modes of transportation.

Freight and Logistics: Efficient freight and logistics solutions are essential for the economic viability of rail transport. Research in this area focuses on optimizing logistics chains, improving freight handling, and developing new technologies to enhance the efficiency of rail freight. Germany's DZSF and Swiss' projects on digital automatic coupling are examples of initiatives aimed at modernizing freight transport.

1.1.2 Concrete Examples

France: France's Research and Innovation Orientation Council for the railway sector (CORIFER) plays a critical role in steering state-industry dialogue and optimizing support for rail innovation. The CORIFER 2023 call for expressions of interest, funded under the France 2030 plan, focuses on several key areas, including sustainable transportation, digitalization, and the development of intelligent machines. France also supports projects through DUT Call 2023 and CETP 2023, with a dedicated budget that surpasses those of other countries like Belgium for specific calls.

Austria: The Shift2Rail consortium VVAC+ is a prominent example of Austria's commitment to rail research. This consortium, comprising 12 major parties, focuses on various research themes, including sustainable transportation, high-speed rail, and digitalization. The Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK) and the Austrian Research Promotion Agency (FFG) are key funding bodies supporting these initiatives.

Belgium: Belgium's funding landscape is characterized by diverse sources, including the FNRS and VLAIO. The DUT Call 2023 and CETP 2023 have provided substantial funding for projects related to hydrogen and renewable fuels. Additionally, the M-ERA.NET program, with a budget of €2.2 million, targets the development of advanced composites for industrial applications, including transportation.

Germany: The German Centre for Rail Traffic Research (DZSF) exemplifies Germany's strategic approach to rail research. Established under the Federal Railway Authority (EBA), the DZSF conducts interdisciplinary research and collaborates with other institutions to address the entire rail system. In 2023, DZSF allocated approximately €13 million to 25 rail research projects, focusing on themes like digitalization, safety, and freight logistics.

Poland: The BRIK initiative in Poland, a joint effort by the National Centre for Research and Development (NCBR) and Polish Railway Lines (PKP PLK), aims to enhance the innovation and competitiveness of rail transport. With a budget of PLN 100 million, this program supports infrastructure modernization, safety improvements, and efforts to meet EU standards.

1.1.3 Themes Comparison

While national programs address a variety of local and regional needs, Europe's Rail aims to harmonize and elevate the European rail sector through targeted investments in critical areas. The combined efforts of national and European funding bodies are essential for advancing rail technology, improving infrastructure, and ensuring the sustainability of rail transport across Europe. Through collaborative research and strategic investments, Europe is making significant strides towards a more efficient, safe, and integrated rail network. The alignment of national and European priorities in areas such as digitalization, sustainability, infrastructure modernization, safety, connectivity, high-speed rail, and freight logistics highlights the collective commitment to transforming the rail sector and achieving a more connected and sustainable future.

2 Description of the Project

Academics4Rail is a stable and durable scientific community that can share and exchange scientific knowledge with ERJU and ERRAC in an organized way.

This knowledge is shared at different levels (strategic to concrete technical areas) and for different purposes. When it comes to the strategic level, the scientific community intends to share knowledge with ERRAC and ERJU with the purpose of optimising the program for railway research, providing insights for efficient use of funds, existing themes for research and scientific necessities for the future of European railways. It also supports the methodology of program assessment using KPIs and impact assessment towards the objectives set out in the ERJU masterplan. Finally, the scientific community shares its knowledge on necessities of future PhD funding with a relevant European and scientific weight.

In a more concrete technological domain, the scientific community engages in specific themes, creating 6 PhD positions that will enlarge the knowledge in 6 specific areas and will enable the cooperation of academia with industry. The areas are:

- PhD1 Aerodynamics of freight trains.
- PhD2 Electromagnetic compatibility.
- PhD3 Additive Manufacturing in wheel reprofiling.
- PhD4 Digital communications for virtual coupling.
- PhD5 Prognostics and health management approach for railway asset maintenance.
- PhD6 Driving assistance.

3 Scope of the Task and intended audience

The present document was formulated in the framework of Task 1.2 “*Mapping European (including national) rail research themes and funds*”. The goal of this task is to create an inventory of rail research themes that are currently considered as necessary to be investigated by the European countries. These themes maybe mentioned and launched either as stand-alone topics, or as part of the overall national transport research programs

The mapping and reporting of research themes are multi-dimensional, following:

- EURNEX categorization in the 10 scientific poles and
- The technologies and capabilities by area and TRL

The ultimate goal of this task is to make recommendations in order to achieve effective complementarity and cooperation among the EU countries and the various rail related, national and international R&I Programmes.

The information collected and mapped through this process has been stored in a web tool that comprises the final product of the task and is described in the present document. This tool will provide the user with the opportunity to gain knowledge on the rail related research topics currently in the spotlight of European researchers, along with the corresponding funds.

4 Methodology

The methodology followed in order to accomplish the above-mentioned goals, includes 5 steps which are described below.

Step 1: Allocation of work

During the kick off meeting, the allocation of European countries among the participating (in the task) partners has been proposed. This allocation was then sent via email and comments were received. The final allocation of countries is depicted in the table below:

Table 1: Final allocation of work

Beneficiary	Countries to be examined
CERTH	EU Funds, Greece, Belgium, Norway, France, Portugal, Luxembourg
ROM	EU Funds, Italy, Ireland, UK, Denmark, Finland, Sweden
EURNEX	EU Funds, Germany, Spain, Switzerland
ZAG	Slovenia, Austria, Slovakia, Czech Republic
IK	Poland, Lithuania, Latvia, Estonia
ZGR	Croatia, Hungary, Netherlands
BEL	Serbia, Bulgaria, Romania

It should be noted that, the table above includes and allocates among partners:

- the EU Commission (major, rail-related Undertakings and Authorities) that sets the main objectives in rail research,
- the 27 Member States,

Finally, apart from the seven partners participating in the task, the amount of 0,1 MMs has been allocated to each one of the rest of the project's partners. This is to ensure the review of the report at the end by some of the partners, as well as for the provision of support in regards to national rail research themes during the data collection process.

Step 2: Formulation of the template

In order to ensure that the information was collected and stored in a uniform way, a specific template was created, which was completed by the partners for each one of the countries under examination, as well as for the EC. The template is provided in the next section.

Step 3: Data Collection

During this step, the actual investigation of the rail research themes took place, using the template mentioned above. The partners completed the template for each one of the countries they were responsible for and for each one of the rail themes. The partners involved in the examination of EU rail related research themes, were responsible for the completion of the template for the authorities identified.

The time frame considered for the data collection is 2023 and on, as the scope of the task was to identify the rail research topics currently under the spotlight.

Step 4: Design of the tool

Parallel to the above and based on the data collection process, the final outcome, the web tool was designed. This tool will aim to map the research themes in such a way that the user will be in the position to search them using various criteria, such as:

- by country;
- by EURNEX Pole;
- by TRL level;
- by type of technology
- by national or EU level

etc.

Step 5: Development and feeding of the tool

Once the above steps were completed and therefore the data collection process was finalized and the tool designed, the tool was developed and the information collected, stored.

5 Data collection Template

Country	<p>Dropdown list including all the EU countries (27), plus the UK</p> <p><i>Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and Switzerland.</i></p>
Responsible Ministry and/or Authority	<p>Title of the Authority (one or more) that are launching the theme and reserve the funding.</p> <p>Free Text</p>
Title of the rail research theme	Free Text
Description of the rail research theme	<p>5-10 lines on the description of the scope and objectives of the call and topic.</p> <p>Free Text</p>
Funding for the theme	<p>Please insert the amount for the specific theme/topic</p> <p>Numeric</p>
Is this research theme part of a national or EU policy?	Dropdown list: National Policy, EU policy, both
If yes, part of which general policy	<p>Explain if the specific theme is part of a general policy implemented in the country and if yes, provide a brief description.</p> <p>Yes, No answer (jn case the answer is yes – free text)</p>
If yes, what is the funding of the relevant policy	<p>If case the theme is launched in the framework of a general national policy, please state also the total funding.</p> <p>Numeric</p>

Relevance to EURNEX Pole	<p>Mention the Pole(s) to which the theme is mostly relevant</p> <p>Dropdown list:</p> <p>1 Strategy and Economics; 2. Operation & System Performance; 3. Rolling Stock; 4. Product Qualification Methods; 5. Intelligent Mobility; 6. Safety & Security; 7. Environment & Energy Efficiency; 8. Infrastructure and Signaling; 9. Human Factor, Cognitive engineering and Social Sciences; 10. Training & Education</p>
Is a specific TRL expected	<p>Expected or perceived (in the case that the no specific TRL is requested by the description of the topic, then select perceived</p> <p>Dropdown list: expected - perceived</p>
TRL	<p>If the answer to the above is expected, please mention the specific TRL. In the case of perceived, make an estimation of the TRL based on the description of the them.</p> <p>Dropdown list: TRL 1 – basic principles observed TRL 2 – technology concept formulated TRL 3 – experimental proof of concept TRL 4 – technology validated in lab TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) TRL 7 – system prototype demonstration in operational environment TRL 8 – system complete and qualified TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)</p>
Related technology	<p>Mention the technologies that are related/expanded/developed through the specific research theme</p> <p>Free Text</p>
Timeframe	<p>Mention all the relevant dates – launch of the theme, deadline for proposals (if open), duration of the research conduction, finalization dates (past or future).</p> <p>Free Text</p>
Bibliography	<p>Include all relevant links from which information was retrieved</p> <p>Free Text</p>

6 User guide of the Tool

As mentioned above, the main product/outcome of the specific Task is the development of the Tool. This tool has been developed by CERTH, fed with all the information collected by the participating partners and is available at the following url: https://hit-projects.gr/academics4rail_tool/. At this point, this is a stand-alone link/tool, but in the future and as the project progresses it will be embedded in the Project's official website, as well as at the EURNEX official website, giving this way the opportunity to all interested parties to access it at any time and retrieve the information they are looking for.

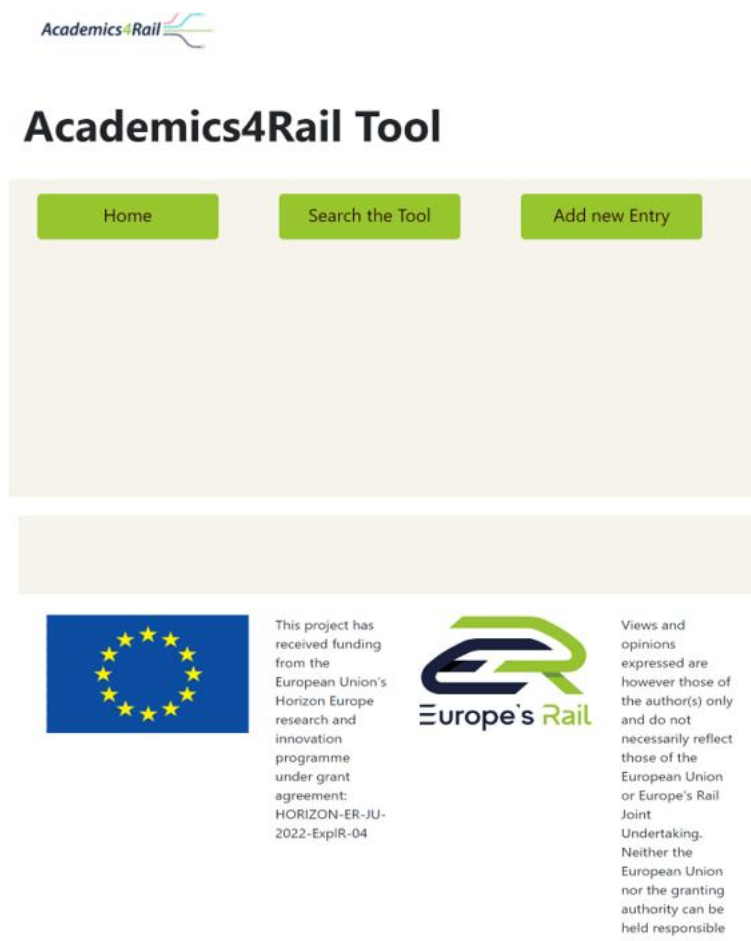


Figure 1. Home page of the tool

In order to retrieve the information, the user needs to press the “Search the tool” tab. Once this is done, these three options appear; search by country, by EURNEX Pole or by TRL.

[Home](#)[Search the Tool](#)[Add new Entry](#)

The tool supports combined search.

Search by Country

Select a country to search for ▼

Search by EURNEX Pole:

Select a EURNEX Pole to search for ▼

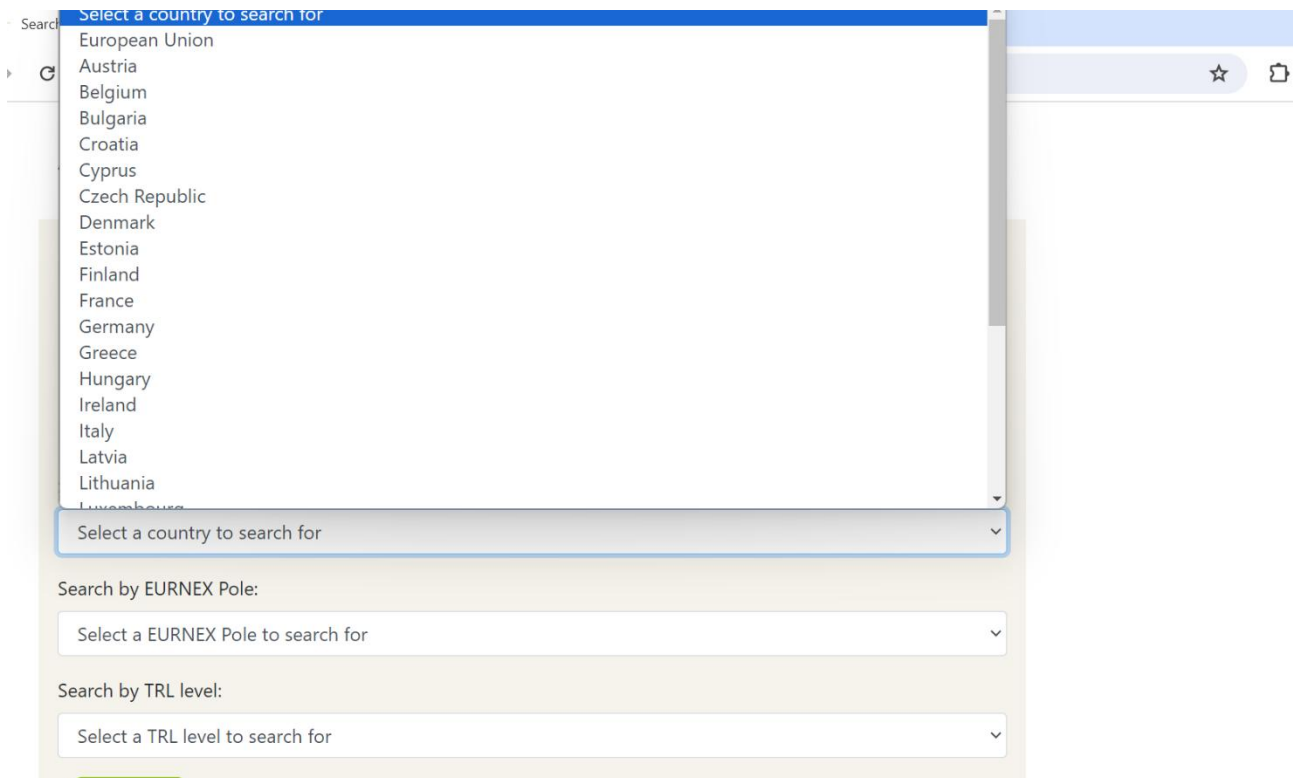
Search by TRL level:

Select a TRL level to search for ▼

Search

Figure 2. Search options in the “Search the Tool” tab

Once the user hits on the “Search by Country” tab, a drop-down list of the countries for which information is available appears:



Select a country to search for

- European Union
- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Lithuania
- Luxembourg

Select a country to search for

Search by EURNEX Pole:

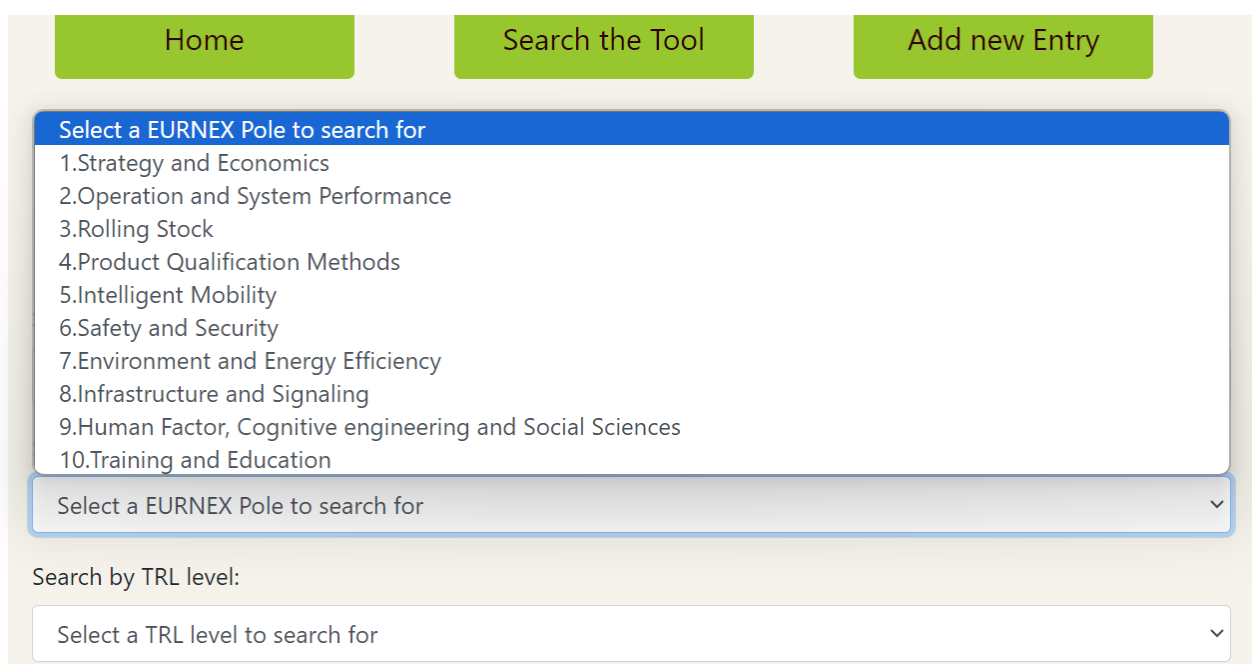
Select a EURNEX Pole to search for

Search by TRL level:

Select a TRL level to search for

Figure 3. Search by country

The same goes for the other two options:



Home Search the Tool Add new Entry

Select a EURNEX Pole to search for

- 1.Strategy and Economics
- 2.Operation and System Performance
- 3.Rolling Stock
- 4.Product Qualification Methods
- 5.Intelligent Mobility
- 6.Safety and Security
- 7.Environment and Energy Efficiency
- 8.Infrastructure and Signaling
- 9.Human Factor, Cognitive engineering and Social Sciences
- 10.Training and Education

Select a EURNEX Pole to search for

Search by TRL level:

Select a TRL level to search for

Figure 4. Search by EURNEX Pole

[Home](#)
[Search the Tool](#)
[Add new Entry](#)

The tool supports combined search.

Select a TRL level to search for
TRL1 – basic principles observed
TRL2 – technology concept formulated
TRL3 – experimental proof of concept
TRL4 – technology validated in lab
TRL5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL7 – system prototype demonstration in operational environment
TRL8 – system complete and qualified
TRL9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Select a TRL level to search for

Search

Figure 5. Search by TRL

Once the user hits the “Search” button the results appear in the screen, based on the selection made. Below, indicatively the results for “Germany” are shown.

Home	Search the Tool	Add new Entry
Results		
Deutsche Zentrum für Schienenverkehrsforschung (DZSF)	Digitalization and technology - Systematization of application scenarios for ATO	Details
Deutsche Zentrum für Schienenverkehrsforschung (DZSF)	Digitalization and technology - Concept and strategy development for the use of drones in traffic authorities	Details
Deutsche Zentrum für Schienenverkehrsforschung (DZSF)	Digitalization and technology - Feasibility study on a dust extraction system for ballast regulators	Details
Deutsche Zentrum für Schienenverkehrsforschung (DZSF)	Digitalization and technology - Use Cases for a Digital Railway Infrastructure Map	Details
Deutsche Zentrum für	Climate protection,	Details

Figure 6. Results for “Germany”

Finally, the user has the opportunity to enter further information by clicking on the “Add New Entry” tab and by filling in the requested fields.

[Home](#)[Search the Tool](#)[Add new Entry](#)

Add new Entry.

Country
To select more than one, hold the Ctrl button when selecting.

European Union
Austria
Belgium
Bulgaria

Responsible Ministry and/or Authority

Title of the Authority (one or more) that are launching the theme and reserve the funding.

Description of the rail research theme

5-10 lines on the description of the scope and objectives of the call and topic.

Funding for the theme

Please insert the amount for the specific theme/topic

Is this research theme part of a national or EU policy?

[Explain if the specific theme is part of a general policy implemented in the country.]

Select a policy from the list

Relevance to EURNEX Pole:

[Mention the Pole(s) to which the theme is mostly relevant.]

To select more than one, hold the Ctrl button when selecting.

- 1.Strategy and Economics
- 2.Operation and System Performance
- 3.Rolling Stock
- 4.Product Qualification Methods

Figure 7. The “Add New Entry” tab

7 National programs, funding sources and themes

In the context of Task 1.2 “Mapping European (incl. National) rail research themes and funds”, desktop research was carried out regarding the research themes that have currently been funded in the European countries. The information collected is presented in the Academics4Rail Tool. However, complementary to the Tool, it was deemed necessary to also create a summary for each country in order to enable readers to have an overall understanding. The summary for each country is presented below in alphabetical order:

7.1 Austria

In addition to national research agencies, in **Austria** some research projects can be funded directly by industry or other governmental bodies and ministries. This is more feasible in countries with a strong industrial base, such as Austria, where major rail companies are interested in making innovative breakthroughs. In Austria, for example, a strong cluster named Shift2Rail consortium VVAC+, consists of 12 major parties that want to make progress on rail research issues is willing also to contribute funding. According to this, rail research themes in Austria are being funded mainly by the following bodies:

- Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK)
- Austrian Research Promotion Agency (FFG)

7.2 Belgium

In **Belgium**, calls for research projects are most of the times funded by at least two different authorities: by authorities in the French Community of Belgium (e.g., Fund for Scientific Research - FNRS) and authorities in the Flemish Region of Belgium (e.g., Flanders Innovation & Entrepreneurship - VLAIO). As in most of the European countries, DUT Call 2023 and CETP 2023 - CM2023-05 “Hydrogen and renewable fuels” were also funded in Belgium. In more detail, DUT Call 2023 was funded by four different institutions and the budget was higher compared to Mediterranean countries such as Greece for example. It is worth noting that DUT Call is divided into 3 topics; the Positive Energy Districts (PED) Transition Pathway, the 15-minute City (15minC) Transition Pathway and the Circular Urban Economies (CUE) Transition Pathway. The only topic related to mobility and by extension to railway is the 15-minute City (15minC) Transition Pathway. In this sense, only if a country funds this topic the call is taken into consideration here. CETP 2023 was funded by two different institutions and also with a higher budget than the aforementioned countries. In addition, M-ERA.NET (Topic 3) was funded by three different authorities in Belgium given in total 2,200,000 €. Its goal is to enhance the role of materials RTD in advancing clean energy technologies, including energy production and collection, as well as energy storage solutions like batteries, electrolyzers, and fuel cells. Topic 3 targets the development of advanced composites with specialized features for industrial uses, such as in transportation, building, reducing weight, and packaging. AI-ICON 2022 Call is another call related to railway funded in Belgium by VLAIO. The relation is not direct, but it is mentioned that the call is open to all application areas including but not limited to health, industry 4.0, government & citizens, circular economy, energy, and mobility.

7.3 Bulgaria

In **Bulgaria**, under the EU policy (European Cohesion Fund), there are two research initiatives aimed at supporting investment projects and providing technical assistance for the development of railway infrastructure that belongs to the TEN-T network. The budget for these research themes exceeds €700 million.

7.4 Croatia

Croatia currently does not provide national funding for railway research projects directly from a national initiative. However, two institutions (Ministry of Science and Education and Croatian Science Foundation) publish once per year call for research. Railway research topics fall under the category of mobility and green policy. The goal of the Croatian Government is to cover railway research with European Union research funds such as Horizon, Erasmus+, and similar.

In **Cyprus**, the railway operated until 1951 and thus, currently funding for research projects related to railway is not applicable.

7.5 Czech Republic

Publicly available information on rail research themes and funding in **Czech Republic** is limited, mainly comprising past research projects funded by public sources such as EU Programs and national research calls. National research agencies and transport ministries and/or agencies are the main sources of funding. Rail research themes in Czech Republic are being funded mainly by the following bodies:

- Ministry of Transport of the Czech Republic
- Technology Agency of the Czech Republic (TACR)

In past and on-going publicly available research projects following research themes highlights the primary focus areas in rail research such as:

1. Sustainable and Green Transportation Solutions
 - Sustainable and eco-friendly rail infrastructure solutions
 - Sustainable and energy-efficient rail transport
 - Reduced noise, vibration, etc. in rail transport
2. High-Speed Rail Technologies
 - High-speed rail development
3. Rail Safety and Security
 - Rail safety and security
 - Rail safety and signaling systems
 - Rail safety and security enhancements
4. Digitalization and Automation in Rail Transport
5. Infrastructure Modernization and Maintenance
 - Assets management and life cycle extension
 - New materials and construction & maintenance technologies
 - Rehabilitation and modernization of rail infrastructure
 - Rail network modernization and capacity expansion
6. Enhancing Rail Connectivity and Interoperability
 - Enhancing rail connectivity and interoperability within the European rail network
7. Development of Freight Transport and Logistics
8. Integration of Rail Transport with Other Modes

National research agencies distribute public research finances for research and development on a competitive basis within their respective countries. They also provide additional financing for Horizon 2020 (H2020) and Horizon Europe (HEU) projects, as well as bilateral calls with other countries. Generally, these agencies are responsible for promoting research and development across all fields, including international research cooperation.

However, the rail sector competes for research funding with other disciplines including physics, medicine, social science etc., which often demonstrate greater scientific impact. This competition

makes it challenging to secure funding for rail research projects.

In addition to national research agencies, some research projects can be funded directly by industry or other governmental bodies and ministries. This is more feasible in countries with a strong industrial base, where major rail companies are interested in making innovative breakthroughs.

Overall, while there is a recognition of the importance of rail research, the sector faces significant competition for funding, necessitating strategic alignment with broader research objectives and collaboration with industry and governmental bodies.

7.6 Denmark

In **Denmark** there are no funding for rail research projects directly from a national initiative. The Innovation Fund of Denmark (IFD) provided funding for the DUT Call 2023 - 15-minute City Pathway (15mC).

7.7 Estonia

The Ministry of Economy and Communications of **Estonia** (population 1.4 million) published the transport strategy for 2021-2035. As far as rail transport is concerned, there will be an increase in the speed and safety of the railway, new branches will arrive. By 2035, the train must cover the route from Tallinn to Narva in 1 hour 45 minutes and to Tartu in one and a half hours. The corresponding upgrade of the routes will cost €260 million. The Estonian government wants to raise the money through loans and EU structural funds. DUT Call was funded both by Estonian Research Council (ETAG) and Ministry of Climate (MoC_EE) with a budget of 150,000€ from each.

7.8 Finland

In **Finland** the investment programme is a proposal for new rail, road and waterway projects and their impacts submitted by the Finnish Transport Infrastructure Agency. The latest investment programme was prepared for the period 2025–2032 and it is part of the implementation of the National Transport System Plan (Transport 12). Finnish Parliament will decide on the implementation of the development projects listed in the investment programme.

7.9 France

DUT Call 2023 (15minC), CETP 2023 (CM2023-05 Hydrogen and renewable fuels) and M-ERA.NET (Topic 3) are also funded in **France**. The dedicated budget for these calls is higher than Belgium except for M-ERA.NET. In addition, the Research and Innovation Orientation Council for the railway sector (CORIFER) constitutes the forum for State-industry dialogue, steering and optimization of support for innovation and signposting projects in the sector towards public aid schemes, in particular those of the France 2030 plan. In this context, three different calls are funded: call for expressions of interest “CORIFER 2023” (AMI 2023), “Offer of robots and intelligent machines of excellence” and “Digital commons for generative artificial intelligence”.

7.10 Germany

In **Germany**, national rail research is organized through a comprehensive framework involving government agencies, dedicated research centers, universities, and industry stakeholders. The Federal Ministry of Digital and Transport (BMDV) oversees transport policy and provides strategic direction for rail research through programs such as the Federal Rail Research Program and the Strategic Research Plan.

The German Centre for Rail Traffic Research, Deutsche Zentrum für Schienenverkehrsforschung (DZSF), established in 2019 under the Federal Railway Authority (EBA), plays a pivotal role by conducting solution-oriented, practical, and interdisciplinary research covering the entire rail system. The DZSF undertakes its own research projects, collaborates with other research institutions, and commissions external research (Auftragsforschung) to cover a broad range of federal tasks in rail

transport. It also facilitates the funding of innovative projects, especially those with market potential, and implements the Federal Program for the Future of Rail Freight Transport. A significant part of the DZSF's role is to systematically evaluate, document, and disseminate research findings, serving as a bridge between science, industry, and policy-making. In 2023 the volume awarded to 25 rail research projects was of ca13 million Euros.

The EBA regulates railway operations and supports research related to safety and regulatory aspects. Deutsche Bahn (DB), the national railway company, is heavily involved in rail research and development. Prominent research institutions like the German Aerospace Center (DLR), Fraunhofer Institutes, and universities such as TU Berlin, RWTH Aachen, and TU Dresden conduct research on diverse aspects of rail technology.

Industry players like Siemens Mobility and Bombardier Transportation collaborate with research institutions on innovation projects, facilitated by clusters and networks. Germany also participates in EU-funded rail research initiatives, promoting international collaboration and advanced rail technologies. The BMDV and other governmental bodies provide funding through various programs to support rail research and innovation, however they may include rail as tangential subject.

7.11 Greece

Greece currently does not provide funding for rail research projects directly from a national initiative. However, the General Secretariat for Research and Innovation (GSRI) provided funding within European frameworks. In more detail, GSRI in the context of Clean Energy Transition Partnership (CETP) Joint Call 2023 - CM2023-05 Hydrogen and renewable fuels provided 500,000€ funding for projects and other 500,000€ in the framework of Driving Urban Transition (DUT) Call 2023. It is worth noting that DUT Call is divided into 3 topics; the Positive Energy Districts (PED) Transition Pathway, the 15-minute City (15minC) Transition Pathway and the Circular Urban Economies (CUE) Transition Pathway. The only topic related to mobility and by extension to railway is the 15-minute City (15minC) Transition Pathway. In this sense, only if a country funds this topic the call is taken into consideration.

7.12 Hungary

Hungary has two interesting national projects that are connected directly to railway research. Hungarian Hydrogen Association manages the first project that covers "Hydrogen and alternative propulsion in railway transport". This project is carried out research and pilot projects in cooperation with the national railway company (MÁV) and some vehicle factories (Stadler, Siemens). This project covers Green policy and concrete decarbonisation goals. "Digital Automatic Coupling (DAC)" is managed by the Ministry for Innovation and Technology. Digital Automatic Coupling (DAC) is an innovative component that automatically couples and decouples the rolling stock in a freight train both physically (the mechanical connection and the air line for braking) and digitally (electrical power and data connection). DAC is key to increasing the efficiency and transparency of rail freight. This project covers sustainable freight railway traffic. Other railway research is covered by European Union research funds such as Horizon, Erasmus+, and similar.

7.13 Ireland

In **Ireland** currently there is no funding for rail research projects directly from a national initiative.

7.14 Italy

Italy currently does not provide funding for rail research projects directly from a national initiative. However, The Recovery and Resilience Plan (PNRR) presented by Italy envisages investments and a consistent reform package, with € 191.5 billion in resources being allocated through the Recovery and Resilience Facility and € 30.6 billion being funded through the Complementary Fund established by Italian Decree-Law No. 59 of 6 May 2021, based on the multi-year budget variance approved by the Italian Council of Ministers on 15 April.

7.15 Latvia

Latvian Railways LDZ has published plans related to the electrification of existing railway lines. Today, the network is 257 km, and when the programme is completed, it will have a total of 839 km. At the same time, changes will be made to the power supply system - from direct current to alternating current. Worth €1.3 billion, the programme will be supported by EU funding. Latvia will receive €347 million in funding from the Cohesion Fund. The implementation of the programme will be divided into three phases. Phase one of the programme will be implemented between 2019 and 2023 and involves the electrification of the Rzezitsa - Krustpils - Vindava and Krustpils - Dyneburg lines. This will create an electrified east-west corridor through the central part of Latvia. Between 2020 and 2025, phase two of the programme will start. From Dyneburg, the catenary will be routed to Indra on the border with Belarus, as well as from Krustpils towards Aizkraukle. On the Aizkraukle - Škirotava section, the power supply system will be changed from direct current to alternating current. This will facilitate the transport of goods from Belarus to the freight terminal in Salaspils near Riga. Phase three of the programme will involve changing the power supply system - from direct current to alternating current on the remaining railway lines in the Riga area. These tasks will be carried out between 2025 and 2030. In addition to this, Latvijas Zinātnes padome (LCS) provides funding for the DUT Call 2023 with budget of 600,000€.

7.16 Lithuania

In Lithuania, as in Estonia and Latvia, currently the funding available related to rail is in the context of EU initiatives. RB Rail AS is a multi-national joint venture of the Republics of Estonia, Latvia and Lithuania, which has been established to implement Rail Baltica – the first pan-Baltic infrastructure project of its kind. RB Rail is the central coordinator for the Rail Baltica project. This is a greenfield rail transport infrastructure project with a goal to integrate the Baltic States in the European rail network. The project includes five European Union countries – Poland, Lithuania, Latvia, Estonia and indirectly also Finland. It will connect Helsinki, Tallinn, Pärnu, Riga, Panevėžys, Kaunas, Vilnius, Warsaw. The Baltic part of the Rail Baltica project is referred to as the Rail Baltica Global Project.

7.17 Luxembourg

Luxembourg's unique fund related somehow to rail was the Joint call 5G Communication Technologies 2023 under which the research and development projects must address innovative problems that require 5G communication resources. The transport industry and thus the railway sector is eligible for the call.

In **Malta**, there is no railway operating and thus, currently funding for research projects related to railway is not applicable.

7.18 The Netherlands

The Netherlands has one national project "Public Transport in 2040 - Outlines of a vision for the future" managed by the Government of the Netherlands. There is no specific research line only for railway in this project, but the railway is covered under public transport. This project is in order for public transport to help meet social and spatial challenges relating to the economy, housing and the human environment, we aim to achieve the following five objectives by 2040: (1) Public transport will assume its share of the growth in demand for transport; in urban areas, public transport and bicycles will be the main modes of transport, (2) Passengers will rate public transport with an average score of eight out of ten, (3) The entire public transport sector will be emission-free and circular, (4) the Netherlands will pioneer public transport innovation, and (5) while intensifying public transport, we will also seek ongoing improvements to safety and quality of life in surrounding areas. For each of this project pillars, the amount is decided during the contract negotiations. Other railway research is covered by European Union research funds such as Horizon, Erasmus+, and similar.

7.19 Norway

In **Norway**, during the period that desktop research was conducted, the Research Council of Norway had no calls that were related only to rail, but there was a call related to transport in general (all four modes of transport – road, rail, air and sea). The total budget for Pilot-T: New Mobility Solutions 2023 is approximately 3,500,000€. In a similar context, [Innovation Norway](#), which is an important instrument for the Norwegian Government for innovation and development of Norwegian enterprises and industry, had a [call related to green mobility](#). The budget had a range of 50,000,000-100,000,000 € per year as it is a recurrent call. It is worth noting that the call addresses pilot and demonstrations projects with a positive environmental impact. It covers zero emission transport solutions, energy storage and energy systems, as well as purification technologies for air and water.

7.20 Poland

In **Poland** since 2017 the National Centre for Research and Development (NCBR) – and Polish Railway Lines (PKP PLK) have been implementing the Joint Research and Development Undertaking with the acronym BRIK (Research and Development in Rail Infrastructure – BRIK).

The aim of the conducted projects is to increase the availability of infrastructure and to improve the rail transport quality, as well as to adapt the railway network to EU standards and to create an integrated system of rail transport within the European Union.

The main objective of the Joint Undertaking is to increase innovation and competitiveness of rail transport. The implementation of the programme is to contribute to the increase in R&D activity in the field of railway infrastructure, rise in the number of innovative solutions in this area, improve the effectiveness of operation and management of railway infrastructure and reduce the negative impact of rail transport on the environment. The programme is dedicated to scientific units and companies from the railway sector. Within the framework of the Joint Undertaking BRIK - Research and Development in Railway Infrastructure, PKP Polskie Linie Kolejowe S.A. and the National Centre for Research and Development will allocate a total of PLN 100 million (PLN 50 million from each partner) for the development of innovations in the railway industry until 2033.

The BRIK I competition from the National Centre for Research and Development is financed from the Intelligent Development Operational Programme. Financing of the BRIK II competition is from national funds. In the first competition, 30 applications were submitted. The projects' implementation period covers the period of 2017 -2022. In December 2021, NCBR announced the second BRIK competition. A total of PLN 50 million was allocated to support projects in the competition (PLN 25 million from each partner). Only consortia may join the competition. The consortium may consist of at least one scientific unit and at least one enterprise or at least two scientific units, but no more than 5 entities. Only a scientific unit may become a consortium leader. The competition cannot be entered by entities related or partner companies in relation to PKP PLK S.A. The BRIK Joint Undertaking was included in the 18-year perspective, which is related to the time needed to produce, test and implement the tools that are the results of funded research work carried out under more than one competition.

The area of research and development occupies a very important place in the PKP S.A. Strategy. for the years 2021-2025, with a perspective until 2030. A significant part of the planned activities is based on the search and implementation of new solutions and technologies on the railway. The accession of PKP S.A., together with the research and development ecosystem, to the Europe's Rail Partnership is one of the steps towards achieving the set goal of continuous improvement and improvement of solutions used on the railways.

The projects are partially financed by the Ministry of Education and Science in Poland. 17 entities from Poland participate in the research and development ecosystem, which was created to implement projects under the Partnership, and the leader of this consortium is PKP S.A.

Europe's Rail Joint Undertaking is the successor to Shift2Rail in the current Horizon Europe financial perspective.

In the new financial perspective, the Railway Research Institute (IK) is actively cooperating with PKP S.A., which has acquired the status of a direct member of EU-Rail. In the first announced competition, project applications were submitted under two flagship areas: FA4 and FA6. Within FA 6, IK is participating in the development of functional requirements for a light rail vehicle for capillary lines, design guidelines for the vehicle according to freight demand and in defining the needs of regional lines in terms of cost reduction and efficiency gains. In FA4, IK participation consists of developing safety analyses for hydrogen rolling stock refuelling stations, including hydrogen storage, hydrogen refuelling station loading and refuelling station process.

7.21 Portugal

The situation in **Portugal** resembles that of Greece; currently the only funding available related to rail is in the context of EU initiatives. The Foundation for Science and Technology (FCT) provided funding of 5000,000 € in the context of CETP 2023 - CM2023-05 Hydrogen and renewable fuels. In addition, FCT and Centro Region of Portugal, in the context of DUT Call 2023 (15minC), both provided 500,000€ funding for the 5-minute City Pathway.

7.22 Romania

In **Romania**, there are currently three active research calls aimed at advancing the railway sector. These calls are part of the national policy and focus on the following research areas:

- Improving the Efficiency of Romanian Railways: This area focuses on modernizing rail transport infrastructure, particularly lines within the TEN-T core network. It involves implementing measures to enhance service quality and operational efficiency.
- Increasing the Attractiveness of Rail Passenger Transport: This call supports projects aimed at enhancing user satisfaction with rail passenger services. Key areas include improving train frequency, tariff policies, and the reliability of rolling stock, among other factors.
- Developing Sustainable Mobility in Urban Nodes: This research area focuses on upgrading metro infrastructure. It includes constructing new metro sections, purchasing new rolling stock, and modernizing metro stations.

The total funding allocated for these three research calls exceeds €3 billion. In addition to the aforementioned calls, the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) provided funding for the DUT Call 2023.

7.23 Serbia

In **Serbia** there is one comprehensive research initiative supported by the World Bank aimed at modernizing Serbia's railway sector over a ten-year period through a three-phase program. The call supports the projects related to:

- Strengthening sector management with clear contractual arrangements.
- Improving infrastructure.
- Encouraging corporate efficiency and commercial goals.
- Enhancing reliability and safety with modern technology and systems.
- Increasing rail modal share through improved connectivity and integration.
- Realization of this research call is planned in three phases:

Phase 1 focuses on infrastructure rehabilitation, technical assistance, and governance improvement

to enhance service quality and safety, setting the stage for further corporatization and sector reforms.

Phase 2 will integrate intercity and urban rail services, improving operational safety and potentially using intelligent transportation systems (ITS). It will also continue the efforts from Phase 1 on corporatization and commercialization of the sector, and scale up safety management systems to foster a safety culture.

Phase 3 will consolidate the performance of the railway sector by promoting multimodality in both freight and passenger services, synchronizing railways with urban development, and ensuring universal accessibility.

The total funding of research call exceeds €120 million.

7.24 Slovakia

In general, there is no specific research support focused only to railway transport in **Slovakia**. Railway-oriented research can be funded by the following organizations/programs:

Slovak Research and Development Agency – general grants for Slovakia, additional financing of H2020 and HEU projects, Bilateral Calls with different countries, etc.) SRDA is the instrument for distribution of public finances for research and development on the competitive basis in Slovakia. SRDA is responsible for research and development promotion in all research fields, including international research cooperation.

VEGA – VEGA projects are devoted to topics of basic research - Scientific Grant Agency of the Ministry of Education. The Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences (hereinafter referred to as "VEGA") is an internal grant system of the Ministry of Education and the Slovak Academy of Sciences, which provides a common, coordinated approach when selecting and assessing projects of basic research by universities and scientific institutions of the Slovak Academy of Sciences. The Scientific Grant Agency proposes to the Ministry of Education, Science, Research and Sports and the President of SAS the amount of the subsidy to be granted to address selected new and ongoing research projects from institutional funds.

<https://trimis.ec.europa.eu/programme/scientific-grant-agency>

KEGA – KEGA projects focus on methodological topics of the development of study programmes and study subjects – Cultural and Educational Grant Agency of the Ministry of Education. KEGA is the internal grant system which is aimed at funding projects of applied research in the fields of education, teaching and creative and performing arts, which are initiated by investigators from public universities or the Ministry of Education, Science, Research and Sport of the Slovak Republic.

Additionally, railway research may be financed by private sources (companies, industry, ...).

Research institutions and universities can use their own sources to finance their railway research as well.

Slovakia has additional sources from European Regional Development Fund and “Plan obnovy” (Next Generation EU) - <https://www.planobnovy.sk/>.

7.25 Slovenia

In **Slovenia**, publicly available information on rail research themes and funding is limited, mainly comprising past research projects funded by public sources such as EU Programs and national research calls. National research agencies and transport ministries and/or agencies are the main sources of funding. Rail research themes in **Slovenia** are being funded mainly by the following bodies:

- Ministry of Infrastructure of the Republic of Slovenia

- Slovenian Research Agency

In addition, EU programmes (e.g. Horizon Europe and other EU funding programmes) are important sources of funding for railway research topics.

In past and on-going publicly available research projects following research themes highlights the primary focus areas in rail research such as:

1. Sustainable and Green Transportation Solutions
 - Sustainable and eco-friendly rail infrastructure solutions
 - Sustainable and energy-efficient rail transport
 - Reduced noise, vibration, etc. in rail transport
2. High-Speed Rail Technologies
 - High-speed rail development
3. Rail Safety and Security
 - Rail safety and security
 - Rail safety and signaling systems
 - Rail safety and security enhancements
4. Digitalization and Automation in Rail Transport
5. Infrastructure Modernization and Maintenance
 - Assets management and life cycle extension
 - New materials and construction & maintenance technologies
 - Rehabilitation and modernization of rail infrastructure
 - Rail network modernization and capacity expansion
6. Enhancing Rail Connectivity and Interoperability
 - Enhancing rail connectivity and interoperability within the European rail network
7. Development of Freight Transport and Logistics
8. Integration of Rail Transport with Other Modes

However, the rail sector competes for research funding with other disciplines including physics, medicine, social science etc., which often demonstrate greater scientific impact. This competition makes it challenging to secure funding for rail research projects.

In addition to national research agencies, some research projects can be funded directly by industry or other governmental bodies and ministries. This is more feasible in countries with a strong industrial base, where major rail companies are interested in making innovative breakthroughs. In other cases, such as Slovenia, governmental bodies face technical challenges when executing investments in railway infrastructure. Therefore, they are willing to provide research funds to address these issues.

Overall, while there is a recognition of the importance of rail research, the sector faces significant competition for funding, necessitating strategic alignment with broader research objectives and collaboration with industry and governmental bodies.

7.26 Spain

In **Spain**, funding for rail research is sourced from various key entities, each playing a role in advancing innovation, technology development, and infrastructure enhancement within the rail sector.

The Spanish Railways Technological Platform (PTFE) is an industry-led tool at the service of the railways sector, set up to define a “long-term vision” and the “Strategic Research Agenda”, with the aim of achieving the scientific and technological advances required to ensure the competitiveness, sustainability and growth in the Spanish railway sector. Its main mission is to align the strategies of the various agents, concentrate R&D and innovation efforts, and reduce the fragmentation of research fields. It has defined the “Strategic Research Agenda for the Railways Sector”, which is

permanently being updated. This agenda is a Public document that remain under consideration of the national instruments for the R&D promotion. PTFE is one of the Spanish R&D Technologies Platforms (<https://www.aei.gob.es/ayudas-concedidas/plataformas-tecnologicas>)

The Centre for the Development of Industrial Technology (CDTI), under the Ministry of Science and Innovation, insures that the Spanish business sector generates and transforms scientific and technical knowledge into sustainable and globally competitive growth, CDTI uses different instruments: *Expert guidance, evaluation, and awarding of public grants* in the form of subsidies or partially reimbursable aid to innovative companies and entrepreneurs; *Management, promotion, and defense of national interests* in national and international R&D&I programs and forums and the *Promotion of legal and socioeconomic changes* favorable to technological innovation. This set of actions motivates different financial instrument to the industrial ecosystem, including rail industrial sector.

The mission of the Spanish Research Agency-Agencia Estatal de Investigación- AEI- is to promote scientific and technical research in all areas of knowledge through the efficient allocation of public resources, the promotion of excellence, the promotion of collaboration between the agents of the System and support for the generation of knowledge of high scientific and technical, economic and social impact, including those aimed at solving the great challenges of society, and the monitoring of financed activities as well as the necessary advice to improve the design and planning of actions or initiatives to through which the R+D policies of the General State Administration are implemented. The thematic area 13, energy and transportation, focuses its attention on the railway sector. AEI issues competitive calls (Convocatorias) under various schemes. The Agency is part of various programs, consortia, and joint programming initiatives at both European and international levels with the aim of promoting research collaboration. In the case of European initiatives, the main objective is to strengthen the European Research Area (ERA). In particular, within the Horizon Europe program, the AEI is actively working together with the Ministry of Science and Innovation to help achieve the internationalization objectives of the Spanish Science, Technology, and Innovation System (SECTI).

The Ministry of Transport, Mobility, and Urban Agenda (MITMA) manages rail transport policy and funds projects aimed at improving infrastructure, sustainability, and operational efficiency.

CEDEX (Centre for Studies and Experimentation of Public Works), under the Ministry of Transport, conducts applied research on rail infrastructure, focusing on technology advancements, safety, and sustainability. It addresses railway research, but it does not award projects via open calls.

Regional governments often offer funding programs for local R&D efforts in rail infrastructure and transport networks. Spanish universities and research institutions engage in fundamental and applied research across rail technology, collaborating with industry and applying for national and EU funding.

Industry associations and clusters like MAFEX facilitate collaboration among companies, research institutions, and universities, driving innovation and competitiveness in Spain's rail sector through joint R&D projects and participation in funding initiatives from entities like CDTI and EU programs.

7.27 Sweden

In **Sweden**, Vinnova (The Swedish Agency for Innovation Systems) funds research such as “Decision-making based on sensor-data from rail and infrastructure– How information from trains & infrastructure can assist decisions on energy savings and capacity increases” to develop a digital decision support model for decision-makers, traffic authorities and operators to prioritize the right measures so that energy use can be reduced and the transport capacity can be increased.

7.28 Switzerland

In **Switzerland**, national rail research is funded by the following departments, agencies, and

organizations:

Federal Office of Transport (FOT): The FOT is the supervisory authority responsible for public transport in Switzerland (railways, cableways, ships, trams and buses). Large areas of freight transport also fall within the FOT's remit. The FOT is responsible for safety, finance and infrastructure, as well as the legal and political frameworks of public and freight transport. The FOT provides the following funding programmes:

- **Rail Infrastructure Fund (RIF):** The Railway Infrastructure Fund (RIF) can be used to fund research helping to maintain the value of railway infrastructure, and ensure its efficient and safe operation, maintenance and expansion. Funds can also be used to promote innovations which benefit operation and asset maintenance, including upgrading infrastructure to the state of the art and modern transport requirements. Certain innovation projects can also be funded in the various expansion stages. The amount of these funds is determined annually by the Federal Assembly as a separate budget item in the RIF. Two possible instruments are used to promote research: research contracts and the support (subsidisation) of third parties' research projects. The funds available for research from the RIF are to be used primarily for research contracts that are initialised and awarded by the FOT. Secondly, applications from third parties that meet the requirements and research priorities described in the FOT's current rail infrastructure research programme may also be considered.
- **Innovation in regional passenger transport:** The budget for regional passenger transport (RPT) is used to promote innovations that help to reduce costs and create added value for public transport users. The aim of the programme is to make regional transport more efficient and attractive.
- **Changes in society, digitalisation, new technologies and the growth of mobility demand pose major challenges for regional passenger transport (RPT).** However, transport companies often lack the financial resources to be able to develop and test new solutions. For this reason, a federal funding programme provides 5 million Swiss francs annually to support innovations in RPT. The programme "Innovation RPT" aims to promote innovative solutions in a coordinated and goal-oriented manner. If possible, the project results should provide the basis for a broader implementation within the industry. In principle, the programme provides for co-financing by third parties. The innovations are usually carried out as pilot projects with a duration of up to three years.
- **Energy Strategy 2050 in public transport:** The FOT can fund research and development including demonstration projects (pilot projects/plants, field trials, etc.) as part of the federal government's energy strategy in public transport. It can also support innovations that improve energy efficiency in operations, infrastructure and vehicles or that contribute to renewable energy generation. Support is also available for the dissemination of methodologies, knowledge and good practices and for the development of principles and tools for incentive schemes.
- **The "Energy Strategy 2050 in Public Transport" (ESPT 2050) programme promotes research and innovation projects in the sector that help reduce energy consumption, cut CO₂ emissions and increase the use of renewable energy.** The goals of the ESPT 2050 programme are: i) Increasing energy efficiency, ii) Withdrawal from nuclear energy, iii) Reduction of CO₂ emissions and iv) Renewable energy production.

The programme applies to all public transport in Switzerland - rail transport, urban public transport, regional road public transport, as well as ships and cable cars. The transport companies are primarily called upon to improve their energy consumption and greenhouse gas emissions with suitable measures. The Federal Office of Transport takes on the role of a driving force both in the implementation of measures and in shaping the framework conditions for the

industry. In accordance with the federal decree, a maximum of CHF 3 million per year is available for the programme. These are largely used to promote projects and measures in the sector.

- **Swiss National Science Foundation (SNSF):** Based on a government mandate, the Swiss National Science Foundation (SNSF) supports scientific research in all academic disciplines, including intelligent transportation systems and smart-railway engineering. With 5500 projects involving more than 20,000 researchers at the end of 2022, SNSF is the leading Swiss organisation for the promotion of scientific research. To ensure its independence, the SNSF was established in 1952 as a private foundation. Its core task is the evaluation of research proposals. In 2022, it awarded 910 million francs to the most promising project proposals under its regular funding schemes. It allocated a further 173 million for the Horizon Europe transitional measures. SNSF awards public research money based on the principle of competition to support research quality within Switzerland.
- **Future Mobility program:** It is a long-term research program funded by the ETH Mobility Initiative partners (AMAG, SBB and Siemens Mobility) and ETH Zurich since 2018. The aim of the program is to bring together competences from academic and industrial research in the field of Future Mobility. The overarching goal is to develop solutions that address major challenges like the decarbonization, digitalization, and development of the infrastructure in the coming decades. The program is structured around annual calls over a period of ten years that support research projects at the doctoral and post-doctoral level. Many of the funded projects address railway transportation systems.
- **The State Secretariat for Education, Research and Innovation (SERI):** SERI is the federal government's specialised agency for national and international matters concerning education, research and innovation policy. SERI directly funds researchers and innovators in Switzerland whose participation in positively evaluated collaborative and mono-beneficiary projects in the Horizon package is not funded by the European Commission (EC). This includes Europe's Rail projects.
- **Additional funding is available, usually for small explorative projects, from private foundations** such as Hasler Stiftung, whose purpose is to promote information and communications technology (ICT) for the well-being and benefit of Switzerland, and to take a leading position in science and technology; this is achieved by financing or co-financing selected research and innovation projects and undertakings in the field of ICT, possibly including railway digitalization projects.

7.29 United Kingdom

In the **United Kingdom**, FOAK funding, which aims to develop new and innovative technology to drive efficiency, modernise our current infrastructure and make using our railways a better experience for passengers. The funding will support the projects through their development phases involving real trials on the railways in the coming months and giving them a better chance of being used across the network long term. The responsible is the Department for Transport, Innovate UK with £5.3 million investment in innovative projects to make railways more accessible. Moreover the university of Leeds in 2023 with the "Train unit capacity strengthening optimisation using RS-opt" research aims to investigate optimised capacity strengthening under stochastic passenger demand using RS-opt.

8 Summary and Conclusions

Academics4Rail has established itself as a vital and enduring scientific community that efficiently shares and exchanges knowledge with ERJU (European Rail Joint Undertaking) and ERRAC (European Rail Research Advisory Council). This collaboration spans various levels, from strategic insights to specific technical domains, ensuring a comprehensive approach to advancing railway research in Europe.

At the strategic level, the scientific community aids ERRAC and ERJU in optimizing railway research programs. This includes offering guidance on efficient fund allocation, identifying current and future research themes, and addressing scientific necessities for the European railway sector. By supporting the assessment of programs through Key Performance Indicators (KPIs) and impact assessments aligned with the ERJU masterplan, the community ensures that the objectives set out in strategic plans are met. Additionally, they highlight the future needs for PhD funding to maintain and advance the scientific prowess of European railways.

The present document is part of Task 1.2, which focuses on mapping European and national rail research themes and funds. This task aims to create an inventory of necessary research themes across European countries, providing a detailed and multidimensional view of current rail research priorities. The collected information is stored in a [web tool](#) that enables users to access up-to-date knowledge on rail research topics and their corresponding funding sources. This tool enhances transparency and fosters cooperation among EU countries and various rail-related national and international R&I (Research and Innovation) programs.

The methodology for this task involved five key steps: allocation of work among partners, formulation of a standardized template for data collection, actual data collection, design of the web tool, and its subsequent development and feeding with collected data. This structured approach ensures a comprehensive and uniform collection of information, making it accessible and useful for stakeholders.

The resulting web tool, developed by CERTH, serves as a central repository of information on rail research themes and funds. It allows users to search by various criteria, including country, EURNEX scientific poles, Technology Readiness Levels (TRL), and type of technology. This tool is poised to become an essential resource for researchers, policymakers, and industry stakeholders, providing a clear and accessible overview of ongoing and future research initiatives.

Complementing the web tool, the document also presents a detailed summary of national research themes across various European countries. Each country has its own set of priorities and funding mechanisms tailored to address specific challenges and opportunities within their rail systems. For example, Austria focuses on eco-friendly rail infrastructure solutions and high-speed rail technologies, while Germany emphasizes digitalization and automation in rail transport. In contrast, countries like Greece and Portugal rely heavily on EU initiatives for funding their rail research projects. This national perspective highlights the diverse approaches taken by European countries to enhance their rail systems, reflecting their unique industrial bases, policy environments, and strategic goals. By understanding these national themes, stakeholders can identify opportunities for collaboration, avoid duplication of efforts, and leverage synergies across borders to foster a more integrated and innovative European rail network.

The tool will be maintained by Academics4Rail (EURNEX) until the end of the project.