



ADOPTED BY GB DECISION N° 5/2026 ON 23 JUNE 2026

EUROPE'S RAIL JOINT UNDERTAKING (EU-RAIL)

Consolidated Annual Activity Report 2025

In accordance with Article 26 of Council Regulation (EU) 2021/2085 of 19 November 2021 and with Article 23 of the Financial Rules of the EU-Rail.

The Europe's Rail Joint Undertaking (EU-Rail) became the legal and universal successor of the Shift2Rail Joint Undertaking (S2R JU or S2R). Hence, EU-Rail has succeeded in the management of the S2R JU Research and Innovation Programme.

However, in this report, references may still be made to S2R Programme, S2R Other Members, S2R R&I, S2R Regulation, S2R JU, S2R etc. to identify all the activities and governance inherited by EU-Rail and related to the former S2R JU.



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FACTSHEET

Name of the JU	Europe's Rail Joint Undertaking (hereinafter "EU-Rail" or "JU")
Objectives¹	<p>EU-Rail is an autonomous body with its own legal personality. It is an institutional European partnership as per Article 187 of the Treaty on the Functioning of the European Union dedicated to managing and coordinating mission-oriented R&I activities for a major transformation in rail systems in Europe.</p> <p>The general objectives of EU-Rail are to:</p> <ul style="list-style-type: none"> (a) contribute towards the achievement of the Single European Railway Area; (b) ensure a fast transition to more attractive, user-friendly, competitive, affordable, easy to maintain, efficient and sustainable European rail system, integrated into the wider mobility system; (c) support the development of a strong and globally competitive European rail industry. <p>The main focus of EU-Rail is on delivering a high-capacity integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure and services, aiming to achieve faster uptake and deployment of projects and innovations.</p>
Legal basis	Article 187 of the Treaty on the Functioning of the European Union ² and Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014.
Executive Director (ED)	Mr Giorgio Travaini, appointed ED as from 22 May 2024 ³ .
Governing Board	<p>European Commission (EC) members:</p> <ul style="list-style-type: none"> • DG MOVE Magda Kopczyńska • DG RTD Joanna Drake <p>EC alternates:</p> <ul style="list-style-type: none"> • DG MOVE Kristian Schmidt

¹ The key objectives pertaining to the S2R Programme, pursued by the former Shift2Rail Joint Undertaking, and inherited by its successor – EU-Rail, are the following:

- a 50 % reduction of the life-cycle cost of the railway transport system (i.e. costs of building, operating, maintaining and renewing infrastructure and rolling stock),
- a 100 % increase in the capacity of the railway transport system,
- a 50 % increase in the reliability and punctuality of rail services (measured as a 50 % decrease in unreliability and late arrivals).

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12016E187>.

³ Based on the [EU-Rail GB Decision no. 07/2024](#).

	• DG MOVE	Joachim Luecking
	• DG RTD	Jane Amilhat
	Industry members:	
	• ACCIONA	Javier Bonilla
	• ADIF	Luis Fernando López
	• ALSTOM	Richard French
	• ANGELRAIL consortium led by MER MEC	Francesco Inzirillo
	• AŽD	Vladimir Kampik
	• CAF	Jorge De Castro
	• CEIT	Juan Melendez
	• ČD	Jan Ilík
	• DEUTSCHE BAHN	Jasmin Bigdon
	• DLR	Meike Jipp
	• ESGR JV	Noemi Jimenez Redondo,
	• FAIVELEY TRANSPORT	Paolo Pagliero
	• FERROVIE DELLO STATO ITALIANE	Andrea Volponi
	• FREQUENTIS	Michael Holzbauer
	• HITACHI RAIL STS	Antonella Trombetta
	• INDRA-TALGO	Jose Miguel Rubio Sanchez
	• INFRAESTRUTURAS DE PORTUGAL	Patricia Figueira
	• JERNBANEDIREKTORATET	Preben Saethre
	• KNORR-BREMSE	Hans-Christian Hilse
	• KONTRON	Michael Mikulandra
	• ÖBB	Mark Topal Goekceli,
	• PKP	Zbigniew Jancewicz
	• PRORAIL-NS GROEP	Julien Cayet
	• SIEMENS	Roland Edel
	• SNCF	Christophe Cheron
	• STRUKTON	Tjark de Vries
	• THALES	Amaury Jourdan
	• TRAFIKVERKET	Andres Carolin
	• VOESTALPINE RAILWAY	

	SYSTEMS	Franz Sodja
	• XLAB	Nejc Bat
	Industry alternates:	
	• ADIF	David-Ibán Villalmanzo Resusta
	• ALSTOM	Michael Haddad
	• ANGELRAIL consortium led by MER MEC	Vincenzo Scarnera
	• AŽD	Michal Pavel
	• CAF	Imanol Iturrioz Villalba
	• CEIT	Jaizki Mendizabal
	• ČD	Petr Jindra
	• DEUTSCHE BAHN	Manuel Lianos
	• DLR	Michael Meyer zu Hörste
	• ESGR JV	Jose Solis Hernandez Celestino Martinez
	• FAIVELEY TRANSPORT	Matteo Frea
	• FERROVIE DELLO STATO ITALIANE	Davide Pifferi
	• FREQUENTIS	Guenther Graf
	• HITACHI RAIL STS	Carlo Crovetto
	• INDRA-TALGO	Alfredo Gonzalez Moreno Leyre Merle Carrera
	• INFRAESTRUTURAS DE PORTUGAL	Margarida Pinto Francisco Ganhão
	• JERNBANEDIREKTORATET	Pal Midtlien Danielsen
	• KNORR-BREMSE	Martin Ertl
	• KONTRON	Ulrich Geier
	• ÖBB	Strohmeier Flora
	• PKP	no alternate
	• PRORAIL-NS GROEP	Tijmen Voet
	• SIEMENS	Lars Deiterding Ralf Kaminsky
	• SNCF	Gilles Quesnel
	• STRUKTON	Henk Samson
	• THALES	Mounir El Said

	<ul style="list-style-type: none"> • TRAFIKVERKET Christer Lofving • VOESTALPINE RAILWAY SYSTEMS Uwe Ossberger • XLAB/SŽ Jemenšek Blaž • XLAB/VIAS Ismael Sanchez • XLAB/VIAS Manuel Menedéz Muñiz <p>Other participants:</p> <ul style="list-style-type: none"> • Giorgio Travaini, Executive Director of EU-Rail <p>Observers:</p> <ul style="list-style-type: none"> • Pio Guido (ERA) from January 2025 • Oana Gherghinescu (ERA) replaced Pio Guido as from 2 June 2025 • Anna Gigantino (ERA) • Ny Tiana Tournier (ERA) • Marion Berbineau (ERRAC) • Artur Fojud (ERRAC) • Angela Di Febbraro (SC) • Miroslav Haltuf (SRG)
<p>Other bodies</p>	<p>System Pillar Steering Group</p> <p>High-Level Deployment Group (HL-DpG)</p> <p>States Representatives Group (SRG)</p> <p>Scientific Steering Group (SSG)</p>
<p>Staff number</p>	<p>31 confirmed posts as at year-end 2025⁴</p>
<p>Total budget 2025</p>	<p>At year-end 2025, the JU implemented 100% of its commitment appropriations made available in its active budget (Titles 1 to 4) and 98,1% for the total budget (Titles 1 to 5). The payment appropriations were implemented up to 92,2% (87,9% in 2024) of the active funds (or 79,1% of implementation when compared to the full JU budget (including Title 5)). The Active budget relates to the Titles 1 to 4, while the Total budget includes the Title 5 of the Unused appropriations.</p> <p>By means of the GB Decision 17/2024 of 21 November, the EU-Rail Governing Board adopted the initial Annual Work Programme and Budget for 2025. There were two amendments to this initial Decision adopted during 2025 having impact on the budget.</p> <ul style="list-style-type: none"> - <u>Amendment number 1</u>: The amendment recognised the increase of the commitment appropriations (Revenue and Expenditure) through the reactivation of unused appropriations from previous years with an amount of EUR 0.4M for operational activities and EUR 0.1M for

⁴ The full staffing as per the JU’s Staff Establishment Plan comprises 32 posts, out of which 1 post was vacant at year-end 2025 and 29 working staff.

	<p>administrative operations. At the same time, the expenditure appropriations were reallocated between titles, chapters and items in accordance with the revised needs of the JU for the year.</p> <ul style="list-style-type: none"> - <u>Amendment number 2</u>: The amendment recognised the increase in commitment appropriations by EUR 3.3 million and in payment appropriations by EUR 3 million following the signature of new contribution agreements between Europe’s Rail and DG MOVE. At the same time, the expenditure appropriations were reallocated between titles, chapters and items in accordance with the revised needs of the JU for the year. <p>As a result, the budget as finally adopted amounted to:</p> <p>Commitment appropriations: EUR 151,5 million</p> <p>Payment appropriations: EUR 85,8 million</p>
<p>Budget implementation</p>	<p>The implementation rate of the active operational budget in commitment appropriations was 100% and 92,2% in payment appropriations (87,9% in 2024).</p> <p>Commitment appropriations total consumption of the active budget: EUR 148,6 million is 100%, while the consumption percentage on the total budget is 98,1%. Further breakdown by Titles in EUR and in % of total, excluding unused appropriations:</p> <p>Title 1 – EUR 3,8 million – 100%</p> <p>Title 2 – EUR 1,5 million – 100%</p> <p>Title 4 – EUR 143,2 million – 100%</p> <p>Payment appropriations total consumption of the active budget: EUR 67,8 million representing 92,2% while the consumption percentage on the total budget is 79,1%. Further breakdown by Titles in EUR and in % of total, excluding unused appropriations:</p> <p>Title 1 – EUR 3,6 million – 92,2%</p> <p>Title 2 – EUR 2,0 million – 92,8%</p> <p>Title 4 – EUR 62,2 million – 92,2%</p> <p>The reported implementation also includes payments to the Expert Evaluators managed by the REA Services.</p>
<p>Grants/Tenders</p>	<p>The value of 2 signed grants in 2025 resulting from the 2024-01 and 2025-01 calls for proposals corresponds to EUR 8,9 million of funded by EU-Rail</p> <p>In 2025, contracts/orders (legal commitments) amounting to EUR 12,4million were signed, of which EUR 11,101 million resulted from operational procurements and EUR 1,28 million from administrative procurements.</p>
<p>Strategic Research & Innovation Agenda</p>	<p>In the context of EU-Rail, as defined in the SBA, the “Strategic Research and Innovation Agenda” (SRIA) represents the document covering the duration of Horizon Europe that identifies the key priorities and the essential technologies and innovations required to achieve the objectives of the JU. In accordance with SBA Article 86(5), the SRIA of EU-Rail is constituted by its Master Plan⁵.</p>

⁵ https://rail-research.europa.eu/wp-content/uploads/2022/03/EURAIL_Master-Plan.pdf.



<p>Call implementation</p>	<p>Number of calls launched in 2025: 2</p> <p>Number of proposals submitted: 1 (the second call closed in 2026)</p> <p>Number of evaluated proposals: 1</p> <p>Number of proposals retained for funding: 1</p>
<p>Participation, including SMEs</p>	<p>Total number of beneficiaries, affiliated entities and associated partners in retained for funding in projects from the call 2025-01 only: 19, out of which:</p> <ul style="list-style-type: none"> • 32% are SMEs receiving 46 of total EU funding provided by EU-Rail, 100% of the SMEs that participated to the call were retained for funding. • 63% are private for-profit companies receiving 71% of total EU funding provided by EU-Rail. • 5% are non-EU entities receiving 7% of total EU funding provided by EU-Rail. • 16% are newcomer entities. <p>Six SME participations were part of the evaluated proposals in the 2025-01 call, all of which were included in the proposals retained for funding.</p>

FOREWORD

2025 was a year of delivery and consolidation for Europe's Rail Joint Undertaking. With the EU-Rail integrated Programme reaching full maturity after four years of operation, the results now emerging from the Innovation, System and Deployment pillars demonstrate that this European public-private partnership in the JU model is delivering on its promise. The Programme engaged 377 participant entities from 28 countries. Additionally, with 30 Members in total following the integration of five new Associated Members, and full commitment of the yearly budget appropriations for operational activities, EU-Rail confirms that the European rail sector is effectively mobilised to advance the Single European Rail Area.

Over 70 demonstrations were ongoing or under preparation by year-end 2025 and this marks the EU-Rail's Programme transition from research to tangible prototypes testing on rail track. Additionally, early R&I results on infrastructure management, that represents an important recurring cost for the railway system, are already showing increased asset availability and reduced intervention costs, pointing to a significant economic impact of the EU-Rail's outputs.

The System Pillar delivered mature specifications freely available on the EU-Rail website and already used in procurements. These specifications, together with the production by EU-Rail of harmonised operational rules and the development of an on-board modular architecture, lay the groundwork for standardised European solutions that will create economies of scale and reduce system costs. Additionally, the submission of 45 Change Requests to the ERA represents also an unprecedented cross-stakeholder alignment effort to support future revisions of Technical Specifications for Interoperability.

A major milestone was the formalisation and launch of the High-Level EU-Rail Deployment Group, ensuring that innovations reach the market faster and more cost-effectively. The Group focused its initial activities on the Future Rail Mobile Communication System (FRMCS). The Commission have entrusted EU-Rail to move FRMCS forward, through testing and validation in its Innovation Pillar, through sector alignment on governance and scope definition of technical specifications with its System Pillar, and through migration planning and deployment recommendations with the High-Level Deployment Group. The results from a comprehensive stakeholder questionnaire, together with analyses of National Investment Plans and the initial development of migration scenarios and costs analysis, provided the insights for EU-Rail to advise EU Agency for Railways (ERA) on optimising authorisation processes. This is a demonstration of the cooperative endeavour enabled in 2025 by EU-Rail Joint Undertaking framework with the European Commission and EU Bodies for policy setting, including safety and interoperability works of ERA, and the rail sector with committed Private Members and beyond.

EU-Rail has continued to support the development of a comprehensive migration strategy to coordinate deployment of Digital Automatic Coupling (DAC) technology, based on the R&I output of the Programme, which is highlighted as a game-changer for European rail freight in the 2023 Greening Freight Transport communication⁶ of the EC to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. EU-Rail's support to the European Commission and CINEA for the call under the Connecting Europe Facility resulted in the Pioneer DAC project – a concrete step from research towards first commercial deployment.

Building on the reflection process started in 2024 on the future of the JU, the Governing Board adopted in June 2025 the High-Level Paper entitled "A Future Policy-Based Public-Private Partnership for Rail,"⁷ confirming the need of a new rail JU. The Membership has been united in calling for a coordinated EUR 18 billion investment strategy for 2028–2034 to simplify and modernise Europe's rail system, making intelligent use of future FP10, ECF, private and possibly also national financing. With a mission centring on simplifying rail systems and operations while enhancing fundamental capabilities to strengthen the Single Market and deliver a harmonised Single European Rail Area, the associated annexes outlining four Flagship Initiatives aligned with the European Commission strategy were approved⁸ in December 2025.

⁶ https://transport.ec.europa.eu/system/files/2023-07/COM_2023_440.pdf.

⁷ https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_06-25_High-Level-Paper-on-future-rail_v1.pdf.

⁸ https://rail-research.europa.eu/wp-content/uploads/2025/12/Annex_GB-Decision_10-25_High-level_Paper.pdf.

Also in December 2025, the General Assembly confirmed a clear support from DG MOVE and the private Members for a next rail JU, further echoed at the European Parliament during the Rail Forum Europe roundtable in January 2026, where MEPs expressed strong interest in supporting the legislative process for a successor rail Joint Undertaking.

The direct commitment from all private Members' CEOs to continue and increase their engagement, together with several letters of support addressed to European Commissioners from the sector's associations, confirmed a shared ambition and long-term alignment underpinning the successful results of this partnership.

The JU's Membership was further strengthened in 2025 with the integration of five new Associated Members – Acciona (Spain), Frequentis (Austria), Infraestruturas de Portugal and the Alliance (Portugal), Kontron (Austria), and XLAB D.O.O. (Slovenia and Spain) – bringing their unique expertise in key technological and operational areas and expanding the geographical reach of the EU-Rail.

The EU-Rail Research and Innovation activities are designed to deliver concrete solutions to answer the needs of passengers and the supply chain, not only to contribute to the European Green Deal but also to address the energy transition and the new competitiveness challenges facing Europe. As the evolving geopolitical context, including the strategic importance of railway infrastructure for European security and defence, further underscores the need for a resilient, competitive and harmonised European rail system, the JU Programme Office and its Members are well aware of this urgency and of the importance that the work of the integrated Programme carries.

The mission-oriented nature of the JU, building on openness and inclusiveness, answers the call of the Member States and Parliament to deliver impact and added value to European citizens. Synergies with other Union, as well as national and regional, programmes and partnerships continue to provide opportunities to complement the series of actions expected from the rail sector. Stakeholder relations, communication and dissemination of results ensure the visibility and uptake of the progress achieved. Sound financial and risk management and compliance underpin the implementation of the Programme along its lifecycle. The cohesion that EU-Rail has created within the European rail industry builds upon a small team of passionate professionals fully committed to deliver this ambitious integrated Programme.

The Executive Director would like to express his gratitude to all EU-Rail Members, the EU-Rail staff, the Member States representatives and the observers for their collaboration and support during 2025, making these significant results possible.

INTRODUCTION

Europe's Rail Joint Undertaking is a public-private partnership within the meaning of Article 187 of the Treaty on the Functioning of the European Union, managing and coordinating Research and Innovation (R&I) activities for a major transformation in rail systems in Europe.

EU-Rail is an autonomous body with its own legal personality. EU-Rail founding act is Council Regulation (EU) 2021/2085⁹ of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014 (hereinafter "Single Basic Act" or "SBA"), which entered into force on 30 November 2021. In accordance with Article 174(6) of the SBA, EU-Rail is the legal and universal successor in respect of all contracts, including employment contracts and grant agreements, liabilities and acquired property of the Shift2Rail Joint Undertaking which it replaced and succeeded. In addition, in its first meeting, the EU-Rail Governing Board approved the list of decisions adopted by the S2R JU that will continue to apply for EU-Rail in accordance with Article 174(12) of the SBA¹⁰.

The Vision of EU-Rail is

To deliver, via an integrated system approach, a high capacity, flexible, multi-modal, sustainable and reliable integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, for European citizens and cargo.

The mission statement of EU-Rail is

"Rail Research and Innovation to make rail the everyday mobility"

In accordance with article 87(1) of the SBA, the members of EU-Rail are the Union, represented by the Commission, and Private Members¹¹. The Private Founding Members of EU-Rail were selected via an open and transparent process, started with an "invitation to manifest the interest to become Candidate Founding Member of the Transforming Europe's Rail System European Partnership" on 13 August 2020 and concluded with the listing of 25 entities retained as Founding Members in Annex II of the SBA. The Private Founding Members of EU-Rail signed a Letter of Commitment in accordance with the provisions of the SBA to deliver the contributions established in its Article 89.

Following an in-depth review of the areas where associated membership would bring added value to the R&I Programme, and after having launched a call for expression of interest in 2024¹², EU-Rail have incorporated in 2025 five new private members – the Associated Members – in accordance with Article 7 of the SBA. The Associated Members have the required potential to contribute to the achievement of the objectives of the Europe's Rail Joint Undertaking and its related open call procedure.

It has to be noted that Thales Six GTS France SAS terminated its membership in EU-Rail on 24 July 2025¹³. In consequence, EU-Rail has currently 29 private members¹⁴.

The objective of Europe's Rail Joint Undertaking is to deliver a high-capacity integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure and services, aiming to achieve faster uptake and deployment of projects and innovations. That should exploit the huge potential for digitalisation and automation to reduce rail's costs, increase its capacity and enhance its flexibility and reliability, and should be based upon a solid reference functional system architecture shared by the sector, in coordination with the European Union Agency for Railways (ERA).

⁹ OJ L 427, 30.11.2021.

¹⁰ EU-Rail GB Decision no. 02/2021.

¹¹ As per Article 2(5) of the SBA, "Private Member" means any legal entity established under public or private law that is a member of a joint undertaking other than the Union, participating states or international organisations.

¹² "Call for expression of interest with a view to selecting associated members with the potential to contribute to the achievement of the objectives of the Europe's Rail JU" adopted by the Governing Board on 21 June 2024 (GB Decision no. 09/2024).

¹³ Article 8(3) of the SBA which stipulates that the termination of membership becomes effective and irrevocable six months after its notification to the Executive Director of EU-Rail. THALES termination notice e-mail was received on 24 January 2025.

¹⁴ EU-Rail has 24 private founding members and 5 private associated members.

In addition to the General and Specific Objectives common to all JUs established in Title II, Chapter 1 of the SBA, EU-RAIL is also entrusted with the following:

General Objectives

- (d) contribute towards the achievement of the Single European Railway Area;
- (e) ensure fast transition to more attractive, user-friendly, competitive, affordable, easy to maintain, efficient and sustainable European rail system, integrated into the wider mobility system;
- (f) support the development of a strong and globally competitive European rail industry.

Specific objectives

- (a) facilitate research and innovation activities to deliver an integrated European railway network by design, eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure also including integration with non-standard national gauges, such as 1520, 1000 or 1668 mm railway, and services, and providing the best answer to the needs of passengers and businesses, accelerating uptake of innovative solutions to support the Single European Railway Area, while increasing capacity and reliability and decreasing costs of railway transport;
- (b) deliver a sustainable and resilient rail system: by developing a zero-emission, silent rail system and climate resilient infrastructure, applying circular economy to the rail sector, piloting the use of innovative processes, technologies, designs and materials in the full life cycle of rail systems and developing other innovative solutions to guided surface transport;
- (c) develop through its System Pillar a unified operational concept and a functional, safe and secure system architecture, with due consideration of cyber-security aspects, focused on the European railway network to which Directive 2016/797 applies, for integrated European rail traffic management, command, control and signalling systems, including automated train operation which shall ensure that research and innovation is targeted on commonly agreed and shared customer requirements and operational needs, and is open to evolution;
- (d) facilitate research and innovation activities related to rail freight and intermodal transport services to deliver a competitive green rail freight fully integrated into the logistic value chain, with automation and digitalisation of freight rail at the core;
- (e) develop demonstration projects in interested member states;
- (f) contribute to the development of a strong and globally competitive European rail industry;
- (g) enable, promote and exploit synergies with other Union policies, programmes, initiatives, instruments or funds in order to maximise its impact and added value.

As defined in the SBA, the “Strategic Research and Innovation Agenda” (SRIA) represents the document covering the duration of Horizon Europe that identifies the key priorities, essential technologies and innovations required to achieve the objectives of the JU. In accordance with SBA Article 86(5), in the case of EU-Rail, its Master Plan shall constitute the SRIA.

The EU-Rail Master Plan builds also upon the “Rail Strategic Research and Innovation Agenda”¹⁵ of the European Rail Research Advisory Council (ERRAC). ERRAC is a research platform composed of representatives from most of the major European railway research stakeholders: manufacturers, operators, infrastructure managers, the European Commission, EU Member States, academics and users’ groups. Its mission is to deliver a vision of the railway’s future enabled by Research and Innovation activities. The Master Plan provides guidance for the Europe’s Rail Joint Undertaking’s more specific tasks, namely:

- develop in its System Pillar a system view that reflects the needs of the rail manufacturing industry, the rail operating community, Member States and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector.

¹⁵ https://rail-research.europa.eu/wp-content/uploads/2020/12/RAIL-Strategic-Research-and-Innovation-Agenda-2020-_FINAL_dec2020.pdf.

The 'system view' shall encompass:

- the development of the operational concept and system architecture, including the definition of the services, functional blocks, and interfaces which form the basis of rail system operations;
- the development of associated specifications including interfaces, functional requirement specifications and system requirement specifications to feed into Technical Specifications for Interoperability (TSI) established pursuant to Directive (EU) 2016/797 or standardisation processes to lead to higher levels of digitalisation and automation;
- ensuring the system is maintained, error-corrected and able to adapt over time and ensure migration considerations from current architectures;
- ensuring that the necessary interfaces with other modes, as well as with metro and trams or light rail systems, are assessed and demonstrated, in particular for freight and passenger flows;

- perform the research and innovation activities necessary to achieve the objectives of EU-Rail, including low TRLs rail-focused research and innovation activities. In that respect, EU-Rail shall:

- define and organise the research, innovation, demonstration, validation and study activities to be carried out under its authority, while avoiding fragmentation of such activities;
- exploit standardisation and modularity opportunities, and facilitate the interfaces with other modes and systems;
- develop demonstration projects;
- develop close cooperation and ensure coordination with related European, national and international research and innovation activities in the rail sector and beyond as necessary, in particular under Horizon Europe, thereby enabling the Europe's Rail Joint Undertaking to play a major role in rail-related research and innovation while also benefiting from scientific and technological advances reached in other sectors;
- perform any tasks necessary to achieve the objectives set out in SBA Articles 4 and 85.

- facilitate the market uptake of rail innovation developed in the Europe's Rail Joint Undertaking and to support deployment of the innovative solutions through the establishment of a Deployment group pursuant to Article 22 of the SBA.

Five areas of priority for EU-Rail have been determined in its Master Plan:

- 1) European rail traffic management and supporting rail's key role in a multimodal transport system
- 2) Digital and automated train operations
- 3) Sustainable and digital assets
- 4) Competitive digital green rail freight
- 5) Smart solutions for low density traffic lines (cost-efficient regional lines)

These priorities will be underpinned by a system view to ensure a harmonised approach to the evolution of the Single European Rail Area. They will be complemented by forward-looking activities, tackling disruptive technologies and thinking, through performing exploratory research and other complementary activities.

EXECUTIVE SUMMARY

The R&I activities performed under the new EU-Rail integrated Programme are covering innovative solutions' lifecycle, from exploratory research to pre-implementation and deployment, are designed to deliver the transformation of the rail sector needed to answer clients' needs, passengers and supply chain. Not only to contribute addressing the European Green Deal but also the energy crises and new competitiveness challenges.

By the end of 2025, after four years of operation, the EU-Rail Programme engaged 377 participant entities across 801 participations from 28 countries, including 55 SMEs and 106 research centres and universities, with 30 Members in total following the integration of 5 new Associated Members.

The established System Pillar works in 2025 provided outputs including:

- Second Version of Standardisation and TSI Input Plan
- System Concept for the Traffic Control System
- Train Control System Architecture
- Cybersecurity specifications V1.0
- Trackside Assets specifications update (TACS/EULYNX Baseline 4 Release 4)
- System Pillar Report on FRMCS Version 2 and Version 3
- Submission of 45 Change Requests to the ERA Change Control Management Database

Finalised specifications are freely available on the EU-Rail website and could be used by the sector in procurements, supporting cost reduction and strengthening the harmonisation of the railway system. Significant achievements include the production of system concept for future harmonised operational rules and associated CCS specifications essential for achieving the Single European Rail Area, the development of an on-board modular architecture including Ethernet consist network and enhanced train interfaces, and the extension of the CCS/TMS data model as part of the ERA ontology.

In the Innovation Pillar, following the launch of the first six Flagship Projects in December 2022, the monitoring of the activities and assessment of the results continued in 2025 in view of the fulfilment of the main milestones ahead of their conclusions in 2026. Over 70 demonstrations were ongoing or under preparation across the programme by year-end, including critical demonstrations in real operational environments such as Digital Automatic Coupling (DAC) testing under winter conditions in Sweden with demonstrator trains running in commercial service, Automatic Train Operation Grade of Automation 4 (ATO GoA4) in the Czech Republic, remote train operations and a pilot Energy Hub in the Netherlands, Moving Block demonstration in Germany, robotic prototypes for trackside ERTMS equipment installation, and digital twin and predictive maintenance solutions. The results expected from this first wave of Flagship Projects will constitute the basis for the continuation of the technological developments in the next phases of the programme. Additionally, in 2025, EU-Rail monitored also the activities of: 1) five projects embedded in the Flagship Areas including two projects launched in 2024 in synergy with the European Smart Networks and Services Joint Undertaking (SNS JU) and the SESAR 3 Joint Undertaking 2) twelve Exploratory research projects, complementing the work of the Flagship Projects in often different areas of research and innovation of the EU-Rail Innovation Pillar. Two of these exploratory projects were successfully concluded in 2025 (RAIL4CITIES and ESEP4Freight).

Two new Grant Agreements were signed (stemming from the 2024-01 and 2025-01 Call for proposals) and EU-Rail launched two calls for proposals in 2025 to ensure appropriate programme implementation. Call 2025-1, launched in February, advanced the development of Maglev Derived Systems and their feasibility for the European railway network, with the new MaDe4Rail 2 project already running following a grant agreement finalised in November. A new Grant Agreement was also signed under Flagship Area 5 "Sustainable Competitive Digital Green Rail Freight Services" on Digital Automatic Coupler. Call 2025-2, launched in October, covered sixteen topics including the second wave of Flagship Projects – defining the next steps towards large-scale demonstration at higher Technology Readiness Levels – as well as four new exploratory projects, paving the way for the deployment of innovative operational and technological solutions across Europe.

Deployment activities are also a central activity of EU-RAIL. During 2025, following the Governing Board Decision No 11/2023 EU-RAIL has organised formalised the setup of the High-Level Deployment Group. Three meetings in 2025 included formal decisions on procedures and key topics, FRMCS (Future Rail Mobile Communication System) was agreed as a first subgroup focus. A comprehensive FRMCS questionnaire gathered valuable insights from key stakeholders, revealing notably different foreseen timelines for infrastructure managers and railway undertakings/lessors, limited awareness in smaller countries and companies, and the need for future-proofness and stability of the system. In addition, the European DAC Delivery Programme under the leadership of EU-RAIL has continued to bring together the rail sector beyond the Membership to bridge the research work with innovation, including migration planning, towards the deployment of a European DAC solution, built on open and transparent standard specifications.

Beyond the operational activities, 2025 was the third year of implementation of Article 13 SBA, where EU-Rail took over the responsibility for the coordination of the Back Office Arrangement (BOA) Accounting Services. Other 3 BOAs led by other JUs were operationalised, where EU-Rail also took a supporting role. Furthermore, the migration to the SUMMA financial management system was successfully completed by the end of 2025, reaching 100% for both Expenditure and Revenue, ensuring EU-Rail's full compliance with the new EU financial management system.

The year 2025 sought the continuation of the close collaboration established between EU-Rail and:

- the European Railway Research Advisory Council (ERRAC),
- the European Union Agency for Railways (ERA),
- the European Union Agency for the Space Programme (EUSPA),
- the European Telecommunications Standards Institute (ETSI) – signature of a Memorandum of Understanding with EU-Rail in 2025,
- other programmes, partnerships and bodies, with the objective to establish synergies that will result in coordinated and consistent activities, or joint R&I projects or administrative synergies,
- different associations representing the key stakeholders of the rail sector and beyond,
- third countries programmes, in line with the policy priorities of the Commission and considering the key objective of the competitiveness of the European rail industry.

The JU's key messages and events continued to reinforce the objectives of the initiatives such as the European Green Deal, the Sustainable and Smart Mobility Strategy or the Digital Decade and European Competitiveness by disseminating R&I results and showing the future evolution of rail in terms of services for passengers and freight clients. In this respect, in line with its communications strategy, Europe's Rail aims to:

- showcase the innovative technological and operational solutions that result from the research and innovation activities, and in particular those ready to enter industrialisation and deployment, in particular demonstrating concrete impact;
- raising awareness on the research and innovation activities outreaching to the stakeholders at European level as well as engaging at global events/conferences to promote EU-Rail results;
- enhance the partnership nature of the JU through communications and dissemination activities that will create opportunities for inclusiveness.

EU-Rail's communication activities in 2025 were extensive and impactful. The JU participated in nearly 50 different events across Europe and beyond, significantly enhancing its visibility and showcasing the Partnership's importance within the global rail and transport communities.

New outreach initiatives in 2025 included the launch of the European Railcast, a podcast on the future of rail mobility with 5 episodes published during the year, as well as the first Flagship Project Information Sessions held in December. A study on net-zero logistics, published together with European rail and logistics stakeholders in coordination with DG MOVE, demonstrated the critical role rail freight plays in achieving a competitive and climate-neutral transport system. The third edition of the Women in Rail Award – organised in collaboration with DG MOVE, ERA, ALE, CER, EIM, and UNIFE – was included in UNESCO's "Advancing Gender Equality in Science" Open and Inclusive Science Hub.

A High-Level Paper on “A Future Policy-Based Public-Private Partnership for Rail” was approved by the Governing Board in June 2025, and associated annexes describing potential Flagship Initiatives was approved in December 2025. Together these documents outline the activities that could be supported in a third rail Joint Undertaking to support European rail systems become more agile, resilient, and competitive.

Following a 2024 Call for Expression of Interest, EU-Rail selected five new Associated Members in 2025, strengthening the sector's research and innovation capacity. The new Associated Members Acciona (Spain), Frequentis (Austria), Infraestruturas de Portugal and the Alliance (Portugal), Kontron (Austria), and XLAB D.O.O. (Slovenia and Spain) bring unique expertise in key technological and operational areas (including expanding geographical reach) and enhance EU-Rail's ability to deliver a more competitive, digital, resilient, and sustainable rail system, working alongside Founding Members on ongoing R&I activities. Additionally, in 2025, the membership of Thales was terminated following the acquisition of Thales GTS by Hitachi, with the private Members reaching agreement on the redistribution of commitments to ensure the Programme would not be significantly impacted.

Mr. Nicolas Furio has been recruited on 17 March 2025 as Head of Innovation Pillar.

EU-Rail Programme Status

In general, the objectives of the integrated Programme include the following:

- contribute towards the achievement of the Single European Railway Area;
- ensure a fast transition to more attractive, user-friendly, competitive, affordable, easy to maintain, efficient and sustainable European rail system, integrated into the wider mobility system;
- support the development of a strong and globally competitive European rail industry.

The System Pillar

The System Pillar is the “generic system integrator” for EU-Rail, and the architect of the future EU's railway system. It is established under the Single Basic Act as a fundamental activity of EU-Rail, alongside the Innovation Pillar and Deployment Group.

The System Pillar provides governance, resource, and outputs to support a coherent and coordinated approach to the evolution of the rail system and the development of the system view, based on a formal functional system architecture approach to speed innovation and deployment. The System Pillar brings rail sector representatives under a single coordination body.

To achieve this, the System Pillar will deliver a unified operational concept and a functional, safe and secure system architecture, with due consideration of cyber-security aspects, focused on the European railway network to which Directive 2016/797 applies (i.e. the heavy rail network), for integrated European rail traffic management, command, control and signalling systems, including automated train operation which shall ensure that research and innovation is targeted on commonly agreed and shared customer requirements and operational needs, and is open to evolution.

The outputs of the System Pillar Tasks and Domains are detailed in section 1.2.1.

The Innovation Pillar

The Innovation Pillar is set up to deliver user-focused research, innovation and large-scale demonstrations. It is tasked to deliver the operational and technological solutions which provide the necessary capabilities to transform the European rail system. Its activities are organised in seven Flagship Areas and the Transversal Topic.

In 2025, the Flagship Projects responsible for undertaking the initial implementation of these Flagship Areas continued their activities. Building on the work done in 2023 and 2024, all projects have continued working on use cases, defining requirements and developing specifications, while also developing prototypes and initiating testing activities across multiple countries. These testing activities have already provided preliminary insights into the solutions developed within the Flagship Projects. All Flagship Projects have also continued collaborating among themselves, as well as with the EU-Rail System Pillar.

The outputs of the Innovation Pillar are detailed in section 1.2.2.

The EU-Rail High-Level Deployment Group

As per Article 97 of the Single Basic Act, the Deployment Group is to advise the Governing Board on the market uptake of rail innovation developed in EU-Rail and to support the deployment of innovative solutions. The main objective of the Deployment Group is to analyse how to strengthen the capability of the sector to sustainably contribute and accelerate rail innovation to reach the market. It focuses on different aspects to make recommendations to the different actors of the system on the deployment of innovative solutions that require high levels of coordination.

During 2025, following the Governing Board Decision No 11/2023 EU-RAIL has organised formalised the setup of the High-Level Deployment Group. Three meetings in 2025 included formal decisions on procedures and key topics, It was agreed was to take FRMCS (Future Rail Mobile Communication System) as first subgroup focus. Next to FRMCS discussions were held on the alignment and interactions between upcoming large transition programmes, as ETCS, FRMCS, DAC, ASTP and ATO.

A dedicated FRMCS subgroup was set up on European FRMCS Deployment. For this group remits and working plan was discussed and set as basis for the works. Four formal meetings of the FRMCS subgroup were held in 2025. Three Working groups were set up: 1. WG technology, 2. WG legal and finance, 3. WG migration and alignment. All working groups already delivered first analyses and reports. The outputs of the High-Level Deployment Group are detailed in section 1.2.3.

The European DAC Delivery Programme (EDDP) under the leadership of EU-Rail

In July 2020, the Governing Board of the JU endorsed the creation of the EDDP proposed by the ED, voicing the request of the railway sector. Building upon the outcomes achieved in S2R's freight related R&I activities (IP 5), this Programme brings together the rail sector beyond the Membership to bridge the research work with innovation, including migration planning, towards the deployment of a European DAC solution, built on open and transparent standard specifications. This activity constitutes a major step ahead of the digital rail freight, enabling new operations and services that will contribute meeting the expectations of the Sustainable and Smart Mobility Strategy of the European Commission.

The EDDP integrates, with an independently managed delivery programme, the relevant results from the projects linked to Europe's Rail JU FA5 activities, such as FP5-TRANS4M-R, FP5-DACtiVate and DACFIT, on European rail freight. In 2025 several meetings continued with the ERA DAC Topical Working Group and national NSA's with the aim to agree a DAC specifications that could be adopted in future TSI, supporting the harmonization all across EU rail network.

In 2025, the DACcord Coordination and Support Action, continued to support the running of EDDP. The refined EDDP programme planning as basis for an exhaustive risk management was delivered and the permanent coordination with FP5-TRANS4M-R via regular reports in the EDDP boards. Regular alignment meetings took place between the different bodies and, in coordination with the EU-Rail. This work is continued through executing and managing the DAC General Master Plan. It further worked on the DAC migration roadmap and on a EDDP Stakeholder Management. The DACcord project also worked together with FP5 TRANS4M-R project for the continuation of the three so called EU-Rail "sounding boards". The results of these sounding boards were reported to the EDDP programme board and used for evaluation by the FP5 TRANS4M-R project.

In 2025 CINEA appointed the PioDAC consortium to lead and implement the Pioneer Train phase, the first commercial deployment of the new DAC system and equipment, building notably on the work of the EU-Rail FP5-TRANS4M-R project. As the timeline for operational use approached, the EDDP led several dedicated actions to address longstanding issues related to authorisation, technical topics and (pre-) production activities of DAC suppliers.

Other activities

The EU-Rail Staff Establishment Plan covering, from the resources needs perspective, the EU-Rail activities of 2025, was adopted by the Governing Board on November 2024, including 3 staff members of the Back Office Accounting arrangements, which covers accounting services for all Joint Undertakings. According to the Staff Establishment Plan applicable to 2025, EU-Rail should have been staffed with 33 staff members including 2 Seconded National Experts. As a consequence of the revision of the Multi-Annual Framework with a reduction of the Horizon Europe amount, as well as the signature of the association Agreement with the UK, one CA position was transformed from a position funded by the EU to a position funded by Third countries without having an impact on the total number of the EU-

RAIL staff, applicable as of 2025, as well as an additional TA post financed from external revenues. In 2025, the JU experienced six departures of staff members and the vacant posts were progressively filled in. To remedy temporary gaps or long-term absences, the JU made use of external competencies and expertise to achieve its operational activities, as well as of temporary outsourcing of some administrative tasks.

With regard to communication and dissemination activities, the JU focussed its communication effort on promoting the Europe's Rail Joint Undertaking highlighting its R&I activities, while also raising awareness of the Europe's Rail Programme, its Calls for Proposals, System and Innovation Pillar, and the Deployment Group. To streamline these efforts, the JU revised its Communication and Dissemination Guidelines, integrating them into the updated Governance and Process Handbook.

Over the course of the year, the JU actively participated in and organised multiple events, strengthening engagement with stakeholders and institutional partners. In total, the JU took part in nearly 50 events across Europe and beyond, significantly enhancing its profile and reinforcing the Partnership's role within the global rail and transport sectors, including UITP, ITF, the World Congress of Railway Research, and TRAKO.

In addition to the efforts on stakeholder involvement, the JU further continued improving its internal organisation as to provide continuous support to its Members and beneficiaries. Attention was paid to the continuous implementing of the internal control framework and to the assessment and management of risks. The EU-Rail Horizon Europe Control Strategy for grants has been updated in 2024 and in 2025 to reflect the disinvolvement of the DG RTD CAS from the EU-Rail ex-post activities. As a result, EU-Rail is in charge of performing the ex-post technical reviews, with five reviews launched in 2025 and the two reviews launched in 2024 concluded with positive outcome.

The JU cooperated with different stakeholders engaged in audit activities, such as the European Court of Auditors, the Internal Audit Service of the Commission, the Common Audit Service of DG RTD or the external auditors auditing the Annual Accounts of the JU. The EU-Rail Anti-Fraud Strategy 2026-2028 has been adopted by ED Decision 25-15 in December 2025. All of these activities have contributed to the continuous assurance regarding the sound financial management of EU funds managed by the Joint Undertaking.

The JU has systematically examined the available control results and indicators, as well as the observations and recommendations issued by the internal auditor and the European Court of Auditors. All the above elements have been assessed to determine their impact on management's assurance about the achievement of the control objectives. Please refer for further details to Section 4 on Internal Control and Financial Management. In conclusion, management has reasonable assurance that, overall, suitable controls are in place and working as intended; risks are being appropriately monitored and mitigated. Executive Director, in his capacity as Authorising Officer by Delegation, has signed the Declaration of Assurance.

In 2025, the JU submitted to the European Parliament a follow-up report on Parliament's observations provided in its Resolution related to the decision on discharge in respect of the implementation of the JU's budget for the financial year 2023. In this follow-up report, the JU explained how it addressed these observations or intends to address them in the upcoming period. More specifically, the report elaborated on how EU-Rail promotes the transformation of scientific knowledge into marketable innovations. For example EU-Rail Deployment Group supports the uptake of innovation into the market to enable the creation of a Single European Rail Area, EU-Rail System Pillar works closely with the European Commission 1) On their request for standardisation to the European standardisation setting organisation, and associated inputs, and 2) On their request for revisions to the Technical Specification for Interoperability by the European Union Agency for Railways, and associated inputs. The report also referred on the state of implementation of the Back Office Arrangements (BoA), including for BoA on Accounting Services where EU-Rail has the lead. In response to some HR-related issues that were pointed out by the Parliament, the JU explained the objective conditions in which it operates, and the feasible actions that it took in that area.

It can be concluded that thanks to the commitment of both the JU Members and the Programme Office, 2025 has seen the JU further continuing its important progress towards delivering the EU-Rail Programmes.

The next sections of this 2025 CAAR present in detail the achievements, risks and opportunities, and the developments pertaining to the JU during the past year.

1. IMPLEMENTATION OF THE WORK PROGRAMME 2025

1.1. Key objectives 2025, associated risks and corrective measures

European Green Deal, the United Nations Sustainable Development Goals, the Sustainable and Smart Mobility Strategy and the Digital Decade

The European Green Deal was presented in December 2019, setting out a clear vision of how to achieve climate neutrality in Europe by 2050¹⁶. Transport accounts for a quarter of the EU's greenhouse gas emissions, and still growing. To achieve climate neutrality, a 90% reduction in transport emissions is needed by 2050. As a matter of priority, a substantial part of the 75% of inland freight carried today by road should shift onto rail and inland waterways.

“To transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use.” (European Green Deal, p. 2). Priority areas include accelerating the shift to sustainable and smart mobility: “Automated and connected multimodal mobility will play an increasing role, together with smart traffic management systems enabled by digitalisation. The EU transport system and infrastructure will be made fit to support new sustainable mobility services that can reduce congestion and pollution, especially in urban areas” (European Green Deal, p. 10).

In July 2021, the so-called “Fit for 55”¹⁷ package was introduced by the Commission – a package consisting of a set of inter-connected proposals making the existing legislation more ambitious, where possible, and even putting on the table new proposals, where needed. The main ambition of the EU under this package is cutting emissions by at least 55% by 2030 by also supporting a faster roll-out, relative to prior objectives, of sustainable transport solutions such as rail. Overall, the package strengthens eight existing pieces of legislation and presents five new initiatives, across a range of policy areas and economic sectors: climate, energy and fuels, transport, buildings, land use and forestry.

The European Green Deal is also an integral part of the Commission's strategy to implement the United Nations 2030 Agenda and the 17 Sustainable Development Goals (SDGs).¹⁸ The JU has been reporting in its Consolidated Annual Activity Reports already under the S2R Programme on its contribution to the SDGs since 2018. The Joint Undertaking, under its current Programme, will continue in this endeavour, more specifically with regard to these SDGs¹⁹:



SDG 9: Building resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation



SDG 12: Ensure sustainable consumption and production patterns



SDG 13: Take urgent action to compact climate change and its impacts

¹⁶ European Commission (2019). The European Green Deal. COM(2019) 640 final, Brussels.

¹⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0550> and <https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/>.

¹⁸ United Nations General Assembly (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. Draft resolution referred to the United Nations summit for the adoption of the post-2015 development agenda by the General Assembly at its sixty-ninth session. UN Doc. A/70/L.1. New York.

¹⁹ As also indicated in the Biennial Monitoring Report 2022 on Partnerships in Horizon Europe, page 295: <https://op.europa.eu/en/publication-detail/-/publication/a6cbe152-d19e-11ec-a95f-01aa75ed71a1/language-en/format-PDF/source-search>.



SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all



SDG 5: Achieving gender equality and empower all women and girls

More specific insights into how EU-Rail aims at contributing to the broader objectives represented by the SDGs can be obtained from Annex 5 providing information on the Key Performance Indicators/Key Impact Pathway Indicators.

Further to the above, the Sustainable and Smart Mobility Strategy of the Commission, launched in December 2020²⁰, includes more concrete milestones for the railway sector to enhance a smart and sustainable future. Its underlying Action Plan of 82 initiatives lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises. In particular, it provides the visionary ambitions that the next rail R&I Programme will have to contribute to insofar as possible and notably:

- By 2030 the high-speed rail traffic will increase by 50%; the scheduled collective travel of under 500 km should be carbon neutral within the EU and automated mobility will be deployed at large scale.
- By 2050 rail freight traffic will double; high-speed rail traffic will triple and the multimodal Trans-European Transport Network (TEN-T) equipped for sustainable and smart transport with high-speed connectivity will be operational for the comprehensive network.
- A shift of a substantial part of the 75% of inland freight carried by road towards transport by rail and inland waterways.

Additionally, rail transport will also need to be further electrified; wherever this is not viable, the use of hydrogen should be increased. And the roll out of the European Rail Traffic Management System (ERTMS) will be pursued including further efforts to develop train automation, for instance through joint undertakings.

Further to the topic of “Digital Decade”, the Commission indicated in its Communication of March 2021²¹ how digital transformation can improve the ecosystems related to mobility and transport. Digitalisation can improve environmental and cost performance and simultaneously increase safety levels contributing to a higher quality of life. It will be achieved through more advanced levels of automation, faster and more reliable connectivity, and IT enabled profound transformation of the management of mobility services. The public could also benefit from fast internet connectivity for passengers on most stations and lines, user-oriented telematics and facilitated multi-modality.

In this context, EU-Rail and its Programme strived for speeding up the development and deployment of innovative technologies in railway transport in order to contribute to achievement of the above-mentioned milestones. This will require a significant transformation of the railway sector, addressing long overdue changes in legacy operational processes, systems and governance models, as well as integrating with other transport and mobility solutions for passenger services and cargo logistics. The ongoing energy crises, which has major impacts also on rail, requires accelerating research and innovation towards deployment of innovative technological and operational solutions that would contribute to operational efficiencies and energy performance.

²⁰ European Commission (2020). Sustainable and Smart Mobility Strategy – putting European transport on track for the future. COM(2020) 789 final, Brussels.

²¹ European Commission (2021). 2030 Digital Compass: the European way for the Digital Decade. COM(2021) 118 final, Brussels.

Besides the efforts made via its R&I Programme, the JU itself and its staff, to the extent corresponding to the size of the organisation, also strived to contribute to the fight against climate change when conducting the day-to-day business. Those “little things” that the JU applies to be as green as possible include:

- Separating waste in the JU's premises,
- Suppression of single-use items,
- Reducing paper consumption by applying paperless workflows to the extent possible,
- Encouraging staff not to commute to work by car by providing a scheme for reimbursement of public transport cost and arrangements supporting commuting by bike.
- Increased usage of online/hybrid meetings and events to reduce the carbon footprint related to travelling.

While the option of moving office in 2022 or early 2023 was eventually not realized, any future decision-making of EU-Rail in this respect will include due considerations regarding the energy-efficiency parameters of the respective premises.

Key objectives 2025

The JU objectives of 2025 were met with the full commitment of the budget appropriations (99.5%) related to the Horizon Europe funded EU-Rail Programme for the operational activities for that year. This demonstrates that the JU was able to engage the railway sector to an effective resource commitment to progress in delivering the railway system evolution, through an increasingly integrated Programme.

The Work Programme (WP) and budget 2025, initially adopted in November 2024, were amended on two occasions mainly to address the updates regarding operational activities and the related financial figures:

(1) The WP Amendment no. 1 adopted in February 2024 recognized the inscription of EUR 32.9 million of payment appropriations on Title 3 of the Budget 2024 to ensure the closure of the remaining S2R projects.

(2) The WP Amendment no. 2 adopted in November 2024 adapted the budget both in commitment and payment appropriations considering the evolution of budget needs, the multi-annual operational planning of EU-Rail, and finally to amend the multi-annual IKAA plan 2023-2024 following a proposal of private founding members.

The progress achieved and the launch of these additional core activities represented another key step towards the digitalization and automation of the railway system, to contribute delivering sustainable (climate neutral, life cycle cost efficient, connected, integrated through a system approach) mobility and transport for passengers and supply chain.

In 2025, the operational priorities consisted of:

- Innovation Pillar:
 - o the monitoring and performance analysis of the continued work of the Flagship Projects (begun in 2022), including the achievement of the planned milestones, the launch of testing activities to be continued in 2026 → achieved;
 - o the launch of the Call 2025-1 during Q1 2025, followed by the conclusion of the grant agreement in Q4 2025, to create new opportunities for inclusiveness and participation, continuing the work done on Maglev Derived Systems in Flagship Area 7 → achieved;
 - o the launch of the Call 2025-2 during Q4 2025, to create new opportunities for inclusiveness and participation, covering six topics for successors to the FPs launched in 2022, as well as four new exploratory projects → achieved.

- System Pillar:
 - o the delivery of the results of the System Pillar Tasks and Domains, including the second Standardisation and TSI Input plan to the European Commission and verify in the mid of 2025 → achieved;
 - o the launch of the contract to support activities in 2026 → achieved;
- High-Level Deployment Group:
 - o the operationalization and formalisation of the high-level and topical working group(s) in 2025, following the GB decision for their creation, aiming at closing the innovation gap towards deployment with addressing European migration and implementation plans, → achieved;
 - o supporting the activities of the European DAC Delivery Programme (EDDP), in particular working with the European Commission towards the development of a comprehensive migration strategy and support to the first DAC pioneer phase, to coordinate deployment, in accordance with the Commission communication on “Greening Freight Transport” COM(2023) 440, → achieved and ongoing;
- Membership:
 - o the selection of Associated Members following the launch of a call for expression of interest in 2024, in accordance with articles 7 and 87(1) point c of the SBA → achieved;

In addition, the year 2025 saw the continuation of the close collaboration established between EU-Rail and:

- the European Railway Research Advisory Council (ERRAC),
- the European Union Agency for Railways (ERA),
- the European Union Agency for the Space Programme (EUSPA),
- the European Telecommunications Standards Institute (ETSI) – signature of a Memorandum of Understanding with EU-Rail in 2025,
- other programmes, partnerships and other bodies, with the objective to establish synergies that will result in coordinated and consistent activities, or joint R&I projects or administrative synergies, such as for example under the Back-office arrangements with other JUs,
- different associations representing the key stakeholders of the rail sector and beyond,
- third countries programmes, in line with the policy priorities of the Commission and considering the key objective of the competitiveness of the European rail industry.

Finally, in 2025, EU-Rail continued to prove to the European citizens that rail is the answer to their expectations regarding sustainable and reliable mobility solutions. The JU's key messages and events continued to reinforce the objectives of the initiatives such as the European Green Deal, the Sustainable and Smart Mobility Strategy or the Digital Decade by disseminating R&I results and showing the future evolution of rail in terms of services for passengers and freight clients. In this respect, in line with its communications strategy, Europe's Rail aims to:

- showcase the innovative technological and operational solutions that result from the research and innovation activities, and in particular those ready to enter industrialisation and deployment, in particular demonstrating concrete impact;
- raising awareness on the research and innovation activities outreaching to the stakeholders at European level as well as engaging at global events/conferences to promote Europe's Rail results,;
- enhance the partnership nature of the JU through communications and dissemination activities that will create opportunities for inclusiveness.

At the corporate level, EU-Rail strives for appropriate workload distribution, as well as for costing and staffing levels needed to ensure successful delivery of the Programme. In addition to supporting continuous learning and raising of the staff qualifications, activities improving the well-being and team cohesion were conducted throughout 2025.

The following sections of this CAAR describe how the JU’s objectives have been pursued, the activities performed on the way towards achieving its goals, and the resources used. In Annex 5 the JU’s performance is measured against the set of agreed KPIs. More details related to call for tenders, procurements and contracts concluded and/or launched in 2025 are presented in Sections 1.3 and 2.5.

Risks

In Q4 2023, the IAS has carried out an in-depth risk assessment²² of EU-Rail, which resulted in the establishment of the IAS Strategic Internal Audit Plan(SIAP) 2024-2026 for the JU²³.

In Q4 2024, EU-Rail performed a risk assessment exercise with the aim of updating the elements related to risks and opportunities already included in its risk register, as well as identifying potential new ones. The corresponding risks relevant for 2025 associated with the Programme activities and the financial administration of the JU, requiring continuous ED attention (and when relevant, the attention of GB), as well as the corresponding risk mitigating actions have been communicated via the EU-Rail Work Programme 2025. They are summarised in the table below together with an update on follow-up and mitigation actions performed in 2025.

As for the average JU’s risk profile pertaining to 2025, as followed from the annual risk assessment performed, and also from the continuous monitoring of risks and opportunities during the year, this was determined by having moderate to high net criticality of the most relevant risks identified.

Risk identified for 2025 in the Work Programme	Action plan/measures	Follow-up on action plan/measures for 2025
<p>Intrinsic to the EU-Rail limited Staff establishment plan and its actual fulfilment, efficiency of operations is impacted by extensive workload of JU’s staff. In combination with the HoRI vacancy, SNE and ICC vacancies, as well as HRO vacancy and the timeframe of the recruitment process for these positions, resulting in high staff turnover, difficulties for the JU to attract new people, while vacant positions might be filled with delays resulting in shortage of resources becoming critical especially during peak periods</p>	<ul style="list-style-type: none"> - Continue in conducting recruitments for reaching the actual staffing according to the EU-Rail Staff Establishment Plan – once accomplished, the envisaged positive effects on workload allocation and back-ups should become visible. - Design/apply a replacement plan (back-ups) where possible. - Within the current budget constraints, a career plan for staff has been prepared and business continuity is ensured. - Enhancement of the overall planning of activities will allow for better personnel risk management. - Recruitment of short-term resources (interim or trainees) has been extended. - Outsourcing of some activities, when applicable, making use of the existing Framework contracts or own procurements. 	<p>Actions/measures have been implemented on an ongoing basis:</p> <p>Vacant posts as per new Staff Establishment Plan were gradually filled.</p> <p>Internal planning and organisation were refined.</p> <p>Bluebook Trainees were deployed in accordance with the SLA signed with DG EAC, as needed.</p> <p>Synergies under BOA HR have been utilised.</p> <p>Activities aimed at enhancing team spirit and work-life balance have been carried out.</p> <p>Outsourcing of some activities, as applicable, making use of the existing Framework contracts or own procurements.</p>

²² IAS assessment covered all EU-Rail auditable entities, i.e.: set of organisational structures, information technology systems, policies and procedures, financial and human resources that an entity implements to direct, execute, monitor and report upon its activities/processes.

²³ SIAP 2024-2026, Ares(2023)8515994.

Risk identified for 2025 in the Work Programme	Action plan/measures	Follow-up on action plan/measures for 2025
	<ul style="list-style-type: none"> - Implementation of back-office arrangements among the JUs might decrease the EU-Rail's internal workload in some areas. - Introduction of a multi-annual learning and development policy will be considered. - Flexible arrangements within the bounds of the respective Commission Decision are in place with regard to hybrid working. - Initiatives aimed at ensuring good working environment and team spirit are implemented on a regular basis, such as social events and team building activities. - Provision of career opportunities. 	
<p>Given the interdependencies of complementary R&I projects, considering as well the complexity of the integrated EU-Rail Programme (including input/outputs between System and Innovation Pillars), delays and misalignments in the completion of activities may lead to negative project cascading effects impacting Programme outputs.</p>	<ul style="list-style-type: none"> - Ensure, through adequate Programme management strengthened monitoring and reporting of projects, including gate reviews, to determine whether specific actions need to be taken with regard to a specific project (re-orientation, early closure, etc.). - Addressing during the GAP any possible alignment issues between ongoing and future R&I activities. - Follow the high-level interactions as detailed in the MAWP. - Application of maturity check points. 	<p>Measures have been implemented on an ongoing basis:</p> <p>Adequate Programme monitoring was continuously ensured and any issues related to the R&I projects were addressed.</p>
<p>The ambitions of the System Pillar sector/EU are not matched by the outcomes of EU-Rail Programme due to the limitation in terms of available resources to cover the related activities. This might negatively affect the image of the JU.</p>	<ul style="list-style-type: none"> - Analysis of feasibility of requirements expressed by the sector and appropriate management of expectations. - Application of shorter contractual periods. - Checking of contract deliverables by third parties, for example ERA, and third-party experts. - Constant communication on outputs, focusing on concrete results that can be implemented taking into account the legacy system, migration aspects, business cases, etc. - Request to the contractor evidence allowing matching the foreseen outputs with resources allocation. 	<p>Measures have been implemented on an ongoing basis:</p> <p>Adequate continuous management of the System Pillar activities was carried out including communication with the relevant stakeholders.</p>

Risk identified for 2025 in the Work Programme	Action plan/measures	Follow-up on action plan/measures for 2025
<p>Vulnerabilities in IT infrastructure or human failures/omissions enabling unauthorized computer network access or cyber-attacks may lead to compromising of data with potential financial losses and/or reputational damage. Delays might also occur, e.g. if data relevant to day-to-day operations became unavailable due to a successful ransomware attack.</p>	<ul style="list-style-type: none"> - Azure VPN connection encryption based on user certificates. - Azure VPN connection encryption based on user certificates. - Two factors authentication for M365 and EU login. - VLANs used for LAN segmentation/separation minimizing attack/connectivity footprint. - Secured guest Wifi, LAN-independent. - Corporate Wifi secured with user authentication. - Monthly security assessment of both Cooperation Tool and website. - Computers disk encryption in place. - Internet only for non-corporate devices on the wired network. - Lock, change user password remotely; inform the mobile telephony provider; implement intunes security policy for mobile phones. - Implementing mitigation measures of the DPIA for Microsoft Office 365. - Continuous awareness-raising of JU's staff with regard to cyber security and protection of IT tools and assets. Yearly mandatory cybersecurity sessions. - Sharing of information with the staff about detected actual phishing attempts (also from the EC or other EU bodies) and providing advice on the appropriate way of procedure in such cases. Yearly phishing exercise. - Recurring penetration test of the infrastructure. - Realtime monitoring of our infrastructure logs by CERT.EU to detect early signs of attacks. - Joint ICT strategic plan for all JUs is in place. It foresees, i.e. the implementation of EC authentication method for the JU infrastructure and of a new regulation for a close cooperation with all EU bodies in terms of cybersecurity and data protection. 	<p>Technical measures have been implemented on an ongoing basis.</p> <p>Several reminders and awareness-raising activities to JU's staff were provided with regard to cybersecurity and phishing.</p> <p>Joint activities among the JUs were carried out in the context of BOA. Application of business continuity measures in case the risk materialized.</p>

Risk identified for 2025 in the Work Programme	Action plan/measures	Follow-up on action plan/measures for 2025
<p>Deficiencies in dissemination of results may lead to lack of adequate information to the end-user/interested parties and could compromise the intended JU's impact. That can also negatively impact the overall reputation of the EU-Rail Programme.</p>	<ul style="list-style-type: none"> - Proper planning and regular follow up at dedicated JU communication meetings, guidelines, as well as at the Flagship Projects Steering Committees - Whenever possible, ensuring presence of high-level EU/national (political) representatives in events presenting EU-Rail's results. - Communication via social media channels might be expanded from providing general information about EU-Rail to also reporting on results of individual projects. - Creating an overall dissemination communication plan at JU level including the coordinated planning from the EU-Rail projects communication and dissemination activities. 	<p>Actions/measures have been implemented on an ongoing basis.</p> <p>Various channels were deployed for communication and dissemination of R&I results related to the JU's Programme (see also Section 1.8).</p> <p>Cooperation with relevant stakeholders was ensured.</p>
<p>Delays or deficiencies in deploying the innovations and new (target) architecture, e.g. due to delayed activities of the Deployment Group, due to administrative reasons or difficulties in mobilising the European rail representatives (Infrastructure Managers and Rail Operators, suppliers, etc.). This might cause that the JU's role and position are negatively affected, as well as the deployment of EU-Rail outcomes in a coordinated and integrated manner, with the achievement potential of Programme objectives.</p>	<ul style="list-style-type: none"> - Continuous efforts of the JU towards the correct setting up of the Deployment Group, finding appropriated resources such as a Programme manager, including clear communication regarding its role and importance. Introduction and application of an easy selection process for the candidates to the Deployment Group. 	<p>Actions have been implemented on an ongoing basis.</p> <p>Adequate monitoring of the JU's Programmes was continuously ensured.</p>

In September 2025, EU-Rail performed a new risk assessment exercise with the aim of updating the elements related to risks considered relevant for 2026. Within this exercise, due account was taken of topical internal and external factors and developments having influence on JU's business. Attention was given also to the fraud risks. Although the peer review within the cluster did not take place due to the absence of the cluster coordinator, the updated EU-Rail risk register has been provided to the parent Commission service, DG MOVE.

In addition, EU-Rail has proactively liaised, between September and November 2025, with ENISA, the chair of the EUAN Performance Development Network (PDN). In November 2025 EU-Rail participated in the EUAN PDN meeting on preliminary conclusions of the 2025 peer review of the most common important risks for EU bodies under EUAN PDN umbrella. The risks identified by EU-Rail in the above-mentioned risk assessment exercise which require, due to their critical nature, continuous monitoring by the Executive Director and, where relevant, by the Governing Board, are presented in the JU Work Programme 2027 and the state of play of their follow-up will be included in the 2026 CAAR.

1.2. Research & Innovation activities/achievements: the EU-Rail Programme

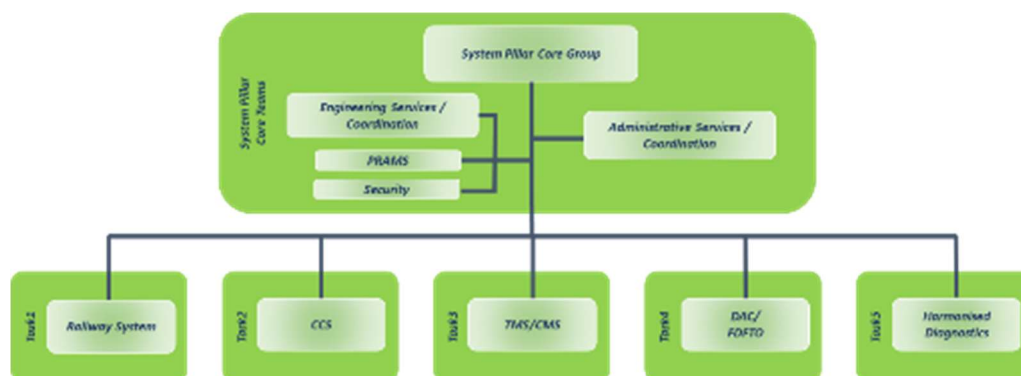
1.2.1. System Pillar

Organisation structure

The governance structure was set in 2022, with the System Pillar Core Group, under the supervision of the EU-Rail Executive Director and/or his delegated Head(s) of Units, leading the day-to-day work of the delivery of the System Pillar through the Tasks and with the support of Engineering and Administrative support services. It manages progress of and collaboration between the Tasks.

Progress and results achieved in 2025 from the SP governance and organization point of view:

- The standardised system of systems approach has been updated in the form of a new version of the System Engineering Management Plan (SEMP), the Version 4, which is an enhancement of SEMP V3.
- The second version of the Standardisation and TSI Input Plan (STIP) has been approved and published. The STIP is intended to coordinate the enhancements of the TSIs and the Commission standardisation request.
- Several activities related to the process for interaction of the System Pillar and Innovation Pillar have been carried out, like: Cooperation and a coordination between Task 2 and FPs 1 to 6 (specially with FP2 in ATO, MB and ASTP topics), shared interest topics between Task 3 and FP1, alignment of Task 4 and FP5.
- Publication of the EU-RAIL System Pillar CCS/TMS data model as an extension of the ERA Ontology



Together with the SP Core Group, the other SP horizontal teams are the Engineering Services / Coordination Team and the Administrative Services/Coordination Team.

The System Pillar Engineering Services / Coordination Team consist in:

- Engineering Environment Team: includes methods & tools definition and training for the whole System Pillar, monitoring of formal quality and allocation of work items and the consistency, traceability and integrity of the specification, active support to ensure quality and efficiency in the work of Tasks and Domains.
- Standardisation and TSI Input planning: structured along the catalogue of processes and interfaces/systems - describes the process of collecting and assessing IP and SP input to the harmonisation channels including regulation (TSI), standardisation (CEN/CENELEC, ETSI) and System Pillar Industrial standards (SP documents).
- Performance, Reliability, Availability, Maintainability and Safety (PRAMS): Coordination on the PRAMS requirements.
- Security: Coordination of the Security requirements.

The System Pillar Administrative Services / Coordination Team consist in:

- Programme (Management) Office: Support all the activities of the System Pillar, including management of:
 - Progress
 - Quality
 - Resources and administration
 - Communication
- Economic Analysis: economic analysis supporting the activities of the System Pillar (e.g. cost-benefit, enhancement change request, specific business cases, etc.).

Deliverables

The System Pillar Tasks and domains are:

- Horizontal Domains : EET, PRAMS, Security
- Task 1: Railway System
- Task 2: CCS
- Task 3: CMS/TMS
- Task 4: DAC/FDFTO System design
- Task 5 : Harmonised diagnostics

Engineering Environment Team

The Engineering Environment team includes methods definition (System Engineering Management Plan (SEMP)) and tools provision and training (Polarion, Capella, SysML specification environment) for the whole System Pillar. The Engineering Environment team monitors the formal quality of the work items, their correct allocation to the tasks and domains, and the consistency, traceability and integrity of the specification.

Progress and results achieved in 2025:

- The new version 4 of the System Engineering Management Plan (SEMP) has been developed, which includes the configuration and quality management plan, and the update of the existing annexes.
- The Requirements management plan has been updated with a clear traceability concept between System Pillar deliverables, requirement types and architecture concepts.
- An updated SP Glossary (incl. terms from European legislation) was produced including a synchronisation with ERA terminology
- Tool support has been being provided during 2025, as needed for access management, as well as configuration improvements (e.g. update of documents lifecycle). This support activity also includes test and setup of API bridge between Capella and Polarion.

System Engineering Management Plan (SEMP)

The SEMP defines the workflow rules and arrangements, methods, and tool usage for all specification related activities in the System Pillar.

It is essential that all SP tasks and domains, and linked work, follow the SEMP processes to enable the large and dispersed group of people working within the System Pillar to speak the same language and follow common processes.

SEMP V4 has been elaborated during 2025 as an enhancement of SEMP V3 based on the remit of the specific contract 2.4 and feedback from users.

PRAMS

The PRAMS team is in charge to define the strategy, policies, methods, and principles to be followed by the other Tasks and Domains during the design activities as well as to coach and support implementation. In addition, the PRAMS team define harmonized safety processes to ease the deployment of future modular systems. PRAMS team do not produce PRAMS Analysis, Hazard and Risk Analysis, for system components or system parts; these activities are delegated to the related Domain that have to include members with PRAMS skills. The PRAMS Functional team is in place to have a proper coordination and synchronization.

Progress and results achieved in 2025:

- Extension of the EU Hazard Database.
- Reinforcement of risk assessment template and safety guideline.
- Establish a “Design Safety Case structure” adequate to the new railway standardized modular architecture of SP.
- Deliver the “Evolution Management in a Modular Architecture” to manage changes of modular safety-related systems throughout their lifetime.
- Human Organizational Factor: completion of the impact evaluation in the CENELEC V cycle and Domain’s design activities (e.g. OD domain).
- Maintain the CMB requirements.
- Maintain the definition of Performance KPIs and Performance targets for a modular rail architecture.
- Support EGNOS Project.

Security

Security requirements are coordinated centrally by the Security team. This includes top-level design and assurance of the security strategies and requirement implementation in the System Pillar Tasks and the specification of the subsystems for monitoring and the system control access.

Progress and results achieved in 2025:

- Cybersecurity specifications were finalized and approved by the SP-STG
 - Shared Cybersecurity Services Specification: This specification defines the standard security interfaces (SSI) to the Shared Cybersecurity Services (SCS) and proposes the interfaces from SCS to the Enterprise Security Services (ESS) for the following services: STS, PKI, IAM, NAC, LOG, UAS, BKP, DNS.
 - Secure Component Specification: This document is a Cybersecurity Requirements Specification (CRS) that focuses on protection against threats and compliance with various standards. It aims to harmonize security measures across the market, minimizing deviations.
 - Secure Communication Specification: This specification is a Functional Interface Specification (FIS) for the security layer of Secure Components required for interoperability.
 - Security Program Requirements: This document outlines the security requirements for railways and suppliers, supporting the technical implementation and life-cycle management of security systems. It provides guidance for decisions needed before specification, tender, or implementation processes.

Task 1: EU Railway System

The main ambition for the Task 1 System Levels is to get a list of the needed and important improvements in selected interaction processes (business, technical and operational) (for a better “to be” architecture). A preliminary analysis should highlight differences in the selected interaction processes between countries represented in Task 1 to assess migration issues. For prioritized capabilities, full operational analysis and system analysis should be finalized using the SEMP.

Progress and results achieved in 2025:

- To-Be architecture of «Maintain and Monitor Infrastructure Capability» and «Maintain and Monitor Rolling Stock Capability» capabilities progressed

Task 2: CCS

Task 2 consists in developing the operational concept(s) and functional system architecture for a genuine integrated European CCS system, supported by a model-based systems architecting & engineering approach, beyond the current specifications in the CCS TSI, with much greater standardisation and much less variation than at present.

Task 2 is structured in Domain teams:

- The Architecture and Release Coordination Team
- The Operational Design Team
- The Traffic Control and Supervision Team
- The Trackside Assets Control & Supervision Team
- The Train Control and Supervision Team
- The Transversal CCS Components Team (to note since October 2025 Transversal CCS and Computing Environment have been combined to form the Concept of Employment (CONEMP) Domain team)
- The Computing Environment Team

Progress and results achieved in 2025:

- Architecture and Release Domain:
 - Granularity Concepts and Principles
 - System Level 3 architecture
 - Version 1 release of all outputs from the System Pillar compiled and released for access to the applicants of the Innovation Pillar Wave 2 call
 - Delivery of the pre assessment and problem definitions for 45 Change Requests for the 2026 and 2028 TSI Revisions
- Operational design Domain:
 - Harmonised operational processes for
 - Movement A to B
 - Revoke Movement Permission
 - Manage Usage restrictions
 - Boarding and disembarking of passengers
 - Preparation to train departure
 - Approaching Stop Location
- Traffic CS Domain:
 - SP-STG approval of the Traffic CS System Concept as a direction for future specification work
 - Trackside migration considerations

- System specifications for ATO, European Traffic Protection System, Plan Execution System associated to
 - Movement A to B
 - Revoke Movement Permission
 - Manage Usage restrictions
 - Boarding and disembarking of passengers
 - Preparation to train departure
 - Approaching Stop Location
- Train CS Domain
 - SP-STG approval of the Train CS Architecture as a direction for future specification work
 - Completion of the definition of the Ethernet CCS consist network
 - Proposal of functional enhancements to the train interface specifications
 - Development of the solution proposal for Train Length and Train Integrity
 - Development of Change requests associated with Onboard modularity and upgradeability
 - Support to the EGNOS project
- Computing Environment Domain
 - System Analysis for Computing Environment
- Trackside Asset CS Domain:
 - Release of the Baseline 4 Release 4 subset
- Transversal Domain:
 - ERA ontology extension for CCS/TMS for enabling deriving data models, including the Catalog of Symbols for UI-related ERA-ontology concepts.
 - Supporting the set up of the Interoperability Test Bed (ITB) for data validation based on ERA-ontology.
 - Development of the Service Functions Configuration (SMI) and Diagnosis (SDI), including a toolchain for creating diagnosis models from product group models based on ERA-ontology.

Task 3: Traffic Management System/Capacity Management Design Team

Task 3 carries out the coordination and execution of the detailed design work for the lower System Levels 3, 4 and 5 for the Traffic Management System/Capacity Management and defines detailed operational processes and requirements, functional system analysis and technical architecture. This domain is responsible for all planning activities including producing the operational plan and keeping it up to date. The two main areas of activities are Capacity Planning (CMS) and Capacity Production (TMS)

Progress and results achieved in 2025:

- Variant analysis for CMS/TMS implementation in Europe updated.
- Submitted a preliminary GAP analysis which compares the principles of the Federated Model with the regulatory framework

- Update to the deliverable “Interface between TMS and Traffic Control and Supervision system”, aimed to align the Traffic CS and TMS joint interface.
- Submitted a preliminary proposal for a function distribution and harmonization scope between CMS and TMS, with identification of relevant Use Cases
- Submitted an introduction to the digitalization developments in the context of the draft capacity regulation

Task 4: Digital automated coupling (DAC), Full Digital Freight Train Operations (FDFTO)

Task 4 is responsible to manage all cross-cutting activities related to DAC/FDFTO (e.g., regarding operational procedures, architecture and interfaces embedding the onboard system, developed by FP5, into the overall railway system), manage the input to the Standardisation and TSI Input Plan (STIP) for DAC/FDFTO in support request from FP5.

Progress and results achieved in 2025:

- Work regarding the European operational rulebook is maintained during 2025.
- Continued work on FDFT Central Instance and sector-aligned concept.
- Continued work on Train Length and Integrity with continuous interface with Task 2 and FP2 leading to a first aligned draft start of 2026.

Task 5: Harmonised diagnostics

The HERD team consists of representatives of the data user as well as of the data provider from supplier industry, infrastructure managers (IM), railway undertakings (RU), and vehicle keepers (VK). Strong alignment with the Innovation Pillar Flagship projects FP1, FP3 and FP5 as well as with the System Pillar Tasks 1, 2 and 4 is ensured by the team members.

This specific topic project was re-defined as Task 5 Harmonised European Railways Diagnostics (HERD) during 2024. This Domain is responsible to design a new standard procedure to harmonise European railway diagnostics. By this it will contribute to the creation of the Single European Railway Area (SERA).

Progress and results achieved in 2025:

- Finalised analysis of the two use cases for harmonised diagnostics were delivered
 - Track Side Wheel Monitoring use case, which consists in monitoring the condition of railway vehicle wheels using WTMS (Wayside Train Monitoring Systems)
 - On-Board Track Monitoring use case, which consists in monitoring the track quality using on-board measuring devices (on special and commercial vehicles).

Standardization and TSI input Plan (STIP)

The System Pillar has developed a strategic Standardisation and TSI Input Plan V2.0 of the main changes to be introduced within TSIs (mainly CCS and OPE TSIs) and Commission standardisation request. This will include, inter alia, new functionalities and rules. This plan will also be made on the basis of migration considerations and alignment with Innovation Pillar flagship projects. Allowing for an agreed plan and timeline for the evolution of the CCS/TMS system, consistent with the agreed operational concept and system architecture and a clear picture of the role of the EU-RAIL in delivery, including the allocation of those elements that will be delivered by the Innovation Pillar, and the System Pillar.

Topics for harmonisation have been delivered by the members of EU-RAIL via the Task and Domains of the System Pillar as well as the Flagship Projects of the Innovation Pillar. In total, over 200 topics have been proposed, analysed by the System Pillar Core Group and EU-RAIL, and classified to allocate the topic to a manageable number of categories. The proposed categories are outlined in the table below.

Category for topic classification		
Category		Description
Main section		
C1	Operational harmonisation	Topics related to operational processes and rules
C2	Evolvability and maintainability	Topics aiming at enhanced compatibility between versions and easy maintainability
C3	TMS and CMS	Topics related to enhanced European TMS and CMS
C4	ATO GoA2	Topics related to ATO until GoA2
C5	ATO GoA3/4	Topics related to ATO until GoA3/4
C6	Remote supervision and control	RTO as application independent from ATO GoA3/4 (can come earlier) specific applications, e.g. shunting yards.
C7	ASTP	Topics related to enhanced odometry and localisation systems
C8	FDFTO	Topics related to enhanced freight traffic including DAC
C9	FRMCS	Topics related to new radio system
C10	Onboard	Topics related to CCS onboard systems
C11	Cybersecurity	Topics for cybersecurity in CCS systems
C12	Safety management	Topics related to safety in CCS
C13	PRAM	PRAM topics
C14	Trackside assets	Topics related to CCS trackside assets
C15	Traffic CS	Topics related to enhanced Traffic CS and interfaces to TMS/CMS
C16	Driving control, Adhesion management	Topics related to adhesion management and driving control
C17	Energy management and supply	Topics related to energy management and operational measures
C18	Bridge dynamics	Topics related to vehicle-bridge dynamical interaction
C19	Alternative propulsion, traction energy	Topics related to battery and hydrogen train
C20	TCMS	Topics related to TCMS
C21	Subsystem Components	Topics considering e.g. braking, environmental conditions etc.
C22	Reduction environmental impact	Topics considering noise, air quality and climate change
C23	Composite materials	Use of composite materials for lightweight design
C24	ETCS CR enhancement	ETCS CR enhancements from ERA assessed by the SP

Additional topics ²⁴		
C25	Digital asset management, data spaces and models	Topics related to data spaces, data models and asset engineering
C26	Digital Twin	Topics related to Digital twin modelling and digital register
C27	Virtual certification	Methods for virtual certification and implementation
C28	Zero-Onsite-Testing	Use of simulations and lab testing procedures
C29	Drones	Topics related to the use of drones in railway applications
C30	Field force applications	Topics related to field forces (maintenance staff and machines)
C31	Diagnosis, monitoring	Topics related to diagnosis, condition-based maintenance in railway applications

*Categories for Harmonisation.*²⁵

Through the Standardisation and TSI Input Plan, the System Pillar has defined a clear and agreed plan for the evolution of the CCS/TMS system, the TSI enhancements, and standards, which will support interoperability, modular interchange ability, system integration ability, robustness, harmonisation and implementation of the SERA, and the role of EU-RAIL (both System Pillar and Innovation Pillar) in delivery.

System Pillar and Innovation Pillar interactions

In order to deliver a coherent output from EU-RAIL, the System Pillar and the Innovation Pillar will work together in the following way:

1. The System Pillar aims to provide the Innovation Pillar, where relevant, with a set of requirements aligned with the SP work, in order to ensure that research is targeted on commonly agreed and shared customer requirements and operational needs, compatible and aligned to the defined system architecture.
2. Reciprocally, the Innovation Pillar will impact the scope of the System Pillar where new technologies or processes mean that innovations can drive a change in approach, as well as delivering detailed specifications and requirements.
3. Accordingly, the SP considers results to be expected from the IP in its architectural works.

The main objectives of the IP-SP interaction are:

- Identify the main technical standardisation areas of collaboration between SP and IP, build in the projects the necessary details of the continuous process integration to reach together the EU-Rail outcomes that will achieve target system complying with the CBO.
- Include necessary provisions to achieve the Standardisation and TSI input plan together with all the necessary mature standards and regulation proposals.
- Revision that the inputs expected by the Flagship projects from the SP are foreseen to be achievable on time.

²⁴ The section "Additional Topics" includes topics with one or more of the following characteristics:

- Topics which do not yet have a defined time planning due to the early state and uncertainty in the development process.
- Topics which are very innovative and disruptive compared to established technical solutions. Acceptance and uptake by the sector might therefore require additional alignment and coordination.
- Topics for which the state of maturity does not allow a scheduled input to harmonisation channels in the short/medium term. Development and specification work is still ongoing, aiming at a higher maturity and the inclusion in one of the next STIP versions.

²⁵ Please consider that the list of topics may change/evolve as the project progress.

1.2.2. Innovation Pillar

The Innovation Pillar is structured in 7 Flagship Areas leading to large scale demonstration as defined in the SBA, complemented by Transversal Topics which ensure the engineering integration of the Programme.

In 2025, the Flagship Projects responsible for undertaking the initial implementation of these Flagship Areas continued their activities. Building on the work done in 2023 and 2024, all projects have continued working on use cases, defining requirements and developing specifications, while also developing prototype and initiating testing activities across multiple countries. These testing activities have already provided preliminary insights into the solutions developed within the Flagship Projects. All FPs have also continued collaborating among themselves, as well as with the EU-RAIL System Pillar.

Flagship Area 1 (FA1): Network management planning and control & Mobility Management in a multimodal environment

The main objective of FA1 is to significantly improve flexibility, efficiency, resilience and capacity adaptation of the European rail network, while enabling the development and operation of a Single European Rail Area.

FP1-MOTIONAL

FP1-MOTIONAL is the first project in the Flagship Area 1 which started on 1 December 2022. This project paves the way towards a Single European Railway Area through the delivery of functional requirements, associated specifications, and operational and technological solutions to enable a future European Traffic Management and Capacity Management System that will make rail the backbone of a multimodal transport system for passenger and freight.

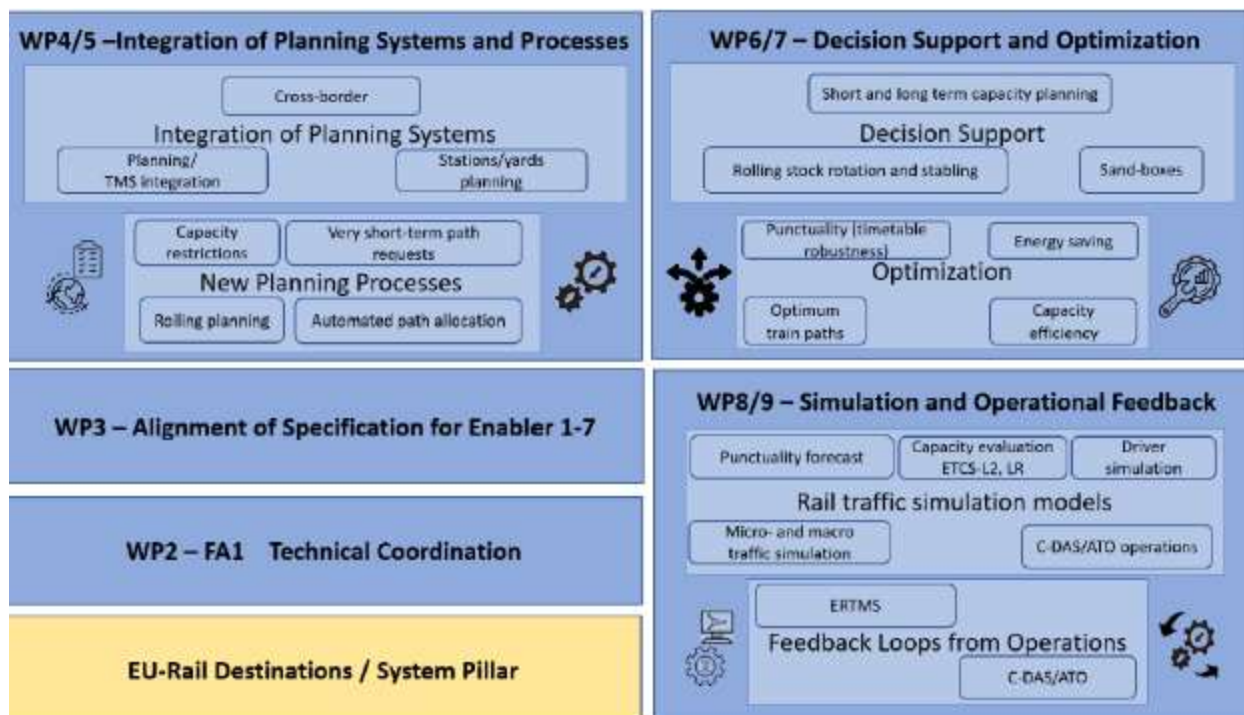
FP1-MOTIONAL is being delivered in two Work Streams (WS):

- Work Stream 1 (WS1) is organised in 3 sub-streams: Rail Services Planning (WS1.1) and Operations (WS1.2) at the European level, as well as multi-modal door-to-door rail integration (WS1.3).
- Work Stream 2 (WS2) for digital enablers solutions (Transversal Topics) across all EU-Rail destinations.

Workstream 1.1: Capacity Management (rail services planning)

The main objective of Workstream 1.1 (WS1.1) is to investigate solutions to improve the short-term and long-term rail services planning at the European level, covering the following main areas (see figure below):

- Integration of planning systems and new planning processes;
- Planning decision support and optimization;
- Simulation models and operational feedback loops.



Progress and results achieved in 2025

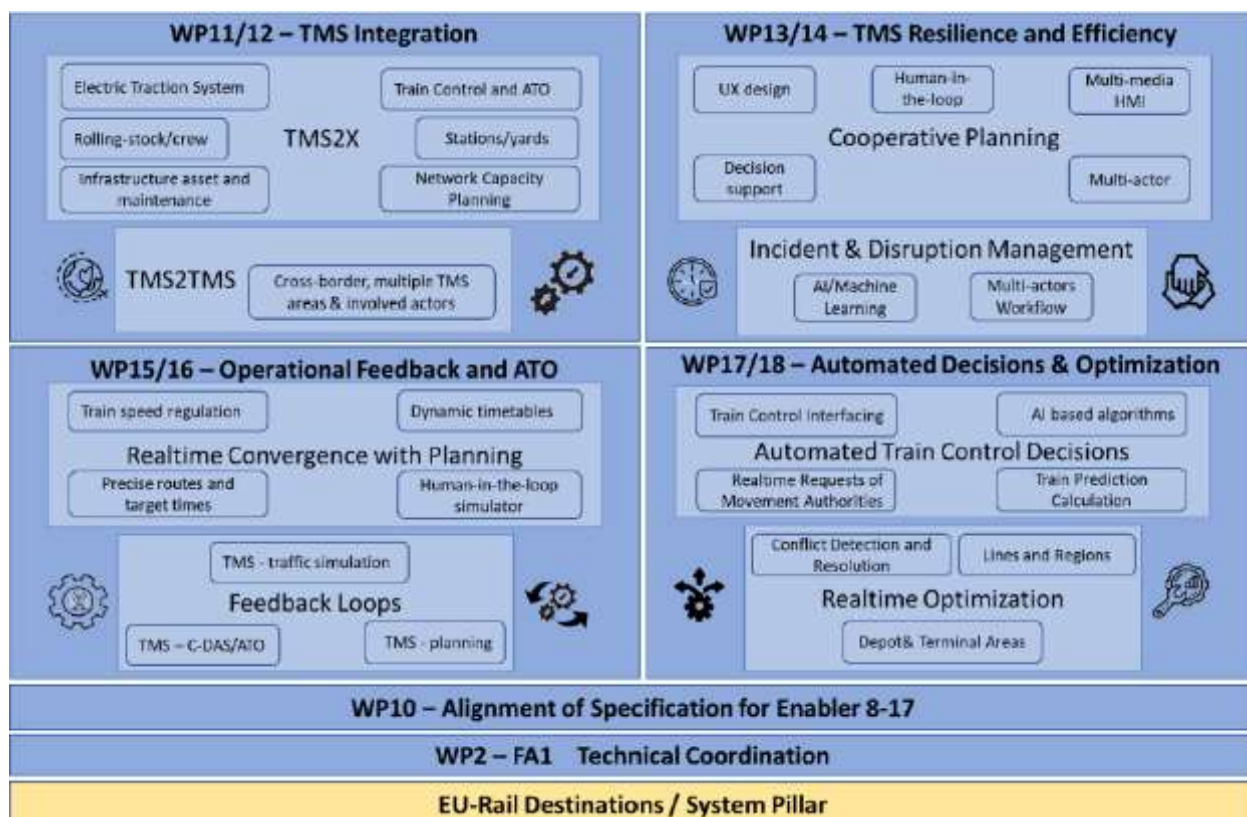
- Development of the design, high-level requirements and use cases for the integration of planning systems and processes explored by the project including: cross-border planning; use of rolling stock planning and Time Table redesign (TTR) for improved capacity planning; integration of TMS with yard and station capacity planning.
- Development and implementation of algorithms required for the use cases related to long-term and short-term timetabling and rolling stock planning, train paths optimisation, decision support in case of modified train paths, on-time running and new planning and operational processes using feedback loops from European Train Control System Hybrid Train Detection (ETCS HTD), Automatic Train Operation (ATO) and C-DAS.
- Phase 1 - Demonstration preparation: 28 demonstrations were defined and planned across cross-border planning, decision support timetabling, and simulation with operational feedback, establishing validation events, stakeholder involvement, test data requirements, demonstration outcomes and end-user training plans.
- Phase 2 - Implementation: the 28 demonstrations progressed to execution stage, focusing on end-user recruitment, software and hardware deployment, demonstration data collection and processing, external validator recruitment, integration testing, and training material development. Validation events are foreseen in Spring 2026. For each demonstration, it has been defined how to measure the results and outcomes. This will include events related to cross border planning and traffic.
- Regular engagement with System Pillar and Rail Net Europe (RNE) has fostered dialogue on future federated European traffic and capacity management. RNE has shown particular interest in the Malmö demonstration on collaborative decision-making, which aligns with their handbook development work that resumed in June 2025. Railway collaborative decision making is a method used in air and harbours. Now it is coming to railways. RNE is interested in this area because sharing realtime information is beneficial for improving both planning and operational process. RNE is planning to restart the work with writing a handbook for railway collaborative decision making. This will have connections both to Flagship Area 1 and Flagship Area 5.
- The project's work was formally recognized with the Best Paper Award at the 11th International Conference on Railway Operations Modelling and Analysis (RailDresden 2025) for the paper

entitled “An iterative heuristic for strategic timetabling with integrated passenger routing in railway networks” (Authors: Yahan Lu, Rob Goverde, Gábor Maróti and Dennis Huisman).

Workstream 1.2: Traffic Management (operations)

The main objective of Workstream 1.2 (WS1.2) is to provide solutions for a more dynamic rail network and traffic management at European scale allowing agile, borderless and mixed-traffic operations based on a harmonised functional system architecture (see figure below):

- Integration of TMS and processes including cross-border traffic management
- Improved resilience and efficiency of disruption management
- Linking TMS to ATO / C-DAS for optimised operations
- Automated decisions and decision support for traffic management optimization



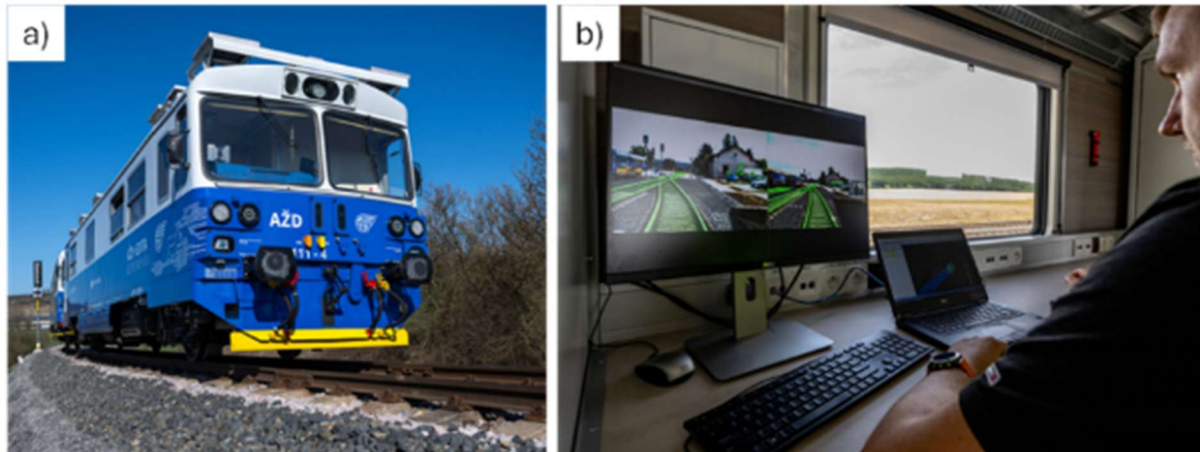
Progress and results achieved in 2025

- Finalized development of design, high-level requirements and use cases related to TMS developments in scope of the FP1-MOTIONAL project
- Completed preparations for 31 comprehensive demonstrations across 10 European countries
- Successfully defined the technical demonstration environments and involved in running first test cases using real railway network data

Advanced Communication Platforms with generic, interoperable APIs were developed to enable seamless communication between different TMS and traffic control systems. Intelligent cross-border coordination interfaces were created with real-time technical decision support, replacing traditional phone/fax communication methods and enabling collaborative conflict resolution across regional boundaries. Collaborative Decision Support Systems were developed that automate decision-making through intelligent alarm management, reducing operator cognitive workload during critical situations.

Advanced algorithms for rolling stock rescheduling during disruptions were implemented, considering train cancellations, seat shortages, and delayed maintenance to minimize passenger impact.

In 2025, major breakthroughs in railway automation were achieved through the successful development of live TMS-ATO integration over ERTMS using Human-in-the-Loop simulation with Train Path Envelope Generators for GoA2 operations. Intelligent Real-Time Traffic Plan (RTTP) Updater systems combining machine learning and optimization were created to automatically adjust traffic plans while reducing controller workload. Additionally, standardized European interfaces between ATO Trackside and TMS were established, enabling bidirectional information flow using existing standards. These achievements represent a fundamental advancement from conceptual frameworks to functional systems, demonstrating the practical viability of integrated ATO-TMS operations while paving the way for more efficient and standardized railway operations across Europe.



Pictured: "TMS-ATO integration in full-scale test track" evaluates the performance of the Integration Layer (IL) to dynamically interface ATO track-side and TMS, within a real-life rail operation environment

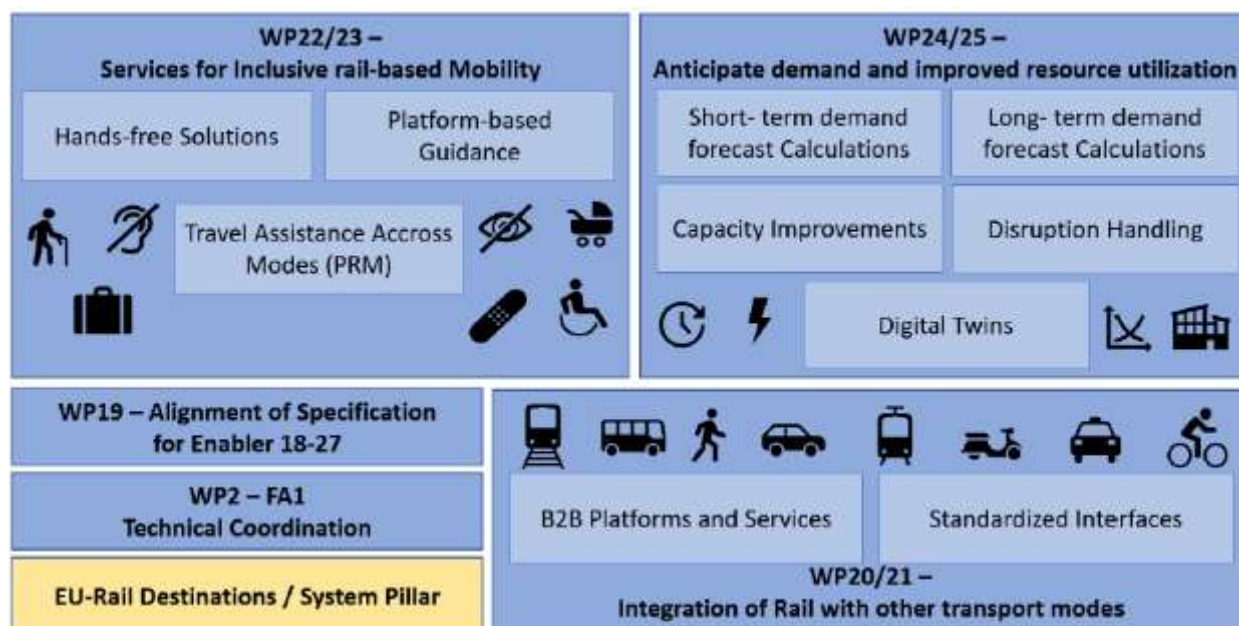
Real-time, AI-driven conflict identification and resolution algorithms were developed that transition dispatchers from active problem-solvers to passive supervisors. Advanced double decomposition algorithms combining time horizon procedures with line-station decomposition schemes were implemented to accelerate decision-making processes. Microscopic simulator frameworks were created for evaluating optimization algorithm performance and quantifying deployment strategy impacts.

The 31 demonstrations validate solutions ranging from TRL 4 to TRL 8, establishing the foundation for harmonised functional system architecture that enables agile, borderless operations through automated decision support and standardized integration protocols.

Workstream 1.3: Integration of rail traffic with door-to-door mobility

The main objective of Workstream 1.3 (WS1.3) is to investigate solutions for the multi-modal rail integration to improve door-to-door mobility (see figure below):

- Integration of Rail with other transport modes.
- Services for inclusive rail-based mobility
- Anticipate demand and improved resource utilization



Progress and results achieved in 2025

In line with the priorities of strengthening multimodal integration, enabling inclusive and seamless rail-based mobility, and improving demand anticipation and resource optimisation—the project successfully advanced the implementation and validation of several multimodal door-to-door mobility solutions throughout 2025.

1. Multimodal Integration and Standardised Interfaces

During 2025, the work stream delivered validated prototypes for multimodal services enabling the integration of rail with other transport modes. Key progress includes:

- Completion of multimodal interface solutions for ticket distribution, financial clearing and disruption management, ensuring interoperability across mobility providers.
- Validation of end-to-end communication flows, confirming their suitability as the backbone for cross-platform information exchange in real-time and for multimodal journey planning.
- Implementation of cross-modal disruption management workflows enabling the coordination of rail services with alternative modes, providing passengers with consistent information and re-routing options in case of disruptions.

These developments contribute to the objective of enabling a harmonised European multimodal ecosystem supported by standardised digital interfaces.

2. Passenger-Centric and Inclusive Mobility Services

2025 saw major advancements in the validation of solutions aimed at improving passenger experience, with special attention to Persons with Reduced Mobility (PRM):

- Digital guidance displays (Totem and Gobo) deployed in stations to assist passengers with real-time information, wayfinding and onward mobility options. An interactive totem that provides accessible information, suggested routes and support: A guidance robot that accompanies travellers to their destination inside the station. Integrated software that connects these elements and generates tailored accessibility solutions. (Successful demo done in 2025)
- Mobile guidance via a MaaS application, offering integrated trip planning, station navigation, PRM support, and multimodal route options.
- Seamless validation solutions using Ultra Wide Band (UWB) technology to support touchless ticket verification, reducing barriers for PRM and improving the fluidity of passenger flows.

- Illuminated platform guidance systems designed to provide visual support and enhanced safety, particularly during crowded operations or disruptions. Platform-based passenger guidance by using smart LED-floor elements connected with real time train data directly integrated in the platform surface. The illuminated platform edge provides visual indications of the upcoming entry or passage of the next train, the stopping position, the train departure/door closing and the train compartment occupancy. (Successful demo done in 2025)

These innovations address the goals of improving accessibility, enhancing situational awareness for passengers, and increasing the attractiveness of rail as the backbone of door-to-door journeys.

A pilot demonstration was developed to improve rail accessibility for passengers with reduced mobility. The initiative, tested at Málaga María Zambrano station, uses a light projection system to indicate the location of the accessible train door in advance.

The system, which projects the international accessibility symbol onto the platform, allows passengers to independently position themselves for boarding, enhancing both autonomy and the overall travel experience. The validation and demonstration were conducted on two platforms at Málaga's María Zambrano suburban commuter rail station, and included input from passengers with disabilities, railway staff, and accessibility experts.

Further validation and demonstration activities before the end of the project, including the testing of an informative totem with accessible content, a digital route guidance system for mobile devices, and an assistive robots. All these tools will also connect to a mobile app that uses NaviLens codes to provide accessible navigation and improve mobility for all passengers.

3. Demand Forecasting, Analytics and Optimised Resource Utilisation

2025 activities strongly focused on the implementation and validation of advanced forecasting tools aimed at improving resource utilisation and supporting both short-term and long-term operational planning.

Key achievements include:

- Validated prototypes for short-term and long-term demand forecasting algorithms leveraging runtime data, historical patterns and multimodal context information.
- New analytical models enabling the optimisation of rail capacity, passenger occupancy and intermodal connections, particularly during peak demand or service reconfiguration.
- Exploration of synergies between short-term and long-term demand forecasts to support adaptive timetabling and resource allocation.
- Implementation and demonstration preparation of a Digital Twin-based Human-Machine Interface, providing operators with real-time passenger flow visualisation and decision-support tools to manage disruptions across mobility modes and improve passenger guidance.

These developments reflect the objectives of enhancing predictive planning capabilities and supporting efficient, demand-responsive multimodal rail services.

Workstream 2: Digital Enablers Solutions (Transversal Topic (TT))

The main objective of the “Digital Enablers Solutions – TT” is to support the operational processes and activities across all EU-Rail Flagship Areas by exploring solutions for digital enablers covering the following aspects:

- a Federated Rail Data Space to enable cyber secure rail data exchange;
- a Conceptual Data Model which will build on the ERA ontology and Shift2Rail work on a standardised rail model and language;
- preparation and development of a Digital Twins (DT) environment, design tool-box and reusable, digital interoperable model units to enable the virtual representation of rail subsystems and allow the analysis of interoperability with other sub-systems.

Workstream 2 - TT.1 - Federated data space

The objective is to deliver a trusted, reliable, cybersecure federated Rail Data Space sandbox environment that enables exchange and sharing of digital resources across Rail operators, Infrastructure Managers and Suppliers. It is envisaged that the Federated Rail Data space will be a component of the future Common European Mobility Data Space and will be designed in compliance with the principles of the European Data Strategy, e.g., Data Sovereignty, Data level playing field, public-private Governance and Decentralized soft infrastructure.

Progress and results achieved in 2025

- Further onboarding (deployment of connectors) of new participants to the Sandbox (some from outside of the project consortium)
- Implementation of the extended data exchange methods to be used by the Federated Rail Data Space
- Development of first App-Store based on the user requirements (development finished in 2025)
- Planning and development of a demonstration of the sandbox (demonstration of the main functionalities of the Data Space, including the connectors, market place, etc...) which will be shown in Q2/2026
- Held one public presentation (Town Halls) where the scope, approach and progress of this work was presented aiming to encourage awareness and contribution from the industry.

Workstream 2 - TT.2 - Common Domain Ontology

This work stream delivers the Conceptual Data Model (CDM), a machine-readable semantic dictionary for the rail system domain. Building on the results of Shift2Rail LinX4Rail, the aim is to provide a shared semantic foundation so that different railway stakeholders and digital systems can use consistent concepts, definitions, and structures when exchanging and interpreting data.

The CDM follows a semantic approach, aligned and developed in synergy with the orientations of the European Union Agency for Railways (ERA) ontology—notably around the Registers of Infrastructure (RINF)—and with European Commission digitalisation objectives. The work leverages established industry standards and, where available, federates specialist modelling initiatives into a coherent model of the rail system, in close collaboration with key stakeholders (ERA, System Pillar, Joint Sector Group, building SMART International, and others).

In 2025, the Conceptual Data Model was further expanded through the development and consolidation of several domain ontologies. This included continued work on localisation, as well as modelling of ports, rolling stock (covering typology and composition), and an operations ontology. In parallel, interoperability and alignment activities progressed through key adapters and semantic bridges, including an update of GeoSPARQL, and continued work on ifcOwl and SOSA/SSN. These adapters ensure consistency with established standards and enable structured integration with geospatial, building information, and sensor-related data ecosystems.

Significant progress was also achieved in tooling to improve modelling robustness and downstream usability. Demonstrated solutions for automated and assisted ontology Quality Assurance supported consistency checking, validation, and continuous improvement of the semantic models. In addition, JSON Schema generation from ontology sets was successfully demonstrated, enabling the automated creation of data templates and facilitating integration with conventional data exchange environments and developer toolchains.

Work on data and datasets focused on making the models tangible and reusable. Reference datasets were developed and/or published to support testing, validation, and demonstration activities. The team successfully demonstrated RDF serialisation for topology representations, confirming the feasibility of expressing structured railway topology information in a machine-readable semantic format. Furthermore, Quality Assurance feedback was provided to the System Pillar regarding identified shortcomings in the SP CCS/TMS Scheibenberg dataset, contributing to improved data clarity and modelling consistency.

Collaboration remained a central pillar of the activities. Work with FP5-TRANS4M-R on the Intelligent Video Gate explored potential extensions to the ERA ontology through the telematics domain-oriented operations ontology. Maintenance-related use cases continued to mature, including work on Lindometer data and on-foot patrolling semantics. Engagement with FP3-IAM4RAIL explored asset management data requirements for a range of rail assets, including track circuits, markers, level crossings, and light signals. Throughout these interactions, FP1-MOTIONAL provided preliminary feedback addressing ambiguities in data requirements and identifying opportunities for taxonomy creation or reuse to enhance clarity, consistency, and interoperability.

Together, these results strengthen the foundations for a sector-wide, standards-based semantic framework: one that supports interoperability, reuse, and scalable digitalisation across rail domains while remaining aligned with regulatory and programme stakeholders.

Workstream 2 - TT.3 - Digital Assets Engineering

The objective of digital asset engineering is the harmonization of digital processes for the engineering design of physical railway assets (including CCS, Stations, etc.). It will enable the digitalisation of the end-to-end asset engineering processes. The outputs include a specification of common domain models (Data model), software components (validation tool) and recommendations on application across Europe (Guidelines and Engineering rules) to foster the Single European Railway Area (SERA) vision.

Progress and results achieved in 2025

- Data requirements have been finalized, and data acquisition is complete with two datasets. The algorithm development based on these datasets has been successfully achieved.
- The data requirements document has been completed, and four datasets have been acquired. The development of the Automatic Planning Tool is approximately 70% complete, covering ETCS Level 2 without signals. All the related engineering rules have also been implemented in the tool.
- The document outlining the guidelines and standards for acquiring, updating, and developing BIM/AIM data and models is nearly complete, with around 80% of the content finalized.
- The proof-of-concept validation tool is under development and will be delivered in 2026.

Workstream 2 - TT.4 - Digital Twin support, development and run-time environment

The objective is to deliver a common Digital Twin design and simulation environment to allow the virtual representation of digital models able to imitate the behaviour of the physical railway system, its multiple heterogeneous subsystems and interactions during their lifetime. This environment is to be designed based on Digital Twin use cases provided by the Flagship Projects.

Progress and results achieved in 2025

- Those digital twin use cases selected in 2024 have been elaborated in 2025 in order to prepare their validation with TRL 5. Three use case applications were presented at the Modelica & FMI Conference in Lucerne in September 2025. The associated papers are available online at <https://doi.org/10.3384/ecp218>.
- Generic versions of the proprietary use cases or the associated component models and assembly architectures, respectively, have been derived and uploaded to a GitLab repository together with example data and documentation. This GitLab repository presents the Digital Twin support and design-time environment.
- So far, the Digital Twin use cases have mainly been executed with off-the-shell simulation tools on premises, which serve as Digital Twin run-time environment. As an alternative, first execution tests have been performed with a distributed co-simulation set-up as a web-service on basis of the so-called Distributed Co-Simulation Protocol, see <https://dcp-standard.org>.

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp1-motional/>

FP1-TRAVEL WISE

Travel Wise is the first rail-aviation synergy project, supported by both EU-Rail and SESAR 3 Joint Undertakings. The Grant Agreement is managed by EU-Rail.

Travel Wise supports the shift from rail and air traffic orchestration in silos to an intermodal approach. This will be achieved by developing an Intermodal Collaborative Decision Making solution to support Air-Rail operations management for nominal situations as well as disruption, while optimising the passenger experience. The project benchmarks and defines the common technological enablers and provides a roadmap towards integrated intermodal transport, and provide recommendations for standardisation in both aviation and rail.

The project officially started on 1 October 2024.

Progress and results achieved in 2025

- **Benchmarking, common architecture and ConOPs**
The project has identified the user requirements and needs through 5 workshops with operators from the air, rail and maritime sectors, benchmarked of existing technological solutions in the air and rail domains, drafted the roadmap towards a common air-rail federated dataspace. Travel Wise also delivered a common glossary of terms (air/rail/maritime domains) and the Travel Wise concept of operations and of the related use cases.
- **Methodological framework for scenario demonstration, assessment and integration**
The project delivered preliminary identification of the objectives and of the KPA (Key Performance Areas) for the validation of the Travel Wise solution. The consortium has also worked on the Scenarios to set up the demonstrations and started detailing the technical specifications of the Travel Wise solution (D2.2 TS-IRS interim version).

All results are available on the website: <https://travelwise-project.eu/>

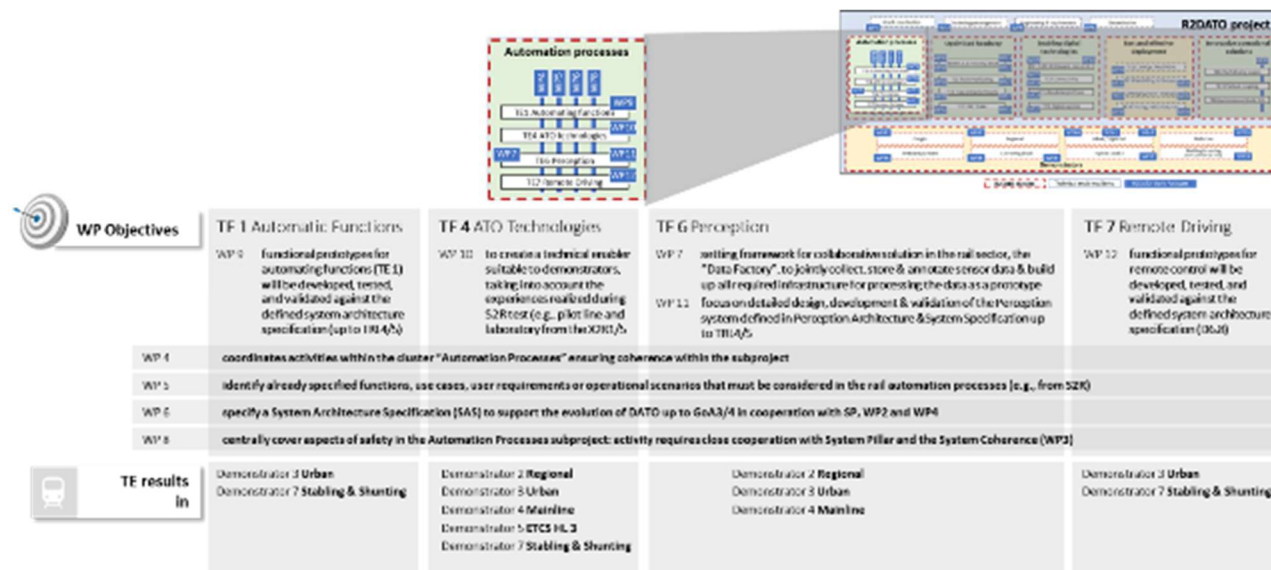
Flagship Area 2 (FA2): Digital & Automated up to Autonomous Train Operations

The objective of FA2 is to take the major opportunity offered by digitalization and automation of rail operation and to develop solutions expected to bring additional functionalities to control command and signaling. This includes next generation Automatic Train Control (ATC), including Automated Train Operation (ATO) Grade of Automation (GoA) 4, building upon radio-based European Rail Traffic Management System (ERTMS) or above, representing the next evolution of the system, incorporating the latest technological advances, and with functionalities enabling full optimization of performance in line with the Traffic Management improvements developed in FA1. FA2 aims at delivering scalable automation in train operations with fully unattended train operations including setting a train in motion, driving and stopping the train, opening and closing the doors, remote train control and recovery operations in the event of disruptions.

FA2 was in 2025 implemented via Flagship Project 2 – R2DATO (FP2-R2DATO) launched in December 2022. In December 2024, FP2-MORANE-2, the EU-wide test campaign for the validation of FRMCS V2 was also officially kicked-off.

FP2-R2DATO

Sub-Area 1: Automation processes



General objectives of the Sub-Area 1 - Automation processes

The *Automation Processes Cluster* (APC) covers the Technical Enablers (TEs) required to get to the target of achieving the automated to autonomous train operation in Europe. As automation is one of the main pillars of the future rail system, it means that the APC activities have strong links with other tasks and initiatives such as the System Pillar, Flagship Projects 5 and 6 and the former Shift2Rail projects like TAURO, X2Rail-4 and CONNECTA.

The *Automation Processes Cluster* integrates four Technical Enablers (TE1 – Automating Functions, TE4 – ATO Technology, TE6 – Perception, including the data factory, and TE7 – Remote Driving) which represent core technologies required for the automatization of the railway operations.

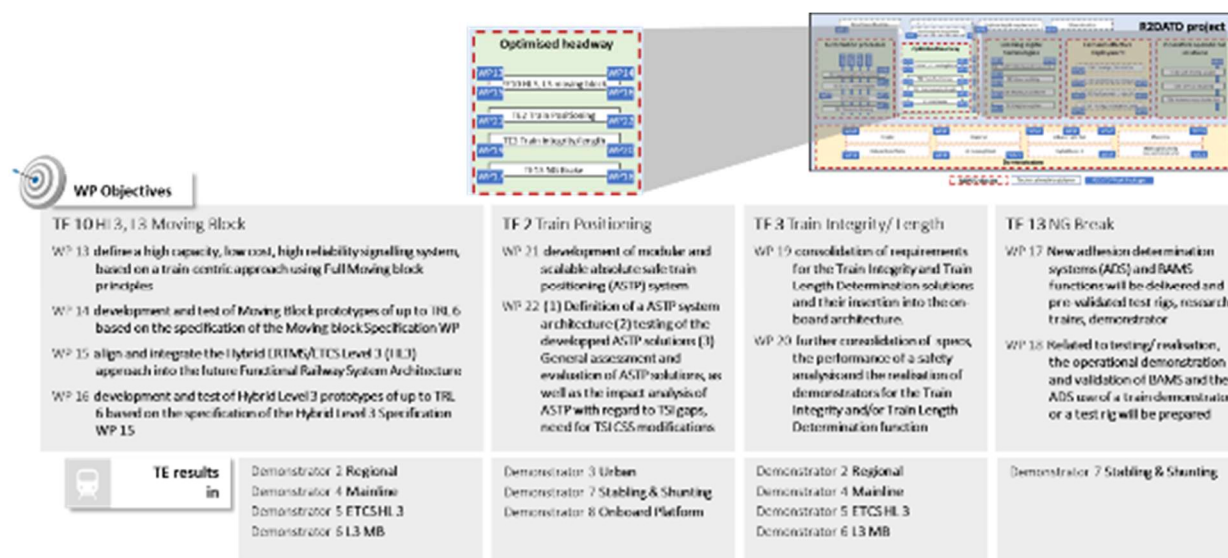
These Technical Enablers are developed to the level of laboratory validated prototypes (TRL4/5) ready for demonstration (TRL6/7) in the *Demonstrators Cluster*.

Progress and results achieved in 2025

The *Automation Processes Cluster* (APC) activities were focusing on three major areas in 2025:

- Delivery of first stable baseline for the specifications for ATO GoA3/4, remote driving, perception system and automating functions. This has enabled the development and testing of prototypes. This baseline was produced on top of an extended Capella model coming from X2Rail-4 and supporting documents and requirement specifications.
- The delivery of the specifications for the four Technical Enablers was also accompanied by related safety studies.
- In 2025, FP2 teams delivered major advances across Automating Functions, ATO, Perception and Remote Driving prototypes, achieving readiness for the 2026 demonstration phase. Automating Functions prototypes have reached TRL4 maturity, with three ready for integration into Mainline and Regional demonstrators. ATO GoA3/4 prototypes achieved near final technical completeness, including full laboratory validation and integration of key modules across multiple suppliers. Four Perception System prototypes were developed and laboratory tested, while a Proof of Concept (PoC) on an SBB vehicle collected real world multimodal data in shadow mode. Remote Driving prototypes progressed to an advanced implementation stage, with core teleoperation functions validated and preparation for demonstrator integration underway.

Sub-area 2: Optimised Headway



General objectives of the Sub-Area 2 – Optimized Headway

Optimized Headway's main expected outcome is the validation of prototypes ready to demonstrate the ERTMS game changers in different operational environments, with mixed radio based ETCS levels with Hybrid Train Detection (HTD), Moving Block, absolute train position, train integrity and train length management, as well as optimized and reproducible braking performance under low adhesion conditions. To achieve this, focus has been put on developing use cases and requirements in addition to work on architectural elements, in collaboration with the System Pillar. These steps are expected to lead to the development of building block prototypes and integrated demonstration.

Progress and results achieved in 2025

Significant progress was made across several technical areas. A first specification was delivered for a novel system integrating a Radio Block Center (RBC) and Interlocking, based on geometric safety logic. This system minimizes pre-configuration and relies on a compact safety core. Field testing was conducted using Specification Release 3, thereby validating the core concepts defined in that version of the specification.

In the HTD area, prototype development for the FP6-FutuRe demonstrators continued steadily, with delivery expected by year-end. A draft of the new specification has been delivered for further internal iteration. This document aims to address all open points related to the specification (Hybrid Level 3 Specification) and serve as a reference specification for HTD for Flagship Area 2.

For the Next Generation Brake System, demonstrator preparation and pre-validation activities were successfully concluded. The work delivered key documents such as ATO impact of brake/adhesion management systems, the report on functional pre-validation of adhesion management methods on a test train and reports on pre testing activities.

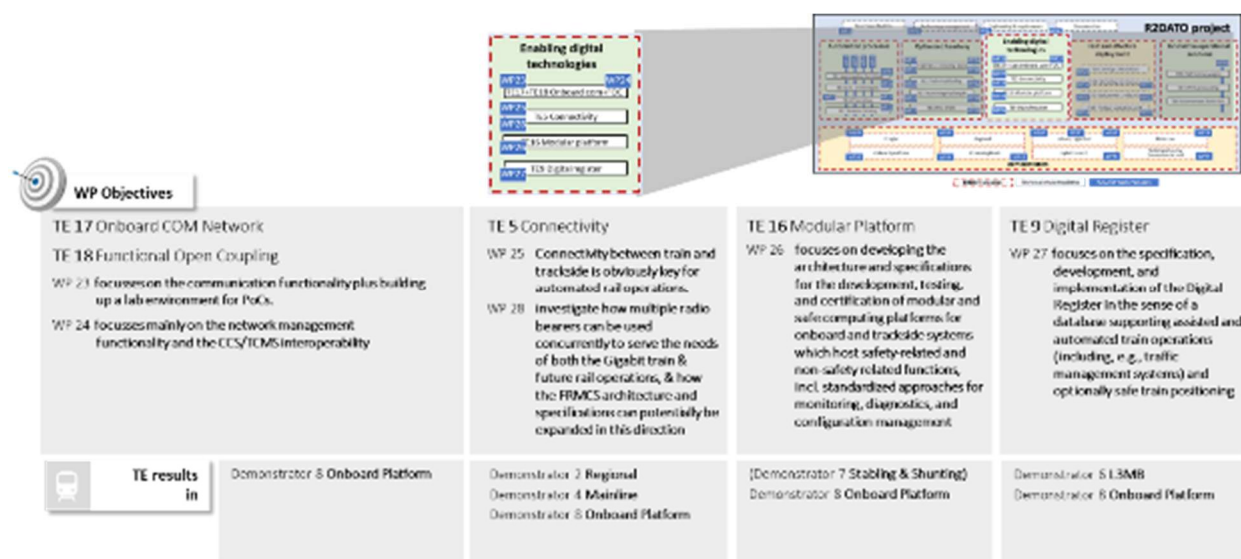
Train Integrity and Train Length Determination activities progressed well in 2025, with the work on the architectural baseline and functional requirements nearing completion and already supporting demonstrator development. Safety analysis advanced in parallel, feeding back into the specification and contributing to refinement of the final baseline. Use cases, test cases, and the shared test environment were finalised, enabling structured preparation for demonstrator execution, and initial test implementations have already begun. In addition, the work was aligned with FP5-TRANS4M-R and the System Pillar to ensure a harmonised technical approach and the required safety level. As part of this coordination, it was agreed that the Train Length Monitoring Function (TLMF) involves a more complex calculation than simply comparing two length values, and its formal specification will be produced within the System Pillar before deciding whether it belongs to the CCS or Rolling Stock domain. Furthermore, joint topics included the provision of a "Merge Box" within FP2 R2DATO and planning for a demonstrator to validate operational scenarios. Together, these efforts ensure a coherent, interoperable pathway toward final demonstrator integration and validation of the Train Integrity and Train Length functions over ETCS.

In the ASTP domain, the specification has been finalized in close alignment with the System Pillar. Furthermore, the generic architecture progressed in 2025 through bottom-up alignment derived from the eight demonstrators, and design updates across all demonstrators ensured coherence with the evolving common ASTP concept. Development advanced to the validation stage, supported by first laboratory and field tests. The testing of the 8 different solutions supports the convergence towards a generic architecture as the strengths and weaknesses of the solution can be analysed after the testing. The RAM and safety assessment reached a consolidated level, providing a consistent safety argumentation and a harmonised view of input integrity, hazard mitigation and degraded-mode behaviour. Work also started on the integrated evaluation of ASTP solutions, comparing design approaches, performance expectations and early implications for future regulatory developments.

Testing activities delivered several key insights. A unified KPI framework was agreed and adopted by all demonstrators, enabling consistent reporting of accuracy, availability, continuity and integrity. Verification tests confirmed correct sensor and algorithm integration and showed that diverse sensor combinations can maintain localisation performance even under limited GNSS conditions. First data packages from the demonstrators provided early evidence of consistent system behaviour across lab and field environments, laying the foundation for consolidated performance analysis.

EGNOS-related activities progressed well. A draft roadmap for EGNOS deployment in rail was prepared with ESA, EUSPA, ERA and the System Pillar, confirming EGNOS as a strategic enabler for future GNSS-based train positioning. The accompanying analysis strengthened the case for early EGNOS service introduction, showing how augmented GNSS can address existing performance gaps and accelerate safe positioning solutions. Demonstrators integrating EGNOS Dual Frequency Multi Constellation corrections delivered initial insights into dual-frequency, multi-constellation GNSS performance, and progress on the space/rail hazard analysis further reinforced the safety basis for future CCS TSI discussions

Sub-area 3: Enabling digital technologies



General objectives of the Sub-Area 3 – Enabling digital technologies

The main and final results from *Digital Enabling Technologies* are further evolved specifications and validated prototypes related to connectivity (both for train-to-ground communication and onboard communications), modular IT platforms, and the Digital Register providing reliable interoperable and accessible infrastructure information as crucial enabler for safety related and non-safety related functions. These results are complemented by studies and specific concepts of how the modular connectivity, IT and data platforms can be efficiently integrated, certified, and driven toward acceptance. Same as for other specific outcomes of the project, the basis of the work will be to consolidate prior work, further derive the requirements of future rail operation toward connectivity, IT and data platforms, and define related platform architectures in collaboration with the System Pillar.

The connectivity, IT and data platform solutions developed in the Enabling Digital Technologies cluster start from very different maturity levels. Beyond the development and validation of the individual technologies, a key challenge is still to integrate these among each other, and for instance to demonstrate how connectivity protocol stacks and common service functions can be efficiently implemented side-by-side with railway applications, leveraging common hardware pools and for instance common orchestration approaches. The main focus will be to provide the future-proof connectivity, IT and data platforms required for the automation of rail operations. Increase the cost efficiency will be a main focus leveraging off-the-shelf IT solutions by decoupling the life cycles of railway applications and connectivity.

Progress and results achieved in 2025

Onboard Communication activities commenced with a strong focus on network management functionality, associated processes, and overall system integration. The team successfully completed the user stories content and defined both functional and non-functional system requirements. A comprehensive list of network management functionalities was also established. These efforts culminated in the delivery of “Definitive and aligned requirements set for managing an Onboard Communication Network and concluded selection of suitable management functionality.”

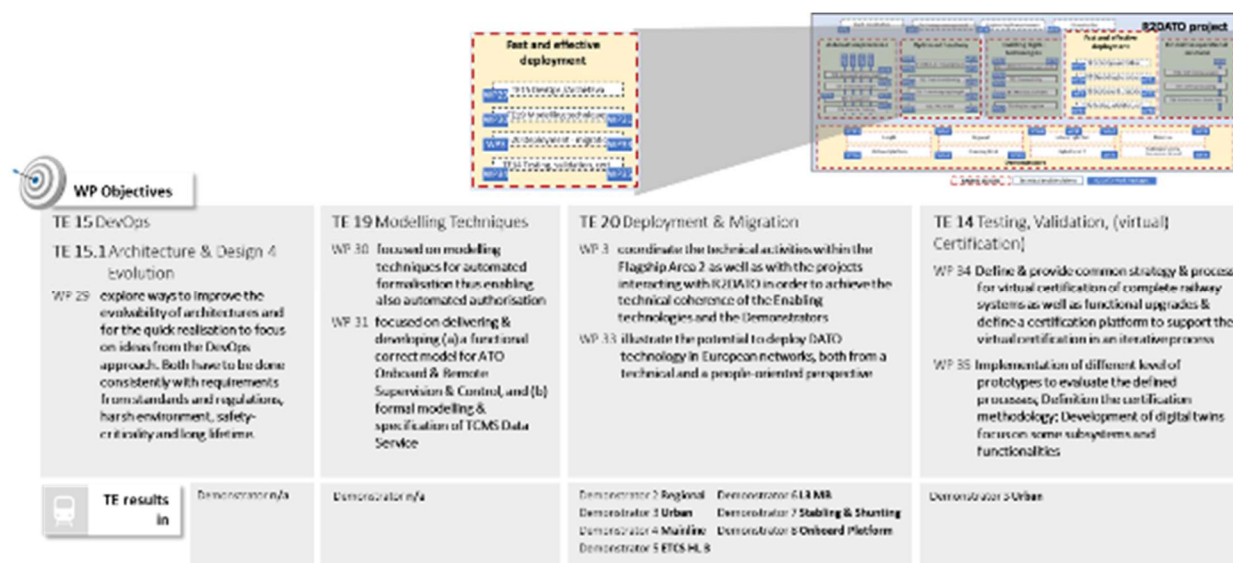
Regarding **Connectivity Development – FRMCS activities**, the work on gateways was finalized after testing a set of functions in the lab. Furthermore, an SNCF ETCS traffic emulation tool was developed to be compatible with FRMCS V1 and FRMCS V2. It was then interfaced with Kontron and Alstom gateways. It was possible to perform end-to-end FRMCS communications with a simulated railway critical application. The scope of work has undergone substantial changes due to the influence of the FP2-Morane-2 project and other internal developments. As a result, an amendment request was submitted in 2025 to reflect the revised direction.

Regarding **modular platforms specification activities**, the objectives were successfully met, leading to the delivery of a thorough analysis and a set of recommendations for the certification and homologation of Modular Computing Platforms within the European railway system. This deliverable builds upon the earlier architectural and specification work performed in the Technical Enabler and is closely aligned with the Europe's Rail System Pillar, particularly the domains Computing Environment (CE), PRAMS (Processes, RAMS, Safety), Transversal CCS, and Cybersecurity, ensuring full coherence with the evolving regulatory framework and the future system architecture.

Regarding **Digital Register** activities, extensive collaboration with the System Pillar has ensured that most deliverables produced in 2025 remain aligned with the latest specifications in the Transversal Domain. Demonstrators were developed to enable reliable transfer of static infrastructure data to both trackside and onboard systems, including integration with Moving Block functionalities. Within this context, a dedicated task force was established in the EDT cluster to standardise the interface between trackside and onboard Digital Register components. This task force consolidated system level interface definitions, harmonised data exchange principles, and established a consistent baseline for future validation activities, before submitting its outputs to both the Innovation and System Pillars for refinement. In parallel, the data model supporting Digital Register data transmission and generation was jointly developed with ERA, the System Pillar, and the Innovation Pillar Functional Areas, ensuring coherence with the wider FP2 R2DATO architecture.

Finally, the **Connectivity Development work focusing on ACS/Gigabit Train** has reached completion. Laboratory testing (Technology Readiness Level 4/5) was conducted on both the trackside and onboard ACS/multi-connectivity platforms developed inside the technical enabler. A key deliverable focused on the development of several prototypes based on defined functionalities and various radio networks, and their laboratory testing aligned with the architecture, use cases, and requirements from FP6-FUTURE.

Sub-area 4: Fast and effective deployment



General objectives of the Sub-Area 4 - Fast and efficient Deployment

In order to allow fast and effective deployment, the various impacts of DATO shall be anticipated and analysed. While the development and demonstration of technical enablers will allow to check feasibility and performance of technological solutions, there is also a need to quantify the benefits, and refine the concept and feasibility for the final application. This societal and logistic-oriented workstream will focus on human factors and operational aspects when preparing, migrating, and demonstrating the future potential for operations. Innovative new modelling techniques such as Formal Methods, DevOps and Architecture Design4Evolution, will contribute to this overall methodology to speed up the development process and secure fast and effective impacts.

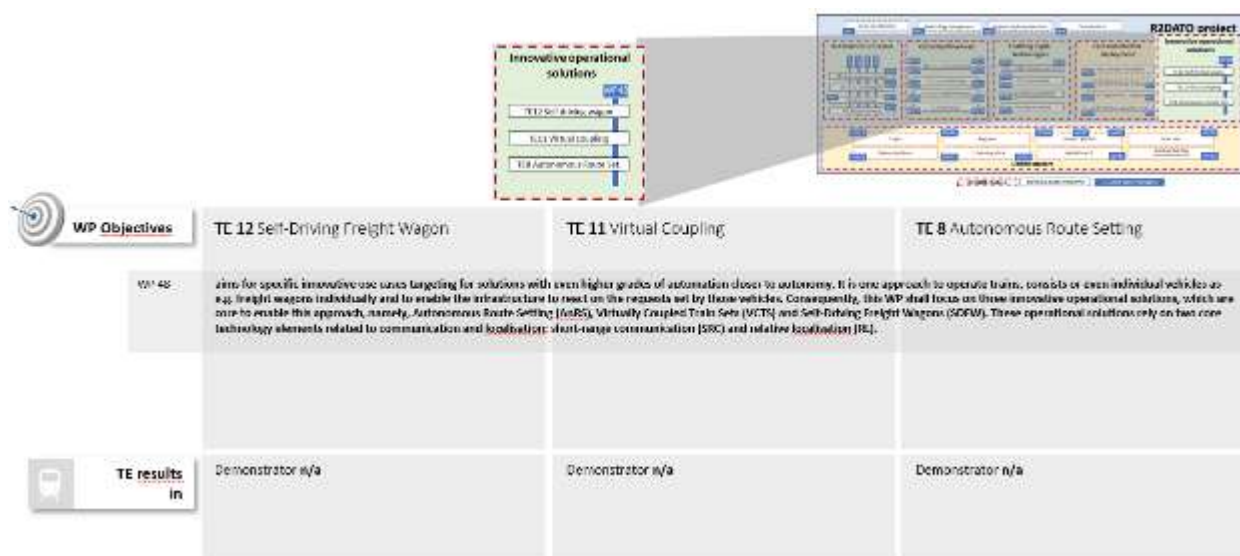
Progress and results achieved in 2025

The project has successfully delivered key outcomes in four major domains.

Under **DevOps and Architecture4evolution**, the team produced a comprehensive report detailing architecture alternatives and variants, addressing the challenge of balancing long system lifetimes with the need for architectural evolution. A stakeholder-driven DevOps process framework tailored to the rail domain was defined, incorporating tool support and feedback loops for continuous improvement. Additionally, a demonstrator was implemented to validate architectural patterns that enhance the evolvability of train on-board systems.-In the area of **Formal Methods**, significant progress was made in Automated Train Supervision and Control. A viable concept for a TCMS Data Service was developed, enabling service-oriented access to vehicle status information for operator-specific applications. This was complemented by system and interoperability test bench demonstrator. Furthermore, the first formal model of the upper and lower ontology was completed, with the ontology defined as an object model.

The **DATO Assessment and Migration** workstream delivered an analysis report on infrastructure wear and cost reduction potential through ATO. The Business Case value framework was finalized as a continuation of the initial outline. Research efforts included interviews and analysis of FP2-R2DATO demonstrations, providing valuable input for refining migration methodologies and identifying gaps and lessons learned. Finally, in **Testing, Validation and Certification**, a strategy and process for virtual certification were defined, incorporating updated architectural inputs, distributed testing concepts, and performance evaluation methods for advanced signalling and automation subsystems. In parallel, a draft suite of analysis tools for the test bench was developed, including event based and continuous evaluation mechanisms, time and distance window checks, and a structured test report template. These activities were complemented by the construction of early virtual certification test platforms using simulation environments and GNSS simulation components and the development of subsystem focused digital twins—covering traction, braking, and switch and crossing (S&C) systems. Together, these technological elements establish the foundation for rigorous future validation and model based certification workflows.

Sub-area 5: Innovative operational solutions



General objectives of the Sub-Area 5 – Innovative Operational Solutions

The aim of the cluster *Innovative Operational Solutions* is to identify, based on the definition of innovative concepts, specific use cases where a further innovation beyond the GoA4 could bring additional value. The foreseen innovative concepts include the Autonomous Route Setting (AnRS), that will realize the autonomous path allocation on a technical level and help increasing the capacity on the network, the Virtually Coupled Train Set (VCTS), that is required for the steady state of operating virtually coupled train sets and the Self Driving Freight Wagon (SDFW), that will enable autonomous operations of single wagons. The technological element in focus will be short-range communication (SRC), in order to reduce latencies down to the minimum in a train-to-train communication and relative localization (RL) e.g. between two consists or vehicles, to ensure the shortest possible dynamic distance between them.

Progress and results achieved in 2025

The task on use case definition and trackside concept and technology analysis for Autonomous Route Setting) has been successfully closed. In addition to completing the planned analyses, a dedicated simulation environment was implemented to demonstrate and validate the AnRS concepts at low Technology Readiness Level (TRL), enabling early stage assessment of operational behaviour and interface requirements. The scientific publication associated with the AnRS work is currently under preparation.

The operational concept for the VCTS was defined and the corresponding system architecture consolidated using the Capella modelling tool. The team completed a comprehensive risk assessment and cybersecurity analysis addressing operational, functional, and communication related threats. In addition, initial simulation scenarios were prepared to support later validation of VCTS behaviour.

Regarding the task on operational concept for the Self-Driving Freight Wagon (SDFW) and connection of the SDFW to Terminal Management Systems (TMS) and Yard Management Systems (YMS), the use case definition was completed, interviews with rail freight experts were conducted and five distinct types of SDFW were identified to reflect the varying needs of the use cases and operational concept:

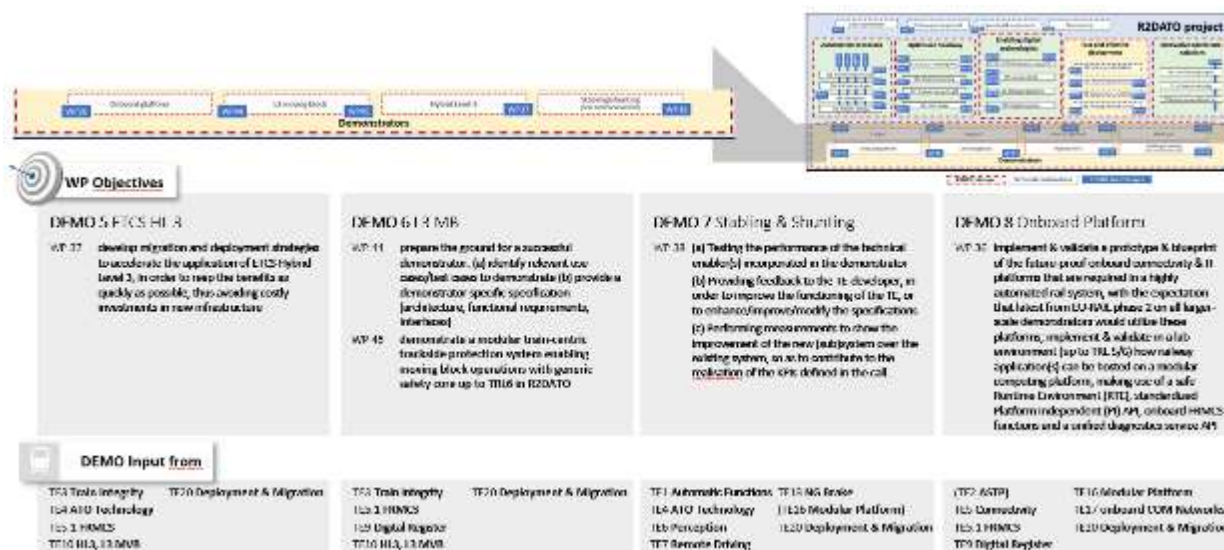
- Type 1 allows autonomous operations (movement) only in yards, commanded by the YMS and within a yard that ensures the safety of the operation; last mile <50 km, operational line within a consist >50 km.
- Type 2 allows autonomous operations (movement) only in yards, commanded by the YMS and the own SDFW ensures the safety of the operation; last mile <50 km, operational line within a consist >50 km.

- Type 3 allows autonomous operations (movement) only in yards, and last mile (<50 km), commanded by the YMS (yard) and TMS (last mile), and the own SDFW ensures the safety of the operation; operational line within a consist >50 km.
- Type 4 allows autonomous operations (movement) in yards, last mile (<50 km), and operational line (>50 km), commanded by the YMS (yard) and TMS (last mile and operational line), and the own SDFW ensures the safety of the operation in the yard and the last mile, and the ETCS (ATP) in the operational line.
- Type 5 allows autonomous operations (movement) in yards, last mile (<50 km), and operational line (>50 km), commanded by the YMS (yard) and TMS (last mile and operational line), and the own SDFW ensures the safety of the operation in the yard and the last mile, and the VCTS in the operational line.

A preliminary business-case analysis was conducted, including CAPEX and OPEX evaluations for each of the five SDFW types. The scientific publication and presentation of the SDFW concept were successfully delivered at the 7th SmartRaCon Scientific Seminar. Deliverable D48.3 (Self-Driving Freight Wagon (SDFW) conceptual studies: use case list and concept definition) has been finalized and is currently undergoing review by the EU-Rail.

The task on technology development of Short-Range Communications (SCR) and Relative Localisation (RL) involved the setup of SRC units and the implementation of RL algorithms. Test cases were defined in relation to VCTS and SDFW manoeuvres and environments. Lab and pre-tests of the SRC and RL equipment were conducted, followed by a three-day test campaign using two NS SNG trains in Amersfoort. Public relations activities included LinkedIn posts, a YouTube video, a press release, and two articles in non-scientific DLR magazines. The scientific publication and presentation of the SRC and RL tests were also featured at the 7th SmartRaCon Scientific Seminar.

Sub-area 6: Demonstrators



General objectives of the Sub-Area 6 – Demonstrators

The *Demonstrator* cluster main expected outcomes are the following:

- validation of the benefits of DATO technical enablers and;
- validation of DATO technologies for specific target implementations.

The demonstrators will be derived from one Technical Enabler (TE) or a combination of TEs, with the goal to demonstrate the targeted maturity level for the TE(s). Each demonstrator is set-up to verify specific technical enablers in a certain environment and for different use case(s). To effectively

demonstrate each TE, a selection is made out of representative environments, which are related to the main use cases and deployment needs for the technology. The demonstrator will allow to validate the KPIs set at the inception of the programme, uses cases and functional needs and deployment and migration needs. Moreover, TEs can be used in specific demonstrations as support to validate other TEs. This process is shown in the figure above.

Depending on the required TRL, the demonstration will be performed either in a simulated/ lab environment, or in a controlled real-world environment. For most activities, a full system demonstrator at TRL7 is out of scope for this project phase 1. However, pre-deployment activities will be undertaken by demonstrating the performance of the system in a controlled environment and/or in a lab or simulated environment and preparing verification, validation, and certification evidence. These results can then be used as input during the full system level demonstration in the future phases of the EU-RAIL programme. First steps in the development of the new functions and technical enablers will be completed, leading to prototypes and/or validation in laboratory (TRL5) and field (TRL6). The project will also allow to progress towards modularization, and first validation of the next generation ATC system in close collaboration with the System Pillar.

Progress and results achieved in 2025

For the **Regional Demonstrator (FP2-R2DATO – DEMO 2)** a comprehensive framework has been developed, focusing on identifying the technical enablers, selecting relevant and feasible use cases, and defining test environments and scenarios. The defined modules - part of the demonstrator (Automatic Driving Module (ADM), localisation module, perception module, digital register/ repository and remote control) – being developed and lab-tested throughout this year. Following the prototype installation phase, field testing is scheduled for early 2026. The demonstrator integrates the technical enablers supporting automatic functions, ASTP, ATO technologies, perception and remote driving.

For the 2nd **Urban Demonstrator (FP2-R2DATO – DEMO 3)** the specific operational test cases being analysed and selected. The preliminary testing and calibration phase to iterate and refine the developments started and the official testing phase will be performed throughout 2026. The demonstrator integrates the technical enablers supporting automatic functions, train integrity, ATO technologies, perception, data factory and remote driving.

For the **Main Line Demonstrator (FP2-R2DATO – DEMO 4)** the integration laboratory setup and the electrical and mechanical design was completed during 2025. The integration test in the laboratory started and will be continued in 2026. The demonstrator integrates the technical enablers supporting automatic functions, ATO technologies, perception and remote driving.

The **ETCS HTD Deployment Strategies Demonstrator (FP2-R2DATO – DEMO 5)** consists of various case studies and scenarios in Europe across Spain, Sweden, France, and the Netherlands. The goal is to develop migration and deployment strategies for implementing HTD based on various scenarios and configurations. In 2025, the capacity simulations have been performed to the defined case studies. The best practices and lessons learned have also been completed, together with the elaboration of results from the developed ETCS HTD survey and workshops. The current works focus on the development of the optimal methodology of line signalling design, the multi-criteria impact analysis and the overall deployment strategies. In 2026, the report on determining ETCS HL3 capacity impact analysis using simulations will be delivered. The demonstrator integrates the technical enablers supporting train integrity, Hybrid Train Detection and deployment-migration.

In 2025, the **Moving Block System Demonstrator (FP2-R2DATO – DEMO 6)** was successfully tested on the Deutsche Bahn test track in the Ore Mountains, Germany. The test campaign included both single and dual train configurations, effectively demonstrating the moving block concept in real-time. These tests validated dynamic train spacing and enhanced traffic management capabilities. The demonstration integrated the Moving Block System, the Digital Register, and the Plan Execution (PE) module from FP1-MOTIONAL, confirming the interoperability and effective integration of these key subsystems. The results directly contribute to the advancement of a modular, train-centric trackside protection system towards Technology Readiness Level 6 (TRL6). Furthermore, the feedback gathered during the tests has been instrumental in refining the architectural, functional, and interface specifications necessary for future moving block operations. In 2026, the WP45 will provide the results for the different test cases and visualisations of the main simulation scenarios) and the report of test execution and test results for testbed trials and demonstrations). The demonstrator integrates the

technical enablers supporting train integrity/train length, FRMCS, digital register and Hybrid Train Detection.

The **Stabling and Shunting Demonstrator (FP2-R2DATO – DEMO 7)** was conducted in the Netherlands, with test runs between Enschede and Hengelo reaching speeds of up to 125 km/h in mixed traffic conditions. These operations were remotely controlled from Utrecht, located 120 km away. The tests covered various operational modes, including GoA1 and fully automated GoA4, and incorporated obstacle detection capabilities within the shunting yard to enhance safety. The trials successfully met their objectives of validating technical enablers under real-world conditions and demonstrated measurable improvements over current systems. The results from remote control operations and obstacle detection confirmed the performance of the subsystems involved. Feedback collected during the demonstration is now being used to support ongoing technological and procedural enhancements. The demonstrator integrates the technical enablers supporting ATO technologies, perception and remote driving.

In 2025, the **Onboard Platform Demonstrator (FP2-R2DATO – DEMO 8)** has realized its main implementation tasks, resulting in the implementation and testing of multiple User Stories (as defined in the Demonstrator Specification D36.1). The conducted activities successfully demonstrate and evaluate the objectives of validating technical enablers from the Enabling Digital Technologies cluster (i.e. connectivity, FRMCS, modular platform, onboard COM networks and deployment-migration). Detailed results have been presented with the provision of the deliverable D36.3 (Demonstrator implementation phase 2 and test result).

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp2-r2dato/>

FP2-MORANE-2

The main purpose of FP2-MORANE-2 is to validate the FRMCS V2 Specifications and V3 target requirements, with precommercial FRMCS system components in realistic operational conditions.

The objectives and ambition of the FP2-MORANE-2 project include:

- Providing a future proof FRMCS architecture with the necessary telecommunication elements.
- Testing the necessary functions of the FRMCS V2 set of specifications
- Validating and returning on experience – this includes confirming / correcting / amending / evolving FRMCS V2 specifications, and communicating these elements to the UIC FRMCS Program for issuing FRMCS V3 ahead of the 1st Edition of the FRMCS specification in the CCS TSI.

Progress and results achieved in 2025

The project has focused on the following activities during its first year of execution:

- General work on the test scope for laboratory and field testbeds as well as initiation of work on the scope of test cases for each field testbed. Key deliverables related to test cases and test strategy will be made available in the Spring 2026.
- Regarding the preparation of the system components, the work on the test architecture has progressed. The End to End Generic Architecture is expected to be completed by beginning of 2026.
 - Kick-off of the laboratory preparation: lab tests will take place from mid-2026 onwards then leading to field tests starting beginning of 2027 in the 5 testbeds: (Sweden, Germany, The Netherlands and two in Spain – one for conventional and one for high speed). Spain – Conventional line – max 80km/h (RMR bands: FRMCS 900, FRMCS 1900)
 - Spain – High speed - max 300km/h (RMR band: FRMCS 1900) - possible elements of border crossing.
 - Sweden – Conventional line – max 200km/h (RMR band: FRMCS 1900 + MOCN scenario with Swedish MNO Telia).

- Germany - Conventional line – max 80km/h (RMR bands: FRMCS 1900 + GSM-R 900)
- The Netherlands – Conventional line – max 140 km/h (RMR bands: FRMCS 1900 + MNO testing with Dutch MNO KPN).
- Setting the Liaison Committee with ERA at the end of 2025 in order to ensure transparent and efficient communication ahead of update of the FRMCS specifications with the FP2-MORANE-2 results.

All results are available on the website: <https://www.fp2morane2.eu/>

Flagship Area 3 (FA3): Intelligent & Integrated asset management

The main objective of FA3 is to provide new innovative technical requirements, methods, solutions and services – including technical requirements and standards for future developments – based on the latest leading-edge technologies to minimise asset life-cycle costs or extend life cycles, while meeting the safety and improving the reliability and availability and capacity of the railway system, addressing both infrastructure and rolling stock. FA3 was in 2025 implemented via Flagship Project 3 – IAM4RAIL (FP3-IAM4RAIL) launched in December 2022.

FP3-IAM4RAIL

Sub-Area 1: Wayside Monitoring and TMS link

The primary objective of Sub-Area 1 is to integrate predictive maintenance and intelligent asset management. Specifically, an Intelligent Asset Management System (IAMS) for wayside assets has been designed and is ready for deployment, with future validation planned in two different Use Cases in Italy and Spain. This system includes securely collecting, storing and analysing data from wayside assets, and sharing information with the Traffic Management System (TMS) regarding asset status and the detection of possible anomalies.

Progress and results achieved in 2025

During 2025, test and validation phase successfully started in both Use Cases of this sub-area, i.e., Italy and Spain, reaching TRL6.

The non-intrusive interlocking (IXL) monitoring system in the Italian Use Case has been installed for the monitoring of switches, crossings, and track circuits. The collected data from IXL, along with data from the TMS and the maintenance system has been used for the development of anomaly detection algorithms and dashboards for the decision support system.

In Spain, similarly, data collected from sensors installed on point machines and level crossings in different locations has been integrated into a common IAMS platform, with dashboards for asset status visualisation and alarm management. Anomaly detection and prediction models have been developed, and the demonstration has started. The interface between IAMS and TMS has been defined with the main objective of enabling the exchange of diagnostic and operational data. This will allow the creation of impact scenarios in case of faults, with the aim of supporting the TMS in rerouting and priority management.

The IAMS analytics models for anomaly detection, fault prediction, and maintenance strategies have been developed.

Based on these initial results, the project is confident to achieve an increase of up to 50% in the availability and reliability of monitored assets thanks to the implementation of monitoring systems and the proactive management of anomaly detection. This means that the systems have proven to be more stable, predictable, and less prone to sudden failures.

The introduction of predictive maintenance strategies will contribute to at least a 10% reduction in maintenance costs and an estimated 25% decrease in in-service failures, demonstrating how intelligent use of data can lead to tangible operational savings. n

Sub-area 2: Rolling Stock Asset Management

Sub-area 2 is focused on rolling stock asset management addressing on-board and wayside technologies developing new monitoring and inspections systems. Data on asset health is collected and analysed to develop predictive algorithms supporting decision-making and maintenance planning.

This is crucial as European railway operators face increasing pressure to reduce operating costs while maintaining high reliability and efficiency. The shift from traditional preventive/corrective maintenance to Condition-Based Maintenance (CBM) requires the development of intelligent algorithms and integrated platforms.



Progress and results achieved in 2025

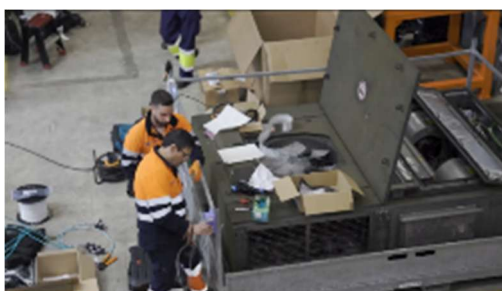
The vision of an integrated intelligent railway asset management system has been consolidated, with the primary objective of supporting operational and maintenance decisions through data-driven insights. This covers both on-board and wayside rolling stock monitoring.

The on-board monitoring activities have focused on enhancing the reliability and efficiency of critical subsystems, with particular attention to passenger comfort and service continuity.

Among the different subsystems, FP3-IAM4RAIL has implemented monitoring of sanitary systems, including toilets, tanks, pumps, and discharge mechanisms. Through dedicated sensors and telemetry, data has been collected on fill levels, usage frequency, pressure, and valve performance. This data has been integrated into an analytics platform capable of identifying anomalies such as leaks, blockages, or recurring malfunctions. As a result, targeted maintenance actions can be planned before issues affect passenger experience or cause service disruptions, with an expected reduction of up to 30% of the reactive maintenance intervention. This proactive approach supports a cleaner, more reliable onboard environment and reduces the need for emergency repairs.



Another domain is the monitoring of the HVAC system, where sensors are used to collect extensive data about the operation for 2 HVAC units on the SNG fleet in the Netherlands. The data is being used for analytics and to detect anomalies such as inconsistent temperature variations, compressor malfunctions, and loss of refrigerant. These insights are essential for anticipating failures and optimizing maintenance interventions. The expected potential outcomes include reduced in-service failures, improved energy efficiency, and enhanced passenger satisfaction.



A further system being analysed on the SNG fleet is the magnetic track brake. One unit on the fleet has been equipped with current monitoring, which allows remote

analysis of the operation and the quality of the friction surface, thus enabling early detection of weldings and other disruptions to the brake.

The concept of European Railway Checkpoints has evolved into a validated operational model. These checkpoints are now recognized as strategic nodes within the railway network, enabling real-time, multi-modal inspection of rolling stock and infrastructure assets. Their core function is to support Condition-Based Maintenance (CBM) and enhance operational decision-making through intelligent data

acquisition and analysis. The demonstrator architecture has been successfully defined and tested, integrating technologies such as acoustic/vibration technology (sensors and microphones), 2D/3D imaging, video analysis, laser scanning, and Radio Frequency Identification (RFID). These systems enable the detection of physical anomalies on key components including bogies, pantographs, and general train structures.

Several Railway Checkpoint configurations have been deployed and validated. These include systems capable of capturing high-resolution images and acoustic signatures as trains pass through, identifying wear, damage, or misalignment. Other applied configurations focus on pantograph inspection and general anomaly detection, with additional setups supporting freight-specific diagnostics. In 2025, the acoustic technology test as part of Use Case 7.1 was successfully completed in Beasain Railway Station (Spain), for freight trains.

The data collected is processed through advanced analytics platforms, feeding into maintenance systems and supporting predictive strategies. A key achievement has been the development of a standardized data path, ensuring traceability, interoperability, and compliance with safety and certification requirements.



All demonstrators have reached TRL 5–6, confirming their maturity and readiness for broader deployment. The deployment of Railway Checkpoints has shown a clear potential to reduce the operational impact of asset failures (up to 30% reduction of service failure in specific Use Case), enabling early detection and timely maintenance. Moreover, the integration of multi-sensor inspection and predictive analytics has contributed to improved traffic fluidity and reduced service disruptions, particularly in mixed-traffic environments where rolling stock diversity increases diagnostic complexity.

Sub-area 3: Infrastructure Asset Management

Strategic railway infrastructure asset management, particularly in maintenance, is crucial for safety, asset longevity, and operational reliability. It enhances customer satisfaction, minimizes costs, ensures regulatory compliance, and contributes to a sustainable and efficient transportation system by optimizing resources and minimizing environmental impact. Sub-area 3 addresses various aspects of infrastructure asset management through demonstration in 28 use cases, with two main objectives:

- Long term asset management: developing decision and support systems for asset management and life cycle costing optimization;
- Enhancement of asset management and infrastructure via new monitoring and inspection system. These systems integrate Big Data from on-field and on-board sources, facilitating information sharing across the supply chain and Traffic Management System.

Work Stream 2 - Advanced Sensing and Prescriptive Maintenance and Work Stream 4 - Civil Asset Monitoring and Risk Management focus on specific assets, while Work Stream 3 - Multi-Source Data and Reality Modelling provides tools and data integration applicable across all streams. Work Stream 1 - Long-Term Maintenance Optimization - benefits from these innovations for long-term strategies, creating a cohesive IAM approach.

Progress and results achieved in 2025

In 2025, the infrastructure asset management activities within FP3–IAM4RAIL have transitioned from development to large-scale demonstration and integration, delivering tangible results across all work streams, with demonstrators deployed in multiple European countries and technologies reaching maturity levels between TRL 6 and TRL 8. The activities focused on advanced monitoring systems, predictive maintenance, and data-driven decision support tools.

Work Stream 1 – Long-Term Maintenance Optimization

In 2025, activities focused on validating decision-support tools for long-term infrastructure maintenance, with the goal of optimizing life-cycle costs while ensuring high standards of operational safety.

One of the most significant results was achieved in Norway, where a steel truss bridge completed its first full year of continuous monitoring. Data collected via strain gauges installed on both the structure and the rails enabled comparison between measured and simulated stress responses, improving the reliability of Finite Element Method (FEM) models. The inclusion of cyclic loading effects refined the estimation of Remaining Useful Life (RUL), resulting in a 15–20% increase in life-cycle cost assessment accuracy.

Further progress was made in rail damage prediction: new methods allow simulation of crack growth and deformation, helping to prevent transverse fractures. A high-precision digital twin demonstrated the ability to predict rail profile evolution with sub-millimeter accuracy, validated on the Swedish West Main Line.

Integration with planning tools such as optimized tamping scheduling and maintenance activity clustering yielded concrete results: tests conducted in Norway, France, and Germany showed a 25% reduction in corrective interventions and a 10% increase in track availability. Additionally, the work coordination feature, now integrated into a commercial system, enabled more efficient multi-activity planning, reducing track occupation conflicts by up to 30%.

Work Stream 2 – Advanced Sensing and Prescriptive Maintenance²⁶²⁷

The Demonstration campaigns conducted in 2025 have successfully concluded and entered the final phase of analysis, validation, and result consolidation. The intelligent sleeper with embedded multisensing and graphene-enhanced materials, LiDAR-based automated ballast profiling, and fibre-optics-driven DAS monitoring for rockfalls and wheel flats have proven technical viability respectively in Spain, France, and Sweden.

Several technologies are now transitioning into operational use. Infrared camera monitoring for S&C is replacing hazardous manual inspections. At ProRail, lipping-detection algorithms are currently undergoing pilot implementation. Meanwhile, DB has integrated a prescriptive maintenance tool directly into its shift planning workflows, enabling a significant shift from reactive to predictive maintenance operations. Standardisation pathways have been initiated by Siemens and SNCF, with contributions from infrastructure managers and project partners. These efforts aim to ensure interoperability and scalability of the developed solutions. Upcoming activities include the consolidation of results, the definition of exploitation plans, and the continuation of selected research lines to further increase TRL and support future deployment.

A key result within this work stream is the development of an operational lipping indicator, now integrated into ProRail's asset management ecosystem. A uniquely large and fully validated dataset was created, comprising approximately 8,555 crossing point clouds collected across the Dutch network. Each point cloud was manually checked for plastic deformation, resulting in a high-quality, expert-labelled dataset that includes examples of incidents such as breakouts. A robust detection algorithm, compatible with all ProRail crossing types, was developed and refined through stakeholder feedback. It is now actively used by inspectors and contractors, with tailored output formats that support the prioritisation of maintenance resources. Additionally, the dataset has generated new scientific insights into degradation patterns and root causes.

A low-cost, smartphone-based solution for continuous track monitoring has been successfully validated in commercial train operations. Maintenance teams simply place a smartphone in the cab, where the app captures geolocated acceleration data reflecting real-time track geometry and train-track interaction. Following a six-month operational trial, which delivered conclusive

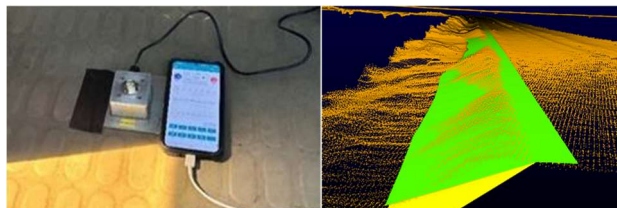


²⁶ IAM4RAIL – Predictive Maintenance results, Germany - <https://www.youtube.com/watch?v=oafevA2sLUA>.

²⁷ IAM4RAIL – Predictive Maintenance results, The Netherlands - <https://www.youtube.com/watch?v=ZIHIXIG2cD8>.

results, SNCF is now rolling out the system across all French regions. The solution is intuitive, requires minimal deployment effort, and integrates seamlessly into existing workflows via an online analysis platform—enabling safer, faster, and more data-driven maintenance decisions.

In parallel, ballast maintenance, one of the most resource-intensive activities in rail infrastructure, is being addressed through an onboard LiDAR-based method developed by SNCF. The system automatically compares measured ballast profiles with expected compliance levels using digital terrain modelling, 3D geometry computation, and advanced object filtering. Initial test runs have been successfully validated by SNCF's operations teams, with further campaigns underway. The solution is expected to support more precise recycling and renewal decisions, reduce ballast waste, and optimise resource planning.



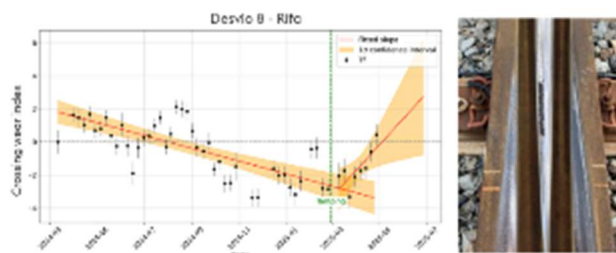
Work Stream 3 – Multi-Source Data and Reality Modelling

Work Stream 3 has developed an advanced technical monitoring ecosystem based on a multi-source, multi-purpose platform (MSMP), aimed at supporting short-term asset management and off-site intervention planning. The integration of data from both wayside and onboard sensors enables continuous and traceable diagnostics, with a particular focus on switches and their surrounding areas.

Thirteen specific applications are currently under development, structured into two categories: high-TRL technologies ready for rapid deployment; and more analytical solutions based on data fusion to generate deeper insights. Several applications have already reached TRL 6, demonstrating operational reliability, while others are being refined for deployment at pilot sites in the Netherlands and Spain. One of the most significant outcomes is the Reality Model developed within ProRail's ASAP-ERTMS partnership. Using the Leonardo measurement platform, the model integrates LiDAR, Trackscan, and Ground Penetrating Radar technologies with infrastructure databases, generating a high-precision 3D representation of railway sections. This tool enables smarter and more practical design of axle counter and balise installations, reducing costs associated with errors and last-minute execution changes.

The model was validated at the Kampen-Zuid test area and Lage Zwaluwe yard, demonstrating object location accuracy between 5 and 10 cm. Virtual validation allows projected component positions to be visualized directly in a 3D environment, facilitating visual feasibility checks. Adoption of the model has improved design feasibility, reduced execution errors, and enhanced object recognition through AI. Full-scale implementation expected in 2026.

In parallel, sensor systems have been installed at two turnout sites in Spain—one on a high-speed line and one on a mixed-traffic line—to detect degradation mechanisms such as wear, cracking, ballast deterioration, and abnormal vibrations. These systems, currently at TRL 7, provide early indicators of structural issues, supporting predictive maintenance strategies and reducing the risk of service disruptions.



In fastener monitoring, signal processing methods based on Axle Box Acceleration (ABA) have been advanced. A flexible track model was validated using FEM and integrated into multibody simulations (MBS), leveraging real data to generate synthetic acceleration signals. This has improved the precision of virtual testing.

Work Stream 4 – Civil Asset Monitoring and Risk Management

Multiscale approaches for asset management have been developed combining satellite, aeroplane, drones and ground data, with AI trained by bulk data gathered across Italy. Data fusion between satellite and airborne lidar data, feeding a bespoke convolutional neural network, allowed inferring the vegetation height from satellite imagery in the area surrounding Milan, paving the way for the avoidance of recurrent costly field inspections. Bridge inspection has been demonstrated via drone in Potenza, with availability

of vast campaigns of data, enabling the study of automatic recognition of defects via AI. This method of inspection impacts bridge inspection time and related traffic disruption.

A new monitoring approach for railway transition zones was developed to overcome the limitations of traditional low-frequency geometry inspections. The work uses AI to continuously predict longitudinal track levels by integration of track geometry, Interferometric SAR (InSAR) and axle box accelerations (ABA). A new KPI was proposed to quantify transition zone health and the approach was validated on a real transition zone in the Netherlands (Dordrecht–Lage Zwaluwe). The geological risk monitoring network was expanded to include ten new embankment sites equipped with wireless clinometers and weather stations. These systems were integrated into a central platform, enabling automated alerts and predictive risk scoring. In Spain, the Huerta Mateo Viaduct was equipped with over 60 sensors, including LVDTs, accelerometers, inclinometers, and GPS units. This enabled real-time anomaly detection and digital twin validation. In France and Spain, tunnel and subsoil monitoring systems were deployed using IoT-based sensors and microwire technologies, reaching TRL 7. These systems provided predictive insights into structural health and environmental risks, contributing to safer and more resilient infrastructure.

The demonstrators within Work Stream 4 have delivered measurable impact, with bridge inspection times reduced by up to 50% (from over 24 hours to less than 12), traffic disruption times cut by 25%, and intervention costs lowered by at least 10%.

Sub-area 4: Railway Digital Twins

The demonstrations in this sub-area continue to focus on implementing railway Digital Twins (DT) to optimise processes, maintenance planning and logistics related to the design, upkeep, upgrades and renewal of railway assets. DT implementations address common challenges in the railway domain, such as asset modelling, secure data acquisition and exchange, data fusion, data presentation and behavioural simulation, establishing a reference best practice for Digital Twin deployment. The main goals of Sub-area 4 are to develop methods for implementing Building Information Modelling (BIM) replicas for asset management, connecting inspection and diagnostic data to the DT, presenting and processing DT asset data, and enhancing the DT with behavioural simulation and certification capabilities.

Progress and Results Achieved in 2025

In 2025, the activities in the Railway Digital Twin sub-area have focused on integrating real-time data, enhancing simulation capabilities, and supporting certification processes through digital environments.

The BIM-based Digital Twin of Málaga Zambrano station has achieved an advanced level of integration, becoming an operational environment capable of supporting predictive management and real-time asset monitoring. The activities have enabled the integration of data flows from environmental sensors, passenger flow counters, CCTV systems, and IoT devices directly with the station's BIM model, through an interoperable Asset Management System – Digital Twin (AMS–DT) platform. It is then possible to dynamically visualize station conditions (temperature, crowd density, system status) and automatically trigger alerts for operational or maintenance anomalies. The architecture implemented also allows heterogeneous data from SCADA system and Computerized Maintenance Management System (CMMS) to be merged into a centralized Data Lakehouse, improving the accuracy of simulations and the timeliness of decision-making. Tests carried out in 2025 showed a 20% improvement in operational responsiveness and a 15% reduction in manual inspections, with an increase in the level of technological maturity (TRL 6).

In the domain of smart cleanliness and waste management, the trash detection system initially demonstrated in 2024 has been fully deployed in three stations.

In 2025, it was upgraded with real-time dashboards for station operators and classification algorithms capable of distinguishing between regular and hazardous waste. These enhancements have



enabled predictive cleaning scheduling based on traffic heatmaps and historical waste patterns. The system has delivered measurable benefits, including a 25% reduction in cleaning-related operational costs, a 15–18% increase in passenger satisfaction, and a 30% faster response time to hazardous waste incidents.

A major innovation in certification processes has been the pilot deployment of the Virtual Certification Framework, integrating blockchain-based traceability for selected infrastructure components. Digital passports have been created for materials used in station upgrades, enabling full traceability from supplier to installation. Secure certification logs have reduced administrative overhead and improved auditability, cutting certification processing time by up to 40%.

The Common Data Environment (CDE) specifications have also been finalized and tested in collaboration with FP1-MOTIONAL and FP4-RAIL4EARTH. The CDE now supports seamless integration of inspection and diagnostic data into DT platforms and provides standardized interfaces for data exchange across asset management systems. This has enabled real-time synchronization between physical assets and their digital counterparts, improving planning accuracy and reducing data silos.

Collectively, these developments have strengthened the operational maturity of Digital Twins for railway stations. The integration of Data Lake architectures, BIM execution frameworks, and blockchain certification tools demonstrates tangible impact, achieving measurable improvements in cost efficiency (15–30%), data transparency, and regulatory compliance, while confirming the scalability of the solutions across multiple European pilot sites.

Sub-area 5: Environment, User and Worker Friendly Railway Assets

Sub-area 5 focuses on creating environmentally sustainable, user-friendly and worker-friendly railway assets by addressing sustainable and cost-effective railway lines, new Additive Manufacturing (AM) repair processes, robotic platforms for railway interventions and Augmented Reality (AR) and exoskeleton technologies to support railway maintenance.

Progress and Results Achieved in 2025

In 2025, Sub-area 5 has delivered concrete advancements in the development of railway assets that are not only environmentally sustainable, but also safer and more ergonomic for workers and more accessible for users. The activities have focused on eco-design, additive manufacturing, robotics, augmented reality, and wearable technologies, with several demonstrators entering advanced validation phases.

In the domain of eco-design, the green turnout demonstrator was successfully installed in the Austrian railway system. This installation incorporated recycled materials, resulting in a 15% reduction in CO₂ emissions during installation and a 20% improvement in structural resilience under dynamic loads.



Moreover, studies on bridge dynamics done in the FP3-IAM4RAIL project show that current limit values for dynamic amplification are over-conservative, indicating a potential cost-reduction of 20% in design of new bridges.

Additive Manufacturing (AM) activities have also accelerated. A door panel was successfully produced using Fused Filament Fabrication (FFF) 3D printing. The component met EN45545 R1/HL3 flame retardancy standards and required 32 hours of printing. Compared to conventional methods, lead time was reduced by over 80% and production costs by approximately 50%.

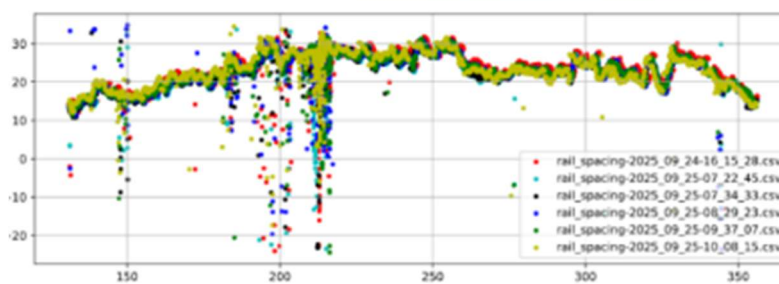
A Digital Warehouse demonstrator was developed to identify spare parts and propose AM solutions. It includes core features such as part listings, use case uploads, detailed descriptions, and usability tools.

In one example, AM enabled an 80% reduction in both lead time and cost compared to conventional methods. Research on the applicability of several AM technologies—Cold Spray AM, Laser-Directed Energy Deposition (L-DED), and Wire Arc Additive Manufacturing (WAAM) for rail, turnout, and wheel repair applications progressed in 2025. A successful in-situ L-DED repair of an R350 HT rail demonstrated strong metallurgical bonding and compliance with porosity and hardness standards. Ongoing material testing shows promising wear resistance compared to current solutions.



The robotic platform continues to mature. By autumn 2025, three of the four demonstrators targeting TRL 6 had already achieved this level.

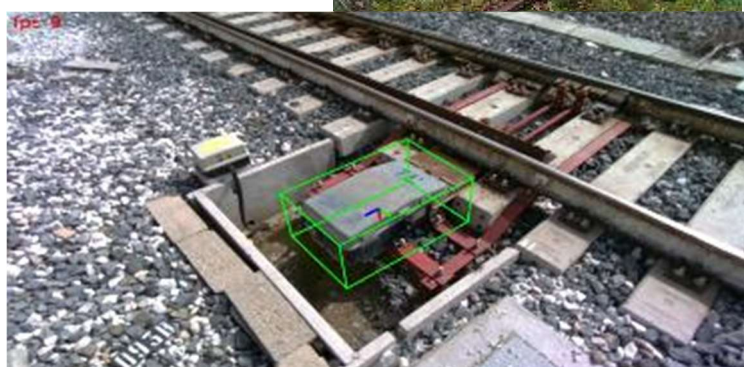
As the operating conditions for the robots developed have yet to be established in some cases, the assessment of usage costs remains very preliminary. However, the trends are encouraging. It has been shown that robots complement other modes of inspection or intervention. For example, a track inspection robot can adapt its behaviour (by slowing down or even moving backwards) by analysing its inspection data in real time. This objective was achieved by implementing the latest state-of-the-art techniques and methodologies, such as behaviour trees and model-based engineering. The year 2025, marked by numerous trials, has produced concrete achievements that often inspire a desire to extend the scope of robotics. The track object placement robot will even be used as early as 2026 as part of a contract on the Dutch network.



Reproducibility of rail spacing measurement (robot in full autonomous mode)



Wearable technologies have also advanced. The exoskeleton prototype has entered the integration phase, combining a novel motor-reduction system with a kinematic structure optimized for railway maintenance postures. Validation in real-world scenarios is underway, with expected outcomes including a reduction in arm and shoulder physical load, particularly in overhead operations. In parallel, the augmented reality (AR) system architecture has been finalized. This architecture allows to simplify the development of deployment of AR application to different kinds of devices. AI models for 6D pose estimation, and 3D reconstruction have been trained on datasets generated automatically from data gathered from the AR scenarios. In 2025, an initial AR scenario was validated (calibration of track monitoring device) and another for point



machine inspection is in preparation. The use of techniques such as Gaussian Splatting is enabling the generation of new assets for legacy devices. These tools are now being integrated into mobile devices and smart glasses for field deployment, enhancing both maintenance efficiency and training effectiveness.

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp3-iam4rail/>

Flagship Area 4 (FA4): A sustainable and green rail system

The main objective of FA4 is to provide new innovative products and services based on leading edge technologies to minimize the overall energy consumption and environmental impact of the railway system, to make this transportation mode healthier and more attractive and to provide resiliency against climate change at a reduced total cost of ownership. FA4 was in 2025 implemented via Flagship Project 4 – RAIL4EARTH (FP4-RAIL4EARTH) launched in December 2022.

Sub-Area 1: Alternative (to Diesel) energy solutions for the rolling stock

The main objective of sub-area 1 is the demonstration of three Batteries Electric Multi-Unit (BEMU) trains (two high performance and a low-traffic trains), two hydrogen hybrid trains (one heavy-duty inspection vehicle and one locomotive) and, one virtual demonstrator of an on-board energy storage system (OESS) for trains using a catenary. This will be enabled by increasing the energy density stored on board the train, by extending the range accessible to the BEMU in catenary-free mode from 80 km (present state-of-the-art) to 200 km and by improving the efficiency of the hydrogen traction system and standardizing its' refuelling interface. The physical demonstrations planned as outcomes for this sub-area are high performance battery-powered regional trains (200 km) reaching TRL 6; hydrogen hybrid locomotive reaching TRL 5/6; hydrogen inspection vehicle achieving TRL 5 in 2026.

Progress and results achieved in 2025

- Progress was made in the development of innovative next generation propulsion system components. In particular, for the low-traffic train demonstrator, the tests in laboratory were completed on all the sub-systems of the traction system including the converters, the battery and its management module, the transformer. The battery cells for the high-performance demonstrators were also validated in laboratory and a digital twin approach was developed to estimate the electrical and thermal degradation of power semiconductors. For the high-performance North Europe BEMU demonstrator, the complete traction chain, including the power converter based on silicon carbide (SiC) technology and the power transformer, is under test in laboratory. Due to the ambitious new range of this demonstrator, a corresponding study was conducted to analyse the most suitable lines where it could be used in Germany, Sweden and Norway.



BEMU traction chain in laboratory

- As energy management was identified as a critical aspect to optimize the performance of long range BEMUs, energy management strategies were developed, aiming to maximize energy efficiency both during propulsion and while managing the auxiliary system of the train. Predictive models for train energy consumption were developed enabling virtual optimization of energy use under real operational scenarios. Techniques to reuse thermal losses from the ESS have also been explored: the use of the energy losses when cooling the DCDC (Direct Current to Direct Current) converter and by the battery thermal management system in thermal storage modules was studied. The sizing of these modules has also been discussed.

- The key work on power semiconductors reliability also progressed in the area of requirements specification. The work already started with the European Center for Power Electronics is helping the project to identify the SiC specific reliability topic for the future traction systems.
- The work related to the developments of hydrogen storage technologies on trains was completed in 2025. For the demonstrator prototype of a hybrid locomotive for passengers, the mechanical design and integration of the metal hydrate reactor in the current hybrid locomotive was performed, along with the simulation of energy efficiency and optimization.

Sub-Area 2: Energy in rail infrastructure and stations

The main objectives of sub-area 2 are the improvement of hydrogen refuelling stations for the railway sector by standardization, development and integration of innovative solutions into the legacy railway system to improve and enhance the infrastructure traction power supply and the definition of the requirements and preliminary developments for the use cases of innovative solutions to manage and minimize energy consumption by optimizing the usage of needed resources and reducing the total cost of ownership. The sub-area also targets the development of energy hubs using energy storage for peak shaving and to open the way to powering railway grids using renewable energy sources and local energy balancing solutions. The work also involves defining a pilot project for a new modular station in Poland, as part of the "Building a Modular Low-Emission Station" initiative. Additionally, it includes a pilot for a "Railway Station Energy Digital Twin", to be demonstrated using the example of the Málaga-María Zambrano station in Spain.

Progress and results achieved in 2025

- The models and tools developed for the optimization of the localization of the hydrogen refuelling station were validated thanks to case studies in Poland. This action validated the feasibility and strategic relevance of the proposed methodology. A comprehensive hazard register for refuelling stations was created, also on the basis of the analysis of the Technical Specifications for Interoperability (TSIs). In parallel, initial design of a modular, interoperable hydrogen refuelling demonstrator has begun, including the control system architecture, simulation tools, and prototyping scenarios. As hydrogen delivery is a key topic for railways, a pre-standardisation analysis was carried out, and the initial design of a mechanical refuelling interface (SAE J2601-compliant) was completed.



1:1 Scale model of an interoperable hydrogen refuelling interface presented at TRAKO 2025

- With regard to the introduction of an energy hub as an advanced element of the railway system, for a typical demonstrator of energy storage on DC (Direct Current) side, the pilot demonstration of an Urban Energy Hub in a light rail urban environment is installed in Rotterdam and data is being collected to evaluate its' performance in a real environment. Up to now the system is operating as expecting and has been able to demonstrate that the energy hub can deliver equivalent traction support at only 30% of the cost of a conventional rectifier station. In addition, simulations and early measurements suggested a reduction of up to 30% in total energy consumption due to peak shaving, braking energy capture, and smart charge/discharge cycles.
- Studies on double side feeding of 50 Hz AC traction substations using Flexible Alternating Current Transmission Systems are ongoing, especially the realistic line model representative of railway environment co-simulated with the previously developed model of a Railway Interline Power Flow Converter. Regarding energy storage solutions for AC railway grids, a comprehensive global simulation model of the Swedish railway traction power system has been successfully developed based on real-world field data and validated. A novel approach was also proposed to integrate Energy Storage Systems directly into existing static frequency converters to enable peak power shavings and effective utilization of regenerative braking energy.

- Regarding progress on the modular station, the daily distribution of passengers, information regarding the location of the demonstrator station, and the analysis of the possibility of using a station building from the prepared catalogue of modular stations have been defined. Concrete made with aggregate derived from waste from an incineration plant was tested, and various types of structures were also examined (e.g. wooden, reinforced concrete, steel). In terms of mechanical strength and Global Warming Potential (GWP), it was deduced that the choice of cement type is the leading parameter for reducing emissions and increasing strength. Work on the energy Digital Twin for an existing railway station (the María Zambrano station in Malaga) progressed with the development of the first prototype of the digital twin, including the 3D viewer and the monitoring, energy efficiency, alarms and maintenance modules, that will be involved in the future demonstrator.



Concept of a green modular station presented by PKP at TRAKO 2025

Sub-Area 3: Sustainability and resilience of the rail system

The objectives of sub-area 3 deal with the sustainability and resilience of the rail system. This sub-area performs research, develops models, and will demonstrate solutions to better adapt the rail system to climate change and to reduce the impact of vibrations and noise on the surrounding environment.

Progress and results achieved in 2025

- The work performed on pre-standardization led to the agreement of one common mechanical interface for all railway mechanical interfaces for railway hydrogen refuelling. Several railway specific key parameters were identified, such as standardised pressure, coupling and ambient temperature. It was also defined that the preferred solution for rail application is the refuelling without dynamic communication between the HRS (Hydrogen Refuelling Station); hence, to achieve a safe and fast refuelling the HRS must know already the rolling stock data. Finally, it was convened that a refuelling time of 30 minutes can be sufficient for operation.
- For the optimization of energy consumption at system level, a description of energy management functions was proposed (including, among others, eco energy management in parking and lift and drop of pantograph) and studies on the optimisation of BEMU charging considering infrastructure and battery lifetime, as well as train preconditioning were performed. This led to different preferred solutions depending on the type of charging means: charging via pantograph and catenary islands or through shore energy supply with higher power performances than the current shores. In addition, a standardized methodology for the comparison of alternative drive trains and related systems was developed and new use cases will be studied in 2026 to challenge the methodology.
- As a continuation of the work done on adaptation to climate change, a risk analysis method was selected and adapted to railway assets. Based on the concept of impact chains, it makes optimal use of the latest methodological advances from the IPCC (Intergovernmental Panel on Climate Change) and other transport sectors (road). Of the seven impact chains to be developed within the project, four have been created. A list of 31 assets was described with climatic impacts (ice, snow, water, heat, storm) and related design standards.
- Two methodologies for aeroacoustics source characterization have been defined and compared with measurements: one for high-speed train first bogie and the other for high-speed train inter-coach. The first annoyance responses of residents along a high-speed line collected in spring 2024 were analysed. The first result is that there were little variations of these indicators between different train passages.

- Considering noise and vibrations emissions over lifespan, a second version of Neoballast using recycled substrate was produced and will be tested next year. Vibration measurement with the optical fiber along the track were analysed. This showed clearly the characteristics of this technique compared to the use of accelerometers. In particular, the behavior of fiber optic and accelerometers is not the same in high-frequency range, while it is close in the low-frequency range.
- The catalogue of ground-borne mitigation measures was completed with information derived from several key sources. The impact of heavy mass on the ground will be measured along the DB network, for which a soil characterization campaign is being completed. The results will serve as input to the simulations for the influence of heavy masses next to the track.
- A catalogue for curve squealing mitigation methods was finalised and shared among the project partners. In parallel, a long-term monitoring campaign was finalized in the first quarter of the year and statistical analysis and correlation studies will follow in the last year of the project.
- Considering circular economy solutions, a first version of the ecolabels was made and a mock-up of the marketplace for circular economy was finalised and shared among the project partners.

Sub-Area 4: Electro-mechanical components and sub-systems for the rolling stock

The main objectives of the sub-area 4 involve developing and introducing to the market airless electromechanical braking system, pantograph and suspensions. A parallel objective is the optimisation of motors and gearboxes, high performance bogies and suspensions regarding energy consumption and weight, considering new materials following circular economy principles. In the scope of new usage, one key objective is to deliver alternative technologies to replace hydrofluorocarbon refrigerants with HVAC systems using green refrigerants or new cooling technologies with reduced energy consumption. In addition, a global objective for the rolling stock is to introduce enhanced experimental and numerical methods for aerodynamics.

Progress and results achieved in 2025

- For the air-less brake, integration studies on one train in UK were finalized and discussions have commenced with functional safety experts to determine the required level of documentation, such as the product safety case, risk mitigation plan, and validation plan, in preparation for anticipated AsBo (Assessment Body) queries. This proactive approach aims to ensure that all safety documentation is comprehensive and ready to support regulatory and certification processes as the projects advance.
- For the air-less pantograph, pre-standardisation work continued and two prototypes are being built. For the first demonstrator, the preliminary results of the wind tunnel aerodynamics test correlate with the simulation; end of testing is planned for Q1 2026. For the second demonstrator, a modification of the test bench was conducted to allow full-scale testing in HIL (Hardware-in-the-Loop) of the e-pantograph; these tests shall begin in 2026.



Uplift and down lift test

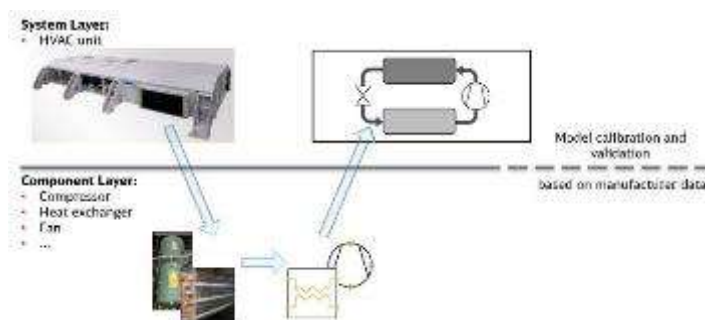
Sinus test

ADD Test



Electro-mechanical Brake dynamic test bench and e-pantograph test bench

- For the air-less suspension, three concept architectures were studied. Continuation is being given to the development towards proof of concept and to narrowing down the concept. Globally, the estimated possible global weight saving for an air-less train compared to an actual one is about 900 kg + 25 kg/meter. The most important impact of an air-less train (e.g. estimated today compared to the project's baseline in 2023, at 2% energy saving, 2 to 4% noise reduction and, 15% LCC reduction) will be reached if all the pneumatic sub-systems of the train are replaced.
- Regarding the development of an eco-friendly HVAC, a digital twin of a HVAC in a train has been developed and the type of test procedures for the demonstrator HVAC unit (e.g. air flow measurement, cooling capacity, heating capacity, noise measurement) have been defined. The activities in optimizing motors and gearboxes, including several demonstrators, are aiming at reaching a global weight saving of 20%.
- The work on the lightweight axel for freight wheelset was closed in 2025: the demo for the freight wheelset is represented by a 1:1 scale wheelset prototype, refurbished after a first track test.



Modelling approach for HVAC unit

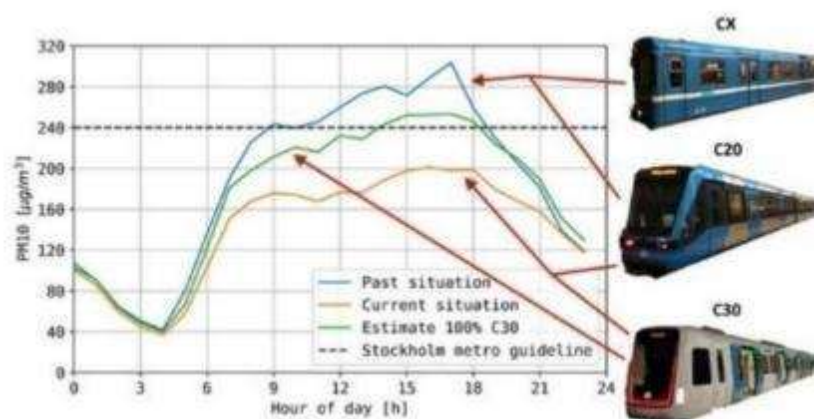
- In the aerodynamics domain, two sets of wind tunnel tests were completed in 2025 (generic train and influence of the roof configuration) and the analysis of the relevant test results is ongoing. On the numerical side of the work, a first set of numerical simulations were completed and their validation using experimental test results are ongoing, with the first comparison results looking promising. An analysis of the test results related to the influence of roof configurations is also ongoing. The development of the pantograph model using carbon-fibre tubes and 3D printed parts with carbon-fibre stabilisation is nearly finalized and wind tunnel tests are ongoing.

Sub-Area 5: Healthier and safer rail system

The Sub-project 5 is designed to reach two main objectives: developing technologies and methodologies ensuring a reduced health risk for rail passengers and staff and building a better understanding of the issue of non-exhaust emissions emitted by wear particles from brakes, wheels-rail contact, pantograph-catenary line contact and assessing the related risks.

Progress and results achieved in 2025

- For the topics related to rolling stock onboard air quality, 2025 was mainly devoted to preparing and performing the first demonstrations onboard trains. In terms of centralised solutions for air treatment, a PEPA-F™ pathogen filter was validated on a DIRK DB train and the analysis of the testing results of a particulate filter are currently ongoing. Different tests specific to the HVAC system (long life filter, dielectric barrier discharge ionization system) have also been performed at the end of the year.
- Various hat rack and the headrest concepts are being tested in Germany.
- In the domain of air quality on covered platform and tunnels, PM1, PM2.5, and PM10 measurements were taken at Arlanda Central Station in Stockholm and have been used as input to several machine learning-based prediction models. The pros and cons of the methods have been studied against their main characteristics (accuracy, feature importance, minimum training data requirements and transferability), and directions to improve the predictive robustness have been proposed. The data analysis highlighted train frequency and hour of day as the most impactful predictors. Air quality improvement solutions were studied and classified: at-source pollutant control, airborne concentration reduction systems, and some emerging solutions as photocatalytic coatings. This work is currently at an early stage.



PM10 emission estimations during the day are based on the combination of train-type fractions

- Work was also performed on the definition of a pre-standardized method to calculate non-exhaust emissions (PM10, PM2.5) from rail activities using emission factors. The goal is to develop a method for the calculation of railway activities' emission. The most relevant non-exhaust emission sources (such as emissions from braking, rail-wheel contact and pantograph-overhead line contact) started to be determined through bibliography study. Three different methodological approaches have been identified: the material loss method, the real-life measurement method, and the bench test method.

Sub-Area 6: Trains Attractiveness (Interiors)

The sub-area 6 is dedicated to the train attractiveness through the enhancement of various elements and aims to develop technologies and interiors design by facilitating:

- Rolling stock adaptation with refurbishment and regular evolving layouts, and innovative concepts to support the increase of capacity of the rolling stock targeting TRL6 in 2025 and preparing for later evolutions.
- Reduction of the environmental impact by using an interior designed for circular economy with specific materials, shapes or assemblies done for the re-use or for very low impact during the life of the train.
- On-demand comfort for users, as well as new architectures to increase passenger capacity (targeting TRL6 in 2026).

Progress and results achieved in 2025

- The work performed on ideation and pre-concept of train interiors ultra-modularity led to progresses in several domains: quick fixing systems for interior modules, especially in the interior area (such as the luggage rack, the bike rack and the cantilever seat), were defined and a proof of concept was validated. For example, the cantilever seat beam for 1st and 2nd class seats was modelled, optimized and simulated to offer the capability to improve the comfort while maintaining the structural part of the seat; one cantilever seat beam for 2 and 3 sets of seats was instead developed to offer the capability to increase the capacity while maintaining the structural part of the seat.
- Regarding the two immersive 3D virtual reality configurators of train layouts were developed with different goals (one for the train supplier to facilitate the exchange with the customers, the other following the train operator's view to valid the feasibility of refurbishments), the first is fully developed, while the second was validated at TRL 5 and validation for higher TRLs is ongoing.
- The developments on circular economy design, led to progress on the topic of sustainable materials for interiors panels. In a first work, processability tests were conducted in collaboration with a trusted supplier and a raw material formulator, utilizing existing equipment and infrastructure without requiring new investments. Based on the evaluation of processing behaviour and mechanical performance, an optimum range of recycled content was identified. In addition, a new process has been tested - additive manufacturing with wood - with a mock-up of a roof panel made with WoodFlow, a sustainable and high-performance biocomposite. The primary goal is to provide a circular, lightweight, durable, and aesthetically appealing alternative to traditional (linear or critical) raw materials, determining therefore a positive impact on energy efficiency (and ultimately on operational costs and GHG emissions), on passengers and train-staff wellbeing and on lifecycle management of train interiors. Smoke and fire testing are on-going to validate the relevance of this new sustainable material.



Sustainable materials

- The topics related to architectures to facilitate modularity and flexibility have also progressed in 2025. An aluminum extrusion mock-up of a compact ceiling to free volume for passengers was done and its numerical testing by Finite Element Analysis has started. Expectations have been defined and suppliers have been selected to progress on “modularity of use by electricity without cable. The first acoustic simulation of the acoustic impact analysis of changing the layout of a simple deck train is also ongoing. All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp4-rail4earth/>

Flagship Area 5 (FA5): Sustainable Competitive Digital Green Rail Freight Services

The objective of FA5 is to make rail freight more attractive through increased capacity by leveraging innovations such as the Digital Automatic Coupler (DAC). The DAC enables more functionalities in

freight, and together with seamless interaction of the various IT systems, leads to increasing network capacity smartly for all types of rail freight transport. This also results in significantly improved cross-border operations and multimodal customer services. Increased capacity is crucial for enabling a shift of transport volumes to rail, thereby substantially reducing greenhouse gas emissions.

During 2025, FA5 was implemented via Flagship Project 5 – TRANS4M-R (FP5-TRANS4M-R, launched in July 2022) and Flagship Project 5 – DACtiVate (FP5-DACtiVate, launched in December 2024).

FP5-TRANS4M-R

FP5-TRANS4M-R tackles the abovementioned challenges through two interlinked clusters.

Workstream 1: Full digital Freight Train Operations with DAC as enabler for full digital freight train operation

This cluster focuses on increasing the productivity, quality, and capacity of rail freight by applying digitalisation and automation to all possible operational functions and processes, including innovative freight assets, with the overall goal of Full Digital Freight Train Operations (FDFTO). The FA5 activities are aligned with the EN 50126-1 standard (i.e. considers the generic aspects of the RAMS (Reliability, Availability, Maintainability and Safety) life cycle), starting with systematic requirements capture and leading up to an extensive three-phased testing process. Prototypes are tested in test rigs to ensure functionality and interoperability. This is then validated in a closed environment in the Train Test Lab and integrated into assets like wagons and locomotives. Final tests take place in demonstration trains to test interoperability and functional readiness in real-world infrastructure.



ERA and NSA experts experiencing DAC technology in the Train Test Lab of FP5-TRANS4M-R in Berlin-Spandau

The significant achievements in 2025 show that activities are progressing from an analytical-focused phase with requirements capture, specification definition and architecture work towards testing and validating developments.

Progress and results achieved in 2025

- Demonstrator planning and conversions advanced:** Two demonstrator trains are already up and running in commercial service in Sweden. DAC4 from different suppliers are being tested in a heavy steel train in the North of Sweden, running appr. 250,000 km p.a. between Lulea and Borlänge. An intermodal train equipped with DAC4 from different suppliers is running between Nässjö and the Port of Gothenburg in the South of Sweden. In Austria the demonstrator train of ÖBB, showing full FDFT technology of FP5-TRANS4M-R is in preparation with first tests starting. Two Siemens Vectron locomotives have been converted with hybrid couplers, lead Control Command Units (CCU) and power supply and communication systems. Currently freight wagons of different types are being retrofitted with DAC5 and FDFT technology for wagons. In Italy the demonstrator train of Mercitalia is also in preparation, showing full FDFT technology. However, the start of demonstration in Italy will be in 2026.

- **Power and data supply readiness strengthened:** Complementing the specifications and test planning, the interoperable power supply programme advanced materially in 2025 reaching TRL6. The traction-unit scope was submitted in June 2025, establishing the interoperable power supply system and associated integration instructions for locomotives. In parallel, the wagon scope of action was finalised, completing the end-to-end view on energy and data provisioning across the consist. These outcomes support the conversion plan and provide a consistent technical baseline for executing the planned functional, interoperability, and power tests. They also align with the winter test window and the phased rollout across sites, ensuring that energy and communication interfaces are validated in representative operational conditions
- **DAC Level 4 readiness consolidated:** Functional and interoperability validations confirmed performance for representative operational conditions, i.e. Train Test Lab in Berlin, establishing a robust baseline for scaling into larger demonstrators.
- **Safety and IT-security:** Hazard and risk analyses for DAC/FDFT technology and operations are in place, personnel training and operational rules are defined, and safety integrity expectations support a pragmatic, safe rollout.
- **Automated Yard Operations integration progressed:** A light shunting locomotive from ÖBB has been retrofitted with an Automated Shunting Operations (ASO) device and wagons have been equipped with DAC and FDFT systems for demonstrating ASO and FDFT operations in flat and hump yards. This builds upon the Hazard Analysis and Risk Assessment for Hump Yard and Flat/Last Mile Yard which has been finalised in the previous year, specifically supporting the preparation of demonstrations of Flat Yard Shunting and Hump Yard Shunting.
- **Architecture and requirements alignment maintained:** The physical and digital/data reference system architectures continue to guide consistent interfaces (train-wide communication, consist-internal functions, and the FDFT-Link), with harmonised requirements supporting traceable validation across test phases.
- **Stakeholder engagement:** Continued transparency on demonstrator schedules, vehicle conversion readiness (i.e. four locos with three different locomotives types and appr. 200 wagons (appr. 20 different wagon types) that will be retrofitted with DAC/FDFT technology) and test execution supported timely decisions (e.g. safety requirements in November, test plan, etc.) and cross-actor alignment such as EDDP PB, Sounding Board, etc. Following feedback was collected making use of the alignment:
 - feedback on the File Rolling stock prepared to DAC, showing which assets are going to be equipped.
 - feedback by unions on workers' perspective relevant topics.

In addition the specification work on the DAC and train functions, updates on development, testing, etc. were shared.

- **Collaboration with FP2 and System Pillar:** Yard automation representatives contribute to the ATO business case of FP2, ensuring operational coherence. In the System Pillar, work continues on a potential Central Instance for DAC as well as on Train Length/Integrity, including preparations for ETCS interface considerations and continuity into subsequent waves of projects.

Workstream 2: Seamless Freight with easy access and reliable (intermodal) transport service offering digital solutions.

This cluster addresses the efficiency of the informational (data) layer of transport, aiming to save time and reduce costs by ensuring a seamless environment for planning, execution, and management among different actors, countries, and modes. It focuses on both long-term integration and short-term achievements, with progress in dynamic dispatching, video gate systems, and seamless planning, ensuring the development proceeds in a coordinated and efficient manner.

Progress and results achieved in 2025

- Integration for a **Seamless Corridor showcase. Requirements and use cases from FA5 are integrated with developments from FA1**, with an orchestrated, incremental demonstration strategy tailored to different TRL and maturity. That highlights interoperability, data flow, and user-relevant value in realistic operational scenarios. There are several use cases prepared on the cross-border corridor Malmö/Sweden – Alnabru/Norway, which include cross-border connections facilitated by FP1-MOTIONAL developments and last mile developments from FP5-TRANS4M-R.
- Cross-FA alignment has been strengthened. Consistent **foundations for Railway Checkpoints and demonstrations are ensured through joint vision and deployment work across FA3 and FA5**, with continuous coordination among FA3–FA5–FA1 on semantic and interface consistency. The alignment includes structured workflow connecting operational information needs from checkpoints to a robust data exchange framework and into a consolidated CDM (Conceptual Data Model), supporting interoperable data semantics across systems. FP1-MOTIONAL has provided data requirements, ontologies and sequence diagrams based on scenarios provided by FP5.
- **Data sharing over RNE has been established.** The administrative and legal process to receive the agreement letters from the respective partners has progressed and with the share of agreements received, the work started using historical train run data from some partners to train the models. The usage of live train data for the testing and piloting is currently blocked, as the new Common Interface of RNE which was developed by their supplier is still not working properly and could not be installed yet. Support to RNE with its know-how to solve the general problem with the new CI is being provided by FP5-TRANS4M-R, so that it can also be used as soon as possible for the project's needs. Then the train run information from multiple railway undertakings can be shared to enable the ETA predictions; the agreements with some key partners will then provide a solid foundation for testing and validation, and a subsequent scale-up when additional data is accessible.
- **Checkpoint deployments matured (TRL8)** with intelligent video gates and way side checkpoints being operated across multiple networks (including Germany, (13 gates at various marshalling yards), the Netherlands (12 gates in total, 6 on main lines (of which 2 close the port of Rotterdam) and 6 at 3 different marshalling yards), Spain (2 gates in Can Tunis yard), and Sweden (2 gates, One close to the port of Gothenburg and the other in Malmö close to the Dannish border selected installations are rescheduled to optimise readiness, with no knock-on effects currently foreseen for other work streams.
- **Installed base leveraged for demonstrations:** An extensive footprint of gates; across main lines and marshalling yards; supports operationally meaningful demonstrations, including sites with existing RFID detection complemented by image analysis capabilities.
- Seamless planning and dynamic dispatching capabilities evolved and progressed in further developing and connecting advanced planning tools (incl. optimisation algorithms) like Yard Crane Scheduling and Treatment Planning Systems plan by jointly agreed interfaces, enabling short-term dynamic dispatching, and intermodal monitoring/prediction strengthens real-time awareness and reliability across corridors.

By integrating these two clusters, FP5-TRANS4M-R is well-positioned to enhance the attractiveness of rail freight through increased capacity, operational efficiency, and environmental sustainability. The 2025 focus on demonstrator execution, interoperable train-borne functions, and seamless information flows shows a clear transition from analysis and specification to integrated validation and corridor-level showcases, advancing Europe's vision for a modern, efficient, and connected rail freight system.

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp5-trans4m-r/>

FP5-DACtiVate

The project aims to enable the **pre-deployment of pilot trains with Digital Automatic Coupling (DAC)** by executing required additional tests to the complementary project FP5-TRANS4M-R, thus establishing confidence before full implementation, while enabling DAC-authorisation processes. The project aims to test the interchangeability of DAC components, expand the number of Wagon Onboard Units in line with FP5-TRANS4M-R's system architecture, and enable thorough validation of the pre-deployment trains by additional locomotives able to integrate hybrid couplers. Collaboration with FP5-TRANS4M-R is vital to align with its functional specifications and technical architecture, ensuring the project's contribution is significant and supports the related DAC authorization process.

Progress and results achieved in 2025

- Since the start of project FP5-DACtiVate **tests for derailment and in the climate chamber** could be achieved and providing awareness of the state of technical development of the DAC components. Next steps for testing are the ones addressing crash tests, interoperability, interchangeability and hybrid coupler tests with two Loco types (EuroDual-Stadler and Shunting Loco SM 42-CPK).

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp5-dactivate/>

Flagship Area 6 (FA6): Regional rail services/Innovative rail services to revitalize capillary lines

The overall objective of Flagship Area 6 (FA6) is to ensure long term viability of regional railways by decreasing the total cost of ownership (TCO), in other words, cost per passenger/ton kilometre both in terms of operational expenditure and capital expenditure, while offering a high quality of service and operational safety. In addition, the aspired results aim to increase customer satisfaction and to make rail an attractive and preferred choice of transport mode. These goals are expected to be achieved through a concept tailored to regional railways that includes digitalization, automation and utilization of mainstream and emerging technologies for signalling and trackside components, rolling stock and customer information.

In the first phase of the programme, FA6 is implemented via the project FP6-FutuRe that started in December 2022.

FP6-FutuRe

Sub-Area 1: Regional Rail System Solutions/Architecture

This Sub Area coordinates the system architecture of all others Sub Areas as well as ensuring exchange, alignment and harmonization with System Pillar and other Flagship Areas. The main objectives of this Sub-Area are to identify a harmonised and integrated high-level railway architecture and requirements suitable specifically to regional lines according to the overall project objective to optimise operational and capital costs. In addition, this sub-area evaluates the safety principle and the migration strategy applicable to regional lines.

Progress and results achieved in 2025

- Progress meetings with System Pillar were held jointly with FP2-R2DATO, enabling early identification of potential issues in adopting demonstrators from this Flagship Area. These interactions also contributed to the consolidation of the CCS architecture. Moreover, thanks to these meetings and the comments received from the System Pillar, specific focus was placed on architectural requirements, including train-to-track and trackside-to-trackside communications, as well as wayside asset architecture. As a result of these interactions, these requirements were consolidated in depth.
- Regional lines operational functional and nonfunctional requirements are being provided and consolidated. For G2 lines (Group 2 regional lines with no or limited connection with mainline) the consolidation is ongoing. Where present, the differences between what was specified in FP6 and the current TSIs have been highlighted.
- How each demonstrator can contribute to the measurement of the relevant KPIs has been investigated. Based on this exercise, bilateral actions have been put in place to allow all demo leaders to provide a measurement of the KPI by making use of assumptions, conditions and results without presumption of making statement having general validity.

- Safety and security analysis: the areas of greatest impact of the analysis have been identified. The risks associated with the different operational areas were identified, and potential mitigation measures were discussed in some cases. These risks were then communicated to the technical Work Packages responsible for developing the demonstrators to ensure that suitable mitigations could be defined. The process adopted complies with current European TSI standards.
- Regional migration strategy: a two-way strategy has been developed: i) A high-level approach addresses the migration to the market of a selected set of technical enablers which can be generalised to the Technical Enablers linked to the demonstrators in FP6-FutuRe. Commonalities are identified at the lowest common denominator; while national rules are not considered. ii) A low-level approach describes the migration from the laboratory to the field tests while the specific rules of the country in which the demonstrator is deployed are followed.

Sub-Area 2: Regional Rail Command, Control and Signalling CCS & Operations

The Regional Rail CCS & Operations sub-area focuses on proposing suitable Command, Control and Signalling (CCS) solutions and defining preparatory demonstration activities by using existing and potential interoperable standards applicable on European G1 lines (i.e., lines or network of lines that are connected to the railway network, forming together the Single European Railway Area (SERA) in accordance with the Directive 2016/797/EU) to ensure their long-term viability of the CCS system by reducing the capital and operational costs while taking into consideration regional lines specificities.

Progress and results achieved in 2025

- **ATO (up to GoA4) and Remote Driving demonstrations:** ATO GoA2 demonstrations were performed targeting interoperability and adhesion management use cases while arriving at conclusions on punctuality fulfilment and provided valuable input for testing higher TRLs. The adhesion management functionality contributes to e.g. operational safety improvement, energy efficiency and driving optimisation, predictive maintenance strategies, rolling stock management improvement, punctuality increase, and management of real data. The Remote Driving demonstration campaign was performed and put the focus on researching into remote driving as an intermediate stage prior to full ATO, as a backup/emergency option in case of ATO failure, and as an enabler of unmanned operation in areas not covered by ATO; concerning ATO GoA3/4 demonstrators, the preparation of laboratory environments is still ongoing on account of prototyping activities. **Hybrid Train Detection (HTD) and Moving Block (MB) demonstration:** All demonstrators made progress on preparing the laboratory environments. Concerning the MB demonstrator, additional use cases were elaborated, and the preparation of the trackside and on-board constituents of the demo architecture was defined. As regards Hybrid Train Detection, the integration of two FP2-R2DATO prototypes in the regional context into test benches started and almost finalised; additionally, a third HTD prototype was tested in Italy, results will be assessed in 2026. **Traffic Management System demonstrations:** The Conflict Resolution and Adhesion Management demonstrators succeeded in elaborating the target test cases. The laboratory preparation is ongoing and test campaigns are planned to start as of January 2026.
- **Advanced Safe Train Positioning demonstrations:** A series of ASTP demonstrators progressed on the preparation of the test campaign (e.g., regional ASTP concept development, evaluation parameters specification, test cases specification); while others finalized laboratory test campaigns. Additionally, some laboratory-based demonstrators will be complemented by on-site ones, for which significant steps towards train equipment installation have been taken. On-site test campaigns are now in progress and are foreseen to finalize in spring 2026.
- **Integrity and Length determination:** The preparation of a laboratory environment for the demonstration has been carried out. The FP2-R2DATO prototype shall be tested in the regional context. It is being integrated into a test bench and the test campaign shall start as of March 2026.

Sub-Area 3: Regional Rail Infrastructure Assets

Assets represent a significant cost factor in regional railway systems. Reducing asset costs, in terms of both capital and operational expenditure, is critical to lowering overall system costs. Sub-Area 3's focus is on developing cost-efficient assets specifically tailored to regional railways. This is achieved by simplifying systems and eliminating the need for cabling to transmit data and supply power.

Progress and results achieved in 2025

The focus has been on developing prototypes based on previously defined requirements. The project involves developing ten demonstrators and one simulation, which can be categorised as follows:

- **Wireless energy self-sufficient wayside assets:** Activities were focused on selecting relevant use cases and deriving corresponding test cases, drafting the demonstrator architectures, and identifying key system components and interfaces. the design of modular units that minimise cabling and simplify integration.
- **Obstacle detection systems:** Activities focused on setting up test environments and conducting preliminary measurements to evaluate system performance. Preliminary technical results have been obtained, including initial performance data and validation of measurement procedures.
- **Wireless communication link to wayside assets:** Activities included establishing test cases, implementing functional prototypes, and installing the first wireless-connected trackside gate signal with solar energy harvesting and storage. Preliminary technical results demonstrate functional communication between level crossing and gate signals. Additionally, simulations were performed to validate message exchange and key components, supporting reliable wireless operations for regional railways.
- **Solutions for communication systems:** Activities included defining use cases and integrating the multi-connectivity platform with the network. Laboratory architecture and test-bed setups were initiated. Prototypes on-board and track-side multi-bearer gateway were developed. Additional efforts addressed the integration of cloud enablers into distributed control architectures, including federated data spaces, and supported multi-bearer communication with traffic prioritization.

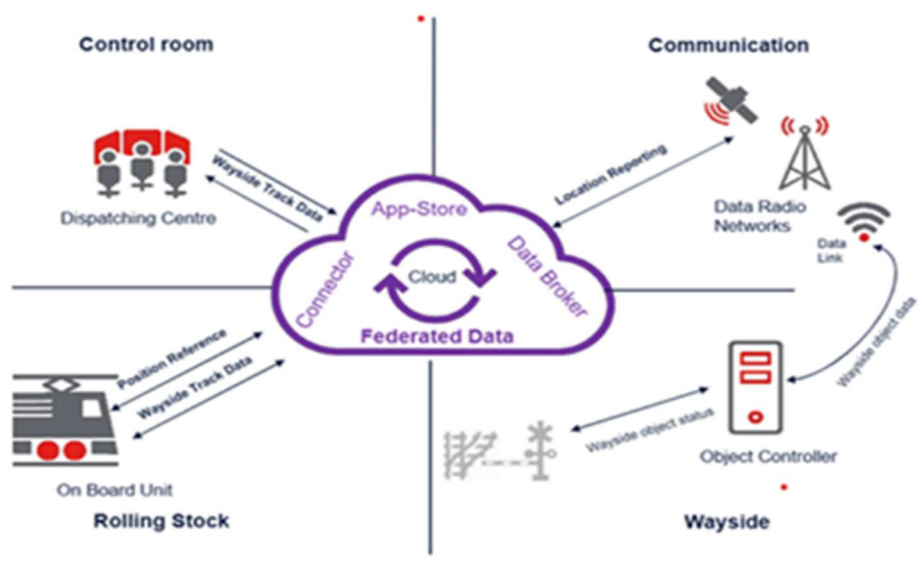
Sub-Area 4: Regional Rail Rolling Stock

This sub-area focuses on developing cost-efficient vehicle concepts for G1 and G2 lines. The G2 lines differ from the G1 lines in being physically or functionally separated from the main network and therefore do not require interoperability. A novel, lightweight, emission-free regional vehicle with significant weight reduction and flexible, modular interior solutions for passenger and freight applications is under consideration. The sub-area also includes the development of an efficient and sustainable vehicle-centric CCS for G2 lines.

Progress and results achieved in 2025

- **Carbody mass reduction and cost efficiency:** An analysis for the development of specifications for the mechanical architecture of the rolling stock carbody was carried out with a focus on mass reduction and cost efficiency. The use of topology-optimized steel structures and composite materials was studied, as well as combinations of the two.
- **Running gear designs:** Work has continued developing specifications for two different single-axle running gear designs. One is a conventional design featuring a solid axle between the wheels, while the other is an axle less design that allows for a step-free interior floor. The running behaviour of the conventional design has been studied in detail, as this aspect posed potential challenges, and it is now confirmed to meet the required standards. The space envelope for the axle less running gear has also been analysed and verified.
- **Battery sizing and number of charging stations:** A larger vehicle battery allows longer driving segments without recharging, but it also increases cost, weight, and environmental impact. These factors must be balanced against the cost of installing additional charging stations. The trade-off has been analysed across several use cases to show how the characteristics of a route influence the optimal battery size and the location of charging stations.

- **Preparatory work for G2 onsite demonstrators:** The preparatory work for the G2 demonstrators (integrated RBC/Interlocking, satellite-based positioning and train to cloud communication) have been launched, based on the concept developed within the project. Track data related to the selected target line, Nassjo – Goteborg in Sweden, has been collected for the digitalisation of the track layout.
- The hardware components have been specified and the integration work has started. The software development started including feasibility study for the connection with FP1-MOTIONAL enabler Federated Data Spaces.
- **Use of satellite communication:** The utilisation of satellite communication can take benefit from the technical interaction with the European Union Agency for the Space Programme (EUSPA), from which it is expected a consolidation of the minimum performance requirements needed for this kind of not interoperable application.



G2 CCS Building blocks

Sub-Area 5: Regional Rail Customer Services

The focus of Sub-Area 5 is to provide customer services centered around passenger information systems (PIS). The objectives comprise the development of a multimodal trip planner that includes demand responsive transport (DRT) options for first and last mile transport and that offers support for passengers with reduced mobility (PRM). This Sub-Area also works on the integration of a PIS with a Traffic Management System (TMS) so that information can be shared in order to improve planning in both realms. Furthermore, the Sub-Area deals with the forecast of demand and congestion to enable decisions by passengers and operators to improve travel experience. In addition, the goal of Sub-Area 5 is to ensure that good data quality, standard data formats and standardized interfaces will be applied wherever possible, and gaps in existing standards will be identified.

Progress and results achieved in 2025

In 2025, the work in Sub-Area 5 concentrated on the implementation of the specified use cases. During the development work, a few requirements and test cases were added or modified due to the limitation of achievable data transfer rate from PIS to TMS. For some functionalities that have been developed, tests were started.

- **Passenger information system**
 - A web-based PIS front end was set up and fed with timetable data from the demo partner ZPS. The integration of DRT services based on static data was done. The online journey planner interface to FP1-Motional was established. Real-time data were integrated and associated uses cases were already tested, or other use cases implementation was started or continued, e.g. for the availability check of DRT vehicles and profiles for Passengers with Reduced Mobility.

- For the interface between PIS and TMS the interface format was implemented and on TMS side, the processing of received demand data was developed.
- The intake and recording of trip request data from the demonstration partner ZPS was started so that the foundation for the demand forecasts is available. Regarding the display of occupancy levels in the front ends, a new mechanism of fetching data from the Analytics component in a cloud-based and container-based environment was established.
- **Congestion monitoring and passenger flow optimisation**
 - Regarding congestion monitoring, the development environment has been prepared, data collection, cleaning and pre-processing were performed. Machine Learning algorithms have been applied to predict passenger congestion, with ongoing evaluation of model outputs.
 - The implementation of the optimization algorithm for allocating regional trains to platforms of a big station has been almost completed. The aim of the algorithm is to minimize the overall average transfer times of passengers by deciding to which platform each train is allocated. The optimisation model considers the walking times between the platforms, the timetable including estimated delays and the number of passengers transferring between each pair of trains. The development has reached the testing phase.

All results are available on the website: <https://rail-research.europa.eu/rail-projects/fp6-future/>

Flagship Area 7: Innovation on new approaches for guided transport modes

The objectives of FA7 is to explore non-traditional and emerging flexible and/or high-speed guided transport systems, as well as to create opportunities for innovators to bring forward ideas for shaping those future systems via a scientific approach into an existing rail system. This shall provide socio-economically efficient and long-term sustainable transport for citizens and businesses throughout Europe.

Pods4Rail

Pods4Rail project aims to achieve the vision of a rail based fully automated supermodel mobility system for passengers and goods, which is standardised, scalable and suitable for all transportation modes. The ambition is to develop of a new autonomous multi-modal transport system (Pod System) based on railway switching fast from rail to another transport mode such as road or funicular and thus creating a continuous transport chain from house to house without changing the transport system.

Progress and results achieved in 2025

- Based on the use cases defined in 2024, the "Design Concepts for Different Use cases" (D8.1) were derived and elaborated. The extensive work on possible materials to be used, design methods, design features and joining technologies, shows in detail the path from the idea to the conceptual design and the identification of the design variant. As a further important step, the "Detailed Concept of a Sample Vessel for one Use Case" (D9.1) was developed, and a comprehensive presentation of the possible designs and design options was included.
- The "Concept Development for Equipment of Sample Vessel" (D10.1) which built upon the fundamental work from the "Concept Proposal (System)", concept proposals are being developed for the power supply of the equipment and the and packaging of the Transport Units (TU), for the air conditioning of the passenger TU, for localisation, and for communication.



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- Also, the work on the “Concept Development for Traffic Coordination of Pods System” began in 2025. This phase is intended to develop the system requirement specification, the design concepts for information and communication, and the traffic coordination concept for the pod system, culminating in prototyping and validation.
- Another essential step was the “Defining and Developing the Concept for the Coupling System” (D12.1) of the planned new system. Through the work of the participating project partners from the railway sector and the universities, the necessary technology was evaluated and derived. Of note are the contributions made during a student workshop organised by ProRail, which provided further insights into the topic.
- The project's public Mid-Term Event took place on February 4, 2025. Furthermore, lecture was held in June 2025 at the "International Conference on Transportation Systems", in September 2025 at the "Graz Smart Vehicle Forum" and at the "SmartRaCon" in Stuttgart, and in November 2025 at the "World Congress on Railway Research". Additionally, a publication about “Pods for Healthcare” was published in September 2025 in the German edition of the in “ETR”.

All results are available on the website: <https://pods4rail.eu/>

Hyper4Rail

The Hyper4Rail project aims to define the role of Hyperloop in Europe's future multimodal transport system by developing a Concept of Operations. The objective of the project is to produce an initial draft of system requirements and identify, evaluate, and compare technical solutions, leading to a harmonized European Hyperloop concept.

Hyper4Rail will validate the maturity and technical readiness of key subsystems (TRL4) critical to system functionality, performance, and safety. These results will feed into a joint industry roadmap and include a blueprint for a full-scale (1:1) demo facility to align future development and deployment efforts. The project will also deliver a business case for three European corridors, complemented by a comprehensive cost-benefit analysis for a Hyperloop network in Europe, assessing its social, economic, and financial viability.

Progress and results achieved in 2025

During the first year of the Hyper4Rail project progress has mostly been achieved on the front of the concept of operations and cost-benefit analysis of a European Hyperloop Network. Results include:

- A comprehensive overview of Europe's medium- and long-distance transport policy objectives, stakeholder needs, and the challenges of the transport sector. An overview of proposed hyperloop concepts and their underlying technological building blocks, highlighting commonalities and design options across different developments establishing a technical and strategic foundation for subsequent harmonization (D2.1 Hyperloop Technologies, Applications & Opportunities). Key insights from preliminary stakeholder surveys on expectations for a new ultra-high-speed transport system was carried out. The main takeaways are the following: hyperloop's highest added value is seen on long-distance corridors (>600 km) to shift demand

from aviation; it must complement and integrate with rail and other modes; and core priorities are network speed, connectivity, and interoperability from day one. Users would choose hyperloop mainly for travel-time reduction. A quantitative Cost-Benefit Analysis (CBA), adhering to EU Guidelines was developed in 2025 (D3.1 Hyperloop Network Analysis and Use Case Identification). Based on the assumptions taken, the report confirms the Hyperloop is economically viable for long-distance European transport. The optimal rail + hyperloop integrated network (connecting all Europe capitals at >750 km/h) could shift over 50% of intra-European aviation demand. The main economic benefit is from reduced waiting time, with financial break-even achieved at a construction cost of approximately €115 million/km.

- A preliminary concept of operations was drafted highlighting the importance of high-speeds, direct connections with high-speed switches, and low boarding times (D2.2 Interim Hyperloop Design Concept and Business Case). Inspired by European Directive 2016/797 and Directive 2016/798 a common system architecture was agreed upon between the hyperloop developers as well as a safety targets and risk acceptance criteria inspired by the ERA Common Safety Method and EASA Certification Specifications.
- A first set of system requirements was defined and a qualitative technology comparison done among various technical assessments. This research includes an analysis of the vehicle size, aerodynamics, tube loads, and assessments of different levitation and propulsion solutions as well as cooling and ccs solutions. Furthermore, a first business case was completed on a corridor between France and Italy.

All results are available on the website: <https://www.hyper4rail.eu/>

MaDe4Rail 2

On the 1st of December 2025, the MaDe4Rail 2 project “MAGLEV-DERIVED SYSTEMS FOR RAIL 2” was launched. Gathering 19 partners, the project aims to advance the development of Maglev-Derived Systems (MDS) and assess their feasibility for integration into the European railway network. Building on the outcomes of the previous MaDe4Rail project, MaDe4Rail 2 will refine MDS configurations and investigate their compatibility with existing infrastructure, focusing on subsystems such as power, propulsion, levitation and guidance.

All results are available on the website: <https://www.made4rail2.eu/> <https://www.academics4rail.eu/>

Exploratory Research

Academics4Rail

The Academics4Rail project aims to build a stable and durable community of railway scientific researchers and academia to share and exchange scientific knowledge with Europe's Rail, as well as to enable a network of PhDs (with the academia teaming up with the industry) on the following topics:

- PhD1: Aerodynamics of freight trains.
- PhD2: Electromagnetic compatibility.
- PhD3: Additive Manufacturing in wheel re-profiling.
- PhD4: Digital communications for virtual coupling.
- PhD: Prognostics and health management approach for railway asset maintenance.
- PhD6: AI-based Driving Assistance.

Progress and results achieved in 2025

The Academics4Rail project has made good progress in 2025 across the various work packages, focusing on key technical advancements and organizational strategies.

- In 2025, the consortium established a Scientific Observatory to align academic research with Europe's Rail priorities, identifying knowledge gaps and creating a structured framework to integrate academia into Europe's Rail strategy. It produced a position paper on research gaps (notably in low-TRL, multidisciplinary, and interoperability studies) and a catalogue of PhD topics from a global survey of 296 responses, mapping academic contributions to EU-Rail priorities.

- Additionally, the consortium developed an assessment framework to measure how Europe's Rail innovations deliver its objectives through technical KPIs (cost, capacity, reliability) linked to societal impacts (carbon, welfare, modal shift). Using an elasticity-based mode choice model, the framework is currently under validation via a UK case study on open-access operators (LNER vs Hull Trains). The framework will support evidence-based evaluation, guiding future Europe's Rail's funding and highlighting barriers and enablers to innovation deployment.
- Regarding above-mentioned six PhDs :
 - PhD1 – Politecnico di Milano: Research on freight train aerodynamics developed advanced computational models and a detailed database of vehicle geometries to understand aerodynamic effects in complex train formations. The study improves energy efficiency and safety for fast freight operations and provides new design tools for future rolling stock, in collaboration with HUPAC.
 - PhD2 – Universidad Politécnica de Madrid: This work focused on electromagnetic compatibility (EMC) in alternating current electrification systems, simulating different electrical configurations to evaluate induced voltages and electromagnetic fields. The results support compliance with EN 50121 standards and enhance human safety and system reliability, in cooperation with Siemens, CAF Signaling, Alstom, ADIF, and Hitachi Rail.
 - PhD3 – University of the Basque Country: Research on additive manufacturing for wheel re-profiling combined 3D metal deposition with traditional machining techniques. The results demonstrated reduced material waste, extended wheel service life, and decreased maintenance frequency, showing the potential for more sustainable and cost-effective wheelset management. Industrial partners include Euskotren and Metro Bilbao.
 - PhD4 – Gustave Eiffel University: This study on wireless communication dependability for virtual coupling of trains (platooning) developed a methodological framework to analyze safety implications of 5G-based train-to-train links. It defined key reliability and safety requirements, contributing to European standards and supporting deployment of Virtual Coupling Train Systems (VCTS), in cooperation with Alstom and CAF.
 - PhD5 – Luleå University of Technology: Focused on prognostics and health management (PHM) for railway assets, this research created hybrid predictive models that merge machine learning, sensor data, and physics-based approaches. The resulting integrated framework enables real-time anomaly detection and predictive maintenance, improving operational reliability in collaboration with Trafikverket. PhD6 – Université Polytechnique Hauts-de-France: Research on AI-based driving assistance developed a human-in-the-loop system (AIDAS) that adapts automation levels to driver state, performance, and environmental factors. This approach ensures smoother, safer transitions between manual and automated modes, strengthening the human–AI interface for future train operations in collaboration with Alstom Italy.

All results are available on the website: <https://www.academics4rail.eu/>.

InBridge4EU

The InBridge4EU project continues to advance the development of harmonised methods for assessing the dynamic interaction between railway bridges and rolling stock across Europe. By combining experimental data, numerical modelling and statistical analyses, the project is addressing long-standing uncertainties in the European standards that govern bridge–train compatibility, including dynamic train categories, dynamic amplification factors, damping values and acceleration limits.

Progress and results achieved in 2025

- **Dynamic train categories and modelling improvements:** The project has finalised the rolling stock database and identified the most influential vehicle parameters affecting bridge response, including car length and bogie spacing. Updated methodologies have been proposed to overcome limitations of existing spectral approaches, establishing the basis for the new Dynamic Train Categories that will underpin future compatibility assessments.

- **Characterisation of critical bridge typologies:** Simplified models for over 500 bridges were completed, enabling the identification of structures most susceptible to dynamic amplification. The analyses confirmed that bridges with low mass, low frequency and simply supported single-track decks are the most critical, while portal frame configurations tend to exhibit lower dynamic responses. These findings provide the foundation for refined parametric studies using more detailed numerical models.
- **Dynamic amplification and track–bridge interaction:** Extensive coupled simulations demonstrated clear correlations between the dynamic amplification factor and the statistical properties of vertical track irregularities. Revised formulations have been proposed to better capture the influence of moving loads and track distribution, aligning closely with the physical behaviour observed in recent measurement campaigns.
- **Damping assessment and code revision proposals:** The study of bridge damping has led to proposed updates to the EN 1991-2 guidelines. The new recommendations distinguish between structural typologies, merging reinforced and prestressed concrete into a single category, defining higher damping for portal frame bridges, and separating composite from pure steel structures. These refinements enhance both accuracy and consistency across Europe's bridge stock.
- **Bridge acceleration and track stability:** For ballastless decks, studies showed that vertical acceleration is poorly correlated with derailment risk or passenger comfort, with track quality proving to be the dominant factor for operational safety. With regard to the ballasted track bridges, analyses revealed that lateral failure modes, such as track buckling, are more critical than vertical settlement. Shaking table experiments and discrete element modelling highlighted the importance of accounting for high-frequency vibrations up to 100 Hz, which substantially reduce lateral resistance. The results recommend maintaining the current 3.5 m/s² acceleration limit for such structures and emphasise that any relaxation of criteria should be supported by detailed measurements, inspections, and verification.

Together, these outcomes contribute to a more realistic, data-driven approach to bridge–train compatibility, paving the way for future updates to the Eurocode and TSI frameworks.

All results are available on the website: <https://inbridge4eu.eu/>

RAIL4CITIES

The RAIL4CITIES (“RAILway stations for green and socially inclusive CITIES”) project aimed to trigger the transition of railway stations in Europe into real promoters of sustainable cities, by developing a new operational, readily available, and highly applicable model of stations (SCP model), combined with a common European methodology and tools for its effective implementation.

The project finalised its activities in June 2025 after 24 months of operation.

The project developed the following major innovations:

Sustainable City Promoter (SCP) model

- The project defined two model components: “Fields of Action” and the “Methodological Toolkit.” These components were defined thanks to several workshops organised. To define the “Fields of Action”, the consortium used the Cambridge Value Creation Model to identify uncaptured value by aligning stakeholder needs and exploring key themes such as intermodal mobility, station's spaces and services, transit-oriented development, urban governance and urban climate adaptation.
- Other workshops took place to validate and expand the initial fields of action. They also tested a proposed methodology for applying the model in Living Labs, using consortium experts and selected IAB (International Advisory Board) members as representatives of local stakeholder groups. As a result, the “Methodological Toolkit” was defined to be used by local stakeholders for assessing station development strategies.

Living labs

- The SCP model has been applied to five living labs addressing the stations' transformation into hubs of **green and active mobility (FR)**, **energy hubs (IT)**, towards **Transit Oriented Development (DE)**, into a socially inclusive services hub using **Nature Based Solutions (PL)** and **services hubs enabling the 15-minute city and circular economy (BE)**. This has been enhanced by three case-studies from the rail line from **Lisbon to Oporto (PT)** to study the resilience of infrastructures for both adaptation of spaces to new future uses, and adaptation to **climate change issues and health crises**. The methodology developed for these Living Labs is a structured, iterative process comprising six core steps:
 1. **Understanding the Context:** Each Living Lab begins with an in-depth analysis of the station's local context through desk research and stakeholder questionnaires, mapping spatial, socioeconomic, and governance characteristics. This ensures that interventions are rooted in reality, not abstract theory.
 2. **Applying the Methodological Toolkit:** Leveraging the toolkit developed in the initial stages of the project, Living Labs adapt the SCP's seven fields of action (energy, mobility, logistics, circularity, resilience, station-city integration, and social inclusion) to the specific challenges and opportunities of the local station area.
 3. **Involving Stakeholders:** A comprehensive stakeholder mapping and engagement process ensures that all relevant actors—railway operators, municipal agencies, private sector partners, NGOs, and, above all, end-users—are involved from the outset. This is operationalized through bilateral and multi-actor workshops, designed to build trust, surface conflicts, and align strategic objectives.
 4. **Identifying Underserved Needs:** Employing Human-Centered Design (HCD) principles, the methodology integrates fieldwork (observations, behavioral mapping, user interviews) to uncover the needs, habits, and aspirations of everyday users, especially vulnerable or underserved groups. This step ensures solutions are anchored in lived experience.
 5. **Ideating Solutions:** Structured ideation workshops use collaborative templates (e.g., MIRO boards) to co-create interventions that respond to identified needs. These sessions are designed to bridge technical, operational, and community perspectives, generating a menu of possible innovations.
 6. **Validating and Implementing Solutions:** Ideas are stress-tested against local governance and business model constraints, with selected solutions piloted through tactical urbanism and placemaking experiments. Implementation includes feedback loops for rapid learning and adjustment, culminating in events that communicate results and stimulate broader buy-in.

All results are available on the website: www.rail4cities.eu

Leader 2030

The LEADER 2030 (Learnings for European Autonomy to Deliver Europe's Rail in 2030) project has for main objective to conduct research activities aiming at providing answer to the following key question: "will there be enough raw materials and components to bring to the market in 2030 all the Railway innovations EU-RAIL is delivering?".

Progress and results achieved in 2025

- Completion of the analysis of the EU-RAIL Master Plan and Multi-Annual Work Programme (MAWP) aimed at identifying in detail what components (hardware, software) are necessary to produce each target innovation, detailed for sub-functions. The analysis also identified the key raw materials and processed materials necessary to produce each sub-function, as well as what components will become obsolete as result of the innovations. This represents the "Demand side".
- Completion of the analysis on raw materials needed for the fostered Rail transformation under a complete point of view: availability, consumption drivers, supply scheme, economics, market dynamics, domestic vs external sourcing, disruptions, dependencies, geopolitics, recycling, substitution. This represents the "Offer side". The work was accompanied by factsheets on all raw materials needed by the Railway sector for its innovations.

- Key field visits to “Norsk Hydro” Aluminium plant in Belgium, to “KME” Copper plant in Italy, to “X-Fab” Silicon and Gallium-Nitride semiconductors plant in Germany, to discuss challenges around strategic raw materials and components which will become even more critical to supplies for Rail innovations.

All results are available on the website: https://www.eurailclusters.com/erci_project/leader-2030/

DACcord

The DACcord project as a Coordination and Support Action aims to support the running and overall management of the European DAC Delivery Programme (EDDP) including its programme risks and interfaces, refine the DAC migration roadmap and develop major criteria/options for overall migration/deployment scenario optimisation.

Progress and results achieved in 2025

- Developing Digital Automatic Coupling and its different linked projects made further progress in 2025. In the EDDP (European DAC Delivery Programme), the relevant EU rail freight and industry stakeholders work together in a **Joint Sector activity**, with the goal of aligning all the DAC initiatives into a single programme, oriented to define a standard solution for DAC and the DAC applications and especially to prepare the way for future DAC deployment.
- Permanent **management of the EDDP**, including preparation/management of the different EDDP Sounding board meetings along the year as well as the introduction and regular follow-up of the overarching Europe's Rail DAC-related projects (FDFTO) risk management, materialising in four quarterly workshops and involving the Project Coordinator from the FP5-TRANS4M-R project, the DAC migration roadmap work area, the DACFIT project and the FP5-DACtiVate project. A special task force was created to align the time plans and content of FA5 activities with the Pioneer DAC Trains initiative (PiODAC Project).
- On **DAC migration roadmap**, the main task has been to steer and manage the resources working in and for EDDP work area C (Retrofitting capacity aspects and migration strategies). The work has continued on the regular review of the collection of the European vehicle fleet data with the DACFIT project and a subsequent intermediate evaluation of the DAC migration scenarios and the driving-further of the solution-finding for locomotive re-authorisation after DAC retrofit. The work on separability of traffics (essential for migration planning for parallel operation of two coupler systems on the network in the transition phase) could be started, e. g. in an on-site visit at a major customer site.
- On the stakeholder management, coordinated actions on the DAC-related communication/dissemination events took place, especially the ramp-up of the so called “DAC Fora” in the different EU regions/countries. 9 DAC Fora could be organised (online & physically) between March and October 2025.
- Organised and coordinated the representation of DAC in more than 20 European public events or workshops in EU MS and on various channels, most visible maybe e. g. on Transport Logistic fair in Munich (Germany/May 2025) and TRAKO fair in Gdansk (Poland/September 2025) This work continues in the last reporting period for 2026.

All results are available on the website: <https://rail-research.europa.eu/rail-projects/daccord/>

ESEP4Freight

ESEP4Freight project aimed to enable the shift to freight by rail across Europe by providing the freight customers with high-quality and open information regarding rail transport options and associated benefits. This has been achieved through the development of a Web platform based on an interactive map that identifies freight flows with a higher potential for rail transport, as well as modules for CO2 calculator, a schedule viewer, a contract toolbox and match making tools. The outcomes of the project also include recommendations for the current contractual and legal intermodal transport framework covering the needs of different actors involved in the supply chain. The results of the project have been tested by a large number of actors from the European logistics.

The project finalised its activities in August 2025 after 24 months of operation.

The Web Platform has been successfully developed and comprises the following modules:

- **An Interactive map of existing rail freight infrastructure, terminals and services:** this sits at the centre of the platform (developed from TRL 5 to TRL 7) including a Corridors viewer with TEN-T corridor details, freight volumes between major nodes, and insights into high-potential modal shift routes.
- **A smart contract module** proof of concept: a repository of standardised contract models relevant to different types of business relationships, integrating eFT (electronic Freight Transport Information) and blockchain.
- **A CO2 calculator** for the selected routes (developed from TRL 3 to TRL 5).
- **A Schedule viewer** that allows a graphic display of schedule information provided operators (developed by the project from TRL2 to TRL 5).
- **A Route viewer** on top of the intermodal map showing the connectivity among nodes and select the best alternative based on project defined KPIs (developed from TRL4 to TRL 6).
- **A Match making tool** integrated in the Web Platform allowing small and mid-sized businesses to find suitable cleaner transport intermodal alternatives (developed from TRL1 to TRL5)
- Recommendations for harmonised contracts and legislation to overcome the fragmentation of the legislation on the logistics sector.

Together, these resources aim to facilitate efficient, sustainable, and digitally enabled freight transport and collaboration across the European logistics ecosystem.



The map, the different modules and other results and resources are available here: <https://www.esep4freight.eu/>

SYMBIOSIS

The SYMBIOSIS “Systemic Mobilisation for Joint Biodiversity and Infrastructure,” project aims to integrate biodiversity throughout the lifecycle of railway and linear infrastructure projects, aligning with the UN Sustainable Development Goals and the European Green Deal.

Progress and results achieved in 2025

A review of 102 environmental impact assessments (EIA) was performed and shows that biodiversity considerations are unevenly integrated across the infrastructure lifecycle. The key findings point to the need for hybrid methodologies, improved data transparency, broader life-cycle coverage, and clearer baselines for measuring co-benefits.

An online survey was also launched to assess habitat and biodiversity data collection practices across transport infrastructure. Responses from more than 15 countries show strong interest in improving monitoring but highlight constraints such as fragmented practices, inconsistent terminology, and limited taxonomic coverage. Future work led by UKCEH will examine how AI and data-science approaches can address these gaps. Initial dialogue with ISO/TC 331 has begun to explore opportunities for biodiversity standardisation.

Analysis of stakeholder involvement in decision-making has identified both the benefits of early engagement and the challenges posed by fragmented governance, late consultation, and limited feedback loops. Recommendations from literature review encourage inclusive participation, structured consultation processes, and the integration of social and environmental concerns into rail planning frameworks. Therefore, a dedicated dive session was held with the Advisory Board and Technical Stakeholders. The interim strategy for the Knowledge Transfer and Learning Hub has also been completed, establishing the foundation for future capacity-building.

All public results can be found here: <https://symbiosis-transport.eu/>

QuieterRail

The QuieterRail project is organized into 4 Work Streams (WS). WS 1 (Noise analysis and evaluation methods) aims to develop improved railway noise prediction and evaluation methods that can be used in noise mapping, and in new rolling stock acceptance testing. WS2 (Cost-effective noise mitigation measures) aims to propose a harmonised procedure to determine rail roughness levels from on-board sensor data, and to develop a tool capable of optimising railway track systems with respect to life cycle costs (LCC), noise and vibration. WS3 (Ground-borne vibration prediction) further develops the SILVARSTAR hybrid vibration prediction tool. WS4 (In-situ testing to support validation) conducts in-situ noise and vibration measurements to validate models from WS1 and WS3.

Progress and results achieved in 2025

- **Noise analysis and evaluation methods (WS1):** New models are being developed to predict rolling noise in curves, curve squeal and flange noise. A benchmark study of 2 different squealing noise models was conducted for an urban configuration (tramway with resilient wheels), with very satisfactory results in terms of unstable mode prediction and wheel vibration response. For acceptance testing, the method to transpose pass-by noise levels measured on one site to another one includes correction factors that consider differences in combined roughness, Track Decay Rates (TDR) and site acoustic transfer functions. The different calculation and measurement methods that can be used to determine site transfer functions and TDRs respectively, as well as the differences between them that introduce uncertainties in the transposition process, were analysed in detail. Adaptations of the calculation and measurement protocols have been proposed. Work has also been engaged to assess uncertainties in pass-by noise measurements, and preliminary surveys of new propulsion systems (e.g. battery, hydrogen trains).
- **Cost-effective noise mitigation (WS2):** A literature review is underway to identify and classify existing on-board measurement systems used to achieve noise reduction through on-board monitoring of acoustic rail roughness combined with targeted rail grinding, since significant variations exist between current measurement systems and their implementation across different networks. The review is complemented by a survey oriented towards both equipment suppliers and end-users. To broaden its scope and ensure alignment with industry needs, this work is being performed in coordination with an external Advisory Board and the ACORD project led by the UIC Noise Group.

Noise and vibration mitigation measures often introduce additional costs for railway systems, due to both their installation and potentially increased maintenance costs. A software tool to optimise railway track systems with respect to life cycle costs (LCC), noise and vibration is being developed, to optimise railway track systems with respect to life cycle costs (LCC), noise and vibration. A set of potential Use Cases for track system optimisation has been proposed, supported by an external Advisory Board. To support tool development, noise and vibration reduction calculations, associated with various mitigation measures and combinations of track components, are being performed and stored in a dedicated database. Life cycle costs (including installation and maintenance costs) and financial estimates of the environmental and health benefits associated with noise and vibration reduction are being assessed.

- **Ground-borne vibration prediction (WS3):** Rail discontinuities (rail joints, crossings, etc.) are important sources of localized ground-borne vibration, particularly in urban environments. To provide fast yet reliable predictions, a hybrid methodology is being developed that combines simplified wheel-rail interaction models with detailed ground vibration assessment. The first results have been validated, by comparison with more detailed models. The next step will be a validation against test results. A procedure to predict ground vibration from trains running in curves is also being developed.

In parallel, numerical soil and building databases are also being extended to cover a wider range of soil stratifications and building typologies.

- **In-situ testing to support validation (WS4):** For urban configurations, a measurement campaign was successfully completed on Lyon's tramway network during the summer of 2025. The network offers a large variety of track installations and is served by two types of rolling stock. A complete set of measurements was obtained (pass-by noise and ground vibration in curves vs. straight alignment, ground vibration generated by impact due to rail joints and switches, etc.).

For mainline configurations, a site in Switzerland has been identified and discussions are underway for test organization. This site presents track sections with significantly different physical properties in terms of rail-pad stiffness and soil properties, making it very interesting for the project. Rolling tests are expected to be carried out during the first half of 2026.

Five technical papers were presented during the 15th International Workshop on Railway Noise (IWRN15).

All results are available on the website: <https://www.quieterail.eu/>

DACFIT

The main objectives of DACFIT is to provide a robust technical and quantitative analysis of the European freight wagon and locomotive fleet to establish the foundations for large-scale deployment of the Digital Automatic Coupler (DAC). This includes the systematic assessment of retrofitting processes, the development of standardised conversion methodologies, and the evaluation of workshop capacities across Europe for retrofitting in order to develop a comprehensive retrofitting strategy and integrated plan. In addition, the project aims to create harmonised data and assessment frameworks and to develop digital tools that will enable strategic migration planning for the Europe-wide introduction of DAC.

Progress and results achieved in 2025

- **Data collection, consolidation, and analysis:** The systematic gathering and harmonisation of vehicle data, combined with an initial qualitative assessment of technical prerequisites, now provide a coherent basis for the project's subsequent analytical stages. In parallel, a structured methodological approach for assessing the retrofit capability of different vehicle categories was developed, including information from beneficiaries into technical requirements, documentation availability, and potential challenges for locomotives, freight wagons, and special vehicles
- **Consolidation and data harmonisation data from various European vehicle registers and public sources,** creating a consistent framework that enables DAC migration modelling. Structured retrofitting processes were defined, detailing technical groups, material requirements, and capacity needs to improve planning efficiency. A Europe-wide workshop database was developed to assess and map retrofit capacities, forming a central component of the Decision Support System (DSS), aimed at supporting the future planning and evaluation of migration scenario.
- **DSS architecture and specifications have been finalised** with early testing confirming the importance of practical applicability and realistic data integration. These results establish a solid methodological and technical foundation for the development of the comprehensive DAC retrofitting and capacity plan in 2026.

All results are available on the website: <https://dacfit.vpi-vers.eu/en/home>

Nexus

The main objectives of NEXUS are to establish an innovation benchmark and provide guidance towards a transformative future for the European metros, with a focus on optimisation and adaptability to passenger demands. The NEXUS project, "Next-gen technologies for enhanced metro operations", has made substantial progress toward its objective of developing adaptable, inclusive, and sustainable next-generation metro systems. The work performed across all technical work packages has delivered a solid scientific, technical, and stakeholder-driven foundation for the subsequent phases of validation and demonstration.

Progress and results achieved in 2025

- **Requirements, framework and state of the art:** The consortium completed a comprehensive collection and analysis of requirements through surveys, interviews, and co-creation workshops involving passengers, operators, manufacturers, and authorities. This resulted in a unified set of functional, operational, and inclusivity requirements that guide all subsequent technical developments. The workshop interactions ensured alignment with real-world needs and strengthened user-centred design.
- **Models supporting metro adaptability analysis:** NEXUS developed an integrated simulation environment combining passenger flow modelling, vehicle dynamics, station operations, and network-level adaptability analysis. Initial test cases validated the models, achieving TRL 4. This work now provides a quantitative backbone to assess metro performance under varying demand, disruptions, and operational strategies.
- **Future Train Control Feasibility Study:** The project defined the architecture, functional specifications, and potential configurations for next-generation train control systems aligned with Digital and Automated Train Operations (DATO). Early assessments indicate significant potential benefits in energy efficiency, resilience, and operational optimisation.
- **AI and Data Science Implementation in Metro Operation:** Several AI use cases were identified, and four TRL 4 demonstrators were developed covering predictive maintenance, crowding prediction, passenger demand analysis, and anomaly detection. These developments mark an important step toward data-driven and automated metro operation.

NEXUS also implemented a strong participatory approach involving external metro operators, industry representatives, passenger associations, and policy bodies. Workshops were conducted to collect user requirements and priorities, assess feasibility and acceptability of automation concepts, discuss AI use cases and data-sharing challenges, gather feedback on early models and control system concepts. These sessions ensured that the project's technical developments remain grounded in real operational constraints, user expectations, and broader societal needs.

All public results can be found here: <https://nexus-heproject.eu/>

XCROSS

The main goal of the XCross project is to enhance the monitoring and inspection of railway crossing surface profiles. Key activities include:

- Developing handheld 3D laser scanning and computer vision techniques for fast, accurate, and repeatable crossing surface measurements.
- Creating digital twins of crossings to optimize geometry profiles using advanced strategies, with lifecycle costs as a key consideration.
- Developing Augmented Reality (AR) and 3D printing technologies to provide virtual and physical visualization guides for on-site procedures.

Progress and results achieved in 2025

Regarding 3D Scanner development, the consortium created in 2025 an initial lightweight prototype and conducted field tests on several frogs to demonstrate the applicability of the solution.

Early-stage optimisation models with Digital Twin were also developed to simulate reprofiling strategies.

Additionally, the consortium created a prototype Augmented Reality with overlay functionality for visualizing wear patterns, tests being foreseen in 2026.

Regarding 3D Printing, the consortium produced first physical templates for use in on-site welding.

Finally the consortium progressed in 2025 on the Monitoring System with HW/SW integration underway, and all needed sensors have been tested at partner facilities.

All public results are available at: <https://xcross-rail.eu/>

PhDs EU-Rail

The project PhDs EU-Rail aims to promote collaboration and innovation in the European railway sector by building a scientific community and conducting research through ten PhD positions. Each position will focus on a specific topic, with the goal of developing a dedicated research plan. The titles of the ten PhDs are:

- PhD1 Measures and mechanisms to support implementation of rail technical innovations supporting the decarbonisation of transport.
- PhD2 Change making for gender equality in rail.
- PhD3 New generation Education and training methods for rail.
- PhD4 Rail enabled urban logistics.
- PhD5 Fast night train operations.
- PhD6 Dynamic stability of trains over bridges: a normative research approach.
- PhD7 Safety-relevant communication in the railway system with special consideration of human factors using the example of the digital command.
- PhD8 Assessing the economic impact of rail technical research: delivering societal objectives in the face of external challenges.
- PhD9 Railway inclusion and accessibility for individuals with intellectual disability.
- PhD10 ICT platforms for reliable and interoperable ERTMS systems.

Progress and results achieved in 2025

PhDs EU-Rail has made progress across its ten research themes, contributing to both technical innovation and strategic development in the European rail sector by the scientific community.

- In the area of rail decarbonization (PhD1), a multi-criteria decision-making toolkit has been developed, with initial modelling results for CAPEX/OPEX and CO₂ reduction scenarios (2030–2050), in collaboration with Ukrainian Railways. Research on improving the experience of women in rail (PhD2) has included stakeholder interviews and gender gap analysis including the drafting of a handbook of good practices with Siemens Mobility and UIC input. Education and training efforts (PhD3) have led to the creation of an industry–academia framework and piloted a curriculum assessment tool with NetworkRail and Infraestruturas de Portugal. The harmonization model for rail education is currently in testing.
- Urban logistics (PhD4) and high-speed night train operations (PhD5) are also advancing. A conceptual model for urban freight systems integrating rail is being developed with a best practices map based on CD Cargo and Czech Post cooperation, while feasibility studies for new fast night-train routes and market assessments been completed, the “Hotel on Wheels” concept has been defined, with testing planned in collaboration with HŽPP and ÖBB. In the area of bridge and train dynamics (PhD6), analytical models for vibration and deflection under dynamic loads have been developed in cooperation with ADIF and Infraestruturas de Portugal, with expected contributions to Eurocode revisions. Safety communication research (PhD7) has produced prototypes for digital command and communication analysis in safety-critical contexts, with initial usability testing with DB InfraGO involvement completed.

- Additional work includes the development of a social cost–benefit model for evaluating EU-Rail innovations to assess the economic impact of rail technical research (PhD8), supported by preliminary case studies and collaboration with SNCF Réseau and ERJU data and extension with WP3 of Academics4Rail. Inclusion and accessibility for individuals with intellectual disabilities (PhD9) has been addressed through fieldwork and participatory workshops, leading to co-designing inclusive training protocols with SNCF and Alstom and draft guidelines. Finally, a prototype ICT platform for reliable and interoperable ERTMS (PhD10) has been developed and validated for interoperability and real-time predictability with ongoing integration of AI/ML modules in collaboration with RFI.

All results are available on the website: <https://www.academics4rail.eu/phdseu-rail/>

1.2.3. High-Level Deployment Group

The main objective of the Deployment Group is to analyse how to strengthen the capability of the sector to sustainably contribute and accelerate rail innovation to reach the market. It focuses on different aspects to make recommendations to the different actors of the system on the deployment of innovative solutions that require high levels of coordination.

In 2025 the HL-DpG provided advice and recommendations to the sector and decision makers on the best way to deploy FRMCS (business driven: cost efficient, simple, fast)

Deliverables

- Analyse (current) Infra, rolling stock, industry and workshop capacity for (fast, easy and cost effective) deployment. Estimate necessary capacities
- Support to accelerate and simplify authorisation,
- Perform cost analyses, CBA and risk assessments
- Develop toolbox with diverse migration scenario's (greenfield and brownfield situations)
- Provide dedicated cross-border (installation) alignment analyses and public-private mobile network interface analyses
- Alignment with other major Rail programmes (ERTMS, DAC, ...) and stakeholders

Please note Implementation programmes are and stay responsibility of RUs/IMs/lessors and Member States (including financing).

Progress and results achieved in 2025

The High-Level Deployment Group (HL-DpG) had its first three formal meetings in 2025 and the group decided to focus its activities of 2025 on FRMCS.

The FRMCS European Deployment Subgroup executed first analyses and delivered first products in 2025.

EU-RAIL FRMCS Deployment Group conducted a survey ("questionnaire") to gather sector information regarding the FRMCS deployment activities and to create more awareness in the sector about the upcoming big transformation.

With the support of several associations the questionnaire has been distributed, and 66 answers have been received.

The distribution of respondents:

- 19 Infrastructure Managers from 19 countries,
- 26 Railway Undertakings from 12 countries,
- 5 Trackside Providers,
- 5 Onboard Providers,
- 11 NSAs from 11 countries.

The respondents are from 20 different countries (including UK, Switzerland and Norway).

The report in September was well received by the sector and is used for further activities and creating awareness in the Sector.

Following reports were delivered to the sector:

- ✓ Intermediate report WG1 (technical deployment activities)
- ✓ NIP (national implementation Plan) analyses on FRMCS plan,
- ✓ cross border analyses on deployment topics
- ✓ Intermediate report WG2 (finances and authorisation)
- ✓ Cost drivers model developed, including first financial and funding analyses
- ✓ Authorisation analyses on blockades considering cheap, easy and fast testing, validating and authorisation processes. The work included advice to ERA to support the simplification of mass retrofitting activities.
- ✓ Intermediate report WG3 (scenario's and alignment)

An accessible and readable report on different migration scenario's (toolbox0 was published, including different starting points, technical and legal basis knowledge and usage of MNO, RMR (dedicated or non-dedicated) networks.

The EU-Rail FRMCS Deployment subgroup executed dissemination activities (webinars, conferences, newsletters), published a first deployment risk matrix and gave an overview of main industry partners.

In the EU-Rail Call2025-02, a coordination and support topic was included to support Deployment Activities.

1.3. Calls for proposals, grant information and other funded actions

1.3.1. Grants

Considering the annual budget availabilities and the EU-Rail Multi-Annual Work Programme and Work Programme 2025, the EU-Rail R&I activities are implemented through combined and interdependent multi-annual Projects. This structured interdependence of the EU-Rail Projects is based on the mutually integrated System and Innovation Pillars, complemented by the work of the Deployment Group.

In 2025 the Europe's Rail Joint Undertaking signed the Grant Agreement for the last project from the call 2024-01, with the requested EU contribution of EUR 5 899 666.22. In 2025, the Europe's Rail Joint Undertaking also launched the fifth and sixth calls for proposals: HORIZON-JU-ER-2025-01 and HORIZON-JU-ER-2025-02.

In particular, on 26 February 2025, the JU launched the fifth call for proposals (HORIZON-JU-ER-2025-01), following the adoption of the JU's Work Programme 2025-2026²⁸ by the Governing Board on 21 November 2024. This call for proposals covered one destination (Flagship Areas) in accordance with Annex VI of the Work Programme 2025-2026. It was open to all eligible entities in accordance with the eligibility criteria set out in the Horizon Europe Work Programme 2023-2025 General Annexes, in particular Annex 2²⁹.

The respective Decision of the JU GB approving the results of the call was adopted on 24 June 2025³⁰. The number of proposals submitted was 1, the number of evaluated proposals was also 1 and that one was retained for funding.

The retained proposal, MaDe4Rail 2, brings together participants from eight countries, including seven EU Member States (Italy, Germany, France, Netherlands, Poland, Spain, Portugal) and Switzerland,

²⁸ https://rail-research.europa.eu/wp-content/uploads/2024/12/Annex_GB-Decision_17-24_WP2025-2026.pdf.

²⁹ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-13-general-annexes_horizon-2023-2024_en.pdf.

³⁰ https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_07-25_Call_2025-01_final_MK-signed.pdf.

and includes six SMEs alongside large industry actors, infrastructure managers, railway undertaking, research organisations and universities. Building on the results of the previous MaDe4Rail project, it aims to advance the development and assess the feasibility of Maglev-Derived Systems (MDS) for integration into the European railway network. The funded action involves participants from the eight countries and receives a JU contribution of EUR 2.9 million, distributed among the beneficiaries in accordance with their respective activities.

The following tables summarise the amounts and topics related to the call:

Call	Topic Code	Type of Action	Expected EU contribution
HORIZON-JU-ER-2025-01	HORIZON-ER-JU-2025-FA7-01	IA	3.0

Topic Code	Topic Description	Type of Action
HORIZON-ER-JU-2025-FA7-01	FURTHER TECHNOLOGICAL DEVELOPMENT OF MAGLEV-DERIVED SYSTEMS	IA

The total number of proposals received in response to the call for proposals was 1:

Call	Topic	Type of Action	Number of proposals received
HORIZON-JU-ER-2025-01	HORIZON-ER-JU-2025-FA7-01	IA	1

A total of 19 participants were involved in the eligible proposal submitted to this call, reflecting on the only topics open to them. Following the evaluation, all of the participants (100%) are involved in the proposal, which was considered for funding.

The total EU-Rail contribution requested by all the submitted proposals amounted to EUR 3 million compared to EUR 3 million available for funding:

Call	Grant Requested	Expected EU contribution
HORIZON-JU-ER-2025-01	3.0	3.0

Following the GB Decision N°7/2025 of 24 June 2025, grants were proposed to be awarded resulting in the amounts provided below:

Call	Total Project Cost	EU-Rail Funding	IKOP	Other contribution to R&I
HORIZON-JU-ER-2025-01	4.5	3.0	0.8	0.1

Following the GAP phase, the value of activities resulting from this call to be performed in the coming period in respect to the signed grants corresponds to EUR 3.8 million of eligible costs, and EUR 4.5 million of total project value, that will be funded by EU-Rail up to EUR 2.9 million.

The sixth call, HORIZON-JU-ER-2025-02 was launched on October 2025 following the adoption of the revised EU-Rail Multi-Annual Work Programme and the amendment of the EU-Rail Work Programme 2025-2026 by the Governing Board on 24 June 2025. This call for proposals covered seven destinations (Flagships Areas + Exploratory Research) in accordance with Annex VI of the Work Programme 2025-2026. It was open to all eligible entities in accordance with the eligibility criteria set out in the Horizon Europe Work Programme 2023-2025 General Annexes, in particular Annex B. Since the grants resulting from this call were evaluated and awarded at a later stage in 2026, the detailed funding figures related thereto will be presented in the 2026 CAAR. The following tables summarise the amounts and topics related to the call:

DESTINATION Topics	Type of Action	Expected TRL	Expected EU contribution per project (EUR million)	Number of projects expected to be funded
Opening: 30 October 2025/ Deadline: 11 February 2026				
HORIZON-JU-ER-2025-FA1-TT-01	IA	6 to 8	22.4	1
HORIZON-JU-ER-2025-FA2-01	IA	5 to 7	33.1	1
HORIZON-JU-ER-2025-FA3-01	IA	6 to 8	32.8	1
HORIZON-JU-ER-2025-FA4-01	IA	6 to 9	26.6	1
HORIZON-JU-ER-2025-FA5-01	IA	5 to 8	20.4	1
HORIZON-JU-ER-2025-FA6-01	IA	5 to 7	10.0	1
HORIZON-JU-ER-2025-EXPLR-01	RIA	1 to 2	0.6	N/A
HORIZON-JU-ER-2025-EXPLR-02	RIA	1 to 2	0.6	N/A
HORIZON-JU-ER-2025-EXPLR-03	RIA	1 to 2	1.0	N/A
HORIZON-JU-ER-2025-EXPLR-04	CSA	N/A	0.7	1

1.3.2. Operational tenders and contracts

With regard to the implementation of procurement activities, the JU has complied with the principles of the EU Financial Regulation and the guidance provided in the European Commission Procurement Vademecum. This resulted in the implementation of activities obtaining the best value for money. The values established for the different procurement procedures, which are below any materiality level considering the total value of the R&I activities and the Programme, result from the collective knowledge of involved staff and their experience in previous private and public organizations.³¹

In 2025, the JU awarded open tender procedures:

- "Strategic Advice to Europe's Rail Joint Undertaking:" framework contracts in cascade with a maximum value of EUR 1 200 000³²
- "Locomotive fleet retrofit and engineering solutions for DAC (and ERTMS)": framework contracts in cascade with a maximum value of EUR 3 000 000³³.

In addition, the open tender procedure "Europe's Rail Multi-Project Collaborative Tool" was cancelled because the tender received was found inadmissible³⁴.

In accordance with Article 43(4) of the EU-Rail Financial Rules and as announced in the Europe's Rail Work Programme 2024 (amendment n°2), in 2025 EU-Rail renewed six direct contracts for services with

³¹ Also in answer to point 15 of Discharge 2016 of EP, reference P8_TA-PROV(2018)0173.

³² Award contract notice: <https://ted.europa.eu/en/notice/-/detail/738372-2025>

³³ Award contract notice: <https://ted.europa.eu/en/notice/-/detail/702473-2025>

³⁴ Non award and cancellation notice: <https://ted.europa.eu/en/notice/-/detail/651405-2025>

EU-Rail private Founding Members to avail EU-Rail with the services of Flagship Project Managers with a total value of EUR 900.000 (six contracts) The EU-Rail Financial Rules allow to conclude direct contracts with EU-Rail private Founding Members “*without having recourse to a public procurement procedure*”. To preserve the principle of sound financial management and the legality and regularity of the procedure, EU-Rail implemented a light “negotiated procedure” with the EU-Rail private Founding Members and applied by analogy the procurement negotiated procedure for very low value contract (Point 14 FR Annex 1 of the EU Financial Regulation).

In accordance with the Work Programme 2025-2026 (amendment n°2), the implementation of the following framework contracts continued in 2025:

- Europe's Rail System Pillar. Implementation of framework services contracts concluded on 12/07/2022 with “System Pillar Consortium” (for the 3 lots) for the provision of services to EU-Rail in the fields of System Pillar core group (lot 1), System Pillar expertise (lot 2) and CCS TSI maintenance activities (lot 3).
- Strategic support to the EU-Rail and other impact assessments, evaluations, foresight, analyses and studies. Implementation of framework services contracts concluded on 03/02/2021 for the provision of services to the EU-RAIL in the fields of strategy advice (LOT1), support to programme management (LOT 2) and legal assistance (LOT3) with companies Ernst&Young, Deloitte Consulting and consortium Daldewolf/Privanot respectively³⁵.
- Passenger perspective in rail transformation. Implementation of a framework contracts for services concluded on 18/12/2023 with the European Passengers' Federation (EPF).
- Strategic Advice to Europe's Rail Joint Undertaking. Implementation of the new framework contract concluded in 12/09/2025 with 3 contractors (cascade mechanism) above referred..

In accordance with Article 15 (Principle of transparency) of the EU-Rail Financial Rules the JU shall make available on its internet site no later than 30 June of the following financial year information on the recipients of funds deriving from its budget, including procurement contracts. In addition, as stated in point 3.3 of Annex I to the Financial Regulation 2018/1046 (which applies to the JU), EU-Rail, as a contracting authority, shall publish a list of contracts on its website no later than 30 June of the following financial year for specific contracts and order forms implementing a framework contract. The EU-Rail recipients of Funds and Annual List of Specific Contracts are published at <https://rail-research.europa.eu/participate/recipients-eu-rail-funds/>.

1.4. Evaluation procedures and outcomes

EU-Rail launched 2 calls for proposals in 2025 but only evaluated the call 2025-01. The evaluation of the call 2025-01 was carried out between 12 May and 4 June 2025. The evaluation procedure was performed remotely, making use of digital web-conferencing tools. However, this represented no issue to the proper performance of the evaluation process.

The evaluation of proposals was carried out with the assistance of 6 independent technical experts (1 of them financial expert), and 1 additional expert contracted as recorder. Evaluations were conducted in one panel, with the representatives from the Commission (DG MOVE, DG RTD) and from ERA having been invited to be present at the panel's meetings as observers. An independent observer was also appointed in accordance with the procedures laid down in the Guide for proposal submission and evaluation of the Horizon Europe grants. The independent observer's role was to observe and offer independent advice on the conduct and fairness of the evaluation sessions, on the application of the evaluation criteria and on ways to improve processes.

In selecting the independent external experts, the primary objective was to ensure a high level of skills, experience, and knowledge in the areas of the call (including project management, innovation, exploitation, dissemination and communication). Under these conditions, special attention was given to achieve an appropriate balance composition of the panel in terms of various skills, experience, and knowledge, geographical diversity and gender. The composition was the following:

³⁵ Taken into consideration the nature of the services covered by LOT 2 and LOT 3, the implementation of those Framework contracts is covered by the administrative expenditure (see section 2.5- Administrative Procurement and contracts).

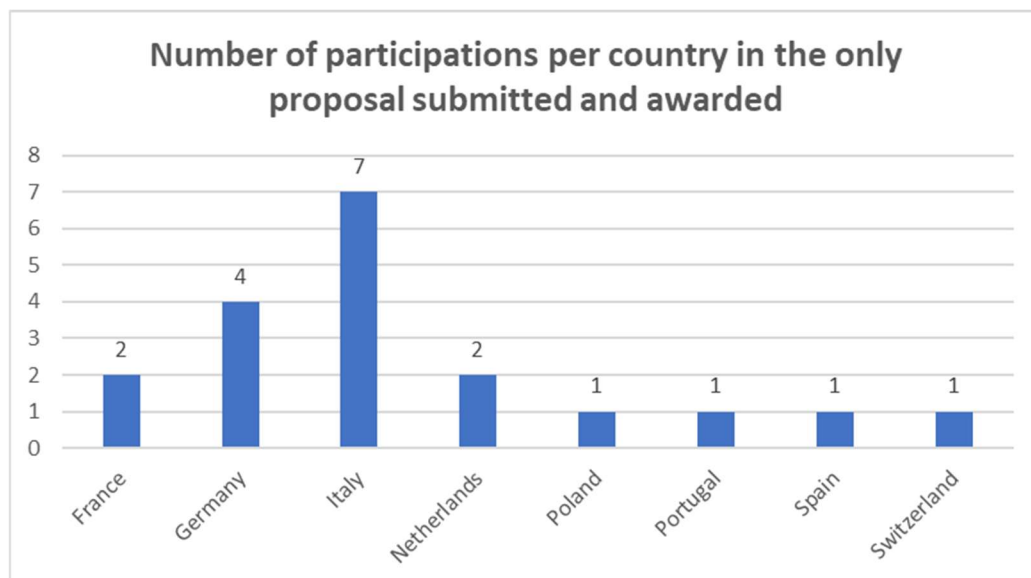
- Gender balance: 10 men (56%), 8 women (44%);
- Regional balance: representatives from 13 different countries.

The consensus meetings of the experts were organised remotely during the period 2 – 4 June 2025. A briefing was held on 12 May 2025, in which the EU-Rail representative provided relevant information related to the consensus phase to the independent experts, such as the specificities of the EU-Rail calls for proposals, the confidentiality requirements, or the experts’ obligations regarding potential conflicts of interests.

The total number of proposals submitted was one, which was evaluated and retained for funding, representing a success rate of 100% out of the admissible and eligible proposals.

There were 6 SMEs participating in the call with a success rate of 100%, since all of them had their proposal retained for funding. Participations of SMEs represented 32% within the overall proposals evaluated and retained for funding.

From a geographical perspective, there were participants to the call coming from 8 countries, there were participants from 7 EU Member States and 1 participant from Associated Countries.



The call 2025-02 is being evaluated in 2026 and will be included in this section in the CAAR 2026.

1.5. Follow-up activities linked to past calls

For the EU-RAIL Programme, by the end of 2025, the JU had signed a total of 25 EU-Rail grant agreements. The signed EU-Rail grants agreements correspond to R&I activities in the Programme that reached EUR 681.1 million (286.7M in Funding, 173.7M in IKOP contributions, 170.9M in IKAA contributions, 41.9M from Associated Members Contributions and 7.8M in Non-Member Contributions).

Acronym	Project Title	Call Reference	Period	Project Value (signed GA)
FP1 - MOTIONAL	Flagship Project 1 - Mobility management multimodal environment and digital enablers	HORIZON-ER-JU-2022-01	01/12/2022 to 30/09/2026	92.424.352,10
FP2 - R2DATO	Flagship Project 2 - Rail to Digital automated up to autonomous train operation	HORIZON-ER-JU-2022-01	01/12/2022 to 31/05/2026	160.775.910,38
FP3 - IAM4RAIL	Flagship Project 3 - Holistic and Integrated Asset	HORIZON-ER-JU-2022-01	01/12/2022 to 30/11/2026	108.748.800,11

	Management for Europe's RAIL System			
FP4 - Rail4EARTH	Flagship Project 4 - Sustainable and green rail systems	HORIZON-ER-JU-2022-01	01/12/2022 to 30/11/2026	95.117.482,11
FP5 – TRANS4M-R	Flagship Project 5 - Transforming Europe's Rail Freight	HORIZON-ER-JU-2022-01	01/07/2022 to 31/12/2026	97.908.136,17
FP6 - FutuRe	Flagship Project 6 - Delivering innovative rail services to revitalise capillary lines and regional rail services	HORIZON-ER-JU-2022-01	01/12/2022 to 30/11/2026	33.490.977,78
RAIL4CITIES	Railway stations for green and socially inclusive cities	HORIZON-ER-JU-2022-02	01/07/2023 to 30/06/2025	844.604,07
InBridge4EU	Enhanced INterfaces and train categories FOR dynamic compatibility assessment of EUropean railway BRIDGES	HORIZON-ER-JU-2022-02	01/09/2023 to 31/08/2026	999.921,24
ESEP4Freight	European Shift Enabler Portal for Freight	HORIZON-ER-JU-2022-02	01/09/2023 to 31/08/2026	1.299.750,00
Academics4Rail	Building a community of railway scientific researchers and academia for ERJU and enabling a network of PhDs (academia teaming with industry)	HORIZON-ER-JU-2022-02	01/09/2023 to 28/02/2027	1.858.357,43
MaDe4Rail	Maglev-Derived Systems for Rail	HORIZON-ER-JU-2022-02	01/07/2023 to 30/09/2024	2.311.623,03
Pods4Rail	Concept Development of a System for Pods and Pod-Carriers to be used as Moving Infrastructures mainly for Rail, but as well for Road and Ropeways	HORIZON-ER-JU-2022-02	01/09/2023 to 28/02/2026	4.578.712,55
DACcord	DAC migration roadmap towards deployment and related activities	HORIZON-ER-JU-2022-02	01/09/2023 to 31/03/2026	1.499.829,16
LEADER 2030	Learnings for European Autonomy to Deliver Europe's Rail in 2030	HORIZON-ER-JU-2022-02	01/07/2023 to 31/12/2025	700.032,12
DACFIT	DAC: Freight's intelligent transformation	HORIZON-JU-ER-2023-01	15/10/2024 to 14/10/2026	1.499.326,00
NEXUS	Next-gen technologies for enhanced metro operations	HORIZON-JU-ER-2023-01	01/10/2024 to 30/09/2026	3.607.995,63
PhDs EU-Rail	Extending the Rail Network of PhDs in Europe's Rail Joint Undertaking	HORIZON-JU-ER-2023-01	01/10/2024 to 30/09/2027	1.691.125,00
SYMBIOSIS	SYstemic Mobilisation for Joint Biodiversity and Infrastructure	HORIZON-JU-ER-2023-01	01/09/2024 to 31/08/2027	2.299.328,63
Travel Wise	TRansformation of AViation and rAirway soLutions toWards Integration and SynergiEs	HORIZON-JU-ER-2023-01	01/10/2024 to 30/09/2027	6.268.292,99

XCROSS	The next generation of railway crossing asset management technology	HORIZON-JU-ER-2023-01	01/10/2024 to 31/03/2027	2.072.581,33
Hyper4Rail	A Giant Leap for Loop: Towards a harmonized implementable Hyperloop concept with Hyper4Rail	HORIZON-ER-JU-2024-01	01/12/2024 to 30/11/2026	2.561.865,95
QuieterRail	A step change in prediction, mapping, acceptance testing and cost-effective mitigation for railway noise and vibration	HORIZON-JU-ER-2023-01	01/10/2024 to 30/09/2027	3.283.051,57
FP2-MORANE-2	MOBILE radio for RAILway Networks in Europe 2	HORIZON-ER-JU-2024-01	01/12/2024 to 30/09/2027	25.903.766,45
FP5-DACtiVate	Fa5 - digital automatic coupler – testing to support DAC authorisation, mix and match for DAC coupler head and draft gear interchangeability and dac hybrid coupler fitting solutions	HORIZON-ER-JU-2024-01	01/12/2024 to 30/12/2026	9.858.871,60
MaDe4Rail 2	Further Technological development of Maglev-derived Systems	HORIZON-JU-ER-2025-01	04/12/2025 to 30/11/2028	3.899.038,99

1.6. Openness, cooperation, synergies and cross-cutting themes and activities

In terms of national funded R&I activities in the railway sector, the JU invited the relevant Member States to present their programmes and projects in the context of the meetings of the State Representative Group (SRG). This has allowed discussion on ways to interconnect the different activities and ensure that resources are leveraged to achieve the best results. This is an ongoing process, which becomes increasingly relevant in view of standardisation processes and market uptake.

During 2025, Europe's Rail actively advanced its cross-cutting initiatives through strategic engagement across EU institutions. The JU collaborated with the European Parliament's TRAN Committee to highlight progress in rail digitalisation and automation, while also organising in a joint event with other Joint Undertakings to demonstrate how public-private partnerships deliver tangible results aligned with the EU's strategic goals. Additionally, Europe's Rail contributed to the "Cutting Costs in Rail" conference under the Danish Presidency, fostering discussions on harmonised regulations and market-oriented solutions for Europe's railway sector. The JU has also played a key role in the first Implementation Dialogue on High-Speed Rail in Europe, chaired by European Commissioner for Sustainable Transport and Tourism Apostolos Tzitzikostas.

EU-RAIL has created synergies with other JUs, partnerships, European Standards Organization and Executive Agencies:

- **SNS JU:** managing the FP2-MORANE-2 project, jointly funded by EU-RAIL and SNS JU. EU-wide testing and validation campaign of the FRMCS V2 specifications, the next EU rail communication system.
- **SESAR 3 JU:** managing the FP1-Travel Wise, jointly funded by EU-RAIL and SESAR 3 JU. The project will use digital solutions and lessons from the air sector to enhance coordination and create an integrated European transport network.
- **Clean Hydrogen JU:** EU-RAIL is a member of Clean Hydrogen JU stakeholders group since 2024, providing input/feedback regarding needed developments and potential synergies between the Clean Hydrogen Joint Undertaking and the rail sector.

- **EUSPA/ESA:** Continuation in 2025 of the collaboration with the EU Agency for the Space Programme (EUSPA) and with the European Space Agency (ESA) of the project on EGNOS for rail, under the strategic leadership of the Commission and in full coordination with ERA, for delivering through R&I the technical and operational elements to reach competitive and resilient satellite-based rail services. A draft roadmap for EGNOS deployment in rail was prepared with ESA, EUSPA, ERA and the System Pillar, confirming EGNOS as a strategic enabler for future GNSS based train positioning. The accompanying analysis strengthened the case for early EGNOS service introduction, showing how augmented GNSS can address existing performance gaps and accelerate safe positioning solutions. Demonstrators integrating EGNOS Dual Frequency Multi Constellation corrections delivered initial insights into dual frequency, multi constellation GNSS performance, and progress on the space/rail hazard analysis further reinforced the safety basis for future TSI CSS discussions. To assess the use of EU satellite-based communication in railway signalling and safety critical telecommunication, Europe's Rail, ERA, EUSPA and the European Commission agreed to reinforce their strategic cooperation in 2025 through the establishment of an expert group (the SATCOM expert Group) to be launched early 2026. The main group's objective is to analyse applications and define requirements for the EU Space Programme in view of the adoption of space-based telecommunication for railways. .
- **European Telecommunications Standards Institute (ETSI) :** The signature of a Memorandum of Understanding with EU-Rail in 2025 laid the foundation for a strengthened partnership focused on shared objectives in ICT standardisation, interoperability and strategic research.

Coherence and synergies in relation to major national (sectoral) policies, programmes and activities: It is estimated that around 15% of the EU stimulus package called Recovery and Resilience Facility -RRF- has been invested in different areas of rail national systems. There is a need to ensure maximum levels of complementarity and impact, including focusing on future-proof investments. This will require to leverage local, regional and national investments to complement the research and innovation activities performed at EU-Rail level and vice versa. In this respect, the States Representatives Group has delivered in 2025 countries report describing the national or regional policies in the scope of the Europe's Rail joint undertaking and identified specific national projects where cooperation could be sought with the actions funded by EU-Rail.

EU-Rail also continued the cooperation with a number of key international partners, such as APTA(US) and CUTRIC (CA).

The JU continued also its participation to the Digital PRIME working group, promoted by the European Commission together with rail infrastructure managers around traffic planning/management improvements mainly.

In terms of synergies with other Union Programmes, the JU works closely with the other Joint Undertakings sharing the same building, infrastructure, etc. maximising the opportunity for collaboration in terms of administrative and operational activities.

Beyond the operational activities, 2025 was the fourth year of implementation of Article 13 SBA, where EU-Rail took over the responsibility for the coordination of the Back Office Arrangement (BOA) Accounting Services. Other 3 BOAs were established led by other JUs where EU-Rail took also a supporting role, please refer to the section 2.7.2 "Efficiency gains and synergies", of the present document.

1.7. Progress against Key Impact Pathways and JU's Key Performance Indicators

1.7.1 Progress against General Horizon Europe Key Impact Pathways Indicators (KIPs)

The HE Key Performance Indicator results for the year 2025 are presented in Annex 5.

1.7.2. Progress against HE Common JUs Key Performance Indicators

The HE Key Performance Indicator results for the year 2025 are presented in Annex 5.

1.7.3. Progress against JU-specific Key Performance Indicators

The EU-Rail specific Key Performance Indicator results for the year 2025 are presented in Annex 5.

The Societal Impact measurement methodology was developed together with the supervision and validation of the European Commission's science and knowledge service, the Joint Research Centre (JRC) through the Academics4Rail project, launched on 1 September 2023. After two years of work, the project delivered an initial KPI model that also used the technical and operational KPIs produced by the Flagship Projects, results are accessible on <https://www.academics4rail.eu/>. JRC provided the following assessment.

Joint Research Centre assessment on the initial KPI model developed by the Academics4Rail project

This section of the report presents the work conducted to develop an overarching assessment framework for Europe's Rail technical innovation programme. The purpose of the work was to support an evidence-based assessment of how research and innovation activities may contribute to wider programme objectives, including future rail passenger and freight market share, rail attractiveness, costs, externalities and societal value.

The main reason for developing societal key performance indicators was to move beyond purely technical project outputs and assess what the innovations may mean in practice for passengers, freight users, operators and society. The indicators are intended to translate technical improvements, such as changes in life-cycle cost, capacity, punctuality, energy use or environmental performance, into wider outcomes such as modal shift to rail, user benefits, operator impacts, emissions, noise and overall welfare.

The work was carried out within the Academics4Rail project, launched on 1 September 2023 and involving 25 partners from ten countries.

The assessment framework uses a multi-level KPI logic. At the technical level, the Flagship Projects generate technical KPIs, which describe the direct effects of innovations, for example on capacity, punctuality, life-cycle cost, energy use, safety, carbon or noise. These technical KPIs are then translated into higher-level model inputs that can be used to assess expected changes in rail performance and attractiveness.

The societal KPIs are the wider outcomes that the framework ultimately aims to assess. At the highest level, these include expected rail passenger and freight market share. The wider framework also refers to rail attractiveness indicators, such as delays, frequency, journey time, interchange, waiting time, comfort, station access, ticketing and information quality, as well as enabling indicators such as integration, interoperability and deployment.

The Elasticity-Based Approach (EBA) model was chosen to operationalise the subset of KPIs that can be translated into quantitative model inputs, mainly life-cycle cost, capacity and punctuality. These inputs are then used within elasticity-based market model to estimate societal outputs such as rail mode share, consumer surplus, producer surplus, externalities and overall welfare. This creates a practical bridge between technical innovation outputs and wider Europe's Rail's objectives such as rail attractiveness, market share, costs and societal impacts.

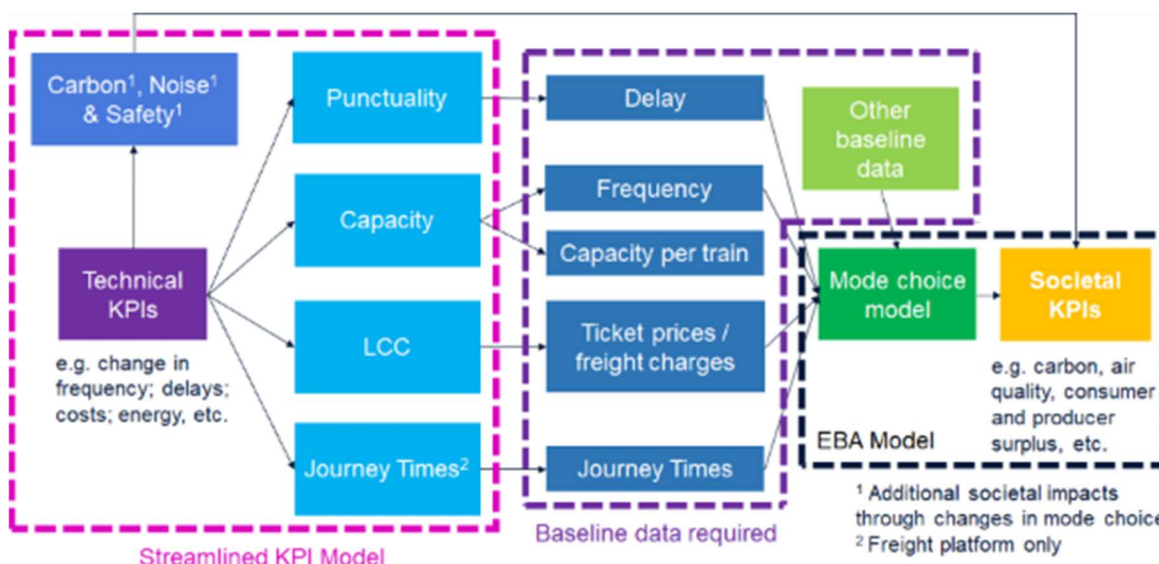
There is a clear potential to further improve the KPI framework. As the work develops further, the KPI framework could be strengthened by refining selected KPI mappings, confirming assumptions with the

Flagship Areas, and adding or strengthening indicators where useful. A consolidated KPI register, including definitions, units, baselines, target years, owners and data sources, would make the framework even more robust and easier to apply in future assessments.

The EBA model represents the main operational component of the assessment framework. The EBA is a practical modelling approach that starts directly from observed rail market conditions without a need of building a complex network model. The model uses evidence-based elasticities from the literature to estimate how demand changes when rail becomes cheaper, faster, more frequent, more reliable or less crowded. For freight, it estimates how innovation-driven cost changes affect rail freight demand and shift from competing transport modes. For passenger markets, it also includes fare and frequency optimization capabilities. This provides a working modelling core within the overall assessment framework.

The EBA model translates changes in rail service characteristics driven by innovation into corresponding changes in demand and associated societal impacts. Improvements in cost, capacity, reliability, delays or operational performance are reflected in changes in the generalised cost of travel and, consequently, in the perceived attractiveness of rail. This results in estimated shifts in demand, expressed in passenger numbers and freight tonne-kilometres, with implications for users, operators and wider societal impacts. The Figure below summarises the overall logic from technical innovation inputs through the EBA modelling framework to estimated societal outcomes.

Europe's Rail Assessment Framework



A set of representative use cases was developed for freight and passenger markets. The freight model applies the elasticity-based cost approach using European-level freight inputs. It provides a complementary representation of how innovation-driven changes in cost and operational performance may affect rail freight demand and modal substitution. The passenger modelling framework is presented through three representative case studies covering long-distance services, high-density regional services and low-density regional services. These use cases are based primarily on publicly available data from the UK and are designed to illustrate how the common elasticity-based modelling framework can be applied under different operational and market contexts.

The rail system economics and societal impact layers have been implemented in a high-level Cost-Benefit Analysis (CBA). The modelling framework produces outputs that are interpretable in policy terms, including consumer surplus, producer surplus, externalities and total welfare. A 30-year appraisal period and standard discounting assumptions are applied. At this stage, however, the CBA should primarily be regarded as an assessment of the potential welfare benefits, while innovation-related capital costs and deployment assumptions are expected to be further consolidated as implementation progresses. The framework also includes a high-level scaling approach to support the interpretation of results at European level. This approach applies macroeconomic adjustment factors, including purchasing power parity, to translate case study outputs into indicative EU-level estimates. It provides a practical basis for EU-level interpretation as an order-of-magnitude illustration of potential EU-wide impacts rather than a fully structural bottom-up aggregation.

As the framework develops, it may be further strengthened through the introduction of more country and region-specific assumptions and calibration, depending on national market conditions, service structures, subsidy regimes and competitive environments. This includes, for example, demand elasticities, fares, subsidies, modal competition and financing regimes, thereby improving robustness while preserving transparency and usability. Overall, the work has been delivered to a good and meaningful level, providing a concrete assessment methodology and a working modelling framework. It provides a solid basis for assessing how Europe's Rail technical innovations may affect rail modal shift, costs, welfare and wider societal impacts. The core methodological framework and modelling approach are already in place.

1.8. Dissemination and information about project results

In 2025, Europe's Rail continued its commitment to disseminate the results of its funded projects. Ensuring visibility and impact remained a key priority, with dissemination efforts focused on maximising outreach through multiple channels, including events, social media, newsletters, and the corporate website. The objective was to enhance awareness among stakeholders and facilitate knowledge transfer across the rail sector. Projects were actively encouraged to promote their results through Europe's Rail's communication platforms. Regular interactions between the Joint Undertaking and project consortia ensured a coordinated approach to dissemination. Europe's Rail also provided visibility by featuring project updates in corporate communications and supporting their presence at key industry events.

To facilitate the process, the JU revised and updated the Communication and Dissemination Guidelines for projects as part of the update of the Governance and Process Handbook. The revised guidelines introduce clearer objectives and KPIs, define common rules for projects to follow, and aim to better harmonise and maximise dissemination activities. Dissemination plays a crucial role in sharing project outcomes, ensuring that innovations reach relevant audiences and clearly demonstrate the impact of the programme.

To present and explain the new guidelines, two dedicated meetings were held. As in previous years, these joint meetings also served the purpose of strengthening communication between Europe's Rail Programme Office and the projects. These involved Project Coordinators, Flagship Project Managers, and Communication Work Package Leaders, and provided a forum to exchange on progress, best practices, and alignment on targets and milestones. The meetings also helped build synergies between the corporate communication team and individual projects, as well as among the projects themselves. In addition, projects received guidance on best practices for event planning, media engagement, and the preparation of scientific publications.

The dedicated tool, called EU Survey, was implemented in 2024 and continued to be used in 2025, allowing projects to submit their latest news at least once a month. This structured approach ensured that Europe's Rail could efficiently gather information and share it through its corporate channels, including the newsletter, social media, and website. To facilitate participation, calendar reminders were sent to all projects, and detailed guidelines were developed to assist them in completing the survey effectively. In 2025, the Communication Team received 145 content submissions through this tool.

Additionally, a series of feature articles showcasing the key demonstration activities of the projects was published on the Europe's Rail website and disseminated through the monthly newsletter.

In 2025, Europe's Rail continued to leverage shared dissemination efforts among its projects, coordinated by the Joint Undertaking's Communication Team. The Project Results webpage, originally launched in collaboration with the Programme Unit, remained a priority for ensuring consistent communication of achieved progress. The structured presentation of deliverables, with concise descriptions highlighting their contribution to advancing rail transport, ensured effective outreach. Additionally, these updates were repurposed for broader dissemination across Europe's Rail's corporate social media channels and newsletters, creating a multiplier effect for visibility and engagement.

In December 2025, the Europe's Rail General Assembly provided a vital platform to reflect on the past year's achievements and outline strategic objectives for the future. Held over two days, the event gathered key stakeholders to discuss the progress of ongoing research and innovation efforts. The first day was dedicated to Europe's Rail Strategic Reports, including the next chapter of EU-Rail and an update on the state of play. The second day was hosted as an open online event, bringing together over 100 participants from across the sector. Participants delved into the operational reports, including

presentations from advisory bodies. Teams from the System Pillar, Innovation Pillar, Deployment Group and the European DAC Delivery Programme (EDDP) shared insights into their ongoing work and key achievements. Europe's Rail also maintained a strong presence at major industry events and conferences, where project results were showcased through dedicated sessions, exhibition stands, and panel discussions. Participation in these events provided opportunities to engage with stakeholders, share progress, and demonstrate the impact of research and innovation efforts.

As a highlight, following the success of Europe's Rail Info Day (which presented the EU-Rail 2025-02 Call for Proposals) Europe's Rail organised a series of online information sessions in December dedicated to the first-wave Flagship Projects in EU-Rail. These sessions provided a comprehensive overview of FP1-MOTIONAL, FP2-R2DATO, FP3-IAM4RAIL, FP4-RAIL4EARTH, FP5-TRANS4M-R, and FP6-FutuRe, highlighting key achievements and recent progress. Participants also had the opportunity to engage with project coordinators and experts, learn about the latest developments in EU-Rail innovation, and take part in an interactive Q&A session.

2. SUPPORT TO OPERATIONS

2.1. Communication activities

The JU continued to promote the activities of the Programme during 2025. The JU communication activities in 2025 were focused on the continued promotion of the Europe's Rail Programme and bringing as much visibility as possible to the results of its R&I activities, while also raising awareness of its mission and vision, its Calls for Proposals and the System and Innovation Pillars, as well as the newly established High-Level Deployment Group.

The majority of the communication activities in 2025 revolved around organisation and participation to events, as well as streamlining dissemination activities and promoting the outputs of the EU-Rail Flagship and Exploratory Research projects. EU-Rail also puts a particular emphasis on maintaining an active network of stakeholders who engage regularly in joint activities with the JU. Alongside the key events organised and attended by the JU in 2025 (see Annex 3), the JU reinforced its engagement with key stakeholders and institutional bodies in the following ways.

Europe's Rail took part in several important discussions within the European Commission and the European Parliament. Notably, Europe's Rail participated in the first Implementation Dialogue on High-Speed Rail in Europe, chaired by the European Commissioner for Sustainable Transport and Tourism, Apostolos Tzitzikostas, at the European Commission. The discussion focused on accelerating the rollout of efficient, cross-border train services that contribute to Europe's decarbonisation, competitiveness, and growth. Europe's Rail also met with the European Parliament's Committee on Transport and Tourism (TRAN), providing an update on Europe's Rail ongoing initiatives to advance rail digitalisation and automation. In May, at the European Parliament, all Joint Undertakings came together at a joint event to showcase how public-private partnerships are delivering concrete results aligned with the EU's strategic priorities, meeting with decision-makers to exchange on how these partnerships are driving impact where it matters most.

Another major highlight was the European Startup Prize Ceremony held under the patronage of the Polish Presidency of the EU Council. Europe's Rail was proud to be a sponsor and present the Special Prize on Rail Mobility to an outstanding startup in recognition of its contribution to the future of sustainable rail transport.

Under the Danish Presidency, Europe's Rail participated in the "Cutting Costs in Rail" conference held in Copenhagen, which brought together EU institutions, national governments, regulators, and the rail sector to discuss harmonised rules and innovative solutions for a more market-oriented European railway system.

Europe's Rail was also proud to be a co-organiser as in collaboration with DG MOVE, ERA, ALE, CER, EIM, and UNIFE of the Women in Rail Award, which has now become part of UNESCO's "Advancing Gender Equality in Science – Open and Inclusive Science Hub." The 'Women in Rail' award to recognises outstanding contributions in the sector. The initiative featured 4 distinct prizes, awarded following a rigorous jury evaluation. In addition, Europe's Rail attended the EU Agencies Network Heads of Agencies meeting in Brussels, where agency and Joint Undertaking leaders met to strengthen collaboration across the EU Agencies Network and discussed shared priorities.

In addition to reinforcing its engagement with stakeholders, the JU participated in nearly 50 different events across Europe and beyond, significantly enhancing its visibility and strongly showcasing the Partnership's importance within the global rail and transport communities. A key example of this visibility came from the 2024 ITF Summit and the UITP Summit. During the ITF Summit, Europe's Rail hosted a media event highlighting the latest progress in research and innovation, the crucial role of international collaboration, and the strategic vision outlined in the high-level draft paper. The JU also had the pleasure of welcoming several ministerial delegations to its stand. At the UITP Summit 2025 in Hamburg, Europe's Rail hosted a Power Session and welcomed numerous visitors to its exhibition stand. Europe's Rail also organised an online press event for the launch of the *Net-Zero Logistics Study*, during which the main findings were presented and the key benefits and challenges of rail freight's contribution to achieving net-zero logistics were discussed. This event was accompanied by a targeted social media campaign carried out in collaboration with a Steering Committee representing European rail and logistics stakeholders, including CER, CLECAT, EIM, ERFA, ETP-Alice, the European Commission (DG MOVE), UIP, UIRR, and UNIFE.

When it came to activities outside Europe, Europe's Rail participated in the 14th World Congress of Railway Research 2025 in Colorado Springs, USA, which brought together the global rail community to exchange ideas on research, innovation, and emerging solutions. The JU took part in key panels highlighting EU-Rail's public-private partnership model, its role in addressing system fragmentation, costs, and resilience, and the importance of EU-level coordination to support digitalisation, climate objectives, and competitiveness. It also shared insights on the role of system engineering in advancing the Single European Railway Area.

The promotion of the 2025 Calls for Proposals remained a key focus of the annual communication activities. In 2025, two Calls for Proposals were launched and widely promoted through the website, newsletter, social media channels, and dedicated events. To maximise outreach, a dedicated Information Days were organised, complemented by targeted paid social media campaigns to boost visibility. The first call, Europe's Rail Call for Proposals 2025-01, highlighted the objectives of Europe's Rail Research and Innovation Programme and offered €3 million in funding for innovative solutions to enhance rail transport across Europe. The second call, Europe's Rail Call for Proposals 2025-02, opened in October, offering €148.2 million in EU funding for projects valued at €245 million. Over 250 participants joined the Europe's Rail Info Day on 10 October 2025, which introduced the new call and provided insights into funding opportunities. To further strengthen networking and collaboration, Europe's Rail also opened a dedicated B2Match online matchmaking platform designed to connect key stakeholders from across Europe's rail ecosystem and facilitate partnership building. The platform attracted over 470 registered participants.

In addition, to ensure strong representation of EU-Rail and support regional participation, the Europe's Rail Brokerage Event was held on 24 September at TRAKO in Gdańsk, Poland. The event was co-organised by EU-Rail, PKP S.A., and the National Contact Point for EU Research Programmes. Participants took part in a series of bilateral meetings to exchange ideas, build partnerships, and explore potential collaborations. In 2025, JU Communications organised two meetings with the Communication Officers of founding member companies, welcomed new associated member companies, as well as other key partners, to align on key priorities and communication expectations, and to agree on best practices for information exchange.

On top of various events, Europe's Rail has been active in other communication areas as well. In 2025, Europe's Rail launched its podcast, 'The European Railcast', with a total of five episodes published. The EU-Rail podcast highlights the Partnership's contribution to European competitiveness, sustainability, and resilience. Through engaging conversations with experts, it shares concrete success stories, ongoing innovations, and future ambitions, while encouraging collaboration among key stakeholders. The podcast helps underline the strategic role of rail in achieving the EU's mobility and climate objectives, supports wider discussions on research and innovation, raises awareness of EU public investment in R&I, and strengthens the visibility and reputation of EU-Rail. In addition, EU-Rail developed and published a new corporate video.

The website was another major focus in 2025. Following the initial revamp, further improvements were made to legacy pages, harmonising their appearance and creating new pages, such as those dedicated to the high-level paper and the podcast series. The website was continuously updated with articles presenting project results and demonstrator activities, as well as various corporate information.

The newsletter, published monthly, was also revamped and redesigned for easier access and readability. To further increase visibility of JU projects, a new format was introduced in September and October 2025: at the end of each month, alongside the newsletter, a page is added to the News section highlighting the latest project updates. The team produced various publications, including the AAR – Executive View, contributed to the revision of the MAWP in collaboration with the Publications Office of the EU, developed a factsheet on project closures, and prepared a brochure outlining the case for the future of the programme.

Throughout the year, the JU continued to invest in long-term social media planning to ensure that all relevant news was promoted in a timely and effective manner across its platforms. Europe's Rail continued to increase its presence on social media, resulting in significant follower growth on LinkedIn. By the end of 2025, the LinkedIn account had more than 16,600 followers. Overall impressions on the Europe's Rail LinkedIn channel reached over 1.6 million impressions in 2025, compared to 1.2 million in 2024, demonstrating strong interest in content produced by the JU. As in previous years, promoting JU project results through social media remained at the heart of Europe's Rail communication strategy.

A close collaboration with the European Union Agency for Railways (ERA) in different areas, and with the European Railway Research Advisory Council (ERRAC), as well as with the different International and European organisations and associations was maintained. A continuous and constructive exchange took place with other Union bodies and agencies. In 2025, journalists have also been targeted by the JU on social media which has proved effective as well. The fact that the Programme continues to become better known and the interest in its results progressively increases is reflected in a broader media coverage of EU-Rail compared to previous years.

Communication statistics can also be found in Annex 3.

Data protection and web site security

In cooperation with the ICT Officer, the Chief Legal Officer, who also acts as the JU's Data Protection Officer, and two contractors managing the rail-research.europa.eu and projects.shift2rail.org domains, EU-Rail Communication team continued to work on making the website compliant with the data protection regulation based on the instructions provided by the European Data Protection Supervisor. It was ensured that the website platform and applications are compliant with the GDPR and EUDPR Regulations. In particular, our contractor ensured that full website maintenance procedures are carried out on a daily basis. As a result of EU-Rail comprehensive approach implemented in 2024 towards compliance with the EU General Data Protection Regulation (GDPR) and website security, including cybersecurity, in 2025 the Europe's Rail website has remained compliant with the GDPR. Regular server and website maintenance were conducted, including quarterly updates to Ubuntu packages, PHP, Apache, and MySQL, ensuring security vulnerabilities were promptly addressed. Non-OS-related packages were also updated regularly, alongside routine checks on daily backups and retention policies to safeguard data integrity.

A key focus was on mitigating security risks, with specific fixes implemented for vulnerabilities such as an HTML injection issue in admin-ajax.php and iframe sandbox problems identified in a security report. Additionally, issues arising from plugin updates, including EventOn and EventOn - Ful Cal, were promptly resolved to maintain website functionality and security. A dynamic listing of calls was also integrated into the Tender Archive to enhance transparency. EU-Rail prioritised compliance with EUDPR by updating its Matomo analytics code to improve data tracking in alignment with privacy regulations. The Complianz plugin was frequently updated to ensure GDPR compliance, managing user consent and cookie policies effectively. The removal of the amr shortcode any widget plugin, which posed a security risk and was no longer maintained.

To enhance cybersecurity resilience, the website's firewall and security monitoring plugins were consistently updated. WordPress core and plugins, including those handling authentication, forms, and user access (Members), received regular updates to prevent unauthorised access and potential data breaches. Additional WordPress plugins supporting website functionality were regularly maintained and updated, including navigation and content management tools, operational utilities, communication and email components, search engine optimisation tools, and backup solutions. Endpoint level protection was ensured through Trend Micro Cloud One, contributing to the overall cybersecurity infrastructure.

As a result of this work, JU's website is considered compliant with the data protection regulation that also helped the domain to substantially improve its position in the EU Privacy Score Tool.

2.2. Legal and financial framework

In accordance with Council Regulation (EU) 2021/2085 (the “SBA”), EU-Rail is the legal and universal successor of the S2R JU, which it replaced and succeeded as from 30 November 2021.

To ensure the business continuity of the operations, in the first Governing Board meeting of EU-Rail a list was approved containing Decisions³⁶ (the so called “GB omnibus decision”) adopted still under the S2R JU which continue to apply for EU-Rail in accordance with Article 174(12) of the SBA³⁷. This list includes Decisions concerning aspects related to governance, human resources, finance, audit and internal controls and compliance, and in particular the Financial Rules of the JU. The Executive Director also approved the list of ED Decisions adopted under the S2R JU that will continue to apply to EU-Rail.

Thus, as indicated in our web site³⁸, any references to S2R JU in the internal legal framework shall be construed as references to EU-Rail (e.g.: references to S2R JU in the Financial rules shall be construed as references to EU-Rail³⁹).

In 2025, the EU-Rail legal framework refers predominantly to:

- Treaty on the Functioning of the European Union (TFEU), and in particular Article 187 and the first subparagraph of Article 188 thereof.
- Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014 (“the Single Basic Act”)⁴⁰ as amended by Council Regulation (EU) 2023/1782 of 25 July 2023 as regards the Chips Joint Undertaking⁴¹. This Regulation sets up nine joint undertakings – including EU-Rail - within the meaning of Article 187 TFEU for the implementation of institutionalised European partnerships referred to in Article 10(1), point (c), of the Horizon Europe Regulation. It determines their objectives and tasks, membership, organisation and other operating rules.
- The Regulation (EU, Euratom) 2024/2509⁴² of the European Parliament and of the Council of 23 September 2024 on the financial rules applicable to the general budget of the Union (recast), which entered into force on 30 September 2024, subject to any specific provisions of the Financial Rules of EU-Rail and the Single Basic Act.
- The Financial Rules of EU-Rail, adopted by the S2R JU Governing Board Decision N° 11/2019 of 20 December 2019⁴³ and entering into force on 1 January 2020, which continue to apply to EU-RAIL in accordance with the GB omnibus decision above referred.
- The EU-Rail Governing Board (GB) Decisions adopted since its establishment, which frame the functioning of EU-Rail, within the boundaries of the Single Basic Act and the EU-Rail Financial Rules, in particular the Europe's Rail Work Programme 2025-2026 and its amendments⁴⁴ approved by the GB (budget, Staff Establishment Plan, Scientific Priorities, calls for proposals, call for tenders, etc.). As indicated in the EU-Rail GB Rules of Procedure, once adopted, the GB decisions are published on the EU-Rail website⁴⁵.

³⁶ EU-Rail GB Decision no. 02/2021. The list of EU-RAIL GB decisions in force are available at: <https://rail-research.europa.eu/about-europes-rail/europes-rail-structure-of-governance/europes-rail-governing-board/>

³⁷ https://rail-research.europa.eu/wp-content/uploads/2021/12/GB-Decision_02-2021_Omnibus_Annex_list.pdf

³⁸ <https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/>

³⁹ The JU Financial Rules were included in the “GB omnibus decision”

⁴⁰ OJ L 427, 30.11.2021, p. 17–119.

⁴¹ OJ L 229, 18.9.2023, p. 55–62. Consolidated text available in <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02021R2085-20230921&qid=1710346003599>

⁴² OJ L 2024/2509, 26.9.2024.

⁴³ <https://rail-research.europa.eu/wp-content/uploads/2020/01/S2R-JU-Financial-Rules.pdf>

⁴⁴ <https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-annual-work-plan-and-budget/>

⁴⁵ <https://rail-research.europa.eu/about-europes-rail/europes-rail-structure-of-governance/europes-rail-governing-board/>

In addition:

- Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013⁴⁶. This regulation) establishes the policy and legal framework for European partnerships with private or public sector partners. European partnerships are a key element of the policy approach of Horizon Europe – the Framework Programme for Research and Innovation ('Horizon Europe').
- The Staff Regulations of officials and the conditions of employment of other servants of the European Union⁴⁷ are applicable to the staff of the JU.

Additional reference documents can be found on the JU's dedicated webpage:

<https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/>

⁴⁶ OJ L 170, 12.5.2021, p. 1–68. Current consolidated version: [01/03/2024](https://eur-lex.europa.eu/eli/reg/2021/695/2021-05-28/eng)

⁴⁷ [https://eur-lex.europa.eu/eli/reg/1962/31\(1\)/2014-05-01/eng](https://eur-lex.europa.eu/eli/reg/1962/31(1)/2014-05-01/eng)

2.3. Budgetary and financial management

STATEMENT OF REVENUE (in EUR)	Initial voted budget 2025		Amendment No 1		Amendment No 2 and budget as finally adopted (including credit operations)	
	Commitment appropriations	Payment appropriations	Commitment appropriations	Payment appropriations	Commitment appropriations	Payment appropriations
EU contribution (excluding EFTA and third countries contribution)	87.888.739	30.905.930	87.888.739	30.905.930	91.234.339	33.905.930
<i>of which (fresh C1) Administrative (Title 1&2)</i>	2.450.261	2.450.261	2.450.261	2.450.261	2.450.261	2.450.261
<i>of which frontloaded commitments (Title 1 and Title 2)</i>	0	0	0	0	0	0
<i>of which Operational (Title 3)</i>	85.438.478	28.455.669	85.438.478	28.455.669	85.438.478	28.455.669
<i>of which related to additional entrusted tasks</i>	0	0,00	0,00	0,00	3.345.600	3.000.000
EFTA and third countries contribution	12.083.607	10.516.580	12.083.607	10.516.580	12.083.607	10.516.580
<i>of which Administrative EFTA (Title 1&2)</i>	67.382	67.382	67.382	67.382	67.382	67.382
<i>of which Administrative third countries excluding EFTA (Title 1&2)</i>	0	0	0	0	0	0
<i>of which Operational EFTA (Title 3)</i>	2.349.558	782.531	2.349.558	782.531	2.349.558	782.531
<i>of which Operational third countries excluding EFTA (Title 3)⁴⁸</i>	9.666.667	9.666.667	9.666.667	9.666.667	9.666.667	9.666.667
Financial Members other than the Union contribution	2.537.000	2.537.000	2.537.000	2.537.000	2.537.000	2.537.000
<i>of which Administrative (Title 1&2)</i>	2.537.000	2.537.000	2.537.000	2.537.000	2.537.000	2.537.000
<i>of which Operational (Title 3)</i>	0	0	0	0	0	0
<i>Financial Contributing partners contribution</i>	0	0	0	0	0	0
<i>Interest generated</i>	0	0	0	0	0	0
Assigned Revenue	p.m.	p.m.	p.m.	p.m.	14.147⁴⁹	14.147
Unused appropriations from previous years	45.190.392	38.788.226	45.587.747	38.788.226	45.587.747	38.788.226
<i>Of which Administrative</i>	3.059.813	3.532.735	3.164.261	3.532.735	3.164.261	3.532.735
<i>Of which Operational</i>	42.130.579	35.255.491	42.423.485	35.255.491	42.423.485	35.255.491
TOTAL	147.699.737	82.747.736	148.097.092	82.747.736	151.456.839	85.761.882

⁴⁸ This amount represents the EARN/N credits (UK contribution) transferred by DG MOVE in 2025

⁴⁹ EUR 1 832 are recoveries from others in revenue/other staff expenditure in admin and EUR 12 314 are recoveries from S2R grants audits in revenue/operational expenditure

STATEMENT OF EXPENDITURE (in EUR)	Initial voted budget 2025	Amendment No 1	Amendment No 2 and budget as finally adopted (including credit operations)	Executed budget 2025	%	Available for future use (N+3 rule)
Commitment appropriations						
Title 1 - Staff expenditure	3.841.000,00	3.895.244,00	3.806.230,74	3.806.230,74	100%	-
Salaries & allowances	3.371.000,00	3.425.244,00	3.371.483,17	3.371.483,17	100%	-
Mission expenses	120.000,00	120.000,00	120.000,00	120.000,00	100%	-
Training	50.000,00	50.000,00	13.310,42	13.310,42	100%	-
Other Staff related expenditure	300.000,00	300.000,00	301.437,15	301.437,15	100%	-
Title 2 - Infrastructure and operating expenditure	1.313.643,00	1.457.852,00	1.548.697,41	1.548.697,41	100%	-
Rental of buildings and associated costs	378.000,00	378.000,00	371.299,00	371.299,00	100%	-
Information, communication technology and data processing	245.000,00	306.154,00	580.855,54	580.855,54	100%	-
Movable property and associated costs	10.000,00	20.000,00	5.000,00	5.000,00	100%	-
Current administrative expenditure	15.000,00	15.000,00	24.818,40	24.818,40	100%	-
Postage / Telecommunications	15.000,00	15.000,00	5.574,70	5.574,70	100%	-
Meeting expenses	-	36.000,00	40.664,00	40.664,00	100%	-
Running costs in connection with operational activities	110.000,00	124.700,00	86.482,45	86.482,45	100%	-
Information and publishing	350.000,00	452.998,00	324.003,32	324.003,32	100%	-
Other infrastructure and operating expenditure	190.643,00	110.000,00	110.000,00	110.000,00	100%	-
Title 4 - Operational expenditure EU-RAIL	97.354.702,00	139.878.187,98	143.236.102,46	143.223.788,02	100%	12.314,44
Title 5 - Unused appropriations not required in current year	45.190.392,00	2.865.808,00	2.865.808,00	-	0%	2.865.808,00
TOTAL	147.699.737,00	148.097.091,98	151.456.838,61	148.578.716,17	98%	2.878.122,44

STATEMENT OF EXPENDITURE (in EUR)	Initial voted budget 2025	Amendment No 1	Amendment No 2 and budget as finally adopted (including credit operations)	Executed budget 2025	%	Available for future use (N+3 rule)
Payment appropriations						
Title 1 - Staff expenditure	3.841.000,00	3.888.446,00	3.930.203,28	3.625.467,59	92%	304.735,69
Salaries & allowances	3.371.000,00	3.403.384,00	3.473.683,60	3.264.023,87	94%	209.659,73
Mission expenses	120.000,00	120.000,00	99.731,02	69.816,36	70%	29.914,66
Training	50.000,00	53.332,00	43.226,60	17.319,45	40%	25.907,15
Other Staff related expenditure	300.000,00	311.730,00	313.562,06	274.307,91	87%	39.254,15
Title 2 - Infrastructure and operating expenditure	1.313.643,00	2.154.209,00	2.114.283,78	1.962.010,05	93%	152.273,73
Rental of buildings and associated costs	378.000,00	733.240,00	754.646,43	714.152,91	95%	40.493,52
Information, communication technology and data processing	245.000,00	313.220,00	371.319,09	316.419,59	85%	54.899,50
Movable property and associated costs	10.000,00	20.000,00	4.909,26	409,26	8%	4.500,00
Current administrative expenditure	15.000,00	15.000,00	27.694,33	17.890,53	65%	9.803,80
Postage / Telecommunications	15.000,00	15.000,00	7.416,50	3.649,52	49%	3.766,98
Meeting expenses	-	35.524,00	18.214,76	17.443,27	96%	771,49
Running costs in connection with operational activities	110.000,00	297.793,00	352.514,20	328.460,15	93%	24.054,05
Information and publishing	350.000,00	408.647,00	261.784,21	261.173,82	100%	610,39
Other infrastructure and operating expenditure	190.643,00	315.785,00	315.785,00	302.411,00	96%	13.374,00
Title 4 - Operational expenditure EU-RAIL	38.804.867,00	67.517.388,00	67.529.702,45	62.218.659,74	92%	5.311.042,71
Title 5 - Unused appropriations not required in current year	38.788.226,00	9.187.693,00	12.187.692,92	-	0%	12.187.692,92
TOTAL	82.747.736,00	82.747.736,00	85.761.882,43	67.806.137,38	79%	17.955.745,05

At the year-end 2025, the JU has implemented 100% of its commitment appropriations made available in its active budget (Titles 1 to 4) and 98,1% for the total budget (Titles 1 to 5). The payment appropriations were implemented up to 92,2% (87,9% in 2024 and 85,2% in 2023) of the active funds (or 79,1% of implementation when compared to the full JU budget (including Title 5)). The Active budget relates to the Titles 1 to 4, while the Total budget includes the Title 5 of the Unused appropriations.

With the GB Decision 17/2024 of 21 November, the EU-Rail Governing Board adopted the initial Annual Work Programme and Budget for 2025.

There were two amendments adopted to this document during 2025 with budget impact.

- **Amendment number 1**

The Executive Director proposed to the Governing Board adaptation of the Budget as per following:

Statement of Revenue

Introduction of EUR 397.354,89 of unused commitment appropriations (EUR 292.906,8 from the operational part and EUR 104.448,09 from the administrative part of the Budget) stemming from decommitments made for the years 2022-2024.

Introduction of the Assigned Revenue fund source in the EU-RAIL Budget Structure with a pro-memoria (p.m.) reference.

Statement of Expenditure

Title I and II

Adaptation of the commitment and payment appropriations per line is proposed considering the evolution of budget needs identified during the first quarter. The amount of EUR 198.453 of commitment appropriations and EUR 888.012,5 of payment appropriations are transferred from unused administrative appropriations from the Budget Line 520 to various Budget Lines in titles I and II to cover the administrative needs of EU-RAIL for the current year.

Title III

Transfer of EUR 42.523.485,48 of operational unused commitment appropriations from the Budget Line 530 to the Budget line 400 to cover for the launch of the CALL-2025-02–2nd wave of Flagship area projects.

Transfer of EUR 28.712.521,3 of operational payment appropriations from the Budget Line 530 to the Budget line 400 to cover operational needs of the EU-RAIL for the current year.

- **Amendment number 2**

The Executive Director proposed to the Governing Board adaptation of the Budget as per following:

Statement of Revenue

Title III

The commitment appropriations for the operational budget are increased by EUR 3.345.600 following the signature of the Contribution Agreements MOVE/C4/SUB/2025-518 - "Pilot project — Bring sustainable transport up to speed with hyperloop" and FV_25_225#MOVE.C4#PO#4500119889 - Acceleration of System Pillar work on Rail Sector priorities. The payment appropriations for the operational budget are increased by EUR 3.000.000 following the expected receipt of the pre-financing for the Contribution Agreements MOVE/C4/SUB/2025-518.

Statement of Expenditure

Title I and II

Adaptation of the commitment and payment appropriations per line is proposed considering the evolution of budget needs. The amount of EUR 138.000 of commitment appropriations and EUR 226.221 of payment appropriations are transferred between the lines of the administrative titles.

Title III

The commitment appropriations for the operational budget are increased by EUR 3.345.600 following the signature of the Contribution Agreements MOVE/C4/SUB/2025-518 - "Pilot project — Bring sustainable transport up to speed with hyperloop" and FV_25_225#MOVE.C4#PO#4500119889 - Acceleration of System Pillar work on Rail Sector priorities.

Title V

The unused payment appropriations are increased by EUR 3.000.000 following the expected receipt of the pre-financing for the Contribution Agreements MOVE/C4/SUB/2025-518.

Implementation of the Budget

Administrative costs (Title 1 Staff Expenditure and Infrastructure and Title 2 Operating Expenditure)

Title 1 and Title 2 of the Budget were executed up to 100 % in commitment appropriations, demonstrating a reliable budgetary planning.

Title 1 – Staff Expenditure was mainly used for the salaries of the JU staff. During the year, the JU also made use of external support, to fill the gaps during the recruitment process on staff turnover and to cope with the important workload on JU activities.

Title 2 – the administrative expenditure was mainly used to ensure the JU activities

The implementation rate of the payment appropriations was 92.4% (87.7% in 2024), showing an increase in the implementation of payment appropriation in relation to the previous budgetary year.

Title 4 Operational Expenditure

Title 4 of the budget constitutes the JU's Operational Budget for the implementation of the new EU-Rail Programme activities.

The majority of the JU's budget falls under this category representing 95% of the overall budget in commitment appropriations and 79% in payment appropriations (including Title 5).

The budget category Title 4 covers the call for proposal of the JU 2025-01 for a total funding of EUR 3 million EUR, the first instalment of the call for proposals 2025-02 for a total of EUR 126.1 million (total call value EUR 148.2 million) and the call for proposals 2026-01 for a total of EUR 3 million. In addition to the call for proposals, the title covers the tenders for System Pillar activities and other tenders and studies.

The implementation rate of the operational budget in both commitment and payment appropriations was 100% (99.5% in 2024) and 92.2% respectively (87.9% in 2024).

The reported implementation also includes payments to the Expert Evaluators which is managed by the European Research Executive Agency (REA) Services.

Title 5 Unused appropriations not required in current Year

The amount included under Title 5 – Unused appropriations not required in current year has been established to support a transparent implementation of JU Financial Rules Art.6.5, the so called n+3 rule. In accordance with the Financial Rules and the general practice of the JU, these appropriations will be reactivated in the future year budget(s) of the following year and used first.

The 2025 as finally adopted budget presents EUR 2.8 million of unused administrative commitment appropriations, and EUR 12.2 million of unused administrative (EUR 2.5 million) and operational payment appropriations (EUR 6.7 million) that will be re-inscribed in revenue and expenditure in the following years.

2.4. Financial and in-kind contributions from Members other than the Union

As not all the contributions included in the Single Basic Act as funding options for the activities carried out on various programs, are reflected in the financial statements of the Joint Undertaking, the below information aims to provide a comprehensive overview of the funding for the on-going programmes used.

The information provided combines contributions validated and estimated in an effort to breach the timing gap in the validation of the cash and in-kind contributions. In addition to the information on cash and IKOP presented the notes related to the net assets and liabilities, the below overview also includes information on the IKAA contributions which are not presented in the financial statements.

Members' contributions						
Programme	EU cash ⁵⁰	Third Country Contributions (UK)	Private members cash	Private members IKOP	Private members IKAA	Total (e)=(a)+(b)+(c)+(d) + (e)
	(a)	(b)	(c)	(d)	(e)	
H2020	450.000.000,00		13.500.000,00	336.500.000,00	120.000.000,00	920.000.000,00
Horizon Europe	585.914.600,00	29.000.000,00	24.000.000,00	591.000.000,00 ⁵¹		1.229.914.600,00

Members contributions as of 31.12.2025									
Programme	EU cash validated	EU cash not validated (PF)	Private members cash validated	Private members IKOP validated	Private members IKOP estimated	Private members IKAA certified	Private members IKAA estimated	Total	Achievement rate
	H2020	450.000.000,00 ⁵²	0,00	13.500.017,03	362.138.533,10	0,00	267.618.770,86	0,00	1.093.257.320,99
Horizon Europe	280.575.095,52	24.776.816,16	10.952.063,10	31.554.489,38	99.721.063,71	206.201.101,74	42.902.510,06	696.683.139,67	57%

⁵⁰ The EU contribution for the Horizon Europe programme reflects the adjusted figure following the mid-term revision of the MFF, the financing decision for the AI Gigafactories and the individual contribution agreements signed between Europe's Rail JU and the EC.

⁵¹ The value of the Private members contribution to the Horizon Europe programme reflects the adjusted figure as per the GB decision 17/2023 on the commitment expressed by the private members to match a possible increase in the EU contribution following the association of the United Kingdom to the Horizon Europe programme.

⁵² The value of the EU cash for the Horizon 2020 programme includes also the EUR 52 million provided by the EU for the Lighthouse projects and approx. EUR 1.8 million of costs incurred before the financial autonomy of the Joint Undertaking.

Horizon 2020 programme

The information presented for Horizon 2020 represents the consolidated view over the financing of the programme during its full life cycle.

The financial operations for the programme were completed in 2024 and the information is presented only for a historical perspective.

Horizon Europe programme

The information presented for Horizon Europe includes the adjusted target for EU contributions, as amended through the MFF's mid-term revision and through the addition of third country contributions to the programme. The cumulative impact of these changes has led to an increase of EUR 15 million in EU funding towards Europe's Rail activities. The funding target for the Private Members has also been adjusted in the respective Letters of Commitments to match the EU contribution. Those have been reflected in the amended Multi-Annual Work Programme approved by the Europe's Rail Governing Board in June 2025⁵³.

After the mid-term revision of the MFF, the proposal made in 2025 to fund the implementation of AI Gigafactories in Europe has led to a foreseen decrease of Horizon Europe funding for Europe's Rail Joint Undertaking of EUR 4,13 million. Each decrease of EU commitment, has led to a revision of Europe's Rail implementing programme and to the application of mitigating measures, such as the decrease in its grant funding rate and a de-scaling of its other activities.

Independent of the decrease in funding, the Joint Undertaking has signed three individual contribution agreements with the European Commission for a total value of EUR 4,05 million, implementing additional activities not foreseen in the original Multi-Annual Work Programme.

The information presented for Horizon Europe is in line with the financing expectations from a programme that is approaching its maturity phase. The overall financing stands at 56% of the total foreseen EUR 1,23 million which is in line with the programme's implementation timeframe.

When looking at the adjusted contribution targets per member category, the total contribution of the Union stands at 50% against the EUR 615 million adjusted target and the Private Members' total contribution is estimated at 64% against the adjusted target of EUR 615 million. The EU validated cash shows an implementation of 46% of the total expected funding of 615 million for the programme. On the Private Members' side, the confirmed implementation stands at 40% when considering the validated cash and IKOP together with the certified IKAA. The comparable pace of validated contributions provided by the Union and the Private Members can be confirmed mainly following the timely certification process of the IKAA and IKOP contributions. At the same time, the comparable contributions indicate a robust management of the grant calls and IKAA planning.

2.4.1. Europe's Rail in-kind contributions

The in-kind contributions to operational activities received from the EU-Rail Private Members and certified in 2025 amount to EUR 29.572.917 bringing the total of in-kind contributions to operational activities to EUR 31.554.489. In-kind contributions to operational activities should be accounted for solely on the basis of eligible costs and should be reported and audited in accordance with the mechanism applicable to the specific grant agreement. Under Horizon Europe only validated and accepted contributions by the Executive Director can be recognised under net assets. Therefore, the same accounting treatment as used under the previous regulations is applied to IKOP under Horizon Europe.

Moreover, the in-kind contributions for additional activities that have been already certified for the years 2022 to 2025 is EUR 206.201.101,74. The status of the reported IKAA is in Annex 6.

Values of certified IKAA – Evolution (in EUR)
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⁵³ GB decision: https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_03-25_Revised_MAWP_final_MK-signed.pdf and Annex: https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_03-25_Revised_MAWP_EU-Rail_MAWP_v4_Clean.pdf.

Year	Amount of certified IKAA (in €)
2021	N/A
2022	31.956.950,37
2023	73.084.086,16
2024	76.862.719,10
2025	24.297.346,11
TOTAL since 2021	206.201.101,74

Cumulatively the EU-Rail private Members validated EUR 237.76 million of in-kind contributions, representing 40.23% of the planned amount of in-kind contributions for the EU-Rail Programme.

EU-Rail Member	Signed Membership Agreements			Planned contributions				Validated contributions			
	IKOP	IKAA	Total In-Kind	IKOP	IKAA	Total In-Kind	% of signed	IKOP	IKAA	Total In-Kind	% of planned
ACCIONA	550.000,00	478.500,00	1.028.500,00	-	165.624,00	165.624,00	16%	-	-	-	0%
ADIF	15.804.000,00	13.720.000,00	29.524.000,00	8.645.098,59	25.220.325,03	33.865.423,62	115%	1.988.641,59	8.590.045,91	10.578.687,50	31%
ALSTOM	19.583.000,00	17.019.000,00	36.602.000,00	10.218.831,16	20.446.320,00	30.665.151,16	84%	1.930.440,70	4.483.416,81	6.413.857,51	21%
AZD	7.987.000,00	6.933.000,00	14.920.000,00	3.239.596,34	2.944.818,92	6.184.415,26	41%	745.897,33	4.305.476,47	5.051.373,80	82%
CAF	16.539.000,00	14.378.000,00	30.917.000,00	7.959.726,67	6.879.191,30	14.838.917,97	48%	1.101.468,02	8.424.097,08	9.525.565,10	64%
CD	1.010.000,00	876.000,00	1.886.000,00	548.072,00	878.699,00	1.426.771,00	76%	30.870,00	708.457,10	739.327,10	52%
CEIT	5.951.000,00	5.184.000,00	11.135.000,00	2.666.498,30	4.815.000,00	7.481.498,30	67%	500.977,91	2.706.791,46	3.207.769,37	43%
DB	16.449.000,00	14.278.000,00	30.727.000,00	10.030.388,68	11.540.000,00	21.570.388,68	70%	886.332,53	15.001.087,77	15.887.420,30	74%
DLR	8.463.000,00	7.359.000,00	15.822.000,00	4.071.405,17	8.561.231,70	12.632.636,87	80%	991.036,91	-	991.036,91	8%
eSGR	6.135.000,00	5.348.000,00	11.483.000,00	2.837.021,74	4.960.285,28	7.797.307,02	68%	1.024.277,90	3.754.801,77	4.779.079,67	61%
Faiveley	13.907.000,00	12.074.500,00	25.981.500,00	7.704.549,40	6.211.000,00	13.915.549,40	54%	1.406.601,89	8.770.436,91	10.177.038,80	73%
FREQUENTIS	1.800.000,00	1.566.000,00	3.366.000,00	-	551.406,67	551.406,67	16%	-	-	-	0%
FSI	16.437.000,00	14.268.000,00	30.705.000,00	8.355.165,08	17.365.138,93	25.720.304,01	84%	1.576.464,14	6.819.438,67	8.395.902,81	33%
HITACHI	27.277.000,00	23.680.000,00	50.957.000,00	17.132.810,61	17.057.941,17	34.190.751,78	67%	5.233.752,28	10.088.387,36	15.322.139,64	45%
INDRA TALGO	15.593.000,00	13.564.000,00	29.157.000,00	7.128.352,79	11.445.034,77	18.573.387,56	64%	1.799.270,70	8.738.138,43	10.537.409,13	57%
IP	4.000.000,00	3.480.000,00	7.480.000,00	-	1.265.994,36	1.265.994,36	17%	-	-	-	0%
KB	10.679.000,00	9.310.000,00	19.989.000,00	5.977.599,39	8.407.241,34	14.384.840,73	72%	759.359,73	29.147.397,78	29.906.757,51	208%
KONTRON	300.000,00	261.000,00	561.000,00	-	9.624.766,00	9.624.766,00	1716%	-	-	-	0%
MER MEC	13.291.000,00	11.537.000,00	24.828.000,00	6.720.648,78	8.217.707,88	14.938.356,66	60%	1.379.017,49	9.306.992,18	10.686.009,67	72%
NRD	8.218.000,00	7.135.000,00	15.353.000,00	4.012.402,84	3.480.000,00	7.492.402,84	49%	793.247,84	1.769.868,88	2.563.116,72	34%
OBB	15.798.000,00	13.715.000,00	29.513.000,00	8.056.373,85	13.247.460,00	21.303.833,85	72%	767.676,76	7.168.023,45	7.935.700,21	37%
PKP	8.333.000,00	7.234.000,00	15.567.000,00	4.636.612,49	5.747.650,72	10.384.263,21	67%	1.345.961,11	-	1.345.961,11	13%
PRO RAIL	15.804.000,00	13.720.000,00	29.524.000,00	8.425.913,16	12.464.010,57	20.889.923,73	71%	1.400.354,39	2.189.000,00	3.589.354,39	17%
SIEMENS	19.818.000,00	17.230.000,00	37.048.000,00	10.617.910,46	13.130.000,00	23.747.910,46	64%	1.920.621,74	19.803.434,24	21.724.055,98	91%
SNCF	16.437.000,00	14.268.000,00	30.705.000,00	8.074.690,90	42.056.173,00	50.130.863,90	163%	1.371.489,51	33.975.752,68	35.347.242,19	71%
STRUKTON	5.369.000,00	4.677.000,00	10.046.000,00	2.376.396,76	2.750.000,00	5.126.396,76	51%	1.041.697,50	4.807.257,25	5.848.954,75	114%
TRV	13.955.000,00	20.113.000,00	34.068.000,00	7.810.135,29	16.919.096,40	24.729.231,69	73%	1.106.037,89	11.646.455,03	12.752.492,92	52%
Voestalpine	6.333.000,00	5.499.000,00	11.832.000,00	2.996.594,04	4.110.000,00	7.106.594,04	60%	452.993,50	3.996.344,51	4.449.338,01	63%
XLAB	900.000,00	783.000,00	1.683.000,00	-	412.911,45	412.911,45	25%	-	-	-	0%
Total	312.720.000,00	279.688.000,00	592.408.000,00	160.242.794,49	280.875.028,50	441.117.822,99	74%	31.554.489,38	206.201.101,74	237.755.591,12	54%

2.5. Administrative Procurement and contracts

In order to reach its objectives and adequately support its operations and infrastructures, the JU continued in 2025 to allocate funds by procuring the necessary services and supplies. In the interest of sound financial management the JU made, to the possible extent, use of Service Level Agreements (SLAs) with relevant Commission services and EU Agencies (such as in the field of ICT, training, payroll, mission, experts reimbursements, interim staff, etc.).

As it was the case since 2022, in 2025 EU-RAIL continue to provide services under the SLA for back office arrangements for the accounting services with other JUs (EU-RAIL as lead JU). EU-RAIL continued to participate in the SLA implementing the back office arrangements for human resources (Circular Bio-based Europe as lead JU), the SLA related to back office arrangements for procurement (Clean Aviation as lead JU) and the SLA related to back office arrangements for ICT (Clean Hydrogen and Innovative Health Initiative as co-leads JUs).

EU-Rail signed in 2025 new SLAs with European Commission services and EU Agencies, in order to benefit from additional services or to remove services that became obsolete.

In 2025 EU-RAIL continued to manage, as lead contracting authority, two inter-joint undertakings framework contracts:

- External Support to the Back Office Arrangement for the Joint Undertakings for Statutory Audit Services (Lot 1) and Accounting Services and Other Assurance Engagements (Lot 2)
- EU Data protection online central register

In 2025 EU-Rail continued to participate in inter-institutional framework contracts (e.g.: IT, audit, office furniture, insurance, human resources services) by signing Memoranda of Understanding. In particular, to ensure synergies between the JUs. In particular in 2025 EU-Rail continues to implement a Multiple Framework Service Contract in cascade (4 lots) for communication services between Clean Aviation (lead JU), SESAR and EU-Rail Undertakings. As indicated in section 1.4.2, EU-Rail continues to implement its framework contract for services supporting programme management and legal assistance. With this regard, in order to ensure synergies between the JUs, EU-Rail acting as the sole contracting authority, managed, signed and implemented specific contracts for other JUs. This was preceded by signing of the SLA with the JUs concerned. The approach was validated by the European Court of Auditors during the Audit of the annual accounts of the EU-Rail concerning the financial year 2022 and EU-Rail complied with the transparency requirements by publishing such specific contracts in the EU-Rail recipients of funds.

No negotiated procedure without prior publication of a contract notice were launched or awarded in 2025.

Where SLAs or FWCs were not available for specific services or supplies, the JU resorted to middle and low-value contracts. As indicated in the Amended Work Programme 2025, in 2025 EU-Rail launched several very-low value procedures (i.e.: below EUR 15.000) for e.g.: team building and trainings, subscriptions to journals and periodicals, catering services.

As indicated in section 1.3.2 (Operational tenders and contracts) EU-RAIL The EU-Rail recipients of Funds and Annual List of Specific Contracts for 2025 were published at <https://rail-research.europa.eu/participate/recipients-eu-rail-funds/>.

In 2025 EU-RAIL continue to apply the European Commission public procurement rules and guidance (e.g.: Public Procurement Vademecum, DG BUDG templates). Procurement is part of the EU-RAIL control framework (ICF) and the internal control indicators, which are reviewed in an annual basis. For the lesson learnt, the procurement process is regularly discussed and constantly improved at Unit level and revised workflows decided with the Executive Director. In addition to the confirmation of the Chief Legal Officer as Acting Head of Corporate Services and Delegation of powers as Authorising Officer by Delegation in accordance with the EU-RAIL deputising rules – due to the long absence of the Head of Corporate Services, no changes were introduced in 2025 nor in the EU-RAIL Manual of Financial Procedures⁵⁴ neither in the EU-RAIL document management policy⁵⁵.

⁵⁴ https://railresearch.europa.eu/wpcontent/uploads/2024/01/EURAIL_Manualoffinancialprocedures_v2.1_clean.pdf

⁵⁵ https://rail-research.europa.eu/wp-content/uploads/2022/12/EU-Rail_DMP_20221206_final_clean.pdf

In 2025, for open procedures, the JU continued publishing them on the Funding and Tenders Opportunities portal (F&T)⁵⁶ with a link to EU-RAIL web site⁵⁷ and allowing the tender's submission exclusively via the electronic submission system (eSubmission) available from the F&T Portal. In the context of the eProcurement strategy, in 2022 EU-Rail started the on-boarding process of the Public Procurement Management Tool (PPMT), the tool that will replace TED e-notices and e-tendering. The on-boarding process finalised in April 2023. Open tender procedures that EU-Rail launched in 2025 were published using the PPMT tool. EU-RAIL aims at fully on-boarding in 2026 on e-contracting /e-procurement where contract management will be standardised using the European Commission tools and workflows.

During 2025 several guidance documents and templates for procurement procedures continued to be updated by the Chief Legal Officer (i.e.: calendar, tender specifications, opening and evaluation of tenders, award procedures for low value contracts, etc.) to adapt them to JU needs and to the DG BUDG recommendations, in particular to the e-submission and PPMT procedures. In addition, the register of framework contracts, SLAs and Memoranda of Understanding has been regularly updated to ensure a proper follow-up of the SLAs and FWCs in force.

In 2025, the register of procurement contracts built from ABAC legal commitment (LCK) continued to be updated. The "e-contract register" contains records of all JU's legal commitments (i.e.: "procurement contracts and grant agreements") and thus serves also as the source of data for publication of the "EU-Rail Annual Recipient of Funds, including all specific contracts implementing framework contracts" information on its website. The register also allows the monitoring of the JU's consumption of framework contracts. In 2025 EU-RAIL started the process to review the financial workflows in order to be aligned with SUMMA, the new EU-RAIL financial management tool.

2.6. IT and logistics

The JU's focus was on the core activities: since its creation, the JU has been one of the most active promoters of a single approach for all the JUs to the ICT environment, reducing costs, outsourcing, and increasing performance. In this respect:

a. Use of European Commission applications and framework contracts

The JU has implemented common ICT tools designed and made available by the EC for the financial and call management. These tools are updated and maintained on regular basis by the EC; they require continuous input from the side of the JU, on the one hand, to correct the multiple and repetitive mistakes and, on the other hand, in terms of future developments to meet the expectations of the partnership. The follow-up of these processes absorbs multiple resources of the JU. In order to ensure the correct usage and implementation of these applications, JU makes use of the training services offered by the EC on these applications. For the execution of the calls for proposals, the IT systems were used throughout the entire process: for the publication of the call, for the submission and evaluation of the proposals as well as for grant preparation. The EC IT systems "e-submission/e-tendering" have also been used since 2020 by the JU for operational tender procedures.

In addition to the extended use of the Commission financial applications, the JU adopted the EC's ICT systems for HR (Sysper) and daily document management (ARES) to leverage the EC's proven working technology solutions already in place, but also to streamline and further harmonize the processes, workflows, procedures of record management, document archiving and electronic document cataloguing, secure storage and document access. The JU continued to make use of the Commission's ICT framework contracts to procure all ICT services required to run its activities.

b. Use of European Agencies' framework contracts, including with or on behalf of other JUs

In addition, EU-Rail participates to the joint strategic ICT plan of the JUs located in the White Atrium building. Since 2018, EU-Rail shares its virtual IT infrastructure that is hosted by a cloud computing provider

⁵⁶ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home>

⁵⁷ <https://rail-research.europa.eu/participate/procurement/ongoing-calls-for-tender>

and also shares the ICT managed services performed by a private company, in synergy with the other JUs. In 2020, the connectivity to the EC tools has also been migrated to this private cloud, which provides a full mobility and independence from the EU-Rail premises, and which proved to be very efficient during the Covid-19 pandemic. In 2024, the connectivity to the EC tools was transferred to DIGIT as broker, now providing the connectivity as a service. As per the Regulation 2023/2841 on Cybersecurity that entered into force on 07/01/2024, EU-RAIL appointed a Local Cybersecurity Officer (LCO) reporting directly to the Executive Director to communicate with the Interinstitutional Cybersecurity Board (IICB). All deliverables were provided on time as per the Regulation 2023/2841 on Cybersecurity, including an IT cybersecurity plan that defines actions covering all systems, to increase the cybersecurity posture of the JU and reach a high common level of cybersecurity within the EU institutions.

2.7. Human Resources

2.7.1. HR Management

In 2025, one new Staff Implementing Rule (SIR) was adopted on 02 December 2025, namely the Application by analogy of Commission Decision C(2025) 2495 of 13 May 2025 on the general provisions for implementing Articles 11, 12 and 13 of Annex VII to the Staff Regulations of Officials and on authorised travel.

In line with the Establishment Plan, recruitment procedures were launched and finalized as needed in order to recruit and replace departing statutory staff. At the end of the year, 31 EU-Rail position were covered with staff members including 2 Seconded National Expert (SNE). The occupational rate for statutory staff was de facto 97%. The recruitment of one CA FG IV initially launched as internal mobility for a Budget officer is still ongoing at the end of 2025.

In total, three new Reserve Lists were established within two months from application closing deadline for the posts of Assistants CA FGIII, Communications and Ex-Post Audit Officer TA AD5, as well as System Pillar Programme Manager CA FGIV. In 2025, four recruitment procedures were launched for the following positions and the first 3 finalised with a recruitment by the time of the adoption of this report:

Title	Contract type	Grade
Assistant (2 posts)	CA	FGIII
Communication and Ex-post Audit Officer	TA	AD5
System Pillar Programme manager	CA	FGIV
Budget officer (internal mobility)	CA	FGIV

Additionally, a selection process for a Financial Verifying Agent CA FGIV post was launched within the framework of the Governing Board Decision N. 07/2019⁵⁸, which introduced the possibility for contract staff to advance to the next function group by taking part in a general selection procedure organised by the Appointing Authority (commonly known as "Article 10 procedure"). This selection recognized the evolving functional requirements that justify the reclassification of a Contract Agent post to a higher function group, reflecting a change in the complexity, responsibility, and scope of the duties assigned to that post.

Through a SLA with Global Health EDCTP3 JU, EU-Rail ensured that the role of the EU-Rail Local Cybersecurity Officer is covered by a EU-staff (from Global Health EDCTP3 JU).

In addition to statutory staff members and the SNEs already in place, EU-Rail made recourse on total of 3.7 FTE as Interim Staff throughout 2025, due to vacant posts and other leaves. The higher than foreseen interim percentage was mainly due to vacancies temporarily filled by interims, which helped ensure business continuity until the recruitment process was ongoing and completed. Similarly to previous year,

⁵⁸[GB Decision 07-BIS-2019_CA.pdf](#)

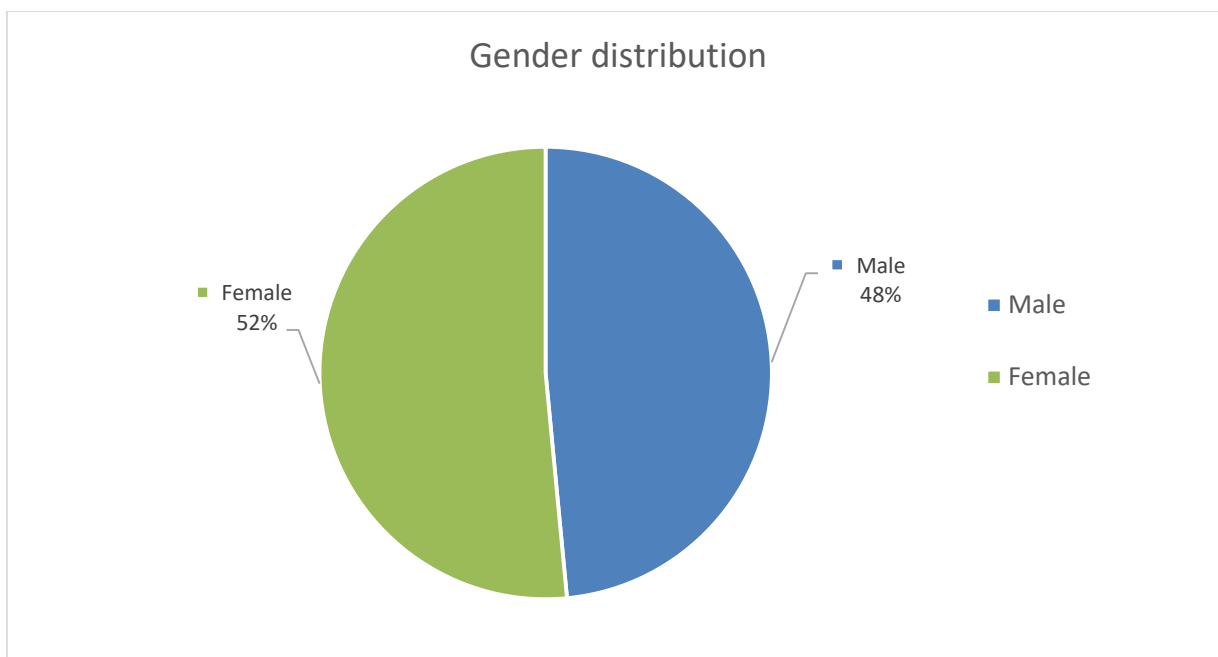
EU-RAIL made use of the European Commission’s Bluebook scheme to hire trainees. Further details on the staffing are provided in the Staff Establishment Plan in Annex 2.

In addition to recruitment activities, the EU-Rail HR Officer ensured the conduct of the day-to-day personnel-related administration not covered by the Commission central services and continued to ensure improvement of all HR processes and to develop its internal guidelines, policies, and legal framework, paying particular attention to how EU Staff Regulations’ Implementing Rules shall apply to the JU’s particularities (in accordance with Article 110 of the EU Staff Regulations). Monthly HR reports were created to ensure transparency, traceability, and availability of historical HR data. Annual appraisal and reclassification exercises were set up by HR within the limits of the Staff Establishment Plan and the EU-RAIL Financial Rules.

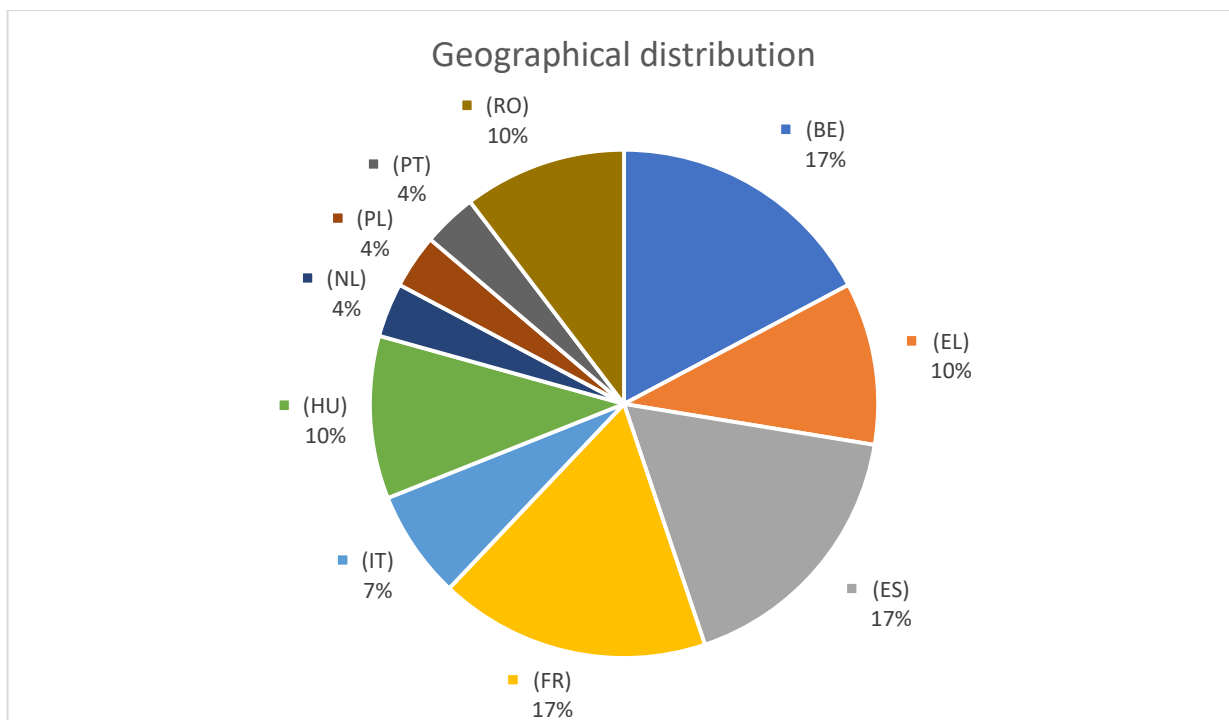
In line with the applicable Decision on working time and hybrid working, EU-Rail ensured on a continuous basis a good working environment and team spirit. For this purpose, social events and team building activities were proposed on a regular basis. In-house trainings/info sessions were also developed and proposed to staff with regard to HR-related aspects. Synergies with other JUs were exploited in terms of training, with colleagues participating in trainings dedicated to Ethics and Integrity and to Prevention and Detection of Fraud.

Acknowledging the new reality of the widespread hybrid working arrangements, a new revised public transportation lumpsum contribution scheme was introduced. The aim of this scheme is to reduce administrative burden by a simplified and transparent scheme that ensures fair and consistent treatment of staff, and reflects the current working reality. By offering a lump-sum contribution for public transport commuting combined with for teleworking-related expenses—depending on the staff member’s work pattern—this scheme supports both sustainability and work-life balance in a practical and cost-effective manner.

In 2025, the gender representation in the JU was as follows:



The geographical balance as of 31 December 2025 was as below:



2.7.2. Efficiency gains and synergies

In 2025, the JU's challenge was to continue in the successful and smooth transition towards the new EU-Rail Programme.

From the HR perspective, EU-RAIL is committed to ensuring the well-being of staff and that every staff member reaches their full potential. Trainings were strongly encouraged, and staff events were organised on regular basis in order to reinforce the cohesion of the team, the staff engagement and motivation.

In 2025, the JU defined priorities among these topics and continue the implementation of an action plan and indicative timeline for each one of them. In order to ensure synergies and efficiencies are exploited, the EU-RAIL HR ensured close collaboration with the Network of JUs' HR officers. In detail, EU-RAIL optimised synergies and efficiency gains by sharing reserve lists to shorten time to recruit, providing expertise and resources for selection procedures of other JUs and contributing to the development of a common legal framework among JUs by sharing ED and GB decisions on diverse regulatory topics.

In terms of operational efficiencies, EU-Rail was the first body of the Union together with the Commission to introduce since 2018 the Lump Sum form of granting. Based on the experience acquired and in line with the overall targets of Horizon Europe, the lump sum approach is the primary implementation way of the Programme. This will provide opportunities to focus the resources on added value functions, in particular on the cost effectiveness of the projects towards achieving the EU-Rail Programme results.

In terms of synergies and collaboration with the other Joint Undertakings, the Single Basic Act⁵⁹ establishes that the JUs shall achieve synergies via the establishment of back office arrangements (BOA), operating in some identified areas and by concluding service level agreements (SLAs). The SBA also underlines that these synergies should be implemented where screening of resources has proved to be efficient and cost-effective, while respecting the autonomy and the responsibility of each Authorising Officer.

In order to obtain an independent view on the possible synergies among the JUs and the impact in terms of efficiencies, the JUs contracted an external consultant to perform a study on BOA. The study was finalised in July 2022 and the JUs identified and decided to implement from 2022 and 2023 the preferred model for the back office arrangements considering a setup with one JU taking the lead dealing in coordinating tasks with one backup JU, organising the work among staff of several JUs and having a clear

⁵⁹ Article 13, Council Regulation (EU) No 2021/2085, of 19 November 2021

scope and decision-making power, as was used in BOA for the provision of accounting services (following DG BUDG decision to terminate the respective contract with the JUs).

For some synergies, a more flexible option was chosen, with collaboration involving only some JUs, while remaining open for the others to join at a later stage.

The preparation work led to establishment of coordinated plans, prioritising those aspects of the BOA that had the objective to bring most value in the short term. These included, as top priorities, (i) the accounting function (ii) IT deployment (iii) joint procurement opportunities and (iv) HR support. These topics encompass 4 of the 7 synergies as per SBA Article 13. This approach was endorsed by the respective JUs Governing Boards.

When these arrangements were presented, the respective JUs Governing Boards stressed the need to have a balanced approach to the BOA implementation ensuring, as a priority, the execution of JUs’ core businesses (ensuring budget execution and call implementation) which is very challenging in the context of a new programme with new legislation, new actors and ambitious timelines due to the delayed launch of the Horizon Europe programme.

The BOA that were put in place between 2022 and 2025, or submitted for proposal for implementation, were:

AREA	CONTENT	LEAD JU
<i>Accounting</i>	Accounting services	EU RAIL JU
<i>ICT</i>	ICT services	Clean Hydrogen JU
<i>HR</i>	Common Recruitment, HR Legal framework and HR digitalisation	CBE JU
<i>Legal</i>	Administrative procurements	Clean Aviation JU

In detail, those BOA were put in place or submitted for proposal through the following action plans:

BOA for Accounting Services

The JUs took over the Accounting services that until 30 November 2022 were provided by DG BUDG and succeeded in implementing the BOA for Accounting Services in 2022, and immediately for the accounting closure 2022.

EU-Rail is the lead JU of this BOA and concluded the SLA with the other JUs on 16 December 2022. Accounting services will be provided by 3 Accounting Officers coming from the following JUs: CA JU, SESAR JU and EU-Rail.

Organisation:

- The Executive Director of the Lead JU is responsible for the organization, oversight and coordination of the accounting services to the other JUs on the basis of an annexe of the BOA SLA.
- The Head of Corporate Services or another officer with the necessary grade, skills and competencies of the Lead JU shall act as Accounting Coordinator of the BOA Accounting Officers.

- The Accounting Officer(s) of the JU Accounting Providers delivers the service to one or more JU Accounting Beneficiary and is responsible for the accounts she/he signs off, while counting on the support and coordination with the lead JU.

In order to ensure the provision of these services, it was agreed between the EC and the JUs to make use of the support of 3 additional Contractual Agents and of an external Accounting Services provider.

The BOA for Accounting services are fully operational and are delivering the intended services, including the preparation of the Provisional and Final Annual Accounts for 10 Joint Undertakings and liaising with the audit teams on accounting matters, the follow-up on the collection of Accounts Receivable past the due date, the VAT reporting towards the Belgian authorities, the annual validation of the accounting system, the inscription of the budget etc.

During 2025, BOA Accounting continued to ensure the business continuity of its services and prepared the provisional accounts for the 10 JUs in a timely manner. The external auditors have issued clean opinions for all 10 JUs for the 2025 provisional annual accounts.

During 2025, the BOA accounting has also provided support for the migration to the new accounting system, SUMMA, from 1st of January 2026 as well as on request ad-hoc support on various accounting and financial matters.

As of January 2025, the BOA team is composed of 3 Accounting Officers supported by 3 Accounting Assistants.

BOA HR

The BOA HR implements actions in three main areas of HR Support: recruitment, HR legal framework and HR digitisation. Its objectives are to maximise synergy among the JU's, harmonise procedures by valorising best practices, ensure coherent HR support services, achieve efficiencies and economies of scale and increase the negotiation power of JU's operating under the SBA with contractors and service providers.

The signature of the SLA, under the lead of CBE JU, took place on 03/04/2024.

In 2025, the Joint Undertakings have continued to optimize their synergies and implemented several initiatives in the above-mentioned areas.

In line with the HR BOA Action Plan 2025, the JUs have:

- finalised the alignment and harmonisation of the selection and recruitment practices across all JUs;
- conducted a state-of-play analysis of the inter-JU Competency Framework, which will be further developed in 2026;
- launched a pilot initiative establishing common Service Level Agreements (SLAs) between DG HR and the JUs for the provision of badges;
- strengthened cooperation by organising an HR Officers' Away Day to share best practices and enhance collaboration;
- shared reserve lists to reduce time-to-recruit and provided expertise and resources by contributing as panel members to several selection procedures across JUs;
- supported newly established JUs by providing guidance, advice, and templates;
- centralised the organisation of training courses of common interest for all JUs (e.g. ethics and integrity, respect and dignity in the workplace, first-aid trainings);
- joined the Standing Working Party as part of a dedicated JU cluster to facilitate effective participation of the JUs;
- contributed to the development of a common JU HR legal framework by sharing Executive Director and Governing Board decisions on various HR regulatory matters;
- Finalised the selection of new Confidential Counsellors to reinforce the existing network.

The JUs, as interinstitutional partners, have also attended meetings held by the European Commission on the HR transformation programme aiming at setting up a new IT platform to replace SYSPER. The JUs will further strengthen this collaboration in 2026.

BOA ICT

ICT activities were carried out in accordance with the priorities set forth in the BOA ICT AWP and common services, namely:

- Service area #1 Inter-JU IT Governance,
- Service area #2 Management of shared ICT infrastructure and Service area #4 Workplace services provision,
- Service area #5 Security and compliance management;

In 2025, in continuation of the practice over the previous years, the JUs held 4 ICT Steering Committee meetings, during which:

- The implementation of the common ICT annual work plan and budget for 2025 (AWP 2025) was monitored
- The common ICT annual work plan and budget for 2026 (AWP 2026) was defined, with an early adoption during the meeting of September 2025.

The AWP 2025 contains the following 7 actions and related budget:

- Action 1. BOA ICT implementation
- Action 2. Next FWC for ICT Managed services
- Action 3. Upgrade Common Meeting
- Action 4. Internet line provider
- Action 5 Security regulation(s)
- Action 6. SaaS O365
- Action 7. Windows 11 migration
- Action 8. reconversion White Atrium building

The actions of the AWP 2025 were implemented in accordance with the plan. Particular effort was devoted to the cybersecurity action plan, implemented in full accordance with the timeline defined in Regulation 2023/2841 of the European Parliament and of the Council laying down measures for a high common level of cybersecurity at the institutions, bodies, offices and agencies of the Union. This resulted in the delivery of the 4 mandatory document according to the cybersecurity regulation :

- cybersecurity review
- risk assessment
- maturity assessment
- cybersecurity plan

In the context of the BOA ICT, EU-RAIL, together with Global Health EDCTP3 JU, runs a pilot with the objective to assess the possibility to further externalize part of the ICT tasks. This pilot exercise will be used to identify efficiency gains that could include savings from new ways of working with a potential implementation of such services for all the JUs in the coming years.

BOA Procurement

This BOA has been established with the objective of centralising administrative procurement capability and process to maximise open tenders for award of inter-JUs FWCs and middle value negotiated procedures.

On this basis a Service Level Agreement was drafted by the BOA Procurement Coordinator (CA JU) and concluded on 8 November 2023. EU-Rail, as back-up JU, continued to actively participate in 2025 in the implementation of this SLA. The concept is supported by a bi-annual Joint Public Procurement Planning reflecting the common needs identified by the Parties and endorsed by the BOA procurement Steering Committee. The focus is on the critical joint administrative procurement such as ICT, building management/corporate services and common support services that will be identified and agreed via joint Public Procurement Planning (PPP).

The 2025 activities of BOA Procurement were not limited to the execution of the tender procedures. They also included a feasibility analysis of how the corporate E-Procurement tools provided by DIGIT could support JUs current operational and implementation model in relation to joint specific contracts.

BOA Facility Management

In the previous years, the activities related to the White Atrium building facility management were carried out through informal arrangements by a single JU (Clean Hydrogen JU until 2024 and Chips JU afterwards). During 2025, in order to regularise the situation and in line with Article 13 of the Single Basic Act, a BOA Facility Management (to be led by the Chips JU for the first term) has been proposed. The BOA Facility Management concept note was shared, at the end of 2025, with the Executive Directors of the JUs having their seat at the White Atrium building in Brussels. The note is expected to be adopted in the first half of 2026, and the signature of the SLA with the specific services provided by this BOA will follow.

3. GOVERNANCE

3.1. Major developments

With the Europe's Rail Joint Undertaking going live after the SBA came into force, several new elements with regard to the organisation and governance of the JU were implemented, reflecting the design of the new EU-Rail Programme built around the two Pillars (the System Pillar and the Innovation Pillar) reinforced by a High-level Deployment Group (DpG) set up in 2024 and officialised in 2025, and including the integration/adaptation of the European DAC Delivery programme in the new structure. The Governing Board Decision n° 17/2024 on the Work Programme 2025-2026 (adopted at the Governing Board meeting of 21 November 2024) included a new EU-Rail organisation structure in force since 1 of January 2025 (see Annex 1).

Further details on EU-Rail's current governance and organisation are available by means of its [Governance and Process Handbook](#).

3.2. Phasing-out Plan monitoring

EU-Rail adopted in November 2024 by means of the respective GB Decision⁶⁰ its revised Phasing-out Plan reflecting on the fact that the Joint Undertaking is set up as a Union body for a period ending on 31 December 2031 and financed under the EU multiannual financial framework 2021-2027. EU-Rail phasing-out plan includes the administrative and operational adaptations needed for a 'winding-up procedure', and the necessary steps, including procedural and process aspects, to complete the phasing-out of the Joint Undertaking from Horizon Europe funding. In accordance with Governing Board Decision N°14/2023⁶¹, the other elements of the phasing-out plan related to short and long-terms targets, strategic alignment, and the future financial stability should be further completed during 2024. The revised Phasing-out Plan included those elements.

EU-Rail has closely follow-up and actively contribute to the discussions among the relevant stakeholders regarding the future of the EU partnerships in the area of Research and Innovation and their possible extension for the next EU multiannual financial framework, leading to the publication of the draft high-level paper and will continue in 2025.

Additionally, a High-Level Paper on "A Future Policy-Based Public-Private Partnership for Rail" was approved by the Governing Board in June 2025, and associated annexes describing potential Flagship Initiatives was approved in December 2025. Together these documents outline the activities that could be supported in a third rail Joint Undertaking to support European rail systems become more agile, resilient, and competitive.

The Flagship Initiatives are

- the European Simplified and Integrated Railway System (ESIRS) – is an initiative for increased Europe's railway competitiveness and lowering European rail system costs through automation, cutting-edge technology and harmonized operations. This based on simplification/standardisation and improvement of Command-Control and Signalling Systems, Capacity and Traffic Management Systems, digital infrastructure information systems, systems for digital operational communications and unified data management solutions and related processes, aiming at optimum system cost-effectiveness and efficiency. This initiative directly addresses upgradability and scalability through secure modular systems and simplified certification and to harmonised approaches or adaptors solutions towards legacy systems, resilience by design and through harmonized cybersecurity frameworks, and competitiveness through cost reduction and industrial leadership.
- the Next-Generation Rail Freight Operations with European Digital solutions – is an initiative for transforming Europe's rail freight operations and making rail freight transportation more competitive. For this purpose, a comprehensive plan is needed to favour a competitive European rail freight through automated processes, digital coupling with advanced communication systems technologies, and intelligent capacity management. Transition pathways are developed jointly, to identify the actions needed to achieve the twin greening and digital transitions for logistics with rail with proper solutions' cost effectiveness and efficiency. This initiative enhances competitiveness of rail freight accelerating modal shift, supports quick adaptability to demand through dynamic freight planning, and strengthens resilience through multimodal integration and strategic logistics capabilities.
- The third flagship initiative - Resilient Railway (Re²Rail) – is an initiative addressing the fundamental challenge of maintaining reliable, secure rail operations under increasingly complex and unpredictable disruption scenarios. Climate change (floods, heavy storms or landslides), cybersecurity threats, geopolitical tensions, and system interdependencies create vulnerability patterns that demand integrated resilience strategies built into the core architecture of European railway systems while enabling seamless civilian-military interoperability and logistics (dual-use) when required. This initiative addresses the entire system with a focus in the area of automation, digitalization and control command (on-board and trackside), but as well design and maintenance of infrastructures and rolling stock in order to create a system which is resilient and recoverable. This flagship directly delivers resilience through climate adaptation and cybersecurity, supports agility through adaptive systems, and enhances competitiveness through dual-use infrastructure optimization.
- The fourth flagship initiative - Innovative EU High-Speed Rail Corridors – is an initiative unifying the innovation, deployment, and operation of next-generation high-speed systems within a harmonised European architecture. It ensures unmatched interoperability across borders. The initiative will pioneer harmonised pre-deployment corridors serving as early implementation pilots for pan-European high-speed expansion. These corridors will validate new rolling stock and infrastructure technologies, including ETCS L2-only operations, predictive maintenance, and EU traffic management under real conditions, ensuring safe, reliable, and cost-effective scaling. This flagship directly delivers competitiveness through cost reduction, energy efficiency, and industrial technological sovereignty; enhances service quality through reliability improvements and multimodal integration; and strengthens resilience through climate-adaptive infrastructure, cybersecurity, territorial inclusion, and strategic autonomy in critical high-speed technologies.

3.3. Governing Board

In accordance with the Single Basic Act, the Europe's Rail Governing Board (GB) continued its work steering the Joint Undertaking through the adoption of decisions to be implemented and executed by the Executive Director. Three ordinary and two extraordinary meetings of the Governing Board were convened in 2025. These GB meetings dealt with both operational and administrative aspects.

The 15th GB meeting was held on 5 February 2025 and served to approve the list of Associated Members with the potential to contribute to the achievement of the objectives of EU-Rail. There was also a detailed discussion on the future of rail research from EU-Rail.

The 16th GB meeting was held on 24 June 2025, adopting decisions on: 1) the Amendment n°1 of EU-Rail Work Programme 2025-2026; 2) the Revised Multi-Annual Work Programme; 3) the Final Accounts for 2024; 4) the Final Accounts for 2024; the High-Level Paper on a future policy based public private partnership for rail; 5) and the award of call for proposal 2025-01. The new Associated Members joined a GB meeting for the first time. The GB Members had the opportunity to exchange views on the topic "Rail high-speed technologies innovation".

The 17th GB meeting was held on 2 December 2025. The following decisions were taken: 1) Amendment n°2 of EU-Rail Work Programme 2025-2026; 2) EU-Rail Work Programme 2026; 3) Annex of the High-Level Paper on a future policy based public private partnership for rail; and 4) on the application by analogy of Commission Decision C(2025) 2495 of 13 May 2013 on the general provisions for implementing Articles 11, 12 and 13 of Annex VI to the Staff Regulation of officials and on authorised travel. The EC representatives updated members on the latest policy developments, such as the presentation of the Transport Package, Military Mobility Package, and upcoming revision of the EU Regulation on Rail Infrastructure Capacity Management, as well as on the on-going negotiations of the next EU budget. The topic for content discussion was devoted to the principles of data interoperability.

The Executive Director regularly provided at each GB meeting with an update on the different activities ongoing, in particular on the System and Innovation Pillars, the Deployment Group and the DAC Delivery Programme and overall Programme status, as well as the foreseen calls for proposals/tenders. He also informed the GB Members regularly of the main communication and dissemination activities held prior to each meeting, as well as of those planned in the next months.

In every GB meeting, the ED referred to the deliberations and opinions and scientific advice provided by the advisory bodies SRG and SSG, respectively, during the year.

The third General Assembly was organised on 2-3 December 2025. According to Article 93.5 of the SBA, the GB shall meet once a year in a General Assembly and all participants to the research and innovation activities of EU-Rail shall be invited to attend. The first day was dedicated to EU-Rail's strategic reports, where DG MOVE confirmed its commitment to support the preparation of a next Joint Undertaking and all private Members reaffirmed their engagement in the future of the JU, confirming a shared ambition and long-term alignment across the Partnership. The second day, organised as a public online event, gathered over 100 participants from across the sector for operational reports covering the System Pillar, Innovation Pillar, Deployment Group and the European DAC Delivery Programme (EDDP), confirming that the programme is on track and delivering on its objectives.

3.4. Executive Director

According to the Article 19 of the SBA the Executive Director (ED) is the Chief Executive Officer responsible for the day-to-day management of the JU in accordance with the decisions of the GB. The ED is the legal representative of the Joint Undertaking, accountable to the GB. He is supported in performing his duties by the Head of Corporate Services, Head of System Pillar Communication and Outreach, Head of Innovation Pillar and all JU staff organized in the Programme Office.

In 2025, the Executive Director continued to make use of the dedicated advisory body - the ED System and Innovation Programme Board (ED-SIPB). The SIPB provides advice and support to the ED, focusing on strategic exchanges, on the Innovation and System Pillars, on Deployment Group activities and also on their evolution, interdependencies as well as strategic guidance and recommendations on the management of integrated Programme and its progress.

Mr Giorgio Travaini was appointed by the EU-Rail Governing Board⁶² as Executive Director of Europe's Rail Joint Undertaking on 22 May 2024 for a period of four years, that can be renewed. Before this posting, Mr Travaini served as Executive Director ad interim and acting Executive Director as well as Head of Programme of Europe's Rail and Head of Research and Innovation in the predecessor programme Shift2Rail since 2015.

⁶² https://rail-research.europa.eu/wp-content/uploads/2024/05/GB-Decision_07-24_Appointment-ED.pdf

3.5. States' Representatives Group (SRG)

The SRG worked in 2025 as an advisory body to the JU GB composed by 29 countries which nominated at the end of 2025 70 representatives.

During 2025, the SRG held three regular meetings and one extraordinary meeting. In each of them participants were informed in detail by the ED about the ongoing and planned activities of the JU and overall status of the Programme. SRG Members were regularly updated on the developments in the System and Innovation Pillars, the European DAC delivery programme, Deployment Group setting-up, the implementation of the calls for proposals and the communication and dissemination activities of EU-Rail.

The first regular meeting of the SRG was held on the day after, 19 February 2025, included two presentations on 1) the FP5 and EDDP activities and 2) EGNOS application to rail and EU-Rail cooperation with EUSPA and ESA. In addition, the ED informed members on the status of the GB decision regarding the enlargement of the JU membership with new associated members as a result of the call for expression of interest of the previous year.

During the SRG meeting of 14 May 2025, the SRG members provided positive opinions on the following documents: 1) draft Consolidated Annual Activity Report for 2024; 2) draft Amendment n°1 of EU-Rail Work Programme 2025-2026; 3) draft Revised EU-Rail Multi-Annual Work Programme; and draft High-Level paper on a future policy based public private partnership for rail, after integrating the proposals made by the SRG. In this meeting, the SRG Chair was re-elected by consensus for a new mandate of two years.

The last meeting of the year was held on 22 October 2025 and served to present SRG Members the outcome of the first call for proposals of the year with the topic *HORIZON-JU-ER-2025-FA7-01: Further Technological Development of Maglev-derived Systems*, including a breakdown of the contributions per country. The SRG provided its positive opinion on: 1) draft Amendment n° 2 of Work Programme 2025-2026; 2) draft Work Programme 2026; and 3) draft Annex of High-Level Paper on the future of rail, after the inclusion of the SRG proposals. During this meeting, the new Vice-Chair of the SRG was elected by consensus for a mandate of two years.

In each meeting, the SRG Members were requested to provide/update their national lists of R&I activities, in preparation of the end of the year report to be presented at the General Assembly, in accordance with the Single Basic Act.

The SRG also held a extraordinary meeting on 18 February 2025 dedicated to discuss about the future policy based public private partnership for rail under the next EU Multi-Annual Financial Framework and linked to FP10/ECF frameworks.

3.6. Scientific Steering Group (SSG)

The SSG worked in 2025 as an advisory body to the JU composed of 12 renowned scientific experts, focusing on the long-term research and on identifying scientific and technological achievements and development priorities. The SSG held three meetings in 2025.

The Members of the SSG were informed by the ED on a regular basis of the developments in the EU-Rail Programme, System and Innovation Pillars and setting-up of the Deployment Group, and all JU communication activities.

In the first SSG meeting held on 18 February 2025, the ED informed the members on the outcomes of the Governing Board decision regarding the selection of new JU associated members. The SSG members also agreed on a dedicated scientific advise on the running Flagships Projects. Members contributed to the discussion on the draft High-Level paper on the future of rail.

In its meeting of 13 May 2025, the SSG Members provided positive scientific advice on the: 1) draft Consolidated Annual Activity Report for 2024; 2) draft Amendment n° 1 of EU-Rail Work Programme 2025-2026; 3) draft Revised Multi-Annual Programme; and 4) draft High-Level Paper on a future policy based public private partnership for rail.

The last meeting of the year was held on 21 October 2025. Besides the regular update on Programme implementation and communication activities, as well as the latest Governing Board decisions, the ED informed in particular on the outcome of the first call for proposals of the year and imminent launch of the second call for proposals, requesting the support of SSG members in further dissemination to obtain good

coverage. The ED further explained the documents that would be prepared for adoption at the Governing Board meeting of 2 December 2025, which were: 1) draft Amendment n°2 of EU-Rail Work Programme 2025-2026; 2) draft Work Programme 2026; and 3) draft Annex of High-level Paper on a future policy based public private partnership for rail. The members provided their positive advice to the final versions of those documents.

3.7. Deployment Group

As per Article 97 of the Single Basic Act, the Deployment Group is to advise the Governing Board on the market uptake of rail innovation developed in EU-Rail and to support the deployment of innovative solutions. The Deployment Group shall provide recommendations on issues related to the deployment of rail innovative solutions upon the request of the Governing Board. The Deployment Group may also issue recommendations on its own initiative.

The main objective of the Deployment Group is to analyse how to strengthen the capability of the sector to sustainably contribute to and accelerate rail innovation to reach the market. It focuses on different aspects to make recommendations to the various actors in the system on the deployment of innovative solutions that require high levels of coordination.

Following Governing Board Decision No. 11/2023 and in accordance with Articles 22 and 97 of the Single Basic Act. EU-Rail organized and completed the setup of the High-Level Deployment Group.

After the set-up phase, the first formal meeting took place in February 2025. In the first formal meeting in 2025, all documents and informal decisions were formalised, including Rules of Procedure, procedure to set-up specific working groups and communication plan.

The current members of the high-level deployment group are: ADIF, AERRL/Nextrail, ALE, Alstom, CAF, CER, DB, EIM, FSI, Hitachi Rail, Knorr-Bremse, Norwegian Railway Directorate, OEBB, Siemens, SNCF, SRG (Portugal), Thales, Trafikverket, UIC, UNIFE, Voestalpine, DG MOVE, and EU-Rail. ERA and the ERTMS coordinator attend as observers. In 2025 new members (Axians and ProRail) applied to join thanks to the open application platform that EU-Rail launched on its website (at the beginning of 2025, following the formal setup and adoption), transparently also sharing the output of the groupwork: <https://rail-research.europa.eu/participants-deployment-group/>. Twice a year, an assessment will be made for new members, following the Rules of Procedure.

Three formal meetings were held in 2025. In the first meeting all administrative and legal processes were approved (RoP, setting-up a dedicated group, first subgroup on FRMCS, communication plan). The other two meetings were dedicated to discussing outcome, remits and plans of the FRMCS deployment and alignment between upcoming large transition programmes (ERTMS, DAC, ATO, FRMCS, ASTP). Close stakeholder management was executed with related programmes, amongst others: ERTMS forum, FRMCS Stakeholder Alignment Meeting, UIC ERIG and SP-STG.

The High-Level Deployment Group discussed the main objectives of the Group, how to avoid duplications in work performed by other groups (e.g., ERTMS Stakeholder Platform), and the topics that need coordination at the EU level. It was agreed that FRMCS would be the first topic to focus on in a subgroup. The remits for the FRMCS subgroup were approved by the High-Level Deployment Group.

A dedicated subgroup was created for European FRMCS Deployment. For this group, remits and a working plan were discussed and set as the basis for the work. Three working groups were set up:

1. WG Technology
2. WG Legal and Finance
3. WG Migration and Alignment

A management team to steer the European Deployment activities, coordinators to lead the working groups and experts were appointed (all on voluntarily basis). Support is given by the EC DMT contract and EU-Rail resources.

The possibility to include, following the closure of DACcord programme, also EDDP activities into the High-Level Deployment Group, was debated towards the end of 2025. Decision, coordinated with the DAC supervisory board and Programme Board, will be taken in 2026.

3.8. System Pillar Steering Group

As per SBA Article 96, the System Pillar Steering Group (SPSG) is responsible for providing advice to the Executive Director and the Governing Board on:

- the approach to operational harmonisation and the development of system architecture,
- the detailed annual implementation plan for the System Pillar in line with the work programmes adopted by the Governing Board,
- monitoring the progress of the System Pillar.

Domain Teams and Core Group are preparing decisions to be validated at the System Pillar Steering Group and Governing Board levels.

The SPSG is composed of the following members:

- Chair: DG MOVE
- Members: Commission (DG MOVE and DG RTD), EU-Rail, Chairperson of the States Representative Group, ERA, ERRAC, AllRail, CER, EIM, UNIFE, UITP, UIP
- Observers (technical bodies providing advice to members): EUG, UIC, UNISIG, UNITEL
- Observers (other): ERTMS Coordinator, EPF, EUSPA, ETF, NB-Rail, RNE

During 2025, the SP Steering Group has given strategic direction and consent on the following topics in the several meetings held throughout the year:

- SP STG Meeting 12
 - Approval of the analysis
 - Of standardisation potential for power supply and power management of trackside asset subsystems
 - Of standardisation for interfaces to field devices
 - Approval of the Traffic CS System Concept
 - Approval of the Cybersecurity Specifications
 - Discussion on the updated FRMCS report
 - Discussion on the second phase of the contract
 - Discussion on the update to the EU-RAIL Standardisation and TSI Input Plan
 - Discussion on Advanced Safe Train Positioning
- SP STG Meeting 13
 - Approval of the update to the Trackside Asset Control system B4R4
 - Discussion of the FRMCS System Pillar Report V2
 - Discussion of the EU-RAIL Standardisation and TSI Input Plan v2
 - Discussion on strategic direction of the next contract
 - Discussion on Train CS domain and link to OCORA
 - Discussion on PRAMS release of document for consultation
 - Discussion on Task 2 Transversal Domain outputs
- SP STG Meeting 14
 - Approval of the EU-RAIL Standardisation and TSI Input Plan v2

- Approval of the FRMCS System Pillar Report V2
- Approval of the AWP 2026 (SP elements)
- Discussion on V1 Sp release
- Discussion on Train CS Architecture
- Discussion on Task 2 Transversal domain - end2 end date process
- Discussion on preassessment bundles and associated change requests
- SP STG Meeting 15
 - Approval on Train CS Architecture
 - Approval on preassessment bundles and associated change requests
 - Discussion on Traffic CS and Operational Domain next steps
 - Discussion on Train Length and Train Integrity
 - Discussion on Future Freight Central Instance
 - Discussion on Task 3 – CMS/TMS outputs
 - Discussion on the feedback from the Stakeholder Alignment Meeting

3.9. European Union Agency for Railways (ERA)

The SBA for EU-Rail, provide for a collaboration between the JU and ERA. In this respect, the rules of procedures of all relevant groups/bodies established under the JU foresee the participation of representatives from ERA (either as observers or their direct members). This ensures that the Agency is duly prepared to take into account the results of the Programme in its activities.

As a result, staff members of ERA have been participating in meetings of the JU's GB, SRG, SP-STG, Scientific Steering Board, High Level Deployment Group and DAC SB. Due to participation in the work of these bodies, the representatives of ERA had access and contributed to the draft documents in preparatory work for establishment of the Europe's Rail Joint Undertaking. Additionally, ERA is member of the System Pillar Core Group.

The JU's Governance and Process Handbook⁶³ clarifies the way ERA can access the R&I activities performed within the EU-Rail Programme in the areas of their competence, interoperability and safety.

In terms of contribution to the development of Technical Specifications for Interoperability (TSIs), the System Pillar has coordinated the input from the whole EU-Rail programme into the EU-Rail Standardisation and TSI Input Plan (STIP), which sets out the expected outputs from the EU-Rail programme into different harmonisation channels including TSIs. The second version of the STIP was approved by the SP-STG (including ERA and the EC) – Decision 5/2025. Additionally, the System Pillar supports the maintenance of the CCS TSI, including the update for the FRMCS specifications.

Regular coordination meetings have been organised between the two EDs, operational staff and communication staff. At a working level there is a close working relationship with ERA being involved where necessary in programme review and assessment, including Flagship Project maturity checkpoints. The overall objective is to ensure that the R&I innovative solutions that will be delivered by the EU-Rail Programme will be considered in the pipeline of ERA activities to avoid any step back in the future market uptake.

⁶³ [ED-DECISION-ED-25-09 Annex Gov.Proc .Handbook 2.7.pdf](#).

4. FINANCIAL MANAGEMENT AND INTERNAL CONTROL

This section reports on the control results and other relevant elements that support management's assurance on the achievement of the financial management and internal control objectives.

4.1. Control Results

EU-Rail, as a body entrusted with the implementation of the EU budget, has adopted and implements, *mutatis mutandis*, the EC Internal Control Framework.⁶⁴ Pursuant to Article 14 of EU-Rail Financial Rules⁶⁵ and to Article 36 of EU Financial Regulation⁶⁶, Europe's Rail JU internal control framework is designed to provide reasonable assurance regarding the achievement of the following objectives:

- Effectiveness, efficiency and economy of operations;
- Reliability of reporting;
- Safeguarding of assets and information;
- Prevention, correction, detection and follow-up of fraud and irregularities;
- Adequate management of the risks relating to the legality and regularity of the underlying transactions, considering the multiannual character of programmes as well as the nature of the payments concerned.

EU-Rail management monitors the functioning of the internal control systems on a continuous basis and carries out an objective assessment thereof.

4.1.1. Effectiveness of Controls

The effectiveness of controls is assessed by EU-Rail based on the legality and regularity of the financial transactions, on fraud prevention, protection and detection measures and on the safeguarding of assets.

4.1.1.1. Legality and regularity of the financial transactions

EU-Rail uses internal control processes to ensure sound management of risks relating to the legality and regularity of the underlying transactions for which it is responsible, considering the multiannual character of programmes and the nature of the payments concerned.

The JU budget comprises in principle two main types of expenditure:

- Administrative Expenditure covering Titles 1 and 2 of the Budget, and
- Operational Expenditure covering Title 4 (for the EU-Rail Programme) of the Budget.

The Title 5 is dedicated to account for unused appropriations.

The current JU Financial Rules were adopted by the Governing Board⁶⁷ on 20 December 2019 and entered into force on 1 January 2020. They are in line with the EU Financial Regulation⁶⁸ and with the Model Financial Regulation for PPP bodies.⁶⁹ As per this legal framework, the JU's financial procedures are designed in a manner allowing compliance with the principle of sound financial management.

EU-Rail Manual of Financial Procedures⁷⁰, revised in 2024, is designed to guarantee a segregation of duties and to apply the four eyes principle in JU's financial transactions. In this respect, the initiation of a financial transaction and its verification are performed by different actors (ABAC⁷¹ users). The document describes

⁶⁴ ED Decision 26-02 amending ED Decision 20-08.

⁶⁵ Adopted on 20/12/2019 by GB Decision NO.11/2019, with effect from 01/01/2020.

⁶⁶ Regulation (EU, Euratom) No 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union.

⁶⁷ GB Decision NO.11/2019.

⁶⁸ Regulation (EU, Euratom) No 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union.

⁶⁹ Commission Delegated Regulation (EU) 2019/887 of 13 March 2019 on the model financial rules for public private partnership bodies referred to in Article 71 of Regulation (EU, Euratom) 2018/1046.

⁷⁰ https://rail-research.europa.eu/wp-content/uploads/2024/01/EURAIL_ManualofFinancialprocedures_v2.1_clean.pdf.

⁷¹ SUMMA replaced ABAC on 1st January 2026 with respect to EU-Rail.

in detail the financial circuits applicable to different transactions and the roles and responsibilities of each actor. To a lesser extent, it also describes the basic principles of main procedures (grants & procurements). It should be noted that in addition to the JU-specific methodological framework for financial procedures, common rules of the R&I Family (Vademecum) established for Horizon Europe are applied by EU-Rail as well.

Regarding the accounting services, a significant change took place in 2022, when the Accounting Officer of the Commission ceased to support EU-Rail, except for the treasury function. The accounting services of EU-Rail were thus transferred to the JU's newly appointed Accounting Officer within the common back office arrangements (BOA) established among the Joint Undertakings. In line with the respective Service Level Agreement, EU-Rail not only took the role of the lead JU for the accounting part of the BOA but also became one of the three accounting service providers (together with CA JU and SESAR JU) under the SLA. More information about synergies among JUs can be found in the section 2.7.2 "Efficiency gains and synergies" of the present document.

Ex-ante Controls on operational Expenditure

EU-Rail follows the provision of Article 21(1) of its Financial Rules stating that "*each operation shall be subject at least to an ex-ante control relating to the operational and financial aspects of the operation, on the basis of a multiannual control strategy which takes risk into account*". The ex-ante controls are considered essential to prevent errors and to avoid the need for ex-post corrective actions. They take the form of checking contracts and grant agreements, initiating, checking and verifying invoices and cost claims and carrying out desk reviews (such as mid-term reviews carried out by external experts on JU's projects and other). In 2025, the JU continued to follow the procedures for ex-ante controls defined internally (JU Financial Rules⁷²) as well as the common Horizon Europe ex-ante control framework.

The JU applied standard financial circuits in ABAC Workflow for the commitments and payments. The circuit has a three-step authorisation performed by the following financial actors:

- Initiating Agent (OIA and FIA)
- Verifying Agent (OVA and FVA) and
- Authorising Officer (AO).

Staff members designated by the AO to verify financial operations are chosen on the grounds of their knowledge, skills, and appropriate professional experience.

The JU financial circuits comply with the requirements of the four eyes principle, segregation of duties and the independence of the verifier. At the same time, they allow for the necessary flexibility to ensure the continuity of operations within the existing staff number limitations. The AO is the Executive Director of EU-Rail, Mr Giorgio Travaini, who acts in accordance with EU-Rail's financial rules and has the final responsibility for any action or transaction carried out. The AO can delegate all or part of his authorising authority for financial commitments or payments, according to the delegation model adopted. This is reflected in the financial circuits by means of amendment to the JU's Manual of Financial Procedures introduced in January 2024.

For the operational expenditure, the JU recognises two different types of transactions: the ones solely performed in the ABAC Workflow and the ones with the initiation and verification functions outside of the ABAC environment - in the SyGMA tool. This tool is also linked to ABAC which allows real time controls over the budget and its implementation.

The particular system where the initiation and verification are to be performed is derived from the nature of the transaction, as follows:

- ABAC for all procurement related transactions, and
- SyGMA for any transactions related to grant management.

However, in all transactions, irrespective of whether initiated in SyGMA or ABAC, the AO will always give his/her authorisation in ABAC only.

⁷² <https://rail-research.europa.eu/wp-content/uploads/2020/01/S2R-JU-Financial-Rules.pdf>.

A key element of the ex-ante controls are the common guidelines for Horizon Europe, the “HE Ex ante controls” and “HE Ex ante anti-fraud checks” guidelines. The HE ex ante controls developed in these guidelines build upon the principles and practices adopted under H2020 with enhancements based on lessons learnt. They combine a pre-defined set of simple and straight-forward standard controls with additional risk-based checks that are triggered when specific risks are detected. The main principles of the common HE ex ante control strategy are:

- Controls must provide reasonable assurance about legality and regularity, based on the information available at the time;
- Controls must strike the right balance between reducing the administrative burden and exercising effective financial control;
- Controls must be risk-based and cost-effective;
- Beneficiaries should be treated equally.

To complement the common HE guidance documents put in place by the European Commission, EU-Rail adopted towards the end of 2023 its own HE Control Strategy for Grants⁷³, which includes additional control practices performed by the JU on top of the standard level of checks (e.g. the maturity checkpoints). This Strategy, revised in 2024 and in 2025, is built on a risk-based approach and tailored to reflect the fact that EU-Rail applies solely the lump sum form of grants under its current programme.

Ex-post controls of operational expenditure and error rates identified

Ex-post controls intervene at the last stage of the project life cycle and aim at verifying the financial and operational aspects of finalised budgetary transactions, in accordance with Article 22 of the JU Financial Rules. The objective of the ex-post controls is threefold:

- to assess the legality and regularity of underlying expenditure,
- to ensure the respect of the principle of sound financial management (economy, efficiency and effectiveness)
- to provide the basis for corrective and recovery activities, if necessary.

For the **H2020 programme**, the ex-post controls include mainly the financial ex-post audits as well as the recovery/correction of any amounts found to have been paid in excess of the sum eligible.

As a general rule, the ex-post controls of operational expenditure at EU-Rail are covered by the Horizon 2020 Audit Strategy. The implementation of the Horizon 2020 Audit Strategy falls under the responsibility of the Common Audit Service (“the CAS”) of DG Research and Innovation (RTD). The role of the CAS is defined in the Commission Decision “C(2014) 2656 final” on the operating rules for the Common Support Centre for Horizon 2020, the Framework Programme for Research and Innovation (2014-2020)⁷⁴. As follows from this Decision *“The Common audit service shall contribute to assessing the legality and regularity of Horizon 2020 project payments by means of ex-post financial controls carried out, either by its own auditors or by independent audit firms in accordance with the decisions of the Steering Board. It shall provide the relevant Authorising Officers by Delegation (AODs) with necessary elements of assurance on the research budget for which they are responsible.”*⁷⁵

The main actions identified to realise the objectives following from the Horizon 2020 Audit Strategy include:

- the gradual achievement, in a cost-effective way, of quantitative multi-annual targets in terms of audited participations⁷⁶;
- the closure and communication of audit findings and extension of audit findings to those responsible for their implementation providing the basis for corrective and recovery activities, if necessary.

⁷³ EU-Rail HE Control Strategy revised in December 2024 and in September 2025 and adapted with the new guidance from RTD on ex-post technical reviews for lump sum grants.

⁷⁴ [https://ec.europa.eu/transparency/documents-register/detail?ref=C\(2014\)2656&lang=en](https://ec.europa.eu/transparency/documents-register/detail?ref=C(2014)2656&lang=en)

⁷⁵ In principle, the same mandate of the CAS applies also for the Horizon Europe Framework Programme as defined in Article 23 of the Commission Decision C(2021) 4472 final.

⁷⁶ A participation is the combination of a beneficiary and an action. An audit can cover more than one participation.

For Horizon 2020, the CAS carries out all audits, including those concerning grants concluded by the Executive Agencies and the Joint Undertakings. This is a major step towards ensuring efficiency gains, a harmonised approach, legal certainty, equality in treatment of beneficiaries and the least audit burden on beneficiaries.

The main indicators on legality and regularity of EU Framework Programmes for Research and Innovation are:

- **Cumulative representative detected error rate**, based on errors detected by ex-post audits on a Common Representative Sample of cost claims across the R&I Family.
- **Cumulative residual error rate**, which is the extrapolated level of error after corrective measures have been implemented by the respective services following the audits, accumulated on a multi-annual basis.

The **targets** set at the R&I Family level for this control system are, respectively:

- For Horizon 2020, to ensure that the cumulative residual error rate remains within a range of 2-5 %, aiming to be as close as possible to 2%. Progress against Horizon 2020 targets is assessed annually based on the results of the implementation of the ex-post audit strategy and taking into account the frequency and importance of the detected errors along with cost-benefit considerations regarding the effort and resources needed to detect and correct the errors.
- For Horizon Europe, to ensure that cumulative detected and residual error rates do not exceed 2%⁷⁷.

It should be noted, however, that due to its multi-annual nature, the effectiveness of the ex-post control strategy of the R&I Family can only be measured and assessed fully in the final stages of the EU Framework Programme, once the ex-post audit strategy has been fully implemented, and errors, including those of a systemic nature, have been detected and corrected.

The Horizon Europe Audit Strategy of the R&I Family is risk-based and draws on the achievements of lessons learnt from Horizon 2020.

Technical (qualitative) ex-post reviews of H2020 lump sum grants have been conducted by the JU since 2023, following the pilot exercise. In 2024, EU-Rail has launched, in accordance with its HE Control Strategy for Grants, two ex-post technical reviews for H2020 lump sum grants, that has been assigned to the JU by the CAS from the first Common Representative Sample ("CRS").

The respective ex-post review consolidated reports were drafted in 2025 and provided to the CAS, concluding that the outcome for both reviews was positive and in line with the objective and scopes of actions under the Grant Agreement. Following risk-based sample selection carried out in accordance with its HE Control Strategy for Grants, in 2025 EU-Rail has launched 5 technical ex-post reviews, 2 of which for the H2020 lump sum grants.

However, since EU-Rail will continue to apply exclusively lump sum form of grants under the Horizon Europe Programme, and such grants cannot in principle be subject to financial type of ex-post audits conducted by the CAS, the JU has updated its HE Control Strategy for grants in 2024 and in 2025. The updated Strategy reflects the fact that EU-Rail conducts its own ex-post technical reviews focused on the qualitative (technical) aspects of implementation of lump sum grants.

For the **HE programme**, which is implemented by EU-Rail exclusively in the form of lump sum grants, JU payments no longer depend on the costs actually incurred by the beneficiaries but rather on the fulfilment of the conditions for releasing lump sum contributions. Consequently, the ex-post checks, reviews and audits focus on the above conditions as well as on compliance with other obligations embedded in the grant agreement, for example in the area of ethics and research integrity, dissemination and exploitation of results, management of intellectual property, procurement, etc.

It follows that there are no financial ex-post audits conducted by the CAS for EU-Rail HE grants, which are fully under lump sums. Instead, it is EU-Rail that performs qualitative (technical) ex-post reviews of lump sum grants, first tested in 2023 by means of a pilot review conducted together with the ECA participation

⁷⁷ No representative error rate for Horizon Europe was available in 2024 AAR. Originally planned in 2023, the HE ex-post audits selected in 2024 will only be closed in 2025.

as observer. In 2025, EU-Rail launched 5 technical ex-post reviews in a risk-based sample of H2020 (2 reviews) and HE (3 reviews) lump sum grants. In these ex-post reviews, which constitute a supplementary control layer to the ex-ante control activities, emphasis will be put on scientific/technical performance and output of projects. Hence the overall JU's control approach for grants under Horizon Europe is characterized by shifting from quantitative (financial) to qualitative (technical) type of controls.

EU-Rail remains confident that the implementation of its own ex-post reviews of lump sum grants will be complemented by the assurance, especially in the form of audits, provided by the dedicated EU audit bodies, most notably by the European Court of Auditors and by the Internal Audit Service of the Commission, the latter acting as internal auditors of EU-Rail.

Ex-post controls of the Horizon 2020 programme globally

In 2020, the Commission refined its methodology for calculating the Horizon 2020 error rates in line with the European Court of Auditors' observations in its 2018 and 2019 Annual Reports. The IAS has carried out a limited review on the methodology for calculation of the error rates of Horizon 2020 in the year 2020. The findings of this limited review confirmed that there is no weakness in the calculation of the detected error rate and that the impact of these findings on the accuracy of the calculation of the residual error rate is minor. The three recommendations issued were closed by IAS with the Note on audit conclusions⁷⁸ in March 2024.

The error rates for Horizon 2020⁷⁹ globally as of 31 December 2025 were the following:

- Cumulative representative detected error rate: 3,83%⁸⁰,
- Cumulative residual error rate for the for the Framework Programme: 1,78% (2,00% for DG Research and Innovation⁸¹).

These error rates are calculated on the basis of the audit results available when drafting the Consolidated Annual Activity Report. They should be treated with caution as they may change subject to the availability of additional data from audit results.

Since R&I Framework Programmes are multi-annual, the error rates, and the residual error rate in particular, should be considered within a time perspective. Specifically, the implementation of the audit results over time will tend to lower the cumulative residual error rate thus increasing its difference with the representative detected error rate.

Given the results of the audit campaign, and the observations made by the European Court of Auditors in its Annual Reports, the Common Implementation Centre of DG Research and Innovation, in close cooperation with central Commission services, defined actions aimed at significantly simplifying the rules and paving the way for an important reduction of the error rate in Horizon Europe. Actions were undertaken including further simplification, increased use of simplified forms of funding (including lump sums and unit costs), focused communication campaigns to more "error-prone" types of beneficiaries with higher-than-average error rates (such as SMEs and newcomers), and enhanced training to external audit firms performing audits on behalf of the Commission. Focusing on the most common errors, these actions will be straightforward and achieve higher impact.

Horizon Europe Framework Programme

The year 2025 was the fourth year of implementation of the Horizon Europe Framework Programme. In 2024, there was no representative error rate for Horizon Europe, as the ex-post audit campaign for the Programme was launched only in 2024 once a meaningful number of payments became available for audit. In its 2025 Annual Activity Report, DG RTD will issue a reservation on the rate of the residual error within grant payments in the Horizon Europe Framework Programme (including Euratom), implemented directly and indirectly by DG RTD.

⁷⁸ Note on audit conclusions by Internal Audit Service (IAS): Ref. ARES(2024)1956231 – 14/03/2024.

⁷⁹ The Horizon 2020 audit campaign started in 2016. At this stage, six Common Representative Samples with a total of 948 expected results have been selected. By the end of 2025, cost claims amounting to EUR 61.3 billion have been submitted by the beneficiaries to the services. In addition to the Common Representative Samples, Common Risk Samples and Additional Samples have also been selected. The audits of 5.647 participations were finalised by 31/12/2025 (of which 394 in 2025).

⁸⁰ Based on the 930 representative results out of the 948 expected in the six Common Representative Samples.

⁸¹ It should be noted that most of Horizon 2020 grants managed by DG Research and Innovation were delegated to Executive Agencies. Hence, this figure is based only on the actions that remained with the DG R&I.

The reservation is due to the fact that the residual error rate is significantly above materiality threshold of 2%. According to the explanation provided by DG RTD: *“most of the errors relate to incorrect claims for actual personnel costs, mainly due to beneficiaries’ incorrect application of the Horizon Europe rules, despite the introduced simplifications. Newcomers and small and medium-sized enterprises (SMEs) are more prone to errors compared to more experienced or larger beneficiaries. Due to the relatively small number of ex-post audits and technical reviews completed by the end of 2025, the error rate calculation is highly sensitive to few extreme results. Excluding the latter cases, the Representative Error Rate would be below the materiality threshold of 2%.”*

However, in parallel DG RTD will include in its AAR 2025 the following statement: *“The preliminary results suggest, as expected, that lump sums result in fewer errors. Since only relatively few lump sum projects have been subject to an ex-post technical review so far, these results are not statistically significant yet and will need to be corroborated by further reviews as part of the multi-annual ex post control strategy”*.

At this stage, the overall error rate for Horizon Europe remains nearly entirely determined by the estimated error rate on cost-reimbursement grants. With the share of lump sum grants and payments gradually increasing, the lower error rate on lump sum grants is expected to lead to a lower overall error rate in the future.”

In consequence, considering that CAS sample does not cover EU-Rail HE grants which are fully lump sum based, that EU-Rail has displayed low error rate throughout the previous programming period and that the lump sum projects will result in decreasing the HE error rate, the above reservation is not representative to the EU-Rail HE grant payments and therefore does not affect EU-Rail AO assurance on the legality and regularity and sound financial management. Finally, the European Court of Auditors (ECA) issued, in 2025, an unqualified opinion on the reliability of EU-Rail 2024 accounts and on legality and regularity of revenue and payments underlying the accounts. Finally, considering that there are currently no finalised ex-post reviews or finalised ECA audits for EU-Rail HE grants, an estimation of the error rate for the EU-Rail HE programme will not be disclosed. It should be reported in the 2026 AAR.

Ex-post controls 2025: EU-Rail specific sample

The number of ex-post audits of EU-Rail participations carried out by the CAS until year end 2025 corresponds to the relatively small share of the JU’s budget (less than 1%) in relation to the overall H2020 budget. However, the JU in cooperation with the CAS continuously strive for ensuring on an ongoing basis sufficient ex-post audit coverage allowing to provide the respective reasonable assurance to the EU-Rail Executive Director to support his declaration of assurance, also in light of the discharge procedure. In this context, when no EU-Rail grants were sampled in 2025 under H2020, the Executive Director requested CAS to provide additional audit evidence. As a result, a risk-based sample of two EU-Rail H2020 cost-based grants has been drawn by EU-Rail and added to the CAS Annual Audit Plan 2025, with closure target 2026.

The previous years of the H2020 audit campaign were still marked for the CAS with the effects of the Covid-19 pandemic, which adversely influenced the execution of the ex-post audits in 2020 and 2021, and created a backlog reflected in the reduced number of new sample selections for the 2022 target (9 participations in the case of EU-Rail). The EU-Rail sample counting towards its 2023 local representative audit target counted 5 participations and no new participations were in principle foreseen for EU-Rail in 2024. Overall, the CAS managed to close 6 ex-post audits of EU-Rail participations in 2024.

In addition, in Q2 2024, the CAS confirmed the selection of the EU-Rail participations counting towards its 2025 local audit target, with no additional selections for the old S2R programme. However, as previously mentioned, due to a backlog at CAS’s side, there were no CAS audits of EU-Rail participations counting towards 2025 target. Instead, in Q2 2025 two audits of participations were confirmed, with 2026 target.

As of 31 December 2024, total cumulative cost claims related to projects managed by EU-Rail, hence representing its potentially auditable population, reached the amount of EUR 366.837.804,73 for 101 projects. This amount has not changed throughout the year 2025, since the H2020 programme has been fully implemented and closed by 31 December 2024.

As for the amount of cost claims audited by the end of 2024, it was EUR 19.667.967,67 representing the direct EU-Rail audit coverage of 5,36%. The indirect coverage, i.e. the total directly non-audited cost claims of all audited EU-Rail beneficiaries amounted to EUR 267.166.173,45(72,83%). In 2025 CAS confirmed there will be 2 new audits of participations, counting towards 2026 targets. The results will be reported in the 2026 AAR, upon the finalisation of the audits in question.”

The overall status for H2020 ex-post audits related to the JU projects as of yearend 2025 is shown below⁸².

Number of participations for which audits were launched during individual years (risk-based audits not included):

H2020 - CAS - PARTICIPATIONS STATUS PER GROUP - OVERALL VIEW - TOP-UPS included																														
GROUP	Total Launch 2018	Total Launch 2019	Total Launch 2020	Total Launch 2021	Total Launch 2022	Total Launch 2023	Total Launch 2024	Total Launch 2025	Total Launch	Total Closed 2018	Total Closed 2020	Total Closed 2021	Total Closed 2022	Total Closed 2023	Total Closed 2024	Total Closed 2025	Closed Total	Sched Total	Open Total	Sched + Open + Closed Total	Specific Target 2025	Specific Target 2026	Specific Target 2027	Specific Target 2028	Specific Target 2029	Specific Target 2030	Specific Target 2031	Specific Target 2032		
EU-RAIL	17	12	39	12	5	5	1	2	109	22	22	30	12	11	6	0	107	2	2	111	15	25	14	12	8	5				

H2020 - CAS - PARTICIPATIONS CLOSED PER CLIENT - OVERALL VIEW - TOP-UPS INCLUDED													
Framework	Domain	Client	Closed 2016	Closed 2017	Closed 2018	Closed 2019	Closed 2020	Closed 2021	Closed 2022	Closed 2023	Closed 2024	Closed 2025	Closed Total
H2020	CAS	EU-RAIL	0	0	4	22	22	30	12	11	6	0	107

Overview of cost claim figures related to the JU projects as of 31/12/2024:

Total number of validated cost claims	3124
Total cost accepted by JU (cumulative) (A)	366.837.804,73
Total cost audited by the end of 2023 (B)	19.667.967,67
Total non-directly audited cost claimed by audited JU’s beneficiaries (C)	267.166.173,45
Direct audit coverage ratio (B / A)	5,36%
In-direct audit coverage ratio (C / A)	72,83%

As of 31 December 2024, 93 final audit reports from ended ex-post audits covering the JU’s projects were available.

Overall detected error rate based on 109 participations: by applying simple average is 2,29% and by applying weighted average is 1,88%.

Representative Error Rate based on 103 participations: by applying simple average is 2,35% and by applying weighted average 1,93%.

EU-Rail Residual Error Rate: by applying simple average is 1,01% and by applying weighted average 0,67%.

As at the cut-off date 31.12.2025, **the JU’s H2020 cumulative residual error rate is below the targeted threshold of 2%**⁸³ under both methodologies - the simple and the weighted average.

⁸² As per the data files provided by the CAS.

⁸³ See Annex 8 for materiality criteria regarding the error rate.

4.1.1.2. Fraud prevention, detection and correction

Early July 2022, EU-Rail adopted its new Anti-Fraud Strategy for 2022-2025⁸⁴ which replaced the previous one initially introduced in 2017. The adoption was preceded by a thorough specific fraud risk assessment. Part of this assessment, in particular the one pertaining to the fraud risks in grant management, was conducted commonly at the level of the entire Family of the EU Research & Innovation Services, Agencies and Joint Undertakings (Research Family) and steered by DG RTD. This was complemented at EU-Rail level with the assessment of other risks of fraud, such as those related to procurement, recruitment, misuse of internal information, misuse of JU’s reimbursement schemes, etc.

Throughout the year 2025, EU-Rail also actively participated in the activities of the Fraud and Irregularities in Research (FAIR) Committee. By means of its Anti-Fraud Strategy 2022-2025 EU-Rail continued to cover, to the applicable extent, all four elements of the anti-fraud cycle, namely: prevention, detection, support to investigation and correction.

The main anti-fraud objectives of the JU for the period of 2022-2025 are the following:

- 1) keeping the JU’s internal legal framework related to anti-fraud policy up to date,
- 2) fostering an anti-fraud culture throughout the organisation,
- 3) maintaining a high level of awareness and knowledge among the staff members on the subject matter,
- 4) ensuring high level of reactivity towards OLAF/EPPO,
- 5) preventing the misuse of internal information/data.

These objectives are pursued by means of particular measures and actions, as listed in the below action plan. The actions are subject to follow-up and to assessments regarding potential updates conducted, as a minimum, once a year. For 2025, the follow-up of the anti-fraud actions brought the following outcomes:

	Action	Follow-up on the action plan for 2025
1	The EU-Rail management strives for ensuring the appropriate overall anti-fraud culture throughout the organisation and sets the tone at the top by conveying messages to staff on the subject matter stressing the importance of acting according to the highest professional and ethical standards.	2 communications related to fraud prevention and ethics were provided to EU-Rail staff from the Executive Director
2	The EU-Rail bodies are informed about the JU’s anti-fraud policy and its practical application and their members are reminded of their duties related to the subject matter, most importantly on the obligation of reporting any conflicts of interests.	Information on the anti-fraud policy implementation as part of the internal control framework assessment outcomes was provided in the EU-Rail GB meeting held on 05/02/2025 and later on 24/06/2025 in which also the 2024 CAAR was adopted, containing information on the EU-Rail anti-fraud policy. Other written communications were provided to the EU-Rail GB members and observers, including reminders on submitting declarations of interests.
3	The EU-Rail internal legal framework related to the anti-fraud matters is regularly reviewed in order to keep it up to date and complete.	A review was performed via EU survey questionnaire. In line with its 2024 action plan, EU-Rail implemented in 2025 the Cybersecurity Regulation by adopting, in 2025:

⁸⁴ https://rail-research.europa.eu/wp-content/uploads/2022/07/ED-DECISION_ED-22-02_Anti-Fraud-Strategy-2022-2025_Annex_AFS.pdf

	Action	Follow-up on the action plan for 2025
		<ul style="list-style-type: none"> - Cybersecurity risk-management measures⁸⁵ under Article 8 of Cybersecurity Regulation, - Cybersecurity plan⁸⁶ under Article 9 of Cybersecurity Regulation and - By appointing EU-Rail Local Cybersecurity Officer⁸⁷ (LCO) under Article 6(8) of Cybersecurity Regulation.
4	The EU-Rail staff members are regularly provided with information and updates with regard to anti-fraud matters by means of a dedicated section on the JU’s intranet.	A dedicated intranet page and a comprehensive repository of files related to anti-fraud matters and ethics was maintained and made available to staff.
5	Regular information sessions and trainings are organised for EU-Rail staff on the subjects of anti-fraud and ethics.	<p>Two dedicated anti-fraud training sessions were made available to EU-Rail staff in 2025.</p> <p>Specific communications were made to EU-Rail staff on ethics-related matters, especially with regard to declarations of interest.</p> <p>Several awareness-raising communications were made to EU-Rail staff with regard to cybersecurity and IT threats, and a phishing test campaign was participated to by the JU.</p>
6	Ensure comprehensive and timely cooperation with the respective EU bodies (OLAF, EPPO) and swift provision of requested information and documents in cases of investigations or other activities with regard to potential fraud.	<p>No case occurred at EU-Rail requiring reporting to OLAF/EPPO.</p> <p>In 2025 EU-Rail consulted with OLAF its draft Anti-Fraud Strategy 2026-2028 and its Action Plan. Comments received from OLAF were taken onboard in the final version of EU-Rail Anti-Fraud Strategy 2026-2028, adopted in December 2025.</p>
7	Ensure appropriate follow-up and the necessary action based on the results of OLAF’s/EPPO’s investigations and other activities by means of recovery of the concerned amount of funds, application of administrative sanctions and other measures.	No case investigated by OLAF/EPPO occurred requiring follow-up actions by EU-Rail.
8	Participate in the Research Family anti-fraud activities by contributing to common discussions, outputs and documents. Utilising of the knowledge shared within the Research Family in JU’s internal anti-fraud documents, activities and trainings.	EU-Rail participated in the FAIR Committee meetings held in 2025 and actively contributed to the common R&I Family activities.
9	Ensure an appropriate level of cooperation with the parent Commission Service – DG MOVE.	<p>EU-Rail proactively consulted with DG MOVE its draft Anti-Fraud Strategy 2026-2028.</p> <p>In the framework of peer review of most relevant risks steered by EUAN PDN, EU-Rail shared with DG MOVE, in the absence of cluster coordinator, the results of EU-Rail 2025 risk assessment exercise.</p>

⁸⁵ Ares(2025)7456828.
⁸⁶ Ares(2025)11557530.
⁸⁷ Ares(2025)8804059.

In accordance with the current EU-Rail Anti-Fraud Strategy, and in line with agreement on usage of common indicators within the Research Family, the below indicators with regard to the results of fraud prevention/detection/correction activities are reported as at year end 2025:

	Indicator	Result for 2025
1	Number of messages/communications on anti-fraud matters addressed to the staff by the Executive Director.	2 communications related to fraud prevention and ethics were provided to EU-Rail staff from the Executive Director
2	Number of information on anti-fraud matters communicated to the EU-Rail Governing Board and other JU bodies, as applicable.	1 dedicated presentation in the EU-Rail GB meeting. 1 written communication to the EU-Rail GB members and observers.
3	Number and value of contracts subject to close monitoring or additional controls due to an assessment of a high risk of fraud.	0
4	New cases sent to OLAF and opened in the respective year, and cases handled by OLAF relevant to EU-Rail in that year.	0
5	Timeliness and completeness of JU's implementation of financial recommendations received from OLAF.	No recommendations were received from OLAF.
6	Time elapsed between OLAF requests for information and date when the information is provided to OLAF.	No requests for information were received from OLAF.
7	Number and content of performed trainings and other activities aimed at awareness-raising of the EU-Rail staff.	2 anti-fraud trainings were made available to EU-Rail staff. 2 communications were made to EU-Rail staff on ethics-related matters, especially with regard to declarations of interest. 7 anti-fraud awareness sessions with regard to anti-fraud, ethics and integrity.
8	Number of cooperative activities in the field of anti-fraud policy with relevant stakeholders (e.g. FAIR Committee, other JUs) to which representatives of EU-Rail participated and contributed to.	EU-Rail participated in the FAIR Committee meetings held in 2025. EU-Rail proactively consulted with DG MOVE its draft Anti-Fraud Strategy 2026-2028. In the framework of peer review of most relevant risks steered by EUAN PDN, EU-Rail shared with DG MOVE, in the absence of cluster coordinator, the results of EU-Rail 2025 risk assessment exercise.

4.1.1.3. Assets and information, reliability of reporting

EU-Rail continued in 2025 to apply various measures and control activities in order to safeguard its assets and information. In that respect and to protect EU public funds from potential irregular or illegal application, EU-Rail thoroughly applies to the grant and procurement management all requirements regarding controls and checks applicable under the current legal framework including the common methodological guidance provided by the Commission. These are complemented, where deemed necessary, by additional internal guidelines and manuals, application of which is then reflected in the day-to-day conduct of control activities at the JU. Apart from various ex-ante and ex-post controls, continuous monitoring is ensured with regard to the implementation of the JU's budget, for operational and administrative payments and for the JU Members' reporting of their in-kind contributions/total project costs. Follow-up is conducted with regard to the beneficiaries of JU's grants when systemic errors were found by the financial ex-post audits performed by the CAS.

In addition to the safeguards aimed at financial aspects, EU-Rail pays particular attention also to non-financial elements of its assets and information, including personal data protection. For example, a comprehensive Data Protection Impact Assessment was carried out in 2021 in connection with the Microsoft Office Online services implementation and results thereof were duly documented. Measures are in place regarding the IT tools and IT infrastructure used by the JU aiming at preventing any loss or theft of the electronically processed information. Similarly, measures exist to ensure physical protection of assets, documents and data contained at the EU-Rail premises. Awareness-raising activities aimed at JU staff are organised regularly, drawing staff attention to the importance of protection of assets and information. With this regard, phishing remains the most frequent way in which intruders seek to gain unauthorised access to non-public data. A comprehensive Document Management Policy⁸⁸, formalised by means of the respective ED Decision, is applied at the JU.

In 2025, the JU continued to implement the EU data protection policies and legal framework. As regards the processing of personal data, the JU applied the current EU Data Protection rules (Regulation (EU) 2018/1725 or "EUDPR"⁸⁹) that entered into force on 11 December 2018. In particular, the JU Data Protection Officer (DPO) followed the recommendations and guidance provided by the European Data Protection Supervisor (EDPS), attended the different data protection meetings and networks, coordinated his work with the other DPOs and provided guidance to JU staff on data protection issues.

To ensure compliance with the data protection principles and synergies with the other Joint Undertakings, EU-Rail took the following actions:

- continued the monitoring of a common inter-JU central on-line register of records of activities processing personal data (article 31(5) Regulation (EU) 2018/1725) tailor-made to the needs of the JUs;
- In accordance with article 43(4) of Regulation 2018/1725, EU-Rail continued to have recourse to an external provider via a procurement contract to provide support to the DPO tasks, which is allowed for small or medium sized EU agencies and bodies – article 43(2) of the Regulation besides sharing the same DPO tasks amongst several JUs in line with the synergies of the back-office arrangements in the legal field (article 13 of the SBA).
- Continued to reply to the EDPS requests, such surveys, website Compliance Awareness Campaign, etc.
- continued to update privacy policies and the central data protection register (<https://rail-research.europa.eu/dpregister/>) in order to provide transparent information, communication and modalities for the exercise of the rights of the data subjects (Articles 14 to 16 of Regulation (EU) 2018/1725).

⁸⁸ https://rail-research.europa.eu/wp-content/uploads/2022/12/EU-Rail_DMP_20221206_final_clean.pdf

In 2025, in light of the findings of the EDPS decision against the European Commission on the use of Microsoft 365, a Data Protection Impact Assessment (article 39 EUDPR) were performed by EU-Rail with other 8 JUs for their own use of Microsoft tools and services, particularly focusing on both information security and data protection risks. No personal data breaches were reported and notified by the DPO to the EDPS. Similarly to the previous year, the role of the DPO was exercised in 2025 by the JU's Chief Legal Officer. The current mandate of the DPO was renewed in October 2024 for the additional 5 years.

It has to be underlined that no material issues were detected in 2025 at EU-Rail in terms of inadequate safeguarding of assets or information not in the audits conducted by the ECA/IAS, nor during the comprehensive self-assessment of the EU-Rail internal control system. One case of non-compliance occurred in 2025, with no financial impact. It consisted in the fact that, due to an oversight, the 2nd batch of Q&A on EU-Rail call for proposals HORIZON-ER-JU-2025-01 (launched on 26/2 and closed on 7/05) was published on 29 April 2025 on the EU-Rail's website but not on the EU Funding & Tenders Portal. Knowing that the EU Financial Regulation imposes no deadline for the publication of Q&A on the call for proposals, nor is their publication on the EU Funding & Tenders Portal mandatory, the non-compliance in question is a case of non-alignment with the practical tool, the EC Vademecum on Grant Administration. The latter advocates in favour of the publication of the Q&A in a reasonable time before the deadline for submission, to allow sufficient time for the preparation of proposals. The issue has been analysed, and addressed and the outcome registered in Note to the file Ares(2025)11305558. In practice, EU-Rail verified if the questions concerned (Q n°4 and Q n°5) could have had any impact on the submission or evaluation of proposals. EU-Rail established the following: the answer to Q4 could be easily found in the EU-Rail Work Programme 2025-26, available on the website and by analogy on the published Horizon Europe Work Programme 2023-2025. The answer to Q n° 5 was a public information, also available to the public on the Commission website. None of the two questions concerned related to the award criteria. As a result, and in order to ensure equal treatment of the applicants, the questions and replies thereto were disregarded by EU-Rail. The evaluators were duly informed about the issue during the experts' briefing, to ensure the applicants are not penalised in this respect.

As for the reliability of reporting, EU-Rail continuously strives for utilising precise and up-to-date information for reporting purposes, most notably for the production of its consolidated annual activity reports. In this respect, especially in the field of grant management, the IT tools and systems owned by the Commission, and deployed also by EU-Rail (Compass, SyGMA, Corda), are used as the primary source for collecting various sets of data. These are further complemented by internal tools, databases and repositories maintained by the respective staff members. Possibilities for improvements in internal data processing and record-keeping are considered on an ongoing basis. Attention is paid to maintaining audit trail so that the reported data can be traced back to its initial source, mostly by means of registering files in Ares.

4.1.2. Efficiency of controls ('Time to')

Similarly to other EU services and bodies, EU-Rail, as follows from its Financial Rules, is subject to requirements pertaining to the efficiency of controls and checks applied in the grant agreement management and, as applicable, in management of other types of contracts and agreements. It follows that, in verifying compliance with the principle of sound financial management, EU-Rail should abide by the due diligence procedures, while observing time limits set for certain milestones in the preparation of, or during the lifetime of the grant/contract. Such time limits are referred to as:

- "time to inform" – time elapsed from the submission of complete proposal to the moment of informing the applicant on the evaluation outcome (should not be longer than 6 months),
- "time to sign/grant" – the time elapsed from informing the successful applicant on the results of the call evaluation to the moment of signing of the grant agreement (should not be longer than 3 months),
- "time to pay" – representing different time limits for making the respective payment to the counterparty, being 90 calendar days maximum in case grants-related payments.

EU-Rail uses various monitoring tools in order to comply with the above-mentioned time limits.

It can be concluded that despite the ad hoc accumulation of workload in certain periods of the year, the JU managed on average to meet the deadlines represented by the "time to" indicators. The results for 2025 have not changed significantly compared to the previous year and remain within the target values.

4.1.3. Economy of controls

This section provides information about the JU's cost of the controls applied in connection with grant management and procurement⁹⁰.

JU's resources dedicated to ex-ante controls in connection to grants:

Stage of the control	Description	Year			
		2024		2025	
		EUR	EUR	EUR	FTE
Stage 1 – Programming, evaluation and selection	Cost of programming + evaluating + selecting / value contracted	117.200	1,3	108.500	1
Stage 2 – Contracting including financial (commitments, guarantees,...) and legal checks	Cost of controls related to the contracting / amount paid	43.400	0,5	55,600	0,5
Stage 3 – Monitoring the execution and ex-ante financial management	Cost of controls related to the monitoring of the execution / amount paid	324.600	4,1	391.700	3,7
Total ex-ante		485.200	5,9	555.800	5,2

JU's resources dedicated to ex-post controls in connection to grants:

Stage of the control	Description	Year			
		2024		2025	
		EUR	FTE	EUR	FTE
Stage 4 – Ex-post controls and recoveries	Total cost related to ex-post audits / grants audited	60.700	0,7	70,400	0,8
Total ex-post		60.700	0,7	70,400	0,8

JU's resources dedicated to ex-ante controls in connection to procurements:

Stage of the control	Year				
	2024		2025		
	EUR	FTE	EUR	FTE	
Stage 1 – Planning the procurement procedures, including legal checks	85.400	0,8	83,100	0,7	
Stage 2 – Contracting, including financial (commitments, guarantees,...) and legal checks	59.900	0,8	100.400	1	
Stage 3 – Monitoring the execution and Financial operations (ex-ante), controls on the acceptance of goods and services	91.700	1,1	120.000	1,2	
Total ex-ante		220.600	2,7	303.500	2,9

⁹⁰ The information presented in this CAAR Section corresponds with data reported to DG MOVE with respect to cost of control.

JU's resources dedicated to ex-post controls in connection to procurements:

Stage of the control	Year			
	2024		2025	
	EUR	FTE	EUR	FTE
Stage 4 – Supervisory checks (ex-post), audit, ex-post technical controls if relevant	9.100	0,1	24,700	0,3
Total ex-post	9.100	0,1	24,700	0,3

The internal JU's overall cost of controls (both ex-ante and ex-post) related to grants then represented approximately 0,92% of the EU-Rail operational expenditure/total expenditure in 2025.

The internal JU's overall cost of controls (both ex-ante and ex-post) related to procurements represented approximately 0,48% of the EU-Rail operational/total expenditure in 2025.

The ratios of combined internal cost related to both grants and procurements to the overall 2025 JU's costs are included in the following table:

JU expenditure in 2025 in EUR millions		Estimated overall costs of ex-ante controls in 2024 in EUR	Overall costs of ex-ante controls in relation to expenditures in %
Operational	62,2	859,300	1.38%
Total	67,8		1.27%
JU expenditure in 2025 in EUR millions		Estimated overall costs of ex-post controls in 2024 in EUR	Overall costs of ex-post controls in relation to expenditures in %
Operational	62,2	95,100	0,15%
Total	67,8		0,14%

In terms of own human resources allocated in 2025 to controls related to grants and procurements, both ex-ante and ex-post, approximately 9,2 FTEs were involved. This represents about 29,68% of the total FTEs employed by the JU at year end 2025.

4.1.4. Conclusion on the Cost-effectiveness of controls

The total estimated cost of controls (ex-ante + ex-post) related to grant management and procurement in 2025 represent approximately the amount of EUR 954.200 which represents an increase compared to the previous year.

There will be changes in the future on the deployment of controls, especially in the field of ex-post controls related to grants. With the application of lump sum form of grants, the focus of ex-post controls will no longer be on verifying the costs actually incurred by the beneficiaries, but rather on technical aspects of the grant implementation. Since the JU will have to conduct/steer, using its own capacities, the qualitative (technical) ex-post reviews, apart from the expected qualitative changes in the internal deployment of capacities dedicated to grant-related controls, also quantitative changes can be expected in this respect in the future – towards the increase of the total capacities used for ex-post controls. The volume of control capacities dedicated to the procurement and contract management should remain at a similar level, reflecting the amount of JU's funds deployed through procurement.

With regard to cost-effectiveness of controls, the following table presents figures on overall cost spent at EU-Rail in 2025 on controls related to grants and procurements, compared to total cost⁹¹:

Cost of controls / Total expenditure 2025 (administrative + operational)	1.41%
Cost of controls / Operational expenditure 2025	1,53%

The costs of control has remained constant and the minor fluctuation are due to the fluctuation in the salaries and staff levels..

As for the benefits and particular financial effects of the controls carried out, in most of the cases, these are not possible to be effectively calculated in a precise manner. In general, the main benefit of controls resides in the continuous reasonable assurance on the fact that the principle of sound financial management is being pursued which includes preventing and detecting potential irregularities. To a limited extent⁹², the recoveries following from the financial ex-post audits carried out by the CAS could be considered as a form of particular positive financial impact (benefit) resulting from controls..

In conclusion, from the JU's perspective, controls applied in grant management and procurement are considered cost-effective. Emphasis is given to adequate balance between low error rates and timely payments on one hand, and the costs dedicated to carrying out controls on the other hand. By deploying lump sum form of funding for the grants under the HE Programme, EU-Rail strikes the right balance between reducing the administrative burden for beneficiaries and protecting EU financial interests. However, the fact that EU-Rail will be fully in charge of the ex-post controls for lump sum grants, with no CAS resources involved, will most likely increase the JU's cost of controls in the future. Regardless, achieving reasonable assurance with regard to the sound financial management of the grant implementation will remain EU-Rail top priority.

4.2. Audit observations and recommendations

4.2.1. Internal Audit

In accordance with Article 28 of the JU Financial Rules, the internal audit function shall be performed by the Commission's Internal Audit Service (IAS). IAS reports on its findings and recommendations to the Joint Undertaking's GB and ED.

In line with the International Standards for the Professional Practice of Internal Auditing⁹³ the internal auditor shall advise the JU on dealing with risks, by issuing independent opinions on the quality of management and control systems and by issuing recommendations to improve the implementation of operations and promote sound financial management. In March 2024 the IAS confirmed that EU-Rail has adequately and effectively implemented all recommendations from the "Audit on H2020 grant implementation and closing". As a result, there are currently no pending IAS audit recommendations.

Following its in-depth risk assessment performed at the JU during Q4 2023, the IAS drew up their Strategic Internal Audit Plan for EU-Rail for 2024-2026⁹⁴. The JU was notified in March 2024 by IAS that their engagement planned to start in 2024 and to be finalized in 2025 will be the audit on the set up of back office arrangements (BOA) between the joint undertakings. The audit in question continued throughout the year 2025 and is ongoing at the time of drafting of this AAR.

⁹¹ It should be noted that the quantification of JU's cost of controls is based to a certain extent on qualified estimates and simplified assumptions, as a more precise cost calculation would require continuous detailed time recording throughout the year of all particular control activities conducted at the level of all concerned staff members. Such recording would create excessive administrative burden and would not be considered feasible in terms of the cost-benefit ratio.

⁹² The primary focus of the control system should be on prevention, aiming at minimising the occurrence of and the necessity of subsequent recoveries.

⁹³ As of 9 January 2024, the Standards maintained by the Institute of Internal Auditors are referred to as the "Global Internal Audit Standards."

⁹⁴ Ref. ARES(2023)8515994 – 12/12/2023.

4.2.2. Audit of the European Court of Auditors

The European Court of Auditors (ECA) completed in 2025 its Statement of Assurance audit of the JUs and JU’s Annual Audit Report for the year 2024, in accordance with the ECA mandate as defined in the TFEU. During 2025, for the 2024 Financial Year, the European Court of Auditors released the following opinions:

Opinion on the reliability of the accounts

“In our opinion, the EU-Rail accounts for the year ended 31 December 2024 present fairly, in all material respects, its financial position as at 31 December 2024, the results of its operations, its cash flows, and the changes in net assets for the year then ended, in accordance with its financial regulation and with accounting rules adopted by the Commission’s accounting officer. These are based on internationally accepted accounting standards for the public sector.”

Opinion on the legality and regularity of revenue underlying the accounts

“In our opinion, the revenue underlying the EU Rail accounts for the year ended 31 December 2024 is legal and regular in all material respects.”





Opinion on the legality and regularity of payments underlying the accounts






“In our opinion, the payments underlying the EU-Rail accounts for the year ended 31 December 2024 are legal and regular in all material respects.”

The ECA reported no major or critical findings for the JU in its Annual report on EU Joint Undertakings for the financial year 2024.

On the contrary, in its *Annual report on EU joint undertakings for the financial year 2024*, the ECA noted that EU-Rail is advanced with the implementation of Horizon Europe and members’ contributions. The ECA also reported that its audit of two randomly sampled EU-Rail H2020 and HE transactions, which took place at the level of final beneficiaries and was aimed at assessing the effectiveness of JU’s management and control systems and the legality and regularity of operational expenditure, resulted in no errors. Finally, the ECA underlined that its audit of lump sum payments made in recent years did not reveal any errors.

ECA did not issue specific recommendations for EU-Rail in its Annual report on Joint Undertakings for the financial year 2024. The State of play of the recommendations common with other JUs is as follows:

Reported	Audit Title	JUs	Recommendation	State of play in 2025	Impact on the assurance for 2025
6/2021	Annual report on EU joint undertakings for the 2024 financial year	All JUs except F4E	JUs should implement a time-recording system to obtain objective data on staff time spent on each activity.		
7/2021	Annual report on EU joint undertakings for the 2024 financial year	All JUs except F4E	JUs should develop a formalised model or guidance on how to estimate staff needs (including essential competences) for each activity and unit, with the objective of optimising the use of staff resources.		

State of play	Assurance
 Action plan implemented	 No impact on the assurance
 Action plan implementation is ongoing	 Impact on the assurance
 Preparation of the action plan	

4.2.3. Overall Conclusions

In 2025, no critical findings/observations were issued for EU-Rail, neither by IAS, nor by ECA, which would indicate any serious issues or deficiencies with regard to the JU's risk management or to the design and implementation of its internal control system.

4.3. Assessment of the effectiveness of internal control systems

4.3.1. Continuous monitoring

In 2019, the JU started the process of implementing its new Internal Control Framework (ICF) based on the EC Internal Control Standards, also with the objective of introducing a more pro-active approach in the design and implementation of internal controls, rather than focusing mostly on the compliance aspects. This process resulted in 2020 in the adoption of a revised ICF by means of the Executive Director's Decision ED-20-08.

The JU's ICF is designed to provide reasonable assurance regarding the achievement of the following objectives:

- Effectiveness, efficiency and economy of operations;
- Reliability of reporting;
- Safeguarding of assets and information;
- Prevention, detection, correction and follow-up of fraud and irregularities;
- Adequate management of the risks relating to the legality and regularity of the underlying transactions, taking into account the multiannual character of the JU Programme as well as the nature of the payments concerned.

Ever since the revised ICF was adopted, it has been implemented by the Executive Director in the organisation's day-to-day activities, with the support of the Internal Control Coordinator, involving all staff across all JU functions as well. This process included also further fine-tuning of the internal controls and maintaining awareness among the staff of the ICF and its importance for achieving the JU's objectives.

The design of internal controls and their effective implementation is subject to continuous considerations and the ICF is amended, as deemed necessary. Such continuous monitoring is supplemented by annual in-depth self-assessment exercises aimed at comprehensive evaluation of the presence and functioning of all 17 internal control Principles, forming the five Components of the EU-Rail internal control system⁹⁵:

1. Control environment
2. Risk assessment
3. Control activities
4. Information and communication
5. Monitoring activities

⁹⁵ The EU-Rail ICF is based on the COSO Internal Control Integrated Framework, also applied by the Commission services.

The latest annual ICF self-assessment evaluating the situation in 2025 was conducted in Q1-Q2 2026. The assessment was carried out on the basis of 53 indicators and taking into account all relevant information available at that time, including the results from previous internal/external audits and the records in the JU's register of exceptions and non-compliance events.

After due assessment, no major or critical deficiencies in internal controls were identified. All individual ICF Principles as well as Components were found to be present and functioning. Feedback from staff survey conducted in Q1 2026 with respect to the year 2025 showed positive tendency with all indicators on the rise, but one. The JU will implement the remedial activities, to the extent possible, in 2026.

Finally, the exception reporting shows no evidence of critical exception events that have occurred in 2025. Thus, on this basis, it can be concluded that the JU's control system as a whole is present and functioning well.

4.3.2. Risk assessment and management

EU-Rail's risk assessment and risk management activities follow the principles of the recognised international standards and are aligned to the requirements of the Commission as indicated in its Communication SEC(2005)1327 "*Towards an effective and coherent risk management in the Commission services*"⁹⁶. It is a continuous process involving clear communication to governance bodies, staff, and stakeholders on how EU-Rail positions itself in the management of risks and opportunities that can affect the achievement of its objectives, taking into consideration the assessment of the level of uncertainty that the JU is willing to accept (risk appetite). The Executive Director approves the policy and sets the tone, staff at the different levels implement the policy in the day-to-day operations. The Governing Board takes account of the most relevant risks and of the related action plan depicted in the JU's risk register, brought to its attention by means of the Consolidated Annual Activity Report and the Work Programmes.

Risk is defined as "*any event that could occur and adversely impact the achievement of the Joint Undertaking's strategic and operational objectives. Lost opportunities are also considered a risk*".

The Risk Management system aims at enabling informed decision making with the objective of optimising the ratio between the level of risk acceptable to the JU on one hand, and, on the other hand, the use of the relevant resources related to identifying, analysing, treating, and monitoring of risks and opportunities.

In 2025, in accordance with the JU's Policy for Risk Management as defined in its Governance and Process Handbook, the JU performed a risk assessment exercise with the aim of updating the elements related to risks and opportunities already included in its risk register, as well as identifying potential new ones. Within this exercise, due account was taken of both internal and external factors and developments having influence on JU's daily operations. Attention was given also to the fraud risks. In the framework of peer review of most relevant risks steered by EUAN PDN, EU-Rail shared with DG MOVE, in the absence of cluster coordinator, the results of EU-Rail 2025 risk assessment exercise.

The risks identified in the previous years' risk assessment activities which require, due to their criticality, continuous attention and treatment of the Executive Director and, where relevant, of the Governing Board, are presented in the JU Work Programme 2025-2026 and the follow-up outcomes on these risks will be present in the 2026 CAAR. Follow-up considerations applicable to the most relevant risks identified for 2025 are presented in Section 1.1 of this CAAR.

4.3.3. Prevention of Conflict of Interest

As for the treatment of potential conflicts of interests, and to implement the requirements following from its constituent act with regard to this matter, the JU has adopted the respective rules by means of its internal legal framework applicable to its managers, staff, as well as the members of its Governing Board. The annual declarations of interests of the latter are publicly available in the JU official website. Thus, as it was the case in the past, EU-Rail will continue also in the future to apply various measures, such as:

- requiring annual declarations of interests from the staff members;
- obliging the independent experts used by the JU to declare any potentially conflicting interests;

⁹⁶ https://commission.europa.eu/publications/risk-management_en

- assessing potential conflicts of interests of persons (including those coming from outside of EU-Rail) involved in recruitment procedures, calls for proposals/tenders evaluations, etc.;
- requiring annual declaration of interests from the Governing Board members, as well as declaration of confidentiality and conflict of interest from all attendees to each EU-Rail's Governing Board meeting.

Furthermore, the JU Executive Director will continue in the practice of stressing to the staff and to the GB members the importance of compliance to the highest standards in ethical matters, including the situations potentially involving conflicts of interests. The JU's Internal Control Coordinator and HR Officer will support the ED in this respect, especially by engaging in awareness-raising activities addressing the EU-Rail staff.

4.4. Conclusion on the assurance

The EU-Rail Executive Director is not aware of any element that would bring him to introduce a reservation in this 2025 CAAR.

In addition to the specific supervisory activities carried out by the ED himself, the main elements supporting further the reasonable assurance related to the principle of sound financial management are:

- the Certificate of the Accounting Officer;
- the information received from the Acting Head of Corporate Services, Head of System Pillar , Communication and Outreach, Head of Innovation Pilar, Local Cybersecurity officer;
- the assessment of the Internal Control Framework carried out by the Internal Control Coordinator;
- the results of the audit of the ECA;
- audits and risk assessments performed by the Internal Audit Service of the Commission;
- the overall risk management performed in 2025 and supervised by the ED;
- the assessment of the key performance indicators;
- the dedicated ex-ante controls of the JU's operational and administrative expenditure;
- the results from ex-post audits carried out by the Common Audit Service of DG RTD;
- the JU Members' reporting of their in-kind contributions/total project costs, as applicable;
- the monitoring and follow-up of the processes related to the calls for proposals/tenders;
- the deployment of independent external experts and observers in grant management;
- information reported in the JU's register of exceptions and non-compliance events and the related remedial measures put in place.

4.5. Statement of Assurance

4.5.1. Assessment of the Consolidated Annual Activity Report by the Governing Board

The ED submits the draft CAAR to the Joint Undertaking's Governing Board for assessment and approval. Once approved by the GB, the CAAR is made publicly available. No later than 1 July of each year the CAAR together with its assessment shall be sent by the Executive Director to the European Court of Auditors, to the Commission, to the European Parliament and to the Council.

The EU-Rail GB takes note of the results achieved and recommends the JU to continue improving its effectiveness and efficiency with the Members' stronger support.

4.5.2. Declaration of assurance

I, the undersigned, Giorgio Travaini, Executive Director of the Europe's Rail Joint Undertaking

In my capacity as authorising officer by delegation

Declare that the information contained in this report gives a true and fair view⁹⁷.

State that I have reasonable assurance that the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.

This reasonable assurance is based on my own judgement and on the information at my disposal, such as the results of the self-assessment, ex-post controls, the work of the Head of System Pilar, Communication and Outreach, Head of Innovation Pilar, Head of Corporate Services and Internal Control Coordinator, the observations of the Internal Audit Service and the lessons learnt from the reports of the Court of Auditors for years prior to the year of this declaration.

Confirm that I am not aware of anything not reported here which could harm the interests of the Joint Undertaking.

Brussels, 23 June 2026

Giorgio Travaini
Executive Director

⁹⁷ True and fair in this context means a reliable, complete, and correct view on the state of affairs in the Joint Undertaking.

4.5.3. Statement on management reporting

a) For the Head of System Pilar, Communication and Outreach

I hereby certify that the information provided in Sections 1, 2, and 3 of the present Annual Activity Report and in its annexes is, to the best of my knowledge, accurate and complete.'

Brussels, 23 June 2026

(e-signed)

Ian Conlon

Head of System Pilar, Communication and Outreach

b) For the Head of Innovation Pilar

I hereby certify that the information provided in Sections 1 and 3 of the present Annual Activity Report and in its annexes is, to the best of my knowledge, accurate and complete.'

Brussels, 23 June 2026

(e-signed)

Nicolas Furio

Head of Innovation Pilar

c) For the Head of Corporate Services

I hereby certify that the information provided in Sections 1, 2, 3, and 4 of the present Annual Activity Report and in its annexes is, to the best of my knowledge, accurate and complete.'

Brussels, 23 June 2026

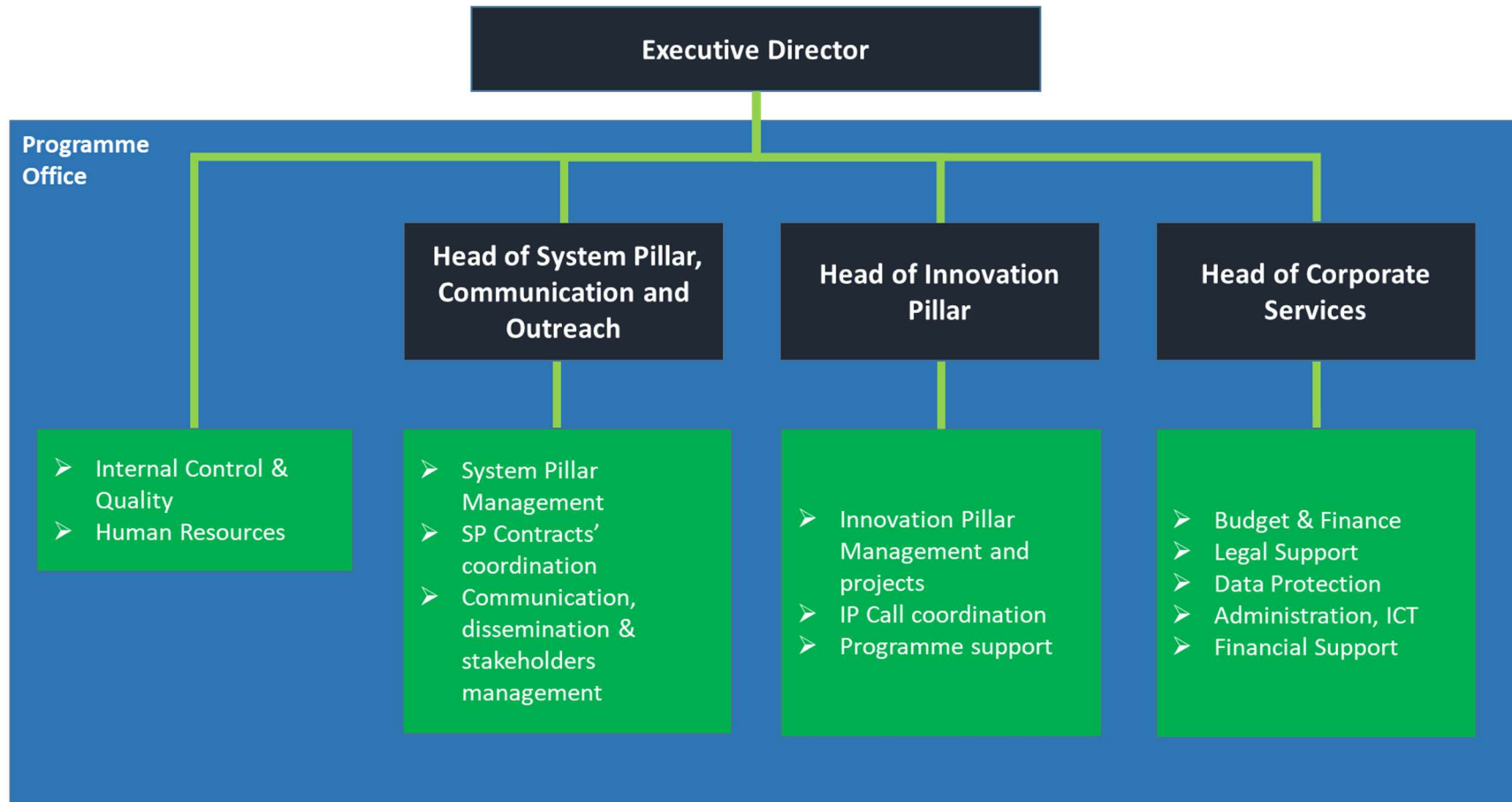
(e-signed)

Isaac González García

Acting Head of Corporate Services

5. ANNEXES

ANNEX 1: Organisational structure of EU-Rail



ANNEX 2: Establishment plan and additional information on HR management

Function group and grade	YEAR 2024				YEAR 2025			
	Authorised		Actually filled as of 31/12		Authorised		Actually filled as of 31/12	
	Perm. posts	Temp. posts	Perm. posts	Temp. posts	Perm. posts	Temp. posts	Perm. posts	Temp. posts
AD 16								
AD 15								
AD 14		1		1		1		1
AD 13								
AD 12								
AD 11						2		
AD 10		2		1		1		1
AD 9		1		1		1		2
AD 8		1		1				1
AD 7						5		4
AD 6		4		4		1		
AD 5		1		1				1
TOTAL AD		10		9		11		10
AST 11								
AST10								
AST 9								
AST 8								
AST 7								
AST 6								
AST 5								
AST 4								
AST 3								
AST 2								
AST 1								
TOTAL AST								
AST/SC 6								
AST/SC 5								
AST/SC 4								

AST/SC 3								
AST/SC 2								
AST/SC 1								
TOTAL AST/SC								
GRAND TOTAL	10	9		11		10		

Contract Agents	Authorized	Actually filled as of 31/12/2025
Function Group IV	15	14
Function Group III	4	5
Function Group II	1	0
Function Group I		
TOTAL	20*	19

*Human Resources financed outside the EU budget	2025
Financed from participation of candidate countries and/or third countries	1 ⁹⁸

Seconded Experts	National	Authorized	Actually filled as of 31/12/2025
		2	2
TOTAL		2	2

The full staffing as per the JU's Staff Establishment Plan comprises 33 posts.

⁹⁸ the reduction of 1 position financed by the EU Budget is compensated by another one financed by third countries.

ANNEX 3: Publications and external events participated to by the joint undertaking in 2025

Overview of publications and events

JU 2025 PUBLICATIONS

Title	Publication Date	Link to publication
Draft Paper- A Future Policy Based Public Private Partnership for Rail	14 February 2025	https://rail-research.europa.eu/publications/draft-paper-a-future-policy-based-public-private-partnership-for-rail/
Annual Activity Report 2024: Executive View	18 September 2025	https://rail-research.europa.eu/publications/eu-rail-annual-activity-report-2024/
Europe's Rail Blueprint: Designing the future of rail innovation		

JU 2025 PRESS RELEASES

Title	Publication Date	Link to publication
EU-Rail Welcomes New Associated Members to Drive Innovation in the EU Rail Sector	19 March 2025	https://rail-research.europa.eu/press-releases/eu-rail-welcomes-new-associated-members-to-drive-innovation-in-the-eu-rail-sector/
Net-Zero Logistics Study: The Essential Role of Rail Freight	17 June 2025	https://rail-research.europa.eu/press-releases/net-zero-logistics-study/
Press Release: The European Commission and the EU-Rail Private Members urge bold action to drive future European competitiveness, resilience and sustainability	3 July 2025	https://rail-research.europa.eu/latest-news/press-release-the-european-commission-and-the-eu-rail-private-members-urge-bold-action-to-drive-future-european-competitiveness-resilience-and-sustainability/
Women in Rail Award 2025: Winners Announced	2 October 2025	https://rail-research.europa.eu/latest-

		news/women-in-rail-award-2025-winners-announced/
Press Release: Europe's Rail launches €245 million worth Call for new R&I Proposals to accelerate rail innovation	7 October 2025	https://rail-research.europa.eu/latest-news/press-release-europes-rail-launches-e245-million-worth-call-for-new-ri-proposals-to-accelerate-rail-innovation/

JU 2025 NEWSLETTERS

Title	Publication Date	Link to Publication
Join Our Info Day Call 2025-1: : January 2025 Newsletter	31 January 2025	https://mailchi.mp/rail-research.europa.eu/january-2025-newsletter
Apply Now to Our Call 2025-1: February 2025 Newsletter	27 February 2025	https://mailchi.mp/rail-research.europa.eu/february-2025-newsletter
New Associated Members Join EU-Rail to Boost Rail Innovation: March 2025 Newsletter	31 March 2025	https://mailchi.mp/rail-research.europa.eu/march-2025-newsletter
The European Railcast — Coming Soon: April 2025 Newsletter	30 April 2025	https://mailchi.mp/rail-research.europa.eu/april-2025-newsletter
Women in Rail Awards 2025: May 2025 Newsletter	28 May 2025	https://mailchi.mp/rail-research.europa.eu/may-2025-newsletter-14404426
The second episode of “The European Railcast – A Podcast About the Future of European Mobility,” is out now! : June 2025 Newsletter	01 July 2025	https://mailchi.mp/rail-research.europa.eu/june-2025-newsletter-14404795
Newly adopted high-level paper “A Future Policy-Based Public-Private Partnership for Rail” : August2025 Newsletter	5 September 2025	https://mailchi.mp/rail-research.europa.eu/august-2025-newsletter-14405571
Europe's Rail Info Day – Call for Proposals 2025-02: Registration Now Open: September 2025 Newsletter	1 October 2025	https://mailchi.mp/rail-research.europa.eu/september-2025-newsletter-14405937
Europe's Rail Launches Call for Proposals 2025-02 to Transform European Rail October 2025 Newsletter	3 November 2025	https://mailchi.mp/rail-research.europa.eu/october-newsletter-europes-rail-launches-

		call-for-proposals-2025-02-to-transform-european-rail
: Join Europe’s Rail Info Sessions and explore the Flagship Projects November 2025 Newsletter	1 December 2025	https://mailchi.mp/rail-research.europa.eu/november-newsletter-europes-rail-launches-call-for-proposals-2025-02-to-transform-european-rail-14406932
EU-Rail Highlights	19 December 2025	https://mailchi.mp/rail-research.europa.eu/eu-rail-2025-highlights

PRESS ARTICLES ABOUT THE JU PUBLISHED IN 2025

1. Global Railway Review	In-Depth Focus: Digital Automatic Coupling	1. https://www.globalrailwayreview.com/article/196702/in-depth-focus-digital-automatic-coupling-2/
	UNIFE hopes €3bn R&I investment to protect European rail’s strategic autonomy	2. https://www.globalrailwayreview.com/news/200662/unife-hopes-e3bn-ri-investment-to-protect-european-rails-strategic-autonomy/
	The role of DAC in optimising European rail freight: Challenges and opportunities	3. https://www.globalrailwayreview.com/article/197847/the-role-of-dac-in-optimising-european-rail-freight-challenges-and-opportunities/
	How EU-RAIL prepares for DAC: specification, design, testing and pioneering	4. https://www.globalrailwayreview.com/article/197876/how-eu-rail-prepares-for-dac-specification-design-testing-and-pioneering/
	“EU rail leaders meet in Poland to push for high-speed network and urgent funding reforms”	5. https://www.globalrailwayreview.com/news/204893/eu-rail-leaders-meet-in-poland-to-push-for-high-speed-network-and-urgent-funding-reforms/
	EU shows faith in key Rail Fund by doubling it – European Rail Supply Industry Reacts to Draft EU Budget	6. https://www.globalrailwayreview.com/news/224661/eu-shows-faith-in-key-rail-fund-by-doubling-it-european-rail-supply-industry-reacts-to-draft-eu-budget/

	Europe's Rail Joint Undertaking launches €148.2 million call for innovative projects across Europe	7. https://www.globalrailwayreview.com/news/231948/europes-rail-joint-undertaking-launches-e148-2-million-call-for-innovative-projects-across-europe/
	Rail sector urges stronger Connecting Europe Facility to boost EU transport funding, competitiveness and security	8. https://www.globalrailwayreview.com/news/231886/rail-sector-urges-stronger-connecting-europe-facility-to-boost-eu-transport-funding-competitiveness-and-security/
2. International Railway Journal https://ec.europa.eu/newsroom/move/newsletter-archives/50348	FRMCS progresses towards field testing	9. https://www.railjournal.com/infrastructure/frmcs-progresses-towards-field-testing/
	Adif prepares for FRMCS trials	10. https://www.railjournal.com/technology/adif-prepares-for-frmcs-trials/
	R2Dato: accelerating the digitalisation and automation of Europe's railway network	11. https://www.railjournal.com/in_depth/r2dato-accelerating-the-digitalisation-and-automation-of-europes-railway-network/
	A new blueprint for European rail industry success	12. https://www.railjournal.com/analysis/a-new-blueprint-for-european-rail-industry-success/
	Spanish consortium tests innovative accessibility systems in Málaga	13. https://www.railjournal.com/technology/spanish-consortium-tests-innovative-accessibility-systems-in-malaga/
	Infrastructure investment funding increased in draft EU budget	14. https://www.railjournal.com/regions/europe/infrastructure-investment-funding-increased-in-draft-eu-budget/
	R2DATO: accelerating the digitalisation and automation of Europe's railway network	15. https://flickread.com/edition/html/67e282420195f?utm_source=UITS&utm_campaign=ddf721fb82-EMAIL_CAMPAIGN_2025_01_14_09_50_COPY_01&utm_medium=email&utm_term=0_697d766359-587176211#27
	<u>Arctic Test Arena opens in Norway</u>	16. https://www.railjournal.com/technology/arctic-test-arena-opens-in-norway/
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EU-Rail participation to 2025 events

In 2025, the JU participated to major events across Europe and beyond, presenting concrete results achieved by JU Members together with other key stakeholders.

ITF Annual Consultation with International Organisations, 28 January, Paris, France

Europe's Rail participated in the 2025 ITF Annual Consultations with International Organisations on 28 January in Paris, represented by our Chief Stakeholder Relations and Dissemination Officer. The event provided an opportunity for invited organisations to comment on the proposed sessions for the 2025 ITF Summit on 'Transport Resilience to Global Shocks' scheduled for 21–23 May 2025 in Leipzig, Germany, and to discuss integrating gender considerations into the ITF - International Transport Forum Summit.

Meeting with the Hungarian Delegation, 17 February, Brussels, Belgium

Our Executive Director, Giorgio Travaini welcomed the CEO of the Hungarian State Railways, MÁV Group, along with his colleagues Zsanett Karacs and Matyas Obreczan, to the EU-Rail premises. This meeting with the Hungarian delegation provided an opportunity to discuss the future of the European rail sector from a Hungarian perspective. Europe's Rail constantly seeks to collaborate with all EU Member States and strengthen our partnership to work together towards innovative solutions in the rail sector.

European Railway Award, 17 February, Brussels, Belgium

The European railway sector has used the 18th edition of the European Railway Award to call on all actors, from policymakers to the broader sector and beyond, to move from planning to execution, in order to fully realise the benefits of the Single European Railway Area. Attended by Europe's Rail Executive Director and many others, it was a great opportunity to discuss how a truly connected European rail network is crucial in tackling the continent's biggest challenges.

Europe's Rail Call for Proposals 2025-1 Info-Day, 11 March, online

The event provided an overview of the objectives of the Europe's Rail Research and Innovation Programme and highlighted opportunities for involvement in making rail a more attractive mode of transport for both passengers and businesses across Europe. Participants also learnt about the Europe's Rail funding opportunity, *Europe's Rail Call for Proposals 2025*, with a total value of €3 million.

Railway Innovation in the 21st century, 12 March, Strasbourg, France

Europe's Rail Executive Director, Giorgio Travaini attended a high-level breakfast debate on 'Railway Innovation in the 21st Century', hosted by MEP François Kalfon. The discussion centred around the need to roll out innovations, particularly in order to improve the reliability of the rail system and offer new services that are key to the attractiveness of rail transport. Maintaining this momentum is essential if the ambitions of the Green Deal are to be realised.

European Rolling Stock Summit, 18-19 March, Warsaw, Poland

Europe's Rail attended and spoke at the European Rolling Stock Summit, which was a pivotal gathering for key decision-makers from across the sector, including Wagon Keepers, Original Equipment Manufacturers (OEMs), Entity in Charge of Maintenance (ECMs), and leading suppliers.

Europe's Rail Executive Director, Giorgio Travaini also had the pleasure of meeting with Alan Beroud, CEO of PKP S.A., as well as Katarzyna Bożek and Pawel Chwiecko, representatives of our EU_Rail Founding Members. The discussions centered around PKP S.A.'s current railway projects, future ambitions for rail transport, and the pivotal role of Research & Innovation, all key aspects highlighted in our recently published draft high-level paper.

Railway Industry Association Innovation Conference 2025, 25 March, South Wales, UK

A flagship event in the Unlocking Innovation programme, the RIA Innovation Conference was attended by our Head of System Pillar, Communication and Stakeholder Outreach, who delivered a keynote speech. The event provided an excellent opportunity to showcase innovations, draw inspiration from technological and research advancements in the UK and beyond, engage with clients and suppliers to overcome barriers.

TRAN Committee Meeting, 9 April, Brussels, Belgium

EU-Rail presented its latest progress to the European Parliament's Committee on Transport and Tourism, highlighting the importance of coordinated collaboration at EU level in rail R&I. Our Executive Director Giorgio Travaini emphasised the focus on developing standardised solutions validated across Member States. This priority was also underlined by Oana Gherghinescu, newly appointed Executive Director of the European Union Agency for Railways, particularly with respect to safety and interoperability. Mr. Travaini highlighted the need for coordinated deployment strategies to transition from legacy infrastructure to next-generation technologies in a cost-effective way across Europe. The event was also an opportunity to elaborate on the European DAC Delivery Programme. Finally, he referenced the recently published EU-Rail draft High-Level Paper, outlining the vision for a future public-private partnership to simplify the rail system and create a Single European Rail Area (SERA).

Antwerp Rail School 2025, 22 April, Antwerp, Belgium

Our Head of Innovation Pillar, Nicolas Furio, participated in the panel discussion on "A broader perspective on groundbreaking innovations". The event aimed to provide students with a comprehensive understanding of rail economics, market dynamics, and the innovative potential of the sector while creating a platform to interact with industry stakeholders.

Joint JU event at the European Parliament, 21 May, Brussels, Belgium

On 21 May, the EU's 11 Joint Undertakings convened at the [European Parliament](#) alongside Members of the European Parliament, European Commission representatives and industry stakeholders to exchange and discuss how public-private partnerships are advancing Europe's strategic objectives. Hosted by MEP Christian Ehler, the event highlighted tangible achievements across multiple sectors, including air and rail transport, health, hydrogen, bioeconomy, semiconductors and telecommunications. Mr Ehler emphasised that Joint Undertakings are the instruments generating the greatest leverage from the EU research budget and are among the most relevant tools to strengthen European Competitiveness.

Portugal Rail Summit, 21-22 May, Entroncamento, Portugal

Europe's Rail Head of the Innovation Pillar, Nicolas Furio, represented us at the Portugal Railway Summit 2025, where he presented Europe's Rail's activities and outlined upcoming opportunities for Research and Innovation (R&I). The event also provided an excellent opportunity to engage with the Portuguese railway community and to meet our new Associated Member, **Infraestruturas de Portugal**.

ITF Summit, 21-23 May, Leipzig, Germany

EU-Rail participated as a Silver Supporter in the International Transport Forum (ITF) Summit 2025, held from 21-23 May in Leipzig, Germany. This year's edition focused on the role of transport in addressing current global challenges, underlying the need for more sustainable, innovative and resilient transport systems.

At a joint stand with the European Union Agency for Railways (ERA), we showcased how policy, innovation and regulation are shaping the future of rail. Our Executive Director, Mr Giorgio Travaini, contributed to the Ministers' Round Table on Transport and Climate Change. A key session focused on integrating transport into climate commitments and scaling up ambition towards COP30.

Additionally, EU-Rail hosted the media event 'Advancing Global Rail: EU-Rail's Innovations and the Path to Interoperability', highlighting key achievements from past and ongoing R&I. As addressed in the high-level draft paper, "A Future Policy-Based Public-Private Partnership for Rail," the evolving role of Technical Specifications for Interoperability (TSIs) emphasises the critical importance of our partnership in building a unified, high-performing European rail network.

13th International Railway Summit, 3-5 June, Vienna, Austria

Our Head of the Innovation Pillar, Nicolas Furio, moderated a key panel at the 13th International Railway Summit in Vienna titled "Digital Transformation in Rail: Where Should We Invest Next?". The discussion focused on three interconnected areas of the Europe's Rail Research and Innovation Programme: advancing the development of critical rail technologies through the Innovation Pillar; strengthening standardisation and interoperability while reducing costs through the System Pillar; and ensuring efficient, coordinated deployment of digital solutions through the Deployment Group. Together, these efforts demonstrate Europe's Rail's key role in shaping the digital future of rail in Europe.

European Rail Research Advisory Council (ERRAC) Plenary, 5 June, Brussels, Belgium

Europe's Rail participated in the European Rail Research Advisory Council (ERRAC) Plenary on 5 June in Brussels, Belgium. Our Head of the Innovation Pillar, Nicolas Furio, delivered a keynote speech on the Europe's Rail Programme and its ongoing activities, and the outlook for 2026-2029.

European Startup Prize for Mobility 2025, 5-6 June, Rzeszów, Poland

Europe's Rail proudly participated in the [6th European Startup Prize for Mobility](#), on June 5 in Rzeszów, Poland, celebrating Europe's top clean mobility innovators. Held under the Polish EU Council Presidency and during the [EU Industry Days](#) the event highlighted startups driving sustainable transport solutions. Mr Travaini awarded the Rail Mobility Prize to [Futurail](#), named Best European Rail Startup of the year. Based in Strasbourg and Munich, Futurail is a pioneer in safety-certified technology for self-driving trains. Their autonomous rail stack enables greater efficiency, cost-effectiveness and sustainability, contributing to a low-carbon rail network and enhancing the passenger experience across Europe.

UNIFE's 34th General Assembly, 11-12 June, Warsaw, Poland

On June 12, EU-Rail participated in the UNIFE's 34th General Assembly in Warsaw, Poland. The event provided a valuable opportunity to discuss the upcoming European rail funding, challenges to competitiveness, trade relations and the development of a European High-Speed Rail Network. Mr Travaini represented the European Commission, alongside Keir Fitch, Advisor for Innovation and Industrial Policy at DG MOVE. Together with Oana Gherghinescu, Executive Director of the [European Union Agency for Railways \(ERA\)](#), they took part in the institutional panel titled "How can the EU support the European Rail Supply Industry?". The panel, moderated by Enno Wiebe, Director General of UNIFE, focused on the pivotal role of EU-Rail, the European Commission, and ERA in advancing the Single European Railway Area and enhancing the competitiveness of Europe's rail supply industry.

Rail Data Forum 2025, 11-13 June, Cluj, Romania

The Rail Data Forum 2025, held from 11 to 13 June in Cluj-Napoca, Romania, gathered over 140 rail and data professionals to discuss the future of digitalisation, interoperability and strategic use of data in Europe's rail systems. The event featured several plenary sessions, workshops and masterclasses, all designed to foster collaboration and innovation across the rail sector.

During the Forum, our Head of the System Pillar and Communication Unit Ian Conlon outlined the significant steps EU-Rail is taking, including the extension of the ERA ontology, developing digital twins and creating a Rail Federated Data Space. These initiatives are crucial in positioning data as a central asset for building a modern, interoperable and sustainable European rail system.

UITP Global Public Transport Summit 2025, 15-18 June, Hamburg, Germany

From 16 to 18 June, EU-Rail participated in the UITP Summit 2025 in Hamburg, Germany, featuring its stand and contributing to crucial dialogues on the future of rail mobility. On 16 June, EU-Rail Executive Director Giorgio Travaini moderated a Power Session titled "Next-Gen Rail: How Technology, Governance, and Other Customer Needs are Reshaping the Sector." The session provided valuable insights from Peter, Lord Hendy of Richmond Hill, Minister of State for Rail at the UK Department for Transport. He outlined the UK's rail reform agenda, focusing on modernisation and improving performance, while also emphasising a shift towards greater state involvement in passenger rail to enhance service delivery and timetable management. Marie-Ange Debon, CEO of Keolis Group, also shared her perspective, highlighting the importance of innovation and passenger experience in driving the future of mobility.

Additionally, on 17 June, Mr. Travaini met with the Norwegian Railway Directorate, one of EU-Rail's members, to further strengthen collaboration in the areas of innovation, standardisation and regulation within the European rail network.

Léa Paties, EU-Rail Senior Programme Manager, participated in the FP2-R2DATO Expert Dialogue on "*Unlocking Full Automation through Strategic R&I.*" During the session, she presented the latest developments in Flagship Area 2, focusing on digitalisation and automation within the rail sector. Additionally, she announced that a Call for Proposals will be launched in October to support the next phase of automation solutions, including testing, development and pre-deployment activities.

Conference on Rail Resilience to Climate Change, 16 June, Warsaw, Poland

On 16 June, a conference on the impact of climate change on the railway system was held in Warsaw, organised by the European Union Agency for Railways, the European Commission, and the Office of Rail Transport. Europe's Rail was represented by Nicolas Furio, Head of the Innovation Pillar, who moderated Panel III – "Innovation for Rail Resilience". The conference formed part of the events organised under the Polish Presidency of the Council of the European Union.

Net-Zero Logistics Study Press Event, 30 June, online

EU-Rail has officially launched the Net-Zero Logistics Study, which was presented on 30 June during an online webinar. Commissioned to Ernst & Young and developed in collaboration with a Steering Committee representing rail and logistics stakeholders from across Europe, the study's findings highlight that investment in rail freight will not only drive decarbonisation but also generate long-term socio-economic benefits, reinforcing European competitiveness. Furthermore, the study outlines the necessary measures and investment requirements to strengthen rail's position as the cornerstone of Europe's sustainable logistics infrastructure.

Forum for Nordic Railway Professionals, 26 August, online

NJS – Forum for Nordic Railway Professionals has organised a seminar on the current implementation of ERTMS in the four Nordic countries.

The seminar will feature a keynote speech from a representative of DG MOVE, followed by discussions on national implementation plans, perspectives from train operators and the industry and future developments. Europe's Rail Senior Programme Manager, Lea Paties, participated as a speaker in the session "*A Look into the Future: ERTMS as Enabler for Future Improvements.*"

TRAKO Fair, 23 September, Gdansk, Poland

On 23 September, during the TRAKO International Railway Fair in Poland, Europe's Rail took part in showcasing the progress achieved in the rollout of Digital Automatic Coupling (DAC) across Europe. The DAC Guided Tour, organised by the European DAC Delivery Programme (EDDP) with support from EU-Rail and several DAC-related projects, brought together rail professionals and partners from across the continent. The tour began at the Railway Institute (Instytut Kolejnictwa) and continued with visits to the stands of PKP S.A., Dellner Train Connection Systems, and Voith Group, where participants explored the latest DAC innovations. The day concluded with a panel discussion featuring opening remarks by Nicolas Furio, Head of the Innovation Pillar at Europe's Rail, which addressed key challenges, the importance of automation in rail freight, and the future of DAC in Europe.

Europe's Rail Brokerage Event, 24 September, Gdansk, Poland

In addition, to ensure strong representation of EU-Rail and support regional participation, the Europe's Rail Brokerage Event was held at TRAKO Fair in Gdańsk, Poland, co-organised by EU-Rail, [PKP S.A.](#), and the [National Contact Point for EU Research Programmes](#). The event opened with remarks from EU-Rail Executive Director Giorgio Travaini and Head of the Innovation Pillar Nicolas Furio, who presented the programme's vision and upcoming co-funding opportunities. Zbigniew Jancewicz, Project Director at PKP S.A., shared insights from PKP's involvement in the Europe's Rail programme, followed by key insights from Miroslav Haltuf, representative of the Europe's Rail States Representatives Group.

Participants took part in a series of bilateral meetings to exchange ideas, build partnerships and explore potential collaborations.

Rail Days 2025, 25-26 September, Vienna, Austria

On 25-26 September EU-Rail member [Frequentis](#) hosted the Rail Days 2025 in Vienna, Austria, an event focused on the evolution of railway solutions and emerging technologies shaping the future of rail. The event brought together customers, partners and representatives from [UIC](#), the [Austrian Rail Industry](#), and EU-Rail to discuss innovations ranging from the Future Railway Communication System (FRMCS) to AI-driven sensors and drones for critical infrastructure.

EU-Rail Executive Director Giorgio Travaini delivered a keynote on EU-Rail's strategic vision, highlighting the System Pillar, which provides a platform for the rail sector to align on a strategic vision for the Single European Rail Area (SERA). The session continued with presentations on Frequentis' innovation roadmap and a joint Q&A with Günter Graf, Karl Wannemacher, Gudrun Senk, and Giorgio Travaini.

EXPO Ferroviaria 2025 - FS Logistix showcase, 1 October, Milan, Italy

On 1 October in Milan, Italy, [FS Logistix](#) showcased a freight wagon equipped with the Digital Automatic Coupling (DAC) system at [Expo Ferroviaria 2025](#), marking a major step forward in the automation and digitalisation of rail freight. Organised by FS Logistix in collaboration with [Dellner](#), the event highlighted the transformative potential of DAC to improve safety, efficiency and sustainability across rail freight operations.

Giorgio Travaini, EU-Rail's Executive Director, underlined Italy's key role, through FS Logistix and its European partners, in driving the green and digital transition of freight transport across Europe. Through its subsidiaries Mercitalia Intermodal, Mercitalia Rail, and Mercitalia Shunting & Terminal, FS Logistix contributes to EU-Rail projects [FP5-TRANS4M-R](#) and [FP5-DACtiVate](#).

Women in Rail Award 2025, 1 October, Krakow, Poland

The winners of the Women in Rail Award 2025 were announced in Kraków, Poland, during the [European Rail Safety Days](#), co-organised by EU-Rail, [the European Union Agency for Railways](#), the [European Commission](#), [CER](#), [UNIFE](#), [EIM](#), and [ALE](#). The awards recognise outstanding contributions to gender equality, innovation, and youth engagement in the rail industry. Following a detailed review process led by a panel of industry experts, including EU-Rail Programme Manager Codruta Bastucescu.

GENELEC International Workshop "ICT for Railways", 2-3 October, Madrid, Spain

On 2 October, Europe's Rail's Head of the Innovation Pillar, Nicolas Furio, participated in the 8th edition of the ICT for Railways Workshop in Madrid - a key industry event exploring how regulation, standardisation, and cutting-edge research are shaping the future of rail. The workshop provided an opportunity to present how Europe's Rail contributes to the development of the railway system through a systemic approach, simplifying operations, fostering collaboration, and reducing costs to keep rail competitive in Europe. It also served as a platform to highlight the work of Europe's Rail's Flagship Projects and the System Pillar, demonstrating how the initiative connects research and innovation with the evolution of European technical regulations and standards, paving the way for next-generation railway solutions.

Europe's Rail Info Day 2025-2, 10 October, online

Over 250 participants joined the online Europe's Rail Info Day on 10 October 2025, which introduced the new Call for Proposals 2025-02. The event featured opening remarks by EU-Rail Executive Director Giorgio Travaini, Kristian Schmidt, Director for Land Transport at the European Commission's Directorate-General for Mobility and Transport (DG MOVE), and Andrea Gentili, Deputy Head of Unit for Clean Transport Transitions at the Directorate-General for Research and Innovation (DG RTD). Magdalena Glogowska, Representative from the National Centre for Research and Development and Member of EU-Rail's Rail State Representative Group, gave insights into the Cluster 5 National Contact Points network in supporting applicants. Participants then joined dedicated matchmaking sessions based on their Destination of interest to connect with potential partners.

13th ERA Budapest Workshop 2025, 16 October, online

On 16 October, the 13th ERA Budapest Workshop, jointly organised by the European Union Agency for Railways (ERA) and Hungary's Railway Authority, brought together railway professionals, policymakers and technical experts. This year's edition, "*Advancing Rail Safety and Interoperability through the 4th Railway Package*," provided a valuable platform for sharing insights, aligning strategies and strengthening collaboration across the European rail community.

Among the featured speakers was Ian Conlon, EU-Rail's Head of the System Pillar, Communication and Stakeholder Outreach unit, who delivered a presentation titled "*Europe's Rail Joint Undertaking: Current Progress and Future Vision*," providing a strategic overview of EU-Rail's key achievements to date and insights into its forward-looking objectives.

UIC FRMCS Conference 2025, 14-16 October, Paris, France

At the 4th UIC – International Union of Railways Global FRMCS Conference in Paris, Senior Programme Managers Léa Paties and Karel van Gils presented the EU-Rail vision for the future of railway communications. During a dedicated panel on the FP2 MORANE2 initiative, Léa Paties outlined the objectives of the EU-Rail co-funded project, coordinated by UIC and involving 12 European railways, 13 manufacturers, UNIFE, The European Rail Supply Industry Association, and two Mobile Network Operators. As a key pillar of ERTMS evolution, the project aimed to enhance the capacity, digitalisation, and competitiveness of rail transport across Europe.

The panel was followed by an update on the current status and intermediate results of FRMCS from EU-Rail and the European Commission. Karel van Gils, alongside EU Transport Policy Officer Wawrzyniec Perschke, shared the outcomes of the 2025 FRMCS Deployment Survey, providing valuable insights into the sector's ongoing digital transformation.

Railway Days Summit 2025, 14-15 October, Bucharest, Romania

On October 15, Nicolas Furio, Head of the Innovation Pillar at EU-Rail, participated in the Railway Days Summit 2025, the largest and most prominent railway conference and exhibition in Romania. He contributed to an engaging panel discussion titled "The Future of Railway Infrastructure – Visions and Trends," where, alongside other industry leaders, he explored emerging technologies, current and future funding sources for railway infrastructure projects, ongoing modernisation efforts, innovative noise reduction methods, and the projects shaping the railway infrastructure of tomorrow. The session also provided an opportunity to present an overview of EU-Rail Flagship Areas 3 and 4 and to promote the new Call 2025-02.

Throughout the event, professionals, experts, industry members, and decision-makers came together to exchange ideas and insights, gaining the latest updates and trends from both Romania and the international railway sector, making it a valuable moment of connection and learning for all participants.

SmartRaCon Scientific Seminar, 16 October, Stuttgart, Germany

On 16 October, EU-Rail member DLR – German Aerospace Center hosted the 7th SmartRaCon Scientific Seminar in Stuttgart, Germany. Our Head of the Innovation Pillar, Nicolas Furio, presented a keynote highlighting the latest EU-Rail Research & Innovation (R&I) activities, our Flagship Projects new opportunities (EU-Rail Call 2025-2) and the strategic vision of Europe's Rail. The Smart Rail Control Scientific Seminars (SRC-SS) provide a valuable platform for sharing scientific research and fostering expert dialogue around the outcomes of EU-Rail, Shift2Rail, and related R&I initiatives.

Network of Heads of EU Agencies meeting, 23 October, Brussels, Belgium

EU-Rail's Executive Director Giorgio Travaini took part in the EUAN Heads of Agencies meeting in Brussels, where agency and Joint Undertaking leaders came together to strengthen collaboration across the EU Agencies Network. The discussions focused on shared priorities such as modernising public administration, fostering positive working environments and reinforcing cooperation and efficiency across EU institutions. As part of this community, EU_Rail shares the same mission of delivering science-based, data-driven and collaborative solutions that make Europe more connected, sustainable and innovative.

Hyperloop Conference, 4 November, Barcelona, Spain

On 4 November, EU-Rail Project Manager Judit Sandor participated in Hyperloop Conference 2025, held in Barcelona as part of the Smart City Expo World Congress. During the panel "Policy Meets Technology: What Will Make Hyperloop a Reality?", she addressed the policy and technological conditions required to enable hyperloop deployment, highlighting the importance of harmonisation, technological maturity, and trust-building. She also shared insights into EU-Rail's upcoming funding opportunities and research initiatives supporting the development of hyperloop as a future transport mode.

Cutting Costs in Rail Conference, 4-5 November, Copenhagen, Denmark

On 4-5 November, The Danish Presidency of the Council of the European Union hosted in Copenhagen, Denmark, a high-level event titled "*Cutting Costs in Rail*," focused on harmonised rules and innovative processes and solutions for a market-oriented Railway across Europe. Representatives from EU national governments, European institutions, national, EU regulators and the rail sector addressed key challenges through open exchange.

EU-Rail Executive Director Giorgio Travaini moderated the "*Supply Market and Competitiveness*" panel, which explored opportunities and challenges in the European rail supply market, highlighting how increased harmonisation and standardisation could improve efficiency, support industrial capacity, foster competition, and meet the growing demand for railway products across Europe.

Furthermore, EU-Rail's Head of the System Pillar, Communication and Stakeholder Outreach Unit Ian Conlon, participated in the "*European Train Control System (ETCS) Complexity / the Need for Simplification*" workshop.

Arctic Test Arena, 4-5 November, Narvik, Norway

On 4–5 November, the Arctic Test Arena was officially inaugurated in Narvik. The launch featured an official ceremony at Narvik Station, where Sébastien Denis, Senior Programme Manager at EU-Rail, delivered opening remarks, highlighting the strategic importance of the initiative for strengthening railway resilience, innovation, and cross-border collaboration under extreme climatic conditions. The inauguration brought together nearly 200 representatives from industry, research, and public authorities and marked the start of a Norwegian–Swedish testing platform dedicated to developing railway technologies in Arctic environments.

WCRR, 17-21 November, Denver, Colorado, USA

From 17 to 21 November, the 14th World Congress of Railway Research 2025 in Colorado Springs, USA, brought together the global rail community to exchange on research, innovation, and emerging solutions. On 19 November, EU-Rail Executive Director Giorgio Travaini participated in key panels highlighting EU-Rail's public–private partnership model, its role in addressing system fragmentation, costs, resilience, and the importance of EU-level coordination to support digitalisation, climate objectives, and competitiveness. Ian Conlon, Head of the System Pillar, Communication and Stakeholder Outreach Unit, also shared insights on the role of system engineering in advancing the Single European Railway Area. Additionally, they visited the PuebloPlex Campus to explore Swisspod's hyperloop testing infrastructure and its potential relevance for future rail solutions.

Rail Live, 26-28 November, Madrid, Spain

From 26 to 28 November, EU-Rail took part in Rail Live, where Senior Project Manager Karel van Gils contributed to key discussions on the transition from GSM-R to FRMCS. During a session he addressed the deployment of FRMCS from operational, technical, and industrial perspectives, outlining challenges, costs, and possible migration scenarios, while highlighting the work of the EU-Rail deployment group and the outcomes of a recent European sector-wide questionnaire. He also participated in a panel on the application of AI in the rail sector, exploring how it can drive customer value, reduce costs, and optimise operational efficiency. In addition, EU-Rail Senior Programme Manager Javier Ibáñez de Yrigoyen joined a panel on full digital freight train operations, sharing insights on the latest developments in this area.

EU-Rail Flagship Project Information Sessions, December, online

Following the success of [Europe's Rail Info Day](#), which presented the EU-Rail 2025-02 Call for Proposals, [Europe's Rail](#) organised a series of online information sessions in December dedicated to the first wave Flagship Projects in EU-Rail. These sessions offered a comprehensive overview of FP1-MOTIONAL, FP2-R2DATO, FP3-IAM4RAIL, FP4-RAIL4EARTH, FP5-TRANS4M-R and FP6-FutuRe highlighting key achievements and recent progress. Participants also had the opportunity to engage with project coordinators and experts, learn about the latest developments in EU-Rail innovation, and take part in an interactive Q&A session.

2026 ITF Annual Consultation with International Organisations, 2 December, Paris, France

EU-Rail's Senior Programme Manager Sébastien Denis attended the ITF 2026 Annual Consultation, contributing to a collaborative dialogue ahead of the 2026 Summit on "Funding Resilient Transport". The event brought together over 70 representatives from key stakeholder organisations, creating a valuable space to exchange on ongoing work, elaborate future summits and identify opportunities for collaboration. Participants also had the chance to learn more about the ITF's research priorities for the coming year. EU-Rail is proud to be a long-standing and committed partner of the [ITF - International Transport Forum at the OECD](#), and remains dedicated to contributing once again to the 2026 Summit and the collaborative work ahead.

Communication Officer Meeting, 2 December, Brussels, Belgium

EU-Rail Communications Team held the second biannual Communications Officers Meeting on 2nd December. This gathering provided an excellent opportunity to connect with communication officers from member organisations and key stakeholders across Europe, with the shared goal of discussing major updates and developments in our communication efforts. As a result of this productive meeting, officers agreed on the key communication priorities for the coming year and laid the groundwork for implementing shared strategic visions. This joint alignment includes promoting and participating in major annual events such as [InnoTrans](#), coordinating dissemination strategies to scale up project outcomes and impact, and supporting the EU-Rail Joint Undertaking's vision of connecting stakeholders across the European rail sector.

General Assembly, 2-3 December, online

On 2–3 December, the Europe's Rail General Assembly 2025 took place, providing a valuable occasion to look back at the achievements of the past year and to outline priorities for the year ahead. The first day was dedicated to Europe's Rail Strategic Reports, including the next chapter of EU-Rail and an update on the state of play. This session also highlighted a clear commitment from DG MOVE to support a next Joint Undertaking, alongside a strong commitment from all private members to continue their engagement in the next JU, confirming shared ambition and long-term alignment across the partnership. The second day was hosted as an open online event, bringing together over 100 participants from across the sector. Overall, EU-Rail confirmed that the programme is on track and delivering. Important discussions also took place on the use of data across the programme, complemented by the technical results presented on Day 2.

Communication statistics in 2025

Website User statistics

In 2025, the JU website recorded 155,605 unique visitors, with the majority of visits (80% / 124,53811,934)) coming from Europe, followed by Asia (15,845) and North America (11,934). By country, the highest number of visitors were from Belgium, followed by Germany, France, and Bulgaria. Most users accessed the website via personal computers (137,028 visitors), with smartphones being the second most popular device (16,874 visitors). The average time spent on the website was 2.50 minutes. Website engagement increased: total downloads rose by 20%, reaching 30,014, and total site searches grew by 45.5%, with 16 searches using 5 unique keywords.

The EU-Rail website was enhanced through a redesign of legacy pages and harmonisation of styles across all sections. A new page on the future of the JU was published, including the High-Level Paper and its annexes. Additionally, a new podcast section was added under News, featuring EU-Rail Podcast titled "The European Railcast: A Podcast About the Future of European Mobility". The EU-Rail podcast highlights the impact of EU-Rail on European competitiveness, sustainability, resilience. Through engaging discussions and expert insights, it showcases success stories, ongoing innovations, and future objectives, while fostering collaboration among key stakeholders. It promotes the role of rail in the EU's strategic mobility and climate objectives, contributes to discussions on research and innovation, increases awareness of EU public spending on R&I, and enhances the reputation of EU-Rail. The podcast also demonstrates rail's contribution to European economic growth, technological sovereignty, security, and resilience, while supporting industry, job creation, and sustainable travel. Five episodes have been published in 2025.

To further increase visibility of JU projects, a new format was introduced in September and October: at the end of each month, alongside the newsletter, a page is added to the News section highlighting the latest project updates.

Newsletter

In 2025, the JU newsletter maintained an average of 22 articles per edition, similar to 2024, while incorporating more project results. The newsletter was refreshed during the year to improve readability and provide a more structured, fluid design. The November edition introduced a layout that will be adopted in 2026. Earlier in the year, a revamp had already improved the overall design compared to 2024, introducing a new section immediately after the main news that highlights the topics covered in the newsletter. Content from the Europe's Rail System Pillar increased in 2025, reflecting more activities and outcomes, while the Deployment Group section was added, presenting approximately two items per month. The Innovation Pillar also saw more content due to the requirement for each project to submit at least one relevant item per month via the EU-Survey, which is then promoted in the newsletter. The readership of the JU newsletter grew from 2,848 at the end of 2024 to 3,731 at the end of 2025, with over 18,000 total opens, compared to 15,500 the previous year. This growth was driven by several factors, including JU's participation in numerous events, a more user-friendly design, and increased updates from the System Pillar, Deployment Group and project news from the Europe's Rail programme.

Social media

Generally, the JU's social channels are used to engage with the rail community and other stakeholders, including the end users. In 2025 the EU-Rail Communication Team continued to produce more in-depth content on its LinkedIn account. This resulted in the account reaching 16,677 followers, an increase of over 2,500 followers compared to the previous year. This type of content was particularly well received, as the LinkedIn audience mainly consists of technical stakeholders and engineers.

During 2025 EU-Rail has increased efforts in communicating with the projects and getting regular updated on their news in order to spread the word through social media. Through a dedicated collection tool, the EU-Survey, projects are able to directly propose content for organic or re-shared posts. Projects are required to submit at least one piece of content per month to the Communication Team to ensure timely promotion across social media channels. In 2025, the Communication Team received 145 content submissions through this tool. The audiences JU targets on social media depend on the channels. While on X the JU is followed by a wide audience with different backgrounds, LinkedIn attracts a more specialised community interested rather in technical details and longer in-depth articles. JU's Communication Team creates different content in order to tailor the message to these different audiences. Content is tailored accordingly: posts on X mirror LinkedIn content but are limited to one per day and 250 characters, providing only essential context, which is explored in more detail on LinkedIn, where up to two posts per day can be published. In 2025, as in previous years, LinkedIn was EU-Rail's most viewed social media channel.

Throughout 2024, the JU has continued putting more effort into long-term social media planning to make sure that all relevant news is promoted through EU-Rail's social media platforms in a timely and effective manner. The JU also focused in 2025 on engaging more intensively with other relevant stakeholders on social media (DG MOVE, DG RTD, CINEA and other EU-institutions; Members and key associations) that helped to support the dissemination of JU messages and vice-versa.

Press

The JU published five press releases in 2025, covering the welcoming of new Associated Members to boost innovation in the EU rail sector, the findings of a net-zero logistics study highlighting the role of rail freight, and the announcement of the Women in Rail Award 2025 winners. a joint call from the European Commission and EU-Rail Private Members for bold action to strengthen Europe's competitiveness, resilience and sustainability, followed by the launch of a €245 million call for new R&I proposals to accelerate rail innovation.

ANNEX 4: Patents from projects

I. Horizon 2020

The table below features the data on patents from projects under H2020:

Project Number	Project Acronym	Project Call Id	Number Of CR Patents
777576	ETALON	H2020-S2RJU-OC-2017	4

II. Horizon Europe

There are currently no patents from projects under Horizon Europe.

ANNEX 5: HORIZON EUROPE KPIS

Scoreboard of Horizon Europe common Key Impact Pathway Indicators (KIPs)*

Key Pathway**	Impact	Short-term	Medium-term	Longer-term	Detail per action or globally for 2025
Towards scientific impact					
1-Creating high-quality knowledge	high-new	Publications - Number of peer-reviewed scientific publications resulting from the Programme	Citations - Field-Weighted Citation Index of peer-reviewed Publications resulting from the Programme	World-class science - Number and share of peer-reviewed publications resulting from the projects funded by the Programme that are core contribution to scientific fields	32
2-Strengthening human capital in R&I		Skills - Number of researchers involved in upskilling (training, mentoring/coaching, mobility and access to R&I infrastructures) activities in projects funded by the Programme	Careers - Number and share of upskilled researchers involved in the Programme with increased individual impact in their R&I field	Working conditions - Number and share of upskilled researchers involved in the Programme with improved working conditions, including researchers' salaries	453
3-Fostering diffusion of knowledge and open science	of and	Shared knowledge Share of research outputs (open data/publication/software etc.) resulting from the Programme shared through open knowledge infrastructures	Knowledge diffusion -Share of open access research outputs resulting from the Programme actively used/cited	New collaborations - Share of Programme beneficiaries which have developed new transdisciplinary/trans sectoral collaborations with users of their open access research outputs resulting from the Programme	75 OA publications 1 OA datasets 1 OA software 100% shared knowledge
Towards societal impact					
4-Addressing Union priorities and global challenges through R&I	policy and	Results - Number and share of results aimed at addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority) Including: Number and share of climate-relevant results aimed at delivering on the Union's commitment under the Paris Agreement	Solutions - Number and share of innovations and research outcomes addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority) Including: Number and share of climate-relevant innovations and research outcomes delivering on Union's	Benefits - Aggregated estimated effects from use/exploitation of results funded by the Programme on tackling identified Union policy priorities and global challenges (including SDGs), including contribution to the policy and law-making cycle (such as norms and standards) (multidimensional: for each identified priority) Including: Aggregated estimated effects from use/exploitation of climate-relevant results funded by the Programme on delivering on the Union's commitment under the Paris	32 policy publications 6 policy results 0 policy IPRs 100% EU Policy Priority results

		commitment under the Paris Agreement	Agreement including contribution to the policy and law-making cycle (such as norms and standards)	
5-Delivering benefits and impact through R&I missions	R&I mission results - Results in specific R&I missions (multidimensional: for each identified mission)	R&I mission outcomes - Outcomes in specific R&I missions (multidimensional: for each identified mission)	R&I mission targets met - Targets achieved in specific R&I missions (multidimensional: for each identified mission)	No data available for 2025
6-Strengthening the uptake of R&I in society	Co-creation - Number and share of projects funded by the Programme where Union citizens and end-users contribute to the co-creation of R&I content	Engagement - Number and share of participating legal entities which have citizen and end-users engagement mechanisms in place after the end of projects funded by the Programme	Societal R&I uptake - Uptake and outreach of co-created scientific results and innovative solutions generated under the Programme	6 signed grant with citizen or end user engagement 14 projects with periodic report 24% grants with citizen or end user engagement
Towards technological / economic impact				
7-Generating innovation-based growth	Innovative results - Number of innovative products, processes or methods resulting from the Programme (by type of innovation) & Intellectual Property Rights (IPR) applications	Innovations - Number of innovations resulting from the projects funded by the Programme (by type of innovation) including from awarded IPRs	Economic growth - Creation, growth & market shares of companies having developed innovations in the Programme	No data available for 2025
8-Creating more and better jobs	Supported employment - Number of full time equivalent (FTE) jobs created, and jobs maintained in participating legal entities for the project funded by the Programme (by type of job)	Sustained employment - Increase of FTE jobs in participating legal entities following the project funded by the Programme (by type of job)	Total employment - Number of direct & indirect jobs created or maintained due to diffusion of results from the Programme (by type of job)	No data available for 2025
9-Leveraging investments in R&I	Co-investment - Amount of public & private investment mobilised with the initial investment from the Programme	Scaling-up - Amount of public & private investment mobilised to exploit or scale-up results from the Programme (including foreign direct investments)	Contribution to '3 % target' - Union progress towards 3 % GDP target due to the Programme	382.5M

* (based on Annex V to Regulation 2021/695/EU)

** NB: For some of those KIPs the data will not be available in the short or even medium term.

Horizon Europe Partnership common Key Performance Indicators

Criterion addressed	Name of the Indicator	Baseline at the start of HE	Results for 2025	Target 2027
Additionality	Progress towards (financial and in-kind) contributions from partners other than the Union – i.e. committed vs. actual	N/A	EUR 187,5M IKAA certified for a total 168,3 K signed	Total In kind contribution: EUR 576M Total financial contribution to the JU running costs: EUR 24M
Additionality Synergies	Additional investments triggered by the EU contribution, including qualitative impacts related to additional activities	N/A	Over the course of the programme, EU-Rail members contribute with additional activities, including mobilisation of private investment and national/regional programmes. Expected according to IKAA Plan 2022- 2025: 2025 = EUR 67,2M Estimated 2025 value of IKAA linked to JU objectives/KPIs - EUR 5,3M Estimated 2025 value of IKAA link to JU projects/topics - EUR 61,9M	Target 2022-2024: EUR 150,5M
Directionality	Overall (public and private, in-kind and cash) investments mobilised towards EU priorities	0	EUR 2,9M funding in signed grants linked to the following EU priorities: - European Green Deal - Europe fit for digital age	EUR 615M

International visibility and positioning	International actors involved	0	<p>For new projects in 2025:</p> <p>1 entity from Associated countries and Third countries is participating in projects as beneficiary (1 from Switzerland)</p> <p>By type: 1 private for profit organizations (100%)</p>	N/A
Transparency and openness	Share & type of stakeholders and countries invited/engaged	0	<p>In general the entire rail value chain: a total of 793 beneficiaries across all projects divided as follow:</p> <p>382 unique beneficiaries (13 public organizations (3%), 59 higher or secondary education establishment (15%), 47 research organizations (12%), 243 private for profit organizations (64%) and 20 others(5%))</p> <p>From 28 countries (22 from EU and 6 associated countries)</p> <p>In the EU-Rail States' Representatives Group: 29 countries demonstrating interest (24 EU member states and 5 associated countries)</p>	N/A

<p>Transparency and openness</p>	<p>No. and types of newcomer members in partnerships and their countries of origin (geographical coverage)</p>	<p>0</p>	<p>5 newcomer members:</p> <p>By type: 4 PRV (Other industrial and/or profil private organisation) and 1 PUB (Public organisation)</p> <p>By country: 2 from Austria, 1 from Portugal, 1 from Spain and 1 from Slovenia/Spain</p>	<p>N/A</p>
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<p>Transparency and openness</p>	<p>No. and types of newcomer beneficiaries in funded projects (in terms of types and countries of origin)</p>	<p>N/A</p>	<p>3 newcomers (EU) of which 1 is SMEs. PRC: 2 HES: 1</p>	
<p>Coherence and synergies</p>	<p>Number and type of coordinated and joint activities with other European Partnerships</p>	<p>0</p>	<p>4 back office arrangements (2 of them as leading and lead backup contracting authorising)</p>	<p>7 arrangements among JUs in accordance with Art. 13 of the SBA</p>
<p>Coherence and synergies</p>	<p>Number and type of coordinated and joint activities with other R&I Initiatives at EU /national/regional/sectorial level</p>	<p>0</p>	<ol style="list-style-type: none"> 1. Coordinated activities at EU level with national / sectorial R&I actions on the Digital Automated Couplers with the European DAC delivery Programme, enabled by EU-Rail. 2. Coordinated at EU level with national&sectorial R&I actions on the deployment of the next generation rail mobile communication system (FRMCS) with the EU-Rail Deployment Group. 3. Rail system architecture coordinated in the System Pillar with national and sectorial input notably around signalling activities. 4. Coordination also with Rail Net Europe on infrastructure capacity planning and R&I on traffic management. 5. Synergies between EU-Rail projects and national projects and regular report at the EU-Rail States Representative Group. 	<p>N/A</p>

			<p>Coordination with national activities following the indication of national projects by the States Representatives Group: 14 countries provided contributions on national R&I activities to EU-Rail. 6 of them updated their contributions in 2025. In total there are 30 programmes and 90 projects, for which several synergies with EU-Rail projects are expected.</p> <p>By the end of 2025, the JU identified 23 synergy actions with some of these activities and their implementation was already ongoing.</p>	
Coherence and synergies	Complementary and cumulative funding from other Union funds (Horizon Europe, National funding, ERDF, RRF, Other cohesion policy funds, CEF, DEP, LIFE, other)	0	<p>EUR 0,7M for Smart Cities (Contribution Agreement between the European Union, represented by the European Commission, and EU-Rail, with the objective to provide a financial contribution to finance the implementation of the action "Pilot project - IRS Smart Cities project: new railway station concept for green and socially inclusive smart cities")</p> <p>EUR 3M Joint topic call with SESAR, project resulting TravelWise , for an optimised and harmonised exchange of traffic management information for passengers between rail and air</p> <p>EUR 1M Joint topic call with SNS, project resulting FP2-Morane2, for the EU-wide testing and validation campaign of the FRMCS V2 specifications, the next EU rail communication system</p> <p>Collaboration with the EU space programme through the contribution from the EU Agency for the Space Programme (EUSPA) as well as the contribution from the European Space Agency (ESA) with the project on EGNOS for rail, under the strategic leadership of the Commission and in full coordination with ERA, for delivering through R&I the technical and operational elements to reach competitive and resilient satellite-based rail services</p>	N/A
International visibility and positioning	Visibility of the partnership in national, European, international policy/industry cycles	0	<ul style="list-style-type: none"> • Published 11 newsletters • Published 5 press releases • Released 3 publications • Organised 8 events 	N/A

			<ul style="list-style-type: none"> • Participated in 42 industry events • Average number of X posts per month was 30 • 4.882 X followers by the end of 2025 • 16.667 LinkedIn followers by the end of 2025 • 3.731 newsletter followers by the end of 2025 • 45 members in the general contact list (receiving the newsletter and mailshots) • 184 members in media list • 90 mentions in press releases • 30 project deliverables highlighted in the news section of the website • 155.605 unique visitors on the website • 72 articles produced by Europe's Rail • 5 podcast episodes published 	
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Scoreboard of Key Performance Indicators specific to EU-Rail

#	Impact areas	Key Performance Indicator	Objective	Baseline at the start of HE	Results of 2025	Target at the end of HE
1	Customer requirements	Accuracy in total planned travel time of passengers from improved matching between supply and demand, #	Increase availability and predictability of intermodal rail transport offer	State of art in 2020 (including results from S2R)	80%	75%

		Traffic planning certainty, #	Planning certainty, considering the demand forecast, is a key requirement for planning on time, reliable and efficient service delivery	State of art in 2020 (including results from S2R)	Between 50% and 65%	Between 65% and 80% ¹
		Handling/response time for intermodal freight offers and regional passenger services, mins	Improve overall customer experience, including growing intermodal freight transport and regional passenger services	State of art in 2020 (including results from S2R)	Up to 50%	At least 50%
2	Improved Capacity	Trains on the line per hour and direction, #	Increased frequency is a key element for improved capacity	State of art in 2020 (including results from S2R)	+10% to +15%	At least +10% ²
		Reduction of total freight transport time, mins	Reduced freight transport time leading to better asset utilization and increased capacity	State of art in 2020 (including results from S2R)	Between 10% and 15%	20%
		Increased average freight train length in existing infrastructure limitations or higher loads, meters	Increased length directly leads to more available capacity	State of art in 2020 (including results from S2R)	Length up to 1.500m	Up to 1.500m
3	Reduced Costs	Overall OPEX and CAPEX costs of regional lines, incl. maintenance, infrastructure and vehicles	Direct link to lower costs of the regional lines	State of art in 2020 (including results from S2R)	CCS system (CAPEX and OPEX) -25% Track side railway assets (OPEX) -30% Rolling Stock (CAPEX & OPEX) – 50%	CCS system (CAPEX and OPEX) -25% Track side railway assets(OPEX) -30% Rolling Stock (CAPEX & OPEX) – 50% ³

		Maintenance costs, including thanks to the use of digital twins, €	Direct link to lower costs	State of art in 2020 (including results from S2R)	Up to -57% depending of Use Cases	-10% ⁴
		Design and manufacturing costs, €	Leading to reduced investment cost	State of art in 2020 (including results from S2R)	Up to -64% depending of Use Cases	-20%
		Virtual certification tasks that can be conducted in a laboratory, #	Cost of virtual certification activities is much lower than cost of physical certification activities, hence more tasks done virtually leads to lower costs	State of art in 2020 (including results from S2R)	80%	+80% ⁵
4	Sustainable and resilient transport	Optimized energy consumption and higher punctuality in regional services, kWh per pax-km or tons-km; mins	More efficient operations, leading to lower energy consumption (with lower CO2 emissions)	State of art in 2020 (including results from S2R)	*Energy consumption -10% Punctuality +15%	-10% (energy); +15% (punctuality)
		CO2 equivalent emissions	Further decrease rail carbon intensity	State of art in 2020 (including results from S2R)	Up to 97% CO2 reduction depending of Use Cases ¹⁰	Up to 30% for specific use cases (e.g. regional operation and heavy duty inspection vehicles)
		Traffic prediction performance, secs	Improve network resilience through dynamic infrastructure restriction handling, train regulation and automated conflict resolution	State of art in 2020 (including results from S2R)	<120 secs	<120 secs ⁶
		Time to respond and resolve a vulnerability (regarding cyber security), mins	Reduced impact of events and increased availability of the rail system	State of art in 2020 (including results from S2R)	*	tbc ⁷

5	Harmonized approach	CCS system CAPEX and OPEX (of main line and regional lines systems (while maintaining or increasing the present safety level	Reducing costs associated with the interoperability of the network will enhance harmonization	State of art in 2020 (including results from S2R)	25%	CAPEX: -25% (regional lines) and -10% (main lines); OPEX -20% (regional and main lines)
		No new national technical rules triggered by innovative solutions coming from the Joint Undertaking and potential reduction of national rules in relation to ERTMS and interlocking	By decreasing the amount of national rules in force, rail transport will evolve towards the Single European Railway Area	State of art in 2020 (including results from S2R)	*	N/A
		Reduction of answering time between the short-term request of a cross-border train path and the answer with a firm offer, mins	Indicator for more efficient border crossing	State of art in 2020 (including results from S2R)	Down to 5 mins	Down to 5 mins
		Operational dwell time at borders and other handover points relying also on relying on more homogenous system approaches (leading to increase in number of trains on given infrastructure), mins	Indicator for more efficient border crossing	State of art in 2020 (including results from S2R)	Up to 50%	-50%
6	Reinforced role for rail	Accuracy in total planned travel time of passengers from improved matching between supply and demand, %	The combination of the indicators from Impact Areas 1 and 3 contribute to more effective and cost-efficient rail transport, thereby improving attractiveness of rail compared with other transport modes	State of art in 2020 (including results from S2R)	75%	75%
		Traffic planning certainty, #		State of art in 2020 (including results from S2R)	Between 65% and 80%	Between 65% and 80% ¹
		Handling/response time for intermodal freight offers and regional passenger services, mins		State of art in 2020 (including results from S2R)	Up to 50%	-50%
		Overall OPEX and CAPEX costs of regional lines, incl. maintenance, infrastructure and vehicles		State of art in 2020 (including results from S2R)	CCS system (CAPEX and OPEX) -25%	CCS system (CAPEX and OPEX) -25%

					Track side railway assets (OPEX) -30%	Track side railway assets(OPEX) -30%
					Rolling Stock (CAPEX & OPEX) – 50% ³	Rolling Stock (CAPEX & OPEX) – 50% ³
		Maintenance costs, including thanks to the use of digital twins, €		State of art in 2020 (including results from S2R)	Up to -57% depending of Use Cases	-10% ⁴
		Design and manufacturing costs, €		State of art in 2020 (including results from S2R)	Up to -64% depending of Use Cases	-20%
		Virtual certification tasks that can be conducted in a laboratory, #		State of art in 2020 (including results from S2R)	80%	+80% ⁵
7	Improved	Maturity of innovative technologies	Innovative technologies will deploy rail capabilities and leverage potential competitive advantages for the EU rail industry	State of art in 2020 (including results from S2R)	Up to TRL 7	TRL 8

¹ Depending on point in time, e.g. one week in advance or one hour in advance

² At the moment this KPI is limited with the outcome of FA2 only, in the course of the Programme a consolidated KPI will be measured

³ The nature of the activity requires a full system approach analysis from improvement at components level, which will be conducted during the course of the Programme

⁴ In specific use cases for both rolling stock and infrastructure and asset management

⁵ Costs only related to the execution of the on-site tests

⁶ In a typical scenario of at least 100 trains running in a 2h interval ahead of actual time

⁷ Due to the confidentiality nature of the baseline, a KPI measure will be assessed and consolidated during the course of the Programme

⁸ As reflected in the ERA database(s) in relation to OPE TSI Appendix A, annex C and other TSIs in relation to ERTMS and interlocking

⁹ Expert estimation with high level of uncertainty

¹⁰ (97% CO2 reduction achieved by the demonstrator with On-board Energy Storage Systems located in Sweden)

* As indicated, a Europe's Rail KPI model is under development.

ANNEX 6: IKAA Report

As the EU-Rail started officially on 30 November 2021, the operational activities performed in 2022, 2023, 2024 and 2025 in relation to EU-Rail are summarized in this Annex 6. All Private Founding Members shall report about the Amount of certified IKAA for the year 2025 by 31 May 2026.

Consequently, this section includes the IKAA reported and certified by 31 December 2025.

IKAA Report 2025

<i>IKAA OVERVIEW 2022-2025</i>	<i>IKAA PLANNED (2022+2023+2024)</i>	<i>IKAA CERTIFIED (2022+2023+2024)</i>	<i>IKAA Planned 2025</i>	<i>IKAA Certified 2025</i>
1. Support to additional R&I	118.997.864,05	149.040.620,34	49.365.948,59	15.805.158,57
Additional activities related to the EU -RAIL program	184.000,00	352.569,49	117.390,15	241.560,79
Additional activities are part and contribute to the Member's activities performed and described within the Exploratory Research Projects in the context of achieving the objectives and KPIs of the related Flagship Area	63.500,00	30.579,92	151.194,88	120.981,21
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	18.151.421,62	28.132.889,40	8.995.463,90	4.112.635,83
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	25.510.764,11	27.672.065,08	11.479.627,84	3.635.791,99
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	29.832.185,81	31.273.004,29	7.454.230,18	1.515.258,11
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	16.931.922,12	30.141.277,72	4.134.109,31	1.752.126,08
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	9.658.184,52	16.733.212,11	2.219.346,60	3.299.243,43
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	12.356.826,08	14.122.341,63	10.879.197,86	901.601,93
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Projects 7 in the context of achieving the objectives and KPIs of the related Flagship Area	396.914,00	468.872,99	134.866,00	80.523,25
Asset Management wayside monitoring and decision management tools	96.000,00	-		

ATO functions & integration ATO-OB with ETCS-OB ATO-TS	300.000,00	-		
Automation Island	208.283,94	-	3.000,00	
DAC / DAK activities outside ERJU projects	400.000,00	91.633,04	200.000,00	
Data space for railway	128.279,02	-	-	
Digital Twin activities outside ERJU projects	100.000,00	-	-	
Intuitive design of remote control centers	113.305,50	-	4.000,00	
Monitoring and Maintenance of vehicle systems	43.440,00	-	43.440,00	
Neuromorphic hardware for railways	44.651,98	-	26.000,00	
OCORA: Non-funded activities	300.000,00	-	-	
Project NGT Fun System dynamics: Non-funded activities	537.840,00	-	50.000,00	
Project ProCo: Non-funded activities	774.320,80	-	321.460,00	
Project RoSto: Non-funded activities	463.332,00	-	300.000,00	
Projects InTra & TraCo: Non-funded activities	1.651.555,55	-	640.000,00	
Projects VMo4Orte, RoSto, ProCo: Non-funded activities	267.000,00	-	285.000,00	
R&D internal projects related to and complementary to ERJU FAs topics.	13.000,00	22.174,67	-	
Real-time guarantees description language and contracts	176.137,00	-	26.000,00	
Remote train operation	45.000,00	-	-	
System Pillar: Non-funded activities	250.000,00	-	415.440,00	
Development of future battery cell technology	-	-	410.000,00	
Development linked to High Performance Bogie and Drive Train	-	-	500.000,00	
Complementary internal activities to support Flagship Area 2 demonstrators	-	-	75.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 7 in the context of achieving the objectives and KPIs of the related Flagship Area	-	-	145.435,95	145.435,95
Infrastructural requirements for robust rail operations	-	-	255.366,30	
Usage requirements and needs of passengers for rail vehicles.	-	-	100.379,61	
2. Scale-up of technologies	12.391.587,35	12.456.230,82	2.090.461,79	2.299.959,14
Account based ticketing and new validation systems	200.000,00	-		
Additional activities related to the EU -RAIL program	-	-	53.243,00	

Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	6.789.362,67	6.191.771,84	315.559,77	174.300,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	1.040.602,00	3.493.859,20	695.900,59	2.125.659,14
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	885.295,00	425.000,00	373.758,44	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	176.000,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	1.754.367,68	2.070.009,37	108.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	465.960,00	275.590,41	144.000,00	
ATO Functionality	200.000,00	-		
Moving Block -TRL 5 to 7	880.000,00	-		
Development of interiors for light weight use of new materials and enhancement of recyclability.	-	-	400.000,00	
3. Demonstrators	23.274.900,13	15.321.919,59	10.841.301,43	4.148.992,18
Additional activities related to the EU -RAIL program	-	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	2.202.789,33	1.270.607,19	1.480.398,73	712.727,63
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	2.251.222,41	1.353.246,49	96.561,91	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	3.200.754,17	2.141.485,78	1.225.169,92	690.429,37
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	5.885.257,50	2.787.399,71	5.227.361,15	890.593,85
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	8.484.876,72	7.301.225,93	2.586.809,73	1.079.758,56

Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	1.250.000,00	467.954,49	225.000,00	775.482,77
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Projects 7 in the context of achieving the objectives and KPIs of the related Flagship Area	-	-	-	
4. Creating new business opportunities	1.098.699,00	634.011,09	500.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	800.000,00	-	500.000,00	
Software DISC EMAN	298.699,00	634.011,09	-	
5. Training and skills development	1.833.636,51	115.791,66	36.000,00	41.500,00
Additional activities are part and contribute to the Member's activities performed and described within the Exploratory Research Projects in the context of achieving the objectives and KPIs of the related Flagship Area	4.000,00	1.418,46	17.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	1.400.000,00	92.000,00		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	30.402,51	18.858,20	8.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	3.000,00	3.515,00		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	374.234,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	22.000,00	-	11.000,00	41.500,00
6. Contribution to the development of new standards, regulations and policies	866.964,22	467.379,80	1.680.239,45	1.531.101,74
Additional activities related to the EU -RAIL program	-	-	137.814,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	222.643,35	119.260,55	250.976,46	48.478,48
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	439.000,00	251.757,18	1.005.000,00	1.172.144,44

Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	-	-	6.448,99	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	56.000,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Projects 7 in the context of achieving the objectives and KPIs of the related Flagship Area	29.320,87	11.594,13	-	
Project "Querkraftverstärkung bei Brücken mit glatten Stäben": Non-funded activities	40.000,00	-	80.000,00	64.536,84
Project "TDR – Tunnel Drainage Rover": Non-funded activities	80.000,00	84.767,94	200.000,00	245.941,98
7. Supporting ecosystem development	5.046.200,18	1.876.686,44	1.349.004,92	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	3.321.265,00	579.496,00	260.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	-	-	180.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	554.835,18	312.000,00	179.004,92	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	770.100,00	122.540,00	480.000,00	
Participation in national organisations and possible pilots and support of initiatives in the shape of contributions towards new concepts and ideas (Railforum, Energy Roundtable, etc.)	400.000,00	862.650,44	50.000,00	
Development of a digital tool to manage repairs and second-hand parts to enable circular economy	-	-	200.000,00	
8. Communication, dissemination, awareness raising, citizen engagement	772.925,39	235.803,64	129.375,00	46.309,43
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	1.250,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	53.675,39	36.965,72	20.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	13.000,00	9.912,07	14.375,00	

Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	10.000,00	-		
Participation in conferences and/or seminars to communicate and disseminate knowledge	695.000,00	188.925,85	95.000,00	46.309,43
9. Other	4.111.562,00	1.755.312,25	1.207.525,00	424.325,03
Additional activities related to the EU -RAIL program	677.000,00	279.116,01	263.866,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area	704.000,00	274.492,00	450.000,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area	450.000,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	468.968,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area	2.075,00	-		
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	1.268.519,00	695.746,24	493.659,00	424.325,03
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area	30.000,00	-		
Design for the implementation of an IT platform, for use by all actors in the supply chain	511.000,00	505.958,00		
Grand Total	168.394.338,82	181.903.755,63	67.199.856,17	24.297.346,09

<i>Country</i>	<i>IKAA PLANNED (2022+2023+2024)</i>	<i>IKAA CERTIFIED (2022+2023+2024)</i>	<i>IKAA Planned 2025</i>	<i>IKAA Certified 2025</i>
Austria	10.138.260,00	18.492.528,02	9.080.520,17	3.130.664,94
Belgium	1.833.500,00	1.491.462,45	1.645.500,00	
Czechia	2.330.699,00	5.013.933,57	759.000,00	
France	28.116.576,80	37.957.135,95	18.683.022,20	
Germany	35.127.019,45	43.722.134,52	6.077.645,91	4.677.811,88
Hungary	1.754.367,68	3.797.921,37	-	
India	228.000,00	1.847.405,18	-	
Italy	26.247.489,26	25.302.087,80	8.834.272,44	2.439.654,16
Netherlands	11.498.315,07	6.996.257,25	2.185.347,75	
Norway	1.740.000,00	1.769.868,88	870.000,00	
Poland	5.462.784,99	8.545,52	324.194,73	
Portugal	30.000,00	-	504.907,06	
Spain	31.474.902,07	23.791.251,65	12.438.344,95	9.329.886,38
Slovenia	-	-	74.770,00	
Sweden	8.743.924,50	7.313.851,86	5.477.330,96	4.719.328,73
Switzerland	2.167.250,00	2.646.291,66	181.250,00	
United Kingdom	61.250,00	16.859,39	51.250,00	
USA	1.440.000,00	1.736.220,56	12.500,00	
Grand Total	168.394.338,82	181.903.755,63	67.199.856,17	24.297.346,09

TOTAL IKAA 2022- 2025 (Evolution - Value in €)		
Planned IKAA	Reported IKAA with pending certificate validation	Certified IKAA
235.594.194,99	25.544.514,98	206.201.101,74

ANNEX 7: FINAL ANNUAL ACCOUNTS

Balance Sheet

	Note	31.12.2025	31.12.2024
NON-CURRENT ASSETS			
Intangible assets	2.1	-	-
Property, plant and equipment	2.2	387.084,65	39.027,00
Long term pre-financing	2.3	4.096.262,81	30.954.617,70
		4.483.347,46	30.993.644,70
CURRENT ASSETS			
Short term pre-financing	2.3	59.512.501,65	67.541.911,37
Exchange receivables and non-exchange recoverables	2.4	34.906.222,00	55.602.782,27
		94.418.723,65	123.144.693,64
TOTAL ASSETS		98.902.071,11	154.138.338,34
CURRENT LIABILITIES			
Payables and other liabilities	2.7	125.846.938,29	134.302.526,07
Accrued charges and deferred income	2.8	47.350.946,80	59.998.444,62
		173.197.885,09	194.300.970,69
TOTAL LIABILITIES		173.197.885,09	194.300.970,69
Contribution from Members	2.9	1.094.903.010,68	997.927.296,32
Accumulated deficit		(1.038.089.928,67)	(905.926.415,39)
Economic result of the year		(131.108.895,99)	(132.163.513,28)
NET ASSETS		(74.295.813,98)	(40.162.632,35)
LIABILITIES AND NET ASSETS		98.902.071,11	154.138.338,34

Statement of financial performance

	Note	2025	2024
REVENUE			
Revenue from non-exchange transactions			
Recovery of operating expenses	3.1	-	189.086,26
Other non-exchange revenue	3.2	1.314.660,12	141.581,35
Financial revenues	3.2	47,05	5.514,70
Revenue from exchange transactions	3.3		
Other exchange revenue		373,02	33,00
Total revenue		1.315.080,19	336.215,31
EXPENSES			
Operating costs	3.4	(127.439.894,47)	(127.518.813,49)
Staff costs	3.5	(2.986.878,20)	(2.612.852,87)
Financial expenses	3.6	(11.823,09)	(3.372,16)
Other expenses	3.7	(1.985.380,42)	(2.364.690,07)
Total expenses		(132.423.976,18)	(132.499.728,59)

ECONOMIC RESULT OF THE YEAR	(131.108.895,99)	(132.163.513,28)
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Cash flow statement

	2025	2024
Economic result of the year	(131.108.895,99)	(132.163.513,28)
<u>Operating activities</u>		
Depreciation and amortization	48.672,63	49.841,24
Increase/(decrease) in in-kind contributions	29.572.917,27	48.695.807,31
Other non-cash movements	-	-
(Increase)/decrease in pre-financing	34.887.764,61	43.199.523,69
(Increase)/decrease in exchange receivables and non-exchange recoverables	20.696.560,27	(1.279.304,46)
Increase/(decrease) in payables	(8.455.587,78)	31.439.901,14
Increase/(decrease) in accrued charges & deferred income	(12.647.497,82)	(30.552.812,75)
<u>Financing activities</u>		
Increase/(decrease) in cash contributions	67.402.797,09	40.619.627,35
<u>Investing activities</u>		
(Increase)/decrease in intangible assets and property, plant and equipment	(396.730,28)	(9.070,24)
NET CASHFLOW	-	-
Net increase/(decrease) in cash and cash equivalents	-	-
Cash and cash equivalents at the beginning of the year	-	-
Cash and cash equivalents at year-end	-	-

Statement of changes in net assets

	Contribution from Members	Accumulated Surplus/(Deficit)	Economic result of the year	Net Assets
BALANCE AS AT 31.12.2023	908.611.861,66	(712.896.116,39)	(193.030.299,00)	2.685.446,27
Allocation 2023 economic result	-	(193.030.299,00)	193.030.299,00	-
Cash contribution	40.415.478,95	-	-	40.415.478,95
Contribution in-kind	48.695.807,31	-	-	48.695.807,31
Unpaid cash contributions	204.148,40	-	-	204.148,40
Economic result of the year	-	-	(132.163.513,28)	(132.163.513,28)
BALANCE AS AT 31.12.2024	997.927.296,32	(905.926.415,39)	(132.163.513,28)	(40.162.632,35)
Allocation 2024 economic result	-	(132.163.513,28)	132.163.513,28	-
Cash contribution	67.596.749,19	-	-	67.596.749,19
Contribution in-kind	29.572.917,27	-	-	29.572.917,27
Unpaid cash contributions	(193.952,10)	-	-	(193.952,10)
Economic result of the year	-	-	(131.108.895,99)	(131.108.895,99)
BALANCE AS AT 31.12.2025	1.094.903.010,68	(1.038.089.928,67)	(131.108.895,99)	(74.295.813,98)

ANNEX 8: MATERIALITY CRITERIA

This Annex provides explanation on how the EU-Rail Executive Director defined the materiality threshold as a basis for determining whether significant weaknesses should be subject to a formal reservation to his declaration of assurance. Both qualitative and quantitative criteria were set in this regard, as follows.

Qualitative criteria

Significant weaknesses in the internal control system

Deficiencies in EU-Rail's internal control system (ICS) considered significant, meaning that the existence of such deficiencies does not allow to conclude that the concerned ICS Component(s) and/or the ICS as a whole is present and functioning. ICS weaknesses may be identified by the JU's management activities, through dedicated self-assessment exercises, by internal or external auditors or by a third party, as applicable.

Critical issues outlined by the European Court of Auditors, the Internal Audit Service and OLAF

Any findings/observations made by the ECA, the IAS or OLAF, which, given their nature and/or magnitude, indicate serious deficiencies in management of risks or in the design and implementation of the internal control system at EU-Rail. Significant delay in the implementation of the action plan addressing previously issued critical findings/observations of ECA/IAS/OLAF may also be taken into account.

Significant reputational events

Events or weaknesses which have a significant reputational impact on EU-Rail, on the associated Commission services (DG MOVE, DG RTD), or on the European Union as such, irrespective of the amount of damage to EU-Rail's administrative and operational budget, will be considered for issuing a reservation to the declaration of assurance.

Quantitative criteria applicable to the JU's Programme falling under Horizon 2020 (S2R Programme)

Residual error rate

Given the fact that more than 90% of the JU's operational expenditure allocated to the H2020 Programme was related to its grants, the focus of assurance in terms of the legality and regularity of the underlying transactions will therefore principally be on the level of errors identified in the ex-post audits of cost claims in grants on a multi-annual basis. These ex-post audits are carried out by the CAS based on a common audit approach shared among the research framework programmes' implementing bodies.

As a result of its multiannual nature, the effectiveness of the EU-Rail's controls can only be fully measured and assessed at the final stages of the Programme's lifetime once the ex-post audit strategy has been fully implemented and systematic errors have been detected and corrected.

In this respect, the decision on whether the ED needs to make a formal reservation to his declaration of assurance for the respective financial year is based on the value of the JU's residual error rate. This should, as follows from the common R&I Family target expressed in the legislative financial statement accompanying the Commission's proposal for the Horizon 2020 regulation, remain within a range of 2 to 5%, aiming to be as close as possible to 2%. However, the JU's control objective is to ensure for the H2020 Programme, that the residual error rate, which represents the level of errors that remain undetected and uncorrected, does not exceed 2% of the total expense recognised until the end of the Programme. Nevertheless, even before the end of the Programme, if the value of the residual error rate is not below 2% at the end of the respective reporting year, the ED might still make a reservation. For this, in addition to this quantitative threshold, the qualitative aspects of the underlying weaknesses will be considered as well before finally deciding on making a reservation, such as:

- The nature and scope of the weaknesses;
- The duration of the weaknesses;
- The existence of compensatory measures (mitigating controls which reduce the impact of the weaknesses);
- The existence of effective corrective actions to correct the weaknesses (action plans and financial corrections) which have had a measurable impact.

The starting point to determine the effectiveness of the controls in place is the “representative error rate” expressed as a percentage of errors in favour of the JU detected by ex-post audits measured with respect to the amounts accepted after ex-ante controls.

The representative error rate will be calculated as the weighted average (WAER) for a population, from which a representative sample has been drawn, according to the following formula:

$$\text{WAER\%} = \frac{\sum (\text{err})}{A} = \text{RepER\%}$$

Where:

$\sum (\text{err})$ = sum of all individual error rates of the sample (in value). Only those errors in favour of the JU will be taken into consideration.

A = total amount of the representative audited sample expressed in EUR.

Second step - calculation of the residual error rate:

To take into account the impact of the ex-post controls, this error level is to be adjusted by subtracting:

- errors detected and corrected as a result of the implementation of audit conclusions;
- errors corrected as a result of the extrapolation of audit results to non-audited contracts with the same beneficiary.

This results in a residual error rate, which is calculated by using the following formula:

$$\text{ResER\%} = \frac{(\text{RepER\%} * (P - A)) - (\text{RepERsys\%} * E)}{P}$$

Where:

ResER% = residual error rate, expressed as a percentage.

RepER% = representative error rate, or error rate detected in the representative sample, in the form of the WAER, expressed as a percentage and calculated as described above (WAER%).

RepERsys% = systematic portion of the RepER% (the RepER% is composed of complementary portions reflecting the proportion of ‘systematic’ and ‘non-systematic’ errors detected) expressed as a percentage.

P = total amount of the auditable population of cost claims, expressed in EUR.

A = total of all audited amounts, expressed in EUR.

E = total non-audited amounts of all audited beneficiaries. This will comprise the total amount, expressed in EUR, of all non-audited but validated and paid costs for all audited beneficiaries, excluding those beneficiaries for which an extrapolation is ongoing.

This calculation will be performed on a point-in-time basis, i.e. all the figures will be provided as of a certain date.

ANNEX 9: LIST OF ACRONYMS

Abbreviation	
ABAC	Accrual Based Accounting
ADI	Austempered Ductile Iron
AO	Authorising Officer
ATO	Automated Train Operation
AWP	Annual Work Plan
BOA	Back Office Arrangements
CA	Commitment Appropriation
CAAR	Consolidated Annual Activity Report
CAS	Common Audit Service
CAPEX	Capital Expenditure
CBM	Condition-Based Maintenance
CBO	Common Business Objectives
CBTC	Communication Based Train Control
CCA	Cross Cutting Activities
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CFM	Call for Members
Covid-19	'CO' stands for corona, 'VI' for 'virus, and 'D' for disease. Formerly, this disease was referred to as '2019 novel coronavirus' or '2019-nCoV.' The COVID-19 virus is a new virus linked to the same family of viruses as Severe Acute Respiratory Syndrome (SARS) and some types of common cold.
CRS	Common Representative Sample
CREL	Core Release
CSA	Coordination and support action
CW	Cloud Wallet
DOI	Digital Object Identifier
DRIMS	Dynamic Railway Information Management System
EC	European Commission
ECA	European Court of Auditors
ED	Executive Director
EDPS	European Data Protection Supervisor
ED-SIPB	ED System and Innovation Programme Board
EDV	Electronic Distributor Valve

EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Norm
ENISA	European Union Agency for Cybersecurity (initially: European Network and Information Security Agency)
ERA	European Union Agency for Railways
ERRAC	European Rail Research Advisory Council
ERTMS	European Rail Traffic Management System
ETCS	European Train Controlling System
EU	European Union
EUAN	European Union Agencies Network
EUG	ERTMS Users Group
EU-Rail	The Europe's Rail Joint Undertaking
FACTs	Flexible AC Transmission Systems
FFFIS	Form Fit Functional Interface Specifications
FIS	Functional Interface Specifications
FREL	Final Release
GA	Grant Agreement
GAP	Grant Agreement Preparation
GDPR	General Data Protection Regulation
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GoA	Grade of Automation
H2020	Horizon 2020, EU framework programme for Research and Innovation
HST	High-Speed Train
HVAC	Heating, Ventilation Air Conditioning and Cooling
IA	Innovation Action
IAMS	Intelligent Asset Management System
IAS	Internal Audit Service
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IKAA	in-kind contributions to additional activities
IP	Innovation Programme/Innovation Pillar
IPR	Intellectual Property Rights

ISO	International Standardisation Organisation
IT	Information Technology
ITD	Integrated Technology Demonstrator
JTI	Joint Technology Initiative
JU	Joint Undertaking
KPI	Key Performance Indicator
LCC	Life Cycle Cost
LIDAR	Light Detection and Ranging
LP	Lighthouse Project
LTE	Long-Term Evolution (standard for wireless communication)
MAAP	Multi-Annual Action Plan
MaaS	Mobility as a Service
MB(S)	Moving block (System)
MC	Mission Critical
MNO	Mobile Network Operator
NaaS	Network as an Asset
NaaS	Network as a Service
NLOS	non-line-of-sight
NTP	Network Time Protocol
OC	Open Call
ODM	Operational Data Management
OMTS	On-board Multimedia and Telematics Services
OPEX	Operating Expenditure
PA	Payment Appropriation
RCA	Railway Command Control and Signalling Architecture
R&I	Research and Innovation
PDN	Performance Development Network
PPP	Public Private Partnership
PRM	Persons with Reduced Mobility
PTC	Positive Train Control
PTI	Platform Train Interface
QoS	Quality of Service
RAL	Unpaid amount
RAMS	Reliability and Maintainability System

RBC	Radio Block Centre
RFID	Radio Frequency Identification
RIA	Research and innovation action
RoI	Return of Investment
S2R	Shift2Rail
SBA	The Single Basic Act - Council Regulation (EU) 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe
SC	Scientific Committee
SDG	Sustainable Development Goals
SETA	Single European Transport Area
SEMP	System Engineering Management Plan
SiC	Silicon Carbide
SIR	Staff Implementing Rules
SLA	Service Level Agreement
SME	Small and Medium Enterprise
SNE	Seconded National Expert
SP	System Pillar
SPD	System Platform Demonstration
SPSG	System Pillar Steering Group
SRG	States Representatives Group
SSG	Scientific Steering Group
SWL	Single Wagon Load
TAF	Telematic Application for Freight
TAP	Telematic Application for Passengers
TCMS/NG-TCMS	Train Control and Monitoring System/Next Generation Train Control and Monitoring System
TCO	Total Cost of Ownership
TD	Technology Demonstrator
TL	Train Load
TMS	Traffic Management System
TRL	Technology Readiness Level
TSI	Technical Specifications for Interoperability
TSP	Travel Service Provider
UAV	Unmanned Aerial Vehicle

UG	User Group
UN	United Nations
WA	Work Area
WCRR	World Congress of Railway Research
WP	Work Package
WSP	Wheel Slide Protection

ANNEX 10: INFORMATION PERTAINING TO THE FORMER SHIFT2RAIL JOINT UNDERTAKING

List of Members of the S2R JU until 29/11/2021

Founding Members



Associated Members



Virtual Vehicle Austria Consortium (VVAC+)



European Rail Operating community Consortium (EUROC)



SwiTracken Consortium



Smart DeMain (SDM) Consortium



AERFITEC



Competitive Freight Wagon Consortium (CFW)



Smart Rail Control (SmartRaCon) consortium



Factsheet of the S2R JU as at 29/11/2021

Name	Shift2Rail Joint Undertaking (also referred to as "S2R JU" or "S2R")
Objectives	<p>The Shift2Rail Joint Undertaking is a public-private partnership in the rail sector, providing a platform for cooperation that drives innovation in the years to come. The S2R JU pursues research and innovation (R&I) activities in support of the achievement of the Single European Railway Area and should improve the attractiveness and competitiveness of the European rail system.</p> <p>The S2R JU contributes to:</p> <ul style="list-style-type: none"> • a 50 % reduction of the life-cycle cost of the railway transport system (i.e. costs of building, operating, maintaining and renewing infrastructure and rolling stock), • a 100 % increase in the capacity of the railway transport system, • a 50 % increase in the reliability and punctuality of rail services (measured as a 50 % decrease in unreliability and late arrivals). <p>The S2R JU shall propose innovative solutions to be explored, tested and demonstrated in operational environment and/or "zero on site" to achieve market uptake. Beyond that, with the deployment of its innovative solutions the S2R JU will foster connections between people, regions, cities, and businesses, supporting the socioeconomic objectives of the Union.</p>
Founding Legal Act	Council Regulation (EU) No 642/2014 of 16 June 2014 establishing the Shift2Rail Joint Undertaking ⁹⁹ (S2R Regulation)
Executive Director (ED)	Mr Carlo M. Borghini, as from 16 May 2016
Governing Board (S2R GB) As at end of Jan 2021	<p>European Commission (EC) members:</p> <ul style="list-style-type: none"> • <i>Henrik Hololei</i>, DG MOVE <p>EC alternates:</p> <ul style="list-style-type: none"> • MOVE DDG 2 <i>Kristian Schmidt</i> • RTD D <i>Rosalinde Van Der Vlies</i> <p>Industry members:</p> <ul style="list-style-type: none"> • ALSTOM <i>Nicolas Castres Saint Martin</i>

⁹⁹ OJ L 177, 17.6.2014, p. 9

• AŽD Praha	<i>Vladimir Kampik</i>
• BOMBARDIER TRANSPORTATION	<i>Nicolas Castres Saint Martin</i>
• CAF	<i>Imanol Iturrioz</i>
• DEUTSCHE BAHN	<i>Hans Peter Lang</i>
• EUROOC	<i>Thomas Petraschek</i>
• HACON	<i>Lars Deiterding</i>
• HITACHI RAIL STS	<i>Antonella Trombetta</i>
• INDRA	<i>Javier Rivilla Lizano</i>
• KNORR-BREMSE	<i>Hans-Christian Hilse</i>
• NETWORK RAIL	<i>Robert Ampomah</i>
• SIEMENS	<i>Roland Edel</i>
• SMARTDEMAIN	<i>Henk Samson</i>
• SMARTRACON	<i>Michael Meyer zu Hörste</i>
• SNCF	<i>Carole Desnost</i>
• THALES	<i>Yves Perreal (Industrial Spokesperson)</i>
• TRAFIKVERKET	<i>Bo Olsson</i>
• VVAC+	<i>Filip Kitanoski</i>
Industry alternates:	
• ALSTOM	<i>Sophie Perrocheau</i>
• AŽD Praha	<i>Michal Pavel</i>
• BOMBARDIER TRANSPORTATION	<i>Richard French</i>
• CAF	<i>Jorge De Castro</i>
• DEUTSCHE BAHN	<i>Ralf Marxen</i>
• EUROOC	<i>not appointed</i>
• HACON	<i>Rolf Gooßmann</i>
• HITACHI RAIL STS	<i>Claudio Monti</i>
• INDRA	<i>not appointed</i>
• KNORR-BREMSE	<i>Jasmina Brackovic</i>
• NETWORK RAIL	<i>Felicity Osborn</i>
• SIEMENS	<i>Jürgen Schlaht</i>
• SMARTDEMAIN	<i>Javier Bonilla Díaz</i>
• SMARTRACON	<i>Jaizki Mendizabal</i>
• SNCF	<i>Christophe Cheron</i>

	<ul style="list-style-type: none"> • THALES <i>Alberto Parrondo</i> • TRAFIKVERKET <i>Christer Lofving</i> • VVAC+ <i>Erik Stocker</i> <p>Other participants:</p> <ul style="list-style-type: none"> • <i>Carlo M Borghini</i> Executive Director of EU-Rail <p>Observers:</p> <ul style="list-style-type: none"> • <i>Josef Doppelbauer</i> (ERA) • <i>Ana Gigantino</i> (ERA) • <i>Ny Tiana Tournier</i> (ERA) • <i>Angela Di Febbraro</i> (SC Chair) • <i>Sarah Bittner-Krautsack</i> (SRG Chair) • <i>Miroslav Haltuf</i> (SRG Vice Chair)
<p>Other bodies</p>	<p>Scientific Committee (SC)</p> <p>States Representatives Group (SRG)</p> <p>Innovation Programmes' Steering Committees (IP SteCos)</p>
<p>Strategic Research Agenda</p>	<p>In accordance with the S2R Regulation, the strategic research and innovation agenda of the S2R JU is described in the Multi-Annual Action Plan (MAAP) adopted in its latest version in November 2019, by means of the GB Decision N° 9/2019.</p> <p>The original MAAP of 2015 is maintained as a reference document.</p>

ANNEX 11: LIST OF MEMBERS OF THE EUROPE'S RAIL JOINT UNDERTAKING¹⁰⁰



¹⁰⁰ As from the date of the adoption of the report in 2025



[RAIL-RESEARCH.EUROPA.EU](https://rail-research.europa.eu)