



In partnership with:



Europe's Rail Joint Undertaking 2028-2034 Vision for a Cost-Efficient Railway Transformation

Executive Summary

Rail is strategically important to the European economy and its security. Rail R&I is a key success factor in strengthening the Single Market, delivering efficient zero emission mobility through a harmonized Single European Rail Area (SERA) and Trans-European Transport Network (TEN-T) and maintaining the competitiveness and global market leadership of the European rail supply industry. Stakeholders across the European rail sector call on the European Institutions to ensure a successor to the Europe's Rail Joint Undertaking is established within the next European Research Framework Programme.

There is a strong need to accelerate the digital transformation and enhance resilience of the European railway system. This requires breakthrough innovation in areas such as digitalisation, automation, artificial intelligence, predictive maintenance, advanced signalling, system integration and standardisation. Equally important, it requires the development of solutions that are affordable to deploy across Europe's diverse railway networks and that can be implemented rapidly and at scale. All the above cannot be achieved by one stakeholder or member state alone but by a successor Rail Joint Undertaking only. Maintaining a standalone rail R&I Joint Undertaking under Article 187 TFEU will ensure long-term private investments can be leveraged, bringing all rail stakeholders together to address in a comprehensive programme the system-level solutions that no single member state or company can deliver alone. A dedicated Joint Undertaking provides far more than funding for R&I. It creates the unique governance structure required to align the entire railway ecosystem behind common objectives, shared priorities and interoperable solutions. It ensures that research is translated into deployable innovations and that investments generate tangible benefits for the European railway system as a whole.

Innovation is not a precursor to deployment but a permanent strategic capability; reducing investment in early-stage R&I would directly weaken Europe's ability to deliver future system transitions.

The successor to Europe's Rail must have a sufficient budget for R&I with a minimum budget of €3 billion, of which half will come from Horizon Europe and the other half from sector contributions, plus €15 billion for pre-deployment funding via the ECF, national and private investments, to support the needed technological maturity level and accelerating market uptake of flagship European programmes: the completion, validation and deployment of the Future Railway Mobile Communication System (FRMCS); the industrialisation and deployment of Digital Automatic Coupling (DAC) for European rail freight; the next generation of cost-efficient ERTMS and automated train operations; and the development of globally competitive high-speed rolling stock in line with the European High-Speed Rail Action Plan. Such a commitment would maintain and strengthen the competitiveness and global leadership of Europe's rail supply industry, accelerate innovation, support a sustainable and cost-efficient transport system for the European rail operating community, and deliver lasting benefits for European citizens, society and the economy.

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1. Introduction

As the greenest mode of transport, rail transport is vital for Europe’s economy, security, and sustainability. The European Commission’s ‘Sustainable and Smart Mobility Strategy’¹ sets concrete objectives and milestones towards the digitalisation and greening of the transport sector and rail. Achieving Europe’s climate neutrality targets by 2050, including a targeted 90% reduction in European transport GHG emissions, is only possible by attracting more passengers and freight to the rail system (long-distance, regional, suburban and urban rail). Rail therefore needs to increase its efficiency, attractiveness, accessibility and to maintain the worldwide competitiveness and technological leadership of the rail supply industry.

Rail is the only transport mode in which the Union retains genuine global technical and industrial leadership. With an annual global market growth of 3% (expected value of EUR 240bn by 2029²), and an investment of 3.6% of its annual revenue to R&I activities, the European rail supply industry is a global leader in design, manufacturing and maintenance of rail systems and products, corresponding to over 650,000 jobs in Europe. However, this status is under threat. State-subsidised global competitors are investing in R&I at a scale the Union does not match and are entering the European market. Staying at the forefront of R&I will be a key factor for Europe to maintain its industrial lead

Rail is a therefore competitiveness question, not solely a transport one, falling within the three imperatives of the Commission’s Competitiveness Compass: closing the innovation gap, aligning decarbonisation with competitiveness, and reducing dependencies while strengthening security.

In 2023, EU rail passenger transport hit its highest level in years, reaching 429bn passenger-kilometers. Rail accounts for 1.8% of the EU’s total energy consumption in transport, while carrying 17% of freight and around 8% of passengers of EU27 inland transport. At urban node level and close to citizens’ daily needs, light rail,

¹ EC’s Sustainable and Smart Mobility Strategy’ - https://transport.ec.europa.eu/transport-themes/mobility-strategy_en

² World Rail Market Study, forecast 2024 to 2029 - <https://www.unife.org/news-resources/wrms/>

metro and regional/suburban rail have a combined patronage of over 30bn passengers per year in Europe, evenly distributed among them, meaning each local rail mode carries 10 times more passengers than air travel. With a total contribution of €247 billion to the EU economy and supporting 3.1 million jobs³, railways offer one of the largest economic footprints of any transport mode while preserving the lowest carbon footprint. With estimated investments at €866 billion by 2040⁴ and €1,625 billion by 2050 to complete the TEN-T Network⁵, Infrastructure Managers are making substantial, long-term commitments to transform the continent's many national rail networks into a single European rail system. It is therefore essential that the EU rail innovations are efficiently transferred into the market for this transformation to succeed.

A coordinated European approach to R&I is vital to accelerate the overcoming of the historic and obstructive fragmentation in the rail system and to deliver harmonised European-wide solutions, making the European rail system more agile, innovative, resilient, capacity-performant, achieve the goals of the Single European Railway Area (SERA) and Trans-European Transport Network (TEN-T), including the comprehensive network) and make Europe more competitive.

Stakeholders from both the European rail supply industry and rail operating community have collaborated together in the first two European rail Joint Undertakings (JU), namely Shift2Rail (2014-2021; EUR 450M funding through Horizon 2020), and its successor, Europe's Rail JU (EU-RAIL, launched in 2021; EUR 600M funding through Horizon Europe) to accelerate research and innovation. The success of Shift2Rail, and now EU-RAIL, in contributing to achieving EU policy by addressing its common objectives outlined below, validates the significance of such public-private collaboration for the future rail system.



The continuation of this work is essential to maintain the rail innovation funnel and advance the Technology Readiness Level (TRL) and maturity of the European innovative solutions initiated and developed within these programmes. It also ensures the next steps in bringing innovations and their benefits to the market faster through targeted pre-deployment and implementation across the EU rail network.

Research and innovation must not be seen only as a preliminary step towards pre-deployment. It is a strategic capability in its own right for the rail sector. Continuous R&I is required to strengthen European competitiveness and sovereignty, to manage and reduce the cost of large-scale infrastructure investments, and to develop scalable solutions that can be deployed across the European network. Given the high capital intensity of rail infrastructure, coordinated R&I at European level is essential to create economies of scale, avoid fragmentation of solutions, and ensure that future investments lead to a more efficient and standardised system.

Stakeholders across the sector have voiced their readiness to commit to a third rail Joint Undertaking to these objectives. The cost of inaction and prolonging the national fragmentation of the European railway networks and R&I would far exceed the investment.

³ https://www.cer.be/images/publications/reports/250922_Railways_Economic_Footprint_Study_2025.pdf

⁴ Schade, W., Khanna, A.A., Mader, S., Streif, M., Abkai, T., de Stasio, C., Fermi, F., Bielanska, D., Deidda, C., Thiery, W., Maatsch, S. Support study on the climate adaptation and cross-border investment needs to realise the TENT network. Report on behalf of the European Commission. Karlsruhe, Milano, Brussels, Bremen. July 2024.

⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021SC0472>

2. A rail JU – Addressing the problems identified in the Call for Evidence

The Call for Evidence identifies five problem areas. The experience confirms that a well-designed Rail Joint Undertaking under the Single Basic Act is the right vehicle to address the challenges.

1. EU steering gap. Europe's Rail Joint Undertaking is already essential for channelling European strategic vision in the sector. Holding 50% of voting rights, the EU is the keystone decision maker, with strategic priorities driven by overall European goals—such as cross-border interoperability and cost reduction. A strengthened Rail JU, with clear 2035 targets and a competitiveness focus, would deliver effective research and innovation aligned with EU policy priorities.

2. Deployment deficit. By focusing not only on demonstration but also on integration into European regulation and standards, Europe's Rail Joint Undertaking has already begun strengthening the link between research, innovation and deployment through flagship projects and deployment-oriented recommendations. A strengthened Rail JU, with direct links to higher-TRL support and use of the ECF, would deliver a qualitatively new European capability and facilitate faster deployment: not replacing deployment actors, regulators or funding authorities, but providing an institutional mechanism that connects innovation, system architecture, validation, pre-deployment, market readiness and implementation feedback. Addressing the deployment gap must not come at the expense of upstream innovation, which is the source of future deployment-ready solutions. This is a game changer that accelerates the SERA and TEN-T and boosts EU industry's competitiveness leadership and strategic autonomy – enabling pilots, real-life cross-border validation and risk-sharing with early adopters, all needed for rail's network and system approach in Europe.

3. Cross-fertilisation. As a single-entry point for the rail innovation ecosystem, Europe's Rail Joint Undertaking already enables system synergies with other Joint Undertakings (e.g. joint calls with SNS, Clean Hydrogen and SESAR), facilitating knowledge transfer and the harmonised application of cross-sector solutions to rail, thereby creating economies of scale. This role can be further strengthened across future ECF and FP10 policy windows to reduce fragmentation and maximise EU-wide impact.

4. Investment leverage. Europe's Rail and Shift2Rail already leveraged Union funds well beyond their reported figures, exceeding initial SBA expectations. However, a gap (the so-called “valley of death”) between R&I and deployment still persists. For instance, in order to test the innovation in freight automation being developed in Europe under real commercial conditions on routes across several countries, additional CEF funding was sought. This included an exhaustive additional proposal and consortium building process, adding time and layers of admin burden to the process. With a more integrated approach in FP10 between R&I and pre-deployment, both processes and admin burden will be reduced and delivery of results become more integrated. In-kind contributions span national and EU-funded actions, so pre-deployment unlocks further investment from industry and from Member States wishing to validate R&I results on their own networks. Coupled with FP10, the ECF will draw meaningful contributions beyond the Union's own – leverage that is quantifiable and aligned with the billions rail must invest to renew its network this decade and stay globally competitive. EU-Rail's private members stand ready to keep matching Union investment and co-invest substantially in pre-deployment.

5. Access and lock-in risk. Europe's Rail Joint Undertaking has built a European ecosystem that did not exist before. Rail is a network operating at European scale, and only the JU instrument has proven able to unite stakeholders around EU rail policy through innovation and to design the interoperable, connected system Europe needs. No national or regional actor could bring together 28 countries, over 100 research centres, around 60 SMEs, more than 400 entities and over 30 private members across the value chain. The sector supports simpler governance and open specifications to ensure scalability and accessibility, competition and SME participation without lock-in.

A strengthened JU should cover the full innovation spectrum, from academic research onwards but with a deployment-oriented mindset, ensuring SME and start-up innovations are matured, validated and taken up by integrators and end-users — raising market uptake and reducing fragmentation.

Europe's Rail Joint Undertaking has transformed Europe's railways into a more sustainable, digital, and integrated transport system by uniting industry, railway undertakings, infrastructure managers, wagon keepers and researchers around shared solutions. Together with its predecessor Shift2Rail (S2R), it has advanced key technologies such as ERTMS, autonomous train operation, real-time traffic management, next-generation traction, and the Digital Automatic Coupler for competitive freight. These breakthroughs improve safety, efficiency, reliability, and cost-effectiveness while supporting green mobility, European jobs, and the global competitiveness of one of the few rail industries still able to compete worldwide. Ongoing work on digital train control, AI-driven decision support, and digital twins will further boost capacity and enable predictive maintenance. Under S2R, 695 prototype testing activities were completed by 2023, with many solutions now at TRL 7/8 and listed in EU-Rail's catalogue of solutions for market uptake. By convening all stakeholders and working closely with the European Union Agency for Railways and the Commission, EU-Rail ensures effective policy implementation with full sector buy-in—standing as a successful model of innovation-driven transformation and reaffirming rail as the backbone of Europe's sustainable mobility. For this reason, there is a strong need to continue the journey paved by Europe's Rail JU and S2R.

3. European Rail R&I Joint Undertakings – Key to unlocking the SERA

A standalone R&I Joint Undertaking under Article 187 TFEU is essential because the challenges it addresses are structural and system-wide rather than project-specific. The Europe's Rail Private members have already pre-identified its needs and mission, together with the European Commission which, following its inter-service consultation, gave a fully positive vote to the Governing Board Decision 06/2025 approving the High-Level Paper on “A Future Policy-Based Public Private Partnership for Rail”⁶: *Simplify the rail systems and operations while enhancing its fundamental capabilities, with European innovation to make rail systems more agile, resilient and competitive*. The High-Level Paper incorporates the strategic vision set out in the Commission's Communication “Connecting Europe through High-Speed Rail”⁷, which provides a comprehensive plan to accelerate the development of high-speed rail across the EU and it is fully supported by the rail sector. In the Communication, the European Commission calls for EU harmonised digital and automation technologies - such as automated and autonomous trains, modern ERTMS signalling, communication and traffic management systems – to be brought to the market and to support a continued joint research under the 2028-2034 Horizon Europe programme and the proposed European Competitiveness Fund, together with the rail supply industry, infrastructure managers and railway companies.

Europe's rail network remains fragmented across more than two dozen national systems, each with distinct technical, operational, and regulatory legacies; overcoming this requires sustained, coordinated investment in interoperable, system-level solutions that no single member state or company can deliver alone. An institutionalised Joint Undertaking provides exactly this: a stable legal framework, pooled long-term funding, binding commitments from public and private partners, and unified governance capable of steering R&I towards the coherent, network-wide architecture needed to complete the Single European Railway Area and the TEN-T network. Cooperating and developing new solutions for the Single European Railway Area will increase the EU supply industries' economies of scale and boost their competitiveness on the global market.

⁶ https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_06-25_High-level_Paper_final_MK-signed.pdf

⁷ https://transport.ec.europa.eu/document/download/774e79c9-1ece-4514-8f16-a2b98049c82e_en

Deployment of innovative solutions on a heterogeneous network consumes a high amount of time as well as financial and engineering resources. Those resources are bound and not available for competing on the non-European market. The EU rail supply industry, however, competes essentially on the non-European market where they need to affirm their role as technological leaders. The ERJU's efforts in the area of harmonization and deployment in the EU market might not seem directly linked to innovation and research at first glance but they have a direct effect on the innovative capacity and the EU rail industry's position as a technology leader on the global market. By contrast, the Work Programme-based partnership offers neither the continuity, the strategic steering capacity, nor the depth of member commitment that these objectives demand. Its lighter, more transactional structure risks reverting to the fragmented, bottom-up approach that has historically slowed deployment—funding discrete projects without the long-term institutional anchor required to translate research into harmonised, deployable solutions across the whole European network.

The benefits of a standalone Joint Undertaking are:

- ▶ **A coordinated EU-level approach** is essential to align new technology deployment across varying national and local systems, to shape future harmonised rail system architectures, standards and regulations to speed up R&I to market. This requires long-term investment and collaboration among stakeholders within a comprehensive framework. Before the creation of Shift2Rail JU in 2014, R&I budget was spent mostly nationally, research efforts were without coordination across countries and not oriented towards achieving the SERA. Coordination was further constrained due to fragmentation among national railway ecosystems, among subsystems and along the innovation life cycle. Since rail is a system, consisting of the complex interaction of rail system components, coordination at EU level is vital. A joint public-private R&I partnership is the best platform to ensure close coordination among all stakeholders along the value chain and the effective implementation of EU priorities, therefore strengthening EU's rail competitiveness as underlined by the 2024 Letta report⁸. A lack of successor JU and the shifting to open collaborative calls fragments rail R&I into disconnected, project-by-project efforts with no coherent target-system roadmap to replace EU-Rail's.
- ▶ **Tangible results with real added value:** Before a standalone rail JU, projects funded under the EU's research programmes were not long enough (3-4 years) to go through all stages of the innovation cycle for high complex technologies. The consistency and long-term nature of the JU's programme allow for the development of technologies from low TRL to pre-deployment and market uptake. Success stories include sector support for the development of the Future Railway Mobile Communication System (FRMCS), the Digital Automatic Coupling (DAC), evolution of European Rail Traffic Management System (ERTMS), Digital Twin technologies, solutions supporting the use of zero-emission propulsion engines or low-cost solutions for regional rail, where the basic principles were developed in Shift2Rail, and the market-ready development is taking place in EU-RAIL.
- ▶ **Predictability & shared risk management to leverage private investment:** Considering the long-life cycle environment of the rail sector, a Joint Undertaking facilitates long-term planning, migration strategies and predictability through large scale R&I projects and serves as a stable platform for innovative initiatives while enhancing financial contributions and synergy within the rail sector. The JU structure has proven key in attracting and leveraging meaningful contributions from private partners in Shift2Rail and Europe's Rail that exceed the initial Single Basic Act (SBA) expectations and requirements.
- ▶ **Creating a rail R&I ecosystem including SMEs, start-ups & academia:** a joint initiative which promotes collaboration between the public and private sectors. The involvement of SMEs, start-ups and the academia will ensure that Europe's ecosystem of rail R&I is strengthened, and new ideas are taken up by the sector.

⁸ <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>

It is supporting the Draghi report⁹ by optimising national rules to ensure competitive markets and the investment in key digital solutions with incentives for market uptake. The sector believes that a future collaborative rail research programme shall deliver:

- ▶ **Stronger European rail industry:** strengthen the global leadership of the European rail supply industry and maintain its positive trade balance in the context of an increasingly competitive global market, notably from Asia. Staying at the forefront of R&I will be a key factor for Europe to foster its industrial lead.
- ▶ **Reduced costs & simplification of the European rail system:** using R&I as a key tool to significantly reduce the complexity and costs of the current European rail system.
- ▶ **Completion of SERA and TEN-T:** coordinated and deployable R&I through a European sector wide cooperation, coordinated between different stakeholders, is needed to deliver an agile and resilient European system covering passenger mobility, freight and EU industrial and military strategic capabilities on high-density corridors in rural as well as urban areas.
- ▶ **Pre-deployment under operational conditions:** All projects should systematically target demonstrators and pilots under real operational conditions, with migration pathways carefully integrated into the technology development process from the outset. Pre-deployment validation under live conditions will accelerate market uptake and reduce innovation risk, necessitating robust regulatory support and the development of adapted approval methodologies.
- ▶ **Innovation funnel:** R&I programmes should support projects across all Technology Readiness Levels, establishing a seamless pipeline from fundamental research through to market deployment. Funding mechanisms should accommodate both high-risk, low-TRL research and deployment-oriented, high-TRL implementation projects to ensure continuity across the innovation lifecycle.
- ▶ **Resilient rail system:** ensuring reliable asset availability, climate-resilient and robust network operations, and prioritising advanced cybersecurity for a reliable and future-proof mobility.
- ▶ **Role of the Joint Undertaking:** Beyond enabling deployment, R&I is essential to structurally reduce system costs and to optimise future infrastructure investments through innovation in design, construction, and maintenance approaches.
- ▶ **Increasing the impact and leverage mechanisms of rail R&I:** the impact of future rail R&I will be further increased by structurally including urban rail research priorities and by allowing a wider range of stakeholders playing an active part in relation to their capacities and characteristics.
- ▶ **Standardisation, harmonisation, interoperability & migration:** Standardisation and harmonisation must be embedded from the outset to simplify and align operational processes across the system. A technology-neutral approach should be pursued to facilitate the scalability and interoperability of emerging technologies, enabling structured migration of existing systems toward digital and sustainable targets. This requires close engagement of railway operators, industry, and European approval authorities in development processes, with strong institutional links to ERA and CEN/CENELEC to ensure research outcomes are systematically integrated into standards and authorisation frameworks. The JU's coordinated interface with ERA and the standardisation bodies turns R&I outputs into TSIs and harmonised standards; losing it risks renewed national fragmentation and slower interoperability.

⁹ https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

- ▶ **Active collaboration with other sectors:** In line with the EU Competitiveness Compass¹⁰, the rail sector should align its R&I priorities with the Sustainable Transport Investment Plan and intensify research in areas such as artificial intelligence, quantum computing, and robotics. Cross-sectoral and cross-disciplinary collaboration should be systematically pursued to maximise knowledge transfer and increase the impact of R&I investments on high-priority challenges.
- ▶ **Attracting new skills:** Investment in innovation reinforces the rail sector's appeal to academic talent and emerging professionals by demonstrating a strong commitment to advanced technologies. The adoption of cutting-edge digital tools — including predictive maintenance, smart infrastructure, and data-driven operations — generates demand for specialised profiles such as software engineers, data analysts, and cybersecurity experts, thereby contributing to addressing the sector's structural workforce shortages.

While the strong focus of FP10 on pre-deployment and system integration is fully acknowledged and justified, it is important to highlight that several key dimensions currently covered by the exploratory research need to be represented. This concerns in particular low-TRL disruptive technologies, socio-economic and human-centric aspects, long-term system economics, supply chain resilience, and the broader rail integration into multimodal and urban systems.

A discontinuation or weakening of such exploratory research and innovation activities over the FP10 execution timeline risks progressively eroding Europe's long-term innovation capacity. In particular, deprioritising early-stage research and emerging technologies may create a growing innovation gap that becomes increasingly difficult to close in later phases. Maintaining a balanced pipeline from exploratory research to pre-deployment is therefore essential to ensure sustained technological leadership and avoid structural weaknesses in the future European rail innovation ecosystem. Elements which should be considered include: (i) low-TRL and disruptive technology development, (ii) socio-economic, human and skills-related research, (iii) system-level economic and financing models, (iv) supply chain and raw material resilience, (v) deep engineering and fundamental research topics, (vi) multimodal and urban system integration, (vii) digital platform and ecosystem perspectives, and (viii) structured knowledge and academic research networks.

4. The Joint Undertaking's contribution to EU policies and priorities

The opportunity is the mirror image of the risk: the European Union and the sector can meet the strategic challenges ahead – resilience, intensifying global competition, decarbonisation, digitalisation and automation, - **together, once, and at scale.** That opportunity is bounded by the 2028–2034 financial framework and is to be realised through the creation of a strengthened Rail Joint Undertaking,

Through coordinated efforts in policy-oriented research, innovation, and pre-deployment activities, a new European Rail Partnership will have significant wide-ranging impact to deliver on numerous EU-level strategies and priorities as described here below:

- **A Competitiveness Compass for the EU¹¹.** Rail is the only transport mode in which the Union retains genuine global technical and industrial leadership. State-subsidised competitors are investing in R&I at a scale the Union does not match and are entering the European market. Rail is therefore a competitiveness question, not solely a transport one, falling within the three imperatives of the Commission's

¹⁰ https://commission.europa.eu/topics/eu-competitiveness/competitiveness-compass_en

¹¹ A Competitiveness Compass for the EU - https://commission.europa.eu/document/download/10017eb1-4722-4333-add2-e0ed18105a34_en?filename=Communication_1.pdf

Competitiveness Compass: closing the innovation gap, aligning decarbonisation with competitiveness, and reducing dependencies while strengthening security.

- **Draghi report on Competitiveness of the EU**¹². The report recommends boosting EU rail competitiveness through coordinated investment in cross-border TEN-T infrastructure, digital technologies (ERTMS, Digital Automatic Coupling), and public-private R&I partnerships. It also calls for targeted EU funding and regulatory harmonization to improve interoperability and support sustainable rail freight and passenger services, aligning infrastructure development with the green and digital transitions.
- **Letta Report “In Much more than a market”**¹³. The report recommends strengthening EU rail competitiveness through coordinated modernization and innovation. Priority actions include advancing cross-border TEN-T infrastructure, deploying digital technologies like ERTMS and Digital Automatic Coupling, and promoting public-private R&I partnerships. It also calls for targeted EU funding and regulatory harmonization to boost interoperability and support sustainable rail services, aligning infrastructure development with the green and digital transitions.
- **EU High-Speed Rail Plan**¹⁴. The EU High-Speed Rail Plan aims to better connect Europe, cut travel times, and reduce emissions, while an EU Rail Partnership would build an integrated, high-capacity network by removing interoperability barriers. The Plan relies on EU-RAIL to deliver its technical goals, including a 2026 research call to develop next-generation rolling stock and a harmonised ERTMS deployment plan. The High-Speed Rail Plan also explicitly calls on the rail supply industry, infrastructure managers and railway companies to continue joint research under the 2028-2034 Horizon Europe programme and ECF to bring the latest High-speed technologies to the market. EU-RAIL also co-funded the FP2-MORANE-2 project to test next-generation FRMCS communications technology on real rail lines, feeding results into future interoperability standards. In short, the HSR Plan sets the political and infrastructure targets, while EU-RAIL and its successor supply the research, pilots, and technical standards to achieve them.
- **EU Council Strategic Agenda 2024/2029**¹⁵. Through coordinated efforts in policy oriented research, innovation, and pre-deployment activities, the initiative is capable to respond to the European Union priorities through cutting-edge rail solutions developed by its industries for retaining their global leadership role (Prosperous and Competitive Europe), strengthening the rail resilience of its system and ensure harmonised and secure operations in critical infrastructures (for a Strong and Secure Europe), and providing an accessible, affordable and attractive transport mode across borders to all its citizens (for a Free and Democratic Europe).
- **2023 “Joint Communication to the European Parliament, European Council and the Council on European Economic Security Strategy”**¹⁶. Promoting, among others, railway competitiveness by making the EU economy and supply chains more resilient bolstering innovation and industrial capacity - fostering the research and industrial base in strategic areas such as clean energy and net-zero industries.
- **Net-Zero Industry Act**¹⁷. The Net-Zero Industry Act aims to scale up EU manufacturing of clean technologies that produce minimal or no greenhouse gas emissions, strengthening the clean energy transition. It frames R&I as central to industrial resilience, strategic autonomy, and competitiveness, while addressing vulnerabilities from gaps in technological and manufacturing expertise.
- European Commission Report **“Addressing European research and innovation challenges for system**

¹² https://commission.europa.eu/document/download/ec1409c1-d4b4-4882-8bdd-3519f86bbb92_en?filename=The%20future%20of%20European%20competitiveness_%20In-depth%20analysis%20and%20recommendations_0.pdf

¹³ <https://www.consilium.europa.eu/media/ny3j24sm/much-more-than-a-market-report-by-enrico-letta.pdf>

¹⁴ https://transport.ec.europa.eu/document/download/774e79c9-1ece-4514-8f16-a2b98049c82e_en?filename=COM_2025_903_HSR.pdf

¹⁵ https://www.consilium.europa.eu/media/yxrc05pz/sn02167en24_web.pdf

¹⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023JC0020>

¹⁷ https://single-market-economy.ec.europa.eu/publications/net-zero-industry-act_en

*transitions in energy and mobility*¹⁸. The report affirms rail's strategic role in achieving the EU's sustainable mobility and climate goals, supporting territorial cohesion and regional connectivity, guiding future R&I under Horizon Europe and the Europe's Rail Joint Undertaking. Critically, the gap between research and real-world implementation must be bridged by focusing on higher technology readiness levels, large-scale demonstrators, and deployment support mechanisms.

- **EU Military Mobility Package**¹⁹. The EU Military Mobility Package 2025 reinforces the case for a European rail partnership. Its emergency framework, dual-use upgrades and military corridors require exactly what such a partnership delivers: harmonised gauges, signalling and loading standards for rapid cross-border movement. It could also address shortages like flatbed wagons through coordinated procurement and help plan the package's ~500 infrastructure "hotspot" projects with Member States and industry.
- *Clean Industrial Deal*²⁰. It mirrors the core aim of bringing together climate action and competitiveness under one overarching growth strategy, positioning rail as a cornerstone of Europe's transformational business plan that simultaneously accelerates decarbonisation, reindustrialisation, and innovation across the entire continent.

5. Europe's Rail Key Challenges

A number of rail sector documents published recently illustrates both the challenges of the rail sector as well as its responses adapted to each rail segment.

- **Protecting rail global competitiveness and leadership.** The European rail supply industry is increasingly exposed to unfair competition from foreign heavily subsidised manufacturers which benefit from non-market financing, preferential procurement, and a protected home market. Operating in the EU's open market, European firms must meet high regulatory, environmental, and labour standards their competitors face no equivalent of abroad. Without decisive action from the European Union, this asymmetry risks eroding Europe's technological leadership and industrial sovereignty in rail.
- **Fostering SERA for one harmonized European market.** Despite progress, cross-border rail operations remain challenged by differences in signalling, electrification, track gauges, and slot allocation — legacies of history, long asset lifecycles, and varying national regulations. Operational rules also diverge, impacting efficiency and train drivers in particular. Harmonisation efforts begun in Europe's Rail must still be completed, implemented, and validated with the European Union Agency for Railways.
- **Optimising Lifecycle Costs Across the Rail System.** Europe's fragmented railway networks drive up costs through duplicated systems, incompatible technical standards, and costly cross-border modifications. Outdated infrastructure, and complex regulatory approval processes add further financial burden. Cost reduction hinges on streamlining and harmonising operations, processes, and products. Addressing these structural cost drivers requires sustained innovation in infrastructure design, standardisation, modularisation, and automation, which can only be achieved through coordinated European R&I efforts.
- **Unlocking Competitive Pricing and Flexibility in Rail Freight.** Freight trains have faced decades of challenges — including increased truck flexibility, declining heavy industry, poor digitalisation, inflexible services, limited last-mile connectivity, and lengthy border delays — making rail freight less competitive than road transport. Widespread adoption of the Digital Automatic Coupler (DAC), combined with new

¹⁸ <https://op.europa.eu/en/publication-detail/-/publication/46e16a85-9d7f-11ef-85f0-01aa75ed71a1/language-en>

¹⁹ https://transport.ec.europa.eu/news-events/news/commission-moves-towards-military-schengen-and-transformation-defence-industry-2025-11-19_en

²⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52025DC0085>

digital services, data analytics, and operational automation, could significantly boost efficiency and restore rail freight's appeal.

- **Scaling up investment in maintenance, regeneration & modernisation.** Many rail networks struggle with deteriorating infrastructure, causing service disruptions, reduced speeds, and unreliable operations. Governments frequently prioritise road and aviation funding over rail upgrades, leaving the sector underfunded. Increased use of robotic solutions for inspection and installation, designed to operate on modular infrastructure components, combined with digital twins and data analysis, can reduce execution costs, standardise interventions and improve asset availability, partially mitigating this funding gap.
- **Bridging Urban, Last-Mile and Regional & Rural Networks.** Across much of Europe, poor integration between rail and other local transit options makes trains impractical for final-leg journeys. This is particularly acute in regional and rural areas, where it deepens transport poverty and restricts mobility for underserved communities. Developing multimodal systems and targeted last-mile solutions is therefore essential to reduce transport poverty, strengthen regional and rural rail connections, and extend public transport's reach where it is needed most.
- **Enabling seamless ticketing & end-to-end integration.** Rail ticketing, unlike aviation's Global Distribution Systems (GDS), is fragmented across markets, operators, and national regulations — whether publicly managed or open to competition. This makes cross-modal and cross-border travel planning cumbersome. Digitalization, cybersecurity, harmonization, and targeted regulation are key to addressing this challenge.
- **Rail system transformation is not a fixed target:** emerging requirements in energy, digital security, automation and climate resilience require continuous development of new solutions. A system focused only on scaling current technologies risks locking in suboptimal solutions.

6. Estimated JU Investment

The new rail Joint Undertaking would implement a “policy-based budget”, with a performance-based approach relying on the ability to track progress towards achieving the above-mentioned targets for the EU policy objectives.

The railway supply sector strongly advocates for the retention of in-kind contributions as the principal modality for mobilising private members within a future European Joint Undertaking. This approach ensures that private-side commitments are channelled directly through the members' own research and innovation activities and resources, thereby securing genuine industrial engagement, sustained co-investment, and shared ownership of results. A shift towards cash-based contributions would, by contrast, risk diminishing the active involvement of private members and undermining the collaborative, demand-driven character that constitutes the principal added value of the partnership model.

The investment effort required to simplify the rail system and deliver improved services for the entire EU network should focus on both Research and Innovation and pre-deployment.

Research and Innovation. Approximately **€3 billion for R&I activities**, with half (€1.5 billion) coming from EU funding (Horizon Europe (2028–2034)) and half from industry contributions to make the rail system more agile, resilient, and competitive. This expanded R&I scope, compared to previous initiatives, addresses the need for costly yet essential one-time developments of innovative solutions aiming to transition the diverse existing legacy systems into a new, simplified European rail system, building upon past Joint Undertaking achievements and incorporating new R&I advancements.

Sustaining R&I funnel means significant new research and innovation remains essential — not for its own sake,

but as the foundation on which deployment depends. A strengthened Rail Joint Undertaking must keep funding the breakthroughs the new European architecture requires: digitalisation, automation, control-command and signalling, traffic management, cybersecurity and resilience. A clear priority is migrating the existing network — developing novel adaptor solutions that let legacy systems and assets operate in line with the new EU target architecture. Because rail assets last decades, the installed base cannot be replaced at once; the proven ability to bridge old and new with standardised adaptors, demonstrating their safe coexistence, is what makes a brownfield transition affordable, avoids stranded investment, and lets the network capture the new architecture's performance gains far sooner. This is a genuine research challenge in its own right — one only a coordinated European partnership can solve once for the whole network, rather than repeatedly, system by system and country by country.

Pre-deployment. Approximately **€15 billion for pre-deployment activities** via the European Competitiveness Fund (ECF). The scale of investment needed is substantially larger as it requires the diverse participation of stakeholders across different countries to upgrade their systems and make investments in their network. It would require significant European procurement activities to enable a first implementation at system level, that can then be replicated based on the pre-deployment results at scale.

Within the European rail sector, pre-deployment designates the phase during which technologies or solutions, having attained sufficient maturity through prior R&I demonstration activities, undergo large-scale validation in genuine operational environments and proof of applicability under commercial conditions to demonstrate readiness for system-wide or commercial rollout.

This phase corresponds broadly to the transition from TRL 8 — where a complete system prototype has been demonstrated in an operational environment — to TRL 9, where performance has been proven at scale.

Its primary objectives are to:

- Mitigate residual technical and operational risk,
- Validate system behaviour across diverse operating conditions, and
- Establish the evidentiary foundation required for subsequent full deployment decisions.

Pre-deployment thus constitutes the phase in which technologies are validated at scale in operational environments, functionally distinct from, yet directly preparatory to, deployment activities financed through instruments such as CEF, but depends on a continuous inflow of new solutions from ongoing R&I activities.

Pre-deployment funding under the ECF must be additional to, and must not displace or reduce, deployment support under the Connecting Europe Facility, on which cross border network-wide rollout continues to depend.

The simplification and modernisation of the rail future do not only rely on an equivalent European future Traffic Management implementation, but of several other European standardised solutions to be deployed as a system in the network. Considering the past ERTMS support efforts from the Union through the Connecting Europe Facility, the estimate of the investment needed for DAC, FRMCS, Satellite applications, other technology game changers and possibly future Traffic Management solutions harmonised at European level. Additionally, pre-deployment instruments could be used to facilitate the integration and promotion of a new generation of High-Speed solutions, directly supporting the creation of a European High-Speed network linking capitals and major cities, requiring further private investments and also possible dual use solutions of rail assets. The estimated amount for all those pre-deployment activities across the network seems the appropriate order of magnitude for a strategic investment in Europe's future, supporting both technological sovereignty and economic sustainability.

7. Activities

The present document is closely aligned with the activities outlined in the Annex to the Europe's Rail Joint Undertaking High-Level Paper on a future policy-based Public-Private Partnership for Rail²¹, which sets out four Flagship Initiatives as a living roadmap for the future of European rail. The Annex details strategic areas of R&I and pre-deployment to simplify the rail system and its operations, while enhancing its fundamental capabilities, grouped into four Flagship Initiatives that together form a cohesive roadmap for the future of European rail.

In particular, the activities described in this document directly reflect the pre-deployment rationale articulated in the Annex, which emphasises the need to engage infrastructure managers, vehicle keepers, terminal operators, maintenance companies, rail operators, and suppliers, and to build confidence and ownership across the sector to support smooth transition into future system European-wide deployment, while using pre-deployment activities to identify and resolve potential technical and operational risks early, reducing delays and cost overruns, and trialling new business cases and addressing potential new policy approaches. This strong alignment confirms that the activities proposed herein are consistent with the strategic direction endorsed at the highest level of the Europe's Rail Joint Undertaking, including the European Commission, and contribute directly to its overarching mission of making European railways more agile, resilient, and competitive.

7.1. The Working Areas: The Flagship Initiatives

The sector supports the Working Areas proposed and defined by Europe's Rail Joint Undertaking's High-Level Paper which address the strategic areas of Research and Innovation (R&I) and pre-deployment to simplify the rail system and its operations, while enhancing its fundamental capabilities in alignment with the core objectives of making European railways more agile, resilient, and competitive. Those areas are grouped in four Flagship Initiatives, which needs to be complemented by other policy actions beyond the field of R&I and pre-deployment to reach the intended objectives.

- The first Flagship Initiative - **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 second Flagship Initiative - **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 automatic 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

²¹ <https://rail-research.europa.eu/wp-content/uploads/2026/01/Europes-Rail-Private-Partnership-for-Rail-2025-Pages.pdf>

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.

These four Flagship Initiative are focussed on areas involving an EU system thinking that necessitate activities of European pre-deployment and associated research to ensure a long-lasting positive impact. There are further activities that should also be considered under the work of a future Joint Undertaking:

- **Horizontal Research and Innovation at lower TRLs:** There are a number of important areas of work where further research and innovation is required to improve future railway systems, but which may lead to full pre-deployment activities within the identified time frame, still providing a valuable input to the works of the Flagship Initiatives. The focus would be on a set of areas related to the four flagships initiatives and on fostering new ideas. These are captured in a dedicated chapter.
- **System and deployment integration:** the production and validation of harmonised specifications and standards with the sector, and the coordination of the outputs of the Flagship Initiatives towards the European regulatory harmonisation and standardisation framework is an essential consideration within the overall programme. Additionally, the broader deployment considerations, including the coordination of European and national deployment programmes resulting from the pre-deployment activities is also necessary within the programme.

These flagship initiatives and additional horizontal activities share the same mission and focus together, they form a cohesive living roadmap for the future of European rail that extends the scope beyond SERA to include complete rail market coverage, including urban rail systems and multimodal transport integration, as urban nodes are included in the revised TEN-T guidelines aligned with the EC Communication on EU Urban Mobility Framework. They represent a holistic effort to ensure that through coordinated investments onto legacy systems, the European Single Rail Area will be delivered capitalising on the strength of the European Single Market. They will

bring innovation, sustainability, and security—delivering long-term environmental, economic, and social benefits for Europe and beyond. By expanding the scope to include urban, suburban, or regional rail aligns with the aim of bringing new partners into the partnership—thereby increasing the share of private funding—and will enable greater ambition in light of significant needs and key priorities. Beyond its strong alignment with the Flagship Initiatives of the JU High-Level Paper, the sector recognises a number of additional strategic areas that present important opportunities for a potential successor programme to Europe's Rail, as highlighted by ERRAC²². These include:

- A stronger focus on users' needs and the whole journey experience — encompassing both passengers and logistics customers;
- A dedicated attention to urban, suburban, and regional rail, where the specific challenges of these environments merit targeted treatment beyond the current scope;
- Significant potential has been also identified in advancing multimodality and the fuller integration of rail within the wider transport system, including the fight against transport poverty as called for by the Social Climate Fund and Commission Recommendation (EU) 2025/1021 on transport poverty, championed by Commissioner Tzitzikostas;
- Further opportunities lie in infrastructure innovation, notably through modularisation and the use of robotic construction and maintenance techniques, which could substantially improve efficiency and reduce costs;
- Finally, the sector highlights materials — including raw materials — as a strategically critical area, directly relevant to European competitiveness and sovereignty, as underscored by recent competitiveness reports, and with tangible implications for both rolling stock and infrastructure.

Taken together, these areas reflect the sector's ambition to build a comprehensive and forward-looking research and innovation agenda that fully captures the breadth of rail's contribution to a sustainable, inclusive, and competitive European transport system.

8. Partner composition and target group

The RailJoint Undertaking should bring together all those ready to perform research and innovation — exploring new concepts and driving step-changes across rail sub-systems, validating them through demonstration, and implementing solutions into systems in operation to pave the way for market deployment. This structure bringing together all the stakeholders of the network is unique. Developing new technologies and determining research priorities for a network that is inherently cross-border requires all concerned parties to cooperate. The European added value of the EU-RAIL JU therefore goes beyond research and innovation. The EU-RAIL JU is a unique forum for cooperation for the railway sector in the area of research and innovation.

Infrastructure Managers. Infrastructure managers strongly support bridging the gap between research and deployment. They carry the largest trackside investment burden for ERTMS, FRMCS and future digitalisation, often assuming costs and risks long before network-wide benefits emerge. The next Rail Joint Undertaking must continue to harmonise the system, develop new solutions, and support funding mechanisms that let infrastructure managers validate harmonised solutions once and reuse them across Europe. To that end, ECF pre-deployment co-funding must be directly accessible to the infrastructure managers and railway undertakings that bear these

²² <https://www.eurnex.org/3d-flip-book/future-tracks/>

deployment costs and explicitly structured to address the business-case asymmetry between those who invest and those who benefit.

Passenger Railway Operators. A dedicated European Rail Joint Undertaking is essential: it underpins the Single European Railway Area and cuts costs significantly through the design, piloting and integration of European solutions that also safeguard the value of the massive long-term investments already under way. Only a Rail Joint Undertaking can ensure a fully integrated, predictable and coordinated migration of new technologies across Europe — delivering harmonised onboard specifications, value-sharing frameworks and ECF-supported fleet renewal, so that cross-border, automated and more reliable services can be rolled out in practice without penalising those who move first.

Urban rail operators (metros, suburban and light rail networks). They represent an important new stakeholder group for the future JU. As a key link in the TEN-T and the interface between long-distance rail services and citizens' daily mobility needs, they play a central role in delivering seamless and sustainable transport across Europe. Operating complex, high-capacity systems serving millions of passengers every day, they bring unique operational expertise and access to large-scale real-life testing environments. Continued investment in research and innovation is essential to help urban rail operators maintain service excellence, strengthen the competitiveness of European mobility solutions and support Europe's technological sovereignty. Their involvement would broaden the Europe's Rail ecosystem, accelerate the deployment of innovative solutions and reinforce synergies between urban and mainline rail systems.

Rail Freight Operators. A dedicated Rail Joint Undertaking is essential to digitalise and automate rail freight and grow its market share. Freight is an ecosystem challenge, requiring coordination across operators, infrastructure managers, suppliers, terminals and logistics actors so that innovation reaches daily operations consistently across Europe. This is especially urgent for next-generation freight built around Digital Automatic Coupling (DAC) and automated operations, which can unlock capacity, faster transshipment and lower costs while shifting traffic from road to rail. A strengthened Rail Joint Undertaking is needed to coordinate an EU-level, risk-shared and co-funded roll-out, turning fragmented pilots into a single European system.

Rail Supply Industry. A Rail Joint Undertaking is essential to deliver European-by-design standardisation, coordinated deployment and industrial-scale uptake. The message is simple: a strong, competitiveness-focused Rail Joint Undertaking must be preserved. It is the only EU-level instrument proven capable of turning European innovation into scalable deployment and safeguarding the global leadership on which our competitiveness, autonomy and sovereignty depend.

Lessors/vehicle keeper/new entrants. The European solutions and simplification a dedicated JU delivers are the precondition for rail's commercial viability: without them, costs stay too high and the sector risks a reverse modal shift. A single, stable European technology for systems like ERTMS would itself be a major strategic innovation, ending the fragmentation that undermines the sector. The JU's pre-deployment activities help close the innovation 'valley of death' and speed rollout, with a coordinated path agreed in dialogue with infrastructure users so locomotives and infrastructure advance together. A more inclusive, proportionate approach to SME participation would strengthen the ecosystem further.

SMEs and Start-ups. SMEs and Start-ups are an indispensable source of agility and disruptive innovation, and a successor Joint Undertaking should actively widen their participation. By lowering barriers to entry — accessible calls, simplified requirements and targeted support — the partnership can mobilise their specialised expertise in fast-moving fields such as AI, sensing and advanced materials. Embedding them across the full innovation cycle, from early research to pre-deployment, diversifies the European supply chain beyond the large integrators and strengthens the long-term competitiveness and resilience of the entire rail ecosystem.

Member States. Member States shall help set the strategic agendas for harmonisation and deployment, ensuring coherence between European and national programmes. An institutionalised partnership is the right vehicle: it secures binding long-term private investment, strengthens Europe's standing against competitors, and covers the full innovation cycle — from low and medium TRL to pre-deployment of near-market products, validated in ECF-funded projects.

Academia. University and research organisation stress that Europe's Rail must continue to anchor a strong research base. The Joint Undertaking already connects more than 100 universities and research centres, sustaining lower-TRL R&I (TRL 1–4) that will deliver the breakthroughs Europe needs beyond 2035, linking PhD funding and research training to industry needs, and bringing critical disciplines — AI, cybersecurity, digital twins, autonomy, telecommunications — to bear on rail's operational and regulatory realities, while reinforcing open science and the talent pipeline. New research is equally vital to the transition itself: designing the solutions and coexistence methods to run the network under the new EU architecture remains an unsolved scientific and engineering problem, with a direct pay-off in lower migration costs and better performance. Continuous R&I investment is essential to sustain Europe's research and engineering talent pipeline, ensuring that the next generation of expertise remains engaged in rail rather than moving to competing sectors.

Passengers. For passengers — including persons with disabilities and older people — rail must become the first choice for mobility: reliable, affordable, accessible and seamless, not a last resort. A strengthened Rail Joint Undertaking delivers the harmonised, interoperable, digital system behind end-to-end cross-border journeys, higher punctuality and shorter travel times, while lower costs make services more affordable across all regions. Accessibility must be designed in from the outset, and passengers' representative organisations should help shape priorities — ensuring a system that is sustainable, smart, fair and inclusive.

Freight customers / shippers. To double by 2050 the rail freight market share, the digital integration all along the operators, infrastructure managers, suppliers, terminals and logistics actors' chain is far more necessary to ensure that innovation reaches day-to-day operations in consistently across Europe. Along the European TEN-T corridors, the freight trains operate reliably, optimised flexibility providing the right insurance to the shippers and their customers for their goods.

ERA and Standardisation bodies. The European Union Agency for Railways (ERA) and the European standardisation bodies (CEN, CENELEC, ETSI) would be essential partners in a successor Joint Undertaking. Early, structured involvement would ensure that research outputs feed directly into TSIs, standards and the regulatory framework — turning innovation into deployable, interoperable solutions. This alignment would accelerate the path from validated results to certification and market uptake across the Single European Rail Area, avoiding fragmentation and securing the JU's lasting regulatory impact.

9. Governance

The Governance structure of the future EU rail Joint Undertaking shall reflect its expanded dual mandate, encompassing both research and innovation (R&I) and a new pre-deployment strand funded through the European Competitiveness Fund. Importantly, both pillars (R&I and Pre-Deployment) would sit under a single Joint Undertaking and a single Executive Director, ensuring coherence across work programmes and facilitating the systematic transfer of Europe's Rail and future R&I outputs into the pre-deployment pillar.

This programme could be organised around three distinct but complementary strands.

The **Innovation Pillar** will continue focusing on longer-term research aimed at developing the breakthrough

technologies and knowledge base that will underpin the future of rail, and it will be structured around a set of strategic priority areas as described in Section 7 (Flagship Initiatives);

The **System Pillar**, by contrast, will gear towards the integrated development and validation of the technologies and solutions needed through a shared operational vision and common system architecture, supporting the deployment of harmonised and innovative solutions across Europe. To address this, the System Pillar develops further a common operational concept and a functional, safe and secure system architecture. This System Pillar should build on, and maintain continuity with, the existing Europe's Rail System Pillar, and its common-architecture role should remain clearly distinct from the regulatory remit of the European Union Agency for Railways.

The **Deployment Pillar**. Recognising the importance of covering the full spectrum of TRL within a Joint Undertaking, the sector called for a stronger deployment focus by transforming the current Deployment Group into a fully-fledged Deployment Pillar with dedicated resources and financing links. It also supports closer alignment between FP10, ECF, CEF-T, and national programmes, alongside stronger Member State involvement, while fully preserving ERA's regulatory independence. It will consist of dedicated projects for large-scale validation in genuine operational environments ensuring successful translation of innovations from concept to implementation. It would require significant European procurement activities to enable a first implementation at system level, supporting a more integrated approach to innovation transition than country by country programme specific implementation. This pillar will comprehensively address the funding challenges, industrial capacity and coordination complexity across actors and borders, to bridge the gap between research and full rollout thereby reducing risks and validating solutions in real conditions.

Unlike its predecessor, Europe's Rail JU, established solely under Horizon Europe for R&I activities, the new body will require a more complex institutional architecture capable of overseeing the abovementioned distinct but complementary workstreams. It will therefore be essential to design a governance framework that clearly delineates responsibilities, decision-making processes, and funding flows amongst these pillars, while ensuring coherence and strategic alignment across the organisation as a whole. When redesigning such a framework, decision-makers should bear in mind possibilities to speed up the internal processes (drafting of MAWP, grant agreements, feedback processes).

The future partnership should also build on the positive experience of Europe's Rail Joint Undertaking to encourage openness to increased membership, participation of SMEs, start-ups & academia, and potential collaboration with other joint undertaking where potential synergies are identified.

The governance structure of the ERJU should take due account of the EU's overarching simplification objective, ensuring that institutional arrangements remain proportionate, avoid unnecessary administrative burden, and preserve the legal and financial predictability needed to deliver simplification in practice rather than merely on paper.

While a cross-modal Joint Undertaking may be perceived as a simplification from an institutional standpoint, it would in practice generate substantial additional governance complexity, as reconciling the divergent research and innovation priorities, technology maturity cycles, and stakeholder architectures of the different transport modes under a single decision-making structure would render day-to-day management considerably more burdensome and resource-intensive than under mode-specific governance arrangements.

Far from delivering the intended streamlining of the EU R&I landscape, a combined multimodal JU risks introducing significant coordination overheads and operational inefficiencies, insofar as the distinct needs and objectives of each transport mode are unlikely to be adequately accommodated within a single, undifferentiated governance framework.

10.The Signatories

AERRL – Association of European Rail Rolling Stock Lessors

ALE – The Federation of European Train Drivers’ Unions

ALLRAIL – The Alliance of Passenger Rail New Entrants

CER – Community of European Railway and Infrastructure Companies

EAL – Association of ERTMS Accredited Labs

EIM – European Rail Infrastructure Managers

ERFA – European Rail Freight Association

FEDECRAIL – European Federation of Museum & Tourist Railways

NB-Rail – Notified Bodies Association

UIP – International Union of Wagon Keepers

UIRR – International Union for Road-Rail Combined Transport

UITP EUROPE – International Association of Public Transport

UNIFE – The European Rail Supply Industry Association

UIC – International Union of Railways

EUG – The ERTMS Users Group