# ANNUAL ACTIVITY REPORT

# 2021

## EXECUTIVE VIEW

Europe's Rail

Manuscript completed in 2022



Brussels: Europe's Rail Joint Undertaking, 2022





Europe's Rail

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## EXECUTIVE VIEW

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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# Foreword

Adina VĂLEAN,
European Commissioner for Transport

The European Union is committed to encouraging more people and shippers to consider using rail, and to bringing more innovation into the sector to make that happen. And we would not be able to do this without Europe's Rail.

The Shift2Rail programme was a turning point, bringing the sector together and focusing minds on making rail the backbone of mobility and transport in Europe. It saw operators, infrastructure managers, suppliers, the research community and other key players all pulling in the same direction, in a way that had never happened before.

I have every confidence that Europe's Rail will continue this work, driving efforts to make our rail network more attractive, more user-friendly, more competitive, more affordable, more efficient, more sustainable, and more integrated within Europe's wider mobility system. Innovation will also ensure our future infrastructure and rolling stock are fit for the modern era and easier to maintain. I am particularly looking forward to more automation in freight operations; Digital Automatic Coupling systems will certainly make rail cargo transport more appealing, and increase its use.

Rail is regarded as one of the most resilient transport modes, as well as one of the most sustainable. To get more citizens and businesses on board across the Single European Rail Area and beyond, we just need to translate this into greater availability and reliability! I look forward to continuing our work with EU-Rail to make this happen.

*Adina VĂLEAN,*
*European Commissioner for Transport*

# Shift2Rail and Europe's Rail in 2021

Carlo M BORGHINI,
Executive Director,
Europe's Rail Joint Undertaking

Although 2021 was still marked by the consequences of the Covid-19 pandemic, Shift2Rail and its successor programme Europe's Rail, continued to deliver its mandate for the benefit of European rail passengers and cargo services. 2021 was a major milestone for the European railway sector as the regulation establishing Europe's Rail Joint Undertaking was adopted in November 2021. After years of intense preparations, the new programme had been officially kicked-off.

As the Shift2Rail Programme is gradually phasing out with projects still running until 2023 – early 2024, the focus remains on delivering the Programme and its key results. In parallel, the European rail community is looking to deliver, with Europe's Rail Joint Undertaking (EU-Rail), even more ambitious objectives. S2R has supported an unprecedented convergence of the rail sector and Europe's Rail will build upon its achievements and the need to speed up the shift to carbon neutral mobility and transport, to deliver the next-generation of railway, for passengers and freight in Europe and beyond. Digitalisation and automation are key enablers of such transformation and are at the heart of EU-Rail as they are expected to contribute to substantially increasing the performance of rail and creating opportunities for the deployment of future proof technologies. This transformation aims to deliver new rail services to its clients – passengers and business – while attracting new ones.

Shift2Rail programme activities in 2021 successfully contributed to the progress of the innovative solutions which are due to be industrialised as from the next years, further strengthening the future of operation of the Europe's Rail programme. Some key achievements include the confirmation of the viability of the Traction SiC technology, European ATO first driverless demonstrator including S2R Adaptable Communication System, the novel rail concept with replaceable rail head, Interoperability Framework tests in Malaga and Lisbon, performance tests of DAC systems, among others.

The JU was not only active in its R&I activities, but also in building relationships with other organisations. During 2021, the JU further expanded its collaboration across Europe and beyond by signing two new Memoranda of Understanding with CEN and CENELEC and the International Union of Railways – a major achievement and precedent for future collaboration.

2021 was also a successful year in terms of disseminating R&I results in external and internal events and conferences. The JU participated to 54 online events across Europe and beyond, presenting concrete results achieved by Members together with other key stakeholders. Additionally, the the annual S2R Innovation Days took place in December, bringing together more than 1000 registered participants, key rail experts, representatives from the institutions and stakeholders from beyond Europe. In the frame of the European Year of Rail, the Shift2Rail Programme had its own dedicated exhibition wagon on the Connecting Europe Express, flagship campaign of the year. It was an opportunity to further disseminate programme results to policy makers, stakeholders, but also the general public.

To reach out to younger audiences, start-ups and SMEs, the JU organised its very first hackathon, Hack2Rail, which gathered strong interest from new audiences, complementing its participation to the European Startup Prize, organised under the patronage of the Chair of the European Parliament's Transport Committee.

Following the 2021 Call for Proposals, in only 5 years, cumulatively €0.8 billion of resources have been invested in Research and Innovation activities (including Lighthouse Projects), accomplishing the JU's mandate to recover the initial delays and accelerate the delivery of the Programme's innovative solutions. Considering the Additional Activities provided by the S2R Members estimated at €0.2 billion, the S2R Programme achieved a leverage effect of 2.2 times for each Euro invested by the Union, creating a total value of research and innovation estimated just above €1 billion.

Working together in an open and inclusive mission-oriented partnership, the rail sector is leading the process that brings new and unexpected breakthrough innovations, and in some cases unwelcomed reality, to people, groups, organisation, systems and societies and helping them to successfully adapt to the change. We are excited to be able to showcase our results during InnoTrans and TRA 2022.

*Carlo M BORGHINI,*
*Executive Director, Europe's Rail Joint Undertaking*

# Call 2021 in figures

**2** **projects**
for a total value of
**€2.34million**

**€1.77**million
**Shift2Rail**
co-funding

**12**
**participants**

**5** **EU** Member States

**3** SMEs

**1** SME retained

# Executive summary

2021 marked the start of a new institutionalised European partnership, Europe's Rail Joint Undertaking (EU-Rail) officially established on of 19 November 2021 by Council Regulation (EU) 2021/2085. It is the new institutionalised European partnership on rail research and innovation established under the Horizon Europe programme (2021-2027) and the universal successor of the Shift2Rail Joint Undertaking. This milestone followed after an intense year of preparatory activities conducted with the European Commission services, including the launch of expression of interest to become a Founding Member of the new JU and the preparation of the JU Master Plan.

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.

This partnership aims to accelerate research and development in innovative technologies and operational solutions. This will support the fulfillment of European Union policies and objectives relevant for the railway sector and the competitiveness of the rail sector and the European rail supply industry. In this way, EU-Rail will accelerate the penetration of integrated, interoperable and standardised technological innovations necessary to support the Single European Railway Area (SERA).

EU-Rail builds upon the results and activities carried out by its predecessor, Shift2Rail (S2R), which was established as a public-private partnership under the Horizon 2020 Framework Programme[1] to manage and coordinate mission-oriented research and innovation (R&I) activities for a major transformation of European railway systems.

The S2R strategic objectives and targets remain more than valid also within the framework established by the new 'Sustainable and Smart Mobility Strategy' adopted by the European Commission on 9 December 2020[2].

2021 activities, those related to S2R Programme as well as those aimed at launching EU-Rail, have continued to be impacted by the Covid-19 pandemic. During such critical periods, rail continued to demonstrate its role as the backbone of the European economy. In a multimodal approach, it has ensured the transport of goods (from food to protective and critical equipment), supported the management of sanitary critical transfers but also continued meeting the needs of the European citizens to commute to work and to cover essential travel reasons thanks to the rail staff and the innate strengths of rail.

According to The Community of European Railway and Infrastructure Companies (CER), the pandemic remains dire in the whole rail industry, and particularly in international passenger services, with the losses suffered by the whole passenger sector from the beginning of the pandemic until end June 2021 amounting to EUR 39 billion. Passenger numbers are dramatically low, more for cross-border traffic, with 2020 total turnover losses estimated by CER at EUR 24 billion for passenger services (-42%) and at EUR 2 billion for cargo (-2%) compared to 2019 values. Especially for rail passenger services, including urban transport, health safety expectations will have to be considered and managed also in the future.

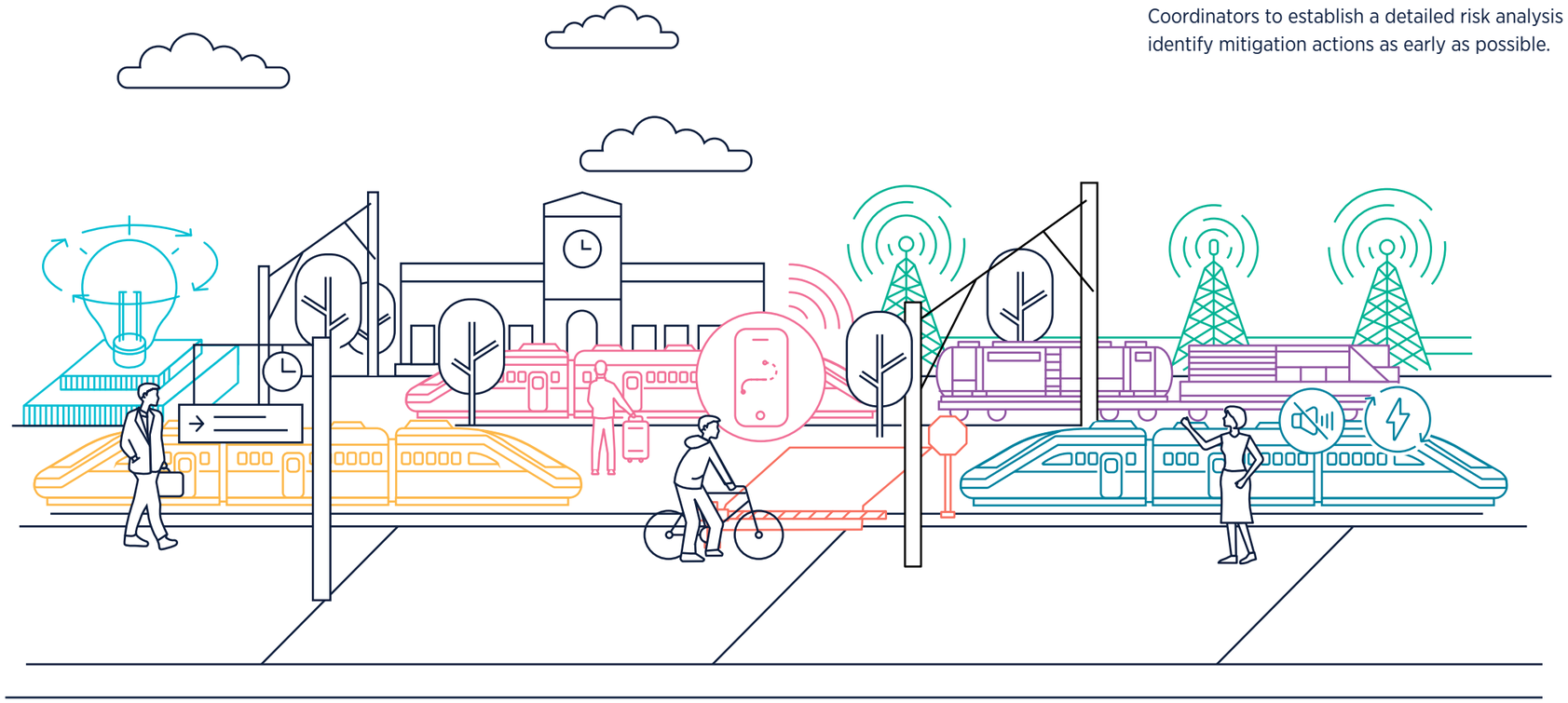
1 Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020), OJ L 347, 20.12.2013 and Council Decision (EU) No 2013/743/EU of 3 December 2013 establishing the specific programme implementing Horizon 2020 (2014-2020), OJ L 347, 20.12.2013, p. 965.

2 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0789

# Shift2Rail Programme Status

During 2021, the JU has further progressed in delivering the S2R Programme, although operational activities have been affected by the Covid-19 pandemic, further delaying the programme outputs of about additional 6 months compared to 2020 delays. This in particular is due to the increased number of demonstration activities on-site that were active in 2021. The internal control system in place has ensured effective and efficient sound financial management.

In this context, the work of S2R other Members, other beneficiaries and the JU staff shall be commended because they have collectively and individually ensured the progress of the research and innovation activities in such complex conditions, not only with paperwork or lab developments but with concrete demonstration activities on the rail network, whenever possible.



This Annual Activity Report is saturated with the achievements of the S2R programme and of many other R&I activities performed around Europe. The JU's projects progressed towards delivering higher TRL levels and prepared for technological demonstrators that will be presented at InnoTrans 2022.

The ongoing projects have been affected in different ways by the COVID-19 pandemic. Although projects at lower TRL levels or where collaboration was possible via digital communication, progressed largely in line with their planning. Projects requiring collaborative activities at different sites in Europe suffered from delays due to different limitations.

Since the early months of the pandemic, the Programme Unit has worked with the S2R Project Coordinators to establish a detailed risk analysis and identify mitigation actions as early as possible.

By the end of 2021, the S2R Programme reached pivotal milestones in terms of Programme implementation:

- almost all S2R resources are committed to the Programme activities and all planned IPs/CCA related activities are running in granted projects,
- on average, almost 75% of the Programme has been realised in view of reaching the TRL6/7 operational demonstrations planned for conclusion during 2023. In total, it is estimated that the total value of the activities performed in 2021 amounts to EUR 123.5 million, of which EUR 113.6 million delivered by the Members other than the European Union (hereinafter S2R Other Members).

During 2021, the JU assessed its R&I activities through a third Control Gate exercise[3]. This exercise took into account the deliverables and reports submitted in the context of the Annual Review of the active Projects coordinated by the S2R Other Members. The JU also ensured through this process that the recommendations made during the previous Control Gate Assessment had been properly applied. The overall result is that the Programme benefited from such feedback, built upon external expertise.

This Programme assessment allowed the JU to confirm that overall, the progress of the activities has been in line with the expectations. In addition, the system approach activities within IPX allowed to provide additional coherence and consistency between the interdependencies of the implementing Projects. Only a few TDs shown delays compared to the initial scheduling, mostly due to the availability of resources and external factors. In such cases, the JU has requested the concerned Project Teams to put in place the necessary mitigating measures.

3 In accordance with the procedure set in the S2R Governance and Process handbook, transparently published on the S2R website: https://shift2rail.org/wp-content/uploads/2021/03/S2RJU-Governance-and-Process-Handbook_20200303_v2.0.pdf

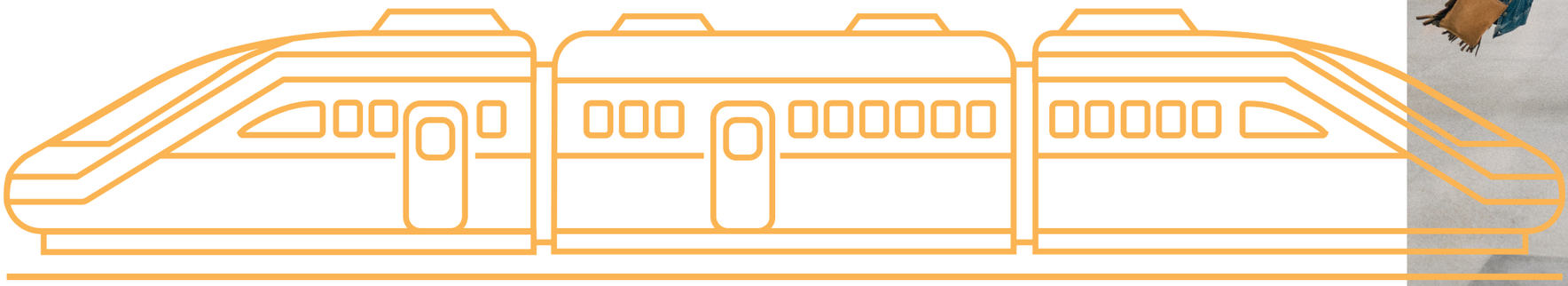
INNOVATION PROGRAMME 1

# Passenger Trains

In 2021, IP1 TDs progressed unevenly and overall reached 86% of the estimated work planned in 2021. TD1.5 (brakes) and TD1.8 (HVAC), which show a significant progress in terms of overall implementation due to the results of their demonstration activities which were accomplished in 2021. Other TDs started their demonstration activities but overall, the progress is more modest as most of the results will come from the finalisation of the demonstrations activities, some not started yet partly due to Covid-19 delays, which overall impacted the acceleration of progress expected in 2021. TD1.6 and TD1.7 have only reached an estimated overall completion of 50%. The mitigation measure put into palace in 2021 for the moulding tool (externalised via a JU procurement procedure), produced its effects for TD1.3 (carbody shell) and TD1.6 (doors and access systems) that are expected to be more visible in the report of 2022, although overall this created some delays.

Some of the most visible R&I results of 2021 are:

- The confirmation of the viability of the Traction SiC technology in particular from the significant improvement of reliability prediction in suburban environment compared to last year predictions from the lab tests performed within Q2 2021 on the sensors and components. New results will be available next year because of the start in November 2021 of the demonstration activities of regional train demo in France and traction component demonstration on a tramway in Germany.
- Interoperability tests of the evolved Wireless Train Backbone (WLTB) shown some limitations of the current V2X implementation when used for wireless inauguration (unexpected channel congestion due to the high frequency of exchanged periodic telegrams) and therefore adaptation of physical and link layer are needed. Even under Covid 19 restrictions, the Functional Open Coupling (FOC) for HVAC and Doors applications have been deployed and tested, using remote connections between CAF, Bombardier and Siemens laboratories to validate them.
- The prototype built in 2021 of the composite frame for an independent rotating wheel running gear achieves a weight reduction of 46%. For the light-weight axle, a long-time test started in August 2021. The first empirical values from the freight application are available and the weight reduction expectations up to 26% were confirmed.
- The newly developed high SIL braking system, as well as the new generation of adhesion management system, were installed and started testing on an existing EUSKOTREN train in the field.
- In 2021 field test on trains in commercial operation were made for Faiveley HVAC unit mounted on a MIREO regional train from Siemens and for Knorr-Bremse HVAC unit mounted on a double-deck coach from Bombardier. Results show the viability of such greener solution from both a comfort and energy perspective.

INNOVATION PROGRAMME 2

# Traffic Management

Significant progress has been reported on all TDs, but TD2.9 due to delays in deliverables submission in the second half of 2021, that on average have reached 94% of the estimated work planned in 2020, all IP2 TDs have been working on the installation of material for the demonstration activities. It is worth noting that TD2.8 on Virtual Coupling concluded its activities at the end 2021, reaching the expected maturity level of TRL3. A full assessment is foreseen with the last project report in 2022. The activities of TD2.4 Fail Safe Train Positioning have not been able to fully recover from the slow progress, in terms of overall TD advancement, they had last year due to additional activities added in 2020 (on a stand-alone train positioning on top of the previously ongoing works on virtual-balises).

Some of the most visible R&I results of 2021 are:

- European ATO first driverless demonstrator including S2R Adaptable Communication System (ACS) was prepared and presented during the S2R Innovation Days, on 9 December 2021. It proved the concept of the GoA3/4 capabilities of running unattended trains safely, as well as demonstrated the capability of transmitting voice and video data using different telecommunication bearers (GSM-R, WLAN and LTE, including 4G).
- The reports of the two ATO GoA2 pilot tests executed in 2020 in the United Kingdom and Switzerland have been delivered in March and June 2021, respectively. These reports were used as the basis for the update of the GoA2 specifications transmitted to ERA. Preliminary GoA3/4 specification has been also delivered in December 2021 and will be made public in the course of 2022.
- The on-board train integrity demonstration preparation activities have added the integration of an OTI-Digital Automatic Coupler (DAC) integrated solution. The collaboration was launched during 2021 with the representatives from the European DAC Delivery Programme (EDDP).

Overall, the results achieved are key milestones for the market uptake of the solutions of this IP and prepare the integration of functions and its specifications in the Control Command and Signalling TSI, in the next revision, currently targeted by 2022, and its further evolution. The work performed in IP2 will show how R&I will feed the new regulatory framework and become a test bed for the future deployment of S2R innovative solutions.

# IP2


INNOVATION PROGRAMME 3

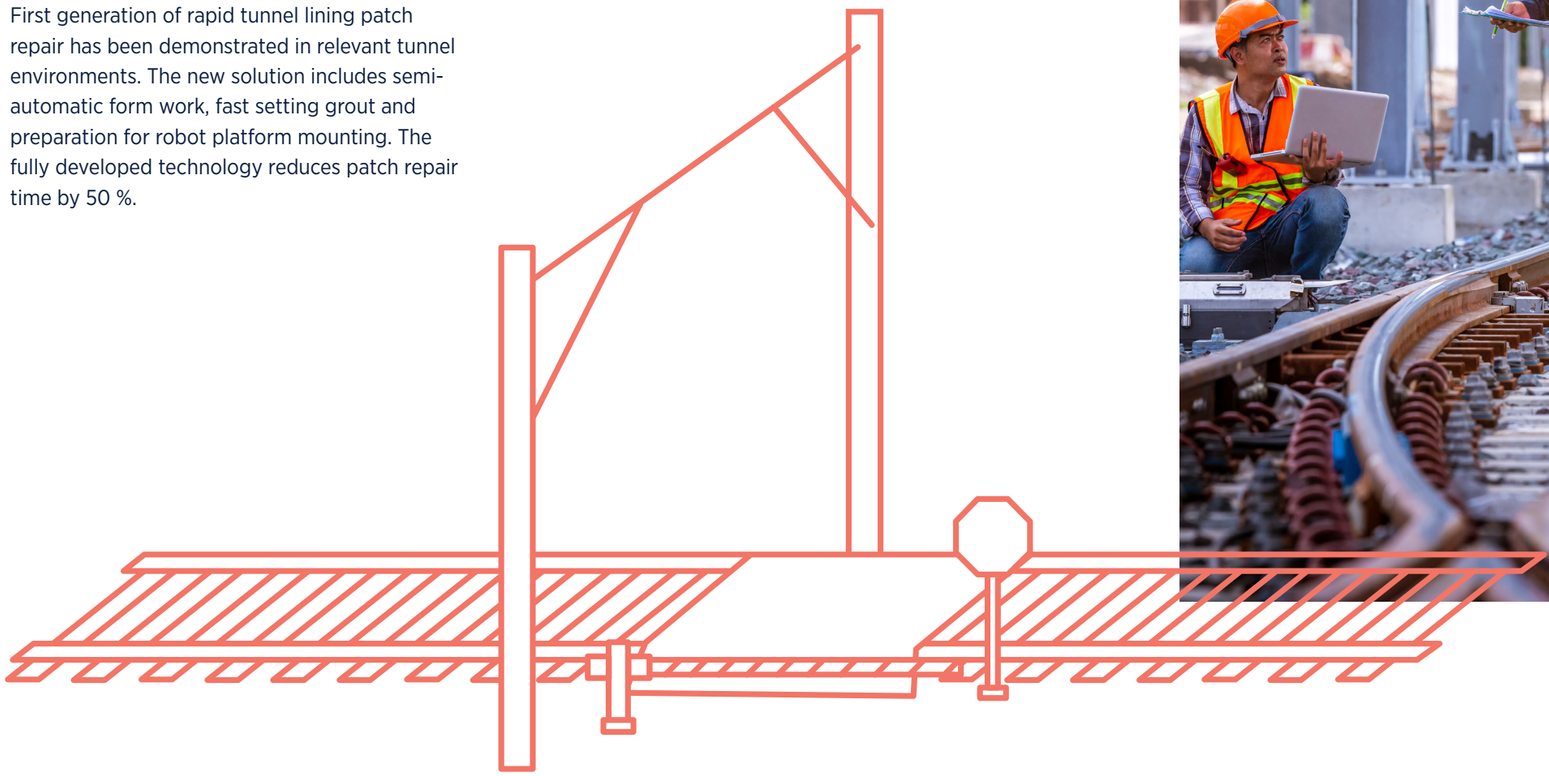
# Optimised Infrastructure

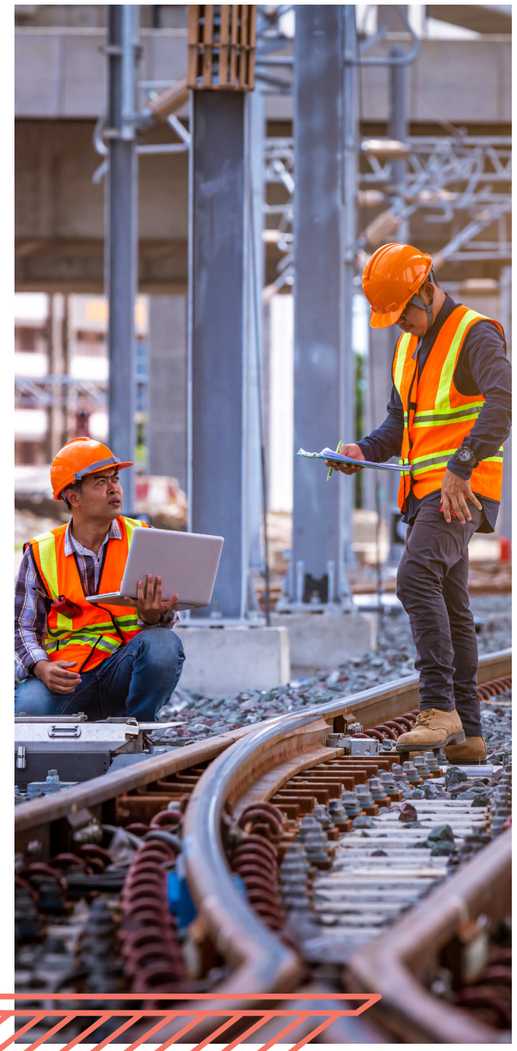
IP3

In 2021, this IP progressed more evenly compared to previous years, thanks to the mitigation measures implemented by the JU, catching few delays. Although differences between TDs remains. On average IP3 has reached 86% of the estimated work planned in 2021. Next generation of track system (TD3.4) remains at an estimated overall progress of only 50%. This is partly due to the Covid-19 crisis for which mitigation measures have been put in place, although mainly resulting in project extensions.

Some of the most visible R&I results of 2021 are:

- The novel rail concept with replaceable rail head has been in service for about one year and exposed to more than 13 MgT with trains that have 31 tons axle loads. The preliminary results show promising results due to the general concept, as well as withstand rolling contact fatigue.
- Innovative slab-track solution has been manufactured and transported to the field for installation. This test track includes track section of 50 m and two embedded transition zones of each 14 m. This system will be instrumented and installed during 2022 in the harsh climate of northern Sweden exposed to 31 tons axle load.
- For the next generation track, among other innovative ideas, a design for noise shielding close to the rail has been tested in a laboratory, and the experimental results suggest that the absorptive treatment can result in a reduction of 4-5 dB in rail noise, with an overall noise reduction of 2-3 dB.
- First generation of technology to clean long drainage pipes has been successfully demonstrated in operational environments. Tunnels over 1 km in length are able to be cleaned from deposits under full operations. The solution enables the reduction of long-term costs for functioning drainage pipes by 25 %. First generation of rapid tunnel lining patch repair has been demonstrated in relevant tunnel environments. The new solution includes semi-automatic form work, fast setting grout and preparation for robot platform mounting. The fully developed technology reduces patch repair time by 50 %.
- The concept of a Solid-State-Transformer based on Multilevel-Inverters, usable for integration in the DC power supply has been developed. The result of the use case “reinforcement of 1,5 kV DC-System by 9kV feed wire” demonstrated an efficiency increase of 5% (A complete change to 9kV increases the efficiency of traction power supply by 10%).
- The implementation of components for crowd management to run the two planned scenarios was concluded positively in Warsaw East Station in 2021.





INNOVATION PROGRAMME 4

# Digital Services

Good progress has been reported on all TDs of IP4 and on average they have reached 93% of the estimated work planned in 2021. Most of the issues reported in 2020 have been addressed thanks to the mitigation measures put in place in 2020. The updated A-REL of the Interoperability Framework showed higher performance and scalability when integrated in the Beta release at IP4 level. This TD back on track increased the confidence on the capability of the Interoperability Framework, although the full performance assessment will only be conducted in 2022 with further services integration and the final release.


Some of the most visible R&I results of 2021 are:

- The Interoperability Framework has been tested in the Shift2MaaS pilots (Malaga, Lisbon and Central East Corridor) with seven TSPs that provided Shopping, Booking and Issuing services with 50 users per pilot.
- Modifications in the orchestrators have been made for the introduction of new use cases as multiple travellers' capabilities (e.g. groups, families, friends travelling together or through different means), that are compatible with all pre-existing features so far developed involving the legacy system of the services tested in the pilots.
- Exploiting of the work carried out in the framework of IP3, a test has been prepared for the Polish Jurata station, making use of 3D models and Digital Twins combined with installed sensors to detect the position of the travellers and overcome the obstacles for indoor navigation.
- Similarly, a cooperation happened with IP2 to prepare a test for exchanging new data sets and information about passenger demand and transport supply capacity. In this way, prescriptive analytics could be developed for Train Management Supervision Systems (TMS) for real-time timetable optimisation based on demand (demand-based operations).
- The next piloting phases have been prepared, and are planned for Padua, Athens, Barcelona, Helsinki, Brno, Liberec, Warsaw and Osijek.

INNOVATION PROGRAMME 5

# Rail Freight

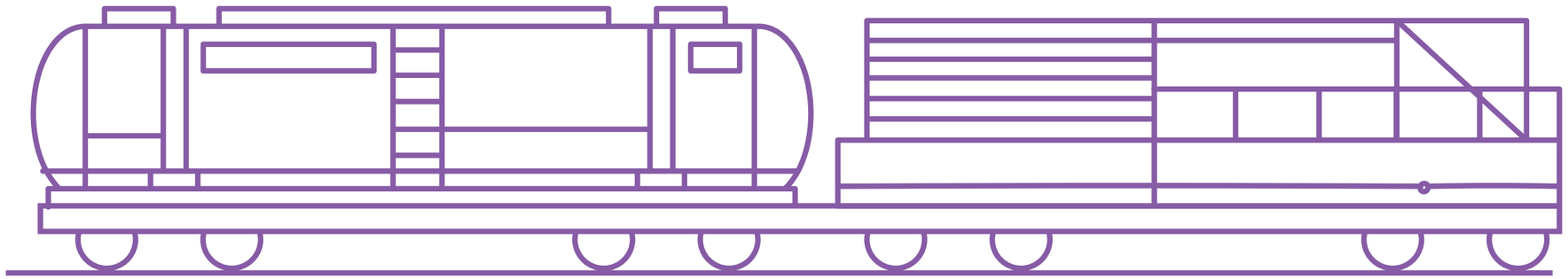
IP5

In 2021, the TDs reached an average implementation rate of 83%. The end of the year was characterised by the conclusion of the freight ATO GoA2 test process with specifications provided to the ERA and lessons learned from this technical demonstrator., but also by conclusion of the R&I works of TD5.5 on Business analytics and implementation strategies. A full assessment is foreseen with the last projects reporting in 2022.

The demonstration activities have been affected by the Covid-19 pandemic, therefore the overall work experienced some delays, for which mitigation measures have been put in place, although mainly resulting in project extensions.

Some of the most visible R&I results of 2021 are:

- The performance of the extensive tests in Sweden from January to April 2021 on four DAC systems from four different suppliers. The couplers were tested on nine different wagons.
- Intelligent Video Gate demonstrator was successfully installed in summer 2021 in Sweden. The gate is now under operation delivering train data which is processed by Hitachi and Indra. A second gate has been used in Germany, as a tool to help easy CBM and train dispatching within the freight segment.
- A 2021 result from the R&I activities which is also significant, although not positive, is the discovery that the designed high energy brake disk did not reach enough maturity to be included in the demonstrator, as lab tests did show that the disk was overheating.
- A field test to assess the behaviour of wireless communication technologies in a freight train have been carried out in Sweden.
- The initial concept of the Distributed Power System was demonstrated in February 2021 on a commercial train, confirming that the DPS functions worked as expected. The release times after brake application were much shorter than today and the measured in-train-forces were in the range or lower than the one from the previous simulation.



# Cross-Cutting Activities

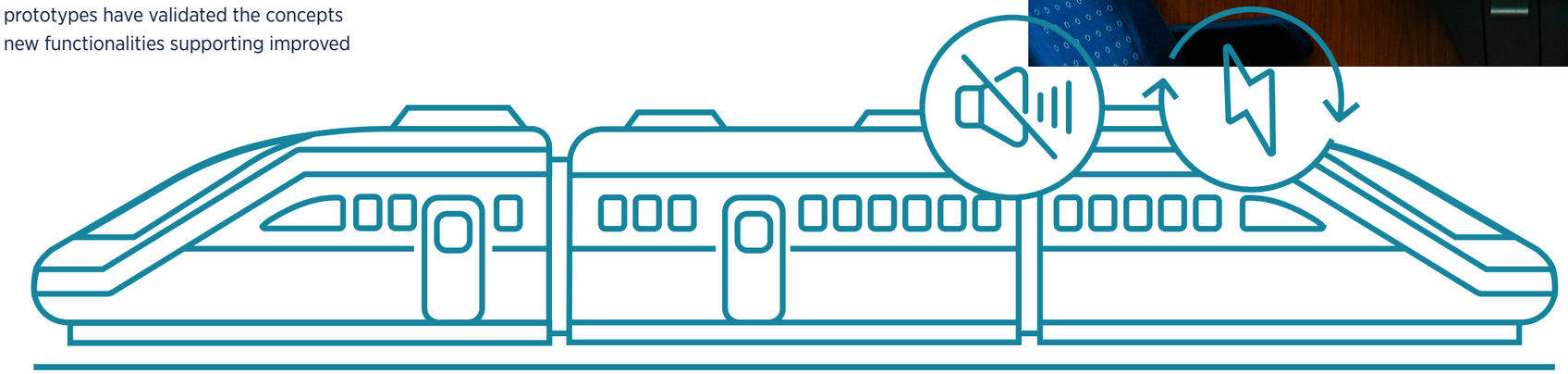
The Cross Cutting Activities caught up of the delays of 2020, with 88% level of implementation of planned activities for 2021. All Work Areas progressed well and it is worth noting that the R&I activities on WA6 Human Capital ended in 2021. A full assessment is foreseen with the last projects reporting in 2022.

In general, the testing related activities have been heavily impacted by the COVID pandemic and some planned tests have to be postponed to 2022, in particular for the noise test campaign which explain the overall delay of the WA. Mitigation measures have been put in place, although mainly resulting in project extensions.

Some of the most visible R&I results of 2021 are:

- The confirmation of potential large positive social benefits from the JU innovation improvements for the high speed and regional use cases as well as for the freight case.
- Development of 11 prototypes for Integrated Mobility Management from TRL3 up to TRL5 demonstrating and validating the specified applications and processes for freight related Traffic Management applications. The test results of the prototypes have validated the concepts of the new functionalities supporting improved timetable planning and execution, increased process automation and a higher level of usage of theoretical line capacity.
- On site, tests started for exterior noise tools development, with a successful campaign taking place in Crespin, France during summer 2021.
- The impact of S2R innovations on human capital was also concluded, focusing on future jobs and skills profiles and a qualitative investigation on its importance of competence and staffing composition needed by the sector. A more detailed analysis was carried out on infrastructure related works by the Swedish case. Results show that technologies developed in IP3 will lead to increased productivity enabled by improved long-term maintenance planning and operation rather than affecting specific professional roles.

# CCA



INNOVATION PROGRAMME X

# System Architecture and Disruptive Technologies

Linx4Rail 1 & 2 project activities within the IPX continued to build upon the basis of the System Pillar in the successor oof S2R. More particularly, they defined an ontology dictionary, built a railway Common Data Model associated to the refinement of the first version of the railway Functional System Architecture delivered in 2020.

The activities of the project TAURO also started, aiming at defining the certification of perception systems (e.g. artificial vision, radar, lidar) for safety relevant functions, such as lateral signals recognition or obstacle detection. TAURO also tackles the specifications for remote driving and command functionalities for three relevant use cases: remote driving under ETCS, in freight shunting yards and in depots for tramways.

The JU also continued to encourage PhD researchers through:

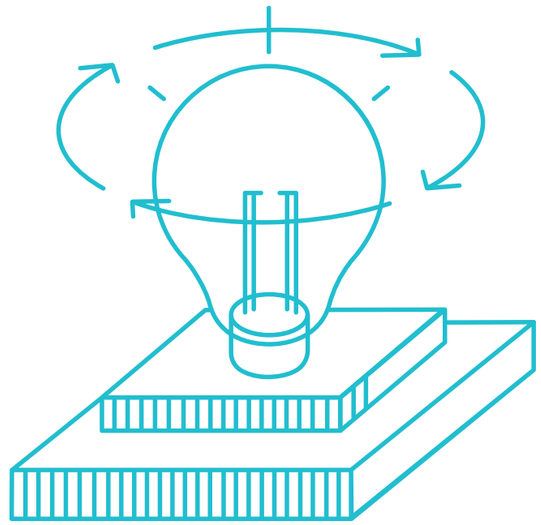
- RAILS (Roadmaps for AI integration in the rail Sector) project that investigates aspects related to the adoption of Artificial Intelligence (AI) in rail automation, predictive maintenance and defect detection, traffic planning, and capacity optimisation.
- The B4CM (Blockchains as a Distributed Ledger for Attribution of Remote Condition Monitoring Data in Rail) project that is identifying key use cases for blockchain technology within the railway. An initial version of the core framework based around Hyperledger Fabric has been developed on 2021 demonstration use cases in the process of being formalised, and the first of a series of journal papers documenting the findings of the team published.
- Medium voltage DC electric railway systems (MVDC-ERS) project discovered that both dual active bridge and bidirectional phase-shift full-bridge converters are suitable for a multi-modular input-series output-parallel medium voltage PETT. The two topologies have been implemented and successfully tested in the laboratory in 2021.

The JU also made use of the results of FLEX-RAIL during the definition of the new Programme. In particular, from the project recommendations for R&I areas of intervention beyond the S2R MAAP.

Translate4Rail (T4R) project developed a language tool prototype which was tested in 2021 in two Pilots in the border region of Austria and Italy. The tests showed that train drivers and traffic controllers are able to establish effective communication through pre-defined messages by using a language tool. The tool was also tested for free speech recognition including railway jargon where enhancements and further developments would still be needed.

HYPERNEX (Ignition of the European Hyperloop Ecosystem) project includes stakeholders currently active in relation to the development of the hyperloop system in the EU. The group examined the legislation in place and the available funding opportunities for the development of the hyperloop from a safe, interoperable, and possible intermodal manner. The consortium looked at the different scenarios that may arise during the start-up process of Hyperloop.

The inducement prize “S2R-Utrain-Prize-01-2020” (Unique Train) with a total budget of EUR 500.000,00 which was launched in 2020, was subject to evaluation in 2021. It was finally not awarded, because the jury decided not to select any of the applications due to the insufficient quality of the proposed solutions and their demonstration. The S2R Governing Board took note of that and acknowledged the non-award of the prize. The GB decided by means of its Decision no. 09/2021 on the respective re-allocation of the budget initially committed to the prize.



# S2R Programme Management and MAAP

In terms of Programme Management, 2021 was the second year during which reviews of Lump Sum projects took place. Experience so far has shown that from an operational perspective the use of Lump Sum for members' projects does not only result in administrative simplification, but also effectively bundles efforts in the project review to focus on the achievements of results. The fact that the proof of concluded work packages (hence related focus on deliverables and milestone approval) provides the basis for the reimbursement of costs has allowed the JU and consortia to focus their efforts in an effective way to ensure the delivery of the projects.

2021 Programme Management has been influenced by the need to continue monitoring projects affected by the pandemic restrictions. According to the Commission guidelines, the JU applied a fast-track procedure to request amendments justified by reasons related to Covid19 pandemic, for up to 6 months. The Programme Office supported the projects in implementing mitigating measures as needed. Delays that already occurred in 2020 in the submission of deliverables, in particular in the case of the demonstration activities, have been mitigated. Although further delays have been happening in 2021. Consequently, some of the running activities are expected to be continuing until the end of 2023, delayed of about 6 months compared to what was reported last year, but still well within the JU mandate ending in 2024.

With a holistic approach, the role of the JU is also to ensure that interactions between the various IPs are adequately considered and managed, as technological developments in one part of the system could lead to changes in performance, or even create barriers, in other parts. In addition, cross cutting activities include research on long-term economic and societal trends such as customer needs and human capital and skills, which must be taken into account by the different IPs.

In 2021, additional change requests following the ED Decision on a renewed Programme Governance and Change Management, setting up the ED Programme Board, have been processed, ensuring sectorial coherence of initiatives, notably with the integration of relevant concepts from OCORA or RCA into the S2R R&I activities that will deliver concrete demonstrations.

In 2021 progress has been achieved in definition of a rail Functional System Architecture, which is setting the basis for an increase sectorial competence for system of systems modelling in view of enabling and accelerating the integration of new technologies and processes in the rail system.

# R&I activities launched in 2021

In June 2021, the JU Governing Board adopted the respective decision approving the results of the 2021 Call. This Call was launched in April following the adoption of the JU's Amended Annual Work Plan 2021. The proposals received in response to the Call covered both topics. Out of the five eligible proposals submitted to the Call, two were selected for funding.

Two grant agreements were signed in September 2021. In total, the project proposals selected for funding will result in Research and Innovation activities funded up to EUR 1,77 million against a total value of EUR 2,34 million.

As in the case of the previous years and for the full duration of the Programme, excluding the S2R light-house projects launched by the Commission in 2014, the Founding Members other than the Union and the Associated Members (jointly referred to as the "S2R Other Members") of the S2R JU agreed to a funding rate of maximum 44.44% (this would mean a net 41.44% for an Other Member after having considered its obligations), demonstrating a strong commitment to deliver the most ambitious Railway R&I Programme for a major transformation to rail systems, once deployed.

In total, twelve participants had their proposal retained for funding in the two topics under the 2021 Call, one of them being an SME. From the geographical perspective, there were participants to the Call coming from eleven countries (nine EU Member States, one Associated Country and one participant was from the United Kingdom). Taking into account only the twelve participations in proposals retained for funding, all of those are coming from five EU Member States.

Given the fact that the 2021 Call was considerably smaller compared to previous years, both in terms of amount to be granted and number of topics, the structure of geographical representation cannot be objectively compared to previous Calls.

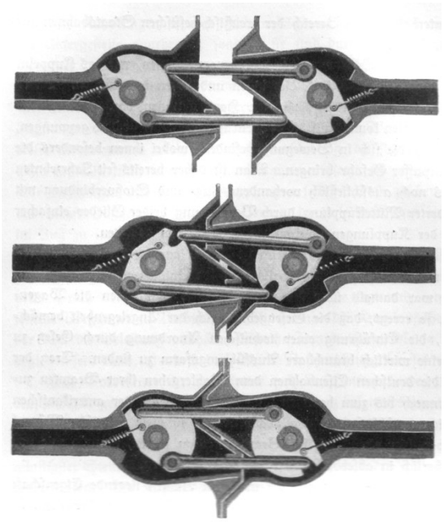
# The European DAC Delivery Programme under the leadership of EU-Rail

In July 2020, the Governing Board of the JU endorsed the creation of the European DAC (Digital Automatic Coupler) Delivery Programme (EDDP) proposed by the Executive Director, voicing the request of the railway sector. Building upon the outcomes achieved in S2R's freight related R&I activities (Innovation Programme 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 (with Mr Mark Topal, CTO of OEBB, appointed as the European DAC Delivery Programme Manager supported by the Co-Manager Mr Jens Engelmann, owner of Railiable), projects like DAC4EU, funded by the German Federal Ministry of Transport and Digital Infrastructure, as well as relevant results from S2R projects under its Innovation Programme 5 on European rail freight.

At the moment of writing of this report, the EDDP can count on almost 300 experts and almost 80 companies and organisation involved across Europe and beyond.

2021 was an important year for the programme as out of the testing carried out during the first two quarters of the year, and following EDDP test specs and EDDP requirements, it was decided to choose the Scharfenberg latch type for the EDDP finalisation of specifications. The latching type is a fundamental element of the coupler head, delivering the mechanical coupling/uncoupling mechanism between wagons.



As a result of the Open Call for Proposal of 2021, the JU signed a Grant Agreement for the project DACcelerate, which started its activities in June 2021. The project is a 'Coordinated and Support Action' that will support the JU to contribute to key elements like technological assessments of the available solutions for electric and communication, testing and demonstrations, definition of migration plans, assessing the interfaces with other programmes, business cases, and communication and dissemination, aiming to facilitate the deployment of the DAC in Europe. The project also contributed to the EDDP dissemination activities through S2R Innovation Days and other rail freight specific conferences all through the year.

In 2021 several meetings took place with the ERA DAC Topical Working Group with the aim to agree on a DAC specification that could be adopted in future TSI, supporting the harmonisation all across EU rail network. In parallel, DACcelerate has supported preliminary CEN CENELEC meetings to standardise DAC specification. To ensure and support the feasibility of the project, a preliminary study over what could be a migration plan for the rail freight fleet has been produced as interim report, which is expected to be completed by the end of 2022. Meanwhile testing activities are carried on, with the aim to bring more maturity to the DAC project.

Specific contracts were also signed to make use of experts to support specific tasks like the DAC Life Cycle Cost (LCC) analysis and also a study to identify potential sources of financing and potential blend of them so as to support the programme. The results are expected to be available in 2022.

# Activities aligned to feed the successor of the S2R JU and with the launch of EU-Rail

The current activities of the S2R JU are progressing towards their demonstrations in 2022 and 2023, paving the way to the R&I activities to be undertaken in the EU-Rail Programme. This will ensure a proper phase out and phase in between the two Programmes. The S2R technological demonstrators are the building blocks of a more systemic railway transformation which is strategically driven by the European Commission's Green Deal, the Digitalisation Agenda and the Sustainable and Smart Mobility Strategy.

During 2021, the JU further supported the European Commission with the development of the Europe's Rail Master Plan. It has been developed in consultation with all relevant stakeholders, including the JU Candidate Founding Members, and put in an open consultation of 4 weeks. A webinar was held on 19/11/2021.

Following the Council Regulation establishing Europe's Rail adopted in November 2021, in accordance with Article 86 of the Single Basic Act, the Master Plan has been finalised by the Europe's Rail Joint Undertaking together with the Commission, for submission to the GB in 2022 after consultation with the SRG, Council Transport Working Party and European Parliament Transport Committee.

The JU also transparently updated the sector and published all information on the progress of the new JU and its key documents in its website, including the provision of Questions and Answers with four different releases, in March, May and two in July 2021: https://rail-research.europa.eu/about-europes-rail/europes-rail-preparatory-activities/

This preparation work for the EU-Rail Programme has also been an opportunity for the JU to reassess the maturity level expected to be reached by the different streams of the ongoing S2R Programme, the potential in terms of market uptake of R&I outputs and indicate the areas of improvements to foresee for the next generation of R&I projects under EU-Rail, the so called Flagship projects.

Significant efforts went into preparing the conditions for the successful signature of the letter of Commitment from the Candidate Founding Members, working in alignment and contributing to the definition of the new framework set by the European Commission services for the JUs R&I programmes within the EU funding conditions of Horizon Europe.

The first administrative Governing Board of the Europe's Rail JU was held on December 21, 2021.

# Other activities

Due to the launch of the new EU-Rail as from 30 November, the Staff Establishment Plan remained the one adopted in the context of the S2R JU. The new Staff Establishment Plan was adopted by the Governing Board only on 1 March 2022.

In 2021, the staff turnover continued to be high with some staff members and one SNE leaving the JU. This was attributable, besides other aspects, to the fact that other Union JUs and Agencies are in the position to offer Temporary Agent posts (TA) instead of Contractual Agent posts (CA).

The new Staff Establishment Plan associated to the launch of the new partnership includes new TAs positions in relation to the new role of the JU in the System Pillar and support to policy activities, that are expected to stabilise the structure. The JU avails itself of external competencies and expertise to achieve its operational activities, while activities temporarily outsourcing administrative tasks – to fill gaps or long-term absences – are accounted for in Title 2 of the Budget.

With regard to communication and dissemination activities, JU continued its efforts to promote the activities of the programme during 2021. As it was the case in the previous year, due to the Covid-19 pandemic, many communication and dissemination activities were performed in the online mode. However, the Connecting Europe Express, the flagship campaign of the European Year of Rail, and the S2R Innovation Days were an opportunity to bring S2R innovations to the railway industry, policy makers as well as the general public.

During 2021, the JU also continued its efforts to increase cooperation in Member States as well as with international parties. On 10 June 2021, the JU signed a Memorandum of Understanding (MoU) with the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC). The MoU aims at formalising the already existing close collaboration between CEN and CENELEC, two of the officially recognised European Standardization Organizations, and the Joint Undertaking. Through this agreement, the participating organizations are committed to foster the uptake of innovation in the railway sector and contribute to maintaining the EU as a world leader. Furthermore, the signature of the MoU between the JU and the International Union of Railways (UIC) took place at the UIC General Assembly, on 8 July. The objective of this MoU is to promote cooperation between UIC and the JU to support the structured implementation of S2R innovative solutions, and to deliver a functional system approach that is suited to the operational needs of the sector and, in particular, the final users.

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 implementation of the internal control framework and to the assessment and management of risks. 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 exercised by DG RTD or the external auditors auditing the Annual Accounts of the JU. All of these activities have contributed to the continuous assurance regarding the sound financial management of EU funds managed by the Joint Undertaking.

In 2021, 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 2019. In this follow-up report, the JU explained its way in which it addressed these observations or intends to address them in the following period. In particular, with regard to Intellectual Property Rights (IPR), the JU confirmed in this report, that it would welcome any initiative the Commission might take in introducing a legal framework concerning the IPR in response to the call for such initiative from the European Parliament. With regard to transparency of R&I results financed also with public money, the JU, when implementing its S2R MAAP by means of individual grant agreements, contributes to a simplified public access to these results not only via the EC CORDA system, but also directly via the JU website (https://projects.shift2rail.org/s2r_matrixtd.aspx).

It can be concluded that thanks to the commitment of both S2R Other Member and the Programme Office, 2021 has seen the JU further continuing its important progress towards delivering the Shift2Rail Programme, and, in parallel, important steps were taken enabling EU-Rail to become operational and to start preparing the launch of the new Programme.

# 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 2050[4]. 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).*

The European Green Deal is also an integral part of the Commission's strategy to implement the United Nation's 2030 Agenda and the 17 Sustainable Development Goals (SDGs)[5]. Already the Shift2Rail JU has been reporting on its contribution to the SDGs since 2018 in its Annual Activity Reports. Shift2Rail's Multi-Annual Action Program sets out key goals to strengthen the role of rail in the transport system, given rail's inherent advantages in terms of environmental performance, land use, energy consumption and safety.

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

5 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

Shift2Rail's unique R&I work concretely contributes to the following SDGs, and related sub targets:


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

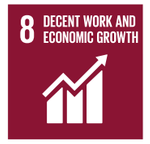

**SDG 11:** Make cities and human settlements inclusive, safe, resilient and sustainable


**SDG 12:** Ensure sustainable consumption and production patterns


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

The SDGs are not 17 individual goals, but are strongly interconnected, whereas progress in one goal can unlock progress in another. Shift2Rail's R&I programme also indirectly contributes to the following SDGs, and related sub targets:


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




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


**SDG 15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reserve land degradation and stop biodiversity loss.

A few Horizon 2020 Key Performance Indicators common to all JUs are aligned with the broader objectives of the SDGs, for example, growth and job creation in participating SMEs or percentage of women participants/coordinators in H2020 projects (Annex C, Table I). The same holds for the Key Performance Indicators specific for the S2R Programme, for example reducing the life-cycle cost of the railway transport system and reducing the negative externalities linked to railway transport (Annex C, Table III). The JU is continuously improving the S2R KPI model data.

Moreover, the new Sustainable and Smart Mobility Strategy of the Commission, launched in December 2020[6], 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 of 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.

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 (JUs).

Further to the topic of "Digital Decade", the Commission indicated in its Communication of March 2021[7] 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 will strive 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.

Besides the efforts made via its R&I Programme, the JU and its staff, to the extent corresponding to the size of the organisation, also strive 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 using single-use items (even though due to Covid-19, a balance needed to be applied respecting also the necessary anti-pandemic measures),
- 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.

EU-Rail will also duly consider the energy-efficiency parameters with regard to the foreseen changes of the premises it uses, no matter if the decision expected to be taken in 2022 will be to move to a different building, or to refurbish the currently used premises.

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

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



# Projects 2021

| Topic | Acronym | Title | Project value € M | Grant € M | Start date | End date |
|---|---|---|---|---|---|---|
| S2R-OC-IP5-01-2021 | DACCELERATE | Accelerated DAC transformation to full digital rail freight operations in Europe | 2,17 | 1,6 | 01/06/2021 | 31/12/2022 |
| S2R-OC-CCA-01-2021 | BENRAIL | Benefits at rail, top-down holistic approach of impact and benefits to make rail attractive for stakeholders | 0,17 | 0,17 | 01/10/2021 | 30/06/2022 |
| **TOTAL** | | | **2,34** | **1,77** | | |

# Europe's Rail overview

| | |
|---|---|
| **Name** | Shift2Rail Joint Undertaking (hereinafter S2R JU or S2R)<br>Europe's Rail Joint Undertaking – as of 30/11/2021 (hereinafter EU-Rail) |
| **Objectives**[8] | 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.<br><br>The general objectives of EU-Rail are to:<br>a. contribute towards the achievement of the Single European Railway Area;<br>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;<br>c. support the development of a strong and globally competitive European rail industry.<br>The main task of EU-Rail 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. |
| **Founding Legal Act** | Council Regulation (EU) No 642/2014 of 16 June 2014 establishing the Shift2Rail Joint Undertaking (S2R Regulation). The S2R Regulation was repealed by entering into force on 30 November 2021 of the Council Regulation (EU) 2021/2085[9] of 19 November 2021 establishing the Joint Undertakings under Horizon Europe (hereafter the "Single Basic Act" or the "SBA"). By means of SBA, the EU-Rail was established and became the legal and universal successor of the former S2R JU, which it replaced and succeeded as from that date. 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 SBA [10]. |
| **Executive Director (ED)** | Mr Carlo M. Borghini, as from 16 May 2016, with his mandate extended until 15 May 2026 [11]. |

8 As this Report largely takes stock on the activities performed in the context of the S2R Programme inherited by its successor – EU-Rail, it is essential to recall the key objectives pertaining to the S2R partnership:
- 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).

9 OJ L 427, 30.11.2021
10 EU-Rail GB decision n° 02/2021
11 S2R JU GB Decision n° 02/2021

**Governing Board of EU-Rail**[12]

***European Commission (EC) members:***

- *DG MOVE - Henrik Hololei*

***EC alternates:***

- *DG MOVE - Kristian Schmidt*
- *DG RTD - Rosalinde Van Der Vlies*

***Industry members:***

- *ADIF - Luis Fernando López*
- *ALSTOM - Nicolas Castres Saint Martin*
- *ANGELRAIL consortium led by MER MEC - Francesco Inzirillo*
- *AŽD - Vladimir Kampik*
- *CAF - Jorge De Castro*
- *CEIT - Juan Melendez*
- *ČD - Kryštof Hajn*
- *DEUTSCHE BAHN - Ralf Marxen*
- *DLR - Christian Sattler*
- *eSGR JV - Noemi Jimenez Redondo*
- *Faiveley Transport - Roberto Tione*
- *Ferrovie dello Stato Italiane - Roberto Tundo*
- *HITACHI RAIL STS - Antonella Trombetta*
- *INDRA-TALGO - Jose Miguel Rubio Sanchez*
- *Jernbanedirektorate - Preben Saethre*
- *KNORR-BREMSE - Hans-Christian Hilse*
- *ÖBB - Mark Topal Goekceli*
- *PKP - Jancewicz Zbigniew*
- *ProRail-NS Groep - Karel van Gils*
- *SIEMENS - Roland Edel*
- *SNCF  Christophe Cheron*
- *Strukton - Tjark de Vries*
- *THALES - Alberto Parrondo*
- *TRAFIKVERKET - Bo Olsson*
- *Voestalpine Railway Systems - Jochen Holzfeind*

***Industry alternates:***

- *ADIF - David-Ibán Villalmanzo Resusta*
- *ALSTOM - Richard French*
- *ANGELRAIL consortium led by MER MEC - Vincenzo Scarnera*
- *AŽD - Michal Pavel*
- *CAF - Imanol Iturrioz Villalba*
- *CEIT - Jaizki Mendizabal*
- *ČD - Libor Lochman - Petr Jindra*
- *DEUTSCHE BAHN - Hans-Peter Lang*
- *DLR - Michael Meyer zu Hörste - Svenja Hainz*
- *eSGR JV - David Sanz - Jose Solis Hernandez - Celestino Martinez*
- *Faiveley Transport - Paolo Pagliero*

12 The GB of the S2R JU operative until 29/11/2021 had a different composition.

| | |
|---|---|
| **Governing Board of EU-Rail** | • *Ferrovie dello Stato Italiane - Riccardo Santoro*<br>• *HITACHI RAIL STS - Carlo Crovetto*<br>• *INDRA-TALGO - Alfredo Gonzalez Moreno*<br>• *Jernbanedirektorate - Pal Midtlien Danielsen*<br>• *KNORR-BREMSE - Martin Ertl*<br>• *ÖBB - Bertram Ludwig*<br>• *PKP - Fojud Arthur*<br>• *ProRail-NS Groep - Jeroen Fukken*<br>• *SIEMENS - Jürgen Schlaht - Lars Deiterding*<br>• *SNCF - Gilles Quesnel*<br>• *Strukton - Henk Samson*<br>• *THALES - Yves Perreal*<br>• *TRAFIKVERKET - Christer Lofving*<br>• *Voestalpine Railway Systems - Uwe Ossberger*<br>***Other participants:***<br>• *Carlo M BORGHINI - Executive Director of EU-Rail*<br>***Observers:***<br>• *Josef Doppelbauer (ERA)*<br>• *Ana Gigantino (ERA)*<br>• *Ny Tiana Tournier (ERA)*<br>• *Roland Moser (ERRAC)*<br>• *David Kupfer (ERRAC)*<br>• *Angela Di Febbraro (SC)*<br>• *Sarah Bittner-Krautsack (SRG)*<br>• *Miroslav Haltuf (SRG)* |

| | |
|---|---|
| **Other bodies** | System Pillar Steering Group<br>Deployment Group<br>States Representatives Group (SRG)<br>Scientific Committee (SC)<br>Innovation Programmes' Steering Committees (IP SteCos)[13] |
| **Staff** | 23 posts as at year-end 2021 as per the JU Staff Establishment Plan[14] |
| **2021 Budget** | The S2R Programme objectives of 2021 were met with the full commitment of the remaining budget appropriations related to the H2020 funded S2R Programme for the operational activities. This demonstrates that the JU was able to engage the railway sector to an effective resource commitment to progress in delivering the railway system transformation, through an increasingly integrated Programme (despite starting its operations almost two years after the start of H2020 programming period).<br>The Annual Work Plan and budget 2021 was amended on two occasions mainly to address the need to support two main key policy priorities: (1) the last steps of the implementation of the S2R Programme Budget and (2) the transition to the new Research & Innovation (R&I) Programme by using the funds available under the provisions of Article 16(1)2 of the ex-S2R Statutes.<br>The progress achieved and the launch of these additional core activities represented another key step towards the digitalization and automation of the railway system, contributing to delivering sustainable (climate neutral, lifecycle cost efficient, connected, integrated through a system approach) mobility and transport for passengers and supply chain.<br>As a result, the Final Adopted Budget amounted to EUR 13,6 million in commitment appropriations, of which EUR 9,6 million for operational expenditure and EUR 4,0 million for administrative expenditure. In payment appropriations, the Final Adopted Budget was EUR 68,4 million, of which EUR 46,7 million for operational expenditure, EUR 3,6 million for administrative expenditure and EUR 18,1 million of unused appropriations (among which EUR 17,5 million of unused operational budget) not required in the financial year. |

13 IP SteCos will no longer be in place for the new EU-Rail Programme under Horizon Europe.

14 Due to ongoing/pending recruitments, on 31/12/2021 there were 19 staff members including 1 SNE available.

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| **Budget implementation** | The Budget implementation refers almost completely to the activities of the former S2R JU. The Budget implementation in terms of commitment appropriations is at 100% and, in terms of payment appropriations at 85% (excluding the unused appropriations not required in the financial year). The payment appropriations' implementation is stable in comparison to previous years (82,3% in 2018, 89% in 2019 and 81% in 2020). Following the second AWP and budget amendment and the delay in the submission of some operational and other requests for payment, suspension of activities either due to the quality of technical reports received or in order to obtain complementary elements confirming the achievement of the project results, the JU would not have been able to implement at least EUR 17,5 million of payment appropriations by the end of 2021. This amount was therefore transferred to the unused appropriations in order to be immediately re inscribed into the payment appropriations of 2022.<br><br>The implementation of administrative budget was EUR 4,0 million in commitment appropriations and EUR 3,5 million in payment appropriations, respectively representing 100% and 95,3% of budget execution. Applying sound financial management, the JU makes use of multi-annual framework contracts, in particular in Title 2. The Administrative budget corresponds to approximately 5% of the JU Budget (Payment 2021). The Operational Budget was implemented at EUR 9,6 million in commitment appropriations (100%) and EUR 39,4 million (84,5%) in payment appropriations. |
| **Grants** | In June 2021, the JU awarded the 2 last grants under the S2R Programme as a result of the 2021 Call launched on 15 April 2021 based on the amended Annual Work Plan 2021. Both topics have been covered. In total, the awarded grants will fund Research and Innovation activities up to EUR 1,77 million against a total value of EUR 2,34 million.<br><br>Under the former S2R Regulation, it should be noted that the S2R Founding Members other than the Union and the Associated Members (jointly referred to as the "S2R Other Member") agreed to limit their requests for funding to 44,44% of the total project cost. |
| **Strategic Research Agenda**[15] | 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 Plan[2]. |
| **Call implementation** | The AWP 2021 was amended in April 2021 to include an additional new Call for Proposal under the MFF 2014-2020.<br><br>The award of the 2021 Call took place during the Governing Board meeting of on 22 June 2021. |
| **Participation, including SMEs** | 3 Small and Medium enterprises (SMEs) participated to the 2021 Call (13,64%); 1 SME was retained for funding (8,33%).<br>The SME represents 9% of the entities selected in the respective project. |

15 For the S2R JU, in accordance with the S2R Regulation, the strategic research and innovation agenda was represented by its Multi-Annual Action Plan (MAAP) adopted in its latest version in November 2019, by means of the GB Decision N° 9/2019 adopting Part B of the Shift2Rail JU Multi-Annual Action Plan.

16 https://shift2rail.org/wp-content/uploads/2022/03/EURAIL_Master-Plan.pdf



Europe's Rail

## Founding Members

**EU-Rail**

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