

## 'Shift to Rail' – Research for the EU rail sector

Rail is one of the main pillars of the EU transport decarbonisation strategy, and research is instrumental to achieving more competitive and resource-efficient railways. To this end, an EU public-private partnership, the 'Shift to Rail' Joint Undertaking, was established in 2014 under the Horizon 2020 programme to boost and coordinate research and innovation in rail products, processes and services. The first projects were launched in 2015 and the first results presented in 2018.

### Background

In 2011, the European Commission observed that in order to address major [societal issues](#), such as rising transport demand, congestion, pollution, climate change and dependence on imported oil, a resource-efficient and more competitive railway sector could deliver a strategic policy response. It also emphasised the key importance of research and innovation (R&I) for creating a Single European Railway Area ([SERA](#)).

In 2013, the Commission noted that past R&I activities had a [slow and low impact](#) on the EU rail market, and the uptake of rail innovations was insufficient. Fragmentation among national rail systems and standards, lack of a common approach to research funding, limited private investment and insufficient coordination among the different stakeholders along the rail value chain (manufacturers of rolling stock and equipment, rail undertakings and infrastructure managers) were identified as the barriers to better performance. Taking these factors into account and seeking to make railways more competitive and R&I more effective, the Commission stated that a new [rail initiative](#) would contribute to providing a single market for rail equipment suppliers with lower costs, on the one hand, and to promoting innovations in rail, on the other.

The following year, the 'Shift to Rail' Joint Undertaking ([S2R](#)) was established by [Council Regulation](#) (EU) No 642/2014, based on Article 187 of the Treaty on the Functioning of the European Union, for a duration of 10 years. It became [financially autonomous](#) and fully operational in May 2016.

### S2R JU structure and budget

The S2R [Joint Undertaking](#) is a dedicated administrative body whose financial resources are jointly held by public and private partners, following a [public-private partnership](#) (PPP) model of governance. It is the third PPP in the transport sector created under the research framework programme [Horizon 2020](#), alongside [Clean Sky 2](#) (aeronautics technologies) and [SESAR](#) (air traffic management). The founding members of the S2R are the EU (represented by the Commission), six rail [equipment manufacturers](#) and two [infrastructure managers](#). Other entities, such as public or private rail stakeholders, SMEs and research organisations, can take part in the JU as associate members, based on [calls for expressions of interest](#).

The main S2R bodies are its governing board, handling strategic decision-making and supervision of JU activities, and its executive director, in charge of day-to-day management. A scientific committee and group of Member States' representatives assist them, advising on scientific priorities and strategic orientations. The EU Agency for Railways ([ERA](#)) also has an advisory role and contributes to the S2R work plans.

For the 2014-2020 period, the S2R has a global budget of €920 million, to which the EU can contribute up to €450 million from Horizon 2020, whose objectives and conditions apply to the JU. To access S2R funding, rail industry members need to contribute together at least [€470 million](#) (partly in kind).

In its [resolution](#) of 9 June 2016 on the competitiveness of the European rail supply industry, the European Parliament welcomed the decision to establish the S2R JU and asked the governing board to analyse ways to improve SME participation in it. On 26 March 2019, the EP adopted a decision on the [discharge](#) for the implementation of the S2R budget in the 2017 financial year. In its resolution, the EP called on the S2R to address the risk of being considered a 'closed shop', by selecting new topics and partners, and underlined the importance of cooperation between the JU and the ERA.

*This is an updated edition of an ['at a glance' note](#) from March 2015.*

## S2R objectives and priorities

The S2R is a cooperative structure that aims to play a key role in rail-focused R&I, ensuring coordination and information exchange among stakeholders. It contributes to achieving the SERA and removing the remaining technical obstacles, while also making European rail more competitive, user-friendly (including for persons with reduced mobility), efficient and sustainable. To achieve these aims, the JU also seeks the active involvement of stakeholders from the entire EU rail value chain and from outside the traditional rail industry. Furthermore, it aims to consolidate their leadership on the global market of rail products and services and accelerate the market uptake of their technologies. The solutions that the S2R integrates and validates must uphold the strictest safety standards, and meet a set of key performance indicators:

- reducing by 50 % the life-cycle cost of rail systems (developing, operating and renewing infrastructure and rolling stock);
- doubling the capacity of the rail system for both passenger and freight transport;
- increasing the punctuality and reliability of rail services by 50 %;
- removing remaining obstacles in terms of interoperability and efficiency; and
- reducing negative externalities such as noise, vibrations and emissions.

To drive innovation in the rail sector in the long term, the S2R defined its strategy in a master plan, in consultation with the ERA and the European Rail Research Advisory Council ([ERRAC](#)). This strategy was [adopted](#) by the JU governing board in March 2015, after the [Council of the EU endorsed it](#) in February 2015. The master plan is structured around five priority research clusters, called [innovation programmes](#) (IP). The work of the five IPs is focused on 1) cost-efficient and reliable trains, including high-capacity and high-speed trains; 2) advanced traffic management and control systems; 3) cost-efficient and reliable high-capacity infrastructure; 4) IT solutions for attractive railway services; and 5) technologies for sustainable and attractive European rail freight. To translate the master plan into detailed activities and work plans, in 2015 the S2R adopted a [multiannual action plan](#) and [updated](#) it three years later.

## Initial activities and assessments

In May 2015, the S2R launched three ['lighthouse projects'](#) aimed at offering innovative solutions for rail infrastructure, rolling stock and digital technologies. Their most important [results](#) were presented in 2018. Each year, the JU organises [calls for proposals](#) and/or calls for tenders addressed to its members, and open calls for proposals for its associated members, whose level of [response](#) has been high from the start. Based on the [2019 annual work plan](#), the [2019 call for proposals](#) received 50 proposals with a funding request of roughly €118 million, exceeding the available funding by 50 %. By June 2019, the S2R had invested more than half (€637 million) of its total 2014-2020 budget in R&I. More than [340 entities](#) are now participating in a [wide range](#) of projects across Europe, some of which have already been completed.

In September 2018, the S2R presented its first [innovative solutions](#), among others a [multi-modal one-stop-shop IT application](#) for passengers across the EU, big-data analysis to improve rail energy savings, and a decision-support tool for [rail noise abatement](#). Recently, S2R experts presented the first results of seven [freight innovation projects](#) in which the JU had invested €48 million. These projects focus on aspects such as rail [freight automation](#), improving [freight capacity and reliability](#), as well as developing new freight [locomotives](#), [longer freight trains](#) and [lightweight wagons](#) equipped with monitoring systems. Lately, the S2R has launched R&I activities in cutting-edge technologies. In cooperation with the [Fuel Cells and Hydrogen JU](#), the S2R commissioned a [report](#) to assess the introduction of fuel cells and hydrogen (FCH) technologies in the EU rail sector on a broader scale.

In 2017, the Commission published its [interim evaluation report of the S2R](#) (2014-2016). Confirming the relevance of the S2R's objectives and the coherence of its working programmes and vision, the Commission underlined its efficiency and key contribution to research. Some of the recommendations made included increasing knowledge transfer between transport JUs and reinforcing the participation of rail companies, SMEs and Member States. The report concluded that keeping the JU would be worth considering. Similarly, the [rail sector](#) highlighted the need for a second version of the Shift2Rail in the ninth framework programme for R&I. It suggested that the new programme should take into account the ongoing mega-trends, especially in terms of urbanisation, environmental issues and ageing population. During a June 2018 event on the [future of R&I in rail](#), stakeholders reiterated their general support for the continuation of the S2R.

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