



EUROPE'S RAIL

Los lunes de CDTI-SOST Bruselas

5 June 2023

Online Event





What is about EU-Rail

VISION

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

MISSION

Rail Research and Innovation to make Rail the everyday mobility

On what EU-Rail is built upon



28
MEMBERS



412
PARTICIPANTS



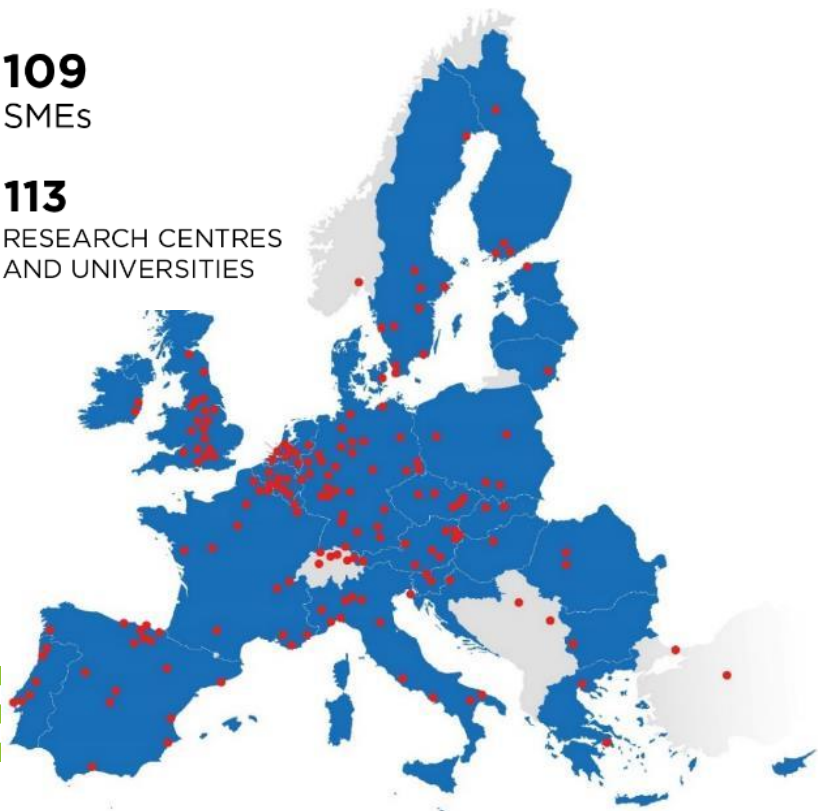
29
COUNTRIES



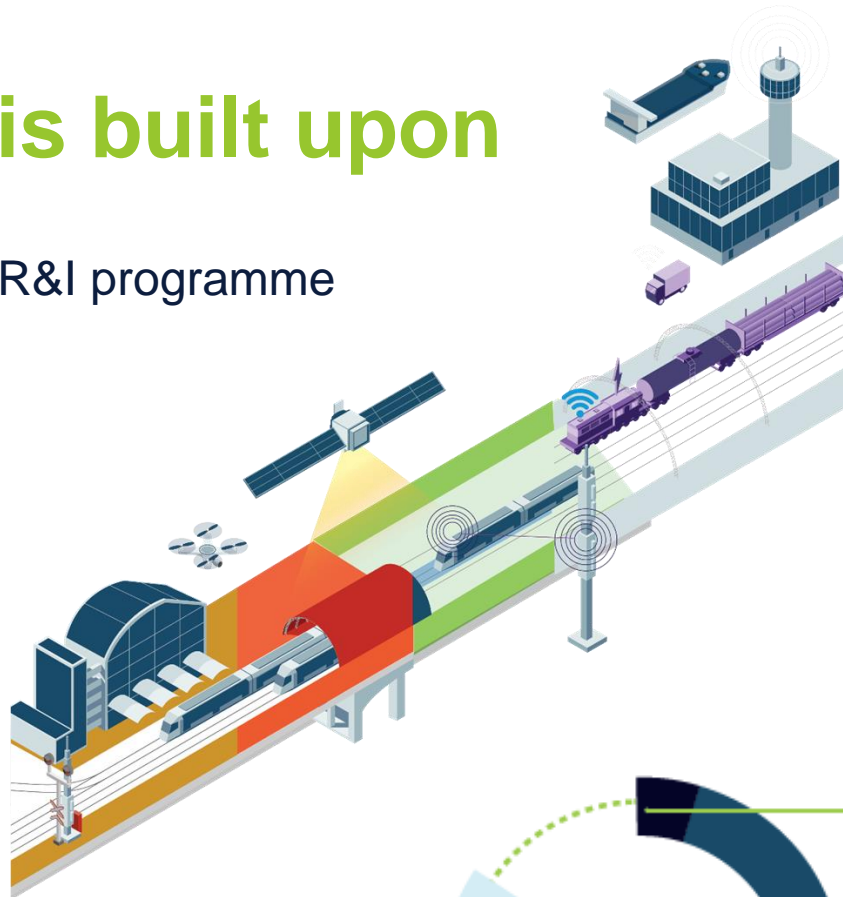
109
SMEs



113
RESEARCH CENTRES
AND UNIVERSITIES



Shift2Rail R&I programme



IP1 Cost-efficient and Reliable Trains, including high-capacity trains and high speed trains

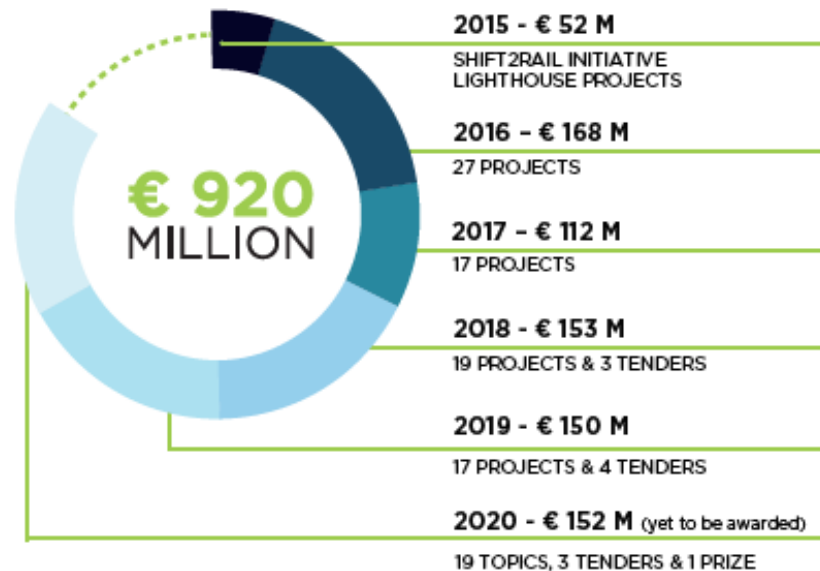
IP2 Advanced Traffic Management and Control System

IP3 Cost-efficient, Sustainable and Reliable High Capacity Infrastructure

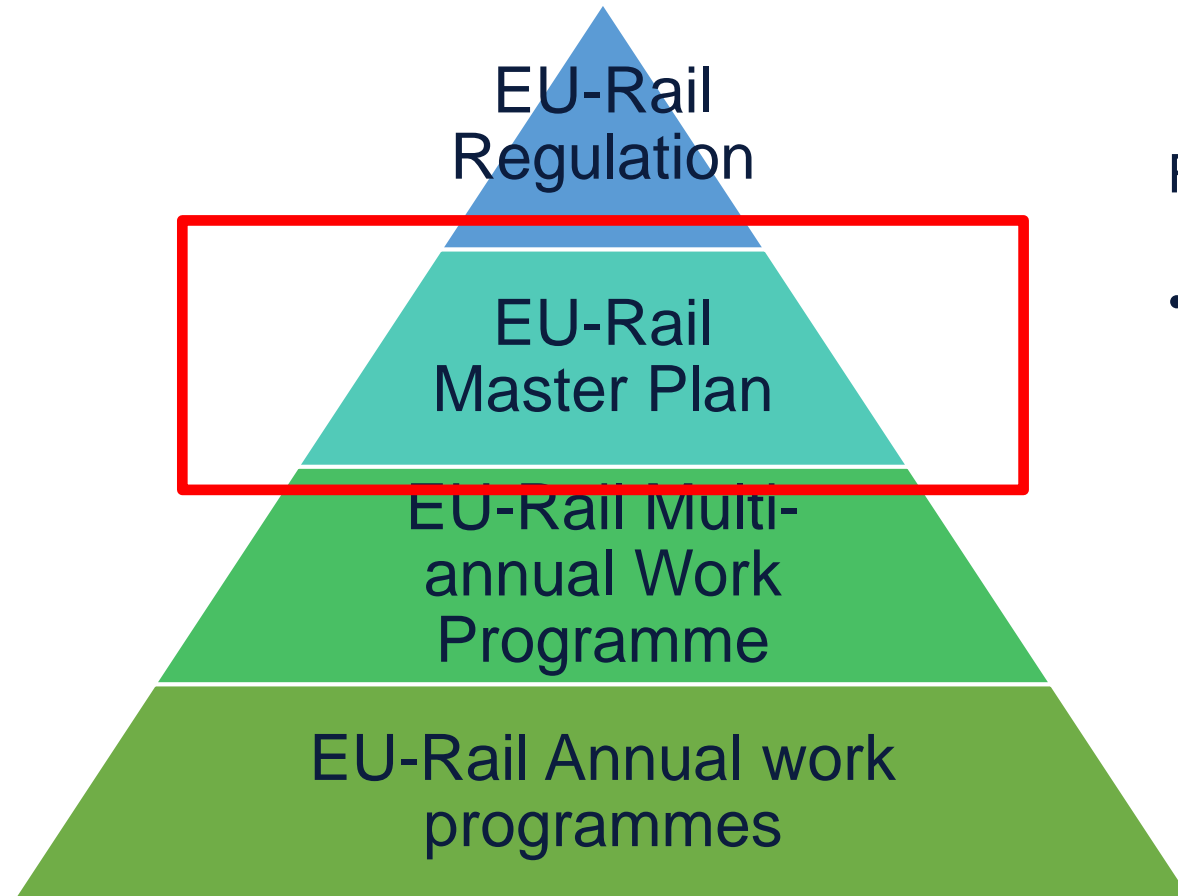
IP4 IT Solutions for Attractive Railways Services

IP5 Technology for Sustainable and Attractive European Rail Freight

CCA Cross Cutting Activities



EU-Rail Programme approach



Focus on the

- **MP:** A common, forward-looking roadmap based on a system view, presenting the areas of intervention within the scope of the Joint undertaking; Give guidance on how to invest the €1,2 billion (EU funding 50%); Based on two integrated pillars, System and Innovation Pillars, complemented by the Deployment Group



DELIVER AN **INTEGRATED EUROPEAN RAILWAY NETWORK BY DESIGN**



DEVELOP A **UNIFIED OPERATIONAL CONCEPT AND A FUNCTIONAL SYSTEM ARCHITECTURE** FOR INTEGRATED EUROPEAN RAIL TRAFFIC AND CCS/AUTOMATION



DELIVER A **SUSTAINABLE AND RESILIENT RAIL SYSTEM**



DELIVER A **COMPETITIVE, GREEN RAIL FREIGHT FULLY INTEGRATED INTO THE LOGISTICS VALUE CHAIN**



DEVELOP A **STRONG AND GLOBALLY COMPETITIVE EUROPEAN RAIL INDUSTRY**

EUROPE'S RAIL: ONE INTEGRATED R&I PROGRAMME

SYSTEM PILLAR

OPERATIONAL CONCEPTS

FUNCTIONAL SYSTEM ARCHITECTURE

A SINGLE COORDINATING BODY FOR THE WHOLE SECTOR EVOLUTION

OPEN INTERFACES TO OTHER TRANSPORT MODES AND BUSINESSES

SYSTEM REQUIREMENT SPECIFICATIONS

INNOVATION PILLAR

TECHNOLOGICAL AND OPERATIONAL SOLUTIONS FOR SERVICES OF FUTURE

FLAGSHIP PROJECTS

LARGE-SCALE DEMONSTRATIONS

EXPLORATORY AND FUNDAMENTAL R&I

1

EUROPEAN RAIL TRAFFIC AND MOBILITY MANAGEMENT

Manage and improve rail traffic at EU level

Adjust rail traffic management in function of the mobility demand

2

DIGITALISATION & AUTOMATION IN TRAIN OPERATIONS

ATO implementation

Digital train operations

3

SUSTAINABLE AND DIGITAL ASSETS

Integrated assets testing & life-cycle framework

Zero-emission, silent rail system

4

COMPETITIVE, DIGITAL, GREEN RAIL FREIGHT

New digital customer interaction & innovative rail freight services

Multimodal and rail freight innovation integration

5

REGIONAL RAIL SERVICES IN LOW DENSITY AREAS

New system approach to regional rail services in low density areas

DEPLOYMENT GROUP

FUTURE SOLUTIONS DEPLOYED IN A COORDINATED AND CONSISTENT WAY AT EUROPEAN LEVEL, TAKING INTO ACCOUNT ALTERNATIVE ROLLOUT SCENARIOS, BEHAVIOURAL AND ORGANISATIONAL CHANGES, SYNERGIES WITH OTHER MODES OF TRANSPORT

EU-Rail expected system impacts from the Programme



- Meeting evolving customer requirements



- Improved performance and capacity



- Reduced costs



- More sustainable and resilient transport



- Harmonised approach to evolution and greater adaptability



- Reinforced role for rail in European transport and mobility

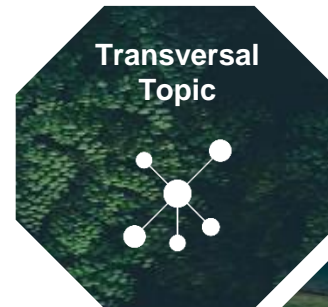


- Improved EU rail supply industry competitiveness

EU-Rail Multi-Annual Work Programme

Network management planning and control & Mobility Management in a multimodal environment

Network management planning and control (new processes and automation for decision support) & rail management in a multimodal environment (real-time demand-driven operations, including demand from other transport modes)



Digital Enablers

Provide Digital Twins Design toolbox for design as well as for validation, verification and test + a Federated dataspace where all digital elements of the system can play together in a coherent and interoperable way

Digital & Automated up to Autonomous Train Operations

Digital "Automated & Autonomous" Train Operations building upon the next gen Automatic Train Control based on ERTMS + enhancements on TCMS for integration at the on-board level



Innovation on new approaches for guided transport modes

Explore non-traditional and emerging flexible and/or high-speed guided transport systems, as well as to create opportunities for innovators to bring forward ideas for shaping those future systems

Intelligent & Integrated asset management

Knowledge from the digital transformation will feed back into the design, construction, manufacturing as well as into operation and maintenance processes.



+ Exploratory Research and other activities



Regional rail services / Innovative rail services to revitalise capillary lines

Decreasing cost while offering a high quality of service and operational safety + increase customer satisfaction and attractiveness

A sustainable and green rail system

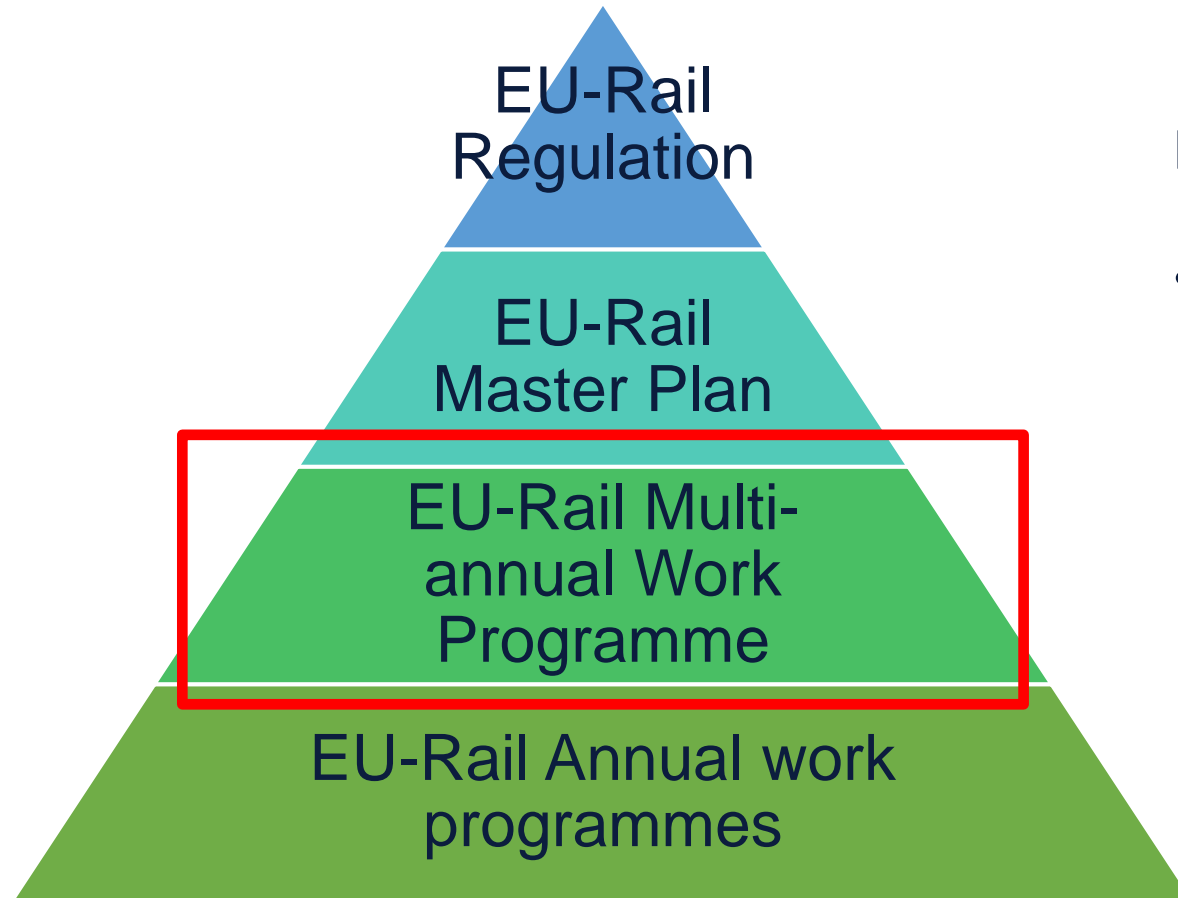
Innovative solutions and services based on leading edge technologies to minimize the overall energy consumption and environmental impact of the railway system



Sustainable Competitive Digital Green Rail Freight Services

Digitalization and automation of operational functions (e.g. DAC) and processes as well as increasing the efficiency of the immaterial (information/data) layer of transport in logistic

Navigating the EU-Rail key documents of a Programme approach

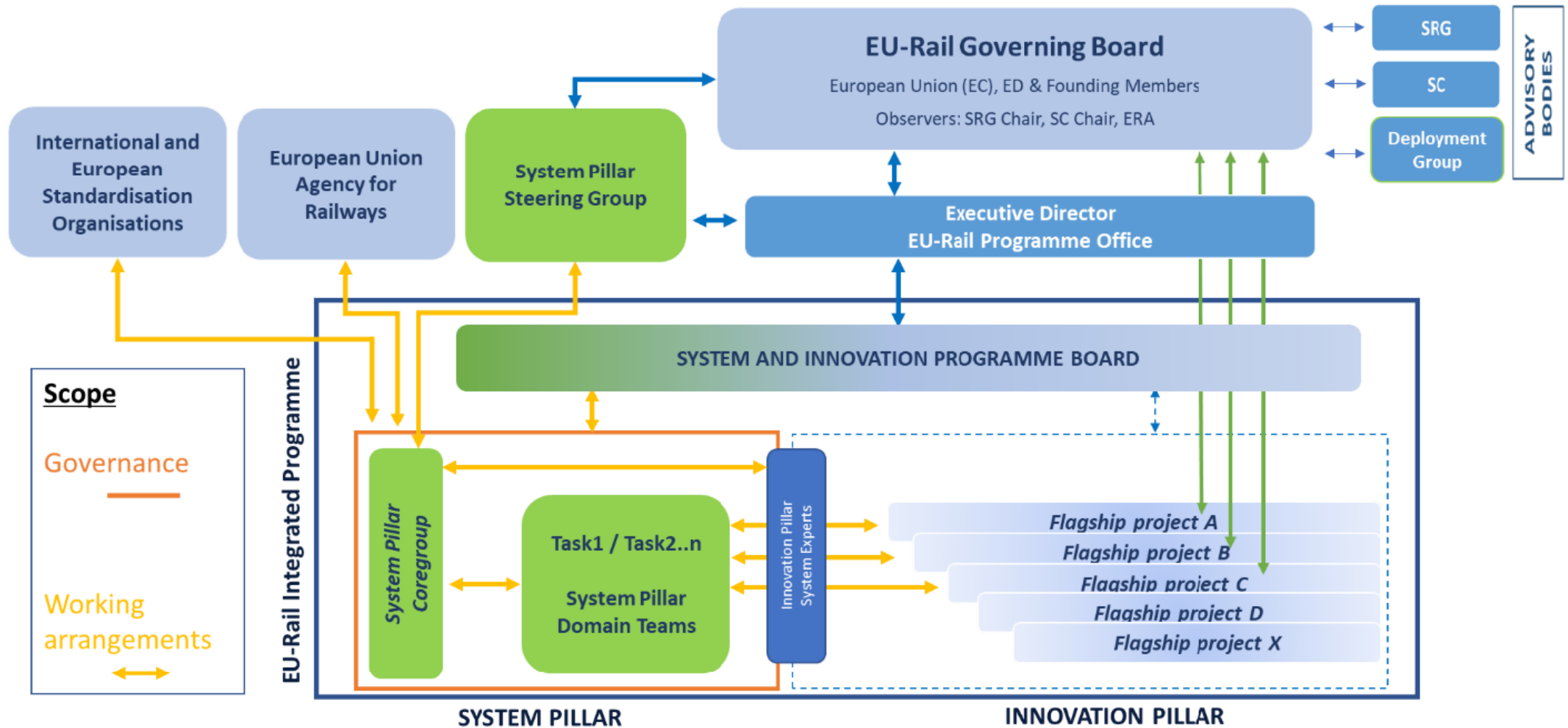


Focus on the

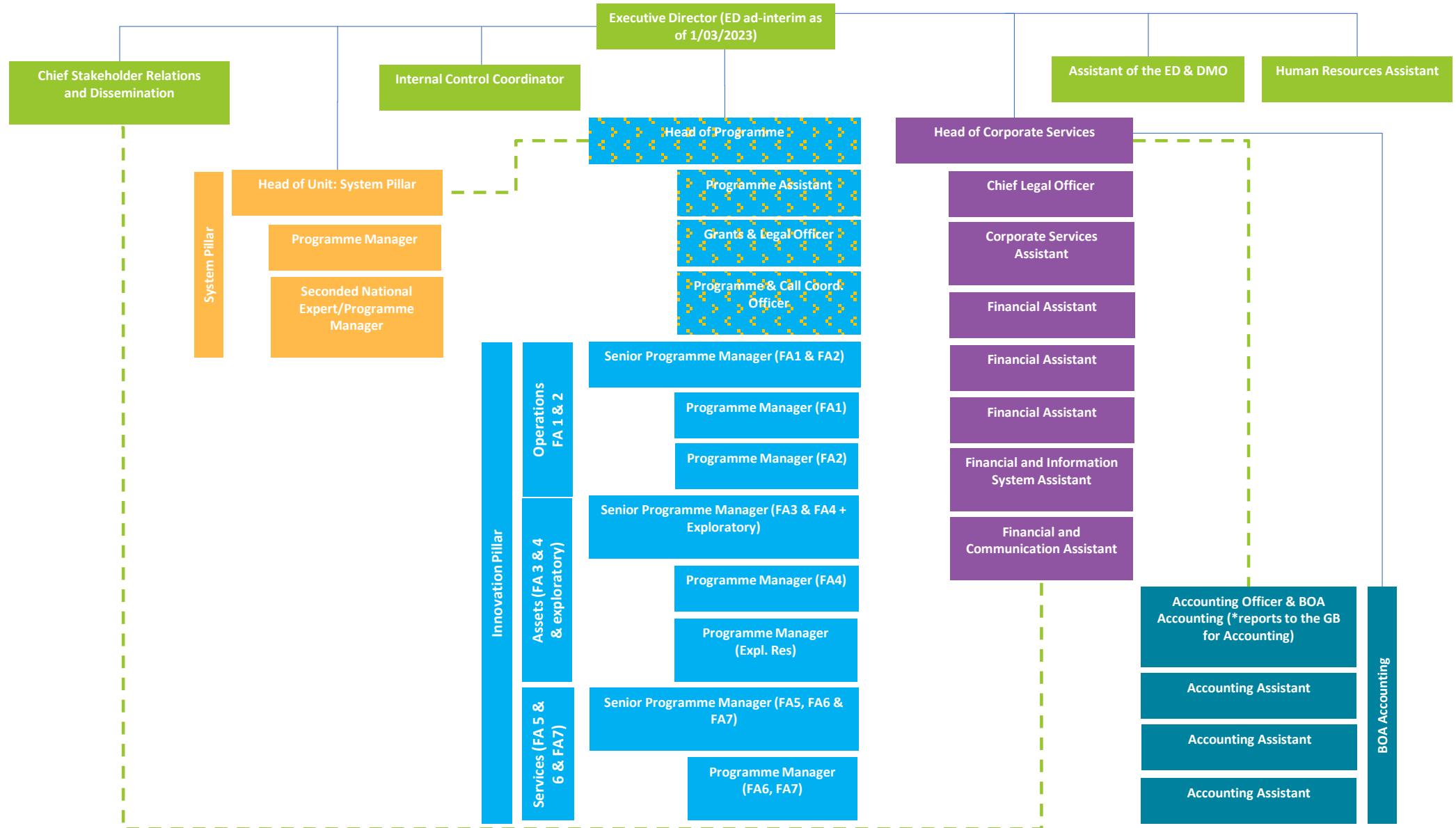
- **MAWP:** It defines how the EU-Rail JU has designed its R&I activities to achieve the general and specific objectives set out in the SBA through an Integrated Programme:
 - *System Pillar (tasks)*
 - *Innovation Pillar*
 - *7 Flagship Areas + TT*
 - *Exploratory and Other activities*
 - *Deployment group*



EU-Rail organisation and its key Programme operational aspects



JU overview (organisation chart)



EU-Rail Call 2022-1

DESTINATION Topics	Type of Action	Expected TRL	Expected EU contribution per Project (EUR million)	Number of projects expected to be funded
Opening: 10 March 2022; Deadline: 23 June 2022				
HORIZON-ER-JU-2022-FA1-TT-01	IA	5 to 7	38.0	1
HORIZON-ER-JU-2022-FA2-01	IA	5 to 7	54.3	1
HORIZON-ER-JU-2022-FA3-01	IA	5 to 8	46.3	1
HORIZON-ER-JU-2022-FA4-01	IA	5 to 7	38.3	1
HORIZON-ER-JU-2022-FA5-01	IA	5 to 8/9	40.6	1
HORIZON-ER-JU-2022-FA6-01	IA	5 to 7	16.5	1

Call structure (see also annex VII of the EU-Rail [Work Programme 2022 2024](#)):

- ❖ **Destination:** indicates the objectives as well as clear and quantified targets in term of KPIs to be reach with the R&I activities.
- ❖ **Expected outcome:** describes the expected demonstrations, the expected preparatory works to be launched for the future set of demonstration foreseen in the MAWP and the input/output expected with the linked actions from other Destinations.
- ❖ **Scope:** identifies the expected capabilities/enablers that should be developed through R&I activities for achieving the expected demonstrators. It also highlight other requirements, as the need to measure and monitor KPI, contribute to standards and interact with the System Pillar activities.



EU-Rail Call 2022-2

DESTINATION Topics	Type of Action	Expected TRL	Expected EU contribution per project (EUR million)	Number of projects expected to be funded
Opening: 13 September 2022; Deadline: 14 December 2022				
HORIZON-ER-JU-2022-FA7-01	RIA	3 to 4	3.0	1
HORIZON-ER-JU-2022-FA7-02	RIA	2 to 3	1.5	1
HORIZON-ER-JU-2022-FA7-03	IA	6	2.3	1
HORIZON-ER-JU-2022-ExplR-01	RIA	-	0.7	1
HORIZON-ER-JU-2022-ExplR-02	IA	6 to 7	1.0	1
HORIZON-ER-JU-2022-ExplR-03	RIA	5	1.3	1
HORIZON-ER-JU-2022-ExplR-04	RIA	1 to 2	2.0	1
HORIZON-ER-JU-2022-ExplR-05	RIA	1 to 3	0.7	1
HORIZON-ER-JU-2022-ExplR-06	RIA	1 to 3	0.7	1
HORIZON-ER-JU-2022-ExplR-07	IA	-	1.5	1

Call structure (see also annex VIII of the EU-Rail [Work Programme 2022 2024](#))

- ❖ **Destination:** indicates the objectives to be reached with the R&I activities
- ❖ **Expected outcome:** describes the expected developments within the destination topic and the **input/output expected with the linked actions** from other Destinations.
- ❖ **Scope:** identifies the expected capabilities/enablers that should be developed through R&I activities



Programme overview

Innovation Pillar





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

FP1 – MOTIONAL

92M € Total Project Cost

87 total partners

Duration: 46 months (Dec 2022- September 2026)



Project plan for the first phase of FA 1 until 2025/26

The project is organized in **4 focus areas** organized in **2 workstreams** covering rail traffic planning, management, multi-modal mobility and digital enablers and therefore starting the work on all enablers included in FA1.

In a joint activity the key stakeholders will **specify, develop and demonstrate** new capabilities for future upgrades of **planning, traffic management and mobility management** applications towards **green, digital and safe solutions** for the rail sector.

WS 1.1 Traffic Planning:

Improved strategic and tactical planning, Integration of planning systems and processes including cross-border planning, Decision support for planning and timetable optimisation, Simulation and operational feedback for improved planning;

WS 1.2 Traffic Management:

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

WS 1.3 Mobility integration:

Integrate Rail with other transport modes, Services for inclusive rail-based mobility, Anticipate demand leading to improved resource utilisation,

WS 2.1 Digital enablers:

Digital Process Scenarios , Digital Asset Engineering , Digital Twin, Conceptual Data Model and semantic dictionary evolution, Federated Data Spaces

FP1-MOTIONAL – Key deliveries by 2026

WS1: Network management planning and control & Mobility Management in a multimodal environment deliver by 2025/2026 innovative solutions to be demonstrated with:

- Tactical and short-term timetable planning including cross-borders with improved models and functions; use of decision support to support integrated capacity planning of the rail network and operations for yards, stations, terminals [TRL4/7];
- HMI for TMS with decision support modules, based on User Experience (UX) Design and human-in-the-loop awareness [TRL4-8]
- Demand-driven predictions to improve operations and service offers, considering information about events across modes. Effect of cross-regional, multimodal travels in combination with demand forecast and disruption handling on improvement of daily operations, benefit on customers (accessibility and attractiveness). [TRL 4-8]

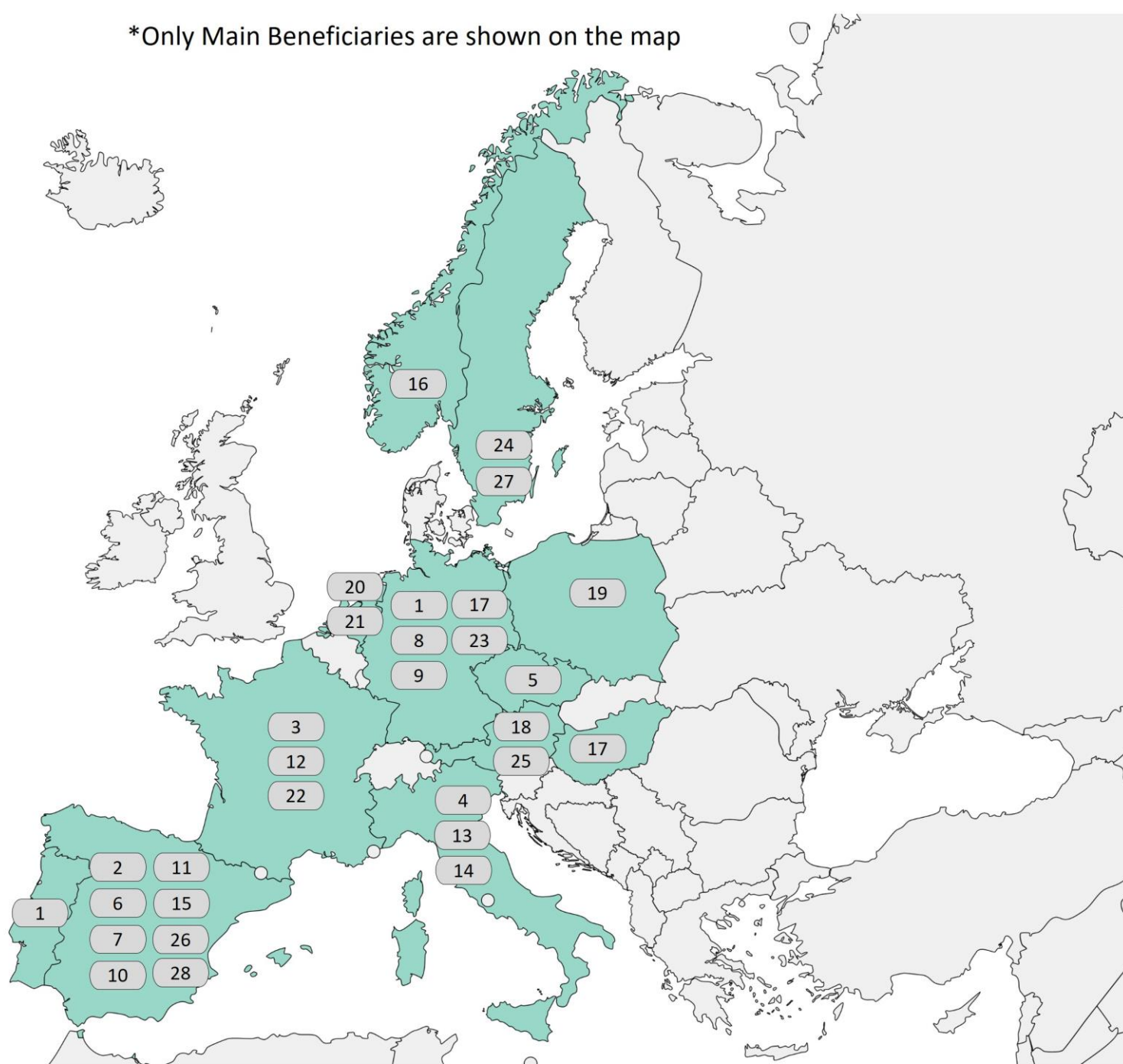
WS2: Digital Enablers - deliver by 2025 the following:

- Connectors for Federated Data Spaces [TRL6]
- Common Domain Ontology, building upon S2R works on Conceptual Data Model (CDM) [TRL6]
- Digital Twin support, development and execution environment [TRL5]
- Common Domain Ontology/ Conceptual Data Model [TRL6]



- 1 HACON
- 2 ADIF
- 3 ATSA
- 4 MERMEC
- 5 AZD
- 6 CAF
- 7 CEIT
- 8 DB
- 9 DLR
- 10 ENYSE
- 11 ETRA I+D
- 12 FT
- 13 FS
- 14 STS
- 15 INDRA
- 16 NRD
- 17 KB
- 18 ÖBB-Infra
- 19 PKP
- 20 PR
- 21 NSR
- 22 SNCF
- 23 TLSG
- 24 TRV
- 25 vaRS
- 26 MDM
- 27 SJ
- 28 FGC

*Only Main Beneficiaries are shown on the map





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

FP2 - R2DATO

Rail to Digital Automated Train Operations

160M € Total Project Cost

72 total partners

Duration: 42 months (Dec 2022-June 2026)

FP2 - R2DATO – Clusters

- **Automation Processes**

- Deliver scalable automation in rail operation (ATO) up to GoA4 for all segments, including freight and urban light rail.
- Implementation of operational solutions for automation up to GoA4 to be demonstrated in specific use cases

- **Optimised Headway**

- Increasing infrastructure capacity
- Reducing operational/Life Cycle costs by ETCS Hybrid Level 3, ETCS Level 3 Moving Block with new train positioning technologies.
- Achieving reproducible braking distances even in low wheel/rail adhesion conditions allowing reduced safety margins,

- **Innovative Operational Solutions**

- Development of concept solutions for the Autonomous Route Setting (ARS), Virtually Coupled Train Sets (VCTS) and Self-Driving Freight Wagons (SDFW) innovative solutions.
- Research on new technology, for short-range communication (SRC) and relative localisation (RL).

- **Fast and Effective Deployment**

- Assess Digital and Automated up to Autonomous Train Operations (DATO), derive guidelines for Migration and Deployment
- Develop a Formal Modelling approach for railway systems in order to support standardisation of approval and certification
- Support the decoupling from Hardware and Software by developing an Architecture for Evolution as well as rail-industrial DevOps.

- **Digital Enabling Technologies**

- Provide the future-proof connectivity, IT and data platforms required for the automation of rail operations.
- Increase the cost efficiency in the rail system by leveraging off-the-shelf IT solutions, by decoupling the life cycles of railway applications and connectivity, IT and data platforms, and by allowing to aggregate multiple railway applications on common platforms.

- **Test and Certification**

- Define and provide a common strategy and process for virtual certification of complete railway systems as well as functional upgrades.
- Assess the integration of new technologies and functionalities from Technical Enablers in a virtual railway environment.
- Define a network of laboratories with linked test facilities to support certification in a system with a modular architecture like interoperability tests.

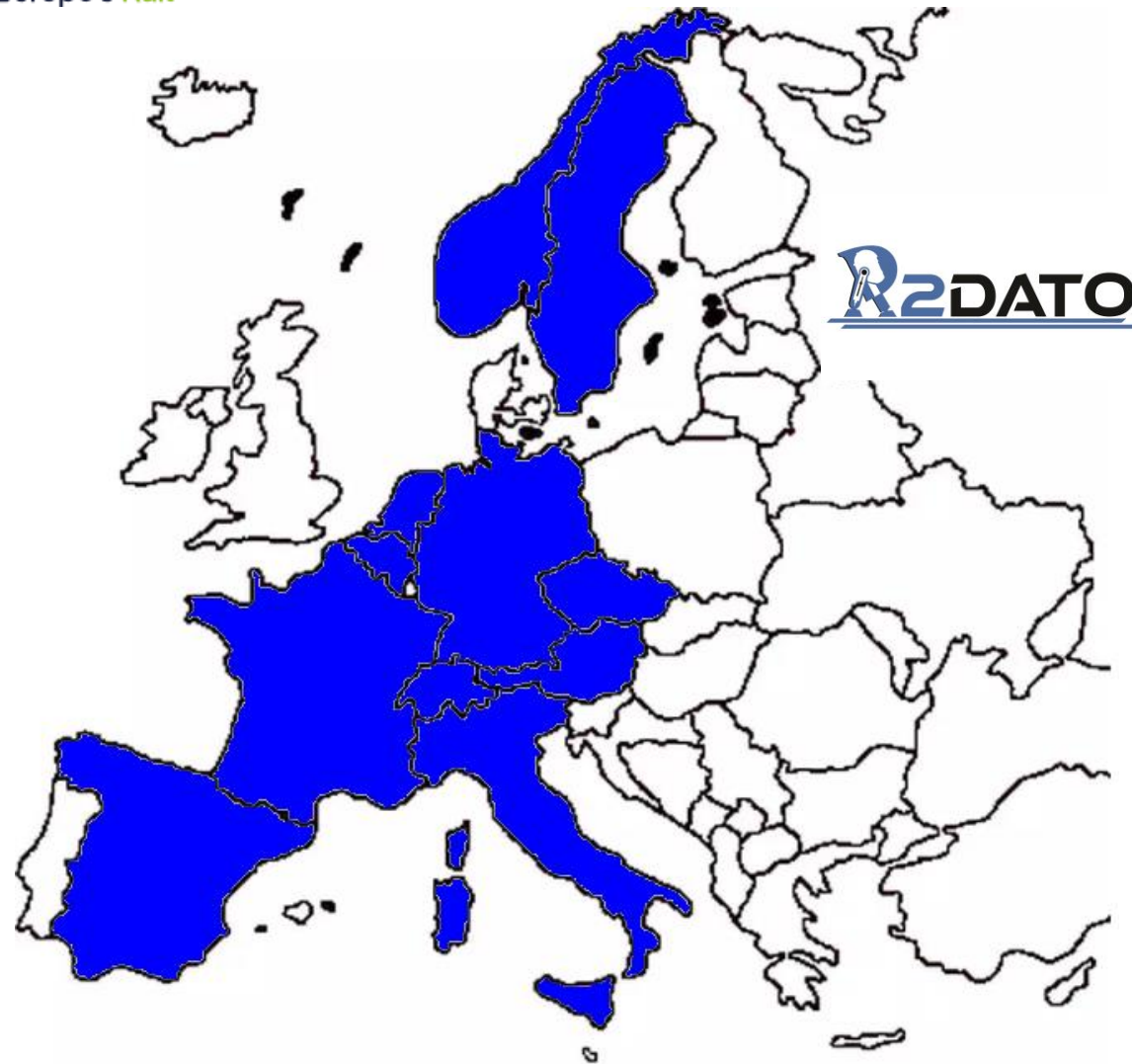
- **Demonstrators**

- Validate the benefits of DATO technical enablers.
- Validate DATO technologies for specific target implementations.

FP2 - R2DATO – Key deliveries by 2026

The first EU-Rail Flagship Project 2 – R2DATO implementing FA2. It is notably delivering the following by 2025:

- Demonstrate technical and functional enablers such as ATO GoA3/4 over mixed radio based ETCS levels (TRL6 or higher), Hybrid Level 3, moving block and TIMS (TRL6), connectivity (TRL6), perception (TRL5/6), train positioning (TRL5/6), automated functions and digital register (TRL6).
- Demonstration of the remote driving and command in depots and yards, including perception systems (TRL6).
- A first demonstrator on next generation ATC, with modular onboard and trackside ATC architectures, at proof-of-concept stage, in close collaboration with the EU-Rail System Pillar.
- A proof-of-concepts and/or validation in laboratory and field (i.e., up to TRL4/5 in Lab and TRL6 on site) for the following new functions and technical enablers:
 - Virtual Coupling Train Set (TRL4/5)
 - Self-driving wagon (TRL4/5)
 - Autonomous path allocation (linked to input from Destination1) (TRL5)
 - Validation and certification (TRL6)
 - Demonstrate a Functional Open Coupling System prototype covering all required subsystems in an operational environment (TRL7)
 - Demonstrate a modular hardware platform using architectural software design patterns and methods (TRL7) allowing SIL2 respective SIL4 (depending on the application)



Partner	Country
Société Nationale SNCF – SNCF	France
ADMINISTRADOR DE INFRAESTRUCTURAS FERROVIARIAS – ADIF	Spain
ALSTOM TRANSPORT SA – ATSA	France
MER MEC S.p.A. – MERMEC	Italy
AZD PRAHA SRO – AZD	Czech Republic
Construcciones y Auxiliar de Ferrocarriles, S.A – CAF	Spain
ASOCIACION CENTRO TECNOLOGICO CEIT – CEIT	Spain
DEUTSCHE BAHN AG – DB	Germany
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV - DLR	Germany
COMSA INSTALACIONES Y SISTEMAS INDUSTRIALES SA – COMSA	Spain
Faiveley Transport SAS - FT	France
FERROVIE DELLO STATO ITALIANE – FSI	Italy
Hitachi Rail STS S.p.A (STS) – HITACHI	Italy
INDRA SYSTEMAS SA – INDRA	Spain
Jernbanedirektoratet - NRD	Norway
Knorr-Bremse Systeme für Schienenfahrzeuge GmbH – KB	Germany
OBB-Infrastruktur AG - OBB-INFRA	Austria
ÖBB-Personenverkehr AG – ÖBB – PV	Austria
ProRail- PRORAIL	Netherlands
NS REIZIGERS BV – NS	Netherlands
Siemens Mobility GmbH – SMO	Germany
GTS DEUTSCHLAND GMBH - GTSD	Germany
Trafikverket (Swedish Transport Administration) – TRV	Sweden
SCHWEIZERISCHE BUNDESBAHNEN SBB – SBB	Switzerland
Kontron Transportation GmbH – KONTRON	Austria
Sporveien Trikken AS – Sporveien	Norway
The International Association of Public Transport – UITP	Belgium
GEOSAT - GEOSAT	France



Flagship Area 3: Intelligent and Integrated Asset Management

FP3 – IAM4RAIL

104M € Total Project Cost

94 total partners

Duration: 48 months (Dec 2022 - Dec 2026)

Flagship Project 3 - FP3 – IAM4RAIL



Traffic Management System (TMS)

1

Design & Manufacturing

6



Asset Management

5



Rolling Stock Assets

2

Interventions

7



Infrastructure Assets

4

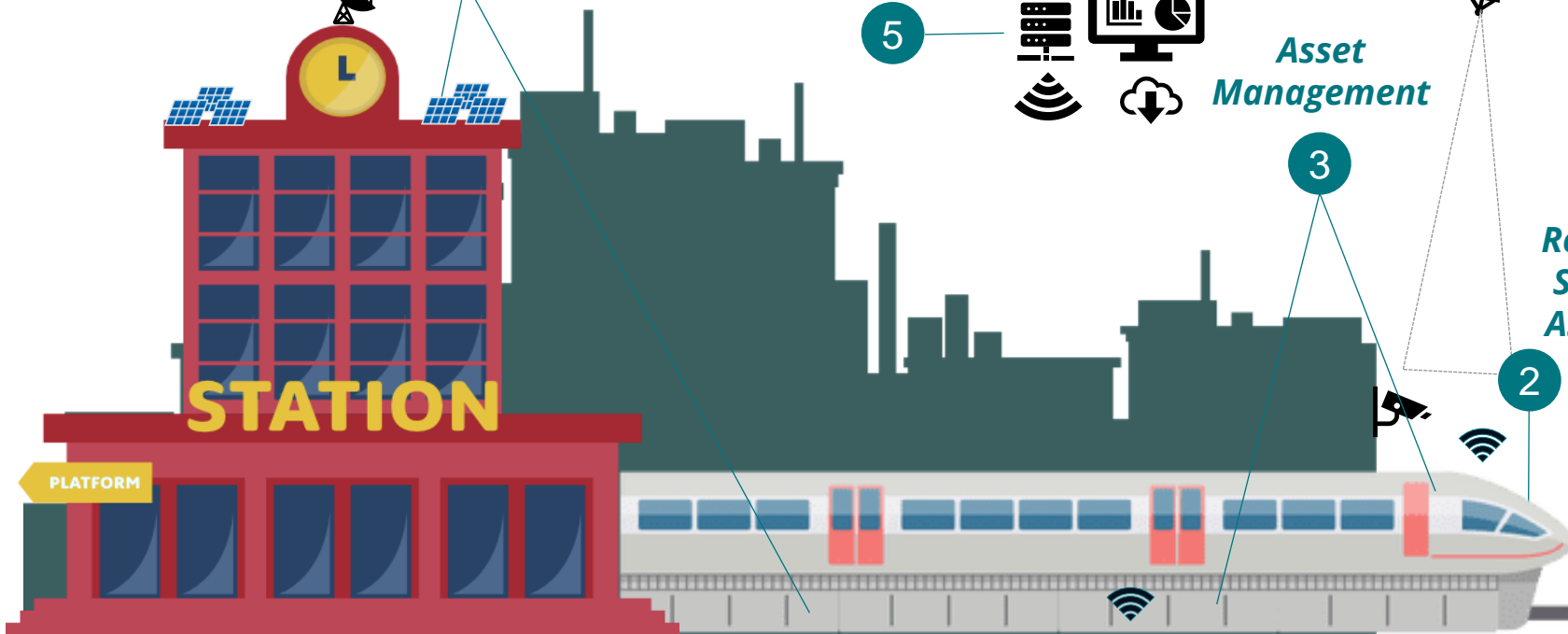
Digital Twins

4



STATION

PLATFORM



FP3 – IAM4RAIL – Key deliveries

- **Demonstrator#1 (DO1): Integration between the Intelligent Asset Management System (IAMS) and the Traffic Management System (TMS)** across railway assets, amongst various use cases (4):
 - **Secure** standardised interfaces, methods, and processes for store/archive for different **data exchanges impacting integration between IAMS & TMS** *TRL6 in 2025*
 - Implementation & testing of **data analytic methods** with a focus on **prediction and prescription of wayside and rolling stock asset** status based on heterogeneous data sources *TRL6 in 2025*
 - Implementation & testing of **analytic results integration with TMS and O&M tools to provide TMS information to optimize traffic** regulation/trains routing and Support O&M activities *TRL6 in 2025*
- **Demonstrator#2 (DO2): Asset Management & Rolling Stock**, developing new monitoring and inspection systems leading to decisions and planning of interventions amongst various use cases (4):
 - Basic **data model design for workshop maintenance data** and digital process collaboration between stakeholders in maintenance and asset management *TRL6 in 2025*
 - **Algorithms for anomaly detection & component health evaluation (Bogie & Traction)** and adhesion management *TRL6 in 2025*
 - **European railway checkpoint for mixed traffic** (inc. wayside inspection & monitoring systems and data analytics combining both on-board & wayside data sources for health assessment) *TRL6 in 2025*
 - **CBM algorithms and methodologies for freight rail applications** that are potentially exploitable by the Digital Automated Coupler (DAC) **related data gathering** *TRL7 in 2025*

FP3 – IAM4RAIL – Key deliveries

Demonstrator#3 (DO3): Long Term Asset Management, developing decision support applications for asset management and Life Cycle Cost (LCC) optimization, amongst various use cases (4):

- **Holistic Asset Management decision support tool with HMI** via condition monitoring including visualization, correlation within signalling and with operational & maintenance information **TRL6 in 2025**
- **Remaining useful-life analysis of civil structures** via development of new techniques, methods, and algorithms based on new cross-border data sources from existing multiple sensors **TRL6 in 2025**

Demonstrator#4 (DO4): Asset Management & Infrastructure, developing new monitoring and inspection systems able to integrate Big Data from on field and on-board systems, sharing info across the supply chain and TMS, amongst various use cases (10):

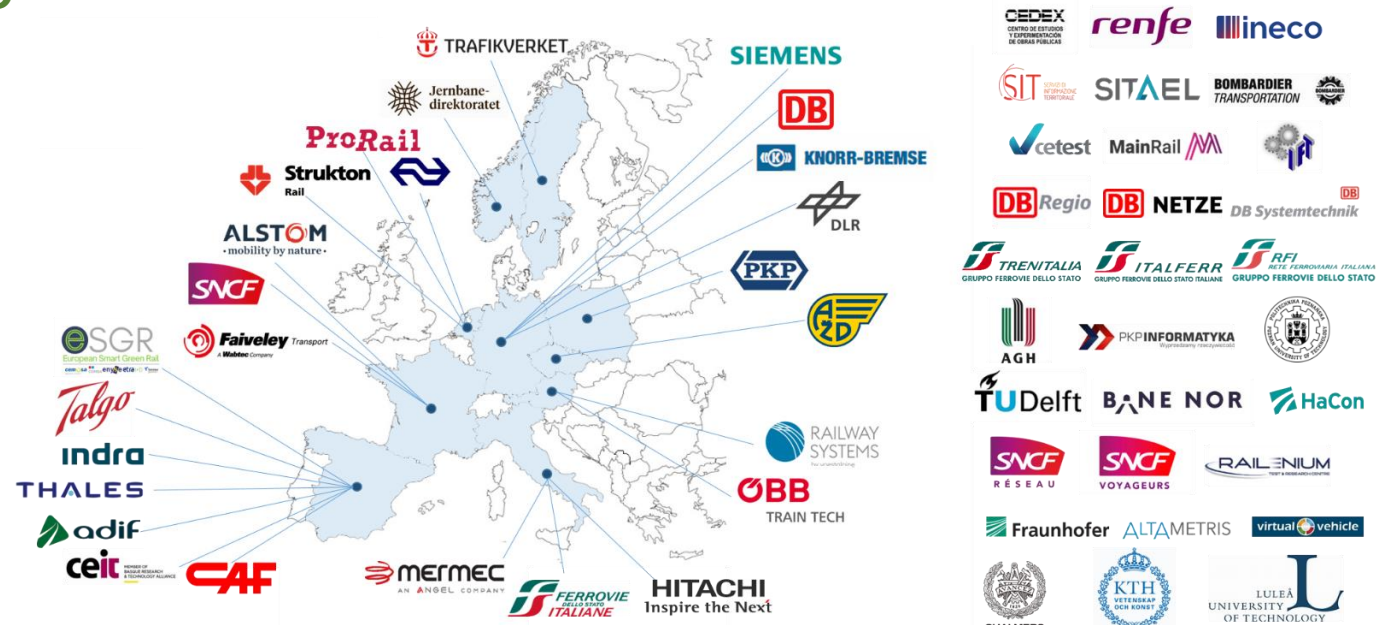
- **Practical solutions for sensing superstructure system components** (including intelligent sleepers, ballast, rail and contact lines) **TRL6 in 2025**
- **Multi-sensor / Multi-source monitoring** of tracks, surrounding and switches **for short-term superstructure asset management** **TRL6 in 2025**
- **Multiscale monitoring of civil assets**: satellite, aerial and UAV data collection and processing approaches, ground data collection strategies, data analysis methodologies and verifications and user data browsing platform **TRL6 in 2025**

FP3 – IAM4RAIL – Key deliveries

- **Demonstrator#5 (DO5): Asset Management & Digital Twins** to support the design, maintenance, upgrade, and renewal of railway assets, amongst various use cases (4):
 - **Digital Twin for Station asset management** exploiting BIM and Digital twin technologies to leverage station supervision and maintenance operations and reducing cost management **TRL7 in 2025**
 - **Virtual Certification for railway infrastructure** framework and applicative use case **TRL7 in 2025**
- **Demonstrator#6 (DO6): Design & Manufacturing**, showcasing the eco-friendly design, production and reparation of resilient assets including Additive Manufacturing (AM), amongst various use cases (7):
 - **Green tracks & turnouts**, developing optimised design solutions for tracks and turnouts decreasing environmental impact **TRL6 in 2025**
 - **Repair of metallic assets using additive manufacturing AM techniques** with four different technologies **TRL6 in 2025**
 - **Development of a Digital Warehouse for AM spare parts** (inc. wayside inspection & monitoring systems and data analytics combining both on-board & wayside data sources for health assessment) **TRL5 in 2025**

FP3 – IAM4RAIL – Key deliveries

- **Demonstrator#7 (DO7): Robotics & Interventions** showcasing high-tech automated solutions for construction and execution of interventions supported by robotics and wearables, amongst various use cases (6):
 - **Train underbody inspection robot** via development of a modular robotic system addressed at the inspection and monitoring of the underbody of the train (either passenger or freight) **TRL6 in 2025**
 - **Upper-body hybrid exoskeleton for railway workers' ergonomics support** in railway maintenance tasks **TRL5 in 2025**
 - **AR (Augmented Reality) architecture, middleware and author tools development** exploiting BIM and Digital twin technologies to leverage station supervision and maintenance operations and reducing cost management **TRL5/6 in 2025**





Flagship Area 4: A sustainable and green rail system

FP4 – RAIL4EARTH

96M € Total Project Cost

71 total partners

Duration: 48 months (Dec 2022 - Dec 2026)

- **Sub-project 1 Alternative (to Diesel)** energy solutions for the **rolling stock**, 6 Demos
 - High performances Battery powered Regional trains (200km), TRL6-7 in 2026
 - Hydrogen hybrid locomotive TRL 5-6 in 2026, Infrastructure inspection vehicles TRL 5 in 2026
- **Sub-project 2 Energy in rail infrastructure and stations**, 7 demos
 - H2 refuelling station TRL6 in 2025
 - Smart low consumption electrical infrastructures (with local renewable energy **sources**, ground **energy storages**, etc), TRL6 in 2025
 - Smart stations as energy hubs, TRL 5 in 2025.
 - Methodologies/ guidelines for the optimal design/rehabilitation of stations including modularity and carbon footprint reduction TRL5/6 in 2025.
- **Sub-project 3 Sustainability and resilience** of the rail system, 3 demos
 - Software tool specification on European **climate variables** usable for railway assets Reports, TRL5 in 2025
 - **Noise** indicators, simulation tools and development of optimized components for noise and vibrations minimisation, TRL6 in 2025
 - Software tools and indicators to promote **eco-design**, assess **environmental performance** /standardised reporting of the environmental impacts of the rail sector, TRL5 in 2025.

- **Sub-project 4 Electro-mechanical components** and sub-systems for the rolling stock, 18 demos
 - (Airless) electro-mechanical braking system, pantograph and suspensions, TRL7 2025
 - Optimised (energy, weight) motors and gearboxes, TRL6 in 2025
 - Replace hydrofluorocarbon refrigerants by HVAC system using green refrigerants or new cooling technologies, TRL6 in 2025
 - Enhanced experimental and numerical methods on train **aerodynamic** optimization, TRL6 in 2025
- **Sub-project 5 Healthier and safer** rail system, 2 Demos
 - Healthier HVAC - **air quality** improvement, contaminant (particle / aerosol) removal, reduced virus/bacteria lifetime, TRL7 in 2025
- **Sub-project 6 Trains Attractiveness** (Interiors), 2 demos
 - Reinforce train attractiveness via on-demand comfort for users (access, lighting, thermal and acoustic comfort), TRL5-6 in 2025.
 - Reinforce the facility to adapt rolling stock interiors (like modular architecture) to support the increase of capacity of the rolling stock targeting TRL5-6 in 2025.



FP5- TRANS4M-R

100M € Total Project Cost

71 total partners

Duration: 45 months (July 2022 - March 2026)



FP5-TRANS4M-R divided into two work streams with focus on DAC development and deployment preparation



Competitive Digital Rail Freight Services: Transforming Rail Freight in Europe

Full Digital Freight Train Operation

- **Demonstration of Digital Freight Trains in 2025** with DAC Type 4 & 5 incl. Energy and Data Supply, Hybrid Coupler and automated brake test **(TRL 8)**
- Preparing further development of **Full Digital Freight Train** incl. Distributed Power, EP-Brake for further **Demonstrators** in 2027 and 2030 **(TRL 7-8)**
- Development of systems and solutions for **automated shunting operation (TRL 7)**

Total Work-Stream Costs 2022 to 2026: EUR 80m

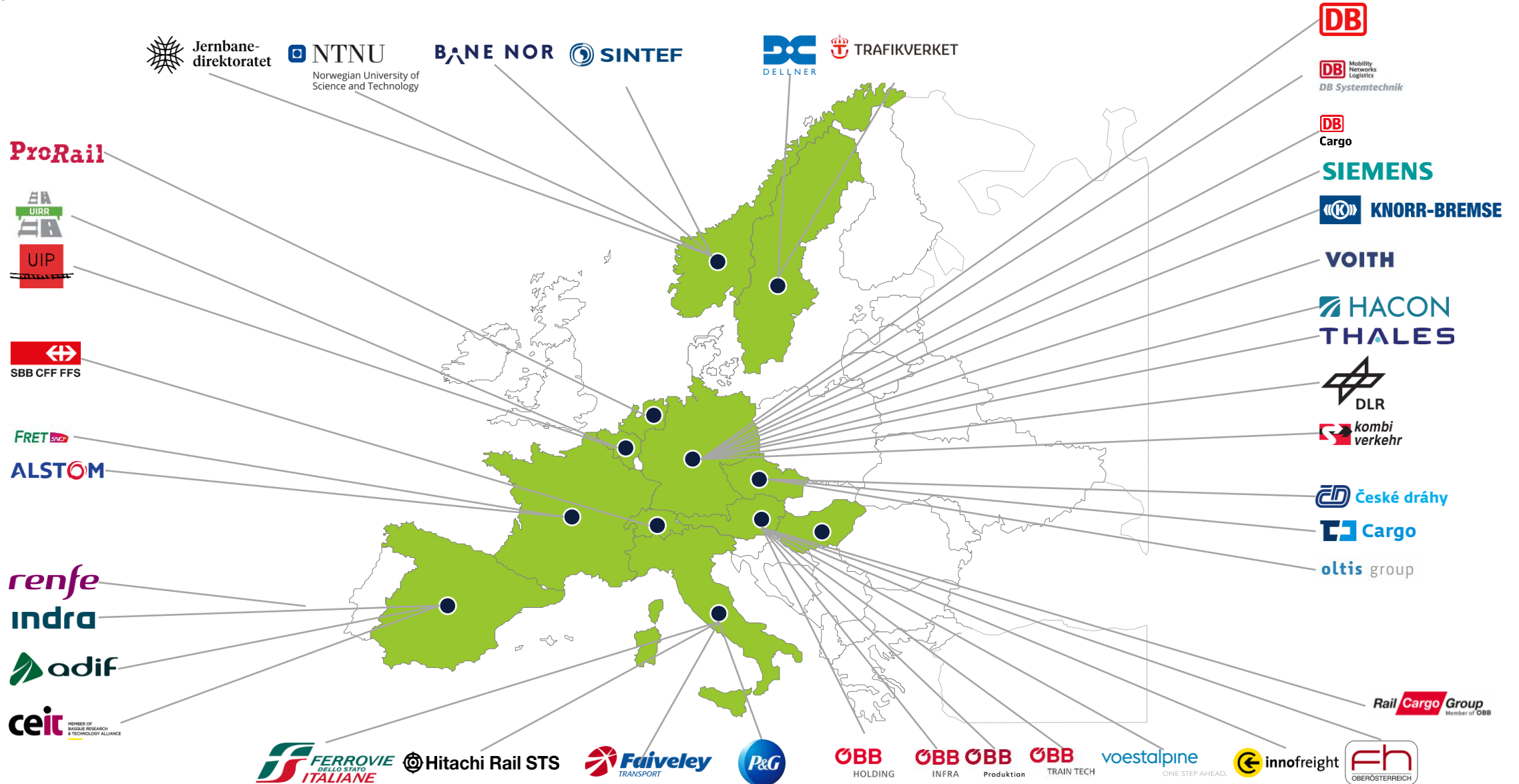
Seamless Freight

- **Real-time data management and processing** to improve cross-border timetable planning, timetable management and train path ordering **(TRL 6-8)**
- Development of **standardised railway checkpoints** to automate handover controls using e.g. sensors, videogates and handhelds **(TRL 8)**
- Development of **dynamic yard/terminal management systems (TRL 6)**

Total Work-Stream Costs 2022 to 2026: EUR 20m



FP5 brings together in total 71 partners from across Europe to transform rail freight in the next 4 years



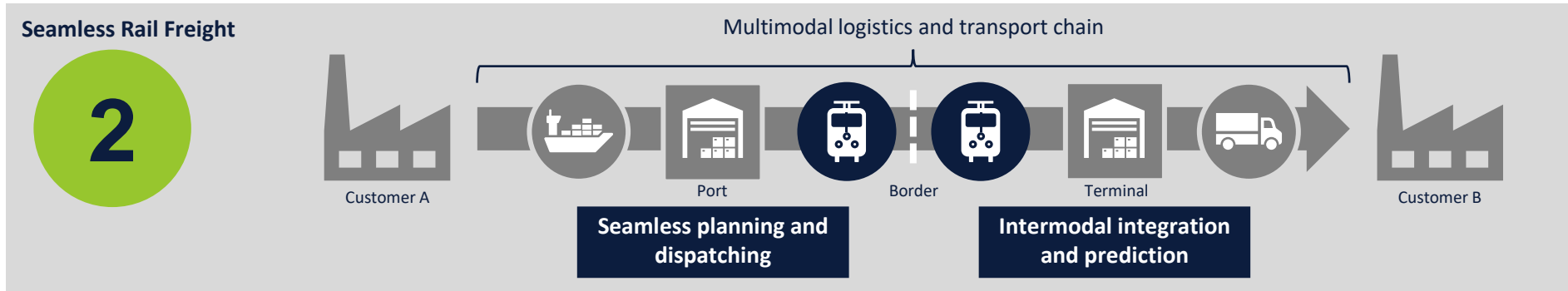


The FP5 Consortium will by 2025 at least deliver the following ambitious technological achievements

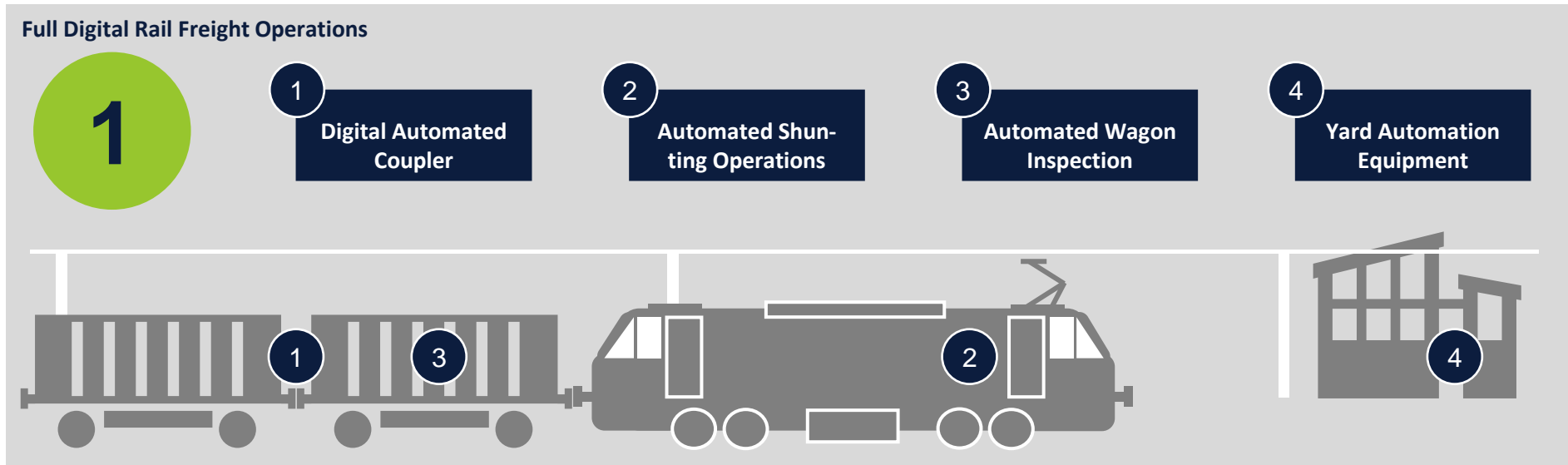
Deliver by 2025 at least the following

- Demonstrate **DAC Level 4 (functional) and level 5 ready** couplers for testing on train lab and for largescale demonstrators **(TRL 8)**
- Demonstrate locomotive **hybrid-coupler and Wagon DAC** for special wagons for testing on trains lab and largescale demonstrators **(TRL 8)**
- **Interoperable power supply and communication system** for Locomotives and wagons **(TRL 8)**
- Operational procedures and harmonization
- Train functions
 - **Train composition detection** (train inauguration) **(TRL 8)**
 - **Automated brake test** **(TRL 8)**
 - **Automatic coupling and uncoupling** (controlled from a locomotive) **(TRL 8)**
 - **Train integrity monitoring and train length determination** **(TRL 7)**
 - **Automated parking brake control function** (controlled from locomotive) **(TRL 7)**
 - **Distributed Power System – DPS** **(TRL 7)**
 - **Train brake control & monitoring** (via train network parallel; EP-Brake) **(TRL 7)**
- Consolidated **Full System Integration plan**, test concept & Validation Concept and Plan
- Authorization, safety analysis and **DAC Running Safety Assessment** Tool
- Definition of use cases and conceptual system specification for **self-propelled wagon**
- Requirements Specification **Yard Automation** for Hump Yard and Flat/Last Mile Yard
- Demonstrate **flat yard/ last mile yard automation** and management and Hump YAMS
- Provision of effective **intermodal prediction algorithms** based on AI models to **boost decision making performance** **(TRL 7)**
- Development of the functions, **tools or supporting systems ensuring a seamless planning** (end-to-end) **(TRL 6-7)**
- Harmonised **real-time interface between Railway Traffic Management System and the yard/terminal** management systems to dynamically adapt planning and tasks **(TRL 6-8)**
- Enabling improved cross-border operations through the use of **Standardised European Railway Checkpoints**, including the deployment of innovative technologies such as **Intelligent Video Gates** **(TRL 8)**
- **Integration of multimodal services for harmonised transport** planners with booking support functions **(TRL 7)**

The DAC enables European rail freight to develop a multimodal, seamless logistics and transport chain



Cluster 1 enables Cluster 2





Flagship Area 6: Regional rail services / Innovative rail services to revitalise capillary lines



FP6 - FUTURE

35M € Total Project Cost

21 total partners

Duration: 48 months (December 2022 - November 2026)

FP6 – FUTURE - Project structure

A clear project structure to achieve our goals

- 12 Work Packages – with all technical WP (WP3, WP4, WP5, WP6) linked to a demonstrator WP - to secure a solid delivery of all project results.

WP1: Project Coordination & WP12: Communication & Dissemination

WP2: Regional Rail System Solutions

- Defining the needs of regional lines and development of system architecture.
- Architecture and functional requirements for all WP and KPI achievement monitoring.

WP3 & WP8: Regional Rail CCS & Operations

- Preparatory work for ATO activities in different GoA, ETCS L3 demos, TMS demos, train positioning/integrity/length detection which will be demonstrated and tested.

WP4 & WP9: Regional Rail Assets

- Requirement specification for wayside assets (e.g., energy self-sufficient level crossings, switches), communication, connection between trackside/trackside and trackside/field devices, obstacle detection and their demonstration.

WP5 & WP10 Regional Rail Rolling Stock

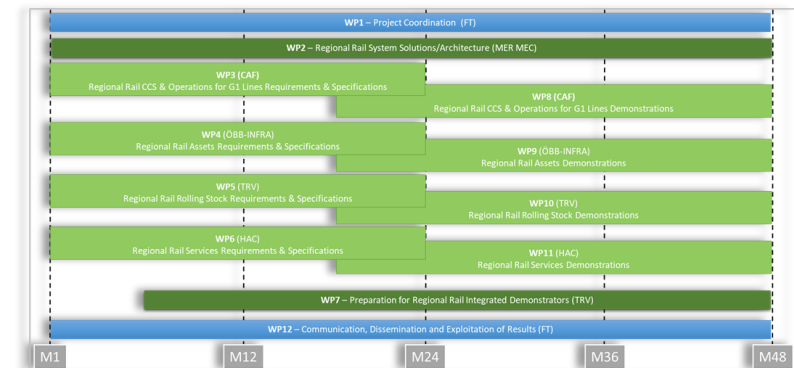
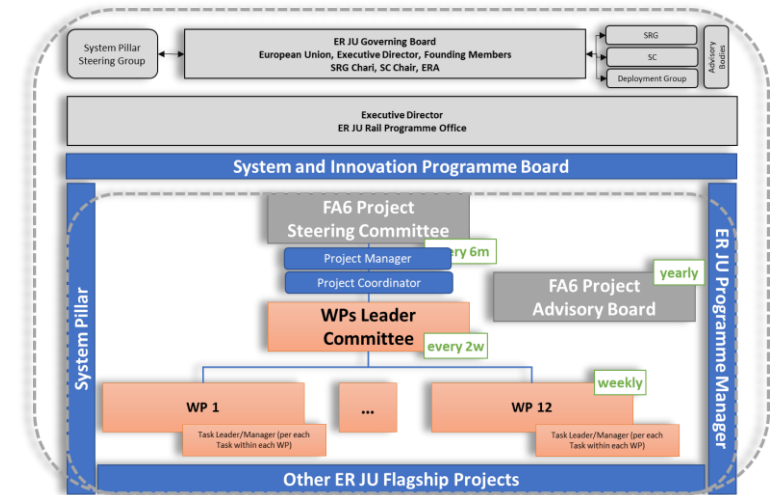
- Development of a cost efficient vehicle concept (incl. traction/propulsion) and multimodal fuelling station as well as development and demonstration of CCS technologies for G2 lines.

WP6 & WP11 Regional Rail Services

- WP6: Development and testing of multimodal travel solutions, integration of demand responsive transport services (incl. for PRM), integration of TMS and passenger information (incl. freight)

WP7: Preparation for Regional Rail Demonstrator

- Preparatory actions for demonstrations in particular for a fully integrated demonstrator under operational conditions in the following projects (e.g. mapping test sites, implementation plan)



FP6 – FUTURE - Outcomes by 2026

Regional Railway System (CCS & Operations) Demonstration

- Demonstrate a single integrated **Operations Control Center (OCC)** covering interlocking, radio blocking and traffic management for regional lines that are not functionally/operationally connected with mainline **(TRL4/5)**
- Demonstrate simple on-track radio network based on the results of the Flagship Project 2 (“R2DATO”) related with **cost effective communications**, supporting all FRMCS applications, minimizing civil works and energy consumption, to the achievement of cost-effective Gigabit Train, the use of public network coverage and compatibility with main lines **(TRL4/5)**
- Demonstrate a specific application for **Traffic Management Systems** for regional lines improving resilience of a connected rail network, optimizing train operations including disturbing events considering high/low-demand situations (disturbance and distraction) **(TRL4/5)**

Assets Demonstration

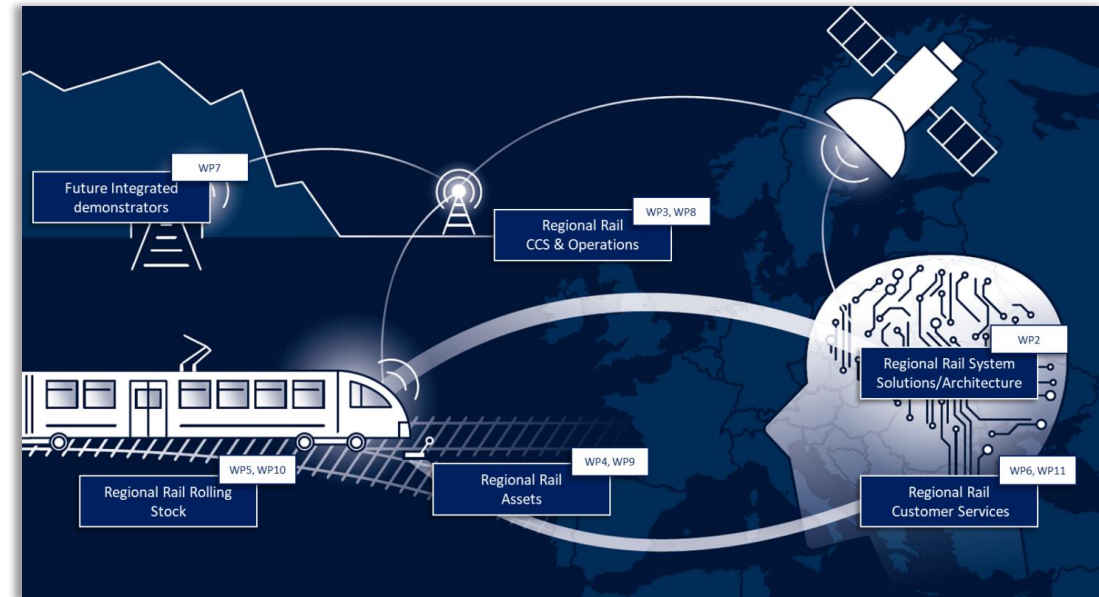
- Demonstrate a **systemic approach** with the implementation of different railway assets in particular for cost-efficient wireless, energy self-sufficient wayside components in particular CCS track-side components (e.g., switches, level crossings) and if applicable for track vacancy detections and signalling shall be evaluated and demonstrated **(TRL4/5)**

Suitable Customer Services

- Demonstrate cost-efficient integration of **on-board information of multimodal services** integrating regional multimodal services such as carsharing **(TRL4/5)**
- Demonstrate **passenger congestion rate monitoring**, flow optimization application as well as a low-cost passenger information system for regional services developed within this action **(TRL4/5)**

Integrated demonstration tests

- To ensure that solutions can be tested and demonstrated in an integrated approach, necessary work to demonstrate a fully integrated demonstrator under operational conditions – in a succeeding project call - will be carried out.



A strong consortium

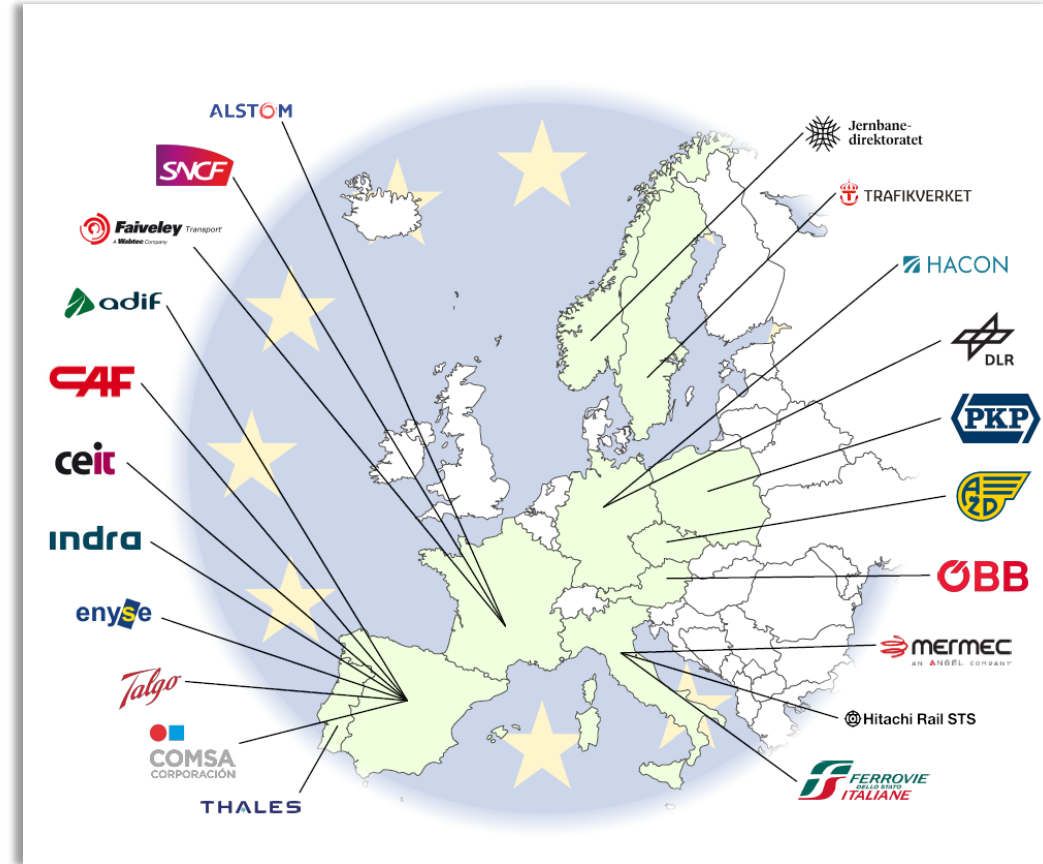
- A strong consortium with more than **20 partners**, including RU/IM and leading industry partners as well as **plus over 30 affiliated entities and subcontractors** will ensure that project results will be achieved.

Advisory Board

- A global Advisory Board with a specific focus on regional railway operator/infrastructure manager.
 - Calea Ferata din Moldova (CFM, Moldova), Canadian Urban Transit Research & Innovation Consortium (CUTRIC, Canada), Ceske Drah (Czech Republic), Destination Sälen (Sweden), GYSEV – Raaberbahn (Hungary), Hilfsgemeinschaft der Blinden und Sehschwachen Österreichs (Austria), Lithuanian Railway (LTG, Lithuania), Magyar Allamvasutak (MAV, Hungary), Niederösterreich Bahnen (Austria), Sälen Municipality (Sweden), Slovenske Zelenice (Slovenia), Steiermarkbahn und Bus GmbH (Austria), Transport for New South Wales (Australia), Zeleznicna spolocnost' Slovensko, a. s. (ZSSK, Slovakia), Zeljenice Republike, Srpske a.d. Doboj (Bosnia and Herzegovina), Zeljeznicki prevoz Crne Gore (ZPCG, Montenegro)

Regional railway operator/infrastructure manager, R&D institution and or regions with interest in solutions for the regional rail system are invited to

Join the Advisory Board with a Letter of Support!



EUROPE'S RAIL CALL 2022-2

DESTINATION 7

Innovation on new approaches for guided transport modes

DESTINATION 7 – Innovation on new approaches for guided transport modes

HORIZON-ER-JU-2022-FA7-01: CONCEPTUAL DEVELOPMENT OF AUTOMATED MULTI-MODAL MOBILITY-SYSTEMS (“MOVING INFRASTRUCTURES”)

- WS1: Identification of Use Cases, Business Cases / CBA, operational concept
- WS2: “Moving infrastructure” vessel and the operation system
- WS3: “Moving infrastructure” carrier incl. locking system and handling system

HORIZON-ER-JU-2022-FA7-02: TECHNOLOGICAL DEVELOPMENT OF MAGLEV DERIVED SYSTEMS

- WS1: Technical definitions
- WS2: Development of business case analysis, including feasibility studies and use cases

HORIZON-ER-JU-2022-FA7-03: HYPERLOOP INDUSTRIAL ROADMAP AND PILOTS

- WS1: Industrial Roadmap, including business case, in parallel to the regulatory framework run by the European Commission
- WS2: Pave the way to proof of concept

EUROPE'S RAIL CALL 2022-2

DESTINATION 8

Exploratory Research and other activities



EU-Rail Call 2022-2

DESTINATION 8 – Exploratory Research and other activities

HORIZON-ER-JU-2022-EXPLR-01: NEW RAILWAY STATION CONCEPT FOR GREEN AND SOCIALLY INCLUSIVE SMART CITIES

HORIZON-ER-JU-2022-EXPLR-02: BRIDGE DYNAMICS

HORIZON-ER-JU-2022-EXPLR-03: STANDARDISED OFFER/CONTRACT MANAGEMENT FOR AGILE ACCESS TO RAIL FREIGHT AND MULTIMODAL SERVICES IN EU

HORIZON-ER-JU-2022-EXPLR-04: BUILDING A COMMUNITY OF SCIENTIFIC RESEARCH AND ENABLING A NETWORK OF PHD (ACADEMIA TEAMING WITH INDUSTRY)

HORIZON-ER-JU-2022-EXPLR-05: DIGITALISATION AND AUTOMATION ENABLING NEW RAILWAY SERVICES FOR PASSENGERS AND FREIGHT

HORIZON-ER-JU-2022-EXPLR-06: EUROPEAN VALUE CHAINS FOR RAIL SUPPLY

HORIZON-ER-JU-2022-EXPLR-07: DAC MIGRATION ROADMAP TOWARDS DEPLOYMENT

EUROPE'S RAIL CALL 2023

Coming soon



Thanks!



<https://rail-research.europa.eu>