

# Transforming Europe's Rail System

Moving European Railways Forward

Source: *Sector High Level Paper*

July 2020

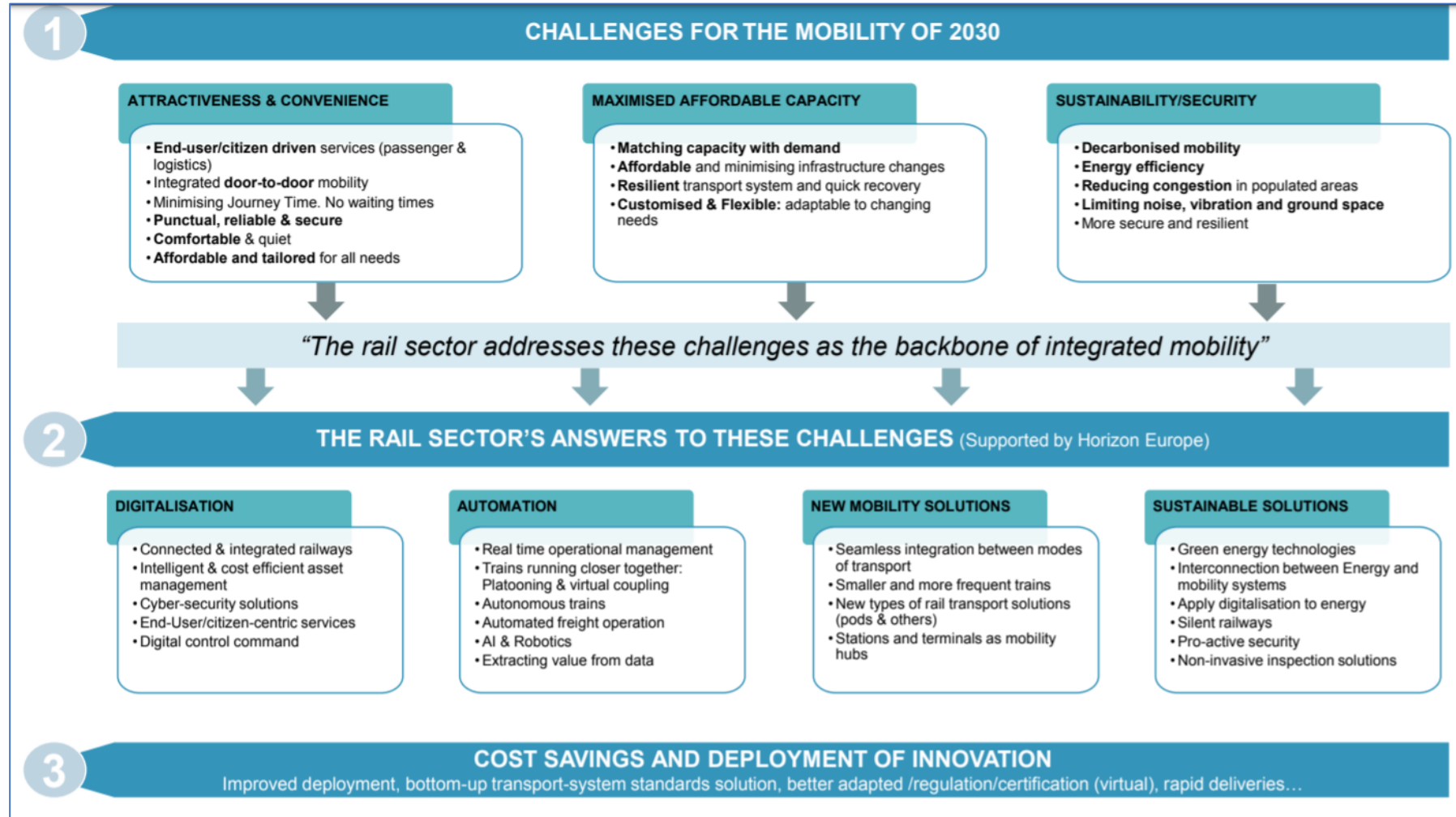
# Background

**The European Commission requested this High Level Paper to:**

- UNIFE / CER (with the technical support of UIC) / EIM / UITP / EURNEX / ERRAC
- S2R, other than the Union, Founding Members

**S2R JU identified as coordinator and in supporting role**

# Context & Problem Definition: ERRAC



# Common Vision, Objectives & Expected Impacts



## European Green Deal:

*decarbonisation through sustainable and smart mobility*

EU policy priorities

A Europe fit for the digital age:  
Shaping Europe's Digital Future

An economy that works for people:  
New Industrial Strategy

Europe in the world

EU rail policy objectives

SERA:  
interoperability +  
safety+ connectivity

Guaranteed  
interconnected urban  
mobility driven by  
citizens'

Passenger focused  
Customer experience,  
accessible mobility

Rail freight improved  
performance and  
competitiveness

Faster modernisation of  
the rail industry  
including deployment

iPPP  
general  
objectives

Integrated European transport  
networks

Urban      SERA

Deliver multimodality

Connected and automated door  
to door mobility for citizens and  
freight users

Delivering European rail  
industry competitiveness

Bridge the innovation "valley of  
death" through coordinating  
live, large-scale demos

iPPP  
specific  
objectives

Deliver a European  
Traffic Management  
Layer that would  
cover the specific  
needs of mainline  
and urban  
services/operations

Competitive green  
rail freight fully  
integrated into  
logistic chain

Achieve mobility on  
Demand

Deliver a  
sustainable, safe  
and resilient rail  
system

Bring into market  
new land guided  
transport solutions

# Necessity for a European Partnership



Rail is a complex system of systems to deliver value to its customers, in terms of mobility and transport services. Mobility and transport solutions of the Green Deal rely on a rail system capable to meet the urgent needs of decarbonisation answering them together with other modes, delivering societal cohesion, integrating socio-economic developments with a systemic, smart and sustainable concept of operations. A new Rail R&I European Partnership Art. 187 TFEU is the strategic pillar to transform the rail system. Only through forward looking cutting edge, integrated and systemic research and innovation, it will be possible to tackle the complexities of rail and maximize the benefits of the R&I investment.

## Requirements :

- Need to gather **diverse expertise** to bring innovation to the rail system
- **Long-term commitment of actors** involved on the basis of risk sharing and regulatory stability needs to be guaranteed
  - **Contribution to policy design and standardisation**
  - **Efficient cooperation** with other transport modes
- **Synergies with other European and/or National Programmes**

# Rail R&I iEP General Objectives 2031



## Delivering Integrated European Rail Networks

To deliver the Single European Railway Area bringing to the market **an integrated, sustainable and digital rail system of systems**, for the **high-speed network, freight and commuter lines**, integrating regional lines for the robustness and resilience of corridors operations

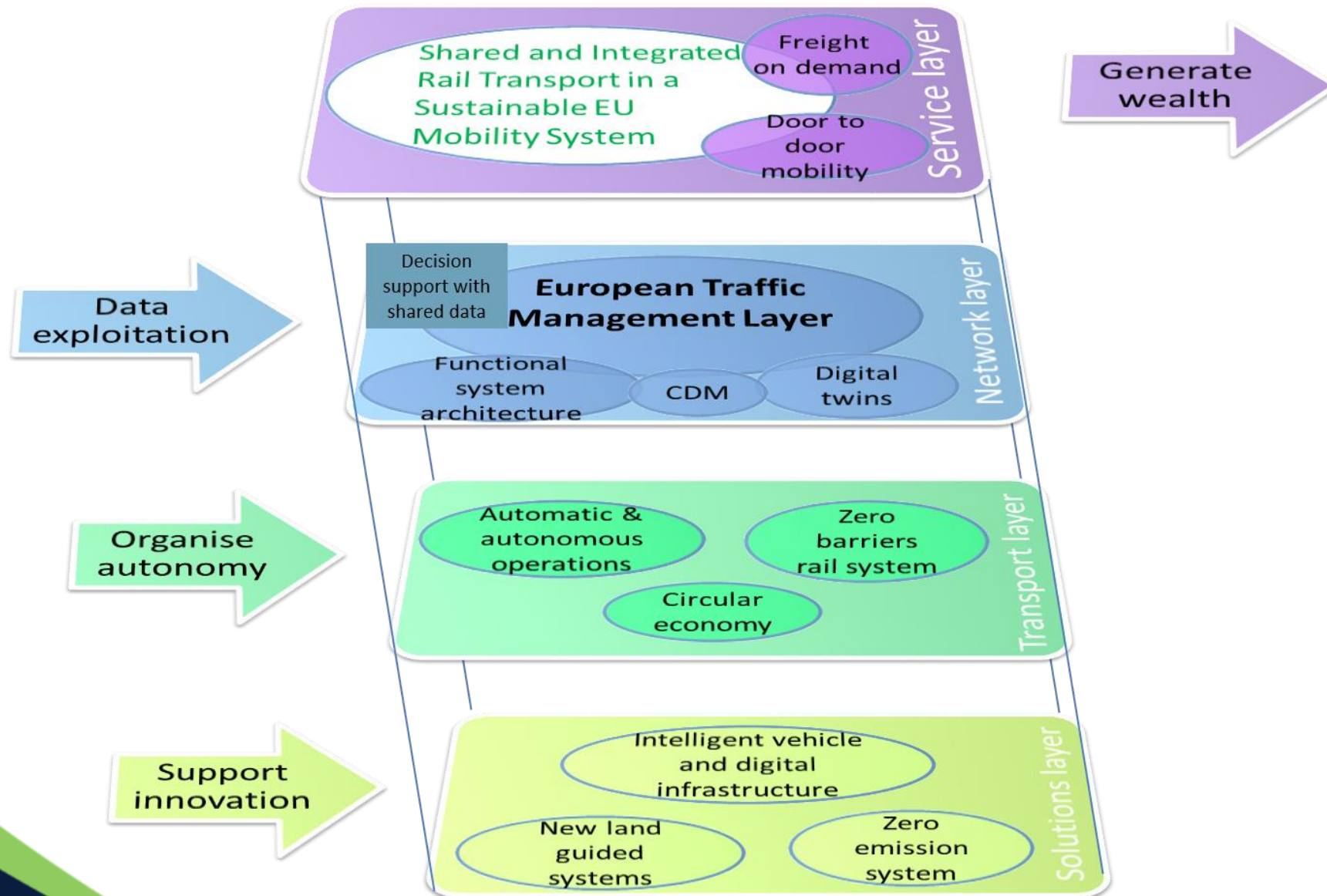
## Delivering multimodality

To deliver, upon the Green Deal ambition on an automated and connected multimodal mobility, **“door-to-door mobility” and “on-demand door-to-door mobility”** through the **introduction of digital technologies, technological and operational solutions** that would maximize the performance of urban rail transport, looking for synergies, and where needed integration, with rail mainlines services and other transport systems

## Delivering European rail industry competitiveness

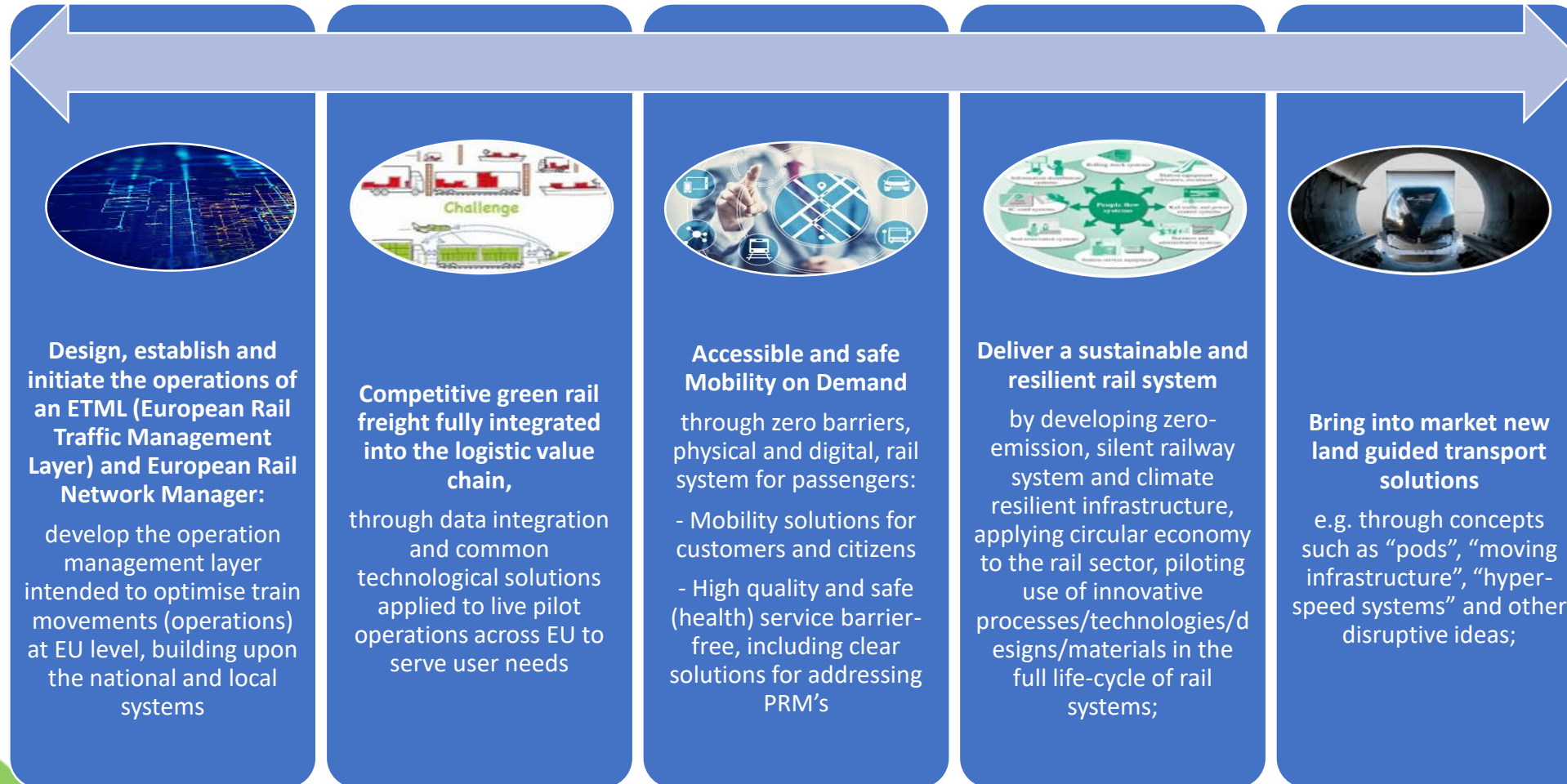
To deliver through R&I excellence in tackling socio-economic challenges and ability *“to demonstrate their impact in real life conditions,”* and *“the support to large-scale deployment innovations is instrumental to market uptake.”*

# Vision of the architectural layers for future system evolution





# Rail R&I iEP Specific Objectives 2031





# Rail R&I iEP funding EUR 1.5 bln (*request*)



## Exploratory and Fundamental Research

integrating the research community, innovators/start-ups and other R&I institutions to work together with the rail sector to explore and generate new ideas

EUR 200 million

## Applied Research and Innovation

wanted market solutions will be pushed to move towards market deployment or terminated because not progressing as expected

EUR 800 million

## R&I Large Scale Operational Demos

Integrated R&I activities to show the possible benefits that would come from the future European deployment of new solutions

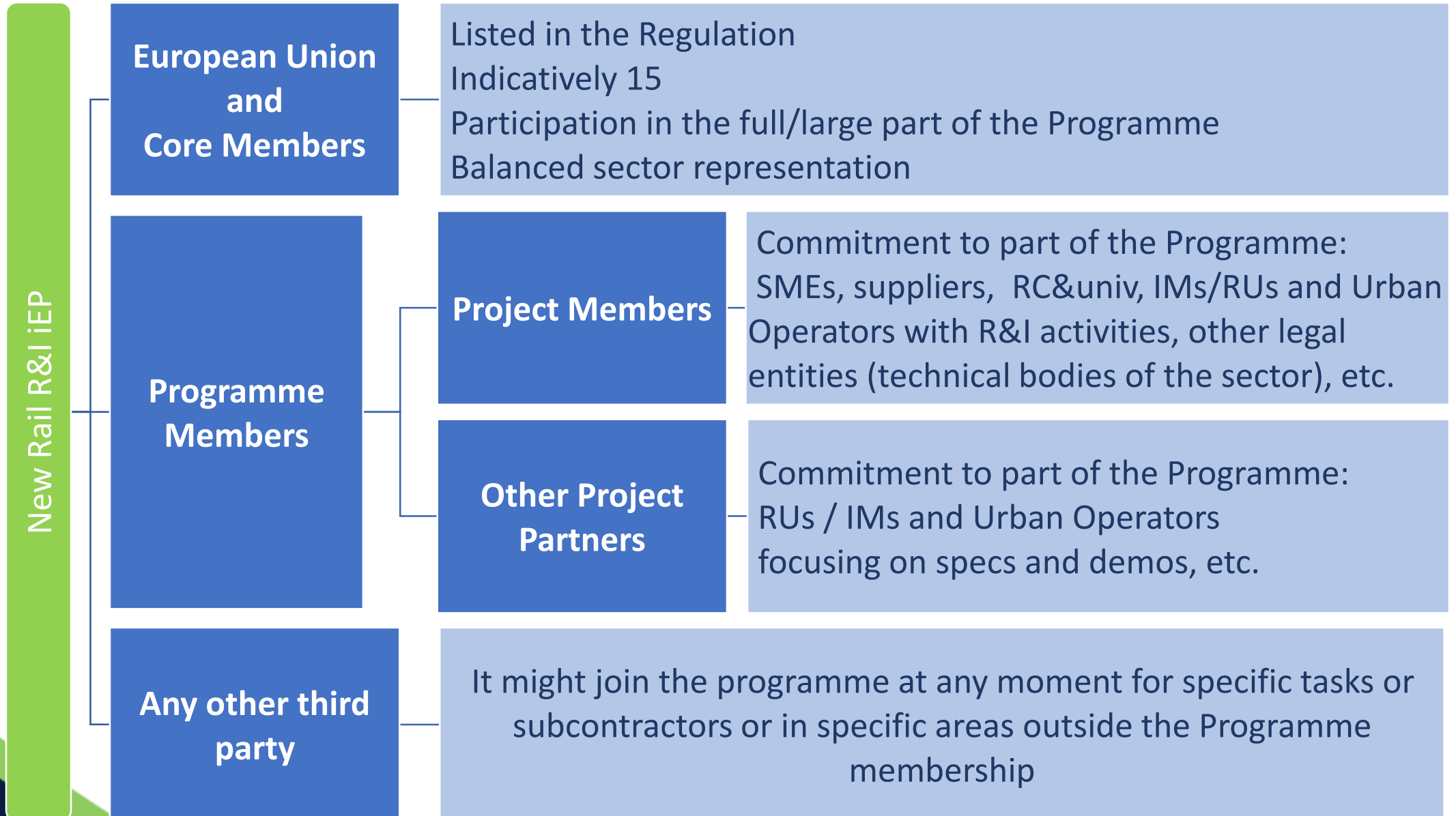
EUR 500 million

A R&I Programme estimated at EUR 2.5 ~ 3.0 bln

# Target Groups & Stakeholders

- The operating community
- Manufacturers of rail systems
- Start ups
- The scientific community
- Freight forwarders and logistic providers
- Passengers
- Representatives of rail staff
- National Supervisory Authorities
- ERA
- EU standardisation bodies
- Sector Associations

# Partners' Composition



- **Members:** The overall investment made by the core members, in terms of Total Project Costs established in according with their usual accounting standards, is expected to be funded by the new Rail iEP at 50%.
- **Programme Members** in the forms of Project Members committed to performing some part of the Programme activities or Projects or different cycles of R&I. The model should be similar to the one for the core members, but with a lighter administrative process, with a **funding rate at 50%**.
- **Programme Members in the form of Other Project Participants** will contribute to the definition of specifications and possibly testing the overall results; the **funding rate might differentiate compared to the activities to be performed**.
- **Other Third Parties** will be subject to the H.E. funding rates for RIA or IA or CSA, mostly involved in lower TRLs or possibly in the highest ones.
- **Financial contributions** – beyond the net internal contributions to be provided by the different categories of members, it is expected that they would get involved with cash contributions to the running costs of the new Rail iEP based on the value of their net contributions, in a % estimated between 3 and 5%.

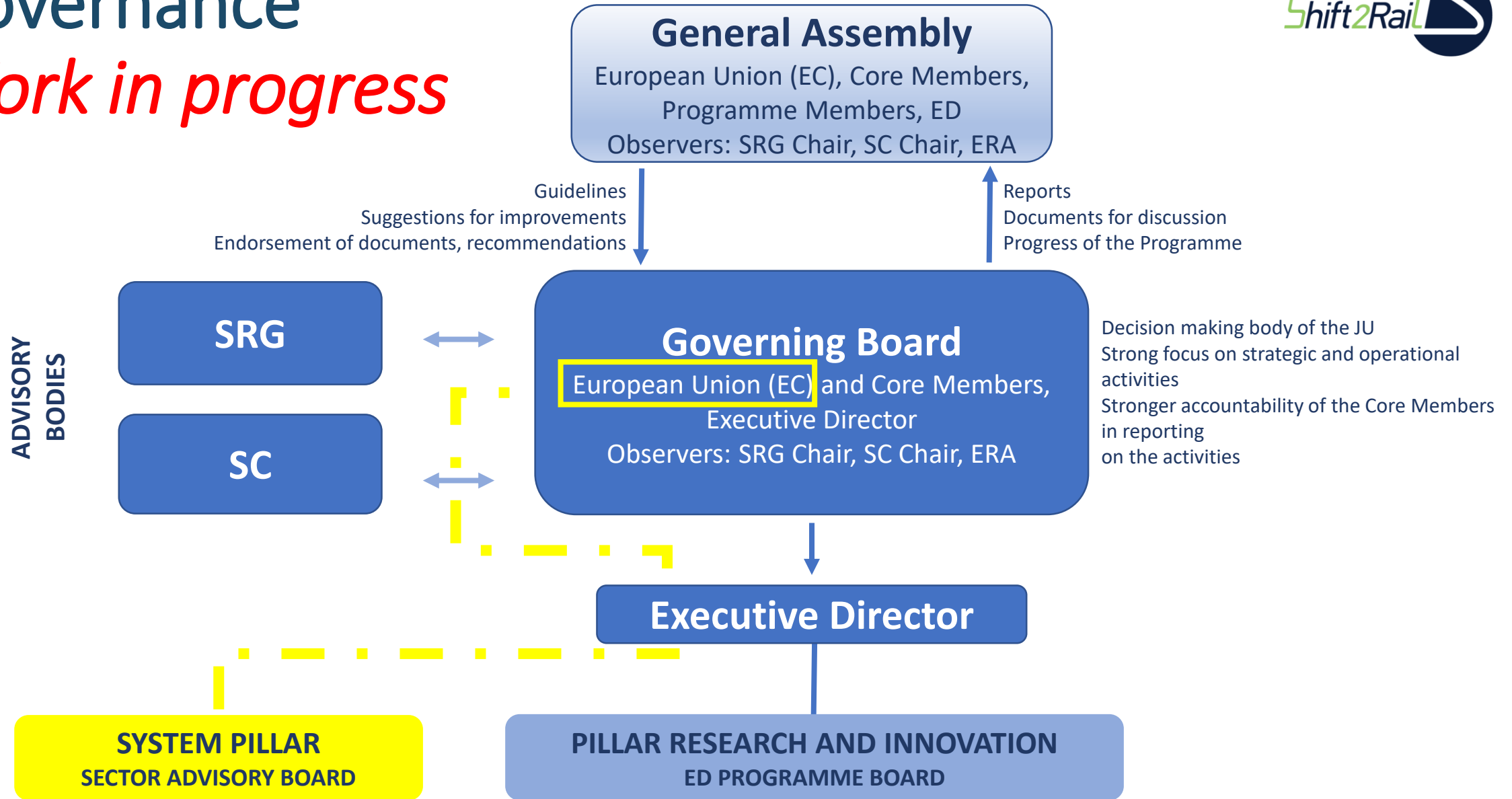
# Governance: Lessons Learned from S2R JU



- **Clear distinction of competences**, to ensure the most appropriate delivery oriented approach and propose attractive ways to join the R&I work;
- **Transparent, simplified governance structure**: simple regulatory framework, to give the Governing Board the possibility to clarify the approach for programme implementation;
- **Emphasize commitment over representation**: incentivize the weight of SMEs and start-ups from across Europe;
- **An effective and efficient decision-making process** towards delivering an ambition Programme and,
- **To take on board the programme members with a key role in defining the specifications and requirements of future rail systems**, including urban, such as operators and infrastructure managers.

# Governance

*Work in progress*



**EUROPEAN COMMISSION (DG MOVE)**

- Legislate (Interoperability/Safety Directives)
  - Strategic guidance on overall vision
  - Follow-up and monitoring
- Mandates for TSI change and standardisation requests

**RU & IM**

- Needs
- Requirements, Specs
- Operations
- Services
- Etc.

**Suppliers**

- Design
- Development
- Systems
- Etc.

**Others****S2R JU & Successor**

Single coordinating Body for the sector to converge on the operational concept, the functional system architecture, and associated specifications and standards to fulfil the overall vision

Manages all EU funded Rail R&I

- operational concept
- functional system architecture, and associated ...
- migration plans, pipeline of the future regulatory framework or standard, if and when necessary

- specifications and standards
- operational and technological solutions
- ....

**ERA**

Act as System Authority  
Deploy appropriate working parties

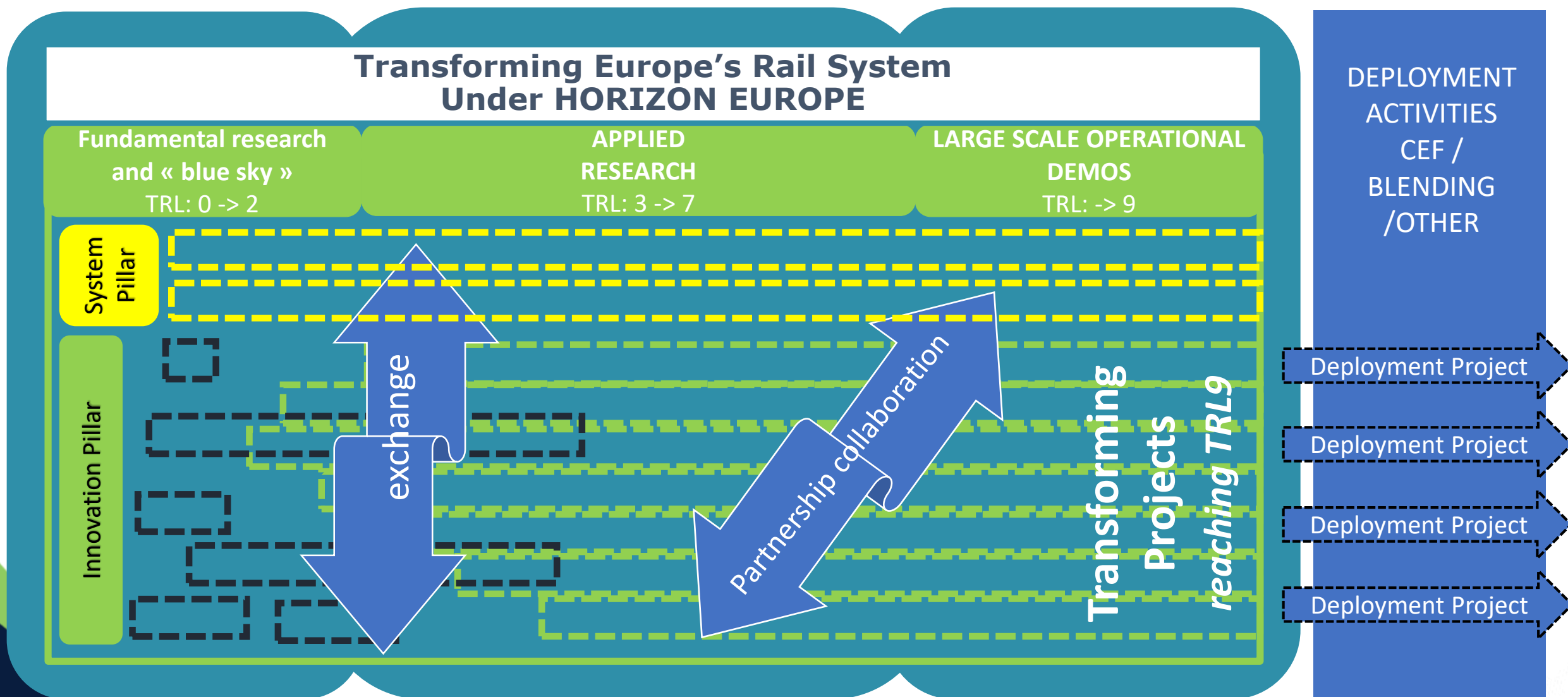
- assessment of S2R results
- additional specifications to be harmonised at European level
- TSI OPE
- harmonization of operational rules

- Specific needs in standardisation, studies, validations or tools identified as necessary
- **Evolutive maintenance**

*Work in progress*



# An integrated Programme for a complex system



# Transforming Europe's Rail System



- Integrated EU rail networks
- Door to door mobility for freight/passengers
- Innovation in the market

S2R Master Plan

S2R MAAP

S2R R&I implementation

Part A: Capabilities  
Part B: Technological Demonstrators per IP

S2R Projects xx  
sub-systems  
architectures (TD or  
ITD) and IT models

S2R IPX, Linx4Rail

Railway Functional System Architecture  
& Conceptual Data Model

Operational  
vision

Interoperability &  
modularity vision

Individual stakeholders  
or other sectors external  
initiatives

## System Pillar

Operational concepts

Migration plans

**A single coordinating body for the whole  
sector evolution**

**Functional System of systems Architecture**

Open interfaces to  
other transport  
modes & businesses

System  
requirement  
specifications

## Innovation Pillar

Operational solutions for  
the services of the future

Integrating project for a  
shared Rail Transport EU  
Mobility System

European Rail Traffic  
Management Layer

TSIs and/or standards  
pre-development

Transforming Projects  
(sub-system R&I  
implementations)

&  
Large scale operational  
demonstrations

# R&I Programme: the System Integrating Project



- overarching the overall R&I activities, its interdependencies and future interfaces
- ensuring:
  - the definition of the new rail system in a seamless continuous transport service, achieving a *Reference Functional Rail System Architecture*:
    - for all the involved functional or technical subsystems (rolling stock, infrastructure, energy, CCS systems), their elements and their interactions
    - open interfaces to other transport modes and businesses providing connected IT services for their clients (for both Passenger and Freight segments)
  - accelerate interoperability and modularity while interacting on the operational rules' changes towards a “one European vision”
  - the integration of the transforming projects and their interdependencies to ensure a maximization of the benefits

# R&I Programme: the Transforming Projects



- ETML (European Rail Traffic Management Layer) and European Rail Network Manager
- Automated and/or autonomous and/or remotely piloted operations
- Railways Digital Twin, Simulation and Virtualisation
- Smart Asset Management and Maintenance of the Future
- Smart integration for door-to-door mobility
- Emerging Transport Models and Systems (Moving Infrastructure System (pods)/MaaS, hyper speed systems)
- Environmentally Friendly and Attractive Sustainable Mobility
- Rail as the backbone of a green freight logistic chain
- Network management planning and control
- Socio-economic area
- Safe and healthy mass transportation area

## Founding Members



## Associate Members



### Virtual Vehicle Austria Consortium (VVAC+)



### European Rail Operating community Consortium (EUROC)



### Swi'Tracken Consortium



### Smart DeMain(SDM) Consortium



### AERFITEC



### Competitive Freight Wagon Consortium(CFW)



### Smart Rail Control (SmartRaCon) consortium

