# TRANSVERSAL EXPLORATORY RESEARCH ACTIVITIES FOR RAILWAY
# TER4RAIL PROJECT

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**EURNEX, European Rail Research Network of Excellence**
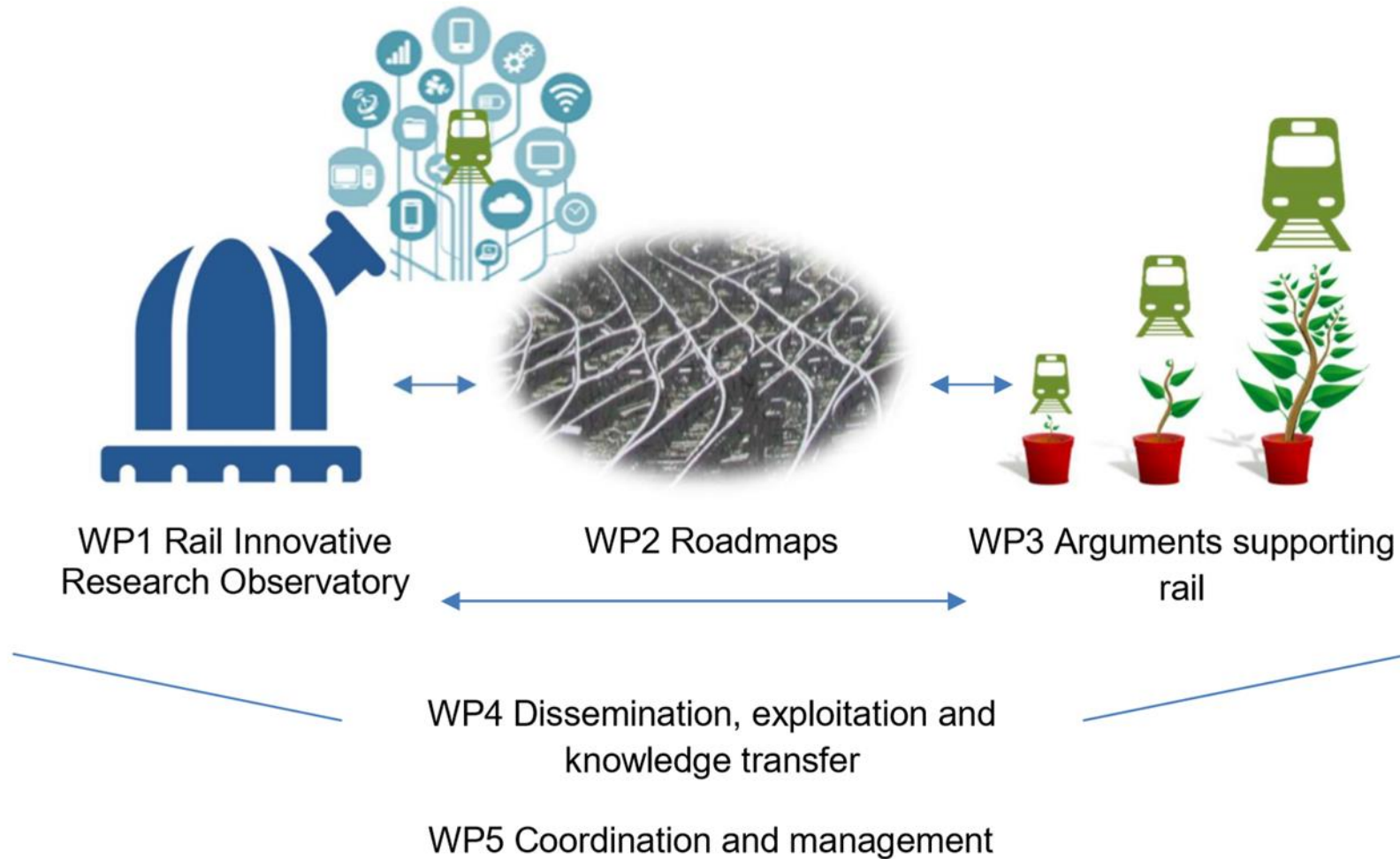
# TER4RAIL PROJECT
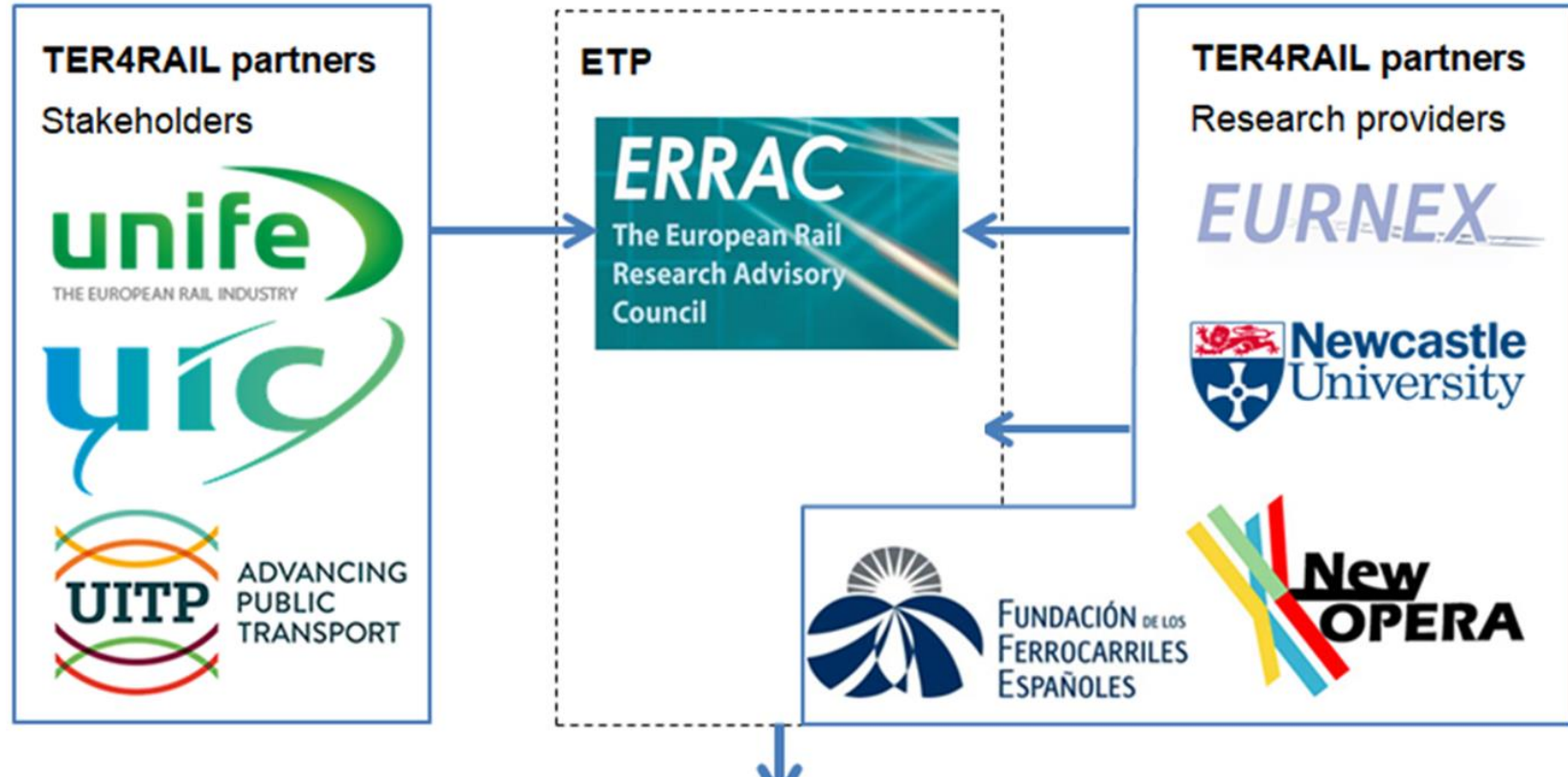


2 Years
500k€

# PROJECT STRUCTURE



WP1 Rail Innovative Research Observatory

WP2 Roadmaps

WP3 Arguments supporting rail

WP4 Dissemination, exploitation and knowledge transfer

WP5 Coordination and management

# WP1 – RAIL INNOVATIVE RESEARCH OBSERVATORY

**Objective:**

➢ Identify, monitor, and facilitate the analysis of new **opportunities emerging from the rail sector and other sectors** for a **more successful rail research**.

➢ **Stimulate the transfer of knowledge** within and outside the sector.

➢ Structure interactions and **stimulate networking, cross-fertilisation, common collaboration and the kick-starting of new ideas.**

### INSIDE THE RAILWAY SECTOR

**STRATEGIC DOCUMENTS**

*Analysis of 28 key documents*

**RAIL STAKEHOLDERS**

*Survey: 115 responses; 46 completed*

**PROJECTS**

*Identification Rail-related projects: 224 H2020; 381 National – 6 countries*

### OUTSIDE THE RAILWAY SECTOR

**URBAN SCENARIOS 2050**

*Workshop + expert view + analysis*

**IDENTIFICATION OF NON-RAIL ACTORS**

*10 factsheets; 8 technology mappings*

**INTERACTING, SHARING EXPERIENCES & CROSS-FERTILISATION**

ERRAC
The European Rail
Research Advisory
Council

Shift2Rail

# WP1 INSIDE RAIL: DOCUMENTS, STAKEHOLDERS & PROJECTS

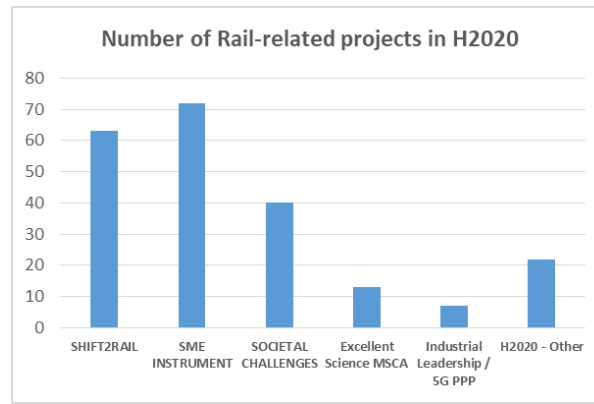Analysis of **28 key strategic and policy documents**

**Survey to rail stakeholders** (115 responses, 46 complete) & questionnaire to associations

- Existing cooperation with other sectors
- Source of R&D public funding
- Collaboration between different actors
- Identification of innovations
- Shift2Rail as a good instrument

## Identification of **Rail-related Projects**

**HORIZON 2020**

(224 Projects)

### Number of Rail-related projects in H2020

| Category | Number |
| --- | --- |
| SHIFT2RAIL | 63 |
| SME INSTRUMENT | 72 |
| SOCIETAL CHALLENGES | 40 |
| Excellent Science MSCA | 13 |
| Industrial Leadership / 5G PPP | 7 |
| H2020 - Other | 22 |

## At National Level

381 Projects, 6 European Countries

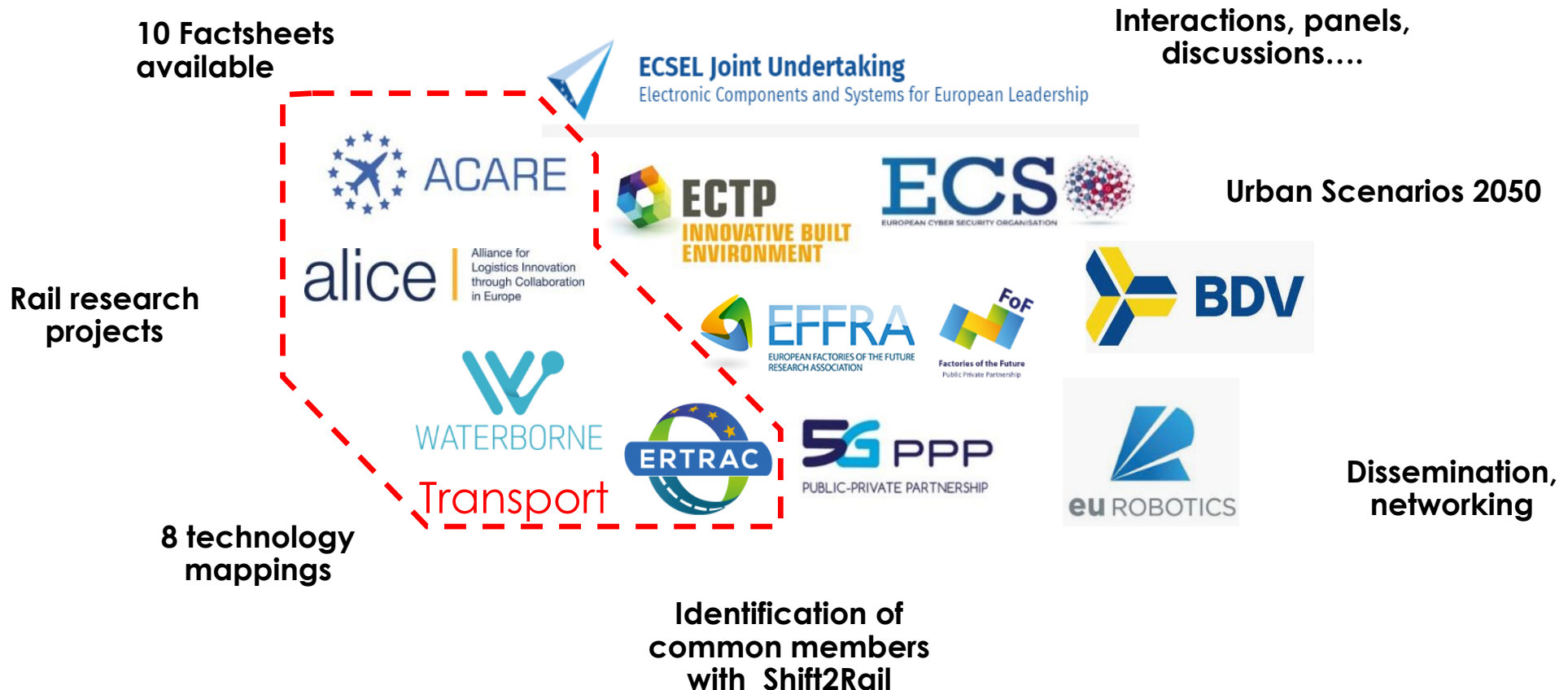| Country | Projects |
| --- | --- |
| AUSTRIA | 87 Projects |
| PORTUGAL | 31 Projects |
| BELGIUM | 1 Project |
| SPAIN | 136 Projects |
| CZECH REPUBLIC | 8 Projects |
| UNITED KINGDOM | 118 Projects |

# WP1 OUTSIDE RAIL: IDENTIFICATION AND KNOWLEDGE EXCHANGE WITH NON-RAIL ACTORS

Analysis of European Technology Platforms & Public-Private Partnerships



10 Factsheets available

Interactions, panels, discussions….

Urban Scenarios 2050

Rail research projects

Transport

Dissemination, networking

8 technology mappings

Identification of common members with Shift2Rail

# WP1 OUTSIDE RAIL: IDENTIFICATION AND KNOWLEDGE EXCHANGE WITH NON-RAIL ACTORS

ETPs /PPPs with ocassional contact with the railway sector, but including it – directly or indirectly- among their scope.

| | 5GPPP | ALICE | ECSEL | ECS | ECTP | ERTRAC | FoF | SPARC |
|---|---|---|---|---|---|---|---|---|
| Railways explicitly mentioned at key documents | | | | | | | | |
| Rail related projects already in place | 7 | | 6 | | | | 3 | 2 |
| Possibility of participation of railways stakeholders through already stablished structures inside the PPP/JU | Vertical Engagement Task Force (Transport) | | | WG3 Sectoral Demand (Transportation) | Infrastructure and Mobility Committee | | | Topic Group on Logistics and Transport |
| Common members with S2R | 7 | 3 | 10 | 7 | 8 | 2 | 4 | 7 |

| | | Construction | Electronic components | 5G | Cybersecurity | Robotics | Road Transport | Manufactoring | Logistics |
|---|---|---|---|---|---|---|---|---|---|
| **RAILWAY INNOVATION CAPABILITIES** | | ECTP | ECSEL | 5G PPP | ECSO | SPARC | ERTRAC | FoF | ALICE |
| 1 | Automated train operation | | ✔ | ✔ | ✔ | | | | |
| 2 | Mobility as a Service | | | ✔ | ✔ | | ✔ | | |
| 3 | Logistics on demand | | | | ✔ | ✔ | ✔ | | ✔ |
| 4 | More value from data | | | ✔ | ✔ | | | | ✔ |
| 5 | Optimum energy use | | ✔ | | ✔ | | | ✔ | |
| 6 | Service timed to the second | | ✔ | ✔ | ✔ | | | | |
| 7 | Low cost railway | ✔ | | | ✔ | ✔ | | ✔ | |
| 8 | Guaranteed asset health and availability | ✔ | ✔ | | ✔ | ✔ | | | |
| 9 | Intelligent trains | | ✔ | ✔ | ✔ | | | ✔ | |
| 10 | Stations and "smart" city mobility | ✔ | | ✔ | ✔ | | ✔ | | |
| 11 | Environmental and social sustainability | ✔ | | | | | | ✔ | |
| 12 | Rapid and reliable R&D delivery | | | | | | | | |

- Vertical engagement activity / key applications / sector reports → include transport or mobility

- Projects with direct application to railways

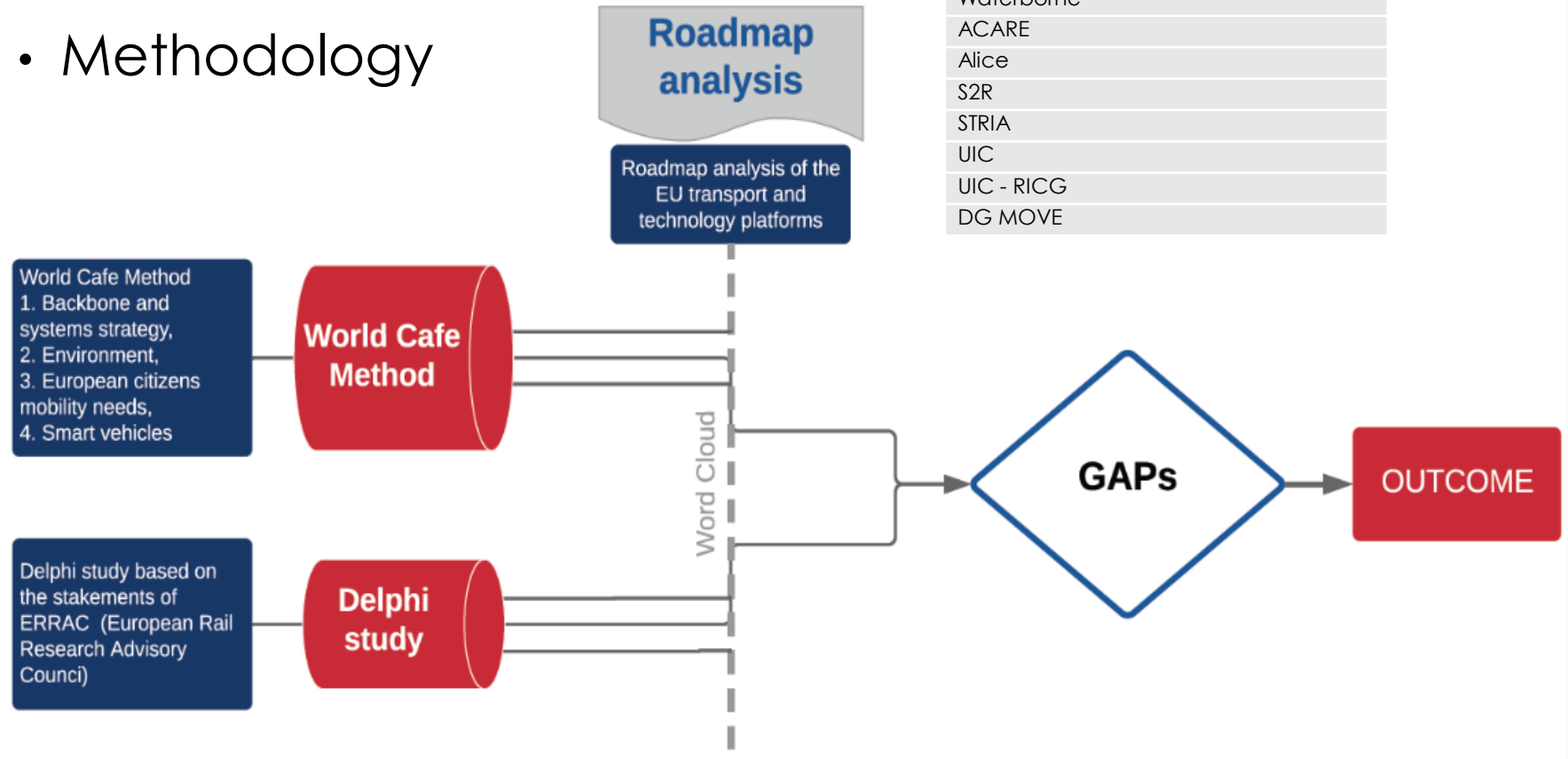- Workgroups open to end users / stakeholders

# WP1 CONCLUSIONS

- Rail Innovative Research Observatory provides **complementary knowledge of Rail R&D status, evolution and vision**

- Excellent exercise to map the rail related work developed by other sectors and their relation/influence with the railway sector → **Stimulates networking, contributes to the transfer of knowledge and cross-fertilisation.**

- TER4RAIL only provided a baseline. There is a need of more resources to broad the exercise to more sectors and programmes- → Specially relevant for **Horizon Europe** – Cluster 5: Climate, energy and mobility

→Need of a clear plan on how to **structure and support synergies** identified by ERRAC Strategic Research and Innovation Agenda

→**Strategic evaluation** of T4R mapping activities: What information is useful? For whom? In which format? Are there activities that should be adopted by ERRAC?

# WP2 ROADMAPS

• Methodology

| |
|---|
| ERRAC |
| ERTRAC |
| ERTRAC, EPoSS and ETIP SNET |
| Waterborne |
| ACARE |
| Alice |
| S2R |
| STRIA |
| UIC |
| UIC - RICG |
| DG MOVE |

# WP2 ROADMAPS

- The analysed roadmaps have major shortcomings and gaps in:

  ✓ Adapting citizen's needs, user acceptation and integration of railways;

  ✓ The influence of short-term policy on transport developments over the long term;

  ✓ An absent multi-modal mind-set in all transport sectors towards the integration of railways; and

  ✓ The need for tailored and on-demand mobility in railways.

# WP2 ROADMAPS

- The analysed roadmaps have major alignments in:

  ✓ • Cross-sectoral and cross-disciplinary research,

  ✓ • information management systems,

  ✓ • physical transport network,

  ✓ • safety and (cyber)security,
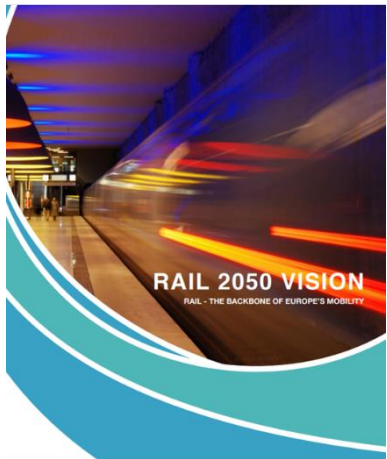
  ✓ • digitalization and interconnecting rail network.
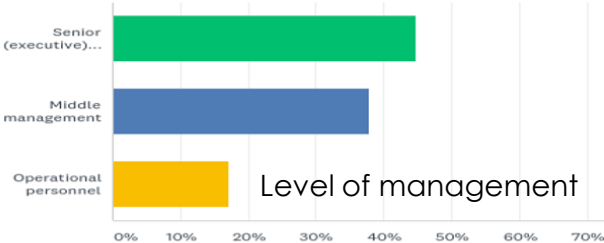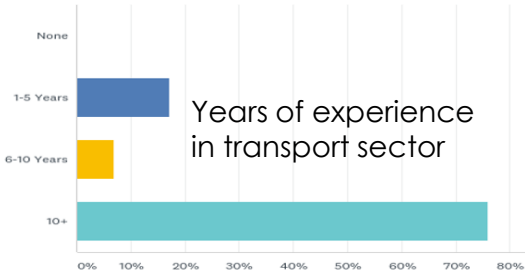
# WP2 DELPHI RESULTS

| Agree | Synthetised Statement |
|---|---|
| 96.30% | In 2050 importance of cost in railways |
| 92.59% | In 2050 rail still in timetables, no tailor-made journeys |
| 88.89% | In 2050 European rail stakeholders sharing data to participate in data economies |
| 87.72% | In 2050 rail freight units communicate with each other |
| 85.96% | In 2050 rail users have internet access |
| 84.21% | In 2050 rail is the backbone of urban mobility |
| 84.21% | In 2050 rail sector is fully into the economy of data |
| 84.21% | In 2050 rail still the safest mode with zero casualties |
| 81.48% | In 2050 non english speakers have easy acces to mobility services in EU |
| 78.95% | In 2050 rail is the backbone of long distance mobility |
| 77.78% | In 2050 still need of capital investment for railways |
| 77.19% | In 2050 autonomous and intelligent rail vehicles operate in European railway network |
| 74.07% | In 2050 asiatics (led by China) are leaders of railway products and services |
| 73.68% | In 2050 rail is core part of city planning |
| 73.68% | In 2050 stations are energy efficient and easy accesible providen interchange across modes |
| 73.68% | In 2050 rail is fully integrated with logistics multimodal chains being its backbone |
| 71.93% | In 2050 rail sector handles cyber-secruity threats in cooperation with other sectors |
| 70.37% | In 2050 people feel safe in rail services |
| 66.67% | In 2050 rail responds to individual demands delivering tailor made solutions of mobility in cooperation with other modes |
| 63.16% | In 2050 rail vehicles are aware of themselves and can adjust journeys to meet demand |
| 62.96% | In 2050 rail still very vulnerable to terrorism |
| 55.56% | In 2050 still a fragmented EU posing difficulties for mobility |
| 55.56% | In 2050 rail is able to have fully smart and autonomous vehicles operating, but only in cities |
| 55.56% | In 2050 rail is the backbone of freight in EU |
| 51.85% | In 2050 national railways not integrated with neighbours, and even worse with other modes |
| 51.85% | In 2050 sharing data economy by railways threatens privacy |
| 48.15% | Few rail smart vehicles in low useage lines in 2050 |
| 29.63% | In 2050 rail not able to be driven by user aspects |

# WP2 DELPHI COMMON THEMES

- Market orientation;
- Cost, competition and efficiency;
- Leadership, political issues, lobbying, government intervention for good or ill;
- Lack of seamlessness for many reasons;
- Inadequate speed of reaction/investments compared to Asian competitors;
- Lacking technical/technological innovations and skills;

- Language barriers;
- Different regulations barriers in EU rail space;
- Info, data availability sharing and management;
- Safety and security issues;
- Accessibility and capacity;
- A limiting of scope from universal visions to: Urban, Native, Backbone.

# WP3 ARGUMENTS FOR RAIL D3.1

**Engaged Categories of Activities**

*This research evidenced that Rail continued to build capabilities despite limited traffic gains but creating conditions for acceleration the growth in the future*

- ➢ High speed rail & cross border developments
- ➢ Local transport & smart mobility
- ➢ Incentives & Pricing policies
- ➢ Network & infrastructure
- ➢ Fleet & Rolling stock

D3.1.1 UITP   Metro
D3.1.2 UITP   Light Rail

D3.1.3  NEWO Freight & Log
D3.1.4 NEWO Social, Envir.
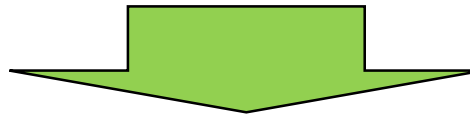
**Considerable Value of this research is the consolidation in one document of 232 pages of all data, facts, figures, charts**

# WP3 ARGUMENTS FOR RAIL SUCCESS STORIES D3.2

## Passengers

➤ **Madrid/Barcelona:** HSR from 2008 Max Speed 300km/h-2h30time, Satisf. 83% less 4.2MM Tons $CO_2$/year 13Kg person versus plane 92Kg, Car 74 Kg

➤ **Vienna:** 79.5% total ridership+40%1995-2018 - Investments for 2030,Satisf. 95% Citizens involved, new technologies, Wien Mobil apps for booking/planning

➤ **Nantes:** 43 km new tram ways Park & Ride, 300K users +54% riders in10 years

## Freight

➤ **Tiger Dry Ports System Adopted all over EU:** +20% train capacity, less shunting Reduced dwelling/transit time up to 92%, optimized slot utilization, Punctuality+85% Reduced emissions and accidents.

➤ **Marathon Train:** longest freight train in EU(1524m) 72 wagons – 4026 tons from Lyon to Nimes at 100 Km/h 2 locos 1 front -1 middle train radio commanded Two tests(1 electric, 1 diesel traction), less 30% operating costs + 50% capacity Plus 10% energy saving

# WP3 ARGUMENTS FOR RAIL CAPITAL INTENSIVE BUSINESS D3.3

## from Back Casting to Forward Casting both Passengers and Freight

<table>
<tr><td></td><td><b>STRENGTHS</b></td><td><b>WEAKNESSES</b></td></tr>
<tr>
<td><b>INTERNAL</b></td>
<td>

- **Sustainability, energy efficiency and easier energy transition, safety differential also in future projections**
- **Cost advantages in scale economies, long distances, high co-modality potential**
- **Growing industrialization benefits from exponential technologies, interoperability, modularization**
- **Core and Extended Network drive towards EU Rail area connecting most population and all big mobility nodes**
- **HSR is rejuvenating all Rail ecosystem**
- Limited de-bottlenecks to be overcome for satisfying demand and service growth
- Local passenger transport solutions are fitting specific/relevant needs in self contained areas

</td>
<td>

- **Long lead time for implementing new services, investments, design/plan/build/ on new infrastructures/technologies**
- **High capital intensity**
- **Service performances not always competitive, inadequate mobility service integration in co-modal mind-set**
- Slow EU harmonization
- Multiple actors with inadequate collaborative Rail ecosystem approach
- Aging staff with unclear replacement plans
- Inadequate internationalization and competitive patterns
- Limited service segmentation not always "inclusive" for p.
- Limited exploration of innovative use of available resources for synergies (HSR, City logistics, Postal/Express Services, … )

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<tr><td></td><td><b>OPPORTUNITIES</b></td><td><b>THREATS</b></td></tr>
<tr>
<td><b>EXTERNAL</b></td>
<td>

- **Fiscal policies favouring more sustainable modes and Rail centrality in co-modal perspective**
- **Acceleration of policy developments in favour of public transport**
- Growing demand patterns in future projections fitting Rail Developments of light assets collaborative/ virtual integrated new business models and public/private partnership
- Resiliency and mobility growing R&D capabilities for managing dynamics
- Co-modal integration through long term more efficient time/space planning
- Faster acceleration towards responsible mobility after COVID 19

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<td>

- Rail is a high capital intensive business, public resources are limited
- The EU Commission efforts for creating a uniform Rail space area are sometimes finding obstacles due to local interests of limited vision
- Faster reaction of other modes to adopt ICT and exponential technologies and other dynamics

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# WP4 DISSEMINATION - ACTIONS

Organisation of:

✓ 2 round tables during ERRAC plenaries

✓ London Summit (June 2019)

✓ Workshop on urban scenarios 2050 at the UITP Summit (June 2019)

✓ 3 webinars on Delphi Study-Recordings: Round 1, Round 2 & Round 3

✓ TER4RAIL/Shift2Rail Video contest (Jan-August 2020)

✓ ERRAC Plenary / Final T4R Event (Nov 2020)

Participation in the Science is Wonderful digital event (Sept 2020)

# WP4 DISSEMINATION - KPIs

✓ Website          2900 users

15 news published

T4R presentation (work done and rail arguments, success stories and chances)

Short report on rail success stories

✓ Twitter          400 Followers, 500 tweets and retweets, 600 likes

✓ UIC eNews     7 articles published on the UIC eNews

✓ Article          Logistics, a matter of life and death – Baltic Transport Journal (April 2020)

✓ Video Contest  3 great video submissions, a broad social media spread with around 60 posts on Twitter, Instagram and Facebook that where seen over 64K times and an average engagement rate of 8%. The competition videos have been seen over 1.5K times on the web & Youtube channel.

# WP4 NEXT STEPS

✓ T4R partners will provide recommendations regarding the necessities, challenges, and possible collaborative research on emerging innovative ideas and key enabling technologies

✓ A flyer will be produced (key outcomes, how it helped rail sector/mobility in general % what will be done with project output)

✓ Presentation of T4R results and outcomes will be made by all project partners in relevant events

✓ T4R website will be maintained after project end

✓ T4R twitter account will remain active after project end

# 5 KEY MESSAGES

- The Rail Innovative Research Observatory could be the basis for the synergies identified by ERRAC SRIA and contributes to a more successful multimodal rail research in HE.

- Railways should be considered in non-railway roadmaps as the key mode to be integrated with. For that, engagement at institutional and individual level in other areas should be pursued.

- Success stories of railways can be told in urban/rural, high speed and freight with large margin of growth, cost advantages in  scale economies (while sustainable) together with important societal benefits.

- Dissemination has been at the heart of TER4RAIL partner work. Not only rail experts have been targeted but also young people who will be the next generation of rail users.

- There are high chances to achieve having railways as the backbone of European mobility, however it needs the railway sector to actively engage with the outside.

# WWW.TER4RAIL.EU

Thank you for your kind attention!

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