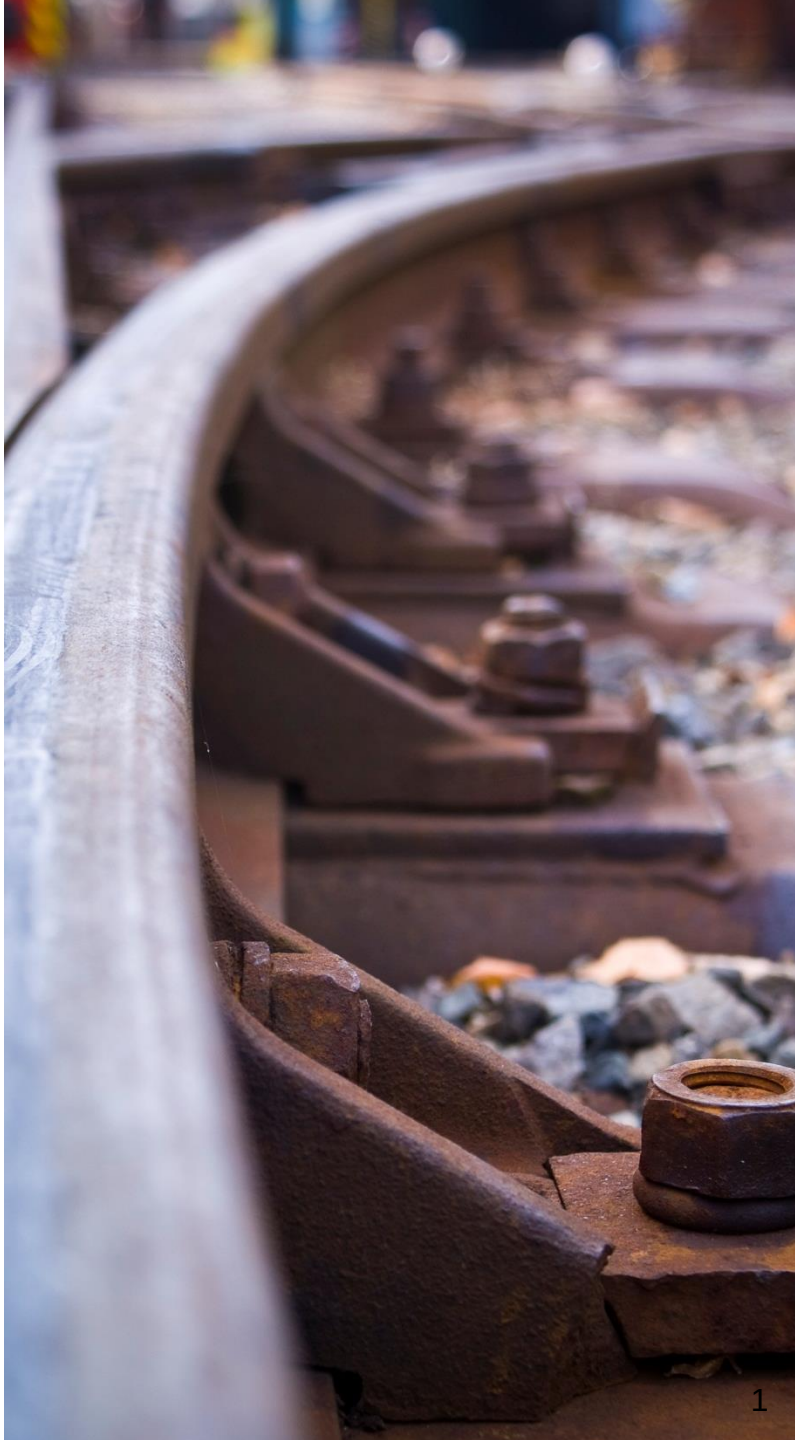
ERRAC
The European Rail Research Advisory Council

ERRAC Plenary

29 November 2019 - Brussels



ERRAC
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Agenda

1) **Welcome from the Chair– Alberto Parrondo**
2) Approval of the Agenda
3) Approval of the Minutes of 21 March 2019 Plenary
4) Keynote speeches - European Commission viewpoint
    1) *Keir Fitch, DGMOVE*
    2) *Jean-Francois Aguinaga, DG RTD*
5) Shift2Rail update – Carlo Borghini, Executive Director, S2R
6) Guest Speaker – Xavier Aertsens, Director, ERTRAC
7) TER4Rail – Panel Discussion – Tackling Cybersecurity Challenges
8) TER4Rail – Armando Carrillo, Secretary General, EURNEX
9) ERRAC Working Groups
    1) *WG1 Vision&Strategy – Ulrich Meuser*
    2) *WG2 Collaboration – Johan Jonsson*
    3) *WG3 Communications – Aida Herranz*
    4) *Academia PAG – Prof Sebastian Stichel*
10) Concluding remarks and 2020 dates – Alberto Parrondo

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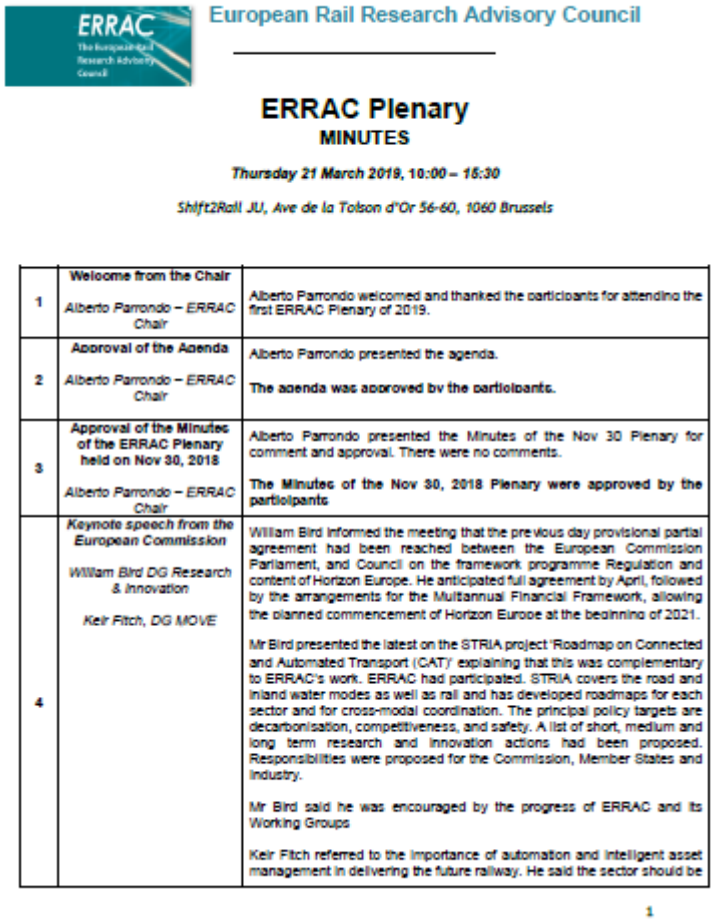

European Rail Research Advisory Council

ERRAC Plenary
MINUTES

Thursday 21 March 2019, 10:00 – 15:30

Shift2Rail JU, Ave de la Toison d'Or 56-60, 1060 Brussels

1	**Welcome from the Chair** *Alberto Parrondo – ERRAC Chair*	Alberto Parrondo welcomed and thanked the participants for attending the first ERRAC Plenary of 2019.
2	**Approval of the Agenda** *Alberto Parrondo – ERRAC Chair*	Alberto Parrondo presented the agenda. **The agenda was approved by the participants.**
3	**Approval of the Minutes of the ERRAC Plenary held on Nov 30, 2018** *Alberto Parrondo – ERRAC Chair*	Alberto Parrondo presented the Minutes of the Nov 30 Plenary for comment and approval. There were no comments. **The Minutes of the Nov 30, 2018 Plenary were approved by the participants**
4	***Keynote speech from the European Commission*** *William Bird DG Research & Innovation* *Keir Fitch, DG MOVE*	William Bird informed the meeting that the previous day provisional partial agreement had been reached between the European Commission Parliament, and Council on the framework programme Regulation and content of Horizon Europe. He anticipated full agreement by April, followed by the arrangements for the Multiannual Financial Framework, allowing the planned commencement of Horizon Europe at the beginning of 2021. Mr Bird presented the latest on the STRIA project 'Roadmap on Connected and Automated Transport (CAT)' explaining that this was complementary to ERRAC's work. ERRAC had participated. STRIA covers the road and inland water modes as well as rail and has developed roadmaps for each sector and for cross-modal coordination. The principal policy targets are decarbonisation, competitiveness, and safety. A list of short, medium and long term research and innovation actions had been proposed. Responsibilities were proposed for the Commission, Member States and industry. Mr Bird said he was encouraged by the progress of ERRAC and its Working Groups Keir Fitch referred to the importance of automation and intelligent asset management in delivering the future railway. He said the sector should be

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- No comments received.
- Plenary is asked to approve the Minutes as presented.

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Keynote speech – European Commission viewpoint

Keir Fitch

Head of Unit, Rail Safety and Interoperability
DG MOVE

Keynote speech – European Commission viewpoint

Jean-Francois Aguinaga

Head of Unit Land Transport
DG Research and Innovation

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ERRAC
29 November 2019

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#Horizon2020

What's going on: **Programme**

- Coordination of the HPC and Blockchain working groups of DG Connect/Move/rail sector and participation on the 5G and Cybersecurity working groups
- Contribution to the DG Grow study on the competitiveness of the rail supply industry
- Delivery to RASCOP of the second version of the S2R Standardisation Roadmap Development Plan (only few comments from ERA to the v1, no other RASCOP members input) and provision to DG Move of preliminary list of possible future ESO needed activities from results of S2R projects
- GAP phase ongoing for projects AWP2019

What's going on: **Programme**

- October IP/CCA SteCos
- Participation to DG RTD R&I days on session Future of Railways
- Participation to Horizon 2020 Transport MaaS Workshop organised by DG Move with INEA and CEN. CEN informed they started a CEN/ISO Technical Report on mobility integration (not mandate by the EU).
- Regular alignments meetings with ERA and GSA
- New Programme Manager for IP5 recruited (starting 18 November)
- **19 Projects finished**: **7 CFM** (2015-16) + **12 OC** (5 2015-16 & 7 2017)

2019 activities

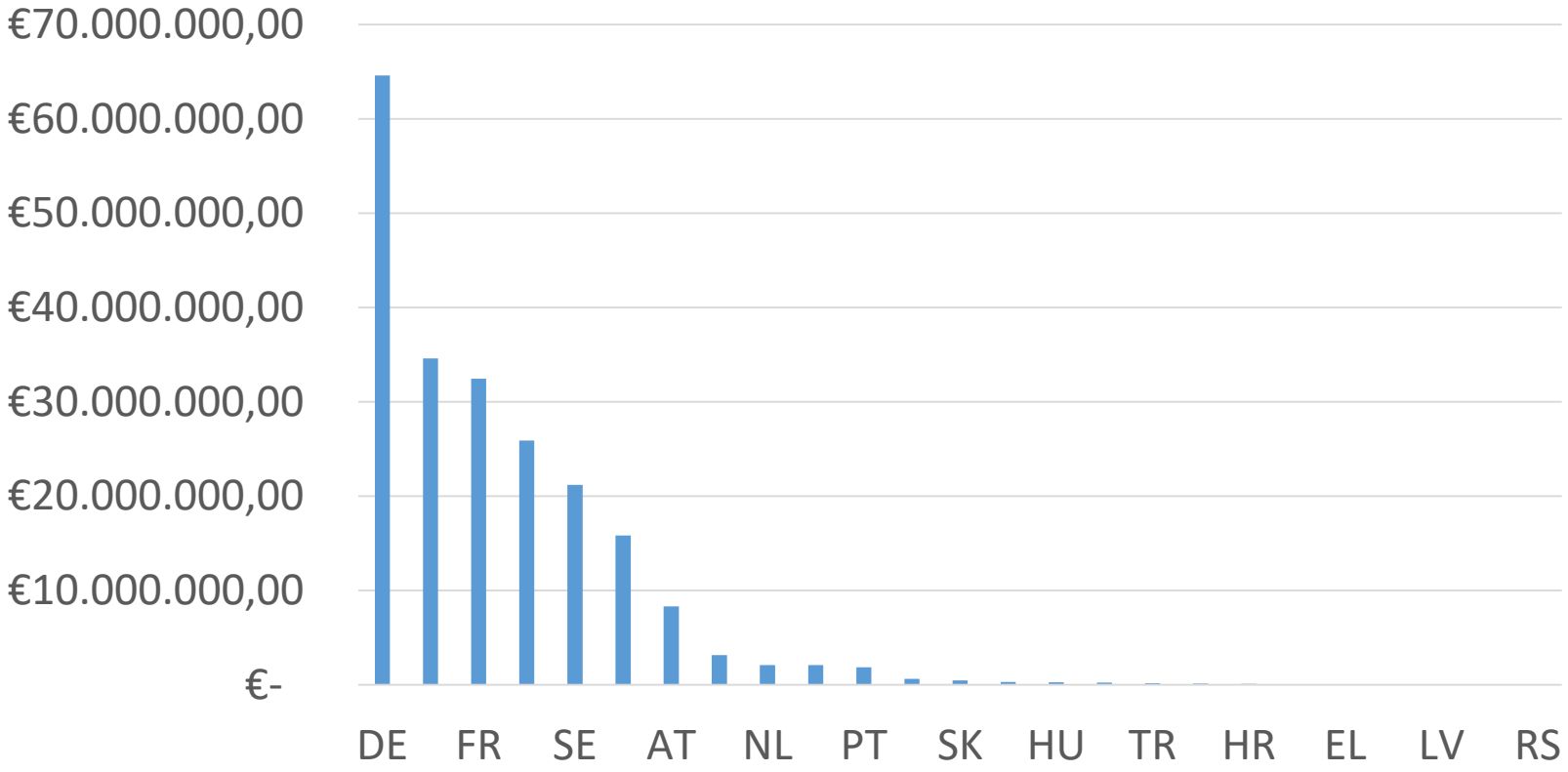
Jul – Aug 2019

- **22 Jul 2019 - Consensus week Call 2019**
- GAP tables preparation
- 2 reviews/checks of OC 2015-2016 Projects

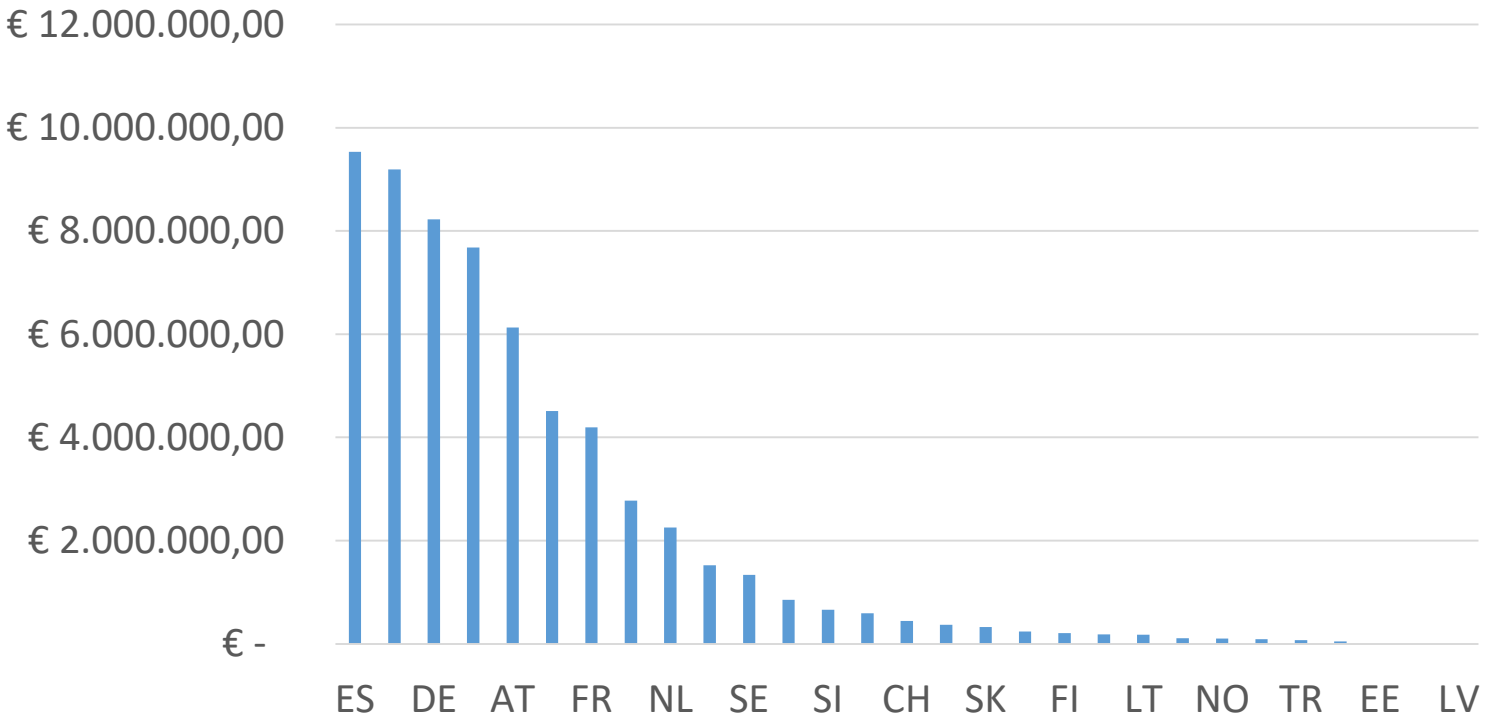
Sep – Dec 2019

- **4 Sep 2019 - extraordinary GB award of Call 2019**
- Launch GAP 2019
- Pre-Financing 2019
- **14 Nov 2019 - GB (AWP 2020, S2R 2, …)**
- Demos activities with NSA
- 11 reviews/checks: *3 CFM 2015-2016 + 4 OC 2015-2016 + 7 OC 2017 + 4 OC 2018 Projects*

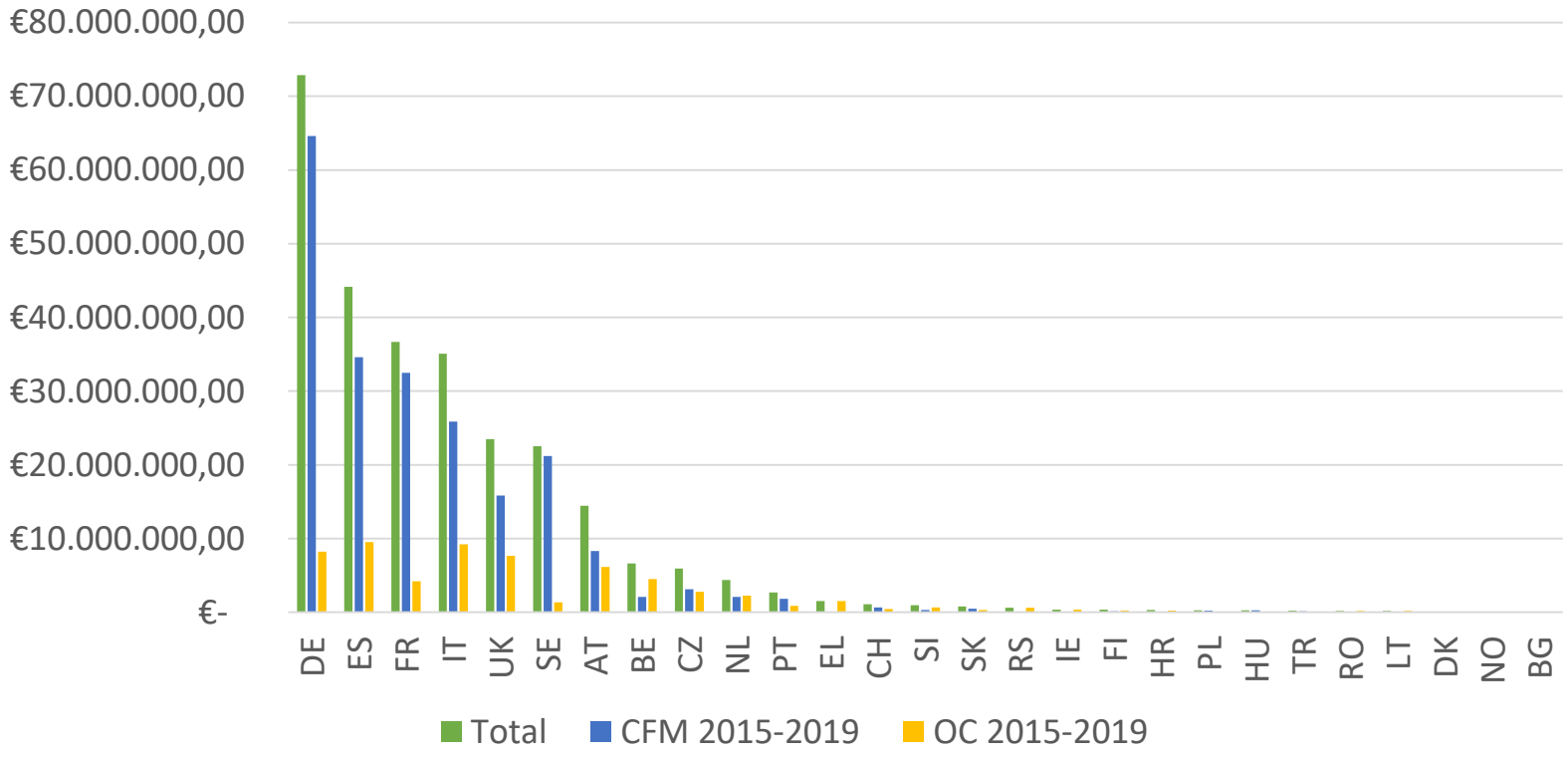
CFM 2015-2019 per MS & Assoc. Countries (Projected)



OC - 2015-2019 per MS & Assoc. Countries (Projected)



CFM & OC 2015 – 2019 per MS & Assoc. Countries (Projected)



2020 activities

- Jan – Feb 2020

  - **7 Jan 2020** Publication of the **Call 2020**
  - 21 Jan 2020 IP SteCo period
  - 27 Jan 2020 Deadline reporting Total Project Cost (including IKOP) + IKAA
  - Feb 2020 SIWG Programme Level (*InnoTrans 2020 QW preparation, Global Planning, RCA, MAAP*)
  - Draft AWP2021 preparation
  - Contribution to the discussions on S2R 2
  - **20 reviews/checks**: *2 OC 2017 + 2 OC 2018 + 2 CFM 2015-2016 + 7 CFM 2017 + 7 CFM 2018 Projects*

2020 activities

Mar – Apr 2020

- 2 Mar 2020 Provisional Annual Accounts
- 26 Mar 2020 GB (AAR 2019, Prov Annual Accounts 2019, S2R 2, …)
- Control gates projects 2015-2018
- 2 reviews/checks: *1 CFM 2015-2016 + 1 OC 2018 Projects*
- 24 Mar 2020 onwards IPs SteCos
- 21 Apr 2020 Deadline Call 2019
- 30 Apr 2020 TPC(IKOP) and IKAA audit certificates

May – Jun 2020

- Interim Payments 2019
- 25 May 2020 Consensus Week Call 2020
- 22 Jun 2020 GB(Final Annual Accounts 2019, AAR 2019, MAAP, S2R 2…)
- Extraordinary GB award of Call 2020 (in case of issues)
- First draft AWP2020
- 5 reviews/checks: *5 OC 2017 Projects*

2020 activities

Jul – Aug 2020

- Launch GAP 2020
- GAP tables preparation
- 2 reviews/checks: *2 OC 2017 Projects*

Sep – Dec 2020

- Pre-Financing 2020
- **19 Nov 2020 GB (AWP 2021, S2R 2, …)**
- 7 reviews/checks: *1 OC 2017 + 3 OC 2018 + 1 CFM 2015-16 + 2 CFM 2018 Projects*

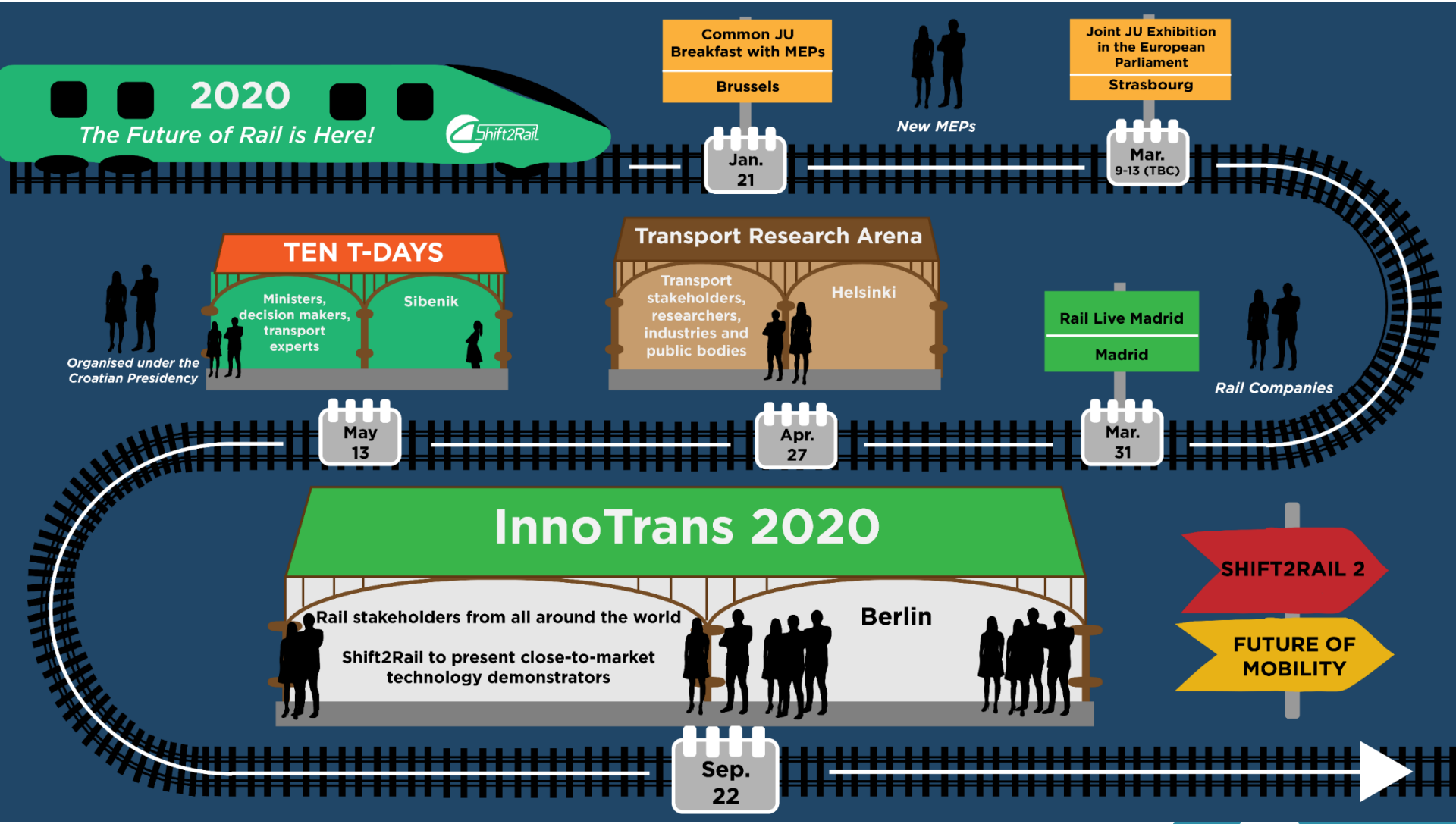
What's going on: **Events**

September – December events:

Event	Date & location	Main target audience	No. of participants	Comments
Research and Innovation Days	24-26 September, Brussels	Policy makers, general public	Thousands	• Shift2Rail participated in a session about "Railways of the Future"
Digital Transport Days	7-9 October, Helsinki	Transport community	1,000+	• Shift2Rail Dialogue – side event with just under 300 participants from 31 countries • Shift2Rail stand to raise awareness in the transport community
Regional Cooperation Workshop	9 October, Brussels	Regional authorities	50	• Side event of the European Week of the Regions and Cities • Building synergies between Shift2Rail and European Structural Investment Funds
Railway Days 2019 - Club Feroviar Investment Summit	9 October, Bucharest	Railway community	Hundreds	• Shift2Rail participated in a panel about "Innovative Projects in Rail Infrastructure"
Business Finland Event on Shift2Rail	25 October, Helsinki	Railway community	Hundreds	• Raising awareness of Shift2Rail and its open call 2020
World Congress on Railway Research	28 October- 1 November, Tokyo	Rail research community	1,000+	• Shift2Rail stand opened by Commissioner Violeta Bulc and Ambassador Patricia Flor (Head of EU Delegation to Japan) – launch of the Catalogue of Solutions • Plenary sessions with Shift2Rail Members • 15+ Shift2Rail R&I related papers were presented • "Adaptable train communication systems" paper won an award

What's going on: **Events**

Event	Date & location	Main target audience	No. of participants	Comments
18th Florence Rail Forum- How to Revitalise Rail Freight with Digitalisation?	8 November, Florence	Rail community	Hundreds	• Raising awareness of Shift2Rail's R&I programme
Final Conference of the INTERREG Project "Alpine Innovation for Combined Transport – AlpInnoCT"	19 November, Brussels	Transport community	Hundreds	• Raising awareness of the Innovative solutions achieved in the Shift2Rail R&I programme
The Intelligent Rail Summit 2019	21 November, France	Rail community	Hundreds	• Raising awareness of how Shift2Rail is using digitalisation to innovate the rail system
Shift2Rail Info Day 2020	10 December, Brussels	All Shift2Rail stakeholders	300+	• Registration launched in mid-October • Invitation to prepare for pitch presentations sent
Information Session on the Shift2Rail Call 2020	12 December, Paris	Rail community	Hundreds	• Raising awareness of Shift2Rail's R&I programme and Call 2020 • Organized together with SNCF
Shift2Rail Regional Info Day	17 December, Jerusalem	Shift2Rail stakeholders	100+	• Raising awareness of Shift2Rail's R&I programme and Call 2020


2020
The Future of Rail is Here!
Shift2Rail
Common JU Breakfast with MEPs
Brussels
Jan. 21
New MEPs
Joint JU Exhibition in the European Parliament
Strasbourg
Mar. 9-13 (TBC)
TEN T-DAYS
Ministers, decision makers, transport experts
Sibenik
Organised under the Croatian Presidency
May 13
Transport Research Arena
Transport stakeholders, researchers, industries and public bodies
Helsinki
Apr. 27
Rail Live Madrid
Madrid
Mar. 31
Rail Companies
InnoTrans 2020
Rail stakeholders from all around the world
Shift2Rail to present close-to-market technology demonstrators
Berlin
Sep. 22
SHIFT2RAIL 2
FUTURE OF MOBILITY

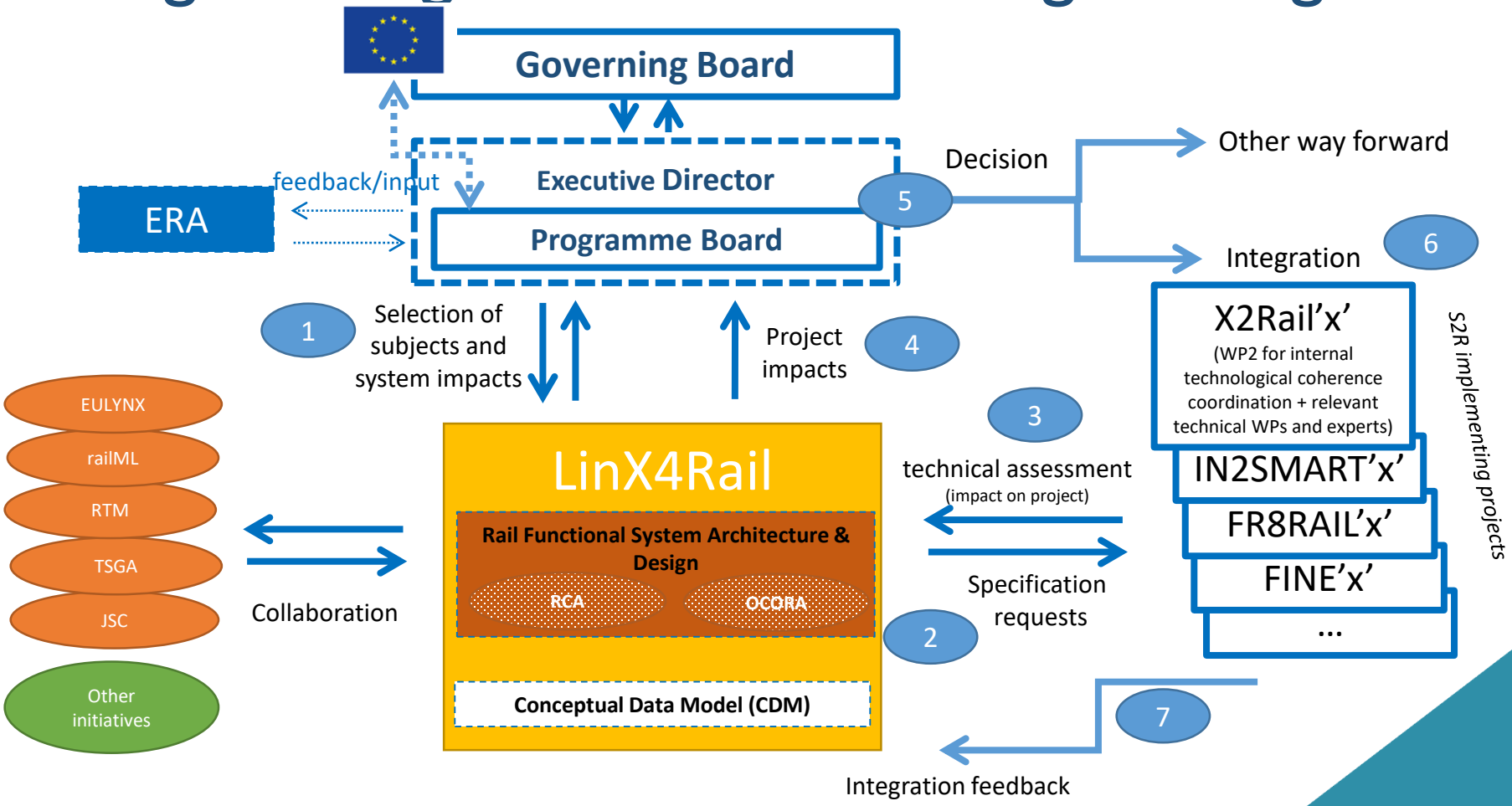
Renewed Programme Governance in application

To:

- ensure that barriers experienced in the integration of new concepts in the S2R R&I activities, in particular in relation to IP2 but not only, are duly addressed
- ensure that the technological and operational impacts of RCA, OCORA and a more encompassing future system architecture would not find obstacles in their integration in the specific R&I projects
- ensure independent business analysis before moving towards R&I strategic changes
- Address the Programme setup by projects/topics' grants that do not facilitate an integrated R&I Programme governance

In all CFM projects + guidance document developed

Programme governance and change management



What's going on: **States Representatives Group**

- 11th SRG Meeting, 23 September - Brussels:
  - AWP 2020
  - S2R2 preparatory process, Horizon Europe state of play
  - S2R JU Regional Cooperation workshop status
  - Information on ongoing/planned railway R&I activities
    - Presentation by the Austrian representative: on-going R&I railway activities
    - Presentation by the German representative: German Centre for Rail Traffic Research (DZSF)
    - Presentation by the Swiss representative: ERTMS Strategy
  - Position and proposal of CZ and PT to the preparation of S2R2

- 12th SRG Meeting, 3/4 March – Brussels, coupled with workshop on SRG position on S2R2
- 13th SRG Meeting, 23 September - Berlin

What's going on: **Scientific Committee**

- 12th SC Meeting, 23 October -Brussels:
  - Welcome of 2 newly appointed SC members
  - Election of the new Chairperson: Professor di Febbraro
  - Election of the new Vice-Chairperson: Professor de Dios Sanz Bobi
  - AWP 2020
  - S2R2 preparatory process, Horizon Europe state of play
  - Presentation on Hyperloop developments

- 13th Meeting of the SC, 29 April - Helsinki
- 14th Meeting of the SC, 23 September - Berlin

Annual Work Plan and Budget for 2020

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AWP 2020, targets and content – IP1 (1/3)

S2R-CFM-IP1-01-2020 Demonstrators for the next generation of traction systems, smart maintenance, virtual validation and eco-friendly Heating, Ventilation Air conditioning and Cooling (HVAC) and Technical research on battery and hydrogen powered regional trains (BEMU/ HMU) (IP1/IP3)- *(EU funding: 9.142M €)*

- Traction systems

-> Bring to TRL 7 research activities performed in PINTA-2

  - Traction demonstrators on trains (Regional, Metro) using SiC technologies, Wheel motors for HST – TRL 7
  - Develop and contribute to implementing new methodologies, tools, norms & standards of noise, reliability, virtual validatic and certification, smart maintenance. TRL 5-7

- HVAC:

-> Bring to TRL 7 research activities performed in PIVOT-2

  - Further development of prototypes and Validation activities TRL 7
  - Pre-standardization of interfaces
  - Assessing of alternative refrigerants, risk analysis and migration strategy

- Battery and Hydrogen solutions
  - Basic research on rolling stock, infrastructure and operational aspects for retrofitting existing regional trains.
  - Preparatory work for next generation BEMUs and HMUs (TRL 2)

AWP 2020, targets and content – IP1 (2/3)

S2R-CFM-IP1-02-2020: Validation of new technologies for the TCMS - *(EU funding: 3.812M €)*

-> Bring to TRL 5-7 research activities performed in CONNECTA-2 + further studies and specifications

Research Area	Specific Technological objective	Demonstrator	TRL
Train Control & Monit. System (TCMS)	Wireless TCMS	Metro	6/7
		Regional	6
	Drive-by-data	Metro	6/7
		Regional	6
	Functional distribution Framework	Metro	6/7
		Regional	6
	Functional Open Coupling	Regional	5/6
	Virtual Certification	Generic	5/6
			5/6

- Further studies and specification for several Application profiles (Train level communication, ATO GoA 3/4 functions), additional function definition for the Functional Open Coupling, visualization of FOC functions in DMI, etc.

AWP 2020, targets and content – IP1 (3/3)

S2R-0C-IP1-01-2020: Support to Development of next generation of Traction systems (TD1.1) - *(EU funding:* 2,300,000 €*)*

- Research on 3D additive manufacturing and new manufacturing technologies for traction components - TRL 3
- Research on Wireless Dynamic Charging for urban vehicles based on SiC semi-conductors – TRL3
- Investigations on reliability of traction components and lifetime mechanisms – TRL4
- Research on Big Data, Artificial Intelligence (AI) applied to Traction systems smart and predictive maintenance – TRL4

S2R-OC-IP1-02-2020: Technical solutions for the next generation of TCMS - *(EU funding:* 4,600,000 €*)*

- Antenna installation study to optimize transmission/reception in Wireless TCMS
- Functional Distributed Framework related research activities and Subsystem functions adapted to Application Profiles – TRL6
- Safety and Cybersecurity studies, methodology and tools to support SIL4 application.
- Development of equipments (TRL 6-7) to support the CFM demonstrators.

S2R-OC-IP1-03-2020: Innovative technologies for Carbodies and Running Gear of the future- *(EU funding:* 2,420,000 €*)*

- Inspection methods for new materials adapted for the maintenance in railway environment (TRL4-5)
- Development of new elastomeric materials with enhanced lifetime for running gear application (TRL3-4)
- Development of new Journal Bearings with enhanced LCC and lifetime (TRL3-4)

AWP 2020, targets and content – IP2 (1/3)

S2R-CFM-IP2-01-2020 [Completion of activities for Adaptable Communication, Moving Block, Fail safe Train Localisation (including satellite), Zero on site Testing, Formal Methods and Cyber Security]

(EU funding 14.970M€), TRL 6/7

- TD2.1: Adaptable Communication System: Provide a detailed field test plan and bring the adaptable communication system demonstrators into one or two field trials, in a realistic and live rail environments. Provide updated specifications.
- TD2.3: Moving Block: Create site tests for different Moving Block systems, based on the existing system specification and the laboratory prototypes to be developed within X2Rail-3. Update the specifications, including the operational and engineering rules.
- TD2.4: Fail safe train positioning (including satellite): Completion of the developments based on the Virtual Balise (VB) concept and on the combined used of different technologies such as, for example, IMU, EGNSS, Digital Map, kinematics sensors to compute a safe train position; Installation and commissioning of three demonstrators in different Laboratories and Pilot Trial Sites, for low traffic lines, regional lines, and high speed lines.
- TD2.6: Zero on site testing: integration and alignment with the challenges that have been identified during prototyping of other TDs inside prototypes.
- TD2.7: Formal methods: establish a demonstrator (linked to LINX4RAIL) and to define a “guidebook” for the use of Formal Methods to enable increased efficiency, automation and use of standards.
- TD2.11: Cybersecurity: demonstrate, validate and apply to other demonstrators the holistic cyber-security approaches defined in the previous projects.

AWP 2020, targets and content – IP2 (2/3)

- S2R-OC-IP2-01-2020: Modelling of the Moving Block system specification and support for Railway Minimum Operational Performance Standards, TRL 3 (EU funding 1.340.000€)
  - Within the framework of the Moving Block the proposal has to carry out the following work:
    - To create semi-formal or formal models of the Moving Block systems, using the Formal Method methodology developed in X2RAIL-2, in order to examine the system behaviour, and check for additional hazards arising from the use of Moving Block.
    - To create semi-formal or formal models of the enhancements to the Moving Block architectures, as proposed by the "Future Moving Block Architectures" topic within the project S2R X2Rail-3.
  - Within the framework of the Fail Safe Train Localisation, the proposal has to carry out the following work:
    - Definition and Development of Railway Fault Detection and Exclusion (FDE) algorithms for coping with railway system and local feared events in the context of both mono/dual constellations and mono/dual frequencies
    - Definition and Development of Data Fusion algorithms among different possible technologies such as for example EGNSS, IMU, Kinematics, Digital Map suitable for providing a safe position in the position domain along with the associated integrity
    - Select candidate techniques and algorithms for the implementation of a Proof of Concept
    - Test and assess performances in a real or simulated railway environment
    - Contribution to the definition of the Railway Minimum Operational Performance Standards and the trade-off analysis about the use of the Standard SBAS (e.g. EGNOS) augmentation systems

AWP 2020, targets and content – IP2 (3/3)

- S2R-OC-IP2-02-2020: Study on alternative bearers and on communication protocols, TRL 4/5 (EU funding 350.000€)
  - For what concerns the study of the communication bearers the action shall:
    - Describe the alternative bearers from a technology perspective;
    - Qualify the benefits and challenges of the bearers, taking into account operational and economic considerations;
    - Compare the expected communication characteristics with well-established wireless technologies
    - Provide recommendations and classification.
  - For what concerns the study of the communication protocols the action shall:
    - Identify the appropriate transport protocol for ensuring communication characteristics and capabilities during application development
    - Analyse the different options for the transport layer (UDP, TCP, SCTP , etc.) and the application layer protocols (HTTP, QUIC, SIP, etc.) with the aim to narrow the selection for certain application requirements, qualifying the protocols in terms of technology features like flexibility, latency and prioritization as well as operational considerations including engineering and implementation complexity, monitoring and debugging capabilities;
    - Analyse the security of the transport and application layer with using the secure version of protocols, e.g. SFTP or SCP instead of FTP, or HTTPS instead of HTTP or combining the protocols with application security.

AWP 2020, targets and content – IP3 (1/2)

S2R-CFM-IP3-01-2020: Research into optimised and future railway infrastructure - *(EU funding: 11.408M €)*

-> Bring to TRL 6-7 research activities performed in IN2Track-2

- <u>Enhancing existing track, S&C:</u>
  - Validation and in-track full assessment of demonstrators of enhanced S&C systems, track system and its components including wheel and rail interaction with improved RAMS – TRL7
  - Development of full monitoring system for S&Cs and optimization of maintenance activities for Track system – TRL7

- <u>Next generation track, S&C:</u>
  - Development of sub-system components, full-scale and whole system demonstrators for next generation track and S&C solutions, using advanced design, materials, manufacturing, construction and installation techniques – TRL6
  - Development of innovative and autonomous track and S&C inspection, maintenance and repair techniques, with integrated monitoring and sensing systems – TRL6

- <u>Enhanced performance of tunnel and bridges:</u>
  - Tunnel and Bridges health monitoring (onboard, optical monitoring and digitalization) – TRL7
  - Demonstrator on improvement of Tunnel and Bridges service capability – TRL6-7
  - Technical demonstrator of low cost bridges for high speed traffic improving damping - TRL7

AWP 2020, targets and content – IP3 (2/2)

S2R-0C-IP3-01-2020: Next Generation Track Transition Zones - *(EU funding: 1,350,000 €)*

- Detailed design and technical specification for physical transition zone demonstrators (->CFM)
- Protypes and small-scale demonstrators of next generation transition zone components and sub-systems - TRL 5

S2R-OC-IP3-02-2020: Technology Development for Railway Systems Asset Management (TD3.6)- *(EU funding: 1,710,000 €)*

- Prescriptive data analytics tools to implement a Decision Support System, with man in the loop, for IAMS – TRL 4-5
- Multi-objective decisions' optimization tools for IAMS – TRL 4-5

S2R-OC-IP3-03-2020: On track machines shift to collaborative robots (TD3.8)- *(EU funding: 2,700,000 €)*

- Development of standalone demonstrator of an improved existing plant (machines and equipment) by integrating robot technology (Robot Operating System) to support future inspection and execution of maintenance actions – TRL 5-6
- Development and validation of a prototype of exoskeleton suitable for outside considtions which can perform a set of different maintenance task– TRL 6-7

AWP 2020, targets and content – IP4 1/2

S2R-CFM-IP4-01-2020: Enhanced end-user centric travel ecosystem (EU funding 5.207M€), TRL 7

- **Prepare the S2R IP4 ecosystem for large-scale implementation,** taking into consideration technical, users and business needs and requirements, such as scalability, coexistence and seamless interaction of multiple ecosystems.
- **Prepare the S2R IP4 ecosystem for implementation with current retailer market** (whether Travel Service Provider (TSP) retail operation or third party e.g. travel agency) by developing an interface to Travel Companion functions
- **Attract TSPs to join the ecosystem, especially small ones, by offering a range of functionalities and services integrated in the ecosystem to be consumed by them** through a common interface "as a service".
- **Enhance traveller experience, improving the travel services offered and their access to the ecosystem.**
- **Exploit the application of Artificial Intelligence (AI) advances to improve travellers experience and operators performance,** specially through the application of Business Analytics techniques (for example, Intelligent assistant to help operators / travellers in their operations, mix of machine learning and business modelling for better decision support, AI methods with data).
- **Tighten links with other IPs and CCA (especially IP2, IP3 and IPX) to facilitate information flow among IP4 services and other railway systems, allowing the creation of enhanced services for users and operators, following the Conceptual Data Model approach and System Architecture.**

AWP 2020, targets and content – IP4 2/2

OC: Complementary Travel Expert Services , TRL 5 (EU funding 2.000.000€)

- Criteria for multi-modal travel planning:
  - Research and definition of categories for the whole trip or legs of the trip (i.e. environmental aspects, comfort, specific needs for disabled people, traffic conditions, other, etc.)
  - Development of algorithms to propose quantitative estimates
- Ride-Sharing in a multi-modal journey context:
  - Research on how to ensure successful ride-sharing to complete first/last mile of multimodal trips based on a sample of existing passengers (behavioral studies)
  - Development of applications running “as a service”, acting as crowd-based Travel Service Provider (i.e. algorithms and proof of concept for ride-sharing incl. offering, ticketing, settlement, validation and tracking) and as part of the Travel Companion through integration of specific modules for (car) seat offer management, validity checks of Entitlements/Tokens generated, etc.
  - Research on algorithms for optimal synchronization of sharing mobility solutions and other transportation modes with the rail service and for optimal matching between drivers - riders within a ride-sharing system, for the first/last mile solution of a rail-based multimodal journey.

AWP 2020, targets and content – IP5 (1/2)

S2R-CFM-IP5-01-2020: Use-centric rail freight innovation for Single European Railway Area – *IA (EU funding 7.879 M€)*

- Condition-Based Maintenance:
  - Demonstrate an end-to-end CBM solution for a European fleet, based on work on Fr8Rail, Fr8Rail II and S2R-CFM-IP5-01-2019 (TRL 7)
  - Provide a proof of concept of brake pad and wheelset monitoring in rail freight, under operational conditions. (TRL 5)
  - Define and test optimized roles & responsibilities in the digitalized maintenance process. (TRL 5)
  - Develop user-specific human machine interfaces to test "cooperation" between humans and artificial intelligence. (TRL 6)
- Core Market Wagon: definition of a verification and validation plan according to the 5L approach, integration of new subsystems enabling CBM and Continuous System Monitoring. Vehicle & Track Friendliness of the developed components should also be assessed by means of verifications as injecting real data in simulation tool. (TRL7)

- Extended Market Wagon: Physical demonstration of the extended market wagon with regards to the structural, aeroacoustical & aerodynamical optimized wagon design concept and novel running gear design concept. (TRL 6)

- Telematics & Electrification: integration of at least one of the telematics product classes including the corresponding subsystems (CMS, WMS, wOBU, FTSMS,EMS) in the extended market wagon and demonstration activities by means of field testing in operational environment. (TRL 7)

AWP 2020, targets and content – IP5 (2/2)

- Automatic Coupling: Integration of the coupler in one of the two new developed wagons. A proof of concept of the Automatic Coupler Demonstrator, in real operational environment, should be performed, according to a pre-defined test protocol covering the most demanding conditions. Specifications review and update are also requested. (TRL7)

- Freight Loco of the future: Two distinct focus areas:
  - Develop a concept for the innovative modular, distributed and hybrid propulsion concept. (TRL 3)
  - Develop a demonstrator for the auxiliary network concept. (TRL 5)

- Long trains: a demonstrator of the new functionalities in a train of up to 1500m length if supported by the infrastructure. (TRL 7)

- Automated train operation:
  - Develop a proof of concept (not tested prototype) for the freight suitable environment sensing systems based on work done in ARCC and S2R-CFM-IP2-01-2019. (TRL 3)
  - Define the requirements of freight specific radio remote control of freight locomotives building on results of Long Trains (FFL4E & FR8RAIL-2).(TRL 3)
  - Analyse existing EU RU user requirements and specifications for freight suitable ATO Onboard systems and what will be delivered by S2R-CFM-IPX-CCA-01-2019.

AWP 2020, targets and content - CCA

S2R-OC-CCA-01-2020: Noise and Vibration call - *(EU funding: 950,000 €)*

- Ground vibration:
  - To develop a commonly accepted, practical and validated prediction tool for ground vibration impact studies during environmental impact assessment of new or upgraded railway projects.

- New Technologies Auralisation and Visualisation:
  - The development of a fully functional system for auralisation and visualisation based on physically correct synthesized railway noise and interfaces to a virtual reality visualisation software.
  - The tool shall be able to meet three basic main requirements:
    - Demonstration of the results of the work on noise reduction in the S2R JU.
    - Demonstration of vehicle performance for customers and development engineers
    - Demonstration of the acoustic situation and the effect of noise mitigation measures in large-scale projects preferable with an interface to commercial 3D Visualisation software

AWP 2020, targets and content – IPX (1/3)

S2R-CFM-IPX-01-2020: Advanced Functions towards Autonomous Trains - *(EU funding: 2.021M€)*

**Please note that any proposal that would result in an upgrade de jure or de facto of any signalling Class B system will be excluded from funding and most probably result in the partial or full proposal rejection*

- train external environment perception* :
  - creation of a common database for artificial intelligence (AI) training
  - certification concept for the artificial sense when applied to safety related functions (TRL 3)
  - track digital maps with the integration of visual landmarks and radar signatures
  - Applicability studies

- train internal perception:
  - Enhanced CCTV to prognose and diagnose potential hazard situations

- enhanced TCMS :
  - train-to-ground application profile to enable the remote driving of trains
  - TCMS auto-heal functionalities

AWP 2020, targets and content – IPX (2/3)

S2R-CFM-IPX-01-2020: Advanced Functions towards Autonomous Trains - *(EU funding: 2.021M€)*

**Please note that any proposal that would result in an upgrade de jure or de facto of any signalling Class B system will be excluded from funding and most probably result in the partial or full proposal rejection*

- <u>accelerate the deployment of ATO over ETCS * :</u>
  - investigate how an on-board ATO over ETCS can still work on a European corridor where a small part of the infrastructure is not yet equipped of ETCS
  - applications for at least three European Countries, considering geographical relevance and without delaying any planned ETCS investment
    - Lateral signalling interpretation
    - Transitions to ATO over ETCS on Class B area
    - Standard ATP interface
  - GoA3/4 state machines using semi-formal model will be prototyped in order to validate the concept with railway experts (including drivers)
  - validate GoA3/4 specification and functions exported to TMS
  - demonstrate the level of headway performances achievable with the TMS/ATO based on GoA3/4

AWP 2020, targets and content – IPX (3/3)

S2R-CFM-IPX and CCA-02-2020: Evolution of Railways System Architecture and Conceptual Data Model (CDM)- *(EU funding: 1.041M€)*

>> Enhance deployment strategy and ensure wider uptake of System Architecture and CDM

- System Integration and Architecture:
  - Provide clear user's feedback on the way the rail system will be operated in the future and the interconnection with other transport modes and other services
  - Define the high-level functions the new operations and services will require and the impact that those could have in the current system
  - Extend business cases analysis and inclusion of different initiatives not yet included in the work of Linx4Rail
  - Further update the migration plan and deployment strategy

- Conceptual Data Model (CDM):
  - Explore ways to enhance/automatise the creation of CDM with the use of Artificial Intelligence tools
  - Support the large scale implementation of the S2R JU IP4 ecosystem by ensuring the developed interfaces are in line with CDM + Increase interoperability in freight transport (IP5)
  - Consider new case studies, considering for example ERA registers

AWP 2020, targets and content – IPX (3/3)

S2R-OC-IPX-01-2020: Innovation in guided transport - *(EU funding: 0.25M€)*

- Define the enhanced / innovative modes in term of:
  - Concept of operations
  - Safety cases
  - Functional specification
  - Operational conditions and testing methodologies / environment.

- Identify the potential transferability and synergies with Railways solutions, processes and procedures in general, and in particular for a technological perspective with the S2R innovations (Technology Demonstrators and IPx activities).

AWP 2020, targets and content – Prize

Train ID - *(EU funding: 0.5M€)*

Specific Challenge:

- The objective of this prize is to support the implementation of achieving throught Europe a unique representation of the train and path objects.
- To this aim the implementation of efficient algorithms that generate a single Train ID is needed. In particular this should be associated to commercial trains in synergy with the Train ID generated in cooperation with the Joint Sector Group and Rail Net Europe (RNE).

Expected Impact:

- The solution should demonstrate its technical validity and universality while at the same time it should provide a viable path (of measures and advantages) to overcome the possible stakeholder inertia to implement such solution in nationally driven systems.

Status on the CCA models: S2R KPIs, attractiveness model and mode choice model

Results KPI release 2.0 – key targets

SPD	LCC		Capacity		Punctuality	
Target	-50%		+100%		+50%	
High speed	-15%	-18%	69%	74%	29%	19%
Regional	-21%	-24%	57%	49%	51%	15%
Urban	-16%	-18%	23%	28%	n / a	
Freight	-39%	-40%	42%-114%*	91%	78%	71%

release 1.0

*depending on IP2 improvement 0-50%

Results of KPI release 2.0 – IP specific

SPD: High speed	LCC	Capacity	Punct.
Vehicle / IP1	-5%	22%	23%
Signalling / IP2	-32%	38%	10%
Infra./ IP3	-19%	0.4%*	58%

SPD: Urban	LCC	Capacity	Punct.
Vehicle / IP1	-3%	2%	n / a
Signalling / IP2	-59%	20%	n / a
Infra./ IP3	-15%	0.4%*	n / a

*reduction of capacity reserve in peak hour

SPD: Regional	LCC	Capacity	Punct.
Vehicle / IP1	-8%	20%	35%
Signalling / IP2	-45%	30%	10%
Infra./ IP3	-26%	0.4%*	61%

SPD: Freight	LCC	Capacity	Punct.
Freight / IP5	-17%	32%	79%
Signalling / IP2	-20%	0-50%	10%
Infra./ IP3	-18%	6%	52%

Result discussion

Scenarios:

- Freight has the highest potential for improvement - among others due to a more flexible operation concept in the SPD
- CCS is the area with the most challenging conditions to identify the impact

LCC:

- Cost improvements for **IP1** are rather low as for now only the **cost for prototypes** can be estimated, which are foreseen to be significantly higher than for the end-product (reduction <10%)
- **Cost share** within the railway system has a significant influence on LCC-KPI (e.g. for SPD1 reduction of infrastructure maintenance cost by 42%)
- New results for IP2 could not be included in time for release 2.0

Capacity:

- Calculation with the highest complexity of integrated systems
- Highly influenced by IP2

Punctuality:

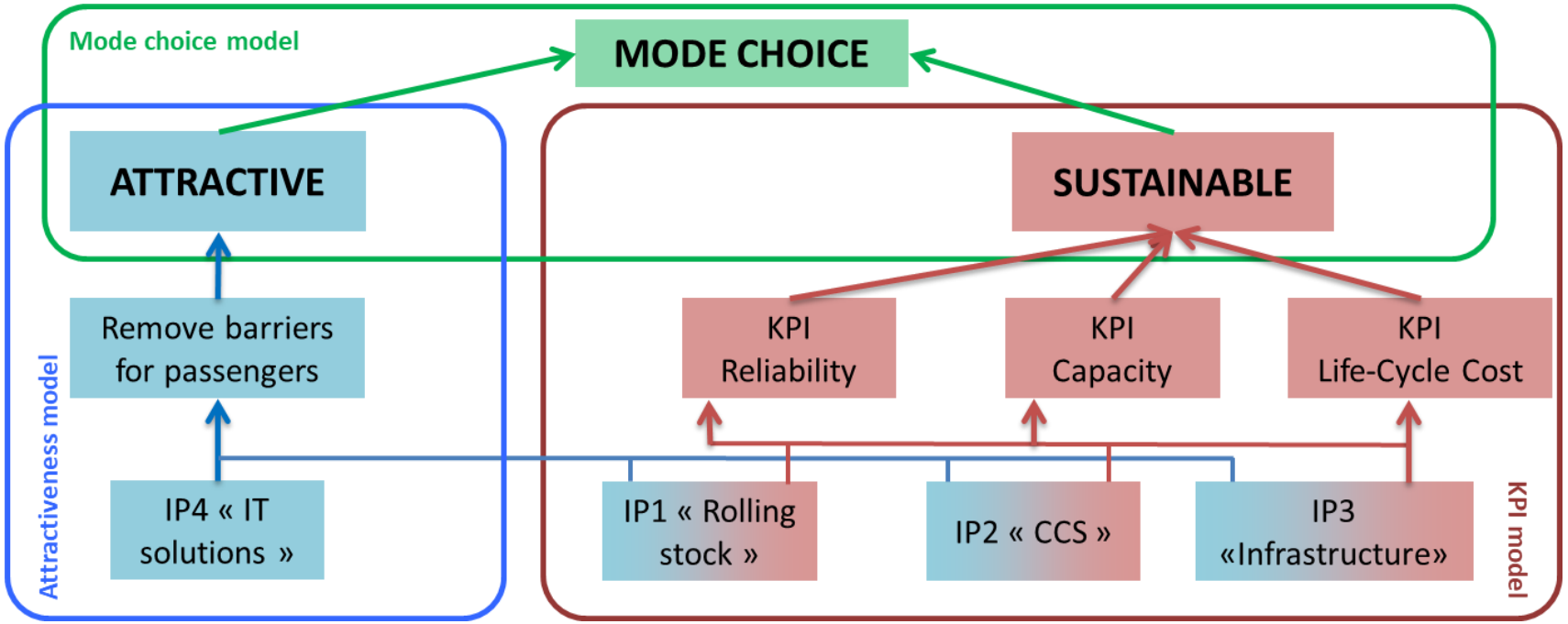
- Improvements to release 1.0 mainly by **change of calculation method** (as presented at GB workshop 05/09/19)

Validation Process

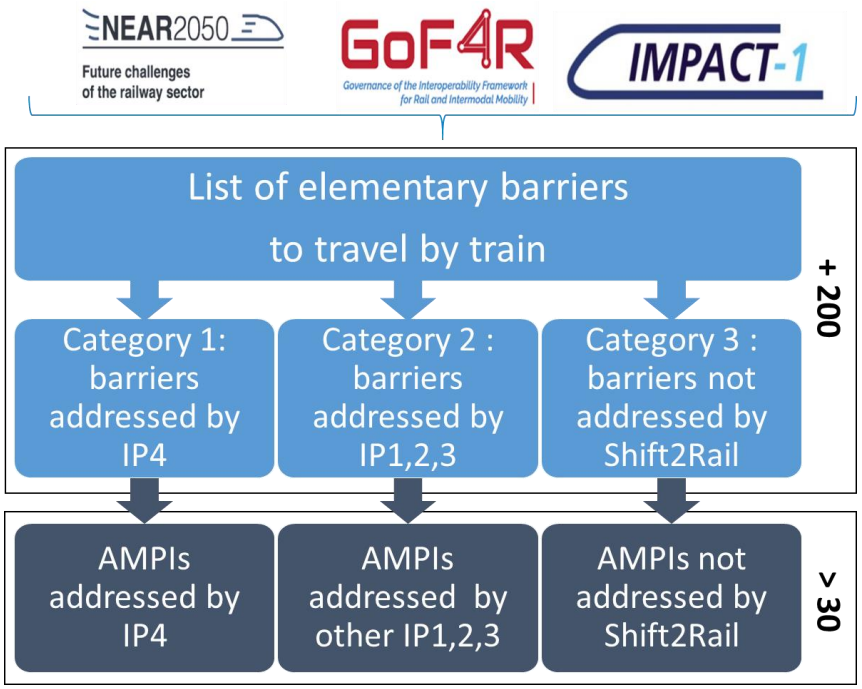
Next Step: Validation process to increase accuracy level

- Detailed validation process will be developed within November & December 2020 by the KPI team
- TD leaders will be asked for 2020 release how ”confident“ they are about their improvements (e. g. high / medium/ low)
- General idea for accuracy level was already presented in October SteCos and in principal well received by SteCos
- Detailed procedure will be presented at all next SteCos in January & February 2020

Overall Approach
Mode choice, KPIs and attractiveness



Attractiveness model
From Elementary Barriers to AMPIs

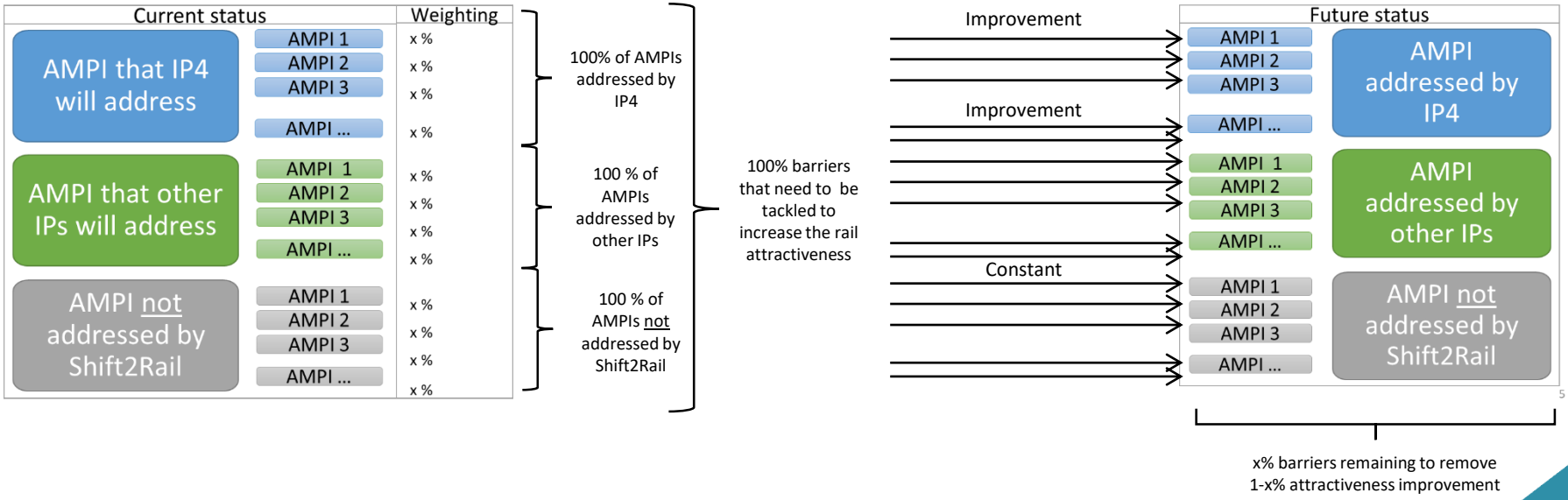


Exemple for 2 IP4 AMPIs

AMPI	Included initial elementary barriers
Real-time information	• No info on the travel time remaining • No information (schedule, departure,…) • No up-to-date information • Public transport schedule during the trip; Route info during the trip
Travel assistant	• No assessment of the transport services by peers • No feedback Option • No possibility for travel complaints • No travel assistant during journey • Trip Booking unavailable • Trip Planning unavailable • Unreliable information

AMPI : Area of Major Potential Improvement, which is a coherent group of elementary barriers

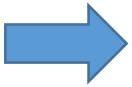
Attractiveness model methodology



Attractiveness model
First results

AMPIs (= group of barriers) distribution per SPD

	SPD1 High Speed	SPD2 Regional	SPD3 Metro
IP4	45%	39%	38%
Other IPs*	10%	9%	13%
Not S2R AMPIs** *(non technological AMPIs)*	45%	52%	49%

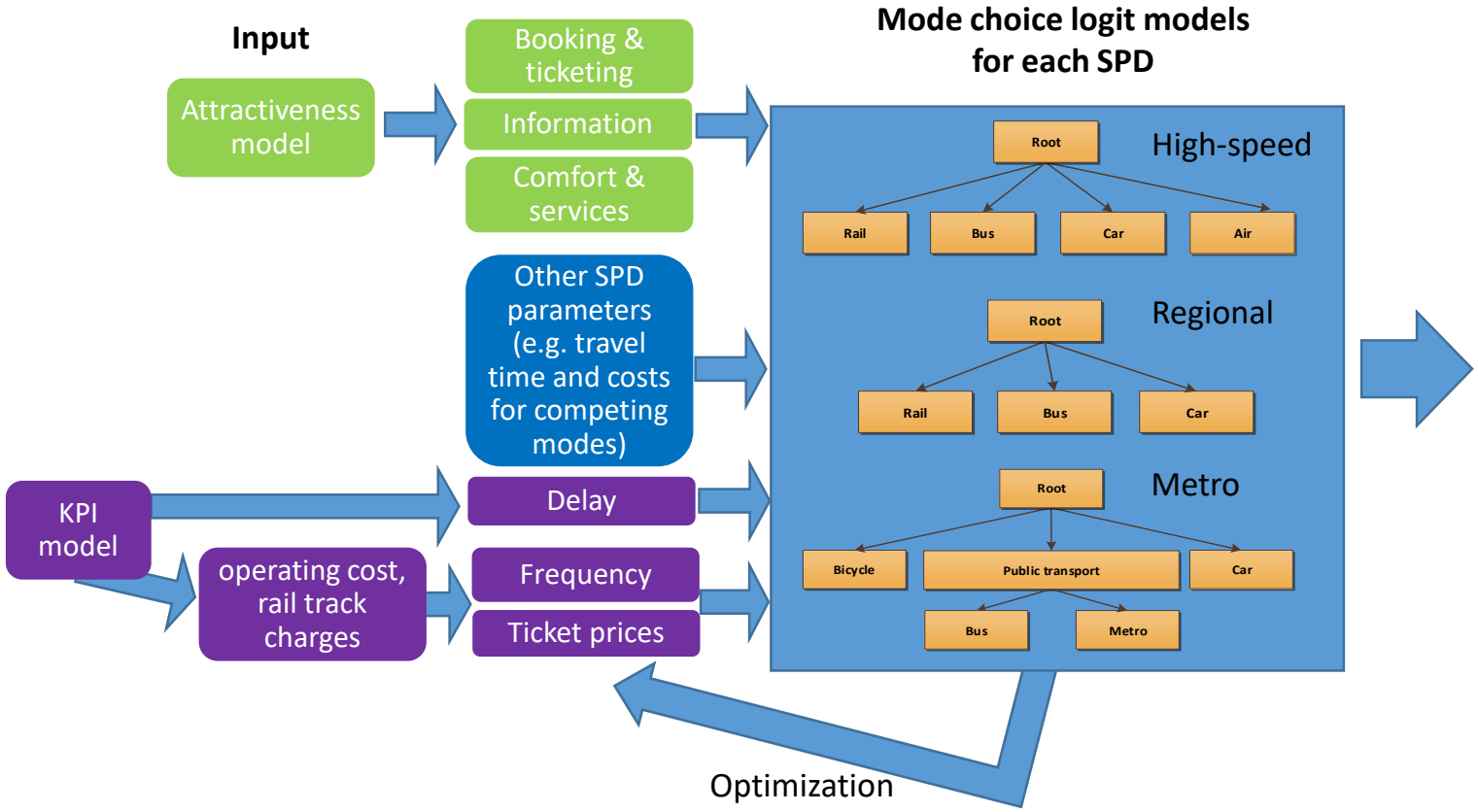


Barriers reduction
Values with respect to IP4 baselines

	SPD1 High Speed	SPD2 Regional	SPD3 Metro
IP4 obstacles reduction	44%	45%	46%

* Other IPs AMPIs are the following: Train layout, Train noise, Station design, Station services
** Not S2R AMPIs are the following : Cleanliness (vehicle & station), Physical connexion with other public transportation, client personnal preferences, RU's service offer, security, safety, staff (RU & station), public policy incentive

Passenger mode choice - methodology



Output

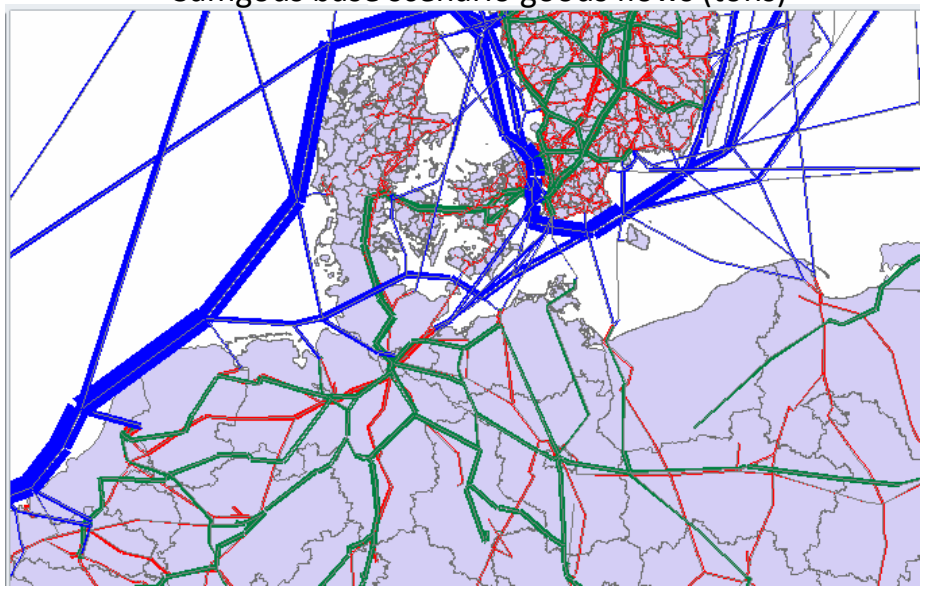
In reference and Shift2Rail scenario:

- Modal shares
- Ticket prices and frequency in optimum (operator/welfare minimization of costs)

Freight mode choice model

- Estimate the effect on modal split (tonkm) from Shift2Rail innovations
- Using the **Samgods** model (TRV model for goods flows within, to, from and through Sweden)
- First **preliminary result**: Reduction of transport time (e.g. faster loading) → increases rail modal share substantially

Samgods base scenario goods flows (tons)



Red=road, Green=rail, Blue=sea

MAAP Part B

Adoption of MAAP Part B

- The MAAP Part B – Technical Content, focuses on the re-prioritised R&I activities included initially in the 2015 MAAP and ensures adequate alignment with the MAAP Part A
- Draft version of MAAP Part B was published on the S2R JU website on 20 May 2019
- Feedback received to the draft version
  - European Commission (DG MOVE)
  - S2R Members
  - Scientific Committee
  - UR-ID Working Group
- The MAAP Part B introduces a demonstration plan by Technological Demonstrators and incorporates new ideas to enable a more appropriate quantification of the impact of each new technology

Update on Cooperation with Regions and International Organisations

Cooperation Agreements

- MoU ETSI:

  signed in May 2019
- MoU region of the Basque Country (ES) on ESIF synergies:

  After approval by Basque authorities, ready for signing end 2019
- MoU CUTRIC:

  final drafting stage, aim to launch GB consultation procedure with a view to signing end 2019
- MoU FERRMED:

  final drafting stage, aim to quickly launch GB consultation procedure
- MoU World Alliance for Efficient Solutions: drafting stage, waiting for WA feedback

  3 Shift2Rail funded TDs pre-selected:
  - TD2.2: S2R Automatic Train Operations for mainline railways, sponsor ALST
  - TD3.10: S2R smart metering for energy management, sponsor ALST
  - TD5.4: High Performance Freight Train, sponsor BT
- MoU CEN/CENELEC:

  drafting stage, waiting for CEN/CENELEC feedback

S2R JU regional cooperation workshop

- First regional cooperation workshop held on 9 October 2019
- Aim to explore synergies between Shift2Rail JU and European Structural Investment Funds
- Representatives of more than 10 EU regions present
- Representatives of EP, EC, JRC, Clean Sky JU, public transport operators, S2R JU present
- Wrap up video available on S2R website:

https://shift2rail.org/events/shift2rail-regional-cooperation-workshop-09-10-2019/

S2R 2
Transforming Europe's Rail System

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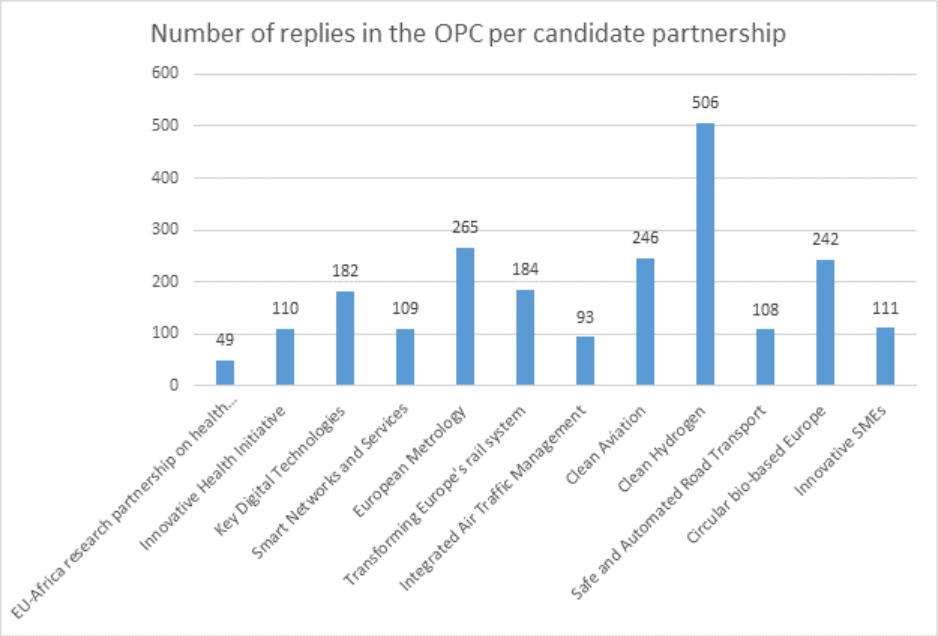
Outcome of public consultation



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FOUNDING MEMBERS

ALSTOM

BOMBARDIER

CAF

Hitachi Rail STS

NetworkRail

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ASSOCIATED MEMBERS

amadeus · ČD PRAHA · DB · DIGINEXT be visionary · Faiveley Transport A Wabtec Company · HaCon

indra · KNORR-BREMSE · kontron S&T Group · mermec AN ANGEL COMPANY · SNCF · Talgo

Virtual Vehicle Austria consortium+ (VVAC+)

virtual vehicle · MIENER LINIEN · FCP · TATRAVAGÓNKA POPRAD · getzner engineering a quiet future · ACT · KIRCHDORFER CONCRETE SOLUTIONS · mcl · Plasser&Theurer · PJM · voestalpine ONE STEP AHEAD · AVL

European Rail Operating community Consortium (EUROC)

ÖBB Immer in Bewegung · bls · COMBOIOS DE PORTUGAL · Lilk erne vira sto · PKP POLSKIE KOLEJE PAŃSTWOWE Spółka Akcyjna · SBB CFF FFS · ProRail · Infraestruturas de Portugal · TCDD · Slovenske železnice

Swi'Tracken consortium

RAILENIUM · Universidad del País Vasco · Euskal Herriko Unibertsitatea · U.PORTO · TATA STEEL · University of Minho · vossloh · TRONICO · izt · egis · EURO TUNNEL

Smart DeMain (SDM) consortium

Strukton Rail · cemosa · Fraunhofer IVI · acciona · DLR

AERFITEC

AERnnova · FIDAMC · tecnalia Inspiring Business

Competitive Freight Wagon Consortium (CFW)

ConTraffic Consulting Network for Traffic System · DLR · DIE BAHNINDUSTRIE. · ceit · WBN

Smart Rail Control (SmartRaCon) consortium

DLR · RAILENIUM · ceit · NSL

Shift2Rail

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ERRAC
The European Rail Research Advisory Council

Agenda

1) Welcome from the Chair– Alberto Parrondo
2) Approval of the Agenda
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5) Shift2Rail update – Carlo Borghini, Executive Director
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7) TER4Rail – Panel Discussion – Tackling Cybersecurity Challenges
8) TER4RAIL – Armando Carrillo, Secretary General, EURNEX
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ERTRAC
European Technology Platform for Road Transport Research

ERRAC Plenary
29 November 2019

ERTRAC is the European Technology Platform (ETP) for Road Transport recognized and supported by the European Commission.

Members gather all the stakeholders of Road Transport Research: involving industry and researchers, private and public organisations, including administrations from European, national and local levels.

ERTRAC Organisation

Plenary

Gathering all the ERTRAC members;
Establishing the strategic orientations of the technology platform;
Endorsing the publications.

Working Groups

Gathering experts from the ERTRAC members;
Responsible for the preparation of the ERTRAC documents;
Co-managed by industry and research Leaders.

ERTRAC Working Groups

- Urban Mobility
- Energy & Environment
- Safety & Security
- Long Distance Freight Transport
- Global Competi-tiveness
- Connectivity & Automated Driving

ERTRAC Strategic Research Agenda

Key document in preparation of Horizon Europe:

- Long-term Vision with objectives for 2050
- R&D topics for timeframe 2020-2030

- Ensure mobility in **urban areas**
- **Environmental sustainability**: energy and resource efficiency, decarbonisation and air quality
- Ensure an **efficient and resilient** road transport **system**
- **Connectivity and Automation** – an enabler for improved mobility
- Provide perfect protection: **safety** and **security**
- **Europe as world leader** in innovation, production and services

Recent Roadmaps published in 2019:

- Connected and Automated Driving (3rd version)
- Long Distance Freight Transport
- Road Safety

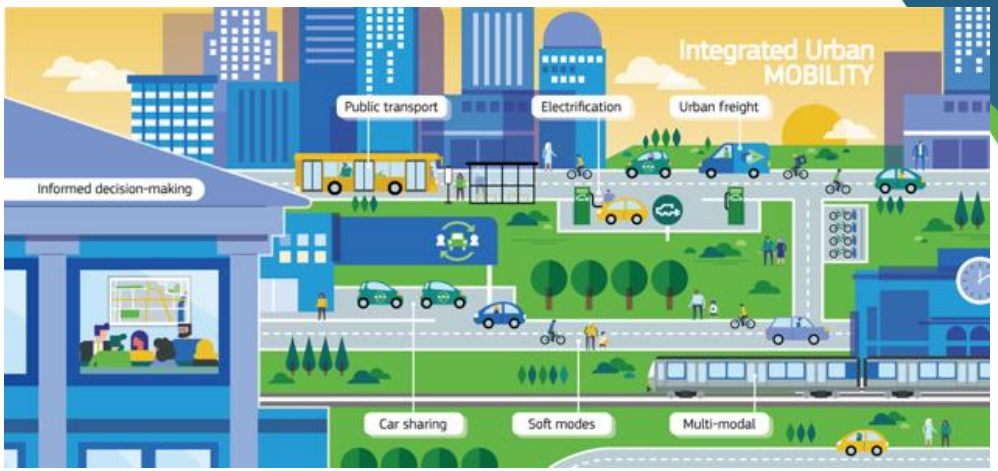
Next Roadmaps to be updated in 2020:

- Urban Mobility: to include all the new mobility services (shared, micro)
- Energies, Powertrains and Electrification: grouping together 3 roadmaps into one!
- Connected and Automated Driving

Fields of cooperation with ERRAC:

- Urban Mobility
- Freight Transport
- Connectivity and Automation
- Competitiveness and manufacturing

Urban Mobility



- Roadmap is prepared jointly by ERTRAC together with ERRAC and ALICE.
- Vision: **towards an "Integrated Urban Mobility", connecting all modes and mobility services with a user-centric perspective**.
  - MaaS, enabled by seamless connectivity
  - Infrastructures adaptation and urban planning to support a true integration of mobility offers
  - Governance and tools to support local authorities knowledge and decision-making

Freight Transport

New ERTRAC Freight roadmap listing as R&I priority “Integration to the European transport system: guidelines to enhance inter-modality.”*

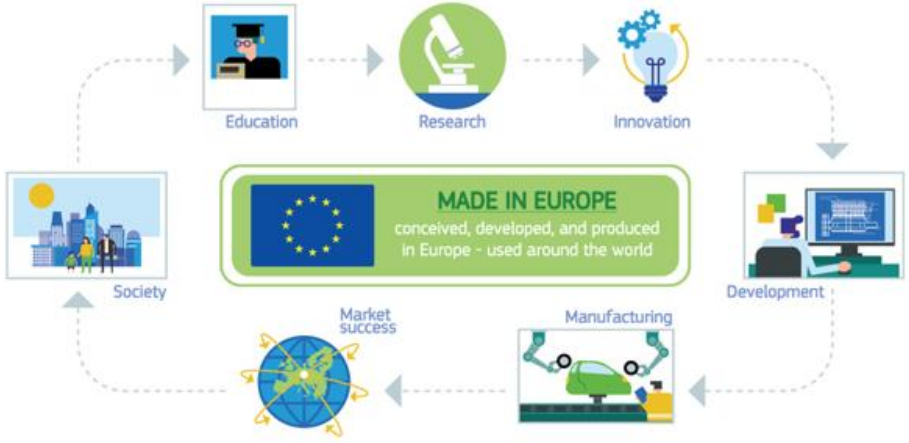
- Support European standardisation
- Digitalisation and processes
- Enable flexible interchanges: increased efficiency of transhipments at hubs
- Modularisation of compatible load units
- Emerging type of new transports

*Chapter 4.4 of ERTRAC Long Distance Freight Transport roadmap 2019

Connectivity and Automation

- ETPs issued a joint position to complete the multi-modal chapter of the STRIA CAT Roadmap
- CAT technologies supporting inter-modal hubs:
- - for passengers through MaaS and integration of new automated mobility solutions
- - for freight through automation of transhipment operations, and integration towards end-to-end flow
- Data sharing and cyber-security harmonisation
- Specific rail-road topic: safety at level crossing integrated in automated driving systems
- Harmonisation, replicability and scale-up!

Competitiveness and manufacturing



- ERTRAC cooperating with EFFRA/FoF, looking at topics that should be of interest to other modes:
- Manufacturing technologies, Additive Manufacturing
- Optimised design and production processes through digitalisation (simulation, virtual testing and validation)
- Sustainability of energies and raw materials, light-weighting, Life-Cycle Assessment
- Evolution of skills and training, industry-research cooperation

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This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement no. 826055 (TER4RAIL)

A Panel discussion organized by the European Rail Research Advisory Council (ERRAC) and the TER4RAIL project

Protecting Railways:

R&D Priorities to tackle cybersecurity challenges of emerging technologies

Moderator: Alberto Parrondo, ERRAC

- Mihai Chirca, UITP
- Nina Hasratyan, ECSO
- Francois Hausman, Shift2Rail/UNIFE
- Borja Lanseros, Titanium Industrial Security

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TER4RAIL
Transversal Exploratory Research Activities for Railway

This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement no. 826055 (TER4RAIL)

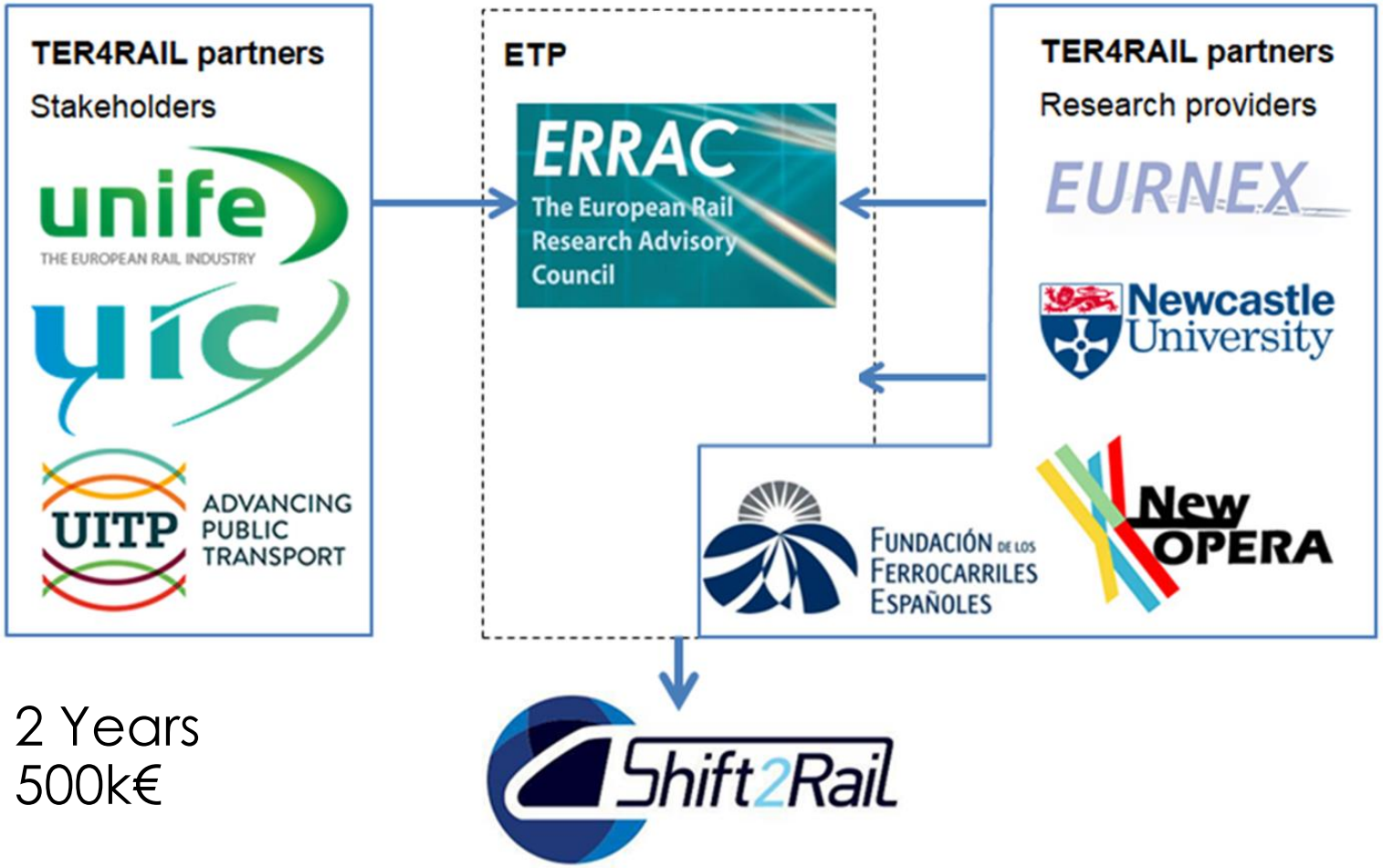
STATUS T4R PROJECT

ERRAC Plenary, 29.11.2019

Coordinator: Armando Carrillo Zanuy

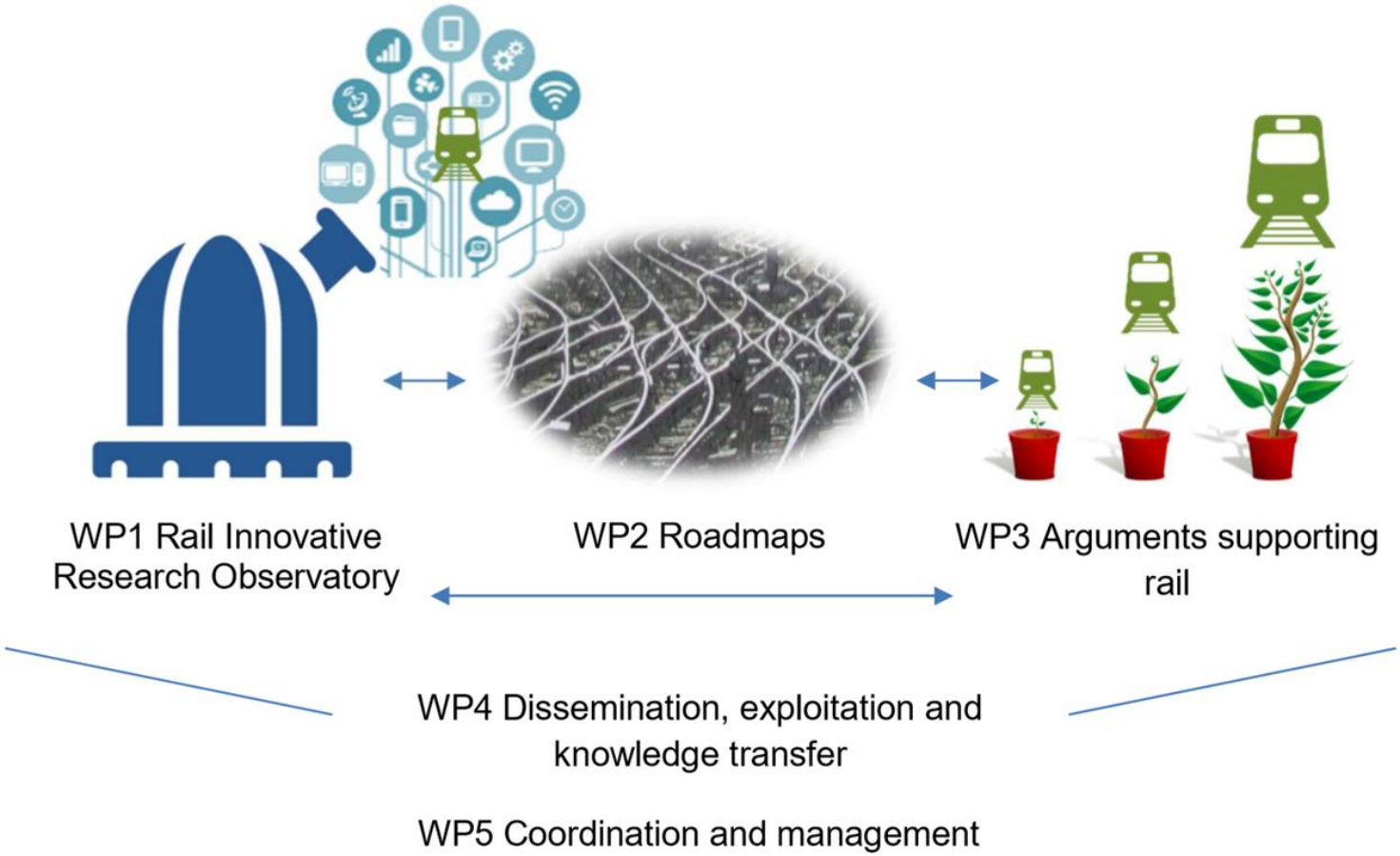
EURNEX, European Rail Research Network of Excellence

CONSORTIUM



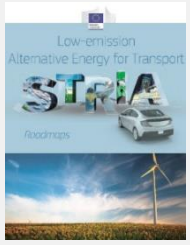
2 Years
500k€

PROJECT STRUCTURE



WP1 RAIL R&I OBSERVATORY

DOCUMENTS



Key strategic and policy documents

28 key strategic documents

RAIL STAKEHOLDERS

Rail operators and infrastructure managers, rail industry, SMEs, universities and research centres…

ERRAC The European Rail Research Advisory Council · Shift2Rail · uic · unife THE EUROPEAN RAIL INDUSTRY · UITP · EURNEX · New OPERA

115 responses
46 valid for analysis

PROJECTS

Horizon2020: Smart, green and integrated transport; Secure societies; Secure, Clean and Efficient Energy; Shift2rail Projects; SME instrument; …

Rail-related projects:
179 H2020
381 National

Full report:
Link

Survey to Railway Stakeholders

Understanding of the vision that the sector has of itself and the **trends and challenges of rail research and innovation** from the perspective of different rail stakeholders

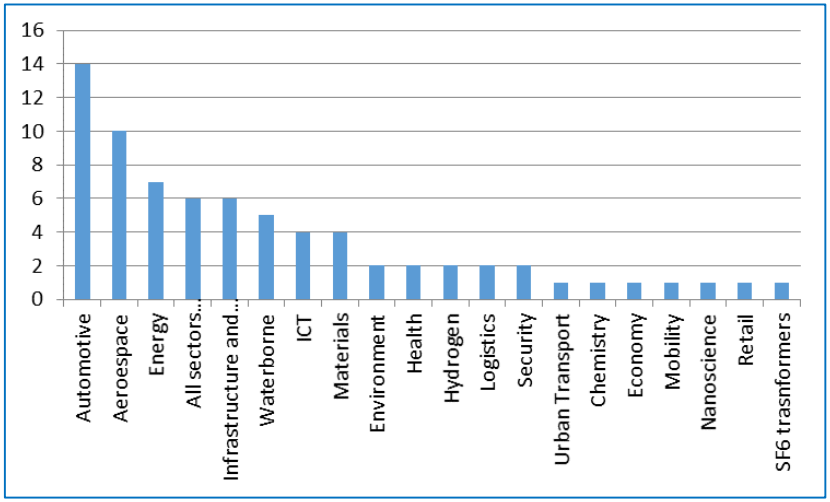
The most promising technologies or innovations that have the potential to transform the rail sector…

… in the next 5 years

Digitalisation	10
Materials	8
5G	5
Automation	5
Batteries	5
Big Data	5
Energy	5
Condition based maintenance	4
Artificial Intelligence	3
Building Information Modelling - BIM	3
Automatic Train Operation	2
Augmented Reality	2
Block Chain	2
Communications	2
Internet of Things	2
Monitoring technology and sensors	2
Power sources	2
Signalling technology	2

…in the coming decades

Digital transformation	10
Materials	7
Artificial Intelligence	6
Automation	5
Autonomous mobility	5
Power sources	5
Hyperloop	4
Big data	3
Energy	3
5G Wireless connectivity	2
Condition based monitoring & predictive maintenance	2
Environment necessities	2
Internet of Things	2
Nanotechnology	2



Non-rail sectors with whom Rail actors are currently cooperating

Checkout the full report!

WP1 OBSERVATORY

- Results 1 (rail sector)
  - ✓ Rail should be the backbone of European Mobility (confirmation of ERRAC 2050, ERRAC 2030), climate change emergency
  - ✓ Shift2Rail plays **the** major role in building research and innovative framework within railways sector
  - ✓ Collaboration with other modes and sectors is mandatory (majorly road and ICT), necessity for H2020 funding cross-mode and sectorial with rail
  - ✓ Continuation of alignment ERRAC/stakeholders & Shift2Rail

ALREADY COLLABORATING WITH THE RAILWAY SECTOR

ACARE

alice | Alliance for Logistics Innovation through Collaboration in Europe

ERTRAC

WATERBORNE

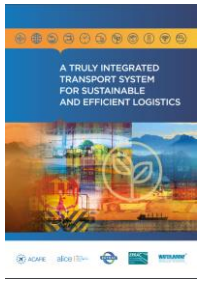
ERRAC The European Rail Research Advisory Council

Shift2Rail

Railway stakeholders

TRA TRANSPORT RESEARCH ARENA

Cooperative, Connected and Automated Transport STRIA Roadmaps



REFINET INFRASTRUCTURE MOBILITY

SETRIS

Bi-directional participation at Plenaries

Working Groups / Expert Groups

Consultations

Collaboration H2020 Work Programme

OTHER ETPS / PPP

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

Projects with direct application to railways

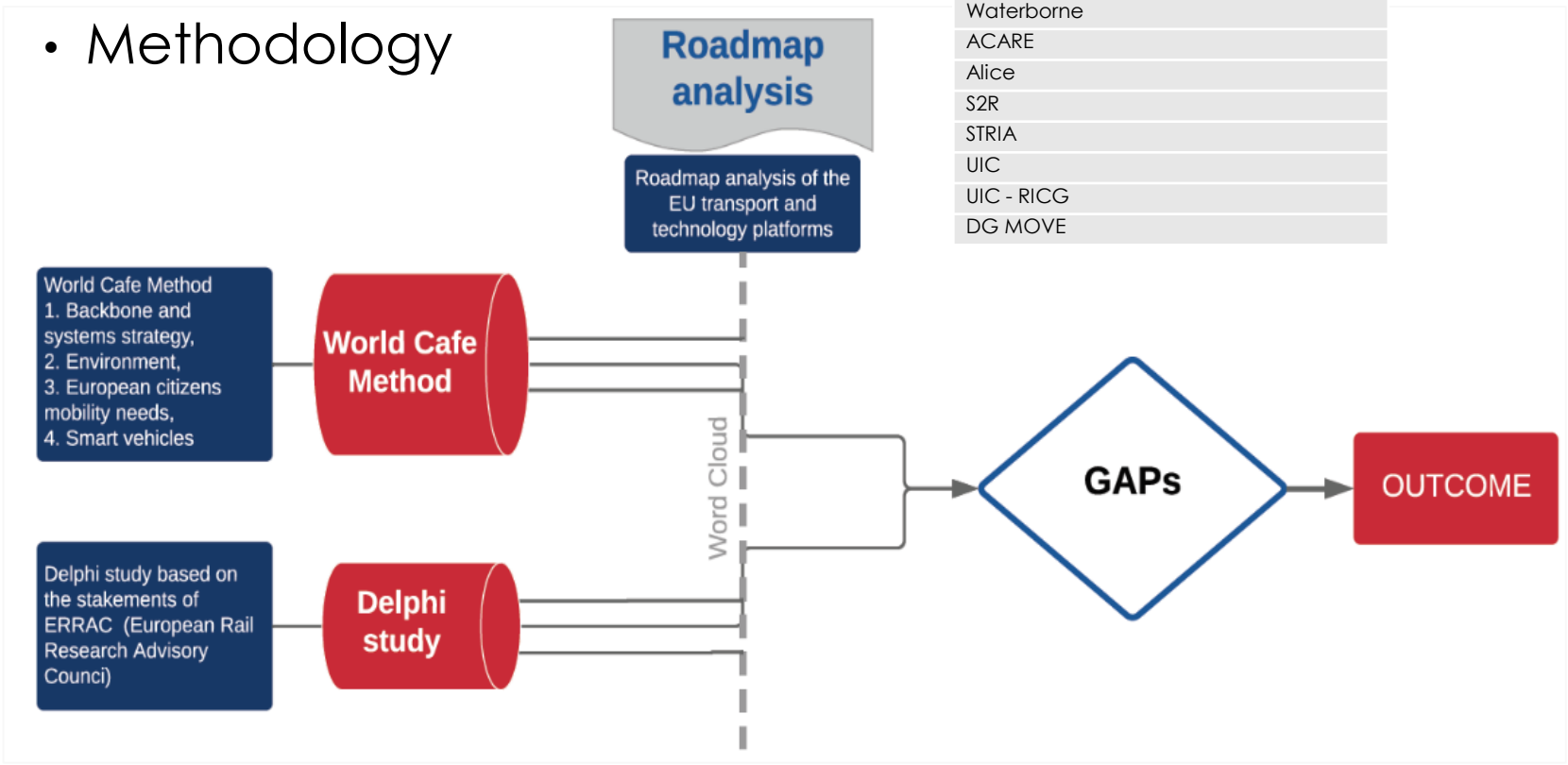
Workgroups open to end users / stakeholders

WP1 OBSERVATORY

- Results 3 (urban and rural aspects)
  - ✓ Major role of public transport, especially rail, in shaping the city and conurbations
  - ✓ Necessity of co-creation of transport systems with citizens role and their input, user-centered design
  - ✓ Understanding social and economic vulnerabilities, e.g. local needs, rural areas accessibility
  - ✓ Chance of digitalisation and connectivity, new technologies

WP2 ROADMAPS

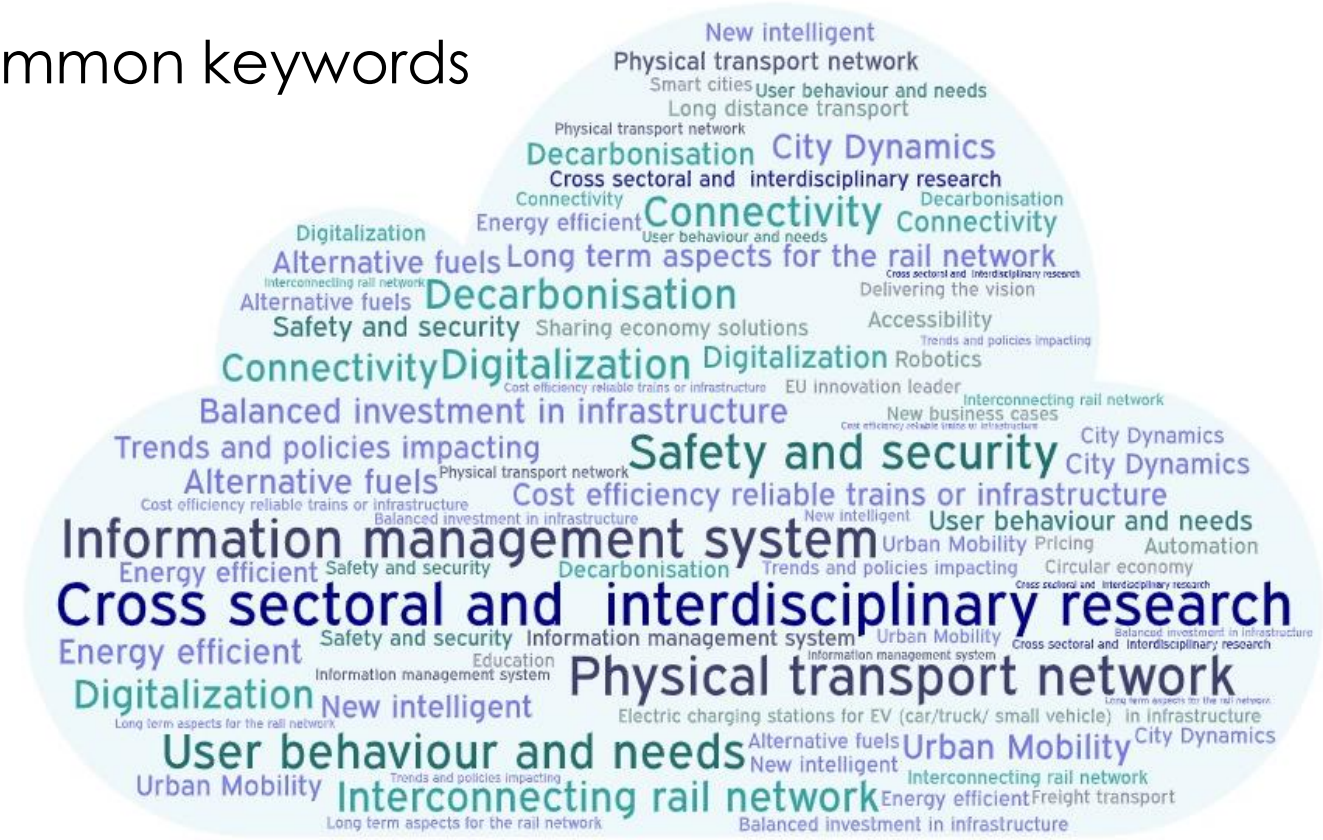
- Methodology



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

WP2 ROADMAPS

- Common keywords



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 security,
  - ✓ digitalization and interconnecting rail network.

WP3 ARGUMENTS FOR RAIL

- Success stories of railways and its chances (Freight)
  - ✓ Steady growth in combined transport (+10% semitrailer traffic)
  - ✓ Consolidation of Landbridges rail intermodal services with China(Silk Road) via Transiberian & Eurasia lines in economy of scale. 40 trains weekly to Duisburg and regular services to many other Eu Ports and Terminals(Hamburg, Milan, Belgrade, UK, France, Spain etc)
  - ✓ Substantial Increase of Maritime traffic distribution via Dry Ports and large hubs in " traffic industrialization" mode increasing the Ports' competitive reach(Hamburg, Rotterdam, Antwerp, Genoa)
  - ✓ Progressive introduction of Longer heavier faster trains on existing rail network. +750m.
  - ✓ Trieste Port doubled its rail traffic with regular services to Germany, Austria, Benelux, and towards the Eastern countries becoming very attractive for the Shipping lines serving the Adriatic, becoming port of Choice for Maritime Silk Road.

WP3 ARGUMENTS FOR RAIL

- Success stories of railways and its chances (Socio economic), public transport
  - ✓ Metro: 180 Lines in the world, ca. 35% fully automated, steady growth in line opening, Asia (leading), Africa
  - ✓ Steady growth in light rail (Europe leading)
  - ✓ Metro saves 220h per person per year per line (vs car)
  - ✓ Metro is 50 times safer than cars (and bikes!)
  - ✓ Metro has 40% less emissions and energy consumption compared to cars
  - ✓ Automation of metros growth, and soon light rail, HS and conventional rail

HIGH SPEED RAIL

HIGH-SPEED RAIL TRANSPORT (*)

	billion pkm														%
	BE	CZ	DE	ES	FR	IT	NL	PL	PT	SI	FI	SE	UK	EU-28	CHANGE
1990	-	-	-	-	14.92	0.30	-	-	-	-	-	0.01	-	15.23	-
1995	-	-	8.70	1.29	21.43	1.10	-	-	-	-	-	0.42	-	*32.94*	7.2 %
2000	0.87	-	13.93	1.94	34.75	5.09	0.11	-	-	-	0.07	2.05	-	*58.80*	11.6 %
2005	0.98	0.01	20.85	2.32	43.13	8.55	0.69	-	0.49	-	0.31	2.33	*0.45*	*80.11*	5.3 %
2006	1.00	0.15	21.64	2.70	44.85	8.91	0.73	-	0.51	-	0.44	2.49	0.90	*84.32*	5.2 %
2007	1.02	0.33	21.92	2.59	47.97	8.82	0.80	-	0.51	-	0.58	2.78	1.39	*88.70*	5.2 %
2008	1.08	0.25	23.33	5.48	52.56	8.88	0.87	-	0.53	0.01	0.62	2.99	0.99	*97.60*	10.0 %
2009	1.06	0.24	22.56	11.51	51.86	10.75	0.92	-	0.53	0.02	0.60	3.05	1.01	*104.10*	6.7 %
2010	1.06	0.27	23.90	11.72	51.89	11.61	0.29	-	0.52	0.02	0.65	*2.94*	1.01	*105.87*	1.7 %
2011	0.91	0.29	23.31	11.23	51.37	12.28	0.31	-	0.47	0.01	0.71	2.83	4.36	*108.06*	2.1 %
2012	*0.91*	0.27	24.75	11.18	51.09	12.79	0.32	-	0.46	0.01	0.71	2.95	*4.36*	*109.80*	1.6 %
2013	*0.91*	0.25	25.18	12.74	50.79	*12.79*	0.36	-	0.47	0.01	0.76	3.06	*4.36*	*111.67*	1.7 %
2014	*0.91*	*0.25*	24.32	12.79	50.66	*12.79*	0.24	-	0.54	0.01	0.65	3.23	2.90	*109.28*	-2.1 %
2015	1.20	0.57	25.28	14.13	49.98	*12.79*	1.00	0.47	0.57	0.01	0.57	3.37	2.90	*112.82*	3.2 %
2016	1.50	0.70	27.21	15.06	50.54	*12.79*	0.37	1.44	0.61	0.00	0.61	3.48	2.80	*117.12*	3.8 %
2017	1.56	0.77	28.50	15.54	58.28	*12.79*	0.41	*1.44*	0.65	0.00	0.68	3.60	*2.80*	*127.03*	8.5 %

Source Publications Office of the European Union, 2019 - STATISTICAL POCKET BOOK 2019 - EU TRANSPORT in figures

WP3 ARGUMENTS FOR RAIL

- Success stories of railways and its chances (high speed)
  - ✓ • HSR has been and is a major success story and a revolution in Rail services after decades of decay and oblivion;
  - ✓ • HSR is an advance technological innovation;
  - ✓ • HSR delivers effective and efficient services at competitive costs to old and new categories of users;
  - ✓ • HSR demonstrates its profitability and long term sustainability;
  - ✓ • HSR has eroded dramatically market share to air in medium long distances;
  - ✓ • HSR proved the viability of co-modal integration extracting the best value performance from each mode;
  - ✓ • HSR has a long way to go for exploiting its full potential in cross border traffic;
  - ✓ • HSR should evolve from a National to an International Experience giving the customers a new modal choice which today is not available for travel time between cities of 3 and 3.5 hours.

WP4 DISSEMINATION

- Project documents and social media
  - ✓ TER4RAIL website (https://ter4rail.eu/)
  - ✓ Twitter account: https://twitter.com/Ter4R
  - ✓ LinkedIn group: Ter4Rail_Shift2Rail
  - ✓ All deliverables of project online (f.i.)
    - ❖ Analysis of RAIL projects financed under H2020: https://bit.ly/2OYU6Pp
    - ❖ Compilation of Rail Research and Innovation projects financed at National Level: https://bit.ly/2qDiNJ1

WP4 DISSEMINATION

- Events organised by T4R partners
  - ✓ Organisation of a panel discussion on rail research and innovation at the ERRAC plenary on 21/03/2019
  - ✓ TER4RAIL survey for RAIL R&D stakeholders and transportation experts launched on 25/03/2019
  - ✓ Workshop on urban scenarios 2050 during UITP Summit in Stockholm, Sweden on 11/06/2019: https://bit.ly/2Oosm7z
  - ✓ TER4RAIL London Summit on 28/06/2019: https://bit.ly/37CMNVT
  - ✓ TER4RAIL Webinar Delphi Study Round One: https://vimeo.com/366213220
  - ✓ Organisation of a panel discussion on cybersecurity at the ERRAC plenary on 29/03/2019
  - ✓ Upcoming: TRA Session? Video competition for the youth

5 KEY MESSAGES

- Rail should be the backbone of European mobility (only way for transport growth while sustainable)
- Shift2Rail is key in building a research and innovative framework within railways sector
- Railways should be considered in non-railway roadmaps as an important mode to be integrated with
- Success stories of railways can be told in urban/rural, high speed and freight with large margin of growth (and sustainable)
- Railways sector should have good presence in transport conferences and events (e.g. TRA, World Economic Forum)

This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement no. 826055 (TER4RAIL)

QUESTIONS

Thank you for your kind attention!

Armando Carrillo Zanuy

Eurnex, European Rail Research Network of Excellence

Email: acarrillo@eurnex.eu

Agenda

1) Welcome from the Chair– Alberto Parrondo
2) Approval of the Agenda
3) Approval of the Minutes of 21 March 2019 Plenary
4) Keynote speeches - European Commission viewpoint
    1) *Keir Fitch, DGMOVE*
    2) *Jean-Francois Aguinaga, DG RTD*
5) Shift2Rail update – Carlo Borghini, Executive Director
6) Guest Speaker – Xavier Aertsens, Director, ERTRAC
7) TER4Rail – Panel Discussion – Tackling Cybersecurity Challenges
8) TER4RAIL – Armando Carrillo, Secretary General, EURNEX
9) **ERRAC Working Groups**
    1) *WG1 Vision&Strategy – Ulrich Meuser*
    2) *WG2 Collaboration – Johan Jonsson*
    3) *WG3 Communications – Aida Herranz*
    4) *Academia PAG – Prof Sebastian Stichel*
10) Concluding remarks and 2020 dates – Alberto Parrondo

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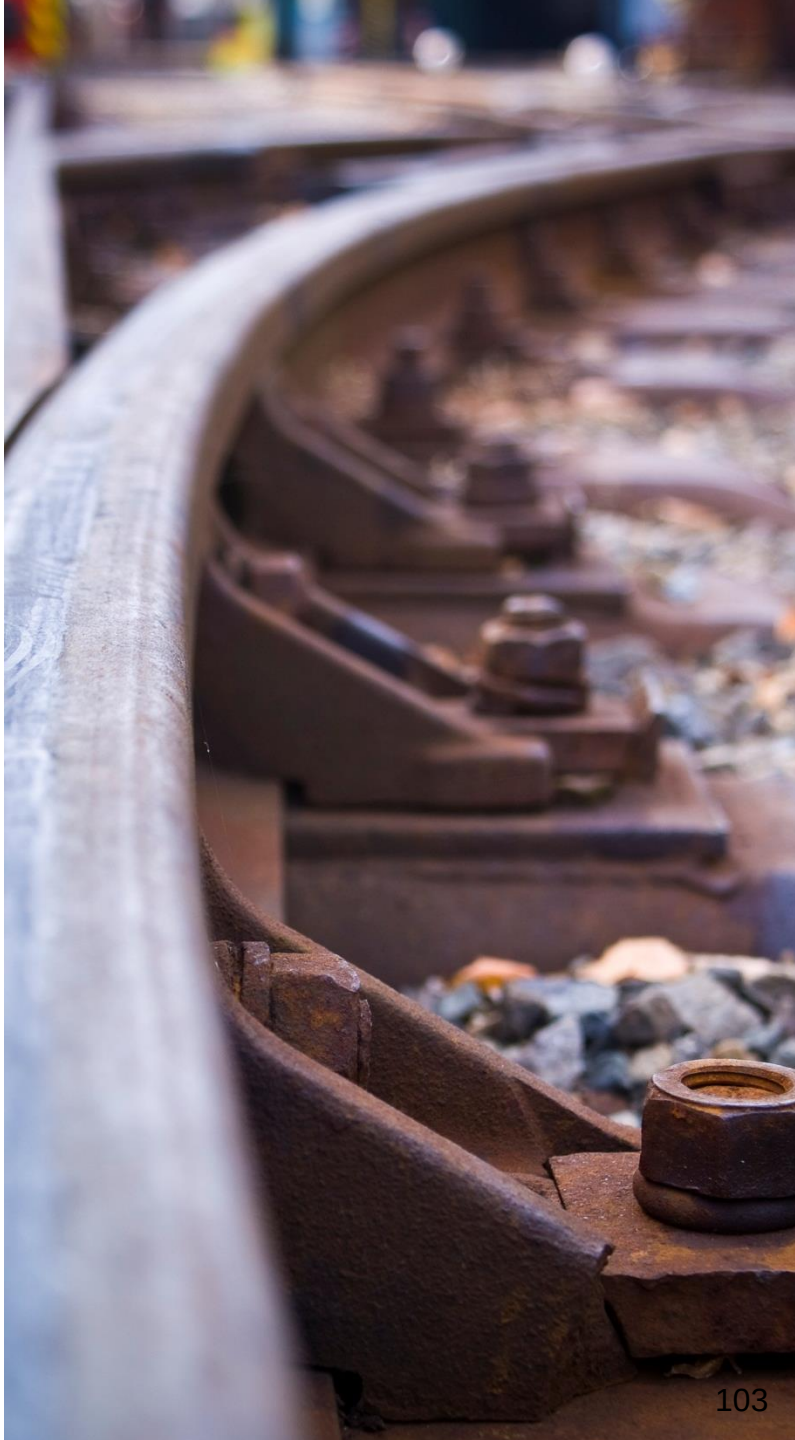
WG1

ERRAC Plenary
29th November Brussels

Ulrich Meuser



ERRAC WG 1 (1/4)

Objective: Deliver a rail sector paper describing the R&I activities planned for the period 2021 – 2027

Working documents: ERRAC 2050, ERRAC 2030 R&I priorities , description of 8 mega projects developed by a group of rail stakeholders

ERRAC WG1 (2/4)
8 mega projects

- **<u>Mega-projects (MP) proposed:</u>**
- **MP n°1: Assets for Automatic & Autonomous Operation**
- **MP n°2: Railways Digital Twin, Simulation & Virtualisation**
- **MP n°3: Smart Asset Management (SAM)**
- **MP n°4: Smart Integration for D2D Mobility**
- **MP n°5: Multi-Modal Pod-Systems**
- **MP n°6: Attractive Environmental Sustainability & Carbon Free Mobility**
- **MP n°7: Rail Freight – The backbone of a green logistic chain**
- **MP n°8: Network management Planning and Control**

ERRAC WG1 (3/4)
Mega project - Structure

- **Vison**
- **Challenges of the Mega project**
- **State of the Art and Achievements in Shift2Rail**
- **Content/Scope**
- **Stakeholders and role**
- **Impacts (Societal, Economic/technological, Scientific)**
- **Indicative timeline**
- **Visualisation**

ERRAC WG1 (4/4)
Timeline

- **20.11. 2019 - WebEX conference - Kick-Off Meeting**
  - **18 participants (44 invited)**
  - **Context, working process, timeline**
- **27.11.2019 – first feedback**
- **02.12.2019 – WG 1 WebEX conference**
- **t.d.b. –WG 1 WebEX conference -option, if needed**
- **16.12.2019 – WG 1 WebEX conference - final**
- **End of December handover to ERRAC SC for review**

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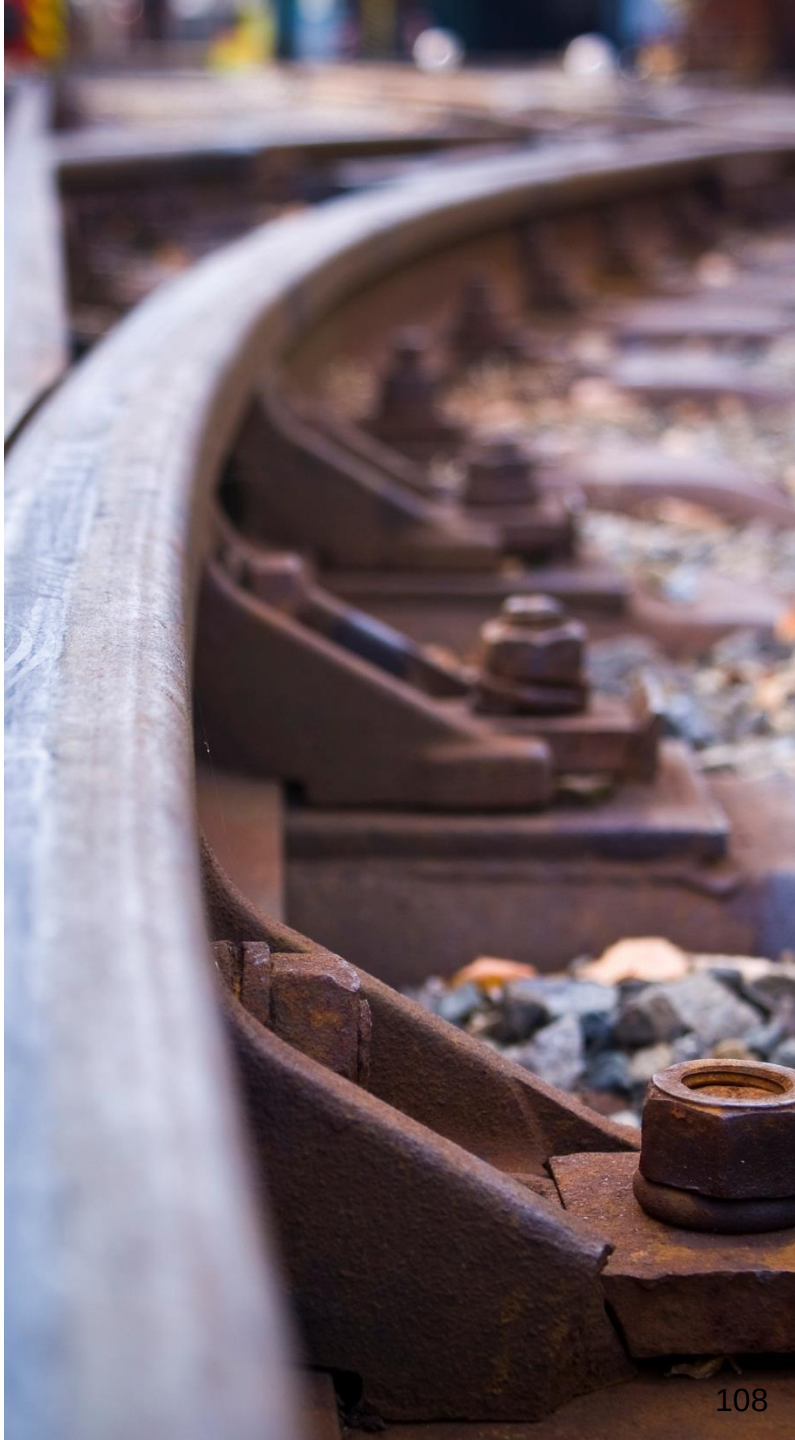
WG2

ERRAC Plenary
29th November Brussels

Johan Jonsson



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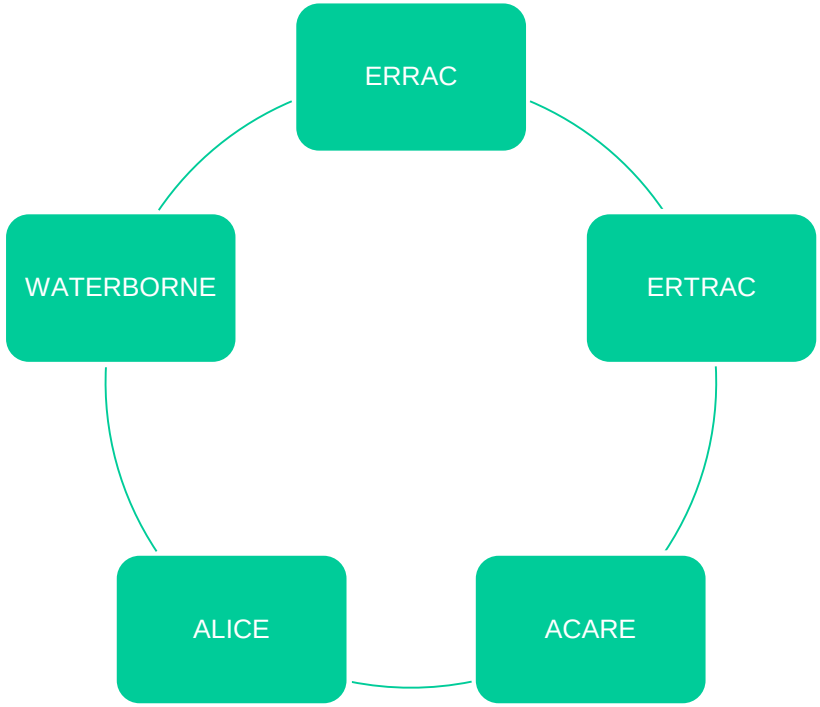
All ETPs share the same …

- Digitalisation
- Automation
- Environment
- Productivity & economy
- Society
- Regulatory & political framework
- Pre-competitive activities



Can we do better?

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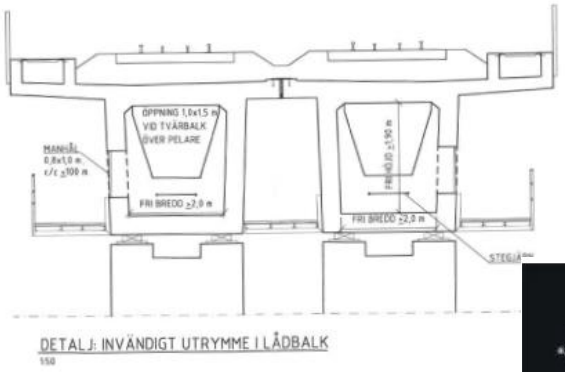
Be inspired!



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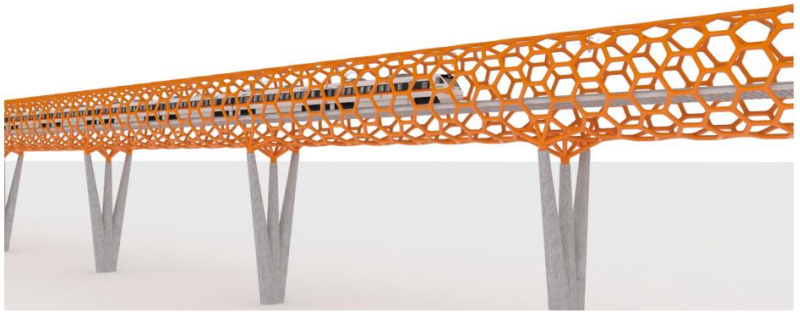
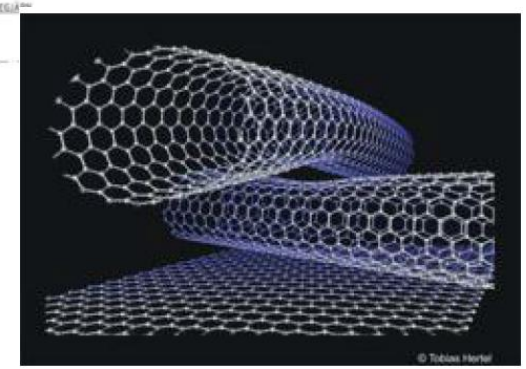
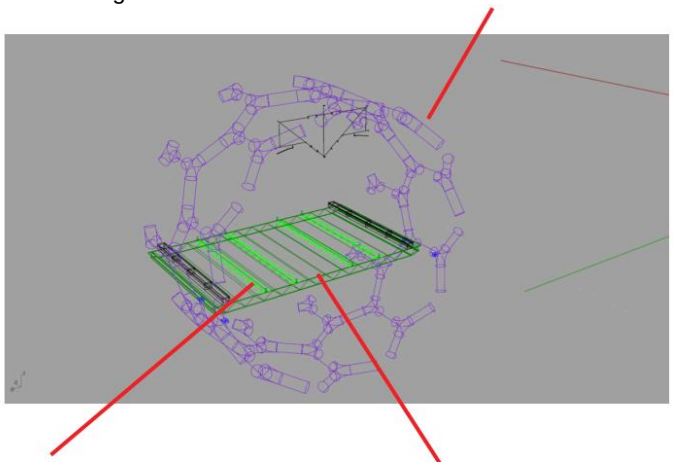




Model of two carbon nano tubes on a graphite surface. Tobias Hertel, Institute for Physical Chemistry, University of Wurzburg



A meeting point

ERRAC @ TRA 2020 HELSINKI

Rethinking transport

Towards clean and inclusive mobility

27–30 April 2020

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TRA2020 Program

- **Plenary sessions**
- **Strategic sessions**
- Technical and scientific sessions
- *Invited sessions – under development*
- Poster sessions
- Technical tours
- TRA VISIONS – Researcher Competition
- **Side events – ERRAC Plenary**

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ERRAC2030 *vs.* TRA2020 key topics

- Environmental Sustainability and Carbon Free Mobility
- Automation of the Railway System including Automated Train Operation
- Integrate the Railway in a Door to Door Mobility Ecosystem
- Intelligent Assets Lifecycle Management: Whole-Life assets Approach
- Cost-efficient and rapid Deployment of Innovations
- Transversal Enablers

- Clean transport – URGENT ACTION!
- Data-driven mobility
- Intelligent infrastructure
- European competitiveness

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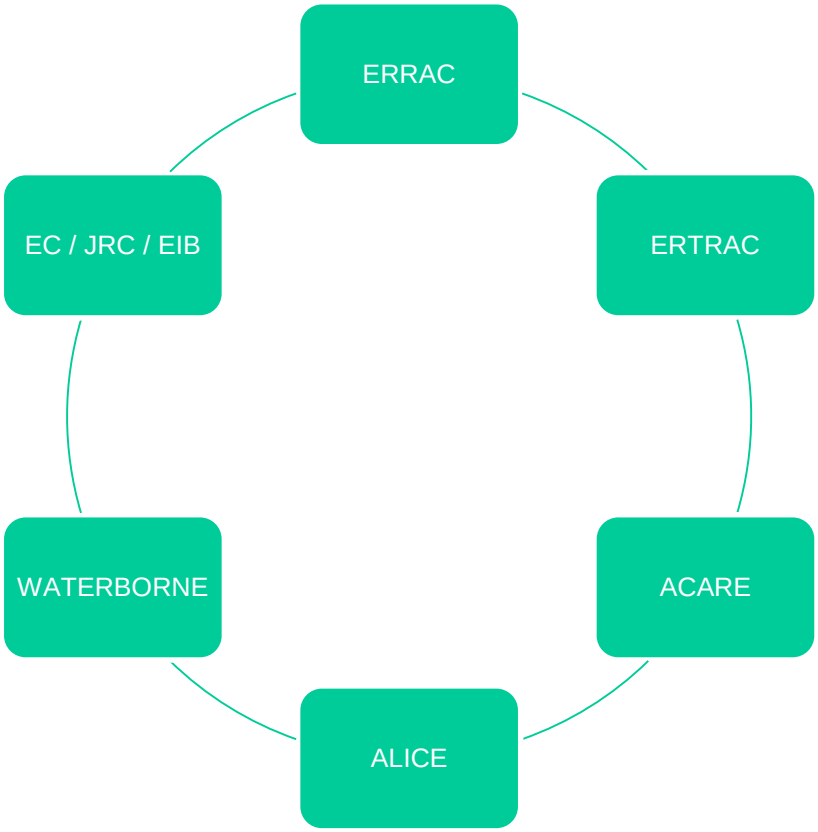
12 themes - 12 strategic sessions

- dig deep into the themes of the plenaries
- offer strategic insights into major challenges of the transport system
- jointly planned



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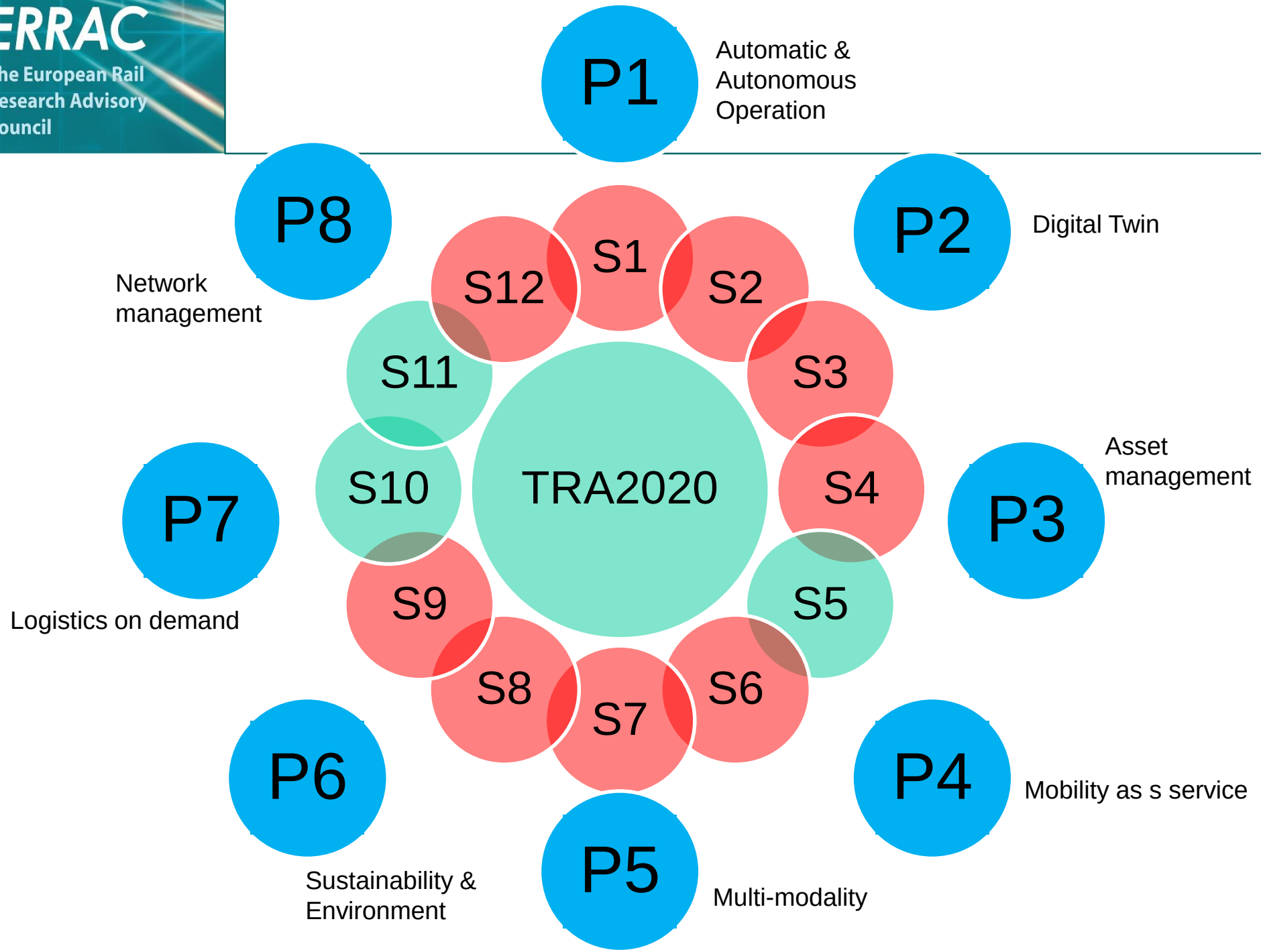

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Strategic sessions – *under development*

- Monday 27 April 2020
  Climate change mitigation – what can transport do?
- Cities' and citizens' action in reducing environmental impacts of transport
- Adapting to climate change – how to achieve a resilient transport system
- Tuesday 28 April 2020
- Going beyond algorithms
- Rethinking the role of users
- Taking transport safety to a new level: societal challenges, research solutions – the way forward

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Strategic sessions – *under development* (cont'd)

- Wednesday 29 April 2020
- Delivering quality transport infrastructure for the future
- Infrastructure for co-operative, connected and automated mobility
- Powering future transport networks
- Thursday 30 April 2020
- The road to a new urban mobility era – new governance models to enhance the deployment of policy-responsive innovative mobility solutions in cities
- Industrialising innovation
- Socio-economic impact of automation in transport

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Rail related invited session – *under development*

- **Digital Railway**: how can rail leverage on the opportunities offered by automation, AI, Big Data analytics, IoT and cloud computing s in order to be the backbone of a smart, environment and user-friendly mobility system
- Organisers: ERRAC and DG MOV

- Innovative solutions to **improve the safety of road and rail infrastructure**:
  - decision-making and the management of infrastructure assets
  - railway level crossings
  - use of smart nano- and micro sensors
- Organisers: UIC

Technical tours

- HSL- a metro system

Photo: Indav, Timo Kauppila

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Demos

- Three ERRAC related
  - My-TRAC, the multimodal travel companion for me and my friends
  - Data passenger
  - Gamification

- Total 38

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By the numbers

- 12
  topics
- 755
  submitted papers
- 38
  demos
- 12
  strategic sessions
- 1
  ERRAC side event

Thank you for your attention!

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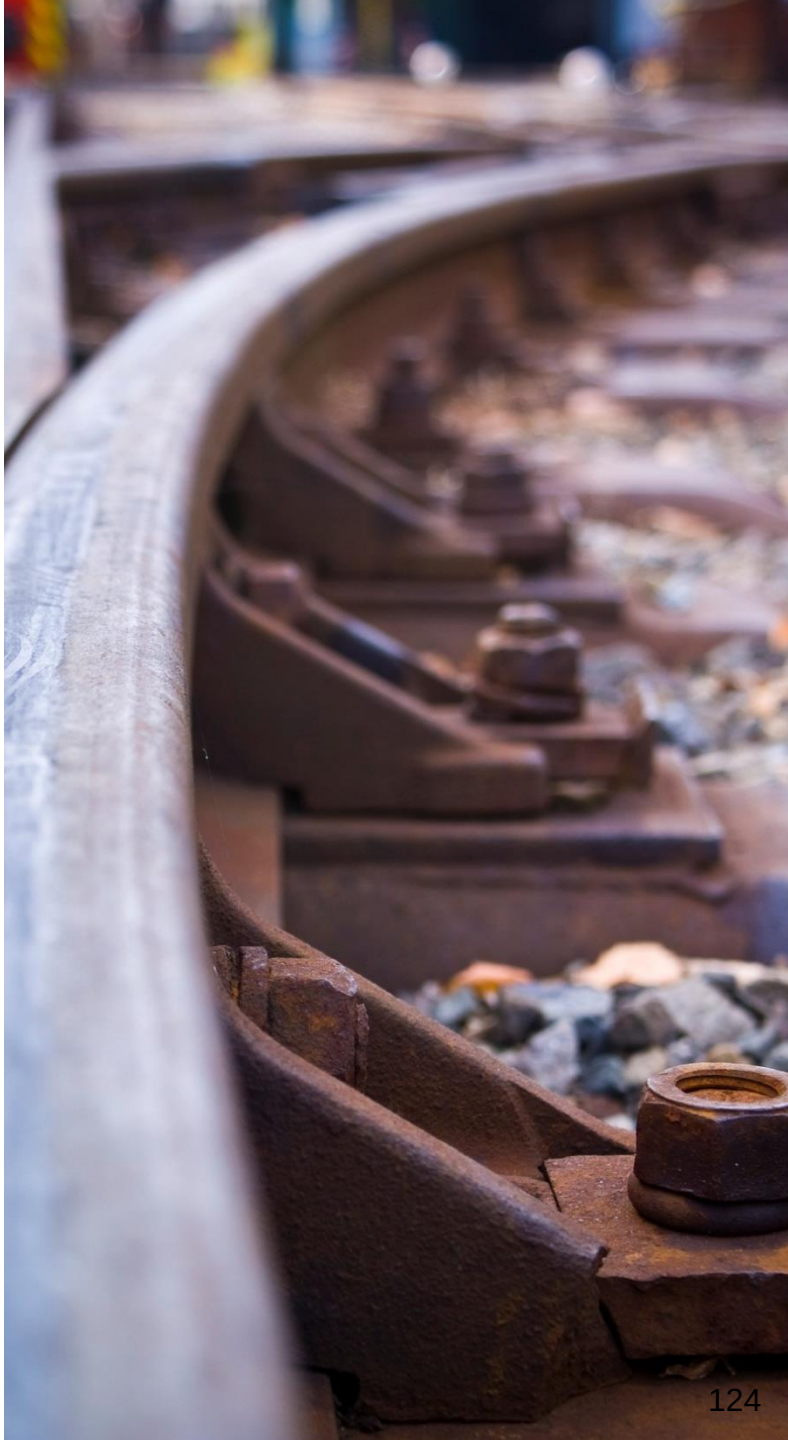
Communication in ERRAC - An important driving force for progress

ERRAC Plenary
Brussels, 29 November 2019

Aida Herranz

Lotta Andersson, Trafikverket
WG 3 leader



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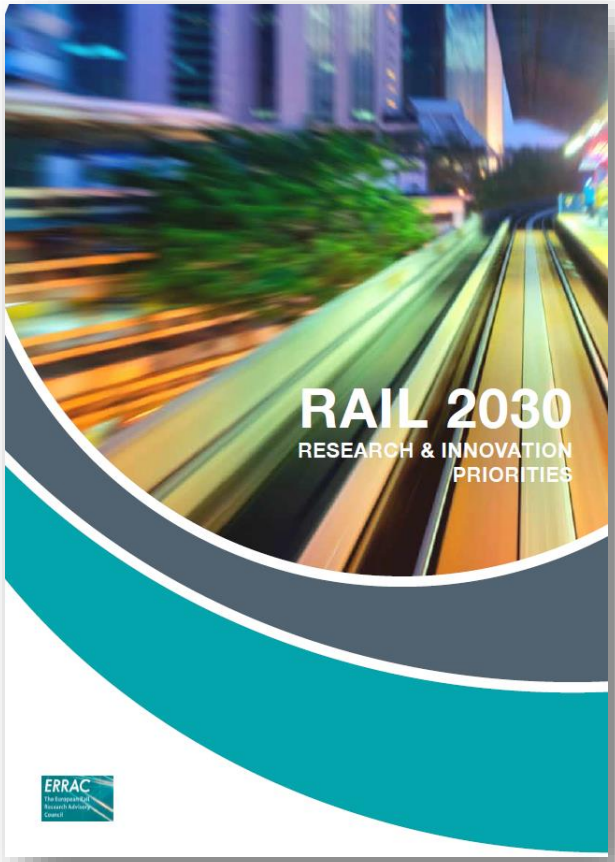
Rail 2030 – Research and innovation priorities



Full report

Brief version

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Promotion of the ERRAC Rail 2030 document

- The brochures can be downloaded from the ERRAC website where we also made some updates on the sites.

- The brochures where launched late September at the first of the European Research and Innovation Days in Brussels.

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Rail 2030 – Dissemination

- Shift2Rail, Caroline Kearney and Martin Brennan promote the ERRAC vision document on the Shift2Rail stand at WCRR in Tokyo.
- An article and link was included in the Shift2Rail October newsletter.
- Several tweets have been sent out by members and stakeholders.
- We plan a scheduled series of tweets, based on the areas of priorities to be sent out at the same time by the WG3-members to disseminate the work of ERRAC and especially the 2030 documents.

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Business cards with QR - for climate considerations

- We have produced a business card with QR code to errac.org and the brief version that can be distributed to promote ERRAC, be handed out at trade shows etc. instead of a physical brochure.
- The card is available at today's Plenary.

Please, grab a bundle, disseminate and help us promote ERRAC and our 2030 Research and innovation priorities – Thank you!

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Work in progress

- We have decided to create a fixed area on the web page to promote the Plenary's on a regular basis.
- Our aim is to start with a summary already after this meeting.

- TRA2020 - Shift2Rail is kind enough to provide ERRAC with a 10 sqm angle of their stand. Planning is underway.

- A list is being compiled among ERRAC members for upcoming rail-related events with the option to 'flag' them for communication purposes. The aim is to share the list on the web under Upcoming Event.

Thank you for your attention!

You are most welcome to contact WG3 for suggestions and ideas!

brennan@uic.org **lotte.eriksson@trafikverket.se**

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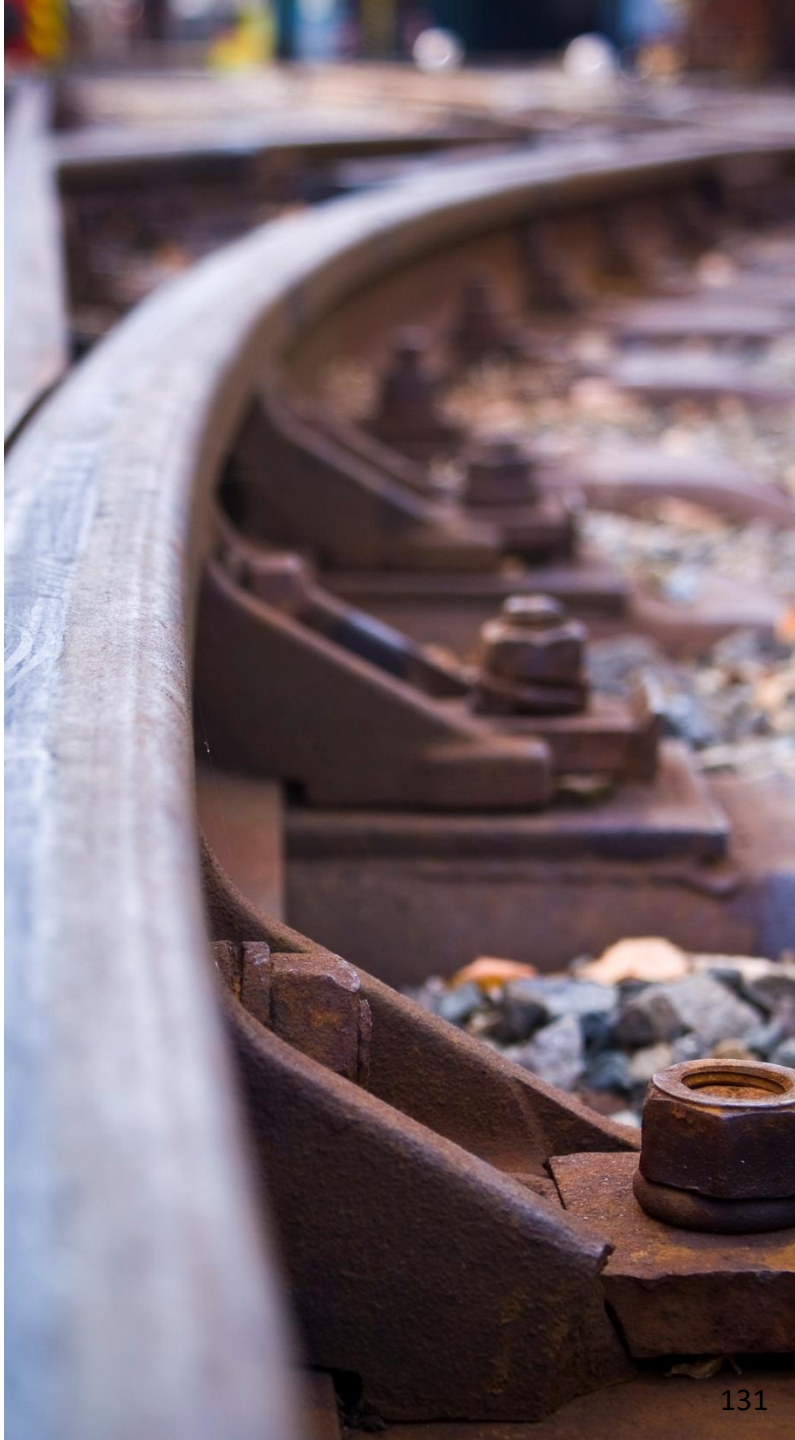
ERRAC Academia PAG

Sebastian Stichel

Brussels, 29 November 2019



ERRAC
The European Rail Research Advisory Council

Meetings

Meetings held:

17 April 2018 – 9:00-14:00, Vienna

29 November 2018, 14.30-17.30, Brussels

20 March 2019, 14.00-17.30, Brussels

28 November 2019, 14.00-17.30 Brussels

Next meeting

27 April 2020 – 14:00-17:00, Helsinki (during TRA2020)

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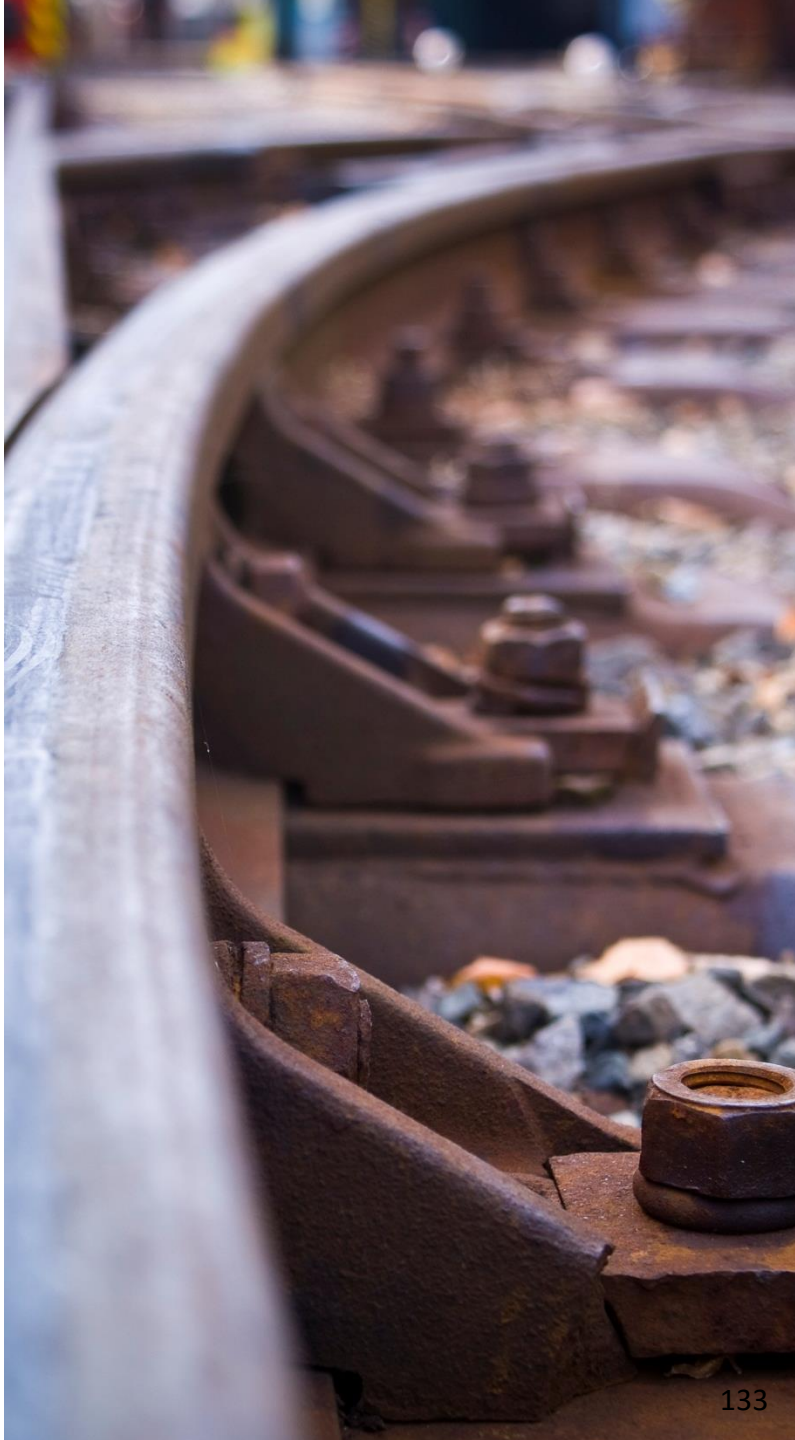
ERRAC Academia PAG

Input to
ERRAC Rail 2030 Research and Innovation priorities



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Introductory statement

- THE ERRAC PAG Academia was asked to give comments on the ERRAC 2030 Research and Innovation Priorities.
- Today only parts of the comments will be presented.
- All comments will be sent to the ERRAC Steering Committee .
- We will continue to gather comments.

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General comments

- A good document that addresses most important areas where research is needed to make the railway system in Europe fit for the future.
- There is very little said about engineering knowledge. Digitalisation will bring new tools and possibilities, but will not enhance our knowledge about the physical system.
  → There is a relation to competence building.
- In chapter 1 it is indicated that railways will have a strong market position if the innovations and efficiency increases foreseen are implemented. The more flexible individual road transport, however, will always remain a strong competitor.
  → EU has in parallel to provide the framework that can help railways to grow.
- Many references to making the journey attractive, but nothing is said about making the environment in the vicinity of the railway attractive.

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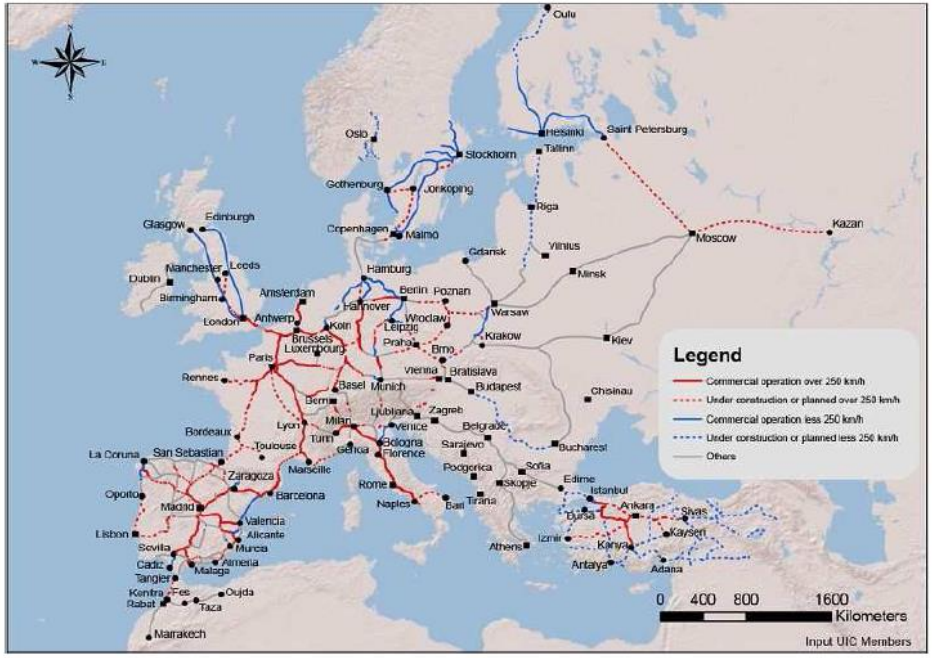
The importance of economic research

- Modelling the market share that might be achieved by radical improvements in rail services, such as future automated freight railways and passenger railways with integrated ticketing and information systems with other modes.
- Examining ways of accelerating innovation in railways through case studies of past successful and unsuccessful innovations.
- Studying the impact on costs of different ways of contracting out; for instance framework agreements
- Improved cost modelling to support examining the business case for innovations.

2 The Backbone of Mobility in 2030

- We are very positive to the focus on multimodality and also regard it as crucial for a future sustainable transport system
- Why not being a little bit more visionary and proposing a real European High-Speed network like the one in China? (“zero air-travel”)



3.3 Intelligent Assets Lifecycle Management: Whole-Life Approach

- The status-quo is not as bad as indicated in the document. Since about 15 years digitalisation has partly been implement and therefore some data-driven maintenance regimes are quite well developed today.
- The wheel-rail interface is an important cost driver today. In the document basically nothing is said about optimisation of the wheel-rail interaction.
- The same applies for the critical pantograph-catenary interface.

3.4 Environmental Sustainability and Carbon Free Mobility

- There should be a bit more focus on the CO_2-footprint, respectively the ecological footprint of the railway infrastructure. Activities are ongoing in this area and this is a discussion point regarding railway infrastructure investment.
- In relation to above a “whole life – whole system” approach should be adopted judging the environmental impact of railway transport.

Facilitation of blue sky or “cutting edge” research

- In the current setup of S2R it is not so easy with “cutting edge” research. The open call projects are basically defined by the members and also during the project phase tightly linked to a member project. This leaves little freedom for exploring new ideas.

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Agenda

1) Welcome from the Chair– Alberto Parrondo
2) Approval of the Agenda
3) Approval of the Minutes of 21 March 2019 Plenary
4) Keynote speeches - European Commission viewpoint
    1) *Keir Fitch, DGMOVE*
    2) *Jean-Francois Aguinaga, DG RTD*
5) Shift2Rail update – Carlo Borghini, Executive Director
6) Guest Speaker – Xavier Aertsens, Director, ERTRAC
7) TER4Rail – Panel Discussion – Tackling Cybersecurity Challenges
8) TER4RAIL – Armando Carrillo, Secretary General, EURNEX
9) ERRAC Working Groups
    1) *WG1 Vision&Strategy – Ulrich Meuser*
    2) *WG2 Collaboration – Johan Jonsson*
    3) *WG3 Communications – Aida Herranz*
    4) *Academia PAG – Prof Sebastian Stichel*
10) **Concluding remarks and 2020 dates – Alberto Parrondo**

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Agenda

1) Welcome from the Chair – Alberto Parrondo
2) Approval of the Agenda
3) Approval of the Minutes of 16 May Plenary
4) European Commission viewpoint
    1) *Keir Fitch, DGMOVE*
    2) *Clara de la Torre, DG RTD*
5) Shift2Rail update – Carlo Borghini
6) ERRAC Working Groups
    1) *WG1 Vision&Strategy – Ulrich Meuser*
    2) *WG2 Collaboration – Johan Jonsson*
    3) *WG3 Communications – Lotta Andersson*
7) ERRAC Academia PAG – Prof. Sebastian Stichel
8) Guest Speaker – Fernando Liesa, Secretary General, ALICE
9) TER4RAIL – Armando Carrillo, Secretary General, EURNEX
10) **Concluding remarks and 2019 dates – Alberto Parrondo**

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Next meetings

- **ERRAC 1st 2020 Plenary – Tuesday April 28**

  Helsinki (TRA)

- **ERRAC 2nd 2020 Plenary – Thursday November 19**

  Brussels

Thank you for your attention!