

## Deliverable 1.2

### Overview of the rail missions 2050

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## 1. Executive Summary

Deliverable 1.2 is organized in two different sections. **In the first one**, a list of approached non-rail stakeholders that can enrich research and innovations in rail sector is provided, together with a first assessment of the potential for synergies between the identified organizations and the railway sector that emerged from the analysis of a set of factsheets distributed to **European Technological Platforms and Partnerships** by the TER4RAIL project partners.

There are two ways in which the results of this exercise can be further used. On the one hand, all the information and analysis performed of the different ETPs and PPPs will be available to any stakeholder of the railway sector by publishing this deliverable at TER4RAIL's website, facilitating the identification of non-rail actors, projects or thematics of their interest.

On the other hand, this exercise feeds Task 1.3. "Rail Innovative Research Observatory" by mapping non-rail actors and making a suggestions for the focus of the cross-fertilisation and communication activities between rail and other sectors to be developed under Task 1.3.

A summary of the information collected through the **9 factsheets (5G PPP, ACARE, ALICE, ECSO, ECSEL, ECTP, EFFRA, ERTRAC, WATERBORNE)** received is presented, focussing on four aspects: contact with the railway sector to date; identification of opportunities for further interaction; research and innovation projects; and membership.

With the information obtained, it is **recommended to Task 1.3** to explore further and map how transversal interactions with five ETPs / PPPs may have potential to influence or foster innovative rail research. Those are: ECSO, 5G PPP, ECTP, FoF and ECSEL. These entities identify touching points between the sectors they represent and the railway sector on research and innovation issues; their contact with the railway sector was occasional and informal so far; and they also perceive as positive / interesting continuing the communication with TER4RAIL project, as described at the corresponding factsheets.

**In the second one**, a detailed report on the features of urban scenarios 2050 and technologies influencing the development of rail transport is provided. Outcomes emerging from the workshop on urban scenarios 2050 organized by UITP within its Global Summit in Stockholm in June 2019 have been analyzed and compared to the outcomes emerged from the questionnaires and interactions with the rail stakeholders performed by the TER4RAIL consortium.

From the workshop on Urban Scenarios, to which representatives of industry, academia, transport and organizing authorities, land planners, urbanists and interested stakeholders participated, different aspects emerged. When it comes to how the urban environment will look like in 30 years, the first aspects emerged have been the ones related to the digital revolution. In particular, the digitalization of processes and the big data-related issues, including cybersecurity threats. Despite cities were shaped for cars, there is a slow process of re-organization of the urban environment taking into consideration the “mobility of the future” that will be public-transport oriented. Singapore is a valuable example of how needs and behaviors of different categories of citizens are taken into consideration in the urban scenario planning by planning authorities, operators and policy makers. Mobility of the future will be shaped by and for more flexible people, always connected and active. It will take into serious account environment and sustainability issues (in terms of utilization of renewable sources, development of EV and EV infrastructure, circular economy, new materials, reduction of congestion and pollutants in the cities). Inclusiveness will be ensured to all categories of citizens, allowing old and people with reduced mobility to be free of travelling without problems. It will be customer (citizen) oriented, and able to tailor the services on the needs of the customer, delivering in real time exactly what he wants according to his behaviors. Inclusiveness also means balance between urban and rural areas, and between city centers and peripheries. Urban spaces and consequently urban mobility will be shaped taking these aspects into account, and also taking into account the currently urbanization and ageing population trends. The city of the future will develop “use value-driven” design projects. And to do so, all categories of stakeholders have to be involved in the decision making process, in order to understand their needs and to tailor the long term actions on them. It was unanimously agreed that rail, being the cheapest, fastest, greenest, safest and more reliable transport mode can and have to play a central role in shaping the mobility of the future, in particular metro, mainly automated. MaaS full development will enable seamless multi-modal journeys. Disruptive technologies such as flying taxis, passenger drones, unmanned aerial vehicles, hyperloops, have a potential that is still unknown but may constitute an epocal change in the transport services users’ behaviours, expectations, priorities

Many of the key issues identified by the stakeholders attending the workshop have been shared by the rail actors involved in Task 1.1 by the TER4RAIL consortium. In particular, digital transformation, artificial intelligence, automation and autonomous mobility have been identified as the most promising technologies or innovations having the potential to transform the rail sector in the next decades. The importance of environmental issues and climate change, safety and security, urbanization and demography, new transport modes, social inclusion, accessibility, safety and security (including cybersecurity) is also something shared by the two groups.

Gaps and barriers towards the full implementation of these concepts have been analyzed. Among them, the most important are: technology acceptance, fragmented and not well defined legal/regulatory framework, security and cybersecurity, data ownership/utilization, fragmentation in railway ecosystem, environmental challenges (new materials, more sustainable power sources, infrastructure adaptation, recycling and circular economy), demographic changes (urbanization, ageing population, social unbalance), social and ethical aspects, financing and funding. From this analysis and the analysis of related documents, it was possible to identify key figures that will be required by the transport sector in the years to come in order to ensure a proper transition towards a rail-centric mobility system of the future. These are professionals mainly involved in the development and application of new technologies, capable of understanding and translating the digital revolution we are involved in, delivering sustainable, reliable and flexible service to the customers. Since environment will dominate the agendas of industry and policy makers, professionals involved in research and development of new materials, new propulsion systems, transition towards EVs will play a key role.

Research and innovation activities have to be encouraged since they constitute a powerful driver capable of fostering and accelerating the transition towards the envisaged scenario. Collaboration and cross-fertilization among stakeholders both in the planning phase and in research and development activities is also fundamental to reach the ambitious goal of a rail centric transport system. Finally, understanding citizens' needs is something that does not have to be ignored. On the contrary, involvement of users is a powerful tool to reduce the distance between the target and the outcome.

## 2. Abbreviations and acronyms

- 5G PPP, 5G Public Private Partnership
- ACARE, Advisory Council for Aeronautics Research in Europe
- ALICE, Alliance for Logistics Innovation through Collaboration in Europe
- BDV, Big Data Value Association
- CS2, Clean Sky 2
- ECSEL, Public-Private Partnership for Electronic Components and Systems for European Leadership
- ECSO, European Cyber Security Organisation
- ECTP, European Construction, built environment and energy efficient building Technology Platform
- EGVI, European Green Vehicles Initiative
- EPoSS, European Platform on Smart Systems Integration
- ERRAC, European Rail Research Advisory Council
- ERTRAC, European Road Transport Research Advisory Council
- ETPs, European Technology Platforms
- euROBOTICS, Partnership for Robotics in Europe EVs, Electric Vehicles
- FCH2, Fuel Cells and Hydrogen Joint Undertaking
- FoF / EFFRA 'Factories of the Future' public-private partnership & European Factories of the Future Research Association
- MaaS, Mobility as a Service
- PPPs, Public Private Partnerships
- SESAR, Single European Sky ATM Research Joint Undertaking
- S2R, Shift2Rail
- T4R, TER4RAIL
- UIC, International Union of Railways
- UITP, Union Internationale des Transports Publics
- UNIFE, Association of the European Rail Industry
- WATERBORNE, Waterborne Technology Platform
- ZEP, European Technology Platform for Zero Emission Fossil Fuel Power Plants



### 3. Introduction

In order to facilitate the emergence of the future rail system innovations, part of the TER4RAIL activities is targeted at encouraging contact, discussion, and networking between rail and non-rail stakeholders (including stakeholders involved in blue sky technologies) that can influence innovative rail research with rail stakeholders. This document summarizes the efforts made by the project consortium in this sense. Sectors, disciplines, and actors that may influence or foster innovative rail research and encourage dialogue have been approached and their opinions have been collected and analysed in order to establish fruitful collaboration, cross fertilization and bridges, understanding the way in which the activities of these stakeholders could be beneficial and could nourish the current rail innovation activities. Mutual learning and exchange of visions may foster synergies and opportunities bringing mutual benefit.

As a first exercise, the most relevant rail technologies, processes, innovations, trends, and needs identified in the previous Task 1.1 have been used to select the areas of major interest, identify non-rail stakeholders in these areas, approach them and encouraging the identification of a contact person. This was a first but crucial step in order to establish contact and deliver the information required by them. In order to allow the selected stakeholders (European ETPs and PPPs) to share their ideas regarding the interactions with the rail system and its technologies, processes, innovations, trends, and needs, factsheets have been distributed by TER4RAIL partners and, once filled by the non-rail actors, analysed.

Considering the current society profiles and urbanisation trends, a workshop dedicated to “Urban scenarios 2050” have been organized by UITP during its Summit in June 2019. The aim of the workshop was to understand the point of view of non-rail stakeholders active in the urban environment about the mobility of the future and the implications that the evolution of cities and suburban areas may have on mobility and particularly. To engage stakeholders and experts in this field, as a second exercise, a number of architects, land-planners, urbanists, digitalisation experts, smart-cities experts and others stakeholders involved in the topic of future city development have been invited to present and discuss their point of view. After the workshop, the gathered information have been analysed and compared to the ones collected from the interactions with rail stakeholders, in order to highlight key priorities shared by the two groups.

## 4. Identification of non-rail actors

One of the work streams of Task 1.2. “Identification of non-rail actors and pool of expertise for the Rail Innovative Research Observatory” is focussed on facilitating the emergence of the future rail system innovations by mapping a pool of expertise on non-rail actors that will feed Task 1.3. “Rail Innovative Research Observatory”.

This is achieved through the identification of sectors, actors and technological areas that may influence or foster innovative rail research and encourage dialogue in order to understand the way in which the activities of these stakeholders could be beneficial and could nourish innovation through the railway sector. Cross-fertilisation and communication activities between rail and other sectors will be developed under Task 1.3.

### 4.1 Methodology for identification

The methodology is based on the following steps:

#### **STEP 1: List of non-rail organisations and stakeholders**

In order to expand the outreach and ease the contact with stakeholders from other sectors, the focus has been put on European Technology Platforms and Partnerships officially recognised by the European Commission, as they may act as a interlocutor to facilitate the following information: What is ongoing in other sectors; if there have been previous connections between other sectors and the railway sector; information on research projects; common stakeholders shared by entities from different sectors; etc.

The specific list of European Technology Platforms and Partnerships considered can be checked inside Appendix 1. It includes a total of 52 entities.

#### **STEP 2: Selection of non-rail organisations and stakeholders**

To focus the approach and facilitate the identification of the non-rail stakeholders that may have higher potential to enrich or foster innovative rail research, and with the aim of doing a first approach of mapping the already existing interactions between railways and the organisations included in the list of European Technology Platforms and Partnerships, specific questionnaires/interviews have been elaborated to the rail associations partners of TER4RAIL: UNIFE, UIC, UITP, EURNEX, NEWOPERA, and feedback has also been obtained from Shift2Rail and ERRAC. The respondents could mark each listed non-rail stakeholder according to three categories: if they already have contact with the specific organisation; if they do not have contact, but may find interesting to have it; or no interest declared.

As a result of this exercise, a matrix where the 52 entities have been listed according to the perceived interest or the existing contact with the railway sector has been elaborated. This matrix is available in Appendix 2.

This has been used to narrow the list of non-rail stakeholders to be analysed, prioritising those ones that may bring in more added value for a more successful rail research and facilitate the cross-fertilisation and communication activities to be developed in Task 1.3.

The initial list of 52 entities has been organised into three groups:

#### Block 1:

- Advisory Council for Aviation Research and Innovation - ACARE
- ETP Alliance for Logistics Innovation through Collaboration in Europe - ALICE
- European Road Transport Research Advisory Council - ERTRAC
- TP Waterborne
- Fuel Cells and Hydrogen 2 - FCH2
- Clean Sky 2 - CS2
- Single European Sky ATM Research - SESAR

The entities included in this group, have direct contact either with ERRAC or Shift2Rail. This indicates that there are already some contacts / interactions established and that these organisations are familiar to the railway sector.

#### Block 2:

- Big Data Value Association      BDV
- European Cyber Security Organisation      ECSO
- Robotics PPP & euRobotics [AISBL]      euRobotics
- Advanced 5G networks for the Future Internet      5G
- European Construction, built environment and energy efficient building TP      ECTP
- ETP on Smart System Integration      EPoSS
- Electronic Components and Systems for European Leadership      ECSEL
- European Green Vehicles Initiative      EGVI
- Factories of the Future      FoF
- ETIP Zero Emission Fossil Fuel Power      ZEP

The entities included in this group seem to have weaker connections with the railway sector to date, or not so structured interactions. Their activities and thematic show a very high potential for further synergies, becoming the main target group of this task.

### Block 3:

- ARTEMIS Industry Association    ARTEMIS-IA
- European Steel TP            ESTEP
- ETP for High Performance Computing    ETP4HPC
- ETP Advanced Engineering Materials and Technologies    EuMaT
- ETP for Communications Networks and Services Networld2020
- Photonics PPP    Photonics21
- ETIP Smart Networks for Energy Transition            SNET
- Graphene FET Flagship    Graphene Flagship
- ETP Software, Services and DataNESSI
- Quantum Technology FET Flagship            QuantERA
- ETP Sustainable Mineral Resources            SMR
- ETIP Sustainable Nuclear EnergySNETP

The entities included in this group are mentioned with less frequency.

Considering the information included in this matrix, the non-rail stakeholders included in Blocks 1 and 2 will be considered to explore further their activities and map the areas / projects / initiatives that may be relevant for the railway sector through the collection of factsheets, as described in STEP 3. The entities included in these two blocks are a total of 17.

### **STEP 3: Factsheet collection**

In order to gather more detailed information on the activities of the non-rail stakeholders included in Blocks 1 and 2, and the possible common grounds existing between the railway sector and their sectors, a template for a Factsheet summarizing information relevant for the railway sector to be collected from each organisation was elaborated. It is available in Appendix 3 and includes a section on general information, a section on the contact with the railway sector to date and a section on possible future common grounds between their sector and the railway sector.

The entities to be approached for the collection of the information included in the factsheet, that are those included in Blocks 1 and 2, have been divided among Task 1.2. Partners. The organisations, their activities and documents are studied in order to plan a specific approach. An initial contact is established, asking them to fill in the factsheet and making them aware of the possibility to have further contact in further stages of T4R during Task 1.3 through the cross-fertilisation and communication activities planned facilitating the flow of information between the railway sector and the sector/entity approached.

The approach followed to contact these entities in order to get the information sought by the factsheet has tried to avoid any duplications with the communication channel already established with ERRAC and/or Shift2Rail, keeping them informed.

## 4.2 Factsheets Results

Following the methodology previously described, the initial list of 52 entities, as gathered in Annex 1, was reduced to 17 entities to be contacted by TER4RAIL Task 1.2 partners to obtain the information included in the factsheet template available at Appendix 3.

This process had as a result the collection of 9 factsheets that are available at Appendix 4 and will be uploaded at TER4RAIL's website. The following table shows the entities from which the factsheet has been received.

			Type of entity	Factsheet received
<b>Block 1</b>	ACARE	Aviation European Technology Platform	ETP	✓
	ALICE	Alliance for Logistics Innovation through collaboration in Europe	ETP/Association	✓
	ERTRAC	European Road Transport Research Advisory Council	ETP	✓
	WATERBORNE	Waterborne Technology Platform	ETP	✓
	FCH2	Fuel Cells and Hydrogen Joint Undertaking	JU	
	CS2	Clean Sky 2	JU	
	SESAR	Single European Sky ATM Research Joint Undertaking	JU	
<b>Block 2</b>	BDV	Big Data Value Association	cPPP/Association	
	ECISO	European Cyber Security Organisation	cPPP/Association	✓
	euROBOTICS / SPARC	Partnership for Robotics in Europe	cPPP/Association	
	5G PPP / 5G IA	5G Public Private Partnership	cPPP/Association	✓
	ECTP	European Construction, built environment and energy efficient building Technology Platform	ETP/Association	✓
	EPoSS	European Platform on Smart Systems Integration	ETP/Association	
	ECSEL	Public-Private Partnership for Electronic Components and Systems for European Leadership	JU	✓
	EGVI / EGVI A	European Green Vehicles Initiative	cPPP/Association	
	FoF / EFFRA	'Factories of the Future' public-private	cPPP/Association	✓

	partnership & European Factories of the Future Research Association	
ZEP	European Technology Platform for Zero Emission Fossil Fuel Power Plants	ETP

Table 1. ETP / PPP Factsheet availability

Here after, **a summary of the information collected** though the received factsheets is presented, focussing on four items: contact with the railway sector to date; identification of opportunities for further interaction; research and innovation projects; and membership.

#### A. Contact with the railway sector to date

The entities who have provided information for the factsheet could be classified into two groups according to their contact with the railway sector to date.

On the one hand, there are five of the European Technology Platforms that are **already interacting with the railway sector** in different ways. These are mainly the transport-related ones, ACARE, ALICE, ERTRAC, and WATERBORNE, in addition to ECTP.

On the other hand, there are some ETPs / PPPs that have had **only occasional and informal contacts** (ECSO, 5G PPP, ECSEL) with entities from the railway sector or no specific contact (EFFRA). Occasional contacts have taken place mainly related to the organization of **workshops** to which a specific railway stakeholder was invited (this has been the case of 5G PPP and ECSO); or just **informal** exchange of impressions when happening to meet at events (e.g. ECSEL).

Looking into more detail on the answers of the ones already collaborating with the railway sector, there are some initiatives that have been identified as a good mechanism to foster transversal cooperation between them. These are:

- **Transport Research Arena – TRA:** thanks to the co-organisation of the event by the different Transport European Technology Platforms. It has been mentioned by ACARE, ALICE, ECTP, ERTRAC and WATERBORNE.
- **Strategic Transport Research and Innovation Agenda - STRIA:** For example, the work on the “Connected and Automated Transport Roadmap” has been outlined by ACARE, ALICE, ERTRAC and WATERBORNE.
- Collaboration in relation to the **Horizon 2020** 2018-2020 Work Programme (suggestion of topics agreed by all the Transport ETPs).

Other ways in which interactions are taking place are:

- Participation at ERRAC General **Assemblies**; invitation of railway stakeholders to join the other ETPs General Assemblies; specific collaboration on technical workshops. This type of interactions have been mentioned by ACARE and ALICE.
- Participation at specific **Shift2Rail** Meetings. For example at the User Requirements / Implementation and Deployment working Group (mentioned by ALICE); relationship with specific Innovation Programmes (mentioned by ACARE); informal exchanges with S2R Executive Director (mentioned by ALICE).
- **Joint Working Group** on **Urban Mobility** mentioned by ALICE, ERRAC and ERTRAC.
- **Cross-modal roadmaps**. For example: "Roadmap for Cross-Modal Transport Infrastructure Innovation" elaborated by ERRAC, ERTRAC, WATERBORNE, ACARE, ECTP; "A Truly integrated Transport System for Sustainable and Efficient Logistics" elaborated by ACARE, ALICE, ERTRAC, ERRAC and WATERBORNE; "Integrated Urban Mobility Roadmap" by ERTRAC, ERRAC, ALICE.
- Joint **Coordination and Support Actions: REFINET Project**, with stakeholders from construction and railways; **SETRIS Project** "Strengthening European Transport Research and Innovation Strategies" bringing together 5 Transport European Technology Platforms (ETPs) – ERTRAC, ERRAC, ACARE, WATERBORNE and ALICE –, issuing the "Towards a fully integrated transport system" document, focussing on freight transport.
- **Consultation to ERRAC** when preparing own roadmaps. This has been mentioned by ERTRAC when preparing the 2019 roadmap on "Long Distance Freight Transport". Similar to this is the invitation to ERRAC to join the "Green Shipping Expert Group" made by WATERBORNE to prepare their strategic research and innovation agenda.
- **Members** of the ETPs / PPPs that are also active on the railway sectors. This has been mentioned by ALICE.

Analysing in more detail the information gathered in the factsheets of those that have had only occasional contact with the railway sector, it has been identified as a common point that transport or mobility is considered as a vertical sector / end user / application area of their research and innovation developments. This may be the framework in which further interactions with the railway sector could take place.

Examples of this connection with transport are the following ones:

- **5G PPP**: it entails a **vertical engagement activity** coordinated at Board level to promote 5G in vertical sectors and receive inputs to fine tune 5G requirements and foster 5G adoption. The **Trials Work Group** is open to the participation of representatives from vertical sector organisations that are not members of the 5G IA or beneficiaries of a 5G PPP project. **5G Vertical User Workshops** are organised with vertical industries (two in 2019 and one



planned early 2020). In relation to mobility, the majority of the actions have been addressed to the automotive sector.

- **ECSO**: engages directly with users through the Working Group 3: Sectoral Demand (WG3). It is segmented into eight sub-working groups, being one of them **SWG3.3: Transportation** (road, rail, air; sea, space). They elaborate **sector reports**. The one corresponding to transport will be published by the end of 2019. ECSO membership does not currently cover the rail sector extensively, at least from the demand side, so engagement with user associations and PPP's at EU level are strongly welcomed to ensure that needs and requirements can be elicited from all relevant stakeholder groups.
- The **ECSEL's** Strategic and Research Agenda 2019 identifies as one of the Key Application Areas **"Transport and Smart Mobility"** (Road, Rail, Aviation (incl. drones) and Maritime) out of a total of five key application areas. Despite Rail is considered as a target sector inside this area, the applications in other modes, such as automotive, concentrate most of the developments.
- **EFFRA** performs cross-fertilisation activities with other sectors. Actions undertaken so far that may have some connection with transport sectors have addressed aeronautic and automotive industries.

## **B. Identification of opportunities for further interaction**

Most of the ETPs / PPPs that have completed the factsheet show interest in having more contact with the railway sector and exploring possible commonalities through further interactions. The availability of resources has been mentioned sometimes as a drawback for these interactions. An overview of the items mentioned are described here below.

Some of the targeted ETPs /PPP's have mentioned areas or possible ways for further interactions from the organisational point of view:

- **Continuation of current ways of cooperation** (e.g. TRA Committees; STRIA; participation at joint meetings)... These are identified as the right mechanism for interaction. Mentioned by ACARE, ALICE, ERTRAC, WATERBORNE, ECTP.
- 5G PPP may envisage further exchanges and be interested in possible interactions with stakeholders from the railway sector following the same type of actions as they are currently doing with entities from other **vertical industries**. These may be: participation at open working groups; cross participation to relevant events with high qualified speakers



(bi-directional); dissemination and promotion; participation at deliverables; MoU encompassing previous points.

- **Cross-fertilization actions** with other sectors (EFFRA).
- Enlarge their **membership** with individual entities (mentioned by ECSO)
- Raise awareness **exchanging bi-directionally information** on capabilities and inputs on requirements (ECSEL)
- Collaboration on **dissemination** and networking (mentioned by ECTP, EFFRA).
- **Workshops** addressed to vertical industries / end users: for example 5G PPP and EFFRA (workshop with automotive industry to take place on the 5th of February 2020)

Some of the targeted ETPs / PPPs have identified **specific thematics**. Examples of this are:

- European Transport Technology Platforms have already identified areas of common interest, for example the topics jointly recommended as high priority and added value to the **Horizon 2020 2018-2020 Work Programme**.
- Cross-cutting topics in **Horizon Europe**.
- ACARE mentions **specific research areas** such as Mobility / Customer-Centric Transport system; Connected & Automated Transport; Environmental impact / propulsion; other general areas; European MaaS Transport system.
- There are **commonalities for all modes of transport**, which should be jointly discussed and developed. In addition, transport sectors could learn from each other in terms of solving certain challenges (Waterborne). Transport modes cooperation could be strengthened by collaborating on transversal areas, for example construction and infrastructure (ECTP).
- **Global issues** such as Digitalization (mentioned by ECTP and EFFRA) and Climate Change.

### C. Research and Innovation Projects

There are three organisations among the ones from which the factsheets have been collected, that issue calls for research and innovation projects: 5G PPP, ECSEL and FoF. The information included in Deliverable 1.1. "A comprehensive map of rail innovative research and key rail stakeholders", specifically the H2020 Railway Project Scan exercise, has been used to map the projects financed under their calls that are directly related to railways (e.g. including rail developments, use cases or applications to the railway sector). These are identified here after.

## 5G PPP, 5G Public Private Partnership



**5G Programmable Infrastructure Converging disaggregated neTwork and compUte Resources.** Railway demonstrator (out of three): a 5G railway experimental testbed showcasing seamless service provisioning and mobility management in high-speed moving environments. 01/06/17 – 29/02/20 [www.5g-picture-project.eu](http://www.5g-picture-project.eu)



**Vertical demos over Common large scale field Trials fOr Rail, energy and media Industries.** Rail use cases: “Enhanced Mobile broadband under high speed mobility”; “Critical services for railway systems”; “Smart Energy Metering”. 01/06/19 - 31/05/22 [www.5g-victori-project.eu](http://www.5g-victori-project.eu)



**5G-enabled Growth in Vertical Industries.** Technical and business validation of 5G technologies. Part 3: “Advanced 5G validation trials across multiple vertical industries. Rail level crossing. 01/06/2019 – 30/11/2021 <http://5growth.eu>

**ECSEL, Joint Undertaking** - the Public-Private Partnership for Electronic Components and Systems for European Leadership:



**SECREDas: Product Security for Cross Domain Reliable Dependable Automated Systems.** Aims to develop and validate multi-domain architecting methodologies for autonomous systems, for Automotive, Rail and Healthcare. 01/05/18 - 30/04/21 [www.secredas.eu](http://www.secredas.eu) / [Cordis](#)



**SCOTT: Secure COnnected Trustable Things.** Railway domain (out of 5). Rail industrial cases: Autonomous wireless network for rail logistics and maintenance; Secure cloud services for novel connected mobility applications; Smart train composition coupling. 01/05/17 – 30/06/20 [www.scottproject.eu](http://www.scottproject.eu) / [Cordis](#) / @SCOTTProject2



**WiSiC4AP: Wide band gap Innovative SiC for Advanced Power.** Rail demonstrator: Intelligent Power Switch (IPS-RA): High Voltage PowerConverters (<10 kV) for embedded railway equipment's. 01/06/17 - 31/05/20 [www.winsic4ap-project.org](http://www.winsic4ap-project.org) / [Cordis](#)



**ENABLE-S3: European Initiative to Enable Validation for Highly**

**Automated Safe and Secure Systems.** Rail domain: complex automated railway command and control systems. 01/05/16 – 31/05/19  
[www.enable-s3.eu](http://www.enable-s3.eu) / [Cordis](#) / @ENABLE\_S3



**AMASS: Architecture-driven, Multi-concern and Seamless Assurance and Certification of Cyber-Physical Systems.** CS5: Railway domain: Platform Screen Doors Controller. CS6: Automatic Train Control Formal Verification. Alstom, Thales, Tecalia. 01/04/2016 – 31/03/2019  
[www.amass-ecsel.eu](http://www.amass-ecsel.eu) / [Cordis](#) / @AMASSproject

#### FoF 'Factories of the Future' public-private partnership



**RECOTRANS: Integrated manufacturing of REciclable hybrid metalthermoplastic COMposites for the TRANSport sector.** Integrates unconventional manufacturing technologies such as (microwave) MW radiation and laser joining in current RTM and pultrusion production lines. Demonstrator for the railway sector (out of three). 01/10/17 – 31/03/21 [www.recotransproject.eu](http://www.recotransproject.eu) / [Cordis](#) / @RECOTRANS\_H2020



**MAESTRO: Modular laser based metal additive manufacturing platform for large scale industrial applications.** Rail demonstrator: check valve, Alstom. Increased building speed and reduced manufacturing costs. 01/10/16 – 30/09/19. [www.maestro-project.eu](http://www.maestro-project.eu). [Cordis](#)  
<https://www.maestro-project.eu/alstom-demonstrator-full-am-version/>



**SHAREWORK: Safe and effective HumAn-Robot coopEratioN toWards a better cOmpetiveness on cuRrent automation lacK manufacturing processes.** Software and hardware modular system. Railway application at real industrial scenario (out of 4): Introduction of a robotic co-worker in Alstom rolling stock's assembly line.  
01/11/18 – 31/10/22 [www.sharework-project.eu](http://www.sharework-project.eu) / @Sharework\_EU

#### D. Membership

Some stakeholders mention in their factsheets the fact that there are companies very active in several sectors, which are both working in the railway sector and in some of the sectors analysed. This has been mentioned by ECSEL, EFFRA, ALICE.

A mapping of the entities that are member of the ETPs and PPPs analysed, compared to the ones active on the railway sector may be of interest. This has been elaborated in relation to the members of the Shift2Rail Joint Undertaking, and is available at Appendix 5.

### 4.3 Exploitation of the collected results

Work package partners gathered to review the process of contact and information collection from the different ETPs / PPPs and analysed the factsheets received. In addition to this information, results from Task 1.1 and own experience of the partners involved was also considered.

There are two ways in which the results of this exercise can be further used. On the one hand, all the information and analysis performed of the different ETPs and PPPs will be available to any stakeholder of the railway sector by publishing this deliverable at TER4RAIL's website. This may facilitate the identification of non-rail actors, projects or thematics of their interest.

On the other hand, this exercise should feed Task 1.3. "Rail Innovative Research Observatory" by mapping non-rail actors and identifying those ones with whom transversal interactions may have potential to influence or foster innovative rail research, and that could be willing to engage at cross-fertilisation and communication activities between rail and other sectors to be developed under Task 1.3.

Having this in mind, it is **recommended for Task 1.3. to base the interactions** to be planned under this task on one or more of the following ETPs / PPPs:

- European Cyber Security Organisation      ECSO
- Advanced 5G networks for the Future Internet      5G
- European Construction, built environment and energy efficient building TP  
ECTP
- Factories of the Future      FoF
- Electronic Components and Systems for European Leadership      ECSEL

The entities included in this list identify touching points between the sectors they represent and the railway sector on research and innovation issues. They also perceive as positive / interesting continuing the communication with TER4RAIL project, and identified some commonalities, as described at the corresponding factsheets.

As a general recommendation to the railway sector, there are European Technology Platforms / Partnerships that already have contact with the railway sector, either through their secretariats or through the entities working in their respective fields, and

perceive this interaction as an added value. In this case, TER4RAIL recommends the railway sector to strengthen the cooperation with them to identify further synergies.

- Advisory Council for Aviation Research and Innovation ACARE
- ETP Alliance for Logistics Innovation through Collaboration in Europe ALICE
- European Road Transport Research Advisory Council ERTRAC
- TP Waterborne

Regarding the rest of the entities initially approached, there were no commonalities – or there were just few- identified between their organisations and the railway sector (EPoSS, EGVI, ZEP), or there was a lack of information available / answer received (FHC2, CS2, SESAR, euROBOTICS). Regarding Big Data Value Association BDV, information as expected to be received at the moment of writing this deliverable.

## 5 Update on Rail Missions 2050

To engage non-rail stakeholders and experts in this field, fostering cross-fertilization and fruitful exchange of views, a dedicated workshop on Urban scenarios 2050 has been organised within the UITP Summit that took place in Stockholm from 9<sup>th</sup> to 12<sup>th</sup> June 2019. The above mentioned workshop had the aim of bringing together a number of architects, land-planners, urbanists, digitalisation experts, smart-cities experts and others stakeholders involved in the topic of future city development. They had the unique opportunity to discuss and exchange visions and ideas about future urban scenarios identifying the features that will directly impact the conception of future rail systems. Keynote speakers and eminent personalities coming from the industry, the academia, the research and the institutional world have been invited and took part to the fruitful discussion.

### 5.1 Methodology for identification

In order to maximize the quality and the impact of the discussion, extrapolating the highest added value for TER4RAIL research, it was decided to organize the workshop as a side event of the UITP Global Public Transport Summit, the world's biggest event dedicated to sustainable mobility.

During the 4-days Summit, 2.718 delegates from all around the world gathered in Stockholm to discuss, participate, share ideas and considerations about all aspects of public transport. Challenges, threats and opportunities have been discussed during 53 Congress sessions and multiple workshops, covering all shades of urban and regional transport modes across the globe. Face-to-face meetings and informal networking sessions gave to the participants the opportunity to strengthen partnerships and foster collaborations. Latest innovations, solutions and products have been presented and tested during the event, with a particular eye on the digital revolution that is affecting all facets of people's lives.

The aim of the Urban Scenarios 2050 workshop was to host a global get-together knowledge sharing session with the main actors from the urban sector to discuss Research & Design of long-term urban scenarios and the role that public transport and urban mobility will play in 2050.

The main topics discussed during the workshop have been:

- The evolution of the city and its infrastructures (including digital ones) in the future;
- Changes in citizens habits and needs: future mobility scenarios;
- Technology enablers for improved / new mobility;

- Role of rail in these scenarios.

Candidates from multiple areas of expertise coming from all around the world have been approached by UITP. The selection procedure was organized in three main steps, described here below.

The TER4RAIL consortium was kept informed in all these phases, in order to regularly monitor the progresses.

### **STEP 1: Identification of possible non-rail stakeholders to approach**

In the initial phase, brainstorming sessions have been organized and carried out in order to identify all potential non-rail stakeholders that might be contacted for the workshop. Particular focus was dedicated to the following areas of expertise: land/space planning, urban planning, architecture, digital evolution, smart-cities, public transport operations, construction and materials. A wide number of options have been identified after the brainstorming session.

### **STEP 2: Selection of non-rail stakeholders to be approached**

After the conclusion of STEP 1, a deeper and more detailed analysis of profiles was carried out by UITP in order to identify the most suitable candidates. In this phase, priority was given to people (planners, urbanists, architects, academia, institutions, decision makers) with strong expertise in urban planning and experts in space and land use. Long lasting collaboration with public transport authorities, regional and city institutions was considered as a valuable aspect. Geographical spread was also kept in consideration, in order to bring examples coming from different spots of the world allowing continuous learning and stimulating interactions among the participants. After this selection process, a list of key stakeholders have been drafted.

### **STEP 3: Contact**

Once the STEP 2 was finalized and the list of key non-rail stakeholders ready, the candidates have been contacted by UITP via email. Information on what it is expected from the workshop have been given and further exchange of information took place via telephone in order to establish a more direct contact with the selected expert. Logistic info on the UITP Summit and on the practical organization of the workshop have been provided. Once completed the panel structure, UITP opened the registrations for the workshop to all the participants to the Summit. When the registration phase was closed, the registered audience was grouped in thematic round tables, and a moderator was appointed for each table. The list of participants and the tables' organization is included in Appendix 4 of this document.

## 5.2 Information about the workshop on urban scenarios 2050

The workshop was held at the UITP Summit as a side event in order to involve more relevant stakeholders not only on the EU level but on the international one. Eminent personalities involved in urban planning activities coming from different fields and covering different areas of expertise gathered in Stockholm to share and discuss experiences, views and to mega-trends.

**Date:** 11<sup>th</sup> of June, 2019

**Time:** 8.00-11.00

### The concept of the workshop

Key stakeholders: land-planners, urbanists, architects, digitalisation experts, smart-cities experts, operators focused on long-term vision, local transport authorities advanced in applying new technologies and others active in research and design of long-term urban scenarios and transport of the future have been invited to discuss urban scenarios and the place of public transport in a city in 2050.

During the workshop, different urban scenarios, the implications that they may have for mobility and rail due to the enormous challenge it entails, and the particular role of public transport (specifically, rail) have been identified and discussed largely.

Topics discussed:

- The evolution of the city and its infrastructure (including digital ones) in the future;
- Changes in citizens habits and needs: future mobility scenarios;
- Technology enablers for new and smart mobility;
- Role of transport and, specifically, rail in these scenarios.

The discussion of the workshop has been organised in the following way:



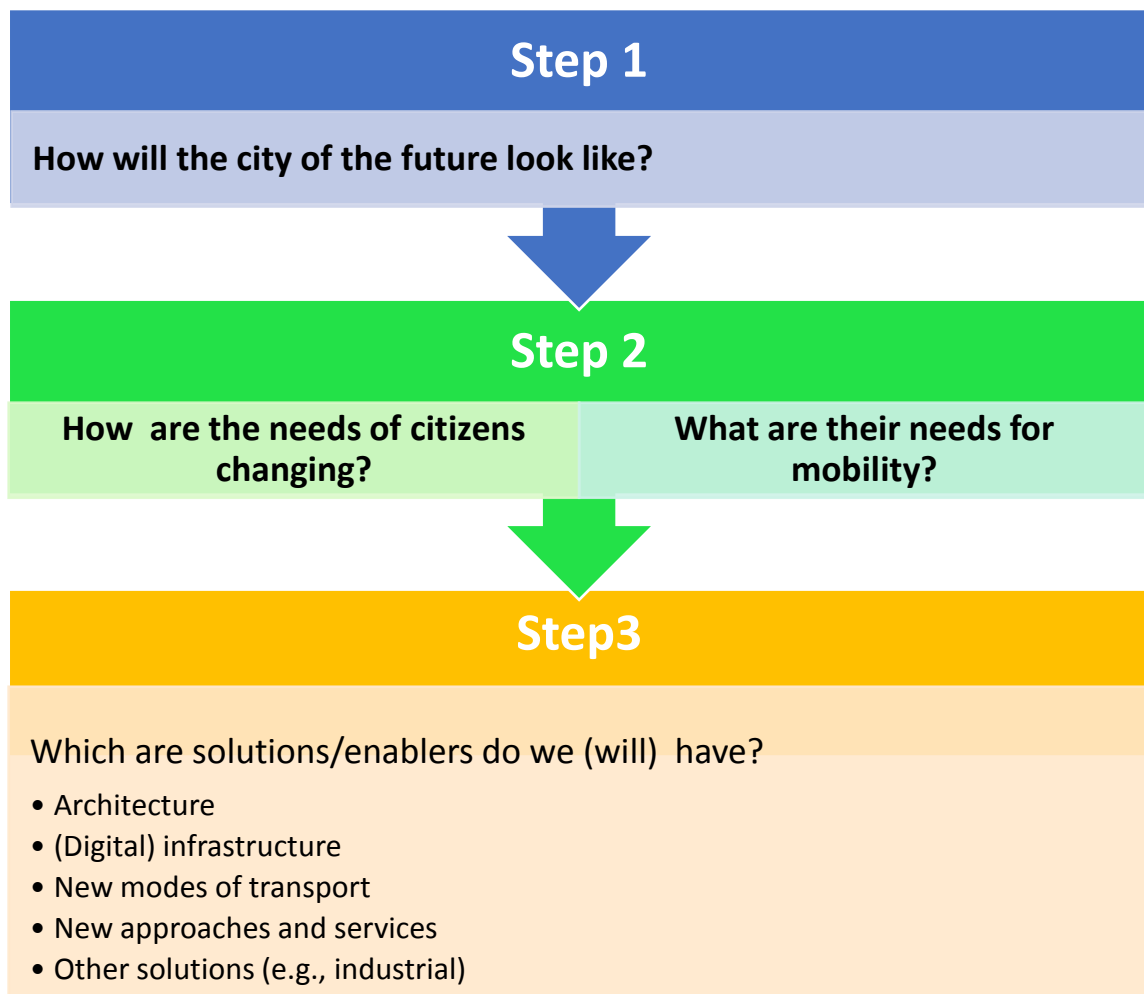


Figure 1: Workshop's organizational chart

Each participant was free to choose whether he/she would like to give a presentation according to the above-mentioned topics or participate in the discussion without performing a presentation.

Agenda and list of participants in the round tables are presented in Appendix 6 and Appendix 7 of this document.

A detailed report of the workshop is included in Appendix 8.

All the presentations performed by the speakers attending the event are included in Appendix 9.

### 5.3 Exploitation of the workshop's outcomes

The outcomes emerging from the fruitful discussion that took place in Stockholm have been then elaborated and compared with the ones emerging from the "rail" side of the

TER4RAIL research, largely developed within Task 1.1 of TER4RAIL project. A complete overview of this exercise is available on Deliverable 1.1 of TER4RAIL project. In particular, the rail-related sources considered in this section have been:

- The ERRAC 2050 Vision;
- The questionnaires collected among rail stakeholders within the TER4RAIL Task 1.1;
- The key projects/documents analysed in Task 1.1;
- The interviews/specific questionnaires addressed to European rail sector associations (UNIFE, UIC, UITP, EURNEX and NEWOPERA) distributed and collected in May 2019 by the TER4RAIL partners.

This exercise was made to compare mega-trends and key elements emerging within the discussion with both rail and non-rail experts, in order to find synergies and common views and to finally identify the areas of potential collaboration delivering mutual benefit and added value.

The table below summarizes the key elements emerging from the discussion with rail stakeholders and from the analysis of the various rail related sources listed above (on the left). The key topics emerged within the interactions with non-rail stakeholders are listed on the right side of the table.

The common results have been highlighted in green.

<b>RAIL STAKEHOLDERS</b>	<b>NON RAIL STAKEHOLDERS</b>
Digital Transformation	Digital Transformation
Artificial Intelligence/Augmented reality	Artificial Intelligence
Automation	Automation
Autonomous mobility	Autonomous mobility
Energy/Alternative Fuels and propulsion systems	Energy/Alternative Fuels and propulsion systems
Environment	Environment
Internet of Things	Internet of Things
MaaS	MaaS
Circular economy/Zero waste	Circular economy/Zero waste
Accessibility	Accessibility
Demand based/flexible services	Demand based/flexible services
Intelligent stations/Multimodal hubs	Intelligent stations/Multimodal hubs
V2V/V2X communication	V2V/V2X communication
Smart City Planning	Smart City Planning
5G Wireless Connectivity	5G Wireless Connectivity
Life Cycle Cost	Life Cycle Cost
Safety/Security	Safety/Security
New transport modes (drones, hyperloop, etc.)	New transport modes (drones, hyperloop, etc.)
Urbanization/Demography	Urbanization/Demography
Big Data	Big Data
Cybersecurity	Sustainability/Reliability

Materials	Optimal land use
Robotics	Behavioural changes
Condition based monitoring	Cycling/Walking networks
Predictive Maintenance	Ethics/Gender balance
Regulatory frame/SERA	Citizen-centric collaborative approach
Blockchain	Social inclusion
Nanotechnology	Intelligent solutions for rural areas

Table 2: List of key priorities for rail and non-rail stakeholders

The table above shows the key inputs, mega-trends, hot topics provided by all the stakeholders involved in the TER4RAIL activities, being them rail stakeholders (approached through questionnaires, analysis of key documents, categorization of EU or National projects) and non-rail ones. What emerges from the investigation of the key elements and mega trends identified by both rail and non-rail sector professionals, is that a significant amount of issues are shared by the two categories. This confirms that both groups share the same vision on a certain number of topics considered of extreme importance. On these aspects collaboration, enrichment and synergies are not only foreseeable but also very likely to happen. One of the aim of the project is to foster these synergies. Particularly relevant is the fact that rail was mentioned several times both in the presentations and in the verbal discussions with the experts attending the Stockholm workshop. This means that its potential as “backbone” of transport system of the future is recognized even by non-rail stakeholders.

Going into the detailed analysis of the table, it emerges that digital transformation, artificial intelligence, automation and autonomous mobility have been identified by the rail stakeholders as the most promising technologies or innovations having the potential to transform the rail sector in the next decades. This was one of the main outcomes of the questionnaires addressed to the rail experts in Task 1.1 and was confirmed by ERRAC who inserted “Digitalization and Automation” as the first R&I items in its “2030 R&I Priorities report” issued in 2019<sup>1</sup>. The importance of these elements was also highlighted by the non-rail stakeholders during the Stockholm workshop. One of the biggest challenges that the transport system has to face in the next future is to overcome the citizens’ tendency to preserve existing behaviours, habits, perceptions. And this is particularly crucial when it comes to technology

<sup>1</sup> [https://errac.org/wp-content/uploads/2019/09/errac\\_rail\\_2030\\_research\\_and\\_innovation\\_priorities.pdf](https://errac.org/wp-content/uploads/2019/09/errac_rail_2030_research_and_innovation_priorities.pdf)

acceptance (existing and under development). This is strictly linked to the “mind-set” changes that are needed in order to break the “status quo” and to foster the required significant step changes in people’s habits, perceptions and behaviours. In a wider sense, the emergence of new technologies is considered a powerful driver that may help cities in improving their service offering, better interacting with citizens (including the real-time information management and the consequent ability to promptly adapt the service to the demand), increasing efficiency and effectiveness of the solutions and addressing environmental/sustainability challenges delivering resilient, versatile and flexible services both to citizens and for goods. However, the technological revolution also raises several issues, including data privacy and ownership, appropriate and consistent legislation, data sharing and standards, cybersecurity. These gaps are analyzed later. Due to the development of digitalized services increase, cities play a central role in driving innovation: geographical proximity of stakeholders and multidisciplinary interaction stimulate creativity and innovation.

Speaking about automation and autonomous vehicles, this was one of the major mega trends identified during the workshop. Its importance is confirmed by the fact that the rail stakeholders also agreed on the central role that automation of operations and autonomous means of transport will have in 2050. Connected and automated vehicles could contribute significantly to increase the levels of road safety, energy efficiency, accessibility, social inclusion and could decrease the level of emissions and congestion in the urban areas. However, it has to be taken into account that only an appropriate urban governance approach can lead to the virtuous inclusion of autonomy and automation in people’s and goods’ mobility. In this sense, digital platforms bringing together information about different available means of transport allow to plan and organize an integrated transport system that better suits the citizen’s needs. What emerged from the presentations performed in Stockholm is that in shaping the 2050 urban scenarios for transport and mobility, the most important factor is the demand based and the delivery of tailored and flexible services to citizens, adapting to the demand in real time. This element was mentioned several times and clearly constitutes a key aspect to be considered when thinking about how mobility services will be delivered in the near future. The “user-centric” approach was a concept particularly shared during the Stockholm workshop among all the participants, regardless to their field of competence.

Environmental changes, global warming, raising sea levels are issues gaining increasing importance. Cities generate about 70% of global GHG emissions, and are extremely

vulnerable to the impacts of climate change<sup>2</sup>. This is something that is becoming visible and visible and the urgency to deal with these serious problems emerged as a key aspect to consider both by the rail and the non-rail stakeholders. Rail can contribute significantly to make huge steps towards the congestion and emissions' reduction. This is particularly true when considering the urban environment. Rail transport is recognised as being the most environment friendly form of mass transport. According to the ERRAC 2050 Vision its low levels of atmospheric emissions compared to automotive and air transport are due to the widespread use of electric traction, low energy consumption due to low friction between rail and wheel, relatively small land use of its infrastructure, ability to access town and city centres, and by the efficiency of comfortably and quickly moving large volumes of people and goods over long distances. With an average consumption of 0.12 kWh per passenger-km, urban rail is 7 times more energy efficient per passenger than car travel in cities. Rail's carbon footprint is much smaller than those of other modes of transport. Road produces the 72.5% of GHG emissions in Europe, rail only the 0.6% according to the European Commission Pocketbook 2018<sup>3</sup>. Light rail produces no emissions at street level in sensitive areas contributing significantly to localised air quality improvement. High-speed rail is also 3.4 times less polluting than air transport. Rail produces lower CO<sub>2</sub>, NO<sub>x</sub> and particulate matter (PM<sub>10</sub>) emissions causing less external environmental negative externality (accidents, noise, or other) than any other mode of transport<sup>4</sup>. With regards to environment protection, not only emissions' reduction, but also circular economy, recycling, renewable energies' utilization, upgradable products have been identified by the Stockholm workshop participants as key topics driving the mobility innovations in the near future.

Rail is not only the most environment friendly but even the safest land transport mode, having the lowest risk of death and serious injury. In fact, rail is 1,5 times safer than long-distance bus and 24 times safer than car<sup>5</sup>, according to the ERRAC 2050

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2 The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

3 Publications Office of the European Union, 2018 - STATISTICAL POCKET BOOK 2018 - EU TRANSPORT in figures

4 ERRAC 2050 Vision. ERRAC, 2018

5 Fatalities per billion passenger-kilometres: rail 0.13, bus/coach 0.2, car 3.14, ERA 2014

Vision. ERRAC 2030 R&I Priorities report states that rail is 20 times safer than road<sup>6</sup>. Additionally, tramways are 6 times safer than cars in terms of accidents<sup>7</sup>. A shift from other transport modes to rail improves the overall safety of the European transport system. This justifies the answers collected by both rail and non-rail stakeholders evidencing the need to push for a rail-centric mobility system in Europe.

Urbanization is a key aspect emerged from both the rail and non-rail stakeholders' discussion. According to a report issued by the JRC in 2019<sup>8</sup>, 75% of the world's population (6.1 billion people) currently lives in urban areas, doubling the numbers registered in 1975. The urbanization trend is currently driven by Asia Pacific countries (+40% increase in the number of people living in cities compared to 1990) and Africa. In the EU-28, the urbanization rate in 2015 was 72%. According to the above-mentioned study, Europe shows some distinct trends which are the result of different urbanization patterns taking place in the Old Continent in his history. European cities' network is the densest in the world and the main role is played by mid-sized cities. However, the urbanization trend is something happening in Europe with a slower pace compared with some other parts of the world.

Urbanization trends goes side by side with the ageing population issue, which is gaining more and more relevance in Europe. Life expectancy at birth increased significantly due to modern medical techniques and better service provision. In general, quality of life increased in the last decades in Europe and Europeans now live about 5.1 years longer than in 1995. Death rates have also registered a consistent decrease<sup>9</sup>. The transport sector has to find solutions to the aging trend currently in place, as older people are most likely to experience mobility difficulties. To understand these new demands and needs for mobility/accessibility in urban and rural areas and to promptly respond to them is a challenge that the transport actors have to face in the very close future. In this sense, New Demand Responsive Transport (DRT) cross-modal solutions need to be studied and deployed, based on the above mentioned needs and requirements.

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6 [https://errac.org/wp-content/uploads/2019/09/errac\\_rail\\_2030\\_research\\_and\\_innovation\\_priorities.pdf](https://errac.org/wp-content/uploads/2019/09/errac_rail_2030_research_and_innovation_priorities.pdf)

7 Per m. passenger-km from a sample of 15 European cities surveyed, UITP 2016

8 The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

9 Eurostat, 2019 database, <https://ec.europa.eu/eurostat/data/database>

New transport modes have been recognized as powerful innovations with huge potential by both categories of respondents. In particular, the utilization of drones in the transport sector appears to be very likely in the years to come. Drones can have a disruptive impact on the logistic chain organization and particularly on the last mile delivery of goods, especially considering the massive diffusion of ecommerce and food delivery platforms particularly utilized in the urban areas. Transport of people is also under discussion but it will take longer time to get to the market. Drones have been identified as a very valuable way to reduce delivery costs, abating congestion and emissions in cities. Due to the very high level of provision of education and the frequency of interactions that happen every day in the urban areas, technological innovation, research, entrepreneurship, creativity are boosted and stimulated, and initiatives such iCapital award aim at increasing the innovative spirit of cities<sup>10</sup>. Inter-city collaboration is also something that is happening in Europe. This increase sharing of ideas, continuous learning and the development of a collaborative spirit. In terms of potentially disruptive innovations that can reshape the way people deal with the mobility systems, ERTRAC (the European Technology Platform for Rail Transport) also identifies in its “Urban Mobility Roadmap” the eyewear devices, in addition to the more traditional hand-held devices and the full MaaS implementation<sup>11</sup>.

Looking at the above presented table, there are some topics that the participants to the urban scenarios workshop have identified as “key”, which have not been identified as “key” by the rail stakeholders. Among these, it is important to mention social aspects such as social inclusion (particularly for vulnerable categories of citizens), ethics, behavioral changing and gender balance. Sustainability and reliability of the mobility system are also topics whose importance has been considered as “key” by the non-rail stakeholders. Finally, optimal land utilization has been identified as one of the most important factors affecting the urban scenarios 2050. In this sense, urbanization trends have to be considered by planners, authorities, urbanists in order to cleverly utilize the available space (that is likely to diminish in the future according to the current demographic/urbanization trends). Peripheries, commuters and rural areas don’t have to be forgotten in urban and space planning activities, even because they can gain increasing importance thanks to the widespread diffusion of practices like, among others, teleworking. A proper balance between city centers and peripheries

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10 [https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/icapital\\_en](https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/icapital_en)

11 ERTRAC, ERRAC, ALICE Integrated Urban Mobility Roadmap. ERTRAC-ERRAC-ALICE Working Group on Urban Mobility, February 2017



development has to be guaranteed in order to ensure livability and a good quality of life to all categories of citizens. With regards to space planning shaping the cities of the future, particular attention has to be dedicated to pedestrians and cyclists needs. The role of walking and cycling has been largely debated during the workshop. These two mobility options have been identified as complementary to the rail-centric (prevalently autonomous) public transport of the future, in particular for first and last mile, and have to be encouraged not only for their positive impacts on the environment and on the reduction of the congestion, but even for their benefits on health and well-being of citizens. A rail-centric approach cannot be possible without the affirmation of the role of rail stations as multimodal hubs/interchanges. Rejuvenation of stations is already taking place in Europe and there are some virtuous examples already in place, gathering not only the “traditional” mobility options (metro, bus, LRT, HSR/regional trains, connections to airports, taxi), but even new solutions like EVs, bike/sharing, e-scooters, powered two-wheelers and car sharing/carpooling, with available parking slots equipped with charging facilities. A multi-level approach can make easier the organization of spaces and make smoother for the users to switch from one mode to the other. Accessibility has to be guaranteed to all categories of users and a reliable information system has to be put in place in order to facilitate the modal shift. Commercial and ancillary services contribute to improve the overall user experience ensuring also an increased level of security. Stations have also a strong potential to be exploited with regards to the mobility of goods. In fact, they can become small urban logistic hubs during night time, reducing the number of small/medium sized vehicles delivering parcels “attacking” the city centers every day. The growing importance of stations is an aspect emerged from both the rail and the non-rail stakeholders’ discussion.

### 5.3.1 Gaps and Barriers analysis

With regards to the gaps to be filled and barriers to be abated by the rail sector in order to successfully face the challenges provided by the identified mega-trends, becoming the backbone of the European transport system of the future, they have been partially investigated in the Deliverable 1.1 of TER4RAIL project, but it is useful to integrate them with the non-rail people’s points of view and contributions emerging from the Stockholm workshop.



#### 5.3.1.1 Technology acceptance, security and cybersecurity

Technology acceptance has already been discussed in this sense. System integration is also considered one of the most important barriers to overcome in order to achieve a seamless and efficient rail-driven mobility system. This is true for the freight business and high-speed lines (particularly when it comes to cross border operations), but even in urban scenarios, since systems are becoming smarter and smarter and need to communicate across different rail services, transport modes and infrastructure in order to deliver a valuable service to the user.

Autonomous vehicles might constitute in the decades to come a significant part of the transport landscape. Both rail and non-rail stakeholders identified this as one of the most important mega trends in the medium-long term. But gaps and barriers related to the autonomous vehicles exist, both when it comes both to ethical and legal aspects: for example it remains not so clear how the autonomous vehicle will react in challenging and unpredictable traffic situations, such as unavoidable crashes. A certain amount of laws and regulations have also to be reviewed in order to take into account the existence of autonomous vehicles, including a trans-European harmonisation and standardisation for autonomous vehicle systems (when it comes, for instance, to cross border). When analysing the implication of the massive introduction of these kind of vehicles in the transport system, there is also a social impact to be considered: people might find better to use these vehicles rather than walking or cycling. This may result in an increase in the congestion in the centres. The above mentioned regulatory and legal framework updates/modification also apply to the drones' introduction (particularly in the freight sector).

As already anticipated, security and cybersecurity are becoming dominant issues due to the number of hazards and vulnerabilities to which more digitised and interconnected systems are exposed. European citizens are becoming extremely connected, particularly when it comes to transport services: 64% of them regularly utilizes online devices to access live public transport schedule information, and 77% of them use mobile mapping and navigation services<sup>12</sup>. 5G technologies are ready and will have a tremendous impact on people's and businesses' everyday life in the very near future. Data utilization, storage, protection and transparency are key aspects to take into account when considering a full development of MaaS based on V2V, V2X and user-to-vehicle connectivity, and in general when developing a transport system

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<sup>12</sup> The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

based on intelligent devices dealing with a huge quantity of (often sensitive) data. Mobility as a Service (MaaS) is *“the integration of, and access to, different transport services (such as public transport, ride-sharing, car-sharing, bike-sharing, scooter-sharing, taxi, car rental, ride-hailing and so on) in one single digital mobility offer, with active mobility and an efficient public transport system as its basis”*<sup>13</sup>. In particular, integrated ticketing is an issue gaining a lot of importance in the user-centric approach to be developed by the mobility system of the future. Web based technology platforms are available and a harmonization of the legal and regulatory framework for smart ticketing interoperability has to be exploited in order to make a step further towards the MaaS full implementation. As a result of the tremendous development of apps and web-based platforms, there is a great availability of data, but is important to make considerations on how they are processed. The overall objective is to extrapolate from these information the biggest added value and benefit for the user. To do so, an adequate European coordination and regulatory framework with regards to data protection is essential. A stricter legislation on privacy has been recently put in place<sup>14</sup>. Policy and regulatory framework for full implementation of MaaS in particular and sustainable transport system more in general is a crucial aspect that has to be taken into consideration. Planning, financing and managing of urban areas is the outcome of intense negotiation process with several actors involved at different levels (among others, national governments, local administrations, NGOs, associations, social movements, local communities representatives, trade unions, private sector). With regards to the MaaS, governmental institutions have to define the correct business model for its development, in terms of public transport services. They also have to widely accept MaaS as a type of sustainable transport system. Virtuous examples (such as the city of Leipzig) are still present in Europe<sup>15</sup>.

#### 5.3.1.2 Citizen-centric mobility system

A user/citizen-centric mobility system need accurate and punctual travel demand modelling for MaaS. In order to be efficient, this modelling process has to be capable of taking into account a dynamic context of modern lifestyles, behaviours, social impact, ICT, responses to travel recommendation systems, attitudes and subjective

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13 Mobility as a Service Report. UITP, April 2019

14 The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

15 The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

considerations. Travel behaviours and decision making processes have to be recognized by the system who has to respond promptly to the needs of the user with the solution that suits most his necessities<sup>16</sup>. As discussed above, walking and cycling are mobility options that have to be taken into account when developing the cities of the future. The participants to the Stockholm workshop stressed the point of pedestrian and cyclists-friendly spaces. The importance of these two categories' requirements is increasing and urbanists/space planners have to deal with a transport system in which the rail is backbone but walking and cycling as safe and fast ways to get to the stations and access the rail services. A deep investigation of people's needs, habits, behaviours in terms of on-line purchases is also required for optimizing the logistic chain and the urban distribution of parcels. Integration of urban nodes in the TEN-T network, ensuring seamless, smooth, efficient and quick circulation of goods, is an aspect to be taken in consideration when analysing the evolution of the cities in the medium run, together with the integration of freight transport with passenger private or public transport (use of automatically collected data can be extremely useful in this sense, considering the current resistance of freight operators to share data). Business models based on the demand analysis and on the investigation of operational, technological and infrastructural bottlenecks aimed at better linking the urban and long distance transport have to be developed<sup>17</sup>.

In order to provide an accessible, available, reliable, safe, efficient user-centred mobility environment, coordinated transport network management measures have to be put in place. To do so, integration of active transport modes and new mobility services (and of all the actors working on each of these) has to be encouraged in order to proper utilize the increased amount of big data generated by connected travellers and vehicles. An integrated network management approach addressing mixed traffic solutions in a multimodal dimension (including also walking and cycling spaces) has to be strongly encouraged in order to avoid waste of resources and inefficient land allocation, and to increase the safety and security of citizens since coordination of actions may help to respond more promptly to emergencies<sup>18</sup>. Integration of decision support systems is also something on which efforts have to be made in the future<sup>19</sup>.

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16 Intend Project, 2018

17 ERTRAC, ERRAC, ALICE Integrated Urban Mobility Roadmap. ERTRAC-ERRAC-ALICE Working Group on Urban Mobility, February 2017

18 OPTICITIES Project, 2016

19 CONDUITS Project, 2015

Fragmentation among railway ecosystems but also between modes acting as “silos” was one of the biggest barriers highlighted by the rail stakeholders. When thinking about the mobility of the future, and especially the urban mobility of the future, the participants to the workshop raised the need for more coordination and collaboration of different actors’ actions. This is necessary to overcome the power imbalance and to reduce searching and transaction costs, to avoid moral hazard and opportunism, ensuring fair gain, transparency, proper risk assessment and mitigation measures delivering mutual benefits to all the stakeholders and to the users. From the analysis of the material collected among the rail related professionals, it can be said that this view is shared by both the two macro-categories.

#### 5.3.1.3 Environment

Environmental challenges and climate change are issues that are going to shape more and more citizen’s everyday life and will affect the transport system too. Temperature is increasing at a significant pace (0,2°C per decade) and global warming has reached 1,5° with respect to the pre-industrial levels<sup>20</sup>. Cities produce approximately 70% of the overall global GHG emissions, contributing in a serious way to the increasing of temperatures<sup>21</sup>. Frequent flooding, droughts, heatwaves, intense rain events, hurricanes and storms are something that many people are getting familiar with all around the globe, in a way that was never experience in the past. Impacts of these phenomena on residential areas and infrastructures have to be taken into account when taking decisions about the investments to be made in transport services. In particular, infrastructure and rolling stock (speaking about rail) have to be capable of facing an increasing quantity of environment-related issues. Construction materials will also take into consideration this aspect and be as environment friendly as possible.

Measures to boost decarbonisation have been launched in Europe in recent years. One of the most successful is the Global Covenant of Mayors, which gathers 9.261 cities (95% in Europe) with the strong commitment to significantly abate CO2 emissions (in Europe, -27% by 2020)<sup>22</sup>.

Despite the tremendous efforts in reaching acceptable levels of emissions’ reduction, the transport sector witnessed an increase of the greenhouse gas (GHG) emissions

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20 <https://www.ipcc.ch/sr15/>

21 The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019

22 <https://www.globalcovenantofmayors.org/>

generated in the period 1990-2016. In the recent years, it is even growing at a faster pace after a slight reduction in the period 2007-2012, according to the figures presented in the EU Commission Pocketbook 2018. Transport represents almost a quarter of Europe's greenhouse gas emissions and is among the main causes of air pollution in cities. Within this sector, road transport constitutes by far the biggest source of pollution accounting for more than 70% of all GHG emissions from transport in 2014<sup>23</sup>. With the global shift towards a low-carbon, circular economy already underway, the Commission's low-emission mobility strategy, adopted in July 2016, aims to ensure Europe stays competitive and able to respond to the increasing mobility needs of people and goods making a substantial step towards the reduction of the dependency from fossil fuels<sup>24</sup>. The widespread use of alternative fuels (especially when it comes to road vehicles) is the major expected evolution in the next years/decades. But the fleet renewal (both with regards to private vehicles and public transport) will not happen overnight. This process will take time. Nevertheless, the introduction of alternative fuel road vehicles is progressing with different pace from one country to another. In this sense, Norway and Poland can be considered as "European Champions" with regards to the new passenger cars with alternative fuels<sup>25</sup>. Cities and local authorities, together with national governments, are big players in climate governance issues and have the responsibility to drive the transition towards an environment friendly scenario. While some big cities are developing initiatives aimed at producing ambitious results, efforts still have to be done in order to concretely insert in the small and medium sized cities' local government agenda climate initiatives.

Another aspect to be considered when analysing the transition towards EVs, it is the uncertain impact the electric mobility will have on the mining areas for cobalt and lithium (materials utilized for the production of batteries), most of which are located in politically unstable regions. The charging infrastructures and the batteries' end life are also big issues to deal with. Long lasting batteries, inductive charging technologies/infrastructure, standardisation of charging systems between various vehicle suppliers, reutilization of raw material within batteries in a circular economy perspective are topics of discussion and need to be better exploited in order to ensure

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23 Publications Office of the European Union, 2018 - STATISTICAL POCKET BOOK 2018 - EU TRANSPORT in figures

24 <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016DC0501&from=en>

25 <https://ec.europa.eu/eurostat/web/products-statistical-books/-/KS-DK-18-001?inheritRedirect=true&redirect=%2Feurostat%2Fpublications%2Fstatistical-books>

an appropriate transition towards more environment friendly transport systems<sup>26</sup>. Additional questions still partially unanswered or to be further exploited deal with more practical aspects such as: the characteristics and the management of the charging/storage infrastructure, the technical characteristics of the grids and their interaction with the vehicles (including interoperability issues), the batteries, the refuelling facilities, the space organization, the governance of the business model<sup>27</sup>.

#### 5.3.1.4 Urbanization and Society

Urbanization is a phenomenon that is globally booming in the last decades and Europe is also going to be affected, although the pace is different from Asia and Africa. Urbanization trends has to be taken into account when planning the cities of the future and particularly the transport system to be developed. Private car has always been the predominant transport mode in Europe and this led to the well-known congestions, emissions, safety and security problems. Measures have started to be taken by the cities in order to discourage the utilization of the private car as preferred transport mode. Congestion charges, high parking fees, closure of city centers are some of the measures to internalize the external costs. But they are only a part of the solution. City planners, urbanists, together with public authorities have to prepare the transition towards the city of the future considering the needs of the citizens and developing their public transport network in order to try to respond to them in the most efficient way. Public transport has to be encouraged but it also has to be improved in order to be perceived as a valuable alternative to the private vehicle. SUMPS - Sustainable Urban Mobility Plans are the basic documents in which public authorities and other stakeholders promote sustainable and efficient mobility in cities, including land use and spatial planning. Additionally, urbanization requires the redesigning of areas, developing higher density housing and, consequently, optimal public transport solutions, avoiding social segregation, ensuring inclusivity and equal distribution of social groups. Virtuous examples of EU promoted initiatives are available. In the period 2014-2020, 14 billion euros from ESIF – European Structural and Investment Funds have been invested in sustainable urban development<sup>28</sup>. New “social” trends have also to be taken into account, such as flexible work hours, the diffusion of tele working and the explosion of ecommerce. In this sense, drones and autonomous vehicles are in the

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<sup>26</sup> Intend project, 2018

<sup>27</sup> ERTRAC, ERRAC, ALICE Integrated Urban Mobility Roadmap. ERTRAC-ERRAC-ALICE Working Group on Urban Mobility, February 2017

<sup>28</sup> European Union, European Structural and Investment Funds 2014-2020: Official texts and commentaries. Publications Office of the European Union, November 2015

frontline on the fight against congestion. They can be used for last mile delivery, replacing hundreds and in some cases thousands of mini vans or vehicles dedicated to delivery of goods and services to people. Technology is available, but regulations and guidelines for its optimal utilization haven't been clearly and uniformly designed yet. Additionally, as a consequence, the higher level of automation in transport system could cause the disappearance of a certain variety of jobs. This constitutes a social challenge that has to be kept under consideration since as a side effect, it might be possible that disruptive technologies do not create as many jobs as they replace.

When analyzing the possible evolutions of urban and space planning, it has to be considered that the widespread utilization of new technologies and transport solutions (among which autonomous vehicles) can lead to an enhancement of the gap between city centre and countryside, since new technologies are more likely to be implemented in the centres leaving rural areas in a situation of disadvantage in terms of mobility options and quality of the services. Administrators, transport authorities and space planners have to take into account that a coordination and a balance between the city and the countryside development has to be guaranteed. In this sense, one solution might be to develop mobility demand in peripheral regions models based on the analysis of activities, lifestyles, needs, behaviours of people living far from the city centres<sup>29</sup>.

As previously discussed, European population is living a deep demographic change. Ageing is one of the most visible trends and this issue has to be included in the urban planners' agendas. To consider this ageing trend is essential when shaping the cities of the future. Not only an aging population has different needs and priorities, but even that reconsideration of available space has to be planned in time, with a particular eye dedicated to inclusivity and accessibility issues. According to a JRC study<sup>30</sup>, many cities in Europe are already developing strategies to address the demographic challenge. Barcelona, Manchester and Edinburgh are just three examples.

#### 5.3.1.5 Financing and funding

When thinking about transport system of the future, it is impossible to avoid discussions about investment costs. Infrastructure building and upgrading is the main

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<sup>29</sup> Intend project, 2018

<sup>30</sup> The future of cities: opportunities, challenges and the way forward. European Commission Joint Research Centre EC, JRC, 2019



source of costs, but modification or replacement of vehicle fleet, signalling systems, retrofitting also constitutes extremely capital-intensive activities, particularly in rail. Since cities are growing and changing their profile very fast, huge investments will be required in order to adapt the transport service to the social, demographic and spatial evolution of the urban centres. From expansion of existing lines, to construction of new ones, to reconversion of others (for example upgrading metro trains to GoA4), authorities and planners have to try to find efficient and sustainable funding schemes. As previously stated, technology evolution and digital revolution could contribute significantly to reduce the operative costs in the long term. Some examples might be intelligent self-diagnosing rolling stock, vehicles capable to communicate with the infrastructure and with each other, driverless operations.

#### 5.3.1.6 Final considerations

A safe, reliable, green and sustainable rail centric mobility system that guarantees inclusivity and accessibility to all categories of users, that continuously interact with the customer giving him a targeted service and that is seamlessly integrated with all the other transport modes through intelligent devices and efficient multimodal infrastructure, is an ideal scenario towards which all the actors involved in the evolution of transport system have to target. This is something that emerged clearly from the presentations performed during the workshop and from the discussion taking place in Stockholm. To make it possible, it is necessary that the all the stakeholders are included in the decision-making process and particularly in the design phase. Analysis of best practices, organization of workshops and round tables, shared methodology, new governance bodies allowing a more horizontal cooperation and knowledge exchange through a collaborative approach may bring added value to the projects and can ease the transition phase towards the ideal scenario previously identified. To do so, it is important to include the citizens from the very beginning in the development process, understanding their requirements and their needs and trying to deliver a mobility system that keeps the citizen and his demands at the centre. Understanding social and economic vulnerabilities is essential to formulate actions adapted to local needs, with local communities playing a central role. New arising technologies and the increasing importance of city networks and associations contribute to make this engagement process easier. Virtuous examples of bottom-up approaches to urban governance already exists in Europe, and initiatives such as “fix my street”<sup>31</sup> in Brussels

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<sup>31</sup> <https://fixmystreet.brussels/>



and Decidim<sup>32</sup> in 40 Spanish and French municipalities demonstrate that it is possible to make a virtuous use the latest technologies in order to involve and engage citizens in the city-shaping process. Participatory budgeting and participatory planning are also powerful citizen-inclusion community-driven tools utilized in European cities (Madrid is a typical example). In the SUMPs development and implementation, planners usually apply participatory approaches involving cross-sectorial planning teams including, among others: transport planners, architects and urban designers, environment experts, decision-makers, lawyers, urban transport and mobility practitioners, associations, citizens. Regular monitoring/evaluation activities are required in order to check the implementation of the SUMP and to guarantee an appropriate learning and improvement process.

### 5.3.2 Concrete functions to be fulfilled by the rail system

With regards to the concrete functions to be fulfilled by the rail system in the years to come, the intense discussion taking place during the Stockholm summit made it possible to identify a series of figures that will be required in the years to come and that will play a crucial role in supporting the transition towards the urban mobility of the future, with rail as a backbone.

The most important figures are summarized in the table below

	KEY TOPICS FROM THE URBAN SCENARIOS 2050 WORKSHOP	KEY FIGURES REQUIRED
<b>TECHNOLOGY</b>	Digital Transformation Artificial Intelligence Automation Autonomous mobility Internet of Things V2V/V2X communication 5G Wireless Connectivity Big Data	Cybersecurity experts 5G and Connectivity experts IT & Digitalization experts Data management and data protection experts Legal and Regulatory Experts Researchers (transversal)
<b>ENVIRONMENT</b>	Energy/Alternative Fuels and propulsion systems Environment Circular economy/Zero waste Sustainability	Batteries manufacturers EV+EV Infrastructure manufacturers EV+EV Infrastructure maintenance staff EV storage systems professionals

<sup>32</sup> <https://decidim.org/>

		<p>Trainers on EV</p> <p>Fuel cells/Smart Grids experts</p> <p>Engineers dealing with infrastructure construction/maintenance considering adverse weather</p> <p>Engineers dealing with infrastructural damages caused by adverse weather</p> <p>Mining (new materials for batteries)</p> <p>Renewable energies experts</p> <p>Recycling experts (new ways of recycling)</p> <p>Weather specialists</p> <p>New materials professionals</p> <p>Researchers (transversal)</p>
<b>SPACE PLANNING</b>	<p>MaaS</p> <p>Accessibility</p> <p>Demand based/flexible services</p> <p>Intelligent stations/Multimodal hubs</p> <p>Smart City Planning</p> <p>Optimal land use</p> <p>Cycling/Walking networks</p>	<p>Spatial Planners</p> <p>Legal and Regulatory Experts</p> <p>Urbanists, Architects, Engineers</p> <p>Politicians, Policy makers</p> <p>Researchers (transversal)</p>
<b>SOCIAL DIMENSION</b>	<p>Urbanization/Demography</p> <p>Ethics</p> <p>Gender balance</p> <p>Social inclusion</p> <p>Behavioural changes</p>	<p>Politicians, Policy makers</p> <p>Inclusive mobility experts</p> <p>Demography experts</p> <p>Associations of citizens (particularly the ones representing the interests of vulnerable categories)</p> <p>Social movements for sustainability</p> <p>Public communication supporting socio technical transformation</p> <p>Researchers (transversal)</p>
<b>SAFETY</b>	<p>Safety</p> <p>Security</p>	<p>Vehicles manufacturers</p> <p>Infrastructure manufacturers</p> <p>Maintenance staff</p> <p>Researchers (transversal)</p>
<b>DISRUPTIVE TECHN.</b>	<p>New transport modes (drones, hyperloop, etc.)</p>	<p>Drones + infrastructure manufacturers</p> <p>Drones' trainers</p> <p>Certification and patents for Drones</p> <p>Legal and Regulatory Experts</p> <p>Politicians, Policy makers</p> <p>Researchers (transversal; hyperloop is in embryonal phase)</p>

Table 3: List of Key figures emerged from the Workshop on Urban Scenarios 2050



**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)

## 6 Conclusions

A safe, reliable, green and sustainable rail centric mobility system that guarantees inclusivity and accessibility to all categories of users, that continuously interact with the customer giving him a targeted service and that is seamlessly integrated with all the other transport modes through intelligent devices and efficient multimodal infrastructure, is an ideal scenario towards which all the actors involved in the evolution of transport system have to target. This is something that emerged clearly from the presentations performed during the workshop and from the discussion taking place in Stockholm. The role of public transport and particularly of rail in shaping the 2050 transport system was emphasized by all the stakeholders attending the event. To make it possible, it is necessary that the all the actors included in the decision-making process and particularly in the design phase collaborate and interact. Analysis of best practices, organization of workshops and round tables, shared methodology, new governance bodies allowing a more horizontal cooperation and knowledge exchange through a collaborative approach may bring added value to the projects and can ease the transition phase towards the ideal scenario identified. To do so, it is important to include the citizens from the very beginning in the development process, understanding their requirements and their needs and trying to deliver a mobility system that keeps them and their demands at the centre. Understanding social and economic vulnerabilities is essential to formulate actions adapted to local needs, with local communities playing a central role. New arising technologies and the increasing importance of city networks and associations contribute to make this engagement process easier. Virtuous examples of bottom-up approaches to urban governance already exists in Europe, and initiatives such as “fix my street”<sup>33</sup> in Brussels and Decidim<sup>34</sup> in 40 Spanish and French municipalities demonstrate that it is possible to make a virtuous use the latest technologies in order to involve and engage citizens in the city-shaping process. Participatory budgeting and participatory planning are also powerful citizen-inclusion community-driven tools utilized in European cities (Madrid is a typical example). Regular monitoring/evaluation activities are required in order to check the implementation of the SUMP and to guarantee an appropriate learning and improvement process.

Europe can be considered a global “champion” in city development discussions thanks to its long lasting tradition of policy experience and scientific knowledge production.

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33 <https://fixmystreet.brussels/>

34 <https://decidim.org/>

To provide a sustainable and efficient transport and mobility for people and goods are among the biggest challenges planners, institutions and authorities have to face. All the political and institutional actors involved at International, National and Regional level, together with the private sector, universities & academia, associations representing different stakeholders' interests, civil society at large have to work together in order to meet these ambitious targets and deliver a sustainable, efficient, reusable, co-usable, modular, personalized and data driven service in the future promoting values such as inclusiveness, equity, livability, accessibility, equity and resilience. Sustainability is a particularly relevant aspect broadly taken into consideration by National and super national organizations when setting their agenda. A valuable example in this sense can be considered the United Nations 2030 Agenda for Sustainable Development, adopted in 2015<sup>35</sup> as a plan of action for people, planet and prosperity. This Agenda includes 17 Sustainable Development Goals (SDGs). One of these goals (number 11) is targeted at "building sustainable cities and communities, making cities inclusive, safe and resilient".

TER4RAIL has also mapped and analysed the European scenario of **European Technology Platforms and Partnerships**, with the aim of identifying current connections with the railways sector and pointing at the ones with higher potential to contribute to fostering innovation in the railway sector through transversal collaboration, as a suggestion to be explored under Task 1.3. The factsheets gathered by the TER4RAIL partners also demonstrate that collaboration opportunities are in some cases already in place; in others, there is a potential to be exploited in order to foster cross fertilization among sectors and deliver mutual benefit from this collaboration. In particular, participation to already established Working Groups or Committees, partake in events and workshops, collaborate on the drafting of position papers or joint publications, participation to S2R or Horizon Europe projects, signing of Memorandum of Understanding have been identified as ways to exploit this "collaboration potential", particularly on cross-sectorial topics such as Artificial Intelligence, Cybersecurity, Big Data, Human Factors, Materials, Safety&Security. This analysis constitutes a mapping exercise that key railway stakeholders may use as a source of information to enhance transversal collaboration. In this framework, ERRAC can play a key role in fostering collaboration acting as a valuable platform for meeting, sharing, learning.

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35 UN Sustainable Development Agenda. United Nations, 2015  
<https://www.un.org/sustainabledevelopment/development-agenda/>

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WATERBORNE Towards a Strategic Research Agenda for Inland Waterways and Ports

## **WEBSITES**

<https://fixmystreet.brussels>

<https://decidim.org>

<https://ec.europa.eu/eurostat>

<https://ec.europa.eu/info/research-and-innovation/funding>

<https://eur-lex.europa.eu>

<https://www.eu-robotics.net>

<https://www.globalcovenantofmayors.org>

<https://www.ipcc.ch/sr15>

## **PROJECTS**

CONDUITS Project, 2015

Intend Project, 2018

OPTICITIES Project, 2016

## 8 Appendices

### 8.1 Appendix 1: List of European Technology Platforms and Partnerships

#### European Technology Platforms.

Bio-based economy	Environment	ICT	Production and processes	Transport
<u>European Aquaculture TP (EATIP)</u>	<u>European Water Platform (WssTP)</u>	<u>ARTEMIS Industry Association</u>	<u>European Construction, built environment and energy efficient building TP (ECTP)</u>	<u>Advisory Council for Aviation Research and Innovation (ACARE)</u>
<u>Farm Animal Breeding and Reproduction TP (FABRE TP)</u>		<u>ENIAC</u>	<u>European Steel TP (ESTEP)</u>	<u>ETP Alliance for Logistics Innovation through Collaboration in Europe (ALICE)</u>
<u>ETP 'Food for Life'</u>		<u>ETP on Smart System Integration (EPoSS)</u>	<u>ETP Advanced Engineering Materials and Technologies (EuMaT)</u>	<u>European Rail Research Advisory Council (ERRAC)</u>
<u>Forest-based Sector TP (FTP)</u>		<u>ETP for High-Performance Computing (ETP4HPC)</u>	<u>ETP Fibres, Textiles, Clothing (FTC)</u>	<u>European Road Transport Research Advisory Council (ERTRAC)</u>
<u>Plants for the Future ETP</u>		<u>euRobotics [AISBL]</u>	<u>ETP Manufuture</u>	<u>TP Waterborne</u>
<u>TP Organics</u>		<u>New European Media Initiative NEM</u>	<u>ETP Nanomedicine</u>	
		<u>ETP Software, Services and Data (NESSI)</u>	<u>ETP Sustainable Mineral Resources (SMR)</u>	
		<u>ETP for Communications Networks and Services (Networld2020)</u>	<u>ETP for Sustainable Chemistry (SusChem)</u>	



## Photonics 21

### European Technology and Innovation Platforms (ETIPs)

- ETIP Bioenergy: <http://biofuelstp.eu/>
- ETIP Wind: <https://etipwind.eu/>
- ETIP Deep Geothermal: <http://www.geoelec.eu/etip-dg/>
- ETIP Ocean Energy: <http://www.oceanenergy-europe.eu/>
- ETIP Photovoltaic (ETIP PV): <http://www.etip-pv.eu/homepage.html>
- ETIP Renewable Heating and Cooling: <http://www.rhc-platform.org/home/>
- ETIP Smart Networks for Energy Transition (SNET): <http://etip-snet.eu/index.html>
- ETIP Sustainable Nuclear Energy (SNETP): <http://www.snetp.eu/>
- ETIP Zero Emission Fossil Fuel Power (ZEP): <http://www.zeroemissionsplatform.eu/>

### Contractual public-private partnerships (cPPPs) between the EU and business representatives

- Factories of the Future (FoF) <https://www.effra.eu/factories-future>
  - Energy-efficient Buildings (EeB) <http://e2b.ectp.org/>
  - European Green Vehicles Initiative (EGVI) <https://egvi.eu/>
  - Sustainable Process Industry (SPIRE) <https://www.spire2030.eu/>
  - Photonics (Photonics21) <https://www.photonics21.org/>
  - Robotics (euRobotics) <https://www.eu-robotics.net/>
  - High-Performance Computing (ETP HPC) <https://www.etp4hpc.eu/>
  - Advanced 5G networks for the Future Internet (5G) <https://5g-ppp.eu/>
  - European Cyber Security Organisation <https://ecs-org.eu/>
  - Big Data Value Association <http://www.big-data-value.eu/>
  - Graphene FET Flagship <https://graphene-flagship.eu>
  - Human Brain Project FET Flagship <https://www.humanbrainproject.eu/en>
  - Quantum Technology FET Flagship <https://www.quantera.eu/>
- <https://ec.europa.eu/digital-single-market/en/news/first-call-proposals-under-fet-flagship-quantum-technologies>
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  - Fuel Cells and Hydrogen 2 (FCH2) <https://www.fch.europa.eu/>
  - Clean Sky 2 (CS2) <https://www.cleansky.eu/>
  - Bio-based Industries (BBI) <https://www.bbi-europe.eu/>
  - Electronic Components and Systems for European Leadership (ECSEL) <https://www.ecsel.eu/>
  - Shift2Rail (S2R) [www.shift2rail.org](http://www.shift2rail.org)
  - Single European Sky ATM Research (SESAR) <https://www.sesarju.eu/>

## 8.2 Appendix 2: Results and ranking of non-rail actors

NON-RAIL ACTORS										
Technology Platform / PPP	Acronym	SHIFT2RAIL	ERRAC	UIC	UNIFE	UITP	EURNEX	NEWOPE	Rail Relat	TOTAL
European Rail Research Advisory Board	ERRAC	2	2	2	2	2	2	2		14
Shift2Rail	S2R	2	2	2	2	2	2	2		14
Advisory Council for Aviation Research	ACARE	2	2	1	2	2	2	2		13
ETP Alliance for Logistics Innovation	ALICE	2	2	1	2	2	2	2		13
European Road Transport Research	ERTRAC	1	2	1	2	2	2	2		12
TP Waterborne	TP Waterborne	1	2	1	2	2	2	2		12
Fuel Cells and Hydrogen 2	FCH2	2	1	1	2	1	1	1		9
Clean Sky 2	CS2	2	1		2	1	1	1		8
Single European Sky ATM Research	SESAR	2	1	1		1	1	2		8
Big Data Value Association	BDV	1	1		1	1	1	1	2	8
European Cyber Security Organisation	ECSSO	1		1	1	1	1	1		7
Robotics PPP & euRobotics	AIS/euRobotics	1	1	1	1	1	1	1		7
Advanced 5G networks for the F5G		1			1	1	1		2	6
European Construction, built for ECTP	ECTP	rg/			2		2	1		5
ETP on Smart System Integration	EPoSS	t-systems-int	1	1		2		1		5
Electronic Components and Systems	ECSEL	1			1				2	4
European Green Vehicles Initiative	EGVI					2	1	1		4
Factories of the Future	FoF	.eu/factories	1					1	2	4
ETIP Zero Emission Fossil Fuel	ZEP	missionsplatform.eu		1		1	1	1		4
ARTEMIS Industry Association	ARTEMIS-IA	.eu/	1	1			1			3
European Steel TP	ESTEP	.eu/		1			1	1		3
ETP for High Performance Computing	ETP4HPC	1		1	1					3
ETP Advanced Engineering Materials	EuMaT	1			1		1			3
ETP for Communications Networks	Networld2020	1		1			1			3
Photonics PPP	Photonics21	onics21.org/		1		1				2
ETIP Smart Networks for Energy	SNET	/index.html			1		1			2
Graphene FET Flagship	Graphene Flag	1								1
ETP Software, Services and Data	NESSI	europe.com		1						1
Quantum Technology FET Flagship	QuantERA	tera.eu			1					1
ETP Sustainable Mineral Resources	SMR	r.org/					1			1
ETIP Sustainable Nuclear Energy	SNETP	eu						1		1

## 8.3 Appendix 3: Factsheet for non-rail stakeholders (template)

### INSTRUCTIONS

The current template aims at presenting an informal description of the non-rail initiative, to serve as a basis for the contact with the railway sector. Then target audience that will read this factsheet, once is completed, are stakeholders from the railway sector. It aims at providing them with basic data on your initiative, trying to identify what type of interaction has already taken place with the railway sector and what are the opportunities for collaboration, as seen by the initiative.

This information will be made available to the members of the European Rail research Advisory Council, ERRAC, [www.errac.org](http://www.errac.org) and Shift2Rail Joint Undertaking [www.shift2rail.org](http://www.shift2rail.org). Making this information available will be a first step and will serve to support deeper discussions on synergies and possibilities for collaboration, which will take place in a further stage.

### BACKGROUND

**TER4RAIL** Project (S2R-OC-IPX-02-2018 [www.ter4rail.eu](http://www.ter4rail.eu)) aims to **reinforce the cooperation between rail and non rail-related stakeholders** to improve the efficiency of the consensual exploratory research across the rail sector, in order to facilitate emerging innovative ideas and cross-fertilization of knowledge from other disciplines or of disruptive technology and innovation. TER4RAIL intends to promote this process by **strengthening transversal exploratory research in Europe** for and with a railways perspective.

As part of WP1: “**Rail Innovative Research Observatory**”, project partners work on the **identification of non-rail actors** that may influence or foster innovative rail research and engaging with them in order to understand the way in which the activities of these stakeholders could be beneficial and nourish innovation through the railway sector.

In order to expand the outreach and ease the contact with stakeholders from other sectors, **the focus has been put on non-rail European Technology Platforms and Partnerships** officially recognized by the European Commission.

<NAME OF THE INITIATIVE>

<Logo>

### General information

*Please provide general information on the initiative, such as:*

- *General description, size / budget, timeline*
- *Key figures*
- *Mission / Objectives / Priorities*
- *Organization*
- *Involved Partners*

## Contact with the railway sector to date

*Please explain if there have been formal or informal contacts with the railway sector over the trajectory of the initiative, or if there are contacts/joint actions/initiatives already planned/foreseen in the near future. If so, please provide details and examples of them.*

*For example, railways considered as end user of specific developments / Vertical sector; mentioned at SRIA / strategic documents; counting with / open to participants from the railway sector in Committees / Work Groups...; research projects with application to railways; stakeholders from the railway sector involved in the initiative, etc.*

## Opportunities for collaboration with the railway sector

*Please name the opportunities for collaboration / interaction with the railway sector that you may foresee, such as technical (e.g. possible thematic in common); organizational (e.g. participation at working groups; end user...); possibilities for joint activities or contacts. Would your organisation will be interested in exploring further the possibilities of cooperation with the railway sector?*

## More information:

<Contact>

<Useful links>

## 8.4 Appendix 4: Compilation of non-rail stakeholders factsheets

This document gathers the Factsheets received through the identification and contact with non-rail European Technology Platforms and Partnerships that has been performed under TER4RAIL Task 1.2. "Identification of non-rail actors and pool of expertise for the Rail Innovative Research Observatory". It aims at identifying possibilities for collaboration with the railway sector, and understanding the way in which the activities of these stakeholders could be beneficial and could nourish innovation through railways.

A template for a factsheet was elaborated, with the following sections:

- General Information
- Contact with the railway sector to date
- Opportunities for collaboration with the railway sector

This document contains information on the answers received by the entities listed below:

- **5G PPP, 5G Public Private Partnership**
- **ACARE, Aviation European Technology Platform**
- **ALICE, Alliance for Logistics Innovation through collaboration in Europe**
- **ECISO, European Cyber Security Organisation**
- **ECSEL, Joint Undertaking - the Public-Private Partnership for Electronic Components and Systems for European Leadership**
- **ECTP, European Construction, built environment and energy efficient building Technology Platform**
- **EFFRA European Factories of the Future Research Association / FoF 'Factories of the Future' public-private partnership**
- **ERTRAC, European Road Transport Research Advisory Council**
- **WATERBORNE, Waterborne Technology Platform**

For further information please refer to D.1.2 that will be available at [www.ter4rail.eu](http://www.ter4rail.eu) after its approval.

## 5G Public Private Partnership (5G PPP)



### General information

The 5G Public Private Partnership (5G PPP) is the 5G collaborative research program that is organized as part of the European Commission's Horizon 2020 program – The European Union Program for Research and Innovation. It is aimed at fostering industry-driven research, monitored by business-related, technological performance and societal KPIs. The 5G PPP will deliver solutions, architectures, technologies and standards for ubiquitous next-generation communication infrastructure over the coming decade.

In the 5G PPP, the 5G Infrastructure Association (5G IA) represents the private side and the European Commission the public side. The 5G IA is committed to the advancement of 5G in Europe and to building global consensus on 5G. To this aim, the Association brings together a global industry community of telecoms & digital actors, such as operators, manufacturers, research institutes, universities, verticals and SMEs. The 5G IA carries out a wide range of activities in strategic areas including standardization, frequency spectrum, R&D projects, technology skills, collaboration with key vertical industry sectors, notably for the development of trials, and international cooperation.

[www.5g-ppp.eu](http://www.5g-ppp.eu) - Twitter: @5GPPP

### Contact with the railway sector to date

5G IA has entailed a vertical engagement activity coordinated at Board level to promote 5G in vertical sectors and receive inputs to fine tune 5G requirements and foster 5G adoption.

Within this activity, in 2019 5G IA has organized 2 workshops with vertical industries (and a 3rd edition is under discussion). On this occasion, an informal contact was established with UIC (Dr. I. Wendler).

TER4RAIL Project has identified through the railway projects scan the following 5G PPP **Projects** with direct application to railways:



**5G Programmable Infrastructure Converging disaggregated neTwork and compUte Resources.** Railway demonstrator (out of three): a 5G railway experimental testbed showcasing seamless service provisioning and mobility management in high-speed moving environments. 01/06/17 – 29/02/20 [www.5g-picture-project.eu](http://www.5g-picture-project.eu)



**Vertical demos over Common large scale field Trials fOr Rail, energy and media Industries.** Rail use cases: “Enhanced Mobile broadband under high speed mobility”; “Critical services for railway systems”; “Smart Energy Metering”.



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01/06/19 - 31/05/22 [www.5g-victori-project.eu](http://www.5g-victori-project.eu)

**5G-enabled Growth in Vertical Industries.** Technical and business validation of 5G technologies. Part 3: “Advanced 5G validation trials across multiple vertical industries. Rail level crossing.

01/06/2019 – 30/11/2021 <http://5growth.eu>

## Opportunities for collaboration with the railway sector

Different collaboration models are envisaged following partnerships with other vertical industries:

- Participation to 5G IA open Working Groups (eg. Trial WG)
- Cross participation to relevant events with high qualified speakers
- Promote, as appropriate, each other dissemination and PR activities through respective social media accounts, newsletters and official websites
- Participate to deliverables (eg. whitepapers and similar)
- Sign an MoU encompassing previous points

## More information:

Useful links:

<https://5g-ppp.eu/verticals/>

<https://5g-ppp.eu/5g-trials-roadmap/>



# ACARE

## General information



ACARE



ACARE BRINGS TOGETHER  
HUNDREDS OF STAKEHOLDERS



Strategy, Networking, Monitoring

Advisory Council for Aviation Research and Innovation in Europe

10/11/2019

2

## ACARE timeline (the full story so far)



Advisory Council for Aviation Research and Innovation in Europe

10/11/2019

6



## Strategic Research and Innovation Agenda (SRIA)



### Road map for aviation research, development & innovation

#### Content aligned to five goals of Flightpath 2050:



Advisory Council for Aviation Research and Innovation in Europe

10/11/2019

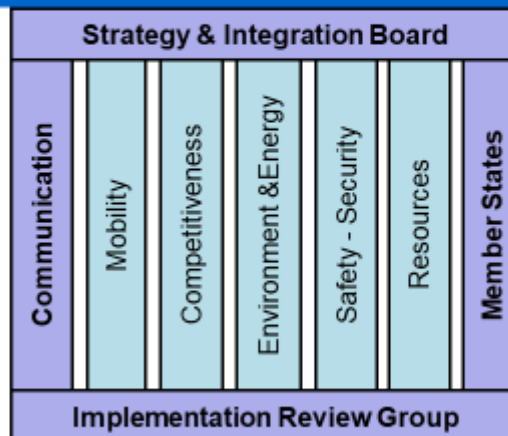
7

## ACARE structure & membership



### General Assembly

- ☐ 28 Member States
- ☐ European Commission
- ☐ Manufacturing Industry
- ☐ Airlines
- ☐ Airports
- ☐ Air Navigation
- ☐ EASA
- ☐ Eurocontrol
- ☐ Research Centres
- ☐ Universities
- ☐ Energy
- ☐ Regulators
- Over 50 members



Advisory Council for Aviation Research and Innovation in Europe

10/11/2019

8

## Contact with the railway sector to date



We co-organize TRA ...



... because we need a forum to identify and address cross-modal issues and learn from each other.

**VIENNA 2018 TRA**  
A digital era for transport  
solutions for society, economy and environment



...contribute(d) to the STRIA ...



The STRIA initiative was based on a consultation process to

- Identify the options towards low carbon transport and mobility
- Create consensus among policy makers, stakeholders and civil society

### Technical areas STRIA:

Electromobility  
Alternative fuels  
Vehicle design & manufacturing  
Connectivity & automation of transport  
Transport infrastructure  
Network and traffic management systems  
Smart transport and mobility services (incl. urban)

### ACARE STRIA goals

Meeting Societal and Market Needs  
Maintaining and Extending Industrial Leadership  
Protecting the Environment and the Energy Supply  
Ensuring Safety and Security  
Prioritising Research, Testing Capabilities & Education

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...and cooperated successfully before !



Advisory Council for Aviation Research and Innovation in Europe

10/11/2019

24

## Opportunities for collaboration with the railway sector

### Research Areas:

#### Scope Mobility / Customer-Centric Transport System:

- Understand customer, market and societal expectations and opportunities
- Design and implement an integrated, intermodal transport system
- Develop capabilities to evaluate mobility concepts, infrastructure and performance
- Provide travel management tools for informed mobility choices
- Deliver mobility intelligence: journey information, data and communication
- Provide tools for system and journey resilience, for disruption avoidance and management

#### Scope connected & automated transport (in line with recommendations in the STRIA doc roadmap do:

- Combination of sensors with AI in environment perception
- Connectivity and data communication with digital infrastructures
- Cyber security and functional safety of control systems
- Human factors in the sharing of tasks between drivers/pilots and machines
- Universal design and user acceptance
- Testing and validation
- Socio-economic impact assessment
- Backwards compatibility
- Harmonization and standardization
- Liability and regulatory issues

#### Scope environmental impact / propulsion:

- Alternative propulsion/power solutions
- Noise simulation and analysis
- Recycling



#### General:

- Safety
- Cyber security
- Materials
- Batteries
- Sustainable fuels

#### Organizational:

##### Continuation of current areas of cooperation:

- Partners in TRA Committees
- Shift2Rail IP4 represented at ACARE WG1
- Representing transport sector in STRIA Governance Group
- ACARE is open for more joint activities ....

##### Future areas of cooperation:

- Research on cross-cutting topics in Horizon Europe
- Joint activities towards a European MaaS-system with rail and air transport at its core

Would your organisation will be interested in exploring further the possibilities of cooperation with the railway sector?

Yes

## Alliance for Logistics Innovation through collaboration in Europe, ALICE



### General information

The European Technology Platform ALICE is set-up to **develop a comprehensive strategy for research, innovation and market deployment of logistics and supply chain management** in Europe. The platform support, assist and advise the European Commission into the implementation of the EU Program for research: Horizon 2020 and Horizon Europe (*in Logistics*). ALICE was officially recognized as a European Technology Platform by the European Commission in July 2013.

ALICE is based on the recognition of the **need for an overarching view on logistics and supply chain planning and control**, in which shippers and logistics service providers closely collaborate to reach efficient logistics and supply chain operations. ALICE engages with all different kind of stakeholders operating in the Logistics sector and is an open platform always welcoming new members.

ALICE is established as a Non for-Profit International Association in Brussels. (AISBL)

### Vision

Future logistics will be based on an open global system of systems connecting logistics networks seamlessly and founded on physical, digital, and operational interconnectivity enabling substantial increase in efficiency and sustainability. We call this vision the **Physical Internet (PI)**. In the long run, 2050, we envision a world in which freight transport and logistics is close to **Zero emissions**.

### Mission

- Development of new logistics and supply chain concepts and innovation for a more competitive and sustainable industry.
- The ambition is to contribute to a 30% improvement of end to end logistics performance by 2030
- ALICE, the ETP on logistics, aims to accelerate the deployment of more efficient, competitive and sustainable supply chains.

### Activities/Output

- Define research and innovation strategies, roadmaps and priorities agreed by all stakeholders to achieve ALICE vision. These items will assist the European

Commission in the definition of Research and Innovation Programs, i.e. HORIZON 2020

- Foster innovation in logistics and supply chains, stimulating and accelerating innovation adoption supporting the growth of the European economy through competitive and sustainable logistics.
- Raise the profile and understanding of new logistics technologies and business processes, monitoring progress and adjusting research and innovation roadmaps accordingly.
- Contribute to a better alignment and coordination of European, national, regional innovation programs in logistics.
- Provide a network for interdisciplinary collaborative research involving industry, academia and public institution.

## ALICE Roadmaps

ALICE developed in 2013-2014 five roadmaps in key areas for freight transport and logistics (see the figure). All these roadmaps converged towards the Physical Internet vision. Currently, ALICE is implementing the SENSE<sup>1</sup> project to accelerate the path towards the Physical Internet so **pilot implementations of the Physical Internet concept are well functioning and extended in industry practice by 2030**. On top, ALICE is working on a Roadmap Towards Zero Emissions Logistics 2050.

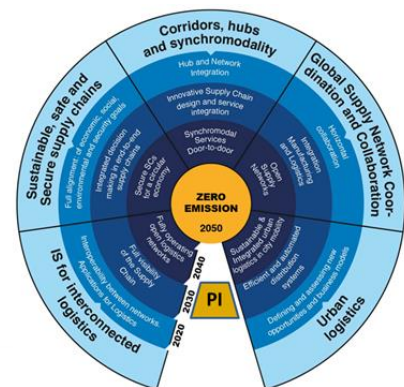
Physical Internet (2030)

Zero Logistics Emissions (2050)

### Roadmaps



[More information on ALICE Roadmaps](#)





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)

## ALICE Membership

alice |

ALICE membership per type of organization		
Type of Organization	Members	EU/International Associations
Shippers & Retail	      	   
Logistics Service Providers, Courier and Postal operators & Freight Forwarders	           	   
Ports, Hubs, Intermodal terminals & Transport Infrastructure	         	 
Vehicle Manufacturers & Logistics operations, handling (modular units)	     	
Information and Communication Technologies & Consultancy	                   	 
Regional & National Logistics Clusters & Associations	              	
Research and technology Centers	        	 
European Technology Platforms / PPPs	     	
Member States and innovation Funding*	     	

\* Involved in ALICE Mirror Group

## Contact with the railway sector to date

- Some of our ALICE members have a close link or are part of the rail sector such as: LINEAS, UIRR, HACON, New Opera and others are users of rail freight services (see Shippers & Retail as well as Logistics Service Category members). We also have a strong link to the sector with our Ports and Hubs members as well as infrastructure managers (Trafikverket and RWS).
- ALICE worked together with ERRAC and the rest of Transport ETPs in the development of the document on the *Truly integrated Transport System for Sustainable and Efficient Logistics* ([Link to the document](#)).
- ALICE has participated as speaker in 2 ERRAC Plenary meetings in 2015 and 2018.
- ALICE and ERRAC together with the rest of Transport ETPs are part of the Transport Research Arena ([www.traconference.eu](http://www.traconference.eu)) Management, Program and Organizational Committees.
- ALICE and ERRAC together with the rest of Transport ETPs are part of the STRIA Governance group. Jointly, we have developed a Joint document on the STRIA Connected and Automated Transport Roadmap.
- ALICE, ERRAC and the rest of transport ETPs prepared together 3 topics<sup>36</sup> that were proposed for Horizon 2020 Work Programme 2018-2020 in order to strengthen some collaborations and joint initiatives.
- ALICE, ERRAC and ERTRAC have a joint Working Group on Urban Mobility.
- ALICE is part of Shift 2 Rail *USER REQUIREMENTS/IMPLEMENTATION AND DEPLOYMENT WORKING GROUP*.
- Shift 2 Rail and ERRAC representatives are invited to ALICE events and are in ALICE members distribution lists.
- Shift 2 Rail has participated actively in:
  - *Physical Internet workshop* ([link](#))
  - *Collaborative Innovation Day "New Global Routes: One Belt One Road Initiative & TEN-T"* ([link](#))
  - *International Physical Internet Conference* (<https://www.pi.events/>)
- ALICE chairman and secretary general have regular exchanges with Shift 2 Rail Executive Director.

## Opportunities for collaboration with the railway sector

See above the opportunities that we are already working on.

As ALICE has regular contacts with ERRAC and Shift 2 Rail representatives and we share many forums and groups we consider the right mechanisms are in place to find out and establish potential opportunities.

However, we miss some specific European Commission supported actions to ensure enough

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<sup>36</sup> [http://www.etp-logistics.eu/wp-content/uploads/2015/08/ALICE-Recomendations-WPs-2018-2020-v161216.01\\_rev170117.pdf](http://www.etp-logistics.eu/wp-content/uploads/2015/08/ALICE-Recomendations-WPs-2018-2020-v161216.01_rev170117.pdf).





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)

alice |

resources are in place to work on common interest areas but that not have a clear “owner” so it is difficult for a specific stakeholder to work on and dedicate the required resources individually. As concrete examples, see the proposed topics for Horizon 2020 2018-2020 Work Programme<sup>1</sup>

Would your organisation will be interested in exploring further the possibilities of cooperation with the railway sector?

Some opportunities are already identified but there are no concrete resources to address them.

### Contact Information:

[Follow ALICE in Linked In](#) and Join our [Linked In discussion Group](#)

## European Cyber Security Organisation (ECSO)



EUROPEAN CYBER SECURITY ORGANISATION

### General information

- *General description, size / budget, timeline*

The European Cyber Security Organisation (ECSO) is the European Commission's partner in implementing the contractual public-private partnership (cPPP) on cybersecurity, established in 2016. ECSO is the independent voice of the European cybersecurity stakeholder community, representing industry players, national public administrations, research centres, SME's, regions, and academia.

We are working together to build up the future European cybersecurity by identifying priorities to be funded (via Horizon Europe and the Digital Europe Programme) from 2021, and developing the ecosystem for your business growth.

Our membership has grown from 132 members in June 2016 to 254 members in September 2019 (we are also reaching out to all the members of our 26 associations, i.e. a Community of more than 2000 bodies).

- *Key figures*

- 254 Members, i.e. 24 Associations + 53 Large Companies + 21 Public Administrations + 9 Regions/Clusters + 68 Universities + 54 SMEs + 17 Users/Operators/Associations of Users.
- 6 Working Groups, each targeting a different aspect of cybersecurity
- 22 Publications

- *Mission / Objectives / Priorities*

Concrete actions going forward:

- Certification: Practical application of meta-scheme & collaboration with ENISA and EC
- Market aspects: ECSO Market Radar as "one-stop-shop" for market taxonomy and mapping of European companies
- User needs: Growth of Users' Committee and contribution to EU Cyber Security Industrial Policy
- SMEs & regions: SME Hub fully operational with label "Cyber Made in EU" in place and implementation of interregional accelerator programme. Cyber Security Business Matchmaking events as a service.
- Education, awareness, skills: Creation of private foundation for Women4Cyber initiative and development of European skills taxonomy & framework. Visibility for efficient capacity and capability building approaches, offering hands-on "Cyber Made in EU" solutions for the skills gap challenge.

- R&I: Monitoring of cPPP projects, identification of research and innovation needs for the EU, identification of strategic technologies and solutions, and coordination of cyber security strategy across sectors and domains (IoT, AI, Blockchain, 5G, Robotics,...)
- EU capacity-building efforts: Enlarging the Community and launching new initiatives (Youth4Cyber, European Cyber League, Service to facilitate access to finance and VC, job portal)
- *Organization*



<https://www.ecs-org.eu/about>

## Contact with the railway sector to date

In the context of its SWG3.3 “Transportation”, ECSO has organised a workshop on 11 February 2019, inviting external (non-ECSO members) stakeholders from all transportation sectors to contribute to the discussions. The SWG is currently writing a report on the needs and requirements of the transportation sub-sectors, including air, sea, rail and road.

On the occasion of the workshop, Shift2Rail representatives were in attendance and gave a presentation on the state of the art of the rail sector, in terms of digitalisation and cybersecurity.

ECSO membership does not currently cover the rail sector extensively, at least from the demand side, so engagement with user associations and PPP’s at EU level are strongly welcomed to ensure that needs and requirements can be elicited from all relevant stakeholder groups.

ECSO is currently working on finalising the report with the aim of publishing it before the end of the year.

## Opportunities for collaboration with the railway sector

- Become an ECSO member and join the SWG3.3 “Transportation” – possibility to hear from and exchange with experts of the other sectors, create cross-sector networking opportunities, etc.
- Become an ECSO member and join the Users Committee - an entity created for Users/Operators to meet (CISO-level or equivalent) and share strategic intelligence on incidents in all trust and confidence. The UC also has a cross-sector approach, including finance, energy, etc.
- Partnership with ECSO, specifically the WG3 “Sectoral Demand”, on projects, initiatives, workshops, etc.
- Possible participation in workshop groups as external observer on an *ad hoc* basis (only ECSO members will have full access)

## More information:

Useful links

<https://www.ecs-org.eu/about>

<https://www.ecs-org.eu/working-groups/wg3-sectoral-demand>



## **ECSEL Joint Undertaking**

Electronic Components and Systems for European Leadership

### **ECSEL Joint Undertaking - the Public-Private Partnership for Electronic Components and Systems for European Leadership**

## **General information**

The ECSEL Joint Undertaking - the Public-Private Partnership for Electronic Components and Systems – funds Research, Development and Innovation projects for world-class expertise in these key enabling technologies, essential for Europe's competitive leadership in the era of the digital economy. Through the ECSEL JU, the European industry, SMEs and Research and Technology Organisations are supported and co-financed by 30 ECSEL Participating States and the European Union.

Electronic components and systems are a pervasive Key Enabling Technology, impacting all industrial branches and almost all aspects of life, also railway transport.

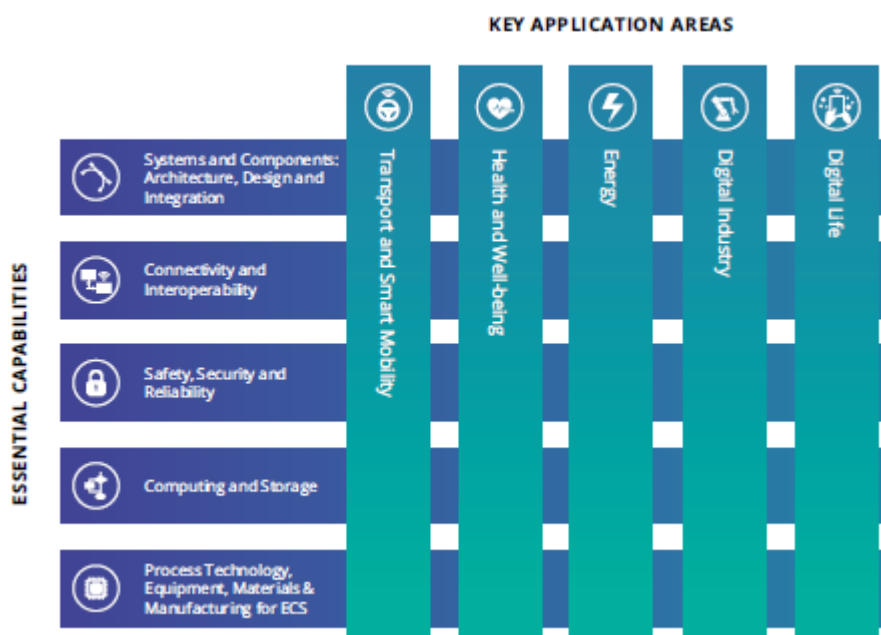
### **The ECSEL JU Objectives:**

- Contribute to the development of a strong and globally competitive electronics components and systems industry in the European Union;
- Ensure the availability of electronic components and systems for key markets and for addressing societal challenges, keeping Europe at the forefront of technology development, bridging the gap between research and exploitation, strengthening innovation capabilities and creating economic and employment growth in the Union;
- Align strategies with Member States to attract private investment;
- Maintain and grow semiconductor and smart system manufacturing capability in Europe;
- Secure and strengthen a commanding position in design and systems engineering;
- Provide access for all stakeholders to a world-class infrastructure for design and manufacturing;
- Build a dynamic ecosystem involving Small and Medium-Sized Enterprises (SMEs), strengthening existing clusters and creating new clusters.

### **Members:**

- Three associations (EPoSS, AENEAS and ARTEMIS Industry Association) representing the actors from the areas of micro- and nano-electronics, smart integrated systems and embedded/cyber-physical systems.
- the European Union (through the Commission);
- Member States and Associated Countries to the Framework Programme Horizon 2020 on a voluntary basis;

ECSEL's Strategic and Research Agenda 2019 focuses on a set of 5 key applications areas, and 5 essential capabilities, as depicted in the figure below.



## Contact with the railway sector to date

The ECSEL's Strategic and Research Agenda 2019 identifies as one **Key Applications Area "Transport and Smart Mobility"** out of a total of five key application areas. The major Challenges identified in Transport & Smart Mobility are:

- Clean, affordable and sustainable propulsion
- Secure connected, cooperative and automated mobility and transportation
- Interaction between humans and vehicles
- Infrastructure and services for smart personal mobility and logistics.

These four major Challenges aim to keep Europe in the lead for innovations throughout the automotive value chain and to broaden the Research & Development & Innovation- (RDI)-horizon so that future research and innovation focuses more on holistic, cross-domain and sustainable mobility solutions for all the main transportation domains (Road, Rail, Aviation (incl. drones) and Maritime).

Through the description of the ECSEL's Strategic and Research Agenda 2019 on the Key Applications Area "Transport and Smart Mobility", rail is mentioned in relation to: Autonomous trains in connection with current project developments supported by Shift2Rail JU; Smart sensors – Rail PowerTrain systems; Safety & Security at Sustainable public spaces such as railway stations; Multi-modal (intermodal) traffic in sparsely populated areas (e.g. autonomous vehicles called on demand to/from the stations of the backbone railway line, since frequent public bus transport does not pay off, etc.), "Tram (small train units) on demand" etc.; Overall transport automation in European regions (automated "robot taxis" vehicles complementing high speed railway lines, last-mile freight transport by automated vehicles or by small autonomous train units, etc.); Safety certification on key domains.

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)

Despite Rail is considered as a target inside this area, the applications in other modes, such as automotive, concentrate most of the developments under this area.

In relation to projects financed under ECSEL JU Calls with application in the railway sector, the following ones have been identified by the Rail Project scan performed by TER4RAIL Project:



**SECREDAS: Product Security for Cross Domain Reliable Dependable Automated Systems.** Aims to develop and validate multi-domain architecting methodologies for autonomous systems, for Automotive, Rail and Healthcare. 01/05/18 - 30/04/21 [www.secredas.eu](http://www.secredas.eu) / [Cordis](#)



**SCOTT: Secure COnnected TruStable Things.** Railway domain (out of 5). Rail industrial cases: Autonomous wireless network for rail logistics and maintenance; Secure cloud services for novel connected mobility applications; Smart train composition coupling. 01/05/17 – 30/06/20 [www.scottproject.eu](http://www.scottproject.eu) / [Cordis](#) / @SCOTTProject2



**WinSiC4AP: Wide band gap Innovative SiC for Advanced Power.** Rail demonstrator: Intelligent Power Switch (IPS-RA): High Voltage PowerConverters (<10 kV) for embedded railway equipment's. 01/06/17 - 31/05/20 [www.winsic4ap-project.org](http://www.winsic4ap-project.org) / [Cordis](#)



**ENABLE-S3: European Initiative to Enable Validation for Highly Automated Safe and Secure Systems.** Rail domain: complex automated railway command and control systems. 01/05/16 – 31/05/19 [www.enable-s3.eu](http://www.enable-s3.eu) / [Cordis](#) / @ENABLE\_S3



**AMASS: Architecture-driven, Multi-concern and Seamless Assurance and Certification of Cyber-Physical Systems.** CS5: Railway domain: Platform Screen Doors Controller. CS6: Automatic Train Control Formal Verification. Alstom, Thales, Tecnalía. 01/04/2016 – 31/03/2019 [www.amass-ecsel.eu](http://www.amass-ecsel.eu) / [Cordis](#) / @AMASSproject

To date, there are some touching points between ECSEL and the railway sector, but there is not a structured interaction.

There are companies very active both Joint Undertakings, ECSEL JU and Shift2Rail JU, and both sectors.

There has been informal contact between ECSEL and Shift2Rail Executive Directors.



## Opportunities for collaboration with the railway sector

As described before, there are commonalities between ECSEL and the railway sector and informal interactions have taken place. To date, there is not a structured interaction between both fields, but due to touching points it seems worth to be explored.

Possible limiting factors to be taken into account are: the identification of a business case for electronic components and systems for the railway sector; limitation of time and availability of human resources; need of long term commitment to explore the relationship; differences in structure and funding levels between the JUs.

Some possible actions:

- Raise awareness: present to the railway sector what are the Electronic Components and Systems under ECSEL capable / what type of inputs could give on requirements; and bi-directional: S2R introducing how the role of the electronic components and systems in railways and possible inputs on requirements.
- Contact at Technical Level; companies talk to one another; expert-to expert discussions
- Possible contact at Governing board / Other JU Committees
- Identify synergies and find opportunities
- Some possible interesting thematic: drones; power components; semiconductor manufacturing; artificial intelligence.

Would your organisation will be interested in exploring further the possibilities of cooperation with the railway sector?

Certainly yes.

## More information:

**ECSEL JU**

[ecsel-office@ecsel.europa.eu](mailto:ecsel-office@ecsel.europa.eu)

[www.ecsel.eu](http://www.ecsel.eu)

## Relevant documents:

Strategic Research Agenda 2019:

<https://www.ecsel.eu/sites/default/files/2019-02/ECS-SRA%202019%20FINAL.pdf>





## General information

The European Construction Technology Platform (ECTP) was set up in 2004 by the Construction sector on the request of the European Commission. ECTP is today an industry-led stakeholder forum recognised by the European Commission and the Construction sector as a key actor in driving innovation, developing knowledge transfer and leveraging European competitiveness.

ECTP gathers around 140 member-organizations (large enterprises, SMEs, universities, research organisations and professional associations) from the Construction sector and other sectors from the whole supply chain of the Built Environment. The different main areas of focus for ECTP are addressed in respective Committees and include:

- Active Ageing & Design
- Energy & Efficient Buildings
- Heritage & Regeneration
- Infrastructure & Mobility
- Materials & Sustainability

The main mission of ECTP and its 5 experts Committees is to develop new R&D&I strategies to improve competitiveness, meet societal needs & take up environmental challenges through an Innovative Built Environment.

ECTP mobilises stakeholders to deliver on agreed priorities and share information across the EU. ECTP is an independent and self-financing entity. It conducts its activities in a transparent manner and is open to new members.

ECTP has an annual budget of around 450 k€.

## Contact with the railway sector to date

ECTP has contacts with ERRAC at the time of the Roadmap for Cross-Model Transport Infrastructure Innovation (2013).

After that a significant collaboration have been exploited with the railway sector in the H2020 REFINET project, thanks to the participation as consortium member, of UIC.

This allowed REFINET strategic documents, namely the Multi-Modal Transport Infrastructure (RMMTI) model, the Strategic Implementation Plan and its deployment strategy, to take into account needs and requirements of the railway sector as well.

Moreover, ECTP as member of the TRA, jointly shares and discusses with ERRAC under this umbrella.

## Opportunities for collaboration with the railway sector

ECTP sees its role in being transversal to transport modes, including rail.

As such any opportunity of cooperation with the rail sector is welcome and highly interesting.

This is from both a technical point of view (e.g. Understanding how the construction sector can technically help/support the railway stakeholders) as well as from the point of view of networking and sharing the point of view of ECTP and the Infrastructure & Mobility Committee in terms of R&D&I priorities and target goals and objectives of the sector by 2030 and 2050.

Moreover, global issues, such as Climate Change, Digitalization, etc. and how transport infrastructure can cope with them or can make use of them, could be a topic for discussion.

Would your organisation be interested in exploring further the possibilities of cooperation with the railway sector?

YES

### More information:

Useful links: <http://www.ectp.org/>; <http://infrastructure.ectp.org/>;  
<http://infrastructure.ectp.org/csa-refinet/>

## European Factories of the Future Research Association (EFFRA) 'Factories of the Future' public-private partnership

<https://www.effra.eu/>

### General information

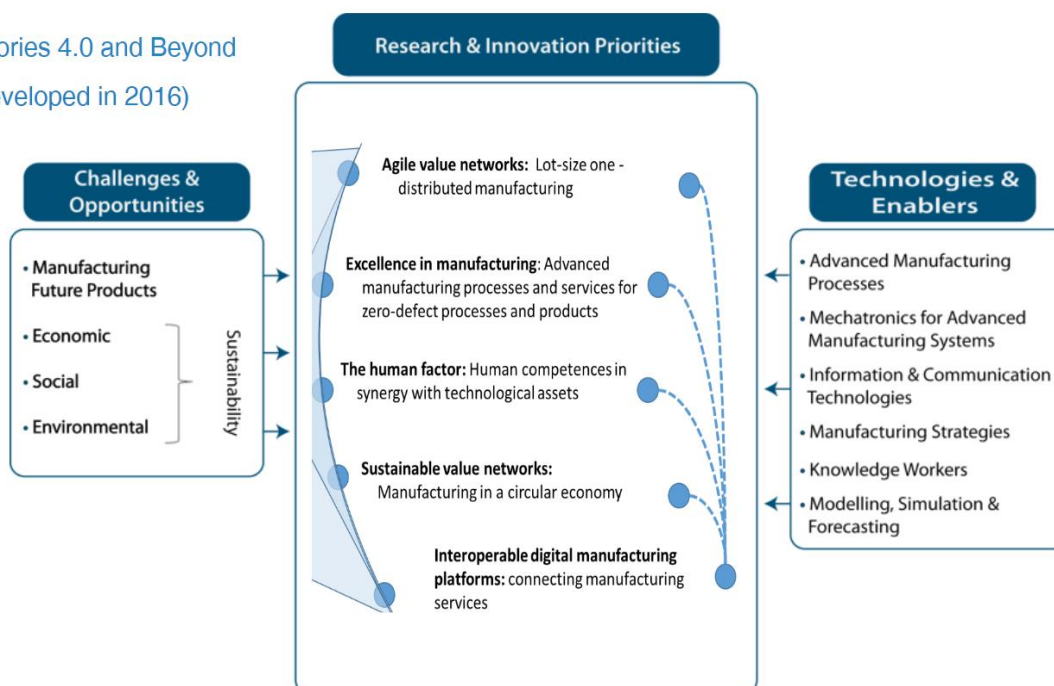
EFFRA – towards Made in Europe

- Presentation: <https://cloud.effra.eu/index.php/s/HMzoUdabiqvxjk3>
- Brochure: [https://www.effra.eu/sites/default/files/190312\\_effra\\_roadmapmanufacturingppp\\_eversio\\_n.pdf](https://www.effra.eu/sites/default/files/190312_effra_roadmapmanufacturingppp_eversio_n.pdf)

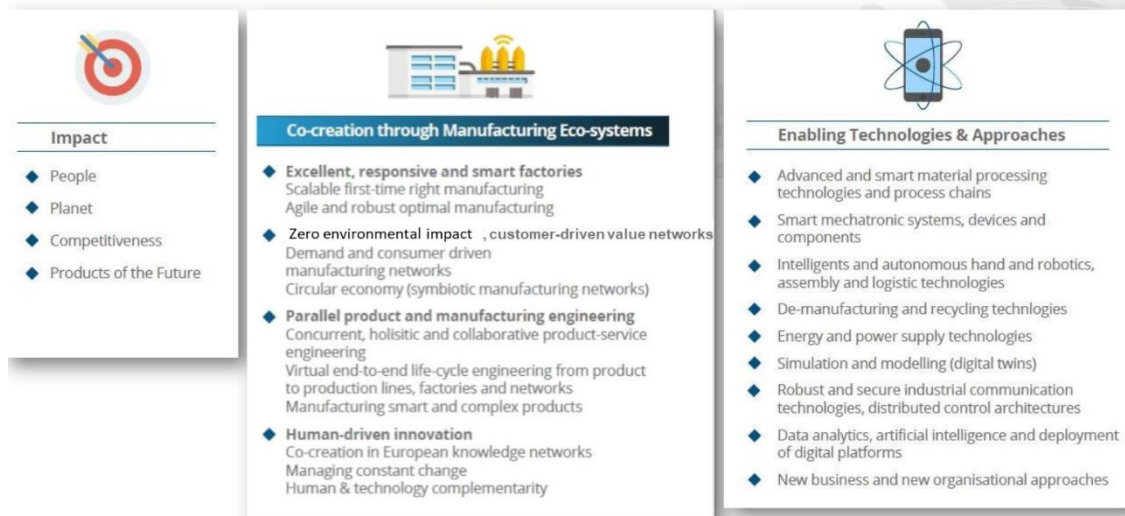
### Members



### Factories 4.0 and Beyond (Developed in 2016)



## Roadmap for the Manufacturing Partnership (2021 – 2027)



## Contact with the railway sector to date

There has not been a direct and specific contact with the railways sector to date. However, there are issues that can be indirectly related, such as stakeholders that are active in both domains (e.g. Acerlor Mittal, Technalia...); similar topics (e.g. hyperconnected supply chain; SCADA, digital twins, additive manufacturing...); projects applied to railways (e.g. RECOTRANS Oct17-Marzo21; MAESTRO end Sept 19).

## Opportunities for collaboration with the railway sector

- Regarding thematic: digitalization of value networks / logistics could be a touching point between both sectors. More information on the Digitalisation – Connected Factories Project: <https://www.effra.eu/connectedfactories-project>
- Evolution of manufacturing may be also relevant
- Interaction human-robot
- EFFRA Innovation Portal: <https://portal.effra.eu/projects>. Online resource for sharing information about research and innovation projects and associated project results and demonstrators in the area of manufacturing. Possibility for collaboration.
- Cross fertilization with other sectors. So far more centered in automotive, maritime, aerospace → opportunity for the railway sector y considered relevant
- Collaboration in dissemination: public newsletter, events, general Assemblies – a possible moment for engagement, public. 2 per year, etc.
- Very relevant: Event on the 5<sup>th</sup> of February, automotive Workshop.

In relation to projects financed under Factories of the Future Calls with application in the railway sector, the following ones have been identified by the Rail Project scan performed by TER4RAIL Project:



**RECOTRANS: Integrated manufacturing of REciclable hybrid metalthermoplastic COMposites for the TRANSport sector.** Integrates unconventional manufacturing technologies such as (microwave) MW radiation and laser joining in current RTM and pultrusion production lines. Demonstrator for the railway sector (out of three). 01/10/17 – 31/03/21 [www.recotransproject.eu](http://www.recotransproject.eu) / [Cordis](#) / @RECOTRANS\_H2020



**MAESTRO: Modular laser based metal additive manufacturing platform for large scale industrial applications.** Rail demonstrator: check valve, Alstom. Increased building speed and reduced manufacturing costs. 01/10/16 – 30/09/19. [www.maestro-project.eu](http://www.maestro-project.eu). [Cordis](#) <https://www.maestro-project.eu/alstom-demonstrator-full-am-version/>



**SHAREWORK: Safe and effective HumAn-Robot coopErAtion toWards a better cOMpetiveness on cuRrent automation lacK manufacturing processes.** Software and hardware modular system. Railway application at real industrial scenario (out of 4): Introduction of a robotic co-worker in Alstom rolling stock's assembly line. 01/11/18 – 31/10/22 [www.sharework-project.eu](http://www.sharework-project.eu) / @Sharework\_EU

## More information:

### Useful links

<https://www.effra.eu/>

EFFRA – towards Made in Europe

Presentation: <https://cloud.effra.eu/index.php/s/HMzoUdabiqvxjk3>

Brochure: [https://www.effra.eu/sites/default/files/190312\\_effra\\_roadmapmanufacturingppp\\_eversion.pdf](https://www.effra.eu/sites/default/files/190312_effra_roadmapmanufacturingppp_eversion.pdf)

Pathways to digital manufacturing

Presentation: <https://cloud.effra.eu/index.php/s/TAqpZ2s2F8qoz1x>

EFFRA Innovation Portal: <https://portal.effra.eu/projects>



## EUROPEAN ROAD TRANSPORT RESEARCH ADVISORY COUNCIL

<https://www.ertrac.org/>



## General information

### The tasks of ERTRAC are to:

- Provide a strategic vision for road transport research and innovation in Europe.
- Define strategies and roadmaps to achieve this vision through the definition and update of a Strategic Research Agenda (SRA) and implementation research roadmaps.
- Stimulate effective public and private investment in road transport research and innovation.
- Contribute to improving coordination between the European, national, regional public and private R&D activities on road transport.
- Enhance the networking and clustering of Europe's research and innovation capacities.
- Promote European commitment to Research and technological development, ensuring that Europe remains an attractive region for researchers, and enhancing the global competitiveness of the transport industries.
- Support the implementation of Horizon 2020, the European Framework Programme for Research and Innovation

FUTURE-RADAR Project. Support action. 01/01/2017 – 31/12/2020.



## Contact with the railway sector to date

There has been some common work done between ERTRAC and ERRAC:

- We have a joint Urban Mobility Working Group, which issued the "Integrated Urban Mobility Roadmap":  
<https://www.ertrac.org/uploads/documentsearch/id45/2017%20ERTRAC%20Urban%20Mobility%20Roadmap%20-%20web.pdf>
- There was a joint work in the project SETRIS, which issued the "Towards a fully integrated transport system" document, focusing on freight transport under the leadership of ALICE:  
<https://www.ertrac.org/uploads/documentsearch/id46/2017%20Integrated%20Logistics%20-%20SETRIS.pdf>
- We consulted ERRAC when preparing our new 2019 roadmap on "Long Distance Freight Transport":  
<https://www.ertrac.org/uploads/documentsearch/id56/ERTRAC-Long-duty-Freight-Transport-Roadmap-2019.pdf>
- We co-organise with the European Commission and the national host the TRA Conference:  
<https://traconference.eu>
- We recently issued together a position about the EC STRIA Roadmap on Connected & Automated Transport, to support more R&D efforts on topics in common to several transport modes.

## Opportunities for collaboration with the railway sector

The last point mentioned, the joint topics we identified for the STRIA Roadmap on Connected & Automated Transport, offers the most opportunities for further collaboration in the future.

### More information:

[www.ertrac.org](http://www.ertrac.org)



## **Waterborne Technology Platform**



WATERBORNE has been set up as an industry-oriented Technology Platform to establish a continuous dialogue between all waterborne stakeholders, such as classification societies, shipbuilders, shipowners, maritime equipment manufacturers, infrastructure and service providers, universities or research institutes, and with the EU Institutions, including Member States.

Waterborne brings together about 50 members, representing the industry, research organisations, academia as well as waterborne related associations. Recently, the Waterborne TP launched its [Strategic Research Agenda](#), related to the following main areas of attention:

- Ships and shipping;
- Ports and Logistics;
- Blue Growth

This Strategic Research Agenda lays down the visions and missions of the European waterborne sector, with a timeline of 2030 and 2050. As for all modes of transport, the common denominators are the following:

### **Green and Clean Waterborne Transport**

- The sector's targets are two-fold: first of all, to tackle new-build short sea ships and new-build inland vessels (by 2030), to decrease emissions during navigation by 50% for other ship types (by 2030), and secondly, to address all ship types operating deep-sea trades (by 2050). It concerns all emissions to air, water as well as noise emission;

### **Connected and Automated Waterborne Transport**

- Digitisation will connect smart ships and vessels as well as smart ports and smart infrastructure. It will enhance data flows. It will also lead to a higher degree of automation and autonomy, automated and autonomous systems, ship operations (both maritime and inland navigation) and remote control from the shore by 2030. Future ships and vessels will be designed so that they can be continuously updated with the digital technologies throughout their lifecycle. Connectivity and automation will not only improve nautical operations, safety or the energy-efficiency of Waterborne transport, but will also improve logistics and mobility flows.

### **Safe, competitive and eco-friendly shipyards and production sites**

- By 2030, digitisation and automation will also lead to the use of advanced design and production technologies, which will deliver flexible and cost-effective ships, vessels and offshore structures with competitive production costs and increased productivity by 50%. They will, furthermore, contribute to the establishment of an entire production chain of safe, competitive and eco-friendly shipyards and production sites. They will enable European shipyards to master the increasing complexity of ships and vessels, maintaining their leadership in the area of specialized ships and vessels and increasing their market share of new ships and vessels of other types.

## Port operations

- By 2050, ports will offer the fastest, most reliable service with zero-waste and zero emissions in a safe and secure environment at the lowest cost. Therefore, ports will be able to achieve zero-emissions in their own port operations and to adapt to the new demands following the energy transition

## Integrating maritime and hinterland logistics

- Maritime transport is part of complex logistics chains and transport networks where ports are key multimodal nodes linking maritime and hinterland logistics. Therefore, waterborne transport seaports and inland ports are not isolated, and their challenges are those of the logistics and transport system.

## Contact with the railway sector to date

*Errac and Waterborne are both involved in the developments regarding the STRIA connected and automated transport, as well as in the preparation of the TRA 2020. In addition, the Technology Platforms have the intention to meet twice a year to discuss issues of common interest. In addition, ERRAC will be a member of the "Green Shipping Expert Group" which is part of a Horizon 2020 project starting on 1 January 2020, focussing on developing a strategic research and innovation agenda as well as an implementation plan regarding the transition towards zero-emission waterborne transport.*

## Opportunities for collaboration with the railway sector

*I would foresee that in the areas mentioned in this document, there are commonalities for all modes of transport, which should be jointly discussed and developed. In addition, transport sectors could learn from each other in terms of solving certain challenges. Waterborne would therefore absolutely support an enhance cooperation with the railway sector.*

## More information:

[www.waterborne.eu](http://www.waterborne.eu)

## 8.5 Appendix 5: Map of Shift2Rail Members participating at other ETPs / PPPs

SHIFT2RAIL Members	ECSEL																	
	ACARE	ALICE	ERTRAC	WATER BORNE	FCH2	CS2	SESAR	BDV	ECSSO	euROBOTICS	5G	ECTP	EPoSS	EPoSS	AENEAS	ARTEMIS	FoF	EGVI
AC2T research GmbH																		
ACCIONA INFRAESTRUCTURAS SA												✓*				✓*		
AERNNOVA AEROSPACE S.A.U.	✓					✓												
ALSTOM Transport SA					✓													
Amadeus IT Group SA																		
AVL List GmbH			✓		✓			✓	✓				✓	✓		✓	✓	✓
AZD Praha s.r.o.																		
BLS AG																		
Bombardier Transportation GmbH	✓										✓							
Centro de Estudios de Materiales y Control de Obra S.A												✓						
Centro de Estudios e Investigaciones Técnicas (CEIT)																✓		
Construcciones y Auxiliar de Ferrocarriles S.A.																		
Contraffice GmbH																		
CP COMBOIOS DE PORTUGAL EPE																		
Deutsche Bahn AG																		
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	✓				✓	✓	✓			✓								✓
DIGINEXT																		

SHIFT2RAIL Members	ACARE	ALICE	ERTRAC	WATER BORNE	FCH2	CS2	SESAR	BDV	ECSC	euROBOTICS	5G	ECTP	EPoSS	ECSEL			FoF	EGVI
														EPoSS	AENEAS	ARTEMIS		
EGIS RAIL																		
Faiveley Transport																		
FCP Firtsch, Chiari & Partner ZT GmbH																		
FIDAMC																		
Finnish Transport Infrastructure Agency																		
FONDATION DE COOPERATION SCIENTIFIQUE RAIENIUM																		
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. IVI	✓*	✓*	✓*		✓*			✓*	✓	✓*	✓	✓*	✓*	✓*	✓		✓	✓*
FUNDACION TECNALIA RESEARCH & INNOVATION	✓				✓	✓		✓	✓	✓		✓				✓	✓	✓
Getzner Werkstoffe GmbH																		
GROUPE EUROTUNNEL SA																		
HaCon Ingenieurgesellschaft mbH		✓																
Hitachi Rail STS – Hitachi Rail STS S.p.A													✓*	✓*				
INDRA SISTEMAS S.A.	✓						✓	✓	✓	✓		✓				✓		
Infraestruturas de Portugal, S.A.											✓							
INSTITUT FÜR ZUKUNFTSSTUDIEN UND TECHNOLOGIEBEWERTUNG - IZT											✓							
Kirchdorfer Fertigteileholding GmbH																		
Knorr-Bremse Systems für Schienenfahrzeuge GmbH																		



**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)

SHIFT2RAIL Members	ACARE	ALICE	ERTRAC	WATER BORNE	FCH2	CS2	SESAR	BDV	EC SO	euROBOTICS	5G	ECTP	EPoSS	ECSEL			FoF	EGVI
														EPoSS	AENEAS	ARTEMIS		
Kompetenzzentrum – Das virtuelle Fahrzeug, Forschungsgesellschaft mbH virtual vehicle											✓							✓
Kontron Transportation Austria AG																		
Materials Center Leoben Forschung GmbH MCL																		
MER MEC S.p.A																		
Network Rail Infrastructure Limited																		
Nottingham Scientific Ltd NSL																		
ÖBB-Infrastruktur AG																		
Patentes Talgo S.L.U.																		
PJM Messtechnik GmbH																		
Plasser&Theurer GmbH																		
Polskie Koleje Państwowe S.A. (PKP)																		
PRORAIL B.V.																		
Schweizerische Bundesbahnen (SBB)																		
Siemens Aktiengesellschaft					✓	✓*		✓	✓	✓	✓		✓	✓		✓	✓	✓
Slovenske železnice (SZ)																		
Société Nationale des Chemins de Fer Français Mobilités (SNCF Mobilités)					✓													
Strukton Rail BV																		
TATASTEEL												✓						
TATRAVAGONKA a.s.																		
THALES	✓						✓*	✓*	✓*	✓	✓*				✓	✓		

SHIFT2RAIL Members	ACARE	ALICE	ERTRAC	WATER BORNE	FCH2	CS2	SESAR	BDV	ECOS	euROBOTICS	5G	ECTP	EPoSS	ECSEL			FoF	EGVI
														EPoSS	AENEAS	ARTEMIS		
Trafikverket		✓																
TRONICO ALCEN																		
Türkiye Cumhuriyeti Devlet Demiryolları (TCDD)																		
UNIVERSIDAD DEL PAIS VASCO										✓	✓	✓						
UNIVERSIDADE DO MINHO																		
UNIVERSIDADE DO PORTO									✓*			✓						
Verband der Bahnindustrie in Deutschland (VDB)																		
voestalpine Schienen GmbH					✓*													
voestalpine VAE GmbH					✓*													✓
VOSSLOH-COGIFER																		
Waggonbau Niesky GmbH																		
Wiener Linien GmbH & Co KG																		

✓ It indicates that the Shift2Rail Member is also Member of other ETP / PPP

✓\* It indicates that a company from the same group is also member of other ETP / PPP

## 8.6 Appendix 6: Agenda of the workshop on Urban Scenarios 2050

### Agenda

Time	Topic
8.00-8.30	Welcome coffee
8.30- 9.15	<b>Keynote speakers (15' each presentation):</b> <ul style="list-style-type: none"> <li>• Industry: Giuseppe ATTOMA (ATTOMA, France)</li> <li>• Organizing Authority: Jeremy YAP (Land Transport Authority, Singapore)</li> <li>• Research: Anvita ARORA (King Abdullah Petroleum Studies And Research Centre (KAPSARC), Saudi Arabia)</li> </ul>
9.15-09.45	<b>Discussion:</b> <ul style="list-style-type: none"> <li>• Reaction to the keynotes' presentations</li> <li>• Other views/diverging</li> <li>• Additional contributions based on the expertise</li> </ul> <b>Outcomes:</b> (1) definition of key features and (2) questions for further discussion in round tables
09.45-10.25	<b>Discussion in round tables:</b>  Discussions are led by moderators: <b>Moderator Table 1:</b> Anvita ARORA (KAPSARC, Saudi Arabia) <b>Moderator Table 2:</b> Giuseppe ATTOMA (ATTOMA, France) <b>Moderator Table 3:</b> Guido di Pasquale (UITP, Belgium) <b>Moderator Table 4:</b> Tom Page (TfL, UK)  Agree on common ideas: <ul style="list-style-type: none"> <li>• Key features of the future cities</li> <li>• How they influence the development of public transport</li> <li>• Future of rail and relationships with other modes of transport</li> </ul>
10.25-10.45	<b>Debriefing and closing:</b> <ul style="list-style-type: none"> <li>• Each moderator will summarize the table's ideas, it will be mapped on the whiteboard.</li> </ul>
10.45-11.00	<b>Networking closing coffee</b>



## 8.7 Appendix 7: List of Participants in round tables

**Table 1**

1	Ms ANDRÉ Janet	Authority	AB STORSTOCKHOLMS LOKALTRAFIK - STOCKHOLM PUBLIC TRANSPORT	
2	Ms ARORA Anvita	Academic/Research	KING ABDULLAH PETROLEUM STUDIES AND RESEARCH CENTRE	Moderator
3	Mr ATTOMA Giuseppe	Industry	ATTOMA	
4	Mr CHEHWAN Pierre	Industry	NAVYA	
5	Ms LÄTTMAN Katrin	Academic/Research	KARLSTAD UNIVERSITY	

**Table 2**

1	Mr AGOURIDAS Vassilis	Industry	AIRBUS	
2	Mr COHEN Tom	Academic/Research	CENTRE FOR TRANSPORT STUDIES, UCL	
3	Mr HEYM Andreas	Industry	AREP	
4	Ms KUZMINA Daria	Association	INTERNATIONAL ASSOCIATION OF PUBLIC TRANSPORT AISBL	
5	Mr LO Terence	Authority	LAND TRANSPORT AUTHORITY	
6	Mr Timothy Papandreou	Industry	Emerging Transport, ex-Waymo	Moderator

**Table 3**

1	Mr FULTON Lewis	Academic/Research	UNIVERSITY OF CALIFORNIA	
2	Mr JOHANSSON Lars	Industry	VOLVO BUS CORPORATION	
3	Mr PAGE Tom	Authority	TRANSPORT FOR LONDON	
4	Mr SCHAAFFKAMP Christoph	Industry	KCW GmbH	
5	Mr SINGH Jaspal	Association	INTERNATIONAL ASSOCIATION OF PUBLIC TRANSPORT AISBL	Moderator

**Table 4**

1	Mr DI PASQUALE Guido	Association	INTERNATIONAL ASSOCIATION OF PUBLIC TRANSPORT AISBL	
2	Ms FRIMAN Margareta	Academic/Research	KARLSTAD UNIVERSITY	
3	Ms HALL KIHL Susanna	Academic/Research	ROYAL INSTITUTE OF TECHNOLOGY KTH	
4	Ms KÖHLER Simone	Industry	SIEMENS MOBILITY	
5	Mr PANGILINAN Chris	Industry	UBER TECHNOLOGIES INC.	
6	Mr YAP Jeremy	Authority	LAND TRANSPORT AUTHORITY	Moderator

## 8.8 Appendix 8: Report of the workshop on Urban Scenarios 2050

### Workshop on Urban Scenarios 2050 – UITP Summit

#### Scope of the workshop on Urban Scenarios 2050

The workshop was organised by the EU-funded project TER4RAIL<sup>37</sup> at the UITP Summit 2019<sup>38</sup>. The workshop aimed to bring together various stakeholders: land-planners, urbanists, architects, digitalisation experts, smart-cities experts, operators focused on long-term vision, local transport authorities advanced in applying new technologies, and others active in research and design of long-term urban scenarios and transport of the future. These stakeholders were invited to discuss urban scenarios and the place of public transport in a city in 2050.

Three key-note speakers were welcomed in order to boost the discussion:

- Representative of industry: Giuseppe Attoma, CEO of ATTOMA with the presentation: “We shape our cities; thereafter they shape us. Designing tomorrow’s smart, liveable cities: some insights about methodologies and processes”.
- Representative of organising authorities: Jeremy Jap, Deputy Chief Executive (Public Transport, Policy & Planning), Land Transport Authority of Singapore with the presentation: “Possible scenarios for Singapore's urban transportation landscape in 2040”.
- Representative of Academia: Dr. Anvita Arora, Program Director, Transport and Urban Infrastructure, KAPSARC with the presentation: “Global mega trends – what do they mean for the future of our cities”.

Representatives from different organisations enriched the discussion: Airbus, University of California, Transport for London, Navya, and others. Pierre Chehwan, VP Strategic Alliance of Navya, demonstrated the company’s vision on the place of automated vehicles in cities on the future.

#### Main outcomes

Dr. Arora from KAPSARC presented global mega trends and what they mean for the future of the cities.

- **Generation Z**  
New generation requires more flexible work environment and good quality of life (e.g., wellness programs), they will have more ethical and sustainable attitude to a life.
- **Inclusiveness**  
More women will be employed worldwide, vulnerable categories of people (e.g., low income, people with reduced mobility) will travel more.
- **Shared value**  
Environmentally friendliness and social inclusion is a good business sense.
- **Circular economy**  
Maximisation of resource usage: renewable energy, multiple use, recyclable waste, upgradable products will drive mobility innovations (industry and operation).

<sup>37</sup> This project has received funding from the Shift2Rail Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement #826055 <https://ter4rail.eu/>

<sup>38</sup> <https://uitpsummit.org/>

- **Digitalisation**

Internet of things will be integrated in different areas: goods delivery, transport networks, maintenance, health services, land use, etc. Data is becoming cheaper.

- **Entrepreneurship Rising**

Entrepreneurs will drive the solutions in the mobility market.

Despite the megatrends that are coming, tendency to preserve existing systems still exists. Changes in Europe are moving too slow. From the beginning, cities were created for cars and it is not easy to change the infrastructure or mindsets of people that are accustomed to the existing state of things (e.g., car drivers).

At the same time, LTA as an organising authority defined the following trends that influence the development of a city and its adoption:

- **Environmental:** climate change, global warming, rising sea levels;
- **Social:** diversity, inclusivity, ageing population, income divide;
- **Transport:** predictive algorithms for on-demand dynamic-responsive services, driverless vehicles, multi-functional drones (volocopters, inspection vehicles), MaaS, clean energy vehicles;
- **Economic:** rapid technological change, digital economy, significant structural shifts, slowing global growth and productivity;
- **Land Use:** continued growth of cities leading to housing shortages, traffic congestion; rapid urbanisation leading to alienation of suburban areas.

According to ATTOMA, the city of the future will use user-centric approach while developing a “use value-driven” design projects. Key features of such approach are:

- Relevance
- Sustainability
- Desirability
- Legitimacy

Main tools for reaching the goals are:

- Co-design methodology that involves all stakeholder in the design process (e.g., workshops and round tables);
- Benchmarking and best-practices analysis;
- Definition of expected user experience;
- Foresight methodology.

Another question is: How to get to the planned transport future of the city? The city should listen to the changing needs of citizens and adopt the concepts of connectivity, convenience, inclusivity, comfort, sustainability and liveability to transport agenda.

**Features of the transport in a city of future:**

- Journeys should be optimised and it should take less time to reach city facilities and work travelling from home;
- Metro systems are key for city's development;
- Reliable rail system as the public transport backbone:
  - Continuous maintenance & application of new technologies
  - Improvement of reliability
- Transit-oriented development with future rail lines: polycentric development will enable

optimal use of PT systems and bring more jobs closer to homes;

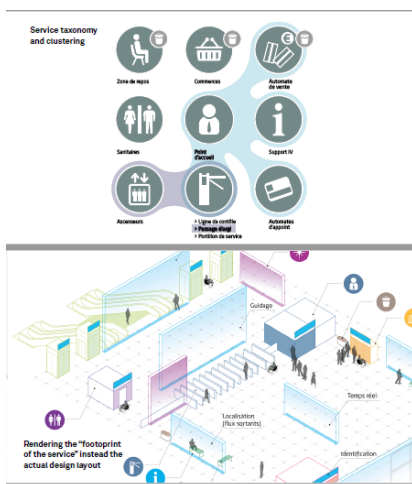
- BRT systems will provide more flexibility to the PT;
- Well-organised walking and cycling networks will improve first-and-last-mile connectivity;
- MaaS is enabler of seamless multi-modal journeys;
- Autonomous vehicles will be used for more direct journeys: they should be complementary and extending routes where mass transit transport unavailable, adaptive, flexible and inclusive;
- Inclusivity is an important factor in the transport systems of the future;
- Focus on the citizens' health and liveability: more vibrant community spaces, active mobility, clean energy vehicles, focus on "zero fatalities";
- The destiny of new technologies such as flying taxis, passenger drones, unmanned aerial vehicles, hyperloops, and etc. are still unknown but may constitute a disruptive change in the transport services users' behaviours, expectations, priorities.

## 8.9 Appendix 9: PPT presentations workshop on Urban Scenarios 2050

The collage displays 15 pages from the book 'Designing the service city, a living infrastructure'. The pages are arranged in a grid, showcasing various design processes, maps, and architectural plans. Key projects highlighted include 'ille-de-France mobilités', 'Société du Grand Paris (SGP)', and 'Ville de Paris'. The pages feature a mix of text, diagrams, and photographs, illustrating the integration of service design into urban infrastructure.



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)

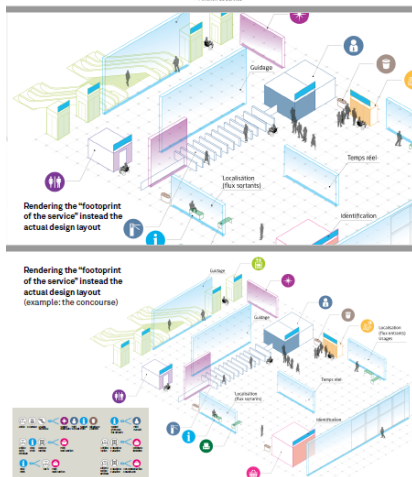


### Final deliverable

Guidelines for the architects.



### The dreamed life of a competition



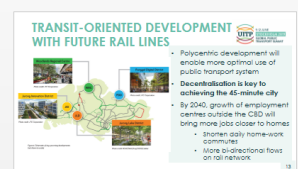
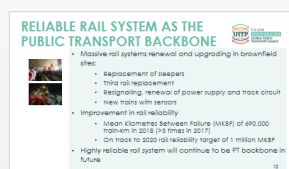
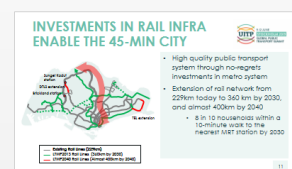
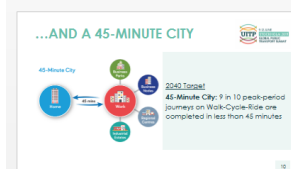
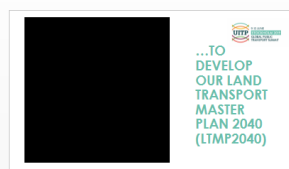
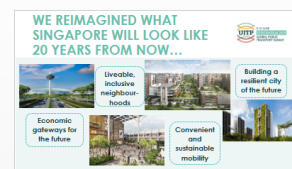
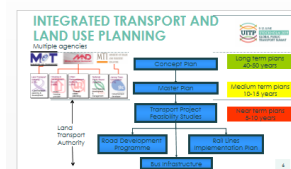
Let's talk about real life...

We shape our cities; thereafter they shape us

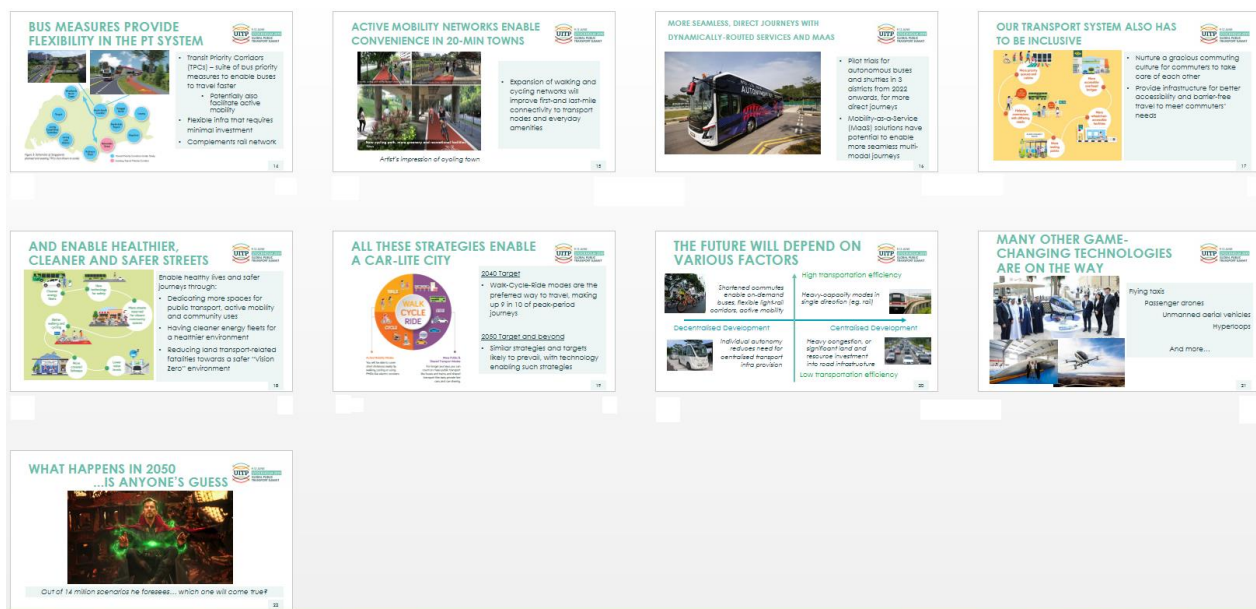
How to fit service design in a design & build competition model?

So, please don't mess around with our future!

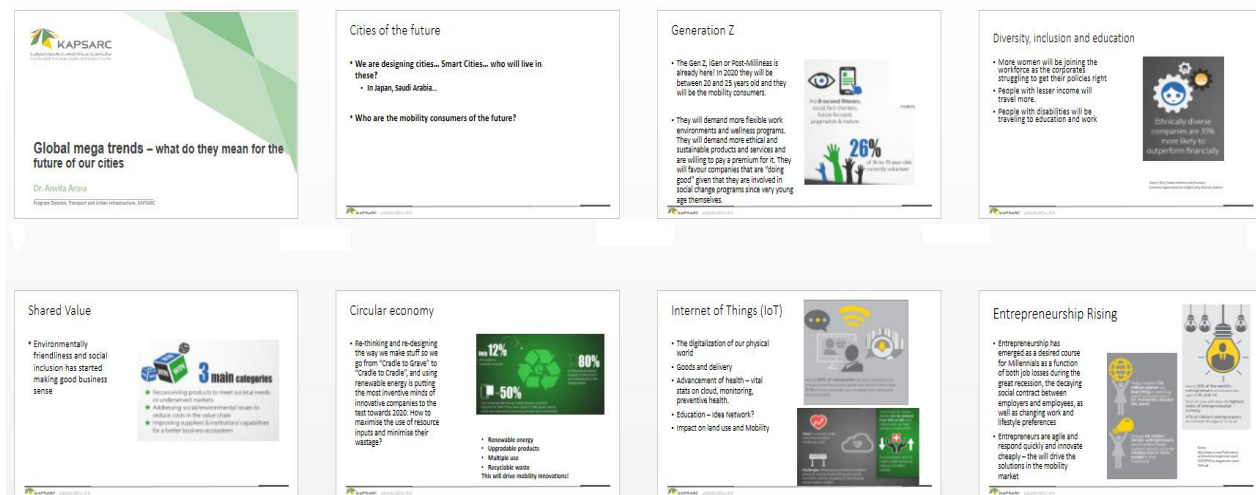
## Presentation 2: Jeremy Yap, Deputy Chief Executive – Land Transport Authority Singapore



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### Presentation 3: Dr. Anvita Arora, Program Director Transport&Urban Infrastructure – KAPSARC



### Presentation 4: Pierre Chehwan, Strategic Alliance - Navya



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## Presentation 5: Tom Cohen PhD, Senior Fellow Research&Teaching - UCL

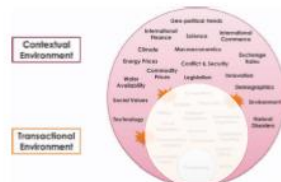


A few words about scenarios:  
At least two schools of thought

Tom Cohen, 11<sup>th</sup> June 2019



### "Classical" scenarios



### "Policy" scenarios



Image courtesy of John P. Sykes

## 8.10 Appendix 10: Matching results Urban Scenarios Workshop – ETPs/PPPs

URBAN SCENARIOS WORKSHOP MAIN TOPICS	ETPs COVERING THE TOPIC (BLOCKS 1 -2)
Demand based/flexible services	ACARE; ALICE; ERTRAC; Waterborne
Citizen-centric collaborative approach	ACARE; ALICE; ERTRAC; Waterborne
Sustainability/Reliability	ACARE; ALICE; ERTRAC; ECTP; FoF
Social inclusion	
Environment	ACARE; ALICE; ERTRAC; Waterborne; ECTP; FoF
MaaS	ERTRAC
Energy/Alternative Fuels and propulsion systems	ACARE; ERTRAC; Waterborne; FoF
Digital Transformation	ACARE; ALICE; ERTRAC; BDV; ECSO; euRobotics; ECSEL; FoF
Optimal land use	ECTP
New transport modes (drones, hyperloop, etc.)	ALICE; euRobotics
Accessibility	ERTRAC
Safety/Security	ACARE; ALICE; ERTRAC; Waterborne; FoF
Autonomous mobility	ERTRAC; euRobotics
Cycling/Walking networks	
Big Data	ACARE; ERTRAC; Waterborne; BDV; ECSO; euRobotics; 5G; FoF
Artificial Intelligence	ERTRAC; ECSO; BDV; euRobotics; FoF
Internet of Things	ALICE; ERTRAC; ECSEL
Automation	ERTRAC; Waterborne; euRobotics; FoF
Intelligent stations/Multimodal hubs	ALICE; Waterborne
Smart City Planning	
Circular economy/Zero waste	ALICE; FoF
V2V/V2X communication	ALICE; ERTRAC
5G Wireless Connectivity	ALICE; ERTRAC; Waterborne; ECSO
Urbanization/Demography	
Behavioural changes	
Ethics/Gender balance	
Cybersecurity	ACARE; ERTRAC; Waterborne; BDV; ECSO; euRobotics; 5G; FoF