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REFINET
INFRASTRUCTURE MOBILITY

REthinking Future Infrastructure NETworks

REFINET

Project Duration: **2015.05.01 – 2017.04.30**
Grant Agreement number: **653789**
Coordinated and Support Project

WP2

D2.3 | FEHRL

Stakeholder's report 2

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Project Coordinator: Alain Zarli (CSTB)
Tel: +33 4 93 95 67 36
Fax: + 33 4 93 95 67 36
E mail: alain.zarli@cstb.fr
Project website address: http://www.refinet.eu

Revision History

Date	Version	Author/Contributor[1]	Revision By[2]	Comments
14/04/2017	v1.0	Thierry Goger (FEHRL)	Miglė Paliukaitė (FEHRL)	Draft
25/04/2017	v2.0	Thierry Goger (FEHRL) Miglė Paliukaitė (FEHRL)	All partners	Incorporation of partners' comments
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29.06.2017	V4.0	Thierry Goger (FEHRL) Miglė Paliukaitė (FEHRL)	Thierry Goger (FEHRL), Miglė Paliukaitė (FEHRL)	Final version submited to EC/INEA with changes linked to publication on CORDIS (EU emblem, disclaimer).

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[1] Partner, Name Surname

[2] Partner, Name Surname

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Abbreviations

Acronym	**Full name**
REFINET	REthinking Future Infrastructure NETworks
USE-iT	Users, Safety, Security and Energy in Transport Infrastructure
FOX	Forever Open infrastructure across (X) all transport modes

Definitions

Term	**Full name**
SIP	Strategic Implementation Plan

Introduction and background

REFINET is a 24-month project under the Horizon 2020 (H2020) topic MG-8.1b-2014, which aims to create a sustainable network of European and international stakeholder representatives of all transport modes and transport infrastructure sectors. It also delivers a shared European vision of how to specify, design, build or renovate, and maintain the multi-modal European transport infrastructure network of the future along with innovative processes to enhance the effectiveness of the sector, and elaborate a Strategic Implementation Plan (SIP) with a comprehensive set of prioritised actions.

REFINET considers two complementary scenarios, namely maintenance and the upgrading of existing transport infrastructures, and development of new transport infrastructures. REFINET contributes to creating a European-wide consensus on where to focus research and innovation to improve the productivity of assets and drastically reduce traffic disruptions of transport flows from inspection, construction and maintenance activities, and to accommodate increasing/changing traffic demand. Thus, REFINET paves the way for enhanced technology integration and transfer and mass-market development for innovative materials, components, systems and processes supporting the pan-European generalisation of advanced multi-modal infrastructures.

In order to strengthen the cooperation between stakeholders in all transport modes, the consortia of three projects (REFINET, FOX and USE-IT) have joined to enhance the performance of multi-modal transport infrastructure. Of particular importance to these projects is the opportunity such cooperation gives in disseminating project results to a wide community of stakeholders.

Objectives of D2.3

The Work Package WP2 – COMMUNITY NETWORK BUILDING focuses on creating the community of transport infrastructure stakeholders that will collaborate with the REFINET partners in the development of the REFINET Vision (WP3) and its SIP deployment strategy (WP4). This WP starts in month 1 and finishes in month 24.

The WP2 is built around four tasks:

- 2.1: Identification of the stakeholders
- 2.2: Set up of the REFINET Group of Experts
- 2.3: Set up of the REFINET Network
- 2.4: Consolidation of the REFINET network

The objectives of the task 2.4 “Consolidation of the REFINET network”are:

- To keep expanding the REFINET network up to 1,000 members.
- To consolidate the REFINET network so that it can form a stable community after the end of the project.
- To foster a communication channel from the project partners to the stakeholders.
- To collect input/feedback from the stakeholders.
- To participate in the consultation process, including the thematic workshops for the Group of Experts.
- To leverage the dissemination of the project results at various events.
- To develop the mid-term and final strategy plans for the consolidation and expansion of the REFINET nerwork (this specific sub-task is adressed by a specific D2.4, which is directly linked to D2.2).

D2.3 *Stakeholders report 2* includes the output of the tasks T2.2 and T2.3. Deliverable D2.3 is the update of the D2.2 *Stakeholders report 1.*

Following the decision to create synergies between the REFINET, FOX and USE-iT projects, all input from the FOX and USE-iT projects have been integrated into the REFINET network, which aims at building a very large community.

Methodology and Results

1.1 From the list of stakeholders to the REFINET network and the REFINET Group of Experts

All REFINET project partners were involved in the tasks 2.2, 2.3 in order to build the REFINET Group of Experts and REFINET network of stakeholders. Existing partnerships with the partners of the projects have facilitated the identification of the list of stakeholders and experts. The list covers all transport modes (road, rail, maritime etc.) and their respective roles over the infrastructure life-cycle (planners, designers, contractors, operators, managers etc.).

1.1.1 REFINET network

WP2 set up the mechanism to reinforce networking across all transport modes (road, rail, water and air), comprising public and private infrastructure operators, contractors, consultants, research organisations, SMEs and universities in order to enhance the effectiveness of the transport sector. This is done through the creation of a REFINET community of stakeholders, which brought together experts from all transport modes within the transport infrastructure sector.

The methodology to build the REFINET network has already been (in anticipation) described in the D2.1. The methodology is based on four sub-tasks:

- Stakeholders definition
- Construction of a matrix of stakeholders
- Stakeholders' mapping and engagement mechanism
- Draft list of stakeholders

Each of the sub-task follows a step by step approach which is described in details in the sections 3.1 to 3.4 of the D2.1.

One important change has nonetheless occurred since the release of the D2.1. As a matter of fact, while the REFINET network was originally considered as the network of stakeholders to be informed (see figure 1), new findings have led to the partners changing their approach. From now on, the REFINET network consists of the stakeholders with whom the project would like to communicate since it is looking at stakeholders with either high:

- Motivation in inputting and disseminating the new vision of future of transport infrastructure developed within the project;
- Influence power at institutional, national or European level to "lobby" for supporting/deploying the results of the projects.

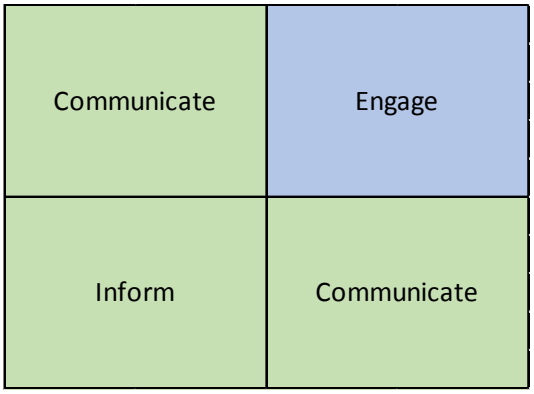


Figure 1: *Quadrant tactics*

As a result, the following structure is used (see figure 2). The overall circle represents the stakeholders to be informed. The WP2 has identified around 10,000 members. The middle circle represents the REFINET community/network to communicate with. The WP2 has identified around 838 stakeholders. Embedded within the REFINET Network, two smaller groups of experts have been established: one for REFINET (74 experts); one for FOX and USE-iT projects (104 experts). These two groups represent experts who have a greater interest and influence in the cross-modal issues.
In the middle, 23 experts) are in common between the two distinct Groups of Experts. Partners of each project (REFINET and FOX, USE-iT) feature within each of the Group of Experts circles.

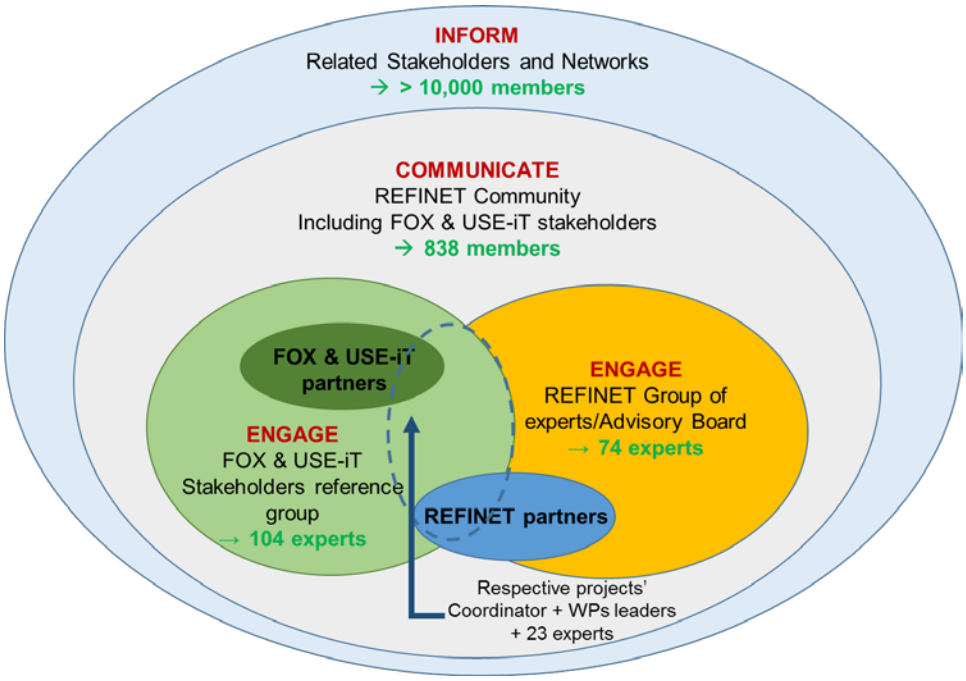


Figure 2: *Roles of the stakeholders in the project*

As the REFINET network is meant to be a dynamic community, its composition and size have been regularly updated. Thus an update is presented in the section 3.2 of this deliverable from the first draft list, whose characteristics were described in D2.1. This update is available online via the the digital repository which has also been already launched (see D2.1) and is available on the REFINET website.

Since the beginning of the project, REFINET partners have liaised very regularly with the REFINET network. As reported in D5.2, a high number of communication initiatives (including in particular the open session TRA 2016 – Warsaw – April 2016) have occured in order to support the partners in:

- Informing/defining the multi-modal transport infrastructure model, which is the backbone of the REFINET Vision.
- Informing/defining the needs of the various transport sectors.
- Leveraging the dissemination of the project.

The role of the WP2 consists of building and consolidating the REFINET network, while the communication with the stakeholders is ensured by the WP5 and the collection of their feedback is made by the WP3 and WP4 members. Therefore, this Deliverable does not provide the report of the different stakeholder input to the project. The description of all the different communication activities so far is available in the D5.2; this Deliverable includes the brief summary of

each of the communication/dissemination activities. In addition, all input/feedback so far from the REFINET network has been collected and incorporated within the D3.1 and D3.2, D3.4, D4.1.

1.1.2 REFINET Group of Experts

The WP participants have built the REFINET Group of Experts from the REFINET network identified in T2.1. Up to now, REFINET has recruited 74 experts whose profile corresponds to the "ENGAGE" category (see D2.1).

In contrary to the initial idea, which consisted of forming and paying a single and fixed group of 10 experts (always the same ones) throughout lifetime of the project, the consortium (with the EC approval) decided to follow a different and more realistic approach where the Group of Experts:

- Is an accumulative list of Experts which contributes actively to some specific parts of the project via workshops, interviews or webinars;
- Are (only) reimbursed for their travel costs (according to EC rules) if they attend a dedicated workshop and they request reimbursement;
- Brings the input from all modes and transport sectors.

This change reflected the willingness of the partners to involve those from the Group of Experts that are very "engaged". Besides, this alternative has enabled the feedback of the Group of Experts to be broadened from an initial 10 to 74, which is much better considering the complexity of the issues dealt with within the project. Finally, the concept preferred by the consortium follows the aim of the project to build, a significant active core pool of experts in the cross-modal transport sector within the REFINET community. In other words, the Group of Experts will be the heart of the REFINET Community in the medium-term.

REFINET has paid attention to select experts whose organisations are not already involved in the REFINET consortium. These experts come from various associations and federations (focused on transport and infrastructure).
It is worth noting that a few experts within both the REFINET and the FOX and USE-iT Stakeholders Reference Group come from Australia and the USA, hence accomplishing the international dimension which was envisaged.

The statistics about the REFINET Group of Experts are depicted below (section 3.2).

In order to substantially support the delivery of the REFINET Vision, the project has engaged the Group of Experts in different activities (see table 1). The summary of the feedback/contribution received at each event is written in chapter 3.3.

Table 1. Workshops and other events

Event	Date	Location
REFINET webinar	October 2015	–
1st REFINET workshop - Technological demands of transport infrastructures	2nd December 2015	Madrid, Spain
Transport Research Board 2016	13th January 2016	Washington DC, USA
ENCORD WG on Infrastructure Meeting – REFINET Workshop	29th February 2016	AICCOPN, Porto, Portugal
2nd REFINET workshop - Strategic Implementation Plan	16th March 2016	ARUP Offices, London, United Kingdom
Transport Research Arena (TRA2016)	18-21st April 2016	Warsaw, Poland
3rd REFINET workshop - Validate the Strategy for the Deployment of the REFINET Strategic Implementation Plan (SIP)	26th October 2016	Roma, Italy

Stakeholders' workshop jointly with FOX, USE-iT	7 – 14 October 2016	Melbourne, Australia
The 7th ECTP Conference	17-18 November 2016	Brussels, Belgium
Scanning tour	23-30 November 2016	South Korea, Japan
Transport Research Board 2017	10th January 2017	Washington DC, USA
4th REFINET workshop – SIP & Development of the SIP workshop#2	7th March 2017	Bucharest, Romania
REFINET final conference	5th April 2017	Brussels, Belgium

The role of the WP2 consists of building and liaising with the Group of Experts, while their feedback and contribution are collected by the WP3 and WP4 members. Therefore, this Deliverable does not provide the report of the expert input to the project. All input/feedback so far from the Group of Experts has been collected and incorporated within the D3.1 and D3.2, and will also be used for the D3.4, D4.1.

1.2 Statistics of the REFINET network and the REFINET Group of Experts

1.2.1 REFINET network

The current list of stakeholders brings together around 838 experts from all transport modes within the transport infrastructure sector. They come mostly from Europe, but the partners have also identified a few ones outside of Europe in order to get a broader perspective. As mentioned above, the stakeholders have been informed about the progress of the projects and will get the possibility to feed back to the partners via online tools (webinars, social media) or workshops.

Communication with the REFINET network has not only informed the RTD community and the industry, including SMEs in particular, about innovative scenarios, vision and priorities (in the SIP), but has also enabled the way to be paved towards the integration in the process loop of the various stakeholders along the value chain, with their different expertise. This will generate a Vision and SIP that are indeed shared by the whole community and integrate most of the stakeholders views and feedback.

The current matrix covers 838 potential stakeholders from 498 different organisations and 42 countries. The partners have paid attention to ensure a fair distribution across:

- Countries
- Transport modes
- The mono versus multi-modal dimension of the organisation of the stakeholder
- The profile of the stakeholder

The statistics about the REFINET Network is represented below (see Figures 3-6).

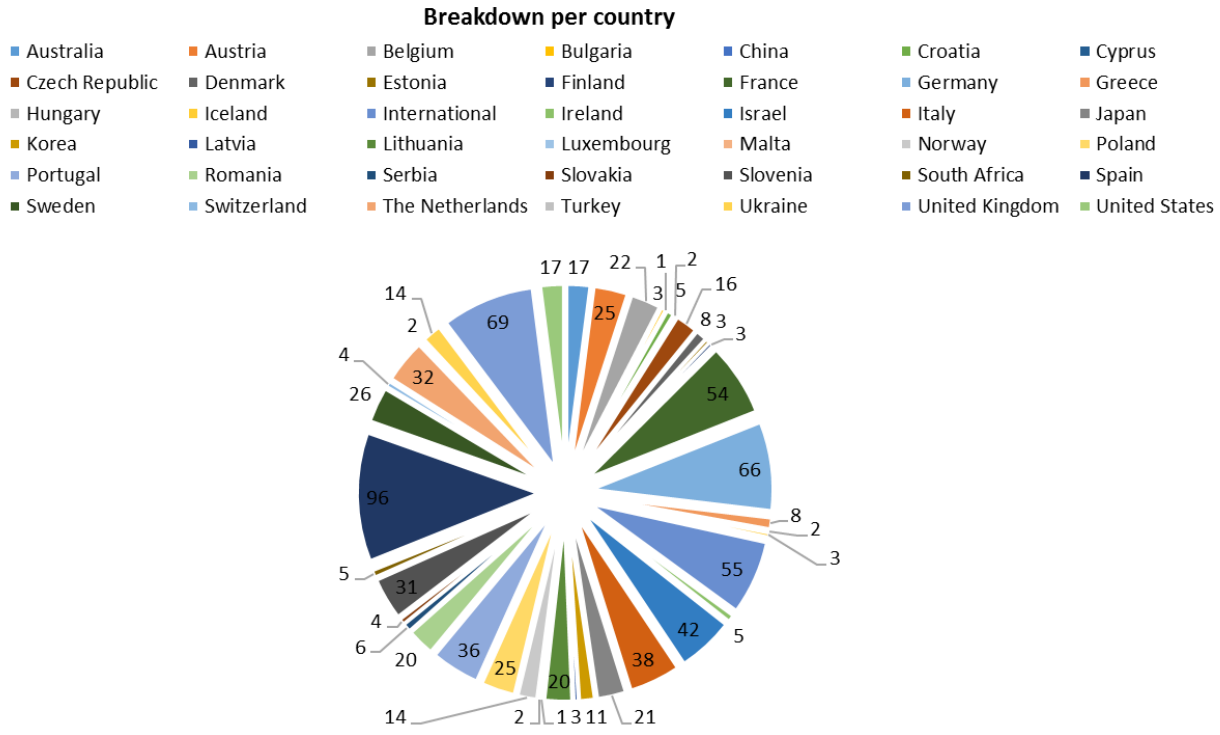


Figure 3: *Stakeholder breakdown per country*

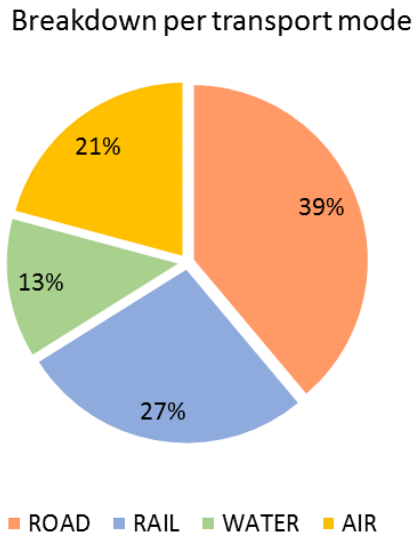


Figure 4*: Stakeholder breakdown per transport mode*

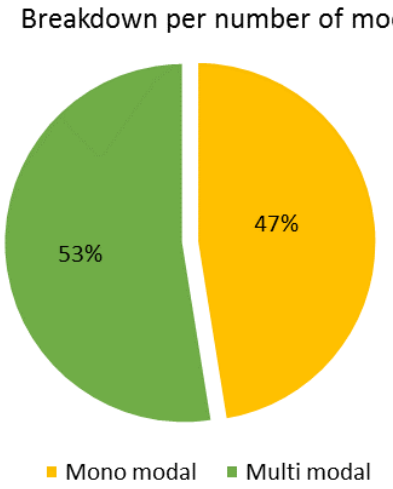


Figure 5: *Stakeholder breakdown per number of modes*

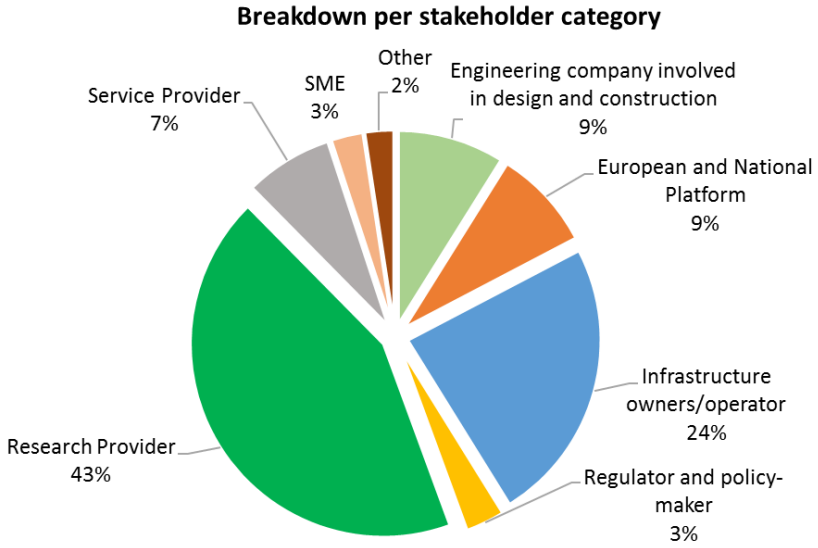


Figure 6*: Breakdown per stakeholder category*

Analysing the stakeholders' breakdown per category, there is a good spread over the different stakeholder categories. The industry has mainly an interest on very high TRL level technologies (8-9), as REFINET focuses on the future transport infrastructure, a significant part of the technologies and innovation which have been taken a deep look at, have a TRL below 8. It is therefore not surprising that research providers are the most represented sub-group (43%). But if we consider the three following sector groups: service providers, industry and SMEs (~20%) is more represented than research. Public bodies (infrastructure owners and regulators) represent ~27%.

1.2.2 REFINET Group of Experts

There are 74 members of the Group of high-level Experts, approximately 1-2 experts per organisation. They have engaged more closely into the content of the project to achieve consensual and shared results. They come mostly from Europe, but the partners have also identified a few ones outside of Europe in order to get a broader perspective. The number of experts from various countries results from the combination of the great interest from these countries in the cross-modal transport issue, as well as the opportunities they have had to attend a workshop in their own country.
The statistics about the REFINET Group of Experts is represented below (see Figures 7-10).

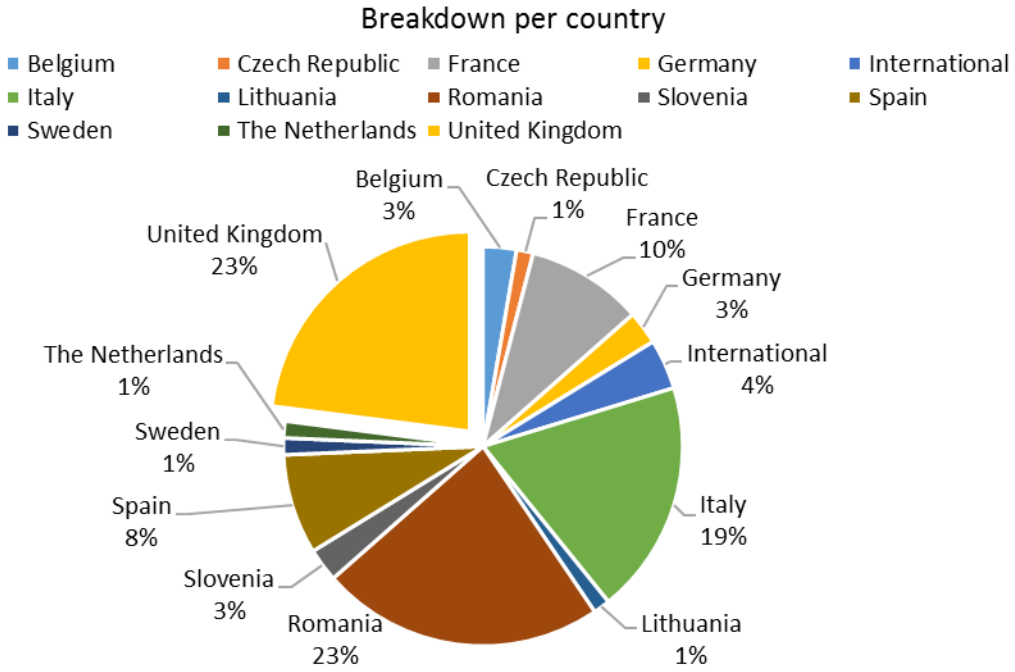


Figure 7: *Expert breakdown per country*

Figure 7 shows that the large stakeholders' representation is from UK, Italy, Spain and Romania. It can be explained by the fact that workshops have been organized in these countries. It was therefore a good opportunity to efficiently engage stakeholders in REFINET. However, these countries are located in a different geographical area of Europe and have a different set up which has allowed REFINET to beneficiate from highly engaged stakeholders to picture the different study cases. Those are the top participations, but there is already a reasonable European coverage in the Expert Group.

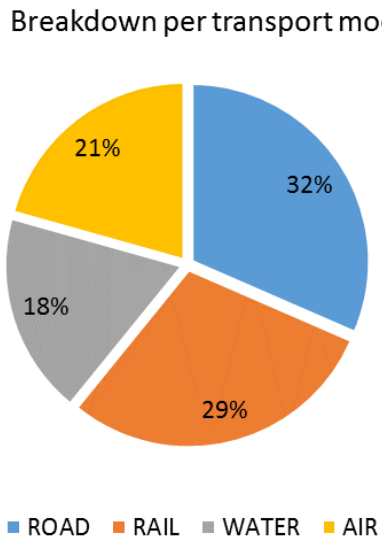


Figure 8: *Expert breakdown per transport mode*

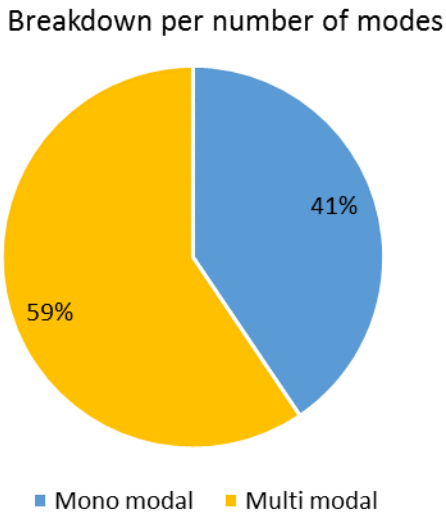


Figure 9: *Expert breakdown per number of modes*

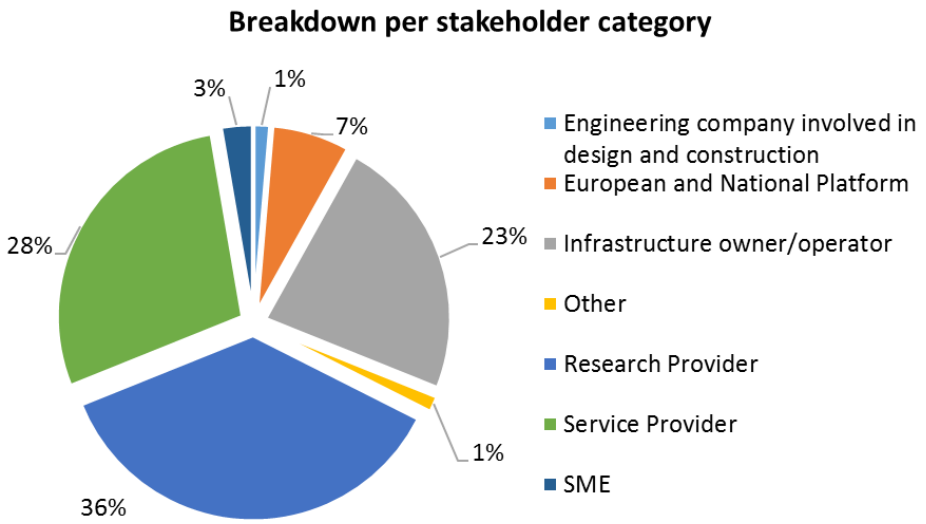


Figure 10: *Breakdown per expert category*

1.3 Summary of the feedback/contribution received so far from the Group of Experts

As mentioned above, REFINET has engaged the Group of Experts at different occasions. The summary of the each event is written below and the summary of the feedback/contribution from each workshop is presented in separate **D2.3 Annex I-IV.**

1.3.1 Webinar

Webinar - October 2015

The REFINET & NTPS WORKSHOP was organised by WebEx on 21st October 2015. After the presentation of the participants,
Jesús Rodríguez summarised REFINET, the REFINET network and the future REFINET Group of Experts. Miguel Segarra presented the activities carried out in ECTP on transport infrastructure since 2010. María Zalbide as WP3 leader in REFINET made a presentation of the scope of work in WP3 "Vision and SIP" and the initial progress at the REFINET Project Meeting in Brussels, 29-30th September. Also, there was a debate between participants.

1.3.2 Thematic workshops

1st REFINET thematic workshop - Technological demands of transport infrastructures. Instituto Eduardo Torroja, Madrid, Spain, 2nd December 2015.

The first REFINET workshop was held at ''Instituto de Ciencias de la Construcción Eduardo Torroja'' (Madrid, Spain) on 2nd December 2015 and organised by TECNALIA with strong support of PTEC. The objective was to define the model to be a reference for the future evolution of the European multi-modal transport infrastructure within the WP3 "Defining Vision and SIP".
The definition of this model has been carried out by the REFINET partners with the assistance of the members of the REFINET network, who have been invited and involved in the discussion through the above-mentioned workshop, in order to involve different and all stakeholder perspectives related to transport infrastructure (user, administration, operator/owners, construction companies, engineering firms and universities and research centres).

Some 27 experts were invited to attend the workshop in Madrid and finally six experts, from different companies, research organisations and universities, and seven REFINET partners (CSTB, PTEC, FEHRL, DRAGADOS, DAPPOLONIA, OAPIL & TECNALIA) were able to attend.

The workshop was divided into two specific themes in order to gather valuable and useful information to define the REFINET multi-modal transport infrastructure model.

The two workshop sessions focused on different targets with the following specific objectives:

- The objective of the morning workshop session was to identify and prioritise the major trends and challenges within the transport infrastructure sector.
- The objective of the afternoon workshop session was to define a framework for the analysis of the future REFINET multi-modal transport infrastructure (RMMTI) model, thinking of new and existing transport infrastructures.

All the contributions gathered in the two workshop sessions will be used, among other activities, for the definition of the RMMTI model. The different levels (PERFORMANCE, SYSTEMIC APPROACH and TECHNOLOGICAL GAP) of the framework will also be established, in order to respond to the identified challenges and finally achieve the final objective of WP3, which is to define the Vision and the SIP in order to guide the evolution of European transport infrastructure.
More information about the first REFINET workshop can be found in the Deliverable D3.1 *REFINET multi-modal transport infrastructure (RMMTI) model*, Annex 1.

Figure 11: *1st REFINET workshop in Madrid*

2nd REFINET thematic workshop - SIP (Technological demands of transport infrastructures), ARUP Offices, London, United Kingdom, 16th March 2016.

The second REFINET workshop was held at the ARUP Offices (London, UK) on 16th March 2016. Organisers briefly presented the overview of the REFINET project, Vision and challenges. Also, the definition of the RMMTI and collection of best practices were presented. The workshop included the overview of the projects and initiatives, the analysis of available technologies, REFINET selection and evaluation criteria for European and international research on REFINET topics.

Experts had interesting presentations on the rail infrastructure innovation towards a European integrated transport system, as well as analysis of available technologies towards the RMMTI.

The morning session started with a brainstorming by the participants. It was a beneficial discussion on the challenges and technological priority areas for the European multi-modal transport.
The afternoon session then introduced the scope, barriers and timeline for the implementation of research priorities for the European multi-modal infrastructure. Experts showed their knowledge of and interest in the particular areas.
More information about the second REFINET workshop can be found in the D3.4 *REFINET Strategic Implementation Plan (SIP)*, Annex 1.


Figure 12: *2nd REFINET workshop in London*

3rd REFINET thematic workshop - Validate the Strategy for the Deployment of the REFINET Strategic Implementation Plan (SIP), Roma, Italy, 26th October 2016.

The third REFINET workshop was held in Rome, Italy on 26th October 2016. It was organised by D'Appolonia, leader of the Deployment of the REFINET Strategy. The scope of the workshop to present and validate the proposed Strategy for the Deployment of the REFINET Strategic Implementation Plan (SIP) and discuss it with 24 invited experts. By the end of the discussions, the representatives of the **Transport Infrastructure managing authorities** of the two REFINET **case study countries** Italy and Romania; Austostrade per l'Italia, AISCAT (Italian Association of Toll Motorways and Tunnels Operators) and RFI (Italian Railway Infrastructure Manager) for Italy; CFR S.A. (Romanian Railway Infrastructure Manager) for Romania confirmed their interest in being actively involved in the next steps of the short-term deployment strategy as well as in providing data and information for the validation of the REFINET Platform.

Feedback from the experts was gathered during a dedicated interactive session in order to improve the strategy and ensure its effective deployment. Finally, an initial discussion on roadmap was organized tackling immediate needs using REFINET tool.

4th REFINET thematic workshop – SIP & DEPLOYMENT OF THE SIP WORKSHOP#2, Bucharest, Romania, 7th March 2017.

The fourth REFINET workshop was held in Bucharest, Romania on 7 March 2017 with a twofold aim. First of all, to present the results of the collaboration with the two case study countries to date and finalize the short-term roadmap approach as illustrated by the Romanian case study. Secondly, to start exploring the medium to long-term roadmap timescale, primarily with the Romanian case study, aiming at feeding information to Policy Makers, Public Bodies and Members States Authorities on future research topics.
In parallel, a wider consultation activity towards selected members of the REFINET community was taking place to produce a final list of high priority topics which will be recommended as high priority research and deployment actions to the key stakeholders, including European Transport Technology Platforms, the Executive Agency for Transport (INEA) in charge of the TEN-T agenda and the European Commission.

Figure 13. 4th REFINET workshop in Bucharest

1.3.3 Ad-hoc-workshop

ENCORD WG on Infrastructure Meeting – REFINET Workshop - AICCOPN (Associação dos Industriais da Construção Civil e Obras Públicas), Porto, Portugal, 29th February 2016

In the case of the third REFINET workshop, the meeting was kept private to the ENCORD Working Group on Infrastructure members. Whereas the other organisations memberships include a variety of actors from the industry, research centres, academia, universities, etc., ENCORD represents the industry and its input is considered to be valuable as it represents current practice in transport infrastructure.

Figure 14: *ENCORD WG on Infrastructure meeting. Topic: REFINET Workshop*

1.3.4 Conference sessions

1st Conference session - TRB 16 Washington – January 2016

This workshop provided an overview of the FOX, USE-iT, and REFINET projects, with the results from FOX and USE-iT feeding into REFINET. Representatives of the three projects briefly introduced the objectives, strategies, and activities of each effort. Following these overview presentations, a more in-depth presentation was provided on the initial results from the FOX programme, highlighting findings on the state of the art and best practices for addressing key challenges in specific modes, along with identification of initial areas for cross-modal application of those solutions. A similar in-depth presentation was then provided on the USE-iT project, highlighting that effort's approach to identifying common challenges and potentially promising research avenues that might have cross-modal application. Lastly, a detailed presentation on REFINET explored the efforts to develop a new framework for multi-modal infrastructure, integrate outcomes from FOX and USE-iT, combine those outcomes with the model to develop a new vision for that infrastructure, and ultimately provide incentives to public and private sectors to invest in the needed R&D. A brief outline of key framing questions was provided, along with a rough timeline for completing the project, with final deliverables planned for the 2017 TRB Annual Meeting.

2nd Conference session - TRA 2016 Warsaw – April 2016

An invited session on the USE-iT, FOX projects in conjunction with the REFINET project was held during the TRA 2016 conference in April 2016. The general theme was how research can respond to the challenges of cross-modal infrastructure.
Initially, Thierry Goger of FEHRL outlined the projects and the overall challenge of infrastructure research. This was followed by Ewa Zofka of IBDiM, leader of USE-iT WP2 giving an overview of all technical work packages (WP2 – 4). Initially, a list of project participants in the project was presented, followed by a diagram showing the process steps for the project, and a note on the point at which the project had reached at that time.

The domains (Infrastructure, Technology, Governance and Customers) were explained in relation to the modes (Road, Rail, Air and Water) and how these were closely linked to FEHRL's FORx4 project. A general overview of the technical areas of each WP was presented, with WP3 split into its two component parts of safety and security. For each WP, there were two slides focussing on a specific technology or process, detailing on slide 1 a brief overview of the technology, its current use (by mode) and potential future use, and any specific experience with it. On the second slide, the potential benefits and possible barriers were listed, followed by the research needs. It was explained that there were many technologies that the project had identified, and that the examples were meant to show the process that had been followed.

An overview of the FOX project was then given as part of the overall session and to show the synergies. Finally, Martin Lamb gave an overview of the future activities and timetable on the project and encouraged those present to engage with the project by, for example, attending the second workshop or final conference, offering to be interviewed on activities and comment or challenge on the documents produced so far, and those to come.

2nd Conference session - TRB 17 Washington – January 2017

During the TRB2017 Conference, a cross Modal Transport Infrastructure Workshop was organised. The workshop started with the opening remarks and introduction to the session by Thierry Goger (FEHRL). Maria Cristina Marolda (EC) presented the need for cross modal transport infrastructure.
An overview of the REFINET project - Multi-modal transport infrastructure model and Strategic Implementation Plan- was presented by Alain Zarli (CSTB). A presentation on REFINET emphasised the overeaching aim to create a sustainable network that integrates relevant stakeholder's representatives of all transport modes and infrastructure sectors in order to create a shared European vision of how should be specified, designed, built or renovated, and maintained the multimodal European transport infrastructure network of the future. Gobal synergies, main REFINET key outputs, REFINET multi-modal Transport Infrastructure (RMMTI) model and development of Strategic Implementation Plan (SIP) were presented.
An overview of the FOX and USE-iT projects - R&D&I and Best Practices Cross-modal Priorities - was given by Thierry Goger (FEHRL).

The 7th ECTP Conference – Brussels, Belgium, 17-18 November 2016

The 7th ECTP Conference took place on 17-18 November 2016 at Bozar in Brussels. More than 170 stakeholders from the whole construction value-chain and representatives of the European Commission shared their experience and discussed innovation in the built environment in Europe.
The opening session, chaired by Emmanuel Forest, CEO of Bouygues Europe and ECTP President, and Luc Bourdeau, ECTP Secretary General, introduced the main challenges of the built environment. Thematic parallel sessions addressed specific issues under the five current challenges of the ECTP. Sessions on transport infrastructure, materials and sustainability innovation, cultural heritage and urban regeneration research, age-friendly housing and energy-efficient buildings and positive energy blocks, chaired by the ECTP Committees chairmen, were the opportunity to develop fruitful exchanges with various perspectives provided by industry, research and institutional representatives. The matchmaking event, organised in the framework of the EeB-CA2 CSA, was the opportunity for 50 stakeholders to discuss potential technological, research and business cooperation during bilateral meetings.
The two days of the Conference also offered some networking opportunities and exchanges of best practices in the hall for the innovation cases exhibition.

1.3.5 REFINET workshops

REFINET, FOX, USE_iT stakeholders workshop – Integrated Approach to Build the Future of Transport Systems, Melbourne, Australia (7-14 October 2016)

Series of events were organised by USE-IT, FOX, REFINET and SETRIS in conjunction with ITS2016 World congress, Melbourne on the 7 – 14 October 2016.
The added value of the workshops to the projects' (REFINET, FOX, USE-iT) approach and vision was definitely achieved due to various participants not directly involved in the project. They provided an 'outside of the box' and more importantly world-wide approach in the topic of multimodal transport and user centric approach. Experience from other countries such as Australia, USA or Japan who are very much on top of the ITS technologies provides an added value to the project.

These workshops provided also an opportunity to have discussions with stakeholders to identify potential research topics that could be of benefit to more than one mode.
Finally, these workshops enabled to expand the consultation process that has been performed recently within the different projects, in particular the USE-iT FOX workshop held on September 15th and the REFINET Workshop held on October 17. The results/feedback will be integrated into the next Deliverable for these projects.

Figure 15. REFINET, FOX, USE-iT stakeholders workshop in Melbourne, Australia

Scanning tour 2016 Infrastructure resilience – South Korea and Japan, 23-30 November 2016, South Korea and Japan

During the Scanning tour in South Korea and Japan, three CSAs (REFINET FOX and USE-iT) projects were presented. Scaning tour concept was on infrastructure resilience as a whole process. The main purpose of the Scanning Tour to South Korea and Japan in November 2016 was to:

- Establish a dialogue on challenges for implementing more resilient infrastructure.
- Establish mechanisms to share information and experiences regarding the management of resilient infrastructure.
- Identify practical applications of resilient infrastructure.
- Explore opportunities for future collaboration.

The desired outcome of this important Tour was to obtain an improved understanding of how roads and associated infrastructure in Japan and South Korea are managed in terms of the provision and maintenance of a resilient network; innovative solutions for technology, governance, and customers for adaptable, resilient and automated infrastructure. This was achieved through visits to a range of multi-modal research facilities and companies responsible for the management of the road, rail and bridge networks, as well as site visits to outstanding construction projects/programs. The successful conduct of the Scanning Tour was to also contribute to the sharing of knowledge and implementation of solutions to other modes (presenting the REFINET, USE-iT and FOX projects), and aimed to assist in drafting the needs for further research proposals managed by the European Commission.
This Tour, whose programme was managed by the Australian Road Research Board (Caroline Evans, Kieran Sharp and Irene Seah) also represented the first cooperation of FEHRL within the Asia region.

Figure 16. Scanning tour in South Korea and Japan 2016

1.3.6 REFINET Final Conference

REFINET Final Conference was held on the 5th April 2017 in Brussels, Belgium. REFINET Coordination Support Action on transport infrastructures, funded by EC within H2020, presented its mains results during FIRM2017 Conference with about 80-100 participants.

Jesús Rodríguez, PTEC Managing Director and REFINET coordinator of dissemination and communication, opened the session and made some comments on R&I initiatives in transport infrastructures before REFINET and the expected actions after REFINET through ECTP Infrastructure and Mobility Committee. Alain Zarli from CSTB and REFINET coordinator presented the multi-modal transport infrastructures approach developed within this CSA. Savina Carluccio from ARUP summarized the best practices in transport infrastructures and the available technologies with different TRL values.

Research and innovation priorities for multimodal transport infrastructures have been identified in REFINET with the coordination of Jesús Isoird and Jon Aurtenetxe from Tecnalia and were also presented in this session. It was pointed out that these R&I priorities are been complemented with contributions coming from National Construction Technology Platforms.

Clemente Fuggini from D'Appolonia presented the recommendations for mobilizing R&I programs in transport infrastructures and a geo-cluster platform, with some conclusions on the lessons learnt from a case study (Railways in Romania).

Finally, after some minutes of debate, Miguel Segarra from Dragados and chairman of ECTP Infrastructure and Mobility Committee made the closing remarks highlighting the need to continue the work of REFINET within ECTP in collaboration with other NTPs.

Figure 17. REFINET final conference at FIRM2017

Conclusion and next steps

WP2 focused on the community network building in order to create the community of transport infrastructure stakeholders who collaborated with the REFINET partners in the development of the REFINET Vision (WP3) and its SIP deployment strategy (WP4). The deliverable D2.3 *Stakeholders' report* 2 is an update of the deliverable D2.2 Stakeholders report 1. Together with the feedback from the REFINET network, the REFINET Group of Experts has provided a significant contribution to the consolidation of the REFINET Vision (see D3.1 and D3.2). The network has also helped in supporting the dissemination of the project. The REFINET network helped to deliver a shared European vision of how to specify, design, build or renovate, and maintain the multimodal European transport infrastructure network of the future along with innovative processes so as to enhance the effectiveness of the transport sector.

In addition, four REFINET thematic workshops were organised involving the group of experts, who helped to define the REFINET vision and Strategic Implementation Plan (SIP). REFINET WP leaders attended the FOX and USE-iT workshops in order to maximise the synergy between the REFINET WP3 and WP4 and the technical WPs of FOX & USE-iT. Furthermore, some additional meetings between the WP leaders of the three CSAs were organised in order to further consolidate he synergy between the three CSAs.

In addition, as REFINET has a clear focus on international cooperation, extra activities such as the Scanning Tour 2016 and Stakeholders' Workshop in Australia 2016 were organised.

Finally, the partners of WP2 have achieved and completed successfully the tasks 2.2 and 2.3 and 2.4. The REFINET Network has been established with a medium to long-term perspective. As a matter of fact, the ECTP will continue to keep alive the database and the community beyond the end of the projects. It is also expected that further activities managed by the ECTP (under the I&M CommitteeWG "Mobility & Infrastructure") as well as other platforms such as FEHRL and PTEC will carry on updating the vision and SIP throughout their respective think-tank activities. To that purpose, it is expected that the members of the experts group will stay highly active beyond the end of the projects.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 653789.

Coordinated and Support Project (CSA)
Call: H2020-MG-2014_SingleStage_B
Topic: MG-8.1b-2014

REFINET
INFRASTRUCTURE MOBILITY

REthinking Future Infrastructure NETworks

REFINET

Project Duration: **2015.05.01 – 2017.04.30**
Grant Agreement number: **653789**
Coordinated and Support Project

D2.3 ANNEXES

Dissemination Level

PU	**PP**	**RE**	CO

Project Coordinator: Alain ZARLI (CSTB)
Tel: +33 493 95 67 36
Fax: +33 493 95 67 33
E mail: alain.zarli@cstb.fr
Project website address: **www.refinet.eu**

Annex 1: Conclusions of the workshop held in Madrid (2nd DECEMBER 2015)

INTRODUCTION

This workshop activity, held at Instituto de Ciencias de la Construcción Eduardo Torroja (Madrid) in 2nd December 2015 and organised by TECNALIA with strong support of PTEC, is included in Task 3.1 "Definition of the REFINET multi-modal transport infrastructure (RMMTI) model", which objective is to define the model and to be a reference for the future evolution of the European multi-modal transport infrastructure within the Work Package 3 "Defining Vision and SIP".

The definition of this model has been carried out by the REFINET´s partners with the assistance of the members of the REFINET network, who have been invited and involved in the discussion through the mentioned workshop, in order to involve different and all stakeholders´ perspectives related to transport infrastructure (user, Administration, operator/owners, construction companies, engineering firms and Universities and Research centres)

27 experts were invited to attend the workshop in Madrid and finally six experts, from different two companies (from Spain and Portugal), two research organisations (from Sweden and The Netherlands) and two universities (from Lithuania and Czech Republic), and seven REFINET partners (CSTB, PTEC, FEHRL, DRAGADOS, DAPPOLONIA, OAPIL & TECNALIA) could attend to the workshop.

The European initiciative reFine, whose aim was to foster Innovation for Transport Infrastructure of the Future, was stablished as a background. Concepts, such as "High Level Service Infrastructure " or " the three pillars of transport network" were regained in order to present the experts a draft version of the framework to work with during the all day workshop session.

OBJECTIVES

The workshop has been divided into two specific themes in order to gather valuable and useful information to define the REFINET multi-modal transport infrastructure model, according to the following agenda of the day:

REFINET
INFRASTRUCTURE MOBILITY

REFINET WORKSHOP

Technological demands of transport infrastructures
2nd December 2015, Madrid

Instituto Eduardo Torroja
Calle de Serrano Galvache, 4, 28033 Madrid
91 302 04 40

Agenda

Wednesday 2nd December

9:00	*Arrival*
9:15	Welcome, organisation
9:25	Overview of REFINET project (Luc Bourdeau, CSTB)
9:40	**WP3 – Defining vision and SIP** (by **TECNALIA**) *Vision, definition of the RMMTI model, collecting Best practices, Overview of projects and initiatives, Analysis of available technologies, REFINET selection & evaluation criteria for European & International research on REFINET topics*
10:00-10:15	**Q&A**
10:15.10:30	Coffee break
10:30-12:30	**Participants view on challenges, opportunities and approach to multimodal model of transport infrastructures** Introduction to the workshop objectives and methodology. Maria Zalbide (TECNALIA) Moderators: Maria Zalbide (TECNALIA), Miguel Segarra (DRAGADOS) Rapporteurs: Jon Aurtenetxe (TECNALIA) and Ben Kidd (ARUP)
12:30-13:00	**DEBRIEFING from the workshop by the rapporteurs**
13:00-13:45	*Lunch*
13:45-16:15	Definition of the framework for the analysis of demands of transport infrastructure: **REFINET multi-modal transport infrastructure (RMMTI) model and multimodal KPIs** Introduction to the workshop objectives and methodology. Maria Zalbide (TECNALIA) Moderators: Maria Zalbide (TECNALIA), Miguel Segarra (DRAGADOS) Rapporteurs: Jon Aurtenetxe (TECNALIA) and Ben Kidd (ARUP)
13:45-14:00	Cataloguing of technologies: Ben Kidd (ARUP)
16:30-16:45	*Coffee break*
16:45	**DEBRIEFING from the workshop by the rapporteurs**
17:15	*Wrap up and Conclusions*
17:30	*End of workshop*

REFINET Workshop Agenda Page 1/1

The two workshop sessions have focused on different targets with the following specific objectives:
The objective of the **morning workshop session** was:

- To identify and prioritize the major **trends and challenges** within the transport infrastructure sector.

The objective of the afternoon workshop session was:

- To define a **framework for the analysis of future multi-modal transport infrastructure RMMTI model**, thinking of new and existing transport infrastructures.

METHODOLOGY

As mentioned before, some concepts from the European reFINE initiative were recovered to define the context about the objectives and framework of the REFINET project as a starting point, in order dynamise the participation of all attendees.

TECNALIA presented some explanatory slides with specific focus on the following two concepts in order to facilitate the development of the workshop:

- **High level service infrastructure HLSI** has the following features:
  - Providing infrastructure for **high quality mobility services for people and goods** while using resources more efficiently.
  - Ensuring overall better service and performance, **including multimodal integration and intermodal continuity for the end-user**, less congestion, optimised transport time, etc.
  - Higher degree of **convergence and enforcement of social, health safety, security and environmental rules** for infrastructure, with the adequate service standards at all times,
  - **Interconnected solutions** for the next generation of multimodal transport management, including information services and systems for all infrastructure

- The **three identified pillars of the high-Level service infrastructure "HLSI"** concept were: Urban mobility, multimodal hubs and long distance corridors, which articulate the transport network.

Methodology for morning workshop session: Challenges and opportunities for multimodal model of transport infrastructure – Identification and prioritisation

The group of fourteen people was divided into two groups, and they were seated along the longest sides of the table.

The participants in each team were required to identify individually with post-its at least five challenges regarding each of the categories: urban mobility, long distance corridors and multimodal hubs during one hour.

After this time, they discussed in group and prioritised the challenges of each categories from 5 (most important) to 1 (less important) for thirty minutes.

The rapporteurs (Ben Kidd and Jon Aurtenetxe) in each group reported to the larger group and then the discussion followed using the post-its as a starting point for debate. (30min)

Methodology for afternoon workshop session: REFINET multi-modal transport infrastructure (RMMTI) model and multimodal key Performances Indicators (KPI)

The group of fourteen people was divided into two groups, to be seated along the longest sides of the table.

The participants in each team were required to identify individually performance concepts and their associated key performance indicators with post-its at three levels: Performance (level1), Systemic Approach (level2) and Technological gaps (level 3) during thirty minutes for each level. Some questions were provided in order to aid the identification.

After one hour and a half, a discussion was launched on the results obtained by each team for thirty minutes and the rapporteurs from each group (Ben Kidd and Jon Aurtenetxe) reported to the larger group and then a discussion followed using post-its as a starting point a debate for other thirty minutes.

RESULTS

Morning workshop session

High-Level Service Infrastructure "HLSI"

	Multimodal hubs	Long distance corridors	Urban mobility
Security challenges			
Cost Efficiency challenges			
Environmental challenges			
Safety challenges			
Smartization challenges			
Inclusiveness challenges			
Social challenges			
other			

Following the methodology described above, the two teams started the morning workshop session with the aim of identifying and prioritising the challenges and trends of European multi-modal transport infrastructure. To help doing this, the table above was presented, in order to organise the different contributions under the same scheme, based on three pillars of transport network and the different themes.

The contributions of the two teams have been gathered as follows:

Group A:

URBAN MOBILITY (green post-its)

- Need of standardisation in design- signalling
- European brand for Multimodal transport Infrastructure model.
- Improve the social acceptance of infrastructure.
- Reduce the time distance to specific main services (hospitals, schools,…)
- Smartening versus vulnerable group of people (disabled, old people,…)
- Clean and healthy transport.
- Seamless transport – no barriers.
- Zero Accidents (especially vulnerable group of people)
- Cost barrier in public transport.
- Man-made and natural hazards, from user and infrastructure perspective.
- Emergency routes
- Terrorist Attacks
- Recycling materials and its standardisation.
- Adaptation for climate change.
- Holistic strategy (governance)
- Nanotechnology: self-repairing materials and self-reporting materials of structural health.
- Drive assistance.
- Smart use of the available data.

-

MULTIMODAL HUBS (yellow post-its)

- Need of standardisation design- signalling
- Smartening versus vulnerable group of people (disabled, old people,…)
- Barriers to mobility (security controls,…)
- No Barriers – seamless travel
- Emergency routes
- Multi hazard- resilient infrastructure
- Terrorist Attacks
- Business models – Balance between transport and commercial use.
- Virtual and lean construction.
- Recycling materials – need for standardisation.
- Sustainable materials and processes.
- Communication among USER-VEHICLE–INFRA.
- Interoperability.

LONG DISTANCE CORRIDORS (orange post-its)

- European brand for Multimodal transport Infrastructure model.
- Improve the social acceptance of infrastructure.
- Best value – Social return of investment
- Zero Accidents (especially in maintenance works in rural areas)
- Cost barrier in public transport. (hinder use of certain modes)
- Holistic and systemic approach (governance)
- Introduction of innovation of procurements (governance)
- Multi hazard- resilient infrastructure
- Adaptation for climate change.
- Durability.
- Recycling materials – need for standardisation.
- Link cost-environment: LCA versus LCC. Need for standardised method.
- Sustainable materials and processes.
- Assess optimal distance for each transport mode.
- Working closely with vehicle industry to introduce innovations in infrastructure (others).
- Skid resistance.
- Nanotechnology: self-repairing materials and self-reporting materials of structural health.
- Smart use of the available data.
- Interoperability.
-

Group B:

Note that the number indicates the priority level assigned by the group (1-most and 5-least).

URBAN MOBILITY (green post-its)

- 4 - Safety – reduce accidents via proper maintenance criteria for optimal management.

- 2 – Environmental: Adaptation of urban infrastructures to new vehicles with reduced environmental impact or supporting.
- 3 – Smartening: Automated connected vehicle -> how to adapt road infrastructure.
- 4 – Environmental: Electric vehicle in city-> inductive technology.
- Social and safety: Integrating cycle networks and walkability into cities alongside other transport nodes.
- More underground transport infrastructure must be developed.
- 3D printing technology using in construction.
- 3 – BIM for urban infrastructure including existing underground infrastructure.
- Environmental: traffic jams.
- 5 – Smartization: connect smart infrastructure to smart cities.
- Smart – Conserve cultural heritage.
- Smart – Provide access to actual information on traffic.
- Smart – Provide complex service for business and community, aging population.
- 1 – Integrate infrastructure planning and urban planning.
- 1 – Urban land management versus transport infrastructure (urban sprawl).
- More healthy transport system.
- Seamless door to door multi modal mobility.
- Integration into regeneration of cities.
- 2 - Modular infrastructure and recycling infrastructure.
- More compact urban territories (cities) must be designed.
- Societal challenge: Single ticketing – parking – public transport.
- 3 – Inclusiveness: Improvement for aged/ disabled/,… people.
- Inclusiveness integrated approach for all urban infrastructures (high connection with ICTs)
- Inclusiveness: ageing population and active mobility: how to design for improving active mobility versus inclusive design for disabled people etc. and increased demand?
- 4 – Prepare for new ways of collaboration/virtual offices etc.

MULTIMODAL HUBS (yellow post-its)

- 2 – Environmental integration in the city.
- Good governance of innovation.
- Long term vision roadmap and organisation on implementation.
- 4 – Environmental+social: indoor air quality and passenger comfort – moving from one mode/ vehicle/ space to another without significant changes in environment.
- Environmental: energy management.
- 2 - Passenger accessibility in ageing Europe.
- 1 – Synchro-modality (ALICE): networks of networks and physical internet.
- 1 – Heritage buildings + infrastructures
- Sensitive designs for upgrade /retrofit.
- Global design to perform all multimodal high level services.
- Cost- efficiency: Virtual reality used in design to model passenger flows + improve efficiency (plus identify opportunities for retail clients – footfall) -> how to make software affordable for all multi-modal designs.
- Security – BIM models – cyber security (particularly if model used for operation/asset/facilities management (see British Standard for BIM Part5)
- Societal Challenge – passenger security: balance between free travel + control?
- BIM modelling
- Smart security systems

- IT smart technologies using for information for motion of travelling, time saving, …
- Warning systems, cyber monitoring system.
- 5 – Smartening: Embedded condition monitoring sensors, access+management issues: different companies managing utilities (telecom, energy, water, etc.)
- Traffic management and pricing across the modes based on real time information.
- 3 – Safety & resilience: climatic change events.
- Safety: Overheating of braking systems on high speed trains when sat idle at stations (fire risk), (being studied at Enston HS2 station design).
- Security: Bomb resistance.
- Increase robustness across modes: capacity, natural hazards, climate change.
- 1 – Smart
- 2 – Social
- 3 – Security
- 4 – Cost-efficiency
- 5 – Environment

LONG DISTANCE CORRIDORS (orange post-its)

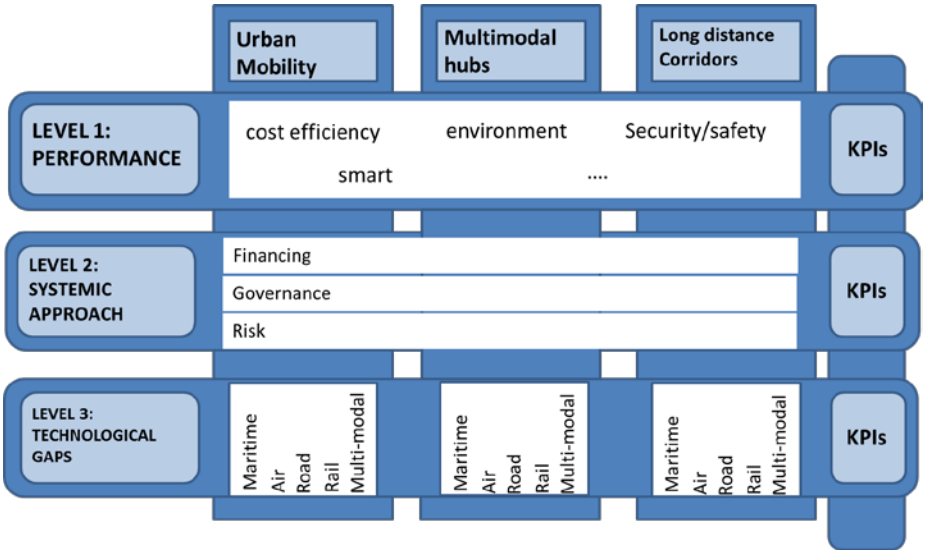
- 1 – Lifetime extension of critical objects, based on condition monitoring.
- Upgrading of existing infra and accommodating new vehicles.
- Durable and self-healing materials and structures using for infrastructure construction.
- 2 – Improve safety during upgrading works (traffic, workers,…).
- 3 – Increase cost efficiency when upgrading infrastructures (bridges …) via new design rules or new construction processes.
- 2. – Social challenge: equal opportunities for rural areas.
- Cost efficiency + resilience: Avoid duplication and look for synergies.
- Increase resilience to natural hazards/climate change.
- 3D printing technologies using for freight of some products.
- Multimodal corridors (others).
- 1 – Recycling of structures (i.e. existing bridges) instead of demolishing to reduce environmental impact.
- 3 – Minimize Natural resources use and impact Environment.
- 4 – Environmental challenges: Shift to rail, “4 hours door to door” (ACARE).
- Noise + vibration from high-speed rail plus habitat loss (See Arup HS2 Soundlab + EIA best practise example)
- Increase Durability through advanced materials
- Technology helping reduce accidents (safety).
- Guide to reduce jumps using IT tools (Smart).
- Interoperability.
- 1 – Environment
- 2 – Cost Effective
- 3 – Safety
- 4 – Smart
- 5 – Interoperability
- 4 – Smartening – monitoring solutions for management, traffic monitoring.
- 5 – safety – accident management
- Cost efficiency - how to balance need for multiple stakeholder engagement with cost efficient?
- Common standards and approaches across disciplines / suppliers (e.g. ECTMS in HS Rail) (others)

- 3 – Safety, cost-efficiency and environment: Inspection and maintenance (long-lasting pavements, self-healing, self-monitoring + drones
- 5 – Safety and smartening: bridges and platooning (trucks).

Afternoon workshop session

The afternoon workshop session aimed at collecting contributions from experts regarding the definition of the framework for the analysis of demands of transport infrastructure, therefore being linked to the outputs obtained from the morning workshop session. However, the main objective was to define the REFINET multi-.modal transport infrastructure (RMMTI) model and their associated key performance indicators (KPIs).

As an introductory explanation to the afternoon workshop session, TECNALIA presented the framework below, as a draft starting point composed by three pillars of transport network and three defined levels.



Level 1, PERFORMANCE, corresponds to identifying which key features should be considered in order to define the European Multi-modal Transport Infrastructure of the future from the all stakeholder´s perspective (end-users, operators/ owners, construction companies, engineering firms and administration), and which they should match with the transport system strategy from a local, regional or global point of view.

Level 2, SYSTEMIC APPROACH, corresponds to identifying which key aspects should be considered in order to have a systemic approach from multi-modal and whole mobility chain perspective This level aims at gathering all aspects related to “holistic integrated transport infrastructure” concept, identifying the main targets which enable the provision of high level service.

Level 3, TECHNOLOGICAL GAPS, corresponds to identifying which key technology/knowledge has to be developed or adapted in the following years/decades to cope with identified challenges and to fulfil requirements of upper levels (1&2). The technological gaps have been structured into transport modes and into the three pillars as components of the transport network. However, it is true that some technology or knowledge could be cross- cutting through modes or the transport network.

These three levels, which try to define the REFINET multimodal transport infrastructure (RMMTI) model, are also linked to their respective key performance indicators, as qualitative or quantitative measurements of implementation level in multimodal transport infrastructure.

The contributions of the two teams have been gathered as follows:

Group A:

This group A worked in the afternoon session focusing on different levels, considering the whole pillars jointly.

- Level 1: Performance

- Security Challenge:
  - Resilience to terrorism attacks (preparedness, prevention, robustness and recovery) => KPIs: time to recovery, % of damaged level of service, ability to be bypassed.
- Cost-efficiency and environmental challenge:
  - Optimal balance LAC and LCC=> KPIs: existence of EPD (environmental product declaration).
  - Use of Environmentally friendly materials => KPIs: % use of environmentally friendly materials.
  - Durability => KPIs: extra years that we can extend the life of an element/component.
  - Energy efficiency
- Smart challenge:
  - Smarter infrastructure that uses available data and communicates with the users /operators.
  - Interoperable
  - Active infrastructure, Structural Health Monitoring, self-healing system, self-reporting

  KPIs: number of downloads of apps for finding one's way at multimodal hubs.
- Cost-efficiency and environmental-safety challenge:
  - Resilience to climate change. => time to recovery (resilience metrics)

- Level 2: Systemic approach

- Security Challenge:
  - Network planning,
  - Cascade effects,
  - Communication protocols between modes.
  - Codes: lack of multimodal standards and tools related to multi-hazard resilience.
  - Energy efficiency
- Cost-efficiency and environmental challenge:
  - New procurement process including optimal balance LAC and LCC.
  - Lack of standards for recycled materials.
  - Financial models that guarantee the life extension of the networks => life span extension.
- Smart challenge:
  - Protection of the information system: data, access…=> KPIs: Creation of European standards regarding operability between modes, number of stakeholders that make use of these data.
  - Communication infra – vehicle – operator.
- Cost-efficiency and environmental-safety challenge:
  - Procurement processes implementation of innovation => KPIs: number of: innovative implemented products, contracts that implement innovation and bidding proposals that include innovation.

- Level 3: Technological gap

- Security Challenge:
  - Lack of tools to analyse: vulnerabilities, mitigation measures at systemic levels
  - Lack of construction materials and processes for rebuilding (quick recovery).
  - Blast resilient design. Lack of codes.
  - Monitoring that enables fast structural assessment.
  - Move from deterministic to probabilistic design.
  - KPIs: time to recovery, measurement of redundancies of the systems, operation capacity after the disruptive event.
- Cost-efficiency and environmental challenge:
  - Lack of protocols for all transport modes to standardise the information.
  - Lack of methods for calculating he LCC.=> availability of protocols and methods to calculate LCC.
  - More durable materials.
  - Structural alternative – use of recycled materials => % of implementation of new solutions/materials/processes.
- Smart challenge:
  - Open standard interfaces to be more operable.
  - Smart use of data.
  - Integration data in asset management systems.

Group B:

This group B worked in the afternoon session focusing on different levels and under one of the three pillars of Transport Network. But, they did not have time to work in the last third level.

URBAN MOBILITY (green post-its)

- Level 1: Performance

- Better planning of transport with land.
- Measurements in travel time reduction by X%.
- Infrastructure to support the traffic.
- Environmental impact in connection with the health of population.
- Adaptation of infrastructure to greener transport means for: pedestrians and cyclers, self-transport and environmental impact.

- Level 2: Systemic approach

- Cooperation between administrations and with “economic actors” that could maximise the benefit of the infrastructure.
- Access to jobs.
- Standards.
- Regulation and incentive.
- Globally design standards and safety.
- Success stories

MULTIMODAL HUBS (yellow post-its)

- Level 1: Performance

- Holistic design that meets the needs of mobility.
- Design that accommodates for 30% more of passengers and 30% more of freights.
- Design that enables 30% of modal shift.

- Level 2: Systemic approach

- Design standards/regulations.
- Incentives/investment
- Operators involved in the design stage.
- Business model/financing aspect.
- End-user.
- Adaptable to future needs.

LONG DISTANCE CORRIDORS (orange post-its)

- Level 1: Performance

- Cost-efficient resilient transport infrastructure
- Construction, maintenance and operation disturbance (noise, vibration, disruption).
- Circular economy (recycling)
- Reduction of waste materials.
- Reduction of maintenance by X% (reducing expenditure and keeping the same or better performance).
- Lifetime extension /upgrading by X% (20% ??)

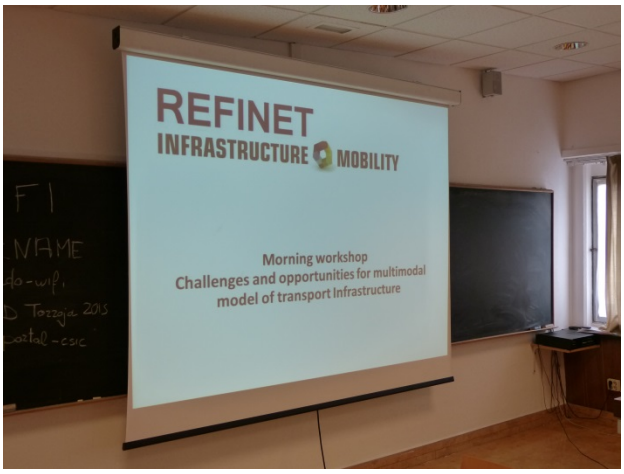
- Level 2: Systemic approach

- Risks assessment tools
- Optimisation
- Harmonisation (across borders)
- Availability of data for the assessment of the network.
- Measure cost-effectiveness within the regulatory period (day to day management).
- Energy savings.
- Carbon footprint.
- Standards for recycling 100% of existing materials.
- New testing methods.
- Improvement of construction and maintenance processes (e.g. prefabrication).
- Communication (with the affected people).
- Legislation.

CONCLUSIONS

All contributions gathered in the two workshop sessions, will be used, among other activities, for the definition of the REFINET multi-modal transport infrastructure (RMMTI) model. The different levels (PERFORMANCE, SYSTEMIC APPROACH and TECHNOLOGICAL GAP) of the framework will also be established, in order to respond to the identified challenges and finally to achieve the final objective of work package 3, which is to define the Vision and the Strategic Implementation Plan in order to guide the evolution of European transport infrastructure.

Photos from the workshop in Madrid



REFERENCES

reFINE Initiative document: *"Building up Infrastructure Networks of a Sustainable Europe – Strategic targets and expected impacts"- October 2012.*

Annex 2: Conclusions of the workshop held in London (16th MARCH 2016)

INTRODUCTION

This workshop activity, held at Headquarters of ARUP in 16th March 2016 and organised by TECNALIA with strong support of ARUP, is included in Task 3.4 "Strategic Implementation Plan (SIP) definition", which objective is to elaborate the REFINET Strategic Implementation Plan (SIP) within the Work Package 3 "Defining Vision and SIP".

The contribution to define the Strategic Implementation Plan of REFINET has been carried out by the REFINET´s partners with the attendance of the members of the REFINET network, who have been invited and involved in the discussion through the mentioned workshop, in order to involve different and all stakeholders´ perspectives related to transport infrastructure (user, Administration, operator/owners, construction companies, engineering firms and Universities and Research centres)

Finally fifteen experts, from different companies, research organisations and universities could attend to the workshop, which are distributed as 7 companies (from UK and Spain), 1 research organizations (from UK) and 2 universities (from UK and Czech Republic)

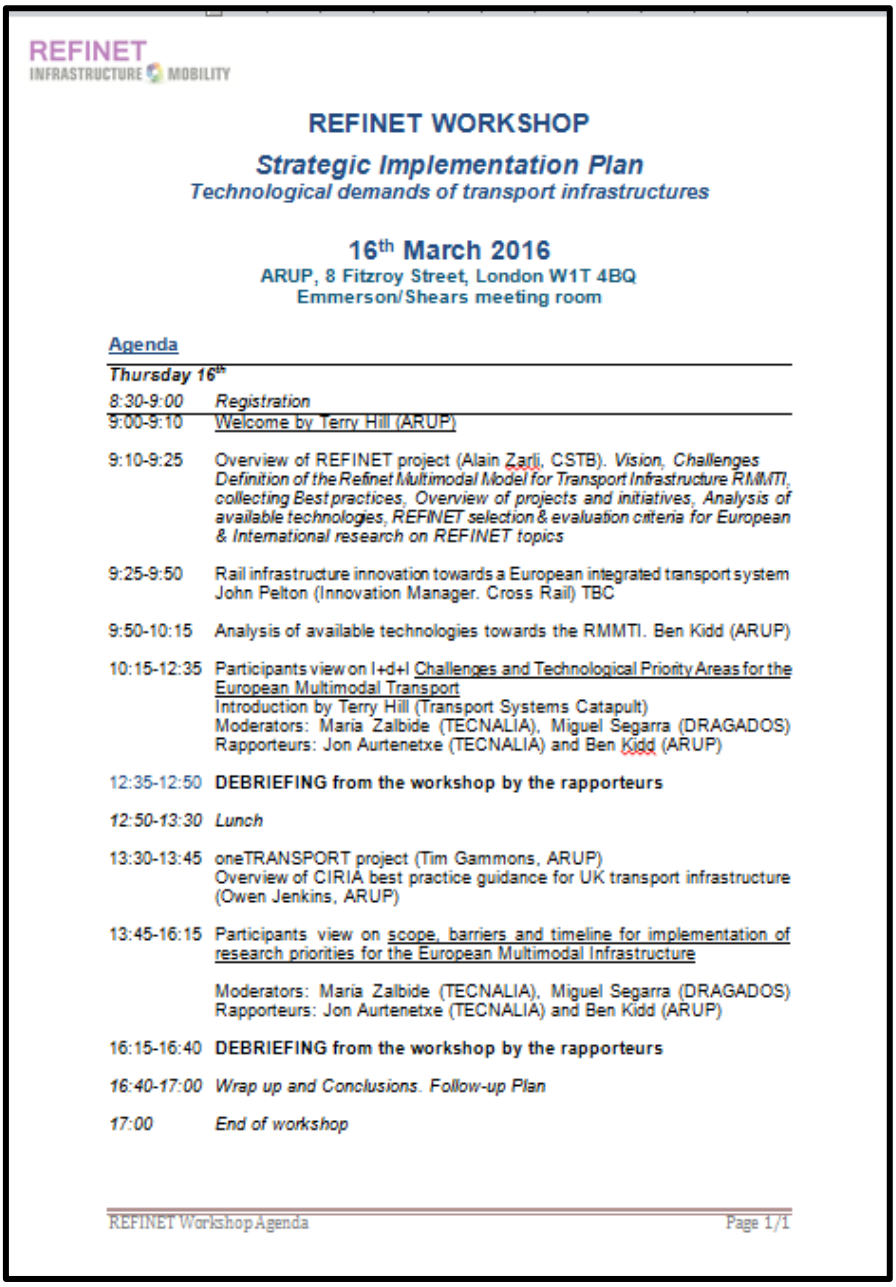
The REFINET partners, who attend the workshop were:

- Alain Zarli: CSTB, France
- Ben Kidd: ARUP, United Kingdom
- Jesús Rodriguez: PTEC, Spain
- Jon Aurtenetxe: TECNALIA, Spain
- María Zalbide: TECNALIA, Spain
- Migle Paliukaite: FEHRL, Belgium
- Miguel Segarra: DRAGADOS, Spain
- Thierry Goger: FEHRL, Belgium

The European initiciative reFine, whose aim was to foster Innovation for Transport Infrastructure of the Future, and the REFINET Multi-Modal transport Infrastructure (RMMTI model), developed in Task 3.1 of the project were stablished as a background and the framework. Concepts, such as "High Level Service Infrastructure " or " the three pillars of transport network" were regained in order to present the experts a draft version of the framework to work with during the all day workshop session.

OBJECTIVES

The workshop has been divided into two specific themes in order to gather valuable and useful information to define the REFINET Strategic Implementation Plan (SIP), according to the following agenda of the day:



REFINET
INFRASTRUCTURE MOBILITY

REFINET WORKSHOP

Strategic Implementation Plan

Technological demands of transport infrastructures

16th March 2016

ARUP, 8 Fitzroy Street, London W1T 4BQ
Emmerson/Shears meeting room

Agenda

Thursday 16th

8:30-9:00	*Registration*
9:00-9:10	Welcome by Terry Hill (ARUP)
9:10-9:25	Overview of REFINET project (Alain Zarli, CSTB). *Vision, Challenges Definition of the Refinet Multimodal Model for Transport Infrastructure RMMTI, collecting Best practices, Overview of projects and initiatives, Analysis of available technologies, REFINET selection & evaluation criteria for European & International research on REFINET topics*
9:25-9:50	Rail infrastructure innovation towards a European integrated transport system John Pelton (Innovation Manager. Cross Rail) TBC
9:50-10:15	Analysis of available technologies towards the RMMTI. Ben Kidd (ARUP)
10:15-12:35	Participants view on I+d+I Challenges and Technological Priority Areas for the European Multimodal Transport Introduction by Terry Hill (Transport Systems Catapult) Moderators: Maria Zalbide (TECNALIA), Miguel Segarra (DRAGADOS) Rapporteurs: Jon Aurtenetxe (TECNALIA) and Ben Kidd (ARUP)
12:35-12:50	**DEBRIEFING from the workshop by the rapporteurs**
12:50-13:30	*Lunch*
13:30-13:45	oneTRANSPORT project (Tim Gammons, ARUP) Overview of CIRIA best practice guidance for UK transport infrastructure (Owen Jenkins, ARUP)
13:45-16:15	Participants view on scope, barriers and timeline for implementation of research priorities for the European Multimodal Infrastructure Moderators: Maria Zalbide (TECNALIA), Miguel Segarra (DRAGADOS) Rapporteurs: Jon Aurtenetxe (TECNALIA) and Ben Kidd (ARUP)
16:15-16:40	**DEBRIEFING from the workshop by the rapporteurs**
16:40-17:00	*Wrap up and Conclusions. Follow-up Plan*
17:00	*End of workshop*

REFINET Workshop Agenda Page 1/1

Figure 1. Workshop Agenda

The two workshop sessions have focused on different targets with the following specific objectives:
The objective of the **morning workshop session** was:

- to identify the R&I **Challenges and Technological Priority Areas** for the European Multimodal Transport Infrastructure.
-

The objective of the **afternoon workshop session** was:

- to collect participants **view on scope, barriers and timeline for implementation of research priorities** for the European Multimodal transport Infrastructure.

Methodology

As mentioned before, some concepts from the European reFine initiative were recovered to define the context about the objectives and framework of the REFINET project as a starting point, in order to dynamise the participation of all attendees.

Moreover, ARUP, CSTB and TECNALIA presented some explanatory slides with specific focus on the overview of REFINET project, available technologies and the methodology to follow during the workshop.

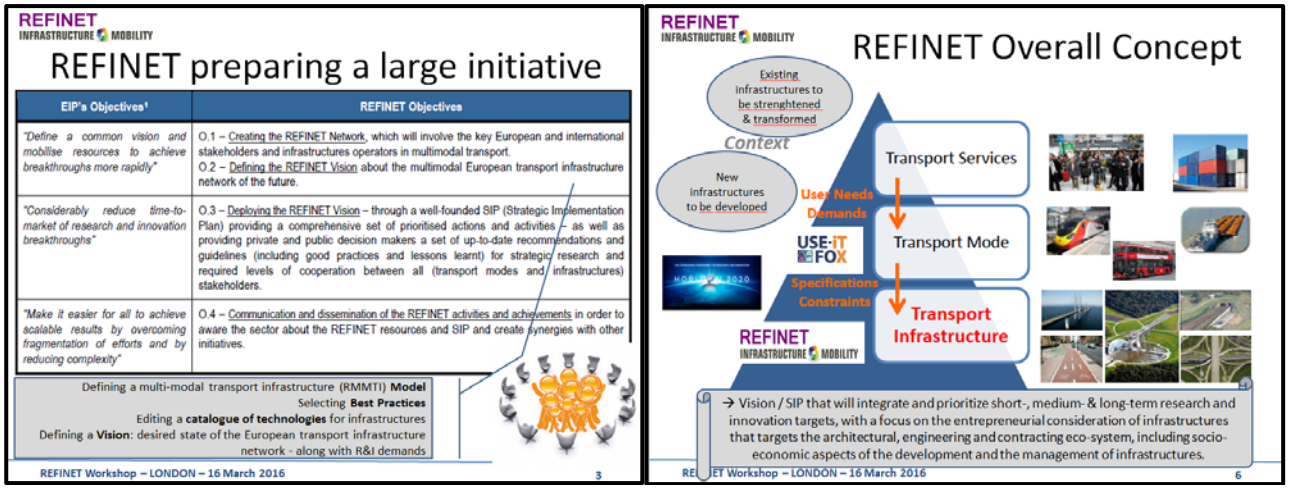


Figure 2: REFINET objectives and Concept

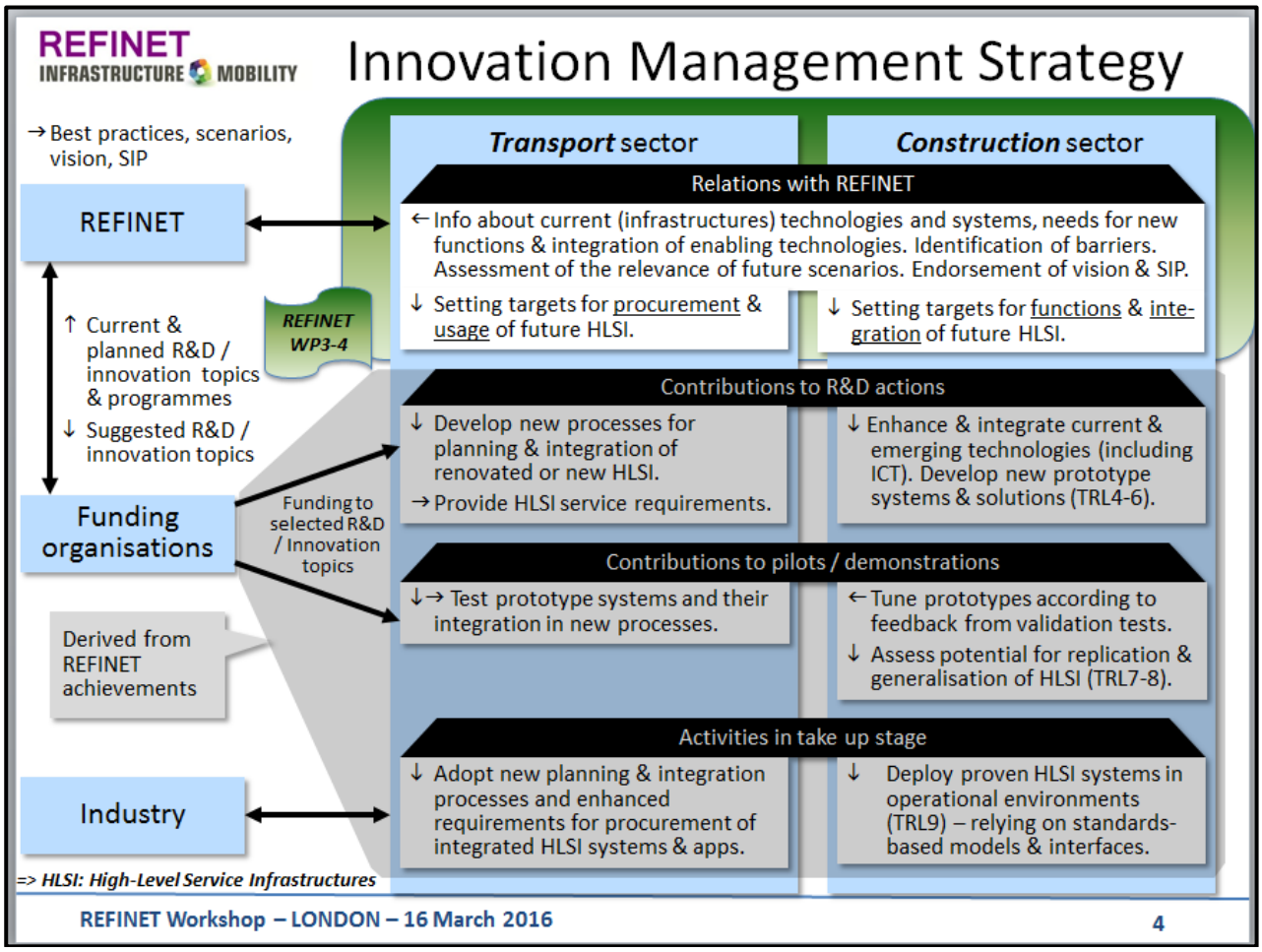


Figure 3:REFINET & Innovation Management System

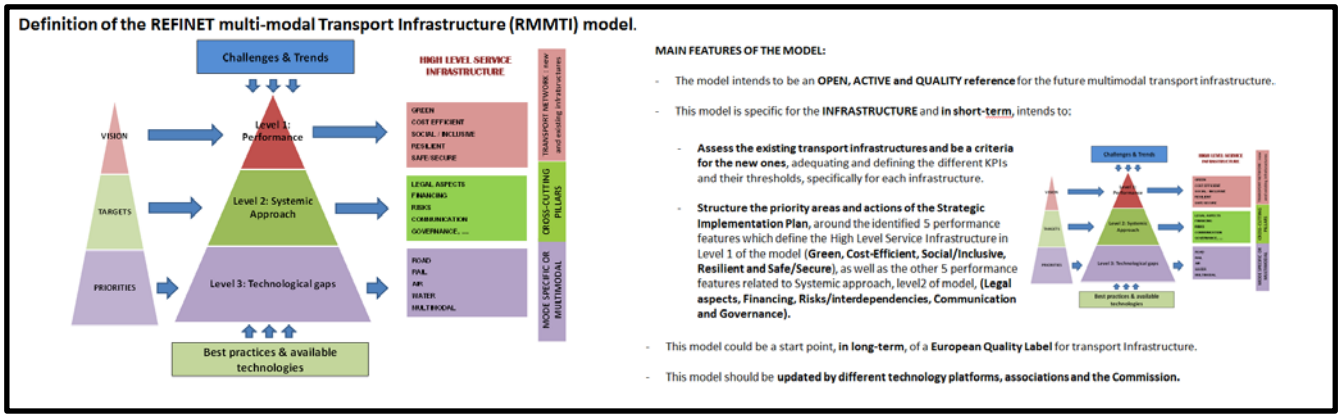


Figure 4: REFINET MultiModal Transport Infrastructure model (RMMTI Framework)

Before each workshop session, Rail infrastructure innovation, analysis of available technologies, oneTRANSPORT project presentation and Overview of CIRIA best practice guidance were presented by some of the experts.

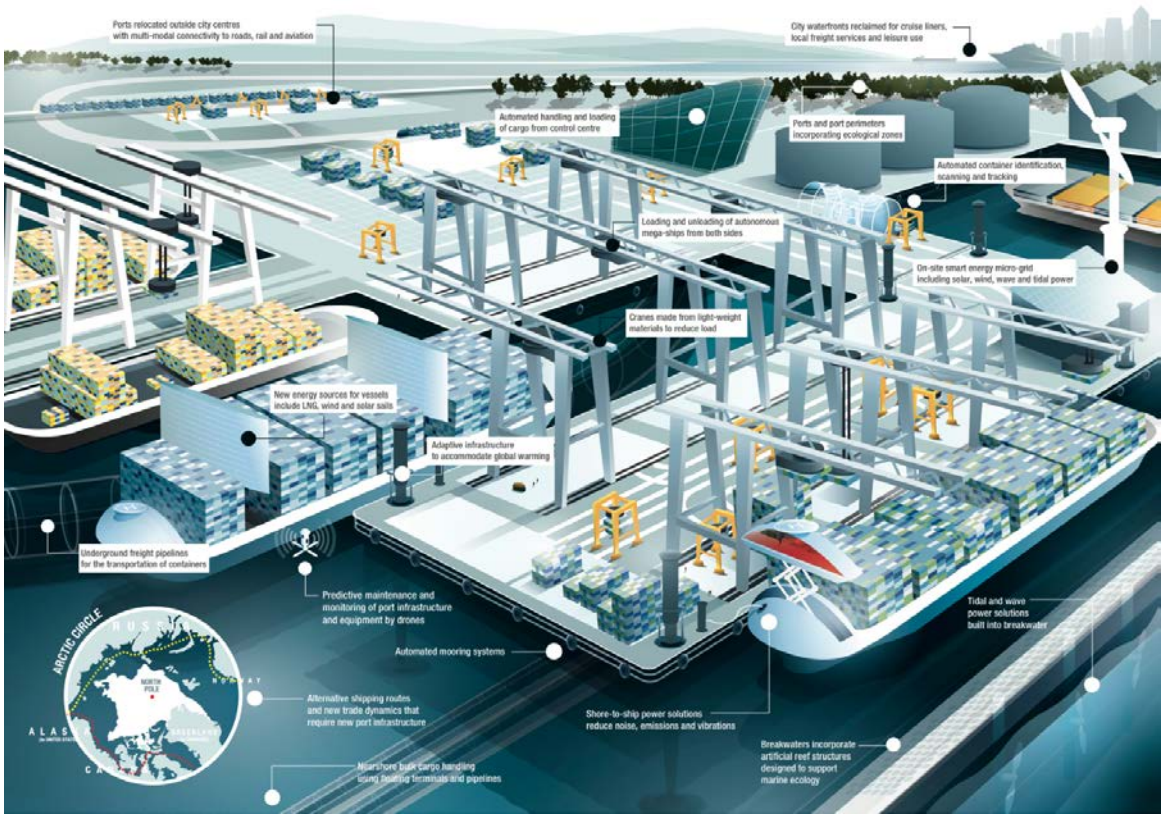


Figure 5: Example of available technologies andPort of the Future - ARUP

As in the first workshop in Madrid, some concepts from reFine initiative were also reminded and explained to every attendee:

- **High level service infrastructure HLSI** has the following features:
  - Providing infrastructure for **high quality mobility services for people and goods** while using resources more efficiently.
  - Ensuring overall better service and performance, **including multimodal integration and intermodal continuity for the end-user**, less congestion, optimised transport time, etc.
  - Higher degree of **convergence and enforcement of social, health safety, security and environmental rules** for infrastructure, with the adequate service standards at all times,
  - **Interconnected solutions** for the next generation of multimodal transport management, including information services and systems for all infrastructure

- The **three identified pillars of the high-Level service infrastructure "HLSI"** concept were: Urban mobility, multimodal hubs and long distance corridors, which compose the transport network, where in the baseline the transport infrastructure is allocated.

Figure 6: Three pillars of the High Level Service Infrastructure

Methodology for morning workshop session: Challenges and Technological Priority Areas for the European Multimodal Transport – Identification

The group of twenty three people was divided into two groups, and they were seated in two groups.

The participants in each team were required to identify the research needs individually with hand-outs during thirty minutes for each priority area (URBAN MOBILITY; MULTIMODAL HUBS; LONG DISTANCE CORRIDOS and SYSTEMIC APPROACH).

After this time, they discussed in group for another thirty minutes to put it in common with everyone in the group.

The rapporteurs (Ben Kidd and Jon Aurtenetxe) in each group reported to the larger group and then the discussion followed using the flipchart a starting point for debate. (30min)

Methodology for afternoon workshop session: Collecting participants' view on scope, barriers and timeline for implementation of research priorities

The group of twenty three people was divided into two groups, and they were seated in two groups.

The participants in each team were required to complete the scope, barriers and timeline for implementation of previously identified research needs with hand-outs during thirty minutes for each priority area (URBAN MOBILITY; MULTIMODAL HUBS; LONG DISTANCE CORRIDOS and SYSTEMIC APPROACH).

After this time, they discussed in group for another thirty minutes to put it in common with everyone in the group.

The rapporteurs (Ben Kidd and Jon Aurtenetxe) in each group reported to the larger group and then the discussion followed using the flipchart a starting point for debate (30min).

RESULTS

The contributions of the two teams have been gathered as follows and classified them by the four priority areas:

PRIORITY AREA A: URBAN MOBILITY		ID	Scope	Impact	Barriers	Budget €	Timeline	Scale	Comments
RESEARCH TRL<5	GREEN	R1.1	Air quality issues - technologies e.g. coatings	Health					
		R1.2	Reducing air pollution in cities						
		R1.3	Relationship between smart grids + energy storage electric vehicles						
		R1.4	Research in Reuse and after life disposal	environment					
		R1.5	Heat removal of tube lines						
		R1.6	Undergrounding large avenues with connections to local car-parks in the cities	Cities are mainly pedestrians or small and smart vehicles oriented					
		R1.7	Technologies for automated transport means inside the cities	More flexibility in transport avoid traffic jams thanks to automation. Mobility as service.					
		R1.8	Solar road						
		R1.9	Inductive technology - electrification						
	COST-EFFICIENT	R2.1	Risk sharing and transactions in construction	Financial / value for money					
		R2.2	3D-printing large scale						
		R2.3	Vehicles as a service	optimise assets both vehicle+road					
		R2.4	Financial innovation to fund new /maintenance of old infrastructure						
		R2.5	New construction techniques to decrease time scales						
		R2.6	Composite materials for sale, smart, cheap structures						
		R2.7	Prefabrication - modular construction/upgrade						
	SOCIAL / INCLUSIVE	R3.1	Approaches to improving access	Social mobility / Independence					
		R3.2	Congestion & evacuation / Crowd control	Public safety					
		R3.3	Smartening versus vulnerable group of people (disabled, old people,...)						
		R3.4	Journeys pertinent to user and not generic						
		R3.5	Assessing HCD aspects of urban mobility + modeling - simulation - accuracy						
		R3.6	Sensors for real-time geolocalised information to cars	Need for collaboration between cars manufacturers & infra contractors					
		R3.7	Co-planning and management of all infrastructure (transport, water, other networks)						
	RESILIENT	R4.1	Self-healing materials	Life extension					
		R4.2	Asset degradation / residual life for older structures						
		R4.3	Impacts of severe weather events-adaptation measures						
		R4.4	Adaptation to abrupt increase of temperature and moisture content						
		R4.5	Governance of transport system						
	SAFE / SECURE	R5.1	cyber security / privacy issues related to "smart"						
		R5.2	Cyber security R&D to keep ahead hackers						
		R5.3	Autonomus vehicles / trains, etc.						
		R5.4	PRT systems	lower casualties/accidents					
		R5.5	Safety standards processes for SIS - ISO 26262						
		R5.6	Forgiving road						
		R5.7	Automated and connected vehicle - Adaptation of transport infrastructure						
		R5.8	Flood partial management by infrastructures (road?) based on new materials / new construction methods.						
		R5.9	Robotics for silent, undisruptive "keynote surgery" construction/rehabilitation						
INNOVATION 6<TRL<8	GREEN	I1.1	Low carbon whole -life costing						
		I1.2	Multiple-benefit design	e.g. air quality, biodiversity					
		I1.3	Advanced materials e.g. materials that repai	less disruption					
		I1.4	Electric buses						
		I1.5	Movement energy harvesting						
		I1.6	Superabsorbing surface materials (CO_2, Nox)	Absorb + reduce emissions					
		I1.7	Integration of nature-based solutions (both GREEN & SOCIAL / INCLUSIVE)	Infrastructures participate to "greening" the cities + CO_2 -free cities					
		I1.8	Inductive technology - electrification						
		I1.9	rapid-charging of electric vehicles-deployment and usage in cities						
		I1.10	Noise & pollution reduction						
	COST-EFFICIENT	I2.1	Greater use of standardiesed approaches	design at once build in n times					
		I2.2	Standard way of commicating innovation in infrastructure	industry-wide impact					
		I2.3	whole life time -> intelligent signs in vehicles for instance.						
		I2.4	Low cost sensors in mobility infrastructures	smartening entire system					
		I2.5	Modular, prefabricated roads + sidewalks	Short construction phase					
		I2.6	Warm-mix asphalt (prefabrication)						
		I2.7	self-healing (long lasting)						
		I2.8	DPI - > airspace and departure planning						
		I2.9	Generalisation of data-communication networks along transport avenues (sensors, cameras, etc.) to improve transport management	Improve traffic in cities, bus raises issues to cost & maintenance of the data networks					
		I2.10	Infrastructure for autonomous travel						
	SOCIAL / INCLUSIVE	I3.1	Transport links info on delays across modes						
		I3.2	Informing custome - providing choice-traveller needs						
		I3.3	Autonomous vehicles/hybrid systems	improve mobility for elderly/ disabled					
		I3.4	Vwide spread technology APP						
	RESILIENT	I4.1	Use of real time info to forecast environmental hazards						
		I4.2	Prioritisation of asset maintenance + investment						
		I4.3	Real time travel options to users						
		I4.4	Addictive manufacturing (3D printing)						
		I4.5	Networked trials and evaluation to engage with SME groups to accelerate TRL progress						
		I4.6	Design for upgradebility, retrofiting	cost reductions for maintenance/retrofit					
	SAFE / SECURE	I5.1	Public communication & awareness						
		I5.2	System of systems thinking requeriment						
		I5.3	Responsive infrastructure - ligths that came on when you walk past						
		I5.4	Autonomous vehicles -> trials + testing in representative environments/hybrid systems						
		I5.5	Management of people/public during upgrade of infrastructure						
		I5.6	Roadway ligthing systems						
DEPLOYMENT 8<TRL		D1	Connectivity for vehicles						
		D2	Open information of data						
		D3	Public acceptance of major infrastructure works.						
		D4	Green procurement for vehicles + infrastructures						
		D5	24/7/365 operation						
		D6	Reduction on impact on adjacent networks whilst infrastructure works being undertaken.						

PRIORITY AREA B: MULTIMODAL HUBS		ID	Scope	Impact	Barriers	Budget €	Timeline	Scale	Comments
RESEARCH TRL<5	GREEN	R1.1	Air quality &congestion in location						
		R1.2	Design for accomodation of new technologies - how to prevent physical lock-in .e.g. Birmingham New Street						
		R1.3	Energy usage in hubs						
		R1.4	Range and usage of vehicles against hub frequency -> electric vehicles on-demand						
		R1.5	Multi-modal hubs as specific energy centers	Hubs as large infrastructures being the case of local energy networks					
		R1.6	Automation (freight)						
		R1.7	low carbon material						
	COST-EFFICIENT	R2.1	Financing models & public-private investment						
		R2.2	Oversite development						
		R2.3	Automatization						
		R2.4	Concentration of infrastructure (vs. Widespread)						
		R2.5	Funding opportunities for cross-sectorial approaches						
		R2.6	Design and construction opportunities						
		R2.7	DPI departure planning-> multimodal, role-out						
		R2.8	Vertical, space-effcient						
	SOCIAL / INCLUSIVE	R3.1	Avoiding congestion at hub						
		R3.2	Multi-lingual communication						
		R3.3	Accesible - Accesibility for elderly and disabled people						
		R3.4							
		R3.5	Vertical hubs: business model centered around "retail business-model" is against good mobility. It needs to have business-model centre around mobility						
	RESILIENT	R4.1	Avoiding rush-hour peaks	overall large increase in capacity					
		R4.2	Pressure in increasing demand of future population						
		R4.3	Vulnerability created by phisical interdependencies - assessment of impacts -cascade effects						
		R4.4	Modelling and prediction occurrency of events	Think twice, build once					
		R4.5	Link with other multimodel hubs (network of hubs)						
		R4.6	Multi-function hubs - Interchange, shopping, working, living, play, energy distribution, healthcare.						
		R4.7	High flexibility to interchange route or transport mode						
	SAFE / SECURE	R5.1	Facial recognition						
		R5.2	Step-free adaptations in congested spaces	ensuring vulnerable/elderly do not get lost/ confused					
		R5.3	Resilience to terrorism attacks (preparedness, prevention, robustness and recovery)	increased security,...					
		R5.4	Barriers to mobility (security controls, ...)	faster mobility, improved customer service and satisafction					
		R5.5	Data sharing, security, privacy,...						
INNOVATION 6<TRL<8	GREEN	I1.1	Renewables/ligthing/low enegy vehicles/low carbon						
		I1.2	Energy self-sufficient						
		I1.3	Provide ecosystem services to city	reduce PM, Nox, CO2					
	COST-EFFICIENT	I2.1	Google maps & Transport options						
		I2.2	Transfer of knowledge + skills from previous projects						
		I2.3	Better linkage across modes for travel times reduction						
	SOCIAL / INCLUSIVE	I3.1	Seamless multi-mode ticketing						
		I3.2	Improved communication at interchanges /apps						
		I3.3	Peak load distribution to increase capacity						
		I3.4	Design for all of multi-modal hubs	Easy access/mobility for all					
		I3.5	Full integration in design of regulations (security, disabled,...) download of plans for easily transfer in hubs/personalised interactive maps	Ease for passenger to move in the hub thanks to digital info on his/her smartphone, tablet, augmented reality.					
		I3.6	Modular						
		I3.7	Accesability, barrier free						
		I3.8	Accessibility for physically impaired users						
		I3.9	Travel information sharing + communication between operators						
		I3.10	Information permanent to user needs. Sent to devices, therefore reomval of sign.						
	RESILIENT	I4.1	Real-time data to predict disruption						
		I4.2	Utility corridors + deliveries						
		I4.3	Distributed model hubs						
		I4.4	Data access and information creation: traffic,...						
		I4.5	Structural Health Monitoring	Less down-time					
	SAFE / SECURE	I5.1	Security surrounding transport hubs	e.g. Birminghan					
		I5.2	Digital design						
		I5.3	Working distance minimisation						
DEPLOYMENT 8<TRL		D1	Integrated transport system						
		D2	Different technology deployment						
		D3	Virtual powerstations - demand side energy management						
		D4	Automation						
		D5	Concentration of infrastructure						
		D6	Time to transversce hub-unknown						
		D7	Funding + financing opportuinities created by merger with retail + real estate						
		D8	Disruption during upgrades						

PRIORITY AREA C: LONG DISTANCE CORRIDORS		ID	Scope	Impact	Barriers	Budget €	Timeline	Scale	Comments
RESEARCH TRL<5	GREEN	R1.1	Use as multi-utility routes						
		R1.2	In-built energy sources for electric vehicles (highways)						
		R1.3	MULTI-MODAL vehicle (able to g on road, rail, …)						
		R1.4	Vertical corridors						
		R1.6	Platooning - energy efficiency						
		R1.7	Understanding demand patterns and "nudging" demand						
		R1.8	Recycled materials for surface transportation						
		R1.9	Noise Cancellation (acoustic performance)						
	COST-EFFICIENT	R2.1	Construction tecniques						
		R2.2	How to re-purpose assets when the centres they connect are no longer relevant.						
		R2.3	Automatic status / maintenance needs detection for bridges and tunnels	Information to corridor operator/manager to enhance maintenance and reduce risks					
		R2.4	Multi-user corridors						
		R2.5	Synchro-modality						
		R2.6	Standard components						
	SOCIAL / INCLUSIVE	R3.1	How to adapt for new vehicle technology						
		R3.2	positive impact infrastructure (increase price of building)						
		R3.3	Google cars - people						
		R3.4	Acceptance & approval process of new routes						
		R3.5	Assessment value added for communities"along the way"						
	RESILIENT	R4.1	Avoiding vehicle impact						
		R4.2	Deterioration of long-term assets - how to model to better target maintenance						
		R4.3	Upgradability and decomissioning						
		R4.4	Long tem shift in vehicle types (especially rail)	Future adaptability					
		R4.5	No maintenance infrastructure						
	SAFE / SECURE	R5.1	Evacuation on to tracks						
		R5.2	Platooning of vehicles						
		R5.3	cyber, systems approach - EU standards	pooling efforts					
		R5.4	Automated freight /hyperloop for goods						
		R5.5	Techniques / methods for maintaining 24/7 365 operation						
		R5.6	Route to autonomy-technologies embedded into onfrastructure to aid autonomous vehicles						
INNOVATION 6<TRL<8	GREEN	I1.1	Greening linear infrastructure						
		I1.2	Hydrogen Infrastructure						
		I1.3	how to design + construct for multiple uses e.g. road/rail embarkment as flood protection						
		I1.4	Electric car - power sources - distributed grids	CO2 decrease					
		I1.5	low carbon materials						
		I1.6	Inductive fast charging while driving						
	COST-EFFICIENT	I2.1	Standard condition assessment e.g. highways/rail/flood protection						
		I2.2	Intelligent signs, removal of sign for in-vehicle information systems						
		I2.3	Intelligent infrastructure						
		I2.4	LOGISTICS / HYBRID MACHINES						
		I2.5	Remote condition assessment techniques						
		I2.6	Integration of multiple scales of data to monitor performance (e.g. radar with sub-surface pant sensors)						
	SOCIAL / INCLUSIVE	I3.1	Communication with travelling public-informed traveller						
		I3.2	inductive chaging integration						
	RESILIENT	I4.1	Critical nodes & interchanges & diversions						
		I4.2	Remote monitoring of condition in use						
		I4.3	Data Communication networks coupled with corridors	Get info through sensors on all sections of corridors					
		I4.4	Cloud Nvigation - intelligent re-routing						
	SAFE / SECURE	I5.1	Autonomy - platooning	User error elimination - adapting autonomous and user interaction					
		I5.2	Drone-based maintenance	Ease of maintenance, incease safety of infra					
DEPLOYMENT 8<TRL		D1	Better communication especially delays						
		D2	BRT systems for connecting center+suburbs						
		D3	Bike highways						
		D4	Wind (microturbines)						
		D5	Solar panels on side of infrastructure						
		D6	Connectivity of vehicle						
		D7	Pollution - Nox						
		D8	Asset monitoring / smart infrastructure						
		D9	Hard shoulder runninng troughout whole EU network						

PRIORITY AREA D: SYSTEMIC APPROACH		ID	Scope	Impact	Barriers	Budget €	Timeline	Scale	Comments
RESEARCH TRL<5	GOVERNANCE	R1.1	Skills focused so far on "offer" side, but it is needed some "demand" - client - side						
		R1.2	BIM - Condition awareness						
	COMMUNICATION	R2.1	interdependences & vulnerabilities						
		R2.2	Artificial intelligence (autonomous decision-management)						
	FINANCIAL	R3.1	ownership &						
		R3.2	real performance based maintenance - remote sensing						
	LEGAL / STANDARD	R4.1	Codes: lack of multimodal standards and tools related to multihazard resilience	Improved, efficient interfaces between different modes at transhipment points for achieving seamless transport.					
		R4.2	RAG standards/codes, specifications to encourage innovation: Red (mandatoy, few) , Amber (advisory, some), Green (suggested, most)						
		R4.3	Regulation						
	RISKS / INTERDEPENDENCIES	R5.1							
		R5.2							
INNOVATION 6<TRL<8	GOVERNANCE	I1.1	How we travel - TSC study-Times?						
		I1.2	Advanced capability of experienced construction project managers. European school for client-side infrastructure commissioners						
	COMMUNICATION	I2.1							
		I2.2							
	FINANCIAL	I3.1	contract forms / risk ownership						
		I3.2	New business models	mobility as service					
		I3.3	Whole life time costs						
	LEGAL / STANDARD	I4.1	Distinguish between standards & regulations						
		I4.2							
	RISKS / INTERDEPOENDENCIES	I5.1							
		I5.2							
DEPLOYMENT 8<TRL		D1							
		D2							
		D3							
		D4							
		D5							

Urban mobility				
Technologies / research needs	Notes	KPIs	metrics	Challenges
Electrification - inductive technologies and energy harvesting	Energy harvesting from regenerative braking, driving asset management remote condition monitoring (MEMS sensors). Automation of freight, autonomous vehicles and the impacts on infrastructure requirements, linked to changes in rail sector through ETCS.	tbc	All scales, short time, low cost	Deployment issues and organisational bounaries. How does transport infrastructure sit into the new emerging decentralised energy system (energy vectors into cities)?
Modular and multi-functionality	Highways as energy and communication corridors too. Robotics and self-maintaining assets. Environmental Product Declarations (EPDs) and material passports for components and structures	tbc	Local, long term	Risk averseness of transport infrastructure sectors. Converting / retrofitting existing infrastructure. Short 'possession' times to undertake retrofit / refurbishment. Driver of circular economy in its infancy
Interdependencies across infrastructure	Weather data and information on system impacts. Passenger information and end-to-end journey planning, last mile logistics. Data security and cyber threats	tbc	Long term	Policy and regulation, harmonisation of platforms.

Multi-modal hubs				
Technologies / research needs	Notes	KPIs	metrics	Challenges
Vertical hubs - business model	High value of land above and below ground, squeezing footprint. Multi-functional spaces.	tbc	High cost, long term	Technical challenges, expectations of developers (eg existing retail alongside)
Designing resilient hubs	Structures, materials, predictive analytics using BIM models, visualisations. Adaptive structures. Accessibility, behaviour, lifestyle changes. Ticketless barriers, blast resilient materials. Integrated cycling infrastructure. Multi-functional electrical charging, and energy harvesting	tbc	Short term projects	Existing infrastructure constraints - eg drainage issues. Understanding behaviour of structures. Concentrating energy, communication infrastructure, and people in small spaces. Digitisation of design and construction introduces cyber risk (BIM models)
Network of apps				Competition - lack of data sharing

Long distance corridors				
Technologies / research needs	Notes	KPIs	metrics	Challenges
Multi-use corridors	Stacked roads on railways. Invisible design seamless with landscape. Concealed, attractive, silent. Use of energy generated in braking. Climate resilient corridors (drainage, flooding, snow)	tbc	Medium scale, high cost, regional, longer term	Majority of issue is existing infrastructure. Cost and ownership barrier. Desire to coordinate with electricity and other utilities but complexity of organisations involved.
Whole life asset management	Retrofit / renewal vs ongoing maintenance. Zero maintenance vegetation. Benefit model (energy, communications, mobility, social benefits).	tbc	Moderate cost, mid-term, national and European scale	Need for communication of innovation between transport operators. Data barriers, business models and ownership of data.
Condition aware infrastructure	Optimising renewal / maintenance cycles. Predicting durability and asset deterioration. Aggregating datasets to make better predictions. Access to best data	tbc	Local (multiple operators sharing data), moderate cost, short term	Reliability of data and cost involved upgrading all existing infrastructure into 'smart infrastructure'
Self healing and other innovative materials and components	Additive manufacturing for self-healing and modular materials and components. Linked to specific call within SHIFT2Rail. Lightweight	tbc	High cost, medium term, regional	Standards and design codes - holding back emergence of additive manufacturing applications in transport infrastructure
Climate resilient infrastructure	Climate change adaptation, material resilience (eg de-icing), business continuity, transport planning and emergency planning.	tbc		Understanding the cascading impacts and where to set boundaries for systems research.

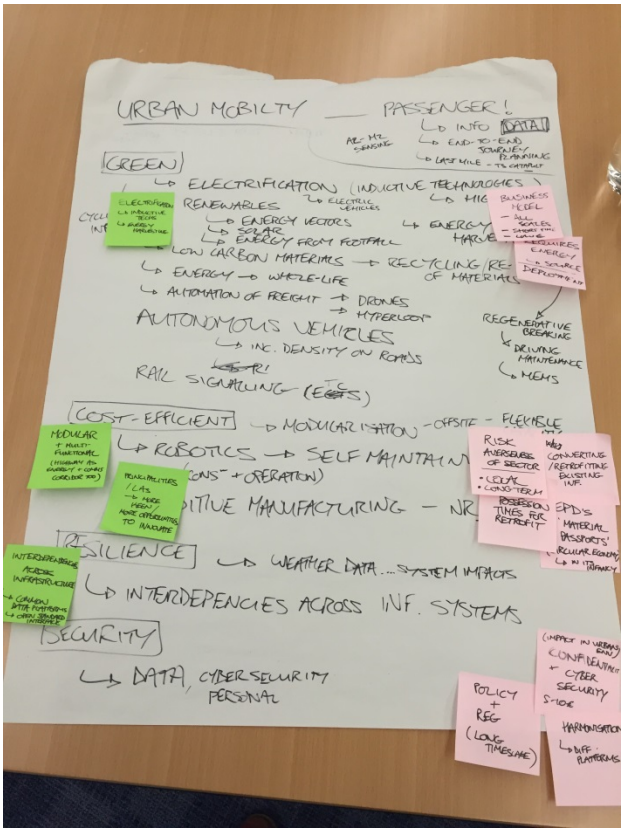
Systemic				
Technologies / research needs	Notes	KPIs	metrics	Challenges
Common performance metrics	Whole life performance, not just lowest cost procurement. London Underground Bank station refurbishment example - demand capacity (rather than supply side)	Procurement focussed on outcomes and TOTEX, not simply CAPEX	Medium term, medium cost, national scale	Procurement as a barrier (least cost normally selected). Mobility as a service is not considered in procurement. Resilience not considered sufficiently in procurement
Condition aware infrastructure for life extension	vehicle to vehicle (V2V) sensing, vehicle to infrastructure (V2I) sensing, remote condition monitoring	tbc	Short term, low cost, national scale	Accuracy of data
Cross-modal asset management (whole-life)	Predictive engineering from BIM / AIM	tbc	Short term, low cost, national scale	More than 1 authority for long distance corridors (eg rather than just TfL for urban mobility)
Research into future skill requirements	Client understanding. Pipeline of projects - network of major project clients across Europe (building on UK group of Crossrail, HS2, Thames Tideway via Major Projects Association	tbc	tbc	Lack of published pipeline of major projects across Europe. Lack of coordinated future skill plans across transport modes and across Europe
Resilience throughout lifecycle	Resilience to natural hazards and future climate change risks, interdependencies between transport modes and with energy/water sectors. Uncertainty in predictions.	tbc	Short to medium term, high cost, all scales	Understanding hazards, vulnerabilities and risks.
Performance based standards	Interoperability - building on TSIs developed in rail sector. Overhaul of codes / specifications / standards	tbc	Longer term deployment, shorter term research	Different levels of maturity in different European Union member states

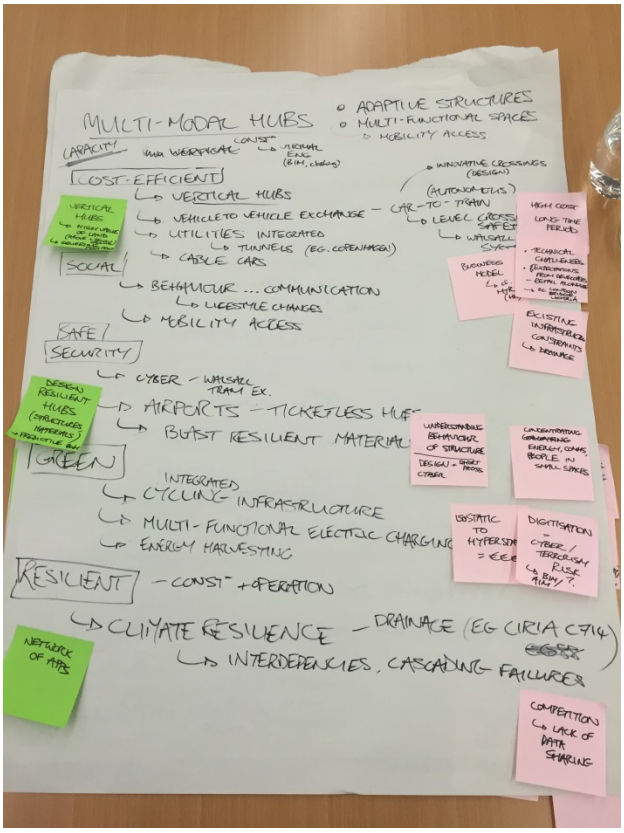
CONCLUSIONS

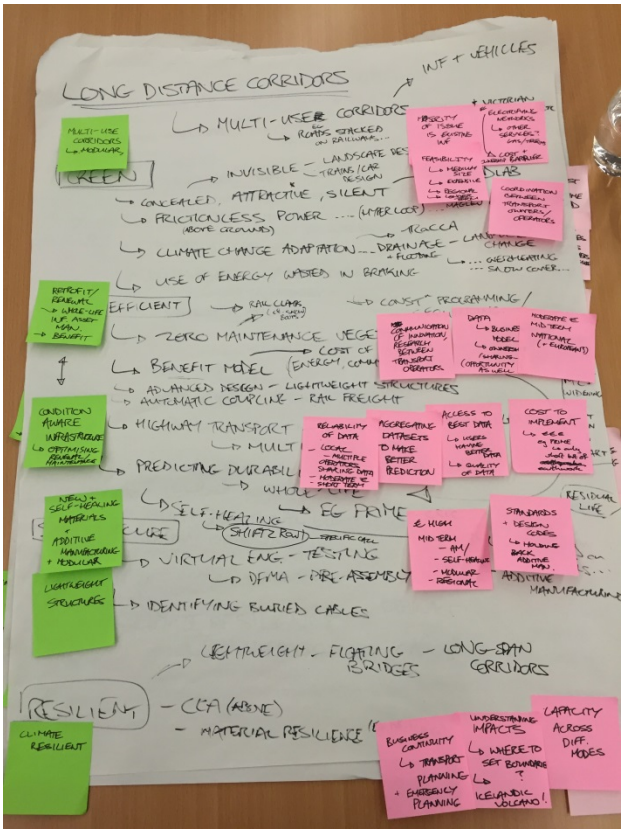
All contributions gathered in the two workshop sessions, will be used, among other activities, for the collection of specific actions regarding with research needs taking into account the framework previously defined in D3.1REFINET multi-modal transport infrastructure (RMMTI) model and the identified four priority areas (URBAN MOBILITY, MULTIMODAAL HUBS, LONG-DISTANCE CORRIDORS and SYSTEMIC APPROACH).

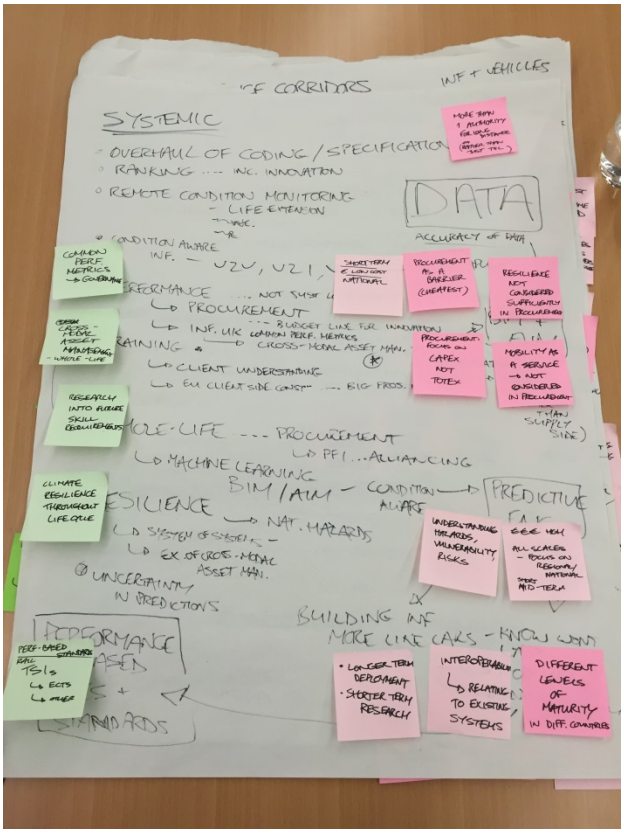
The specific actions and priority areas will structure the research and development needs to improve the future of European multimodal transport infrastructure and to strengthen the specific performances, which had already been defined in REFINET multimodal transport infrastructure framework in order to contribute the achievement of High Level Service Infrastructure.

Figure 7. Photos from the workshop in London


URBAN MOBILITY — PASSENGER!
GREEN
ELECTRIFICATION
RENEWABLES
ENERGY VECTORS
SOLAR
LOW CARBON MATERIALS
AUTONOMOUS VEHICLES
RAIL SIGNALLING
COST-EFFICIENT
MODULARISATION
ROBOTICS
SELF MAINTAIN
RESILIENCE
WEATHER DATA ... SYSTEM IMPACTS
INTERDEPENCIES ACROSS INF. SYSTEMS
SECURITY
DATA, CYBERSECURITY
PERSONAL
POLICY + REG (LONG TIMESCALE)


MULTI-MODAL HUBS
ADAPTIVE STRUCTURES
MULTI-FUNCTIONAL SPACES
MOBILITY ACCESS
COST-EFFICIENT
VERTICAL HUBS
VEHICLE TO VEHICLE EXCHANGE
UTILITIES INTEGRATED
CABLE CARS
SOCIAL
BEHAVIOUR ... COMMUNICATION
LIFESTYLE CHANGES
MOBILITY ACCESS
SAFE
SECURITY
CYBER - WHOLE TRAM EX.
AIRPORTS - TICKETLESS HUB
BLAST RESILIENT MATERIAL
GREEN
INTEGRATED CYCLING INFRASTRUCTURE
MULTI-FUNCTIONAL ELECTRIC CHARGING
ENERGY HARVESTING
RESILIENT
- CONST° + OPERATION
CLIMATE RESILIENCE - DRAINAGE (EG CIRIA C716)
INTERDEPENCIES, CASCADING FAILURES


LONG DISTANCE CORRIDORS
INF + VEHICLES
MULTI-USER CORRIDORS
GREEN
INVISIBLE
CONCEALED, ATTRACTIVE, SILENT
FRICTIONLESS POWER
CLIMATE CHANGE ADAPTATION
USE OF ENERGY WISELY IN BRAKING
EFFICIENT
ZERO MAINTENANCE
BENEFIT MODEL
ADVANCED DESIGN - LIGHTWEIGHT STRUCTURES
AUTOMATIC COUPLING - RAIL FREIGHT
HIGHWAY TRANSPORT
PREDICTING DURABILITY
SELF-HEALING
VIRTUAL ENG. - TESTING
DFMA - PRE-ASSEMBLY
IDENTIFYING BURIED CABLES
LIGHTWEIGHT - FLOATING - LONG-SPAN BRIDGES
CORRIDORS
RESILIENT
- CCA (ABOVE)
- MATERIAL RESILIENCE
CLIMATE RESILIENT


INF CORRIDORS
INF + VEHICLES
SYSTEMIC
OVERHAUL OF CODING / SPECIFICATION
RANKING ... INC. INNOVATION
REMOTE CONDITION MONITORING
- LIFE EXTENSION
DATA
ACCURACY OF DATA
CONDITION AWARE INF.
PERFORMANCE ... NOT SYSTEM
PROCUREMENT
INF. UK COMMON PERF. METRICS
CROSS-MODAL ASSET MAN.
CLIENT UNDERSTANDING
WHOLE-LIFE ... PROCUREMENT
MACHINE LEARNING
PFI ... ALLIANCING
BIM / AIM - CONDITION
RESILIENCE
NAT. HAZARDS
SYSTEM OF SYSTEMS
EX. OF CROSS-MODAL ASSET MAN.
UNCERTAINTY IN PREDICTIONS
PREDICTIVE
PERFORMANCE BASED
STANDARDS
BUILDING INF MORE LIKE CARS - KNOW WHY
LONGER-TERM DEPLOYMENT
SHORTER-TERM RESEARCH
INTERCHANGEABLE
RELATING TO EXISTING SYSTEMS
DIFFERENT LEVELS OF MATURITY IN DIFF. COUNTRIES

REFERENCES

- reFINE Initiative document: *"Building up Infrastructure Networks of a Sustainable Europe – Strategic targets and expected impacts"- October 2012.*
- *Deliverable 3.1: Definition of the REFINET multi-modal transport infrastructure (RMMTI) model*

Annex 3: Conclusions of the workshop held in Rome (26th OCTOBER 2016)

The below gives a number of early outputs from the WP4 workshop held in Rome on 26th October 2016. Participants (listed below) were sent a week before the event a preparation document in which the main outputs of WP3 (Vision & RMMTI model, SIP) and WP4 (Deployment strategy) were presented and questions (see below) were asked for them to come ready on the day of the workshop.

List of participants:

Participant	Company	Country
Claudia de Stasio	TRT TRASPORTI E TERRITORIO srl	Italy
Wolfgang Steinicke	Eurnex	Germany
Livia Pardi	Autostrade Italiane (P)	Italy
Federico Di Gennaro	Aiscat (T)	Italy
Valentina Ranucci	(T/P) Rete Ferroviaria italiana	Italy
Martin Lamb	Maple-Consulting	UK
Ad van 't Zelfde	BAM	Netherlands
Dan Costescu	Former Minister of Transportation CN CFR SA (Romanian railway infrastructure manager) Director of Strategy and Regulation	Romania
Roxana Proca	PM/Investments Sector -National Railways Company CFR-S.A	Romania
Klaus Luetjens	Head of Department, Air Transport Operations and Infrastruct, DLR	Germany
Piero Vendittelli	Rai - Radiotelevisione Italiana S.p.A.	Italy
Alain Zarli	CSTB	France
Savina Carluccio	ARUP	UK
Jesús Rodriguez	PTEC,	Spain
Jon Aurtenetxe	TECNALIA	Spain
Miguel Segarra	DRAGADOS	Spain
Thierry Goger	FEHRL	Belgium
Clemente Fuggini	D'Appolonia	Italy
Célia Gavaud	D'Appolonia	Italy
Simone Genta	D'Appolonia	Italy
Eric Bessmann	IFFSTAR	France
Jesus Isoird	Tecnalia	Spain
Johan Marigny	UIC	France

Scope of the Workshop and Agenda

Scope: Discuss the strategy for the deployment of the REFINET Strategic Implementation Plan (SIP)

REFINET aims at identifying future research needs and at supporting the technology transfer and mass-market deployment of existing innovative technologies, such as materials, components, systems and processes to support Transport Infrastructure (TI) modernisation using a multimodal approach to TI investment decisions, especially for what concerns urban mobility, multimodal hubs and long-distance corridors. To achieve both objectives, REFINET offers a number of solutions enabling decision-makers to carry out an integrated evaluation and selection of projects and programs.

The REFINET solutions banks on the "High Level Service Infrastructure" (HLSI) framework, being based on the implementation ofthe "Multi-Modal Transport Infrastructure" (RMMTI) model defined in the project. The RMMTI model, filled in with a catalogue of Best Practice a High-Potential Technologies, is the kernel of the REFINET Geo-Clustering Platform, that can be used as a tool for multimodal transport infrastructure decisions on investments and future priorities. The project outcomes solutions are now to be disseminated through a deployment strategy to help stakeholders (e.g. Decision and Public Bodies, Members States Ministries, The European Commission, Infrastructure Managers and Operators, etc.) make informed decisions and identify the technologies they need to improve their TI or the network overall. As part of a series of two workshops for the deployment of the REFINET SIP, the first event to be held on 26 October by D'Appolonia, leader of the Deployment of the REFINET Strategy, will be the occasion to discuss the deployment strategies with a number of experts including Infrastructure Managers. Feedback will be gathered during dedicated interactive sessions enabling the co-creation of the strategy and ensure its effective deployment. We look forward to getting your feedback!

9:45	Welcome & roundtable	Clemente Fuggini, D'Appolonia
10:00	REFINET project presentation • The rationale behind the 3 CSAs: FOX & USE-IT & REFINET • Opportunity for clustering activities for dissemination • REFINET project presentation	Alain Zarli, CSTB
10:20	Presentation of the REFINET Strategic Implementation Plan (SIP) & REFINET Vision	Jesus Isoird, Tecnalia
10:50	*Coffee break*	
11:10	Presentation of the Deployment Strategy (DS) for the SIP • A focus on Italy and Romania • The role of experts in the deployment strategy Overview of the REFINET Geo-Clustering Platform	Clemente Fuggini & Célia Gavaud, D'Appolonia
12:00	Italian Highway Network: a challenging scenario	Aiscat
12:20	Developments in the Romanian rail system	CFR-SA
12:40	*Lunch*	
13:45	Workshop session: Deployment Strategy Discussion	**Session #1:** 13:45-14:45 SIP deployment with a focus on the Italian and Romania Cases Study Facilitator: D'Appolonia **Session #2:** 14:45-15:45 REFINET Geo-Clustering Platform Facilitator: D'Appolonia
15:45	Debrief and Wrap-up	Clemente Fuggini, D'Appolonia
16:00	*End of event*	

Workshop Preparation Document

As said, a document was prepared and sent in advance to the workshop to the participants in order to clarify the workshop objectives, to provide them clear and synthetic material to raise their awareness and expectations and to let

them start thinking at the questions that have been formulated during the workshop. The content of page1 provided below. The document is available for consultation.

SIP & DEPLOYMENT OF THE SIP WORKSHOP PREPARATION DOCUMENT

Executive summary

REFINET has two main streams of work:

1. **Identifying future research topics** in the area of Transport Infrastructure (TI) based on an analysis of the current existing technology offer and the future demands and relay that analysis to policy makers.
2. **Supporting TI managers in identifying solutions to their current needs by enabling the transfer of existing and incoming innovative technologies**, such as materials, components, IT systems and processes, etc. to support Transport Infrastructure (TI) update/modernization.

REFINET uses a multimodal approach to TI investment decisions, especially for what concerns **urban mobility, multimodal hubs and long-distance corridors.** To achieve both objectives, REFINET offers a number of **solutions** enabling decision-makers to carry out an integrated evaluation and selection of projects and programs. The REFINET solutions banks on the "High Level Service Infrastructure" (HLSI) framework, whose operation translation is by means of the "Multi-Modal Transport Infrastructure" (RMMTI) model defined in the project. The RMMTI model, filled in with a catalogue of Best Practice a High-Potential Technologies, is the kernel of the REFINET Geo-Clustering Platform, that can be used as a tool for multimodal transport infrastructure decisions on investments and future priorities. The project outcomes are now to be disseminated through a **deployment strategy** to help stakeholders (e.g. Decision and Public Bodies, Members States Ministry, The European Commission, Infrastructure Managers and Operators, etc.) make informed decisions and identify the technologies they need to improve their TI. The workshop in Rome will focus on the **second stream**.

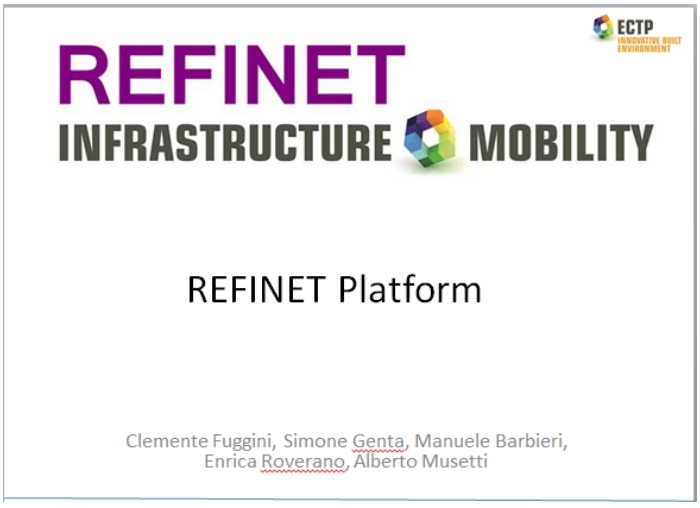
Presentations screenshots:

1. Main presentation

2. REFINET Vision & SIP - Tecnalia

3. REFINET Strategy for the Deployment of the SIP - D'Appolonia

4. REFINET Platform, D'Appolonia



5. State of Italian Motorway - AISCAT (Italian TI Representative)

6. State of Romanian Railway - CFR (Romanian TI representative)

7. Workshop session

Workshop questions:

Dear Participant,

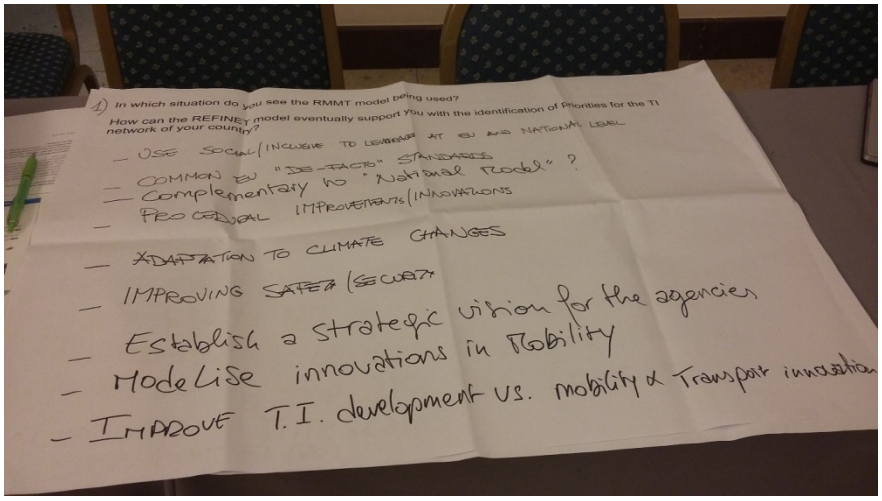
Please start thinking of your answers to these questions now. They will be asked to you specifically during the morning session of the workshop in Rome. Your answers will be collected before lunch and will serve as input during the afternoon:

1. In which situation, given your role and your knowledge of the TI in your country, do you see the RMMT model being used? How can the REFINET model eventually support you with the identification of priorities for the TI network of your country?
2. Do you see the REFINET Platform being useful to you to support strategic planning decisions? And if so how? What type of data/information/parametres would you need to see used in the tool?
3. Can the two H2020 instruments Pre-Commercial Procurements and Public Procurement of Innovation and similar instruments be (or become if their conditions were to be improved) useful instruments to facilitate the deployment of existing or incoming technologies? (https://ec.europa.eu/digital-single-market/en/public-procurement-innovative-solutions)

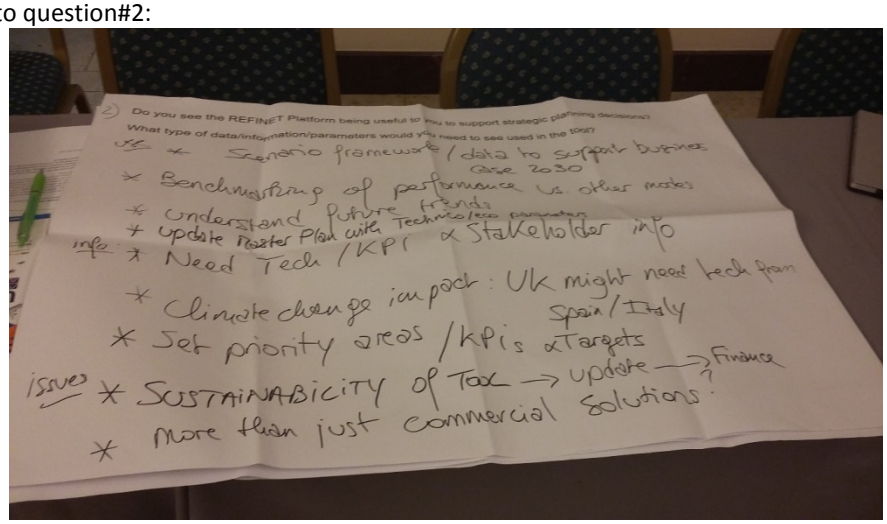
Workshop pictures:

Workshop Answers to Questions

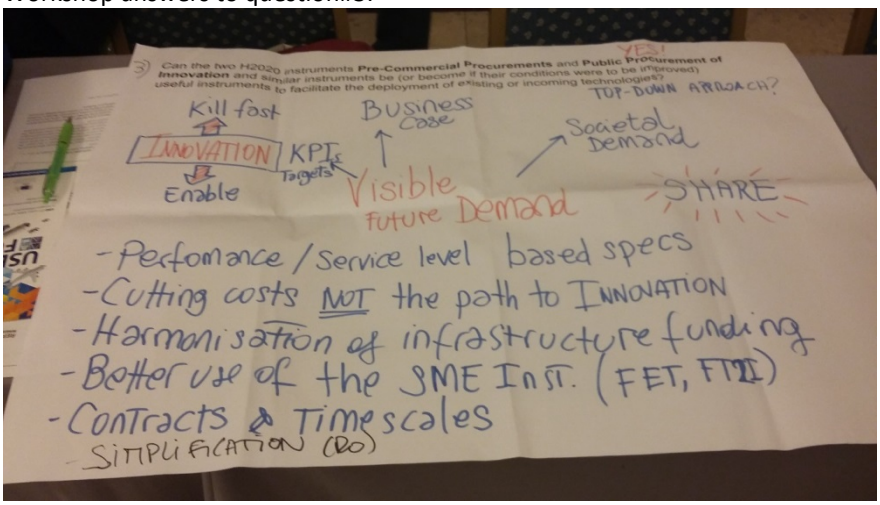
Workshop answers to Question#1:



Workshop answers to question#2:

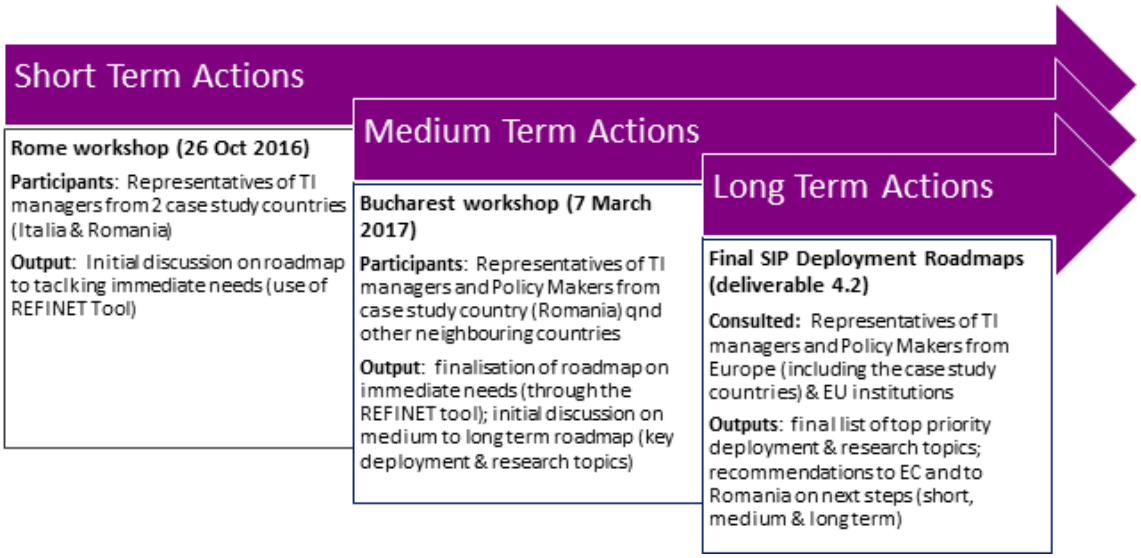


Workshop answers to question#3:



Annex 4: Conclusions of the workshop held in Bucharest (26th OCTOBER 2016)

On 7th and 8th March 2017 in Bucharest, Romania, REFINET held its second STRATEGIC IMPLEMENTATION PLAN (SIP) & DEPLOYMENT OF THE SIP WORKSHOP to continue discussing the future of Transport Infrastructure over a day and a half of high-level exchanges between experts in the field. The workshop was entitled: *From short to long-term research & deployment priorities, leveraging the REFINET SIP in Romania and extending it to Eastern Europe*. This stemmed from the fact that a first workshop had been held in October 2016 to open the dialogue with key REFINET stakeholders on the deployment of the project results including the SIP itself. The deployment strategy continues; hereafter is an overview of its major steps:



Deployment Strategy of REFINET solutions

A **first workshop** was held in October 2016 in Rome to present a proposed deployment strategy and discuss it with 24 invited experts. By the end of the discussions, the representatives of the Transport Infrastructure managing authorities of two REFINET case study countries, Italy and Romania; Austostrade per l'Italia, AISCAT (Italian Association of Toll Motorways and Tunnels Operators) and RFI (Italian Railway Infrastructure Manager) for Italy; CFR S.A. (Romanian Railway Infrastructure Manager) for Romania both confirmed their interest in being actively involved in the next steps of the short-term deployment strategy as well as in providing data and information for the validation of the REFINET Platform. A dialogue between these organisations and REFINET was therefore initiated and a plan for collection of input defined.

A **second workshop** was then held in Bucharest on 7th and 8th March 2017 with a twofold aim (the proposed agenda of the workshop can be found below):

1. present the results of the collaboration with the two case study countries to date and finalise **the short-term roadmap** approach as illustrated by the Romanian case study
2. start exploring the **medium to long-term** roadmap timescale, starting from the Romanian case study, aiming at feeding information to Policy Makers, Public Bodies and Members States Authorities on future research topics.

30 participants from 20 organisations attended the workshop, most of them from Romanian Infrastructure Management authorities and ministries. In advance of the workshop, participants were sent a briefing document including the latest list of R&I topics to be discussed and analysed at the workshop (afternoon of Day#1 session). Representatives of European

associations and of other national organisations involved with TI from Slovenia, Italy and Spain were also present. The two days were structured as follows:

- *Morning of day#1*:
  - Update on the Deployment Strategy for the SIP through Romanian Railway case study and presentation of progress on the REFINET TI-TechMapper (Geo-Clustering) Platform;
  - Discussions on the roadmap for deployment of the SIP in Romania – short to medium term perspective: questions asked to the Romanian CFR stakeholders included: what could be the next steps for the collaboration? What could be CFR's use of REFINET in the short to medium-term? What are their expectations? The debate was then extended to how to deploy the SIP to other modes and to multimodal TI at a regional, Eastern European dimension and later on at a European dimension. Questions asked to the audience included: As far as you can imagine, how could the REFINET Geo-Clustering tool be used in your case? For which purpose (e.g. planning, identification of promising innovations, identification of relevant R&D projects in the field, etc.)? In that case what data would you want included? How do you see its extension from rail to other transport modes (e.g. road, maritime, etc.)? How do you see its extension from Romania to other neighbouring countries?
- *Afternoon of day#1*:
  - Workshop session: Deployment Strategy Discussion – Identification of Research, Development and Innovation Priorities and Topics in the medium to long term, identifying and analysing technological demands of the new and existing transport infrastructure.
  - Debrief and Wrap-up; Information about the REFINET final event at FIRM17
- *Morning of day#2*: Discuss tangible opportunities for collaboration in the scope of REFINET. A round table of two-hours was organised to continue discussing with representatives of the REFINET network members and end-user community (e.g. stakeholders in the transport sector including Infrastructure Managers, Operators, Transport Solutions Supplier, Local and National Organizations, etc.). Discussions targeted how to better exploit the outcomes of the project and to identity opportunities for collaboration in joint initiatives in the form of Public Private Partnership, European Innovation Partnerships or any other Joint Undertaking (e.g. Structural Funds, CEF, etc.) or H2020 tool to be later proposed to deciding bodies (EC, member states, industry, etc.).

From the proceeding of the workshop, an overall roadmap of deployment for the REFINET solutions in the context of European Transport Infrastructure and a more specific roadmap focusing on Romania is being prepared. It will be finalised in a public deliverable at the end of REFINET (April 2017). In parallel, a wider consultation of selected members of the REFINET community is taking place to produce a final list of topics which will be recommended as high priority research and deployment actions to key stakeholders, including the European Transport Technology Platforms, Innovation and Networks Executive Agency (INEA) in charge of the CEF agenda and the European Commission (DG-MOVE primarily).

Highlights of the discussions held in Bucharest

1. *REFINET Romanian CFR case study*

Since the October 2016 Rome workshop the Căile Ferate Române (CFR[3]), the national train operator in Romania serving the 22,247km of track, has become a central partner for the development of the short-term deployment roadmap of REFINET, consequently setting railway as the first of the four transport modes to be explored as part of the work on the deployment roadmap. D'Appolonia, leader of the activity related to the deployment, has since collected input from CFR which directly fed into the TI-TechMapper Platform of REFINET, thus enabling the development of scenarios to help understand how the Platform can be leveraged by its users. At the Bucharest workshop, CFR represented, continued sharing contributions regarding their expectations of the use of the tool (e.g. priority needs to projects and programmes

[3] http://www.cfrcalatori.ro/

targeted at European corridors (CEF), the collection of data needs to be extended to other EU countries or neighbouring countries such as Ukraine and Moldova, etc.). During the workshop it was also discussed that AFER, the specialized technical body of the Romanian Ministry of Transports, could be the next Romanian stakeholder involved in sharing information also on the railway case study but from the standard and regulation angle.

2. *Opening the REFINET Deployment Case study to other modes:*

As explained above, the first transport mode specifically studied as part of the REFINET deployment strategy is rail in the Romania context. At the Bucharest workshop participants, coming from all transport modes, discussed the rationale behind opening the study to other modes of transport or to multimodal TI, first at a regional, Eastern European dimension and later on to a European dimension. In that context, the Representative of the Ministry of Transport expressed his interest in promoting the tool at events organised by the Ministry to the various operators to showcase the REFINET Platform. Participants from Bucharest airport on the other hand explained that they are involved in discussion regarding multimodal access to the airport which has already lasted for many years due to change in political support, lack of authorisation and difficulties with expropriation issues. Their input into the Platform could be very relevant but may be given at a later stage. On behalf of Romanian Waterways BCPC explained that for it to be useful to them the tool must include past projects and information about future calls to enable improvements of navigation on the Danube and the missing link between Bucharest and the Danube. The benefits of using waterways versus other modes should also be emphasised. Finally, participants floated the idea that joint procurement as way to structure R&I activities could be included to the Platform to enable transnational collaboration between TI policy makers or managers. An example of joint procurement between Slovenia and other South Eastern European partners was given by the participant from Slovenia, Prometni Institute[4]. Participants suggested that information regarding the current pre-commercial procurement programme of the European Commission – which supports the transfer and adaptation of innovative solutions – could be added to the Platform.

3. *Workshop session: Deployment Strategy Discussion – Identification of Research, Development and Innovation Priorities and Topics in the medium to long term*

In parallel to the short-term roadmap for the deployment of the REFINET SIP, a medium to long-term approach (from 8 to 20 years) is being developed to relay information to Policy Makers and Public Bodies (including Transport Authorities) about future strategic research topics in TI based on an analysis of the current existing technology offer and the future demands. To achieve this result, the REFINET "research needs" matrix has been developed to collect information in order to help prioritise investments in R&D in three Transport Network Pillars – i.e. urban mobility, multimodal hubs and long-distance corridors – and in a fourth systemic dimension transversal to the whole TI sector. The matrix filters priorities by TRL levels and gives for each of them critical information on scope, impact, costs, timeline, scale and any further comments which can help a user in prioritising.

To prepare for the workshop the matrix was circulated to all participants a week ahead. At the workshop, itself participants were split into two groups; each group worked on two of these pillars to discuss the proposed topics, identify any missing topics in an effort to help refine the final short list which is to be used as part of the long-term roadmap for the deployment of the REFINET SIP. Participants were also asked to select their top three priority topics for immediate lobbying with the relevant institutions to ensure these topics are integrated into either the final H2020 research & development work programme or in the first work programme of FP9. The list of refined topics is being produced right now and will be presented at the final REFINET conference as part of FIRM event on 5th April.

[4] http://www.prometni-institut.si/

Participants list

No	Organisation	Country
1	Ministry of Transport	Romania
2	CNAB, Bucharest Airport	Romania
3	CFR, Railways	Romania
4	AFER, Railways	Romania
5	CNAIR, Roads	Romania
6	BCPC consulting, representing Romanian waterways	Romania
7	UTCB, Technical University Bucharest	Romania
8	PROMETNI-INSTITUT	Slovenia
9	S&T ROMANIA	Romania
10	D'Appolonia	Italy
11	FEHRL	Europe
12	VALAHIA University of Targoviste	Romania
13	PTEC	Spain
14	UIC	EU
15	TECNALIA	Spain
16	GSGROUP	Romania
17	SEAMILANO, Milan airports	Italy
18	ARUP	UK
19	EURNEX	Europe
20	CONFIMA Consulting (expert in ERDF)	Romania

Figure 918 - Introduction to the Bucharest workshop by FEHRL

Figure 10 - PTEC calls for partners contributions to the newsletter at the REFINET Bucharest workshop

Figure 11 - Participants debrief after the afternoon workshop in Bucharest - 1

Figure 12- Participants debrief after the afternoon workshop in Bucharest - 2