



REFINET

REthinking Future Infrastructures NETworks

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Project coordinator



Partners

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ARUP



DRAGADOS



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PRESENTATION

This is Newsletter No.3 of REFINET Coordination Support Action, funded by EC within MG 8.1 Mobility for Growth at H2020.

CSTB (coordinator), Arup, D'Appolonia, Dragados, FEHRL, PTEC, Tecnia and UIC are members of this CSA.

The dissemination and communication activities with experts and stakeholders of the REFINET network are coordinated by PTEC.

During the second year of REFINET, several dissemination activities are planned as the following ones:

- News at REFINET web www.refinet.eu
- News at REFINET LinkedIn group <https://www.linkedin.com/groups/8464241>
- Publication of three newsletters, including this one
- Two workshops with partners and REFINET experts
- Three public events (November 2016 at ECTP conference, January 2017 at TRB and April 2017 at FIRM)

This Newsletter includes four sections:

- **REFINET progress** in WP 3 on Defining the vision and the Strategic Implementation Plan, by Tecnia, Dragados and Arup, and in WP4 on Deploying Strategic Implementation Plan by D'Appolonia.
- Innovation activities on transport infrastructures within **REFINET community**, with contributions from Cemos.
- **Coordination with projects and networks** with a summary of the invited session at TRA2016 on Refinet, Fox and Use-it, the launching of ECTP Infrastructures & Mobility committee and REFINET at PTEC conference.
- **News** on R&I in transport infrastructures.

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REFINET PROGRESS

REFINET workshop on Multi-modal transport infrastructure model

Last March, the workshop was held on ARUP headquarters in London, regarding to the development of the Strategic Implementation Plan (SIP).

The aim of that workshop was to gather valuable information from REFINET experts' network in relation to technological demands on transport infrastructures, and in order to involve them in the discussion of the SIP.

As in previous occasions, the workshop was divided into two sessions, where two main aspects of the Strategic Implementation Plan were considered: R&D challenges and Technology priority areas for the European multimodal Transport in the morning session and the scope, barriers and timeline for implementation of research priorities for the European Multimodal infrastructure in the afternoon session.

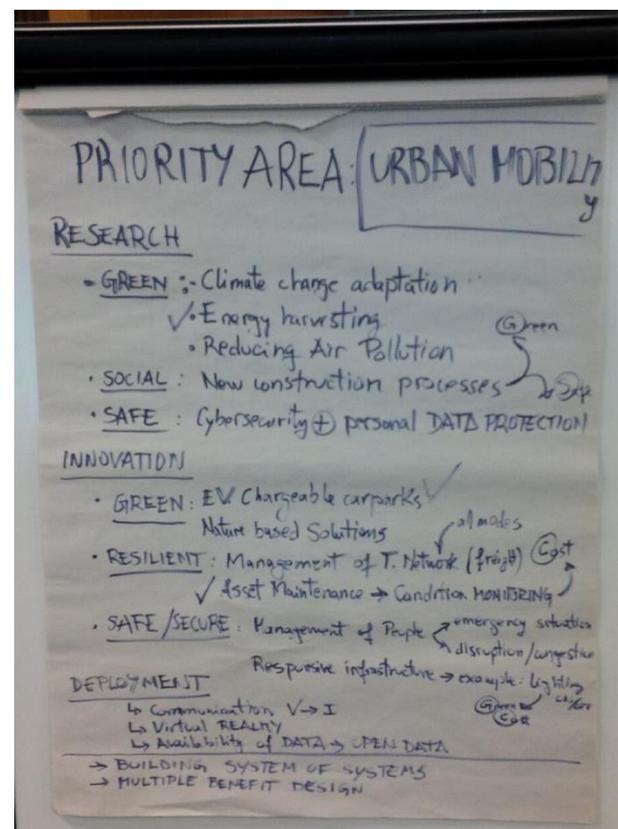


The participants from REFINET expert network were from a variety of organisations (universities, research centres, SMEs and

large companies), which REFINET consortium could gather inputs from different perspectives.

As result of the interaction among experts and the workshop, different technological demands were identified and classified in four priority areas (urban mobility, multimodal hubs, long distance corridors, and systemic approach) and linked at the same time to the five performances which in REFINET multimodal Transport Infrastructure Model had been defined (RMMTI Model) previously: Green, Cost-efficient, Social/inclusive, Resilient and Safe/secure.

And three categories of TRL have been defined for each priority area: "RESEARCH TRL<5", "INNOVATION 6<TRL<8" and "DEPLOYMENT 8<TRL".



One of the working documents of the workshop sessions.

Moreover, the scope, barriers and timeline of those identified specific actions were outlined. This information is being very important to the writing of the Strategic Implementation Plan, which is expected to be finished by end of July.

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Collection of Best Practices and analysis of available technologies

As announced in the newsletter No.2, REFINET has carried two tasks regarding the collection of best practices and analysis of available technologies in design, construction and maintenance of transport infrastructures. The collection and analysis are necessarily non-exhaustive given the ample field of expertise and technology that is intended to be covered. However, in the case of best practices the distinguishing characteristic is that they have been widely used in practical industrial experience in most cases. This means the practices provide a bottom line for the preparation of roadmapping activities as they faithfully represent a set of techniques used by the industry in today's infrastructure. At the same time, the practices provide a baseline for improvement of the techniques, as the constraints for their application are also recorded in the template used for the best practices. In addition, the collection provides a practical taxonomy for the classification of the best practices. The taxonomy reflects real-world objects and processes and can therefore be easily applied and extended to further collection of additional practices.

In the case of the analysis of technologies, currently, many of the technologies that are needed to allow evolving the European transport infrastructures toward the REFINET multi-modal transport infrastructure (RMMTI) model are already available in the market or will be available in the next few years, but the sector is not aware about their availability and potential. In order to overcome the gap between "common practices" in design, construction and maintenance of transport infrastructures and the "most sustainable practices" that could be deployed, examples of different technologies being developed and trialled by transport infrastructure clients, and the main engineering companies, contractors and maintenance services providers were collected and categorised.

Relevant examples have been compiled from different sources; by the REFINET partners themselves, by members of the different networks of organisations represented by the partners and by other organizations external to the project partners or their networks such as National Technologies Platforms, and through a review of the main sectorial conferences to detect the most innovative technologies. In practice, the source organisations for the reviewed technologies cover several of the most innovative transport infrastructure clients, infrastructure designers, constructors, operators, manufacturers and suppliers globally as well as notable academia and research centers in their fields of expertise.

The technologies that have been identified cover a broad range of the Technology Readiness Level (TRL) spectrum, and broadly fall into the following categories:

Digital engineering for design and construction, encompassing next generation Building Information Modelling, remote

sensing, virtual reality and augmented reality for more efficient and effective construction.

Digital infrastructure condition monitoring, encompassing smart monitoring and data analytics techniques that are particularly prevalent in the case of renovation and management of existing transport infrastructure assets.

Immersive & augmented reality, including technologies for enhanced visual and audio engagement in both concept design and asset management. Also used in crowd-sourcing design feedback and stakeholder engagement for major projects.

Internet of Things (IoT) technologies, including vehicle to infrastructure (V2I) technologies.



An inspection robot

Nanotechnologies and composites, including paints and other surface coatings as well as Fibre Reinforced Polymers (FRPs).

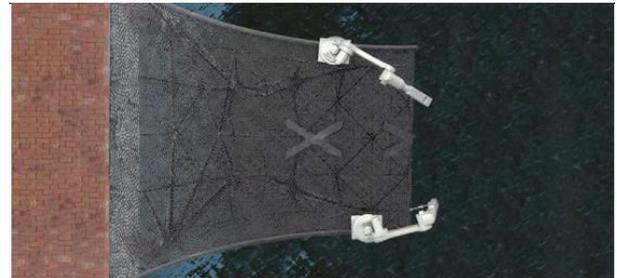
Self-healing materials, such as biologically enhanced concrete.

Drones and satellite applications, which are already widely used currently and the technologies are fast developing – providing ever greater resolution and accuracy of data, for use in design, construction and ongoing monitoring and maintenance.



An example of drone technology

3D printing.



3D printing of a bridge

All in all, more than 200 hundred best practices and technologies have been collected (around one hundred each) providing an overview of where the industry stands today and what could be the path to the future.

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Deploying the Strategic Implementation Plan

As part of the preparatory work done by the Refinet consortium on better understanding the context for a successful deployment of the future Strategic Implementation Plan (SIP), D'Appolonia is leading a series of

exploration activities. The early results of this work has brought forward a number of insights which will be taken into account when drafting the SIP Deployment Strategy and Roadmap, including:

1. The current status of development, disparities and needs for transport infrastructure in the EU28;
2. The current initiatives and programmes aiming at bridging these disparities;
3. And the technologies being investigated currently which could accelerate the process of harmonisation of the quality levels of transport infrastructure across Europe.

1. Hereafter we include some top level facts and figures identified for each of these three areas; they will be fully explored as part of Refinet WP4 Task 4.1.

Whilst exploring the state of development of transport infrastructure in the EU28 (literature search), interesting aspects of innovation performance of the total transport sector¹ – including parameters such as: the share of highly innovative enterprises in transport sector 2010; the average number of patents per year per 100.000 employees (2008-2010); the share of enterprises that have introduced new or significant improved products that were new to the market as share of total population 2010, and the turnover from innovations 2010 – have been uncovered which may help complement a search for specific information around the state of infrastructure per se; this innovation performance analysis shows huge disparities amongst the 28 Member States and could be an essential factor to be taken into account when designing the SIP and targeting the

improved access to innovation for the whole sector including at infrastructure level.



Scores of regions on "innovation achievements" in the total transport sector"

2. The current initiatives and programmes aiming at bridging these disparities include the priority areas under the European Structural and Investment Funds (ESIF) such as those under the European Regional Development Fund (ERDF) including those of the Trans-European Network (TEN – see figure above).

Under ERDF for the Rail infrastructure the following targets have been set for the 2014-2020 period:

RAIL: New

Railway: Total length of new railway line

- Target: 628 km
- In: Poland, Greece, Spain

RAIL: TEN-T new

• Railway: Total length of new railway line, of which: TEN-T

- Target: 571 km
- Greece & Spain

RAIL: Reconstructed

• Railway: Total length of reconstructed or upgraded railway line

- Target: 6 802 km

¹ Source: International Conference on Traffic and Transport Engineering - Belgrade, November 27-28, 2014

- In 16 countries: Slovenia, Lithuania, Croatia, Sweden, Czech Rep, Slovak Rep, Greece, Estonia, Bulgaria, Italy, Romania, Hungary, Latvia, Spain, Poland, Portugal

RAIL: TENC-T Reconstructed

- Railway: Total length of reconstructed railway line, of which: TEN-T
- Target: 4 636 km
- In 16 countries: Slovenia, Lithuania, Croatia, Sweden, Czech Rep, Slovak Rep, Greece, Estonia, Bulgaria, Italy, Romania, Hungary, Latvia, Spain, Poland, Portugal

On the other hand, for the Road, these are the expected ESIF achievements (targets):

ROAD: New

- Roads: Total length of newly built roads
- Target: 3,088 km
- In 14 countries: Slovenia, Lithuania, Croatia, Czech Rep, Slovak Rep, Greece, Estonia, Bulgaria, Italy, Romania, Hungary, Spain, Poland, France

ROAD: TENC-T new

- Roads: Total length of newly built roads, of which: TEN-T
- Target: 2,022 km
- In 10 countries: Slovenia, Lithuania, Czech Rep, Slovak Rep, Greece, Estonia, Bulgaria, Romania, Hungary, Poland

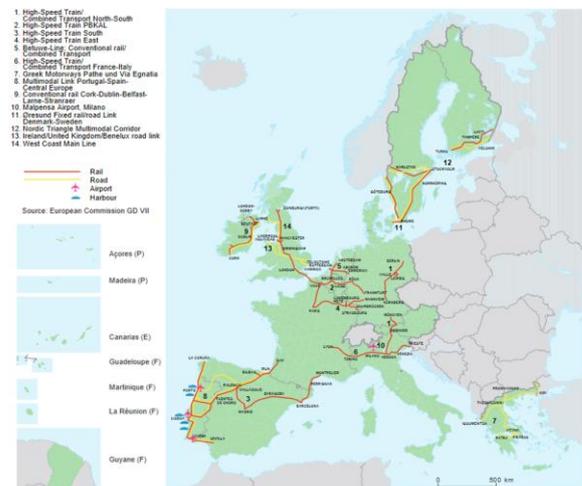
ROAD: Reconstructed

- Roads: Total length of reconstructed or upgraded roads
- Target: 9,615 km
- In 17 countries: Lithuania, Sweden, Czech Rep, Slovak Rep, Greece, Estonia, Bulgaria, Italy, Romania, Hungary, Latvia, Spain, Poland, Cyprus, Malta, UK, France

ROAD: TENC-T reconstructed

- Roads: Total length of reconstructed or upgraded roads, of which: TEN-T
- Target: 798 km
- In 12 countries: Malta, Cyprus, UK, Sweden, Lithuania, Czech Rep, Greece, Estonia, Bulgaria, Romania, Hungary, Poland

WP4 will continue exploring these targets and their policy background to assess how the project can help given public authorities achieve their target by leveraging Refinet's vision.



TEN Rail and Road priority projects²

3. Over 260 Research, Development and Innovation projects have been funded by the European Commission since 2012 in the transport infrastructure area, under FP7 and Horizon 2020. Refinet WP4 will review 102 of these projects – those having been implemented for at least 12 months and giving priority to multi-modal solutions - to understand their status of development and

² Source:

http://ec.europa.eu/regional_policy/sources/docoffic/official/report_s/pdf/sum_en.pdf

results as far as performance, replicability and impact are concerned. Technology solutions offering best fit to the identified issues at regional and national level will be given increased visibility with strategic European actors involved with infrastructure modernisation. the More in the next issue of this newsletter.

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REFINET COMMUNITY

Crossrail Innovate18 open platform for innovation

(Comments related to John Pelton's speech at REFINET workshop in London (March 16th, 2016), summarized by Arup in Deliverable 3.3)

The Crossrail Innovate18 programme, transitioning in Autumn 2016 to a dissemination phase, was an innovative R&D procurement method that was open to all Crossrail employees and colleagues from participating Tier 1 contractors, or nominated supply chain / stakeholder organisations.

The intention was stimulate and incentivise innovation on the major Crossrail project, by requiring that all Tier 1 contractors contribute funding, together with central Crossrail funding, and then making the outputs from the innovation available to all parties / members. The benefits that were put forward from innovate18 included:

- Know-how: through innovate18, members have access to a team of innovation experts who can help develop and share ideas. Members can also use the system to identify people across the programme with the right skills and experience to help.
- Funding: if an idea was accepted for development, Crossrail provided development capital and other resources to make it happen.
- Sharing: awareness of innovations from around the Crossrail programme to use on individual projects.
- Recognition: everyone who shares an idea or helps to develop an idea becomes part of the Crossrail innovation story and legacy to the industry.

Over 1000 innovations have been developed and shared through the programme.

Crossrail are now working with the Major Projects Authority, KTN Ltd, professional institutions, CIRIA and other major project organisations such as HS2 and Thames Tideway, to develop a subscription-based platform to share the innovations from major construction projects in the UK.

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Innovations at CEMOSA



CEMOSA is a Spanish engineering consultancy company in the field of construction (including buildings and civil works) founded in 1972 and employing more than 200 staff. The design and quality control of civil infrastructures and buildings is one of its main business lines in Europe and South America. The vision of the company is to keep its employees at a high level of technical development and to be aware of latest innovations. To support that goal CEMOSA has an active R&D Division with proven experience in Research & Innovation projects funded by the European Commission and the Spanish Government. CEMOSA's R&D Division performs its activities in the following areas: i) transport infrastructures, ii) buildings and energy efficiency and iii) innovative construction materials.

Within the field of transport infrastructures, CEMOSA has several active research lines:

- Innovative infrastructure design, with activities related to characterization and use of new materials, performance-based design, BIM based design methodology,

numerical modeling, virtual testing labs, etc.

- Use of advanced monitoring techniques (such as wireless sensors, artificial vision, high-performance auscultation vehicles, etc.) to assess infrastructure state.
- Intelligent maintenance methodologies and tools integrated in existing asset management system and covering issues such as predictive modeling, maintenance alerts management or optimization maintenance planning under uncertainties.
- Performance assessment: Integrated RAMS & LCC analysis.

CEMOSA is an *Associated Member* of the Shift2Rail Joint Undertaking through the Smart DeMain consortium, participating in the Innovation Programme # 3: Cost-Efficient and Reliable High-Capacity Infrastructure. Furthermore, CEMOSA works in several ongoing collaborative research projects in the field of transport infrastructures such as:

- **INFRALERT:** Linear Infrastructure efficiency improvement by automated learning and optimized predictive maintenance techniques. Funded by EU-H2020 under the same topic as REFINET (MG8.1-2014). (www.infralert.eu)
- **CAPACITY4RAIL:** Increasing Capacity 4 Rail networks through enhanced infrastructure and optimized operations. Funded by EU-FP7. (www.capacity4rail.eu)
- **REPARA2.0:** Advanced and sustainable developments for efficient road pavement rehabilitation techniques. Funded by CDTI-CIEN (Spain). (www.proyectorrepara.com).
- **ROBOTRACK:** Automation of installation systems for a new concept of low-weight slab track. Funded by MINECO-RETOS (www.robotrack.es)



INFRALERT workshop on winter maintenance (Sweden)



Temperature monitoring of asphalt pavement with IR camera



Laboratory testing of innovative construction materials

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COORDINATION WITH PROJECTS & NETWORKS

REFINET&FOX&USE-iT CSAs invited session at TRA 2016

An invited session on REFINET, FOX and USE-iT was carried out in April 20th at TRA 2016 in Warsaw on Increasing the Performance of Multimodal Transport Infrastructure through stakeholder engagement and European wide shared vision. There were about 50 participants and this session was coordinated by FEHRL. Thierry Goger, FEHRL Secretary General, introduced the session and acted as moderator throughout the event.

Presentations on REFINET was done by Alain Zarli from CSTB and presentations on FOX and USE-iT were done by Ewa Zowka of IBIDIM, Ursula Blume of BAST and Martin Lamb of Maple Consulting. The closing of this invited session was done by Jesús Rodríguez from PTEC.



Alain Zarli summarised the REFINET multimodal transport infrastructure model,

developed from the documents of different Technology Platforms and other Associations, that was coordinated by Tecnalia. He also presented the work under progress on collection of best practices and analysis of available technologies that is being coordinated by Dragados and Arup. Ewa Zowka presented an overview of the USE-iT project and Ursula Blume the FOX project, followed by Martin Kamb who outlines the next steps.

Jesús Rodríguez from PTEC closed this session commenting the need to cover initiatives on innovation in both new and existing transport infrastructures, including maintenance and adaptation to new demands, through these three CSAs. He also pointed out the continuity of innovation initiatives in transport infrastructures through the European Construction Technology Platform and its Infrastructure & Mobility committee.

The presentations are available at www.refinet.eu

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Launching the ECTP Infrastructure and Mobility Committee



Under the new organization of the ECTP, the previous reFINE initiative changed its name last year into *Infrastructure and Mobility Committee* as the ECTP was also being reorganized into Committees. Besides, the occasion has been used to update the image and managerial and executive structure of the European Technology Platform.

The I&M Committee is now forming its Executive Board and developing its Action Plan in which one of the main tasks is the contribution of ECTP to the REFINET CSA activities. It should be remembered that it was the idea of the previous REFINE initiative to develop and launch the CSA to contribute to the roadmapping activities of the Infrastructure sector.

The Committee is developing a plan of activities that includes not only REFINET but also other important initiatives like its participation in the TRA 2018, the liaison with other Transport related ETPs and organisations or with other stakeholders in a more wide understanding of the term *infrastructure* (e.g. linking with ECTP *ad hoc* group on water infrastructure).

The I&M Committee will celebrate the first meeting of its executive board next June 28th in Brussels and there are already plans for the ECTP conference and a General Assembly of the Committee by the end of the year. Arup, D'Appolonia, Dragados, PTEC and Tecnalía are members of this board.

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REFINET at PTEC conference

In April 6th, 2016, a conference was organised by PTEC on innovation in the maintenance and upgrading of the existing network of transport infrastructures, with the participation of Public authorities from the Government of Catalunya and the Town Hall of Barcelona, with 120 attendants and where PTEC presented their activities on innovation in the construction sector.

In the first session, five presentations were made on:

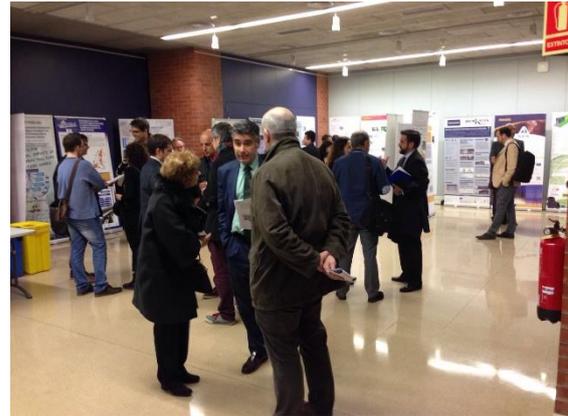
- Mobility at the cities, by Barcelona City Hall
- Maintenance of railways infrastructures, by Ferrocarrils Generalitat de Catalunya and by VÍAS, respectively.
- Upgrading of existing structures to respond to new demands, by Technical University of Catalunya
- The future innovation in the ports, by Port of Barcelona



In the second session, six presentations were made on:

- Adaptation of transport infrastructures to climate change, by CEDEX
- Innovation in the maintenance of motorways, by Abertis Group
- Innovation in pavements, by Technical University of Catalunya
- Sustainable rehabilitation of pavements, by SACYR
- Opportunities in R&I in transport infrastructures within H2020, by CDTI
- REFINET and the strategy of the European construction sector, by Dragados

DRAGADOS presented REFINET CSA in the framework of activities at European level to promote the innovation in transport infrastructures, in connexion with the Infrastructures at Mobility committee within the European Construction Technology Platform ECTP.



An exhibition of R&I projects in 22 posters was carried out during this conference

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NEWS

TRIP publishes recommendations for EU urban mobility



The European Commission funded Transport Research & Innovation Portal (TRIP) has published the first Europe-wide review of urban mobility research - offering technical and policy recommendations to support automotive and infrastructure development.

Download the report at [this link](#)

Over the coming decade, Europe will face a range of mobility challenges related to increasing urbanisation, an ageing but active citizenry and ambitious targets for reducing emissions. This presents new obstacles for achieving Europe's goals for reducing congestion and pollution while increasing transport capacity, accessibility and safety.

Compiled from TRIP's database of over 7,700 projects, the new report highlights the essential policy, infrastructure and technological developments required to fill gaps in capacity and meet the EU's transport needs. It emphasises the need for collaboration between policy makers and researchers to foster better decision making – something TRIP is well placed to support as Europe's single portal for transport research and innovation.

Issues raised in the report include the advances in automotive technology and systems, such as floating transport data and driverless vehicles, and the policy and infrastructure that is needed to provide a framework for this innovation. The review also considers the challenges in smart public transport implementation, including the need

for further work on cross border ticketing and data protection considerations.

Gareth Horton, Transport Analysis Lead, said: "Smart transport solutions are essential for Europe to meet its growing demand for urban mobility, while delivering the European Commission's ambitious targets to reduce road incidents and congestion. The new report is one of the first detailed reviews of urban transport research projects across Europe and provides a rare snapshot into the progress and challenges transport professionals are facing. We hope that fostering greater knowledge sharing through programmes like TRIP will bridge the gap between technical innovation and policy, enabling stakeholders from across the EU to build a shared vision for smart urban mobility".

(Source TRIP)

Projects worth 222m€ proposed under first shift2rail call for research



The Shift2Rail Joint Undertaking (S2R JU) has expressed broad satisfaction with the response to its first calls for proposals. The S2R JU has received 43 proposals with a total funding request of close to €80 million for its 15 open call topics and total available budget of €26.1 million. The 27 S2R JU members presented project proposals for the 13 call topics reserved to them. In addition to the €63 million they are requesting for these projects, the S2R JU members are planning to contribute €80 million themselves to the implementation of these projects.

A total of 454 participants applied to the open calls and the calls for members, of which 25% are SMEs.

Keir Fitch, Interim Executive Director of the S2R JU said: "The application rate to the open calls should ensure that we have healthy competition in most of the topics. We are confident that this will result in the S2R JU funding excellent projects in all its Innovation Programmes. We are particularly enthusiastic to see the high participation rate of SMEs."

Andy Doherty, Industry Spokesperson for the S2R JU said: "We are confident that the projects funded through this first round of calls will build upon and complement the work already launched under the Shift2Rail lighthouse projects, providing the necessary impulse to Shift2Rail activities so that we can meet our ambitious objectives of enabling a true step change to a yet higher performing customer driven railway for Europe".

The evaluation of the proposals started in April 2016 and will be completed by June 2016. Applicants should be informed on the outcome of the evaluations by mid July 2016.

Shift2Rail is the first European rail Public Private Partnership tasked with developing strategically-focused research and innovation (R&I) and market-driven solutions, and with integrating these to create the railway system of the future. With a total value of 920M€ for the period 2014-2020, Shift2Rail is promoting the competitiveness of the European rail industry and ensuring the attractiveness of rail as a safe and sustainable low carbon transport mode. We need it to meet the changing transport/mobility needs of EU citizens and the economy.

The Shift2Rail initiative successfully started a year ago with the kick-off of four "lighthouse" projects with 52M€ of research paving the way for the main programme.

In addition, since the beginning of 2016, the S2R JU members have been able to

implement additional activities in support of the S2R JU work programme, which will add leverage and driving force to the Shift2Rail initiative.

The S2R JU is looking forward to the successful implementation of the new S2R projects and to demonstrating with its Members and the sector at large the potential for innovation to deliver a bright future for railway.

(Source SHIFT2RAIL)