

FIRM

FEHRL INFRASTRUCTURE RESEARCH MAGAZINE



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**INNOVATION FOR TRANSPORT
INFRASTRUCTURE**

Transport infrastructure is the lifeblood of modern society, but often struggles to meet demands and expectations on reliability, availability, maintainability, safety, environment, health and cost. FEHRL's role is to provide solutions for the challenges now faced and anticipate the challenges to come. Through innovation, the operation of transport infrastructure can address society's needs.

FEHRL encourages collaborative research into topics such as mobility, transport and infrastructure, energy, environment and resources, safety and security as well as design and production.

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SUP&R ITN offers training-through-research programme to young researchers across Europe



Welcome to the fourth issue of FEHRL's Infrastructure Research Magazine (FIRM), which outlines how FEHRL provides transport infrastructure solutions for current and future challenges with its fifth Strategic European Road Research Programme (SERRP V) and flagship Forever Open Road (FOR) and FORx4 programmes.

INTERNATIONAL COLLABORATION AND IMPLEMENTATION OF RESULTS

In this issue, we highlight **international cooperation** and the **implementation and exploitation of results** as key themes as I believe, after my first six months as Secretary General of FEHRL, that these are two of FEHRL's key strengths.

In the articles you can read about how FEHRL is linking up with the USA with the ECOLABEL project (page 13) and Ukraine in INCRIS (page 18). We are also in the process of bringing to life the Cooperative Agreement signed with our Associate member FHWA through the work being done in the current Infravation (www.infravation.net) and MIRIAM (miriam-co2.net) programmes.

Since its inception in 1989, FEHRL has gained extensive experience in supporting and managing European projects, in particular those offered by our key stakeholders - the European Commission (EC) and the Conference of European Directors of Road (CEDR). Our role has mostly covered technical guidance and dissemination, but we are now in the process of opening up our capability to support the implementation and exploitation of results as it is essential to the overall success of transport infrastructure research. We give several examples of work being carried out to implement and exploit projects throughout this issue. Our flagship Forever Open road programme (page 7) is building a framework of how past, present and future projects fit seamlessly together to bring the vision to life. Meanwhile, work is ongoing to analyse project implementation in the FOSTER-Road project (page 10). And while the ROSANNE project (page 12) follows directly on from the results

gained in TYROSAFE and other related projects, SMARTRAIL (page 16) contains work done in the preceding SAMARIS and ARCHES projects.

Many of these FEHRL programmes and projects featured recently at TRA2014 in April 2014 and you can read all about this lively event here on pages 6-7. Thank you so much to our member IFSTTAR, who was behind the whole organisation of this excellent fifth edition of TRA, and we wish good luck to IBDiM, who will be the main partner of the Polish Ministry of Infrastructure and Development in organising TRA2016 in two years' time in Warsaw, Poland.



Polish stand at TRA2014

FEHRL also congratulates VTI and UCD for winning the EU Champions of Transport Research competition that was given out at TRA2014 as part of the TRA Visions project and you can read more about this on page 9.

Thierry Goger
 FEHRL Secretary General (thierry.goger@fehrl.org)

► For more information, see www.fehrl.org and:



www.linkedin.com/company/fehrl



twitter.com/FEHRL_comms



www.facebook.com (just search for "FEHRL")



Taking stock of my first six months of being President of FEHRL, I realise how much FEHRL has achieved and how much still lies ahead, especially in the run up to our 25th anniversary next November.

FEHRL is now firmly placed as a major player in the implementation of innovative, near market-ready products for road infrastructure thanks to the FEHRL Office's role in the **ERA-NET Plus Infravation 2014 Call** and its successful launch on 3rd March. The Infravation brokerage event on 20th March also included a high number of FEHRL member participants, which reflects their great interest in the topics.

Forever Open Road remains both a key opportunity and a challenge for us. The next FEHRL US Scanning Tour, being prepared and led by my organisation BAST, is planned to take place next winter on "Automated Road and automotive driving". The Scanning Tour will provide key input to this element which is of course one of the three Forever Open Road elements.

FEHRL has a strong position among the road research stakeholders and increasingly also with transport

MESSAGE FROM STEFAN STRICK, FEHRL PRESIDENT

research stakeholders. ERTRAC is one of these and, as you can read on page 10, we are contributing to a number of their Working Groups and other activities. Other examples of our cooperation are with ECTRI and FERSI to organise the Young Researchers Seminar every two years, the next of which is planned in Rome on 17-19th June 2015 (www.ectri.org/YRS15), as well as with five organisations for the international "Ageing and Safe Mobility" conference in BAST on 27-28th November 2014 (see more to the right).

We are also cooperating more actively with CEDR, as could be witnessed at TRA2014 and the FEHRL booth. Our involvement in so many key sessions at TRA2014 (see page 6) gave an excellent perception to the Association. And we are liaising regularly with the European Commission to give key input to Horizon 2020, especially regarding the infrastructure element.

I would like to thank my fellow FEHRL Supervisory Board (FSB) members for the support they have given me so far, as well as the FEHRL General Assembly (FGA) members for their welcome and cooperation and I am certain that we will continue to work together effectively in the future.

Stefan Strick
FEHRL President (praesident@bast.de)



FEHRL General Assembly (FGA) on 13-14th May 2014



FEHRL CELEBRATES 25TH ANNIVERSARY

This year FEHRL will celebrate its 25th anniversary on 13th November 2014 at the premises of the Belgian Road Research Centre (BRRC) in Sterrebeek, Belgium. More details on the event, entitled "A great support to Research on Road Infrastructures in Europe and beyond", have been sent in an invitation to our key stakeholders.



COME TO THE AGEING AND SAFE MOBILITY CONFERENCE AT BAST

Six European Associations – FERSI, ECTRI, ETRA, Euro NCAP, FEHRL and HUMANIST invite you to the international interdisciplinary "Ageing and Safe Mobility" conference at BAST in Bergisch-Gladbach, Germany on 27-28th November 2014. The conference will focus on road safety issues of elderly road users and aims at elaborating policy recommendations concerning the implementation of available evidence based results in the domain of the road safety research. For more information including registration, see www.fersi.org or contact info.ageingconference@bast.de.



FEHRL HIGHLIGHTS OF TRA2014: KEY PROGRAMMES AND PROJECTS



FEHRL and its members were very active recently at TRA2014 (in Paris from 14-17th April) through our participation in key sessions for our programmes and projects, our dedicated stand and our cocktail organised to give stakeholders the chance to meet our new President,

Stefan Strick of BAST and new Secretary General, Thierry Goger.

FEHRL's activities and plans were displayed at our exhibition booth B1, which was part of the CEDR village and sponsored by our members AIT, BRRC, TNO and VTI. FEHRL also manned the booth

for the new ERA-NET Plus Infravation 2014 Call adjacent to our stand.

Thierry Goger and Deputy Secretary General Adewole Adesiyun, meanwhile, along with several other key FEHRL members, contributed to several sessions.

HIGHLIGHTS OF FEHRL-RELATED PROJECTS



The TRIMM project (trimm.fehrl.org) featured at the Scientific and Technical Session (STS) 4: Auscultation and monitoring asset conditions with a poster called "*Implementation of advanced monitoring techniques in road asset management - results from TRIMM project*" (read more about TRIMM on page 15).



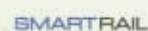
Apresentation on the SAVeRS project (www.saversproject.com) entitled "*Development of a guideline for the selection of vehicle restraint systems - identification of the key selection parameters*" was given in STS 36: Infrastructure and Road Safety.



POTHOLE (www.fehrl.org/pothole) featured as part of STS 42: Pavement Performance and Durability with a presentation entitled "*Durable pothole repairs*".



The ASAP project (asap.fehrl.org) featured at the STS 51: Factor of Accidents. The poster was called "*Speed Management in Work Zones*".



The SMARTRAIL project (smartrail.fehrl.org) featured along with MAINLINE as part of Invited Session (IS) 28: Asset Management and Monitoring for ageing rail infrastructure (read more about SMARTRAIL on page 16).



The SOLUTIONS project (www.urban-mobility-solutions.eu) featured at IS 35 entitled "*Transport Innovation Transferability Workshop: Best Practice Examples from TIDE and SOLUTIONS*".



The AllBack2Pave (allback2pave.fehrl.org), MIRAVEC (www.fehrl.org/miravec), INROADS (www.fehrl.org/inroads), SUP&RITN (superitn.eu) and BRIDGEMON (bridgemon.fehrl.org) projects all had Outreach Market Place posters.



► For more information, contact Isabelle Lucchini at isabelle.lucchini@fehrl.org

COMPLEMENTARY PROGRAMME OF SHORT PRESENTATIONS

The following projects were featured at the Agora space (next to the FEHRL booth B1) along with selected CEDR projects:



ECOLABEL (www.ecolabelproject.eu) - Carlos Martin-Portugues Montoliu, Acciona, Spain (read more about ECOLABEL on page 13)



Distance

DISTANCE (www.distanceproject.eu) - Luc Goubert, BRRC, Belgium



TRIMM (trimm.fehrl.org) - Leif Sjogren, VTI, Sweden (read more about TRIMM on page 15)

FEHRL CO-ORGANISED ETRA SESSION



The European Transport Research Alliance (ETRA) also organised IS 43 entitled "*Education and training issues for the transport researchers of the future ERA*". See www.etralliance.eu for more details.

FEHRL hosted a Forever Open Road Invited Session on Thursday 17th April, attended by 50 stakeholders, to discuss how the Forever Open Road concept responds to the challenges faced by road owners and users. The session included the participation of Thierry Goger (FEHRL Secretary-General), Bob Collis (TRL), Joris Al (Rijkswaterstaat), Stefan Höller (BAST), Mohammed Hoseini (NPRA), Nicolas Hautière (IFSTTAR) and Stefan Deix (CLEPA).

The session was divided into two parts, each one with a short introductory presentation followed by a panel discussion and questions from the audience. Thierry Goger gave an introduction to FEHRL and Bob Collis gave a background to the Forever Open Road, what has been achieved to date and the ongoing requirement to fill the research gaps and undertake demonstration projects.

PART 1: IS THE FOREVER OPEN ROAD ADDRESSING THE NEEDS OF ROAD OWNERS?

In his introductory presentation, Joris Al explained that the biggest problem faced by road owners is the maintenance deficit as even the newest of roads are often 40 years old. Other challenges include climate change, electric vehicles and interchanges between transport modes, all of which need to be related to the users.

Easy and implementable solutions are most helpful, and working with industry is key. Joris also stated that the ERA-NET Plus Infravation Call 2014 has come about as a direct result of the Forever Open Road.



► For more information, contact Bob Collis at bcollis@trl.co.uk or see www.foreveropenroad.eu

FOREVER OPEN ROAD

Redefining Road Transport for the 21st Century



FEHRL FOREVER OPEN ROAD SESSION GETS VITAL INPUT

FIRST PANEL DISCUSSION

Bob asked the panel "how can you build a 5th generation road when roads already exist?" Joris and Nicolas Hautière felt that due to a largely complete network and financial constraints, building new high-tech roads is unlikely, however the Forever Open Road provides technologies and tools for regeneration and modernisation programmes to make existing roads work better.

PART 2: HOW DOES THE FOREVER OPEN ROAD ADDRESS THE NEEDS OF ROAD USERS?

Joris introduced the session, then Bob gave a presentation on road users, who include drivers, freight companies, cyclists and pedestrians, and others such as utilities companies who bury their services in the road.

SECOND PANEL DISCUSSION

Stefan Deix started by saying that the CLEPA represents OEMs whose vehicles are damaged by poor quality roads. Stefan Höller felt that the user wants to get from A to B as economically, quickly and comfortably as possible. The Forever Open Road provides opportunities to combat an ageing infrastructure and improve safety through technologies such as prefabrication.

The audience and panel felt that journey time reliability and reliable information

were important considerations. It was felt that the benefits and costs should be considered and procurement based on life cycle costs would be helpful. A key point raised was that there is a large cost to the economy already though lost productivity due to congestion, and hospital costs from accidents.

The discussion and questions provided useful insights which will be developed by the Forever Open Road Experts Group (FOREX).



TRAVISIONS

TRA VISIONS: TWO TRANSPORT RESEARCH AWARDS IN ONE FOR TRA2014

PARTNERS

The 18-month FP7 TRA Visions project, which runs until the end of October 2014, successfully organised the following two competitions for transport research awards, which were announced in two separate sessions at TRA2014:

- A **research student competition** which nurtured the best transport researchers in Europe and celebrated their achievements at TRA2014. The awards were given out at the end of the Opening Session on the first day of TRA2014.
- The **EU Champions of Transport Research competition** for senior researchers in the field of innovative surface transport concepts based on results only from EU-funded projects. The awards were given out at as part of Strategic Session 13 on "Horizon 2020: Innovating Mobility, Mobilising Innovation".

STUDENT COMPETITION

The student competition aimed at university and technical institute students pursuing bachelor degrees and

higher. Initially, participants were invited to submit an abstract under one of the TRA2014 conference topics: Environment and Energy, Industry Competitiveness, Safety and Security, Logistics and Mobility Systems and Services, Transport Policy Research/Socio-economic/Human sciences, Transport Infrastructures and Vehicles & Vessels Technologies.

All participants were invited to register their ideas and submit a Title and a short abstract by January 2014. They also had until the end of January to develop and submit their idea, which was meant to be a report based on the Final Project Template accompanied by any supporting documents. This was followed by an Evaluation of Ideas period during which a judging panel determined which were the top three ideas per mode.

Some 104 students participated, submitting a total of 51 student projects from 18 different EU countries and 34 different universities. Here are the three winners of each category.

	TITLE	TEAM MEMBERS	UNIVERSITY	COUNTRY
ROAD	Metamaterials for vibro-acoustic isolation	Claus Claeys	KU Leuven	BELGIUM
	Wheeled Mobile Driving Simulator for Urban Traffic Simulation	Alexander Betz, Paul Wagnerl	Technische Universität Darmstadt	GERMANY
	Stochastic optimization of advance traffic signal control	Junchen Jin	KTH Royal Institute of Technology	SWEDEN
RAIL	SELF PRESTRESSED CONCRETE	Alessandro Nardinocchi	Università Politecnica delle Marche	ITALY
	Location Choice Advisor for Internal Migration in the European Union	Dimitrios Efthymiou	National Technical University of Athens	GREECE
	Conception of driver's risky state detection system	Nedjemi Rachedi, Eddine Djamel	University of valenciennes and hainaut cambresis	FRANCE
WATERBORNE	Green Offshore Crew Tender Concept	Morten Ahlström, Kai Schlösser, Julian Herbel, Jan-Christoph Nagel, Julia Ludwig, Tobias Kreklow	Hochschule Bremen	GERMANY
	Robust Design Optimization for Operational Profiles	Bailly Guimaraes, Helio	University of Liege	BELGIUM
	An Electric Transport Design For Suez Canal	Konstantinos Mammous, Andreas Alvanis, Panagiotis Tzotzolis, Abdulrahman Shunaiber, Adel Alenezi	University of Newcastle Upon Tyne	UNITED KINGDOM

Winners of Road competition

All student competition winners





TWO FEHRL MEMBERS WIN EU CHAMPIONS OF TRANSPORT RESEARCH COMPETITION

This first **EU Champions of Transport Research Competition** was an excellence award for leading surface transport researchers in European projects which have proven impacts in the field. In the first stage, candidates applied through the TRA Visions website, showing how their research was impactful. Entrants were initially reviewed by a judging panel, followed by a shortlisting workshop held in Brussels.

OVERALL WINNER AND WINNER OF ROAD

Dr Astrid Linder of VTI, Sweden, was the **Winner of the Road category** as well as the **Overall Winner** of the competition. She won thanks to the EvaRID (Eva female, RID - Rear Impact Dummy), the world's first virtual crash test dummy representing an average female, developed in the ADSEAT project (www.adseat.eu) and already commercially available.

A joint effort between the partners in combination with funding received from the European Commission made it possible for Astrid and her team to establish opportunities for the development of future vehicle safety systems that are suitable for assessing male and female risk alike. EvaRID, as well as the prototype hardware model, in need of further development, symbolises a unique initial step in the direction towards gender equality in vehicle safety. These models have been used as research tools in conjunction with the current low severity rear impact model of an average male, BioRID, when assessing the safety performance of car seats. Research results achieved show how vehicle safety assessment can be improved and thus reduce the risk of soft tissue neck injuries in the future.



CROSS-MODAL AWARD

Professor Eugene O'Brien of UCD, Ireland, won the **cross-modal award**. Over the course of several EU funded projects, Eugene's research has resulted in infrastructures that have been made more sustainable by extending their lives through the quantification of risks, especially the risk of bridges being overloaded. This research has developed road pavement and railway track deterioration models that can be used to predict the remaining service life of these infrastructures.

In Ireland, Eugene's work on Weigh-in-Motion has resulted in an increase in the allowable gross weight of 6-axle trucks from 44 to 46 tonnes. His company demonstrated that the increase would have little effect on the risk of overload on

From left to right: Dr Astrid Linder receiving her award, all the winners together and Prof. Eugene O'Brien receiving his award.



bridges and would have the positive benefits of reducing the cost of transport, reducing the fuel consumption per tonne of freight and reducing cumulative damage to road pavements.

At European and world level, his research on bridge traffic loading is identifying the nature of vehicles that govern the safety of bridges - these findings have made it possible to keep many bridges in these countries in service for much longer. The result is a bridge stock with a longer average bridge life, reducing the carbon footprint of bridges and reducing the demand for non-renewable materials.

The winner for rail was Eckehard Schneider of the Universität Braunschweig for his trans-European approach to rail research and for **waterborne** the winner was Apostolos Pananikolaou of the National Technical University of Athens (NTUA) for his Ship Design Laboratory.



► For more information, contact George Smyrnakis at george.smyrnakis@newcastle.ac.uk, look up TRA Visions on Facebook or see www.travisions.eu



FOSTER-ROAD: SUPPORT ACTION FOR ERTRAC

The road transport sector involves a wide range of industries and services from vehicle manufacturers and suppliers to infrastructure providers, mobility management, communication technologies, energy companies, and many others. Founded in 2003 (with FEHRL as one of its founding members), the European Road Transport Research Advisory Council (ERTRAC) is the European Technology Platform for road transport research. The mission of ERTRAC is to provide a framework to focus the coordinated efforts of public and private resources on the necessary research activities. ERTRAC strives to identify the paths towards a 50% more efficient road transport system by 2030, compared to 2010. This Strategic Research Agenda supports the European Research Area for transport research and contributes to the global technological leadership of the European automotive industry.

The 36-month FP7 FOSTER-Road project, which has been running since March 2013, supports ERTRAC to strengthen the research and innovation strategies of road transport industries and policies in Europe. It brings together experts from all relevant stakeholder groups to monitor projects, develop roadmaps, and support their implementation. FOSTER-Road partners from nine Member States com-

prise 11 companies, five associations (including FEHRL) and one university.

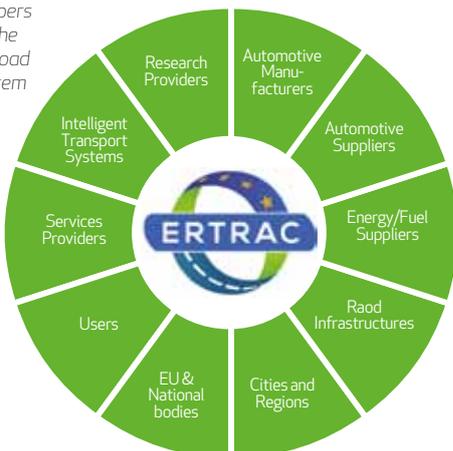
The four key themes of FOSTER-Road, led by AVL List, are:

- 1. Setting strategic road transport research priorities** by creating research agendas, roadmaps and implementation plans for current and future challenges. Recently published technology roadmaps include the "Energy Carriers for Powertrains Roadmap" and the "Transport Infrastructure Innovation Roadmap". FEHRL's Forever Open Road programme roadmaps fed into the latter, which was covered in the June 2013 issue of this magazine. Another roadmap currently in the drafting process addresses "Urban Freight Deliveries".
- 2. Monitoring of projects and fostering innovation** by following European and national road transport research projects. This work will define a suitable methodology for the monitoring of these projects and activities will focus on technological and societal challenges, as well as the project results' potential for successful innovations. The work will be carried out by the ERTRAC Working Groups (WGs) "Energy and Environment", "Safety", "Urban Mobility", "Long Distance Freight Transport" and "Global Competitiveness". FEHRL is involved in many of these WGs and their outputs.
- 3. Supporting co-operation and networking** with European institutions,

other European Technology Platforms and as well as the national technology platforms for road transport. Since 2005, FEHRL has been spearheading the work in ERTRAC to update a survey of Member State research programmes in road transport research. The task is continuing in FOSTER-Road and it compares national activities with EU activities and ERTRAC's research priorities and draws conclusions for reducing the fragmentation of research and increasing the harmonisation of funding programmes.

- 4. Dissemination and communication of ERTRAC activities** to the European road transport research community and as input to relevant transport programmes. A recent highlight of this was the co-organisation of the TRA2014 conference in Paris, together with the European Commission, the French Ministry of Ecology, Sustainable Development and Energy and the other European Technology Platforms on transport.

ERTRAC members represent all the actors of the road transport system



► For more information see www.ertrac.org or contact Alexander Holleis at Alexander.Holleis@avl.com





PROS IDENTIFIES RESEARCH PRIORITIES FOR EUROPEAN ROAD SAFETY RESEARCH

In July 2010, the European Commission released its latest European Road Safety Action Programme (ERSAP) entitled 'Towards a European road safety area: policy orientations on road safety 2011-2020.' The ERSAP sets out the ambitious target of halving road fatalities in the European Union by the end of the decade. In spite of all improvements in European road safety, more than 75 people are killed and about 4,000 get injured on European roads each day. The progress made so far is to a large extent based on intensive, publicly-funded road safety research activities. While many "low-hanging fruits" in road safety have already been picked, a multitude of more specific research issues remains. With ICT opening up an enormous potential for new integrated safety applications, the research area of road safety is becoming broader and broader with the risk of diluting efforts.

Therefore, the FP7 PROS project, working in coordination with the Safety Working Group of ERTRAC, has established a pan-European network to develop commonly agreed priorities in road safety research and overcome the current fragmentation in relevant stakeholder groups. This network brings all relevant stakeholders together (road user groups, industry, research institutions, regional and local authorities) and follows an integrated approach covering human, vehicle and infrastructure aspects and all phases from preventive to post-crash safety.

Launched in September 2012, the Consortium first performed a "gap analysis". This started with a review of societal trends and scenarios influencing the scope and boundary conditions for road safety research, an essential step to establishing the operating framework of the project. In addition, project partners collected and analysed existing national, European and international research agendas and examined the state of the art of existing road safety research activities at European and national level.

Building on this analysis, the PROS Consortium subsequently identified gaps in existing research and filled them with the descriptions of corresponding research topics, prioritised these topics in cooperation with a broad range of stakeholders and outlined a roadmap for the future of European road safety research. The results are to assist policy makers in defining call contents, amongst others for the Horizon 2020 programme.

Having completed this first phase, the second year of the project is now focusing on:

- Updating the results from the first 12 months
- Aggregating research topics in larger thematic challenges
- Intensifying the dissemination of project results
- Developing a mechanism for the continuation of activities beyond the duration of the project

Stakeholders in road safety research who have not taken part in PROS activities yet are very welcome to get involved either as an external stakeholder or as an associate partner of the project.



► For more information, go to www.pros-project.eu, see PROS on Linked In or contact Peter Urban at urban@fka.de

► For more information on the FEHRL Safety & Security Research Area, contact Xavier Cocu at x.cocu@brrc.be and Francesca La Torre at francesca.latorre@unifi.it





ROSANNE MOVES TO IMPLEMENT MANY PRECEDING PROJECTS SUCH AS TYROSAFE ...

ROSANNE (Rolling resistance, Skid resistance, ANd Noise Emission measurement standards for road surfaces) is a 36-month FP7 project which aims at developing/harmonising measurement methods for skid resistance, noise emission and rolling resistance of road pavements as a preparation for standardisation. To achieve this, the project will follow the recommendations of key predecessor projects like TYROSAFE (tyrosafe.fehrl.org), HERMES (www.hermesroadmeasurement.eu), SILVIA (www.trl.co.uk/Silvia), SILENCE (www.silence-ip.org) and MIRIAM (Miriam-co2.net), as well as consider ongoing work in CEN and ISO. The project, started on 1st November 2013, will develop/improve standards in the field of working group CEN/TC 227/WG 5 and in some cases ISO groups with which CEN cooperates. More specific objectives are:

- 1. Skid resistance:** The harmonisation of skid resistance measurement following the TYROSAFE Roadmap, by deriving conversion factors for friction indices based on similar groups of devices.
- 2. Noise emission:** Merging the existing measurement methods into a harmonised tyre-road noise emission characterisation method. An evaluation of its viability for acceptance testing, monitoring and compatibility with environmental noise calculation methods will also be carried out.

3. Rolling resistance: Building on the results obtained in MIRIAM and standardising trailer measurements of rolling resistance coefficients of road surfaces.

4. Texture: Exploring the potential for recent developments in the measurement of surface texture to deliver parameters that better reflect the physical process of tyre/road interaction. That may improve our understanding of how the texture influences skid resistance, noise emission and rolling resistance.

The project aims to produce **improved standards for common European measurement methods** for skid resistance, noise emission and rolling resistance, which determine the road infrastructure influence on important vehicle performance characteristics. This European approach will arise from the roadmap for implementation and any recommended follow up research. The project will make key road surface parameters accessible to harmonised assessment and management with main potential users being Road Authorities and industry. The results will enable the creation of products and services that bring about considerable cost reductions for Road Authorities and industries with European-wide application due to the possibility to rely on common assessment methods. This would create, for example, a common market for pavements with low noise emission and low rolling resistance.



BUILDING ON TYROSAFE RESULTS

The FP7 Tyre and Road Surface Optimisation for Skid resistance And Further Effects (TYROSAFE) project, which ran for two years until mid-2010, found that the interaction between tyres and road surfaces clearly influences road safety, traffic noise, and vehicles' greenhouse gas and air pollutant emissions. TYROSAFE recommended more research to increase understanding of the combined influence of the texture of roads and of tyres, which has now led to ROSANNE.

TYROSAFE's main recommendations were the development of European policies and standards to improve the quality of road surfaces and measurement tools for the consistent assessment of road surfaces and tyres. TYROSAFE also provided a roadmap for greater harmonisation in the assessment of road surface properties. Implementation of the TYROSAFE recommendations through ROSANNE would contribute to a greener, quieter and safer road transport system.

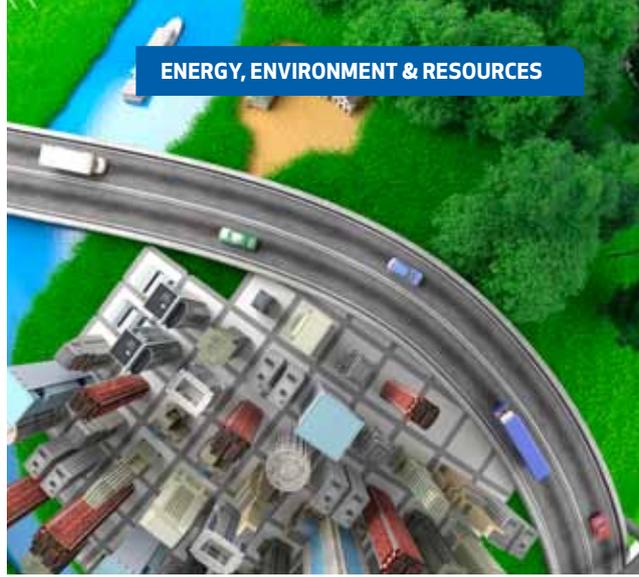


- ▶ For more information, go to www.rosanne-project.eu or contact Manfred Haider at manfred.haider@ait.ac.at
- ▶ For more information on the FEHRL Energy, Environment & Resources Research Area, contact Helen Viner at hviner@trl.co.uk and Ursula Blume at BlumeU@bast.de





... WHILE ECOLABEL COLLABORATES WITH US PARTNER FHWA



ECOLABEL is a 36-month FP7 project that kicked off in October 2013 for the "Development of a novel ECO-LABELing EU-harmonized methodology for cost-effective, safer and greener road products and infrastructures". The project aims to develop this methodology by integrating a Life Cycle Engineering (LCE) approach - environmental indicators along with the economic, technical and social aspects - for the assessment of future and existing road infrastructures. Further on, construction materials, such as asphalt mixtures and cement-based materials, will be investigated. This methodology, together with a guide for road eco-labelling and multi-criteria software tool developed under this project, will define eco-labels and provide recommendations to improve the label achieved, supporting and motivating relevant stakeholders and industry to include greener, more cost-effective and safer technologies in their road construction, maintenance and renewal projects.



The DURABROADS project, which includes FEHRL member KTI, aims to develop and demonstrate cost-effective, eco-friendly, durable and resilient pavements based on innovative nanotechnology enhanced asphalts and optimise procedures to build and rehabilitate long-life, safer and greener roads. For more information, go to www.durabroads.eu or contact Daniel Castro Fresno at daniel.castro@unican.es.

The EU Ecolabel identifies products and services that contribute to sustainability because they have demonstrated a reduced environmental impact throughout their life cycle. There are already more than 17,000 EU Eco-labelled products on the market, but there are no references for road products and infrastructures. In order to achieve the expected results, a complete work plan has been put together. It will move from the definition of the new eco-labelling methodology considering existing relevant labelling approaches, plus the analysis of road products, to the development of guidelines and a software tool. Thanks to the direct involvement of CEN in the project, this software tool will motivate future EU-harmonised labelling approaches for roads that would grant the implementation of the ECOLABEL results.

INTERNATIONAL COLLABORATION ALONG WITH DURABROADS

The European Commission (EC) has selected ECOLABEL, along with the related DURABROADS project, for collaborating with the US Federal Highway Administration (FHWA) (also a FEHRL Associate member) as part of the links to be created between the EU and the USA. The collaboration will be focused on the improvement of road sustainability, Life Cycle Assessment of road infrastructures, the impact of climate change, application of waste for construction purposes and the development of new construction materials.

ECOLABEL Project Coordinator, Acciona Infrastructure, and DURABROADS Project Coordinator, University of Cantabria, together with representatives of the EC went to Washington DC, USA in March 2014 to establish the basis of collaboration in the infrastructure field between the USA and Europe for the following three years in the field of surface transport.



All US research activities will be performed at the Turner-Fairbank Highway Research Center of FHWA and the University of Virginia. The European activities will be run in the facilities of the different ECOLABEL and DURABROADS Consortium partners.

ECOLABEL PARTNERS



► For more information, go to www.ecolabelproject.eu or contact Carlos Martin-Portugues Montoliu at carlos.martinportugues.montoliu@acciona.com

ALLBACK2PAVE: TOWARD A SUSTAINABLE 100% RECYCLING OF RECLAIMED ASPHALT IN ROAD PAVEMENTS

Given today's societal concerns with environmental protection and sustainable development in a post-fossil fuel era, road authorities in Europe are working together to make the dismantling and end-of-life strategies of asphalt pavements more energy efficient. In this context, the amount of recycling of reclaimed asphalt (RA) in new asphalt pavements has grown to the point that it is no longer simply an isolated green construction alternative but a common practice in almost all of Europe. However, in general the share of recycling of RA in new asphalt courses is rather lower than it could be technically, especially in surface course layers.



Mixing plant in Italy: Ferrara Accardi & Figli s.r.l.



Stockpiling in mixing plant of Germany: Richard Schulz Tiefbau GmbH & Co.KG

AllBack2Pave is a two-year CEDR Transnational Road Research project that will evaluate the feasibility of going towards 100% recycling of asphalt pavements into surface courses. Led by the Technische Universität Dresden (TU Dresden) in Germany, together with the University of Nottingham (UNOTT) in the UK and University of Palermo (UNIPA) in Italy, the project started in November 2013. To facilitate the deployment of lean concepts and lean production practices, the investigation will be implemented in close collaboration with the private sector, including asphalt mixing plants, chemical additives producers and waste material managers.

The main objectives of the project are two-fold:

- To establish, through laboratory tests on binders and asphalt mixes, whether the use of high rates of RA is feasible in developing mixes with a high level of durability.
- To develop the so-called "AllBack2Pave end-user manual" on how to best produce cost-effective and high-quality asphalt mixes with high RA content.

The mixes selected for the investigation are two Stone Mastic Asphalt (SMA) mixes typically encountered in the surface courses of Germany and Italy. The percentage of RA within each mixture will vary from 0% (control mix) to the closest feasible to 100%. By comparison to the mechanical characterisation results between the control mix and the mixes with increasing content of RA, the most sensitive factors that affect the mixture performance - either good or poor - will be identified.

The project consists of four technical work packages (WPs). In WP2, blend and mixture design will be performed. The aim of this WP is to achieve mix designs with acceptable volumetric and mechanical properties. The blend design will provide information on the quality and quantity of virgin binders and/or additives that will allow high-content RA mixes for the selected asphalt surface courses to be obtained. The plant production related aspects will be investigated in WP3. Factors such as fractionation and stockpiling of the RA in the mixing plant and quality control during the production process will be considered. WP4 is dedicated to the mechanical characterisation of the asphalt mixes. The materials will be characterised in the laboratory in terms of stiffness, fatigue cracking behaviour, rutting susceptibility, moisture damage resistance and permanent deformation behaviour. WP5 aims to perform a sustainability assessment of the practice of using asphalt surface mixes with high recycling rates. The study will be based on

chosen European case studies and will identify the most cost-effective solutions, together with their environmental impact over the whole lifecycle of the selected road pavements.

PARTNERS



ASSOCIATE PARTNERS



- For more information, see allback2pave.fehrl.org or contact Frohmüt Wellner at frohmuet.wellner@tu-dresden.de, Davide Lo Presti at davide.lopresti@nottingham.ac.uk or Gaetano Di Mino at gaetano.dimino@unipa.it

GEARING UP TO THE END OF THE PROJECT



As reported in the December 2013 FIRM magazine, TRIMM (Tomorrow's Road Infrastructure Monitoring and Management) is a 36-month EC FP7 project started on 1st December 2011. The project focuses on advanced infrastructure monitoring techniques that have not yet been implemented and covers bridge, pavement and road equipment monitoring techniques. The TRIMM consortium comprises five SMEs, FEHRL and nine FEHRL institutes, in all representing 11 European countries. The project only has six months to go so is therefore currently focusing on the final conference and final report, as well as all the final deliverables.

TRIMM FINAL CONFERENCE ON OCTOBER 23-24TH 2014

Register now for the final conference at the Diamant Center in Brussels, Belgium. This meeting is being organised in conjunction with the European Road Profile User's Group (ERPUG), whose objectives fit very well with the TRIMM project. The conference will be composed of a mix of presentations from TRIMM and ERPUG. ERPUG will also organise an exhibition and a get-together event including dinner to facili-

tate networking amongst researchers, manufacturers, companies and stakeholders. You need to pay a fee of 150 Euros if you want to attend the get-together event, dinner and exhibition. A detailed programme will be available on the website trimm.fehrl.org.

TRIMM's contribution to the conference will cover advances in the areas of monitoring of roads and bridges, together with implementation aspects such as indicator framework and added-value of monitoring. The TRIMM presentations will be integrated in the themes of the joint agenda with ERPUG and will cover areas such as the use of 3D images, real time data collection, structural health monitoring and management and much more.

ERPUG ACTIVITIES

If you are interested in making a presentation at the event, please advise leif.sjogren@vti.se as soon as possible. The presentation has to cover the TRIMM/ERPUG objectives. Sponsors and exhibitors are also welcome at the event and you just need to contact roger.moller@ramboll.se. If you become a sponsor at a certain level, you are entitled to a presentation slot.

Event organised in cooperation with ERPUG



It has been recognised that Europe needs a forum to share thoughts, experiences, developments, innovations and practices of how to adapt to the ever changing challenges in the area of road surface monitoring. With the American Road Profile User's Group (RPUG) as an example, an initiative has been taken to start a similar European group. ERPUG shares the latest and hottest topics such as:

- Pavement profile measurement.
- Pavement profile analysis.
- Pavement profile quality assurance (QA).
- Pavement surface texture (measurement, analysis, QA)
- Tyre/road noise.
- Automated pavement condition survey.
- Rolling resistance and ride effects on fuel consumption and wear and tear on vehicles.
- Data usage at road, project and network levels.
- Innovative contract and performance control.

For more information, see www.erpug.org

PARTNERS



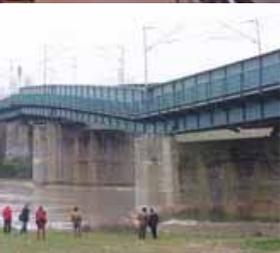
► For more information, contact Robert Karlsson at robert.karlsson@vti.se, go to the TRIMM group on LinkedIn or see trimm.fehrl.org

► For more information on the FEHRL Design & Production Research Area, contact Jos Wessels at jos.wessels@tno.nl and Ken Gavin at kenneth.gavin@ucd.ie



UHPFRC DECK ON CROATIAN BRIDGE

The 36-month FP7 Smart Maintenance and Analysis of Transport Infrastructure (SMARTRAIL) project, set to conclude at the end of August 2014, aims to provide maintenance and rehabilitation solutions for ageing railway infrastructure networks to reduce replacement costs and delays and be environmentally friendly. One of its tasks has been to adopt, test and evaluate the possibility of using Ultra High Performance Fibre Reinforced Concrete (UHPFRC) rehabilitation methods for the rehabilitation of old steel railway bridges. For this, partners have built on the positive experience gained in the SAMARIS (samaris.zag.si) and ARCHES (arches.fehrl.org) projects and successful application on road bridges.

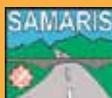


The Buna Bridge bending test

Within SMARTRAIL, numerous UHPFRC mixes have been prepared, adopted to intended use and to local materials and tested at ZAG laboratories. An old steel railway bridge, the Buna Bridge in Croatia was transported whole to the IGH laboratory where it was inspected and tested in bending. The bridge is now ready to be strengthened by an UHPFRC deck and its load bearing capacity analysed. Based on the results, a recommendation will be prepared and presented at the SMARTRAIL final conference on 25-26th August 2014 in Ljubljana, Slovenia (see advertisement on back page).



▶ For more information, see www.smartrail.fehrl.org or contact Dr. Kenneth Gavin at kenneth.gavin@ucd.ie



SUCCESS STORY - FOLLOW UP OF FORMER FEHRL PROJECTS

UHPFRC, characterised by a very low water/binder ratio, high binder content and an optimised fibrous reinforcement, provide the structural engineer with a unique combination of extremely low permeability, high strength and tensile strain hardening. UHPFRC are perfectly suited to the rehabilitation of reinforced concrete structures in critical zones subjected to an aggressive environment and to significant mechanical stresses, to provide a long-term durability and thus avoid multiple interventions on structures during their service life.

The application of cast-on site UHPFRC was first validated during the FP5 SAMARIS project (2003-2006) in Switzerland. The FP6 ARCHES project (2006-2009) then showed that the implementation of this technology with local components in Slovenia and Poland was possible and fostered the use of cost-effective (ECO) UHPFRC mixes with reduced clinker content. By May 2014, more than 25 applications of cast-on site UHPFRC to protect or reinforce bridges or slabs in industrial

buildings, alone or combined with reinforcing bars (rebars), have been performed successfully since 2004 in Switzerland and one in Slovenia in 2009¹. The assessment of the Log Čezsoški bridge in Slovenia two years after its rehabilitation with the ECO-UHPFRC developed during the ARCHES project was very positive². UHPFRC applications on site are rapidly spreading in Switzerland on road structures and building slabs. Lately, this rehabilitation technology was transferred to offshore structures at sea³.

One landmark application of ECO-UHPFRC was developed at the Laboratory of Maintenance and Safety of Structures (MCS) at EPFL in Switzerland in late autumn 2010 with slopes of 5% of the bridge deck. The mix, based on local components, has 50% mass cement replacement by limestone filler, is self-compacting and can be cast on slopes from 5-10% inclination in all seasons. This application helped the owner save 30% on construction costs by avoiding a costly and long re-profiling procedure of the concrete road in front and behind the bridge, to accommodate the challenging position of the rebars unexpectedly close to the road surface in the upper face of the deck.



▶ For more information, contact emmanuel.denarie@epfl.ch and aljosa.sajna@zag.si

PARTNERS



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It's easy to learn

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¹ Brühwiler E., Denarié E., (2013), 'Rehabilitation and strengthening of concrete structures with Ultra High Performance Fibre Reinforced Concretes', Structural Engineering International, AIPC, 04/2013.

² Sajna A., Denarié E., Bras V., (2012), 'Assessment of a UHPFRC based bridge rehabilitation in Slovenia, two years after application', Hipermat 2012, 3rd International Symposium on UHPC and Nanotechnology for High Performance Construction Materials, March 7-9, 2012, Kassel, pp. 937-944.

Habert, G., Denarié, E., Sajna, A., Rossi, P., (2013), «Lowering the global warming impact of bridge rehabilitations by using Ultra High Performance Fibre Reinforced Concretes», Cement and Concrete Composites, 38, pp. 1-11.

³ Denarié E., Jacomo D., Fady N., Corvez D., (2013), 'Rejuvenation of maritime signalization structures with UHPFRC', in Proceedings UHPFRC 2013, 2nd International Symposium on Ultra-High Performance Fibre-Reinforced Concrete (UHPFRC), Marseille, AFGC, pp. 157-166.

SafeLife-X Safe Life Extension management of aged infrastructures, networks and industrial plants

SAFELIFE-X: SAFE EXTENSION AND MANAGEMENT OF LIFE OF AGED INFRASTRUCTURES, NETWORKS AND INDUSTRIAL PLANTS

The importance of ageing infrastructures, networks and industrial plants will continue to increase due to the need to continue the operation of these infrastructures, networks and plants beyond their design life-time and operate under changed conditions. Effective strategies to address these issues have not yet been developed and consistently applied. The SafeLife-X project, started in September 2013, is exploring the issue of ageing as an opportunity for new technologies, services and businesses, primarily in the service and construction sectors. The project relies on the conclusions of global organisations such as the World Economic Forum and OECD, which indicate that the “*underinvestment in infrastructures*” is one of the most important risks for society.

The goal of this 24-month FP7 project is to improve ageing management for infrastructure networks and industrial plants, including roads, railways, tunnels and bridges, so that their availability is maximised and their management cost effective. SafeLife-X will also pursue the development of a European Standard (EN) on a Risk-Based Inspection Framework (FpREN 16286-1:2012 (E)). SafeLife-X will build cost-effective solutions to handle the problem of infrastructures ageing in the next 10 years (2015-2025) by providing specifications for new Research Development Innovation (RDI) projects (Strategic Research Agenda/Roadmap). It will also set up a reference source with Asset Integrity Management (AIM), mapping, a catalogue of the good (best) practices as

well as with Cost-Benefit analysis and Return of Investment.

Managed by the European Virtual Institute for Integrated Risk Management (EU-VRI), the project is creating a multi-disciplinary and multi-sector community able to answer the key issues related to ageing at a European and international level. The Consortium includes members of the European Technology Platforms (ETPs) and a group of 25 experts to complement the expertise needed, and the project will capitalise on best practices of modelling, asset integrity management, decision making, and cost-benefit analysis.

SafeLife-X was initiated by the European Construction Technology Platform (ECTP), in particular its “*reFINE*” (Research for Future Infrastructure Networks in Europe) initiative and the ETP on Industrial Safety (ETPIS). The project has so far carried out an identification of the needs related to safe lifetime extension and ageing management, as expressed by the various stakeholders. In addition, a review of the current standards and regulations has been carried out to identify the gaps, contradictions and overlaps in order to define further improvement.

Ageing infrastructures must keep up with the above challenges and projects like SafeLife-X and standards like the new FpEn developed with the support of this project, will address these changes and work in order to stay ahead as these trends offer a chance to gain competitive advantage.



- ▶ For more information, see safelife-x.eu-vri.eu or contact Aleksandar Jovanovic and Bastien Caillard at SafeLifeExtension@eu-vri.eu



PARTNERS



European Virtual Institute for Integrated Risk Management (EU-VRI)



Steinbeis Advanced Risk Technologies GmbH, Germany



Institut National de l'Environnement Industriel et des Risques (INERIS), France



Fundación Tecnalia Research & Innovation, Spain



Stichting Deltares, The Netherlands



Teknologian Tutkimuskeskus (VTT), Finland



FEHRL, Belgium



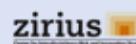
Electricite De France S.A. (EDF), France



EnBW Erneuerbare und Konventionelle Erzeugung AG, Germany



Vce Vienna Consulting Engineers ZT GMBH, Austria



Stuttgart Research Center for Interdisciplinary Risk and Innovation Studies (ZIRIUS), Germany

INCRIS PROJECT SHOWS SIGNIFICANT RESULTS SO FAR



The INCRIS FP7 project, now in its 30th month, has already produced significant results that will be of great value to Ukraine. The project has so far successfully organised four project management training courses for Project Coordinator DNDI (and other) project managers, a session at the FEHRL Infrastructure Research Meeting (FIRM) conference in Brussels in 2013, a number of short-term visits to various research centres in Poland, Sweden, Hungary and Israel as well as hosting researchers from these countries in Kiev. And three DNDI staff members have completed a secondment to the FEHRL Secretariat in Brussels.

To facilitate further international cooperation, DNDI has been involved in the development of five two-stage project proposals within the framework of the European Commission's Horizon 2020 programme in the domain of infrastructure. DNDI also intends to launch a project proposal on the use of coal waste in road construction, and several additional short-term visits to potential partners are proposed.

Due to the current complicated political situation in Ukraine, it was agreed to extend the project duration for a further six months, so the project will now finish in November 2014 after 36 months and the project's final workshop is set to be in September/October 2014. In connection with the prolongation of the project and based on the positive feedback of the trainees of the previous International Project Management (IPM) training modules, it was also decided to hold a final IPM training session within the framework of the INCRIS project on 4-6th November 2014. This fifth training would be

focused basically on the requirements and procedure of participation in Horizon 2020 projects targeted at the project managers potentially involved in the preparation of project proposals.

It was also decided to add two short-term visits to the list of already fulfilled ones. The first was from DNDI to KTI on 2nd April 2014 and the second from DNDI to IBDiM on 26-27th May 2014 (on the above-mentioned issue of setting up a joint project proposal on the use of coal waste in road construction).

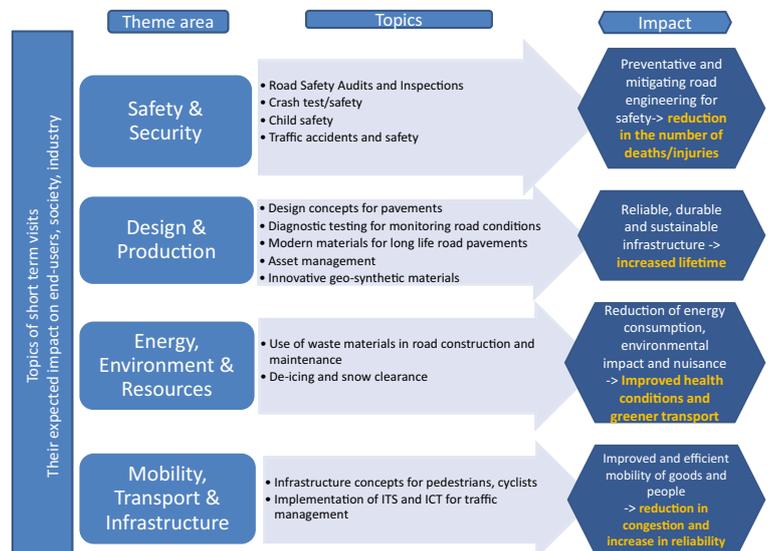
The topics covered during the short-term visits are according to four theme areas (that correspond with the FEHRL Research Areas): Safety & Security, Design & Production, Energy, Environment & Resources and Mobility, Transport & Infrastructure. The expected impacts on the Ukrainian road infrastructure include:

- Reduction of energy consumption, environmental impact and nuisance
- Improved and efficient mobility of goods and people

PARTNERS

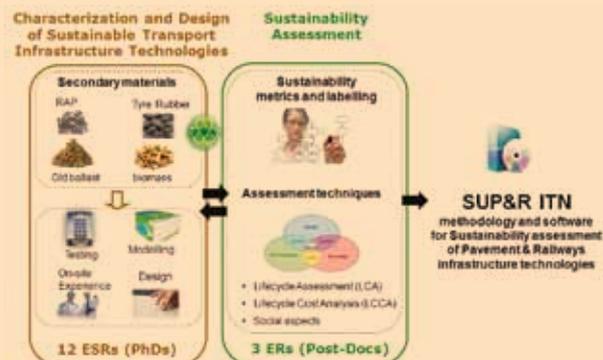


► For more information, go to incris.fehrl.org or contact Valeriy Vyrozhemsky at vv@dorndi.org.ua



SUP&R ITN OFFERS EARLY RESEARCHER TRAINING IN SUSTAINABLE PAVEMENTS & RAILWAYS

The FP7-funded Sustainable Pavements & Railways Initial Training Network (SUP&R ITN), which started at the beginning of October 2013, aims to form a new generation of multi-disciplinary European researchers and professionals capable of conceiving, planning and executing sustainable road and railway infrastructures. This is through a consortium of universities, research centres and companies/industries from five countries (UK, Italy, France, Ireland and Spain). The Nottingham Transportation Engineering Centre (NTEC) at the University of Nottingham is coordinating this four-year People - Marie Curie Actions project and will lead the shaping of the training of all the recruited researchers.



SUP&R ITN offers a training-through-research programme to selected young researchers across Europe. The project includes a high-level four-year training programme which will be international and multi-sectoral. To achieve the overall research and training objectives, the SUP&R ITN has implemented six Work Packages (WPs). NTEC will lead the shaping of the training programme (WP4), be in charge of the management of the SUP&R ITN (WP5) as well as the dissemination and outreach activities of the Consortium (WP6). Each hosting institution will contribute to the training-through-research of the researcher through projects that will be delivered within three scientific research work packages (WP1-WP3)

The training will be local and network-wide and will consist of basic and advanced scientific courses together with complementary skills training courses, workshops, technical visits, research periods abroad, summer schools, conferences and a final symposium. Each course will be coordinated by the Consortium and will be held at the premises of the different partners.

SUP&R ITN will train the researchers/professionals to incorporate sustainability concepts already at the design stage of road and railway infrastructure technologies. SUP&R ITN will drive the researchers on their pathway by closely investigating promising pavements and railway technologies with practical methods, models and tools for estimating their sustainability. This will improve the sustainability of road and rail systems throughout their life-cycle through systematic integration of sustainability metrics at an early stage in the product design.

The SUP&R ITN programme will achieve these results by developing inter-linked research projects aiming at:

- Developing new sustainability technologies and materials for use in road pavements and railway transport infrastructure
- Providing advanced characterisation of recycled and reused materials generated from road and railway infrastructure and/or other production processes for use in road and railway infrastructure.
- Developing detailed material modelling and design approaches

for immediate uptake by industrial stakeholders working in the area of transport infrastructure.

- Developing and refining estimation tools so that industry can assess where it currently stands in key sustainability indicators and determine how much it can improve using low-energy and more recycled materials.

The industry partners cover the whole stakeholder chain of road pavements and railways from transport infrastructure managers, engineering designers, contractors and manufacturers. The Consortium is complemented by 19 Associate partners (see "Partners" on superitn.eu), including FEHRL for dissemination, which range from research and training bodies, professional European Associations, experts in sustainability and online training of sustainability.

FULL PARTNERS



- ▶ For more information, go to superitn.eu, see SUP&R ITN on Facebook or contact Davide Lo Presti at davide.lopresti@nottingham.ac.uk

25-26TH AUGUST 2014

JOIN THE SMARTRAIL FINAL CONFERENCE...



Hosted by project partner ZAG at the Grand Hotel Union Business (GHUB - www.union-hotels.eu) in Ljubljana, Slovenia, the conference will present the practical solutions and guidelines for implementation arising from the following research activities:

- 1. Remote Monitoring and Inspection Procedures:** Demonstration projects from across Europe including methods for monitoring the effect of climate change on the stability of steep slopes, rapid assessment of ballast condition using train mounted geophysical techniques, vibration based assessment of bridge scour and real-time remote monitoring of bridge weigh-in motion and corrosion.
- 2. Analysis and Assessment:** Advanced probabilistic based models to analyse the current condition and degradation of critical assets including bridges and embankments, as well as simplified approaches which can easily be implemented in practice.
- 3. New techniques to remediate ageing infrastructure trialled on live networks.** The use of novel vertical anchoring systems in transition zones, bridge rehabilitation using UHPFRC and geo-synthetic on open track sections.
- 4. A whole life cycle assessment tool** developed for rail infrastructure managers.
- 5. A series of user guidelines** covering the above main areas in the project.

► To register and for more information, contact smartrail_admin@ucd.ie or see smartrail.fehrl.org

23RD-24TH OCTOBER 2014

... AND THE TRIMM FINAL CONFERENCE



Register now for the Tomorrow's Road and Infrastructure Monitoring and Management (TRIMM) final conference on October 23rd-24th 2014 at the Diamant Center (www.diamant.be) in Brussels, Belgium. This meeting is being organised in conjunction with the European Road Profile User's Group (ERPUG), whose objectives fit very well with the TRIMM project. Read more details on page 15.



► For more information, contact leif.sjogren@vti.se or see trimm.fehrl.org

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