

# BASt topics

Information from the Federal Highway Research Institute

Edition January 2016

## Horizon 2020

The Federal Highway Research Institute (BASt) participated in several successful proposals for the first stage of EU's Horizon 2020 programme. Four projects will be introduced in this issue of BASt topics:

- SENIORS - Safety ENhanced Innovations for Older Road users
- PROSPECT - Proactive Safety for Pedestrians and Cyclists
- FLOW - Furthering Less congestion by creating Opportunities for more Walking and cycling
- HEALROAD - Induction heating asphalt mixes to increase road durability and reduce maintenance costs and disruptions



## Update of BASt's research targets

Connected with the creation of a new research plan 2016-2020, which follows the current research planning, the Federal Highway Research Institute has revised the longer-term research objectives and adapted them to current developments. The revision was carried out in consultation with the Scientific Advisory Board and the Federal Ministry of Transport and Digital Infrastructure. BASt pursued now the following research objectives:

### Efficiency in construction and maintenance

Efficiency is a criterion to describe whether a measure is likely to achieve a given goal in the field of construction and maintenance while preserving the efficiency (ratio between the achieved success and use of funds). A measure is efficient compared to other options if it has cost advantages for a similar effect or if it has a higher effect at the same cost.

### Reliability of road infrastructure

A reliable transport infrastructure is one of the essential preconditions for sustainable mobility and economic growth. The infrastructure must be

able to carry out its functions over the expected lifetime in accordance with its dimensioning and adapted to the traffic situation, without posing any hazard.

### Traffic Safety

Traffic safety on the road is characterized by the avoidance of accidents and the reduction of their consequences. Road safety is measured by the number of people killed or injured in accidents and the material damage, taking also account of the relation to transport demand and the severity of an accident. Measures to improve or maintain road safety can focus on the road users, the infrastructure or the vehicle.

### Performance of roads as a transport system

Performance describes the existence of the necessary conditions of the road transport system to provide its functions (measured as vehicle miles or traffic volume) permanently. Thus, the infrastructure should be dimensioned according to the target that the expected traffic demand can be satisfied with a reasonable traffic

quality. Furthermore, the performance of the infrastructure during operation must be ensured when cost-effective maintenance measures are carried out.

### Environmental sustainability

Under environmental sustainability all kinds of direct and indirect environmental effects caused by humans are subsumed which may have an impact on the environmental conditions of soil, water, air, climate, people, animals and plants.

### Resilience of the transport system road

Resilience is the ability of road infrastructure to minimize damages due to unwanted and unplanned adverse events, such as natural disasters and to enable rapid re-commissioning. This includes the preparation, planning for and adapting to these events.

### Technological progress in Highway Engineering

Technological progress refers to any improvement from the technical starting point or all technical innovations in Highway Engineering.

## SENIORS - Safety ENhanced Innovations for Older Road users

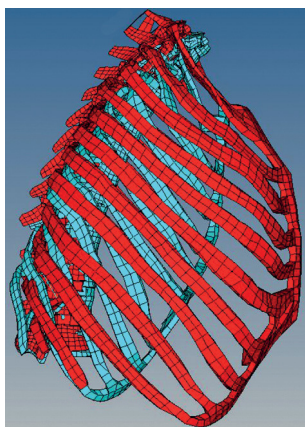
A reduction of almost 48 percent of total fatalities was achieved in Europe in the past years due to efforts that were put into road safety. This includes also a reduced number of elderly fatalities due to road accidents. However, among all the road fatalities, the proportion of elderly is steadily increasing.



[www.seniors-project.eu](http://www.seniors-project.eu)

In an ageing society, the SENIORS project aims to improve the safe mobility of the elderly, and obese persons if found considerable, using an integrated approach that covers the main modes of transport as well as the specific requirements of this vulnerable road user (VRU) group.

Thus, this project will primarily investigate and assess the injury reduction that can be achieved through innovative and suitable tools as well as safety systems in the automotive sector targeting the protection of the elderly (and obese persons) as car occupants and external road users (pedestrians, cyclists) being involved in a crash.



SENIORS started with a comprehensive literature review, studies on accident data and hospital statistics in order to obtain substantial knowledge about the kind of injuries elderly sustain in road traffic accidents and about the injury causation and mechanisms. Based on post-mortem human subject studies, volunteer testing and accident data, assessment tools for the elderly protection are to be implemented that will enhance the introduction of advanced safety systems.

In order to exploit the capabilities of modern safety systems, this project aims to have a short term impact in the elderly road user safety by the following achievements (selection):

- Identified distinctions in kinematics of road users by age in pre-crash and crash phase.
- Identified anthropometric and injury mechanism particularities of elderly, and also obese persons, compared to younger people.
- Customised R-scripts package ([www.r-project.org](http://www.r-project.org)) for the calculation of injury risk curves.
- Developed and optimised test tools, procedures and assessment methods in the area of passive vehicle safety with special regard to elderly and obese users.
- Transfer of knowledge and results through cooperation with regulatory, industry, consumer and insurance entities.

SENIORS was officially launched on 1 June 2015 and ends on 31 May 2018 (duration 36 months). The project volume amounts to approximately 2.9 million Euros. The coordination of the project is carried out by BAST. Other project partners are Autoliv Development AB (Sweden), Ford-Werke GmbH (Germany), Fiat Chrysler Automobiles (Italy), Humanetics Europe GmbH (Germany), IDIADA Automotive Technology SA (Spain), Ludwig Maximilian University of

Munich (Germany) and the Transport Research Laboratory Limited (United Kingdom).

BAST is active in all technical work packages (topics such as accident research, biomechanics, development of test tools, procedures, and assessments, carrying out crash and impactor tests as well as numerical simulations), and heavily involved in the work packages for project management and dissemination of results.

A special attention will be paid in addition to cooperation with industry, academic and governmental bodies, for example from the United States (National Highway Traffic Safety Administration, University of Virginia), Japan (National Traffic Safety and Environment Laboratory, Japan Automobile Research Institute/ Japan Automobile Manufacturers Association) and South Korea (Korea Automobile Testing & Research Institute). Associated with that, a first SENIORS Expert Meeting took already place on 11 September 2015 in Lyon as a follow-up event of the International Research Council on Biomechanics of Injury conference.



## Jürgen Krieger took the chair of the PIARC Technical Committee E. 1

The new PIARC cycle will start in spring 2016. BAST's Head of Department Bridges and Structural Technology, Dr.-Ing. Jürgen Krieger, is the designated chairman of the new technical committee E. 1 Adaption Strategies/Resilience.



## BAST Scientific Advisory Council

In 2015 Professor Dr.-Ing. Martin Radenberg joined the Scientific Advisory Board of the Federal Highway Research Institute. Professor Radenberg is head of the Department of Transport Infrastructures at the Ruhr-University Bochum.

---

## PROSPECT - PROactive Safety for PEdestrians and CyclisTs

Several vehicles that are currently on the market feature automatic emergency braking (AEB) systems either as standard or optional fitment. Assessment procedures for these systems are under development or already available. Their expected positive effect on accident figures is taken into account in consumer testing.

However, current systems suffer from a few limitations. Their intervention in critical driving situations occurs shortly before this event - at a time when the vehicle driver has almost no chance to avoid the accident by him- or herself. As a consequence, this late reaction time makes it difficult for the AEB system to avoid accidents (for example a vehicle comes to a full stop just in front of the threat), in particular in high speed scenarios and scenarios with obscured pedestrians. If the braking intervention would start too early, there would be plenty of false activations in regular traffic, even in perfectly normal situations - which is not acceptable for traffic flow, from a safety perspective, and last but not least for the driver. Also, current systems only have access to vehicle braking systems. There's no automatic steering system in production (some prototypes are available).

Proactive safety systems, especially for pedestrians and cyclists, can be more effective, if they tune their intervention timing better to the traffic situation and driver fatigue, and if they use steering intervention additionally to braking intervention.

This is where the PROSPECT project comes in: PROSPECT will develop advanced Human-Machine Interfaces



(HMI) as well as advanced vehicle control strategies for combined steering and braking. The advanced HMI will monitor the driver's directional attention and for instance intervene earlier in cases where the threat is out of the driver's focus. The control systems will make use of a tremendously increased radial sensor range to find the optimal combination of steering and braking, and advanced sensor interpretation systems will allow to better judge the intention of pedestrians along the vehicle route with respect to their direction of movement.

To estimate the benefit for these new functions, advanced testing and validation methods need to be developed. Current validation of automatic brake systems is carried out on a test track, without irritating objects, road clutter, road signs or lines; thus, in rather artificial surroundings.

PROSPECT will not only introduce novel realistic surrogate targets, but also perform testing in realistic surroundings including other moved objects, infrastructural facilities, clutter and the like.

Final output of PROSPECT will be three vehicle demonstrators, to be tested in detail using state-of-the-art surrogate targets for pedestrians and newly developed surrogate targets for bicycles and their riders.

PROSPECT partners are vehicle manufacturers, suppliers, test tool providers, academia and traffic safety research institutes. The project is coordinated by Applus IDIADA from Catalonia, and BAST leads the validation and testing efforts and is involved in the accidentology and benefit estimation as well. Total budget is slightly below seven million Euros, and the project will run for 42 months until October 2018.

---

## FLOW - Furthering Less congestion by creating Opportunities for more Walking and cycling

In former times urban transport and traffic planning was mainly focused on motorised transport modes. Whereas non-motorised transport modes like cyclist and pedestrian were neglected more or less. The situation changed totally in previous years. More and more cities are discovering cycling and walking as a serious mode of mobility. An evaluation of conducted cycling and walking infrastructure measures showed obviously that these measures may contribute to less congestion in urban road networks.

A consortium of 19 partners from different European countries addresses this issue in the EU funded project "FLOW-Furthering Less congestion by creating Opportunities for more Walking and cycling" with active involvement of BAST.

Main objectives of FLOW are the definition, analysis, and assessment of effective cyclist and pedestrian related infrastructure measures inside urban areas. Therefore, an assessment tool will be developed which should assess the congestion

reducing benefits of cycling and walking infrastructure improvements. The assessment tool will be tested in several European cities like Budapest, Dublin, Lisbon, Munich, Sofia and Gdynia. Afterwards, gained project results will be disseminated to further cities across Europe and beyond. Thereby the project partners would like to promote the diffusion of best practice examples of effective cycling and walking infrastructure measures across Europe.

## HEALROAD - Induction HEating AsphaLt mixes to increase ROAD durability and reduce maintenance costs and disruptions

The Project HEALROAD started at 1 October 2015 and has a term of 30 months. HEALROAD received co-funding from the ERA-NET Plus INFRAVATION Call 2014 for research, technological development and demonstration. The University of Cantabria, Spain, will lead the consortia of six partners.

The main goal of the project is to extend the durability of the road construction by approximately 30 percent and the finding of a better and innovative, cost effective maintenance procedure for asphalt pavements.

With the help of the regular self healing characteristics of asphalt and the support of induction heating the research results are to be achieved. Initial cracks within the construction will be healed at an early stage in order to guarantee that bigger damages will not occur. To support the healing

process via induction heating the asphalt mixture has to be modified. First, the new mixture will be tested with regular laboratory equipment on small scale. In a further step the final results will be evaluated with a full scale test set up. The main scope of application lies on roads with high traffic loads, bridge joints and cross ways. Especially these parts of the network are very critical in terms of their impacts due to construction work closures. Closings of these parts are connected with delays and detours which lead to higher carbon dioxide and pollutant emissions as well as socio-economic costs.

HEALROAD covers the challenges D 'Keeping freight routs open through zero-intrusive maintenance' and B 'Enhanced durability and life-time extension' of the INFRAVATION Call 2014.

BASt leads WP5 and will load the full-scale test section in the Netherlands with the Mobile Load Simulator MLS10 (new: Pave@MLS30) to create micro cracks at the wearing course. During the HEALROAD project the right test construction has to be evaluated. Therefore the BASt will rate various test constructions in the local test environment in advance and will carry out the life cycle cost analysis for the most relevant asphalt mixture.



*Project group of HEALROAD at the Kick-off Meeting at the University of Cantabria*

## World Road Congress 2015 in Seoul

The XXVth World Road Congress was held at the COEX Convention Center in Seoul, Korea from 2 to 6 November, 2015.

The congress was organized in close cooperation between the World Road Association PIARC, responsible for the content and development of the programme, the Ministry of Land, Infrastructure and Transport of the Republic of Korea, the Korea Expressway Corporation, the Korea Road & Transportation Association and the PIARC Korean National Committee.

### BASt participated in the German booth

The exhibition of the 25th World Road Congress has drawn a large number of professionals in all areas of road transport from across the world. BASt supported the Federal Ministry of Transport and Digital Infrastructure at the German booth.

### BASt led TC 1.4

Project appraisal is a deciding step to prove the efficiency of an investment. In addition to a technically sound

appraisal in the planning phase the ex-post evaluation following the commissioning of projects is becoming a core part of road management structures. Four key questions were addressed at the Main Session of TC 1.4 at the XXVth PIARC World Road Congress 2015:

- How can risks and hazards be better embedded in appraisal and evaluation approaches?
- Are environmental aspects sufficiently taken into account?
- Are appraisal methods accurate and how can their quality be improved?
- Are there special issues and insights in developing countries?

Embedding risks into appraisal approaches is still a challenge which should be addressed by PIARC and other international road organizations. Furthermore, ex post-analyses are now confirming their huge potential for the identification of reasons for negative developments. The development of ex post-evaluations should be followed by the associations and their application should be supported. Finally, it should be continued to pay special attention to these issues in developing countries.

The TC 1.4 was chaired by BASt's Research Commissioner Dr. Karl-Josef Höhnscheid (centre).



Further information:  
[www.bast.de](http://www.bast.de)

Picture credits:  
All pictures by BASt or as shown.

Order  
BASt topics is published irregularly and can be subscribed free of charge.