

# BASt topics

Information from the Federal Highway Research Institute

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## Review of the PIARC World Road Congress Abu Dhabi in October 2019



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*Birgitta Worringen (centre), surrounded by members of the German delegation at the German National Pavilion in Abu Dhabi*



Since the first World Road Congress held in Paris in 1908, PIARC (World Road Association) organises every four years a World Road Congress in one of its member countries with the aim to share techniques and experiences worldwide in the field of road infrastructures and road transport. In 2019, the 26th World Road Congress took place in Abu Dhabi (UAE), jointly organized by PIARC and the Abu

Dhabi Department of Transportation (DoT).

The 27th World Road Congress will be held in 2023 in Prague, Czech Republic.

Find out more about PIARC and the WRC:  
[www.piarc.org/en](http://www.piarc.org/en)



“It is my pleasure to take a look back to the 26th World Road Congress which was held in Abu Dhabi, United Arab Emirates, from 6 to 10 October 2019. Under the theme “Connecting Cultures, Enabling Economies”, the WRC confirmed its role as a major event for the road sector worldwide and gathered more than 6,000 participants from 144 countries. The German delegation from BMVI, FGSV and BASt was headed by Birgitta Worringen, Head of Directorate StB1. As part of the big exhibition held in parallel to the Congress, the German National Pavilion welcomed international guests during the entire congress days, thus enabling multiple exchange of knowledge and know-how throughout the worldwide road and transport community. Numerous researchers from BASt presented selected topics in various Congress sessions. With BASt topics focusing on these presentations, I am glad to invite you to a joint review to Abu Dhabi WRC.”

*Stefan Strick,  
BASt President*



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## Cyber resilience of tunnel control centers



Tunnel Control Centre (Photo: DÜRR Group GmbH)

Tunnel control centers are responsible for monitoring and controlling traffic, thereby ensuring safety and secure operation. The IT systems used for monitoring and control must

be adequately protected against the increasing risk of cyber attacks.

Past cyber incidents and the resulting disruptions to important transport links highlight the necessity to implement additional security measures in order to continue to meet the required security level of transport infrastructure even with a changed

hazard situation. The paper presents the status quo of the cyber-security of road tunnel control centers and a methodology

how to assess the existing cybersecurity level. This methodology includes aspects on a threefold level: firstly technical aspects, secondly organizational aspects and thirdly personnel aspects. In order to achieve an improvement quickly, a software application accompanied by a guideline for assessing the existing cyber security level was developed. In addition, the procedure of a penetration test is presented, which was carried out in a tunnel control centre and a tunnel. Finally, the need to extend cyber-security to cyber resilience is highlighted. Related results were achieved in the framework of the cooperative research project "Cyber-Safe" which was funded by the German Federal Ministry of Education and Research (BMBF) and coordinated by BAST.

*Dr. Ingo Kaundinya &  
Dr. Selcuk Nisancioglu*

## PIARC TC 4.4 "Tunnels"

Dr. Ingo Kaundinya, incoming chair of TC 4.4 Tunnels, presented the topics of the 2020-2023 PIARC cycle. For road tunnels, the next 4 years will cover the following topics: measures for increasing resilience of road tunnels, management of tunnels with high traffic loads, Intelligent Transport Systems (ITS) in tunnels, influence of vehicles with new propulsion technologies (e.g. electric vehicles) on tunnel safety and operation as well as the update of the Online Tunnel Manual. Furthermore, various workshops and a large international tunnel conference will be organized.

*Dr. Ingo Kaundinya*



Heavily trafficked road tunnel (Photo: BMVI / René Legrand)

## Resilience measures for road infrastructures

Dealing with disruptive events, such as extreme weather events and/or cyber-attacks, is a major challenge for road infrastructure owners and operators. To maintain the functionality of the road infrastructure during disruptive events or to restore it as quickly as possible after such events, applicable concepts and methodologies are required, which enable a systematic assessment of the functionality of the road infrastructure. At the technical session TS E1: Adaptation Strategies / Resiliency chaired by Jürgen Krieger, Kalliopi Anastassiadou presented a methodology which enables road owners and operators in three simple steps to identify and prioritize resilience measures (e.g. high-performance concrete on bridges, automatic fire-fighting system in tunnels) and procedures (e.g. existing of emergency plans) in order to improve the availability and safety of their road infrastructures (e.g. bridges and tunnels) during and after the occasion of disruptive events. A practical Handbook describing the developed methodology together

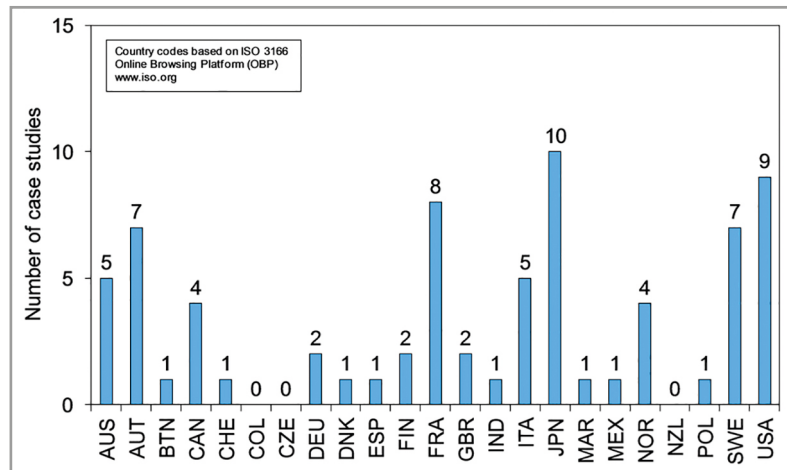


with a simple software application is also provided. The outcomes of this study help to achieve a more effective (all hazards) and efficient resilience assessment and action planning strategy for road networks. This work is carried out within the framework of the BMVI Network of Experts "Knowledge – Ability – Action" of the German Federal Ministry of Transport and Digital Infrastructure ([www.bmvi-expertennetzwerk.de](http://www.bmvi-expertennetzwerk.de)).

*Dr. Kalliopi Anastassiadou*

## Analysis and Categorization of Climate Change Adaptation Case Studies

The Technical Committee E.1 “Adaptation Strategies and Resiliency” conducted a survey of case studies addressing the challenges of climate change for road infrastructures and networks. At the TC E.1 session during the 26th World Road Congress Beata Krieger (Head of BAST’s section S1 “Adaptation to Climate Change”) presented the work of the Case Study Task Force. Under Ms. Krieger’s leadership the Task Force supported the two working groups of the TC E.1 in the review of case studies on adaptation strategies and resiliency. This included the collection, classification and provision of case studies from around the world. For conducting the survey two questionnaires were developed: Questionnaire I provided basic case study information and served to collect the case studies; Questionnaire II contained specific information, such as climate change data, climate change impact, risk analysis, vulnerability analysis, criticality assessment, cost-benefit analysis, adaptation measures and framework, which was used for the classification of case studies. Between



Case studies analyzed and classified by TC E.1 by country (2016-2019)

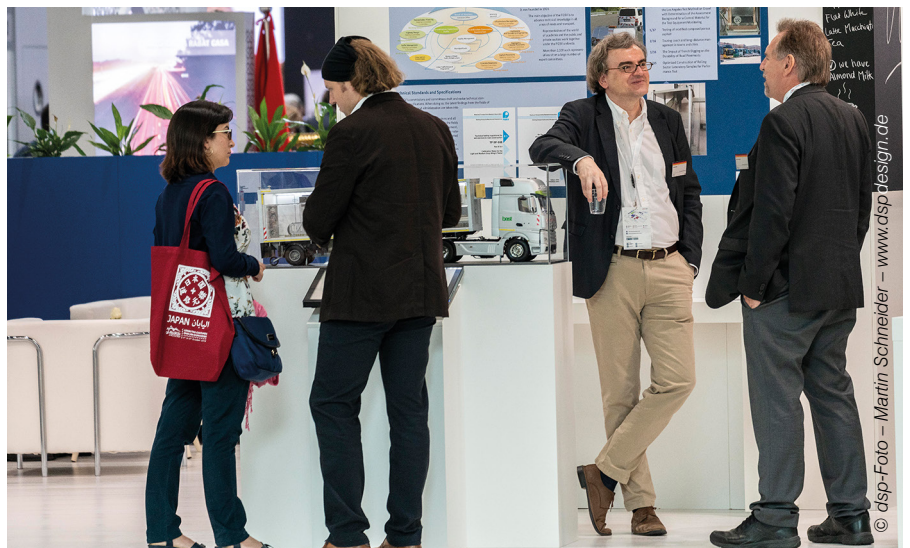
2016 and 2019, 105 case studies from 23 countries were received; of those only 73 case studies from 20 countries were classified due to lack of information or language barrier. Most case studies were provided by European countries, however, North America and Asia made up a considerable number, too. Through the classification of case studies the following results were obtained. The category “adaptation measures” was most represented in the case studies. The categories “climate change

impact” and “climate change data” are also well studied internationally. The detailed classification and analysis of the case studies are included in the final report of the TC E.1 which was not published. The information collected by the Task Force serves as a basis for the work in future PIARC cycles. The survey will be continued in TC 1.4 “Climate Change and Resilience of Road Network”.

Beata Krieger

## Technical Session TC D.2 Pavements

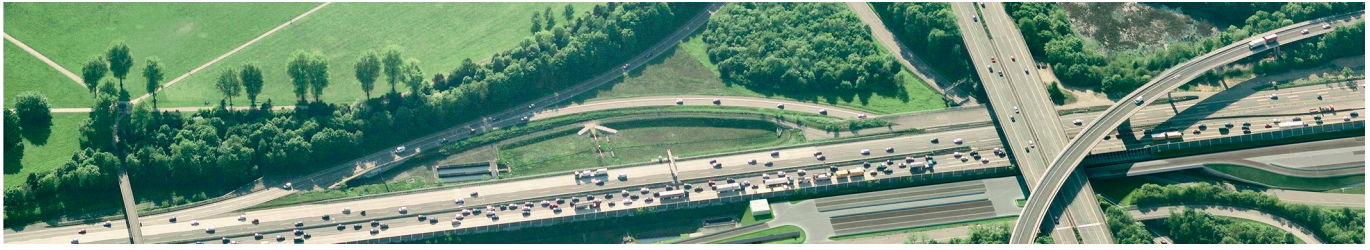
The objectives defined in the strategic plan for the period 2016 to 2019 for the topic of road pavements focussed on non-destructive pavement monitoring and testing techniques, low cost road pavements for financially weak countries and sustainable road construction. These subject areas were reflected in the Technical Session of TC D.2. Green Paving Solutions, Low Cost Pavement Systems and Road Condition Monitoring formed the structure for the presentations. In the run-up to the World Road Congress, the TC carried out a scientific evaluation of the papers submitted on the topic areas and selected three papers for presentation. The authors came from France, the United Kingdom and Mexico. All three won a PIARC Award for their outstanding contributions in the categories Young Professionals, Road Design and Construction and Road Maintenance and Operations. In



addition, the TC members and the TC Chair Dr. Seung-Hwan HAN presented the results of the past four years of work, mainly in the form of practice-oriented case studies. The work in the period 2020 to 2023 will be continued

in Technical Committee 4.1. The focus here will be on the resilience of the infrastructure to the effects of climate change.

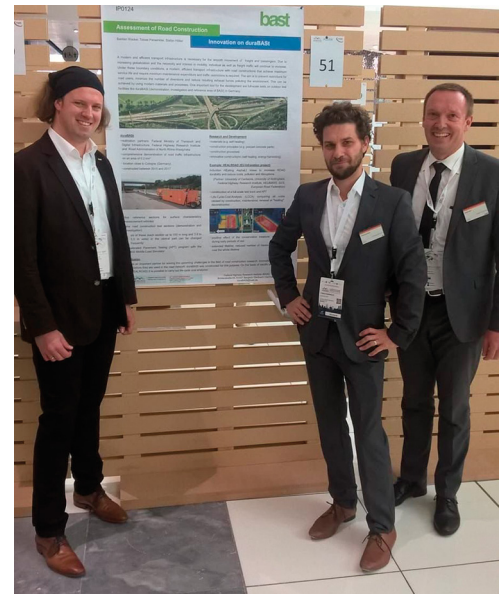
Oliver Ripke



## Assessment of road construction innovation on duraBAST

Road construction sites for maintenance and general reconstruction work have a major impact on traffic flow, reduce economic productivity and increase greenhouse gas (GHG) emissions. Therefore, research projects are important to optimize the pavement structure and materials in order to improve their durability and to minimize the maintenance work on this sensitive network. One important tool for those research projects are full-scale tests on test facilities like duraBAST in Germany. These full-scale accelerated pavement tests (APT) provide useful information on the behavior of the whole structure under realistic conditions. BAST uses the Mobile Load Simulator MLS30 and duraBAST to continue this

research process. With APT the gap between laboratory testing and the first use on the road network can be closed and the likelihood of success can be increased. duraBAST gives the opportunity to conduct research under realistic conditions without the risk of negative effects for the public traffic. Information and results of laboratory- and full-scale tests are needed to continue the assessment process of innovations. One part for the assessment could be a life-cycle-cost-analysis (LCCA) with research results and standardized assumptions to perform a monetary evaluation of the innovation, including an estimate of its monetary saving potential. In the end of the process an assessment of the whole innovation should be presented.



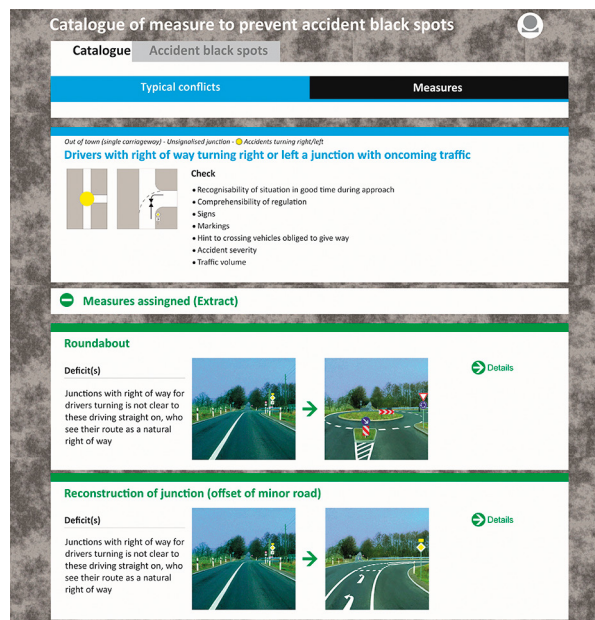
Dr. Bastian Wacker, Tobias Panwinkler, Stefan Höller

## MaKaU – An innovative web-tool for Black Spot Management in Germany

'Black Spot Management (BSM)' is an important task with respect to improve road safety. The aim of BSM is to identify spots like shorter road sections or junctions with a high accident concentration. Furthermore, BSM includes also the accident analysis and from that the determination of appropriate countermeasures for combating 'Accident Black Spots'. In the recent years a web-based tool was developed, which consists of two parts: Firstly, the "Catalogue of countermeasures against Accident Black Spots" (MaKaU) itself (<https://makau.bast.de/>) and secondly, a web work space to assist users to determine appropriate safety measures dependent upon local constraints and the specific accident situation. This work space has to be hosted

by the 16 Federal States, due to their responsibility regarding BSM and data protection regulations for accident records. The main component of the work space includes the

accident analysis, the identification of appropriate countermeasures, and – after their implementation – an evaluation of their effectiveness. The results from the evaluations and also the real costs of each implemented measure can be used for a constant updating of the catalogue and the characteristics of each measure (in particular, degree of efficiency). This 'Self-Learning System' shall help to combat accident black spots more efficiently in the future.



For further information visit:



Dr. Marco Irzik

## Transitions - Safe connections between different safety barriers

Depending on the type of hazard (e.g. obstacle next to the road, possible danger of a breakthrough in the medial strip), safety barriers with different performance characteristics and other materials are used. In order to maintain a continuous bond between safety barriers of different function and/or design, these must be connected by transitions.

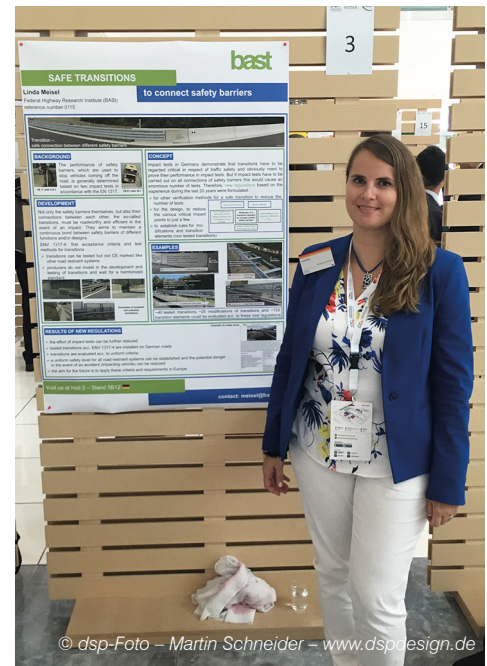
First impact tests in Germany demonstrate that especially transitions which connect ductile steel safety barriers to rigid concrete safety barriers have to be regarded critical in respect of traffic safety and obviously need to prove their performance in impact tests. If impact tests have to be carried out on all connections of safety barriers this would cause an

enormous number of tests. Linda Meisel presented new regulations that were formulated based on the experiences of the last years:

- for other verification methods for a safe transition to reduce the number of tests,
- for the design, to reduce the various critical impact points to just a few,
- to establish rules for modifications and transition elements.

By adapting the criteria for transitions to the existing requirements for road restraint systems, a uniform safety level can be established and the potential danger in the event of an accident or impacting vehicle can be reduced.

Linda Meisel



## Intelligent Controlled Compact Parking – Pilot implementation of a new parking management for trucks



rest periods during the night. Even though expansions have been made to satisfy the demand, overcrowding and dangerous situations still occur as a result of vehicles parking on the entrance and exit roads of rest areas. Jens Dierke continued with the explanation of the control procedure "Intelligent Controlled Compact Parking" which has been developed by BAST to achieve that trucks are parked in a compact way sorted according to the departure times. The idea is

that drivers can choose a parking row based on the departure times which are offered on variable message signs (VMS) above the parking rows. The operating experience with the pilot installation of Compact Parking at the rest area Jura West (Bavaria, A3 motorway) since the beginning of 2016 confirms both, the technical functionality and the acceptance by the users.

Rainer Lehmann & Jens Dierke

The paper "Intelligent Controlled Compact Parking – Pilot implementation of a new parking management for trucks", written by Rainer Lehmann and Jens Dierke, has been awarded a PIARC certificate of merit in the category "Young Professionals". Jens Dierke presented the topic during the technical session of the "TC B.4 Freight".

He informed the audience about the enormous increase of commercial freight transport on German motorways. Due to this fact it is often problematic for truck drivers to find safe parking places for longer



## C-Roads Germany

C-Roads Germany, as part of the European C-Roads Platform, tests and implements Cooperative Intelligent Transport Systems (C-ITS) in a real traffic environment. C-ITS encompass services based on data exchange via wireless communication systems among road users (V2V) and among infrastructure entities and road users (V2I). These technologies enable a new generation of services. Compared to the already widespread collective traffic management systems, cooperative services enable a more precisely tailored influence on the road users. C-Roads Germany has two pilot sites, one in Hessen near Frankfurt and one in Lower Saxony near Braunschweig. Eight C-ITS Services are developed and tested within C-Roads Germany. In general, all services aim to reduce the number and severity of accidents (Safety), minimize the emissions of

noise and exhaust (Environment) and increase the efficiency of the road system (Efficiency). The road users receive the information at the right point in time to react accordingly and adapt their driving behaviour. The Federal Highway Research Institute in Germany fosters the European-

wide harmonization of C-ITS and promotes their interoperability. International cross test will ensure the interoperability between C-Roads Platform pilots.

*Tobias Reiff & Farzin Godarzi*



## EU ITS platform on future motorway traffic



The face of Traffic Management will substantially change in the coming decade to meet the challenges of a growing need for mobility and the simultaneous growth of freight transport. The European Platform for Intelligent Transport Systems (EU EIP) is the place where National Ministries, Road Authorities, Road Operators and partners from the private and

public sectors of EU Member States, cooperate in order to foster, accelerate and optimize current and future deployment of Intelligent Transport Systems (ITS) in Europe.

The aim of the project is to increase the efficiency of the TEN-T core network through a better use of the existing infrastructure by implementing ITS.

The EU EIP Activity 2, led by the Federal Highway Research Institute, fosters interoperability and the development of uniform technical standards by monitoring and disseminating the results delivered by the five ITS Road Corridor Projects. The main activities are: Entering and maintaining a strategic dialogue with key stakeholder about further directions of traffic management and information services, providing guidance for deployment of ITS services, Disseminating operational excellence enabled by collection of best practises.

*Tobias Reiff, Dr. Torsten Geißler, Orestis Giamarelos & Jens Dierke*



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