Bundesministerium
für Verkehr und
digitale Infrastruktur

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European Bridge Forum 2020
during the German EU Council Presidency
on 9 July 2020

Report to the European Commission

Throughout their entire service life, bridges are exposed to high stress. This is why they have to meet enormously stringent requirements which are to ensure reliable operation and low risks of failure. Infrastructure users throughout Europe trust that requirements are reliably met when they travel all across the continent by car or when goods are transported in all directions. This means that clients and operators not only have to see to good planning and construction. The use and operation of bridges must also be guaranteed by applying suitable examination and monitoring measures. Resilience, sustainability and life cycle considerations must be taken into account.

With the European Bridge Forum 2020 of the Federal Ministry of Transport and Digital Infrastructure (BMVI) on 9 July 2020, a whole series of events of the BMVI during the German EU Council Presidency was kicked off. Representatives of all EU Member States, the EU Commission, logistics associations, construction industry associations, planners and engineers as well as other interested parties from Germany and abroad were invited to the event. Due to the COVID19 pandemic, the event was organised as a virtual conference with a central studio in Berlin.

By adopting a New Mobility Approach, the German EU Council Presidency intends to gear the transport system throughout Europe to sustainability and climate change mitigation. At the same time, economies, businesses and jobs in the EU are to be made future-proof through corresponding investments. For this purpose, Europe needs high-capacity and modern transport corridors and modern trans-European networks (TENs). During the COVID-19 pandemic, reliable supply chains are even more important than before, and they are not possible unless infrastructure and, in particular, bridges can be operated safely.

The key questions addressed by the conference were:

- How are the European Member States positioned in terms of the operation of bridges?
- What are the differences between and commonalities of the Member States in terms of requirements?
- What joint approaches can be explored and how can the digital revolution help here?

Internationally, the event met with great interest. 155 experts from 23 European countries took part. After a welcome address by Parliamentary State Secretary Steffen Bilger, together with

- the European Commission (Harald Ruijters Directorate B DG MOVE),

- the presenters from
  Germany Guido Morgenthal Bauhaus-Universität Weimar, Gero Marzahn BMVI),
  France (Bernard Jacob Université Gustave Eiffel Paris) and
  the Netherlands (Leo Klatter Rijkswaterstaat) as well as

- the participants of the panel discussion from
  Portugal (Tiago Rodrigues Infraestruturas de Portugal),
  Denmark (Lars Fuhr Pedersen Sund & Baelt Holding A/S),
  Spain (Pilar Crespo Ministry of Transport Mobility and Urban Agenda),
  Germany (Guido Morgenthal Bauhaus-Universität Weimar, Gero Marzahn BMVI),
  France (Bruno Godart Université Gustave Eiffel Paris),
  the Netherlands (Leo Klatter Rijkswaterstaat) as well as
  the Czech Republic (Josef Sejnoha Generální ředitel ŘSD),

presentations on key issues related to the safe operation of bridges in Europe given by experts were discussed. Based on the exchange of best practices of the individual states, the aim was to explore the possibilities and opportunities offered by future methods for the preservation of structures, such as monitoring, big data, smart data and virtual as well as augmented reality. Moreover, the results of a survey of all European Member States on aspects of structural bridge maintenance were presented. The event was moderated by Dr Antje Grobe, DIALOG BASIS, Germany.

The participants, in common with the European Commission and Member States, were in agreement that we are about to embark on a new path together. With the European Commission's plans for the future, fundamental considerations are being made all over Europe as part of the organisation of the conference on the future of Europe that will bring Member States closer together (https://ec.europa.eu/info/sites/info/files/communication-conference-future-of-europe-january-2020_de_0.pdf). Issues such as learning from one another and evolving commonalities in a targeted manner will determine the way forward Digital inspection techniques and methods can make a major contribution with regard to the construction of structures by means of uniform technical standards.

The outcomes of the conference were as follows:

- In the future, there must be a greater focus on the load-bearing capacity of the bridges on the TEN-T and on measures to combat illegal overloading that causes damage to the structures.

- Requirements to be met by bridges in terms of climate change mitigation and resilience are of crucial importance.

- Basic common requirements to be met by the TEN-T with regard to bridges and their load-bearing capacity and serviceability should be developed.

- It is absolutely essential that research, especially into structures, be stepped up and better coordinated throughout the EU.

Efficient supply chains also require efficient routes and bridges for fast and effective transport of people as well as goods. The TEN-T network forms the central European axes on which transport is handled in Europe. The Member States and the Commission agree that the TEN-T network and its structures must be equipped in an appropriate manner and, where necessary, upgraded based on demand. There is also agreement that irregular or improper use, e.g. by illegal overloading in relation to the total vehicle weights and axle loads permissible, must be prevented. Qualitative requirements also for existing bridges help to ensure a minimum performance level. It should be borne in mind that tonnage restrictions for heavy goods traffic vary from one country to another. For example, in Germany total permissible vehicle weights of 40 tonnes apply while in France it is 44 tonnes. An exception is the combined transport of up to 44 tonnes total permissible vehicle weights for container transport that is regulated on a European basis.

However, the ability of the TEN-T network to meet the challenges of the future also requires adapting the design of network to changing climatic conditions and implementing the necessary steps with regard to structural design in good time. Sustainability and resilience are the guiding principles to which greater attention must be paid in terms of design as well as structural and routine maintenance of structures by setting minimum standards. It must be as easy as possible to control that these principles are met. Digital inspection techniques and methods offer potential here and can support structural or other inspections as well as provide the competent engineers with additional information when assessing the condition of structures. Moreover, detected damages and their assessment can be recorded digitally and a georeference can be included and presented in BIM data models, so that, in the future, digital twins can significantly simplify the planning of conservation measures for road construction administrations.

While there are Europe-wide standards for the static design of bridges in the form of the Eurocodes, the operation of bridges is regulated at national level. For example, there are common ideas on the stability and usability of road bridges, but there are no specific harmonised usage criteria at European level under which the traffic on the bridges of the TEN-T network is actually circulating. In particular, these criteria include processes and measures for the monitoring and inspection of structures with regard to stability, road safety and durability. Despite the differences between the individual national rules, a prior EU-wide survey among Member States on these issues showed that the structures are regularly inspected and monitored in all Member States during the periods of use in accordance with pre-defined national criteria and that the common objectives of safe and secure transport are ultimately met. This can be taken up with a view to the longer-term harmonization of rules and minimum standards by developing digital inspection techniques and methods as an important part of the monitoring of structures, culminating in service life monitoring. It is possible to not only check traffic for compliance with permissible total vehicle weights and axle loads but also the condition and stress loads of structures and their static utilization in real time. Consequently, it will be possible to better assess whether the structures still meet the requirements or whether they need to be adapted.

Growing requirements for secure bridge operations in a Europe that is intensively and dynamically connecting can be a key driver for common developments in the planning, construction and, above all, operation of bridges in Europe. Knowledge of the current state of a structure is essential in order to ensure its safe operation at all times and be able to plan the necessary structural maintenance work in good time and in a manner that is compatible with traffic flows. In principle, unscheduled performance restrictions or even breakdowns of bridges are to be avoided. Some elements of the necessary technologies already exist, but need to be further developed. The approach presented by the Commission that is based on connected research activities in Europe in these fields is strongly welcomed by all participants. However, it is also stressed that, to successfully shape a mobile future, not only the users of the infrastructure, but, as a matter of priority, the infrastructure itself should be the focus of research.

In conclusion, the European Bridge Forum 2020 with 155 participants from 23 countries, can be considered a very successful event that should be continued under future Council presidencies and the results be followed up on. Not only will this help promoting a deeper understanding of the subject matter across borders, but it will also lead to a European harmonisation of rules for safe bridge operations and, as a side effect, a more intensive networking of experts from the EU Member States.

Additional information and the presentations in English can be found at https://bmvi-eu2020.de/european-bridge-forum/.

- *Leo Klatter*, Rijkswaterstaat, Utrecht, The Netherlands,
  Bridge maintenance management in the Netherlands

- *Bernard Jacob*, Université Gustave Eiffel, Paris, France,
  Bridge assessment for an optimized maintenance management in France

- *Gero Marzahn*, Head of the bridge, tunnel and other engineering structures department, Federal Ministry of Transport and Digital Infrastructure, Germany
  Requirements for the safety management of bridges in Europe: Results of the preliminary country query

- *Guido Morgenthal*, Bauhaus-Universität Weimar, Weimar, Germany
  Digitalisation of Structural Inspections - Automatic Scanning, Image Analysis and Georeferencing of Condition Data

- *Herald Ruijters*, Director of Directorate B Investment, Innovative & Sustainable Transport, DG Mobility and Transport (DG MOVE), European Commission, Brussels,
  Enhancing Infrastructure Quality - a New Challenge for TEN-T Policy.