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FUTURE DEVELOPMENT OF HARMONIZED EUROPEAN STANDARDS ON  
MONITORING, DATA-INFORMED SAFETY EVALUATION AND  
MAINTENANCE OF TRANSPORT INFRASTRUCTURE

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Pan-European CoP Forum



**IM-SAFE**<sup>.EU</sup>

# MEETING MINUTES

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Meeting date: 3<sup>rd</sup> of June 2021

Meeting location: on-line (Microsoft Teams meeting)

Topic: Future development of harmonized European standards on monitoring, data-informed safety evaluation and maintenance of transport infrastructure

Attendees:

- Diego L. ALLAIX [DA] (TNO)
- Isabella ALOVISI [IA] (Sacertis)
- Agnieszka J. BIGAJ-VAN VLIET [AB] (TNO)
- Eleni CHATZI [EC] (ETH)
- Alfredo CIGADA [AC] (Politecnico di Milano, Sacertis)
- Sara CUERVA NAVAS [SC] (Ferrovial)
- Lennart ELFGREN [LE] (Luleå University of Technology)
- Clemente FUGGINI [CF] (RINA)
- Herbert FRIEDL [HF] (SBB)
- Jens HANEL [JH] (unknown)
- Inge HOFF [IH] (NTNU)
- Reinier A. KLEISSEN [RK] (ProRail)
- Jochen KÖHLER [JK] (NTNU)
- Frida Liljefors [FL] (NTNU)
- Arjen van MAAREN [AM] (Rijkswaterstaat)
- Andrea NARDINOCCHI [AN] (Italferr)
- Ernst NIEDERLEITHINGER [EN] (BAM)
- Sverre Kjetil RØD [SK] (Norwegian Public Roads Administration)
- Ana SANCHEZ RODRIGUEZ [AS] (University of Vigo)
- Daniëlle van SCHAİK [DS] (CROW)
- Miguel J. SEGARRA MARTINEZ [MS] (DRAGADOS, ECTP)
- Alfred STRAUSS [AS] (BOKU)
- Timo TIRKKONEN [TT] (Vayla)
- Matthias WEISE [MW] (AEC3)
- Jos WESSELS [JW] (CROW)
- Alain ZARLI [AZ] (ECTP)

Agenda:

1. Welcome en introduction to the IM-SAFE project (Jos WESSELS, Diego L. ALLAIX)
2. Summary of results of national / regional CoP's (Sara CUERVA NAVAS)
3. Analysis of trends, best practices, PEST barriers: preliminary results (Jochen KÖHLER)
4. Preliminary definition of the scope of the mandate to CEN (Diego L. ALLAIX)
5. Discussion on the scope of the mandate to CEN
6. Follow-up on engagement of Pan-EU CoP (Diego L. ALLAIX, Jos WESSELS)
7. Closure (Jos WESSELS)

Minutes:

#	Details
1	<p><b>Welcome and introduction to the IM-SAFE project</b></p> <p>JW welcomes the audience. DA summarises the scope, objectives and activities of the IM-SAFE project.</p>
2	<p><b>Summary of results of national / regional CoP's</b></p> <p>SC presents the overview of the 5 national/regional CoP meetings held in March-May 2021 on the topic “Current state of standardization in monitoring, data-informed safety evaluation and maintenance of transport infrastructure”. The results of the CoP meetings are summarized with focus on two topics: monitoring and maintenance.</p> <p>Monitoring methodologies are country- and operator-dependent and vary between the railway and road sector. There is a substantial interest in implementing monitoring strategies, in particular continuous monitoring, which would enable real-time warning systems and would support preventive and predictive maintenance practices. In addition, some participants to the national/regional CoP meetings suggested to define monitoring plans already in the design phase of new structures. Even though standardisation on monitoring is seen as a challenge due to the large variety of structural characteristics and typologies, guidelines and standards are desirable for different aspects, including the definition and harmonisation of monitoring plans, inter-operability, reliability, accuracy, traceability of data and to support the design of the monitoring campaign.</p> <p>The evaluation of the condition of the structure to support decisions regarding maintenance and interventions mainly rely on the outcomes of inspections. Monitoring and inspections are currently complementary techniques with inspections being performed in the first place. Continuous monitoring, data governance and digitalisation are perceived by the stakeholders as means to facilitate the decision-making process regarding maintenance. Furthermore, relationship between safety, threshold levels according to the damage scenarios and maintenance interventions would be helpful for asset managers. Regarding standardisation on maintenance, the stakeholders highlighted that some freedom is needed to cope with different structural typologies and local/national organisation of asset management. In addition, standards could help the allocation of budgets for maintenance by raising awareness on the costs of monitoring and maintenance.</p> <p>SC gives information about the infrastructure monitoring platform (CELOSIA) launched by the Spanish Road Directorate (MITMA), its characteristics and structure and some examples of data available on the platform.</p> <p>MS underlines the importance of addressing the use monitoring data in the assessment of structural condition and safety. AB briefly explains that this topic is addressed in the project.</p>

	<p>AC poses questions about the Spanish monitoring platform, in particular on the ownership of the platform, the methodologies used to guarantee the uniformity of data and if assessment is part of the services provided of the platform. SC explains that the platform is owned by the Spanish government who also drafted a guideline for data collection. The platform is intended at the moment only for collecting monitoring data.</p> <p>AN asks if the platform collects also data of rail bridges. SC answers that at the moment only data concerning road bridges are collected.</p>
<p><b>3</b></p>	<p><b>Analysis of trends, best practices, PEST barriers: preliminary results</b></p> <p>JK explains the best practices in the context of the IM-SAFE project in terms of the principles and challenges of safety evaluation of existing structures. Trends are intended as the technology and knowledge developments in terms of inspection and monitoring technologies, design criteria for inspection and monitoring campaigns, evaluation of reliability and risks and the application of these concepts in supporting optimal maintenance strategies. The main PEST barriers and possible strategies to overcome them are presented.</p> <p>MS initiates a discussion on the possibility in the future of automatising the monitoring of the transport infrastructure and the decisions regarding maintenance. At this moment the human factor plays a crucial role in different stage of the assessment (e.g. modelling, analysis of data, etc.) and in relation to liability for decisions. Full automatization of decisions would require a generic and complex model of the decision making process. However, parts of the assessment might be automatised provided that the decision process remains transparent.</p> <p>EC underlines the difference between SHM (continuous and automated monitoring) and periodic monitoring in terms of procedures for data treatment (e.g. reliability updating). Furthermore, EC addresses the importance of the level of detail of the models used in combination with SHM and the possibility of using parametrized models of the transport infrastructure.</p> <p>EN observes that the knowledge and technology developments (monitoring technologies, sophisticated tools, probabilistic background) presented by JK as trends do already exist and he suggests to connect them and aiming to a more efficient use those developments.</p>
<p><b>4</b></p>	<p><b>Preliminary definition of the scope of the mandate to CEN</b></p> <p>DA presents the preliminary definition of the scope of the mandate to CEN. The scope comprises the following topics:</p> <ul style="list-style-type: none"> <li>• new standard for condition-based and risk-based maintenance of transport infrastructures</li> <li>• further amendment to the existing Eurocodes on safety assessment taking into account inspections, monitoring and testing</li> <li>• new standard on structural monitoring</li> </ul>

	<p>CF mentions that Italy has drafted a guideline on bridges comprising a pragmatic approach to safety and risk management. The guideline is based on a 5-level approach, ranging from the inventarisation of assets to the analysis of the resilience of the transport infrastructure. CF suggests to consider this guideline as a starting point for further standardization.</p> <p>LE asks clarifications about the IM-SAFE approach to consideration of deterioration in the safety assessment, because decision-making regarding deteriorated concrete bridges is a very important topic in the EU. DA explains that this topic is part of the scope of the IM-SAFE project and he elaborates on the need of addressing the analysis of inspection results and the prediction of the effects of deterioration on the future condition of the structure based on state-of-the-art models. AB mentions that several IM-SAFE project partners are actively contributing to <i>fib</i>.</p> <p>MS suggests to consider the topics mentioned in the scope of the mandate regarding maintenance of the transport infrastructure as input for the resilience assessment of the transport network, including the redundancy in case of natural hazards, development of emergency plans, etc.</p>
<p><b>5</b></p>	<p><b>Discussion on the scope of the mandate to CEN</b></p> <p>The discussion begins on the level of detail of the future standards. AB mentions that there is the need to find an appropriate balance between principles (that might be inadequate for implementation of the standards in practice) and explicit requirements.</p> <p>LE points out that background documents of some standards are missing. Also references to examples showing the implementation of the principles in real cases would be very useful. AB explains that one of the project deliverables is a wikipedia of examples across Europe of best practices regarding monitoring, safety assessment and maintenance.</p> <p>LE addresses also the lack of harmonisation between the Eurocodes and research documents such as the <i>fib</i> Model Code.</p> <p>AB explains that outcomes of the project that will not be included in the future standards could be valuable for infrastructure owners/operators to develop national/local guidelines for the specific problems of bridges and tunnels.</p>
<p><b>6</b></p>	<p><b>Follow-up activities IM-SAFE CoP NL</b></p> <p>DA shows the timeline of the project and explains the foreseen interactions with the Pan-EU CoP forum.</p>
<p><b>7</b></p>	<p><b>Closure</b></p> <p>JW closes the meeting.</p>