

OUTPUT FACTSHEET

Project index number	CE0100439	Acronym	BIM4CE			
Output type ("x" to be included)	Strategy/ action plan	x	Pilot action		Solution	
Output number (O.xx)	2.3	Output title	precise methodologies for accomplishing the outlined strategy towards a bridge monitoring system based on real-time data acquisition &			
If the output target is > 1 in the AF, please specify the output(s) described in the factsheet						
Output delivery date	7/30/2025					
Project website	https://www.interreg-central.eu/projects/bim4ce/					

Summary description of the output

Please present the output by addressing the following topics.

Territorial challenges and needs in the regions specifically addressed by the output

(max. 700 characters)

In Germany, Slovenia, and Italy, ageing bridge infrastructure faces high traffic loads, diverse structural types, and varying environmental conditions, making timely maintenance challenging. Existing inspection methods are often periodic and reactive, leading to late detection of critical issues. The jointly developed action plan addresses these needs by defining precise, harmonised methodologies for implementing real-time data acquisition and digital twin-based monitoring, enabling early detection and preventive maintenance.

Main aim(s) of the output and how it contributes to tackle the identified challenge(s)

(max. 500 characters)

This Output delivers a jointly developed action plan with clear methodologies for implementing real-time data acquisition and digital twin-based bridge monitoring. It tackles ageing infrastructure challenges in Germany, Slovenia, and Italy by standardising sensor use — including innovative leakage foils — to enable early damage detection, preventive maintenance, and extended bridge lifespan.

Technical description of the output (e.g. scope, main features, innovative elements etc.)

(max. 1500 characters)

This Output provides a jointly developed action plan defining precise, standardised methodologies for implementing a bridge monitoring system based on real-time data acquisition and digital twins. Its scope covers sensor selection, calibration, installation, data collection, integration into the digital twin platform, and the validation process, ensuring transferability across Germany, Slovenia, and Italy.

The main features include detailed procedures for harmonised deployment of accelerometers, inclinometers, temperature sensors, and the innovative Flexible Leakage Sensor Foil developed by TU Dresden. This foil, the first of its kind worldwide, detects water ingress through capacitive sensing with high sensitivity, preventing corrosion-related deterioration.

Innovative elements include the integration of diverse sensor types into a central data acquisition system, linking both wired and wireless channels to a bridge-based server, and further to the BIM4CE cloud platform (Infohub). The plan incorporates feedback from expert panels and transnational workshops, ensuring practical applicability, cost-effectiveness, and adaptability to varied environmental and structural conditions in Central Europe.

Involvement of target groups during output development and/or implementation

(max. 700 characters)

Infrastructure operators, bridge authorities, monitoring specialists, and research institutions were engaged through transnational workshops in Dresden, Rakičan, and Turin, as well as online consultations and pilot testing. Feedback from the Expert Council, Cestel, ZAG, TU Dresden, Henschke Bau and local authorities guided sensor selection, calibration, and integration into the digital twin platform, ensuring the action plan meets operational needs and regional challenges in Germany, Slovenia, and Italy.

Cooperation dimension of the output, i.e. joint development within the partnership and, if applicable, joint implementation (see output indicator definitions in chapter I.3.3 and Annex 2 of the programme manual)

(max. 700 characters)

Output A2.5 was jointly developed by partners from Germany, Slovenia, and Italy, combining technical expertise and regional insights. TU Dresden contributed the innovative leakage sensor foil, ZAG led lab testing and calibration, Cestel provided the Weight-in-Motion system and data server, and SPd integrated all components into the BIM4CE cloud platform. SINA and CSP provided the crucial information regarding Italian bridge installation and plan the installation. Collaboration through workshops and shared pilot actions ensured harmonised methodologies and cross-border applicability.

Results - expected change and lasting effects in the territories generated specifically by the output, its uptake by relevant organisations and benefits for target groups

(max. 1000 characters)

Output 2.3. delivers a harmonised action plan enabling consistent deployment of real-time bridge monitoring and digital twin solutions across Germany, Slovenia, and Italy. It standardises methodologies for sensor integration, calibration, and data management, ensuring interoperability and cost-effectiveness. The expected change is a shift from reactive to preventive maintenance, allowing early detection of leakage and structural issues, thus avoiding failures such as the 2024 Dresden collapse. Lasting effects include extended bridge lifespan, reduced maintenance costs, improved safety, and a transferable framework adaptable to diverse climates and structures, strengthening infrastructure resilience across Central Europe.

Ownership and durability of the output after the project end, considering financial and institutional support including, if applicable, maintenance

(max. 700 characters)

After the project ends, the Infohub platform developed and used in Output 2.3. will be maintained and further operated by Schüssler-Plan Digital (SPd), ensuring the ongoing availability of the digital twin environment and methodologies defined in the action plan. The leakage sensor technology, including its design and intellectual property, will remain with TU Dresden, while partners such as Cestel, ZAG, and SPd will be able to borrow and implement it in full-scale bridge monitoring systems. This ensures long-term usability of the jointly developed methodologies, supports wider adoption, and facilitates transfer of the solution to other infrastructure projects across Central Europe.

Transferability of the output to other territories, sectors or target groups and planned measures for supporting such transfer

(max. 700 characters)

The action plan from Output A2.3 is fully transferable to other territories and target groups, including local authorities across Central Europe. All partners have access to the Infohub platform, measured data, and standardised methodologies, enabling replication of real-time monitoring and digital twin solutions. Adaptable to various bridge types, climates, and operational contexts, it supports infrastructure operators, engineers, and policymakers in adopting preventive maintenance strategies region-wide.

Related final deliverable(s) (Number(s) and title(s) to be included)	Activity 2.5. Combination of workshops addressing the expert council, decision-makers and representatives of public, Deliverable 2.5.1. Final report including comments of the expert panel in which requirements are documented.
Output web link (if applicable)	https://www.interreg-central.eu/news/bim4ce-is-implementing-novel-sens
GPS coordinates (if applicable)	Global coordinates of the zero point of the demonstrator project: X: 463.869