

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)	1.2	Output title	Jointly developed strategy for Central Europe aiming at the implementation and uptake of a standardized, scalable and cost-effective monitoring system for bridges		
If the output target is > 1 in the AF, please specify the output(s) described in the factsheet					
Output delivery date	03/04/2024				
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)

The expert council for bridge monitoring is a diverse assembly, comprising legal representatives from various sectors. This includes research institutes with extensive experience in prior projects related to bridge monitoring systems. Furthermore, the council incorporates private companies specializing in the maintenance of bridge monitoring systems. In the scope of the project we developed a standardized solution for monitoring for the target bridges that will serve as the foundation for scalable bridge monitoring systems. In Slovenia, it is crucial to continuously gather data on exceptional transports, including speeds and dynamic weights, through sensors. Additionally, long-term statistical data on traffic, such as heavy goods vehicles crossing a bridge/road section within a specific period and the extent of overloading, is essential. Structural parameters like influence lines, dynamic amplification factors, load distributions, and strain information are of paramount importance. The pressure sensor foils developed by TU Dresden offer a potential solution for measuring and collecting all these parameters effectively.

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

(max. 500 characters)

The expert council in each specific country offers a valuable platform to assess the prevailing challenges in respective regions and prioritize them accordingly. Additionally, local stakeholders and experts contribute essential insights regarding the costs associated with maintenance, monitoring, and sensor installation. Establishing a durable network comprising experts, decision-makers, and legal representatives will steer the project development in the correct direction. Through rigorous quantitative analysis, evaluating the importance and cost-effectiveness of various bridge types in Germany and Slovenia, we have identified three critical bridge types: Reinforced Concrete Slab, Prestressed Concrete Slab, and Prestressed Concrete Girder bridges, essential for Central European infrastructure. Based on this data, we selected the pilot site bridges situated in Germany, Slovenia, and Italy.

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

(max. 1500 characters)

An expert council network provides access to a wide range of expertise in bridge monitoring systems and allows to develop a novel monitoring systems solution according to the needs of local representatives. The diversity of experts from different countries allows for comprehensive problem-solving and innovative standardized approaches to technical challenges. By leveraging the expertise within the network, resources can be optimized more effectively and bridge health can be monitored more effectively, leading to efficient project development and implementation. Based on the risk matrix created with a help of experts, and analysing the weak spots of chosen bridge types, we came to the conclusion that the leaking of water with salt during the winter will cause the severe corrosion of inner reinforcement that may lead to the bridge collapse. Additionally, corrosion of attachments, screws, bolts, and railings - extreme occurrence, a high consequence due to the falling off the parts of the bridge on passing infrastructure units. Therefore, based on the expert council advices, in the scope of the project we plan the development of printable flexible condensation sensors.

Involvement of target groups during output development and/or implementation

(max. 700 characters)

The expert council network provide valuable input and guidance to the consortium to make a right decision by providing the monitoring difficulties and challenges. Finally, the expert consortium helps to create a risk matrix to assess and manage the various risks associated with the monitoring of bridges. Such a matrix involves categorizing risks based on their likelihood and potential impact. This matrix helps prioritize the risk according to their severity. This allows stakeholders to focus their attention and resources on managing the most critical or the most common risks first. Additionally, the risk matrix can aid in developing mitigation strategies and contingency plans to address potential risks effectively.

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)

The collaboration among each project partner enables the comprehensive development of standardized bridge monitoring solutions. Partners such as TUD, ZZAG, and SINA conducted thorough analyses of bridge types in Germany, Italy, and Slovenia, focusing on selecting the most critical bridges based on factors like high maintenance costs and logistical significance. CSP contributed valuable insights into IoT analysis, identifying potential challenges in installing and integrating developed sensor solutions. Cestel Company brought expertise in dynamic traffic monitoring, facilitating the identification of weak spots on bridges, which could be incorporated into the digital twin created by SPD.

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)

Implementing the designed monitoring system initially on planned bridge sites, followed by testing on all bridges in Germany, Slovenia, and Italy, can bring about the anticipated changes in the territories. This standardized bridge monitoring system, tailored for specific bridge types, will utilize innovative flexible sensor technologies developed to address critical issues in existing bridge monitoring systems, thus mitigating high-risk factors. The flexible pressure sensor foils with high sensitivity have the potential to enhance dynamic traffic load measurements on bridges, thereby improving predictive maintenance and optimizing bridge operation for cost efficiency. Additionally, condensation sensors could alert drivers on bridge surfaces prone to wetness, reducing traffic congestion and potential accidents. Furthermore, condensation sensors can analyze defects in moisture isolation layers, signaling bridge owners of necessary repairs or maintenance.

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

(max. 700 characters)

Ownership of the technology will be deliberated following the testing of the monitoring system on the pilot sites. The decision will be based on each partner's contribution to the development of the bridge monitoring system. The durability of the bridge monitoring system will be upheld by the bridge owners who utilize the system for monitoring the health of their bridges.

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

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The bridge monitoring system is being developed for application on three critical bridge types: Reinforced Concrete Slab, Prestressed Concrete Slab, and Prestressed Concrete Girder bridges, essential for Central European infrastructure. The system will utilize open-source software for data gathering and sensor technology readily available on the Central European market.

Related final deliverable(s) (Number(s) and title(s) to be included)	D 1.4.1. Meta study on findings from prior Activities emphasizing needs and requirements of bridge owners. D 1.4.2. Conceptual framework for application of digital monitoring system + communication to expert council
Output web link (if applicable)	
GPS coordinates (if applicable)	46.087557, 14.532579