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Vulnerability assessment of embankments and bridges exposed to flooding hazards

Deliverable 7.2

Digital Newsletter 2

Project Information

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INGEO BV	Netherlands
ZAVOD ZA GRADBENISTVO SLOVENIJE	Slovenia
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Executive Summary

This report outlines the project activities performed in the second six months of the oVERFLOw project in accordance with Annex I of Grant Agreement no. 874421. The deliverable was foreseen to cover the period from 1st June 2020 (M7) to 31st November 2020 (M12).

However, due to the delay of some project activities as a result of the Covid-19 pandemics and the 22nd March 2020 Zagreb earthquake, this digital newsletter effectively covers the project activities performed from 1st July 2020 (M8) to 31st December 2020 (M13).

It is the second of four digital newsletters that will be published in regular intervals every six months, until the end of the project. The content of this deliverable will be publically available and will be shared through the project website and social media publications.

Keywords: Newsletter, project activities.

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1 Abbreviations and Acronyms

Abbreviation / Acronym	Description
FCEZG	SVEUČILIŠTE U ZAGREBU GRAĐEVINSKI FAKULTET
IPK	INFRA PLAN KONZALTING J.D.O.O.
GEKOM	GEKOM – GEOFIZIKALNO I EKOLOŠKO MODELIRANJE D.O.O.
VRZHZ	VEILIGHEIDSREGIO ZUID-HOLLAND ZUID
ZAG	ZAVOD ZA GRADBENISTVO SLOVENIJE
NL	NETHERLANDS
SLO	SLOVENIA
CPA	CIVIL PROTECTION AGENCY
IMP	INFORMATION MANAGEMENT PLATFORM

2 Background

In accordance with Annex I of Grant Agreement no. 874421, ZAG is the lead beneficiary for preparing four six months project newsletters, which are aimed at giving regular updates on the performed project activities. This is the second of four newsletters and is foreseen to cover the project activities performed in the second six months of the project for the period of 1st June 2020 (M7) to 31st November 2020 (M12). Due to delay of some project activities, the newsletter effectively covers the period from 1st July 2020 (M8) to 31st December 2020 (M13).

3 Objective/Aim

The objective of this deliverable is the dissemination of project activities performed in the second six months of the project. The content of this deliverable will be publically available and will be shared through the project website and social media publications.

4 Report on project activities

This report outlines the project activities perform in the second six months of the oVERFLOw project in accordance with Annex I of Grant Agreement no. 874421.

In the project proposal, it was foreseen that part of the Digital Newsletter 1 would be an article on the demonstration of embankments related activities. However, due to delay of some project activities, as a result of the COVID-19 pandemics and 22nd March Zagreb earthquake, this was not possible. The demonstration of embankments related activities is therefore included this digital newsletter. A report on the in-situ activities performed for bridges is also presented. It should be noted that not all in-situ investigations are yet completed. The remaining investigations will be performed in the following months, and will be described in Digital Newsletter 3, which is due in May 2021 (M18).

The activities performed in the second 6 months of the project were the following:

- Meeting with representative of SLO CPA on data standards for the IMP (WP2)– 15th July, 2020, Ljubljana;
- Preparatory works in Karlovac (UNIZAG GF with stakeholders) in September, and in Netherlands (UNIZAG GF, InGEO and stakeholders);
- oVERFLOw on-line meeting – 15th October, 2020;
- On-line meeting with representative of the FRISCO1 Interreg EU project – 26th October, 2020;
- On-line meeting with representatives of NL CPA (VRZHZ) on data standards for the IMP (WP2)– 29th October, 2020;
- On-line meeting with oVERFLOw experts on data standards for the IMP (WP2) – 5th November, 2020;
- oVERFLOw 2nd consortium meeting – 22nd December, 2020;
- Demonstration of on-site embankment related activities;
- Demonstration of on-site bridges related activities.

These activities will be described in more detail in the following chapters.

4.1 Meeting with representative of SLO CPA – 15th July, 2020, Ljubljana

On 15th July 2020, a meeting was held between representatives of ZAG and SLO CPA (Primož Uršič, URSZR). The meeting was held to get better insight in the mechanism for protection, rescue and relief used by the SLO CPA in case of flooding events. The basis for the meeting was a survey questionnaire, which was prepared within Task 2.3 (WP2) and was aimed at defining the data need by CPAs to act in case of flooding. The same questionnaire was also used for discussion with CPAs representatives of other countries. The questionnaire was designed to define common aspects of the mechanism for protection, rescue and relief in different countries. This is especially important for the definition of the data to be included in the IMP, which will be developed in WP2. The major outcomes of the meeting were:

- Definition of strategic documents that define the mechanism of response to floods,
- Definition of existing platform used by CPAs,
- Definition of the system used for monitoring of safety/operability of bridges,
- Definition of potential improvement of the current system by the development of the IMP.

The inputs provided by the SLO CPA was compared with the requirements of other CPAs and was used to obtain an agreement on the data to be included in the IMP (see Section 4.9).

4.2 oVERFLOw on-line meeting – 15th October, 2020

The oVERFLOw on-line meeting was held on 15th October 2020. Members of all partners attended the meeting. The aim of the meeting was to discuss the current progress of the project activities. Work package leaders presented the current progress of individual work packages. Larger part of the meeting was devoted to the discussion of the progress of on-going WPs, i.e. WP1, WP2 and WP3. Interrelations between upcoming work packages were also discussed. In the final part of the meeting, future action were defined.

4.3 On-line meeting with representative of the FRISCO1 Interreg EU project – 26th October, 2020

On 26th October 2020, a meeting between representative of the Interreg EU project FRISCO1 (Dr. Sašo Petan from Slovenian Environment Agency) and representatives of ZAG was organized. The FRISCO1 project (Cross-Border Harmonised Slovenian-Croatian Flood Risk Reduction 1 – Non-Structural Measures) is a strategic project aimed at reducing flood risk in the river basins of the Dragonja, Kolpa, Sotla, Bregana and parts of the Drava and Mura river basins and is implemented in the framework of the Cooperation Programme INTERREG V-A Slovenia – Croatia. The aim of the meeting was to obtain existing data regarding the case study region in Karlovac and to define possible synergies between the two projects. At the beginning of the meeting, both sides had a short presentation of the scope and objective of the projects. Dr. Petan explained the mechanism of response and rescue in the event of flood which is used in Croatia, as well as the existing platforms used to monitor flood hazard in Croatia. He was also keen on helping the progress oVERFLOw project by making available the data obtained within the FRISCO1 project, as well as providing contacts of the Croatian member involved in the project. He also offered help in providing data regarding meteorological and hydrological data from archives of Slovenian Environment Agency. This support is gratefully acknowledged.

4.4 On-line meeting with representatives of NL CPA (VRZHZ) on data standards for the IMP (WP2)– 29th October, 2020

On 29th October 2020, a meeting between representatives of NL CPA (Mrs. Chi Brouwer and Mr. Eddy van Well) and representatives of ZAG was held. The topic of the meeting was the discussion of the mechanisms in place in the Netherlands for protection and rescue in case of

flooding. Very similar to the meeting with SLO CPA, the basis for the meeting was a survey questionnaire, which was aimed at defining the data need by CPAs to react in case of flooding. The obtained information helped us identifying the required data to be included in IMP, which will be developed within WP2 and which will serve as a support to the work CPAs. The outcomes of the meeting were:

- Definition of strategic documents that define the mechanism of response to floods,
- Definition of existing platform used by CPAs,
- Definition of the system used for monitoring of safety/operability of bridges,
- Definition of potential improvement of the current system by the development of the IMP.

The inputs provide by the SLO CPA was compared with the requirements of other CPAs and was used to obtain an agreement on the data to be included in the IMP (see Section 4.9).

4.5 On-line meeting with oVERFLOw experts on datastandards for the IMP (WP2) – 5th November, 2020

On 5th November 2020, experts of the oVERFLOw consortium involved in WP4 and WP5 meet to discuss the data standards to be included in the IMP. As defined in Task 2.3, the IMP will serve two basic functions: i) it will provide a tool to support the work of CPAs, and ii) it will also provide a common platform for data exchange between experts of the oVERFLOw consortium. The goal of the meeting was to define the data requited by different experts to perform their tasks. Very similar to the survey developed for the CPAs, a survey for experts was also developed within Task 2.3 (WP2) and was used as the basis for the meeting. The outcomes of the meeting were:

- Definition of input data required by different experts to performed fragility analysis of bridges and dikes (geometry, geotechnical data, inspection and remediation measures, flood height, flood duration, flood velocity etc.),
- Definition of the parameters to be used for measuring the response of bridges and embankments (fragility curves, flood risk),
- Definition of the most effective way to present the obtained results to the CPAs (agreement on the use of a colour scheme).

4.6 oVERFLOw 2nd consortium meeting – 22nd December, 2020

Due to the situation with the Covid-19 pandemics, the 2nd oVERFLOw consortium meeting was held on 22nd December 2020 as a virtual meeting via Microsoft Teams platform. The agenda of the meeting was the following:

- Introduction
- Update on project activities
- Discussion on case studies activities and future plans

- Dissemination activities
- Additional remarks

After the introduction, the work packages leaders present an update of the project activities within their WP. Despite the omnipresent situation with COVID-19, which caused the delay of some foreseen project activities, beneficiaries report that activities continue to be performed mainly through other forms of working (such as remote working). Significant progress has been made even with the on-site measurements despite limited travel possibilities. Leaders report that several deliverables are delayed. Nevertheless, these are in their final preparation phase and will be submitted within next three months.

Consortium members report that in-situ investigation works at the Croatian case study (city of Karlovac) started in December 2020. FCEZG obtained some geotechnical data from previous investigation works on smaller section of the case study area (drilling, CPT, geophysical). Additionally, aerial photogrammetry and thermal scanning of the whole area case study area was performed. Similarly, ZAG and its subcontractors performed a bathymetric survey of riverbed and a detailed photogrammetry and thermal scanning of both case study bridges with a drone. Due to travelling restrictions, the investigations on the Dutch case study areas, which were planned for November 2020, had to be postponed. The consortium will wait for the development of situation with COVID-19 and as soon as the situation improves, UNIZAG GF will conduct all planned investigations.

In the final stage of the meeting, it was agreed that regular on-line meetings will be held every first Thursday of the month. The decision on next consortium meeting (3rd consortium meeting), which was foreseen to be held in Ljubljana in May 2021, was still postponed, since there is a possibility that the meeting will also be held as a virtual event.

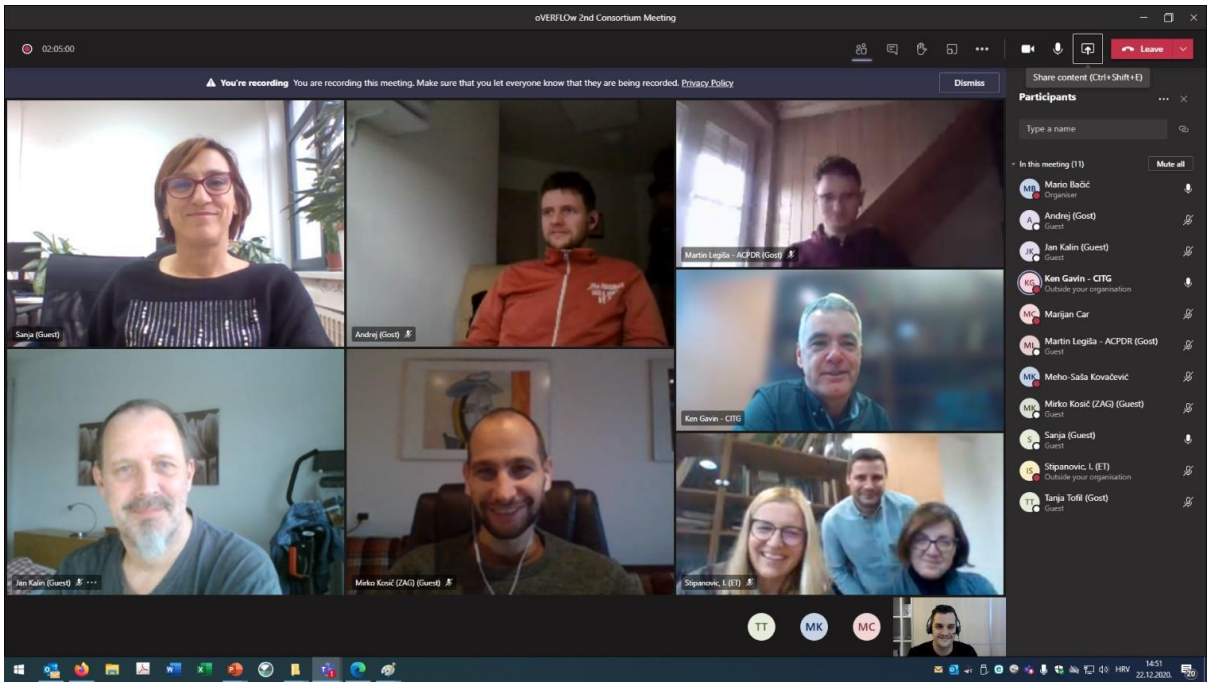

Figure 1: Online (virtual) 2nd oVERFLOw consortium meeting

4.7 Demonstration of on-site embankment related activities

In September and October, FCEZG Croatian case study locations with representatives of stakeholders (Croatian Waters). Further Dutch case study location by the FCEZG and InGEO representatives.

The main purpose of these meetings it to check for optimal type and position of investigation works on sections which were previously agreed with CPAs and stakeholders. The potential obstacles which could hinder the investigation procedures have been noted.

For both case studies partners have obtained some geotechnical data from previous investigation on case study area. On Croatian case study area, some geotechnical investigation works have been performed (drilling, CPT, geophysical) while the aerial photogrammetry and thermal scanning of the whole area case study area was performed in December 2020.

Figure 2: Visit Croatian (left) and Dutch (right) case study location

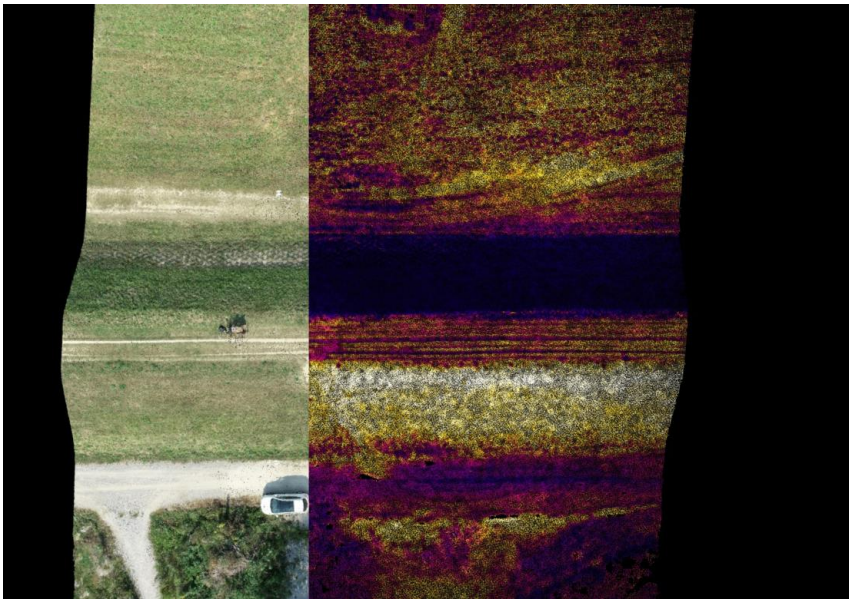

Figure 3: Part of 3D point cloud of Croatian case study location (riverbank)

4.8 Demonstration of on-site bridges related activities

On 17th December 2020, ZAG and its subcontractors performed in-situ investigations at Karlovac case study area. The investigations comprised: i) a bathymetric survey of the river bed, ii) a drone inspection of the river channel and both case study bridges. The work was performed by ZAG's subcontractor IGEA d.o.o..

For the bathymetric survey, a small boat equipped with single- and multi-beam sonar, LIDAR, acquisition system and GPS receiver was used (Figure 4). The sonar helped us obtain a profile of the river bed. The acquisition width of the multi-beam sonar was roughly 8-times the depth of the water, whereas the single-beam sonar measured the depth of the water directly underneath the boat. Due to relatively low water levels, several passages were required to scan the entire river bed. The installed LIDAR on the boat helped to obtain better prediction of the water level near the river banks. In total, 4 hours were required to complete the bathymetric survey of the riverbed between the two case study bridges.

In addition to the bathymetric survey, a drone inspection of the river banks and both bridges was performed. The inspection of the river banks coved a similar area than the bathymetric survey. Additionally, both case study bridges were also scanned in detail with a classical and a thermographic camera (Figure).

The data collected with both inspections will be used to construct a 3D model of the riverbed and both bridges.

Additional in-situ investigations are scheduled to be performed in the following months. The exact dates of the investigations will be planned depending on epidemiologic situation and related travelling restrictions. The results of these investigations will be included in the Digital Newsletter 3, which is foreseen to be issued in May 2021 (M18).

Figure 4: Bathymetric survey of the riverbed in the Karlovac case study area

Figure 5: Drone inspection of bridges in the Karlovac case study area

4.9 Agreement on data standards for the IMP

As elaborated in Deliverable D2.3, the IMP is designed to perform two basic tasks: i) facilitate the work of CPA, ii) serve as a means for data transfer between different experts involved in the development of the platform (engineers, climatologists, hydrologists etc.). In order to fulfill the needs of both users, the platform will be equipped with two sets of layers: i) CPA's layers, and ii) expert's layers. The conceptual design of the IMP, which was developed within D2.3, is presented in **Error! Reference source not found.**. The agreement on the data to be included in two sets of layer was reached based on meetings with CPA representatives and experts of the oVERFLOw consortium. Survey questionnaires for CPAs and experts were developed with Task 2.3 (WP2) in order to identify the need of both users of the platform.

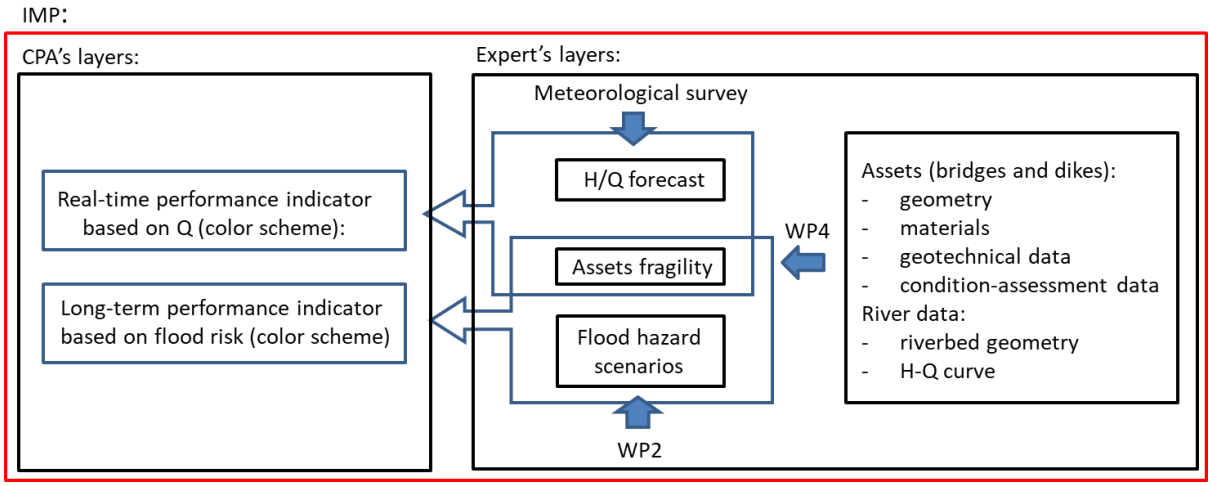

Figure 6: Conceptual design of the IMP

Based on the analysis of CPA's surveys, it was decided that two most useful layers for CPAs would be: i) the real-time performance indicator of the examined assets based on the prognosis of water levels (H)/river discharge (Q), and ii) the long-term performance indication of the examined assets based on flood risk. The first layer provides real-time visualization of the current performance of the assets and can be used by CPAs to guide emergency response during flood events. The second layer provides the long-term performance indicator of the examined assets and can be used to identify vulnerable assets, which can be important for design of flood prevention activities and retrofitting actions. Both layers will be equipped with intuitive performance indicators based on color scheme, which ensures that the IMP can be used also by users with no specific background in civil engineering.

The analysis of the survey questionnaires filled in by the experts allowed us to identify the data need by this group of users. For the IMP to be operational, three basic sets of input data are needed: i) forecasts of water level/river discharge, ii) assets fragility curves, and (iii) flood hazard scenarios. The prediction of water levels/river discharge will be imported in the IMP from the data issued by the national meteorological surveys. The flood fragility curves for the examined assets (bridges and dikes) will be developed within WP4. For this purpose, experts involved in WP4 will required the following data for the examined assets: i) geometry, ii) material characteristics, iii) geotechnical data, iv) condition-assessment data, v) riverbed geometry, vi) the relationship between water level (H) and discharge (Q) in case of bridges,

where discharge is used to estimate the flood velocity. In addition to this, flood hazard scenarios are required for prediction of long-term flood risk. These scenarios will be developed within WP2 and will include also effects of climate change.

All data stored in the developer's layers can be easily shared between different contributions and as such the IMP can be seen as a common link between different work packages.

5 Conclusions

This report outlines the project activities performed in the second six months of the oVERFLOw project in accordance with Annex I of Grant Agreement no. 874421. The deliverable was foreseen to cover the period from 1st June 2019 (M7) to 31st November 2020 (M12). However, due to the delay of some project activities as a result of the Covid-19 pandemics and the 22nd March 2020 Zagreb earthquake, this digital newsletter effectively covers the project activities performed from 1st July 2020 (M8) to 31st December 2020 (M13).

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The progress of the project oVERFLOw can be followed on our web page:

https://projectoverflow.eu/

and oVERFLOw project social media profiles:

Facebook: https://www.facebook.com/OVERFLOw-project-108534450696939/

Twitter: https://twitter.com/oVERFLOWprojec1

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