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Vulnerability assessment of embankments and bridges exposed to flooding hazards

Deliverable D2.4

GIS based IMP



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Table of Contents

Project Information	ii
Partner Information.....	ii
Document Information	iii
1 Introduction.....	5
2 Baseline data	6
2.1 Baseline data for the city of Karlovac	6
2.2 Baseline data for the Rhine-Mass delta region.....	7
3 GIS platform.....	8
4 Conclusions	9
Summary of relevant links:	9



1 Introduction

The output of this deliverable are the operational layers in the GIS platforms of CPAs and authorities from city of Karlovac and Rhine-Maas delta region. While the data use lies with the respective CPAs, the provision of it is the responsibility of ZAG. Therefore, standardised protocols are used for easy integration of GIS information into the existing platforms.

To meet these requirements, a server was set up. An Apache HTTP server was created on a Linux system at ZAG. On the server, QGIS Server is installed, that gives functionalities for exchange of geospatial data. The server is password protected, but can be accessed from anywhere. On QGIS server, standardised protocols for sharing geospatial data are implemented. These are Web Map Service (WMS), Web Map Tile Service (WMTS) for the exchange of raster formats and Web Feature Service (WFS) for the exchange of vector formats.

2 Baseline data

2.1 Baseline data for the city of Karlovac

A point cloud of the embankments has been established within the context of previous deliverables. The cloud is rasterized using two different methods. With the first method, a Digital Terrain Model (DTM) has been created and with the second a Digital Elevation Model (DEM). The DTM, the minimum values within a pixel have been preserved. The output shows the terrain, without the buildings (Figure 1, left). For the DEM, the maximum value within a pixel has been preserved. The output in this case shows the terrain, with all man-made objects and vegetation. The DEM and the DTM are available using the WMS/WMTS services.



Figure 1. Point cloud of the embankments (left) and 3D view from the google maps (right)

The two bridges that are investigated within this project (in Karlovac, Croatia) are added to a vector layer in the GIS platform (example of Banija bridge in Figure 2). In a later stage, this can be connected to a real-time sensor data measuring the water level, and linked to the model evaluating the current flood risk. The vector layer is available using the WFS service.



Figure 2. Point cloud of the Banija bridge with the riverbed (obtained from bathymetric inspection)



2.2 Baseline data for the Rhine-Mass delta region

The baseline for the Oude Molendijk in the Netherlands has already been largely established on other GIS platforms. The location of dykes including additional information about the dyke can be found at the national GIS platform PDOK: <https://www.pdok.nl/introductie/-/article/waterschapsdata>. The height of the dykes can be found using the Algemeen Hoogtebestand Nederland (AHN). This is a Digital Elevation Model & Digital Terrain model of the entire Netherlands and can be found over different periods in time (AHN2: 2012; AHN3: 2018; AHN4: 2021). The data is available on <https://www.ahn.nl/>. On the GIS server only one layer is added: the location of the case study (Oude Molendijk). This location is added as a point feature layer and can be connected to the real-time water level data that is provided by Rijkswaterstaat, again to show an evaluation of the current flood risk.

3 GIS platform

The GIS server has been divided into the data for the Karlovac region and the Oude Molendijk, therefore future data can be easily uploaded and divided into the two geographical areas. The Coordinate Reference System (CRS) used for the Croatian data is HTRS96 / Croatia (EPSG:3765). For the Dutch data, the Amersfoort / RD New (EPSG:28992) reference system is used. Both are also available in WGS84 (EPSG:4326).

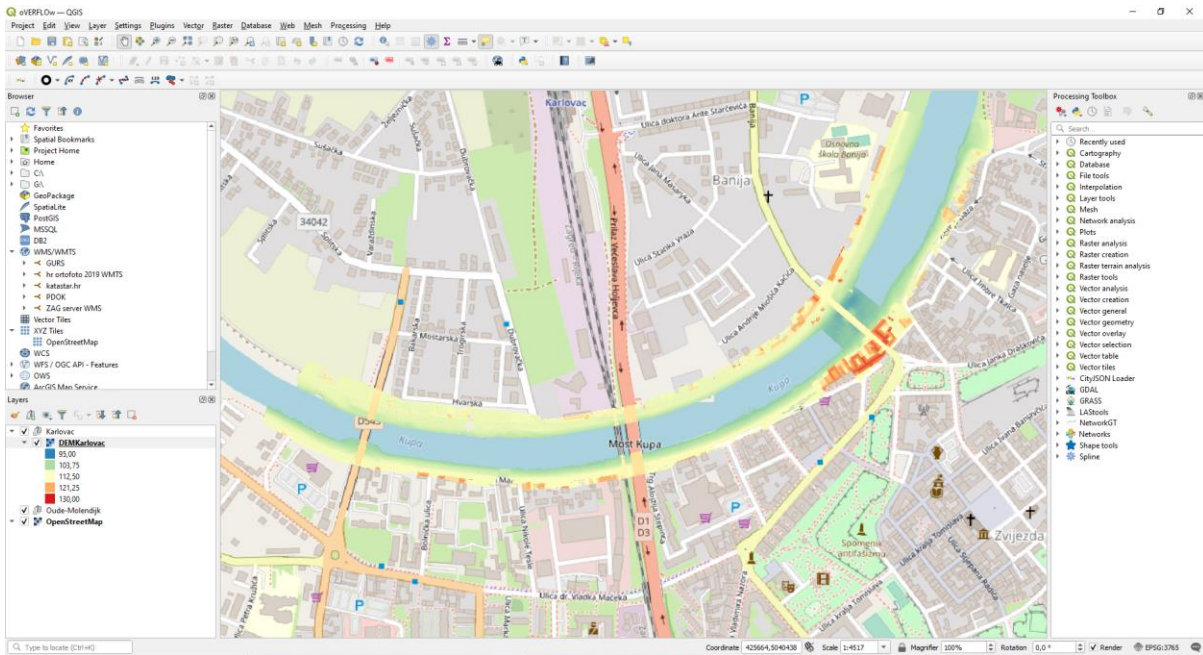


Figure 3 GIS layer for the Karlovac region: DEM of the embankments and the Banija bridge.



4 Conclusions

In this document, the workflow of representing the baseline data for the city of Karlovac and Rhine-Meuse delta region on GIS platforms is presented. A QGIS server was created on a Linux system at ZAG, where the GIS data can be uploaded. Afterwards, this data is streamed to the addressed administrators of the GIS systems, which is being used by the city of Karlovac and dedicated CPA users in the Netherlands.

Summary of relevant links:

National GIS platform PDOK for dykes in Netherland:

<https://www.pdok.nl/introductie/-/article/waterschapsdata>.

Data on the height of the dykes in Netherland:

<https://www.ahn.nl/>

City Karlovac GIS platform

<https://gis.karlovac.hr/gis>