D. 3.1.2

Geodatabase and Danube Floodplain GIS for active and potentially restorable floodplains

Activity: *3.1*

Activity-Leader:

SZTE – University of Szeged, Hungary

Project co-funded by the European Union (ERDF, IPA funds)

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1. Introduction

Among all natural disasters, floods have the greatest damage potential worldwide (UNISDR 2015). In recent years, awareness was raised, leading to the development of new approaches in integrated flood risk management as demanded by the EU Floods Directive (2007/60/EC) by integrating non-structural and structural measures for flood protection. Such new methods of flood mitigation should especially focus on preserving and/or restoring floodplains (Habersack, Schober & Hauer 2015). Therefore, WP3 of the Danube Floodplain project has the purpose to review and update active and potential floodplain areas including data collection and analyses of these data using GIS. The aim is to provide a spatial reference framework with accompanied database based on comprehensive inventory of floodplain areas and their multicriteria analysis along the Danube River and selected tributaries. The resulting actual and potential floodplain areas inventory will provide the main spatial reference base (geodatabase), where other hydrological, hydraulic, ecological and socio-economic parameters will be analysed (Activity 3.1).

In the first step for this approach, active and potential floodplains were identified. The floodplains will be displayed in the Danube GIS and the Danube Floodplain GIS (DFGIS). Active floodplains were originally defined as all areas which are still flooded during an HQ_{100} but have been extensively edited and potential floodplains are areas which are currently not flooded, but have the theoretical potential to be reconnected to the river system again. The definition of the active and potential floodplains was a joint effort of all partners in the framework of Activity 3.2.

In the next step, both floodplain types were evaluated with the Floodplain Evaluation Matrix (FEM), which is a holistic, integrative tool for the assessment of hydrological, hydraulic, ecological and socio-economic effects of a floodplain (Activity 3.2).

In the last step, based on the FEM parameters, all active and potential floodplains along the Danube and selected tributaries were ranked to identify priority areas for preservation and/or restoration ("restoration demand"). The results of the ranking are stored in a spatial database, the DFGIS and are published on a public web map and in the Danube GIS. A summary of the ratings and restoration demand is published as the Danube Floodplain inventory (DFInv) (Activity 3.1).

Activity 3.1 is responsible for the following deliverables:

D 3.1.1. List of jointly accepted data sources and criteria to build up DFGIS and DFInv

D 3.1.2. Geodatabase and Danube Floodplain GIS for active and potentially restorable floodplains

D 3.1.3. Danube Floodplain inventory for active and potentially restorable floodplains

2. Deliverable D 3.1.2. Geodatabase and Danube Floodplain GIS for active and potentially restorable floodplains

The outlines of all identified active and potentially restorable floodplains of the Danube and selected tributaries are available in the DFGIS and the parameters are stored as attributes. The DFGIS is stored as ESRI Geodatabase. All geographic data is stored in EPSG:3035 – ETRS89-extended / LAEA Europe (European Terrestrial Reference System) (Figure 1). The geodatabase serves to create output maps and the FPInv. Results related to the Danube will be shared with the Danube GIS (https://www.danubegis.org/).

The structure of the geodatabase allows for easy update. This provides the opportunity to incorporate new data for storage and publications in the future.

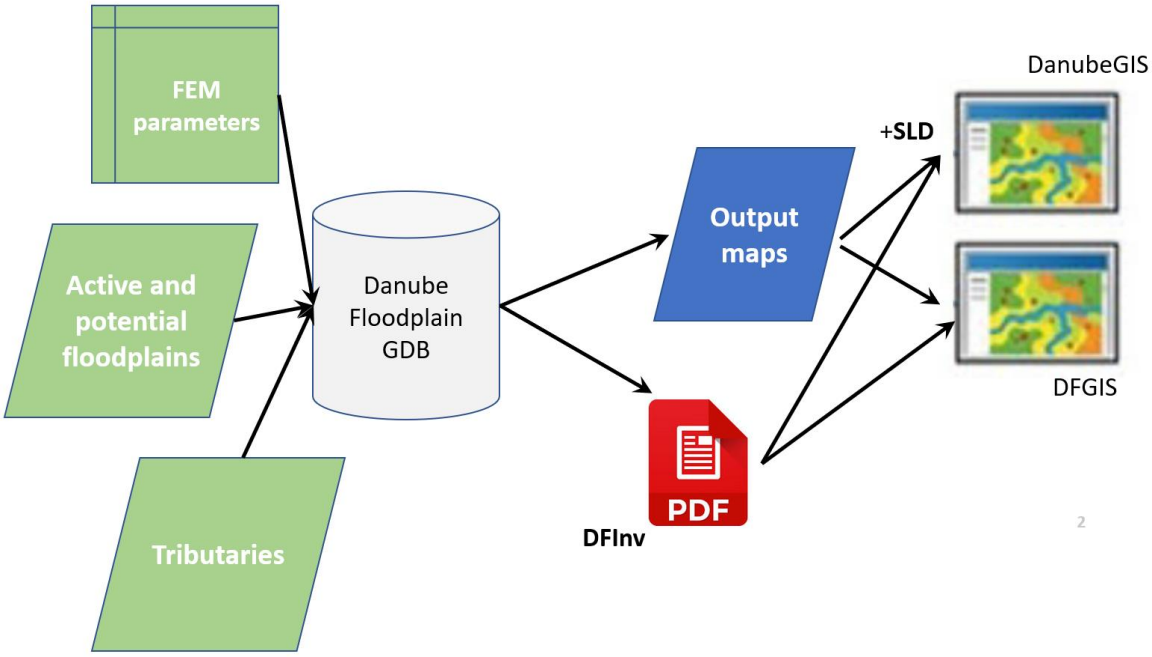


Figure 1: Danube Floodplain data flow

Fifty active floodplains with attribute data along the Danube are stored in the DFGIS (Table 1).

Table 1: Active Floodplains with their IDs in the Danube Floodplain GIS

Number	Floodplain Code	Country
1	DE_DU_AFP01	Germany
2	DE_DU_AFP02	Germany
3	DE_DU_AFP03	Germany
4	DE_DU_AFP04	Germany
5	DE_DU_AFP05	Germany
6	DE_DU_AFP06	Germany
7	DE_DU_AFP07	Germany
8	DE_DU_AFP08	Germany
9	DE_DU_AFP09	Germany
10	DE_DU_AFP10	Germany
11	AT_DU_AFP01	Austria
12	AT_DU_AFP02	Austria
13	AT_DU_AFP03	Austria
14	AT_DU_AFP04	Austria
15	AT_DU_AFP05	Austria
16	AT_SK_DU_AFP01	Austria/ Slovakia
17	HU_SK_DU_AFP01	Hungary / Slovakia
18	HU_SK _DU_AFP02	Hungary / Slovakia
19	HU_SK _DU_AFP03	Hungary / Slovakia
20	HU_SK _DU_AFP04	Hungary / Slovakia
21	HU_SK _DU_AFP05	Hungary / Slovakia
22	HU_DU_AFP01	Hungary
23	HU_DU_AFP02	Hungary
24	HU_DU_AFP03	Hungary
25	HU_DU_AFP04	Hungary
26	HU_DU_AFP05	Hungary
27	HU_DU_AFP06	Hungary
28	HU_DU_AFP07	Hungary
29	HU_DU_AFP08	Hungary
30	HR_HU_DU_AFP01	Croatia/ Hungary
31	HR_RS_DU_AFP01	Croatia/ Serbia
32	HR_RS _DU_AFP02	Croatia/ Serbia
33	HR_RS _DU_AFP03	Croatia/ Serbia
34	HR_RS _DU_AFP04	Croatia/ Serbia
35	HR_RS _DU_AFP05	Croatia/ Serbia

36	RS_DU_AFP01	Serbia
37	RS_DU_AFP02	Serbia
38	RS_DU_AFP03	Serbia
39	RS_DU_AFP04	Serbia
40	RS_DU_AFP05	Serbia
41	BG_RO_DU_AFP01	Bulgaria / Romania
42	BG_RO_DU_AFP02	Bulgaria / Romania
43	BG_RO_DU_AFP03	Bulgaria / Romania
44	BG_RO_DU_AFP04	Bulgaria / Romania
45	BG_RO_DU_AFP05	Bulgaria / Romania
46	BG_RO_DU_AFP06	Bulgaria / Romania
47	RO_DU_AFP01	Romania
48	RO_DU_AFP02	Romania
49	RO_DU_AFP03	Romania
50	RO_DU_AFP04	Romania

Twenty-four Potential floodplains along the Danube per country are stored in the DFGIS (Table 2).

Table 2: Potential Floodplains with their IDs in the Danube Floodplain GIS

Number	Floodplain Code	Country
1	AT_DU_PFP01	Austria
2	AT_DU_PFP02	Austria
3	BG_RO_DU_PFP01	Bulgaria, Romania
4	BG_RO_DU_PFP02	Bulgaria, Romania
5	BG_RO_DU_PFP03	Bulgaria, Romania
6	BG_RO_DU_PFP04	Bulgaria, Romania
7	BG_RO_DU_PFP05	Bulgaria, Romania
8	DE_DU_PFP01	Germany
9	DE_DU_PFP02	Germany
10	DE_DU_PFP03	Germany
11	DE_DU_PFP04	Germany
12	DE_DU_PFP05	Germany
13	HU_DU_PFP01	Hungary, Slovakia
14	HU_DU_PFP02	Hungary
15	HU_DU_PFP03	Hungary
16	HU_DU_PFP04	Hungary, Croatia
17	RO_DU_PFP01	Romania
18	RO_DU_PFP02	Romania

19	RO_DU_PFP03	Romania
20	RO_DU_PFP04	Romania
21	RO_DU_PFP05	Romania
22	RS_DU_PFP01	Serbia
23	RS_DU_PFP02	Serbia
24	RS_DU_PFP03	Serbia

The FEM evaluation results of active and potential floodplain along the tributaries will also be published via DFGIS (Table 3).

Table 3: FEM evaluation results of the active floodplains of the tributaries in the Danube Floodplain GIS

Number	Floodplain Code	River	Country
1	RO_DE_AFP	Desnatui	Romania
2	SI_KR_AFP	Krka	Slovenia
3	SK_MR_AFP	Morava	Slovakia
4	HR_SA_AFP	Sava	Croatia
5	RS_SA_APF	Sava	Serbia
6	HU_TI_AFP	Tisza	Hungary
7	RS_TI_AFP	Tisza	Serbia
8	BG_YN_AFP	Yantra	Bulgaria

Table 4: FEM evaluation results of potential floodplains of the tributaries in the Danube Floodplain GIS

Number	Floodplain Code	River	Country
1	RO_DE_PFP	Desnatui	Romania
2	SI_KR_PFP	Krka	Slovenia
3	SK_MR_PFP	Morava	Slovakia
4	HU_TI_AFP	Tisza	Hungary
5	BG_YN_AFP	Yantra	Bulgaria

The most recent results of the FEM ratings and Restoration demand parameter are published as maps for all active and potential floodplains along the Danube and tributaries in a public map service accessible via an internet browser (Figure 2-9.):

http://www.geo.u-szeged.hu/dfgis/

Functionality for navigation is available. Options to view and download the FEM ratings and Restoration parameter are available. The GIS layers can be downloaded.

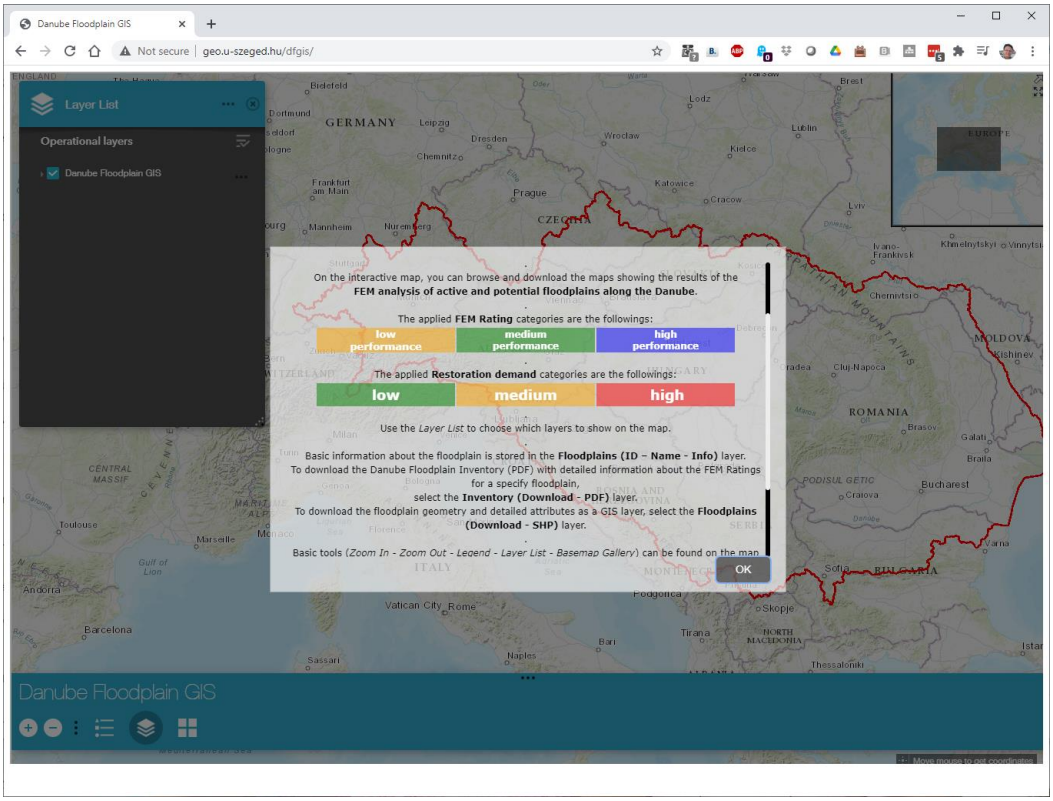


Figure 2. DFGIS web map service starting page providing general information about the DFGIS

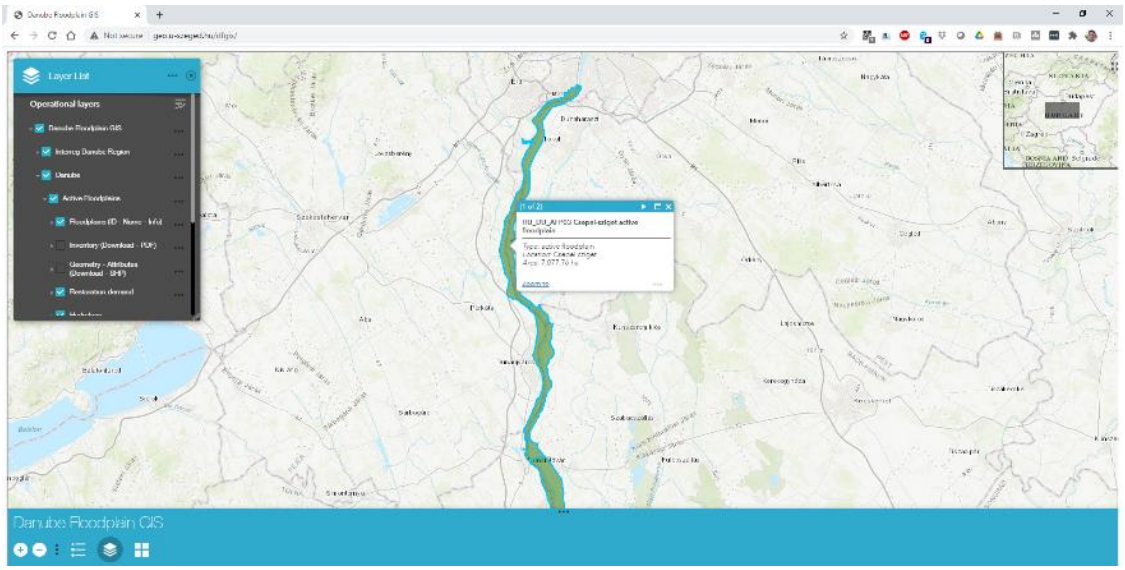


Figure 3. DFGIS Floodplain map, with its name, ID and area

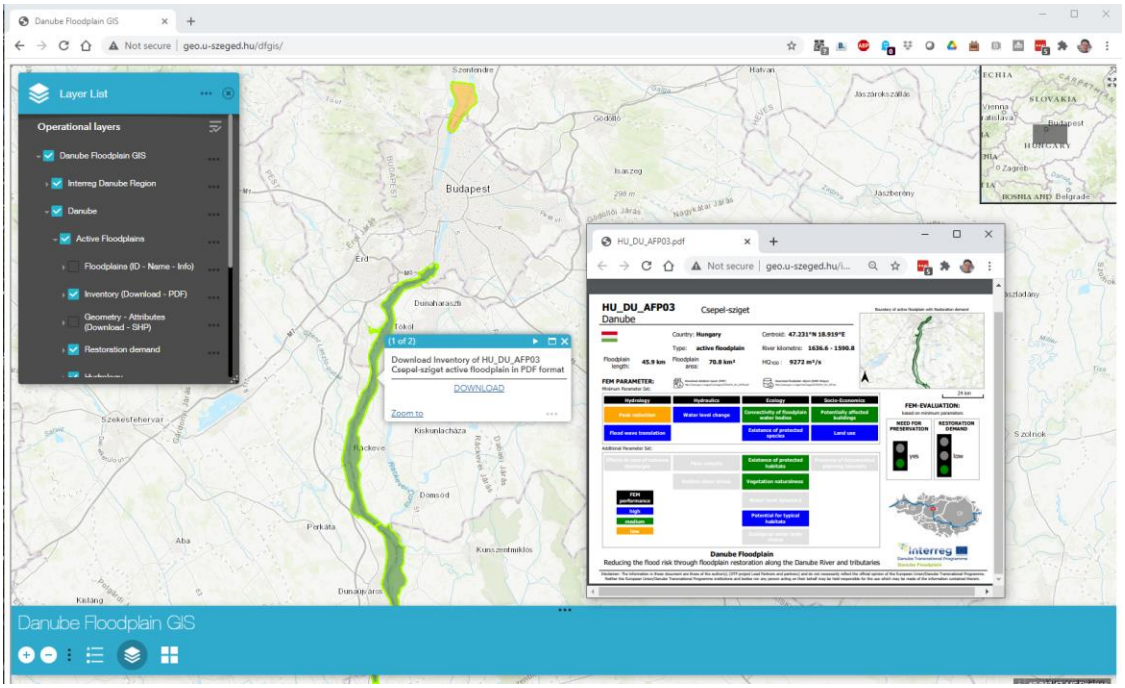


Figure 4. DFGIS Inventory download layer, with link to the PDF storing the FEM parameters

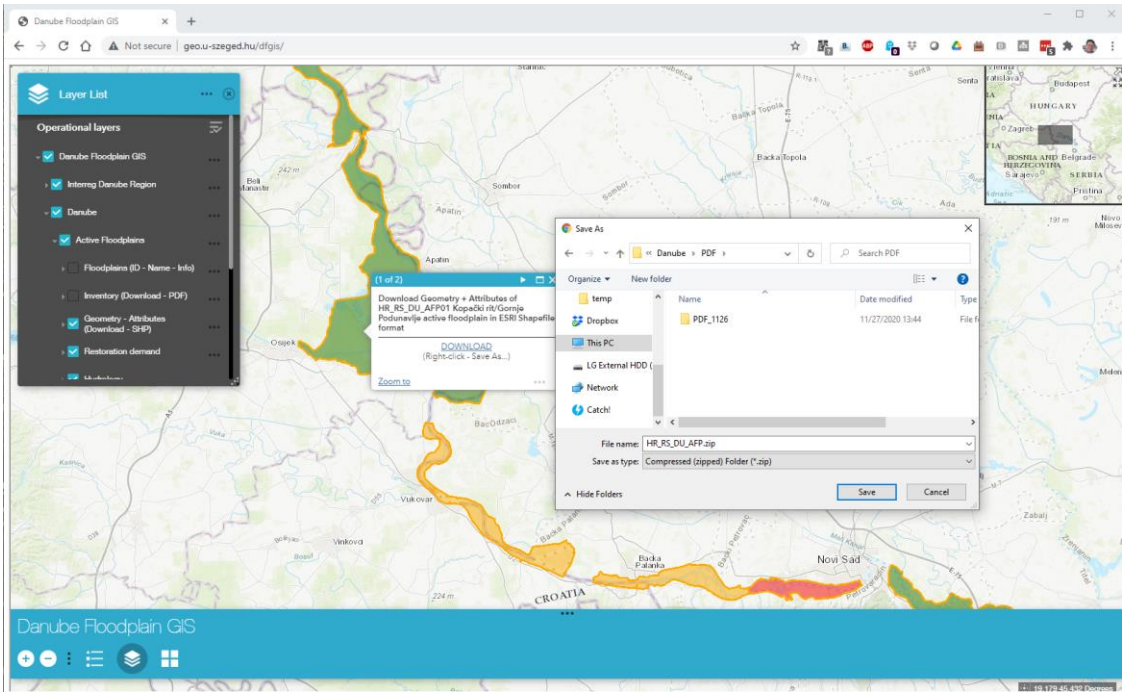


Figure 5. DFGIS map download layer, with the link to the zip file storing the shape files with attributes

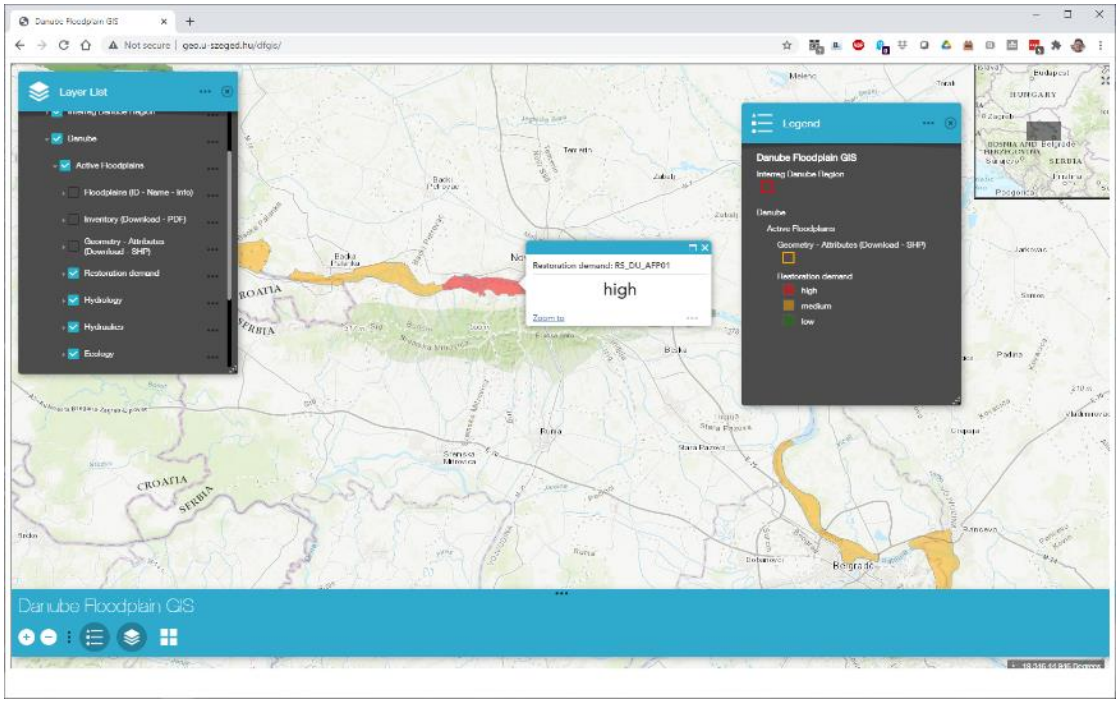


Figure 6. DFGIS Active Floodplain Restoration demand layer

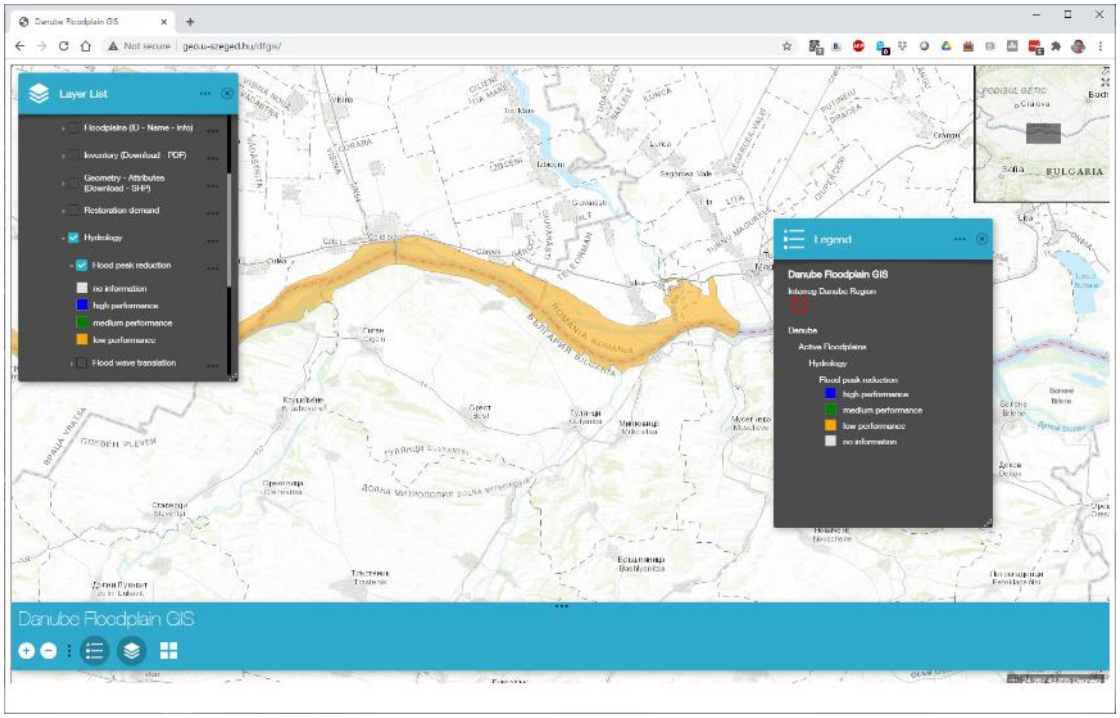


Figure 7. DFGIS Active Floodplain minimum parameter (here: Hydrology – peek reduction) FEM Rating layer

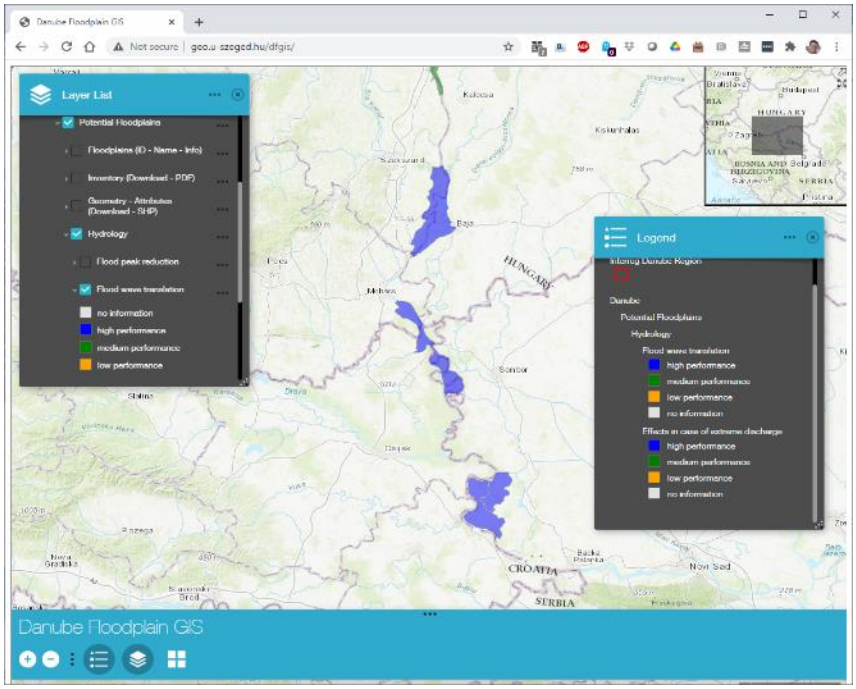


Figure 8. DFGIS Potential Floodplain Flood wave translation parameter

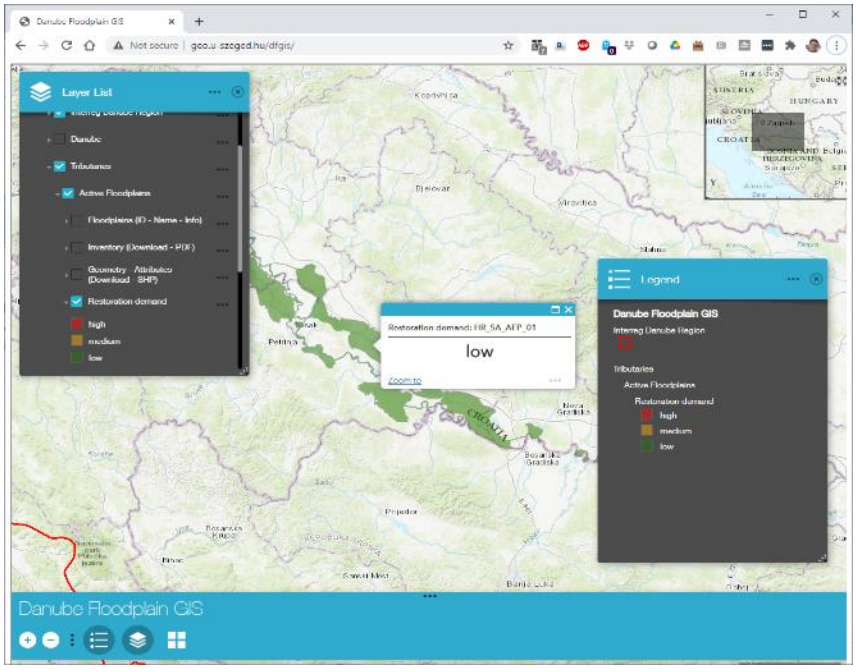


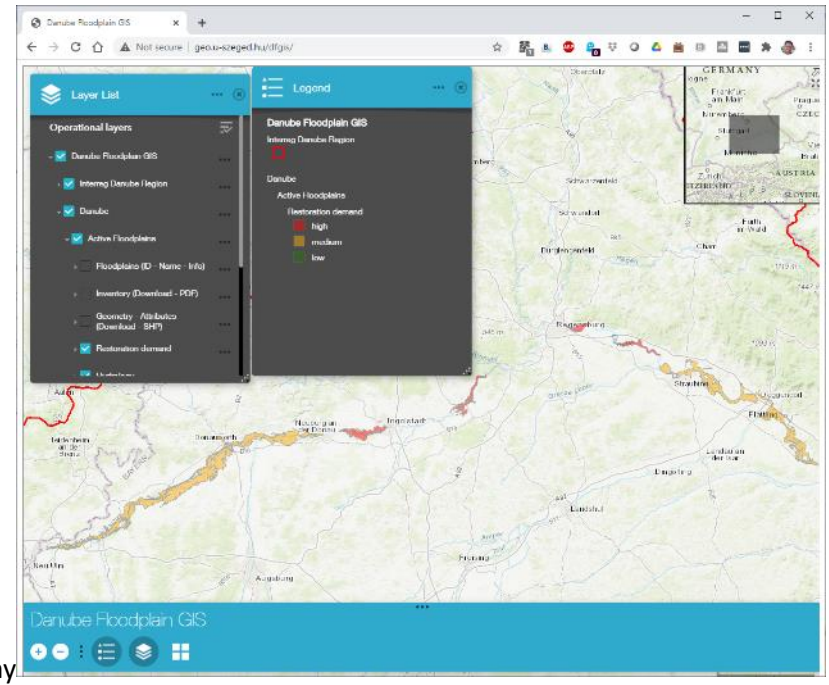
Figure 9. DFGIS Active Floodplain (Sava) Restauration demand

The FEM Ratings and Restoration demand for each active floodplain and FEM Ratings for potential floodplains along the Danube will be shared with the Danube GIS map service. The visualization parameters will be stored in a Styled Layer Descriptor (SLD) file. The FEM Ratings and Restoration demand of the tributaries will only be published in DFGIS and the Danube Floodplain Inventory.

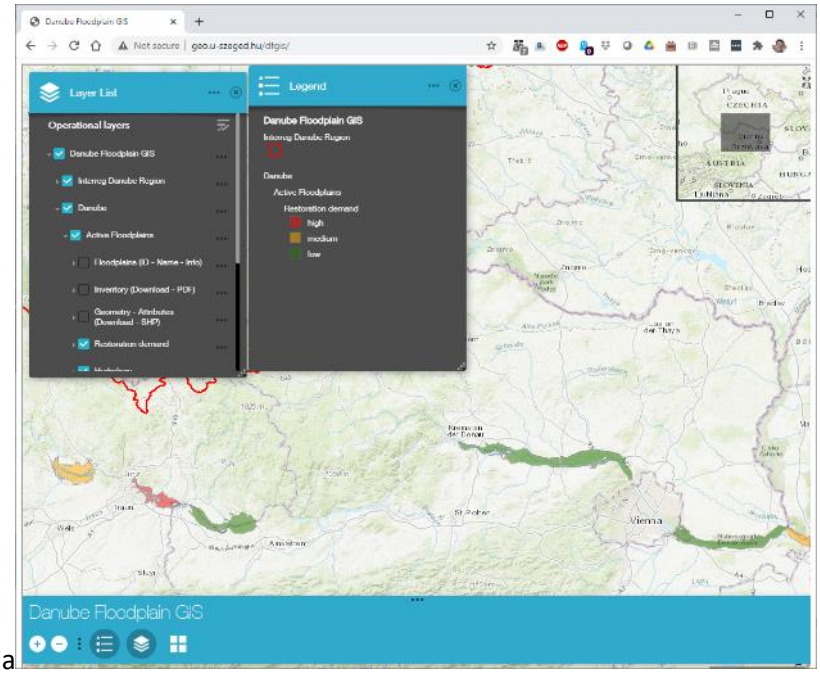
Annex Maps published via Danube Floodplain GIS

For each country, a map is presented showing the Restoration demand parameter for the active floodplains.

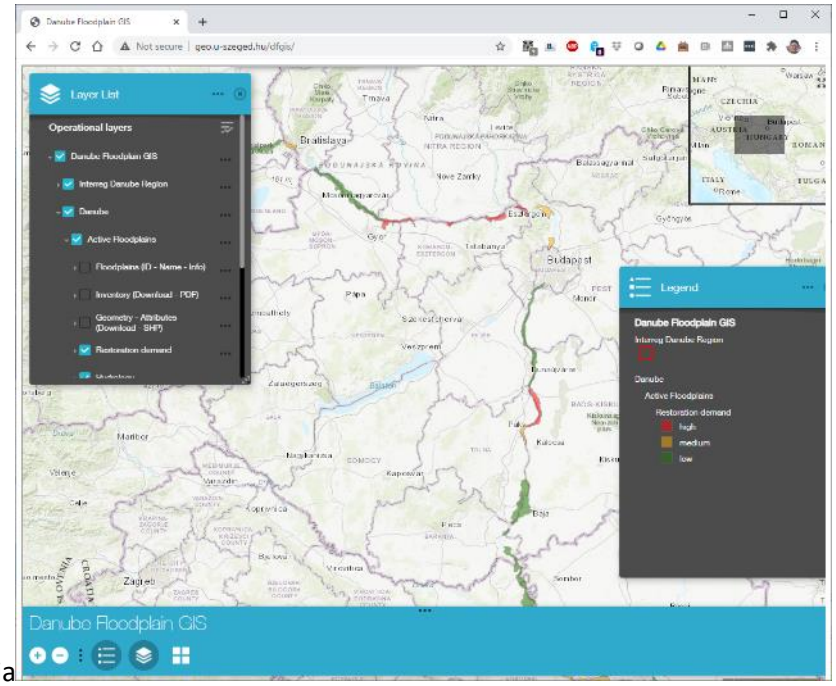
Germany



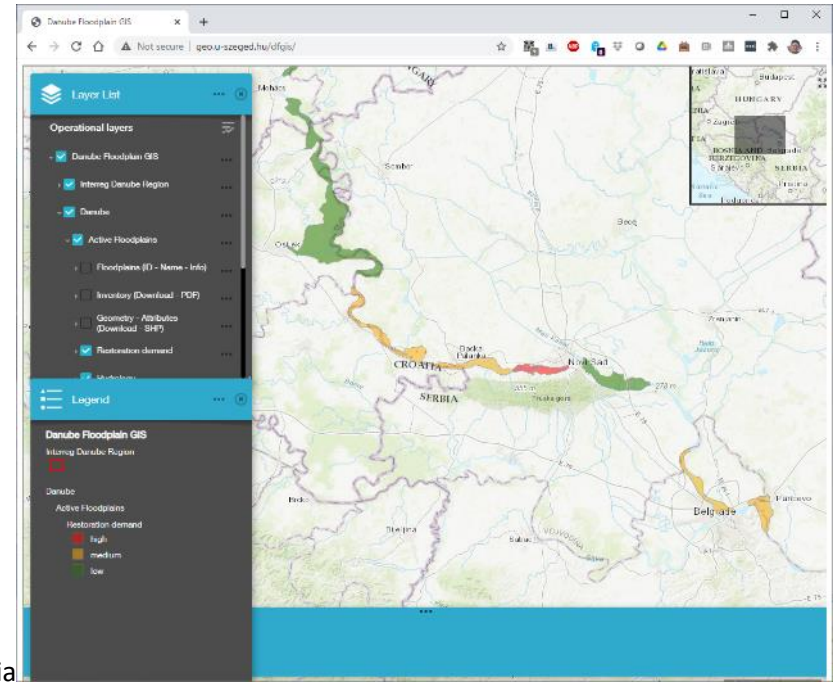
Austria



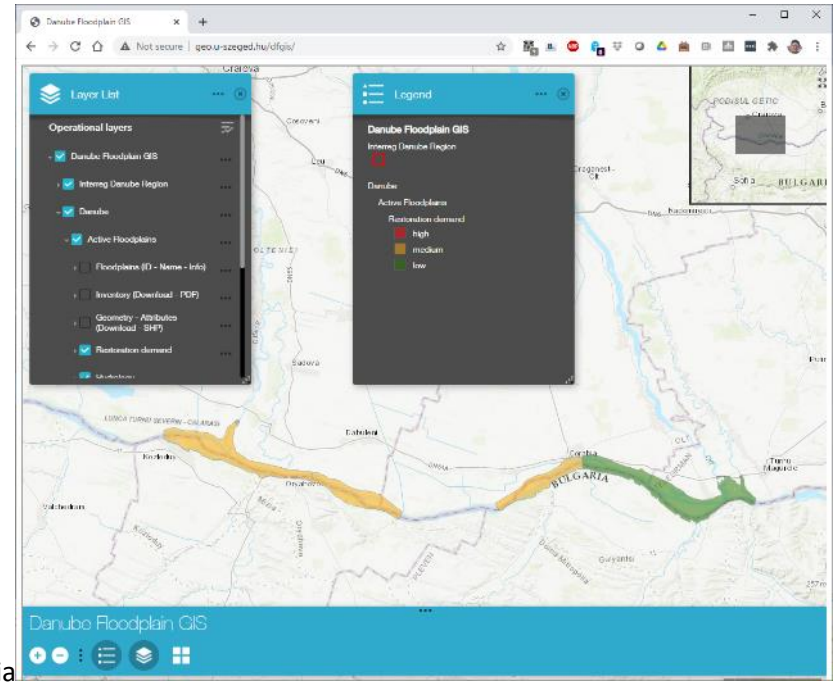
Hungary and Slovakia



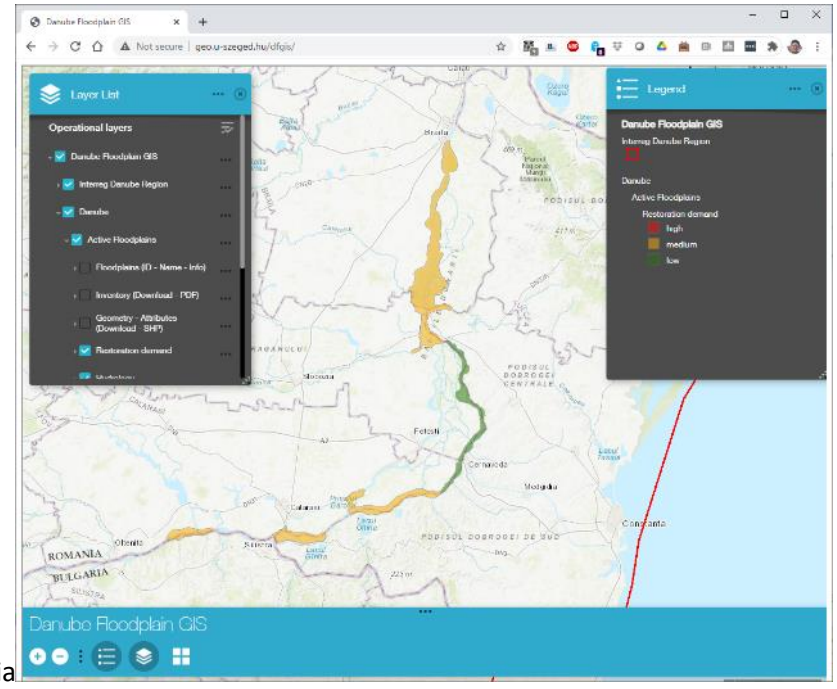
Croatia and Serbia



Bulgaria and Romania

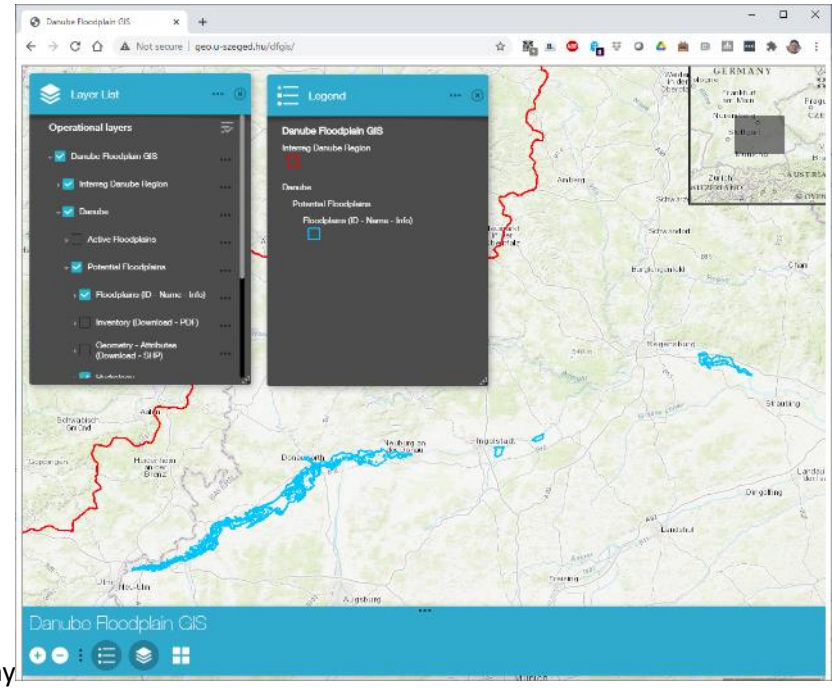


Romania and Bulgaria

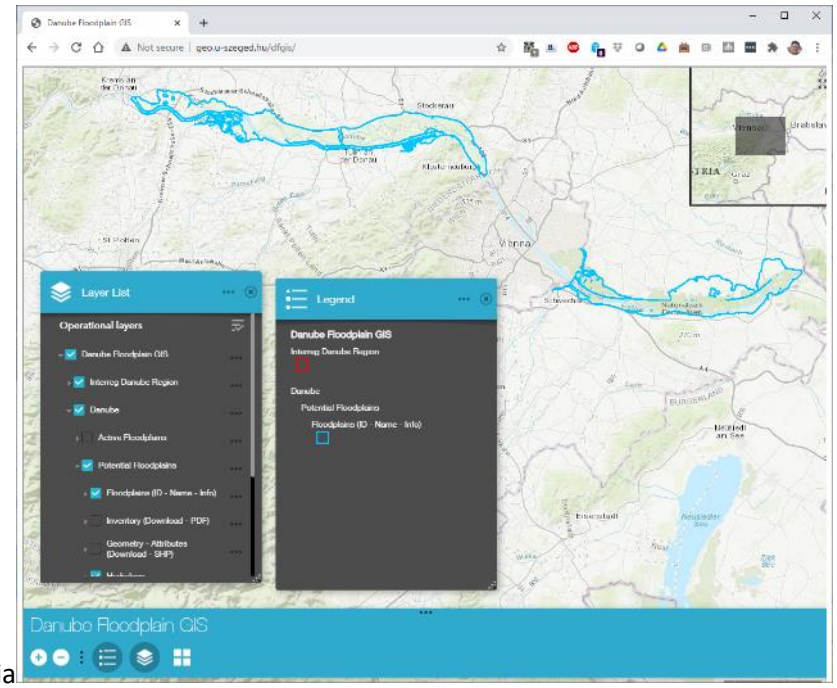


All Potential floodplains (at different scales):

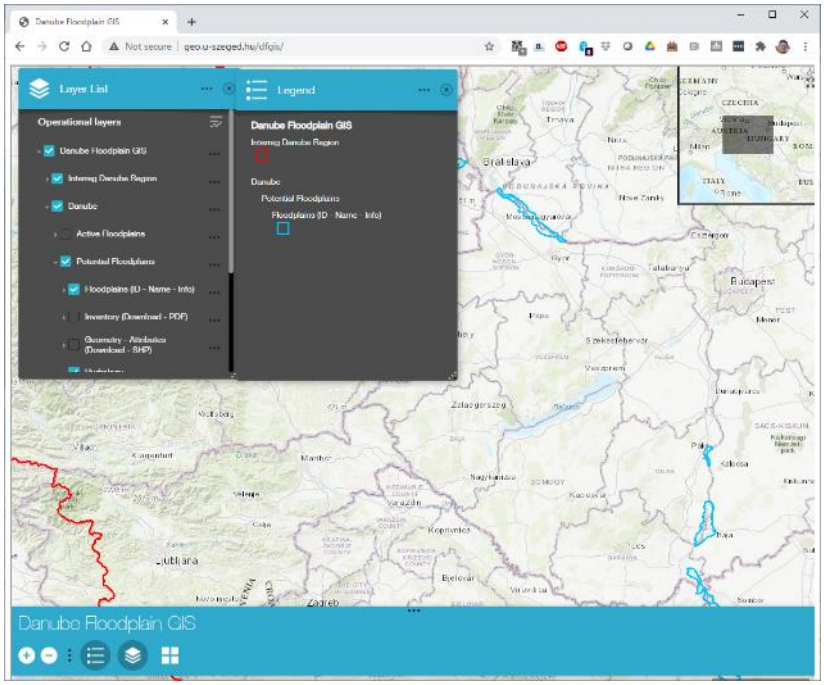
Germany



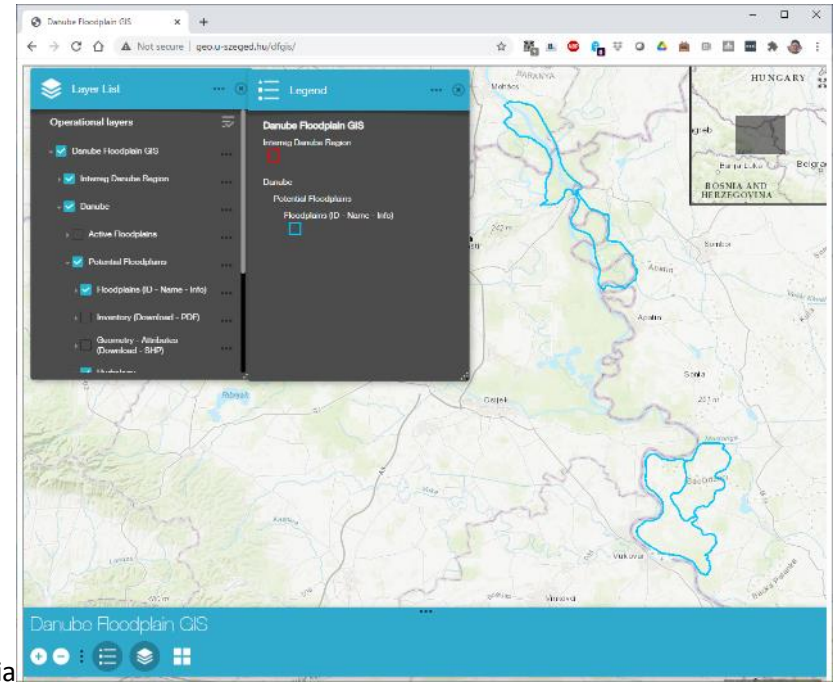
Austria

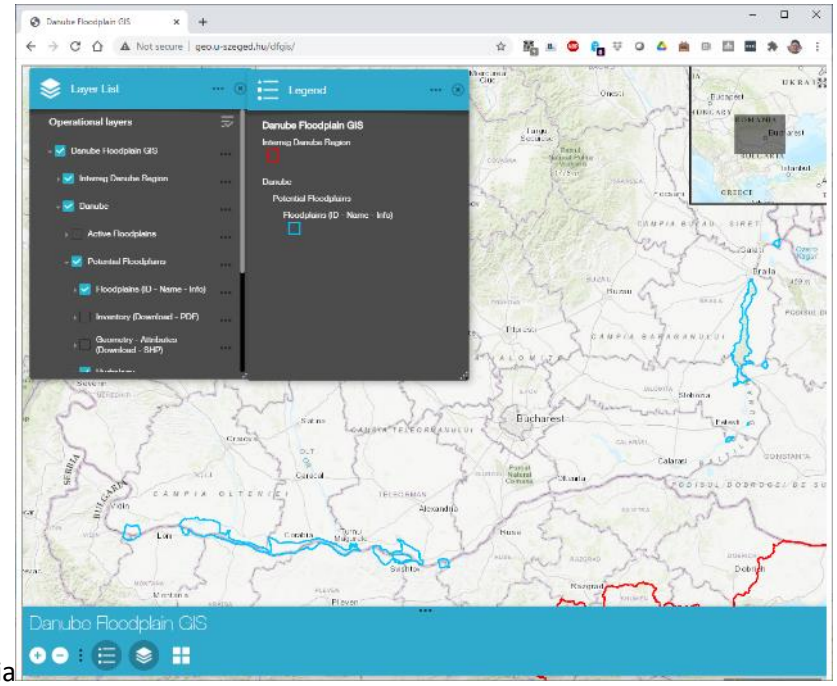


Hungary and Slovakia



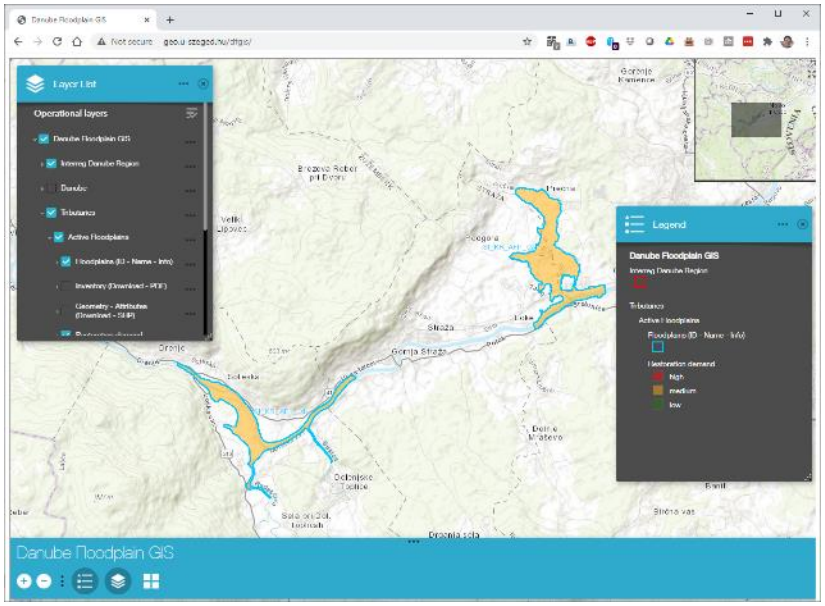
Hungary, Croatia and Serbia



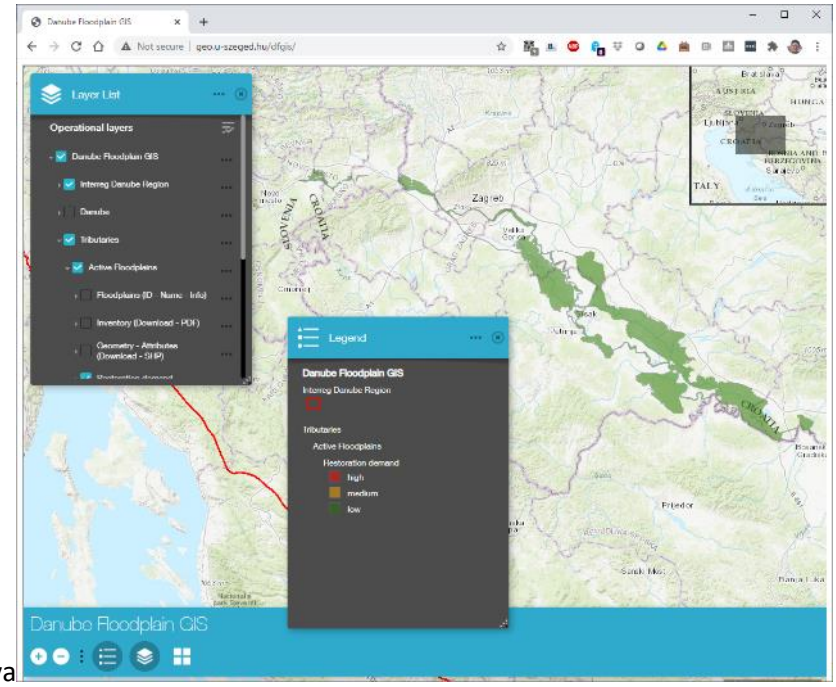
Bulgaria and Romania 

Restoration demand parameter for the active floodplains along the tributaries (at different scales)

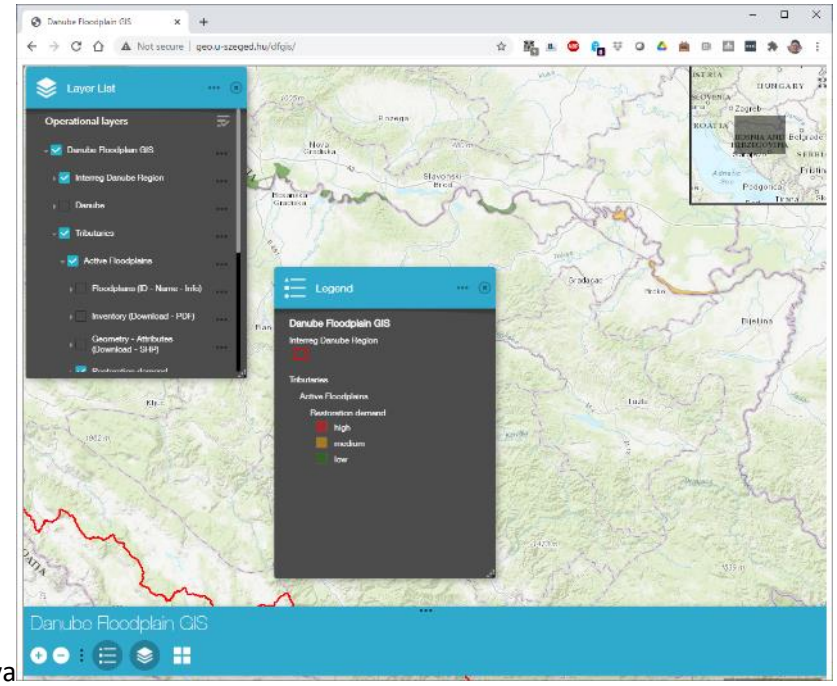
Krka



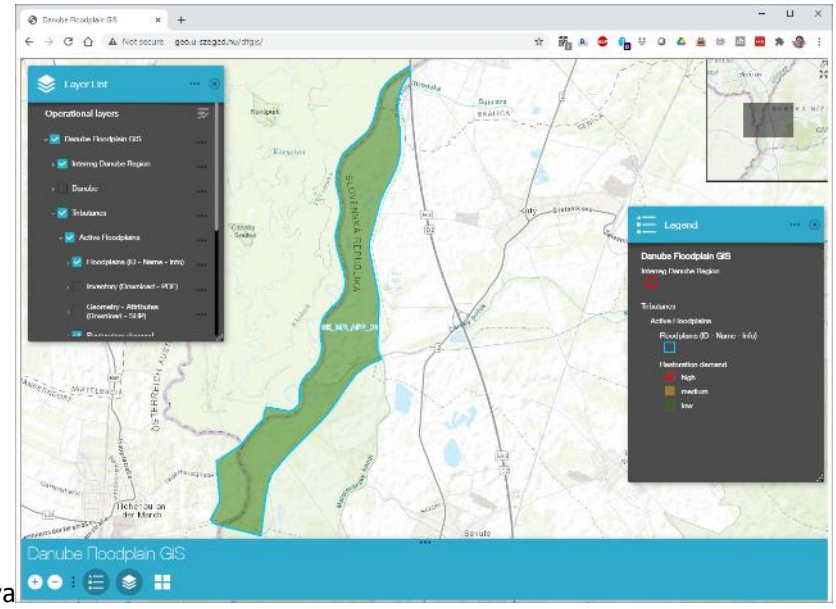
Sava



Sava


Layer List
Operational layers
Legend
Danube Floodplain GIS

Morava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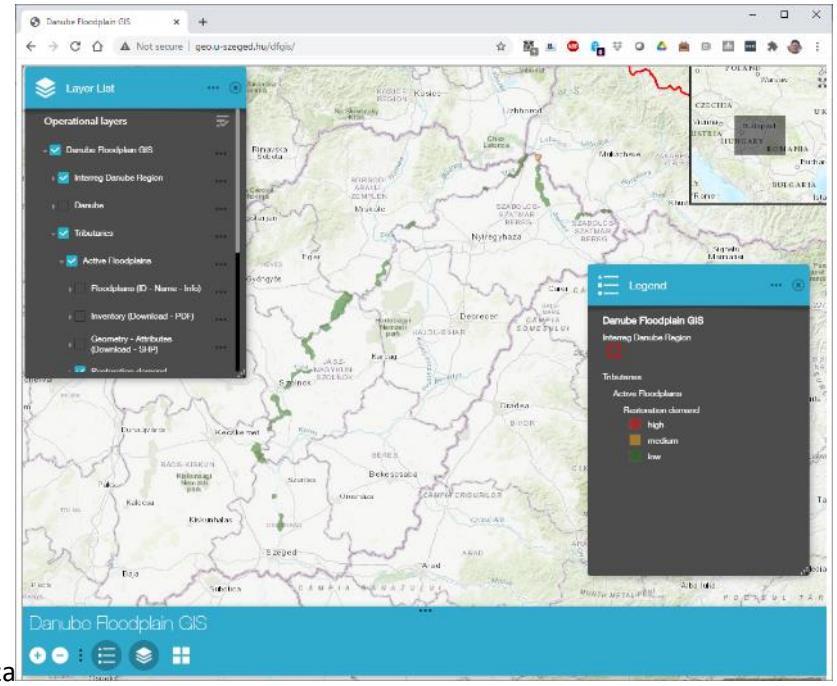
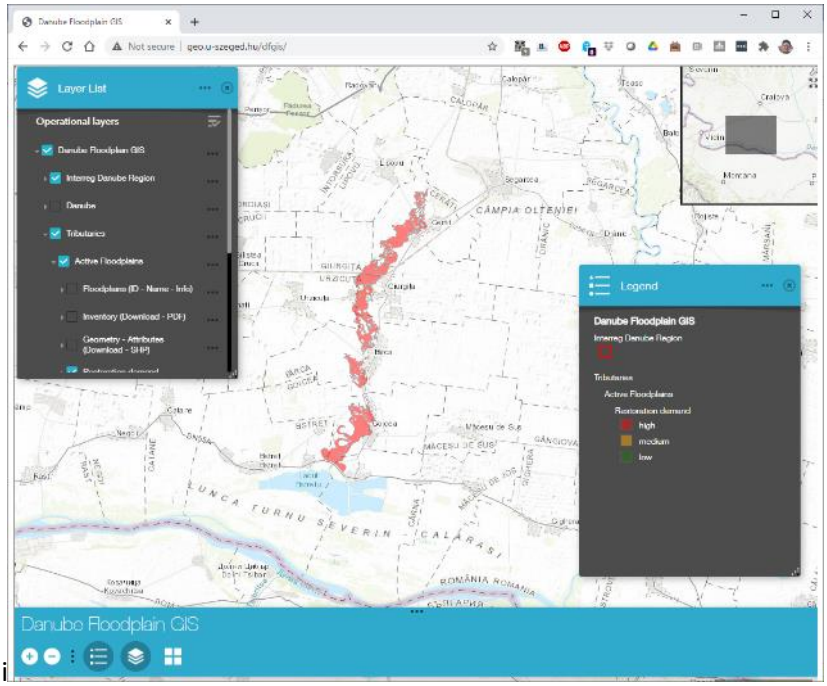
Danube Floodplain GIS

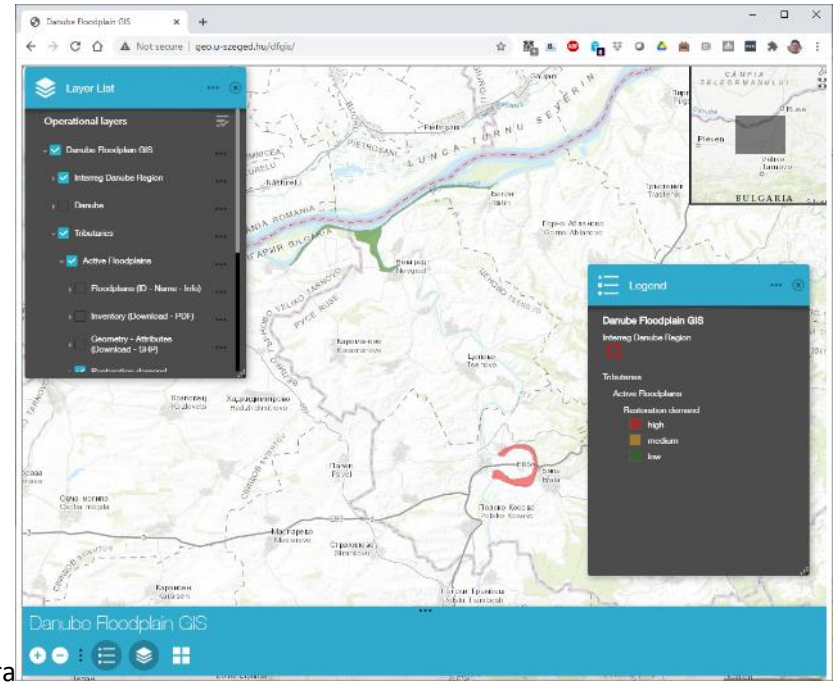


Tisza



Desnatui

Yantra



Yantra