



Sustainable Flood Protection measures in the Danube basin

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Floods and Danube River Basin

- Repeated devastating flood events over past decades at the Danube Basin level (Czech Republic, Hungary, Poland, Romania, Germany, Serbia, Bosnia and Herzegovina, etc.)
- Substantial efforts undertaken at the ICPDR level for the implementation of the EU Directive on assessment and management of floods risk
- Flood Risk Management Plan for the Danube River Basin has been developed and is under implementation
- Important EU funds for reconstruction works for damaged infrastructure but more resources needed for flood defence and prevention schemes
- Effects of climate change will influence floods events in the future

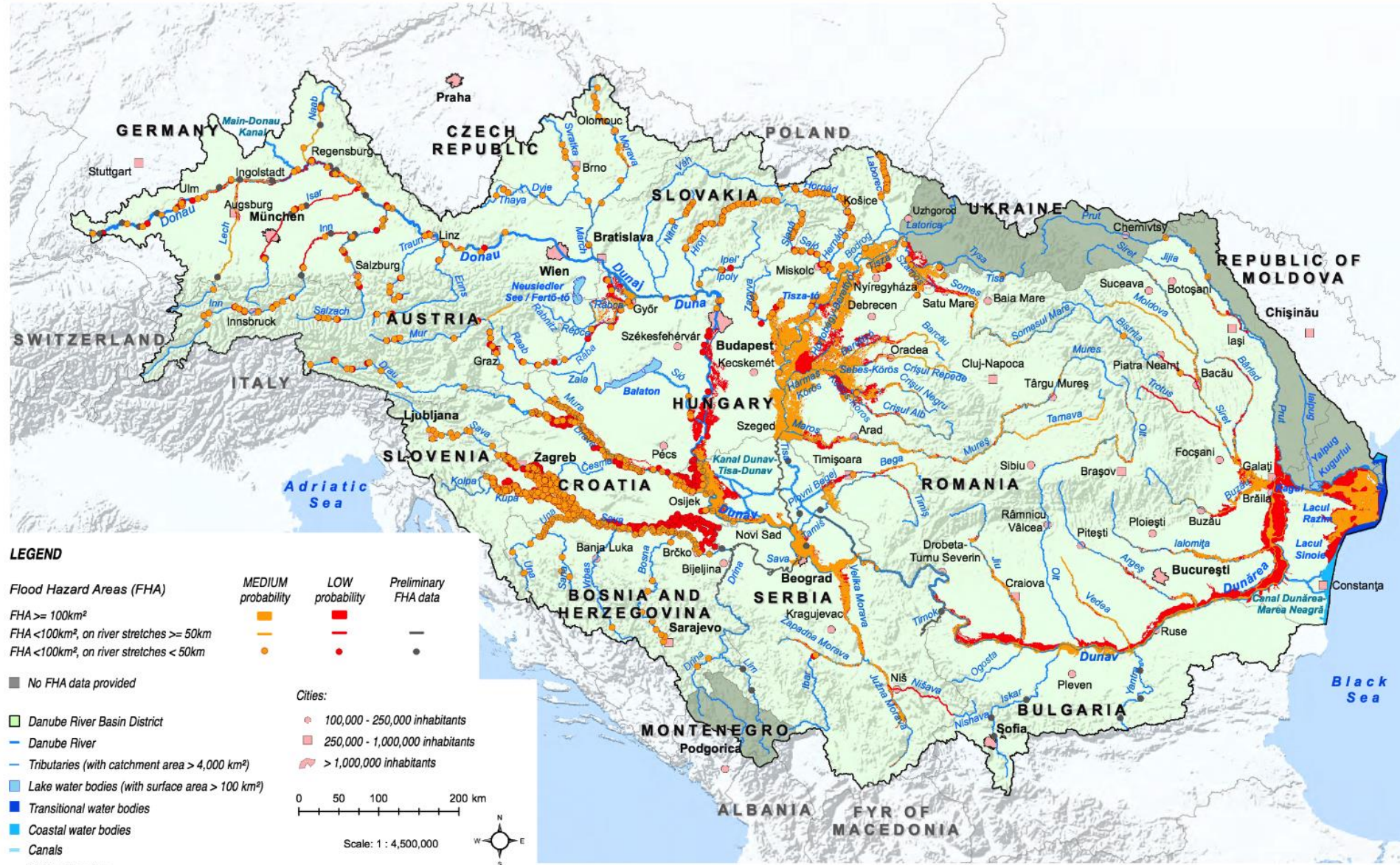






Main objectives of the Flood Risk Management in the Danube River Basin

- Public safety – reducing risk to people
- Property protection – public infrastructure and private property
- Reduction in emergency response during floods
- Avoid loss of critical services – fire, police, medical etc.
- Environmental enhancement and restoration



FHA data for the Danube floodplain in BA, RO and RS was taken from the Danube Floodrisk Project. FHA data for Valika Morava floodplain in RS was taken from the SOFPAS 1 project. FHA data for SI was provided for 11 out of 21 relevant flood hazard areas (based on watershed size and national importance criteria).

This ICPDR product is based on national information provided by the Contracting Parties to the ICPDR (AT, BA, BG, CZ, DE, HR, HU, ME, MD, RO, RS, SI, SK, UA) and CH. EuroGlobalMap data from EuroGeographics was used for all national borders except for AL, BA, ME where the data from the ESRI World Countries was used; Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as elevation data layer; data from the European Commission (Joint Research Center) was used for the outer border of the DRED of AL, IT, ME and PL.



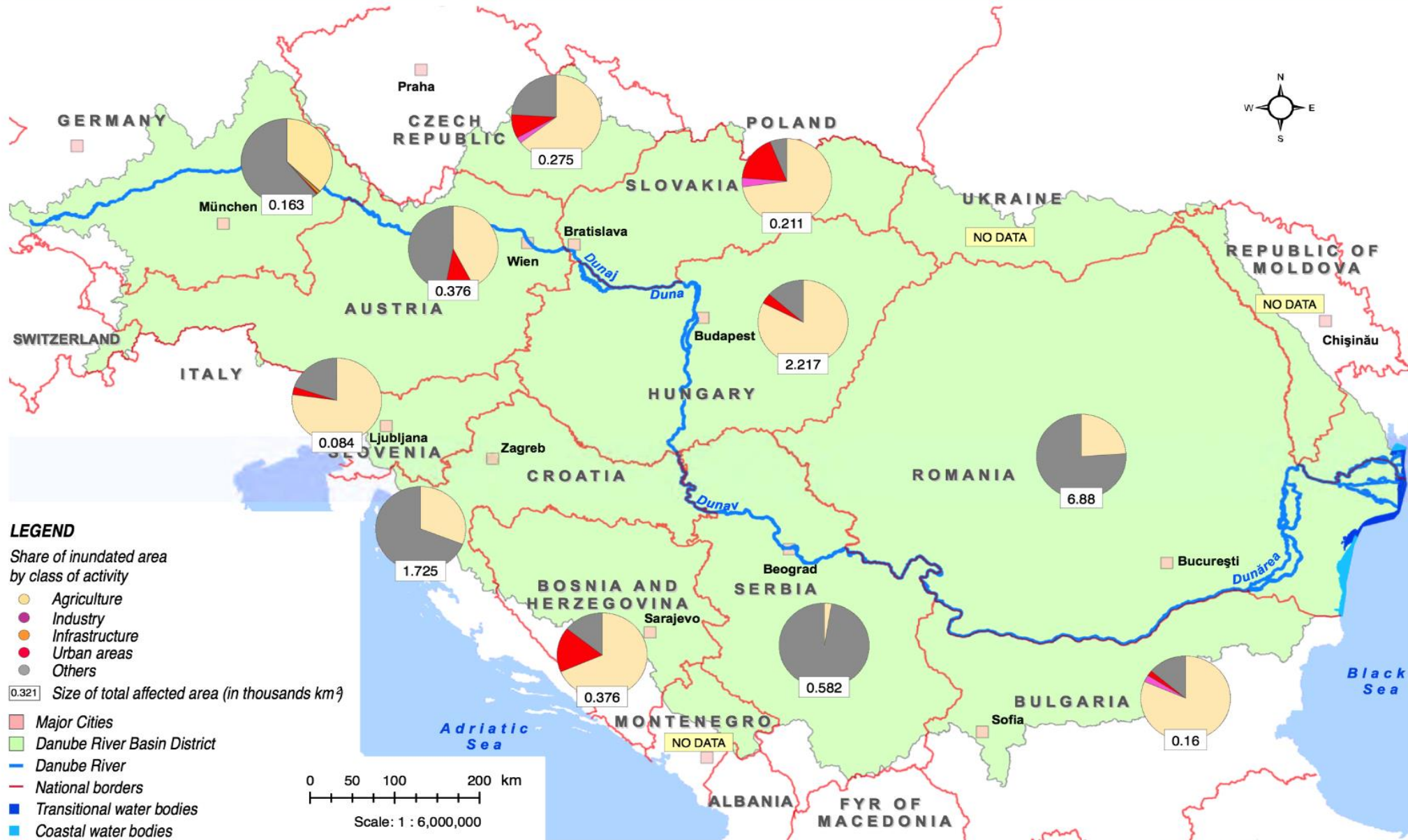
Flood risk data in RS is roughly assessed only for the Danube River corridor. Flood risk data in BG and RO is available only for the Danube river, based on the Danube FLOODRISK project results.

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This ICPDR product is based on national Flood Risk information provided by the Contracting Parties (CP) to the ICPDR. National borders data was provided by the CPs for borders of AT, CZ, DE, HR, HU, MD, RO, SI, SK and UA; ESRI data was used for national borders of AL, ME, MK; Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as topographic layer; data from the European Commission (Joint Research Center) was used for the outer border of the DRBD of AL, IT, ME and PL.
 Vienna, November 2015

International Commission for the Protection of the Danube River

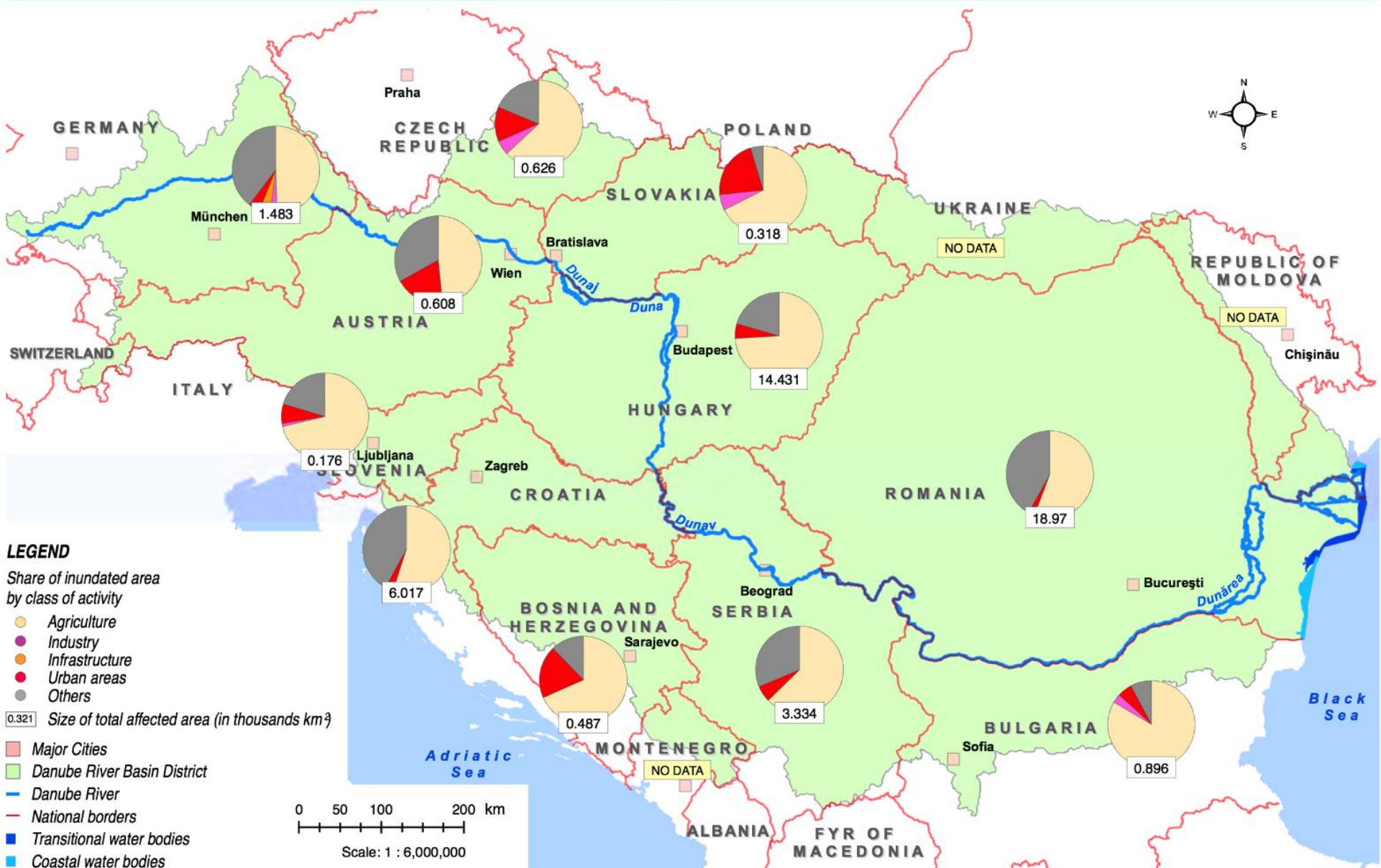


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Vienna, November 2015



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River flooding and flash floods/ debris flow



Main measures in the Danube River Flood Risk Management Plan

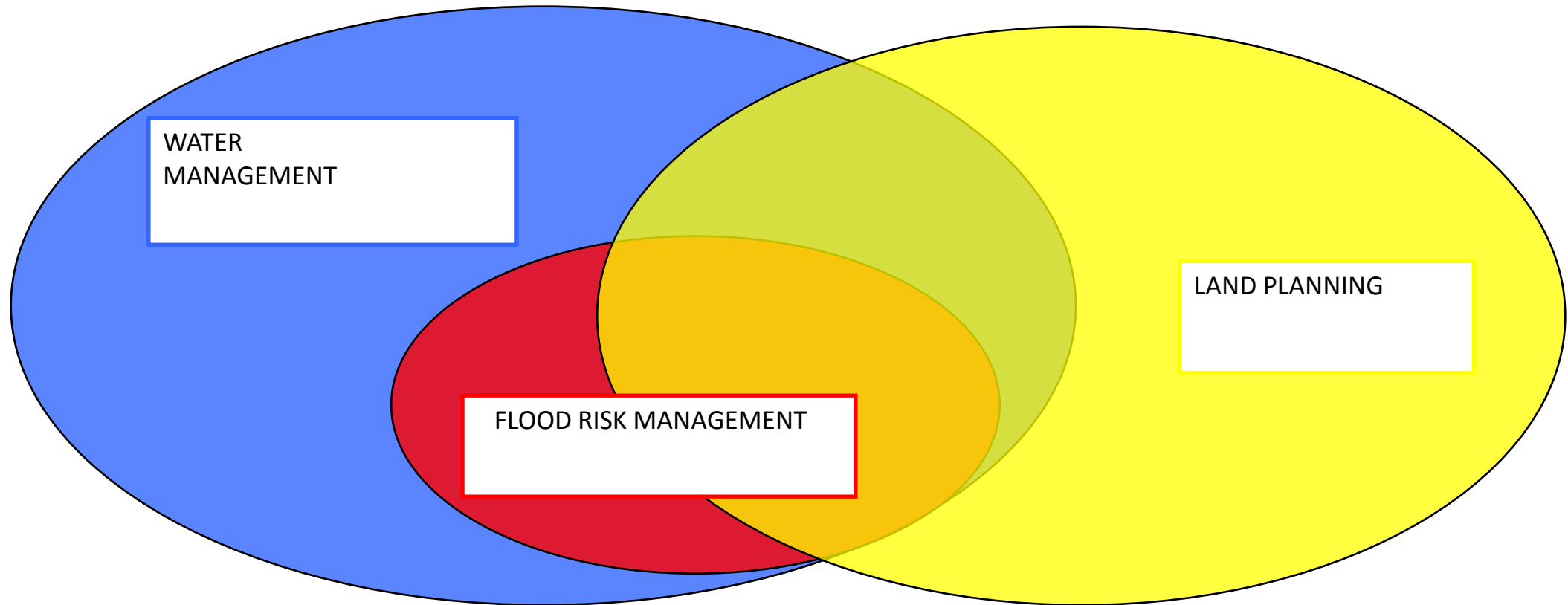
- To avoid new risks
- To reduce existing risks
- To strengthen resilience
- To increase resilience
- To apply solidarity principle

Type of measures in the Danube River Flood Risk Management Plan

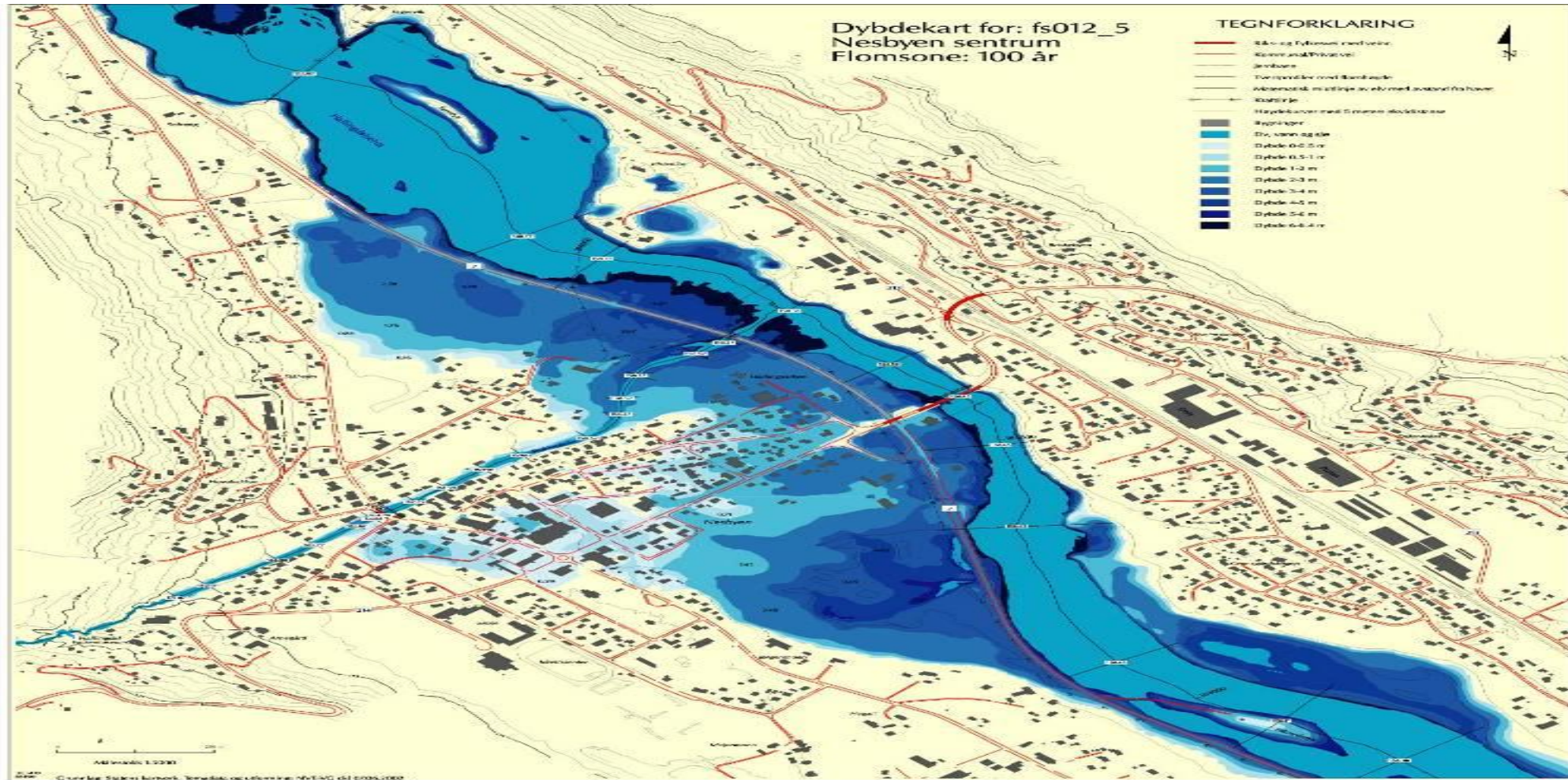
- Preventive, operational and reparatory
- Structural and non-structural
- Environmentally friendly
- Taking into account the climate change and future developments
- Involving public participation
- Planned at the basin level and implemented at the national and local level

Land planning for flood management

Need for coordination



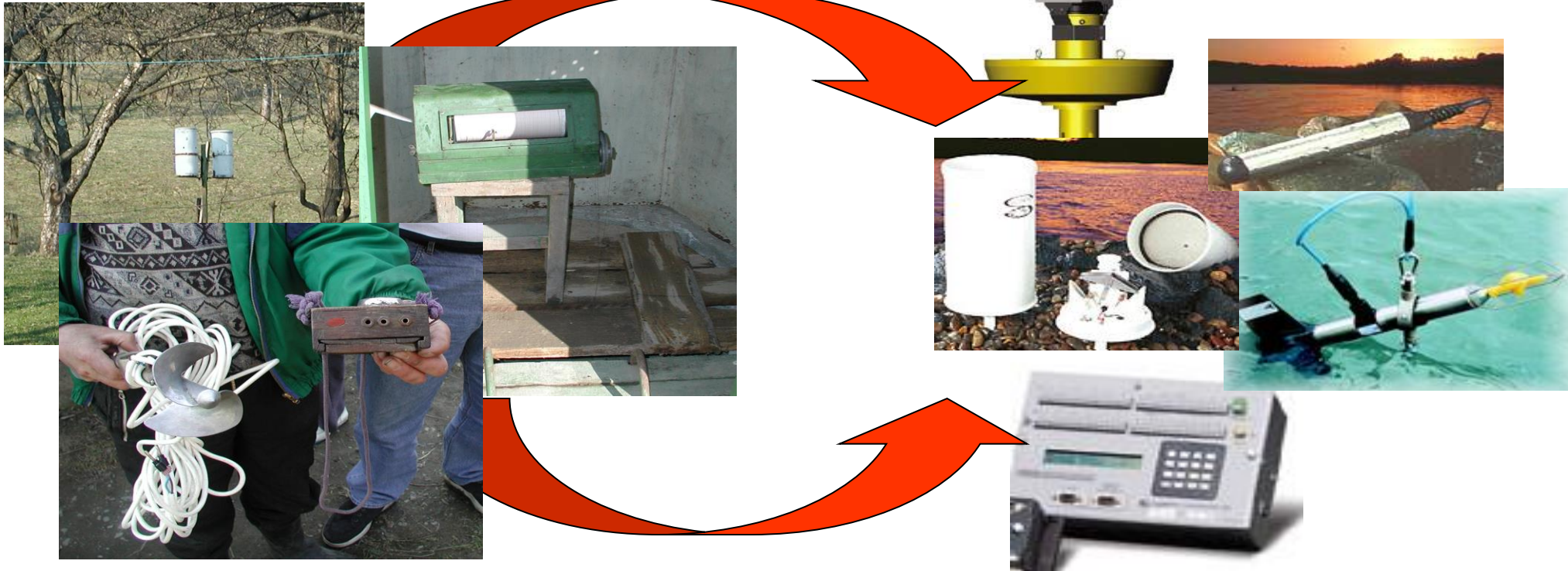
Flood Risk Maps important for land planning





UPGRADE OR REPLACE THE EXISTING STRUCTURES:





REPLACE MANUAL SENSORS WITH AUTOMATIC HYDROMETRIC STATIONS:

- ✿ Water level sensors (float, pressure, radar, soil moisture);
- ✿ Water temperature sensors;
- ✿ Precipitation sensors;
- ✿ Environmental quality sensors (dissolved oxygen, conductivity, pH, turbidity);
- ✿ Heavy metal ion (nitrates, phosphates, etc.)

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ZCZC 001
SRRO40 JHMM 130600
HHXX 13061
44216 2210042 50045 60050 3311313 51643 71383 5510010 50060=
44218 2210102 50110 60124 3311993 72253 5511050 50000=
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SITUAȚIA ȘI PROGNOZA HIDROLOGICĂ

Râu (Fluviu)	Stapă	Stare	Prognoza
1. Siret	de creștere	de creștere	de creștere
2. Bistrița	de creștere	de creștere	de creștere
3. Suceava	de creștere	de creștere	de creștere
4. Prut	de creștere	de creștere	de creștere
5. Moldova	de creștere	de creștere	de creștere
6. Crișana	de creștere	de creștere	de creștere
7. Mureșul	de creștere	de creștere	de creștere
8. Crișul Repede	de creștere	de creștere	de creștere
9. Jiu	de creștere	de creștere	de creștere
10. Argeș	de creștere	de creștere	de creștere
11. Dâmbovitza	de creștere	de creștere	de creștere
12. Teleorman	de creștere	de creștere	de creștere
13. Vâlcea	de creștere	de creștere	de creștere
14. Gorj	de creștere	de creștere	de creștere
15. Hunedoara	de creștere	de creștere	de creștere
16. Alba Iulia	de creștere	de creștere	de creștere
17. Mureșul	de creștere	de creștere	de creștere
18. Timișoara	de creștere	de creștere	de creștere
19. Bega	de creștere	de creștere	de creștere
20. Crișana	de creștere	de creștere	de creștere
21. Mureșul	de creștere	de creștere	de creștere
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28. Crișana	de creștere	de creștere	de creștere
29. Mureșul	de creștere	de creștere	de creștere
30. Crișana	de creștere	de creștere	de creștere

ROMANIA
MINISTERUL APELOR ȘI PROTECȚIEI MEDIULUI
COMPANIA NAȚIONALĂ
"INSTITUTUL NAȚIONAL DE METEOROLOGIE, HIDROLOGIE ȘI
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BULETIN HIDROLOGIC
Anul IV Nr. 60 din 01.03.2002

CARACTERIZAREA STĂRII RĂURILOR
în intervalul 28.02.2002 ora 07⁰⁰ - 01.03.2002 ora 07⁰⁰

Debitele au fost în general staționare pe râurile din Banat, Oltenia, Muntenia și sudul Moldovei și în creștere, ca stec combinat al precipitațiilor cazute în interval și cedării apei din straturile de zapada din zona de munte, pe celelalte râuri, exceptând cursurile inferioare ale râurilor din Crișana, Tarnavelor și Mureșul (curs mijlociu și inferior), pe care debitele au fost în scădere.

Creșteri mai importante s-au produs pe râurile din Maramureș și din bazinul Someșului.

Se situează peste COTELE DE ATENȚIE: Someș-Bodan (161+0), Lapus-Lapusel (350+0) și Tur-Călinești Oas (350+20), iar în interval a fost depășită cota de atenție pe Cărnic la s.h. Cărnic (60+2) și pe Viseu la s.h. Bistra (220) ulterior nivelurile scăzând sub această cotă.

Prin explințarea sistemelor hidrotehnice s-au produs variații de debite pe: Iur, Crișul Repede, Jiu, Argeș, Dâmbovitza, și Siret.

Debitele înregistrate la ora 7 se situează peste medile multianuale lunare pe râurile din Maramureș, Crișana, Transilvania, pe Prut, Siret, Suceava, Moldova și Bistrița și sub aceste valori pe celelalte râuri, cu coeficienți moduli cuprinși între 0,30-0,80.

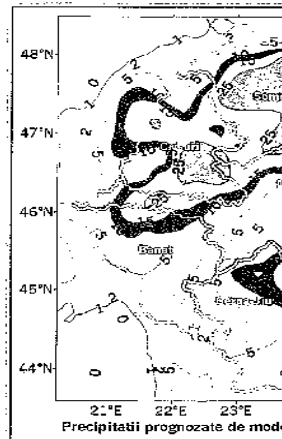
S-a menținut gheata la maluri numai pe cursul superior al Bistriței.

Situația nivelurilor

- ↑ în creștere
- staționare
- ↓ în scădere

Situația debitelor față de debitul multianual lunar

- ↑ peste medie
- în jurul mediei
- ↓ sub medie




Enhance analysis and product generation capabilities.





LEGEND

Flood hazard areas (FHA) with low probability that overlap the Protected Areas

- FHA $\geq 100\text{km}^2$
- FHA $< 100\text{km}^2$, on river stretches $\geq 50\text{km}$
- FHA $< 100\text{km}^2$, on river stretches $< 50\text{km}$
- No FHA data provided
- Protected Areas: Natura 2000 and Others

- Danube River Basin District
- Danube River
- Tributaries (with catchment area $> 4,000\text{ km}^2$)
- Lake water bodies (with surface area $> 100\text{ km}^2$)
- Transitional water bodies
- Coastal water bodies
- Canals
- National borders

Cities:

- 100,000 - 250,000 inhabitants
- 250,000 - 1,000,000 inhabitants
- $> 1,000,000$ inhabitants

0 50 100 200 km

Scale: 1 : 4,500,000

(Scale 1: 6,000,000 in A4 landscape paper format)

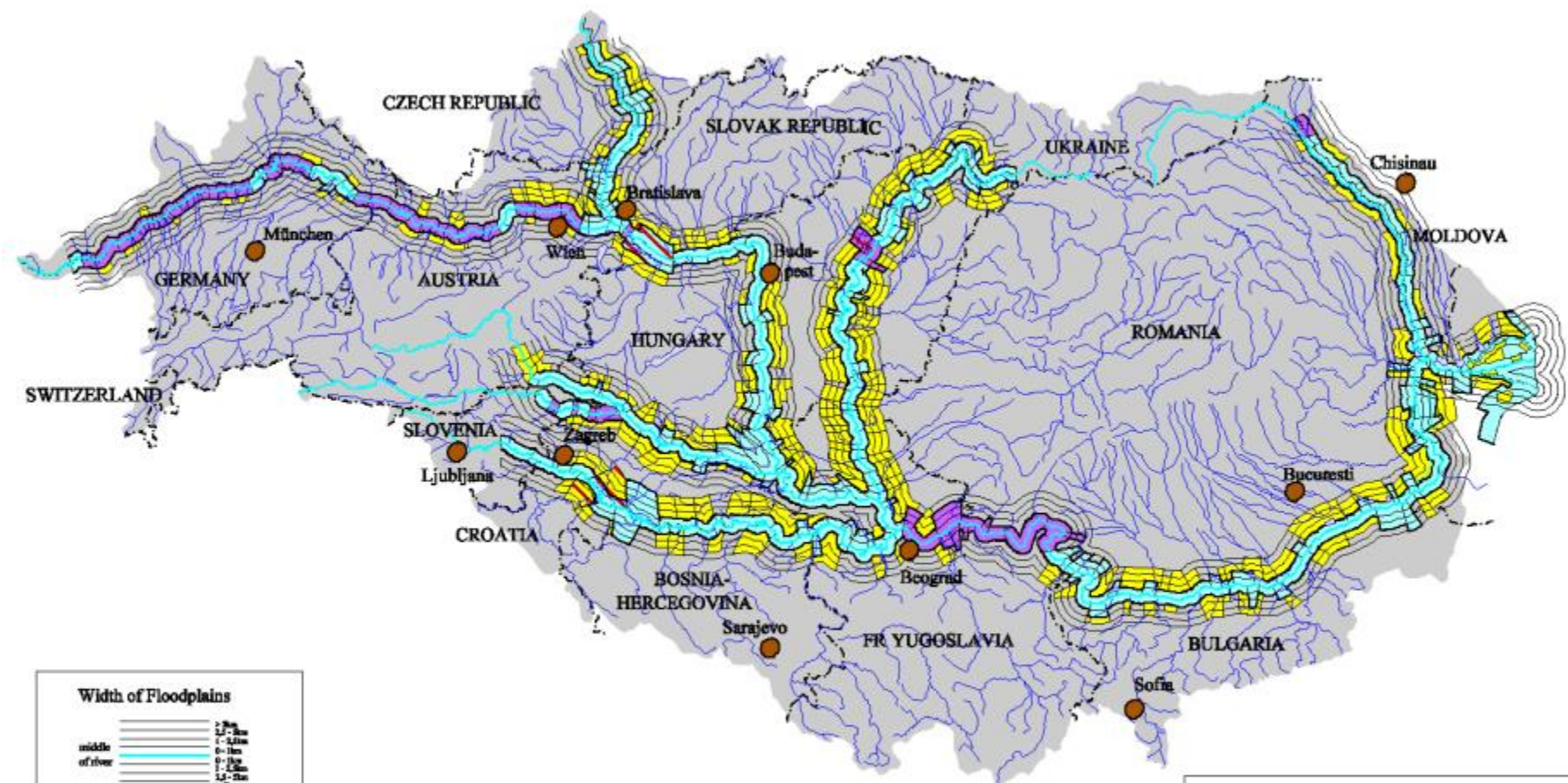
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Symbolized view of floodplains in the Danube River Basin



Width of Floodplains

Wide	2.0 - 3.0 km
Middle	1.0 - 2.0 km
Narrow	0.5 - 1.0 km

Type of Floodplains

- Former Floodplains (Yellow)
- Recent Floodplains (Light Blue)
- Back water area of dams (Purple)

Scale: 1:4.500.000

0 50 100 150 kilometers

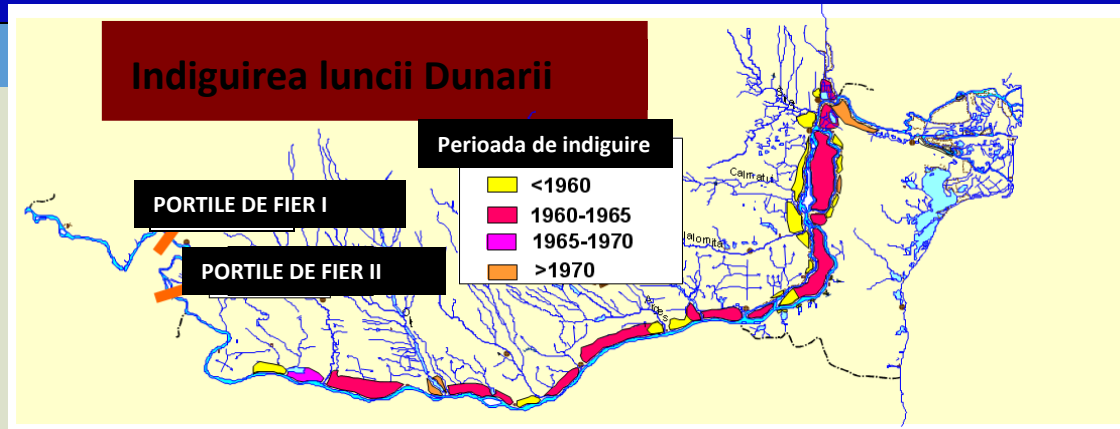
Area of historical floodplains in the study area: 41600 km²
 Area of remaining floodplains in the study area: 8000 km²
 A floodplain loss of more than 80%

Danube Pollution Reduction Programme

United Nations Development Programme
 Global Environment Facility
 ICPDR - Programme Coordination Unit
 1400 Vienna, P. O. Box 500, Austria

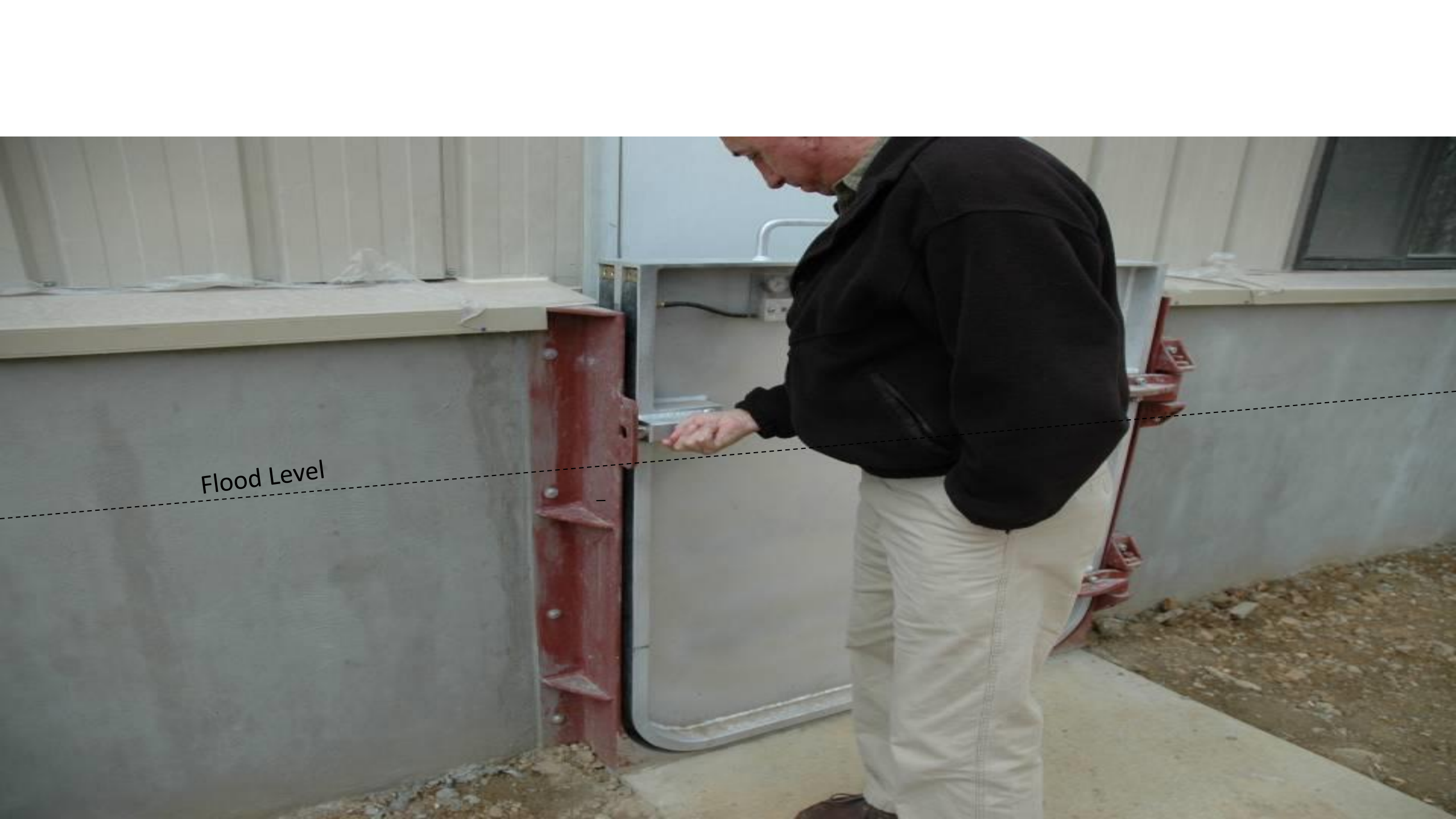
Produced by WWF Danube-Carpathian-Programme
 WWF-Auen-Institut (WWF-Germany)
 Josefstr. 1, D-76437 Rastatt 1999

Rehabilitation of the wetland areas in the Danube floodplain



Floodplain restoration





Flood Level

Flood related activities within EUSDR PA5

- Development and adoption of an overarching Flood Management Plan at the River Basin level
- Support for the rehabilitation of wetlands and floodplains as an effective measure to increase flood protection
- Extension of the coverage of the European Flood Alert System at the entire Danube River Basin

All activities are developed in close cooperation with the ICPDR

Example of projects related to floods promoted by PA5

- DAREFFORT
- DANUBE FLOODPLAIN
- DAMWARM+
- JOINTISZA
- DANUBE SEDIMENT
- WATERatRISK

**THANK YOU VERY MUCH
FOR YOUR ATTENTION!**

