Annex 1

Towards a River Basin Management Plan for the Tisza river supporting sustainable development of the region
Memorandum of Understanding

Towards
a River Basin Management Plan
for the Tisza river supporting
sustainable development of the region
Memorandum of Understanding

On the basis of the outlined related earlier activities and objectives indicated in the Annex and encouraged by a dialogue initiated by the EU Presidency of the International Commission for the Protection of the River Danube (ICPDR), the countries sharing the Tisza River Basin, Republic of Hungary, Romania, Serbia and Montenegro, Slovakia Republic, and Ukraine (subsequently called the Tisza countries), on the occasion of the 1st ministerial meeting of the ICPDR held in Vienna on 13 December 2004 agree on the following:

The Tisza countries

- ***ARE COMMITTED*** *towards an international integrated Tisza River Basin cooperation development – in line with the objectives and provisions of the relevant international and regional environmental obligations, conventions and programmes, including EU policies – supporting sustainable development in the region;*
- ***AGREE*** *to co-operate more closely in the framework of the ICPDR in order to produce a Tisza River Basin Management Plan by 2009 aiming at the objectives set by the EU Water Framework Directive as implemented through the Danube River Protection Convention and the ICPDR Flood action Programme and thereby complementing the efforts of the ICPDR, the bilateral co-ordination and the national level;*
- ***AGREE*** *to start immediately, as a first step, with the preparation of a Tisza Analysis Report with the aim to present it to the ICPDR Ordinary Meeting in 2006. Such a report shall include, inter alia, aspects on water quality, review of human activities and water uses, water quantity and flood risk management;*
- ***WELCOME*** *the intentions of the European Commission to facilitate this process;*

- ***WELCOME*** *the intentions of UNDP GEF to actively support this initiative by launching a new Tisza project whose activities would be closely co-ordinated with the ICPDR and the competent authorities of the countries and strengthen the Tisza countries in their activities to achieve sustainable river basin management;*
- ***INVITE*** *the ICPDR to express their support to this initiative and take the necessary steps to ensure that this initiative is fully embedded in the ICPDR, in particular, by setting up an appropriate group and allowing this initiative to use structures and mechanisms of the ICPDR.*

Done in Vienna on 13th day of December 2004.

István Őri – Permanent State Secretary
Ministry of Environment and Water
Republic of Hungary

Liliana Bara – State Secretary
Ministry of Environment and Waters Management
Romania

Ivana Dulić - Marković – Minister
Ministry of Agriculture, Forestry and Water Management
Republic of Serbia
Serbia and Montenegro

Peter Stanko – State Secretary
Ministry of the Environment
Slovak Republic

Vyacheslav Kruk – First Deputy Minister
Ministry for Environment Protection
Ukraine

ANNEX

1. The Tisza countries are committed to an international integrated Tisza River Basin cooperation under the umbrella of the ICPDR. It should be built on and developed taking into account the achievements and experiences of existing relevant activities as well as earlier international initiatives in this area, especially regarding environmental protection and flood control.

2. The Tisza countries welcome the initiative „Towards a Sub-basin Management Plan for the Tisza River" of the EU, initiated by the ICPDR Presidency in 2004, and are ready to actively participate in its further development and realisation as outlined in the minutes of the related consultation held in Bucharest (15 July 2004).

3. We are strongly interested in a well established Tisza River Basin cooperation which – focusing on specific common interests - integrates national activities and bilateral activities in line with the Danube River Basin level cooperation.

4. In this context we emphasize the necessity of sub-basin approach in the WFD implementation process for the Tisza River Basin.

5. The challenge is to establish effective cooperation supporting sustainable development in the Tisza River Basin - the largest sub-basin of the Danube catchment – which is shared by five countries with specific economic and social conditions.

6. We fully agree with the outlined integrative approach, that in line with the relevant EU policies and the provisions of the Danube River Protection Convention to step-by-step develop:
   - coordinated river basin management planning;
   - measures for protection and sustainable use of water resources;
   - harmonised flood management:
   - measures for reduction of environmental risks, prevention of transboundary pollution, increase of environmental safety;
   - provide good quality of life all of the people living in that large region of the Tisza River Basin.

7. We appreciate the readiness of the EU and ICPDR to take part in launching and developing this process. The Tisza Dialogue initiated by the EU has to be continued with the involvement of all the riparian countries and the EU and the ICPDR.

8. We accept the proposal that at this developing phase the ICPDR provides framework for the Tisza cooperation development activities making use of existing structures. We would suggest to set up an ad hoc expert group for the work. In this process relevant initiatives and cooperation achievements (i.e. the Tisza River Basin Forum on Flood Control/Tisza Water Forum, the Tisza Environmental Program) should be taken into account. Proper cooperation, exchange of information and coherence of work should be ensured with the Tisza Water Forum. Better coordination and avoiding duplication should be ensured also with the other relevant initiatives (i.a. the "Initiative on sustainable spatial development of the Tisza/Tisa River Basin"). To achieve this, establishment of suitable mechanisms is necessary.

9. Taking into account the specificities of the Tisza region, and the complexity of the tasks for the Tisza countries deriving from the EU and other obligations, establishment at a later stage of appropriate legal framework for the Tisza River

Basin cooperation should be considered. When developing this, provisions of the relevant international legal instruments including ECE conventions and protocols as well as the multilateral regional agreements should be analysed and adopted.

10. Cooperation with partners being interested and active in the Tisza region (e.g. UNDP, GEF, FAO, UNEP) should be reinforced and with other potential international professional and financial institutions developed.

11. The EU has a significant role in the Tisza cooperation development. The relevant EU policies i.e. water policy, flood policy, cohesion policy, neighbourhood policy and related initiatives are extremely important and have implications to the Tisza River Basin, ensuring the region's benefit from the EU's enlargement. We consider as most relevant:

    a) Realisation of EU policy conform
        - achievement of good status and sustainable use of water resources as well as protection of water related ecosystems in the Tisza River Basin (as required by the WFD)
        - WFD based river basin management planning in the Tisza River Basin,
        - sustainable flood management at Danube and Tisza basin levels,

          in line with the related activities in the Danube river basin.

    b) Joint efforts to make use of EU funds, such as
        - EU pre-accession funds
        - EU regional funds (CBC, Interreg, LIFE etc.)
        - EU cohesion policy (accession to funds available for development support in eligible countries)
        - EU research funds (submission of joint projects)

Annex 2a

Bilateral Agreements Between the Tisza River Basin Countries

Bilateral (transboundary) agreements

Ukraine - Romania

- Agreement between the Government of Romania and the Government of Ukraine about co-operation in the field of water management on transboundary watercourses was signed in Galati, Romania, on October 30, 1997 (valid from January 28, 1999)

Ukraine – Slovak Republic

- Agreement between the Government of Slovak Republic and the Government of Ukrainian on Water Management on Transboundary Water courses was signed in Bratislava, Slovak Republic, on June 14, 1994(valid from December 15, 1995).

Ukraine - Hungary

- Agreement between the Government of the Republic of Hungary and the Government of Ukraine on water management issues related to frontier waters was signed in Budapest, Hungary, on November 11, 1997 (valid from August 6, 1999).
- Agreement between the Government of the Republic of Hungary and the Government of the Ukraine on cooperation in the field of environmental protection and regional development. Entry into force: 1993

Romania - Hungary

- The Agreement between the Government of the Republic of Hungary and the Government of Romania on water management issues related to waters forming the boundary and transboundary waters (signed in Bucharest, Romania, on June 25, 1986 valid from November 20, 1986) was updated and the new "Agreement between the Government of the Republic of Hungary and the Government of Romania on the collaboration for the protection and sustainable use of the transboundary waters (signed in Budapest, September 2003) enetered into force on May 5, 2004.
- Agreement between the Government of the Republic of Hungary and the Government of the Romania on Cooperation in the field of environmental protection. Entry into force: 2000

Romania – Serbia

- Agreement between the Government of Romania and the Government of the Federal Republic of Yugoslavia on hydrotechnical issues from the hydrotechnical systems and watercourses on the boundary or crossing the state boundary was signed in Bucharest, Romania, on April 7, 1955 (valid from June 17, 1955).

Slovak Republic - Hungary

- Agreement between the Government of the Czechoslovak Socialist Republic and the Government of the Hungarian People's Folk Republic on regulation of water management issues related to frontier waters was signed in Budapest, Hungary, on May 31, 1976 (valid from July 31, 1978).
- Agreement between the Government of Republic of Hungary and the Government of Republic of Slovakia on Cooperation in the field of environmental protection and Nature Conservation. Entry into force: 1999

Hungary – Serbia

- Agreement between the Government of the People's Republic of Hungary and the Government of Federal People's Republic of Yugoslavia in the field of water management issues was signed in Belgrade, Serbia, on August 8, 1955 (valid from May 19, 1956).

Other bilateral agreements:

- Agreement on co-operation and mutual assistance between the Government of the Republic of Hungary and the Government of the Republic of Slovakia in the case of disasters;
- Agreement on co-operation and mutual assistance between the Government of the Republic of Hungary and the Government of Ukraine for the prevention of disaster and grave accident and the elimination of the consequences of those (signed in Budapest on October 27, 1998.);
- Agreement between the Cabinet of Ministers of Ukraine and the Government of Slovak Republic on co-operation and mutual aid in cases of emergencies (December 2000);
- Agreement between the Cabinet of Ministers of Ukraine and the Government of the Federal Republic of Yugoslavia on co-operation in the field of prevention of emergency situation and elimination of their consequences (October 2001).

Annex 2b

International Agreements relevant to the Tisza River Basin

International Agreements relevant to the Tisza River Basin

Name	Hungary	Romania	Serbia	Slovakia	Ukraine
Water Convention The Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes, Adopted: in Helsinki, on 17 March, 1992 Entered into force: October 6, 1996	P	P		P	P
Espoo Convention **Convention on Environmental Impact Assessment in Transboundary Context** Adopted: in Espoo, 25 February 1991 Entered into force: 10 September, 1997	P	P		P	P
Convention on the Transboundary Effects of Industrial Accidents Adopted: in Helsinki, on 17 March, 1992 Entered into force: 19 April, 2000	P	P		P	
Danube Convention **Convention on Cooperation for the Protection and Sustainable Use of the River, adopted in Sofia**, 29 June, 1994 Entered into force: 22 October, 1998	P	P	P	P	P
Aarhus Convention Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Adopted: in Aarhus on 25 June, 1998 Entered into force: 30 October, 2001	P	P		P	P
Protocol on Water and Health Adopted: in London on 17 June, 1999 Entered into force: August 4, 2005	P	P		P	P
Carpathian Convention Framework Convention on the Protection and Sustainable Development of the Carpathians Adopted: in Kyiv, May 2003 Entered into force on: January 4, 2006	P	P	P	P	P
Protocol on Civil Liability Adopted: in Kyiv, 21 May, 2003	P	S			S
Protocol on Strategic Environmental Assessment (SEA Protocol) Adopted: in Kyiv, 21 May, 2003	S	S	S	S	S
Protocol on Pollutant Release and Transfer Registers (PRTR Protocol) Adopted in Kyiv, 21 May, 2003	S	S	S		S

Abbreviations:

P: Party

S: Signatory

Annex 2c

The Competent Authorities for WFD Implementation in the Tisza River Basin

The competent authorities for WFD implementation are designated by the states. The link between these on the basin-wide level is ensured through the ICPDR and its Contracting Parties. The competent authorities are listed in the Table.

List of competent authorities in the TRB

Tisza Countries	Competent authorities	
Ukraine	State Committee of Ukraine for Water Management 8, Chervonoarmyiska str., Kyiv, Ukraine;	www.scwm.gov.ua
	Ministry for Environmental Protection of Ukraine 35, Uritskogo str. UA-03035 Kyiv	www.menr.gov.ua
Romania	Ministry of Environment and Sustainable Development 12 Libertatii Blvd., Sector 5 RO-04129 Bucharest	www.mmediu.ro
	National Administration “Apele Romane” 6 Edgar Quinet St., Sector 1 RO-010018 Bucharest	www.rowater.ro
Slovak Republic	Ministry of the Environment Námestie L’ Stúra 1 SK-81235 Bratislava	www.enviro.gov.sk
Hungary	Ministry of Environment and Water Fő utca 44-50 H-1011 Budapest	www.kvvm.hu
Serbia	Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia Directorate for Water Bulevar umetnosti 2a RS-11070 New Belgrade	www.minpolj.sr.gov.yu

Short introduction of the national authorities

The **Ukrainian** water management system is fairly complex as main responsibilities for water management are shared between two government institutions, namely Ministry of Environment Protection (MEP) and State Committee for Water Management (SCWM) that operate extensively on both national and regional levels. Each of them has numerous functions: MEP is a regulatory body and also involved in monitoring, while oblast branch of SCWM executes regulatory, hydrochemical and radiological monitoring, development and engineering functions. Main responsibility for water management lies with SCWM, which is responsible for construction and maintenance of irrigation, water and flood protection infrastructure, thus acting as a water utility. It is also responsible for keeping records of the state water usage and for the state water cadastre of surface waters. Records and water cadastre for underground waters is the responsibility of the State Geological Service.

In **Romania**, the responsibility for water resources management is with the Ministry of Environment and Sustainable Development, which establishes the strategy in the water management field. The National Administration "Apele Romane" has a main object of activity the unitary application of the national strategy in the field of water management (surface and groundwater, both from quantitative and qualitative point of view).

The Ministry of Agriculture, Forestry and Rural Development (MAFRD) is responsible for the drainage and irrigation, but also for issues of forest and soil management.

Romania has adapted its legislation and regulations to the EU WFD and other EU Water legislation through the issuing of the Water Law 310/2004 which amends and supplements the Water Law 107/1996". For the implementation of the EU Water legislation, the Interministerial Council of Water has been established, and at the level of National Administration " Apele Romane" a co-ordinating team and 11 river basins teams have been established as well.

In **Slovak Republic** the responsibility for water resources management is with the Ministry of Environment (MoE). The MoE is the central state authority in the field of development and protection of the environment, including the water management, water quality protection and protection related to amount of waters, rational use of waters, as well as fishing excluding breeding of fish. Passing of Water Act No.364/2004 Coll concluded transposition of EU legislation into national legislation.

In **Hungary**, water management in the sense of the management of the natural resource water is the responsibility of the Ministry of Environment and Water (MoEW). However, the Centre for Environment and Water is responsible for the operative control of water related tasks across the country except for rural water management (drainage and irrigation), being the competence of the Ministry of Agriculture and Rural Development, and coordinates the elaboration and reporting of RBMP. Regional implementation is the task of the district water and environment directorates with the involvement of the regional environmental, nature conservation and water inspectorates and the national park directorates.

Hungary has adapted its legislation and regulations to the EU WFD and other EU water legislation and has recently adopted decrees on the delineation of river basins, etc. An intergovernmental national co-ordinating body exists, dealing with water management issues (Water Framework Strategic Coordination Inter-ministerial Committee).

The main ministry responsible for water management in the **Republic of Serbia** is the Ministry of Agriculture, Forestry and Water Management (MAFWM), Directorate for Water. Two major Public Water Enterprise Companies, \`Srbijavode\`and \`Vode Vojvodine\`are responsible for operation and maintenance of water structures and water regime. The Serbian part of the Tisza basin is under responsibility of the PWEC \`Vode Vojvodine\`.

Annex 2d

Public Participation in the Tisza River Basin – related informtion (projects, list of NGOs)

1 Public Participation Related Projects

International projects:

Support for the Institutional Development of NGOs and Community Involvement: Developing the DEF, Danube Regional Project 3.1, funded by the Global Environmental Facility (GEF) and the UNDP, 2002 – 2007, implemented by Danue Environmental Programme, See: results at:

http://www.undp-drp.org/drp/en/activities_3-1_ngo_network_reinforcement_fr.html

Danube Small Grants Programme, Danube Regional Project 3.2, funded by GEF/UNDP, 2002 – 2007, First and Second Rounds, implemented by the REC (See results at:

http://www.undp-drp.org/drp/en/activities_3-2_small_grants_programme_fr.html
http://www.rec.org/REC/Programs/NGO_Support/Grants/RegionalDanubeGrants/Default.html)

Enhancing Public Access to Information and Public Participation in Environmental Decision-making, Danube Regional Project 3.4, funded by UNDP/GEF, 2004-2007, implemented in 5 countries including Romania and Serbia by REC in coopperation with Resources for Future and NYU School of Law, See results at: (See more information at:

http://www.undp-drp.org/drp/activities_3_public_participation.html
http://www.rec.org/REC/Programs/PublicParticipation/DanubeRiverBasin/)

Management of the Bug, Latorica and Uzh basins, Project of the European Union, implemented by RODECO, Verseau and WRC Consortium in Ukraine 2004-2006.

Risk Assessment and Flood Management in Zakarpatska oblast, Ukraine, Project of the European Union, implemented by Mott MacDonald and Arcadic Euroconsult, 2003-2006 (See more information at http://www.povini.uz.ua/)

NeWater: new approaches to Adaptive Water Management under Uncertainity, Integrated Project in the 6th EU framework programme. (See more information at: http://www.newater.info)

Bilateral projects:

Transboundary River Basin Management of the Körös/Crisuri River, implemented by the Ministry of Environment and Water, Hungary and Ministry of Environment and Water Management, Romania and the Ministry of Ecology and Sustainable Spatial Planning, France, funded by French Global Environmental Facility, 2005-2007 (www.icpdr.org)

Protection and Promotion of the Meadows of Mures River, funded by PHARE CBC, 2001, implemented by by the Ministry of Environment and Water, Hungary and Ministry of Environment and Water Management, Romania

Development of Hungarian-Romanian Borderland Water Course Relations in the Maros/Mures Valley, funded by PHARE CBC, 2003-2006, implemented by the Lower Tisza Environmental and Water Directorate in cooperation with Mures Water Directorate of National Administration "Apele Romane".

Implementation of the Water Framework Directive in a transboundary context. Transboundary river basin management planning regarding the Hernád/Hornad River, 2004-2006, funded by the Netherlands PPA, imlemented by the consortium of Ameco, Tauw and REC

(See: http://www.euvki.hu/euwfd/index.html and www.rec.hu/husk)

National Projects

Hungary

Support to the implementation of the WFD, Phase II, 2004 -2007, funded by the Ministry of Environment and Water, implemented by a consortium led by Öko Rt. (Component on developing a Stakeholder Involvement Strategy was implemented by WWF Hungary)

(See: http://www.euvki.hu/euwfd/index.html)

Technical Assistance for the Elaboration of the Zagyva-Tarna River Basin Management Plan, 2005-2006, funded by the Ministry of Environment and Water, implemented by WS Atkins International Ltd / DHV Water BV (See: www.zt-euvki.hu/work/hu and http://www.euvki.hu/euwfd/index.html)

Slovakia

Improvement of Flood Management System, Slovakia, Hungary, Ukraine, Romania, Germany – pilot activities, 2005-2008, funded by Interreg CADSES, implemented by the Slovak Hydometeorological Institute and Slovak Water Management Enterprise

Integration of Ecosystem Management Principles and Practices into Land and Water Management of Laborec-Uh region, 2007 – 2012, funded by UNDP/GEF, implemented by the Slovak Water Management Enterprise and other partners

Ukraine

Improvement of the Readiness of the Regional Organizations, related to Flood protection in Bereg region", Tacis project, 2005-2007.

Development of Ukrainian-Hungarian Intergrated Plans of Flood Protection, Water Management Development and Restoration of Floodplains in Bereg region and Borzhava basin, Neighbourhood program Hungary, Slovakia, Ukraine INTERREG IIIA/TACIS (See: http://www.bereg.vodhosp.uzhgorod.ua)

NGO Projects

Floodplain management on the Tisza, Tisza LIFE Nature, 2001-2007, funded by LIFE , implemented by WWF Hungary

Project for the Living Tisza (Tisza Biodiversity Project), 2005- 2008, funded by the **GEF-**

UNDP, implemented by the alliance for the Living Tisza

(See: http://www.elotisza.hu/bovebben.php?id=260)

Transboundary river basin management in Upper Tisza region with regard to floodplain and waste management, 2006-2008,

Funded by the German Ministry for Environment and WWF Germany, implemented by WWF Germany in cooperation with WWF Hungary

(Contact: Georg Rast (rast@wwf.de)

2 NGOs Active on Tisza issues

This list has been prepared by the Regional Environmental Center for Central and Eastern Europe (REC) based on information NGO projects at national and regional level in the Tisza River Basin, implemented in the framework of the Danube Small Grants Programme funded by the UNDP GEF Danube Regional Project and managed by the REC as well as on information gathered from the REC Country Offices in the Tisza RB countries on active NGOs as well as from former projects implemented by REC.

The purpose of the list is to provide information on NGOs carrying out activities on Tisza issues and can be used as a basis for identifying NGO stakeholders during the river basin planning at different levels to provide information to them and to invite them to get involved in the Tisza RBM planning at different levels.

The list is open and any NGO wishing to get on the list may do so. This list will be regularly updated and made available on the ICPDR web site and the REC website.

Hungary
NGOs receiving Danube National and Regional Grants (1st and 2nd Round)
NGO Name: CSEMETE
Contact Person: György Ilosvay

Arany János u.1, 6720 Szeged, Hungary
Tel/Fax: 0036 62 424392
csemete@csemete.com
www.csemete.com

Danube National Grant: Water Quality Protection in South Great Plane region
Project leader: Janos Antal
Project Summary: The project examined the best and worst practices of the agricultural sector related to living waters, awareness raising and technology transfer facilitation.

NGO Name: Green Action Association

Kossuth u. 13, 3525 Miskolc, Hungary
Tel: 0036 46 508 700
Fax: 0036 46 508 701
info@greenaction.hu
www.greenaction.hu

Danube National Grant: Toxic and Nutrient Reduction in Sajo River Valley
Project Leader: Zoltan Demeter

Project Summary: The project conducted awareness raising forums in the Tisza-Sajo river valley, produced publications and promoted alternative agriculture methods.

NGO Name: Hungarian Alliance of Conservationists

Üllői út 91/b, 1091 Budapest; 1450
Budapest, Pf.: 123, Hungary
Tel: 0036 1 2167297
Fax: 0036 1 2167295
info@mtvsz.hu
www.mtvsz.hu

Danube National Grant: Awareness Raising about IPPC Directive
Project leader: Tibor Dragos

Project Summary: The project activities included a 20-page brochure, three workshops, public relations and media work, and visits to pollution sources along the Danube.

NGO Name: Magosfa Foundation

Pf. 184, 2600 Vác, Hungary
Tel:0036 27 512 043
Fax: 0036 27 512 040
marta@zpok.hu

Danube National Grant: Pollution Spots along Ipoly River - Unveil and Map Them Al
Project leader: Marta Kurucz

Project Summary: The project spotted and conducted a research on industrial pollution spots along the Ipoly River, raised public awareness, and displayed on the Internet and in local newspapers steps towards mapping them and reducing the pollution.

NGO Name: Makk Foundation

Mészáros u.18, 1016 Budapest, Hungray
Tel: 0036 1 2126775
Fax: 0036 1 2126778
makk@zpok.hu
http://makk.zpok.hu

Danube National Grant: Bio-agriculture in Bodrog-koz Floodplains
Project leader: Peter Kajner

Project Summary: The project conducted studies in cooperation with local farmers on how they could shift from intensive land use towards extensive, quality products. It included concrete planning and awareness raising activities.

NGO Name: Pangea Association

Ilona u. 3, 2600 Vac, Hungary
Tel: 0036 27 304-484
Fax: 0036 27 304-483
E-mail:

Danube National Grant: Trans-Danubian Creeks and Small Rivers Pollution Monitoring
Project Leader: Laszlo Breuer

Project Summary: The project involved the monitoring of small creeks and rivers in trans-Danubian hill areas, and the education of municipalities on ways to reduce pollution.

NGO Name: WWF Hungary
Contact Persons: Ferenc Márkus Ferenc, Viktória Siposs

Németvölgyi út 78/B, 1124 Budapest, Hungary
Tel: 0036 1 2145554
Fax: 0036 1 2129353
panda@wwf.hu
viktoria.siposs@wwf.hu
ferenc.markus@wwf.hu
www.wwf.hu

Danube National Grant: Chemical-Free Agriculture on Floodplains
Project leader: Laurice Ereifej

Project Summary: The project included promotion of alternative (i.e. chemical free) agriculture in floodplains, including concepts, best practices, lobbying and awareness raising.

NGO Name: HOLOCEN Nature Protection Organisation

3525 Miskolc
Kossuth u. 13. Hungary
Tel: +36 46 508 944
Fax: +36 46 352 010
E-mail: holocen@holocen.hu

Regional Danube Grant(1st Round): Networking the River Coalitions for Healthy Watershed
Partners: SOSNA, Slovakia; Ecological Association Green Osijek, Croatia; Transylvanian Carpathia Society Satu Mare (EKE), Romania
Project Leader: Stefan Szabo, Slovakia

Project Summary: The aim of the project was to support better environmental management and more effective cooperation in watershed protection among different stakeholders and subjects through river-based networks, focused on reducing river pollution and improving its quality. Its main activities included establishing river coalitions, transfer know-how among the partners, and identification and implementation of concrete activities in river protection.

Regional Danube Grant (2nd Round): "Barriers and Bridges": Barriers to Waste, Nutrients and Chemicals Bridges for Communities, Sectors and Information
Project Leader: Laszlo Stoll, HOLOCEN
Partners: SILVANUS Ecological Association, Romania
Dialogue for the Communities Public Welfare Association, Hungary

Other NGOs active on Tisza RB issues
Tisza Platform:
Dialogue for the Communities Public Welfare Association
Hungary
E-mail: dialogegyesulet.@chello.hu

NGO Name: E-misszió Egyesület (Association E-mission)
Contact Person: Tamás Cselószki

Hősök tere 9.
Nyíregyháza, Hungary
Tel/Fax: +36 42 402 107
emisszio@zpok.hu

NGO Name: Magyar Denevérkutatók Baráti Köre (Hungarian Friendship Circle of Researchers of Bats)
Contact Person: Denes Dobrosi

Szabadság út 13.
5452 Mesterszállás, Hungary
Tel/Fax: +36 56 313 239
batsave@externet.hu

NGO Name: Magyar Madártani és Természetvédelmi Egyesület (MME) (Hungarian Ornithological and Nature Conservation Association)

Költő u. 21.
1121 Budapest, Hungary
Tel/Fax: +36 1 209 1829
Mobile: +36 30 969 2781
szabo.balazs@mme.hu

NGO Name: MME Jászkun Természetvédelmi Szervezet (MME Jaszkun Nature Conservation Organization
Contact Person: Sándor Urbán

5001 Szolnok
Pf. 188, Hungary
Tel: +36. 56 429 623
+ 36 20 960 6355
janca@mail.externet.hu

NGO Name: Magyar Ökológusok Tudományos Egyesülete (MÖTE) (Scientific Association of Hungarian Ecologists)
Contact Person: László Gallé and Gábor Bakonyi

6701 Szeged
Pf. 51, Hungary
Tel/Fax: +36 62 420 319 (Gallé)
Tel:+36 28 522085 (Bakonyi)
margoczi@bio.u-szeged.hu
bakonyi@fau.gau.hu

Name of NGO: NIMFEA Természetvédelmi Egyesület (NIMFEA Environment and Nature Conservation Association)
Contact Person: Róbert Sallai

5421 Túrkeve
Pf. 33, Hungary
Tel/Fax: +36 56 361 505
nimfea@externet.hu
info@nimfea.hu
www.nimfea.hu

NGO Name; Tisza Klub
Contact Person: Dr. József Hamar

Szapáry u. 19.
5000 Szolnok, Hungary
5001 Szolnok Pf 148.
Tel/Fax: +36 56/375-497
tiszaklub@externet.hu
www.tiszaklub.hu

NGO Name: Felső-Tisza Alapítvány (Upper-Tsza Foundation)
Contact Person: Miklós Tóth

Damjanich u. 4-6. I. em.
4400 Nyíregyháza, Hungary
Tel/Fax: + 36 42 421 237
utfutf@elender.hu
www.felsotisza.hu

NGO Name; Természet és Környezetvédők Csongrád Városi Egyesülete (Csongrad Society of Environmentalists and Nature Lovers)
Contact Person: József Deák

Szentháromság tér 14.
6640 Csongrád, Hungary
Tel: +36 60 327 275
kornyezetvedok@deltav.hu

NGO Name: Vásárosnaményi Természetbarát Diákkör (Vásárosnamény Student Circle of Nature Protection)
Contact Person: Zoltán Toldi

Kossuth u. 19.
4800 Vásárosnamény, Hungary
Tel: +36 45 470-372
+36 60 470 521
toldiz@egon.gyaloglo.hu

NGO Name: Alapítvány a Vidrákért (Foundation for Otters)
Contact Person: Pál Gera

Nyírpalota u. 60. VII. em. 29.
1156 Budapest, Hungary
Tel: + 36 30 258 3637

NGO Name: Életfa (Tree of Life)
Contact person: Ferenc Bárdos

Bajcsy Zs. ut 9.
3300 Eger, Hungary
Tel: +36 411-036
eletfa@mail.agria.hu

National level NGOs
NGO Name: GWP Hungary Water Partnership
Contact Person: Gyula Reich

Etele ut. 59-61
H 1119 Budapest,
Hungary
Tel: +36 1 3711 333
Fax: +36 1 3711 333
E-mail: gwpmo@gwpmo.hu
Website: www.gwpmo.hu

NGO Name: BITE-Baja / DEF Hungary
Contact Person: Eniko Anna Tamas
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Tel/Fax:+36 79 427 031
Mobile: +36 30 565 1747
http://def.baja.hu
et@baja.hu
skype: et-baja-hu

Romania

NGOs receiving Danube National and Regional Grants (1st Round)

NGO Name: Speo-Alpin MH Mountain Tourism and Ecology Association

Crisan 25, 220012 Drobeta Turnu Severin, Mehedinti, Romania
Tel: 0040 722 355559
Fax: 0040 252 317999
atme_ro@yahoo.co.uk

Danube National Grant: Promoting Measures to be Undertaken for the Reduction of Agricultural-Originated Nutrient Pollutants in the Mehedinti County Danube Basin.
Project Leader: Eduard Faier

Project Summary: The project aimed to reduce nutrient pollution of the Danube basin waters of Mehedinti County. The main activities related to: elaboration of an action plan on the nutrient water pollution at county level; organising training sessions for 40 local farmers on best practices in organic farming, and a public promotion campaign on the benefits of ecological farming and the importance of two natural protected local areas.

NGO Name: BIOTECH Foundation

Grivitei 46, sector 1, Bucuresti, RO
Tel: 0040 722 798338
Fax: 0040 21 2129955
mteodorescu@fundatie-biotech.ro

Danube National Grant: Promoting and Implementing Organic Farming Practices, for the Reduction of Chemical-Farming Substances in the Low Danube Basin
Project Leader: Maria Elena Teodorescu

Project Summary: The project promoted organic farming practices in the Lower Danube Basin and included the following activities: organising training sessions for farmers in four counties in the target region, elaborated and distributed for free a set of informative materials, broadcasted a series of radio/TV shows and conducted field monitoring of the evolution of agro-chemical waste pollution.

NGOs Receiving Danube Regional Grants (1st Round):
NGO Name: Eco Counselling Center Galati
Contact Person: Patruta Moisi

Basarabiei Street no. 2.
800201 Galati
Romania
Tel: +40 236 499 957
Fax: +40 236 312 331
E-mail: eco@cceg.ro
www.cceg.ro
Danube Regional Grant: The Prut Basin Wide Approach for Nutrient Reduction And Cross Border Cooperation (PBWA)
Project Leader: Mirela Leonte, Romania

Project Summary: On the borders of Central and Eastern European countries such as between Romania, Moldolva and Ukraine, problems of cross-border pollution, managing natural resources (especially affecting rivers and lakes straddling the borders) require a wide range of actions concerned with developing new approaches at different levels, including studies to assess current conditions and resources, environmental education, awareness raising; information in schools, enterprises, community organisations, and within the community; pilot actions in conservation, waste management, etc.; development of new environmental friendly production techniques and products; promoting actions to reduce waste and find new ways to recycle waste; joint planning and coordination of services to deal with emergencies, such as spillage; harmonisation of the targets and basic principles, based on which transboundary water management is developed; and involving the public in the development of water protection policy.

NGO Name: Transylvanian Carpathia Society Satu Mare (EKE)

3900 Satu Mare
Str. I. Budai Deleanu nr. 2.
Romania
Tel: + 40 261 711050
Fax: + 40 261 714580
E-mail: eke@xnet.ro
www.eke.ro
Danube Regional Grant: Networking the River Coalitions for Healthy Watershed
Project Leader: SOSNA Civic Association, Slovakia
Partners: Transylvanian Carpathia Society Satu Mare (EKE), Romania,
HOLOCEN Nature Protection Organisation, Hungary; Ecological Association Green Osijek, Croatia;

Project Summary: The aim of the project was to support better environmental management and more effective cooperation in watershed protection among different stakeholders and subjects through river-based networks, focused on reducing river pollution and improving its quality. Its main activities were to establish river coalitions, transfer know-how among the partners, and define and complete concrete activities in river protection.

NGOs involved in Pilot projects under DRP 3.4
Name of NGO: Focus Eco Center
Contact Person: Zoltan Hajdu

4300 Tg. Mures
Str. Crinului 22
Romania
Tel: 00 40 265 262170
Fax: 00 40 265 262170
E-mail: focuseco@rdslink.ro

DRP 3.4 Pilot Project: Taking care of the river together with its beneficiaries: Improving the flow of information and public involvement in water management through the capacity building of diverse interest groups
Project Leader: Zoltan Hajdu

Project Summary: In order to create a better integrated model for NGO participation in River Basin Committees (RBCs), the project will develop and propose approaches to increase public participation within RBCs in order to improve NGOs participation and Water Framework Directive implementation as well as it will assist the Mures RBC in improving the access to information and public participation process and will share the experiences with other RBCs.

Other NGOs Active in the Tisza RB Issues:
NGO Name: Asociatia Agora - Grup de Lucru pentru Dezvoltare Durabila (Association Agora - Working Group for Sustainable Development)

Bld Independentei nr. nr. 28, ap.
8 Odorheiu Secuiesc 535600
Romania
Tel/Fax: +40 266 219 549
office@green-agora.ro
agora@kabelkon.ro

NGO Name: Unesco Pro Natura

Bucharest
Plevnei st.61

NGO Name: Ecotur Sibiu

Dr. I. Ratiu str. 7-9
2400 Sibiu
Romania
Tel: +40 269 215 898
Fax: +40 269 422 661
ecotours@yahoo.com

NGO Name: Ecotop Oradea

Piata Independentei nr. 39 Cetatea Oradea corp I.
Oradea
Romania
Tel/fax: + 40 259 441 681,
Office@ecotop.sbnet.ro
ecotop@rdslink.ro

NGO Name: Asociatia pentru Protectia Liliecilor din Romania (Association for the Protection of Bats in Romania)

str. I. B. Deleanu, nr. 2,
Satu Mare
Romania
Tel/Fax: +40 261 711 395
Tel: +40 722 689 369,
batprotection@datec.ro
www.datec.ro/batprotection

NGO Name: Asociatia Aurarilor "Alburnus Maior"
Contact Person: Stephanie Danielle Roth

Str. Berk Nr. 361,
Rosia Montana
Romania
Tel/Fax:+ 40 258 859 328
alburnusmaior@ngo.ro
www.rosiamontana.org

NGO Name: Asociatia Ecosilva Retezat

Bd.Rusca nr.4 bl.17 ap.1
Hunedoara -2750
Romania
Tel: +40 254 716 451
calin@retezat.ro

NGO Name: Asociatia Otus (Association for Otters)
Str. Calugareni 6/12, 535600
Odorheiul Secuiesc
Romania
Tel: +40 266 218 897
jozsef@birdingdelta.com

NGO Name: Asociatia pentru Protectia Pasarilor si Naturii "Grupul Milvus" (Association for the Protection of Birds and Nature)

str. Crinului nr. 22,
Tg.Mures
Romania
Tel/fax: +40 265 264 726
milvus@fx.ro
tamas.pap@milvus.ro
attila.nagy@milvus.ro
www.milvus.ro

NGO Name: Asociatia Sighisoara Durabila (Association of Sustainable Development)

Str. Bastionului. Nr. 11.
Sighisoara, jud. Mures
Romania
sighisoara@durabila.ro

NGO Name: Eco-Breite Sighisoara

str. Gh. Lazar nr. 10.
545400 Sighisoara
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office@eco-breite.org
sadjoy@eco-breite.org
alex.gota@gmail.com

NGO Name: Mihai Eminescu Trust

Str. Andrei Saguna nr. 29,bloc Z2, ap. 9.
Sighisoara 545400
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lholban@mihaieminescutrust.org

NGO Name: Centrul pentru Arii Protejate si Dezvoltare Durabila Bihor
(Center for Protected Areas and Sustainable Development of Bihor)

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410068 Oradea
Romania
Telefon:+40 359 410 556
Fax: +40 259 472 434,

lifeapusebi@rdsor.ro
www.apuseniexperience.ro

NGO Name: Asociatia Green Cross Romania (Green Cross Association Romania)

str. Nufărului. Nr. 80 bl. B80 et.
V ap. 24 sc. A ap. 8.
Oradea
Romania
Tel/Fax:+40 21 3111 950
blumera@rdslink.ro
office@gcr.ro
www.gcr.ro

NGO Name: Centrul Regional de Supraveghere Ecologica "Muntii Apuseni" Center for the Eclogical Supervision of "Apuseni Mountains")

Piata 1 Decembrie nr. 6 et. I.
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contact@oradeaverde.ro

NGO Name: Romanian Ornithological Society

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3400 Cluj-Napoca
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E-mail: office@sor.ro

NGO Name: Albamont Association

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2500, Alba Iulia
Romania
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albamont@apulum.ro

NGO Name: Pro Ruralis Association

Unirii bd. 23
3400, Cluj Napoca
Romania
Tel: +40 264 544 408
apr@mail.dntcj.ro

NGO Name: Transilvanian Ecological Club (CET)

Sindicatelor st.3.
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cetcluj@internet.ro

NGO Name: Eco Center Maramures

Al.Odobescu Str.
4800, Baia Mare
Romania

NGO Name: Ecological Society Maramures

Luptei str. 15
4800 Baia Mare
Romania

NGO Name: Association for Multidisciplinary Research in Western Area of Romania

Mihai Viteazu str.30
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Romania

NGO Name: Fundatia de Ecologie si Turism “Potaissa” (Foundation of Ecology and Turism “Potaissa”)

Turda
Romania
Tel: +40 264 316 385
potaissa@rdslink.ro

NGO Name: Societatea Carpatina Ardeleana - Filiala Banat

Timisoara
Romania
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National Level NGOs
NGO Name: GWP Romania Water Partnership
Contact Person: Liviu N. Popescu

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032113 Bucharest, Romania
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Fax: +40 21 2215 684
lipopesc@icim.ro ;
lipopesc@b.astral.ro

NGO Name: Prietenii Pamantului (Earth Friends)
Contact Person: Camelia Zamfir

Galati
Romania
earthsfriends@rdslink.ro

NGO Name: Center for Environmentally Sustainable Economic Policy (CESEP)

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Fax:+40 21 4120 069
otortolea@yahoo.com

Serbia and Montenegro
NGOs receiving Danube Regional and National Grants (1st Round)
NGO Name: Terra's Healthy Nutrition Society

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24000 Subotica, SCG
Tel: + 381 24 554 600
Fax: + 381 24 553 116
terras@terras.org.yu

Danube National Grant: Organic Agriculture: The Step Towards Danube River Basin Preservation
Project Leader: Nenad Novakovic

Project Summary: The main activities of the project focused on reducing the usage of chemical substances in agriculture which are polluting the Danube River directly or through underground water. With this project, for the first time on the national level, possibilities were presented to protect the Danube basin. Principles of organic agriculture were advocated, a significant factor for environmental protection. Direct effects of the project included the reduction of nutrients and other toxic materials through media and public campaigns and educational activities for raising public awareness.

Danube Regional Grant: The Support and Promotion of Ecological Agriculture in the Production Areas Located in The Danube Basin
Project Leader: PRO BIO Association of Organic Farmers, Czech Republic
Partners: Terra's, Serbia and Montenegro; Information Centre for the Development of Moravske Kopanice, p.b.c., Czech Rep.; Ekotrend, Slovakia

Project Summary: The Danube Basin is a traditional area of intensive farming. The original agriculture in all the relevant countries has been converted into intensive industrial farming (conventional agriculture), with an extended use of industrial fertilisers and chemical pesticides. Conventional farming causes erosion and is a large source of pollution of both groundwater and surface water. It is impossible to reduce the amount of these polluting substances without a change in the farming practices. One solution can be the expansion of ecological farming (EA) into production areas in the Danube basin. The aims of this project was to disseminate EA in the significant agricultural areas of the Danube basin, promote EA among farmers and teachers, students, university management, advisors, state administration officials and consumers, and acquaint these target groups with the risks involved in conventional agriculture from the point of view of damaging the environment (especially in view of water pollution)

NGO Name: Danube Environmental Forum – DEF, Serbia and Montenegro
Contact Person: Mirjana Bartula

Andricev venac 2, 11000 Beograd, SCG
Tel/Fax: 011 3231374
defyu@eunet.yu

Danube National Grant: DEF Serbia and Montenegro Network towards EU Water Directive Implementation
Project Leader: Mirjana Bartula

Project Summary: he aim of the project promoted water ecosystems through raising public awareness of key elements of the EU Water Directive (WFD). The project was realised through education of NGO representatives, local governments, and water management companies about basic principles of WFD, and forming a strategy for the NGO sector in Serbia and Montenegro on the process of WFD implementation with emphasis on its role in creating plans for the management of water basins (RBMP). As one of the goals of WFD is improving the chemical and biological status of groundwater and underground water, activities realised through this project had an indirect influence on pollution reduction of the Danube watershed.

NGO Name: Green Network of Vojvodina

Pasiceva 24,
21000 Novi Sad, SCG
Tel/Fax: 381 21 611 484
djnatasa@yahoo.com
Danube National Grant: Towards Pollution Reduction of Upper Stream
Project Leader: Natasa Djreg

Project Summary: The project included environmental education in Upper Stream (Vojvodina) about the point and non-point pollution of water habitats from agriculture and ways of its reduction with the aim of creating local possibilities for addressing the problems of nutrient reduction and filling the gaps of local authorities, NGOs and the wider public about problems of pollution and water management in general. The impact of the project was estimated to be more increased wetland areas, a cross-border and national project related to pollution reduction, improvement of the state of water habitats and vegetation, introduction and usage of organic methods of production and a reduction of pesticide usage.

NGO Name: Association for Nature Protection "Tisa", Municipality Novi Bečej
Contact Person: Branislav Stojančev

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23272 Novi Bečej
SCG
Tel:+ 381 23 772 219

NGO Name: Inter-Municipal Commission for Monitoring State of Tisza River
Contact Person: Milan Knežev

Žarka Zrenjanina 8
23272 Novi Bečej
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Tel:+ 381 23.772 320 or 771 486

NGO Name: Fishery Association "Šaran"
Contact Person: Svetozar Sekulić

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SCG
Tel: +381 21 817356

NGO Name: Scouts "Ivo Lola Ribar"

Radarska stanica
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SCG
Tel: +381 021 812 011
(Sanja Miličić
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Bečej, Tel: 391 21 816 170)

NGO Name: Sporting Fishery Association “Tisa"

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SCG
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NGO Name: Eco Movenent “Zeleno ostrvo”

Maršala Tita 43
24 430 Ada
SCG
Tel:+381 24 851 424
Fax: + 381 24/862 109
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Ecological Society "Tisa klub"
Contact Person: Zoltan Balint

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24420 Kanjiža
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NGO Name: Scouts "Kanjiza"

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24420 Kanjiža
SCG
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abelmiki@yunord.net

NGO Name: Fishery Association "Kečiga"
Contact Person: Stevan Barišić

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NGO Name: Ecological Society "Jegrička"

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SCG
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NGO Name: Ecological Society "Rihard Čornai"
Contact Person: Gergelj Jožef

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gergely@pyrotherm.co.yu

NGO Name: Sporting Fishery Association "Senta"

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SCG
Tel:+381 24 811408

NGO Name: Nature Friends' Association Senta

Karađorđeva 37
24 400 Senta
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Tel: +381 24 814 900
rannika@pyrotherm.co.yu

Researchers' Club "Natura"
Contact Person: Korimanjoš Robert

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NGO Name: Sporting Fishery Association Čoka

Đure Daničića 7
23 320 Čoka
SCG
Tel:+381 23 71 592

NGO Name: Ecological Association Čoka
Contact person: Mesaroš Katalin

Potiska 27/a
23 320 Čoka
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NGO Name: Blue Tisza
Contact Person: Atila Agoston

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NGO Name: Sporting Fishery Association »Proleter« Horgoš

Proleterska 55
24 410 Horgoš
SCG
Tel: +381 24 792 405
+381 63 80 555 02

NGO Name: Association for Environment Protection "Okanj" – Elemir

Žarka Zrenjanina 49
23208 Elemir
SCG
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Fax: +381 23 738 329
okanj@ptt.yu

NGO Name: Ecological Movement "EKO san"
Contact Person: Čordić Branislav

M.Z. Doplja - Crni Šor
Tomićeva 47a
23 000 Zrenjanin
SCG

NGO Name: Ecological Movement »Panonska Zora«

Narodne omladine 1
23000 Zrenjanin
SCG
Tel: +38123 566 888
panonskazora@yahoo.com

NGO Name: Eco Club "Eko čas" Zrenjanin
Cpontact Person: Stevanka Putić-Migles

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NGO Name: Scouts Movement Zrenjanin
Contact Person: Rade Krasnović

Kulturni centar
23000   Zrenjanin
SCG
Tel:+381 23 836 961

NGO Name: Association "Zrenjan Initiative - our City"
Contact Person: Vojislav Cvejić

Narodne omladine 15
23000   Zrenjanin
SCG
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NGO Name: Civil Association "Zdrav život" (Healthy Life), Zrenjanin
Contact Person: Vojin Turinski

Ruze Suman 29/18
23000 Zrenjanin
SCG
Tel:+381 23 41477; 66908

NGO Name: Sporting Fishery Association "Karaš"

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NGO Name: Association for the Water Law
Contact Person: Slavko Bogdanovic

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Mobile: + 381 63 888 3619

NGO Name: Initiative for Democratic Transition
Contact Person: Emilijan Mohora

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Tel. + 381 11 3067784,
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emilijan_mohora@yahoo.com

Slovakia

NGOs Receiving Danube National and Regional Grants (1st Round)
NGO Name: TATRY Civic Association

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03104 Liptovsky Mikulas
Slovakia
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wolf@mail.viapvt.sk

Danube National Grant: Watercourses are not Sewage!
Project Leader: Rudolf Pado

Project Summary: The goal of the project was to involve various stakeholders (schools, local authorities, the Nature Protection Authority and the Slovak Environmental Inspectorate) and local citizens in improving the water quality of the Liptov region. The TATRY Civic Association carried out an information campaign, published and sold “water certificates,” and set up a Water Coalition. Seven groups of volunteers cleaned up illegal dumpsites and streams to reduce municipal waste pollution, revitalise riparian forest buffers and monitor water quality in five rivers of the Liptov region. TATRY organised an exhibition entitled, “Watercourses are not Sewage” at Liptov elementary and high schools.

NGO Name: Society for Sustainable Living in the Slovak Republic

Staroturský chodnik 1,
81101 Bratislava,
Slovakia

Tel: 02 54410647
stuz@nextra.sk

Danube National Grant: Proposal For Participatory Strategy to Decrease Water Sources Pollution in the Myjava River Basin
Project Leader: Vladimir Ira

Project Summary: The goal of the project was to assess Myjava River basin legislative, conceptual, institutional and environmental aspects that influence the level of water course pollution caused by nutrients and toxics, identify point and non-point hotspots and prepare proposals for improving its current state for relevant decision makers. The assessment was based on a set of agreed criteria and indicators prepared for decision makers (river basin authorities, state authorities, municipalities, nature protection groups, local interests and community groups) that would ensure the improvement of Myjava River water quality in the long term.

NGO Name: Bird Life Slovakia

Mlynske nivy 41,
82109 Bratislava,
Slovakia
Tel: +421 2 5542 2185
rybanic@sovs.sk

Danube National Grant: Revitalisation of Meadows and Nitrogen Reduction in Zitava Basin
Project Leader: Rastislav Rybanic

Project Summary: The long-term goal of the project was to contribute to the decease of Danube River pollution and the protection of wetlands. The project revitalised part of Zitava River basin and introduce a new flood regime and management of wetlands in the Zitavsky luh nature reserve (70-80 hectares). Bird Life Slovakia revitalised 30 hectares of wetland meadow in arable land of the Zitava basin, and involved local partners and at least 40 volunteers in wetlands protection. The new flood regime was embedded in a plan for saving Zitavsky luh and in the Zitava river basin management plan. The project was expected to contribute to the removal of roughly 7.8 tonnes of nitrogen per year from the Luh meadow and 10-15 tones of nitrogen per year from the Zitavsky luh.

NGO Name: Nature Protection and Cultural Association of Poiplie – Ipel Union

Hlavne namestie 1
93601 Sahy
Slovakia
Tel: +421 36 7410 451
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ipelunion@stonline.sk

Danube National Grant: Martonka is Living Again
Project Leader: Silvia Nozdrovicka

The project's goal was to remove the source of surface water and groundwater pollution from the Martonka flood area of the Ipel River in close cooperation with local municipalities, NGOs and citizens. Plant succession and illegal dumping of municipal waste are threatening the Martonka nature reserve (3.4 hectares). Ipel Union was implementing clean-up actions, information meetings with local citizens and public relations activities. The project fostered partnerships among local municipalities, citizens and NGOs.

NGO Name: SOSNA

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04001 Kosice
Slovakia

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Mobil: +421 904 951 139
pacenovsky@changenet.sk
sosna@changenet.sk

Danube National Grant: River Coalitions: Cross-Sectoral Partnerships in Three Danube Sub-Basins in Slovakia
Project Leader: Samuel Pacenovsky

Project Summary: The project supported cooperation in decreasing water pollution in three Slovak regions through the formation of cross-sectoral partnerships. SOSNA shared experiences gained from setting up the cross-sectoral River Coalition, which focused on water and environment protection in the southern part of the Hornad River basin to parts of the Povazie and Poddunajska lowlands. A guide was published on how to establish a river coalition, along with information leaflets, organised trainings for project partners (UMBRA and TATRY) and clean-up actions. Project activities encouraged active participation from the public.

Danube Regional Grant: Networking the River Coalitions for Healthy Watershed
Leader: SOSNA Civic Association, Slovakia
Partners: HOLOCEN Nature Protection Organisation, Hungary; Ecological Association Green Osijek, Croatia; Transylvanian Carpathia Society Satu Mare (EKE), Romania
Stefan Szabo, Slovakia

Project Summary: The aim of the project was to support better environmental management and more effective cooperation in watershed protection among different stakeholders and subjects through river-based networks, focused on reducing river pollution and improving its quality. Its main activities included establishing river coalitions, transfer know-how among the partners, and defined and completed concrete activities in river protection.
NGO Name: Creative

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04012 Kosice
Slovakia
Tel: + 421 905 654 535
Fax: +421 55 6441419
robozvara@yahoo.com

Danube National Grant: Small Reed Bed Wastewater Treatment Plant
Project Leader: Robert Zvara

Project Summary: The project constructed a pilot reed bed wastewater treatment plant that would serve as a model for the treatment of wastewaters from small communities in other parts of the Danube River Basin. The project increased public awareness through a web page and an information leaflet. It also promoted the construction of new reed bed wastewater treatment plants and also provided a valuable input into updating the Slovak Technical Standard.

NGO Name: DAPHNE - Centre for Applied Ecology

Podunajská 24
821 06 Bratislava
Slovakia
Tel: +421 2 455 240 19
Fax: +421 2 455 240 19
Email: daphne@changenet.sk

Danube Regional Grant: Addressing Nutrient and Toxic Pollution in the Sub-basins of the Morava, Mura and Ogosta rivers
Leader: DAPHNE - Centre for Applied Ecology, Slovakia
Partners: Centre for Environmental Information and Education, Bulgaria; Ecological Centre of Pomurje,

Slovenia
Project Leader: Andrea Vicenikova, Slovakia

Project Summary: The main goal of the project was to raise awareness on water pollution and its consequences in three selected river basins — Morava River (Slovakia), Mura River (Slovenia) and Ogosta River (Bulgaria) — and to contribute to the reduction of nutrient pollution. The project promoted the sub-basin approach to dealing with pollution problems and will serve as a model for addressing problems in a river basin, including both technical issues and public participation. The project was targeted at local people, local stakeholders (local authorities, farmers, water authorities and local NGOs) and on school children in the three target basins.

National and Local Level NGOs:
NGO Name: Ekosvinka

Obecný úrad,
Obišovce
Slovakia
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NGO Name: Society for Sustainable Living in the Slovak Republic

Staroturský chodnik 1,
81101 Bratislava,
Slovakia
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NGO Name: Friends of the Earth Slovakia

976 33 Poniky
Ponicka Huta 65.
Tel: +421 48 4193 324
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E-mail: foe@changenet.sk

NGO Name: SOVS (Society of Birds Protection in Slovakia)
Contact Person: Rastislav Rybanic

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NGO Name: Slovak Republic Water Partnership
Contact Person: Dr. Peter Roncak

Slovak Hydrometeorological Institute
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Fax: + 421 2 5941 5393
E-mail: peter.roncak@shmu.sk
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Ukraine

NGOs Receiving Danube National Grants (1st Round)

NGO Name: WETI Journalist Environmental Public Organization

PO Box 6685, Lviv-5, 79005 UA
Tel/Fax: 00380 322 723552
weti@lviv.gu.net

Danube National Grant: Carpathians without Pesticides – Clean Danube
Project Leader: Peslyak Volodymyr

Project Summary: The project aimed to increase awareness and knowledge of water pollution issues in the area caused by pesticides, and to improve management instruments for pollution reduction and pollution prevention in the area of pesticide and insecticide storages. In order to address the issue, the public network “Carpathian Ecopulse” was created in the area of Tisa, Prut and Seret Danube basin rivers. The following activities were envisaged within the scope of the project:monitoring of pesticide storages conditions; creation of brigades that would reveal uncontrolled storage; disseminating environmental information; holding public hearings and educational field trips; compiling and printing informational booklets; systematically raising related issues in the mass media; and developing recommendations for local administrations and municipalities.

NGO Name: New Generation All-Ukrainian Public Association

PO Box 134, 03150 Kiev, UA
Tel/Fax: 00380 44 461969
newgen@tehnova.com.ua

Danube National Grant: School of Environmental Leadership
Project Leader: Miroshnychenko Sophia

Project Summary: The aim of the project was to give environmental leaders the skills and knowledge needed to systematically address nutrient and toxic pollution. To this end, the project organised a series of trainings aimed at improving water quality according to the following topics: developing inter-sectoral cooperation; conducting lobbying and campaigning; and preparing legal acts and statements at the local level. The project had a direct and indirect impact on the reduction of nutrient pollution, namely: established cooperation between the representatives of local authorities, the public and manufacturers; and proposed recommendations on the solution of the existing problems in the town of Snyatyn, with nutrient emissions from poultry farms and food processing plants, that could serve as a basis for the development of legal act projects.

Other NGOs

NGO Name: All Ukrainian NGO Мама 86/ Yaremche

V. Stusa str., 6
Yaremche,
Ivano-Frankivska oblast
Ukraine
Tel.: +380 3434 2 20 01
mama86@jar.if.ua

NGO Name: **Environment-People-Law (EPL)**
(formerly: Charitable Foundation “Ecopravo-Lviv”)

Krushelnytska Str., 2
Lviv 79000
Tel.: +380 322 722 746
Tel./Fax: +380 322 971 446

epac@mail.lviv.ua
www.ecopravo.lviv.ua
www.epl.org.ua

NGO Name: Eco Centre "Tysza"

Address: Zagorska Str., 126
Uzhgorod 88017
Ukraine
Tel.: +380 312 616 674/615 315
Fax: +380 312 231 233
E-mail: ruthenia@cec.uzhgorod.ua

NGO Name: Environmental Association of Teachers "Eco-Ex"

Minajska str., 5, app. 4
Uzhgorod 88294
Ukraine
Tel.: +380 3122 3-12-33
Fax: +380 3122 2-98-98
zoenc@mail.uzhgorod.ua

NGO Name: Zakarpattia Environmental Club "Edelweiss"

Universytetskyj lane, 6, app. 28
Uzhgorod 88017
Ukraine
Tel./Fax: +380 3122 42228
mvlep@mvlep.uz.ua

NGO Name: Environmental Club "Karpaty"

P.O.Box 10, 90600
Rakhiv
Ukraine
Tel.: +380 3132 2 26 28
Fax: +380 3132 22632
ecoclub@rakhiv.ukrtel.net

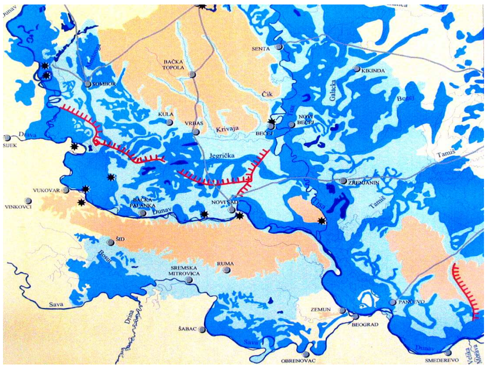
NGO Name: Carpathian Ecological Club "Rutenia"

Address: P.O.Box 11,
Uzhgorod 88018
Tel.: +380 3122 32354
Fax: +380 3122 32014
ruthenia@cec.uzhgorod.ua
potish@komp-as.com

Annex 3

History of the Construction of the Danube – Tisza – Danube Canal System

From the ancient times people in the Vojvodina area made great efforts to protect their properties from frequent flooding and prevent water-related diseases. Organized works started in the eighteenth and nineteenth century. The DTD System is divided into two practically independent parts, in the Bačka and in the Banat region.



Creation of AWB in the Vojvodina province of Serbia

At the end of 17th century, Vojvodina was a region covered with marshes, swamps and bogs full of mosquitoes (Fig. 1), with 2-3 inhabitants/sq. km. That was the time when great efforts to drain swamps, protect properties from frequent flooding, and prevent water-related diseases started.

Fig 1: Wetlands in Vojvodina, 16th-17th century (dark blue- marsh, light blue – occasionally flooded terrain, yellow – high terrace, star – settlements)

Canals were excavated to drain swamps and enable navigation: the Bega Canal for the drainage of the Central marsh (4,000 km^2), the Teresia Canal in the Banat region, and the Danube-Tisza Canal in the Backa region. After the Second World War, the existing canals were connected into a multipurpose water management system. Its design started in 1947 and the project was finished in 1977 with the completion of the dam on the Tisza. These developments changed Vojvodina from a swampy and uninhabited area to a densely populated and developed part of the Republic of Serbia.

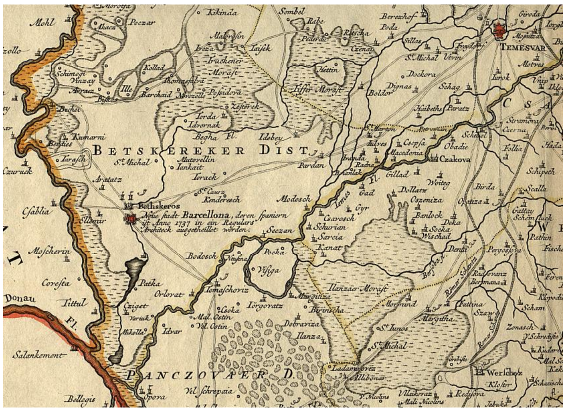
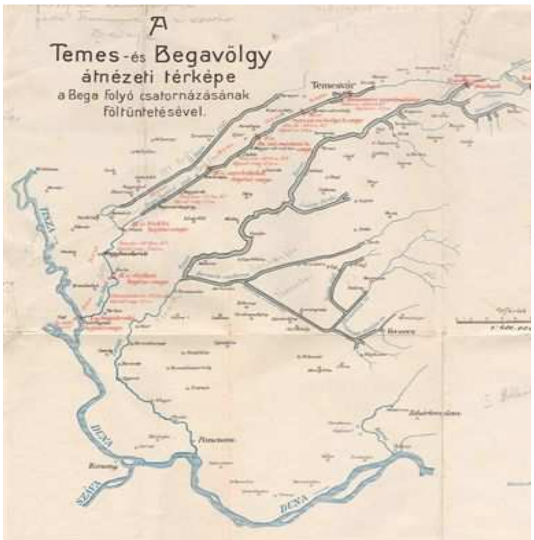


Fig. 2: Swamps and rivers in the Banat Region (1740)

Hydro-technical works commenced in **Banat region**, the part of Vojvodina that was extremely exposed to floods (Fig. 2). In the Middle Banat, the Begej and Timis rivers repeatedly flooded some 3,000 sq. km of land. Excavation of 70 km long Begej Canal started in 1718, but the navigation begun in 1756 when it was linked with River Timis by a supply and a bypass canal (Fig 3). During the subsequent period, works on the Canal were carried out in several stages, and the Canal attained its present size between 1902 and 1913.

Fig. 3: The Timis and Begej Rivers, with levees, sluices and locks (18th century)



The major structure of the DTD System is the dam constructed on the 63rd km of the Tisza River. According to its operating rules, the Dam increases only the levels of low and average waters, when the backwater stretches beyond the Serbian border.

At the beginning of the 18th century, 2.670 sq. km or 30% of the **Backa region** was inundated (2 160 sq. km being in its south part). The first significant water engineering works were done under direction of Mr. Joseph Kish, and encompassed excavation of two large drainage canals. The success of this works led to the construction of the Great Backa Canal (or Francis Canal), from the Danube to the Tisza river, according to design of Mr. Kish (Fig. 4). Works were done between 1793 and 1801, and the exploitation of new navigable route between the Danube and Tisza rivers started in 1802

Fig 4: Map of Backa with the Great Backa Canal (1792)

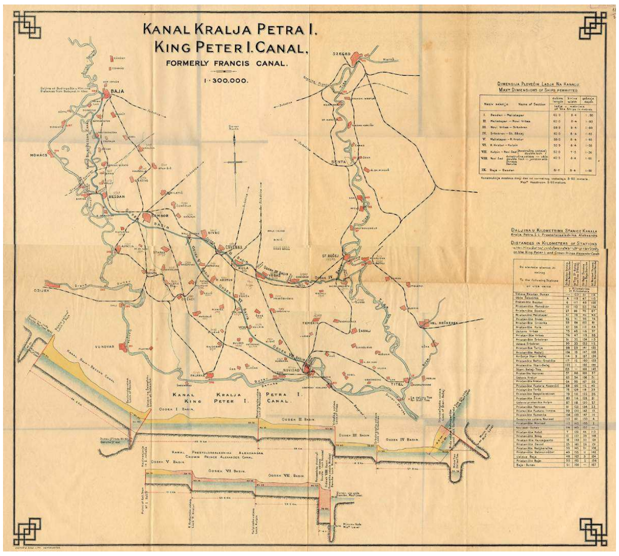


Fig 5: Map of the Backa canals, with distances and dimensions of vessels

After Second World War, the existing Canals were connected into multipurpose water management Danube-Tisza-Danube system. Its design started in 1947, and in 1977 the Project was finished with the completion of the dam on the Tisza. About 900 km of new canals were excavated, 126 million m^3 in total, and numerous new ship-locks, weirs, bridges, pump-stations, levees and other structures. This, final solution of water management problems changed Vojvodina from swampy and uninhabited to densely populated and developed part of Serbia.

ANNEX 4 - Reservoirs of the Tisza River BASIN

Reservoirs in the Tisza River Basin								
Category (capacity range)	Location			Reservoir				
	Country	River Basin	River Name	Name	Catchment upstream of	Volume	Surface	Purpose
Mm^3					km^2	Mm^3	ha	
<10	RO	Somes	Apatiu	Manic	72	0.070	84.51	fish farming
		Somes	Archiud	Budurleni	40	1.4	112	fish farming
		Somes	Somesul Mic	Gilau	947	4.20	68	multipurpose
		Somes	Somesul Cald	Somesul Cald	530	7.00	78	water supply; hydropower
		Crisuri	Fancica (Valea repede)	Salacea	17	1.21	53	irrigation
		Crisuri	Almas	Fegernic	40	2.86	54	fish farming
		Crisuri	Fancica	Crestur	68	4.03	86	flood retention; fish farming
		Crisuri	Gut (Condratu)	Rovina (Ineu)	27	3.66	56	flood retention; fish farming
		Mures	Strei	Subcetate	1,533	5.07	80	hydropower
		Mures	Raul Mare	Paclisa	447	7.90	99	hyropower; water supply
		Mures	Raul Mare	Ostrovul Mic	421	8.60	89	hyropower; water supply
		Mures	Aries	Mihoesti	414	6.30	71	hydropower; water supply
		Bega	Magherus	Murani	108	6.20	192	multipurpose
	SK	Slaná	Klenovská Rimava	VN Klenovec	88.8	8.43	71	drinking water production, flood protection
		Slana	Blh	VN Teplý Vrch	105.1	5.28	105	irrigation, flood protection, fishing, recreation
	HU	Tarna	Gyöngyös-p.	Viszneki	na	4.5/3.027	555	flood retention
		Tarna	Bene-p.	Ludasi	na	5/1.91	162	flood retention
	UA	Tiszа	Roman	Gorbok	50	7.4	246	flood retention, seasonal flow regulation
		Tiszа	Fornosh	Fornosh	24	5.2	285	flood retention, seasonal flow regulation
		Tiszа	Mochila	Mochila	23	3.95	160	flood retention, seasonal flow regulation
		Tiszа	Boronyava	Boronyavske	14	1.75	89	seasonal flow regulation, fish farming
		Latoritsia	Poluy	3obovyschansk	31	1.6	31	seasonal flow regulation
		Tiszа	Salva	Vinogradivske	23	1.38	101	seasonal flow regulation, fish farming
		Latoritsia	Stara	Andriyivtsi	84	1.35	62	seasonal flow regulation
	RS	Tisa	K-23	Moravica	na	1.35	70	Irrigation, Drainage
		Tisa	Čik	Svetićevo	na	3.97	na	Irrigation, Drainage
		Tisa	na	Tavankut	na	1.8	63.3	Irrigation, Drainage
		Tisa	Krivaja	Zobnatica	na	4.8	230	Irrigation, Drainage
		Tisa	K-18-2	Sava	na	0.47	17	Irrigation, Drainage
		Tisa	K-8	Čonoplja	na	0.84	54	Irrigation, Drainage
		Tisa	Canal Adorjan-Velebit	Velebit	na	na	100	Irrigation, Drainage
10-50	RO	Tisa	Tur	Calinesti Oas	375	29.000	382	multipurpose
		Somes	Firiza	Stamtori	212	16.60	113	multipurpose
		Crisuri	Barcau	Salard	1,686	15	700	flood retention
		Crisuri	Crisul Negru	Tamasda	3,503	22.12	507	flood retention
		Crisuri	Cigher	Taut	165	32.8	300	multipurpose
		Crisuri	Iad	Lesu	89	28.0	143	multipurpose
		Mures	Ighis	Ighis	23	13	102	water supply; recreation
		Mures	Cusmed	Bezid	148	31.0	250	multipurpose
		Mures	Tarnava mare	Zetea	352	44.0	234	multipurpose
		Mures	Sebes	Tau	401	21.0	81	hydropower
		Mures	Cerna	Cincis	301.0	43.00	260	multipurpose
		Bega	Gladna	Surduc	135	50.00	532	multipurpose
	SK	Hornad	Hnilec	VN Palcmanská Maša	84.5	10.36	85	electricity production, recreation, fishing
		Bodva	Ida	VN Bukovec II	55.4	23.4	102	drinking water production, flood protection
		Körösök	Ér	Ér-menti	na	12.2	1.352	flood retention
		Zagyva	Zagyva	Jászteleki	na	13	1.800	flood retention

ANNEX 4 - Reservoirs of the Tisza River BASIN

	HU	Bodrog	Bodrog	Ronyva-zugi	na	14.6	968	flood retention
		Tarna	Tarna	Borsóhalmi	na	24/23.5	20.06	flood retention
		Körösök	Fehér-Körös	Kisdelta	na	25.5	580	flood retention
		Berettyó	Berettyó	Halaspuszta	na	35	21.700/2.175	flood retention
		Berettyó	Beretyó	Kutas	na	36.5	39.200/3.896	flood retention
	UA	Tisza	Tereblya	Tereblya- Riksk	438	24	155	hydropower
50-100	RO	Somes	Somesul Cald	Tarnita	491	74.000	220	hydropower
		Somes	Bistrita	Colibita	113	90.000	314	water supply; hydropower
		Crasna	Crasna	Varsolt	345	50.200	652	multipurpose
		Crisuri	Crisul Repede	Tileagd	1,846	52.9	605	multipurpose
		Crisuri	Crisul Repede	Lugasu	1,736	65.4	640	hydropower; water supply
	SK	Hornad	Hornád	VD Ružín I a Ružín II	1,906.7	51.95	390	electricity production, recreation, fishing, flood protection, industry water supply
		Hornad	Hornád	VD Ružín I a Ružín II	1,932.8	4.55	64	electricity production, flood protection, fishing
		Bodrog	Laborec	Polder Beša	4,522.5	53	1,568	flood protection
		Bodrog	Cirocha	VN Starina	125.8	56.95	283	drinking water production, flood protection
	HU	Fekete-Körös	Fekete-Körös	Mályvádi	4,644	75	3,684	flood retention
		Kettős-Körös	Kettős-Körös	Mérgesi	10,384	87.2	1,823	flood retention
		Sebes-Körös	Sebes-Körös	Mérgesi	8,985	87.2	1,823	flood retention
	RO	Crisuri	Dragan	Dragan	159.0	112	292	multipurpose
		Mures	Sebes	Oasa	187	136.0	401	multipurpose
	SK	Bodrog	Ondava	VD Veľká Domaša a Malá Domaša	827	178.28	1,510	electricity production, recreation, fishing, flood protection, industry water supply, irrigation
		Bodrog	Ondava	VD Veľká Domaša a Malá Domaša	852	0.93	54	electricity production, fishing
	RS	Tisa	Tisa	Tisa	na	160	na	Irrigation, Flood Protection
200-500	RO	Mures	Raul Mare	Gura Apelor	235.000	210	411.000	hydropower
		Somes	Somesul Cals	Fantanele	325	225.00	826.000	hydropower; flood protection
	SK	Bodrog	Laborec- bočná nádrž	VN Zemplínska Šírava	1,567.3	297.32	3,280.000	recreation, fishing, irrigation, industry water supply, flood production
	HU	Tisza	Tisza	Kisköre	65,670	253	12,700	multipurpose
unknown	HU	Tisza	na	Tiszalök	na	??	na	na

Annex 5

List of Surface Water Bodies Evaluated in Part II (Water Quality Part) of the ` Analysis of the Tisza River Basin 2007`

Present tables list water bodies of the Tisza River and its tributaries, analysied in the following chapters (based on data from the Tisza Countries collected in templates for the purposes of the report):

- Chapter 4.1. – Identification of surface water categories
- Chapter 4.2. – Surface water types and reference conditions
- Chapter 4.3. – Identification of surface water bodies
- Chapter 4.6. – Provisional heavily modified surface waters
- Chapter 4.9. – Risk of failure to reach environmental objectives

Main Tisza River – List of Water bodies

Country	Code	Name of WB (if available)
RS	CS_TIS_1	CS_T26
RS	CS_TIS_2	CS_T27
HU	HU_RW_AAA506_0160-0243_S	Tisza
HU	HU_RW_AAA506_0243-0402_S	Tisza
HU	HU_RW_AAA506_0402-0521_S	Tisza
HU	HU_RW_AAA506_0521-0569_S	Tisza
HU	HU_RW_AAA506_0569-0679_S	Tisza
SK	SK_WB_35	Tisza
HU	HU_RW_AAA506_0679-0724_S	Tisza
UA	UA_TT_05	Tisza (Szolovka-Zahony/ Chop)
HU	HU_RW_AAA506_0724-0745_S	Tisza
UA	UA_TT_04	Tisza (Tyachiv- Batar/Vilok)
UA	UA_TT_03	Tisza (Shopurka-Tyachiv)
RO	RO_I_1.WB1	Tisa
UA	UA_TT_02	Tisza (Viseu- Shopurka)
UA	UA_TT_01	Tisza (source-Viseu)

Tisza Tributaries – List of Water Bodies

Country	Code	Name of WB (if available)
RS	CS_BEG	Canal Begej
RS	CS_PLBEG	Navigable Begej
RS	CS_STBEG	Old Begej
HU	HU_RW_AAB197_0000-0074_S	Berettyó
HU	HU_RW_AAA614_0000-0051_S	Bodrog
HU	HU_RW_AAB755_0000-0047_S	Bódva
HU	HU_RW_AAB755_0040-0062_S	Bódva
HU	HU_RW_AAA593_0000-0015_S	Dong-éri-focsatorna
HU	HU_RW_AAA593_0015-0070_S	Dong-éri-focsatorna
HU	HU_RW_AAB815_0000-0009_S	Ér-focsatorna
HU	HU_RW_AAA510_0000-0010_S	Fehér-Körös
HU	HU_RW_AAA250_0000-0020_S	Fekete-Körös
HU	HU_RW_AAA582_0000-0091_S	Hármas-Körös
HU	HU_RW_AAA532_0000-0094_S	Hernád
HU	HU_RW_AAA532_0094-0113_S	Hernád
HU	HU_RW_AAA160_0000-0079_S	Hortobágy-Berettyó
HU	HU_RW_AAB724_0000-0014_S	Hortobágy-focsatorna

Country	Code	Name of WB (if available)
HU	HU_RW_AAB724_0014-0065_S	Hortobágy-focsatorna
HU	HU_RW_AAB724_0065-0093_S	Hortobágy-focsatorna
HU	HU_RW_AAA745_0008-0029_S	Kálló-ér
HU	HU_RW_AAA875_0000-0091_S	Keleti-focsatorna
HU	HU_RW_AAA875_0091-0098_S	Keleti-focsatorna
HU	HU_RW_AAA198_0000-0037_S	Kettos-Körös
HU	HU_RW_AAA754_0000-0046_S	Kraszna
HU	HU_RW_AAA134_0000-0044_S	Lónyai-focsatorna
HU	HU_RW_AAA835_0000-0032_S	Maros
HU	HU_RW_AAA835_0032-0050_S	Maros
HU	HU_RW_AAA887_0000-0008_S	Nagyari-Túr ág
HU	HU_RW_AAB056_0000-0052_S	Nagy-ér
HU	HU_RW_AAB056_0052-0084_S	Nagy-ér
HU	HU_RW_AAB659_0000-0069_S	Sajó
HU	HU_RW_AAB659_0069-0125_S	Sajó
HU	HU_RW_AAB680_0000-0015_S	Sebes-Körös
HU	HU_RW_AAB680_0015-0058_S	Sebes-Körös
HU	HU_RW_AAA856_0000-0050_S	Szamos

Country	Code	Name of WB (if available)
HU	HU_RW_AAA746_0000-0043_S	Tarna
HU	HU_RW_AAA746_0043-0085_S	Tarna
HU	HU_RW_AAA746_0085-0101_S	Tarna
HU	HU_RW_AAB763_0012-0030_S	Túr
HU	HU_RW_AAB141_0000-0065_S	Túr-Belvíz-focsatorna
HU	HU_RW_AAA036_0000-0012_S	Vajai-(III.)fofolyás
HU	HU_RW_AAA036_0012-0048_S	Vajai-(III.)fofolyás
HU	HU_RW_AAB074_0000-0063_S	Zagyva
HU	HU_RW_AAB074_0063-0127_S	Zagyva
HU	HU_RW_AAB074_0127-0163_S	Zagyva
HU	HU_RW_AAB074_0163-0177_M	Zagyva
RO	RO_IV-2_WB1	Aranca/Zlatica
RO	RO-IV_1.81WB1	ARIES
RO	RO-IV_1.81WB2	ARIES
RO	RO-IV_1.81WB6	ARIES
RO	RO-IV_1.81WB5	ARIES
RO	RO-IV_1.81WB4	ARIES
RO	RO-IV_1.81WB3	ARIES

Country	Code	Name of WB (if available)
RO	RO_3.1.44.33_WB5	Barcau
RO	RO_3.1.44.33_WB4	Barcau
RO	RO_3.1.44.33_WB3	Barcau
RO	RO_3.1.44.33_WB2	Barcau
RO	RO_3.1.44.33_WB1	Barcau
RO	RO_V-1_WB47	Bega Veche/Stari Begej
RO	RO_V-1_WB48	Bega Veche/Stari Begej
RO	RO_V-1_WB4	Bega/Begej
RO	RO_V-1_WB3	Bega/Begej
RO	RO_V-1_WB2	Bega/Begej
RO	RO_V-1_WB1	Bega/Begej
RO	RO_II_2.WB3	Crasna
RO	RO_II_2.WB2	Crasna
RO	RO_II_2.WB1	Crasna
RO	RO_3.1_WB6	Crisul Alb
RO	RO_3.1_WB5	Crisul Alb
RO	RO_3.1_WB4	Crisul Alb
RO	RO_3.1_WB3	Crisul Alb

Country	Code	Name of WB (if available)
RO	RO_3.1_WB2	Crisul Alb
RO	RO_3.1_WB1	Crisul Alb
RO	RO_3.1.42_WB5	Crisul Negru
RO	RO_3.1.42_WB4	Crisul Negru
RO	RO_3.1.42_WB3	Crisul Negru
RO	RO_3.1.42_WB2	Crisul Negru
RO	RO_3.1.42_WB1	Crisul Negru
RO	RO_3.1.44_WB6	Crisul Repede
RO	RO_3.1.44_WB5	Crisul Repede
RO	RO_3.1.44_WB4	Crisul Repede
RO	RO_3.1.44_WB3	Crisul Repede
RO	RO_3.1.44_WB2	Crisul Repede
RO	RO_3.1.44_WB1	Crisul Repede
RO	RO_3.1.44.33.28_WB2	Ier
RO	RO_3.1.44.33.28_WB1	Ier
RO	RO_I_1.WB6	Iza
RO	RO_I_1.WB5	Iza
RO	RO_II_1.WB14	Lapus

Country	Code	Name of WB (if available)
RO	RO_II_1.WB13	Lapus
RO	RO_II_1.WB12	Lapus
RO	RO-IV_1WB13	MURES
RO	RO-IV_1WB12	MURES
RO	RO-IV_1WB11	MURES
RO	RO-IV_1WB10	MURES
RO	RO-IV_1WB9	MURES
RO	RO-IV_1WB8	MURES
RO	RO-IV_1WB7	MURES
RO	RO-IV_1WB6	MURES
RO	RO-IV_1WB5	MURES
RO	RO-IV_1WB4	MURES
RO	RO-IV_1WB3	MURES
RO	RO-IV_1WB2	MURES
RO	RO-IV_1WB1	MURES
RO	RO-IV_1.102WB3	SEBES
RO	RO-IV_1.102WB2	SEBES
RO	RO-IV_1.102WB1	SEBES

Country	Code	Name of WB (if available)
RO	RO_II_1.WB11	Sieu
RO	RO_II_1.WB10	Sieu
RO	RO_II_1.WB9	Somes
RO	RO_II_1.WB8	Somes
RO	RO_II_1.WB7	Somes
RO	RO_II_1.WB6	Somes
RO	RO_II_1.WB5	Somes
RO	RO_II_1.WB4	Somes Mare
RO	RO_II_1.WB3	Somes Mare
RO	RO_II_1.WB2	Somes Mare
RO	RO_II_1.WB1	Somes Mare
RO	RO_II_1.31.WB7	Somesul Mic
RO	RO_II_1.31.WB6	Somesul Mic
RO	RO_II_1.31.WB5	Somesul Mic
RO	RO_II_1.31.WB4	Somesul Mic
RO	RO_II_1.31.WB3	Somesul Mic
RO	RO_II_1.31.WB2	Somesul Mic
RO	RO_II_1.31.WB1	Somesul Mic

Country	Code	Name of WB (if available)
RO	RO-IV_1.117WB3	STREI
RO	RO-IV_1.117WB2	STREI
RO	RO-IV_1.117WB1	STREI
RO	RO-IV_1.96WB7	TARNAVA
RO	RO-IV_1.96WB6	TARNAVA
RO	RO-IV_1.96WB5	TARNAVA
RO	RO-IV_1.96WB4	TARNAVA
RO	RO-IV_1.96WB3	TARNAVA
RO	RO-IV_1.96WB2	TARNAVA
RO	RO-IV_1.96WB1	TARNAVA
RO	RO-IV_1.96.52WB3	TARNAVA MICA
RO	RO-IV_1.96.52WB2	TARNAVA MICA
RO	RO-IV_1.96.52WB1	TARNAVA MICA
RO	RO_I_1.WB11	Tur
RO	RO_I_1.WB10	Tur
RO	RO_I_1.WB9	Tur
RO	RO_I_1.WB8	Tur
RO	RO_I_1.WB7	Tur

Country	Code	Name of WB (if available)
RO	RO_I_1.WB4	Viseu
RO	RO_I_1.WB3	Viseu
RO	RO_I_1.WB2	Viseu
SK	SK_WB_42	Bodrog
SK	SK_A0002	Bodva
SK	SK_A0001	Bodva
SK	SK_WB_47 + SK_WB_48	Hornád/Hernád
SK	SK_WB_46	Hornád/Hernád
SK	SK_WB_45	Hornád/Hernád
SK	SK_WB_44	Hornád/Hernád
SK	SK_WB_43	Hornád/Hernád
SK	SK_B0006	Laborec
SK	SK_B0004 + SK_B0005	Laborec
SK	SK_B0003	Laborec
SK	SK_WB_36	Latorica
SK	SK_B0018 + SK_WB_41	Ondava
SK	SK_WB_40	Ondava
SK	SK_WB_39	Ondava

Country	Code	Name of WB (if available)
SK	SK_B0015a + SK_WB_38	Ondava
SK	SK_WB_37	Ondava
SK	SK_S0015	Rimava
SK	SK_S0014	Rimava
SK	SK_S0013	Rimava
SK	SK_WB_51	Slaná/Sajó
SK	SK_WB_50	Slaná/Sajó
SK	SK_WB_49	Slaná/Sajó
SK	SK_B0026	Topla
SK	SK_B0024+ SK_B0025	Topla
SK	SK_B0023	Topla
SK	SK_H0017	Torysa
SK	SK_H0016	Torysa
SK	SK_H0015	Torysa
SK	SK_B0012	Uh/Uzh
UA	UA_ CT_01	Chona Tisza
UA	UA_ CT_02	Chona Tisza
UA	UA_BT_01	Bila Tisza

Country	Code	Name of WB (if available)
UA	UA_BT_02	Bila Tisza
UA	UA_ TE_01	Teresva
UA	UA_TE_02	Teresva
UA	UA_RI_01	Rika
UA	UA_RI_02	Rika
UA	UA_BO_01	Borzhava (Borsova)
UA	UA_BO_02	Borzhava (Borsova)
UA	UA_LA_01	Latorica
UA	UA_LA_02	Latorica
UA	UA_LA_03	Latorica
UA	UA_UZ_01	Uzh
UA	UA_UZ_02	Uzh
UA	UA_UZ_03	Uzh
UA	UA_UZ_04	Uzh

ANNEX 6

Overview of all Types for Relevant Rivers with Catchment Size bigger than 1,000 km² in the Tisza River Basin

Country	Code	Name of river type
Ukraine	UA_ 2A	Small rivers, calcareous, low-mountain
	UA_ 3A	Small rivers, calcareous, mid-mountain
	UA_ 2B	Medium rivers, calcareous, low-mountain
	UA_ 3B	Medium rivers, calcareous, mid-mountain
	UA_ 1C	Large rivers, lowland
	UA_ 2C	Large rivers, low-mountain
	UA_ 1D	Very large river, lowland
Romania	RO_01	Mountain stream - Ecoregion 10
	RO_02	High plateau or piedmonts stream - Ecoregion 10
	RO_03	Stream sector in piedmont or high plateau area - Ecoregion 10
	RO_04	Stream sector in hilly or plateau area - Ecoregion 10
	RO_05	Stream sectors in intramountain depression - Ecoregion 10
	RO_06	Stream sector with wetlands in hilly or plateau area - Ecoregion 10
	RO_08	Stream sector in hilly or plateau area - Ecoregion 10
	RO_10	Stream in plain area - Ecoregion 11
	RO_11	Stream sector in plain area (1,000-3,000 km²) - Ecoregion 11
	RO_12	Stream sector in plain area (>3,000 km²) - Ecoregion 11
	RO_13	Stream sector with wetlands in plain area - Ecoregion 11
	RO_32	Temporary stream in plain area - Ecoregion 11
Hungary	HU-Type 2	Small calcareous mountainous stream
	HU-Type 5	Medium calcareous hilly stream
	HU-Type 6	Large calcareous hilly stream
	HU-Type 13	Large calcareous lowland stream
	HU-Type 14	Very large calcareous lowland stream
	HU-Type 15	Small calcareous lowland brook
	HU- Type 16	Small with low slope calcareous lowland stream
	HU- Type 17	Medium with low slope calcareous lowland stream
	HU-Type 18	Middle calcareous lowland stream
	HU-Type 19	Large calcareous lowland streams
	HU-Type 20	Very large calcareous lowland river
Slovak Republic	P1V - B1	Large streams, < 200 m, in Hungarian lowland
	K2V - H1	Large streams, 200-500 m, Carpathians
	K2V - H2	Large streams, 200-500 m, Carpathians
	K2M	Small streams, 200-500 m, Carpathians
	K3M	Small streams, 500-800 m, Carpathians
	K2S	Middle size streams, 200-500 m, Carpathians
	K3S	Middle size streams, 500-800 m, Carpathians
Serbia	CS_Typ1.1	Very large rivers, lowland, siliceous, fine sediments
	CS_V1_P4_SIL	Large rivers, lowland, siliceous
	CS_V1_P3_SIL	Medium rivers, lowland, siliceous

Annex 7

General Criteria as a Common Base for the Definition of Reference Conditions

General criteria for defining reference conditions (harmonised basin-wide)

Basic statements
- Reference conditions must be reasonable and politically acceptable.
- Reference sites have to include important aspects of "natural" conditions.
- Reference conditions should reflect no or minimum stress.

Land use in catchment area
- Influence of urbanisation, land use and forest management should be as low as possible.

Stream and habitats
- Reference sites should be covered by natural climax vegetation or unmanaged forests.
- No removal of coarse woody debris.
- No bed or bank fixation.
- No obstructions that hinder the migration of organisms or the transport of bed material.
- Only minor influence due to flood protection measures.

Bank and floodplain vegetation
- Bank and floodplain vegetation should be present to allow lateral migration.

Hydrology and water management
- No alteration of natural discharge regime.
- No or only minor alteration of hydrology by dams, reservoirs, weirs, or sediment retaining structures affecting the site.
- No alteration of regime due to water diversion, abstraction, and no pulse releases.

Physico-chemistry
- No point source of organic pollution.
- No point source of nutrient pollution.
- No sign of diffuse pollution inputs.
- No acidification.
- No liming.
- No alteration of natural thermal regime.
- No salinisation.

Biology
- No significant impairment of the indigenous biota by introduction of animals and plants (e.g. in the frame of fish farming).

Stream morphology
- Morphological alterations do not influence biodiversity and ecological functioning.

Biomanipulation
- No biomanipulation (e.g. in lakes).

Recreation uses
- No intensive recreational use.

Annex 8

Possible Impacts Related to Different Pressures

Pressures*	Possible Impacts*
Hydromorphological alteration A. Interruption of the longitudinal continuum of rivers (Hydropower, Navigation, Flood defence) B. Interruption of the lateral connectivity of rivers (Hydropower, Navigation, Flood defence, Urbanisation and agricultural land use) C. Hydrological alterations (Hydropower generation - intermittent hydropower generation in the case of hydropeaking - , Agriculture (irrigation), Industry, Water supply (reservoirs), Flood protection (retention reservoirs)	**A. Interruption of the longitudinal continuum of rivers)** • Obstacle for fish migration • Reduction of naturally reproducing fish populations • In impounded sections sediment retention, reservoir flushing, clogging of the river bed/floodplain with fine sediments and reduced transport of sediments • Loss of species habitats with a subsequent loss of typical species • Erosion – degradation of the river bed (downstream of dams, weirs, etc.), decrease of surface and ground water levels • Adaptive changes in biodiversity – loss of species due to habitat changes (adjacent shallow water bodies). • Adaptive changes in species composition of the riverine vegetation. • Overall change of species composition not typical for the given ecosystem. • Alteration of flow regime – reduced flow velocities, hydropeaking, residual water below interruption of longitudinal continuum (for details see 4.3) • Change of species composition from riverine to lake populations • Species loss due to regular artificial flood pulse effects (hydropeaking) • Species loss due to habitat loss (insufficient residual water) **B. Interruption of the lateral connectivity of rivers** • If floodplains/wetlands are disconnected from the main river course the consequences can result in • loss of habitats • loss of species • alteration of natural flow regime and sediment dynamics – change of populations **C. Hydrological alterations** • Species loss/alterations due to regular artificial flood pulse effects (hydropeaking) • Species loss/alteartions due to habitat loss (insufficient residual water and migration barriers)

Pressures*	Possible Impacts*
Nutrient Pollution A. Point sources of pollution from Settlements, Industry and Agriculture B. Diffuse sources of pollution (Households, Industry and Agriculture)	**A + B)** • Risk of eutrophication • Loss of habitat • Increased oxygen depletion • Limiting use of waters (e.g. recreation, etc.)
Organic pollution A. Organic pollution from point sources (Urban development, Industry, Agriculture) B. Organic pollution from diffuse sources (Households, Industry and Agriculture)	**A + B)** • Increased oxygen depletion • Changes in species composition (benthic invertebrates) • Decline of species biodiversity • Reduction of fish population or fish mortality
Hazardous substances pollution A. Hazardous substances from point sources (from industry - including mines – agriculture, urban development) B. Hazardous substances from diffuse sources (from agriculture, old contaminated sites (including abandoned mining sites)	**A + B)** • Toxicity • Bioaccumulation • Persistence

* Information based on Significant Water Management Issues in the Danube River Basin, prepared by: ICPDR River Basin Management Expert Group with support of the PM EG, MA EG and GW TG.

ANNEX 9

Delineation Methods of Provisional Heavily Modified Surface Waters Bodies in Hungary, Slovakia and Romania

Specific national methods and criteria for the provisional identification of HMWB

Hungary

As regards rivers, the provisional identification of HMWBs was based on the river sections heavily influenced by hydromorphological alterations, also taking into account information concerning human intervention. The impact of human activity is significant, if GES cannot be achieved for this reason.

A water body is provisionally identified as heavily modified, where any of the following significant hydrological or morphological changes affected more than 50% of the water body:

- The storage space of mountainous or hill-country barrage reservoirs,
- The impounded section of large lowland rivers,
- Water transfer for power generation.

Significant changes in the biological population of water bodies classified here can be verified and human activity cannot be replaced with any other solution which is environmentally more advantageous and feasible at cost effective level.

A water body is identified as possibly heavily modified, where any of the following significant hydrological or morphological changes affect more than 50% of the water body:

- The tailwater sections of rivers heavily impacted by reservoirs,
- Impoundment on hill-country rivers, small lowland rivers, brooks and runnels causing a significant degree of channel filling,
- Regulation which has heavily modified riverbed sizes and velocity conditions (mean velocity atypical for the type and/or lack of flow areas of different velocity).

For water bodies classified here, significant change in the biological population of the water is assumed and, in certain cases, human activity can be modified or replaced to attain good status.

For lakes, Hungary applied the “possibly heavily modified” category, when identifying provisional heavily modified water bodies due to the lack of biological validation. Provisional identification was made in accordance with the following criteria:

- Over 50% of the shoreline is pitched,
- The form of the bed has heavily changed (water depth exceeds 150% of the original or/and surface exceeds 150% of the original),
- Water residence time in the lake exceeds the original residence time by over 20%.

All in all, the definition of the heavily modified character was made along with the definition of hydromorphological risk and, therefore, certain methodological issues of the provisional identification are addressed in the chapter on risk assessment.

Further tasks:

As regards water bodies provisionally identified as heavily modified or possibly heavily modified, the first stage is the validation of type against the ecological status and actual causal validation (i.e. to which human activity the degradation experienced in the status of biological communities can be linked). This will be attained partly in the biological status survey program to be carried out with PHARE assistance, which is required to be continued and complemented with the assessment of hydromorphological effects.

In the case of heavily modified water bodies, the execution of detailed technical and economical analysis for each heavily modified water body.

<u>Slovakia</u>

In order to identify hydromorphological changes and their quantity related to significant impacts we defined impacts to morphological changes (1-8) and to discharge regime (9-10). Point and diffuse sources for the needs of HMWB are not denoted as significant impacts, however they should be considered in complex assessment of impacts.

1. Covered river sections

Significance criterion:

- If the covered section is longer than 100 m, it is a significant change.
- If any sequence of changing shorter covered and open sections of water course, where cumulative length of covered parts is at least 150 m and which makes more than a half of the overall length of the sequence, then the whole part of such course is considered a covered section.

Data availability: SVP (Slovak water management enterprise); project of the river regulation or river training, maps, aerial photographs.

Consulting: SVP.

2. Channel straightening

Significance criterion:
If the overall cumulative length of all straightened sections is higher than 8% of the total course length (Fig. 1).

Data availability: existing digital river routes (SHMÚ, VÚVH), project of the river regulation or river training, historical maps - archives, River authorities, aerial photos, visual examination.

Consulting: River authorities - SVP; VÚVH.

Figure 1 Example of channel straightening - modification of Morava river, - new river course (indicated in red), - original river course (indicated in blue)

3. Section backwaters

Significance criterion:

- Backwater length (at low discharge 1) is higher than 1500 m for B/H > 15; 1000 m for B/H <15; 600 m for B/H < 8.
- Total length of all backwater sections at low discharge is higher than 10% of the total length of water courses at water body.

Data availability: project of the river regulation or river training, and technical documentation available at river basin authorities, for a very rough estimation also water management maps.

Consulting: River authorities - SVP; VÚVH.

4. Length and bank lining

Significance criterion:
Total length of all sections with stabilized banks is higher than 10% of total watercourse length[2] at water body.

Data availability: river authority, project of the river regulation or river training, technical documentation to the objects on the rivers - available at River basin authorities.

Consulting:: river basin authorities – SVP.

5. Flood protection

Significance criterion:
Distance of flood dikes (B_i) from the course is smaller than 3B (3 times the width of the river channel - fig. 2) on the course in length of 5B[3].

Data availability: river authority, project of the river regulation or river training, technical documentation to flood protection measures - available at River basin authorities.

Consulting: river basin authorities – SVP.

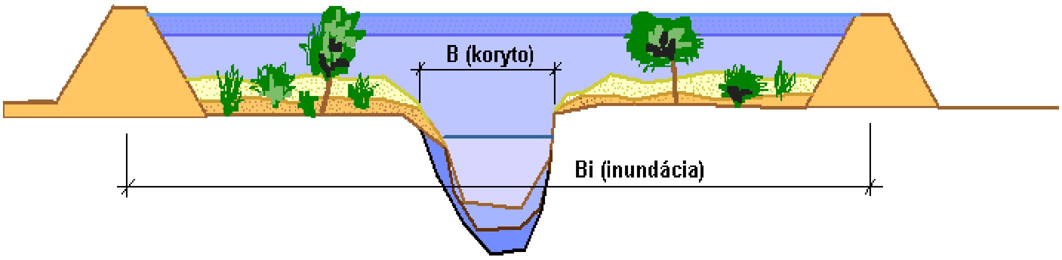


Figure 2 Diagram for evaluation of the river dams impact (B - channel width, B_i –dike distance)

[1] low discharge = Q_{355}
[2] total watercourse length is considered as 2 times the length of watercourse axis
[3] B - is the course width in terms of mean water level width at channel discharge in 1 km section of monitored part of the course

6. Urbanization

Significance criterion:
Urban area is in the distance of 5 m from the edge of river channel in length of more than 15% of the total length of river stretches in the frame of water body.

Data availability: maps in scale 1 : 5000, 1:10 000, river authority; local authorities and municipalities.

Consulting: local authorities and municipalities.

7. Composite assessment

From the assessment summary of points 4, 5 and 6, it follows that the quantification of some above mentioned parameters and criteria is rather difficult in practice and their differentiation is not always useful. Therefore it is possible to use an auxiliary criterion - composite assessment of course modification, which integrates the above mentioned criteria „bank lining“ (4), „urbanization“ (5) and „flood protection“(6).

Table 1 presents 6 classes describing the degree of course modification regarding its ecological status. Table 1 shows an example of course classification.

Data availability: technical documentation to the performed course modifications - available at River basin authorities.

Consulting: river basin authorities - SVP; for the assessment make use of practical and personal experience of the River basin authorities staff.

Table 1 Course classification based on modification level

Class No.	Description of the assessed course section
1	Water course is in its natural state and no significant channel modifications were carried out;
2	„Nature-like“ modifications were carried out on the water course, built of ecological materials;
3	Significant bank modifications were carried out on the water course ; partly course straightening; the course still has certain potential for its natural evolution;
4	„Heavy“ bank (eventually bottom) modifications were carried out on the water course from ecologically unsuitable materials; also smaller objects are present in the channel (low weirs, sills, bridges), which allow for fish migration;
5	„Heavy“ bank and bottom modifications were carried out on the water course; smaller objects obstruct fish migration; significant course shortening; modifications and objects have significantly negative impact on natural evolution potential;
6	„Heavy“ bank eventually bottom modifications were carried out on the water courses; larger objects are present (obstructing fish migration, causing substantial backwaters, producing areas with bottom degradation); significant course route straightening; covered course sections ;

Significance criterion: mean index of water course change is > 2
(*Note:* it is only an auxiliary criterion, which is not set in the directive)

8. Change in cross section profile

Significance criterion:

a) Significant channel widening: if channel width after modification B is 20% higher (compared to the original state) on a section longer than 1 km.

b) Significant channel narrowing: if profile area S is 25% smaller (compared to the original state) on a section longer than 1 km.

On navigable courses there is another criterion of aerial change of cross section profile: if present area of cross section profile (area of cross section profile to the water level of channel discharge) is more than 25% smaller on a section longer than 1 km.

Data availability: project of the river regulation or river training, technical documentation to the performed course modifications - usually older data available at River basin authorities, newer data in VÚVH are digitised and were obtained (surveyed) in frame of different projects.

Consulting: department of hydrology and hydraulics in VÚVH; river basin authorities – SVP.

9. Dikes and weirs

Significance criterion:

- Obstruction height > 0.5 m (provided that it is not a barrier to fish migration).

Data availability: river authority, project of the river regulation or river training, technical documentation of the object on the courses available at River basin authorities, objects can be located from watermanagement maps or aerial photographs.

Consulting: department of hydrology and hydraulics in VÚVH; river basin authorities – SVP.

10. Intakes

Significance criterion:

- Individual intakes with quantifiable recirculation > 50 l/s (150 l/s in case of intakes without recirculation or with incalculable recirculation).
- Individual intakes with quantifiable recirculation > 10% of mean low discharge[5], (30% in case of intakes without recirculation or with incalculable recirculation[6]).
- Total intake for the water body > 50 % of mean low discharge[7].

Data availability: all necessary data are available at river authority; Q_{355} values are available at SHMÚ within the monitoring network profiles.

[5] low discharge in the intake site

[6] recirculation - intake and disposed (treated waste waters) amounts within the water body

[7] cumulative low discharge of water body (low discharge at the end point of downstream of water body)

DETERMINATION OF INDEX OF CHANGE:

Step 1: examination of significance

The above mentioned parameters (in points **1** to**10** - except 9) will be quantified in scale 1 to 10, where:

1 - is the smallest change

10 - is the most significant change over the whole water course within the water body

During the examination of significance of discharge regulation (weirs and barriers - point 9) it is possible to use quantification of continuum interruption (migration), which is caused by these obstacles on the course. The more downstream the migration obstacle is, the bigger is the upstream section, which is not open for migration. Calculation of migration length:

$$L_{migr} = (L_{migr\text{-}pod} + L_{migr\text{-}nad}) / 2L$$

L_{migr} - dimensionless free migration length

$L_{migr\text{-}pod}$ - section length with free migration in downstream section

$L_{migr\text{-}nad}$ - section length with free migration in upstream section

L - total length of course section

Step 2: Combinations of different impacts

After Step 1, each water body is assigned 5 parameters in scale from (0) 1 to 10. The resulting parameter is retrieved after each of 5 parameters is assigned its weighted parameter.

Each assessed parameter has in terms of significance a different impact on final assessment of the state of the water body. To at least partly consider the significance of individual parameters in the total average, we proposed to assign each assessed parameter its weighted value (percentage of representation). Example of assigning impact values to individual parameters is shown in Table 2. Final point assessment, which will also consider the weight of parameters will result from relation:

$$\mathbf{V = 3\ (0{,}06) + 8\ (0{,}2) + 4\ (0{,}15) + 7\ (0{,}17) + 5\ (0{,}2) + 7\ (0{,}22)}$$

$$\mathbf{= 0{,}18+1{,}6+0{,}6+1{,}19+1+1{,}54 = 6{,}11 \approx 6}$$

Table 2 Example of assigning level of influence (1-10) of water bodies

Parameter	Significance of impacts (%)	Point evaluation of individual impacts									
		1	2	3	4	5	6	7	8	9	10
1	0,06			x							
2	0,20								x		
3	0,15				x						
(4, 5, 6)= 7	0,17							x			
8	0,20					x					
9	0,22							x			
L_{migr}											

Step 3 Water body classification

The above mentioned quantification of impacts significance level can result in preliminary classification.

I. Water bodies indicating only low level of overall impact (total result in range 0-3)– natural to slightly impacted water body

II. Water bodies indicating medium level of overall impact (total result in range 4-7) - candidate - on the basis of detailed testing can be re-classified to natural or heavily modified

III. Water bodies showing high level of overall impact (total result in range 8-10) - heavily modified water bodies

Weighted means of the results of different impacts can in some cases lead to significance undervaluation. If the water body has a high impact degree of one specific impact, but other impacts are not represented or their impact level is low, then the high level of one of the assessed impacts need not to be found in the weighted mean at all. Therefore we suggest the following method: if one of the assessing impact reaches value 8 and higher, water body should be classified as moderate (4-7) although the total average is less than 4.

Hydromorphological changes classification criteria need to be supplemented with other impacts, which consider water usage and qualitative parameters.

Due to the fact, that data availability for morphological changes assessment is different on individual streams (no up-to-date data, incomplete or on small courses no data at all), it is essential to have the course assessment done by experts with theoretical and practical experience in this field. Required data and information as well as actual course specification need to be prepared in close cooperation with river basin authorities. Final classification is then a result of assessment based on above mentioned criteria and expert judgement in harmony with the basic scheme of heavily modified water bodies assessment (basic methodology).

Romania

The identification and designation of HMWBs and AWBs has been made according to the definition provided by the WFD and European Guidance on “Identification and designation of HMWBs and AWBs”. The methodology for the provisional identification of HMWBs is presented in the following table.

Abiotic criteria for the preliminary HMWB designation in Romania						
No	**Hydraulic works (Hydro - morphological alterations)**	**Effects**	**Abiotic criteria (Parameters reflecting the pressure)**	**Pressure / Surface water bodies classification**		
				Low pressure / Non-HMWB	**Med. pressure / Candidate to**	**High pressur e /**
1	**Transversal river works** **1.1 dams / weirs / sills**	on hydrological regime, on sediment transport and migration of biota[1)]	Sills density (no. / km)	< 1	2	> 3
			Height of the structure (cm)	< 20	20 – 50	> 50
	1.2 reservoirs - hydropeaking	on the low flow and biota	Low flow in river bed / Q*2) (%)	>100	100 - 50	< 50
		on hydrological regime, bank stability	Water level gradient (cm) / hour	< 50	50 - 100	> 100[3)]
2	**Longitudinal river works** **2.1 embankments, agricultural/fish farming works, etc**	on lateral connectivity, floodplain vegetation and spawning habitat	Length of dikes / Length of water body (%)	< 30	30 - 70	> 70
			Flood protected surface / Floodplain surface (%)	< 30	30 - 70	> 70
	2.2 bank regulation / consolidation works, cutt-meandering works	on longitudinal river profile, on substrate structure and biota	Length of hydraulic works / Length of water body (%)	< 30	30 - 70	> 70
3	**Navigation channels**	on bed stability and biota	(Dredged) channel width/river bed width(%)	< 20	20 - 50	> 50
4	**Water intakes, discharges, river derivation**	on the low flow, bed stability and biota	Abstracted or returned discharge / Multiannual average flow (%)	< 10	10 - 50	> 50
			Low flow rate in river bed / Q*2) (%)	> 100	100 - 50	< 50

1) only the migratory biota; 2) Q* = Q95% (m3/s)+ 0,1 for Q95% > 200 l/s ; Q* = 1,25 x Q95% (m3/s)+ 0,05 for Q95% < 200 l/s
Q95% - Minimum monthly multiannual discharged with 95% probability (mc/s); 3) frequency > 1 / zi

Annex 10

Details on National Methods of Risk Assessment and Criteria

National approaches for the risk assessment on surface water in Hungary, Romania and Slovakia

Hungary

When designating surface water bodies that are at risk in terms of water pollution, Hungary classified according to *three pollution types*:

- Organic substances;
- Nutrients;
- Hazardous substances.

Organic substances were characterised by the biochemical oxygen demand (BOD5) and dichromate chemical oxygen demand (CODd), while nutrients were characterised by total phosphorus and total inorganic nitrogen based on representative concentrations measured or estimated by modelling (calculations).

The thresholds used for the classification of water body risk are listed in Table 1 below. The following classification features have been used:

- The category “possibly at risk” was introduced as an uncertain group between the categories “not at risk” and “at risk”;
- For the general indices of organic substances and nutrients, thresholds were assigned to the 90% frequency test results and mean values. The thresholds corresponding to the 90% frequency test results were applied for water bodies for which regular test results have been obtained. Thresholds belonging to the average value were assigned to the average concentration estimated from the average load.
- The thresholds pertaining to the 90% frequency test results were taken from the standard MSZ 12749 “Quality of surface waters, quality characteristics and rating” with the thresholds of “good” and “bearable” water;
- For hazardous substances, the thresholds pertaining to the 90% frequency test results were assigned to the components for which regularly measured results were available. For other hazardous substances, the highest admissible concentration (HAC) was designated as threshold of the “at risk” category.

Table 1 Limit values applied for risk assessment of water bodies

Risk category	Parameter		Not at risk	Possibly at risk	At risk
organic matter	BOD_5 (mg/l)	90 %	< 6	6-10	> 10
		average	< 4	4-7	> 7
	COD_d (mg/l)	90 %	< 22	22-40	> 40
		average	< 16	16-30	> 30
nutrients	total N (mg/l)	90 %			
		average	< 4	4-7,5	> 7,5
	total P (rivers) (µg/l)	90 %	< 200	200-400	> 400
		average	< 130	130-250	> 250
	total P (lake waters) (µg/l)	90 %	< 100	100-200	> 200
		average	< 65	65-125	> 125
hazardous substances	Alachlor (µg/l)	MAC	< 0,57	0,57-1,15	> 1,15
	Antracen (µg/l)	MAC	< 0,005	0,005-0,01	> 0,01
	Atrazin (µg/l)	MAC	< 1	1-2	> 2
	Benzene (µg/l)	MAC	< 0,85	0,85-1,7	> 1,7
	Bromed difenileters, Pentabrom difenileter (µg/l)	MAC	< 0,7	0,7-1,4	> 1,4
	Cadmium (µg/l)	90 %	< 1	1-2	> 2
	C_{10-13} chloroalcanes (µg/l)	MAC	< 0,41	0,41-0,82	> 0,82
	Chlorofenvinfos (µg/l)	MAC	< 0,15	0,15-0,3	> 0,3
	Chloropirifos (µg/l)	MAC	< 0,005	0,005-0,001	> 0,001
	1,2-dichloroethane (µg/l)	MAC	< 590	590-1180	> 1180
	Dichloromethane (µg/l)	MAC	< 81	80-162	> 162
	Di(2-etilhexil)phtalate (µg/l)	MAC	< 0,33	0,33-0,66	> 0,66
	Diuron (µg/l)	MAC	< 0,9	0,9-1,8	> 1,8
	Endosulphane (alfa-endosulphane) (µg/l)	MAC	< 0,002	0,002-0,004	> 0,004
	Fluoranthene (µg/l)	MAC	< 0,45	0,45-0,9	> 0,9
	Hexachloro-benzol (µg/l)	MAC	< 0,025	0,025-0,05	> 0,05
	Hexachloro-butadiene (µg/l)	MAC	< 0,29	0,29-0,59	> 0,59
	Hexachloro-ciklohexane (µg/l)	MAC	< 0,45	0,45-0,9	> 0,9
	(gamma izomer lindane) (µg/l)	MAC	< 0,02	0,02-0,04	> 0,04
	Izoproturon (µg/l)	MAC	< 0,65	0,65-1,3	> 1,3
	Lead (µg/l)	90 %	< 20	20-50	> 50
	Mercury (µg/l)	90 %	< 0,2	0,2-0,5	> 0,5
	Naphtalene (µg/l)	MAC	< 40	40-80	> 80
	Nickel (µg/l)	90 %	< 30	30-50	> 50
	Nonil-phenoles (4-p-nonilphenole) (µg/l)	MAC	< 1,05	1,05-2,1	> 2,1
	Oktil-phenoles (p-terc-oktil-phenole) (µg/l)	MAC	< 0,067	0,067-0,133	> 0,133
	Pentachloro-benzol (µg/l)	MAC	< 0,5	0,5-1	> 1
	Pentachloro-phenole (µg/l)	MAC	< 0,5	0,5-1	> 1
	Polyaromatic hydrocarbons				
	Benz(a)pirene (µg/l)	MAC	< 0,025	0,025-0,05	> 0,05
	Benz(b)fluorantene (µg/l)	MAC	< 0,03	0,03-0,06	> 0,06
	Benz(g,h,i)perilene (µg/l)	MAC	< 0,016	0,016-0,032	> 0,032
	Benz(k)fluorantene (µg/l)	MAC	< 0,03	0,03-0,06	> 0,06
	Indeno(1,2,3-cd)pirene (µg/l)	MAC	< 0,016	0,016-0,032	> 0,032
	Simazin (µg/l)	MAC	< 1,7	1,7-3,4	> 3,4
	Tributil-tin compounds (Tributil-tin cathions) (µg/l)	MAC	< 0,00075	0,00075-0,0015	> 0,0015

The risks have been defined as follows:

- The loads for each water body (and the constituent catchment area belonging to them) were summarised and the total load was then divided with the flow rate of the recipient water body. Flow rates were calculated from the measurement data of the 1998-2002 period or, where there was no measurement, from the map database of the specific runoff;
- For rivers where foreign sources might influence concentration, the following approach was applied:
  - The concentration was calculated as if no load arrived from beyond the frontier;
  - The calculated value was compared to the measured value (average of 1998-2002) and the difference was the foreign impact.
- When defining risk, Hungary compared the calculated or, where available, the measured concentrations, to the thresholds stated in Table 1;
- For water bodies where Hungary had measurements, Hungary accepted the measurement results to define the risk if the measurement and the calculation resulted in different classifications;
- In order to establish the cause of the risk, Hungary calculated separately concentrations from diffuse and point load sources. Where a water body crossed a class limit value only with combined (diffuse + point source) load, Hungary used the load component with the higher absolute value as reference;
- For water bodies that were classified in the same area when designating the catchment area (i.e. no separate catchment areas were assigned), the concentration was considered to be identical.

Owing to their hydrological and/or morphological status, water bodies were considered at risk if considerable alterations affected over 50% of the water body. If such rate was caused by a modification whose ecological impact is uncertain for the time being, the classification is “possibly at risk”.

The hydrological and morphological alterations of rivers have been classified according to whether the good ecological status of these rivers can be achieved if the alterations remain in their present condition. The assessment should have been based on biological data, but there are no databases available in Hungary for such an assessment. To make up for this lack of information, we have carried out a survey expedition involving the quick analysis of the ecological status of 60 river sections, on the basis of which the ecological significance of hydrological and morphological alterations has been assessed, and a degree of influence has been established for each area of activity where the achievement of good ecological status is probably no longer possible (this has been termed as “significant degree of influence”). The following activities were surveyed:

- The effects of reservoirs with a barrage dam on the upper and lower sections;
- The effects of impoundment on the upper and lower sections;
- The effects of water flow regulation on riverbed and velocity conditions;
- The effects of dykes on the high-water river bed and the floodplain;
- The effects of bank reinforcement and sealing on the riparian zone;
- The effects of abstractions and water transfers on velocity conditions and water level fluctuations.

We have considered water bodies to be at risk because of their hydrological and/or morphological status if more than 50% of their total length was under a significant degree of influence. If this was caused by an alteration whose ecological effect was not yet known for certain, then the water body was classified as “possibly at risk”. In the case of such water bodies, further assessment based on data from surveillance monitoring is needed in order to determine whether good status can be achieved without taking any intervention.

Natural lakes (like rivers) have been classified as possibly at risk because of their hydromorphological status if the achievement of their good ecological status was found to be uncertain by unchanged conditions. Risk assessment was based on two criteria:

- whether the morphology of shore areas was greatly altered, leading to a significant deterioration of the living conditions of the various communities (e.g. in the case of establishing bath, or dredging, where delving affected more than 50% of the shoreline);
- Whether water level regulation activities led to an alteration in the natural water resource fluctuation in excess of +/-20%.

The GIS database on human activities influencing the hydromorphological status of rivers includes reservoirs, transversal barrages, longitudinal flow regulation works, flood-levees, paved sections, dredging and water abstractions.

In preparing the analyses, Hungary made use of the data and descriptions obtained during on-site surveys carried out on the sections under influence.

The available hydromorphological information is not entirely reliable, especially in the case of water bodies on rivers with small or medium-sized catchments and on lakes.

Further assessment based on data from surveillance monitoring is needed in order to determine whether the human activities causing hydromorphological alterations really have significant effects on the ecological status.

Romania

For the water body classification, Romania uses the risk classes “at risk”, “possibly at risk”, and “not at risk”. Water bodies classified as “possibly at risk” need further characterisation, analysis or investigative monitoring by end 2006 to finally classify the risk.

For the risk categories named according to related significant pressures, criteria of WB risk assessment were defined as follows:

- Organic pollution (ICPDR and national criteria): Saprobic index: 2.25 – upstream water courses and 2.40 – downstream water courses;
- Nutrient pollution (ICPDR and national criteria): Limit of 2nd class of National quality standard and eutrophication aspects for lakes and reservoirs;
- Hazardous substances pollution (ICPDR and national criteria): Limit of 2nd class of National quality standard;
- Hydromorphological alterations: the existence of hydraulic works which have impact on river morphology and hydrological regime.

Slovakia

Three risk classes were distinguished: 1 “water body not at risk”, 2 “water body maybe at risk”, 3 “water body at risk”.

Preliminary objectives - quantitative limits of good status of general physico-chemical and chemical parameters were mostly overtaken from Governmental Decision about general objectives for surface waters No.491/2002 Coll. (limits relate to 90% frequency) and from EU draft of EQS for priority substances (maximum and average value). See Table 2.

The analysis is based on a combined approach which considers significant pressures and impacts – qualitative data from monitoring results of WBs. Used risk categories are :

Ecological status

- organic pollution (used parameters : dissolved oxygen; BOD_5; COD_{Cr}; and benthic invertebrates - Saprobic index)
- nutrient pollution – eutrophication risk (used parameters : N-tot, N-NH4, N-NO3, P- tot, P-PO4; chlorophyle-a)
- hydro-morphological changes – water body was classified at risk when it was designated as HMWB candidate.

Chemical status

- pollution caused by priority substances
- pollution caused by other substances relevant for SR

Water body was designated in risk, when monitoring results exceeded the preliminary objective, or in case no monitoring data were available when significant pressure was influencing the water body.

The assessment of risk analysis was performed for each category of risk independently. The results obtained were used as the basis for designating the resultant risk. It is set by the risk category with the most unfavourable assessment.

The current status is represented by data from the period 2001-2002.

Table 2 Provisional objectives for chemical status

Type of element	CAS	Chemical substance	CODE	Symbol	Unit	Limit	Statistical value	Criterion of objective selection
	Volatile organic substances							
		Aromatic hydrocarbons						
R, A	71-43-2	benzene	K22	BENZEN				
	541-73-1	1,3-dichlorobenzene	K28	1,3-DCB	µg/l	1	max	limit - GD No.491/2002 Coll.
	106-46-7	1,4-dichlorobenzene	K29	1,4-DCB	µg/l	1	max	limit - GD No.491/2002 Coll.
	95-50-1	1,2-dichlorobenzene	K30	1,2-DCB	µg/l	1	max	limit - GD No.491/2002 Coll.
R	108-88-3	toluene	K23	TOLUEN	µg/l	50	max	limit - GD No.491/2002 Coll.
	108-90-7	chlorobenzene	K25	CHLORBENZEN (CB)	µg/l	10	max	limit - GD No.491/2002 Coll.
		Halogenic hydrocarbons						
	74-34-3	1,1-dichloroethane	L41	1,1-DCEAN	µg/l			
	75-35-4	1,1-dichloroethene	L22	1,1-DCEEN	µg/l			
R, A, B	67-66-3	trichloromethane	L23	CHLOROFORM	µg/l	270/12	max/mean	limit - EQS EU
R, A, B	107-06-2	1,2-dichlorethane	L24	1,2-DCEAN	µg/l	1180/10	max/mean	limit - EQS EU
	71-55-6	1,1,1-trichloroethane	L25	TCEAN	µg/l			
R	79-00-5	1,1,2-trichloroethane	L26	1,1,2-TCEAN	µg/l	1	max	limit - GD No.491/2002 Coll.
B	56-23-5	tetrachloromethane	L27	CCL4	µg/l	12	max	limit - GD No.491/2002 Coll.
R, B	79-01-6	1,1,2-trichloroethylene	L28	1,1,2-TCE	µg/l	10	max	limit - GD No.491/2002 Coll.
R, B	127-18-4	1,1,2,2-tetrachloroethylene	L29	pCE	µg/l	10	max	limit - GD No.491/2002 Coll.
	683-53-4	bromodichloromethane	L30		µg/l			
	124-48-1	chlorodibromomethane	L31		µg/l			
	75-25-2	tribromomethane	L32		µg/l			
	78-87-5	1,2-dichloropropane	L36		µg/l			
A	75-09-2	dichloromethane	L37	DCM	µg/l	1900/20	max/mean	limit - EQS EU
	540-59-0	1,2-dichloroethylene	L40	1,2-DCEEN	µg/l	0,4	max	limit - GD No.491/2002 Coll.
	10061-01-5	cis 1,3-dichloropropene	L42		µg/l			

Type of element	CAS	Chemical substance	CODE	Symbol	Unit	Limit	Statistical value	Criterion of objective selection
	10061-02-6	trans 1,3-dichloropropene	L43		µg/l			
	79-34-5	1,1,2,2-tetrachloroethane	L44		µg/l	10	max	limit - GD No.491/2002 Coll.
A,N	85535-84-8	C10-C13 chloroalcanes						
		Polyaromatic hydrocarbons	M21	PAU				
R, A	206-44-0	fluoroanthene	M23	FLUORANTEN	µg/l	0,9/0,09	max/mean	limit - EQS EU
R	85-01-8	phenanthrene	M24	FENANTREN	µg/l	0,03	mean	limit - PNEC ČZ
	86-73-7	fluorene	M25	FLUOREN	µg/l			
R,A	120-12-7	anthracene	M26	ANTRACEN	µg/l	0,4/0,1	max/mean	limit - EQS EU
	129-00-0	pyrene	M27	PYREN	µg/l			
	208-96-8	acenaphthylene	M28		µg/l			
	83-32-9	acenaphthene	M29		µg/l			
	218-01-9	chryzene	M30	CHRYSEN	µg/l			
	polyaromatic hydrocarbons							
R, A	50-32-8	benzo (a) pyrene	M22	B-A-PYREN	µg/l	0,05	mean	limit - EQS EU
R, A	205-99-2	benzo (b) fluoroanthene	M32	B-B-FLUORANT	µg/l	0,03	mean	limit - EQS EU
R, A	191-24-2	benzo (g,h,i) perylene	M36	B-GHI-PERYL	µg/l	0,016	mean	limit - EQS EU
R, A	207-08-9	benzo (k) fluoroanthene	M33	B-K-FLUORANT	µg/l	0,03	mean	limit - EQS EU
R, A	193-39-5	indeno (1,2,3-cd) pyrene	M37	IN-123-CDPYREN	µg/l	0,016	mean	limit - EQS EU
	56-55-3	benzo (a) anthracene	M31	B-A-ANTRACEN	µg/l			
		benzo (c) fluoroanthene	M34	B-C-FLUORANT	µg/l			
R, A	91-20-3	naphtalene	M35	NAFTALEN	µg/l	80/2,4	max/mean	limit - EQS EU
	53-70-3	dibenzo (a,h) anthracene	M38	DIB-AH-ANTR	µg/l			
		Halogenic aromatic hydrocarbons						
A,N		bromed diphenyletheres						
		Chlorinated pesticides						
	76-44-8	heptachlor	P28					
R,B	DDT (sum P36 - P39)				mg/l	25	max	limit - GD No.491/2002 Coll.

Type of element	CAS	Chemical substance	CODE	Symbol	Unit	Limit	Statistical value	Criterion of objective selection
R, B	50-29-3	p,p-DDT	P37	p,p-DDT	µg/l	10	max	limit - GD No.491/2002 Coll.
R, B	53-19-0	o,p-DDD	P36	o,p-DDD				limit - GD No.491/2002 Coll.
R, B	3424-82-6	o,p-DDE	P38	o,p-DDE				limit - GD No.491/2002 Coll.
R, B	789-02-6	o,p-DDT	P39	o,p-DDT				limit - GD No.491/2002 Coll.
	72-43-5	methoxychlor	P35					
R, A, B	118-74-1	hexachlorobenzene	P22	HCB	µg/l	0,05/0,0004	max/mean	limit - EQS EU
R, A, B	608-73-1	hexachlorocyclohexane (sum P23-P26)		HCH	µg/l	0,04/0,02	max/mean	limit - EQS EU
R, A	58-89-9	lindane (gamma-hexachlorocyclohexane)	P25	G-HCH	µg/l			
A	319-84-6	alfa-hexachlorocyclohexane	P23	A-HCH	µg/l			
A	319-85-7	beta-hexachlorocyclohexane	P24	B-HCH	µg/l			
	319-86-8	delta-hexachlorocyclohexane	P26	D-HCH	µg/l			
B	309-00-2	aldrin	P29	ALDRIN	µg/l	10	max	limit - GD No.491/2002 Coll.
B	60-57-1	dieldrin	P32	DIELDRIN	µg/l	10	max	limit - GD No.491/2002 Coll.
B	72-20-8	endrin	P33	ENDRIN	µg/l	5	max	limit - GD No.491/2002 Coll.
A	115-29-7	**endosulphane**	P52	ENDOSULFAN	µg/l	0,01/0,005	max/mean	limit - EQS EU
	959-98-8	alfa-endosulphane		A-ENDOSULFAN	µg/l	0,01/0,005	max/mean	limit - EQS EU
B	465-73-6	isodrin	P53	ISODRIN	µg/l	0,005	max	limit - GD No.491/2002 Coll.
A, B	87-68-3	hexachlorobutadiene	P54	HCBD	µg/l	0,6/0,003	max/mean	limit - EQS EU
B	12002-48-1	trichlorobenzenes	P55	TCB	µg/l	50/0,4	max/mean	limit - EQS EU
R, A, B	120-82-1	1,2,4-trichlorobenzene	P56	1,2,4-TCB	µg/l	50/0,4	max/mean	limit - EQS EU
B	108-70-3	1,3,5-trichlorobenzene	P57	1,3,5-TCB	µg/l	50/0,4	max/mean	limit - EQS EU
A	608-93-5	pentachlorobenzene	P59	PENTACBENZEN	µg/l	1/0,003	max/mean	limit - EQS EU
R	1336-36-3	**Polychlorinated biphenyles**	Q21	PCB	µg/l	0,01	max	limit - GD No.491/2002 Coll.
R		Delor 103	Q22	Delor 103	µg/l			
R		Delor 106	Q23	Delor 106	µg/l			
R		PCB No. 8	Q24	PCB8	µg/l			

Type of element	CAS	Chemical substance	CODE	Symbol	Unit	Limit	Statistical value	Criterion of objective selection
R		PCB No. 28	Q25	PCB28	µg/l			
R	35693-99-3	PCB No. 52	Q26	PCB52	µg/l			
R	37680-73-2	PCB No. 101	Q27	PCB101	µg/l			
R	31508-00-6	PCB No. 118	Q28	PCB118	µg/l			
R	35065-28-2	PCB No. 138	Q29	PCB138	µg/l			
R	35065-27-1	PCB No. 153	Q30	PCB153	µg/l			
R	35065-29-3	PCB No. 180	Q31	PCB180	µg/l			
R		PCB No. 203	Q32	PCB203	µg/l			
		Triazine herbicides						
	7287-19-6	prometryn	R23		µg/l			
	886-50-0	terbutryn	R28	TERBUTRYN	µg/l			
A	1912-24-9	atrazin	R22	ATRAZIN (ATZ)	µg/l	2,9/0,6	max/mean	limit - EQS EU
	834-12-8	ametryn	R24		µg/l			
R, A	122-34-9	simazin	R27	SIMAZIN	µg/l	3,4/0,7	max/mean	limit - EQS EU
		Aniline herbicides						
R, A,N	15972-60-8	alachlor		ALACHLOR				
		Dinitroaniline herbicides						
R, A,N	1582-09-8	trifluralin		TRIFLURALIN				
		Urea herbicides						
A,N	330-54-1	diuron						
R, A,N	34123-59-6	izoproturon		MOCOVINA				
		Organophosphate insecticides						
R, A,N	2921-88-2	chloropyrifos		CHLORPYRIFOS				
A,N	470-90-6	chlorofenvinfos						
		Metals						
R, A, B	7439-97-6	mercury and its compounds	D01	HG	µg/l	0,2	c90	limit - GD No.491/2002 Coll.
R, A, B	7440-43-9	cadmium and its compounds	D02	CD	µg/l	5	c90	limit - GD No.491/2002 Coll.

Type of element	CAS	Chemical substance	CODE	Symbol	Unit	Limit	Statistical value	Criterion of objective selection
R, A	7439-92-1	lead and its compounds	D03	PB	µg/l	20	c90	limit - GD No.491/2002 Coll.
R	7440-38-2	arsenic and its compounds	D04	AS	µg/l	30	c90	limit - GD No.491/2002 Coll.
R	7440-50-8	copper and its compounds	D05	CU	µg/l	20	c90	limit - GD No.491/2002 Coll.
R	7440-47-3	total chrome and its compounds	D06	Cr-celk.	µg/l	100	c90	limit - GD No.491/2002 Coll.
R, A	7440-02-0	nickel and its compounds	D09	NI	µg/l	20	c90	limit - GD No.491/2002 Coll.
R	7440-66-6	zinc and its compounds	D10	ZN	µg/l	100	c90	limit - GD No.491/2002 Coll.
	7440-39-3	barium	D25	BA	µg/l			
	7429-90-5	aluminium	D26	AL	µg/l	200	c90	limit - GD No.491/2002 Coll.
		Chlorinated phenoles	H21					
A, B	87-86-5	pentachloropfenol	H25	PCP	µg/l	1/0,2	max/mean	limit - EQS EU
		Phtalates						
R, A	117-81-7	di(2-ethylhexyl)phthalate	N21	DEHP	µg/l	1,3	mean	limit - EQS EU
R	84-74-2	dibutylphtalate	N22		µg/l	1	mean	limit LOQ
		Phenoles						
R, A,N	25154-52-3	nonylpfenoles						
	104-40-5	4-(para)-nonylpfenol						
R, A,N	1806-26-4	oktylpfenoles						
	140-66-9	para-tert-oktylpfenol						
		Organo-metallic compounds						
A,N	688-73-3	tributyltin compounds						
A,N		cations						

Legend:
R – Dangerous substance – relevant for SR
A – Substance from the list of priority substances - WFD 2000/60/EC, Annex X
B - Substance of Annex IX WFD 2000/60/EC (Annex 7 GD No. 491/2002 Coll.)
N – Non monitored parameters
sum PCB - congeners PCB No.8,28,52,101,118,138,153,180

ANNEX 11

Water Uses and Sources of Water Used for Different Water Users

Background Information for Chapter 6 – Water Uses of the ` Analysis of the Tisza River Basin – 2007`

Water uses in the Tisza River Basin

The water resources of the Tisza River Basin are mainly used for public water supply, irrigation and industrial purposes, but also for other agricultural uses, such as fishery, and recreation.

Analyses were made in the framework of the ICPDR Tisza Group on the present water uses of the public water supply for agriculture irrigation or other agricultural use, as well as for industrial purposes where the average value for three years (2002-2004) was analysed. **Annex** includes detailed background information on the water quantity used by various users as well as figures on the sources of water related to water uses based on the collected data.

Based on the `*average total water quantities annually used by the given users*` and the `*percentage of the estimated consumptive use*[1]` initial calculations were done by the Tisza Group experts, which gave the estimated consumptive uses by the various water users (million m^3).

[1] **Consumptive use :** Water abstracted which is no longer available for use because it has evaporated, transpired, been incorporated into products and crops, or consumed by man or livestock. Water losses due to leakages during the transport of water between the point or points of abstraction and the point or points of use are excluded. Definition source Joint OECD/Eurostat questionnaire 2002 on the state of the environment, section on inland waters.

The present table gives background information related to Figure III.1a.

Water use (10^6 m^3)		Irrigation	Other agricultural use	Public water supply	Water supply of industry	Cooling of plants	Total water use
Total water used		**252.81**	**452.91**	**749.84**	**2,343.33**	**1,652.80**	**5,451.70**
Consumptive use*		**250.00**	**50.00**	**110.00**	**230.00**	**80.00**	**720.00**
Sources of water	**Surface water**	**196.39**	**382.75**	**337.73**	**1,876.95**	**1,433.11**	**4,226.93**
	Rivers	65.27	194.28	331.20	1,592.48	1,253.10	3,436.32
	Canals	112.68	177.85	3.76	204.60	178.92	677.81
	Reservoirs	18.44	10.62	2.77	79.88	1.09	112.81
	Groundwater	**56.42**	**70.16**	**412.12**	**466.38**	**219.69**	**1,224.77**
	Springs	0.07	2.03	17.89	26.31	0.00	46.30
	Alluvial aquifers	8.33	15.41	146.35	26.56	0.91	197.57
	Deeper aquifers	48.03	52.72	247.88	413.50	218.78	980.90

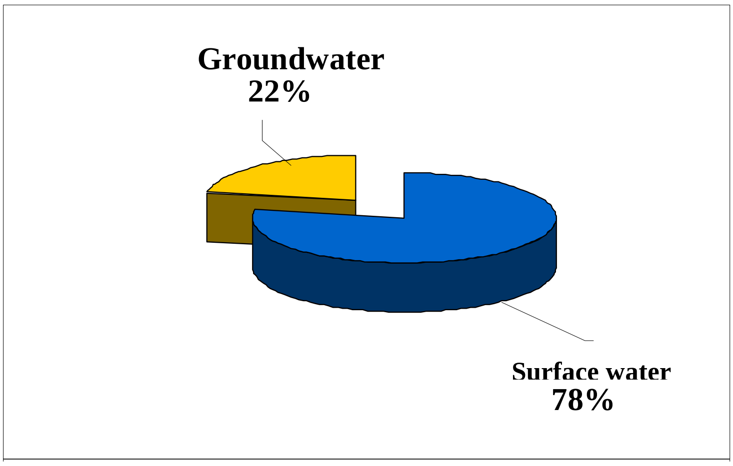
*Expert judgement

Irrigation

Table on Quantity of water used for irrigation

Country	UA	RO	HU	SK	RS	Total
Areas under irrigation systems	15	249,000	142,201	40,907	64,552	496,675
Average areas annually irrigated in last 3 years (ha)	13	10,880	76,881	15,086	31,280	134,140
Average water quantity annually used for irrigation in last 3 years per hectare (m^3 per ha)	7,333	1,811	1,142	113	2,200	12,599
Average total water quantities annually used for irrigation in last 3 years (10^6 m^3)	0.11	19.7	163	1.2	68.8	252.81
Estimation of consumptive use (%)	90	100	85-90	100	80-85	Calculation with 100%*

*Expert judgement



Sources of water used for irrigation

Other agricultural use (livestock farms, fish production, etc.

Table on Quantity of water used for other agricultural use

Country	UA	RO	HU	SK	RS	Total
Average water quantities annually used for livestock farms for last 3 years (10^6 m^3)	2.7	5.9	15	2.9	18.2	44.24
Estimation of consumptive use (%)	80	67	-	23	12	
Average water quantities annually used for fish production for last 3 years (10^6 m^3)	10.5	125.4	117.0	-	142.2	395.1
Estimation of consumptive use (%)	4	16	-	-	5	
Average water quantities annually used for other agricultural uses for last 3 years (10^6 m^3)	0.1	-	13	-	-	13.1
Estimation of consumptive use (%)	90	-	80	-	-	Calculation with 10%*

*Expert judgement

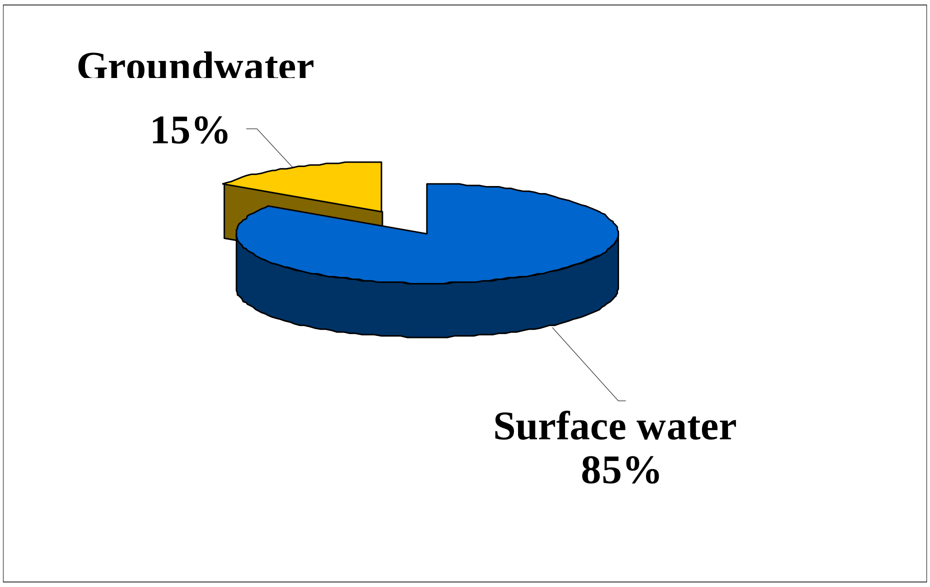


Figure on Sources of water used for other agricultural purposes

Public water supply

Table on Quantity of water used for public water supply

Country	UA	RO	HU	SK	RS	Total
Total capacity of public water supply systems (m^3/s)	1.6	42.1	9.0	5.8	4.7	63.2
Average water quantities annually used for public water supply for last 3 years (10^6 m^3)	25.0	388.7	187.0	91.1	58.1	749.9
Estimation of consumptive use (%)	20	11.7	15	14	20	Calculation with 15%*

*Expert judgement

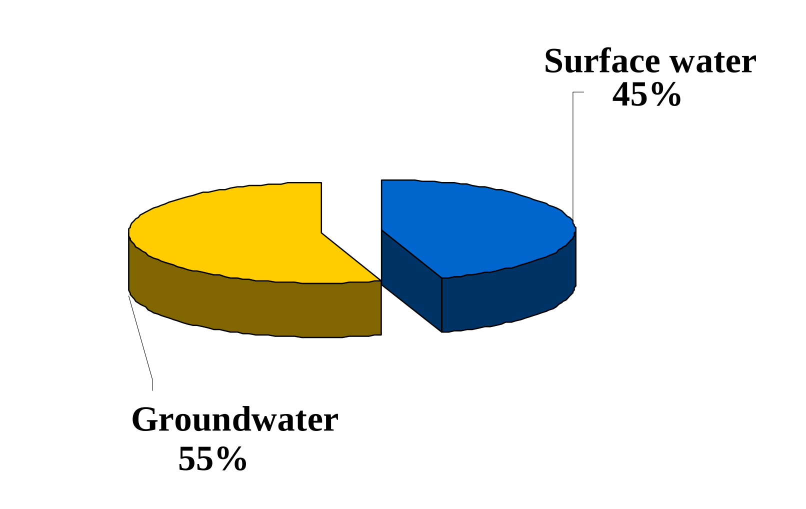


Figure on Sources of water for public water supply

Water supply of industry - including thermal power plant cooling

Table on Quantity of water used for water supply of industry

Country	UA	RO	HU	SK	RS	Total
Total capacity of industrial water supply systems (m^3/s)	0.2	185.8	5	21.3	0.6	212.9
Average water quantities annually used for industrial water supply for last 3 years (10^6 m^3)	2.0	1,380.0	628	315.0	19.9	2,345
Estimation of consumptive use (%)	43	8	10	7	10	Calculation with 10%*

*Expert judgement

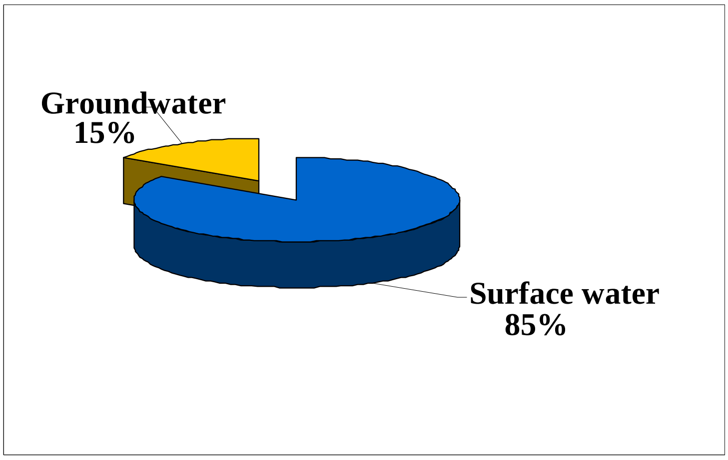


Figure on Sources of water used for industry

Table Quantity of water required for cooling of plants

Country	UA	RO	HU	SK	RS	Total
Average water quantities annually used for thermal power plant cooling for last 3 years (10^6 m^3)	-	909.0	497	246.8	-	1,652.8
Estimation of consumptive use (%)	-	4.7	4.8	5.0	-	Calculation with 5%*

*Expert judgement

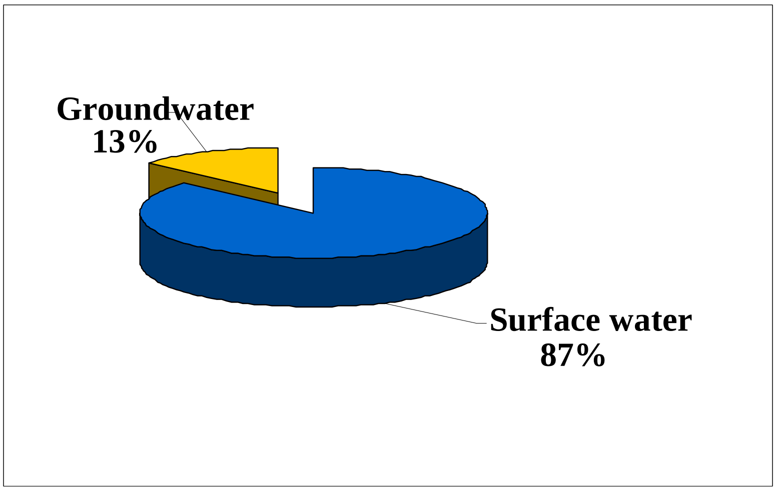


Figure on Sources of water used for cooling of thermal power plants

Scenario for 2015 – water demand

The present table gives background information related to Figure III.1b.

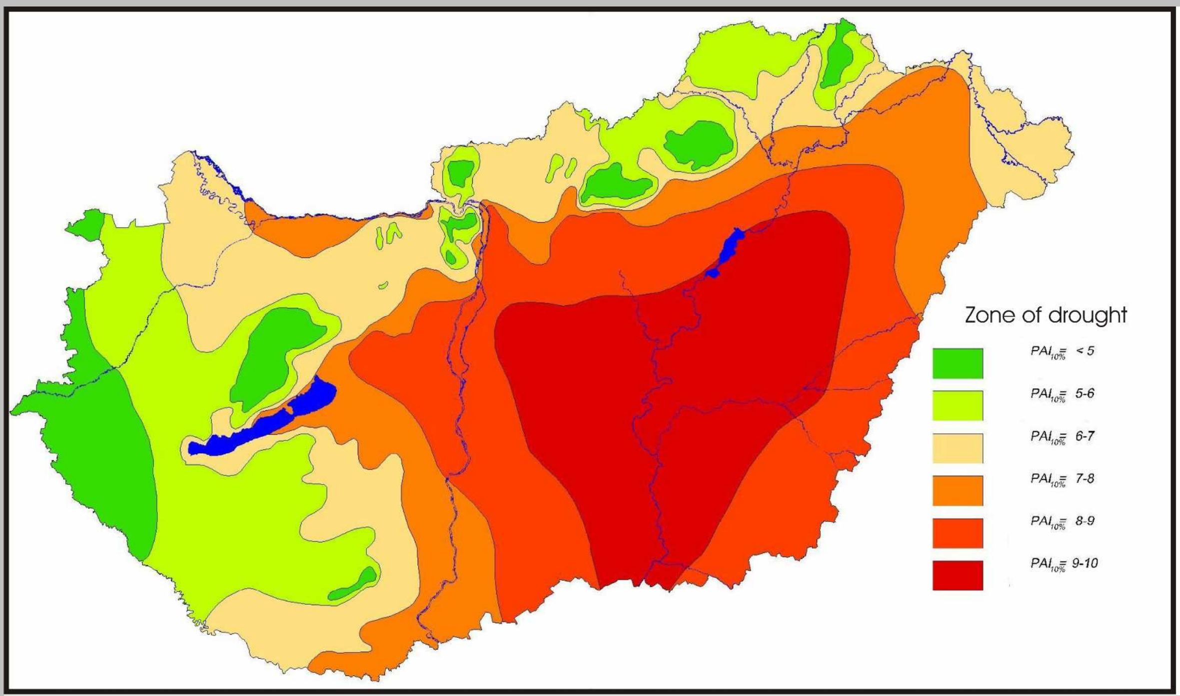
Water use (10^6 m^3) scenario 2015

		Irrigation	Other agricultural use	Public water supply	Water supply of industry	Cooling of plants	Total water use
	Estimated total water use	**1.214,43**	**980,00**	**1.000,40**	**10.699,16**	**1.668,80**	**15.562,80**
	Consumptive use*	**950,00**	**100,00**	**140,00**	**120,00**	**80,00**	**1.390,00**
Sources of water	**Surface water**	**1.107,99**	**901,48**	**488,71**	**5.560,51**	**1.443,22**	**9.501,90**
	Rivers	492,12	599,84	438,89	4.603,67	1.257,06	7.391,59
	Canals	579,76	294,94	25,42	941,27	185,04	2.026,43
	Reservoirs	36,10	6,69	24,40	15,56	1,13	83,88
	Groundwater	**106,45**	**78,52**	**511,69**	**5.138,66**	**225,58**	**6.060,90**
	Springs	0,05	2,60	22,02	81,03	0,00	105,71
	Alluvial aquifers	48,92	37,33	33,47	89,87	0,91	210,50
	Deeper aquifers	57,47	38,59	456,20	4.967,75	224,67	5.744,69

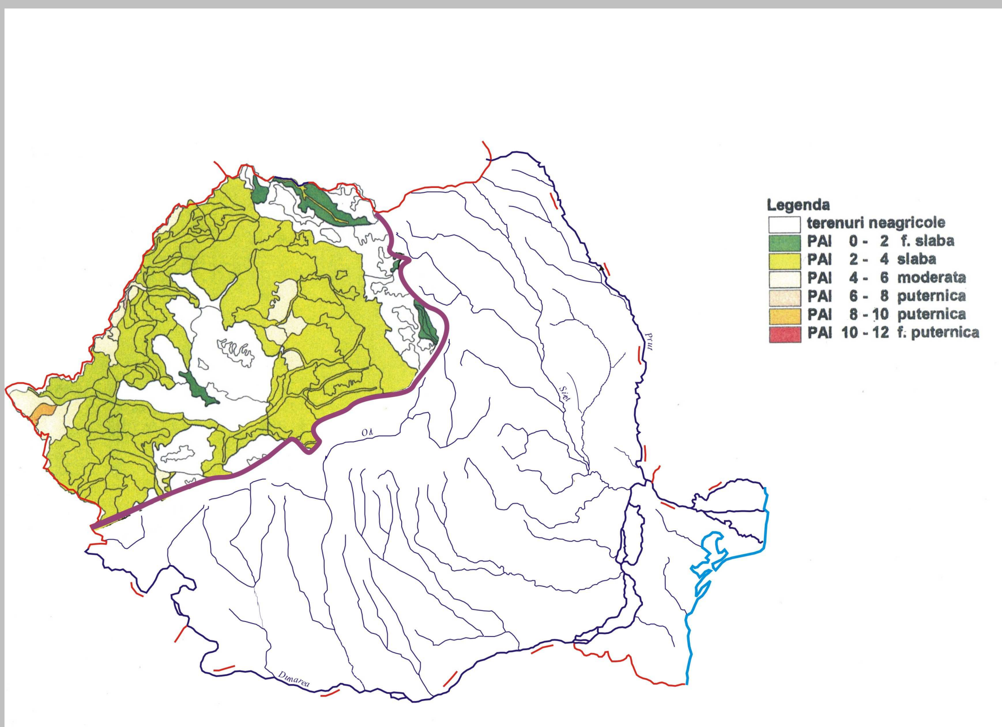
*Expert judgement

Annex 12

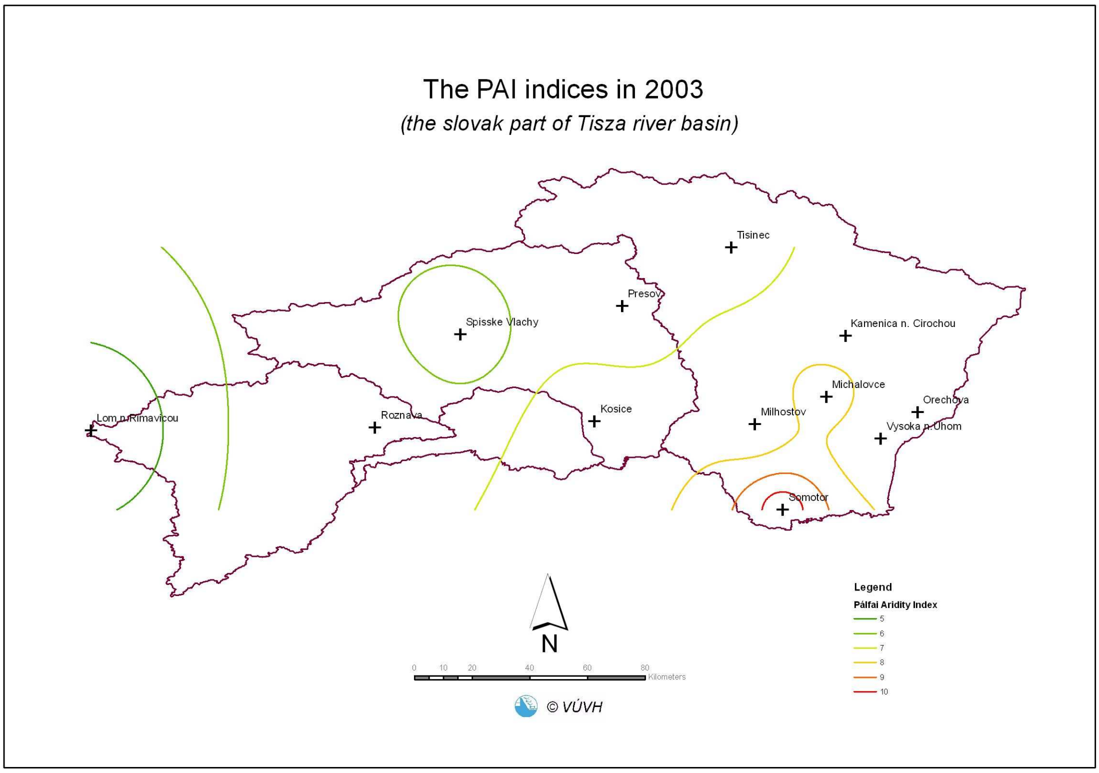
PAI Index in Hungary, Romania and Slovak Republic



PAI – Hungary



PAI – Romania Map of the areas with different drought intensities established on the basis of the Palfay



PAI – Slovakia (2003)

For the evaluation **of Slovak part** of the Tisza river basin according to Palfai Aridity index (PAI), by means of which the extent of draught can be evaluated, the data from 12 climatological stations from period 1994 – 2005 were used. Based on the evaluation it can be concluded that from the evaluated period the most unfavourable year was agricultural year 2003. PAI values were in range from 4.4 to 10.4. The most of the Slovak Tisza river basin territory was classified as “moderate draught”, with exception of stations Somotor (situated in vicinity of Bodrog river) with value of 10.4 which means “severe draught“ and Michalovce (Laborec valley) with value of 8.41 as “medium draught”.

Return periods were not calculated.

Annex 13

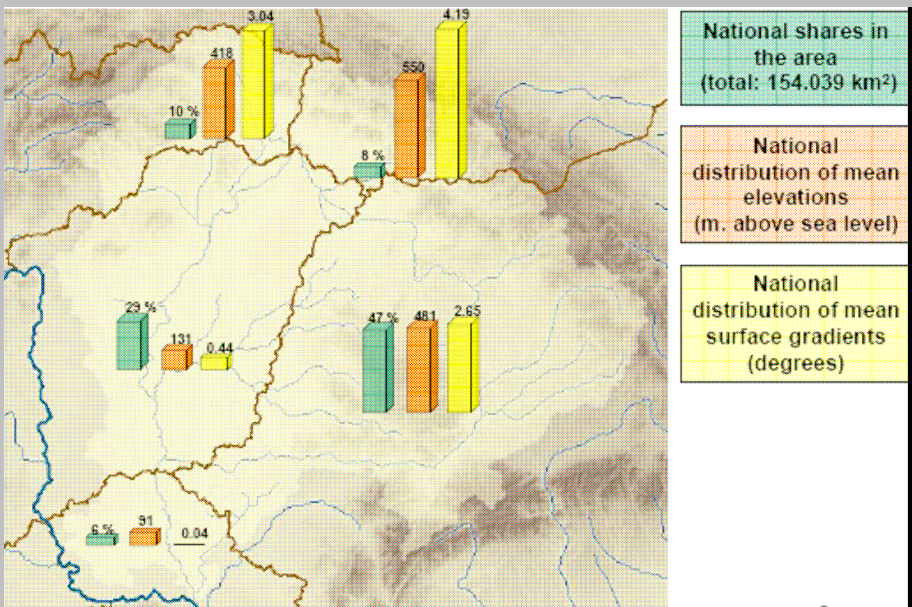
Territorial Distribution, National Distribution of Mean Elevations and Surface Gradients, Amount of Water Transfer among Tisza Countries

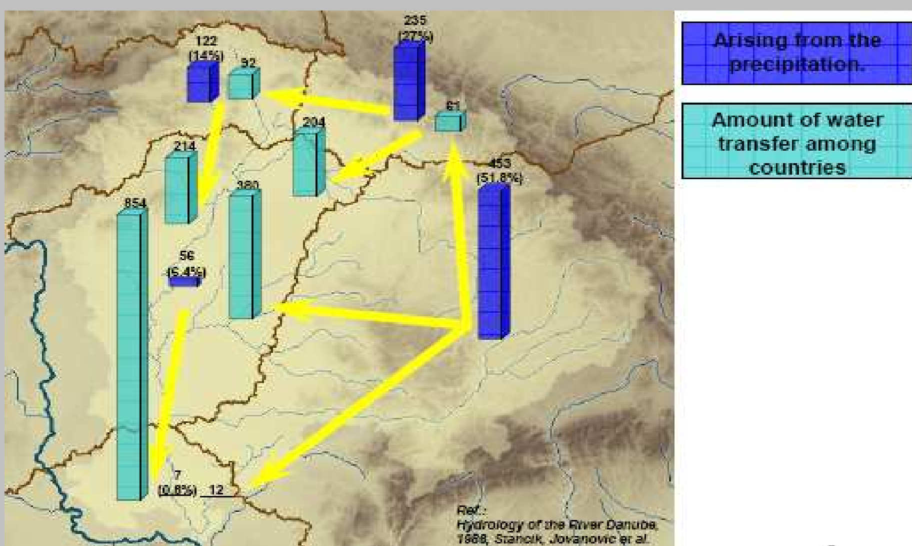
Territorial distribution, national distribution of mean elevations and surface gradients, amount of water transfer among Tisza countries

Mean elevation and mean surface gradient (slope) indicate dissection of the terrain and thus give the source of natural hazards, especially floods. The higher values imply sources of a higher risk.

Not only the elevation and the surface slope but also the average surface water resources budget was analysed along the river Tisza based on data of "Hydrology of the River Danube, 1988" (Stancik, Jovanovic et al.). Results of the referred source were controlled by up-to-date modelling tool, the DIWA distributed rainfall runoff model (Szabó, 2007) and were found correct with some slight deviation.

Below the national water balance for the Tisza catchment is summarized. The rate of runoff from the contributing catchments varies substantially along the route of the Tisza. A significant proportion of the rainfall contributing to this runoff falls on the upper catchment (Upper-Tisza).





(Figures/data, introduced in the present BOX are not correlated with other parts of the Report)
Information based on data of Szabó, J. A. (2007): Decision Supporting Hydrological Model for River Basin Flood Control.

ANNEX 14 - List of Hydropower Plants in the Tisza River Basin

Overwiew of hydropover industry with installed capacity

Country	Name	River	Installed capacity (MW)	Installed discharge (m^3/s)	Production in year 2005 (GWh/year)	Remark
Ukraine	Tereblya-Ritska	Tereblya, Rika	27	6	107.259	
Ukraine	Onokivska	Uzh	2.65	22	2.601	
Ukraine	Uzhgorodska	Uzh	1.9	22	2.466	
Ukraine	Bilyn	Il'min	0.5	-	-	Started to operate from June 2006
Romania	Tarnita	Somesul Cald	45	66	105	
Romania	Mariselu	Somesul Cald	220	60	497	
Romania	Galceag	Sebes	150	40	260	
Romania	Somesul Cald	Somesul Cald	12	70	26.6	
Romania	Sugag	Sebes	150	51.6	260	
Romania	Remeti	Dragan	100	40	200	
Romania	Ostrovu Mic	Raul Mare	15.9	90	22.8	
Romania	Retezat	Raul Mare	335	70	605	
Romania	Clopotiva	Raul Mare	14	70	24.5	
Romania	Sasciori	Sebes	42	52	80	
Romania	Carnesti I	Raul Mare	15.9	90	23	
Romania	Carnesti II	Raul Mare	11.5	90	16.7	
Romania	Colibita	Bistrita	21	15.5	40.2	
Romania	Munteni I	Dragan	58	49	115.4	
Romania	Paclisa	Raul Mare	15.9	90	23.3	
Romania	Totesti I	Raul Mare	15.9	90	23.1	
Romania	Ostrovul Mare	Raul Mare	15.9	90	23.1	
Romania	Tileagd	Crisul Repede	18	90	35.2	

Country	Name	River	Installed capacity (MW)	Installed discharge (m^3/s)	Production in year 2005 (GWh/year)	Remark
Romania	Lugasu	Crisul Repede	18	90	35	
Romania	Totesti II	Raul Mare	15.9	90	22.8	
Romania	Hateg	Raul Mare	15.9	90	21.5	
Romania	St. Maria Orlea	Raul Mare	11.5	90	15.4	
Romania	Fughiu	Crisul Repede	10	90	20.5	
Romania	Sacadat	Crisul Repede	10	90	20.5	
Romania	Bacia	Strei	14.5	100	22.5	
Romania	Bretea	Strei	16	100	31.7	
Romania	Blidari - Firiza	Firiza	8.7	21.6	20.3	
Romania	Ruieni	Bistra Marului	140	55.4	264	
Slovakia	Domaša	Ondava	12.4	50.0	11.85	below dam
Slovakia	PVE Ružín	Hornád	60.0	134.0	54.2	Pumped storage plant
Slovakia	PVE Dobšiná	Hnilec	24.0	9.0	62.03	Pumped storage plant
Hungary	Tiszalök	Tisza	11.5	300	56,0	
Hungary	Kisköre	Tisza	28	560	100,0	
Hungary	Kesznyéten	Hernád	4,4	40	22,8	

ANNEX 15 – Interannual Distribution of Monthly Discharges

Figure1 presents the interannual distribution of monthly discharges at 8 stations on the Tisza river, where significant changes of river discharge are present due to input from tributaries:

- Rahiv (UA),
- Tiszabecs (HU),
- Vasarosnameny (HU),
- Zahony (HU),
- Tiszalok (HU),
- Kiskore (HU),
- Szeged (HU), and
- Senta (RS)

Similar data for 6 stations at the main tributaries are given at Figure 2:

- Chop (UA, Latorica river),
- Satu Mare (RO, Somes river),
- Streda nad Bodrogom (SK, Bodrog river),
- Felsozholca (HU, Sajo river),
- Gyoma (HU, Harmas-Koros river), and
- Mako (HU, Maros river).

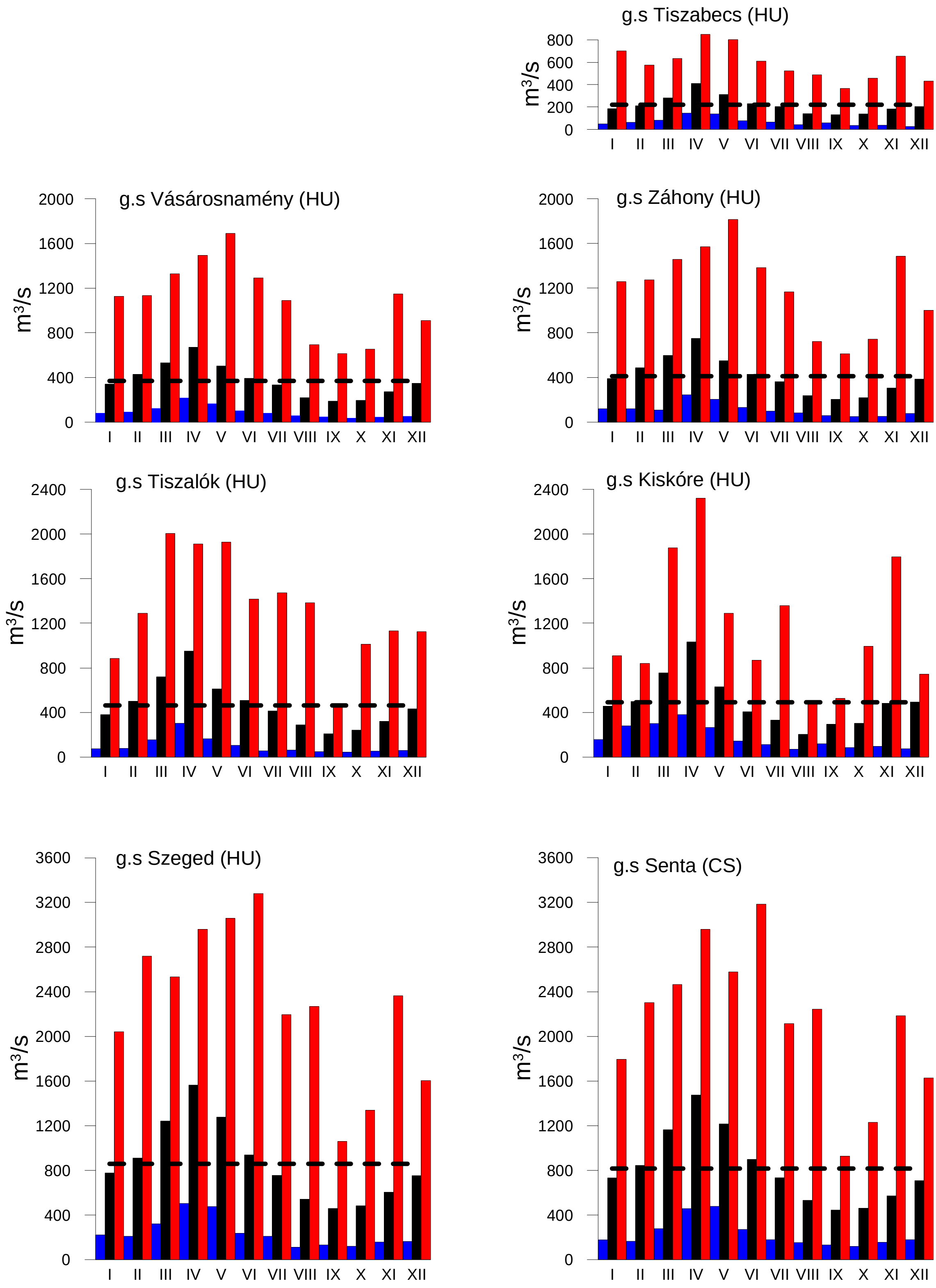


Figure 1: Interannual distribution of monthly mean, minimum and maximum discharges of the Tisza River (reference period 1955-2000)

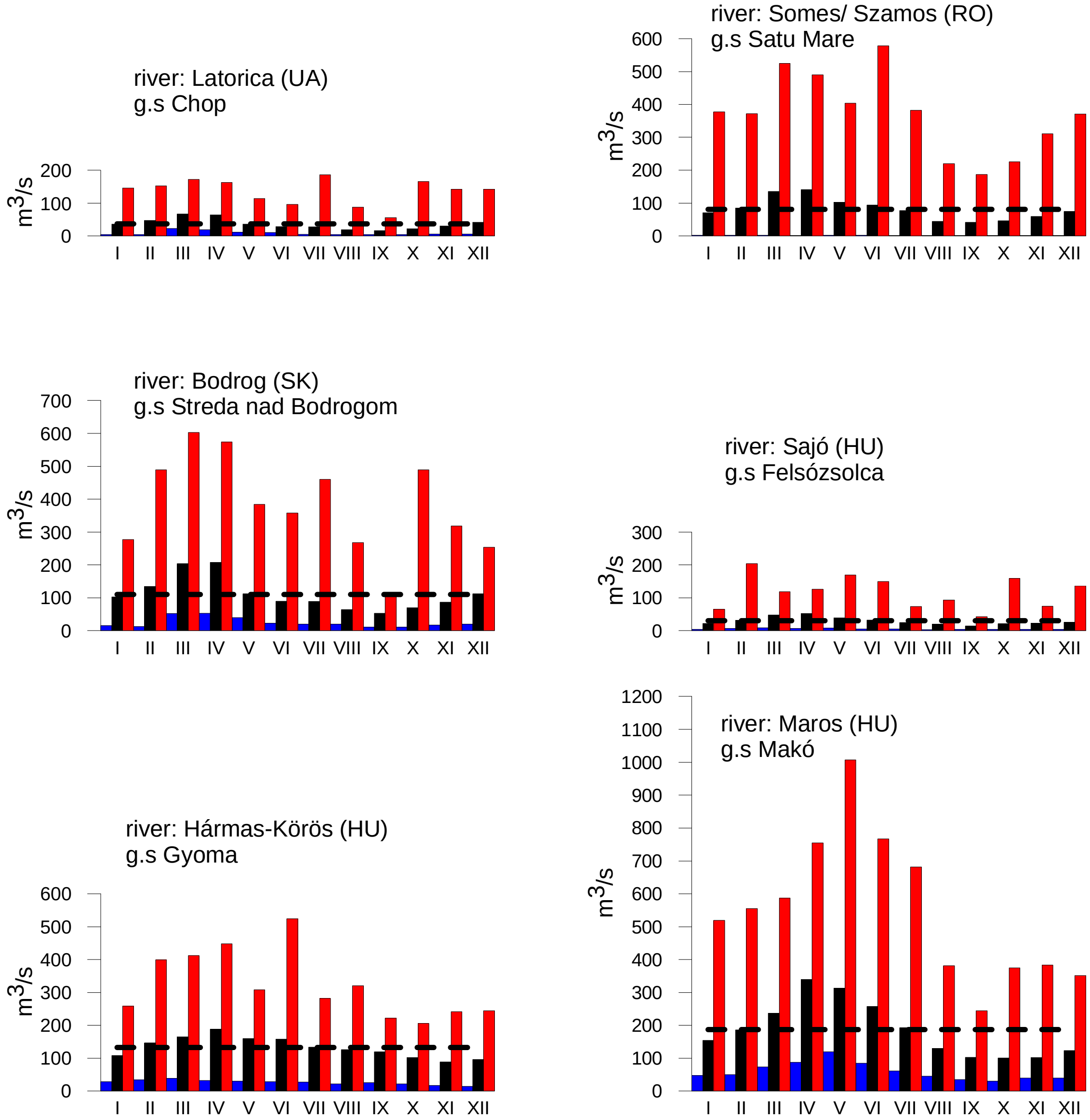


Figure 2: Interannual distribution of monthly mean, minimum and maximum discharges at selected gauging stations for the selected tributaries (reference period 1955-2000)

ANNEX 16

Flood risk assessment and management strategy for the development of flood action plans in the Tisza River Basin (version January 2008)

Prepared by Tóth Sándor chairman of the ICPDR Flood Protection Expert Group

Flood risk assessment and management strategy for the development of flood action plans in the Tisza River Basin[1]

[1] Document is prepared in the frame of the `TISAR – 2007` - EU Grant

1 Introduction

In December 2004, the ICPDR Ministerial Meeting adopted the ICPDR Action Programme on Sustainable Flood Protection in the Danube River Basin (DRB FAP). The DRB FAP laid down the basic principles, set the major targets of flood prevention, protection and mitigation for the entire Danube River Basin supplemented by some specific targets for its sub-basins. According to the DRB FAP the flood action plans are to be developed in the sub-basins, in cooperation of the countries sharing the given sub-basin, *'preferably by 2009'*. Content, structure as well as elements and influencing factors to be taken into account during the preparation of the action plans are defined by the DRB FAP. Implementation of the DRB FAP is ongoing, however, the activities related to the preparation of flood action plans are in delay in comparison with the deadline.

In the meantime the European Commission launched the European Flood Risk Management Planning Action Programme in 2004, which is based on three pillars, namely:

- co-ordination of information exchange and the promotion of best practices on flood prevention, protection and mitigation[2];
- ensuring that all relevant EU policies contribute to flood protection;
- development and implementation of a legal tool on the assessment and management of flood risks.

The Directive 2007/60/EC on the assessment and management of flood risks (EFD) has been prepared and entered into force on 26 November 2007.

With respect to the newly adopted Directive, the 10th Ordinary Meeting of the ICPDR held on 04-05 Dec 2007 in its Resolution 3.6. i) '*encourages the FP EG to finalize the technical upgrade of the ICPDR Action Programme on Sustainable Flood Protection in the Danube River Basin to ensure its full harmonization with the new EU Directive on the assessment and management of flood risks. Until its formal adoption possibly at the ICPDR Ministerial Meeting in 2010 the upgraded Action*

[2] Under this pillar three important exchange platforms were established:

EXCIFF – (Exchange **Ci**rcle on **F**lood **F**orecast), lead by France and EC–JRC main objective is to enable and facilitate the exchange of knowledge and experiences on flood forecasting, in Europe. Main objective is to enable and facilitate the exchange of knowledge and experiences on flood forecasting, in Europe. URL: http://exciff.jrc.it Publication: Good Practice for Delivering Flood-related Information to the General Public. May 2007.

EXCIMAP – (Exchange **Ci**rcle on Flood **Map**ping), lead by France and Switzerland, with the aim of compilation of a *Handbook on good practices of flood mapping in Europe* to support the implementation of the EU proposal on the Floods Directive. The handbook will be disseminated in early 2008.

EXCLUP – (Exchange **C**ircle on **L**and**u**se **P**lanning), lead by Norway and the Netherlands, with the aim of assessment and dissemination of good practices in the reduction of flood risks by adequate land use and spatial planning. The activity started in January 2007.

Programme will be used as a working document giving guidance to the flood prevention, protection and mitigation activities under the ICPDR.'

Nevertheless, the flood action plans (in the terminology of the EFD: flood risk management plans) are result of a strict sequence of deliverables, namely

– a *preliminary flood risk assessment* shall be undertaken with the aim of identifying those areas which are prone to flooding and where the consequences of flooding represent potential significant risk to human life and health, economic activity and the environment, taking into account the impacts of climate change and land uses on the occurrence of floods;

– preparation of *flood hazard and risk maps* for the areas defined above;

– based on the evaluation of the distribution of flood risk, *appropriate objectives of flood risk management are to be set*;

– based on the objectives determined and on the topographic, hydromorphological, land use, etc. conditions, *a good combination of non-structural and structural measures of flood risk management* are to be defined, their impacts, cost-benefit ratio are to be assessed and finally, the measures have to be prioritised.

These are the building blocks of the flood action plan; none of them can be skipped or left out.

From among the above tasks, especially the flood hazard and risk mapping is quite a costly exercise while the European Territorial Cooperation Programme (former INTERREG) in the South-East European Space (SEES) programme area, covering the Tisza River Basin, for the period of 2007-2013 will only be launched in March 2008 and followed by a two-step evaluation the start of the first selected projects cannot be expected before 2009.

In the following, an overview of the details of the above tasks and *a proposal for the development of the flood action plans* aiming at the implementation of a *sustainable flood risk management strategy in the Tisza River Basin* will be given, with the view of serving as a key input to the flood-related aspects of the final Integrated River Basin Management Plan of TRB to be delivered b*y the end of 2009*.

2 Preliminary flood risk assessment

Flood risks in certain areas, which are either not subject to flood hazard (no, or no significant inundation occur) or the consequences of inundation are limited, especially in thinly or unpopulated areas, also, where economic assets or ecological value are limited, could be considered not to be significant.

Therefore the EFD *prescribes* in Article 4 *the elaboration of the preliminary flood risk assessment* for each river basin district, or unit of management referred to in Article 3(2)(b), or portion of an international river basin district *with the aim* formulated in Article 5, e.g. *to identify those areas where potential significant flood risks exist or might be considered likely to occur*.

The *assessment of potential flood risks is to be based on available or readily derivable information*, such as records and studies on long term developments, in particular impacts of climate change on the occurrence of floods.

History of remarkable floods of only the past 100-120 years proves to be very rich; in average every 5th-6th year brought significant floods in different parts or sometimes across the Tisza River Basin. *A non-exhaustive list of significant floods of the past 120-150 years is given* in page 96 of the Preliminary Analysis Report of the Tisza River Basin 2007 prepared by the ICPDR. Available information on these events are of course different concerning the details, however, can serve as a good basis to describe and to draw conclusions of the most remarkable past floods which had significant adverse impacts on human lives, health, cultural heritage, economic activity and the environment.

The task will be to select from among the past significant floods those which are documented in historic and professional records as extreme events from the point of view of

– hydrometeorological characteristics,

– flood stages,

– extension and, if available, depth of inundation and

– the consequences they caused

in different parts of and/or across the TRB.

Historical maps, if available, flood marks, historical records and professional reports, etc. will be collected and analysed to identify the flood extent and the conveyance routes of the historical floods. Information on flood victims, damaged and destroyed houses, roads, railroads, bridges, etc. will be collected and analysed to identify the consequences of the given floods. Information related to the adverse impacts of floods on the environment will most probably be available in case of the most recent floods only.

An assessment of the likelihood of similar future events, taking also into consideration the expectable impacts of climate change, relying on estimations derived from the available information of the related IPCC research output, will be made. Flood conveyance routes and the extension of inundation of the expectable future extreme floods will be estimated based on the experiences of past floods, as well as relying on topography and the network of watercourses, their general hydrological and geo-morphological characteristics. Special attention will be paid to open and restorable floodplains as natural retention areas. The effectiveness of existing man-made flood defence infrastructures will also be examined, including their height, freeboard, and stability (safety) based on the recorded behaviour of these structures during extreme floods.

Concerning the potential future consequences of these floods not only the recent conditions of settlements, industrial, commercial and transport area, sensitive infrastructures and hot spots, but also the available information on long term development plans will be taken into account.

As a result of the above work, which will be done in close cooperation of the partners involving flood managers and spatial planners of the countries sharing the TRB, areas where potential significant flood risks exist or might be considered likely to occur will be identified and shown on uniform map of the river basin in digital format (to fulfil reporting formats of the EU WISE system) at appropriate scale enabling identification of potential flood area, indicating also topography and land use (utilising CORINE Land Cover) and the borders of the river basins, sub-basins.

These potential floodplains will be subject of flood hazard and risk mapping.

It is important to emphasize that *preliminary flood risk assessment is the only element* in the sequence of development of the flood action plan which can solely be based on available or readily derivable information, therefore the *preparation of which does not presume extreme costs and efforts*.

As the *Common Position of the ICPDR Workshop on Flood Risk Mapping in the Danube River Basin* held in Budapest, Hungary on September 12-13, 2007 formulates: 'Fast, cheap overview, … No high accuracy needed.'

3 Flood hazard and risk mapping

In order to have available an effective tool for information, as well as a valuable basis for priority setting and further technical, financial and political decisions regarding flood risk management, the EFD prescribes in Article 6 paragraph 1 the preparation of flood hazard maps and flood risk maps showing the potential adverse consequences associated with different flood scenarios, including information on potential sources of environmental pollution as a consequence of floods.

Flood maps are indispensable tools to show information about hazards, vulnerabilities and risks in a particular area, thus contributing to

- raising of the awareness and preparedness of the general public regarding flood hazards on sub-basin-wide and local scale;
- promotion of appropriate land uses across the river basin to slow down run off and in the flood prone areas to reduce damage potential, enabling a sustainable flood risk management strategy supported by adequate land use and spatial planning practice..

Flood hazard maps and flood risk maps have to be prepared at the most appropriate scale for the areas identified as a result of preliminary flood risk assessment. Requirements of these maps as outlined in paragraphs 3, 4 and 5, together with the Common Position of the ICPDR Flood Mapping Workshop are summarized in the following table:

Article	Topic	Common position on minimum requirement
6	3. <u>Flood hazard maps</u> shall cover the geographical areas which could be flooded according to the *following scenarios:*	High resolution digital map with the thematic content of 1:10.000 maps, recommended scales for local/regional/national maps and different purposes in *EXCIMAP Handbook of good practices for flood mapping in Europe*
	(a) floods with a low probability, or extreme event scenarios;	return period =1000 years; extreme event: case by case
	(b) floods with a medium probability (likely return period ≥ 100 years);	return period =100 years;
	(c) floods with a high probability, where appropriate.	Relevant mostly in case of open floodplains, return period: to be determined case by case
<u>Remark</u>: determination of the *synthetic* flood hydrographs of 0,1% and 1% probability based on harmonised methodology is needed, they cannot be derived from records of past events, being the available data inhomogeneous due to different morphological and flood propagation conditions!		
6	4. Elements to be shown for each scenario:	
	(a) the flood extent;	<u>Recommendations concerning tools</u>:

		• DEM derived from high accuracy topographical survey (*see recommendations in GEODIS presentation*); • hydrodynamic modelling tools: *FLOODsite Task 8 presentation (Karin de Bruijn) on comparison of different tools / purposes* to take into account.
	(b) water depths or water level, as appropriate;	Depth step to be shown: 0,5 m or suitable multiples of 0.5 m where appropriate, based at map purpose and user requirements.
	(c) where appropriate, the flow velocity or the relevant water flow.	Case by case – (for good practice see *EXCIMAP Handbook*)
	5. <u>Flood risk maps</u> – potential adverse consequences expressed in terms of the following:	
	(a) the indicative number of inhabitants potentially affected;	Statistically recorded inhabitants, affected in each separate flood area, by CORINE Land Use categories

	(b) type of economic activity of the area potentially affected;	Simplified classification (based on CORINE categories – except for elements in *italics*):
		• Urban fabric (residential area)
		    • Continuous urban fabric (metropolitan area, historical centre)
		    • Discontinuous urban fabric (garden city, suburb, rural, resort/recreation and special)
		    • Sport and leisure facilities
		    • Sensitive social hot spots (kindergarten, school, hospital, elderly home)
		• Industrial, commercial and transport
		    • Industrial or commercial units
		    • transportation infrastructure (road and rail network, port, airport) and associated land
		• essential services and infrastructure (water supply, sewer, wastewater treatment, gas, electricity, communication)
		• agricultural
		    • arable land,
		    • permanent crops,
		    • pastures,
		    • heterogeneous areas
		• forest
		• wetland
		• water
		• flood defences and infrastructure of emergency services

	(c) installations as referred to in Annex I to Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control which might cause accidental pollution in case of flooding and potentially affected protected areas identified in Annex IV(1)(i), (iii) and (v) to	Task of Accidental Pollution WG of ICPDR Protected areas to be identified by River Basin Management EG

	Directive 2000/60/EC;	of ICPDR
	(d) other information which the MS considers useful such as areas where floods with a high content of transported sediments and debris floods can occur and information on other significant sources of pollution.	Pollution sources: Task of Accidental Pollution WG of ICPDR

The EXCIMAP Handbook of Good Practices for flood mapping in Europe serves with optional solutions beyond the minimum requirements.

Outputs of the workshop

Beyond some recommendations mentioned among the minimum requirements, concerning methodologies in flood risk assessment several presentations (A. Thieken, V. Meyer, P. Stepankova, A. Stegmaier) served with details; as a general recommendation, macro- and mezoscale assessment methodologies are to be taken into account primarily.

The presentations delivered are available on the DANUBIS www.icpdr.org *in the internal area* (password needed!): Expert groups\FPEG Working Area\ ICPDR Flood Action Programme\Flood risk mapping\ICPDR Flood Risk Mapping Workshop\Presentations.

Complexity of the preparation of flood hazard and risk maps is clearly visible from the above table and of course, requires the clarification and harmonisation (sometimes even standardisation) of further details. Nevertheless, *it also has to be beard in mind that,* derived from the definition of 'flood' in Article 2 paragraph 1 of the EFD and from the reference to groundwater flooding in Article 6 paragraph 7, *the Directive covers all kind of inundations of natural origin consequently excess water* (undrained run off) *as well.*

It is advisable to establish specialised task groups to deal with the following issues, parallel with the preparation of the preliminary flood risk assessment, in order *to prepare for a harmonised, effective, objective oriented flood mapping:*

Mapping and GIS applications

– Methodological issues and requirements, including quality, sensitivity and cost efficiency analysis of different applications of different accuracy and resolution, to support the preparation/acquisition/selection of digital maps and digital elevation models (DEM) of required accuracy;

– Methodological issues and requirements, including quality, sensitivity and cost efficiency analysis of supplementary survey of breaklines (different linear constructions including the flood defences, confinement dikes, canals, roads and railroads capable to convey or control the spreading of inundation);

– Tasks related to the establishment of harmonised (uniform, standardised) guidelines in mapping and GIS applications (standards, scales, resolution and accuracy, joint datum and projection system, thematic content, legend, etc. to be applied, coordinated with the ICPDR GIS Expert Sub- group as necessary).

Hydrometeorological-hydraulic foundation

– acquisition and procession of hydrometeorological, hydrological and river hydraulic data;

– determination of (design) flood parameters of different probability along the rivers;

= analysis and determination of probable maximum precipitation (PMP), design precipitation of different probability and the synthetic flood hydrographs of probable maximum floods (PMF) and selected design floods as well as excess water inundation scenarios generated by those precipitations in recent climatic, land use and morphological conditions;

= analysis and determination of probable maximum precipitation (PMP), design precipitation of different probability and the synthetic flood hydrographs of probable maximum floods (PMF) and selected design floods as well as excess water inundation scenarios generated by those precipitations *taking into consideration expectable climate change and land use alterations*;

– 1D-quasi 2D-2D modelling methodologies of flood propagation and inundation – selection of appropriate methods for different cases;

– methodologies for the determination of the extent, depth and, as appropriate, velocity distribution of inundations of different probability in case of

= neglecting existing flood defence structures (assumption of open floodplain, indication of protected flood area by special legend, for example, hatching);

= taking the effect of existing flood defence structures into consideration, in this case failure of the defences can be assessed by

o expert judgement

- on the location of failure leading to the possible largest inundation of the protected flood area;

- on the width and depth of possible breach based on prevailing soil conditions and experience (transformation of the synthetic flood hydrograph of given probability to the breach point and modelling flow through the breach and inundation of the protected flood area by coupling the river flow, outflow and inundation models);

o probabilistic methods (based on the analysis of the failure probability of flood defence structures).

Assessment of the capacity of the defence system (optional, subject to agreement of TRB countries)

– explanation of the load of flood defence systems;

– resistance of flood defences;

– analysis of the failure probability of flood defence structures[3];

– resistance raising effect of traditional flood emergency operation (flood fighting);

– resistance raising effect of flood retention and detention;

– assessment of probability of inundation of protected floodplains taking confinement possibilities into consideration.

Investigations related to flood risk receptors

– methodologies of assessment of affected population and their vulnerability;

– methodologies of assessment of economic activities, land uses and their vulnerability;

– development of aggregated depth-damage functions associated to different types of economic activities, land uses;

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[3] Allsop William: Failure Mechanisms for Flood Defence Assets. T04-06-01. FLOOD*site* Project Report, 2007

Mark Morris: Breaching Processes: A state of the art review. T06-06-03. FLOOD*site* Project Report, 2007

Kanning Wim: Analysis and influence of uncertainties on the reliability of flood defence systems. T07-07-03. FLOOD*site* Project Report, 2007

- methodologies to take flood duration into account;
- methodologies of assessment of potential pollution sources, contaminated sites prone to inundation, protected sites and their vulnerability;
- cultural and historical heritage and their vulnerability;
- other relevant information such as area prone to mud- and debris flow, land slide;
- combination of GIS layers containing the above information on flood risk receptors with those of flood hazards, modelling flood risk.

Further specialised tasks

- decision support systems (DSS)
- digital design support
- informatics.

The preparation of flood hazard maps and flood risk maps for flood areas identified by the preliminary flood risk assessment, which are shared with other countries of the TRB (e.g. where mapping of transboundary floodplains take place) shall be subject to prior exchange of information between the countries concerned. Good experiences on transboundary flood mapping are provided by the EXCIMAP Handbook on flood mapping in Europe.

Methodological proposal for the evaluation of the impacts of climate change on flood hazards and risks

There is increasing evidence that global climate is changing and the observed changes and their magnitude in sea level, snow cover, ice extent and precipitation patterns are consistent with the current scenario of higher temperatures. The assessment reports published by the IPCC, particularly its third assessment report (TAR) led the IPCC to the conclusion that the average global temperature over land surfaces has risen by 0.6 ± 0.2°C in the period from 1861 to 2000. Based on different scenarios of future greenhouse gas emissions projections of climate models indicate another 1.4 to 5.8 ^{o}C of warming over the next century (TAR: The Scientific Basis).

The Preliminary Analysis Report of the Tisza River Basin 2007, on page 121 publishes Figure IV.2. ‘Change of HQ100 river discharge due to climate change (SRES A2 scenario) (EU, JRC)’, based on the DMI-HIRHAM A2 scenario (12km) with 5km LISFLOOD model. According to the published results, decrease of extreme flood events in the Tisza River Basin can be expected. This hardly explainable result, especially its details along some tributaries as shown in the referred figure are not in harmony with the predictions of the Slovak, Hungarian and Romanian studies. The only acceptable statement is that ‘reduced average water flow, increase in extreme events and significant regional and local variations are to be expected’.

Intuitively we expect that evaporation would increase with increasing temperatures, and, in fact, all atmospheric general circulation models predict enhanced evaporation of water. Also an increase in atmospheric moisture has been predicted by models and confirmed by many observations. Increased evaporation must obviously be balanced by increased precipitation. Also the observation that atmospheric moisture is increasing leads to the expectation that precipitation will increase.

Changes in the mean value of climate variables such as temperature or precipitation may also be associated with a change in their distribution as well. The projected change in climate will significantly impact the hydrological cycle. Furthermore, it is expected that the magnitude and frequency of extreme weather events will increase, and that hydrological extremes such as flash-floods, floods and droughts will likely be more frequent and severe.

Based on the well established current trends of the global climate changes and its regional scale to the Carpathian Basin, it is reasonable to assume that the hydrologic cycle will be accelerated along the River-Tisza basin as well, with greater event variability and extremes. Therefore, in order to mitigate consequences, the assessment of the impacts of climate change on the key elements of the hydrological cycle as well as on the risk of the different type of weather driven natural hazards (such as flash-floods, floods, droughts, excess water, etc.) in the Tisza valley is essential point.

The aim of the methodology development project proposal is to develop and harmonise knowledge, scientific tools and sustainable act alternatives in support multi-governmental climate change strategy along the Tisza-Valley. In view of this, one of the most important research topics of the project is to assess the impact of climate change on:

1. Spatially-distributed mean-annual water balance for all important element of the hydrologic cycle;
2. Spatially-distributed mean-annual snow duration and total snow accumulation;
3. Frequency and magnitude of floods including flash-floods;
4. Frequency and duration of droughts;
5. Design flood values.

This could be accomplished by developing an integrated modelling framework that combines regional climate predictions for the Carpathian Basin with an efficient hybrid model-system of physically-based large-scale high resolution distributed hydrological model DIWA (Distributed Watershed)[4] and the hydraulic software package HEC-RAS.

Some information on the DIWA model

DIWA (**Di**stributed **Wa**tershed) is a physically-based large-scale high resolution distributed parameter hydrological model capable for rainfall-runoff (RFRO) modelling, flood events analysis, real-time hydrological forecasting and control, and for the determination of the different hydrological scenarios for flood risk mapping.

The **DIWA** model is based on the distributed rainfall-runoff model philosophy. According to this approach the catchment is divided into basic elements, cells where the basin characteristics, parameters, physical properties, and the boundary conditions are applied in the centre of the cell, and the cell is supposed to be homogenous between the block boundaries. The neighbouring cells are connected to each other according to runoff hierarchy (local drainage direction). Applying the hydrological mass balance and the adequate dynamic equations to these cells, the result is a 3D distributed description of the runoff. The fundamental processes simulated by the model include interception of precipitation, snow-accumulation and snow-melting, infiltration, water intake by vegetation and evapotranspiration, vertical and horizontal distribution of soil moisture, unsaturated and saturated flow of water in soil, surface flow, and flow through river channels.

There is no limitation for the horizontal and the vertical resolution. The recommended horizontal resolution is 1x1 km. The vertical resolution should depend on the vertical structure of the soil texture.

DIWA is one of the model engines of an earlier developed program-system for analysing rainfall-runoff processes on large river basins model (ARES) which has been distributed by the Hungarian Ministry of Environment and Water in the frames of Tisza Water Forum in 2002 among the partner countries. **DIWA** *has further been developed and runs daily as an operational tool in the elapsed period*.

HEC-RAS 1D flood routing hydrodynamic model is used in RS, RO, and among other models also in SK. Extension in UA is in progress.

[4] DIWA model is offered by Hungary for this impact assessment but without the intention of exclusivity; Hungary is convinced that the methodology and tool development for the impact assessments in the TRB are to be based on cooperation of the affected countries and final conclusions are proposed to be derived from the scientific evaluation and comparison of the results of different methodologies and tools.

According to the basic concept of **DIWA**, the following data are used in the model:

- Time-series data:
  - Hydrological;
  - Meteorological;
- Spatial distributed data (with 1x1 km resolution):
  - Meteorological (derived from gauge data and/or radar information);
  - Digital elevation model and its derivates;
  - Land-use;
  - Vegetation density (NDVI, LAI);
  - Network of the local drainage direction;
  - Soil texture and its hydraulic properties;
  - Soil-depth;
- River- and reservoir data:
  - Cross-section geometry and its derivates: hydraulic characteristic curves (wetted area, perimeter, hydraulic radius);
  - Characteristic curves of reservoirs (Storage capacity, wetted area of water)
  - Sub-basin belonging to the reservoirs.

In recent years, under the umbrella of several EU funded projects (e.g., PRUDENCE, STARDEX (FP5) and ENSEMBLES (FP6)), a series of regional climate change scenarios have been and are being (CLAVIER –Climate Change and Variability: Impact on Central and Eastern Europe (FP6)) developed for Europe. The spatial resolution of these regional climate model projections ranges from 50 to 12 km. This resolution does not explicitly capture the fine-scale climatic structures needed for climate change impact studies and policy planning at the catchment or basin scale, which are typically based on DIWA model with a grid spacing of 1 km. To enhance regional detail and introduce fine-scale structures in climate data that force the DIWA model a downscaling interface between the regional climate model output and the hydrological model will be developed.

The integrated modelling framework will be used to assess the impact of climate change on topics 1 to 5 highlighted above for the Tisza-Valley and for a quantitative assessment of the basin's vulnerability to changes in hydrological extremes. This will contribute through the determination of design precipitations, probabilistic (cross correlation) analysis of the coincidence of the floods of different tributaries to the determination of design flood parameters as the loads to assess flood risks, thus to the formulation of spatial planning policy options for adaptation to the potential increase in weather driven natural hazards and to the assessment of the effectiveness of adaptation measures and instruments.

Extension of the analysis of the impact of climate change on runoff for the whole TRB is already possible using the DIWA model, majority of the data needed are available but of course further check, gap analysis and verification of those, plus additional data (on river cross sections, defence structures, especially those of planned, data on the operation of the reservoirs, etc.) are still needed.

Evaluation of the impacts of land use alternatives on flood hazards and risks

Distributed rainfall-runoff models such as DIWA, as the data set they handle demonstrate, capable to analyse different scenarios, among them scenarios related to land use alternatives. The input data related to the prevailing land use, vegetation, soil characteristics of different regions and their spatial distribution can be tailored to recent conditions and, if available, to the conditions of foreseeable long term developments. Thus, for instance, impacts of changes in forest coverage or in paved/sealed surface on runoff conditions thus on the flood parameters can be modelled.

It is even possible to analyse scenarios of forest coverage in the upper catchments and the impact on floods, low water conditions and on water balance, or the impact of different forest conditions in lowland areas on the groundwater conditions.

Evaluation of the impact of different scenarios on flood risk in potentially flood prone areas is possible by flood risk mapping, the upper boundary conditions of fluvial hydrodynamic models (1D, coupled with quasi 2D, 2D as necessary) can be generated by the RFRO models (DIWA, for example).

4 Preparation of flood action/flood risk management plans

4.1 Setting objectives of flood risk management

Based on the evaluation of the distribution of flood risk along different river reaches and different parts of the floodplains, appropriate objectives of flood risk management are to be set.

Throughout the Tisza River Basin different types of floods occur, such as

– *flash floods* along the watercourses in the mountainous regions, and along the upper courses of the rivers, with special attention to areas sensitive for *mud- and debris flow* and *erosion*;

– *slow rising* but high and durable river *floods* along the middle and lower course of the rivers as a result of superposition of multipeak floods arriving from different tributaries;

– *groundwater floods* in karstic regions;

– *excess water:* extensive inundation in the lowland areas of the Tisza River Basin originating from unfavourable meteorological, hydrological and morphological conditions on saturated or frozen surface layers as a result of sudden snow melting or heavy precipitation, or groundwater flooding, or as a result of the combination of the above phenomena.

Majority of the fluvial floodplains are protected by flood embankments, however, their design flood parameters and level of protection is also different. The consequences caused by the above different flood events may also vary across the TRB. Hence, *objectives* regarding the management of flood risks *should be determined by the countries* sharing the TRB themselves and should be *based on local and regional circumstances*.

However, when setting objectives, the countries have a special coordination responsibility to ensure that the risk management *objectives of flood areas shared should be harmonised*, further, the proper selection of objectives and the flood risk management measures should contribute to the achievement of the environmental objectives laid down in the TRB River Basin Management Plan (RBMP) as much as possible.

Diversity of factors, disciplines (including environment protection and water management, regional development, agriculture, disaster management, etc.) to be taken into consideration indicate that the task of *setting objectives of flood risk management cannot be solely done by flood managers*; preparation for decision requires the cooperation of representatives of all relevant authorities on local, regional and national level and of course, stakeholders and public participation.

Decision on the objectives of flood risk management or on the level of services in the different protected flood areas *can even be different*, depending on

– the magnitude of flood hazard (flood extent, depth, duration, velocity),

– the adverse consequences to the

= affected population and their vulnerability, with special regard to sensitive hot spots and infrastructure,

= economic activities, properties, assets and their vulnerability,

= cultural heritage and ecological values endangered,

– the frequency of the events,

especially if flood risk management is based on or is combined with spatial planning regulation, and *is recommended to be made* after careful and thorough decision preparatory process as mentioned above *by political decision making bodies* relevant on the given (local/regional/national) level.

Some of these objectives may extend to the whole or significant parts of the river (sub-)basin(s), while some may be focussed to particular flood areas.

4.2 Selection and determination of the measures of flood risk management

The most important overall task is to reduce the adverse impact and the likelihood of floods in the Tisza River Basin through the development and maintenance of an agreed long-term flood prevention, protection and retention strategy and methodology, based on *a good combination of non-structural and structural measures of flood risk management*.

Chapter 5.2 of the ICPDR Action Programme on Sustainable Flood Protection in the Danube River Basin (DRB FAP) provides detailed list of elements and factors of sustainable flood risk management. Without repeating these, an overview of the potentially effective measures and actions to be considered will be given.

4.2.1 Measures related to preventive land use

When speaking about preventive land use practices, three different targets can be formulated:

4.2.1.1 Land use regulation to preserve and enhance natural retention across the river basin

The purpose of this type of intervention is to promote land uses and cultivation methodologies capable to enhance natural retention and infiltration of the precipitation across the river basin, especially in the mountainous and hilly catchments to reduce flood volumes to be drained and to prevent rapid runoff.

Considering the relevant local characteristic and requirements, the opportunities and necessities of flood retention, protection and drainage among the affected regions and countries will have to be co-ordinated giving priority to the principle that water has to be retained by appropriate land use (forests, wetlands, proper agricultural methods like contour tillage, etc.) or structural measures (retention reservoirs and detention basins) across the drainage basin to decrease run off.

The possibilities for water retention have to be considered on each planning level, local, regional and supra-regional. Therefore changes in actual land use as well as retention measures should be agreed on between the riparian states in the frames of development of the Action Plans on flood risk management on sub-basin level.

Conserve, protect effectively and, where possible, **restore vegetation and forests** in mountainous areas, riparian woodland and meadows.

Maintain and expand the forest population in the river basin by semi-natural reforestation, particularly in mountain and hilly ranges.

Conserve, protect effectively and, where possible, restore degraded wetlands and floodplains, including river meanders, oxbows, and especially reconnect rivers with their floodplains. The maintenance of the vegetation edging a waterway is however necessary in a way that is both respectful of the wealth, biodiversity of these environments, and effective against the risk of flood damage.

Beyond the basic principles and approaches described above and in the DRB FAP under subheading 3.4.1 the followings are recommended for consideration.

The storage effect of vegetation and soil especially in forested area provides not only substantial retention possibilities but even in case of exhausting of the retention capacity there always remains protection against erosion.

Wetlands can reduce floods by temporary storing (large) amount of floodwater and subsequently releasing it, thus reducing flood peaks. Such flood desynchronisation may contribute to evacuation of people, livestock and goods in areas under imminent danger of flood disasters by slowing down water level rise and thus extending the available time and helps to provide sufficient water resources over a long dry period.

Flood water retention by restoration of wetlands and reactivation of protected floodplains by relocating dikes as upstream as possible and along the higher rank tributaries are considered to reduce most efficiently the future flood hazard for the downstream areas or neighbours.. However, regional and trans-national means for compensation have to be achieved to enhance the development of retention in upstream communities even for the benefit in flood hazard reduction in downstream communities. In this context a new form of ‘permit trading for retention volume’ could be considered i.e. a reduction of flood retention volume is only permitted if the same amount will be created preferably within the same sub-basin.

4.2.1.2 Spatial and physical planning regulation to reduce damage potential in flood prone areas

The land use in the potential flood plains has to correspond to the risk, moreover, has to contribute to the reduction of the risk potential. While structural measures still remain an important tool of flood protection, spatial planning on the different levels of administration has to follow the overall goals of non-structural flood measures to mitigate the effects of flooding.

D.5. Immediate flood plains should be identified and designated by law as priority sites for flood retention or to restore, as far as reasonable, mobility to waterways. The purpose is to discourage protective bank construction, embankments, impoundment and undermining, constructions or installations and, in general, any construction or works likely form an obstacle to the natural flow of waterways that cannot be justified by the protection of densely populated areas.

D.6. Stopping building development in the immediate areas at risk of floods, landslides or dam failures if an unacceptable risk to human lives or material damage exists, should be regulated. Exceptions should be restricted to those uses which are of stringent necessity. Adapt uses to the hazards in the potential flood plains (dyke or dam-protected areas) in order to minimise the damage potential. Monitoring the building development in these areas and publishing the results in comparison with the former situation should be realised regularly.

B.5. Information about special measures required and restrictions on construction in flood areas should be easily accessible and easily understood. Competent authorities should therefore provide information on natural risks to be used in the context of real estate transactions, whether for sales or rentals.

With the tools of spatial and regional planning land use and zoning policies can be introduced which facilitate

- the differentiation of parts of the floodplain at different risks
- spatial and physical planning rules attributed to the different hazard/risk zones (prohibitions, restrictions, limitations, etc.)
- the identification of potential retention areas
- the measures to reduce flood risk of the effected community and the downstream areas and/or neighbours.

Restoration and reconnection of floodplain wetlands to watercourses has to go alongside with the zoning of the floodplain areas, identifying areas needing greatest protection and those can be best used for flood storage.

4.2.1.3 Appropriate floodplain and landscape management to explore the benefits of flooding

Rehabilitation of ancient floodplain management based on the retention of abundant water and utilize its benefits in the different levels of micro relief accompanying the rivers by establishing a water system that can retain the abundant water of flood periods and to supply small, landscape-level water cycles is possible. Such a water system should be integrated into a changed land use, creating a diverse, more natural landscape structure.

Elements of such a landscape would play an active role in water retention and would effectively serve the interests of nature protection and biodiversity. Landscape diversity derives from the fact that 0,5 m differences in elevation levels can provide habitats for different plant associations in a landscape with regular water supply. It is the availability of water that brings diversity into such a landscape.

In a flood plain farming basin we can find spots of permanent and temporary water covers, wetland habitats, meadows and pastures, extensive orchards, plough lands and different types of forests according to the elevation levels and farming practices of these spots. Water distribution in the area would enable farmers to influence water supply within a certain range, thus dominant plant covers and related farming benefits can be adapted to demands.

A very important element of the program is the elaboration and introduction of land use and farming practices. Land use would maintain optimal landscape structures through farming activities and would offer decent income for the local population. This land use is mostly extensive and avoids the use of chemicals, therefore its competitiveness in terms of yields is lower than that of the intensive agriculture. Nonetheless, in the long run there is a great advantage in flood plain farming, namely that its typical landscape is very close to a natural pattern, therefore, if the system is well-designed, it requires very low external inputs of energy or other resources (chemicals, irrigation, water pumping), which is not the case in intensive agriculture today.

The new type land use and the maintenance of such mosaic landscapes is in line with the agro-environmental system of the EU, also called eco-social agriculture as this scheme should greatly contribute to a prosperous rural livelihood. Adaptation to 'living with flood' principle needs incentives and training programmes to help recognizing how the benefits of flooding can be explored.

Finally, an important remark related to the above issues: *adequate land-use is a key interlinking factor for flood risk management and river basin management* – those land use patterns which serve the reduction of runoff are equally advantageous for the environmental objectives of river basin management since they also contribute to the reduction in diffuse pollution, e.g. nutrient and pesticide input into rivers. Reactivation of former wetlands and floodplains where feasible can contribute besides flood mitigation, to ecological benefits in the form of maintaining biodiversity, frequent recharging underground aquifers and availability of cleaner water.

4.2.2 Measures related to providing technical flood protection (structural defences)

Maintenance, restoration and if necessary improvement of the capacities of the structural flood defences, or if appropriate, the construction of new ones to protect human life, health as well as economic activities, properties and valuable goods, should be planned here in accordance with the design criteria and safety regulations of the countries.

It is advisable to develop cooperation between public and private sector to use hydropower operation for flood protection.

Taking into consideration that floods don't recognise national borders, to ensure proper functioning of flood prevention and protection, harmonisation of design criteria and safety regulations along and across border sections must be addressed on a supra-regional and trans-national level, utilising existing bi- and multilateral frameworks (e.g., trans-boundary water commissions, Tisza Water Forum, ICPDR Tisza Group).

Assessment of the efficiency of national flood retention / protection projects and their interactions

In the period of 1998-2001 four extreme floods occurred in the Tisza River Basin. Those in 1998 and 2001 proved to be catastrophic in the Upper-Tisza region in Transcarpathia, Ukraine and in the north-eastern parts of Hungary, while the spring floods in the years 1999 and 2000 created unprecedented floods both in ever higher flood crests and in enormous duration in the Middle-Tisza region in Hungary as a result of multipeak floods arriving from the Tisza and tributaries.

The UA national flood retention plan

In order to reduce flood damages and consequences in the region, the Ukrainian government has accepted a complex plan of flood prevention and control ("*Scheme of integral flood protection in* *the River Tisa basin in Zakarpatska District*”), some more details of which are presented in the Preliminary Analysis Report of the Tisza River Basin 2007, on page 103-105 and on Map 18.

This scheme, among others, envisages construction of 42 unregulated, flow-through type flood retention reservoirs with a total capacity of 288 Mm^3 on the mountainous tributaries of the river and additional 22 detention basins with regulated outflow in the flatland with a total capacity of 234 Mm^3 to reduce the flood discharge Q1% to Q10%

With regard to this plan, it is indispensable to analyze the influence of the planned flood retention measures on some extreme flood events. Therefore the two most extreme flood events of November 1998 and March 2001 will be simulated using the physically based, distributed rainfall-runoff model DIWA. The different scenarios will also include following the implementation phases of the reservoir installation.

Specific questions to be analyzed:

– how the relatively small individual capacity and the territorial distribution of the numerous flood retention reservoirs in the mountainous region contribute to the reduction of flood peaks along the tributaries and also along the recipient;

– while flood peaks reduced, the flood volume due to the temporary retention with the unregulated flow-through type reservoirs remains unchanged, as a consequence of which flood propagation downstream slows down and the duration of flood waves will increase – it is important to quantify these effects;

– modelling is also needed to fine tune operation - to avoid superposition of flood waves of significant tributaries downstream

Results of simulation based analysis of the effect of planned flood retention reservoirs in the Upper-Tisza basin on extreme flood events will be reported. First the elaborated methodology and results of geospatial data preparation (to create a 10 m grid DTM using SRTM data) and analysis for the purpose of simulation will be presented. Then a characterisation of the DIWA model, presentation of the results of the calibration-validation on the target region will be given. Finally results of the simulations through different scenarios and conclusions will be presented.

The HU national flood retention plan

The Upgrade of the Vásárhelyi Plan (VTT) more details of which are presented in the Preliminary Analysis Report of the Tisza River Basin 2007, on page 105-107 and on Maps 19 and 20‘ is a room for rivers’-type project, in the frame of which there are three main elements concerning flood hazard reduction:

– development (heightening and strengthening) of the existing dikes where they do not comply with the 1 in 100 year floods;

– improvement of the flood conveyance capacity of the river by setting back the dikes at bottlenecks, creating a hydraulic corridor in the floodway with low resistance by minimising obstacles of flow;

– reactivation of protected floodplains with controlled inundation by creating 11-12 flood detention basins with a total volume of 1.5 billion m3 to cut the flood peaks

In its current structure, the database of the model includes the 740 km long river section between *Tiszabecs* (Hungarian-Ukrainian border) and *Titel* (conjunction to Danube River), as well as 8 main tributaries (*Szamos, Kraszna, Bodrog, Sajó-Hernád, Zagyva, Hármas-Körös, Maros* rivers) from their mouth as far as the national border. Another three tributaries (*River Borzhava, River Túr* and *Lónyai Canal*) are taken into consideration as concentrated load. The total length of streams involved into calculations exceeds 1.500 km.

Cross sections between *Kisköre* and the southern border of the country have been extracted from the digital terrain model of the river section composed from ortophotos made by Eurosense Ltd. in 2001-2002, low water cross sections surveyed by Raab Ltd. by GPS controlled ultrasonic depth measurements and completing geodetic and GPS surveys to connect the measurements made on land surface and under water. Cross sections of the river between the southern boundary of Hungary and the mouth to the *Danube* were made available by the Serbian water management. The section between the Hungarian-Ukrainian border and *Kisköre* was structured mainly on the base of measurement results accomplished after 1999 but within this river reach also some old cross sections measured in 1976 were used. The stream system of the *River Tisza* and its tributaries has been described by more than 1.550 cross sections, 84 bridges and 11 flood reducing structures are also installed into the model.

After careful and successful calibration and verification of the model, effectivity and efficiency of several variations of planned measures including individual and combined effects of floodplain interventions to improve flood conveyance capacity of the flood bed and different flood detention scenarios have been simulated by the HEC-RAS 1D hydrodynamic model. The development of the implementation plans are based on the results of simulation.

Methodological proposal for the extension of the investigation to the whole TRB

There is no technical limit of the extension of the applications to the whole territory of the TRB: the DIWA rainfall-runoff model recently covers the whole TRB, majority of the necessary data are available and used in the daily operation. Flood propagation along the rivers and tributaries and the effects of different measures can be simulated with any 1D hydrodynamic model. Coupling them with the DIWA can serve the automatic generation of the upper boundary conditions.

The modular extension of the available HEC-RAS could be an obvious solution, however, this is not the exclusive solution since the known and widely spread 1D models (HEC-RAS, MIKE, SOBEK, etc.) can also be connected and they can work from the same database.

Obviously, the simulations can be performed not only for any kind of flood management measures but also both for the current situation and for future climate change scenarios, serving the determination of the ‘loads’ even for future flood hazard and risk mapping.

4.2.3 Measures related to the improvement of flood forecasting and warning

Tasks related to flood forecast and warning have two main different level, basin wide and sub-basin wide level. In the flood action plans we deal with the latter, suited to local and regional needs as necessary.

The demands on the quality of predictions as well as warning times are strongly dependent on the extent, shape, topography etc. of the considered catchment area.

The very short response time of the headwater (upper course) sections requires the increase of the quality and reliability of early meteorological warnings, downscaled local weather forecasts and now-casting of the rainfall-runoff conditions.

The reliability of models has to be improved and adapted to the needs for different times and levels of advanced warnings in light of the potential consequences for the downstream section. The quality of the outcome and forecast by hydrological and/or meteorological models depends directly also on the quality and consistency of the used input data. That is why important target is to improve trans-boundary infrastructure for

Hydrological data collection and exchange

The hydrological data from different sources and catchments should be standardised as much as possible. This relates to the type of measurement, the instrument itself5, the interval of measurement and the format of storing and protocol of data transfer.

This has to be adapted or the interfaces have to be created to utilise efficiently the data as input in a general system of hydrological models. Therefore it will be necessary to define more accurately the existing standards for the interfaces respectively to standardise the different methods and standards of data acquisition, editing, storing and transmission. In addition the format of recording of data will have to be standardised as far as possible. On the one hand to enable a simple data exchange of data and on the other hand to ensure data consistency. The question of data ownership or associated costs has to be solved on a basin-wide level. This means e.g. if the hydro-meteorological data are only available for the immediate forecast model run and have to be discarded afterwards or if data provided by third parties can be stored at the model centres.

Collection and exchange of meteorological data

For the purpose of the improvement of database, interpretation and supra-regional exchange, the cooperation with the meteorological departments will have to be further improved. In addition the norms of recording, storing, etc. of data will have to be standardised as far as possible. Data exchange for a large number of meteorological stations exists worldwide; however the number of necessary stations to be introduced in a hydrological forecast model on a basin wide level will clearly increase. The question of data ownership has to be also addressed for the meteorological data.

Improvement of the monitoring network and methods

Availability of a basin-wide, effective flood warning and forecasting system based on reliable, real time hydrometeorological data and other information provided by an automated data collection and transmission system is a pre-requisite of successful flood management. The expanded lead time a proper forecasting and information system can offer is a key element for the organisation of emergency operation and intervention.

The automation of hydrometeorological and hydrographical measurements has been started 30-40 years ago in the Tisza-valley. The main goal was to speed up data collection and to raise the frequency of observation. There are different development programmes realized and are still in progress in the Tisza River Basin.

It is high time to have a joint review of the national development plans of automated monitoring in the Tisza River Basin. Harmonisation of these developments to secure compatibility and the possibility of their interconnection is indispensable.

– *principles and programme of development of a common monitoring system*

In an automated remote monitoring system which extends to several countries it is of utmost importance – beside the organic system approach in the whole river basin – to take into consideration the aspects, the characteristics of existing systems and the results of started developments of the countries concerned. At this point the prime goal is to accept uniform principles in the field of informatics and data transmission, application of which secures the cooperation of the parts of the network even if the elements of the system are of different products and origin.

[5] Best available technology in using satellite images, radar images, automatic rain gauging stations (heated, data logger, on-line communication permanently powered if possible), automatic stream gauging stations (improvement and stabilisation of the cross section, power supply, data logger, on-line communication, calibrated rating curve), Doppler current meter, GPS, US profiler, etc.

The main goal must be to lay down these common principles because failure in doing so can lead to a lot of situation when the new or extant stations couldn't be integrated into the remote monitoring system of the whole catchment area.

The Hungarian-Ukrainian flood hydrological monitoring system might be considered as a sample to the development of automated hydrographical monitoring in the Tisza-valley because:

– this is the first transboundary hydrographical remote monitoring system interconnecting two countries and their systems,
– elements and the operational principles of the Transcarpathian and that of the Hungarian system are the same so the run of the system is smooth,
– from informatics and data transmission point of view it matches all standards therefore the extension has neither technological nor informatics limits.

Sharing and utilisation of these experiences can contribute to the harmonized developments in the whole catchment area. Cooperation between the countries sharing TRB is the most important precondition.

– *Information (inquiry) centres*

In the Tisza-valley we can form several inquiry centres. The number of these centres depends on the structures of the user organization. Decision requires international coordination and joint planning programmes.

The suggested elements of the centres:

– central data acquisition system
– central process control computer
– process control software, complementary database management software, data processing and visualisation software
– communicator computer for the attendant of the external and internal connections

Based on the above, the following steps are proposed:

1. Review the location of the existing hydrometeorological monitoring stations for relevance, efficiency and effectivity with the latest advanced methodologies to identify gaps[6]
2. Elaboration of uniform principles of information technologies and data transmission to secure harmonisation and integration of existing systems and further developments by a common expert group which contains the expert of the concerned countries.
3. International exchange (on-line) and integration of the radar data of the stations in the TRB, production of integrated composite images, development the methods of calibration
4. Prepare a common hydrometeorological and hydrographical monitoring development programme and its conceptual plan with respect to the agreed uniform principles, with the aim of producing and operating a virtual centre with GIS-based system visualised on a web page, serving real time on line data
5. Preparation for the implementation of the plan in the frame of INTERREG IVA project.

[6] Bódis, K. - Szabó, J. A. (2004): *Potential uncertainty of forecast estimated by spatial analyses of operative gauging network.* In: Book of Abstracts of the "2nd European Flood Alert (EFAS) Workshop" (Ispra, Italy, 10-12 November 2004), pp.: 78-82.

Regional flood information and management platforms (SDSS)

The responsibility for flood prevention, protection and mitigation is always at policy level. In order to reduce damaging impacts of floods the decision-makers should consider and weigh many different circumstances and factors. For the purpose of analyzing the numerous alternative strategies of effective, river basin based flood risk management one of the most powerful tools is an up-to-date Real-time Spatial Decision Support System (RSDSS). Development of RSDSS on flood management is rapidly progressive. Numerous RSDSS applications have been developed in the past several years all over the world to support emergency managers to respond quickly to heavy rainfall and/or snowmelt and subsequent flooding events. The various applications of RSDSS have been certified to work successful in real environments.

A Spatial Decision Support System (SDSS) is a special kind of DSS with strong spatial components and incorporating *spatial data, models* and *spatial analysis* to assist the user in arriving at a solution. For these reasons, the most advanced SDSSs incorporate GIS.

A well-designed SDSS assumes that the user is NOT an expert in database management and/or hydrologic/hydraulic/environmental/economic/etc. modelling. Furthermore, an SDSS does not replace the decision-makers. An advanced SDSS application rather places the decision makers at the centre of the decision-making process so that information and timely assistance can be effectively utilized. As such, an SDSS should allow people to combine personal judgment with the results of analysis.

Development of a user-friendly RSDSS for the Tisza basin will allow local users/decision makers to evaluate and compare alternative flood management schemes based on numerous model-simulations, numerical forecasts and their own subjective judgment, goals and objectives in an interactive learning and decision-making process that makes extensive use of computer-generated real time spatial information, data and maps. Maps are an excellent way for decision makers to visualize and understand the spatial relationships among landscape elements as well as the spatial economic and environmental impacts of alternative flood management.

The components or systems of the RSDSS are as follows:

– *Integrated data management system*

= *Input data management* is a collection of data rules, link control protocols and computer-programs that handles and feeds all kind of necessary input data into the “family” of the databases. Input data management sub-system must provision for two basic groups of the input tracks:

o *Real-time data tracks:*

- Data arriving from the integrated monitoring system (ground stations, remote sensors, etc.);
- Data arriving from other system (model-results like forecasted weather conditions, etc.)

o *Non-real-time data tracks:* Master (meta-) -data, historical ground station data, model data, model-parameters, satellite land-data, etc.

= *Family of databases* is a distributed database that is under the control of a central database management system in which storage devices are not all attached to a common CPU. A part of it will be stored in multiple computers located in the same physical location, and another part will be dispersed over a network of interconnected computers.

The data components to be stored in the databases are (must be specified later):

o *Infrastructure*: structural defences, roads, railroads, bridge and culvert, drains, critical facilities.

- o *Terrain/Environmental*: DEM (Digital Elevation Model); slope; LDD (Local Drainage Direction); land use; soil (texture, hydraulic characteristics); wetlands; monthly average NDVI (Normalised Differential Vegetation Index); monthly average LAI (Leaf Area Index).
- o *Hydro-meteorological data*: High-water marks (flood extent); X-sections; outlet location of reservoirs; characteristics of reservoirs; hydrological and meteorological sites/network (gauge locations); precipitation, snow, temperature, dew point or relative humidity; stage and discharge data (for reservoir as well); discharge rating curve; Ice.
- o *Geographic data*: political boundaries (country, county, province); river reach; lakes and reservoirs.
- o *Imagery data*: satellite imagery; aerial photographs.

= *Data harmonization and data pre-analysis sub-system* is a set of computer algorithms and models that developed for preparing data for the models to be used by decision makers.

This sub-system will attend to:

- o data-flow process between the units (databases-models-graphical interface);
- o synchronize the raw data before use (e.g.: to common unit of measurement system, to common coordinate-system, etc.);
- o harmonize the spatially/timely different resolution raw data to common one as it necessary for the model to be executed (up-scaling, down-scaling, interpolation on time series data, etc.);
- o create spatial data form point data using spatial interpolation techniques (e.g.: precipitation, temperature, relative humidity, etc.).

– <u>*Model management system:*</u> it offers a comprehensive support to the decision-makers to analyze the numerous alternative strategies of effective flood protection based on model simulations. Basin-scale models that simulate the behaviour of various hydrologic, hydraulic, reservoir operation, economic, or other variables will be embedded under model management shell. Models to be used in RSDSS for the aims of the project range from fully data oriented models to fully process oriented models. The choice depends on the quantity and quality of data available. Data oriented models are represented by regression (or other statistically-based) models, empirical models, or black box models. Process oriented models are represented by models which have detailed representations of processes, but require more or less site specific data (i.e., 1-2D hydraulic models, distributed hydrological models, etc.).

The list of models to be used will be specified later, following a consultative expert meeting on it.

– <u>*Advanced interactive graphical user-interface*</u> for an up to date RSDSS is of key importance. For that very reason, an advanced interactive graphical user-friendly computer programme will be investigated and developed to manage and display real-time decision aids in user-displays. The displays will allow the integration of spatial information for spatial reference along with the real-time rainfall and stage information. The use of this sub-system will allow not only the common graphical display of this information, but the ability to animate the information in a synchronized fashion.

Among other things, the application to be developed will display of:

= A real-time map of the rain-gauges;

= Spatial distribution of real-time weather conditions (precipitation, snow-water equivalent, temperature and relative humidity, etc.);

= Animated display with history of the spatial distribution of the weather conditions (precipitation, snow-water equivalent, temperature and relative humidity, etc.);

- Animated display with radar images, thunderstorm size and movement and accumulating rainfall amounts;
- Colour coded drainage basins in a map display showing flooding potential;
- Real-time decision aids showing current flooding and potential problem areas;
- Hydrographs of stream gauges.

The RSDSS platform is proposed to be created as a *web-based tool* with different level of access: public info layers, password protected expert layers for authorities responsible for flood defence and system info layers.

Satisfying local demands of flood forecasting and warning

The very short response time of the headwater (upper course) sections requires the increase of the quality and reliability of early meteorological warnings, downscaled local weather forecasts and now-casting of the rainfall-runoff conditions.

Satisfying local demands is typically needed to warn on the development of storms triggering flash floods in fast responding smaller catchments and its tool is “now-casting” of the rapidly developing meteorological conditions including quantitative precipitation predictions that is typically the task of meteorological services. However, automated data collection including radar and satellite images as well as the now-casting models and results can be incorporated into the above mentioned RSDSS. Further simulation of the effects of now-casted and additional scenarios can be done within the RSDSS platform.

Development of dissemination of flood forecast and warnings

An effective and reliable system of flood forecasting and warning dissemination should be set up to inform, at respective level, authorities responsible for flood defence and citizens in threatened areas. Classical and new media such as syrens, formal warnings, state and private broadcasting services, satellite-based communication system, alarm calls on the radio (switching on radios by remote control), mobile telephones, the Internet and teletext etc should be used, tested and performed according to technological progress. Alarm and action plan must be adapted to local conditions.

Such secondary services and channels of information fed regularly by the responsible authorities may also separate them from direct inquiries of the public enabling them to concentrate on the mitigation activities.

The dissemination of information to authorities responsible for flood defence can best be solved by the RSDSS as mentioned above. Information for the public on the internet and mobile phones can be driven by the public info layer of the same system.

For more information on the dissemination of flood forecasts and warnings for the general public see URL: http://exciff.jrc.it Publication: Good Practice for Delivering Flood-related Information to the General Public. May 2007.

4.2.4 Measures related to capacity building

A non-exhaustive list of recommendable and considerable measures is given below:

– raising preparedness of the organisations responsible for flood mitigation

= upgrading contingency and emergency operation plans in digital format, enabling digital archiving and the utilisation of their information and data base in digital decision support system (DSS)

= planning and implementation of informatics system supporting the planning process and utilisation of digital contingency and confinement plans in DSS

= upgrading confinement planning in digital format, enabling digital archiving and the utilisation of their information and data base in DSS

= contingency, confinement and possibly evacuation plans of trans-national flood areas (floodplain basins) should be worked out by the interested countries jointly

Integrated flood defence plans (contingency and emergency operation plans) are the collection of all important technical and other relevant data on the floodplain and the defence structures recorded in appropriate forms and system.

Recommended content: ►technical description (incl. the brief history of the development of the defence structure, summary of experience gained during previous floods, singular spots and sections of special attention etc.), ►general plan, ►detailed layout, ►long- and cross sections, ►data on geotechnical survey of the embankment and the foundation soil, geotechnical cross- and long profiles, evaluation of stratification of the foundation soil, examinations on the stability factors, ►plans of structures crossing the embankment, etc.

Such plans are essential for the engineering assessment of the conditions and capacity of the defences not only during emergency but they serve basic information for the justification and prioritization for development planning as well.

Confinement plans are to be prepared in advance in each separate floodplain basin for the contingency of a breach in the defences. The confinement plan contains ►information on the morp-hology of the floodplain basin (DEM), ►technical parameters of the built or designated confinement defence lines, incl. roads and railways, ►volume-stage functions of the floodplain basin and that of its well defined cells will be derived from DEM. Confinement plan contains also information on the land uses, settlements, historical monuments and environmental and natural values, facilities, infrastructure of special importance, potential sources of pollution in case of inundation, etc. The confinement plan is to give proposals of possible localisation of inundation on the base of predicted possible locations of dike failures.

Confinement plan developed on the above technical basis in case of emergency may forecast the flow and storage processes in the floodplain of the water flow in through a breach using the actual data of a breach and of the flood hydrograph, supporting the organization and control of rescue-, evacuation- and confinement activity.

The plans and databases are recommended to be developed under GIS using AutoCAD. The topographical content, morphology of rivers and floodplains and the geometry of the defences, breaklines, plans of structures crossing the embankment, land use data etc. is the same as in case of flood hazard and risk maps.

= development of methodologies on the monitoring of the condition of the flood defence structures incl. remote sensing techniques

= technology development to improve the efficiency of emergency interventions to raise the capacity of the defences during floods

= development and strengthening emergency organisations and their cooperation

= organise defence exercises on regular basis on local, regional, national and trans-national level to test preparedness and co-operation between water authorities, disaster and rescue services, leaders of public administration and local governments, police, road administration, military forces, hydropower companies and local industry

= establish, maintain and update of agreements upon procedures for mutual assistance among riparian countries in critical situations, including arrangement of formalities to facilitate the travel of flood response personnel from abroad and interoperability of emergency services' equipment (whether by plane, boat or on land) during flood events.

– raising awareness and preparedness of the general public

= information dissemination based on flood hazard and risk assessment and mapping

= information dissemination concerning how to prepare for flood events, promotion of self help, etc.

The above information can be disseminated in different forms including brochures, leaflets, media communications, and recommended to be made available on the internet as well.

4.2.5 Measures related to water pollution prevention and mitigation with respect to floods

The impact of floods has considerable environmental and health consequences, in particular given the very specific vulnerability of domestic water supplies and the physical infrastructure necessary for sanitation. The disruption of water distribution and sewage systems during floods contribute greatly to severe financial and health risks. Preventive measures should be taken to reduce possible adverse effects of floods on these infrastructures. Alternative solutions should be planned and implemented to guarantee the operation of water distribution and sewage systems.

In flood-prone areas, preventive measures should also be taken to reduce possible adverse effects of floods on aquatic and terrestrial ecosystems, such as water and soil pollution: i.e. minimise diffuse pollution arising from surface water run-off, minimise the amount of surface water runoff and infiltration entering foul and surface water sewerage systems, and maintaining recharge to groundwater subject to minimising the risk of pollution to groundwater.

Stocked goods in industry areas, but also in housing areas (oil, sewerage, septic tank) and in agriculture (pesticides, fertilisers), must be judged by their toxicity, their inflammability and explosiveness as well as their ecotoxicity. The best precautionary measure is to stock hazardous substances outside the flood risk area or to elevate stocking areas. All depending on the type and amount of substances concerned and the conditions of operation, individual solutions must be sought for. Experience shows that oil-fuelled heating systems tend to pose a considerable threat when not installed in a flood-proof manner. In quite a number of cases, this proved to be a major problem for re-establishing sound living conditions in flood-stricken buildings.

Emergency management planning and operation against the harmful impacts of water pollution on ecosystems during minor and major floods should be properly prepared in due time and maintained in operational status, particularly to support effective measures and evacuation plans to secure or remove hazardous materials where appropriate. The co-ordination of information systems and existing forms of assistance, i.e. mainly authorities, fire services, and aid organisations is needed, regular training should be implemented.

Code of construction, licensing of hazardous material and industrial and/or agricultural activity, best practise documents should be developed for potentially flood-prone areas. Implementation of legal measures is not enough: law enforcing is necessary to prevent water pollution.

Evacuation and/or localization of hazardous material from flood plains should be planned before flood strikes. During floods these measures can help reducing risks of water pollution.

Post flood clean-up is necessary to prevent water pollution from previously contaminated soil.

International and regional monitoring, reporting and warning specific systems should be put into operation and aimed at ensuring timely warning in case of transboundary pollution (like AEWS) in the same case that floods and ice formation.

4.2.6 Multicriteria analysis (MCA) of the measures

The DRB FAP as well as the EFD prescribes the cost-benefit analysis as well as prioritisation of the measures. In the frames of the FLOODsite Integrated Project under the 6th FP of the EU a "Methodology for ex-post evaluation of pre-flood measures and instruments" (*ex-post EFM*) has been developed for the investigation of (side-)effects, effectiveness, efficiency, robustness and flexibility of physical measures and policy instruments.

The methodology aims at providing a framework for the evaluation of measures and instruments after their implementation. The framework is laid out to be generically applicable with all measures and instruments at project level. By applying the methodology, information about existing measures and instruments shall be made available for the planning of future flood risk reduction.

The Methodology addresses pre-flood and flood event measures and instruments at project level aimed at the reduction of flood risk respectively flood damage. Interventions in all elements of the Source-Pathway-Receptor-Consequences model are considers. Interventions of interest for ex-post evaluation are single measures and instruments or strongly connected combinations of those seen in the context of selected natural and societal conditions.

The Methodology mainly consists of criteria and methods for the evaluation of physical measures and policy instruments. These aim at exploring effects (incl. side-effects), effectiveness, cost effectiveness, robustness and flexibility of existing interventions in to the flood risk system under reverting to experiences from recent flood events. The overall performance of the interventions is investigated under consideration of hydrological, ecological, social and economic aspects. Corresponding to the multiple criteria approach of the methodology a wide range of methods is used including quantitative as well as qualitative approaches.

Natural and societal conditions are defined as part of the methodology and facilitate the case specific selection of criteria. The selection methodology enables a quick and systematic selection of appropriate criteria based on a partly formalised two step approach.

A wide range of measures and instruments (19 different types of interventions and 94 different measures or instruments listed in Appendix 5 of the methodology). are identified and classified as basis for the methodology. These are presented in a newly developed classification system. Classification and the identified types of intervention are presented in a web-based information system

http://www2.ioer.de/floods/html/floodsitedb-ioer.php.

The methodology combined with the criteria selection tool offering in some typical cases over 40-45 criteria to be taken into consideration is a strong instrument giving a very broad scale of possibilities for the ex-post evaluation of flood hazard and risk mitigation measures and instruments.

5 Proposed time table for the implementation of the TRB strategy on the development of flood action plans

Based on the presented elements and in line with the Preliminary Analysis Report of the Tisza River Basin, the following schedule is proposed.

Item	2008				2009				2010				2011				2012			
Preliminary flood risk assessment		■	■	■	■	■	■	■												
Preparation for flood hazard / risk mapping			■	■	■	■	■	■	■	■	■	■								
Topography (digital map, DEM, breakline survey)					■	■	■	■	■	■	■	■								
Flood hazard mapping									■	■	■	■	■	■						
Flood risk mapping											■	■	■	■	■	■				
Setting objectives of flood risk management													■	■	■	■	■	■		
Flood risk management planning															■	■	■	■	■	■

Item two of the above bar chart covers the establishment and activities of the specialised task groups described on pages 5-6 of this document.

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