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PRELIMINARY FINDINGS OF THE ASSESSMENT OF TRANSBOUNDARY RIVERS, LAKES AND GROUNDWATERS IN EASTERN AND NORTHERN EUROPE

Prepared by the secretariat

The present document is based on the discussions in and outcome of the **Workshop on transboundary water management in Eastern and Northern Europe** held in Kiev, Ukraine on 27-29 April 2010, and a preliminary review of the information submitted by the countries. The workshop was organized jointly by the United Nations Economic Commission for Europe (UNECE) with the International Water Assessment Centre (IWAC) hosted by the Slovak Hydrometeorological Institute which also funded the workshop, and co-hosted by the Ministry of Environment of Ukraine and the Ukrainian State Committee for Water Management.

The main themes of the workshop were the following: 1) Basin management: integrated management of transboundary waters and EU Water Framework Directive implementation; 2) Climate change, its impacts on the water resources and adaptation measures; 3) Water quality issues, including — but not limited to — the impacts of new economic development, harmonization of monitoring, biological water quality and 4) Hydromorphological changes. The workshop allowed sharing good practices and lessons learnt, discussion on challenges as well as identifying options for the region on the way ahead. In addition to the thematic plenary, the participants worked on the transboundary basins in break-out sessions to develop jointly an accurate picture of all transboundary waters in the region.

The present document is a first draft of the sub-regional summary of the assessment of transboundary waters in Eastern and Northern Europe, in accordance with the outline agreed upon by the Working Group on Monitoring and Assessment (see ECE/MP.WAT/WG.2/2009/3). The summary will be complemented by assessments of transboundary rivers, lakes and groundwaters in Eastern and Northern Europe draining to the Caspian Sea, the Black Sea or the Baltic Sea, based on information provided by riparian countries. Brief descriptions of the water resources management framework in the countries concerned and a compilation of existing agreements related to the management of transboundary waters will also be included in the assessment.

The content of the draft summary reflects the information made available and as not all the countries have submitted complete datasheets, examples from basins referred to in this document are limited. Those Eastern and Northern European countries which have not yet filled in the relevant datasheets should complete them and send them as soon as possible to the secretariat and in any case not later than

16 August. Possible amendments and additions to this summary should also be sent to the secretariat as exact wordings by 16 August 2010.

The Working Group, and in particular countries in Eastern and Northern Europe, are invited to:

(a) Comment the present draft, advice on issues which should be highlighted in the summary, correct any inaccuracy and provide additional information for its finalization so to cover all issues of relevance for the region in accordance with the agreed outline of the second assessment;

(b) Discuss and agree on how to ensure the completion and submission to the secretariat of the datasheets by 16 August 2010;

(c) Discuss and agree on the process for finalization of the official documents on the Eastern and Northern Europe assessment for the twelfth meeting of the Working Group.

INTRODUCTION

1. The assessment of Eastern and Northern Europe focuses on water bodies shared by EU and non-EU countries which make up an important fringe zone for the implementation of EU's Water Framework Directive (WFD) with a number of international River Basin Districts. The sub-regional assessment work involves the following countries: Belarus, Republic of Moldova, Russian Federation, Ukraine and the neighbouring EU countries Estonia, Finland, Hungary, Latvia, Lithuania, Poland, Norway, Romania and Slovakia.

2. The transboundary rivers, lakes and groundwaters of the subregion as well as selected Ramsar sites are listed in Table 1. Due to many major rivers in the sub-region being transboundary, many downstream countries are highly dependent on flows generated outside the countries' boundaries. For example, Ukraine estimates that only a quarter of the surface water flow in the country is generated within its boundaries. More than 80 per cent of drinking water in Moldova is taken from the Dniester. Such interconnectedness (and related vulnerability) emphasize the importance of good transboundary cooperation.

3. There are distinct differences in the water resources management framework between the EU countries and their Eastern neighbours in the subregion. In the Western part of the subregion, requirements for the status of water resources are defined through environmental objectives in the WFD, and the timing of measures is set there. In the Eastern Europe – Ukraine and the Republic of Moldova stand as examples – the water resources policy emphasizes meeting the economic needs of the society. In the western part, there are well established cooperation frameworks at basin level (for example the Danube River Basin Commission, ICPDR), whereas in the eastern part the transboundary institutions are less developed.

4. Selected Ramsar sites in Eastern and Northern Europe were assessed in cooperation with the Secretariat of the Convention on Wetlands (Ramsar Convention) and the Parties to this Convention: the North Livonian Transboundary Ramsar Site which is extensive bog system, the Domica-Baradla Cave System, as well as sites at Lake Peipsi, along the upper Tisza River, Stokhid-Pripyat-Prostyr Rivers, the Lower Danube and the middle course of the Bug River.

5. Eastern and Northern Europe holds a number of other important transboundary wetland areas, including numerous freshwater lakes and extensive mires connected by rivers and streams stretch all along the Russian, Norwegian and Finnish borders and further to the south along the Russian, Estonian, Latvian and Belarusian borders. Extensive river floodplains, temporary flooded forests, grasslands and fens are also typical for the region, as well as coastal bays, lagoons and river deltas in the Barents, Baltic and Black Seas. A characteristic feature of the northernmost region is permafrost. Numerous services provided by these wetlands extend far beyond their boundaries and range from harboring rich and threatened biodiversity to water retention and storage, support to fishing, farming, and various leisure activities.

Table 1. The transboundary rivers, lakes and groundwaters as well as selected Ramsar sites in the Eastern and Northern Europe[1]

Basin/sub-basin(s)	*Recipient*	*Riparian countries*	*Lakes in the basin*	*Transboundary groundwaters within the basin (aquifers or groundwater bodies)*	*Ramsar sites included in this assessment*
Oulanka	White Sea	FI, RU			
Tuloma	Kola Fjord> Barents Sea	FI, RU			
Jacobselv	Barents Sea	NO, RU		Grense Jakobselv (NO, RU)	
Paatsjoki	Barents Sea	FI, NO, RU	Lake Inari	Pasvikeskeren (NO, RU)	
Näätämö	Barents Sea	FI, NO, RU		Neiden (NO, FI)	
Teno	Barents Sea	FI, NO		Anarjokka, Karasjok, Levajok-Valjok, Tana Nord (NO, FI)	
Kemijoki	Baltic Sea	FI, NO, RU			
Oulujoki	Baltic Sea	FI, RU			
Jänisjoki	Lake Ladoga	FI, RU			
Kiteenjoki-Tohmajoki	Lake Ladoga	FI, RU			
Hiitolanjoki	Lake Ladoga	FI, RU			
Vuoksi	Lake Ladoga	FI, RU	Lake Pyhäjärvi and Lake Saimaa		
Juustilanjoki	Baltic Sea	FI, RU	Lake Nuijanmaanjärvi		
Rakkonlanjoki	Baltic Sea	FI, RU			
Urpanlanjoki	Baltic Sea	FI, RU			

[1] *Notes:*

Country names have been abbreviated as follows: Albania (AL); Austria (AT); Belarus (BY); Bosnia and Herzegovina (BA); Bulgaria (BG); Croatia (HR); Czech Republic (CZ); Estonia (EE); Finland (FI); Germany (DE); Hungary (HU); Italia (IT); Latvia (LV); Lithuania (LT); The former Yugoslav Republic of Macedonia (MK); Moldova (MD); Montenegro (ME); Poland (PL); Russian Federation (RU); Serbia (RS); Slovakia (SK); Slovenia (SI); Switzerland (CH); Ukraine (UA)

Five **transboundary aquifers** (no 47-51) in the Danube Basin and tributaries of the Tisza were assessed as part of South-Eastern Europe but they are included here because of their location within basins assessed as part of Eastern and Northern Europe. For the detailed assessments, see document ECE/MP.WAT/2009/9.

For some aquifers, reference is made to Inventory of Transboundary Groundwaters by UNECE Task Force on Monitoring and Assessment (1999). That list was reviewed in the groundwater session of the subregional workshop in Kiev.

Basin/sub-basin(s)	*Recipient*	*Riparian countries*	*Lakes in the basin*	*Transboundary groundwaters within the basin (aquifers or groundwater bodies)*	*Ramsar sites included in this assessment*
Narva	Baltic Sea	EE, LV, RU	Narva reservoir and Lake Peipsi	Silurian-Ordovician Layer (EE-LV-RU)	Lake Peipsi and surrounding lowlands (EE, RU)
Salaca	Baltic Sea	EE, LV			North Livonian bogs (EE, LV)
Gauja/Koiva	Baltic Sea	EE, LV		D4[2] (LV, LT), D5, D6, P (LV, EE)	
Daugava	Baltic Sea	BY, LT, LV, RU	Lake Drisvyaty/Druksh iai	D4 (LV, LT), D8 (LV-EE-RU)[3], D9, D10[4] (LV, LT, BY)	
Lielupe	Baltic Sea	LT, LV		A (LV, LT), D4 (LV, LT), F3 [5](LV, LT)	
- Nemunelis	Lielupe	LT, LV			
- Musa	Lielupe	LT, LV			
Venta, Barta and Sventoji	Baltic Sea	LT, LV		A, D4, F1, F2, F3 (LV, LT),	
Neman	Baltic Sea	BY, LT, LV, PL, RU	Lake Galadus	Upper Cretaceous (LT, RU)	
Pregel	Baltic Sea	LT, RU, PL		Mazursko-Podlashi Region (PL, BY, LT, RU)	
Prohladnaja	Baltic Sea	RU, PL			
Vistula	Baltic Sea	BY, PL, SK, UA		Lublin-Podlasie Region (PL, UA), Mesozoic of Belianske Tatry and Adjacent Crystalline (SK, PL)	
- Bug	Vistula	BY, PL, UA		Bug (BY, PL)	Wetlands along the Western Bug (PL, BY, UA)
- Dunajec	Vistula	PL, SK			
-Poprad	Dunajec	PL, SK		Alluvium of Poprad (SK, PL)	
Danube	Black Sea	AL, AT, BA, BG, CH, CZ, DE, HU, HR, MD, ME, MK, IT, PL, RO, RS, SK, SI, UA	Reservoirs Iron Gate I and Iron Gate II, Lake Neusiedl	Aggteleki Karszt / Alluvium of Bodva and Slovak Karst (SK, HU), Silurian-Cretaceous (/4) (MD, RO, UA), Mesozoic of West Tatra and adjacent Crystalline (SK, PL), Q,N1-2,Pg2-3,Cr2 (RO, UA), Qall,N,Pg+K2 (SK, PL, RO), Neogene-Sarmatian[6] (BG-RO), Upper Jurassic-Lower Cretaceous[7] (BG-RO)	Lower Danube River (MD, RO, UA)

[2] Corresponds spatially with aquifers “Stipinai” (no. 63) and “Katlesi-Plivinias / Suosos-Kupiskio Istros-Tatulos” (no. 65) of the UNECE 1999 inventory and the riparian countries are the same.

[3] Corresponds spatially with aquifer “Silurian-Ordovician Layer” (no. 42) of the UNECE 1999 inventory and the riparian countries are the same.

[4] Corresponds spatially with aquifer “ Sventoji-Arunula ” (no. 66) of the UNECE 1999 inventory (riparians LV, LT) but later identified as “Sventoji-Arunula / Sventosios-Upninky” .

[5] Corresponds spatially with aquifer “Upper Permian-Famennian” (no. 64) of the UNECE 1999 inventory and the riparian countries are the same .

[6] Neogene-Sarmatian aquifer was assessed in the South-Eastern Europe assessment (aquifer no.50).

[7] Upper Jurassic-Lower Cretaceous aquifer was assessed in the South-Eastern Europe assessment (aquifer

Basin/sub-basin(s)	*Recipient*	*Riparian countries*	*Lakes in the basin*	*Transboundary groundwaters within the basin (aquifers or groundwater bodies)*	*Ramsar sites included in this assessment*
- Vah	Danube	PL, SK			
- Ipel/Ipoly	Danube	HU, SK		Ipoly völgy/Alluvium of Ipel (HU, SK)	
- Tisza	Danube	HU, RO, RS, SK, UA		Karancs-Medves / Alluvium of Slaná, Hernád Völgy / Alluvium of Hornad (HU, SK)	Upper Tisza Valley (HU, SK, UA); Domica-Baradla Cave System (HU, SK)
- Somes/Szamos	Tisza	HU, RO		Samos/Somes alluvial fan[8] (RO, HU), Nyírség, keleti rész / Nyírség, east margin (RO, HU)	
- Mures/Maros	Tisza	HU, RO		Pleistocene Mure/Maros Alluvial Fan[9]	
- Siret	Danube	RO, UA		Middle Sarmatian Pontian [10](MD, RO)	
- Prut	Danube	MD, RO, UA	Stanca-Costesti Reservoir	Middle Sarmatian Pontian (MD, RO)	
Kahul	Lake Kahul	MD, UA	Lake Kahul		
Yalpuh	Lake Yalpuh	MD, UA	Lake Yalpuh		
Cogilnik	Black Sea	MD, UA			
Dniester	Black Sea	UA, MD		Shallow Groundwater (Q) (/1) / Qall,N,K2 (MD, UA)	
- Yahorlyk	Dniester	UA, MD			
- Kuchurhan	Dniester	UA, MD			
Dnieper	Black Sea	BY, RU, UA		Q, Pg2+Pg3,Cr2,A+Pt1 (BY, UA)	
- Pripyat	Dnieper	BY, UA			Stokhid-Pripyat-Prostyr Rivers (BY, UA)s
Elancik	Black Sea	RU, UA			
Mius	Black Sea	RU, UA			
Don/Siversky Donets	Black Sea	RU, UA			

LEGAL, POLICY AND INSTITUTIONAL FRAMEWORKS FOR TRANSBOUNDARY WATER MANAGEMENT

6. Currently a number of countries are in the process or have recently renewed bilateral agreements on transboundary waters in the subregion. Many of the existing agreements have been signed in the late 1990s or in the 2000s. Ukraine and Moldova are preparing a new basin agreement on the Dniester and the subsequent development of a transboundary water commission. Romania and the Republic of

no.51)

[8] Somes/Szamos alluvial fan aquifer was assessed in the South-Eastern Europe assessment (aquifer no.48) .

[9] Pleistocene Mure/Maros alluvial fan aquifer was assessed in the South-Eastern Europe assessment (aquifer no.47).

[10] Middle Sarmatian Pontian aquifer was assessed in the South-Eastern Europe assessment (aquifer no.49).

Moldova have recently entered into an agreement on the Prut. Also, a new intergovernmental agreement on transboundary waters between Belarus and Poland is under development. One factor that has triggered updates, is the need to take into account provisions of the WFD and principles of the Integrated Water Resources Management (IWRM). On some significant transboundary rivers of the subregion, Dnieper or Dniester, there is no river basin commission as of yet. The Water Convention has provided basis for many of these agreements.

7. Transboundary water commissions can promote a variety of cooperation between neighbouring countries, and by building on mutual trust the cooperation can expand. Where the transboundary commissions work, there is an agreement as a basis. Not limited to the common task of joint commissions to organize exchange of monitoring data, commissions may — as for example Estonian-Russian joint commission —define priority directions and programs of scientific studies on protection and sustainable use of transboundary waters, facilitate cooperation between various actors in the basin and ensure publicity of discussions on pertinent questions. In expert groups of transboundary water commissions, cooperation can also be internationally activated.

8. River basin councils or similar institutions advise water management authorities in many countries of the subregion. River basin councils' establishment on the national level not sufficient in the case of transboundary basins: It is necessary to go further to transboundary issues by inviting/involving the co-riparian countries' representatives. As an example of such efforts, both Ukraine and the Republic of Moldova have the intention to invite each other's representatives. It is a challenge to get also the neighbouring countries' concerns discussed if they attend in an observer role.

9. River basin councils (sovjet) have been established for all river basins in Ukraine. On Seversky Donets, there are two. Expanding the participation in the work of councils by for example professionals' organizations could strengthen the substance knowledge of the councils, but in practice enlarging is limited by costs. Already a lack of funding to meet is a constraint. Non-governmental organizations (NGOs) are experts not only on public participation, but bring in also enriching substance knowledge. A broader participation (NGOs, cross-sectoral etc) in the councils is possible — and would potentially help in identifying sustainable solutions to problems — so efforts should be made to that end, also where the EU WFD does not oblige for stakeholder involvement. It is important to include in the transboundary water agreements the interests of local populations, as Norwegian experience with indigenous peoples (the Saami) demonstrate.

10. In the EU Member States of the sub-region, the preparation of River Basin Management Plans is an obligation (the publication of the plans was due in December 2009). In the eastern part, the preparation of such plans has been influenced by donor support: A draft management plan for the Pripyat River basin was developed in the framework of the TACIS project, but this has not been followed up. The countries sharing river basins with the EU countries are encouraged to prepare River Basin Management Plans jointly. Belarus has schemes for complex use and protection of waters, but there is now interest in seeing how these compare with EU river basin management plans.

11. Planning systems in the eastern part of the subregion are still influenced by the history of Soviet style, with a lot of focus on hydraulics and water quality. The principles of integrated water resources management (IWRM) are acknowledged in the countries as important to follow but the implementation in practice is limited in the countries of the Eastern part of the sub-region. There are national institutional problems that remain to be solved, complicating for example intersectoral cooperation

which is a prerequisite for integrated management of water resources. There is little coordination and integration between the national organizations involved in the management of water resources, for example, between the agencies managing surface water and groundwater resources. The countries manage their part of the basin and the transboundary involvement is there. Weak institutional and legislation and weak intersectoral cooperation make the application difficult. Another challenge is the shortage of funding for the water sector to implement the plans, for which high-level support in the ministries is essential.

12. In the Republic of Moldova (previous water code is from 1992), a draft for a new water law incorporating basin principles is in its final stage of agreement between sectoral ministries. Convergence with the EU acquis communautaire and the EU Water Framework Directive in particular is one consideration in the legal update. Recently a piece of legislation for the control of wastewater discharges from municipal sources was drawn up — under the National Policy process under the EU Water Initiative with UNECE as key strategic partner — and has been adopted but the implementation is difficult due to e.g. shortage of funds. A new strategy on drinking water and water management has also been prepared, but implementation has not gotten under way. A new national strategy on waste management is currently being developed and among its objectives is reduction of impact on water resources.

13. Such efforts related to Moldova's convergence plans for EU's water directives indicate a wider tendency in many of the non-EU countries of the subregion. In Ukraine, the need to introduce the principles of river basin management is reflected mainly in the Law of Ukraine "On Environmental Protection" and Water Code of Ukraine.

MONITORING OF TRANSBOUNDARY RIVERS, LAKES AND GROUNDWATER

14. Some bilateral agreements concerning transboundary waters signed in the 2000s — e.g. Belarus-Ukraine and Belarus-Russian Federation — have among their key provisions exchange of hydrometeorological or other data on transboundary waters. The organization o joint monitoring programmes, monitoring/data collection and data management varies: Between Romania and Hungary these are organised through a joint Hydrotechnical Commission. Agreements for exchange of data have been made also between departments and institutions dealing with hydrometeorological information, as the example of Belarus and Poland demonstrates. Despite the bilateral agreement pending, water quantity and water quality surveying on Prut River between water authorities from Moldova and Romania for exchange has been carried out.

15. Formalizing the transboundary cooperation and setting up the necessary institutions facilitates exchange of monitoring information. For example in a framework like Estonia-Russian Federation joint commission, and the working groups under it, systematic exchange of information about the situation of the water bodies takes place. The experience from joint monitoring on the Lakes Peipsi and Narva based on agreed monitoring programme illustrates also the remaining challenges: monitoring programmes need to be harmonized, criteria used for assessing the situation of the water bodies needs to be agreed upon and the comparability of laboratories used needs to be ensured.

16. Physical-chemical monitoring tends to be emphasized, and biological monitoring is less developed. For example in Moldova, the surface water quality assessment is still based on the

maximum admissible concentrations (MAC's), defined for a range of parameters and their exceedences. In Ukraine, the integrated assessment of water quality involves consideration of a range of physical, chemical, microbiological and biological parameters of water quality, and this system has parallels with WFD. For example in the case of Dniester, there is a lack of adequate coordination between various monitoring systems, managed by different agencies.

17. Monitoring and related reporting in the EU countries is largely set by the requirements of the EU's water-related directives. Preparing river basin management plans jointly between EU and the neighbouring non-EU countries (e.g. Moldova and Romania) according to EU WFD influences the thinking in the margin outside the EU also and the related information requirements push for collecting specific information.

18. In the eastern part of the subregion and across the EU border, the different water quality systems make it difficult to compare and agree about water quality status. On the Pripyet (Belarus, Ukraine), water quality classification systems are different, but joint monitoring is carried out, both applying national systems. Approaches are harmonized for selected transboundary sites. For reliably assessing the status of transboundary basins and the spatial distribution of anthropogenic impact, it is necessary to use harmonized methods and agreed indicators. The influence of WFD will over time increase harmonization in the sub-region.

19. A number of Eastern European countries are in the process of preparing or implementing a new system of surface water quality standards (e.g. Ukraine), which would serve as a general framework for the assessment of water quality and subsequent strategic actions to improve it. The move is towards setting water quality objectives away from use-related quality classes and stringent emission limits. Amending national legislation in this direction takes time. New water quality system classification has been prepared for Moldova as a result of the Technical Aid to the Commonwealth of Independent States (TACIS) project "Water Governance in the Western EECCA[11] Countries" (2008–2010) and was submitted to the sectoral ministries for final agreement before submission to government**.** Analytical and data management capabilities commonly need strengthening.

20. Flooding in recent years (e.g. in 2008 in the Carpathians regions of Ukraine) has increased awareness about the need to invest in flood prediction and cooperate with neighbouring countries in developing such systems. Ukraine has been developing hydrometeorological monitoring on the Dniester, Prut and Siret to support related decision-making for reducing damage from flooding.

21. As an example on transboundary cooperation in monitoring, Hungary, Slovakia and Romania have 42 automatic hydrometric stations in the Carpathian region. Early-warning systems require long-term commitment and continuous maintenance: testing of the Accident Emergency Warning System (AEWS) in March 2007 on the Danube revealed that a half of the stations did not react in a timely fashion.

22. The use of information technology in monitoring and data management is gradually increasing, introduced especially through donor-supported projects. The development of structure and content of a pilot Geographical Information System on the Dniester River Basin as the information basis of water management is supported in an Environment and Security Initiative (ENVSEC) project. For these to be

[11] Eastern Europe, Caucasus and Central Asia

beneficial in compiling and analyzing information on transboundary basins and eventually supporting decision-making, it is important to have agreed rules for collecting and processing information nationally and international levels. A practical requirement is also the capacity to use GIS systems.

23. Networks for monitoring transboundary groundwaters are not well developed, and for example Belarus indicates transboundary groundwater monitoring to be needed.

24. Especially for detecting anthropogenic impacts, background information is needed. Voluntary monitoring schemes of water quality can help in small rivers (Latvian experience).

MAIN PROBLEMS, IMPACT AND STATUS

25. Although an improvement of water quality has been observed over the past decade, significant problems remain. Discharges of non-treated or insufficiently treated wastewaters, municipal and industrial is a major pressure factor influencing water quality and wide-spread in the subregion. In the Danube Basin, these were among the sources of organic pollution, which has been identified among the Significant Water Management Issues. Very commonly in the new EU countries of the Danube Basin, industrial wastewaters are not treated or insufficiently treated before discharging either into surface waters or public sewer systems. In the eastern part of the subregion in particular the wastewater treatment equipment and infrastructure is degraded. In Ukraine, a lack of funding is referred to as the reason why the issue has not been effectively addressed. The problems related to aged infrastructure affect the water sector beyond wastewater treatment. It is the bigger cities wastewater discharges that have the biggest potential for transboundary impacts, but especially in the Eastern part of the subregion (e.g. in Belarus), a high percentage of the population is not connected to wastewater collection systems, especially in rural areas and smaller towns. In the northern part of the subregion (Norway, Finland), pressure from settlements is low and local because of low population density.

26. Through the recipient seas, nutrient loads also have transboundary impacts. The ICPDR estimates that for the period 1988-2005, the Danube introduced on average about 35,000 tonnes of phosphorus and 400,000 tonnes of inorganic nitrogen into the Black Sea each year. Since the late 1990s to 2008, nitrogen load through rivers from Poland to the Baltic Sea has reduced significantly – from over 250,000 tons in total nitrogen to less than 100,000 tons. The decrease can mainly be attributed to reduction of nitrate nitrogen in 2003 and after. The amount of organic nitrogen loading has stayed fairly stable. The estimated reduction of BOD_5 is similarly marked from about 270,000 tons/year in 1998 to about 140,000 tons/year in 2008. There are also concerns that even with the nutrient loading substantially reduced, the time required for improvements to be seen in lake water quality can be long.

27. Pollution by hazardous substances —which can seriously damage riverine ecology — is among the Significant Water Management Issues identified in the Danube Basin, one of the major sources being pesticides used in agriculture. In comparison with Western Europe (including the upstream Danube countries), the level of pesticide use in central and lower Danube River Basin countries remains relatively low. A number of pesticides analyzed in water and sediments are not authorized in any of the riparian countries.

28. Agriculture is a major pressure factor in many transboundary basins of the subregion not only through organic pollution (especially from manure), nitrogen and phosphorus loads but also through being a significant water user. Practices need to be improved to limit diffuse pollution. Even those EU

countries who have managed to get point source pollution fairly well under control, acknowledge that diffuse pollution from agriculture needs to be tackled. The importance of agricultural pollution and urban diffuse sources as pressure factors is relatively increasing as efforts for many years have focused on industrial pollution. To protect water sources used for supply, countries that have not yet established protection zones or have embarked on it more actively in recent years — for example Belarus and Romania — are setting them up.

29. Diverse industries operate in the subregion, including food processing, pulp and paper, wood processing,chemical (e.g. oil refining) and metallurgical industry, production of appliances and furniture. Compared with other sectors, industry is not a big water user due to some progress in water saving and rational use of water, but the industry's impact depends heavily on the type of industry, processes used and discharge regulation. Heavy metals and hydrocarbons from industrial wastewater discharges are a concern in a number of basins, including Seversky Donets, despite the legislation in place.

30. Locally the mining industry can be a significant pressure factor, for example in the Siret sub-basin, where storage facilities, including tailing dams are located. In Romania there is copper, zinc and lead mining, coal mining and uranium mining. In the Tisza and Kórós basins, there are cadmium and copper loads from mining activities. In the territories of the Russian Federation and Ukraine in the Seversky Donets basin, coal industry has an impact.

31. Inappropriate solid waste disposal, for example at uncontrolled dump sites is reported to be an issue in some basins, e.g. the Daugava, Ipoly and Prut, albeit commonly of local impact.

32. Hydromorphological changes impact on the biological component of the river systems. Joint Survey 2 of ICPDR made on the Danube with a common methodology to assess the distribution of alterations along the main course of the river identified the following key hydromorphological pressure components of basin wide importance: interruption of river and habitat continuity, disconnection of adjacent wetlands/floodplain and hydrological alterations. The key driving forces causing eventual river and habitat continuity interruptions in the Danube River Basin District are mainly flood protection (45 per cent), hydropower generation (45 per cent) and water supply (10 per cent). Systematic assessments of other major rivers would shed light on the extent of the hydromorphological changes in other parts of the subregion. Based on the results, it can be concluded that a third of the channels along the main course of the Danube is either severely modified (29%) or totally modified (3%). Almost a tenth of the floodplain is totally modified. In general the Upper Danube is hydromorphologically more altered that the downstream. The riparian countries have been encouraged to develop further more detailed national investigations.

33. In the Danube delta, the consequences of water engineering works (flood protections, irrigation systems etc) have a transboundary character: cutting meander bends and similar works cause redistribution of runoff and consequently affect sediment deposition and delta-forming processes. As a result of sediment transport, land area shifts, which has got territorial implications. On the Prut, banks are fortified in Romania to avoid losing territory (sediment moves the river to the west). Large-scale hydrotechnical works have been carried out in the Danube Delta in order to improve the transit navigation between the Danube and the Black Sea. River regulation by dams, their straightening and canalization, the construction of navigation channels and significant water abstraction impact also on

the wetland areas of the subregion through the alteration of their hydrological regime. The impacts from infrastructure for hydropower generation is an issue in many basins of the subregion.

34. Among other anthropogenic pressures that affect wetlands are forestry operations (e.g. cutting, replacement of natural communities with monocultures), peat extraction and associated drainage contribute to the change of hydrological processes and pose a threat to ecosystem integrity. Similar effects are caused by agricultural practices (e.g. transformation of naturally flooded meadows into cultivated lands), while intensive grazing on wet pastures leads to the degradation of natural vegetation and deterioration of the soil structure. Another extreme is the abandonment of traditional agricultural lands and subsequent overgrowing of previously open areas. A specific threat is posed by fires – in forests, on peatlands and grasslands. Unsustainable fisheries and aquaculture, hunting, berry collecting, tourism and recreation practices (including poaching, illegal dumps etc.) contribute to the deterioration of wetland ecosystems. All together, these processes lead to degradation of valuable aquatic and terrestrial wetland biotopes and the subsequent loss of biodiversity and certain ecosystem services. Invasive plant and animal species that outcompete native ones pose another threat.

CLIMATE CHANGE AND ITS IMPACTS ON WATER RESOURCES

35. Some increase of the mean air temperature over the past decades has been observed, e.g. in Ukraine 1976-2007 compared with the period 1961-1975. The observed change mainly relates to winter temperatures, and is most marked in the northern part of the country. Over most of the territory of Ukraine, the change in the annual precipitation sum is increasing. Within the next 30 years climate change is predicted to cause in the forested northern part of Ukraine, a 15-25% increase of mean annual runoff is predicted, involving an increase of winter runoff and a decrease of spring runoff. In the southern and south-eastern part (forest-steppe and steppe zones), Ukraine predicts a 30-50% decrease in mean annual runoff, with about a half of the flow occurring during the winter month. Drought risk is expected to increase in the South. Along the rivers in the Carpathians, the frequency of extreme floods is predicted to increase. Predictions of run-off change have been made to individual rivers (Dnieper, for example). Negative impacts are expected on the water quality in the South and South-East of Ukraine.

36. In the Northern part of the subregion, for the area of e.g. the Kemijoki and Teno Basins in the North of Finland, a set of climate change scenarios suggest an increase of 1.5–4.0 ºC in annual mean temperature and 4–12 % increase in annual precipitation in forthcoming 50 years. Changes in seasonal hydrological discharge are predicted to vary from -5 to +10 per cent, depending on the area. In general the frequency of spring floods may increase. Groundwater levels may increase on winter time and decline on summer time, and groundwater quality in small groundwater bodies may be negatively affected.

37. No specific analysis of climate change and planning of related measures was required in the preparation of River Basin Management Plans according to the EU WFD. However, in some cases – thanks to activity of for example river basin commission — climate change has been included in the considerations: Tisza River Basin Management Plan 2010 in the framework of the ICPDR stands as an example. Significant impacts from climate change on the Tisza and Danube water systems are expected, in particular reduced average water flow and increase in the frequency and intensity of extreme events even though there are significant regional and local variations. Historical changes in land use and water management complicate the assessment of climate change impacts. Changes in

water quality and ecological status are considered likely but have not been investigated. Further work is needed on assessing impacts on water uses, because these are not known.

38. At the level transboundary basins, for example in Pasvik/Paatsjoki River Basin (Finland, Norway and Russia), a programme aimed at producing knowledge and information on environmental impacts for decisions making and strategies on adaptation of climate change and anthropogenic effects on regional level, as well as developing assessment tools for this border region. The ecological status of Lake lnari and the River Pasvik are being assessed for estimating climate change effects. The related activities include an updated manual for the joint monitoring programme for climate change purposes. Concern has been expressed about implications of climate change on the operation regime and water levels in reservoirs in Finland.

39. There is a need to develop monitoring of different components of the water cycle – including evaporation, which is challenging - for water balance studies and to evaluate changes on the hydrological regime using models. The necessity of strengthening inter-disciplinary research of climate change impacts on water-related sectors of the economy is a challenge to coordination between different sectors and agencies. The assessments are most meaningfully concentrated on large river basins and the whole basins need to be looked at. A move from empirical to mathematical modelling (in assessing hydrological changes?) and to decision support systems can be observed.

40. Efforts are being made to address climate change related concerns, and the need to develop intersectoral and international cooperation to this end is acknowledged. In the EU countries of the sub-region, European Commission's so-called White Paper (2009) "Adapting to climate change: Towards a European framework for action" calls for promotion of strategies which increase the resilience to climate change, and sees also a need for the development of guidance to ensure "climate proofness" of River Basin Management Plans by 2015. At the national level, for example, a draft Climate Programme for Ukraine has been prepared by the Ukrainian Hydrometeorological Institute, paving the way to an eventual elaboration of a National [climate change] Action Plan. A number of research projects, funded in particular by the European Union, aimed at strengthening the knowledge base. Current practical information needs – as demonstrated by the case of the Tisza – include quantification of the predicted impacts on water resources and a better knowledge about their spatial distribution.

41. Many countries (e.g. Romania) in the sub-region have adopted a National Strategy for Climate Change, and a number of others (e.g. Hungary) are preparing one. A draft concept of the National strategy for adaptation of water resources management to climate change is being developed in Ukraine in the framework of the National Policy Dialogue process. This activity, initiated by the Secretariat of the Water Convention, involves also developing a joint plan between Ukraine and Moldova for adaptation to climate change in the Dniester basin applying the UNECE Guidelines for adaptation of water management in the UNECE specific transboundary basin.

42. Dniester III project of ENVSEC (a joint project of UNECE, OSCE and UNEP) aims at reducing the risks associated with climate change, particularly flooding, by improving the adaptive capacities of recipient countries. In particular, the project aims at expanding and further strengthening of cooperation in the management of the Dniester River in transboundary management of floods, taking into account both current climate variability and possible long-term effects of climate change on flood risk.

43. From time to time periodical flooding causes problems in the subregion. Recent flooding caused by heavy rains in the Carpathians in July 2008 in Ukraine, Moldova and Romania reached significant dimensions on many rivers, for example discharge of Prut reached a record level then.

44. Evaluation of costs of adaptation and comparison of different protection/adaptation measures is commonly further down the road for many basins and few countries have seriously embarked on these aspects yet. In the parts of the subregion where agriculture is a key economic sector, prediction of impacts of climate change to assess vulnerability would add useful knowledge. Ukraine estimates that agriculture in the southern part of the country will likely be affected by climate change, but also water supply to settlements and industry.

RESPONSES

45. EU WFD requirements have put in motion a race towards meeting the environmental objectives. The EU Member States have transposed WFD in their national legislation. Preparing River Basin Management Plans has required an assessment of the situation in the basins according to a common format. There is need for harmonization of the activities from the transboundary integrated River Basin Management Plan(s). Programmes of measures have been defined as stipulated in the WFD, aimed at addressing the main concerns identified in the Plans.

46. Gradual rehabilitation, building and extension of sewerage systems and wastewater treatment plants is being carried out to reduced impact from municipal wastewater discharges (e.g. BOD, COD, nitrogen, phosphorus). In the EU, the Urban Wastewater Treatment Directive (Council Directive 91/271/EEC) sets the requirements for the Member States, requiring collection and treatment (basically biological) of wastewater from agglomerations of more than 2,000 people and the time frame for complying. Wastewater treatment equipment is being repaired and constructed but many countries that acceded to the EU in 2004 and 2007 enlargements — in this sub-region Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Romania — were granted some transitional periods to comply with the Directive's requirements. The investment needed in the new EU Member States is substantial, illustrated by Estonia where more than a half of the wastewater collection areas in agglomerations with more than 2000 p.e. (population equivalent) did not meet the Directive's requirements in 2008.

47. The EU countries are also taking supplementary measures to reduce nutrient pollution, as demonstrated by Slovakia where these range from legislative measures for production of non-phosphorus containing detergents to the application of the good agricultural practices code (related to the implementation of nitrates Directive 91/676/EEC). Studies regarding the mass transport of pollutants (ammonium and nitrates) are envisaged at least in Romania and Slovakia as supplementary measures.

48. Fulfilling the requirements of the Nitrates Directive and to Urban Waste Water Directive are for EU countries the basic measures for reducing nutrient load at basin level. Diffuse pollution by nutrients from agriculture is addressed by, for example, through specific action programmes for vulnerable zones to nitrates (good practices in agriculture code). ICPDR promotes its Best Agricultural Practices Recommendations to non-EU countries in the Danube Basin. To limit impacts on groundwater quality in particular, vulnerability mapping for land use planning has been carried out (e.g. Romania). Protection zones for drinking water supply have been established for most of the sources in Romania.

49. Even though the observed improvement of water quality in the last decade in the new EU Member States like Romania is partly related to reduced industrial activity, a part of the credit is given to the implementation of principles like “polluter pays” in environmental regulation and the transposition of the EU environmental legislation.

50. In the Mures/Maros sub-basin, heavy metal pollution from mining has been reduced by: rehabilitation of the wastewater treatment plants and by closure of mines

51. Related to hydromorphological alterations, the focus of measures in the Danube River Basin District is on establishing free migration for long and medium distance migrants of the Danube and the connected lowland rivers. Deterioration of the current situation should be prevented and measures taken to improve habitats and the situation for migratory species and to support floodplain restoration. Basin approach needs to be applied to planning any hydrotechnical measures. Extending joint monitoring and developing jointly the hydraulic mathematical model of the Delta would support the assessment of impacts from interventions and decision-making.

52. Related to preparedness for hydrological extremes, Romania has prepared a national strategy for flooding and drought. Some transboundary investment cooperation is also reported on: Flood protection is developed in the Romanian-Hungarian area of common interest on the Mures River (the value of the project amounts to 2 MEUR). Improving the hydrological warning and forecasting systems on transboundary rivers would be mutually beneficial for all the riparian countries. The implementation of the EU Flood Directive which entered into force in 2007 improves preparedness by requiring the EU Member States to inventory flood risk zones (2011), to map the zones probable to get flooded (by 2013) and to prepare plans for flood risk management at the level of basin (2015). This framework provides a useful incentive for related and guidance by UNECE provides good examples[12] of transboundary cooperation in flood management. The countries with built reservoir capacity use it to limit impacts from flooding.

53. In order to improve the knowledge base to direct measures effectively, a number of countries are modelling flow, nutrient loads etc. In the case of Mures/Maros Basin a need for updating existing joint models of transboundary aquifers is indicated. Elaboration of a hydrological year book for gauging stations located on transboundary rivers is also called for.

54. In recognition of their outstanding values, many wetland areas in the Eastern and Northern Europe sub-region are designated as protected areas under national and EU legislation, while a number of the most valuable sites have also international protection status, e.g. as Ramsar sites, World Heritage properties and Biosphere Reserves. A bright examples of transboundary cooperation specifically focused on valuable wetlands is the formal designation of Transboundary Ramsar Sites, meaning that the Ramsar site authorities on both or all sides of the border have formally agreed to collaborate in its management. In Eastern and Northern Europe five wetland areas currently have this status: Upper Tisza Valley (Hungary, Slovakia), Domica-Baradla Cave System and related wetlands (Hungary, Slovakia), Ipoly Valley - Poiplie (Hungary, Slovakia), North Livonian mires (Estonia, Latvia), Stokhid-Prypiat-Prostyr (Belarus, Ukraine).

[12] Transboundary Flood Risk Management: Experiences from the UNECE region. UNECE. 2009 (http://www.unece.org/env/water/mop5/Transboundary_Flood_Risk_Managment.pdf)

55. Many identified problems are addressed in projects, but they do not bring sustainability. Commonly there is no follow-up financing to projects, and the countries are often not ready to take the follow-on. Especially related to legal and institutional aspects of transboundary relations, long-term assistance programmes are a key to international cooperation; 1-2 years is short for achieving concrete results.

56. The work of NGOs at basin level is constrained by limited financial resources. Real progress can be seen in bigger basins where there have been big international projects. NGOs' transboundary cooperation is constrained by limitations to mobility (visa needs) and to carrying out activities across the boundary such as chemical sampling.

THE WAY FORWARD

57. WFD implementation influences the Eastern European countries neighbouring the EU, even if the following important WFD deadlines coming up oblige the Member States: Compliance check of River Basin Management Plans from 2010, implementation of "Programmes of Measures" and Blueprint to Safeguard European Waters by 2012. Good status of waters should be reached by 2015 and measures taken will be geared towards it.

58. A number of bilateral agreements concerning transboundary waters have been signed in the subregion to facilitate cooperation, some of them involving setting up a joint commission. Many bilateral agreements on transboundary waters are expected to be revised taking into account provisions of the WFD (Dniester in progress). There is currently no agreement between Romanian and Moldavian governments, but efforts have been made to this end: Romania sent a new proposal in 2006. The studies, plans and recommendations developed in the framework by established river basin commissions in the subregion demonstrate the benefits of institutionalizing the basin level cooperation.

59. Throughout the Danube River Basin District there is a considerable number of future infrastructure projects at different stages of planning and preparation: Some 112 such projects have been reported, with more than a half related to navigation and almost a third for flood protection.

60. For the Danube River Basin District, a Joint Programme of Measures has been defined to address the identified Significant Water Management Issues (organic, nutrient and hazardous substances pollution and hydromorphological alterations) as well as groundwater bodies of basin-wide importance. This Programme is based on the national Programmes of Measures which are to be made operational by December 2012.

61. An increase of water demand is expected by Romania for all uses till 2020 (in Mures/Maros Basin, Siret and Prut at least) and some transboundary consultations are made about possible consequences. Water use for public water supply is expected to increase in some basins, which may or may not have transboundary impact.

62. In Romania, the pollution level is expected to decrease for almost all pollutants by 2015, with the exception of nitrogen compounds and heavy metals. Despite the improvement of water quality observed in the last decade — mostly due to decreasing industrial production — significant water-quality problems remain and improvement is expected until the 2020s.

63. It seems that despite the efforts made by the countries to improve treatment of wastewaters, impact of untreated or poorly treated wastewaters will not be phased out quickly: For example, ICPDR estimated (June 2010) that in the Danube River Basin District, there are 228 agglomerations with >10,000 p.e. still lacking wastewater treatment plants which need to be realized by 2015, and some 40 more agglomerations for which the equipment or set-up is otherwise deficient.

64. The assessment of transboundary groundwater resources is complicated by the introduction of WFD specific groundwater body definition, when aquifer term is internationally well established. ICPDR emphasizes that appropriate controls regarding abstraction of fresh surface water and groundwater and impoundment of fresh surface waters (including a register or registers of water abstractions) must be put in place as well as the requirements for prior authorisation of such abstraction and impoundment. In line with the WFD, it must be ensured that the available groundwater resource is not exceeded by the long-term annual average rate of abstraction.

65. Water and health issues appear to have a low priority and stepping up efforts in this area would have beneficial impacts on public health, considering the influence of access to adequate amounts of water of appropriate quality.