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THE PROTECTION AND USE OF TRANSBOUNDARY
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Item 7 (e) of the provisional agenda

PRELIMINARY ASSESSMENT OF TRANSBOUNDARY RIVERS AND LAKES IN EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA*

Submitted by the Chairperson of the Working Group on
Monitoring and Assessment

1. This document and its addenda (ECE/MP.WAT/2006/16/Add.1–Add.6) have been prepared according to the decisions taken by the Parties at their third meeting (see ECE/MP.WAT/15/Add.2, annex, programme element 3.3 of the workplan 2004–2006) and subsequent decisions by the Working Group on Monitoring and Assessment at its fifth to seventh meetings (MP.WAT/WG.2/2004/2, MP.WAT/WG.2/2005/2 and ECE/MP.WAT/WG.2/2006/2).

2. On the basis of a preliminary inventory[1] of transboundary rivers and lakes, this draft assessment was prepared by the Finnish Environment Institute with the assistance of a consultant. It is based on information submitted by countries in response to a specifically designed datasheet (annex I) as well as information from other sources, such as the Environmental Performance Reviews undertaken by UNECE for countries in Eastern Europe, Caucasus and Central Asia (EECCA), reviews undertaken by the United Nations Environmental

* This document was submitted on the above date because of processing delays.

[1] An updated list of transboundary rivers and lakes in the entire UNECE region will be made available as a working paper to the Parties at their fourth meeting.

Programme's Global International Waters Assessment (UNEP/GIWA), the outcome of assistance projects, reports drafted by the Regional Environmental Centres,[2] and national reports submitted by countries to seminars and workshops organized under the Convention's workplan in the period 2004–2006.

3. This draft assessment is an intermediate product limited to major transboundary rivers in the countries in EECCA and selected lakes in the UNECE region. Its purpose is to show examples of specific water management issues in the various basins and sub-basins, highlight progress made in protecting and sustainably using water resources, and propose further steps to prevent, control and reduce transboundary impact.

4. Following decisions by the Working Group on Monitoring and Assessment, this draft assessment will be further developed, updated and finalized by the Working Group in April 2007 for submission to the sixth Ministerial Conference "Environment for Europe" (Belgrade, 10–12 October 2007).

5. In parallel, assessments of other transboundary rivers and lakes located (a) on the fringe between EU countries and EECCA countries; (b) in South-Eastern Europe (SEE); and (c) in the remainder of the UNECE region, except North America and Israel, will be taken up. For these rivers and lakes, the respective countries should complete the datasheets as soon as possible. Information already available, in particular information produced by EU countries for reporting purposes according to the Water Framework Directive, will be an asset.

6. Work on the assessment of transboundary groundwaters started in September 2006 based on a specifically designed datasheet (annex II). An assessment of the status of selected transboundary groundwaters in the EECCA and SEE countries will be available by April 2007.

7. The Meeting of the Parties may wish to:

(a) Take note of the draft assessment presented in documents ECE/MP.WAT/2006/16 and ECE/MP.WAT/2006/16/Add.1–Add.6;

(b) Express its gratitude to the Government of Finland for its leadership in the development of the draft assessment and the financial contributions made;

(c) Express its appreciation to the representatives of the Finnish Environment Institute; the designated experts from Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Tajikistan, Ukraine and Uzbekistan; and the Water Convention's secretariat for the substantive work done;

(d) Invite Parties and non-Parties to provide amendments and additions to the inventory of transboundary rivers and lakes **by 31 January 2007**;

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[2] An example is the recently published study "Conserving ecosystems on inland water bodies in Central Asia and the Southern Caucasus" (Almaty, Tashkent, 2006), prepared by the Regional Environmental Center for Central Asia (CAREC) with financial and technical support from the Global Partnership for Central Asia and Caucasus, the Government of Finland, the European Commission and the World Conservation Union (IUCN).

(e) Invite Parties and non-Parties to provide amendments and additions to the present draft assessment of transboundary rivers and lakes **by 31 January 2007;**

(f) Invite Parties and non-Parties to provide **by 31 January 2007** data/information on other surface water bodies that have not yet been dealt with, in particular:

(i) Transboundary rivers and lakes on the fringe shared by EU and non-EU countries;

(ii) Transboundary rivers and lakes in South-Eastern Europe (SEE);

(iii) Transboundary rivers and lakes in the remaining part of the UNECE region, except Northern America and Israel;

(g) Invite Parties and non-Parties to provide **by 31 January 2007** updated information on transboundary groundwaters in the Caucasus, Central Asia and South-Eastern Europe;

(h) Request the Working Group on Monitoring and Assessment to make arrangements to prepare the assessment report on the status of transboundary surface waters and groundwaters. The assessment report should include an executive summary for submission to the sixth Ministerial Conference "Environment for Europe" in Belgrade, with a clear action-oriented political message, highlighting the needs for integration of water management issues in the development of related sectors, such as agriculture, energy and industry. Arrangements should include the designation of an ad hoc expert group and the convening of subregional workshops to complete the assessment report;

(i) Decide that the second assessment report should be published either in connection with the seventh Ministerial Conference "Environment for Europe" or with the sixth meeting of the Parties, and entrust the Working Group on Monitoring and Assessment with the preparation of this assessment. The Working Group on Monitoring and Assessment should also inform the Parties at their fifth meeting in 2009 about progress made in the completion of the second assessment report.

Background

8. Under the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention), the Parties shall take all appropriate measures to prevent, control and reduce pollution of waters causing or likely to cause transboundary impact. They shall also ensure that transboundary waters are used with the aim of ecologically sound and rational water management, conservation of water resources and environmental protection. Moreover, the Parties are obliged to ensure that transboundary waters are used in a reasonable and equitable way; and to ensure the conservation and, where necessary, restoration of ecosystems.

9. Riparian Parties (Parties bordering the same transboundary waters) have specific obligations. For example, they shall establish and implement joint programmes for monitoring the conditions of transboundary waters, including floods and ice drifts. Moreover, these riparian Parties shall, at regular intervals, carry out joint or coordinated assessments of the conditions of transboundary waters and the effectiveness of measures taken to prevent, control and reduce transboundary impact. The results of these assessments shall be made available to the public.

10. Following these obligations, this document presents an interim assessment of the status of transboundary waters in countries in EECCA. By highlighting the challenges these countries face in operating adequate monitoring systems; examining existing pressure factors on these water bodies; and providing information on trends in their ecological and chemical status, it sheds light on the effectiveness of measures taken and provides the grounds for further measures to prevent, control and reduce transboundary impacts.

I. TRANSBOUNDARY RIVERS AND LAKES IN THE UNECE REGION

11. Approximately 40 per cent of the world's population lives in river basins that cross the political boundaries of two or more countries. Perhaps even more significantly, over 90 per cent of the world's population lives in the countries that share these basins. These transboundary basins cover nearly one half of the earth's land surfaces and account for an estimated 60 per cent of global freshwater flow. These basins link populations of different countries, are a major source of income for millions of people in the world and create hydrological, social and economic interdependencies between countries.

12. Transboundary water resources play a significant role in the UNECE region. The region has several hundred transboundary water bodies, including rivers, lakes and groundwaters. Many rivers drain into closed seas or into land-locked lakes, and pollution transported by rivers to seas and lakes has a major influence on their ecosystems. The reasonable and equitable use of transboundary waters is a major challenge in the entire region, and interstate distribution of water is a particular challenge in EECCA and SEE countries with arid or semi-arid climates. These countries are in special need of international assistance based on sound assessments of the status of their transboundary waters and trends in water use and water pollution loads.

A. Transboundary rivers

13. A preliminary inventory of transboundary waters in the UNECE region shows that there are some 100 major transboundary river basins covering an area of about 15,000,000 square kilometres. Such transboundary river basins are the area of land from which all surface runoff flows through a sequence of streams, rivers and in some cases lakes into the sea at a single river mouth, estuary or delta, or the area of land from which all surface runoff ends up in another final recipient of water, such as a lake or a desert. In many cases, an assessment of the transboundary rivers that ends up in such a final recipient is not sufficient, as these transboundary basins are made up of a number of smaller sub-basins, many of them also of a transboundary nature.

14. The draft assessment covers, as far as information was available, the following water bodies:

- Transboundary rivers discharging into the Caspian Sea and their major transboundary tributaries (see also ECE/MP.WAT/2006/16/Add.2);
- Transboundary rivers discharging from EECCA countries into the Arctic Ocean and their major transboundary tributaries (see also ECE/MP.WAT/2006/16/Add.3);
- Transboundary rivers in the Aral Sea basin and their major transboundary tributaries (see also ECE/MP.WAT/2006/16/Add.4);
- Other major transboundary rivers in Central Asia originating in, or flowing through, EECCA countries (see also ECE/MP.WAT/2006/16/Add.5); and
- Transboundary rivers in Eastern Europe and the Caucasus discharging into the Black Sea and their major transboundary tributaries (see also ECE/MP.WAT/2006/16/Add.6).

B. Transboundary lakes

15. In addition to transboundary rivers, some 30 transboundary lakes[3] have been identified so far. The present assessment covers lakes in EECCA and selected lakes from other parts of Europe (see ECE/MP.WAT/2006/16/Add.1).

II. DRAFT PRELIMINARY EVALUATION OF MONITORING ACTIVITIES RELATING TO TRANSBOUNDARY WATERS

16. According to the "Strategies for monitoring and assessment of transboundary rivers, lakes and groundwaters" (ECE/MP.WAT/2006/12), monitoring should provide information, rather than data, on the specific water bodies under consideration.

Monitoring in EU countries

17. In EU countries, the knowledge regarding the state of water bodies and possible trends is relatively good. Monitoring results have been used as the basis for various water protection measures; however, there has also been a need to improve the situation, Therefore, during the

[3] For the purposes of this draft assessment, transboundary lakes include lakes shared by two or more countries, national lakes concerning which transboundary agreements exist, national lakes with basins that cover the territories of two or more States, in-stream reservoirs on transboundary rivers operated jointly by two countries, and the Caspian and Aral seas.

last 5–10 years significant changes in developing and especially harmonizing the monitoring programmes and their methodological basis have taken place in Western Europe.

18. At present, monitoring, assessment and reporting activities in EU countries are mostly steered by the obligations of different water-related directives. The main pressures on water resources are documented as a result of the implementation of the Urban Waste Water Treatment Directive (1991),[4] the Integrated Pollution Prevention and Control Directive (1996)[5] and the Nitrates Directive (1991 – on nitrates for agricultural sources),[6] as well as the Directive on Pollution Caused by Certain Dangerous Substances Discharged into the Aquatic Environment of the Community (1976).[7,8]

19. The status of water bodies (including their chemical and ecological status) will be documented in 2009 following the provisions of Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive, 2000[9] and 2001[10]). This forthcoming status assessment of the water bodies will incorporate information received under the other above-mentioned directives. The monitoring- and assessment-related activities under the Water Framework Directive could thus be seen as a kind of guide for monitoring, assessment and reporting for water bodies in EECCA.

20. Currently the implementation of monitoring programmes according to the Water Framework Directive is in a dynamic phase, since the programmes need to be operational by December 2006. Annex V of the Water Framework Directive and the detailed guidance documents[11] provide a sound basis for developing a harmonized monitoring and assessment system for all types of water bodies in the entire EU area.

21. The programme for monitoring the status of water bodies (rivers, lakes, transitional waters and coastal waters) is based both on the use of hydrobiological characteristics, supported with some key physico-chemical determinands, and on surveillance of certain harmful substances, including priority substances. The Water Framework Directive also takes into account hydrological variations during the monitoring period. The first status assessment using the new monitoring data will be reported to the Commission in 2009.

22. The advantage of monitoring programmes that comply with EU legislation is a harmonized methodology in a large region with different types of pressure factors and water bodies. The programme has been established to continue for a longer period, with certain assessment and reporting intervals – for example, 2015 as the deadline for the second report. In

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[4] http://europa.eu.int/eur-lex/en/consleg/main/1991/en_1991L0271_index.html
[5] http://europa.eu.int/eur-lex/en/consleg/ main/1996/en_1996L0061_index.html
[6] http://europa.eu.int/eur-lex/en/consleg/main/1991/en_1991L0676_index.html
[7] http://europa.eu.int/eur-lex/en/consleg/main/1976/en_1976L0464_index.html
[8] In July 2006, the European Commission adopted a proposal for a new Directive to protect surface water from pollution. The proposed Directive – required to support the Water Framework Directive – will set limits on concentrations in surface waters of 41 dangerous chemical substances. The proposal will make it possible to repeal five older directives.
[9] http://europa.eu.int/eur-lex/pri/en/oj/dat/2000/l_327/l_32720001222en00010072.pdf
[10] http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/l_331/l_33120011215en00010005.pdf
[11] http://ec.europa.eu/environment/water/water-framework/guidance_documents.html

the long run, experiences with these water-monitoring activities could form a useful basis for extending similar monitoring and reporting programmes to the even larger UNECE region.

Monitoring in EECCA countries

23. The longstanding cooperation on monitoring and assessment under the Water Convention and the ongoing activities for the present UNECE assessment of transboundary waters have already encouraged EECCA countries with common transboundary watercourses to develop joint monitoring programmes and harmonize their methodologies. The "Strategies for monitoring and assessment of transboundary rivers, lakes and groundwaters" have been developed to assist EECCA countries in this endeavour, taking into account the collective past experience of these countries as part of the former Soviet Union and their current economic capabilities.

24. It is wise and economically efficient to start the development of programmes step by step and stressing the need for harmonized methodology and the use of same or similar principles in assessing the status of shared water bodies. In this process, the EECCA countries sharing waters with EU countries will have a specific role to play: they are a bridge between western and eastern praxis in monitoring, and they could serve as models for introducing "modern" monitoring and assessment praxis as stipulated in the "Strategies" step by step.

25. As the river basin forms a natural unit for integrated water resources management, monitoring programmes should be designed for entire river basins. This is still difficult to achieve in most EECCA countries, where water management is not always based on river basins, due to inappropriate legislation and inappropriate institutional capacity and/or the enormous size of some transboundary basins.

26. A specific problem for the assessment of transboundary waters in EECCA countries arises from the widely used "maximum permitted concentrations of pollutants for a specific water use" (MPC) or water quality standards that seem to be more stringent than the water quality criteria and objectives often used in other parts of the UNECE region. It is often impossible to comply with these norms, partly due to the lack of appropriate measuring devices and partly because financial and human resources are lacking. Given the experience of other countries, particularly those applying the Water Framework Directive, future joint assessments should be based on water quality objectives or even ecologically based objectives, rather than MPC values. However, it is not realistic to expect EECCA countries to amend their national legislation in the short term.

27. Adopting a step-by-step approach, transboundary commissions could take the lead in this process by using water quality and environmental objectives in their daily practice. They should also agree on assessment methods to be used jointly within their transboundary basin. A promising example is cooperation between the Republic of Moldova and Ukraine on the Dniester basin, where data from two of the six agreed-upon measuring stations are already being gathered and exchanged. Almost all of the 30 agreed-upon physico-chemical parameters are being measured, but no measurements are being taken for the agreed-on three biological parameters and four radioactive determinands. In both countries, water laboratories have been designated as well as the entities responsible for data management and information exchange.

28. In EECCA, the ongoing reform of ministerial environmental departments and water agencies is an opportunity to harmonize responsibilities for water management and improve cooperation among entities involved in monitoring and assessment, including new partners (e.g. the research community and academia), and to designate appropriate institutions to supervise, guide and contribute to monitoring and assessment. On the other hand, a never-ending reform of institutions and their responsibilities and assignments could seriously hamper the continuity and sustainability of cooperation.

29. Insufficient and instable financing, a decrease in supply of the stations with spare parts, insufficient replacement of stations and laboratory devices with up-to-date equipment, the worsening situation regarding sampling and sample transport from remote stations, and departures of qualified staff were among the reasons for the decline of monitoring and assessment activities in the early 1990s. After a decade of decline, the funding situation has improved considerably, also due to foreign assistance programmes. However, attempts to upgrade existing monitoring networks still result in unreasonable suggestions to re-activate previously existing networks. Unless a thorough analysis of information needs is made, which is the most basic requirement for a decision on the number of stations, their location, parameters and frequency of measurement, informed decisions cannot be taken. There is a need to set priorities jointly agreed with the major actors, both nationally and in the transboundary context.

30. It should also be recalled that water monitoring is only one of the many sources of data/information on the conditions of transboundary watercourses. For example, in Georgia, assessments of transboundary waters also use estimates of pollution loads based on industrial production analysis. Data should also be gathered from other sources and disciplines such as agriculture, recreation, sociology, ecology and economics. Often local governments and municipalities are able to provide data on water purification and sewage utilities, factories, farmers and/or irrigators. The results of self-monitoring (monitoring of effluents and wastewater discharges by industries or municipalities, often under the conditions of their discharge license) is a valuable additional source of information for transboundary water assessments. Increasingly, these systems are being set up in EECCA, but their use is still limited to big industrial undertakings. Thus so far no data are being used for transboundary water assessments.

31. In many EECCA countries, the labour and operating costs of sample collection and field analysis, laboratory analyses and data processing, interpretation, reporting and production of outputs have often been underestimated. Ignorance and inadequate assessments of these costs have been among the reasons why activities ceased after international assistance projects ended. It is therefore important that such international assistance projects be embedded in the national plans and that systems requirements be adapted to countries' resources so that operations can continue after a project is completed. Furthermore, there have been cases in which international projects had overlapping objectives, duplicated work and did not involve the right actors, thus wasting resources without improving monitoring and assessment. Recipient countries have a responsibility to streamline donors' efforts and avoid duplications and waste. At the same time, donors should respect recipient countries' priorities and indications.

32. Storage of data and information probably remains the weakest point in EECCA countries, where water, environmental and health agencies often rely on hard copies of data. It is of utmost importance that policymakers and planners better understand the various steps in data

management. This will facilitate data exchange among the institutions undertaking the monitoring and assessment, including joint bodies, as was the case in Uzbekistan, where the State Committee for Environmental Protection was made responsible for a joint database for Central Asian countries. The Hydrometeorological Service of Uzbekistan functions as a joint communication center, operates a joint database and provides clients in the riparian countries with hydrometeorological data, water quantity–related information and forecasts.[12] There are also long-term plans to establish other joint information centres in that region.

III. PRELIMINARY EVALUATION OF PRESSURE FACTORS IN TRANSBOUNDARY WATER BASINS IN EECCA

33. The recent review by the secretariat on "Water and sanitation in the UNECE region: achievements in regulatory aspects, institutional arrangements and monitoring since Rio, trends and challenges" (ECE/AC.25/2004/5 and Add.1 and Add.2)[13] identified the most challenging water management issues in the region as a whole and further steps to be taken regarding water policies and technical/methodological work. The following discussion adds to the list issues arising from human activities and natural processes (e.g. geochemical processes) in transboundary river basins.

34. With the *1994 Recommendations to ECE Governments on the Prevention of Water Pollution from Hazardous Substances*, an indicative list of industrial sectors/industries for which discharges should be based on the best available technology was agreed upon. Specific guidance related to pollution from agriculture was agreed upon with the *1992 Recommendations to ECE Governments on the Protection of Inland Waters against Eutrophication* and the *1995 Guidelines on the Prevention and Control of Water Pollution from Fertilizers and Pesticides in Agriculture*.[14]

35. Given these recommendations and the United Nations International Standard Industrial Classification of All Economic Activities,[15] the following sections address the main issues of concern. Other economic activities may be added once the EECCA countries have submitted a more complete set of datasheets.

A. Crop and animal production

36. Water use for crop and animal production in EECCA countries (some 50–60% of available water resources) is quite comparable with the situation in countries in South-Western Europe, especially Greece, Italy, Portugal and Spain. However, water use efficiency is much lower, and the magnitude of water pollution problems caused by agriculture is greater.

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[12] The assessment of transboundary waters discharging into the Aral Sea and their major transboundary tributaries relied mostly on data provided by these centres as well as by other national institutions involved in the activities of these centres.

[13] See http://www.unece.org/env/documents/2004/ece/ac.25/ece.ac.25.2004.5e.pdf
http://www.unece.org/env/documents/2004/ece/ac.25/ece.ac.25.2004.5.add.1e.pdf
http://www.unece.org/env/documents/2004/ece/ac.25/ece.ac.25.2004.5.add.2e.pdf

[14] See ECE Water Series No. 2, *Protection and Sustainable Use of Waters – Recommendations to ECE Governments* (ECE/CEP/10).

[15] Terms according to the United Nations International Standard Industrial Classification of All Economic Activities; see http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27&Lg=1.

37. In general, crop and animal production cause increased levels of nutrients and pesticides in transboundary water bodies due to surface run-off from agricultural land, leaching and – specifically in a number of transboundary waters in the Aral Sea basin – return waters from irrigation channels.

38. Pollution by nitrogen and phosphorus compounds is well measured but badly documented and publicized. In transboundary rivers, pollution levels seem to be decreasing. This is chiefly a consequence of the still difficult economic situation and high fertilizer prices rather than good agricultural practice. With the expected economic growth and the need to increase agricultural outputs, nitrogen and phosphorus will regain their importance as pollutants, unless stringent measures to cut application rates, such as good agricultural practice, are more widely used.

39. Although the use of certain dangerous pesticides has been banned, unauthorized use of old pesticides (reported from some transboundary river basins) and leakages from old stocks of DDT will continue to be an important pressure factor. However, data on the concentration of pesticides in transboundary rivers are mostly unavailable: either no measurements are being carried out, or the measurements do not include sediment or biota.

40. Base flow from groundwaters carries nitrates and pesticides into transboundary rivers, as for example in watercourses such as the Chu and Talas and their tributaries. The relative importance of this phenomenon will be assessed once the status and trends assessment for transboundary groundwaters is available.

41. The impact of animal husbandry (livestock breeding and grazing) on transboundary waters, particularly in the mountainous and foothill areas of the Caucasus and Central Asia, remains little understood, although evidence of adverse effects on the many smaller rivers in these areas is growing.

42. Watercourses created by human activity (irrigation canals and drainage channels to collect return water from irrigation) are abundant. In the Aral Sea basin, their “management area” covers hundreds of thousands of square kilometres, and their length totals many thousand kilometres. In Uzbekistan alone, the total length of main irrigation canals (about 450) and drainage canals (400) is 156,000 kilometres, and their total management area amounts to about 1,100 square kilometres. Water delivery and use are being hampered by increasing vegetation growth in the canals, which lessens their carrying capacity; by algae blooms, which lead to deteriorating water quality and sanitary conditions; and by increasing pollution, sediment transport and sedimentation, which affect the operation of hydraulic structures.

43. Diffuse discharges from agriculture and continued extensive agricultural use of water protection zones along rivers contribute to increasing chemical and bacterial pollution of water resources. Adverse effects of irrigation on aquatic and water-related ecosystems include loss of biodiversity and extinction of whole ecosystems.

B. Mining and quarrying

Mining of metal ores

44. Mining of metal ores has a distinct impact on transboundary waters in the Caucasus. The impact on transboundary waters in Central Asia and other areas is less visible, mostly due to the relative importance of other pollution sources. In Central Asia, however, the pollution level will most likely increase given national plans to further develop mining and ore processing.

45. Pollutants of concern include copper, zinc, cadmium and, in some cases, mercury from gold mining. While pollution abatement technologies exist for these hazardous substances, their use is limited to the minority of industrial plants that are economically viable.

Extraction of crude petroleum

46. Surface run-off from oil production fields located in transboundary water basins is a general problem for watercourses; however, the replies to the datasheets did not yield information about the relative importance of this type of pollution.

C. Manufacturing

47. In EECCA countries, water use by manufacturing industries is on the order of 30 to 40 per cent of available water resources. Manufacturing is also one of the most prominent pollution sources, with a strong impact on the status of transboundary water resources and the future trends.

48. Water use efficiency remains low compared to that in West European countries. Since the information provided on the datasheets was rather limited, water use efficiency as a means of saving water and generating less pollution will be examined at a later stage.

49. The magnitude of water pollution problems seems to originate from the abundant number of small and medium-sized industries, rather than the relatively low number of big undertakings, which were already capable of installing pollution abatement technologies and controlling pollution at the source. In addition, these big enterprises voluntarily carry out self-monitoring in an attempt to demonstrate their compliance with environmental standards.

Manufacture of refined petroleum products

50. A great number of transboundary watercourses show increased levels of pollution by oil products, specifically discharges from oil refineries and surface run-off from refinery sites. Unless these countries comprehensively apply the measures set out in safety guidelines and other guidelines developed under the Water Convention and the 1992 Convention on the Transboundary Effects of Industrial Accidents (Industrial Accidents Convention), which in some cases require investments in the safety of industrial installations, a substantial reduction in oil pollution is unlikely.

Manufacture of chemicals and chemical products; manufacture of basic metals and fabricated metal products

51. Accidental pollution from industrial installations and unauthorized discharges of hazardous substances (mostly at night and during holidays) remain major concerns. Due to the high flow velocity of transboundary rivers and their tributaries in mountainous areas, a number of these events are beyond the detection capability of monitoring stations. The establishment of early warning and notification systems in transboundary mountainous and lowland rivers, which is currently being promoted by assistance projects, is a promising tool for the future.[16]

52. Future assessments are expected to shed more light on these industrial sectors/industries as a source of a great number of organic compounds with toxic effects as well as other hazardous substances.

Manufacture of paper and paper products

53. Obviously, the pulp and paper industry is a significant pollution source in some transboundary waters, as has been documented by Finland and the Russian Federation. Its impact will be dealt with at a later stage, once information on the respective Finnish-Russian and other transboundary waters has been communicated to the secretariat. In any case, the following water-quality determinands are of concern: BOD_5, COD and some hazardous organic compounds, if bleaching processes are used.

Other manufacturing industries

54. A number of specific manufacturing industries, such as leather, sugar and fertilizers, are of concern as they have a significant impact on the status of transboundary watercourse in EECCA. Their relative importance will be assessed at a later stage.

D. Electricity supply

Hydropower generation

55. The construction of reservoirs for energy production (as well as irrigation and flood management) has decreased the volume of biological active sediments, changed the hydrological regime of downstream reaches of rivers, changed erosion and/or sedimentation processes in riverbeds and disturbed migration of fish.

56. Intense sedimentation, erosion of embankments and changes in the hydrological regime resulting in a decrease in the self-purification capability of aquatic ecosystems occur in lowland reservoirs. Eutrophication, a typical problem of reservoirs[17] in lowlands, is intensified due to the shallowness and large water surface of many water bodies.

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[16] See, for example, the assistance projects on the Kura, Nemunas and other rivers by Germany as documented by the Joint Ad Hoc Expert Group on Water and Industrial Accidents (ECE/MP.WAT/2006/2).

[17] Eutrophication in lakes is analysed in one of the addenda to this report (ECE/MP.WAT/2006/16/Add.1).

57. The operation of big reservoirs built on the interface between the high mountainous part and the lowland part of rivers in the Caucasus and particularly Central Asia causes a significant impact on the hydrological regime (e.g. river discharge, flooding, erosion) and water availability in the lowlands.

The conflict between consumptive and non-consumptive water use in transboundary basins in Central Asia for transboundary rivers regulated by reservoirs			
Time period	**Lowlands**	**Reservoir operation**	**High mountain areas**
Summer	High water demand not satisfied due to small amount of water released from the reservoir	Low water release due to low energy demand and accumulation of high water discharge from upstream rivers	Large water discharges into reservoir due to melting of snow
Winter	Low water demand; flooding, bank erosion and other adverse effects may occur due to large releases of water from the reservoir	Large releases of water to satisfy high energy demand	Small water discharge into reservoir

Thermal power stations

58. Except for one lake, countries did not mention thermal pollution as a pressure factor. This issue will be further dealt with in future assessments.

Nuclear power plants

59. Countries' replies to the datasheets indicate that radioactive pollution from nuclear power plants is limited to the sub-basin of the Pripyat River. However, Environmental Performance Reviews by UNECE show that there are many nuclear power plants (and radioactively polluted sites) in EECCA countries. Thus, the scope of the problem needs to be assessed in the future on the basis of more precise country information.

E. Sewerage and waste management

Sewerage

60. As a rule, each person produces some 75 grams per day of BOD5 and some 3 grams per day of phosphorus. Unless treated, sewage is an enormous pressure factor in each of the river basins. Unfortunately, organic pollution is not being dealt with effectively because, over the last decade, the technical status of wastewater treatment plants has greatly deteriorated in many EECCA countries. Although wastewater treatment plants in cities continue to operate (although with decreasing efficiency), most of the other treatment plants are out of order. For some cities, particularly in the Dnieper and Dniester basins, new treatment plants are under construction.

Disposal activities

61. Tailing dams and waste storage ponds containing hazardous waste from mining and ore processing as well as hazardous waste from metal processing and the chemical industry are important pollution sources. There is a need for better guidance on the safe operation of these installations. Such guidance is currently being developed by UNECE under the Water Convention and the Industrial Accidents Convention.

62. Illegal waste disposal along rivers as well as old and often uncontrolled waste disposal sites in river basins are reported from a number of transboundary river basins. If these dump sites are not properly taken care of, they will generate increasing pollution.

F. Transportation and storage

Land transport

63. Water pollution from land transport seems to be limited to the narrow river valleys in the Caucasus mountains and the ranges of Central Asia. However, the causes of water pollution, such as leaking cars and seepage from petrol filling stations, is a general problem in EECCA countries, particularly in rural areas. Losses of crude oil and petroleum products during railway transport and leaking transloading facilities are also causes of increasing water pollution.

Transport via pipelines

64. As is the case with manufacturing of refined petroleum products, a number of transboundary watercourses show increased levels of pollution by oil products due to leakages from pipelines crossing transboundary rivers or their basins. Pollution prevention at the source is addressed in the 2006 *Safety Guidelines and Good Practices for Pipelines* (ECE/CP.TEIA/2006/11 – ECE/MP.WAT/2006/8), expected to be endorsed by the Parties to the Water Convention at their fourth meeting.

G. Tour operator activities

65. Along with the growth of urban populations and of tourism, the use of mountain areas and their watercourses for recreational purposes is increasing. There is an urgent need to control the impact of recreation on mountain ecosystems, including rivers and lakes. It is also necessary to install hydrometeorological stations to warn tourists of extreme weather and high run-off.

IV. PRELIMINARY EVALUATION OF TRANSBOUNDARY RIVERS AND LAKES: STATUS AND TRENDS

66. Based on earlier work on monitoring and assessment under the Water Convention, the most critical issues for EECCA countries' transboundary waters were expected to be suspended solids, eutrophication, microbial pollution, solid wastes and illegal dump sites along watercourses, chemical pollution, oil pollution, accidental spills and illegal discharges of hazardous substances, radio nuclides and thermal pollution as well as water quantity issues (overuse of resources, floods and droughts). In general, the draft preliminary assessment

confirmed that these issues are of major concern, although their relative importance is strongly river basin specific. Although thermal pollution was not mentioned in the countries' replies related to transboundary rivers, its effect on rivers' ecosystems might be hidden due to the more visible impact of other pollution sources. In addition, water pollution from road traffic seems to be an issue of concern, although its effects were observed only in the mountain river valleys in the Caucasus.

67. Although the draft assessment does not cover all major transboundary rivers and lakes, it seems to reflect the overall situation in EECCA countries' transboundary waters. Generally, the results reported here and in the addenda to this report rely on measurements carried out in water as such, and do not include measurements in sediments and biota. The assessments are also based on MPC values or otherwise existing subregional classification systems. Some assessments are based on expert judgement rather than on monitoring.

68. Thus, the status assessment results cannot be compared with status assessments for transboundary waters in countries in Western Europe that take into account both the physical-chemical and the ecological characteristics of water bodies. Strictly speaking, even a comparison of the status of waters in two different subregions is problematic, as many MPC values are country specific and classification systems distinguish either four or six classes.

69. For the above reasons, the datasheets for the assessment distinguished only among three major categories: (a) water bodies of high and good status; (b) water bodies with moderate pollution; and (c) polluted water bodies. It was left to the countries' expert judgment to determine into which category waters fell.

Transboundary lakes

70. Eutrophication is the worst phenomenon affecting transboundary lakes. It is increasing constantly except in areas where wastewater treatment has been effectively implemented and small improvements are visible. In nearly all areas, increasing non-point loading from agricultural and forestry areas has spurred incipient eutrophication even in some lakes which were in good condition.

Transboundary rivers

71. Some 20 per cent of all rivers in the Caucasus and Central Asia are in high and good status, as estimated by the Regional Environmental Center for Central Asia (CAREC).[18,19] The present UNECE assessment specifies that this category includes most of the transboundary rivers and their tributaries in mountain areas in the Caucasus and Central Asia, except those running through areas with mining activities. However, some of these water bodies show signs of increasing pollution or are potentially threatened by mining and ore processing; thus more stringent control measures should be implemented for pollution control at the source. In many

[18] See footnote 2.

[19] According to CAREC's publication (see footnote 2), some 8% of the water bodies in the Aral Sea basin and the Caucasus are "heavily polluted" or "extremely polluted" (water-quality classes 5 and 6), 25% are "polluted" (water-quality class 4), 44% are "moderately polluted" (water-quality class 3) and 23% are "clean" or "slightly polluted" (water-quality classes 1 and 2).

cases, air pollution of glaciers or high-mountain catchment areas is another potential source of increased pollution.

72. The majority of the rivers included in the present assessment fall into the category "water bodies with moderate pollution". Although in the national classifications of the Central Asian countries and the Russian Federation this includes both polluted (water-quality class 4) and moderately polluted (water-quality class 3) water bodies, there is a tendency of improvement in water quality as indicated in the addenda to this document.

73. As a rule, the category "polluted water bodies"[20] is made up of rivers that are tributaries (including transboundary tributaries) to (a) the Amu Darya and Syr Darya, which take up their pollution load in lowland areas and/or foothills with intensive industrial (including mining-related) or agricultural water use; (b) transboundary rivers or their tributaries flowing through areas with mining activities in the Caucasus; and (c) rivers originating in the Ural Mountains and discharging into the Ural and Ob rivers. Pollution of these rivers and subsequent pollution of drinking water sources have resulted in an increase in water-related diseases in the region. Many rivers in these areas have become practically unfit for drinking-water supply.

74. Geochemical processes have repeatedly been seen as an issue of concern in some rivers. Among them are (a) rivers which originate in the Caucasus, Central Asian and Ural mountain chains that are "naturally polluted" by metals; (b) some rivers discharging from Kazakhstan to the Russian Federation that are naturally polluted by salts; (c) and some rivers in the sub-basin of the Pripyat which have poor natural water quality (e.g. high natural organic content, high acidity), especially in areas with a high density of peat and mires.

75. Although the replies to the datasheets did not yet provide information on water use or the ecological status of water bodies, some expert judgements indicated that water shortages and degradation of aquatic ecosystems are likely to continue to adversely affect economic development. Deforestation, soil erosion and degradation of pastures will continue to threaten the proper functioning of water-related ecosystems and lead to higher risks of natural disasters such as floods.

76. Rising air temperatures and contamination of rainwater are the major causes of the significant melting of glaciers, resulting in noteworthy changes of the rivers' hydrological and ecological regimes. These issues will be more specifically addressed in later assessments, as will the adverse impact of water shortages and poor water quality on human health.

[20] In the national classifications of the Central Asian countries and the Russian Federation, this means "heavily polluted" and "extremely polluted" water bodies falling into water-quality classes 5 and 6.

Annex I

DATASHEET FOR INFORMATION GATHERING ON TRANSBOUNDARY RIVERS

Data sheet for the river *[name of river]*

1 INTRODUCTION
General description of the river and the basin

2 GENERAL INFORMATION ON THE RIVER BASIN	
Area (km^2):	
Population density of the total river basin (inhabitants/km^2):	
Mean annual discharge (m^3/s or km^3/a):	
Detailed information on the discharge:	Q_{av} = Q_{max}= Q_{min}=
Lake percentage (%):	
Land use:	
Dams:	
Recipient sea:	

3 COUNTRIES SHARING THE RIVER BASIN	
From each country the following data:	
The area of the river basin in the country (km^2 and % of total area):	
Population density in the river basin in the country (inhabitants/km^2):	

4 TRANSBOUNDARY AGREEMENTS	
Title of the agreement(s):	
Joint body (contact information):	
Information on the legislative basis for monitoring:	
Information on relevant administration:	
Information on contact organizations and persons:	

5 MONITORING ACTIVITY	
Monitoring programmes	
Hydrology:	
Water quality:	
Biology:	
Pressure factors:	

Databases:	
Hydrology:	
Water quality:	
Pressure factors:	

6 ASSESSMENT AND REPORTING	
Short history of water protection measures:	
Most serious water quality problems:	
Most serious water quantity problems (e.g. flooding):	
Status assessment:	
Short description of possible trends in the state of water bodies:	

7 USEFUL LINKS AND POSSIBLE PUBLICATIONS
[including the coordinates of the experts who replied to the datasheet]

8 ANNEXES
Map of the basin, figures and tables

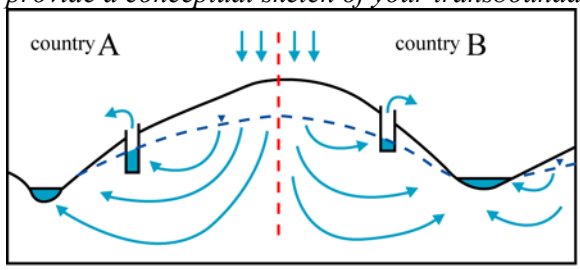
Annex II

QUESTIONNAIRE FOR THE ASSESSMENT OF GROUNDWATER IN TRANSBOUNDARY AQUIFERS

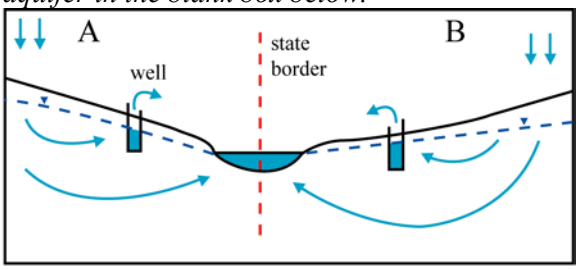
Country..... Aquifer..... Shared with .....

A. Brief description of the transboundary aquifer

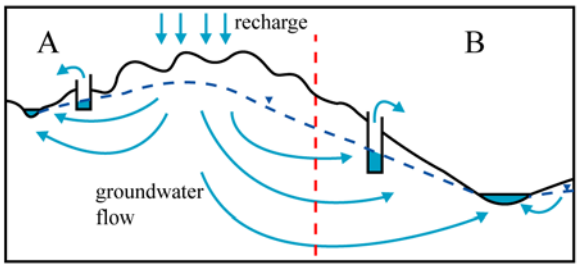
1. Please look at the four simplified pictures of groundwater systems below and indicate in the boxes which of them most closely characterizes your transboundary aquifer. If none of the four, then please provide a conceptual sketch of your transboundary aquifer in the blank box below.



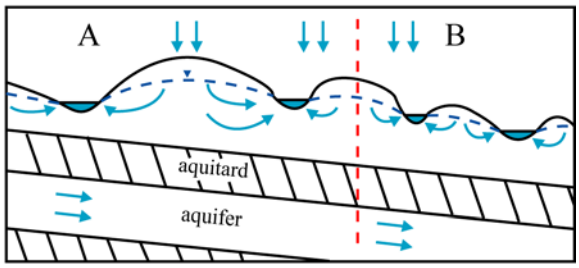
(1) state border follows surface water catchment and groundwater divide, little transboundary groundwater flow.



(3) state border follows major river or lake, alluvial aquifer connected to river, little transboundary flow.



(2) Surface water and groundwater divides separate from state border, recharge in one country, discharge in adjacent.



(4) Large deep aquifer, recharged far from border, not connected to local surface water and groundwater.

(5) Your conceptual sketch of your transboundary aquifer.

Please tick: Example 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

2. Indicate the general characteristics of the aquifer in your country

a) Predominant lithology or lithologies.....
b) Stratigraphy and age .....
c) Thickness: mean (m)..... maximum (m)..... d) Areal extent (km^2).....….
e) Dominant groundwater flow direction: from.. ..... to ..... *(countries)*
f) Link with surface water systems: strong ☐ medium ☐ weak ☐

3. Please provide a clear map of the transboundary aquifer, including its boundaries and adequate geographical reference (coordinates, projection type and projection parameters), preferably as a GIS-file.

B. Importance of groundwater in the transboundary aquifer

Please provide information for the part of the aquifer in your country

1. Uses and functions

Does the groundwater in this transboundary aquifer have direct uses and/or other functions?

No ☐ Why not? Irrelevant groundwater resource (no demand for groundwater) ☐

Problems with groundwater *(if so, indicate these in section C)* ☐

or:

Yes ☐ Uses ☐ Groundwater as % of total water use .....

Other functions:
- Support of ecosystems ☐
- Support of agriculture (directly from shallow water table) ☐
- Preventing land subsidence ☐
- Maintaining baseflow and springs ☐
- Seasonal heat storage ☐
- Any other function *(please specify)*..... ☐

2. Groundwater abstraction and use in the transboundary aquifer

Indicate in the table the percentage of total groundwater abstraction accounted for by each use

Type of use	Percentage	If you do not know the exact percentage, then mark one of the following options			
		< 25 %	25 – 50 %	50 – 75 %	> 75 %
Drinking water					
Irrigation					
Industry					
Mining					
Thermal spa					
Livestock					
Other *(please specify)*					

Please indicate the year to which these figures apply.....

C. Which problems are observed in groundwater in the transboundary aquifer?

1. Problems related to groundwater quantity

a) *Specify if possible the average trend of groundwater level decline* (m/year) .....

b) *Indicate in the table the type and scale of problem associated with groundwater abstraction from the aquifer*

Problem	**Increasing scale of problem** →			
	1. Local and moderate	2. Local but severe	3. Widespread but moderate	4. Widespread and severe
Increased pumping lifts or costs				
Reduction of borehole yields				
Reduced baseflow and springflow				
Degradation of ecosystems				
Sea water intrusion				
Salt water upconing				
Polluted water drawn into aquifer				
Land subsidence				
Other (*please specify*)				

2. Problems related to groundwater quality

Indicate in the table the type, nature and scale of groundwater quality problems in the aquifer

Problem	Nature of problem		Typical range of concentrations	Scale, using classes 1–4 from table above
	Natural origins	From which human activities[1]		
Salinization				
Nitrogen species				
Pesticides				
Heavy metals				
Pathogens				
Industrial organic compounds				
Hydrocarbons				
Other *(please specify)*				

[1] *insert: irrigation, mining, agriculture, industry, waste disposal, sanitation, sewer leakage or others as required*

3. Evidence for transboundary effects

a) Do you observe any decline of groundwater levels (or piezometric levels) caused or probably caused by activities in neighbouring countries?

Yes ☐ No ☐

b) Do you observe any groundwater pollution caused or probably caused by activities in neighbouring countries?

Yes ☐ No ☐

D. Groundwater management measures for the transboundary aquifer

Indicate in the table which measures are presently being implemented or need to be applied in your part of the aquifer

Management Measures	Already used and effective	Used, but need to be improved	Need to be applied	Currently planned
Transboundary institutions (commissions, agreements, treaties, etc.)				
Groundwater abstraction management by regulation (licensing, taxation)				
Groundwater abstraction management by incentives or disincentives (subsidies, credits, energy prices, energy supply, etc.)				
Increasing efficiency of groundwater use				
Monitoring of groundwater quantity				
Monitoring of groundwater quality				

Public awareness campaigns				
Protection zones for public supplies				
Vulnerability mapping for land use planning				
Good agricultural practices				
Groundwater integrated into river basin management				
Wastewater reuse or artificial recharge				
Treatment of urban wastewater				
Exchange of data between countries				
Treatment of industrial effluents				
Other *(please specify)*				

Please provide name, institution, address details and e-mail address of the person who filled in this questionnaire

.....
.....
….....……