POSTERS

LakeNet: Promoting sustainable management of lakes in the UNECE region and beyond

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The world's lakes are in crisis

Lakes hold 90% of the planet's liquid surface. Satellite imagery detects between 3.8 and 5.2 million lakes over one hectare in size. Of this total number, many are found in glaciated northern regions, and only 253 are considered "large lakes" over 500 km^2 in size.

The world's lakes are in crisis. Today, diversion of lake water for use in irrigation, invasions of exotic plants and animals, and contamination by toxic substances and nutrients from industry, farms and sewage are common on a scale that significantly threatens lake ecosystems worldwide. Major threats to the world's lakes include:

- Accelerated eutrophication;
- Invasive species;
- Toxic contamination;
- Overfishing and habitat alteration;
- Water diversion;
- Acidification; and
- Climate change.

In most parts of the world anthropogenic impacts on lakes are spreading geographically and becoming more intense in quantity and quality due to human population increases and the globalization of trade, which has increased deforestation and the use of pesticides and fertilizers, and has spurred the spread of invasive species. Fragmented and resource-poor lake management prevents, delays or distorts the efficient planning, implementation and enforcement of comprehensive, participatory watershed-wide lake management plans in both developed and developing countries.

Promising solutions: participatory watershed-wide management

The nature of the threats to these important ecosystems requires a comprehensive and integrated approach, one that is based on citizen and stakeholder involvement, watershed boundaries and cooperation among multiple jurisdictions and disciplines. The experience of lake management practitioners with managing lakes at the watershed or river basin level shows how important it is to engage diverse stakeholders, including representatives of environmental groups, business associations, private businesses, farms, Government agencies (local, provincial and national), commissions and boards, academic institutions and individual citizens. Finding effective ways to facilitate dialogue and forge partnerships among these stakeholder groups in lake watersheds is one important element of achieving a more sustainable approach to managing the world's lakes.

Institutions and institutional arrangements for addressing these issues and for implementing a watershed approach are just beginning to emerge on lakes around the world and in the UNECE region. In a collection of case studies presented at the Lake99 conference in Copenhagen from eight major lake basins around the world, only two had developed watershed action plans and only one of those was comprehensive in scope [1]. The case studies included several lakes from the UNECE region: Baikal, Champlain, Ohrid and Peipsi. The important elements of successful lake management that participants identified include:

- Citizens and stakeholders should be involved in planning and implementation activities;
- The geographic focus must include the entire lake watershed;
- Development of a strategic plan allows for careful integration of environmental, economic and cultural considerations;
- Effective communication between scientists and decision makers is essential; and

[1] Borre, L., Barker, D. R. and Duker, L., 2001. Lakes & Reservoirs: Research and Management (Vol. 6:3).

- An institutional mechanism is needed to facilitate cooperation and coordination among Government jurisdictions, businesses and organizations in the watershed.

The workshop participants agreed that implementing a watershed approach is a complex process and that sharing experience and lessons learned is an effective way to improve the capability of lake management institutions.

Lake basins that cross international or other political boundaries require unprecedented cooperation among numerous agencies and organizations to successfully manage and protect precious freshwater resources. A preliminary list of 32 international lake basins in the UNECE region is provided in Table 1.

Priorities for lake biodiversity conservation

Lakes provide critical habitat for fish, crustaceans, mollusks, turtles, amphibians, birds, mammals, insects and aquatic plants and support biodiversity of the surrounding land and wetlands. From a biodiversity standpoint, lakes are considered habitat islands, and as a result tend to have high rates of endemism. For example, Lake Ohrid is one of oldest lakes in the world and is home to unique species dating from the Tertiary Period, 60% of which exist nowhere else in the world. Lakes and their watersheds are "hot spots" of freshwater biodiversity. For example, the World Wildlife Fund (WWF) includes 15 lakes and seven lake regions on their Global 200 list.

A recent LakeNet study identified 250 lakes, out of the five million that exist worldwide, with globally significant biodiversity. Of these, about half (130) are in the UNECE region (Table 2).

Partnerships and cooperation in the UNECE region and beyond

Many lakes in the UNECE region are actively engaged in partnerships and cooperation to share experiences and lessons learned in lake management: Lake Ohrid-Lake Peipsi Cooperation; Lake Ohrid-Lake Champlain Sister Lakes; Great Lakes-Baltic Sea Partnership; and Lake Tahoe-Lake Baikal Exchange. Regional networking involving the UNECE region lakes has also been supported by LakeNet with a grant from the Trust for Mutual Understanding. An experience sharing workshop at Lake Champlain and a study tour to the Great Lakes region were held in 2000 and another workshop is planned for August 2002 at Lake Peipsi.

LakeNet was founded in 1997 as a programme of Monitor International, a non-profit organization based in the United States of America. What began as an informal network among participants in sister lake exchange programmes, such as the ones described above, has evolved into a global network of people and organizations dedicated to the conservation and sustainable management of lakes and their watersheds. The network now serves more than 800 members in 80 countries, including many from the UNECE region. The increased demand for good information and interest in sharing experience was due, in part, to the sharp increase in funding for international waters projects from multilateral donors such as the GEF, World Bank, UNDP and UNEP as well as investments from bilateral donors. The LakeNet web site (www.worldlakes.org) and electronic forum are the main vehicles for facilitating dialogue and disseminating information globally. The LakeNet Secretariat also organizes and/or participates in training workshops and international conferences and provides advisory services to lake management programmes.

Table 1. Preliminary list of international lake basins in the UNECE region [2]

	Lake	Countries in the basin
1.	Alto Lindoso	Spain/Portugal
2.	Miranda	Spain/ Portugal
3.	Cedilho	Spain/Portugal
4.	Alcantara	Spain/Portugal
5.	Constance	Germany/Switzerland/Austria
6.	Leman	Switzerland/France
7.	Maggiore	Italy/Switzerland
8.	Ferto/Neusiedlersee	Hungary/ Austria
9.	Galadus	Poland/Lithuania
10.	Peipsi/Chudskoe	Estonia/Russian Federation /Latvia
11.	Saimaa	Finland/Russian Federation
12.	Inari	Finland/Russian Federation
13.	Ijsselmeer	Netherlands/ Germany
14.	Drysvyaty/Drukshiai	Belarus/Lithuania
15.	Ohrid	The former Yugoslav Republic of Macedonia/Albania
16.	Prespa	The former Yugoslav Republic of Macedonia/ Albania/ Greece
17.	Dojran	The former Yugoslav Republic of Macedonia/Greece
18-21.	Lower Danube: Kagul, Kartal, Kugurluy, Yalpug	Ukraine/Moldova/Romania
22.	Sasyk	Ukraine/Moldova
23.	Jandari	Georgia/Azerbaijan
24.	Aral Sea	Uzbekistan/Kazakhstan
25.	Sarez	Tajikistan/Uzbekistan, Turkmenistan/Afghanistan
26.	Xingkai	Russian Federation/China
27.	Superior	Canada/United States of America
28.	Michigan	Canada/ United States of America
29.	Huron	Canada/ United States of America
30.	Erie	Canada/ United States of America
31.	Ontario	Canada/ United States of America
32.	Champlain	Canada/ United States of America

[2] Information on selected transboundary/international lakes can be found in "Monitoring of International Lakes - Background paper for the Guidelines on Monitoring and Assessment of Transboundary and International Lakes" by the UNECE Working Group on Monitoring and Assessment under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes, published by the Finnish Environment Institute, Helsinki, 2002.

Table 2. Approximately 50% of the lakes identified as global priorities for biodiversity conservation are in the UNECE region

(Parentheses indicate the number of priority lakes in each country, 130 lakes total)

Country	Lakes
Albania (2)	Ohrid*, Prespa*
Austria (2)	Constance*, Traunsee, Subalpine lakes (other)
Bulgaria (2)	Shabla, Srebarna
Canada (11)	Beaverhill, Dewey Soper, Erie*, Hay-Zama*, Huron*, Lac Saint Pierre, Old Crow Flats, Ontario*, Quill Lakes, Superior*, Whooping Crane Summer Range
Denmark (2)	Fiil-So, Maribo Lakes
France (3)	Camarque, Etangs de la Champagne humide, Grand-Lieu
Germany (8)	Ammersee, Chiemsee, Constance*, Dummer, Krakower, Ostufer Moritz, Starnberger See, Steinhuder Meer
Georgia (1)	Central Kolkheti
Greece (2)	Prespa*, Volvi & Koronia
Hungary (3)	Balaton, Ferto*, Kardoskt
Iceland (2)	Myvatn-Lax Region, Thingvalla
Ireland (6)	Ballyallia Lough, Lough Corrib, Lough Ennell, Lough Gara, Lough Oughter, Lough Owel
Italy (2)	Biviere di Gela, Vendicari
Kazakhstan (3)	Caspian Sea*, Kourgaldzhin & Tengiz, Turgay & Irgiz
Kyrgyzstan (1)	Issyk-Kul
Latvia (1)	Engure
The former Yugoslav Republic of Macedonia (2)	Ohrid*, Prespa*
Netherlands (4)	Krammer-Volkerak, Naandermeer, Oostuaardersplassen, Zwarte Meer
Norway (1)	Nordre Oyeren
Poland (2)	Jezioro Luknajno, Slowinski National Park
Russian Federation (14)	Bagan, Baikal, Bolon, Chany Lakes, Dvobje, El'gygytyn, Khanka*, Kuban Delta, Manych-Gudilo, Parapolsky Dol, Peipsi-Chudskoe*, Tobel-Ishim, Torey Lakes, Veselovskoye Reservoir
Spain (5)	Fuente de Piedra, Gallocanta, Medina y Salada, Vega, Villaf fila
Sweden (7)	Esnen, Esten, Hornborgas, Ksten, Svarten, Tekern, Ttkern
Switzerland (1)	Constance*
Turkey (17)	Acigol, Akgol, Amik, Apolyont, Bafa, Beysehir, Burdur, Egirdir, Golcuk, Gksu Deltasi, Hazar, Isikli, Kizilirmak Delta, Kus, Seyfe, Sultan Sazligi, Uluabat
Ukraine (4)	Dniester-Turunchuk Crossrivers, Dnieper River Delta, Kugurlui, Shatsk Lakes
United Kingdom (17)	Cameron Reservoir, Castle Loch, Eye, Greenlaw Moor, Kinnordy, Leven, Lough Neagh & Beg, Muir of Dinnet, Rinns of Islay, Rostherne Mere, Skene, South Tayside, Spynie, Stodmarsh, Strathbeg, Upper Lough Enne, Westwater
United States of America (12)	Bear, Caddo, Catahoula, Devils Lake, Erie*, Hay Zama*, Huron*, Michigan, Ontario*, Superior*, Tahoe, Tule
Yugoslavia (1)	Skadarsko Jezero

* Transboundary lakes

International cooperation in the Danube Basin

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Introduction

New challenge in Europe include the implementation of the Water Framework Directive, i.e. the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy [1]. The present EU Member States, but also all countries that are applicants for EU membership, will implement this Directive. It will be the ruling piece of legislation concerning river basin management in a major part of Europe. As concerns the Danube River, only two countries are EU members, but all the other countries in the entire watershed agreed to implement the Water Framework Directive jointly. Appropriate cooperation and coordination of all water-related institutions and experts can help in this process at the local, national, transboundary and international levels. The list of existing water-related cooperation presented in this paper is not complete, but it can anyhow show how many different forms of cooperation exist in the Danube basin.

Different levels of cooperation

In water management activities of a country with shared watersheds, apart from the national and sub-national levels, the transboundary level of cooperation has the most significant importance. The next is the entire catchment level followed by international cooperation and organizations that can give common ground for the adequate and comparable water management practice.

Different levels of cooperation in the Danube basin

Transboundary level

- Transboundary commissions.

Catchment level

- Convention on Cooperation for the Protection and Sustainable Use of the River Danube;
- International Association for Danube Research (IAD);
- International Association of Waterworks in the Danube Basin (IAWD);
- Danube Commission (on navigation issues);
- Forum of the Danube Hydrological Services;
- International Hydrological Programme of UNESCO – Regional cooperation of the Danube countries.

EU level

- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the filed of water policy.

International level

- Convention on the Protection and Use of Transboundary Watercourses and International Lakes;
- World Meteorological Organization – Operational Hydrological Programme.

[1] Published in the Official Journal L 327 of 22/12/2000.

Transboundary level

To demonstrate the transboundary cooperation in the Danube basin, reference is made to the Hungarian practice.

In Hungary, 96% of the surface water resources originate from the neighbouring countries. This explains why the joint commissions on transboundary waters between Hungary and the neighbouring countries play such an important role in water management.

Before the political changes in Europe, Hungary had five neighbouring countries and had with all of them agreements on transboundary waters. Nowadays, Hungary has seven neighbouring countries and seven agreements are in force. Accordingly seven joint commissions on transboundary waters (joint bodies) have been established. Hungary signed with Croatia and Slovenia new agreements on joint bodies in 1994, and with Ukraine in 1998. New, updated agreements with Slovakia and Romania are under preparation and will be based on the 1992 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention) and the 1994 Convention on Cooperation for the Protection and Sustainable Use of the Danube River.

The general feature is that each joint body consists of a Hungarian delegation and a delegation of the other Contracting Party. Each head of delegation has one or two deputies, all authorised by their Governments. In Hungary, the heads of these joint bodies are nominated by the Ministry of Transport and Water Management and approved by the Ministry of Foreign Affairs. In the neighbouring countries, the water or environment ministries also nominate the heads of the joint bodies. As a rule, the commissions have one session per year led by the heads of delegations, and another one led by the deputies. In certain cases, extraordinary sessions are organized. The sub-committees/expert groups/working groups are organized under the joint bodies according to rivers and/or functions.

All the agreements and joint bodies have a relatively long history, starting with the Peace Treaty after World War I, when new frontiers were established crossing the catchment areas of the watercourses around Hungary.

Based on the nature of problems prevailing at that time, main items of the agreements were (and in certain cases are) security against floods, drainage of excess waters, financial questions, etc. New agreements were signed after World War II, however, without any common basis; this is why there are differences both in the structures of the agreements and the joint bodies. The first opportunity of placing the agreements upon a common basis was just the situation when the UNECE Water Convention and the Danube River Protection Convention entered into force in 1996 and 1998, respectively. However, we still face some differences even among the new and/or updated bilateral agreements.

At the first stage, the agreements covered mainly flood control questions, at the second stage, surface water management problems were inserted, and later on water-quality questions and problems of water resources management. In the next phase, groundwater-related issues will be dealt with. At the beginning, the agreements were only valid for several kilometres from both sides of the frontiers, but today we are going to include the whole catchment area.

All the agreements are dealing with monitoring and assessment, but of course not in the same manner. All joint bodies have surface water quality sub-groups, headed in Hungary, for example, by the Ministry of Environment and Regional Policy. Surface water hydrology was covered by the joint bodies from the beginning: as a first step through operational data exchange, afterwards by forecasts of flood events, later on by joint discharge measurements, and more recently by joint data evaluation. The level of detail and the content of the six agreements regarding hydrological topics are different.

Catchment level

Convention on Cooperation for the Protection and Sustainable Use of the River Danube

On 29 June 1994, in Sofia, Bulgaria, eleven Danube countries (Austria, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Republic of Moldova, Romania, Slovakia, Slovenia, Ukraine) and the European Union signed the Convention on Cooperation for the Protection and Sustainable Use of the River Danube (short

title: Danube River Protection Convention – DRPC). The Convention is aimed at achieving sustainable and equitable water management in the Danube basin.

Main objectives of the Convention

- Sustainable and equitable water management;
- Conservation, improvement and rational use of surface waters and groundwaters in the Danube catchment area;
- Control of hazards originating from: (a) accidents involving substances hazardous to water; (b) floods; and (c) ice-hazards;
- Reduction of pollution loads of the Black Sea from sources in the Danube catchment area.

To provide a framework for regional cooperation under the Convention, an Interim International Commission and its secretariat were constituted by a Declaration at the 1994 Sofia meeting. The Danube countries agreed to cooperate on the implementation of the Convention before its entry into force. The Strategic Action Plan (SAP) was a tool for this cooperation.

In May 1998, the ninth signatory of the DRPC ratified the Convention. According to its article 27, the Convention entered into force on 22 October 1998. The first meeting of the Steering Committee (Heads of Delegation) and the International Commission (ICPDR) took place in Vienna in October 1998.

The main bodies established under the Danube River Protection Convention are: Conference of the Parties, International Commission for the Protection of the Danube River (ICPDR), International Commission's Permanent Secretariat, expert groups, ad-hoc groups, and a supporting body – the Programme Management Task Force. The Conference of the Parties is the highest-level decision-making body under the Convention.

Permanent expert groups established under the Convention

- Emission Issues Expert Group (EMIS/EG);
- Monitoring, Laboratory and Information Management (MLIM/EG);
- Accidental Emergency Prevention and Warning System Expert Group (AEPWS/EG);
- River Basin Management Expert Group (RBM/EG);
- Cartography and GIS subgroup established under RBM/EG;
- Ad-hoc Ecological Expert Group (ECO/EG).

The River Basin Management Expert Group was established in 2000 because the implementation of the Water Framework Directive was considered as the highest priority of the ICPDR. The ICPDR will provide the platform for the coordination necessary to develop and establish the river basin management plan for the Danube River basin. Following the joint proposal by Austria and Germany, the only Danube countries that are members to the European Union, the Contracting Parties confirmed their political commitment to support the elaboration of a coordinated river basin management plan for the entire Danube River basin in line with the requirements of the Water Framework Directive using the ICPDR as the common platform.

International Association for Danube Research (IAD)

The International Association for Danube Research (IAD) was founded in 1956 with the goal of promoting and coordinating activities in the field of limnology, water management and water protection in the Danube River basin. The Association is incorporated into the Societies Internationalis Limnologiae (SIL). Eleven countries are IAD members: Germany, Switzerland, Austria, Slovakia, Hungary, Croatia, Bosnia and Herzegovina, Yugoslavia, Bulgaria, Romania and Ukraine. The official languages are German and English. Conferences are held annually, except for the SIL Congress years.

IAD main research areas

- Development of ecological river concepts and models;
- Eco-morphological mapping of the River Danube and its tributaries to identify areas needing restoration;

- Preservation or promotion of biodiversity by ecological improvements of the habitats of threatened and rare species;
- Studies of fish-ecology to ensure sustainable fishery practices;
- Interactions between river system, floodplains and wetland areas;
- Development and standardisation of additional chemical parameters for water-quality monitoring;
- Quality management in data acquisition for improved comparability and evaluation of research;
- Mapping of the biological quality of waters according to the saprobic system;
- Long-term studies on the development of invertebrate stocks of the Danube ecosystem;
- Microbiological and hygienic assessment of the river;
- Investigation and mathematical modelling of biological transformations of material and interactions between river structures, water quality and biocenoses;
- Definition of quality targets for local uses of river water in the Middle and Lower Danube;
- Nutrient content and trophic state of the Danube with special reference to the delta and the adjacent part of the Black Sea;
- Inventory of aquatic vegetation in the delta, in the main channel, and in the floodplain waters of the Danube;
- Concentrations and ecotoxicity of contaminants in sediments and suspended solids;
- Application of ecological short-term and long-term tests for monitoring contaminant concentrations and investigation of the lethal and chronic impacts on organisms (bio-accumulation);
- Implementation of automatic bioassay systems for the protection of biocenoses and early recognition of pollution spills.

International Association of Waterworks in the Danube Basin (IAWD)

The International Association of Waterworks in the Danube Basin (IAWD) was founded in Vienna in 1993. Members are public water services and water-supply companies from Germany, Switzerland, Austria, Slovakia, Czech Republic, Hungary, Croatia, Slovenia, Yugoslavia and Romania. The activity of IAWD covers the whole surface and subsurface basin of the Danube and its tributaries as well as regions supplying water for public water services. IAWD supports at the national and international levels joint efforts aiming at the prevention and elimination of risks to water supply due to pollution or other water-quality impairments of the Danube and its tributaries and its groundwater aquifers and the conservation of the purity of surface and subsurface waters. Thus, it shall be ensured that the members can be supplied at any time with drinking water in sufficient quantity.

Danube Commission

In May 1949, the Belgrade Convention entered into force and the Danube Commission was established. First, the Commission's headquarters were located in Belgrade, but in 1954 Budapest took over the headquarters function. The working languages of the Commission (with Germany, Austria, Slovakia, Yugoslavia, Bulgaria, Romania, Ukraine, Russian Federation, Croatia and Republic of Moldova as members) are French, Russian and German. The Danube Commission meets yearly, in April, in Budapest.

The Convention of Belgrade regulates the unrestricted navigation on the Danube up to Ulm as well as individual tasks and the legal status of the Danube Commission. To ensure and improve the conditions for navigation on the river with respect to technical, nautical and administrative issues, the Commission also deals with hydrometeorological, hydrological, hydraulic and legal topics. Due to regulation works affecting the flow regime and the limnological behaviour, the Commission established a working group on hydrology, which particularly deals with acquisition and exchange of hydrological data, data on water resources as well as discharge forecasting. From 1953 on, a hydrological yearbook is being published.

Forum of the Danube Hydrological Services

The first meeting of Forum of the Danube Hydrological Services had accepted the following guiding principles of the cooperation:

- The Forum is an unofficial body of representatives of National Hydrological Services (NHS) in the Danube River basin to discuss professional, managerial, financial and other issues of operating NHSs to gain information on the relevant problems and their solutions. The Forum does not deal with the hydrological programmes under the aegis of UNESCO and WMO or other international organizations;
- The participants cover the cost of their travel and accommodation;
- The working language is English.

The organizing country sends invitation letters to Hydrological Services of Albania, Austria, Bosnia and Herzegovina, Bulgaria, Czech Republic, Croatia Germany, Hungary, Italy, Poland, Romania, Slovenia, Slovakia, Switzerland, Yugoslavia and Ukraine, and to observers, i.e. the Danube Commission and the ICPDR. The second Forum was held in 1998 in Vienna (Austria), the third in 1999 in Bratislava (Slovakia), the fourth in 2000 in Prague (Czech Republic), and the fifth in 2001 in Koblenz (Germany). The main topics of the coming years will include monitoring activities linked to the implementation of the Water Framework Directive.

Regional cooperation of the Danube countries in the frame of the International Hydrological Programme (IHP) of UNESCO

The cooperation of IHP National Committees of the Danube countries – Germany, Austria, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Yugoslavia, Bosnia and Herzegovina, Republic of Moldova, Romania, Ukraine, Albania – in the framework of the International Hydrological Programme of the UNESCO are subdivided into two tasks:

- Organization of conferences on hydrological forecasting and the hydrological basis of water management;
- Hydrological cooperation on expert level.

UNESCO and, from 2001 on, the ICPDR are also involved.

The working languages are English, Russian and German. The National IHP Committees of the participating countries perform the overall coordination on a rotational basis.

From 1965 to 1974, the cooperation took place in the framework of the International Hydrological Decade of UNESCO, later on under the International Hydrological Programme of UNESCO. The cooperation aims to contribute by common efforts of all Danube countries to the solution of current hydrological and water management issues of the whole river basin. This hydrological cooperation is basically a financially self-sustained venture.

The result of the several phases and topics of this cooperation can be summarised as follows:

- 1974 - 1986 - phase coordinated by former Czechoslovakia and Yugoslavia:
  As the main result of this period, the Hydrological Monograph of the Danube basin (Hydrology of the River Danube) was published:
  Part 1 - Chapter I - Physical-geographical and water management characteristics of the basin;
  Chapter II - Hydrological regime of the Danube and the most important affluents;
  Chapter III - Water balance of the Danube;
  Part 2 - Tables of water levels and flows of 48 representative gauges;
  Part 3 - Maps;

- 1987 - 1992 - phase coordinated by Germany:
  Project 1 - Suspended and bottom sediment conditions of the Danube (Hungary);
  Project 2 - Temperature and ice conditions of the Danube and its major tributaries (former Czechoslovakia);
  Project 3 - Long-term fluctuation of precipitation in the Danube basin (Austria);
  Project 4 - Flood coincidence of the Danube and its major tributaries (Yugoslavia).

- 1993 -1998 - phase coordinated by Austria:
  Sub-Project 5.1 - Inventory of the main hydro-technical structures in the Danube (Romania);
  Sub-Project 5.2 - Updating of the water regime analyses (Germany);
  Sub-Project 5.3 - Updating of the water balance (Slovenia);

Sub-Project 6.1 - Paleogeography of the Danube River and its catchment (Hungary);
Sub-Project 6.2 - The Danube River channel training (Slovenia);
Sub-Project 6.3 - The fords of the Danube (Hungary);
Sub-Project 6.4 - Analyses of the morphological processes;
Sub-Project 7 - Rationalisation of the annual maximum runoff in the Danube river basin (Romania);
Sub-Project 8.1 - Hydrological bibliography related to the Danube basin (Germany);
Sub-Project 8.2 - Basin coding and numbering for the Danube basin (Slovenia);

- 1999 - phase coordinated by Slovakia:

Sub-Project 5.1 - Inventory of the main hydro-technical structures in the Danube (Romania);
Sub-Project 5.2 - Updating of the water regime analyses (Germany);
Sub-Project 5.3 - Updating of the water balance (Slovania);
Sub-Project 6.1 - Paleogeography of the Danube River and its catchment (Hungary);
Sub-Project 6.2 - The Danube River channel training (Slovania);
Sub-Project 6.4 - Analyses of the morphological processes;
Sub-Project 7 - Rationalisation of the annual maximum runoff in the Danube River basin (Romania);
Sub-Project 8.1 - Hydrological bibliography related to the Danube basin (Germany);
Sub-Project 8.2 - Basin coding and numbering for the Danube basin (Slovenia).

The projects in italics indicate the already published reports.

EU level

To demonstrate the start of cooperation, reference is made to the report of the UNECE Water Convention's Working Group on Water Management on the workshop about the experience drawn from the implementation of the Water Framework Directive held in Bratislava on 15-16 October 2001 (UNECE, 2001). This workshop recommended making arrangements, as appropriate, with the European Commission so that activities under both the UNECE Water Convention and the Water Framework Directive are brought even closer together.

As the Water Framework Directive will be implemented not only by the present EU Member States but also by all countries that are applicants for EU membership, the Directive will be the ruling piece of legislation concerning the river basin management in a major part of the UNECE region. The Water Framework Directive underlines the necessity of transboundary coordination. The requirement to produce coordinated river basin management plans for entire river basin districts until 2015 will compel States to evaluate whether the capacities, structures, mandates and legal basis of existing joint bodies are sufficient to meet the challenge of the Water Framework Directive or whether there is a need to adapt them or to establish new ones.

The Water Framework Directive comprises some important new concepts, such as:

- The concept of river basin district, the area of the whole river catchment with their associated groundwaters and coastal waters as main unit for the management of river basins;
- The assessment of the status of water bodies on the basis of the ecological status defined by biological, hydro-morphological, and physico-chemical quality elements;
- The establishment of type-specific reference conditions;
- The combined approach using control of pollution at source through the setting of emission limit values and of environmental quality standards;
- The integration of economics into water policy and planning via the economic analysis of water uses and the use of pricing to encourage better water uses and to recover costs.

International level

UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE Water Convention)

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes, drawn up under the UNECE auspices, came into force on 6 October 1996. So far, 32 countries (Albania, Austria, Azerbaijan, Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Kazakhstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland and Ukraine) and the European Community have ratified this Convention.

Under the Convention, the riparian countries to the same watercourses or lakes need to harmonise their approaches and define their rights and obligations. As many countries depend on transboundary water resources, the Convention – by bringing the riparian countries together – can help preventing disputes over the use of transboundary waters.

The first meeting of the Parties was held in Helsinki in June 1997, and the second in March 2000 in The Hague. For the period 2000 - 2003, the following programme areas were accepted:

- Implementation and compliance
  - Review of policies and strategies for the protection and use of transboundary waters;
  - Implementation of the Convention's provisions on bilateral and multilateral agreements and regarding joint bodies;
  - Strategy and framework for compliance with the Convention;
  - Advisory service on legal instruments;
  - Responsibility and liability.
- Integrated management of water and related ecosystems
  - Strengthening the capability of joint bodies to comply with the obligations under the Convention;
  - Ecosystem approach in water management;
  - Management of transboundary waters in the UNECE region;
  - Groundwater management;
  - Interstate distribution and rational use of water resources of transboundary rivers in water-deficient regions;
  - Management and sustainable development of international lakes;
  - Water and industrial accidents.
- Monitoring and assessment
  - Strategies on monitoring and assessment of transboundary waters;
  - Pilot programmes on monitoring and assessment;
  - Laboratory quality management and accreditation.
- Water and human health
  - Protocol on Water and Health: interim implementation;
  - Conferences on sustainable water management and health.

The following working groups undertake the tasks under these programme areas:

- Working Group on Legal and Administrative Aspects;
- Working Group on Water Management;
- Working Group on Monitoring and Assessment;
- Working Group on Water and Health.

World Meteorological Organization – Operational Hydrological Programme

Commission for Hydrology and the Hydrology and Water Resources Programme (HWRP)

The activities under the HWRP concentrate on operational hydrology and on water resources assessment in general. They include measurements of the basic hydrological elements from networks of hydrological and

meteorological stations; the collection, processing, storage, retrieval and publication of hydrological data; the provision of such data and related information for use in planning and operating water resources projects; and the installation and operation of hydrological forecasting systems. Hydrological data are taken to include those on the quantity and quality of both surface water and groundwater.

The HWRP incorporates and supports a wide range of activities related to education and training in operational hydrology. Regional aspects are covered by the six Regional Associations (RAs) of WMO through their Working Groups on Hydrology. As concerns the RA-VI (Europe) Working Group on Hydrology, its work plan 1999-2002 deals with the following topics:

- Hydrological networks;
- Integration and coupling of hydrological models with water-quality models;
- GIS application in hydrology;
- Regional aspects of the WMO System for Technology Transfer in Operational Hydrology (HOMS);
- Climate and water;
- Extreme floods;
- Operational hydrological research basins;
- Sediment transport;
- Joint hydrology liaison group;
- World Wide Web, hydrology hypertext links;
- Hydrological data exchange;
- Flood forecasting and warning systems.

World Hydrological Cycle Observing System (WHYCOS) and Danube HYCOS

The immediate objectives of WHYCOS are to:

- Strengthen the technical and institutional capacities of hydrological services to collect and process hydrological data and meet the needs of their end-users for information on the status and trend of water resources;
- Establish a global network of national hydrological observatories which provide information of a consistent quality, transmitted in real-time to national and regional databases, via the Global Telecommunication System of WMO;
- Promote and facilitate the dissemination and use of water-related information, using modern information technology such as the World Wide Web and CD-ROMs.

The possible common objectives of Danube HYCOS and of the Convention on Cooperation for the Protection and Sustainable Use of the Danube River are:

- Improvement of national hydrological systems for operational uses;
- Improvement of hydrological forecasting methodologies;
- Contribution to better understanding of regional hydrometeorological processes and environmental trends;
- Promotion of more efficient regional cooperation in hydrological forecasting and water management;
- Supporting a regional approach to the mitigation of extreme events, such as floods and droughts.

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Eutrophication by the Oder River: implications for tourism and sustainable development of the coastal zone

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Tourism as an economic factor along the Baltic coast

In most rural areas along the Baltic Sea, tourism is the most important economical factor. Already in 1993, tourism contributed about 8% to the national income (Feige et al., 2000) and it is likely that it has increased since, as tourism in general has grown. In many coastal resorts in Germany as well as in Poland, tourism contributes to more than 50% to the public income and is even the exclusive economic factor (Schernewski and Sterr in press).

After the German reunification in 1989, a sharp decline in tourism and the transformation of the entire tourist industry took place. State-run holiday hostels were rebuilt or closed down, camping sites reduced, and commercial private hotels, hostels, and sanatoriums gained importance. But since the early 1990s, tourism industry recovered fast along the Baltic Coast of the Federal State of Mecklenburg-Vorpommern and growth has been steady. A new record was achieved in 2001 when 19.8 million people visited Mecklenburg-Vorpommern, which means + 8.3% compared to the previous year (Ostseezeitung, 23-24 February 2002). In 2000, an annual percentage increase of 16.9% was noticed for the number of overnight stays per year. Nowadays, tourism intensity in Mecklenburg-Vorpommern is very high: 8,700 overnight stays per 1,000 inhabitants were registered in 1999 and in 2000, the number increased even up to 10,200. Since 1992, the capacity for tourism, expressed in number of tourist beds, increased from 59,900 up to 1,543,000 in 2000. The number of accommodations, like hostels and private pensions with more than 9 beds, rose from 975 to 2,485 during that period and in 2000, 4.3 million tourists visited Mecklenburg-Vorpommern (Statistisches Landesamt Mecklenburg-Vorpommern, 2001). The Baltic coastal regions show not only the highest density of tourist beds but also high rates of tourism growth.

Tourist surveys yield that tourists demand a high environmental standard, especially concerning water quality. Competition between seaside resorts becomes harder and environmental quality turns out to be one main competitive factor. From this follows that insufficient environmental quality can hamper touristic development (Tourismusverband Mecklenburg-Vorpommern, 1994, 1997, 1999).

The island of Usedom is located in the Oder Estuary with an outer coast towards the Baltic Sea and an inner coast towards the large shallow Szczecinski Lagoon (687 km² surface area, average depth 3.7 m). Due to its long sandy beaches and attractive landscape, the island has a long tourist tradition. Already in the early 20th century, Ahlbeck, Heringsdorf, and Bansin, all known as “emperor baths”, were well-known spas for the international nobility and rich bourgeoisie. After the German reunification in 1990, the architecture and atmosphere have been revitalised, and the island has become a destination for mass tourism as well as a competitive holiday destination with a high international standard. Tourist development on Usedom during the last decade reflects the general pattern along the eastern German Baltic Sea quite well (Schernewski and Sterr in press). About 1 million people visited the island last year, an annual percentage increase of 9%, and 6.6 million overnight stays were reported (Ostseezeitung, 20 February 2002).

The Szczecinski Lagoon, south of Usedom Island, suffers from severe eutrophication and water quality problems due to high discharge of nutrients and pollutants by the Oder River. Due to intensive water exchange with the open Baltic Sea, eutrophication effects are not that pronounced and less obvious at the seaside of Usedom and Wolin.

Especially in this region, where bathing tourism dominates, water quality is important. But there is a difference between the EU evaluation standard (European Union, 2001) and what tourists subjectively regard as good water quality.

The main goal of this work is to investigate the tourists’ subjective perception and assessment of beach and water quality and to detect possible differences between the tourists on Usedom Island and at the Szczecinski Lagoon with regard to their preferences and awareness of bathing water and beach quality.

Comparison of tourism at inner and outer coastal waters

In August 2001, interviews with tourists at inner and outer coastal waters, exemplified by Usedom Island and the Szczecinski Lagoon, were carried out. 256 tourists were interviewed at the seaside resorts Ahlbeck, Heringsdorf and Bansin on Usedom Island and 193 tourists in Ueckermünde and Mönkebude at the Szczecinski Lagoon.

General information about the tourists

75% of the interviewed tourists spent their annual holidays on Usedom Island as well as at the Szczecinski Lagoon and families were dominating. Slightly more than half of the tourists (53%) came from the five new Bundesländer (Federal States). The educational background of the participants on Usedom was significantly higher.

Perception and assessment of the water quality of inner and outer coastal water by tourists

Only 33% of all tourists provide themselves with information about the current state of the water quality at their resort before their holidays. Only 20% gather information about it during their stay at the resort. Differences relating to the educational level were noticed: 42% of all tourists with A-level or university degree collect information about water quality before they travel, while only 25% of tourists with a lower educational background do so. In general, highly educated tourists also assess water quality more severely and give worse marks.

The blue flag was established as an exclusive, international eco-label for high environmental standard as well as good sanitary and safety facilities at beaches and marinas (International Blue Flag Coordination, 2001). Most of the interviewed tourists (81%) do not know about the blue flag and this is independent from their educational background.

In general, a good water quality is regarded to be “important” or even “very important” for the selection of a holiday resort but tourists on Usedom Island are more demanding on it. 53% of them voted for “very important” and 36% for “important” while at the Szczecinski Lagoon 38% voted for “very important” and 45% for “important”. But tourists consider beach quality to be even more important.

There is an obvious tendency that tourists at the Szczecinski Lagoon are less sensitive in respect to waste at the beach, dead animals (e.g. fish and sea birds), and oil lumps although they have distaste for it. Asked how they would evaluate the water quality at their resort, 2.7% of the tourists at the Szczecinski Lagoon voted for “very good”, 26.4% good, 47.8% reasonable, 17% acceptable and 6% poor. In comparison to this 21.8% of the tourists on Usedom Island voted for “very good”, 58.8% good, 17.6% reasonable, 0.8% acceptable and 0.8% poor. This reflects the water quality problems the Szczecinski Lagoon actually has and tourists are aware of it.

Tourists were also asked to evaluate the development of water quality at their resort during the last years. It is deemed to have improved a lot but 50% of all tourists avoid answering. Almost the same with the beach quality, which is also regarded now to be in a much better condition, but also only 63% were willing to evaluate.

With respect to the natural environments of the resorts, it turned out that the individual preferences are important for the tourists’ selection of their holiday resort. For example, tourists at the sheltered, brackish Szczecinski Lagoon prefer less wind and lower waves and disrelish jellyfish. On the contrary, tourists at the open Baltic Sea rather prefer a more rough sea and a maritime atmosphere.

Assessment of coastal waters quality in different regions

The tourists were asked to assess the water quality of the Mediterranean Sea, the North Sea, the Swedish, Polish, and German Baltic Sea and the Szczecinski Lagoon.

Altogether, the German Baltic Sea was rated best by far. Primarily, people from the five new Bundesländer contribute to this result: they consider it to be of a much better quality than tourists from the old West German States do.

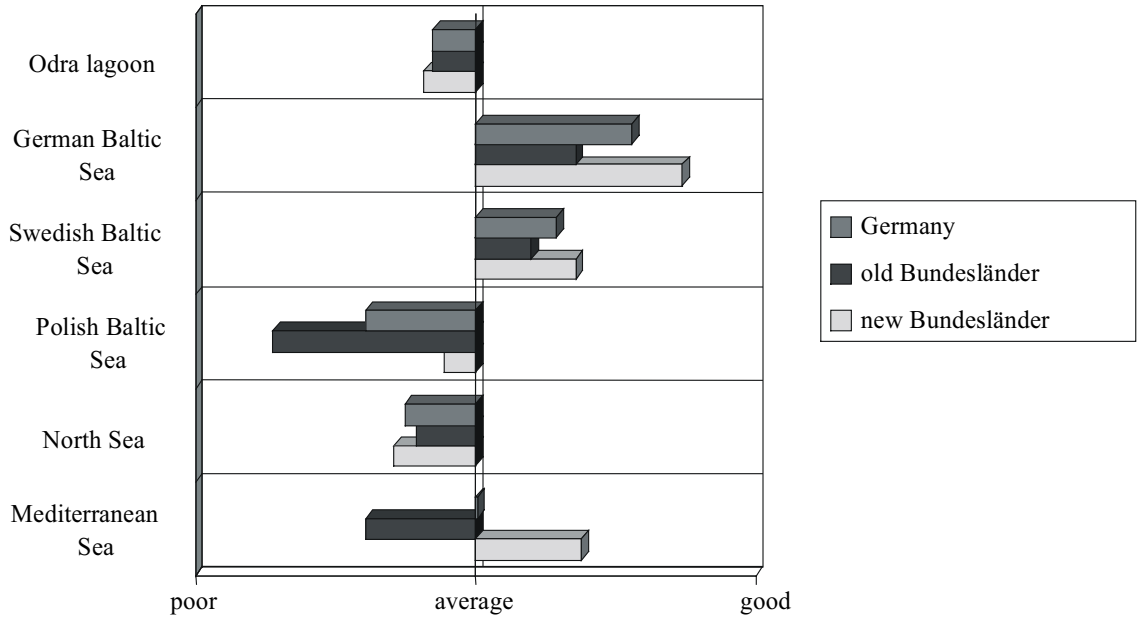
Especially with regard to the high valued German Baltic Sea, the North Sea is marked severely and got a bad valuation.

The Szczecinski Lagoon is also regarded to have a fairly poor water quality, whereas the Swedish Baltic Sea is considered to be in a good condition.

Altogether, the Mediterranean Sea is marked average but having a closer look it becomes obvious that there are significant differences between the assessment by tourists from the eastern and western part of Germany. Tourists from the five new Bundesländer mark the Mediterranean Sea extremely well, while tourists from the old Bundesländer consider it to be in a fairly poor condition.

The Polish Baltic Sea is regarded to be much worse by tourists from the old Bundesländer whereas people from the new Bundesländer consider it to be not that bad.

Regarding the educational background one can say again that highly educated tourist gave significantly worse marks for the water quality.



Discussion

The survey was carried out during two weeks in August and altogether 449 tourists were interviewed. The period did not cover the entire bathing season, the number of tourists that were interviewed was limited and not all subjects could be covered in an appropriate manner. In the following discussion, previous surveys carried out in 1994, 1997 and 1999 by the tourism organization Mecklenburg-Vorpommern were also considered.

It becomes obvious that there are differences not only between perception of water quality and real water quality but also between demand and reality. The survey showed that tourists primarily evaluate bathing water quality on the basis of their visual impression like visibility, occurrence of macro algae, foam, etc. The EU bathing water directive [1] takes only total and faecal coliforms into account. Applying the EU bathing water directive, water at the seaside of Usedom as well as in the Szczecinski Lagoon complied with guide values during the bathing season 2000 (with one exception at the Szczecinski Lagoon that once only complied with mandatory values) (International Blue Flag Coordination, 2001). But tourists from their subjective point of view notice differences in bathing water quality. So the question is if the EU bathing water directive really indicates water quality.

[1] Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water, published in the Official Journal L 031 of 05/02/1976.

On one hand, people are demanding a good water quality and regard it to be essential for the selection of their holiday resort. But on the other hand, they hardly provide themselves with information about it before they travel. This can be due to the fact that local information is not available or only accessible via Internet. It has to be further investigated whether interest is lacking or access to the Internet is not available.

The fact that the blue flag is hardly known by the tourists can have two reasons, either insufficient information demand or insufficient information provision.

When the blue flag is awarded to seaside resorts, it is one of the very few possibilities for them to appear with a positive headline in the news. It can be supposed that for seaside resorts it is more an appreciated advertising possibility than a mark for a good environmental standard. Is the blue flag really an indicator of good environmental conditions or does it only indicate a good infrastructure?

Regarding the assessment of the coastal waters quality of different regions, there is obviously a difference between own experience and mental picture. Further research is necessary to find out the reasons. But one can assume that mental pictures are primarily based on newspapers, advertisings, reports from others and prejudice.

The survey shows that tourists regard the water quality at the Szczecinski Lagoon as not as good as at the seaside of Usedom Island. Nevertheless, there must be reasons attracting tourists. It can be assumed that lower price levels are the crucial factor. Unlike the rest of Mecklenburg-Vorpommern, the region around the Szczecinski Lagoon does not share in the growing tourism, though. In fact, one can find fairly little and less developed tourism. Lower prices might be a possibility to attract at least some tourists, especially in the vicinity of Usedom Island, which is a big rival in business. However, the low number of tourists at the Szczecinski Lagoon is not sufficient to establish sustainable and growing tourism in that region. Utilization rates below 30% are often regarded to be problematic with respect to the profitability of accommodations and infrastructure. Utilization rates dropped from 28.2% in 1992 to 22.5% in 2000 in Uecker Randow County, which includes Mönkebude and Ueckermünde, whereas in Ostvorpommern County, where Usedom is located, stable rates of about 36% - 37% were observed (Statistisches Landesamt Mecklenburg-Vorpommern, 2001).

To summarize, water quality amongst other things influences tourism growth. Water quality of the Szczecinski Lagoon depends on the utilization of the catchment area. Sustainable management of the catchment area, e.g. reducing the discharge of nutrients, is of great importance to the development of the coastal zone. Sustainable tourism can contribute to a sustainable development for both the German and the Polish coastal zone. Since in Poland a large amount of tourist facilities (about 30%) are located along the coastal strips (EUCC, 2001), this could be a point worth being considered. Due to the likely increasing interest of Polish tourists in water quality, as well as the attempt of the Polish tourism industry to attract foreign tourists, the issue of clean water will become more and more important in the near future.

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Tourism as an economic factor along the Baltic coast
Balance of water availability and water demand in large river basins: methodology demonstrated in a pilot study for the Danube River

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Against the background of steadily rising demands for water, integrated water management is a prerequisite of water resources conservation. River basin management constitutes a multi-actor system with mutually influencing parameters. Modelling of basin-related water management is an essential planning tool. It requires the consideration of water quantities, water quality, and ecological and socio-economic aspects in their complexity, as well as the combination of modelling techniques originating from different scientific disciplines.

The Global Runoff Data Centre (GRDC) at the German Federal Institute of Hydrology (BfG) identified methodological steps for establishing balances of available water resources and demands in large international river basins. To this end, existing modelling programmes were combined, using generally accessible data and taking the specific regional features into account. The methodological core is a long-term water management model based on the Monte-Carlo technique. Proceeding from an analysis of the hydrological conditions and the water management practices in the river basin, the response behaviour of the system is examined under varying boundary conditions, such as changes in water uses or in water demands. The computation time step is one month. The outputs of model computations of other disciplines, regarding for example the water cycle, water quality, the groundwater situation or the prediction of water demand, can be integrated. Scenario computations result in distribution functions for several system variables of interest like managed stream flow or satisfaction of water demands.

The methodology of the detailed water management balance, created in the 1970s by the former Institute of Water Management in Berlin, is implemented in a long-term water management model. Using the software system ArcGRM [1], the methodology evaluates the impacts of water management strategies in a river basin, on the basis of measured input data, rather than modelling physical processes. The methodological set-up can be readily used to monitor the water management balance on a regular basis, considering updated or refined data sets of anthropogenic impacts as well as to investigate hypothetical scenarios. Alternatively, the methodology can be used to examine the sustainability of a given water management scheme under changing environmental conditions.

Given the example of minimum stream flow needed for navigation, a pilot study on the Danube River basin tested and proved the applicability of the methodological steps and the software system to assess water availability and allocation in large international basins.

The Danube basin is a region of intensive economic activities. It is shared by 18 countries with different economic and political structures. The main river is navigable almost on its whole length. The model background is formed by changing water uses from the 1980s to the 1990s assuming constant water resources. The study examines the satisfaction of present and future water demands along the Danube River. The accumulated decrease of water consumption in the Danube basin after 1990 results, for instance, in a better potential supply for navigation.

The methodology of the detailed water management balance is suitable to study the impacts of potential management activities in small as well as large river systems. Besides the stochastic simulation of the available water resources, another prerequisite is the basin-related, GIS-based quantification of anthropogenic impacts on the water management system. Following the methodical steps, a basic model, which forms the basis for calculation of various water management scenarios, can also be built for other large international basins.

[1] WASY GmbH (2000), Berlin, Dresden, Cologne. Web site: www.wasy.de.

Water management problems related to borderline waters of the Nysa Łużycka River basin

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Introduction

International cooperation on the Oder River basin has many forms. It includes joint investments in the area of water/waste-water management, water supply as well as environmental protection. The Nysa Łużycka River is an excellent example of this cooperation. It originates in the Izera Mountains at a height of 780 m above sea level. Its length is 251.8 km, of which 54 km run through the Czech Republic. It is a typical mountain river. From Hradek-Hartau-Porajów, where the borders of Poland, Czech Republic and Germany meet, the river forms the borderline between Poland and Germany for 198 km. Some of the more important tributaries forming the Nysa Łużycka water resources within the borderline region include Miedzianka (82.5 km^2), Witka (326.35 km^2), Czerwona Woda (Red Water) (143.2 km^2), Żółta Woda (Yellow Water) (77.39 km^2), Skroda (223.15 km^2) and Lubsza (910.35 km^2) from the Czech side as well as Mandau (297.2 km^2), Pliessnitz (180.93 km^2), Feehrenfliess (82.0 km^2) and Malxe (138.84 km^2) on the German side (see Figure 1). The basin area located in Poland amounts to 2806.46 km^2 and in Germany to 1620.19 km^2.

Agreement between Poland and Germany on Cooperation in the field of Water Management of Border Waters

Article 1 of the agreement defines the area of cooperation between Poland and Germany. Article 1 states: "The Agreement Parties will cooperate in the area of borderline waters' management".

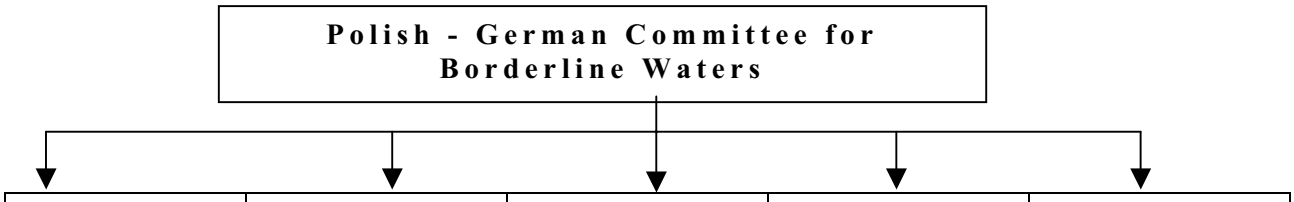
Article 2 provides details about this cooperation. This includes among others:

- Joint evaluation of the borderline waters in order to define their quantity and quality;
- Development of quantitative/qualitative water management balance reports;
- Development of common regulations concerning a register of harmful substances;
- Supply of drinking and industrial water to private, industrial and other users;
- Water transfer between the borderline waters and other basins;
- Protection against floods as well as low waters;
- Matters related to hydrotechnical installations, flow regulation, maintenance of river navigability, protection of the basins and overflow lands, construction and maintenance of embankments, polders and release channels, melioration and water supply for farming purposes, management of water-related plants and devices;
- Immediate actions in case of unusual pollution, information sharing regarding hydrological/ meteorological relations and hydrometeorological forecasts for the entire Oder River basin.

Article 10 of the Agreement allows the Parties to form a Polish-German Committee for Borderline Waters. The key tasks of this Committee include:

- Development of a system for control, notification and warning about unusual pollution of borderline waters;
- Development of technical, technological, organizational and other guidelines for the prevention and alleviation of unusual pollution of borderline waters along with practical training exercises;
- Development of guidelines for joint flood protection investments;
- Development of guidelines for cooperation and mutual assistance.

The Committee members and its operating principles are defined in the statute. The Committee operates continuously, whilst special tasks are executed through joint Polish/German Working Groups.



Working Group: W1 for Hydrology and Hydrogeology	Working Group: W2 for Water Conservation	Working Group: W3 for Unusual Borderline Water Pollution	Working Group: W4 for Borderline Water Maintenance	Working Group: W5 for Borderline Water Planning
Tasks of the Working Groups				
• Observation / measurements of surface waters and groundwaters; • Evaluation of water resources and their distribution; • Development of hydrological and hydrogeological models; • Anti-flood operation systems – development, modernization and implementation; • Operating system for Baltic Sea shore protection – maintenance and modernization; • Ongoing observations, results comparison and data sharing.	• Definition of control / measurement cross sections; • Sampling and analysis for 41 predefined indicators; • Results comparison and cooperative evaluation of the water quality – definition of current water quality class; • Measurement and analytical methods – development of a harmful substance register.	• Development, discussion and implementation of alarm plans; • Information on unusual situations; • Conducting training exercises and preventive actions; • Alleviation of unusual pollution; • Updating the alarm system plans.	• Agreement about the joint development of borderline waters; • Agreement about construction of hydrotechnical and hydro-power plants; • Protection of the river basin and flood plain areas; • Construction and maintenance of embankments. Maintenance of waterway navigability, release channels and polders. Aggregate excavation; • Water supply for farming purposes; • Flood protection.	• Advice on water supply plans for private and industrial purposes; • Development of a common policy for water transfers to other basins; • Development of quality/quantity balance reports for borderline waters; • Evaluation of the influence of water-related investments onto water and adjoining environment; • Advice on plans and projects for hydrotechnical and road construction in the borderline region; • Flood protection during ice thawing.

Agreement execution

Evaluation of the water conditions within the Nysa Łużycka River basin is performed on the basis of joint observations and measurements made through a joint monitoring network. The monitoring network for surface waters includes water gauges located on the Nysa Łużycka River – on both sides of the Polish – German border. The observations and measurements are discussed during meetings of specialists from both countries.

On average, the run-off of the Nysa Łużycka is about 6.0 m^3/s in the upper part and 30.4 m^3/s in the lower part (see Figure 2). Research based on combined observation/measurement data proved that the commonly assumed proportional flow increase based on the basin area is not applicable to the Nysa Łużycka basin.

For the control of groundwaters, a joint monitoring network was set up on both sides of the border. It started with the Jänschwalde mine, and since 1998 it includes also other mines. The groundwater monitoring network includes both piezometers and wells. Its state varies and is actually as follows:

- Jänschwalde mine – 59 measurement points (Poland-31, Germany-28);

- Nochten and Reichwalde mines – 23 measurement points (Poland-23, Germany-0);
- Berzdorf mine – 12 measurement points (Poland-0, Germany-12);
- Turów mine – 90 measurement points (Poland-43, Germany-47).

The main users of these groundwater resources are brown coal (lignite) mines: one at the Polish side (Turów) and 6 on the German side (Olbersdorf, Berzdorf, Reichwalde, Bärwalde, Nochten, Jänschwalde and Cottbus Nord) (Figure 3 and Table 1).

Table. 1. Brown coal mines located at the Nysa Łużycka River basin and their characteristics

Name	Exploitation period (year)	Area of exploitation [ha]	Planned exploitation till the end of the exploitation period [10^6 t]	Exploitation depth from - to [m]	Water removal [m^3/min]	Depression area [km^2]	Water intake by the mine [m^3/s]
Jänschwalde	2035	4,699	361	72-105	195	180[1)]	0.150[3)]
Cottbus Nord	2017	1,362	128	50	85	-	
Nochten	2030	4,825	609	85-110	310	480[2)]	0.748[4)]
Reichwalde	2035	3,945	395	50-75	140	-	
Berzdorf	1998	-	-	100	20	14	0.42
Olbersdorf	1991	-	-	37	2-2.5	2.9	-
Turów	2035	5,086	500	140-240	45-48	40	0.58

1) Jointly with the Cottbus Nord mine.
2) Jointly with the Reichwalde mine.
3) Water intake by the Jänschwalde mine: 0.066 from German areas and 0.084 from Polish areas.
4) Joint intake by the Reichwalde and Nochten mines.

It is assumed that the total water intake by mines, during the water removal from the mines, is about 1.898 m^3/s of which 0.87 m^3/s goes back to the river.

There are over 22 users within the basin area, which require more then 10 l/s of water. Their total joint requirement for both the German and Polish side is 0.652 m^3/s (see Figure 4).

A significant group includes individual users having underground water intakes. There are 219 of them within the Nysa Łużycka basin with a total exploitation of 1.984 m^3/s, of which 54 are directly located within the river valley. The exploitable resources of these intakes are estimated at 0.79 m^3/s (Figure 3).

Water removal from mines along with systematic water intake by other users lead to significant disturbances of the surface and groundwater levels, which is especially visible at the mines and water intake areas (Figure 5).

These disturbances within the water-bearing Quaternary layers and the Tertiary layers located within the surface mine depression areas are usually irreversible.

In the Strzegów and Markosice areas within 2 km from the Nysa Łużycka River, the Tertiary-layer water level dropped from 16.85 to 38.83 m (Figure 6) during the 1985-2000 period, whilst to the east and north-east of these areas, this level dropped from 1.04 to 2.0 m. It is currently observed that these levels continue dropping.

When it comes to Strzegów, the Quaternary layers at the area south to the influence of the mine seem to be stabilized whilst a systematic drop is continuously observed to the east and north-east of this town.

At the Reichwalde, Notchen and Berzdorf mine area, the water levels systematically drop about 0.20-0.70 m per year. Currently, the Nochten mine is nearer to the Polish border as compared to its existence period.

The Turów mine provides extensive measurement data. Internal embankments from the side of the so-called Nysa pillar and flooding of the Olbersdorf mine caused a stop to the underground drop tendencies within the water-bearing layers. Actually this process even reversed and further joint research should show the efficiency of the undertaken preventive actions.

The partnership research is also to be used to develop hydrogeological models of groundwater level changes.

Each river, and especially a borderline river, requires that its water resources are defined. The joint water use quantitative/qualitative balance reports describe not only the available water resources but also their current usage and the condition of the surrounding environment. Any changes related to planned investments should be preceded by a feasibility evaluation and should appraise their influence onto the current water users, so that they will not suffer any losses. It should also describe the influence onto the river and its surrounding. The subjects of joint research and discussions include the German projects of water intake from Nysa Łużycka and its tributary Pliessnitz (12 m^3/s), flooding of the Berzdorf mine (350 million m^3 within 4 years) and water transfer from Nysa Łużycka to Szprewa (North Sea basin) at 2 m^3/s.

The multiple applications of the river water and its basin depend highly on its purity level. Under the Polish - German borderline water partnership programme, special attention is paid to the protection of these waters.

Control measurements are taken at 13 predefined control/measurement points. In 2000, the quality of the Nysa Łużycka waters has been affected mainly by:

- Pollution from the Czech Republic entering Poland;
- Sewage from the Bogatynia industrial region and the Miedzianka River waters;
- Sewage from the German part of the basin – Zittau, Hagenwerden, Görlitz, Forst and Guben.

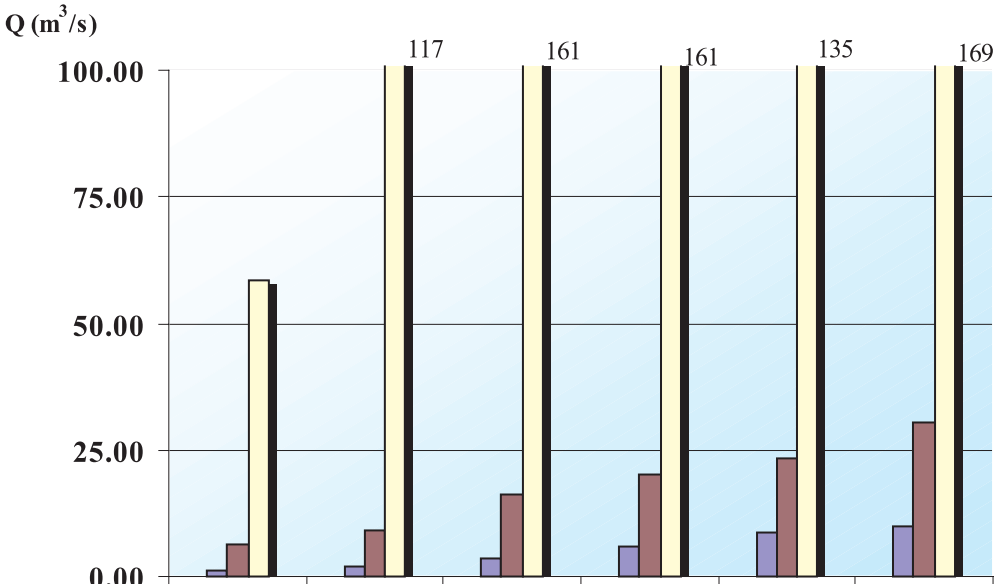
The biological classification showed that class I waters were present at river kilometer 55.0, class II at 30.9 km and class III at 28.5 km. Waters, which were outside the classification range started 83,4 km downstream the border with the Czech Republic and continued to the river mouth at Bielawa.

The control of water purity relates directly to joint actions to quickly alleviate unusual pollution. In order to assure that these actions are effective, certain practical exercises are foreseen regarding warning and alarm systems, and pollution removal. Specialist of both countries have a jointly developed an “Alarm and Warning Plan”, which states the contact media, order of notification, actions to be taken and point-by-point procedures for various types and levels of pollution.

Unusual risks include also floods and other catastrophes. In this area both countries base their activities on a flood protection system for the entire Oder River basin. The flood information system is based on the most modern telecommunications practices. Large data packages are exchanged daily (during flood risk periods, every three hours) containing a few hundred parameters like rainfall, water levels, water management in reservoirs, water flows and groundwater levels, and in winter also the thickness of the ice/snow on the rivers. This data also includes a current water level forecast for the upcoming 72 hours.

Looking back at the previous years, it can be said that the partnership between Poland and Germany in the area of borderline waters proved that cooperation and mutual high demands lead to a better understanding between the partners, and knowledge of their requirements and abilities. It also provided a firm basis and a trust relation, which is especially important in undertaking difficult decisions.

Figure 1. Hydrographic areas within the Nysa Łużycka River basin



	Porajów	Sieniawka	Zgorzelec	Przewóz	Klein Bademeusel	Gubin
SNQ	1.30	2.02	3.63	5.82	8.53	9.99
SSQ	6.14	9.10	16.4	20.0	23.5	30.4
SWQ	58.6	117	161	161	135	169

Figure 2. Long-term record of characteristic discharges of the Nysa Łużycka River
SNQ: Long-term minimum discharge
SSQ: Long-term mean discharge
SWQ: Long-term maximum discharge

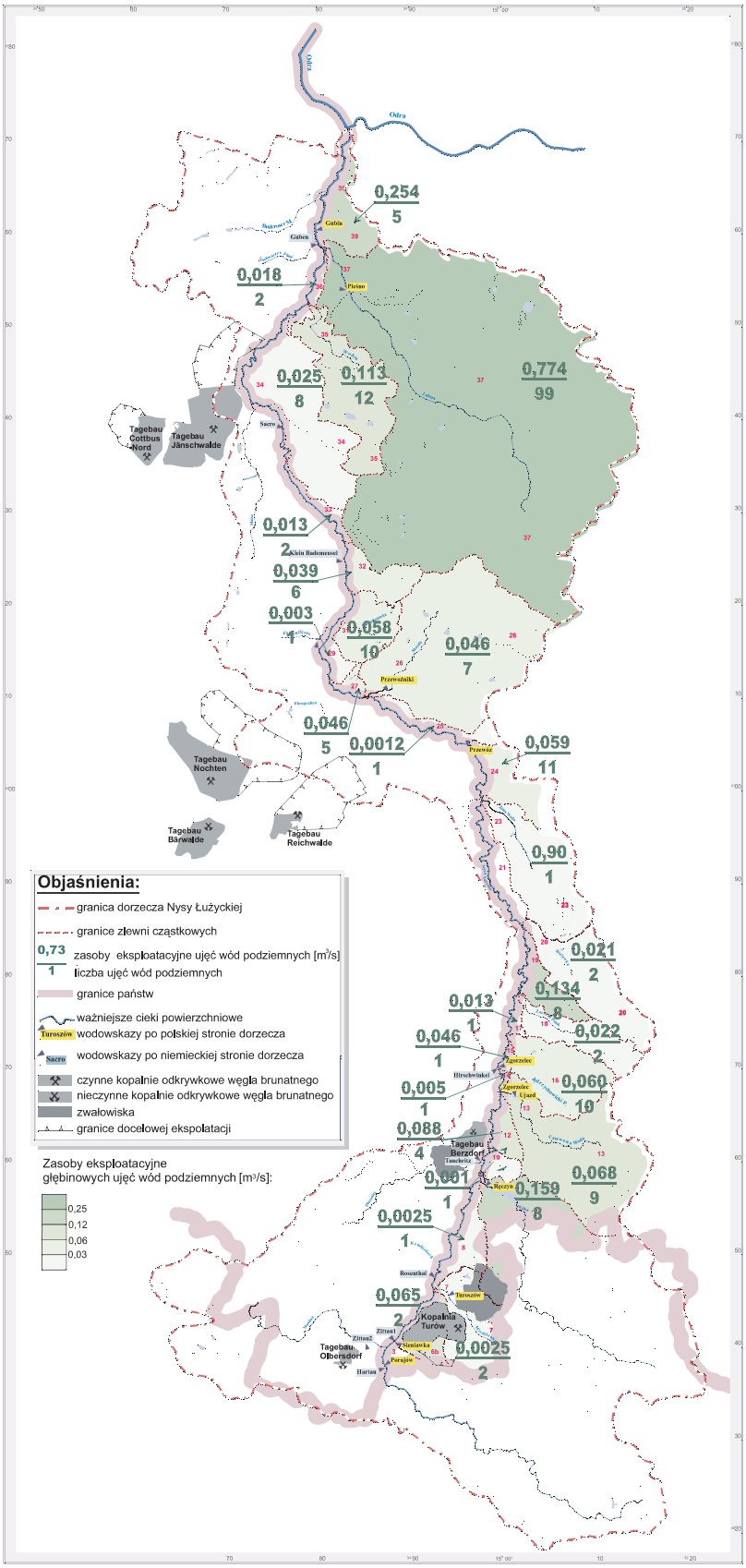


Figure 3. High depth groundwater intakes

Figure 4. Users in the Nysa Łużycka River basin requiring more than 10 l/s of water

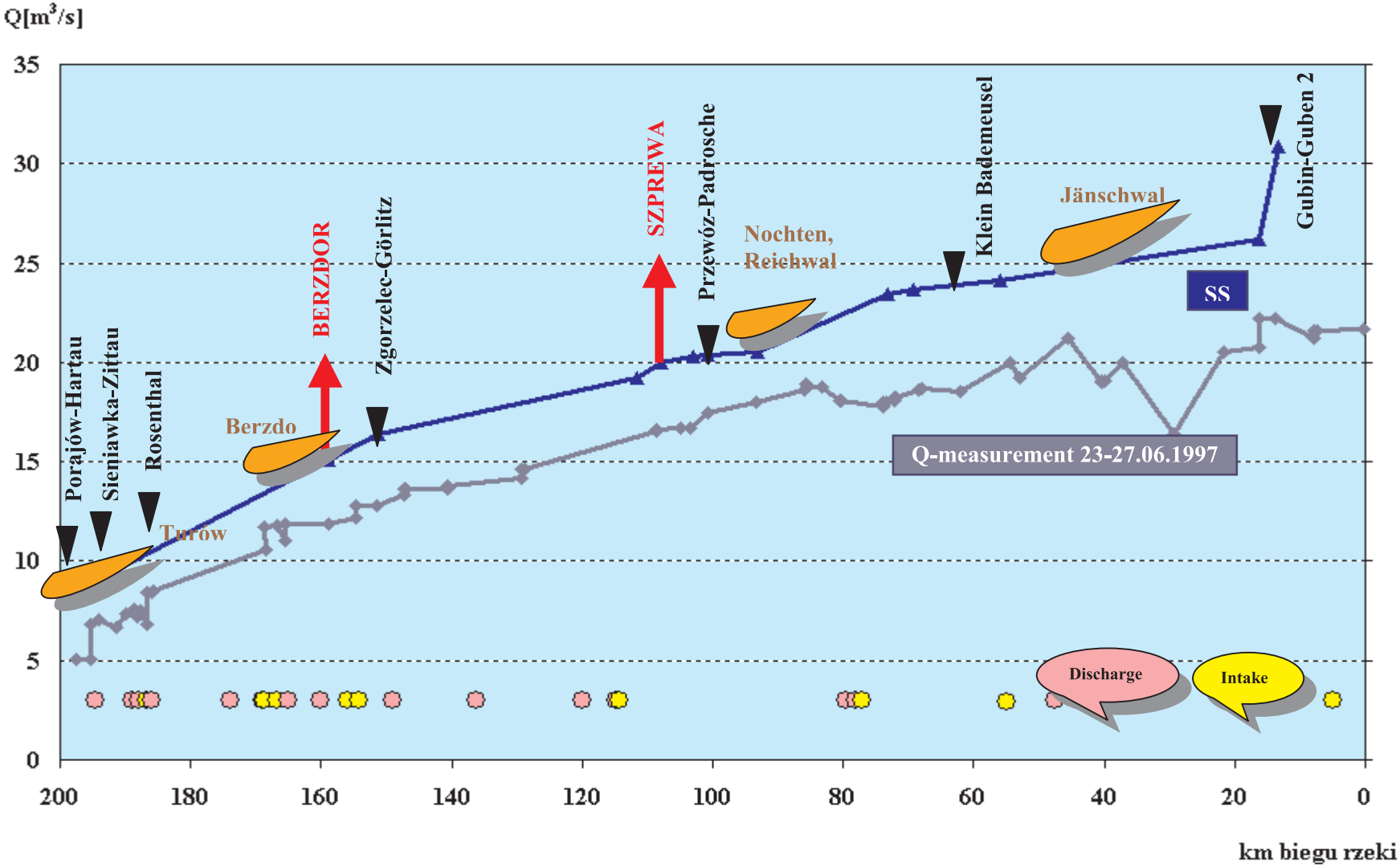


Figure 5. Resource distribution along the Nysa Łużycka River together with their key recipients