

www.unep.org

United Nations Environment Programme
P.O. Box 30552, Nairobi 00100, Kenya
Tel: (+254) 20 7621234
Fax: (+254) 20 7623927
E-mail: uneppub@unep.org
Web: www.unep.org



Hydropolitical Vulnerability and Resilience along International Waters
EUROPE

Water is a unique and vital resource, for which there is no substitute. There are seventy-one international river basins within Europe and approximately eighty-nine international aquifers shared among twenty-seven countries. Most European countries are reliant on water resources that originate outside their territory. Sixteen of the European countries have more than 90% of the country located within an international river basin. Europe is well endeavored sufficient water compared to other regions. It has a good supply of both surface and groundwater which are important sources of freshwater supply. Desalination of seawater comprises only a small percentage of the total water use. Water also contributes substantially to the transportation system in the region. However, like other regions that share transboundary water sources, the impact of climate variability and change is precipitating a certain level of vulnerability and raising tension and conflict potential levels among riparian nations.

The hydro-vulnerability of Europe is governed by the institutions created to resolve transboundary water issues in a cooperative manner that attempts to prevent potential conflict. Institutional capacity through water management bodies, treaties or generally positive international relations, is possibly more important than the physical environment for minimising hydropolitical vulnerability and conflict on the one hand, and strengthening resilience and cooperation on the other hand. This publication aims at a broader promotion and dissemination of assessed information and data that can support informed policy-making.

Hydropolitical Vulnerability and Resilience along International Waters

EUROPE

For further information

Division of Early Warning and Assessment
United Nations Environment Programme
P.O. Box 30552, Nairobi 00100, KENYA

Tel: (+254) 20 7624028 Fax: (+254) 20 7623943 Email: dewa.director@unep.org
Web: www.unep.org



ISBN: 978-92-807-3036-4
Job No. DEW/1184/NA



Hydropolitical Vulnerability and Resilience along International Waters

EUROPE



Copyright © 2009, United Nations Environment Programme
ISBN: 978-92-807-3036-4 DEWA Job No. DEW/1184/NA

This publication is printed on chlorine and acid free paper from sustainable forests.

This publication may be reproduced in whole or in part and in any form for educational or nonprofit purposes without special permission from the copyright holder, provided acknowledgment of the source is made. UNEP and the authors would appreciate receiving a copy of any publication that uses this report as a source.

No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme.

United Nations Environment Programme
PO Box 30552-00100, Nairobi, Kenya
Tel: +254 20 7624028
Fax: +254 20 7623943/44
E-mail: dewa.director@unep.org
Web: www.unep.org

United Nations Environment Programme
Division of Early Warning and Assessment–North America
47914 252nd Street, EROS Data Center, Sioux Falls, SD 57198-0001 USA
Tel: 1-605-594-6117
Fax: 1-605-594-6119
E-mail: info@na.unep.net
Web: www.na.unep.net
www.unep.org

The “Hydropolitical Vulnerability and Resilience along International Waters” project, directed by Aaron T. Wolf and managed by Lynette de Silva, both of Oregon State University (OSU), USA, is a collaboration between the United Nations Environment Program – Division of Early Warning and Assessment, (UNEP-DEWA) and the Universities Partnership for Transboundary Waters. The Partnership is an international consortium of water expertise, including institutes on five continents, seeking to promote a global water governance culture that incorporates peace, environmental protection, and human security <<http://waterpartners.geo.orst.edu>>.

Hydropolitical Resilience and Vulnerability along International Waters: Europe is the third of a five-part series of continental reports. This volume was compiled in collaboration between UNEP-DEWA, OSU’s Transboundary Freshwater Dispute Database, and the University of Dundee, International Water Law Research Institute. “Hydropolitical Resilience and Vulnerability: Series Introduction (Chapter 1)” was authored by Aaron T. Wolf, OSU Department of Geosciences. The following chapters were authored by Alistair Rieu-Clarke, University of Dundee, UNESCO Centre for Water Law, Policy and Science: “Challenges to Europe’s Water Resources” (Chapter 2), “The Evolution of Conflict and Cooperation over Europe’s Transboundary Waters” (Chapter 3), “Major Trends in Conflict and Cooperation” (Chapter 4), “Hydropolitical Vulnerability and Resilience Case Studies” (Chapter 5), and “Conclusion” (Chapter 6). Maps throughout the report and tables in the appendices were compiled by the Transboundary Freshwater Dispute Database (TFDD) Research Team (Department of Geosciences, OSU), which includes Marloes Bakker, Melissa Carper, Ryan Dey, Nathan Eidem, Barbara Geren, Samuel Littlefield, Erick Stemmerman, Yoshiko Sano, Kendra Hatcher, and Patrick MacQuarrie.

Transboundary Freshwater Dispute Database
Department of Geosciences
Oregon State University
104 Wilkinson Hall
Corvallis, OR 97331-5506, USA
Tel: +1-541-737-2722
Fax: +1-541-737-1200
Web: www.transboundarywaters.orst.edu

DISCLAIMER

The views expressed in this publication are not necessarily those of the agencies cooperating in this project. The designations employed and the presentations do not imply the expression of any opinion whatsoever on the part of UNEP or cooperating agencies concerning the legal status of any country, territory, city, or area of its authorities, or of the delineation of its frontiers or boundaries.

Mention of a commercial company or product in this report does not imply endorsement by the United Nations Environment Programme. The use of information from this publication concerning proprietary products for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention of infringement on trademark or copyright laws.

We regret any errors or omissions that may have been unwittingly made.

Cover photo: Rower, Italy, by Keith Davis.

Title page photo: Danube River at Belgrade, Serbia, by Milan Vatovec.

Publication design and layout by Caryn M. Davis, Cascadia Editing, Philomath, Oregon; graphics technical assistance provided by Chris Smith, Corvallis, Oregon; and design consultation by Gretchen Bracher, Philomath, Oregon.

UNEP promotes environmentally sound practices globally and in its own activities. This report is printed on 100% recycled paper, using vegetable-based inks and other eco-friendly practices. Our distribution policy aims to reduce UNEP’s carbon footprint.

Erratum

The name Macedonia as used in this document refers to “The former Yugoslav Republic of Macedonia”.

Erratum

The name Macedonia as used in this document refers to “The former Yugoslav Republic of Macedonia”.

CONTENTS

PREFACE	xi
FOREWORD	xiii
ACKNOWLEDGEMENTS	xv
CHAPTER 1. HYDROPOLITICAL VULNERABILITY AND RESILIENCE: SERIES INTRODUCTION, BY AARON T. WOLF	1
1.1 Hydropolitical Vulnerability and Resilience	1
1.2 Water and Security	5
1.2.1 International Waters	5
1.2.1.1 Examining the Record	5
1.2.1.2 Tensions and Time Lags: Causes for Concern	8
1.2.1.3 Institutional Capacity: The Heart of Conflict Management	11
1.2.2 Intranational Waters	12
1.3 Regional Instability: Political Dynamics of Loss of Irrigation Water	14
CHAPTER 2. CHALLENGES TO EUROPE'S WATER RESOURCES, BY ALISTAIR RIEU-CLARKE	17
2.1 Europe's Water Resources	17
2.2 Water Availability	19
2.3 Water Use	23
2.4 Water Quality Issues	25
2.5 Climate Change	25
2.6 Conclusion	27
CHAPTER 3. THE EVOLUTION OF CONFLICT AND COOPERATION OVER EUROPE'S TRANSBOUNDARY WATERS, BY ALISTAIR RIEU-CLARKE	29
3.1 The Evolution of International Agreements Relating to Transboundary Waters	29
3.2 Regional Integration: the European Union and the United Nations Economic Commission for Europe	30
3.2.1 The European Union (EU)	31
3.2.1.1 The Water Framework Directive (WFD)	32
3.2.2 The United Nations Economic Commission for Europe (UNECE)	33
3.2.2.1 The Helsinki Convention	34
3.3 Selected Conflicts Regarding Transboundary Water	37
3.4 Conclusion	41

CHAPTER 4. MAJOR TRENDS IN CONFLICT AND COOPERATION, BY ALISTAIR RIEU-CLARKE	43
4.1 Legal Scope: Surface Water to Drainage Basins	43
4.2 Substantive Water Rights and Obligations	45
4.2.1 Equitable and Reasonable Utilisation of Transboundary Water	45
4.2.2 Sustainable Use and the Protection of Aquatic Ecosystems	47
4.3 Procedural Rules and Mechanisms for Dispute Avoidance and Compliance	49
4.3.1 Exchange of Data and Information	50
4.3.2 Notification of Planned Measures	51
4.3.3 Environmental Impact Assessment	52
4.3.4 Monitoring and Assessment	53
4.3.5 Public Participation	55
4.3.6 Compliance Strategy	56
4.4 Dispute Resolution	58
4.5 Institutional Arrangements	60
4.6 Conclusion	62
CHAPTER 5. HYDROPOLITICAL VULNERABILITY AND RESILIENCE CASE STUDIES, BY ALISTAIR RIEU-CLARKE	65
5.1 The Dnieper (Dnipro) River Basin	65
5.2 The Danube River Basin	70
5.3 The Narva River Basin	75
5.4 Conclusion	78
CHAPTER 6. CONCLUSION	81
ATLAS OF HYDROPOLITICAL VULNERABILITY AND RESILIENCE	85
Biophysical Parameters	86
Socioeconomic and Geopolitical Parameters	89
Institutional Capacity	91
APPENDICES	95
Appendix 1. International Freshwater Agreements, River Basin Organizations, and River Basin Commissions of Europe	97
Appendix 2. Notes on Basins	158
Appendix 3. Riparian Country Collaborations	160
Appendix 4. Tenders for Large Projects	169
REFERENCES	171
INDEX OF BASIN NAMES	177

LISTS OF TABLES, FIGURES, MAPS, AND ACRONYMS

TABLES

Table 1.1	Selected examples of water-related disputes	6
Table 2.1	International river basins of Europe	20

FIGURES

Figure 1.1	International river basins of Europe	2
Figure 1.2	International river basins and countries, territories, and areas of Europe	3
Figure 2.1	EU and UNECE membership countries	18
Figure 2.2	Water exploitation index	23
Figure 5.1	The Dnieper (Dnipro) River Basin	66
Figure 5.2	The Danube River Basin	71
Figure 5.3	The Narva River Basin	76

MAPS

Map 1 (A)	Climate regions	86
(B)	Average annual runoff	86
Map 2 (A)	International aquifers	87
(B)	Dam density with active and proposed tenders for large infrastructure	87
Map 3 (A)	Climate change: temperature	88
(B)	Climate change: precipitation	88
Map 4 (A)	Projected population density: 2025	89
(B)	Projected water stress: 2025	89
Map 5 (A)	Some socioeconomic indices: HDI, WPI, or GDP	90
(B)	Agricultural water use	90
Map 6 (A)	Water dependency ratio	91
(B)	Percentage of basin under international freshwater treaty	91
Map 7 (A)	River basin organizations and commissions	92
(B)	Votes on the UN Convention on International Watercourses	92
Map 8 (A)	Institutional capacity and proposed Infrastructure	93
(B)	Environmental sustainability index	93
Map 9	Riparian country collaborations	94

ACRONYMS

GEF	Global Environmental Fund
IHE	International Hydrological Programme
IUCN	International Union for the Conservation of Nature and Natural Resources
BBC	British Broadcasting Corporation
EEA	European Environment Agency
EPA	Environmental Protection Agency
EU	The European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information System
HADCM3	Hadley Centre Coupled Model, version 3
HDI	Human Development Index
ICPDR	International Commission for the Protection of the Danube River
IHP	International Hydrological Programme
IPPC	International Panel on Climate Change
IWED	International Water Event Database
IWLRI	International Water Law Research Institute
IWRM	Integrated Water and Resources Management
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration
OSU	Oregon State University
PCCP	Potential Conflict to Cooperation Potential
RBO	River Basin Organizations
SAP	Strategic Action Programme
TACIS	Technical Assistance to the Commonwealth of Independent States
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNEP-DEWA	United Nations Environment Program – Division of Early Warning and Assessment
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNWC	United Nations Water Conference
USAID	United States Agency for International Development
WFD	Water Framework Directive
YILC	Yearbook of the International Law Commission

PREFACE

Within many international river basins including those in Europe, the demand for water for domestic, industrial, and environmental purposes is growing annually. Thus nations sharing river systems, lakes, and aquifers are becoming more vulnerable to tensions and conflicts, and climate change will, in many places, intensify these challenges. Monitoring, predicting, and pre-empting transboundary water conflicts, particularly in developing countries will become ever more central to future human and environmental security.

The good news is that, historically, nations across the world have often chosen cooperation over conflict when it comes to water—"hydro-diplomacy" and "hydrological cooperation" are now at the forefront of scientific enquiry so that the lessons learnt from the past can guide current and future policy-makers in water management decisions.

This report focuses on the challenges and the opportunities facing Europe—a continent that enjoys relatively abundant water resources. On average, up to 3,200 m³ of water is available annually for every European inhabitant, of which only 660 m³ is being extracted. However, while European citizens only utilize around 20% of the available water supply, water is distributed unevenly across the Continent and there is a wide range in the average runoff across European basins. For instance, Cyprus and Malta have less than 160 mm annual runoff, and parts of Spain have less than 25 mm. In contrast, the highest annual runoff rates are more than 1,700 mm in Bulgaria, Serbia, Montenegro, Croatia, and the Netherlands. Meanwhile, several basins in Central Europe, from the Seine to the Dnieper, are showing lower runoff values, which may lead to rising water stress as populations climb.

Major regional institutions like the European Union (EU) and the United Nations Economic Commission for Europe (UNECE), often supported by the international community, are involved in influencing the hydropolitical situation of transboundary waters in Europe. The EU's Water Framework Directive (WFD) and the 1992 Helsinki Convention under the UN Economic Commission for Europe are key instruments that continue to shape improved management of transboundary water bodies.

Activities of the United Nations Environment Programme (UNEP) relating to freshwater compliment these strategies by taking an ecosystem management approach set against the backdrop of its work on climate change. UNEP's activities are also guided by the Millennium Development Goals, the targets and timetable outlined in the 2002 World Summit on Sustainable Development, and the work of UN-Water.

This report presents a comprehensive assessment of the hydropolitical vulnerabilities and resiliencies of Europe's international waters, including detailed information on existing and forthcoming cooperative agreements. It aims to support informed policymaking and greater cooperation across the diverse social, political, and economic boundaries of the Continent at a time of a rapidly shifting political, economic, and environmental landscape.

A handwritten signature in black ink that reads "Achim Steiner". The signature is fluid and cursive, with the first name "Achim" and last name "Steiner" clearly distinguishable.

ACHIM STEINER

United Nations Under-Secretary General

Executive Director, United Nations Environment Programme

FOREWORD

The most influential regional legal frameworks for transboundary waters in Europe have been the UNECE Convention on the Protection and use of Transboundary Watercourses and International Lakes in Helsinki (the 1992 Helsinki Convention), implemented in 1996, and the EU Water Framework Directive (WFD), adopted in 2000. Both the Helsinki Convention and WFD seek to strengthen cooperation, at both bilateral and multilateral levels, on the prevention, control and reduction of transboundary pollution, sustainable water management, conservation of water resources, and environmental protection.

Central to the successful implementation and development of the Helsinki Convention is the regular gathering of the parties responsible for defining and reviewing the activities and policies under the convention as well as sharing information on experience gained in negotiating and implementing bilateral and multilateral agreements on transboundary waters. Under the meeting of the parties, three working groups are charged with developing and implementing new policies, strategies and methodologies for the protection of transboundary waters, as well as organizing workshops, conferences and training, and capacity-building events. In March 2000, the UNECE adopted guidelines on sustainable flood prevention.

The Helsinki Convention is currently binding on 34 countries and the European Community and has been highly influential in promoting cooperation over transboundary waters in Europe, particularly in assisting countries in Eastern Europe, the Caucasus and Central Asia since the break-up of the former Soviet Union. Many agreements relating to transboundary waters reflect the rules and principles contained in the Convention.

It is in this context that I welcome the new publication, *Hydropolitical Vulnerability and Resilience along International Waters: Europe*. The close collaboration between the governments of European countries, UN agencies and the international community continues to generate increased awareness of the vulnerabilities affecting the region's shared water resources, as well as the resilience emerging from collective actions at the national, sub-regional, and regional levels to confront the challenges. This publication should inspire the continuing progress of intergovernmental dialogue and collective action to halt and reverse the water challenges facing our world.



PETER GILRUTH

Director

Division of Early Warning and Assessment

United Nations Environment Programme

ACKNOWLEDGEMENTS

This project, exemplary of the unifying force of transboundary waters, was built on the spirit of incredible collaboration among researchers and staff at the United Nations Environment Programme, and two of the partners in the Universities Partnership for Transboundary Waters: the Oregon State University Department of Geosciences in the United States and the University of Dundee, UNESCO Centre for Water Law, Policy and Science, as well numerous other individuals from around the world who responded to our requests for data, information, and reviews.

First and foremost at UNEP, we would like to thank Achim Steiner, United Nations Under-Secretary General and UNEP Executive Director, Steve Lonergan and Peter Gilruth, the former and current directors of UNEP's Division of Early Warning and Assessment (DEWA), and Halifa Drammeh, Special Adviser to the Office of the Executive Director, for their consistent encouragement and support throughout this project. We would also like to acknowledge: Salif Diop, Senior Programme Officer and Head of DEWA's Ecosystem Section, who provided vital professional oversight; Patrick M'mayi, DEWA Programme Officer, who coordinated editorial contributions; Beth Ingraham, who provided guidance on UNEP publication rules; Audrey Ringler, who provided cartographic input and advice; Winnie Gaiho, who coordinated communication between partners; interns Martin Schaefer, Hanna Lindblom and Vinay Rajdev, who read early drafts and provided editorial support; and Arun Elhance, who assisted with the preface. A special 'thank you' goes to those UNEP staff who provided data for the report, particularly Johannes Akiwumi and Lal Kurukulasuriya.

We are especially grateful to Roger Admiral, Sandra Arbogast, Gary Badertscher, Keith Davis, Lynette de Silva, Richard Hermann, Michael Martin, Bryan Pendergrass, Emily Thomas, Jane McCauley Thomas, and Milan Vatovec, and to photographers from USAID and the Wikimedia Commons project who generously provided images used for this report. Finally, thanks go to Caryn M. Davis of Cascadia Editing for design and layout of the report.

At Oregon State University, we would like to thank Becci Anderson for her assistance with cartography, and Sam Littlefield for his late hours and attention to detail. Other members of the Geosciences team who contributed their time and expertise to the project include Todd Jarvis and Erick Stemmerman. We gratefully acknowledge Steve W. Hostetler for furnishing manipulated HADCM3 climate models. Special thanks to Melissa Carper for her willingness to jump in during the crunch and to Karen Logan, our departmental administrator, who helped to support the backbone of the project through multiple contracts and budget oversight. Our gratitude goes to Eva Lieberherr and Kristie Marsh for their attention to the written words in this report. A special thank you goes to De Stefano for providing her generous assistance with proofreading and editing.

A big thank you to Marloes Bakker and Yoshiko Sano for their attention to detail and mastery of the multiple tables associated with this project; special thanks to Nathan Eidem and Patrick MacQuarrie for their cheerful willingness to handle any task, from research questions to data checking to creating

maps; and our gratitude is extended to Kendra Hatcher for her gracious assistance in generating additional maps as needed. Finally, many thanks to our former colleague, Marcia F. Macomber, who was instrumental in both spearheading and managing the “Hydropolitical Vulnerability and Resilience along International Waters” project.

This was an extraordinarily data-intensive project, which relied on the generosity of many researchers around the world who are committed to open distribution of their incredibly rich data sets, among them Charles Vörösmarty and Ellen Marie Douglas, from the Complex Systems Research Center, Institute for the Study of Earth, Oceans and Space, University of New Hampshire, who generously provided their five-year-mean historical global runoff data.



*People perched on stone parapet above Seine River, Paris, France.
Photo credit: Jane McCauley Thomas.*

CHAPTER 1. HYDROPOLITICAL VULNERABILITY AND RESILIENCE: SERIES INTRODUCTION

Aaron T. Wolf

Water management is, by definition, conflict management. Postel (1999) describes the roots of the problem: Water, unlike other scarce, consumable resources, is used to fuel *all* facets of society, from biologies to economies to aesthetics and spiritual practice. Moreover, it fluctuates wildly in space and time, its management is usually fragmented, and it is often subject to vague, arcane, and/or contradictory legal principles. There is no such thing as managing water for a single purpose—*all* water management is multi-objective and based on navigating competing interests. Within a nation these interests include domestic users, agriculturalists, hydropower generators, recreators, and environmentalists—any two of which are regularly at odds—and the chances of finding mutually acceptable solutions drop exponentially as more stakeholders are involved. Add international boundaries, and the chances decrease exponentially yet again (Elhance, 1999).

Surface and groundwater that cross international boundaries present increased challenges to regional stability because hydrologic needs can often be overwhelmed by political considerations. While the potential for paralyzing disputes is especially high in these basins, history shows that water can catalyze dialogue and cooperation, even between especially contentious riparians. There are 263 rivers around the world that cross the boundaries of two or more nations, and untold number of international groundwater aquifers. The catchment areas that contribute to these rivers comprise approximately 47% of the land surface of the earth, include 40% of the world's population, and contribute almost 80% of freshwater flow (Wolf et al., 1999).

Within each international basin, allocations from environmental, domestic, and economic users increase annually, while the amount of freshwater in the world remains roughly the same as it has been throughout history. Given the scope of the problems and the resources available to address them, avoiding water conflict is vital. Conflict is expensive, disruptive, and interferes with efforts to relieve human suffering, reduce environmental degradation, and achieve economic growth. Developing the capacity to monitor, predict, and preempt transboundary water conflicts, particularly in developing countries, is key to promoting human and environmental security in international river basins, regardless of the scale at which they occur.

1.1 HYDROPOLITICAL VULNERABILITY AND RESILIENCE

In general, concepts of “resilience” and “vulnerability” as related to water resources are often assessed within the framework of “sustainability,” (Blaikie et al., 1994), and relate to the ability of bio-physical systems to adapt to change (e.g., Gunderson and Pritchard, 2002). As the sustainability discourse has broadened to include human systems in recent years, so too has work been increasingly geared towards identifying indicators of resilience and vulnerability within this broader context (e.g., Bolte et al., 2004; Lonergan et al., 2000; Turner, 2003). In parallel, dialogue on “security” has migrated from traditional issues of war and peace toward also beginning to incorporate the human-environment relationship in the relatively new field of “environmental security” (see UNEP, 2004; Vogel and O’Brien, 2004).

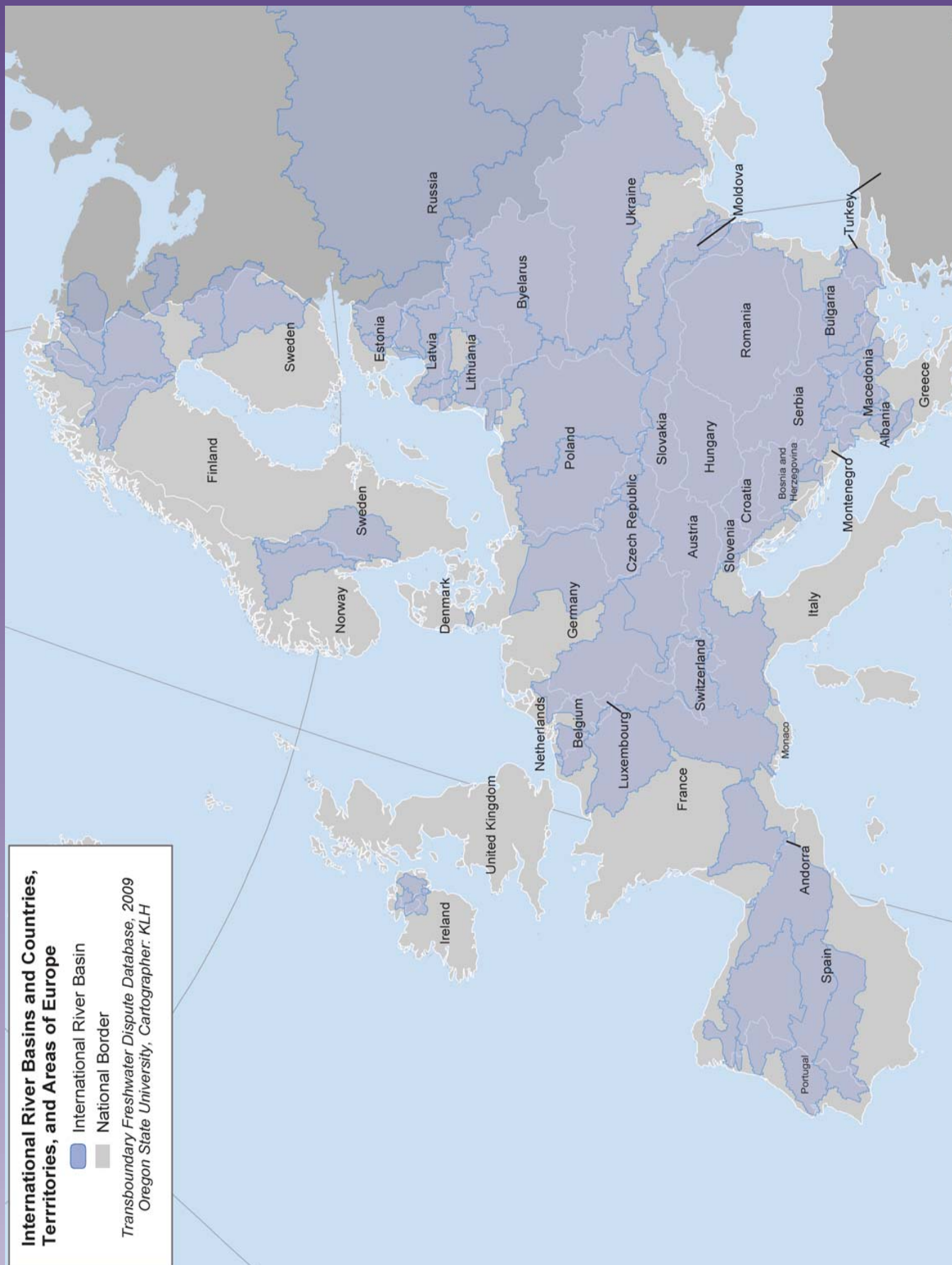


Figure 1.2 International river basins and countries, territories, and areas of Europe.



Bridge over the Glåma at the village of Skarnes, in the municipality of Sør-Odal in Hedmark county, Norway. Photo credit: Mahlum, via Wikimedia Commons.

The term “hydropolitics” (coined by Waterbury 1979) came about as the potential for conflict and violence to erupt over international waters began to receive substantial new attention. Hydropolitics relates to the ability of geopolitical institutions to manage shared water resources in a politically sustainable manner, i.e., without tensions or conflict between political entities. “Hydropolitical resilience,” then, is defined as the complex human-environmental system’s ability to adapt to permutations and change within these systems; “hydropolitical vulnerability” is defined by the risk of political dispute over shared water systems. Wolf et al. (2003) suggested the following relationship between change, institutions, and hydropolitical vulnerability: “The likelihood of conflict rises as the rate of change within the basin exceeds the institutional capacity to absorb that change.”

This suggests that there are two sides to the dispute setting: the rate of change in the system and the institutional capacity. In general, most of the parameters regularly identified as indicators of water conflict are actually only weakly linked to dispute. Institutional capacity within a basin, however, whether defined as water management bodies or treaties, or generally positive international relations, is as important, if not more so, than the physical aspects of a system. It turns out, then,

that very rapid changes, either on the institutional side or in the physical system, that outpace the institutional capacity to absorb those changes, are at the root of most water conflict. For example, the rapid institutional change in “internationalized” basins, i.e., basins that include the management structures of newly independent States, has resulted in disputes in areas formerly under British administration (e.g., the Nile, Jordan, Tigris-Euphrates, Indus, and Ganges-Brahmaputra), as well as in the former Soviet Union (e.g., the Aral tributaries and the Kura-Araks). On the physical side, rapid change most outpaces institutional capacity in basins that include unilateral development projects and the absence of cooperative regimes, such as treaties, river basin organizations (RBOs), or technical working groups, or when relations are especially tenuous over other issues (Wolf et al., 2003).

The general assumption of this series, then, which will be explored in each regional study, is that rapid change tends to indicate vulnerability while institutional capacity tends to indicate resilience, and that the two sides must be assessed in conjunction with each other for a more accurate gauge of hydropolitical sustainability. Building on these relationships, the characteristics of a basin that would tend to enhance resilience to change include

- international agreements and institutions, such as RBOs
- a history of collaborative projects
- generally positive political relations
- higher levels of economic development

In contrast, facets that would tend towards vulnerability would include

- rapid environmental change
- rapid population growth or asymmetric economic growth
- major unilateral development projects
- the absence of institutional capacity
- generally hostile relations
- natural climatic variability—naturally variable rainfall patterns with frequent periods of floods and drought.

1.2 WATER AND SECURITY

Water disputes revolve around one or more of three issues: quantity, quality, and timing. The dynamics of those three issues play out very differently within various scales related to water and security, whether internationally, intra-nationally, or regionally and indirectly. Each setting might be characterized as follows (for examples, see Table 1.1):

1. *International waters*: very little violence, but long processes from tension to cooperation, resulting in exacerbated political relations, inefficient water management, and ecosystem neglect; long, rich record of conflict resolution and development of resilient institutions; institutional capacity is at the heart of whether environmental stresses lead to conflict or cooperation.
2. *Intranational waters* (between sub-national political units, including states/provinces, ethnic/religious groups, and/or economic sectors): violence potential higher than in international setting; rationale for international involvement more difficult, given greater issues of national sovereignty.
3. *Regional instability (indirect)/political dynamics of loss of irrigation water*: potential

for politically destabilizing processes of mass migrations to cities and/or neighboring countries when water supplies for broadly irrigated regions are threatened due to a drop in quantity (including lowering of groundwater levels) or quality; issues of poverty alleviation and distribution of wealth are tied directly to amelioration of security concerns.

1.2.1 International Waters

Water is a unique and vital resource for which there is no substitute. It ignores political boundaries, fluctuates in both space and time, and has multiple and conflicting demands on its use—problems compounded in the international realm by the fact that the international law that governs it is poorly developed, contradictory, and unenforceable. It is no wonder, then, that water is perpetually suspect—not only as a cause of historic armed conflict, but as the resource that will bring combatants to the battlefield in the 21st century. What is the likelihood that “the wars of the next century will be about water,” as some have predicted?¹

1.2.1.1 Examining the Record

In order to cut through the prevailing anecdotal approach to the history of water conflicts, researchers at Oregon State University (OSU) undertook a three-year research project, which attempted to compile a dataset of every reported interaction between two or more nations, whether conflictive or cooperative, that involved water as a scarce and/or consumable resource or as a quantity to be managed—i.e., where water was the *driver* of the events,² over the past 50 years (Wolf et al., 2003). The study documented a total of 1,831 interactions, both conflictive and cooperative, between two or more nations over water during the past 50 years, and found the following:

¹ World Bank vice-president Ismail Serageldin, quoted in the *New York Times*, 10 August 1995. His statement is probably most often quoted. For fear of water wars, see Joyce R. Starr, “Water Wars,” *Foreign Policy* (Spring 1991): 17–36; and John Bulloch and Adel Darwish, *Water Wars: Coming Conflicts in the Middle East* (London: Victor Gollancz, 1993).

² Excluded are events where water is incidental to the dispute, such as those concerning fishing rights, access to ports, transportation, or river boundaries. Also excluded are events where water is not the driver, such as those where water is a tool, target, or victim of armed conflict.

TABLE 1.1 SELECTED EXAMPLES OF WATER-RELATED DISPUTES.**QUANTITY*****Cauvery River, South Asia***

The dispute on India's Cauvery River sprang from the allocation of water between the downstream state of Tamil Nadu, which had been using the river's water for irrigation, and upstream Karnataka, which wanted to increase irrigated agriculture. The parties did not accept a tribunal's adjudication of the water dispute, leading to violence and death along the river.

Mekong Basin, Southeast Asia

Following construction of Thailand's Pak Mun Dam, more than 25,000 people were affected by drastic reductions in upstream fisheries and other livelihood problems. Affected communities have struggled for reparations since the dam was completed in 1994.

Okavango-Makgadikgadi Basin, Southern Africa

In the Okavango-Makgadikgadi Basin, Botswana's claims for water to sustain the delta and its lucrative ecotourism industry contribute to a dispute with upstream Namibia, which wants to pipe water from the Okavango River to supply its capital city with industrial and drinking water.

QUALITY***Rhine River, Western Europe***

Rotterdam's harbor had to be dredged frequently to remove contaminated sludge deposited by the Rhine River. The cost was enormous and consequently led to controversy over compensation and responsibility among Rhine users. While in this case negotiations led to a peaceful solution, in areas that lack the Rhine's dispute resolution framework, siltation problems could lead to upstream/downstream disputes.

QUANTITY AND QUALITY***Incomati River, Southern Africa***

Dams and water transfers in the South African area of the Incomati River basin reduced freshwater flows and increased salt levels in Mozambique's Incomati estuary. This altered the estuary's ecosystem and led to the disappearance of salt-intolerant plants and animals that are important for people's livelihoods.

TIMING***Syr Dar'ya, Central Asia***

Relations between Kazakhstan, Kyrgyzstan, and Uzbekistan—all riparians of the Syr Dar'ya, a major tributary of the disappearing Aral Sea—exemplify the problems caused by water flow timing. Under the Soviet Union's central management, spring and summer irrigation in downstream Uzbekistan and Kazakhstan balanced upstream Kyrgyzstan's use of hydropower to generate heat in the winter. But the parties are barely adhering to recent agreements that exchange upstream flows of alternate heating sources (natural gas, coal, and fuel oil) for downstream irrigation, sporadically breaching the agreements.

Sources: Wolf et al., 2005; Jägerskog, 2003; Allan, 2001; Elhance, 1999; Bulloch and Darwish, 1993; Starr, 1991; Israeli-Jordanian peace treaty (www.israel-mfa.gov.il/mfa/go.asp?MFAH00pa0); Israeli-Palestinian interim agreement (www.mfa.gov.il/mfa/go.asp?MFAH00qd0#app-40, and www.nad-plo.org/fact/annex3.pdf).



Schlossplatz (Palace Place), downtown Stuttgart in the state of Baden-Wuerttemberg, in southwestern Germany. Photo credit: Gary Badertscher.

First, despite the potential for dispute in international basins, the record of acute conflict over international water resources is historically overwhelmed by the record of cooperation. The last 50 years have seen only 37 acute disputes (those involving violence); of those, 30 were between Israel and one or another of its neighbors, and the violence ended in 1970. Non-Mideast cases accounted for only five acute events, while, during the same period, 157 treaties were negotiated and signed. In fact, the only “water war” between nations on record occurred over 4,500 years ago between the city-states of Lagash and Umma in the Tigris-Euphrates basin (Wolf, 1998). The total number of water-related events between nations of any magnitude are likewise weighted towards cooperation: 507 conflict-related events, versus 1,228 cooperative events, implying that violence over water is neither strategically rational, hydrographically effective, nor economically viable.

Second, despite the occasional fiery rhetoric of politicians—perhaps aimed more often at their

own constituencies than at an enemy—most actions taken over water are mild. Of all the events, some 43% fell between mild verbal support and mild verbal hostility. If the next level on either side—official verbal support and official verbal hostility—is added in, the share of verbal events reaches 62% of the total. Thus almost two-thirds of all events were only verbal and more than two-thirds of those had no official sanction (Wolf, 1998).

Third, there were more issues of cooperation than of conflict. The distribution of cooperative events covered a broad spectrum, including water quantity, quality, economic development, hydropower, and joint management. In contrast, almost 90% of the conflict-laden events related to quantity and infrastructure. Furthermore, almost all extensive military acts (the most extreme cases of conflict) fell within these two categories (Wolf, 1998).

Fourth, despite the lack of violence, water acted as both an irritant and a unifier. As an irritant, water can make good relations bad and bad relations worse. Despite the complexity,



Miniature sailboats, Paris, France. Photo credit: Jane McCauley Thomas.

however, international waters can act as a unifier in basins with relatively strong institutions.

This historical record suggests that international water disputes do get resolved, even among enemies, and even as conflicts erupt over other issues. Some of the world's most vociferous enemies have negotiated water agreements or are in the process of doing so, and the institutions they have created often prove to be resilient, even when relations are strained.

The Mekong Committee, for example, established by the governments of Cambodia, Laos, Thailand, and Viet Nam as an intergovernmental agency in 1957, exchanged data and information on water resources development throughout the Viet Nam War. Israel and Jordan have held secret "picnic table" talks on managing the Jordan River since the unsuccessful Johnston negotiations of 1953–1955, even though they were technically at war from Israel's independence in 1948 until the 1994 treaty. The Indus River Commission survived two major wars between India and Pakistan. And all 10 Nile Basin riparian countries are currently involved in senior government-level negotiations to develop the basin cooperatively, despite "water wars" rhetoric between upstream and downstream states.³

In Southern Africa, a number of river basin agreements were signed in the 1970s and 1980s, when the region was embroiled in a series of local wars. Although complex to negotiate, the agreements, once established, were one of the rare arenas of peaceful cooperation between countries. Now that the wars in the area have ended, water cooperation is one of the foundations for regional cooperation (Turton, 2004). Some have identified cooperation over water resources as a particularly fruitful entry point for building peace; however, it is unclear what conditions are required for environmental cooperation to play a major role (Conca and Dabelko, 2002).

1.2.1.2 Tensions and Time Lags: Causes for Concern

So if there is little violence between nations over their shared waters, what's the problem? Is water actually a security concern at all? In fact, there are a number of issues where water causes or exacerbates tensions, and it is worth

³ Mekong Committee from Ti Le-Huu and Lien Nguyen-Duc, *Mekong Case Study*, PCCP Series No. 10 (Paris, France: UNESCO-IHP 2003); Indus River Commission from Aaron T. Wolf, "Water and Human Security," *AVISO Bulletin*, Global Environmental Change and Human Security Project, Canada (June 1999); and Nile Basin talks from Alan Nicol, *The Nile: Moving beyond Cooperation*, PCCP Series No. 16 (Paris, France: UNESCO-IHP 2003).



Excursion boat on the Elbe River, Hamburg, with container cranes in the background. The Port of Hamburg, located in northern Germany, is one of the largest ports in Europe. Photo credit: Bryan Pendergrass.

understanding these processes to know both how complications arise and how they are eventually resolved.

The first complicating factor is the time lag between when nations first start to impinge on each other's water planning and when agreements are finally, arduously, reached. A general pattern has emerged for international basins over time. Riparians of an international basin implement water development projects unilaterally—first on water within their own territory—in attempts to avoid the political intricacies of the shared resource. At some point, one of the riparians, generally the regional power, will implement a project that impacts at least one of its neighbors. In the absence of relations or institutions conducive to conflict resolution, the project can become a flashpoint, heightening tensions and regional instability, and requiring years or, more commonly, decades, to resolve—the Indus treaty took 10 years of negotiations, the Ganges 30, and the Jordan 40—and, all the while, water quality and quantity degrades to where the health of dependent populations and ecosystems is damaged or destroyed. This problem gets worse as

the dispute gains in intensity; one rarely hears talk about the ecosystems of the lower Nile, the lower Jordan, or the tributaries of the Aral Sea—they have effectively been written off to the vagaries of human intractability. During such periods of low-level tensions, threats and disputes rage across boundaries with relations as diverse as those between Indians and Pakistanis and between Americans and Canadians. Water was the last and most contentious issue resolved in negotiations over a 1994 peace treaty between Israel and Jordan, and was relegated to “final status” negotiations—along with other of the most difficult issues such as Jerusalem and refugees—between Israel and the Palestinians.

The timing of water flow is also important; thus, the operation of dams is also contested. For example, upstream users might release water from reservoirs in the winter for hydropower production, while downstream users might need it for irrigation in the summer. In addition, water quantity and water flow patterns are crucial to maintaining freshwater ecosystems that depend on seasonal flooding. Freshwater ecosystems perform a variety of ecological and economical



Rhine River near Burg Stahleck, a 12th-century castle near Bacharach in Rhineland-Palatinate, Germany. Photo credit: Bryan Pendergrass.

functions and often play an important role in sustaining livelihoods, especially in developing countries. As awareness of environmental issues and the economic value of ecosystems increases, claims for the environment's water requirements are growing. For example, in the Okavango Basin, Botswana's claims for water to sustain the Okavango Delta and its lucrative ecotourism industry have contributed to a dispute with upstream Namibia, which wants to use some of the water passing through the Caprivi Strip on its way to the delta for irrigation.

Water quality problems include excessive levels of salt, nutrients, or suspended solids. Salt intrusion can be caused by groundwater overuse or insufficient freshwater flows into estuaries. For example, dams in the South African part of the Incomati River basin reduced freshwater flows into the Incomati estuary in Mozambique and led to increased salt levels. This altered the estuary's ecosystem and led to the disappearance of salt-intolerant flora and fauna important for people's livelihoods (the links between loss of livelihoods and the threat of conflict are described below). The same exact situation exists on the border between the United States and Mexico, where

high salinity problems have not only reduced agricultural productivity, but have severely altered ecosystems in the Colorado and Rio Grande rivers and impacted marine flora and fauna in the Gulfs of California and Mexico, where the respective rivers terminate.

Excessive amounts of nutrients or suspended solids can result from unsustainable agricultural practices, eventually leading to erosion. Nutrients and suspended solids pose a threat to freshwater ecosystems and their use by downstream riparians, as they can cause eutrophication and siltation, respectively, which, in turn, can lead to loss of fishing grounds or arable land. Suspended solids can also cause the siltation of reservoirs and harbors: for example, Rotterdam's harbor had to be dredged frequently to remove contaminated sludge deposited by the Rhine River. The cost was enormous, and consequently led to conflict over compensation and responsibility among the river's users. Although negotiations led to a peaceful solution in this case, without such a framework for dispute resolution, siltation problems can lead to upstream/downstream disputes such as those in the Lempa River basin in Central America (Lopez, 2004).



River Sava, Belgrade, Serbia. Photo credit: Milan Vatovec.

1.2.1.3 Institutional Capacity: The Heart of Conflict Management

Most authors who write about hydropolitics, and especially those who explicitly address the issue of water conflicts, hold to the common assumption that it is the scarcity of such a critical resource that drives people to conflict. It feels intuitive—the less there is of something, especially something as important as water, the more dearly it is held and the more likely people are to fight over it.

The three-year OSU study worked to tease out just what the indicators of conflict are. A 100-layer Geographic Information System (GIS) was compiled—a spatial database of all the parameters that might prove part of the conflict/cooperation story, including physical (e.g., runoff, droughts), socioeconomic (e.g., GDP, rural/urban populations), and geopolitical (e.g., government type, votes on water-related UN resolutions) parameters. With this GIS in place, a statistical snapshot was developed of each setting for each of the events over the last 50 years of conflict or cooperation.

The results were surprising, and often counterintuitive. None of the physical parameters

were statistically significant—arid climates were no more conflictive than humid climates, and international cooperation actually *increased* during droughts. In fact, when the numbers were run, almost no single variable proved causal—democracies were as conflictive as autocracies, rich countries as poor countries, densely populated countries as sparsely populated ones, and large countries the same as small countries.

It was close reflection of aridity that finally put researchers on the right track: institutional capacity was the key. Naturally arid countries were cooperative: if one lives in a water-scarce environment, one develops institutional strategies for adapting to that environment. Once institutions—whether defined by formal treaties, informal working groups, or generally warm relations—and their relationship to the physical environment became the focus, researchers began to get a clear picture of the settings most conducive to political tensions in international waterways.

We found that the likelihood of conflict increases significantly whenever two factors come into play. The first is that some large or rapid change occurs in the basin's physical setting—typically the construction of a dam, river



Fish market, Brugge, Belgium. Photo credit: Sandra Arbogast.

diversion, or irrigation scheme—or in its political setting, especially the breakup of a nation that results in new international rivers. The second factor is that existing institutions are unable to absorb and effectively manage that change. This is typically the case when there is no treaty spelling out each nation's rights and responsibilities with regard to the shared river, nor any implicit agreements or cooperative arrangements. Even the existence of technical working groups can provide some capability to manage contentious issues, as they have in the Middle East.

The overarching lesson of the study is that unilateral actions to construct a dam or river diversion *in the absence* of a treaty or institutional mechanism that safeguards the interests of other countries in the basin is highly destabilizing to a region, often spurring decades of hostility before cooperation is pursued. In other words, the red flag for water-related tension between countries is not water stress *per se*, as it is within countries, but rather the unilateral exercise of domination of an international river, usually by a regional power.

In the Jordan River Basin, for example, violence broke out in the mid-1960s over an "all-Arab" plan to divert the river's headwaters (itself a pre-emptive move to thwart Israel's intention to

siphon water from the Sea of Galilee). Israel and Syria sporadically exchanged fire between March 1965 and July 1966. Water-related tensions in the basin persisted for decades and only recently have begun to dissipate.

A similar sequence of events transpired in the Nile basin, which is shared by 10 countries—of which Egypt is last in line. In the late 1950s, hostilities broke out between Egypt and Sudan over Egypt's planned construction of the High Dam at Aswan. The signing of a treaty between the two countries in 1959 defused tensions before the dam was built. But no water-sharing agreement exists between Egypt and Ethiopia, where some 55% of the Nile's flow originates, and a war of words has raged between these two nations for decades. As in the case of the Jordan, in recent years the Nile nations have begun to work cooperatively toward a solution thanks in part to unofficial dialogues among scientists and technical specialists that have been held since the early 1990s, and more recently a ministerial-level "Nile Basin Initiative" facilitated by the United Nations and the World Bank.

1.2.2 Intranational Waters

The second set of security issues occurs at the sub-national level. Much literature on trans-



Along the Golden Horn, an inlet of the Bosphorus Strait, Istanbul, Turkey. Photo credit: Lynette de Silva.

boundary waters treats political entities as homogeneous monoliths: “Canada feels . . .” or “Jordan wants. . . .” Analysts are only recently highlighting the pitfalls of this approach, often by showing how different subsets of actors relate very different “meanings” to water. Rather than being simply another environmental input, water is regularly treated as a security issue, a gift of nature, or a focal point for local society. Disputes, therefore, need to be understood as more than “simply” over a quantity of a resource, but also over conflicting attitudes, meanings, and contexts. Throughout the world, local water issues revolve around core values that often date back generations. Irrigators, indigenous populations, and environmentalists, for example, can see water as tied to their very ways of life, and increasingly threatened by newer uses for cities and hydropower. Moreover, the local setting strongly influences international dynamics and vice versa.

If there is a history of water-related violence, and there is, it is a history of incidents at the sub-national level, generally between tribes, water-use sectors, or states/provinces. In fact, the recent research at OSU suggests that, as the scale drops, the likelihood and intensity of violence rises.⁴ There are many examples of

internal water conflicts ranging from interstate violence and death along the Cauvery River in India, to the USA, where California farmers blew up a pipeline meant for Los Angeles, to inter-tribal bloodshed between Maasai herdsman and Kikuyu farmers in Kenya. The inland, desert state of Arizona in the USA even commissioned a navy (made up of one ferryboat) and sent its state militia to stop a dam and diversion on the Colorado River in 1934.

Another contentious issue is water quality, which is also closely linked to water quantity. Decreasing water quality can render it inappropriate for some uses, thereby aggravating its scarcity. In turn, decreasing water quantity concentrates pollution, while excessive water quantity, such as flooding, can lead to contamination by sewage. Low water quality can pose serious threats to human and environmental health. Water quality degradation is often a source of dispute between those who cause degradation and the groups affected by it. As pollution increasingly impacts upon livelihoods and the environment, water quality issues can lead to public protests.

⁴ Giordano, M. A., and Wolf, A. T. 2003. Sharing waters: Post-Rio international water management. *Natural Resources Forum*. 27: 163-171.



Produce market, Italy. Photo credit: Keith Davis.

One of the main causes of declining water quality is pollution, e.g., through industrial and domestic wastewater or agricultural pesticides. In Tajikistan, for example, where environmental stress has been linked to civil war (1992–1997), high levels of water pollution have been identified as one of the key environmental issues threatening human development and security. Water pollution from the tanning industry in the Palar Basin of the Indian state of Tamil Nadu makes the water within the basin unfit for irrigation and consumption. The pollution contributed to an acute drinking water crisis, which led to protests by the local community and activist organizations, as well as to disputes and court cases between tanners and farmers (Carius et al., 2003).

1.3 REGIONAL INSTABILITY: POLITICAL DYNAMICS OF LOSS OF IRRIGATION WATER

As water quality degrades—or quantity diminishes—over time, the effect on the stability

of a region can be unsettling. For example, for 30 years the Gaza Strip was under Israeli occupation. Water quality deteriorated steadily, saltwater intrusion degraded local wells, and water-related diseases took a rising toll on the people living there. In 1987, the *intifada*, or Palestinian uprising, broke out in the Gaza Strip, and quickly spread throughout the West Bank. Was water quality the cause? It would be simplistic to claim direct causality. Was it an irritant exacerbating an already tenuous situation? Undoubtedly.

An examination of relations between India and Bangladesh demonstrates that these internal instabilities can be both caused and exacerbated by international water disputes. In the 1960s, India built a barrage at Farakka, diverting a portion of the Ganges flow away from its course into Bangladesh, in an effort to flush silt away from Calcutta's seaport, some 100 miles to the south. In Bangladesh, the reduced upstream flow resulted in a number of adverse effects: degraded surface and groundwater, impeded navigation, increased salinity, degraded fisheries, and endangered water supplies and public health.



Garbage and debris caught in branches along river, Italy. Photo credit: Keith Davis.

Migration from affected areas further compounded the problem. Ironically, many of those displaced in Bangladesh have found refuge in India.

Two-thirds of the world's water use is for agriculture so, when access to irrigation water is threatened, one result can be movement of huge populations of out-of-work, disgruntled men from the country-side to the cities—an invariable recipe for political instability. In pioneering work, Sandra Postel identified those countries that rely heavily on irrigation, and whose agricultural water supplies are threatened either by a decline in quality or quantity. The list coincides precisely with regions of the world community's current security concerns, where instability can have profound effects: India, China, Iran, Pakistan, Uzbekistan, Iraq, Bangladesh, and Egypt (Postel and Wolf, 2001).

Water management in many countries is also characterized by overlapping and competing responsibilities among government bodies. Disaggregated decision-making often produces divergent management approaches that serve contradictory objectives and lead to competing claims from different sectors. And such claims

are even more likely to contribute to disputes in countries where there is no formal system of water-use permits, or where enforcement and monitoring are inadequate. Controversy also often arises when management decisions are formulated without sufficient participation by local communities and water users, thus failing to take into account local rights and practices. Protests are especially likely when the public suspects that water allocations are diverting public resources for private gain or when water use rights are assigned in a secretive and possibly corrupt manner, as demonstrated by the violent confrontations in 2000 following the privatization of Cochabamba, Bolivia's water utility (Postel and Wolf, 2001).

Finally, there is the human security issue of water-related disease. It is estimated that between 5 and 10 million people die each year from water-related diseases or inadequate sanitation. More than half the people in the world lack adequate sanitation. Eighty percent of disease in the developing world is related to water (Gleick, 1998). This is a crisis of epidemic proportions, and the threats to human security are self-evident.



Water faucet by river, Italy.
Photo credit: Keith Davis.

CHAPTER 2. CHALLENGES TO EUROPE'S WATER RESOURCES

Alistair Rieu-Clarke

The hydrovulnerability of Europe is governed by the institutions created to resolve transboundary water issues in a cooperative manner that attempts to prevent conflict. In fact, institutional capacity, be it water management bodies, treaties or generally positive international relations, is possibly more important than the physical environment for minimising hydropolitical vulnerability and conflict on the one hand, and strengthening resilience and cooperation on the other hand. In addition, the likelihood of conflict rises as the rate of change within a basin exceeds the institutional capacity to absorb that change; hence emphasising two key factors in hydropolitical vulnerability and resilience: *rate of change* and *institutional capacity*. Therefore, the key question to address is whether or not the institutional capacity for the management of Europe's transboundary waters is sufficient to absorb likely changes and challenges facing the international waters in Europe.

The major regional institutions influencing the hydropolitical situation of transboundary waters in Europe are the European Union (EU) and the United Nations Economic Commission for Europe (UNECE). More specifically, the Water Framework Directive (WFD) under the EU and the 1992 Helsinki Convention under the UNECE have played major roles in institutions governing transboundary water resources in Europe because they have led to the adoption of drainage basin-wide approaches to managing transboundary waters in Europe.

Europe, in its broadest sense, encompasses the 27 EU Member States, as well as the remaining Eastern European countries, the European Free Trade Area, and the Western Balkan countries (see Figures 1.2 and 2.1). From a political conflict and cooperation stand-point, considerable change has occurred within Europe over the last century, including two World Wars (1914-1918 and 1939-1945), the emergence and subsequent dissolution of the Soviet Union, and the creation of the EU. The demise of the Soviet Union and emergence of the newly independent states in the 1990s resulted in many national basins becoming international; a significant number of water allocation and pollution problems that were previously national issues within the Soviet Union became transboundary in nature. Such a transition has given rise to a host of political, economic, and legal problems (Vinogradov, 1996).

In order to understand the hydrovulnerability issues in Europe, this paper provides a general description of the transboundary water resource issues facing Europe. Furthermore, to develop an understanding of the demand for water resources within Europe, issues of water availability, water extraction and use are depicted. Finally, issues that may have a negative impact on competing uses, water quality, and extreme hydrological events are assessed.

2.1 EUROPE'S WATER RESOURCES

There are 71 international river basins within Europe and approximately 89 international aquifers (see Figure 1.1, Figure 1.2, and Map 2 (A)). A wide range of international basins exists within Europe, from



View of Great War Island (Veliko Ratno Ostrvo) at the confluence of the Danube and Sava rivers in Belgrade, Serbia. Photo credit: Milan Vatovec.

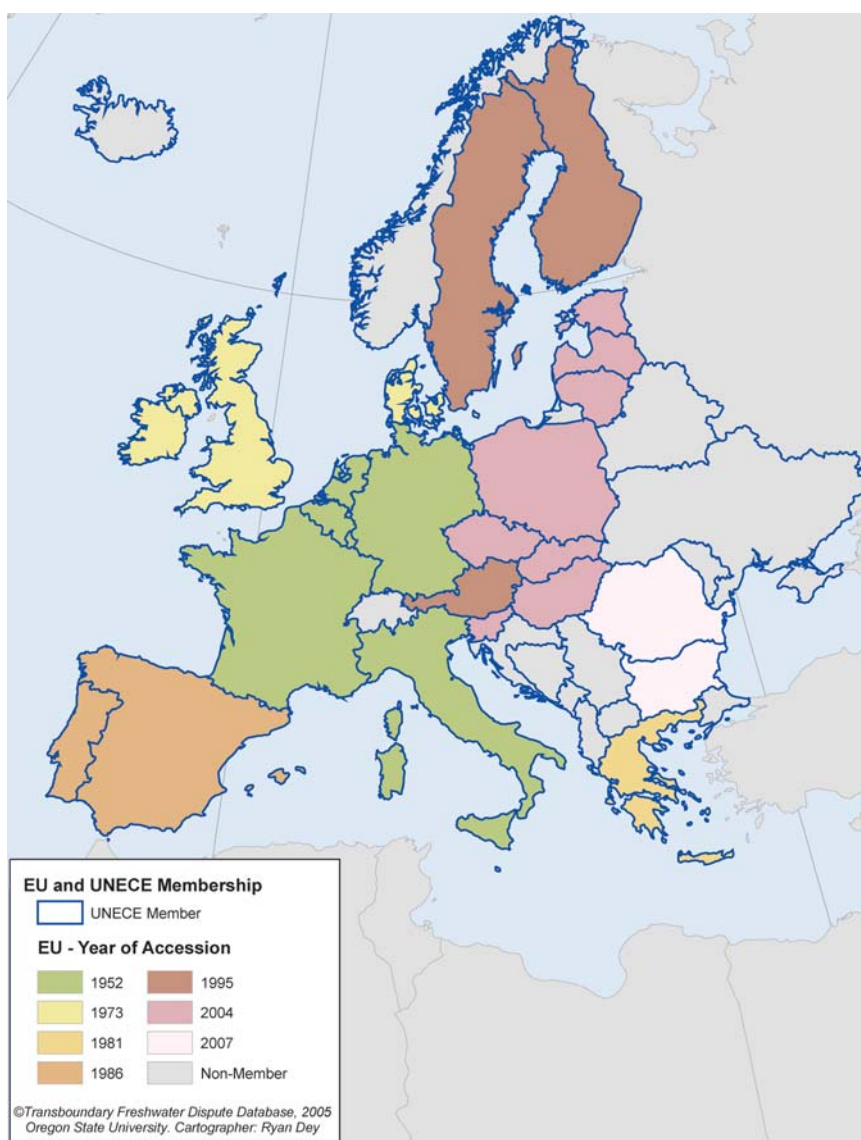


Figure 2.1 Map of EU and UNECE membership countries.

large basins (e.g., the Danube) shared between 17 countries, to 39 basins shared between only two countries. In terms of size, basins vary from the 60 km² (the Flurry basin in United Kingdom and Northern Ireland) to 1,554,900 km² (the Volga basin shared by Russia, Kazakhstan, and Belarus).

Most European countries are reliant on water resources that originate outside their territory; in 16 European countries, more than 90% of the country is located within an international river basin. For example, while Germany, Greece, Luxembourg, and Portugal rely on neighboring countries for 40% of their water resources, the Netherlands and the Slovak Republic rely on 80%, and Hungary relies on neighboring countries for as much as 95% of its water resources (see Map 6 (A)).



The Rhône River with a low water level near Saint-Maurice, Switzerland. Photo credit: Dake, via Wikimedia Commons.

2.2 WATER AVAILABILITY

Europe enjoys relatively abundant water resources. On average, up to 3,200 m³ of water is available annually for every European inhabitant, with only 660 m³ being extracted (EEA, 2009). However, while European citizens only utilize around 20% of the available water supply, water is distributed unevenly across Europe; a wide range in the average runoff amount exists across European basins (see Map 1 (B)). For instance, Cyprus and Malta have less than 160 mm annual runoff, and parts of Spain receive less than 25 mm. In contrast, the highest annual runoff rates are more than 1,700 mm (e.g., in Bulgaria, Serbia, Montenegro, Croatia, and the Netherlands; EEA, 2003a). Some countries that usually have sufficient water available may be water stressed at certain times of the year or in certain years (UNEP, 2004).¹

While water stress is not a severe problem in Europe because the continent is relatively well watered compared to Africa or the Middle East, several basins in Central Europe, from the Seine to the Dnieper, show lower runoff values, which, with increasing populations, may lead to more

water stress (see Map 4(B)). While the latter basins' per capita availability puts their populations closer to the critical threshold for water stress, the figures do not account for spatial variability or technological innovations such as desalination or pumping of groundwater.² Similarly, according to the EEA's water exploitation index eight European countries are water stressed (Germany, England and Wales, Italy, Malta, Belgium, Spain, Bulgaria, and Cyprus; see Figure 2.2). While the majority of water abstraction in Germany, England and Wales, Bulgaria, and Belgium is for non-consumptive use, Italy, Spain, Cyprus, and Malta face significant pressures given the high level of consumptive use vis-à-vis water availability).

Recent droughts throughout Europe have also shown that water resource problems are not limited to semiarid regions (UNEP, 2004).

¹ Levels of water stress are calculated on the basis of cubic meters of water available per person per year.

² Socioeconomic indicators show that there is a wide disparity between European countries, with Western European countries generally enjoying higher rates of gross domestic product (GDP) per capita and human development rankings than other parts of Europe (UNECE 2003).

TABLE 2.1 INTERNATIONAL RIVER BASINS IN EUROPE

RIVER BASIN	TOTAL AREA (KM ²)	AREA DIVISION (%)	
Bann	5,600	United Kingdom	97.14
		Ireland	2.86
Barta	1,800	Latvia	60.87
		Lithuania	37.71
Bidasoa	500	Spain	89.33
		France	10.67
Castletown	400	United Kingdom	76.12
		Ireland	23.88
Danube	790,100	Romania	28.97
		Hungary	11.74
		Austria	10.30
		Serbia	9.41
		Germany	7.46
		Slovakia	5.75
		Bulgaria	5.22
		Bosnia and Herzegovina	4.87
		Croatia	4.52
		Ukraine	3.74
		Czech Republic	2.59
		Slovenia	2.17
		Moldova	1.76
		Montenegro	0.89
		Switzerland	0.31
		Italy	0.16
		Poland	0.08
		Albania	0.03
Daugava	58,700	Byelarus	48.14
		Latvia	34.38
		Russia	16.11
		Lithuania	1.38
Dnieper	516,300	Ukraine	57.97
		Byelarus	24.19
Dniester	62,000	Russia	17.83
		Ukraine	75.44
		Moldova	24.52
		Poland	0.05
Don	425,600	Russia	87.23
		Ukraine	12.76
Douro/Duero	98,900	Spain	81.63
		Portugal	18.37
Ebro	85,800	Spain	99.36
		Andorra	0.48
		France	0.16
Elancik	900	Russia	71.32
		Ukraine	28.68
Elbe	132,200	Germany	62.86
		Czech Republic	36.02
		Austria	0.54
		Poland	0.56
Enningsdalselva*		Norway	
		Sweden	
Erne	4,800	Ireland	59.28
		United Kingdom	40.72
Fane	200	Ireland	96.46
		United Kingdom	3.54
Flurry	60	United Kingdom	73.77
		Ireland	26.23
Foyle	2,900	United Kingdom	67.30
		Ireland	32.70
Garonne	55,800	France	98.83
		Spain	1.07
		Andorra	0.08

RIVER BASIN	TOTAL AREA (KM ²)	AREA DIVISION (%)	
Gauja	11,600	Latvia	90.42
		Estonia	9.58
Glama	43,000	Norway	99.00
		Sweden	0.99
Guadiana	67,900	Spain	80.82
		Portugal	19.18
Isonzo	3,000	Slovenia	59.48
		Italy	40.09
Jacobs	400	Norway	68.10
		Russia	31.90
Kemi	55,700	Finland	94.52
		Russia	5.41
		Norway	0.01
Klaralven	51,000	Sweden	84.54
		Norway	15.46
Kogilnik	6,100	Moldova	57.82
		Ukraine	42.18
Lake Prespa	9,000	Albania	88.17
		Macedonia	8.50
		Greece	3.32
Lava/Pregel	8,600	Russia	74.00
		Poland	23.84
Lielupe	14,400	Latvia	66.76
		Lithuania	33.32
Lima	2,300	Spain	50.88
		Portugal	49.04
Maritsa	49,600	Bulgaria	66.49
		Turkey	25.69
		Greece	7.55
Mino	15,100	Spain	96.18
		Portugal	3.70
Mius	2,800	Russia	69.82
		Ukraine	30.07
Naatamo	1,000	Norway	57.73
		Finland	41.97
Narva	53,000	Russia	53.20
		Estonia	34.09
		Latvia	11.13
		Byelarus	1.57
Neman	90,300	Byelarus	46.13
		Lithuania	43.97
		Russia	5.30
		Poland	4.21
		Latvia	0.36
Neretva	5,500	Bosnia and Herzegovina	95.98
		Croatia	3.47
Nestos	10,200	Bulgaria	53.63
		Greece	46.36
Oder/Odra	122,400	Poland	84.20
		Czech Republic	8.38
		Germany	6.33
		Slovakia	1.09
Olanga	18,800	Russia	89.37
		Finland	10.62
Oulu	28,700	Finland	93.20
		Russia	6.78
Parnu	5,800	Estonia	99.85
		Latvia	0.15
Pasvik	16,000	Finland	77.46
		Russia	16.15
		Norway	6.39
Po	87,100	Italy	94.44
		Switzerland	4.92
		France	0.54
		Austria	0.10

RIVER BASIN	TOTAL AREA (KM ²)	AREA DIVISION (%)	
Prohladnaja	600	Russia	76.90
		Poland	23.10
Rezvaya	700	Turkey	74.66
		Bulgaria	25.34
Rhine	172,900	Germany	56.49
		Switzerland	14.05
		France	13.34
		Belgium	8.03
		Netherlands	5.75
		Luxembourg	1.46
		Austria	0.76
		Liechtenstein	0.09
		Italy	0.04
Rhone	100,200	France	89.88
		Switzerland	10.05
		Italy	0.05
Roia	600	France	67.39
		Italy	30.45
Salaca	2,100	Latvia	78.52
		Estonia	5.70
Sarata	1,800	Ukraine	63.90
		Moldova	36.05
Schelde	17,100	France	50.03
		Belgium	49.28
		Netherlands	0.47
Seine	85,700	France	97.78
		Belgium	2.14
		Luxembourg	0.08
Struma	15,000	Bulgaria	57.66
		Greece	25.88
		Macedonia	12.22
		Serbia	4.19
Tagus/Tejo	77,900	Spain	66.06
		Portugal	33.50
Tana	15,600	Norway	59.71
		Finland	40.23
Torne/Tornealven	37,300	Sweden	67.98
		Finland	28.00
		Norway	4.03
Tuloma	25,800	Russia	91.85
		Finland	7.93
Vardar	32,400	Macedonia	62.83
		Serbia	25.22
		Greece	11.94
Velaka	700	Bulgaria	95.25
		Turkey	3.74
Venta	9,500	Latvia	65.15
		Lithuania	34.72
Vijose	7,200	Albania	64.83
		Greece	34.66
Vistula/Wista	194,000	Poland	87.45
		Ukraine	6.55
		Byelarus	5.03
		Slovakia	0.96
		Czech Republic	0.01
Volga	1,554,900	Russia	99.77
		Kazakhstan	0.14
		Byelarus	0.08
Vuoksa	62,700	Finland	86.48
		Russia	13.52
Wiedau	1,100	Denmark	86.23
		Germany	13.32
Yser	900	France	53.63
		Belgium	46.37

*No information available
Source: Wolf et al., 1999.

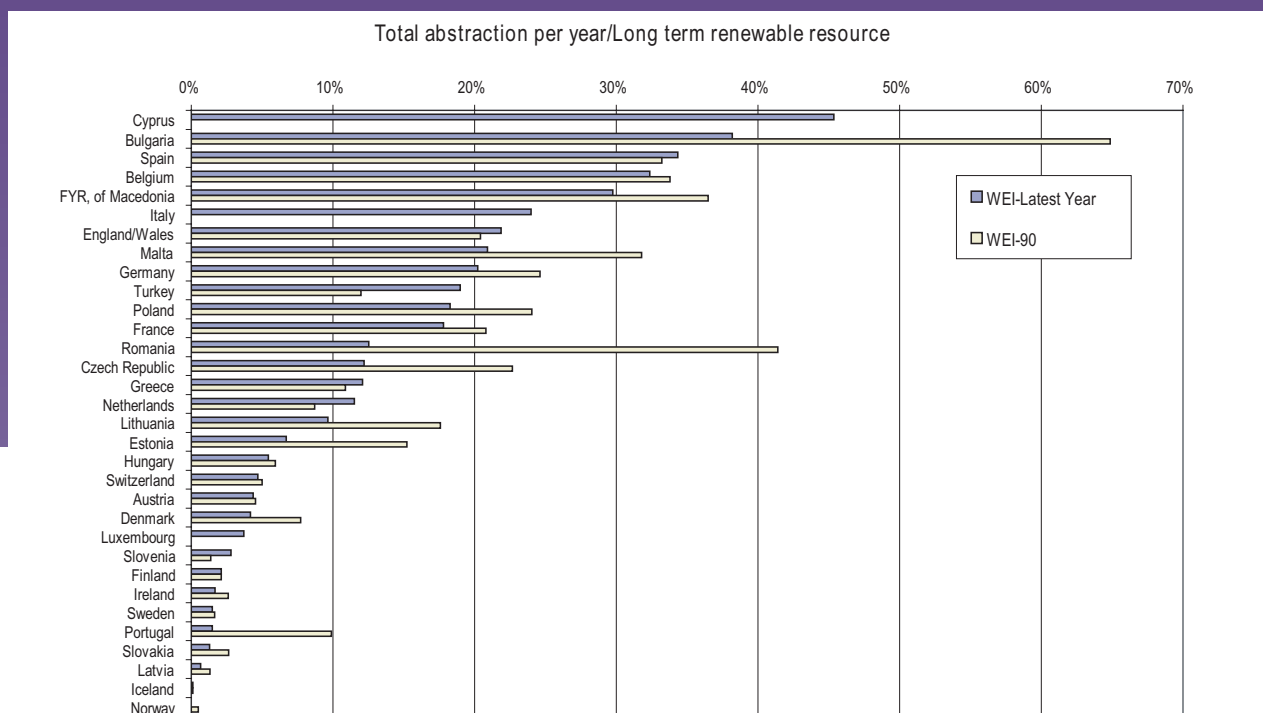


Figure 2.2 Water exploitation index (WEI). Total water abstraction per year as percentage of long-term freshwater resources in 1990 and 2002 (Ver. 1.00) Data source: EEA-ETC/WTR based on data from Eurostat data tables: Renewable water resources (million m³/year), LTAA & annual water abstraction by source and by sector (million m³/year) - Total freshwater abstraction (surface + groundwater). Accessed from http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007131848/IAssessment1116497549252/view_content.

Moreover, desertification is an issue in parts of Europe, including the Mediterranean basins and parts of Russia. In Spain and Portugal, for example, almost one-third of the land is at risk of desertification and in the Kalmyk Republic of the Russian Federation almost 80% of the land is severely affected by desertification (UNEP, 2004).

2.3 WATER USE

Both surface and groundwater provide important sources of freshwater abstraction in European countries; whilst desalination of seawater comprises only a small percentage of the total water use (Krinner, 2000). The proportion of water consumed varies considerably (EEA, 2009). For instance, high temperatures and high evapotranspiration leads to higher average water consumption per hectare in southern European countries. The amount of water used for irrigation in Italy and Spain, for example, is around ten times that of central EU countries, with southern European countries accounting for around 74% of the total irrigated area in Europe (UNEP, 2004). While the total water extractions have decreased in central European countries,



Water left running from outdoor faucets used for washing produce, Venice, Italy. Photo credit: Keith Davis.



Busy harbor, Venice, Italy. Photo credit: Keith Davis.

extractions in western European countries have remained relatively stable over the last decade. A decrease in agricultural and industrial activities in the new EU member countries that is largely due to economic restructuring in the 1990s, has resulted in a 70% reduction in water extractions for agricultural and industrial uses and a 30%

reduction in municipal extraction (EEA, 2003). Furthermore, in a number of countries, the droughts of recent years and a shift in management strategies have been responsible for downward trends in water extractions (Kriner, 2000).

In many Western European countries, urban water demand is a major consumer of groundwater, while in Eastern European and Mediterranean countries it is less significant (Nixon, 2000). Over-extraction of groundwater remains a problem in many areas of Europe; primarily due to municipal uses as well as agricultural and tourism-related uses. Particularly on the Veneto and Emilia-Romagna coasts, the Po delta, and Venice, Bolgne, and Ravenna (Italy) heavy use of groundwater resources has been identified as the source of subsidence and soil compaction (UNEP, 2004). Another issue is that large stretches of the Mediterranean coastline in Italy, Spain, and Turkey as well as countries along the Baltic and Black Sea coasts have been affected by saltwater intrusion (UNEP, 2004). The over-exploitation of groundwater has also been directly linked to severe wetland losses, especially in the Mediterranean region.

Traditionally water quantity problems were addressed by increasing the storage capacities through reservoirs and water transfers. Extensive systems of dams and resources can be found



Tea at the Grand Bazaar, Istanbul, Turkey. Photo credit: Lynette de Silva.



Snowfields, Dolomites, Italy. Photo credit: Keith Davis.

throughout Europe's international waters (see Map 2(B)). However, the last decade has seen a discernible shift in water management practices in Europe, including the introduction of demand management strategies, leakage reduction, increased water efficiency, recycling, metering, and increased water pricing (UNEP, 2002). Despite such a shift, an appropriate balance between supply and demand in many areas remains to be realised (Communication on Water Scarcity and Drought).

2.4 WATER QUALITY ISSUES

While on the whole, the quality of Europe's water has improved over the last 15 years, certain problems still exist. Furthermore, Europe's groundwater quality has generally not improved since the 1990s, with one-third of the groundwater resources exceeding nitrate drinking water limits (EEA, 2005).³ Rivers and lakes across Europe have been heavily modified for various

anthropogenic reasons, such as mitigating floods, navigation, and water extraction, as well as domestic, agricultural, and industrial storage purposes, which have a negative impact on water quality and the aquatic environment (EEA, 2005). However, marked improvements in surface water quality have been witnessed in some areas. For example, heavy pollution in many Western European rivers, such as the Rhine, has decreased significantly in the last 25 years (UNEP, 2002). Such water quality issues place increasing pressure on



Bulls by pond, Spain. Photo credit: Sandra Arbogast.

³ The most significant pollution of groundwater is from nitrates and pesticides. In addition, pollution of groundwater from other substances, such as hydrocarbons and heavy metals, specifically from mining, industrial, and military activities has proved problematic, especially in Eastern Europe.



(From top) Visitors tour the Topkapi Palace on a rainy day in Istanbul, Turkey. Photo credit: Lynette de Silva. Summer rainstorm, Belgrade, Serbia. Photo credit: Milan Vatovec. Cyclist prepares to navigate storm water runoff on a Paris street. Photo credit: Sandra Arbogast.

Member States to be able to meet the objectives of the WFD, discussed later in section 3.2.

2.5 CLIMATE CHANGE

Climate change and the lack of adequate adaptation strategies is perhaps the biggest threat to Europe's water environment at present (EEA, 2007; Flärke, et al, 2004; EEA, 2005). The potential effects of climate change on Europe's water resources is expected to differ across Europe (UNEP, 2004; IPPC, 2007) (see Map 3 (A) and (B)). Northern European countries have already experienced an increase of more than 9% in annual precipitation between 1946 and 1999. In contrast, decreases in precipitation have been observed in Southern and Central Europe (EEA, 2003a). A 2007 IPPC report predicts that water stress will increase over central and southern Europe from 19% to 35% by 2070. In arid countries like Spain, climate change could exacerbate land degradation on agricultural landscapes. Moreover, a predicted temperature increase from 1°C to 3.5°C could cause snow to melt earlier, increasing winter runoff and reducing the thawing process in spring and summer that will affect how international waters are utilised (Krinner, 2000). A rise in temperature in the last few decades has already led glaciers to shrink; alpine glaciers have lost more than 25% of their volume between 1975 and 2000 and it is predicted that half of Europe's alpine glaciers could disappear by 2025 (UNEP, 2004).

Many areas of Europe already experience extreme floods and droughts. Since 1988, an estimated 700 fatalities have occurred due to floods in Europe, around half a million people have been displaced, and economic losses have amounted to at least 25 billion euro (EEA, 2003b). Flooding is the most common natural hazard in Europe, with 188 flood events being recorded between 1980 and 2000 (UNEP, 2004). Areas particularly prone to flood events include the Mediterranean coasts, the Netherlands, South-East United Kingdom, Northern German coastal plains, the Rhine, Seine, Po, and Loire Valleys, coastal areas of Portugal, and alpine valleys (Krinner, 1999). An example of extreme risk is the Rhine basin where more than 10



The aftermath of flooding in western Bulgaria when the Maritsa River burst its banks in August 2005, during a summer marked by torrential rains. Photo credit: CARE International, courtesy of USAID.

million people live in areas at risk of extreme floods; the potential damage from floods within this area is estimated at around 165 billion euro (EU, 2004b).

A marked increase in the frequency and magnitude of flood events is largely due to two interconnected reasons. The first reason is the higher intensity of rainfall and rising sea level that may be a result of climate change that creates more drastic floods. A second reason is the growing number of people and economic assets located in flood plains (EU, 2004a). It is predicted that coastal flooding related to increasing storminess and sea-level rise is likely to threaten up to 1.6 million people across Europe annually (IPPC, 2007).

Droughts also pose a significant threat throughout Europe, with more frequent and prolonged droughts occurring, as well as longer fire seasons, particularly in the Mediterranean region (IPPC, 2007).

2.6 CONCLUSION

This chapter highlighted Europe's heavy reliance on transboundary waters. Increased demands for water and inefficient practices throughout Europe have led to various water-related problems that have the potential to lead to water conflicts between European countries. Common problems include over-extraction of groundwater, pollution, soil erosion, landscape changes, and the loss of natural habitats. In addition, potential threats of climate change as well as changes in land-use practices have increased the risk of harm from extreme hydrological events such as flooding. The fact that the majority of river basins in Europe are transboundary means that many of these common water-related problems are not limited to national boundaries. For instance, the use of fertilisers for agricultural needs upstream may have a detrimental effect on drinking water supplies in a downstream country.



Rhine River from Burg Stahleck, Rhineland-Palatinate, Germany. Photo credit: Bryan Pendergrass.

CHAPTER 3. THE EVOLUTION OF CONFLICT AND COOPERATION OVER EUROPE'S TRANSBOUNDARY WATERS

Alistair Rieu-Clarke

This chapter discusses the evolution of conflicts and cooperation over Europe's transboundary waters – from the evolution of legal institutions dealing with transboundary waters to newer institutions that are shifting towards regional integration of transboundary water management. The primary institutions depicted are the EU's Water Framework Directive and the UNECE's 1992 Helsinki Convention. Despite the history of institutions that promote cooperation, conflicts regarding transboundary water resources occur in Europe.

3.1 THE EVOLUTION OF INTERNATIONAL AGREEMENTS RELATING TO TRANSBOUNDARY WATERS

A long tradition of cooperation over transboundary waters exists in Europe. The main purpose of multilateral treaties created by European countries during the early nineteenth century was to ensure freedom of navigation and equal treatment between riparian countries (YILC, 1972). The 1814 Treaty of Paris, the 1815 Final Act of Congress of Vienna, the 1831 Convention of Mainz, the 1856 Treaty of Paris, the 1857 Navigation of the Danube Act, the 1878 Treaty of Berlin, and the 1883 Treaty of London all sought to promote the freedom of navigation throughout Europe's transboundary waters (McCaffrey, 1993). The peace treaties signed following World War I represent a further level of cooperation over European transboundary waters that extend beyond issues of navigation. For example, the 1919 Treaty of Versailles created priority uses between irrigation, fisheries, and navigation. These early agreements tended to focus more on surface water rather than groundwater. Furthermore, they usually only addressed the main stem of a river; excluding tributaries and groundwater (McCaffrey, 1993).

A number of these early agreements also included a provision for joint commissions. For instance, the 1895 convention between the Netherlands and Germany, concerning the Niers and the Guelder Niers canal (in the Rhine River basin), established an inspection commission to oversee the implementation of the rights and obligations pursuant to the convention. Furthermore, the 1892 Treaty for the regulation of the Rhine established the International Commission for the regulation of the Rhine River. Similarly, the 1856 Treaty of Paris established a European Commission for the Danube River. In 1922, the Frontier Agreement between Denmark and Germany was created, which established a Frontier Water Commission and a Supreme Frontier Water Commission; the former being responsible for examining and deciding all matters connected with the frontier waters, and the latter acting as a court of final appeal. Furthermore, the 1927 agreement between Spain and Portugal on the River Douro established an international commission to implement the provisions of the agreement.

Numerous other agreements were adopted throughout the twentieth century in order to deal with issues such as hydropower production. Examples include the 1930 convention between France and



Rhine River flowing through Düsseldorf, in North Rhine-Westphalia, Germany. Photo credit: Richard Hermann.

Switzerland respecting the Chatelot Falls concession in the Rhone basin, the 1991 agreement between Norway and Sweden concerning the salmon and anadromous salmon fisheries in the Svinesund, the Iddefjord, and the River Enningsdals tributaries of the Glama River basin, the 1950 convention between the former Soviet Union and Hungary concerning measures to prevent floods and to regulate the water regime in the area of the frontier river Tisza (in the Danube basin), and the 1951 agreement between Finland and Norway on the transfer from the course of the Neiden River to the course of the Gandvik River.

In recent decades a discernable shift away from single purpose agreements towards the joint management of international waters has occurred. In some cases joint commissions have evolved into institutions dealing with a range of joint management issues. An example of such a commission is the Finish-Norwegian Commission that has taken a leading role in developing integrated water resources management (IWRM) plans for all the basins shared between Finland and Norway. The first IWRM plan (concerning the Tana River basin) was published in 1990 and updated during the end of the 1990s.

The development of international agreements throughout the last two centuries has led to the development of a large body of international agreements covering the majority of international basins in Europe (see Map 6 (B)). However, in some basins, basin-wide agreements between countries have not yet been established, which as noted in Chapter 1, potentially increases their hydropolitical vulnerability. Notable examples include Daugava basin between Russia, Belarus and Latvia; the Neman basin, shared between Russia, Belarus, and Lithuania; the Dniester basin between the Ukraine and Moldova; and the Dnieper basin between Belarus, Russia, and the Ukraine.

3.2 REGIONAL INTEGRATION: THE EUROPEAN UNION AND THE UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

The shift towards joint management of transboundary waters (discussed above) is largely due to the influence of regional organisations. Regional integration has played an extremely



Snov River, a tributary of the Dnieper River, near Sedniv, Ukraine. Photo credit: Yuriy Tkach, courtesy of Wikimedia Commons.

significant role in shaping legal and institutional frameworks for the management of trans-boundary waters in Europe. The most notable institutions within this sphere are the EU and UNECE, which have played a large role in leading to a shift towards joint management of international waters.

3.2.1 The European Union (EU)

Given its broad remit and supranational status, the EU is unique as an international organisation. Inspired in the post World War II era as a means of promoting peace and security throughout Europe, the EU was first proposed by the French Foreign Minister Robert Schuman in May of 1950. Initially consisting of six countries (Belgium, Germany, France, Italy, Luxembourg and the Netherlands), the EU soon expanded to include Denmark, Ireland, and the United Kingdom in 1973, Greece in 1981, Spain, and Portugal in 1986, Austria, Finland, and Sweden in 1995, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia in 2004, and most recently Bulgaria and Romania in 2007 (see Figure 2.1).

Cooperation between EU countries initially involved issues of trade and the economy; however, as the number of EU countries grew, matters such as citizen rights, freedom, security and justice, employment, regional development, environmental protection, and international development became included. Five key EU institutions became responsible for the development, implementation, and enforcement of EU law and policy: the European Parliament (elected by the peoples of member countries), the Council of the European Union (representing governments of the member countries), the European Commission (responsible for developing law and policy, and enforcement), the Court of Justice (ensuring compliance with EU law) and the Court of Auditors (controlling sound and lawful management of the EU budget). Furthermore, various types of EU laws exist, which include regulations (binding in their entirety and directly applicable in all member countries), directives (binding but leave member countries with the discretion to decide how they will be implemented), decisions (fully binding on those to whom they are addressed), and recommendations and opinions (non-binding, declaratory instruments).



The Europabrücke, or Europe's bridge, above the Sill River (Danube basin) in the Wipp valley just south of Innsbruck, Austria. Photo credit: Richard Hilber, via Wikimedia Commons.

3.2.1.1 The Water Framework Directive (WFD)

Early EU policy adopted a sectoral approach, mainly focusing on setting water quality objectives for particular water uses, or limiting the discharge of certain pollutants. While considerable cooperation throughout the EU member countries occurred, the piecemeal approach to adopting water legislation meant that by 1996, EU water law and policy suffered from a lack of coherence and coordination. Therefore, in 1996 the EU Commission called for the adoption of a framework directive designed to more efficiently and effectively implement EU water law and policy. This led to a directive establishing a framework for community action in the field of water policy: the Water Framework Directive (EU WFD) in 2000 (Chave, 2001). Marking an important shift from the piecemeal approach that existed in the 1970s, the main

objective of the EU WFD is to ensure the long-term sustainable use of all EU waters. Furthermore, the EU WFD attempts to provide both the criteria for determining *what* constitutes sustainable use, and the mechanisms for determining *how* the principle can be implemented.

According to preliminary assessments in 2005, a large part of Europe's water bodies are at risk of failing to meet the ambitious environmental objectives of good ecological status by 2015 (EU, 2005). The EU Commission has already launched infringement proceedings against a number of member countries. However, most member countries have transposed the EU WFD into their national law, designated river basin districts, and employed competent authorities (WFD, 2004). In addition to the EU WFD, the EU has been active in developing law and policy on a number of water-related issues. For instance, a new directive on the protection of

groundwater from pollution that mandates member countries to monitor and assess groundwater quality on the basis of common criteria and to identify and reverse trends in groundwater pollution was adopted in 2006. Furthermore, 2007 saw the adoption of a directive on flood risk management, flood prevention, protection, and mitigation (EU, 2005a). The next major evaluation of the WFD will come in 2010, when the first River Basin Management Plans, due in 2009, are reported alongside the status of the water bodies. The European Commission and EEA will subsequently publish a major status report in 2012.

The EU also provides a number of funding programmes that are relevant to international waters. For example, Interreg III focuses on enhancing economic and social cohesion across borders. Furthermore, the Interreg Rhine Meuse Activities programme was funded through this programme in order to increase safety and public awareness of flood management issues and reduce future flood damage. Pursuant to the project, the governments of Belgium, France, Germany, Luxembourg, the Netherlands, and Switzerland developed a joint flood control programme. Another environment related EU funding programme is LIFE III, which contributes to the implementation of community legislation relating to environmental protection. Under this programme, the Integrated Management of Wetlands Initiative, aimed at the reclamation, conservation, and balanced use of wetlands, was initiated between Germany, Italy, and Poland.

Several further EU funding programmes focussing on non-EU member countries are also relevant to transboundary projects. The first is the Phare programme that provides around 11 billion euro for institutions of pre-accession countries to strengthen public administrations and institutions, promote convergence with EU community law, and promote economic and social cohesion. Similarly, the Tacis programme (implemented from 2002 – 2004 by the EU and supported by the UNECE) funds technical assistance in 12 Eastern European countries, mainly focusing on enhancing the transition process in these countries. Finally, the Sixth Research and Technological Development programme is the

main instrument for funding the EU's research on financing issues related to sustainable development, global change, and ecosystems.

3.2.2 The United Nations Economic Commission for Europe (UNECE)

The UNECE was created in 1947 by the UNECE as one of five regional commissions of the United Nations. As the primary goal of the UNECE is to foster greater economic cooperation among its member countries, it focuses on issues including economic analysis, the environment, human settlements, statistics, sustainable energy, trade, industry and enterprise development, timber, and transport. Activities of the UNECE include policy analysis, development of conventions, regulations and standards, and technical assistance. There are 55 member countries of the UNECE and 70 international professional organizations; other non-governmental organizations are also involved in the activities of the UNECE on an *ad hoc* basis. The geographic scope of the UNECE is far reaching, encompassing the regions of Europe, Central Asia, North America, and Israel.



Dragon fountain, Rome, Italy. Photo credit: Keith Davis.

The UNECE first dealt with water related matters in the late 1960s and early 1970s (Wouters, 2004). In contrast to the EU WFD, which deals with *all* waters of the EU, the UNECE focuses solely on transboundary water resources. A number of non-binding policy documents were developed by the UNECE throughout the 1980s, including the 1980 Declaration of Policy on Prevention and Control of Water Pollution, the 1982 decision on International Cooperation on Shared Water Resources, the 1984 Declaration of Policy on the Rational Use of Water, the 1986 Decision on Cooperation in the Field of Transboundary Waters, the 1989 Charter on Groundwater management, and the 1990 Code of Conduct on Accidental Pollution of Transboundary Waters.

3.2.2.1 The Helsinki Convention

The promulgation of policy documents on transboundary waters led to the adoption of the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes in Helsinki in 1992 (1992 Helsinki Convention). Implemented into action in 1996, this convention is perhaps the most influential regional legal framework for transboundary waters in Europe. While the focus of the 1992 Helsinki Convention is more limited than the EU WFD, the UNECE has a wider influence with respect to the number of contracting parties. As a framework agreement, the 1992 Helsinki Convention has been strengthened by the development of supplementary protocols such as the 1999 Protocol on Water and Health and the

2003 Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters. In addition, the 1992 Helsinki Convention benefits from a wider environmental programme within the UNECE that has seen the adoption of the 1992 Convention on the Transboundary Effects of Industrial Accidents, the 1991 Convention on Environmental Impact Assessment in a Transboundary Context, and the 1998 Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters. Furthermore, the 1992 Helsinki Convention seeks to strengthen cooperation, bilateral and multilateral levels for the prevention, control and reduction of transboundary pollution, sustainable water management, conservation of water resources, and environmental protection.

Central to the successful implementation and development of the 1992 Helsinki Convention is the meeting of the parties, which is responsible for defining and reviewing the activities and policies under the convention as well as sharing information on experience gained in negotiating and implementing bilateral and multilateral agreements concerning transboundary waters. Under the meeting of the parties three working groups are charged with developing and implementing new policies, strategies and methodologies to protect transboundary waters, as well as organising workshops and conferences, training, and implementing capacity-building events.¹

In March of 2000, the UNECE adopted guidelines on sustainable flood prevention (UNECE, 2000). Subsequently, a UNECE task force on flood prevention, protection and mitigation (led by Germany) has analysed the effectiveness of the 2000 Flood Guidelines and



Fallen leaves in water. Hupisaaret Park, Oulu, Finland.

¹ The working group on integrated water resources management has developed policy guidelines on sustainable flood management, inter-state water distribution, and public participation in water management. The working group on monitoring and assessment has developed three sets of guidelines for monitoring and assessing transboundary rivers, groundwater and lakes, as well as adopting pilot programmes to assist countries in the implementation of the guidelines. Finally, the working group on water and health is responsible for the implementation of the 1999 protocol on water and health.



Floating restaurants in the foreground, with excursion boats across the River Sava, Belgrade, Serbia. Photo credit: Milan Vatovec.

proposed further activities, including strengthening legal arrangements at the national and international level; developing soft-law instruments; and enhancing capacity development in flood management activities (UNECE 2004). In parallel to the UNECE's activities relating to flood management, international basins particularly prone to flood events, such as the Rhine, Oder, Meuse, Danube, Saar, Moselle, and Elbe, have started to take coordinated measures at the basin level to manage floods. For instance, in the Rhine basin, pursuant to the 1998 convention on the protection of the Rhine, the contracting parties set the goal of comprehensive flood prevention. The parties adopted the Rhine action plan on floods in January of 1998 that sought a 10% reduction in flood damage by 2005 and a 25% reduction by 2020. Between 1998 and 2020 an estimated 12.3 billion euro is being spent by the contracting parties on flood protection measures. A similar flood action plan has recently been adopted for the Danube basin countries under the auspices of the 1994 Danube Convention. The action plan, prepared by the International Commission for the Protection of the Danube River (ICPDR), sets out basic principles and

approaches to flood management, including both structural and non-structural measures (Danube, 2004).

In September 2000, the International Water Assessment Centre was established to assist with the implementation of the 1992 Helsinki Convention. A legal board and advisory service also support the implementation of the convention as they advise the bodies under the convention on controversial legal issues and provide legal, institutional, economic, financial, and technical support for the practical



Tour boat prices, Brugge, Belgium. Photo credit: Sandra Arbogast.



Moldovan dried fruit and vegetable producers observe a Uniferax-Grup washing machine during a study tour. Photo credit: Rodion Gudim, CNFA, courtesy of USAID.

implementation of the convention. The centre provides expertise on water-related monitoring, assessment, information technology and public participation, and seeks to build a network of

leading European water institutions. Therefore, not only does the convention provide the legal framework by which to develop bilateral and multilateral agreements, it also contains an organizational framework that assists countries in the negotiation, implementation, and development of agreements for cooperation over their transboundary waters.

The 1992 Helsinki Convention, currently binding 34 countries and the European community, has been highly influential in promoting cooperation over transboundary waters in Europe; particularly in assisting Eastern European countries, the Caucasus and Central Asia since the break-up of the former Soviet Union. Many agreements relating to transboundary waters reflect the rules and principles contained in the 1992 Helsinki Convention, including the 1994 Danube Convention, the 1994 Agreements on the Meuse and Scheldt (both components of the Rhine River basin), the 1997 Estonia-Russia Agreement on Transboundary Waters, the 1998 Rhine Convention, the 1998 Spain-Portugal Basin Convention, the 2001 Belarus-Ukraine Agreement on Transboundary Waters and the 2002 Sava Framework Agreement (sub-basin of the Danube), and the 2002 Agreement on the



Douro Valley near Régua, Portugal. Photo credit: Npolvo, via Wikimedia Commons.



Tejo/Tagus River seen from Portas do Sol park, Santarém, Portugal. Photo credit: Fulviusbsas, via Wikimedia Commons.

Chu and Talias Rivers between Kazakhstan and Kyrgyzstan (UNECE, 1993; UNECE 2003).

An example of the effectiveness of the UNECE is that in collaboration with the Organisation for Security and Cooperation in Europe (OSCE), it supports a transboundary project on the Dniester River basin, which started in 2004 for an initial 14-month period. The project aims to enhance regional cooperation between the Dniester riparian countries, Ukraine and Moldova, and draw international attention to the problems of the basin. Part of the project involves the preparation of a new agreement on the management and sustainable use of the waters of the Dniester basin as well as the development of joint methodologies for the assessment of water quality within the basin.

3.3 SELECTED CONFLICTS REGARDING TRANSBOUNDARY WATER

Despite a long tradition of developing cooperative arrangements over Europe's transboundary waters, numerous transboundary

water conflicts between European countries have occurred. For example, during the early twentieth century, Belgium and the Netherlands contested the enlargement of certain canals and the construction of certain works on the River Meuse (in the Rhine basin). This dispute eventually had to be settled in the Permanent Court of International Justice. In 1929 this court also resolved a dispute concerning the River Oder between Germany, Denmark, France, United Kingdom, Sweden, former Czechoslovakia, and Poland. Interestingly, in reaching its opinion the court followed the "general principles of international river law" and recognized the "community of interests" of riparian countries in navigable rivers. In addition, the early twentieth century witnessed a dispute between France and Spain over Lake Lanoux and the Carol River in the Ebro basin. The dispute involved France's proposal to utilize the Carol River in such a way that caused the Spanish government to fear that it would adversely affect their rights and interests (that were protected under the Treaty of Bayonne concluded by the parties in 1866). Eventually, the dispute was resolved by an international arbitral tribunal. France was also involved in a dispute



Dam area in Miranda do Douro (Portugal). Photo credit: Byj2000, courtesy of Wikimedia Commons.

with Italy over the River Roya in the 1930s where France questioned Italy's right to develop the Roya in light of a France-Italy Treaty in which Italy had agreed not to interfere with the waters of the Roya in a way that would affect France.

More recently, during the 1990s, Portugal expressed concern over Spain's plans to divert a number of shared transboundary waters—the Minho, Douro, Tagus, and Guadiana—for hydropower generation (IWED, 2005); a concern that was aggravated by serious droughts within the Iberian Peninsula during the early 1990s. Portugal claimed that implementation of the

1993 Spanish water plan would result in a 13-17% decrease in water flow. Portugal maintained that such a decrease would have led to various problems including increased polluted wastewater, which was discharged directly into the Douro, as well as negative impacts on Portuguese hydropower production. However, positive steps to build hydropolitical resilience within Luso-Spanish waters were taken in 1998 with the adoption of the Albufeira Convention and joint Commission between Spain and Portugal concerning the protection and sustainable use of their shared waters.²

Another example of a transboundary water dispute occurred in the Varda River basin where shared water resources have been the source of conflict between Greece and Macedonia for many decades. Intensive irrigation, development of dams, and increased pollution resulted in significant degradation of water quality in this river basin. As recently as 2002, the Greek government protested about the absence of notification of Macedonia's plans to revitalize



Lion's head fountain, Paris, France. Photo credit: Jane McCauley Thomas.

² Agreement on the Cooperation for the Protection and Sustainable Use of the Waters of the Spanish-Portuguese Hydrographic Basins, Albufeira, 30 Nov. 1998 (entered into force 17 January 2000). 2009 United Nations Treaty Series.



Hydroelectric power plant on the Sava River at Moste in Slovenia. Photo credit: Ziga Koselj, Slovenia, via Wikimedia Commons.

Lake Dorjran. Within the same region, a history of conflict exists between Greece and Bulgaria regarding the Nestos Basin. Despite the adoption of a basin-wide agreement in 1995, cross-border pollution problems continue. In recent years, Greek citizens have repeatedly complained to Bulgarian authorities about industrial and domestic waste that has been dumped upstream, at the cost of downstream uses of the basin (Athens News Agency, 2004). Both countries have agreed to engage in closer cooperation to stop the pollution of the Nestos basin, especially given that Bulgaria recently became a part of the EU and it now has an obligation to meet the environmental obligations of EU law (Athens News Agency, 2005).

The proposed construction of the Gabčíkovo-Nagymaros Dam System in the Danube River basin has been a major source of tension between Hungary and the Slovak Republic. The two countries agreed to the cross-border system of dams in 1977 as a means of supplying much needed hydropower and regulation of flood events. A growing environmental movement forced the Hungarian government to suspend works on the dam system in 1989, which in turn led former Czechoslovakia

to adopt a unilateral dam system. After protracted negotiations and third-party intervention by the European Commission, the dispute was taken to the International Court of Justice. In 1997, the court decided that Hungary had violated international law by abandoning the 1977 bilateral agreement; however, at the same time it found that Slovakia was wrong in going ahead with an alternative system. The countries were then requested to reach a compromise solution based on the court's decision. Despite patchy talks, no mutually agreeable decision has yet been reached.



Drava River, at Drávaszabolcs, Hungary. Photo credit: Spinsta, via Wikimedia Commons.



Park near the confluence of the Danube and Sava rivers at Belgrade, Serbia. Photo credit: Milan Vatovec.

Various other construction projects have caused controversy within the Danube basin in recent years. Following environmental protests from 10,000 Croats and 5,000 Hungarians in November 2004, Croatian plans to build a Hydroelectric Plan on the Drava River have reportedly been put on hold (Hungarian News Agency, 2005). Similarly, plans by the Ukraine to build the Bystre navigation canal have sparked tension due to Romania's claims that the canal would have serious environmental consequences on the Danube delta's ecosystem (BBC, 2005).

Within Northern Europe, the Daugava basin has been the source of tension between Belarus, Latvia, and Lithuania. Pollution from large production facilities, including chemical industries and oil refineries as well as intensive agriculture in Belarus and Lithuania, has had a detrimental effect on Latvia's water supplies. However, positive steps to alleviate transboundary impacts have been taken with the adoption of a basin-wide agreement between Belarus, Latvia, and Lithuania in 2003.

Accidental pollution has also proven to be a source of tension between European countries sharing international basins. For example, in November of 1986, a fire broke out at the Sandoz chemical factory in Basel, Switzerland, causing major pollution in the Rhine River as an estimated 30 tons of highly toxic waste entered the water of the Rhine, which resulted in water supplies being cut off as well as the loss of half a million fish. The Sandoz spill was the impetus behind the cleaning up of the Rhine basin in the last 20 years.

Another example of accidental pollution occurred in Spain when a supporting wall of a reservoir containing toxic wastes burst within the Doñana National Park causing 5,000,000 m³ of toxic waste to enter the Agrio River, a tributary of the Guadiana River. In 2000 a similar dam break in Baia Mare in northwest Romania occurred. The spill resulted in 100,000 m³ of water with high concentrations of cyanide entering the Sasa, Lapus, Somes, Tisza and Danube rivers before entering the Black Sea.



Stora Enso pulp and paper mill in Oulu, Finland, with an empty small harbor in the foreground. Photo credit: Estormiz, via Wikimedia Commons.

While numerous other examples of accidental pollution exist in Europe, the latter accident highlighted the need to address the problems of accidental pollution across Europe. The UNECE subsequently adopted a protocol to the 1992 Helsinki Convention on the transboundary effects of industrial accidents. However, accidental pollution continues to be a major concern in Europe, particularly within the newly independent countries because a lack of financial resources exacerbates the risk of accidents (UNECE, 2003).

3.4 CONCLUSION

This chapter highlighted a variety of conflicts that have arisen over transboundary waters in Europe, and shows how institutional capacity has evolved in response to such conflicts. Most parts of Europe have experienced such conflicts that have largely been as a result of contentious

unilateral actions by one transboundary basin country. Furthermore, the fact that both qualitative and quantitative characteristics are evident in transboundary disputes in Europe was illustrated. While a significant record of conflicts over transboundary waters exists in Europe, a strong commitment by European countries to develop the institutional capacity necessary to resolve is also evident as international agreements relating to European transboundary waters date back over 200 years. While earlier agreements tended to focus on single uses, there has been a marked evolution towards the integrated management of transboundary waters within treaty practice. Today, a large body of international agreements relating to Europe's transboundary waters exists, which in itself is testament to the desire of European countries to develop the institutional capacity to accommodate economic, social, and environmental changes in a basin. The content of such agreements will be examined in the next chapter.



*Tourist fills a water bottle from a public fountain, Rome.
Photo credit: Keith Davis.*

CHAPTER 4. MAJOR TRENDS IN CONFLICT AND COOPERATION

Alistair Rieu-Clarke

The aim of this chapter is to assess the range of legal and institutional mechanisms that exist in Europe to monitor, predict, and pre-empt transboundary water conflicts. Trends in cooperative mechanisms related to European transboundary waters are identified using an analytical framework in order to assess the legal scope, substantive water rights and obligations, procedural rules and mechanisms, dispute resolution mechanisms, and institutional arrangements. This analytical framework recognises the fact that the existence of an agreement between countries over their transboundary waters is not in itself sufficient to ensure hydropolitical resilience. The chapter makes the assumption that in order for a legal framework for transboundary waters to be equitable and sustainable over the long-term, a set of key components must be present. This chapter assesses how these key components have been developed within the European transboundary water context.

4.1 LEGAL SCOPE: SURFACE WATER TO DRAINAGE BASINS

The first section assesses how legal and institutional arrangements leading to cooperation over transboundary waters in Europe have dealt with geographic scope. It is necessary to ensure that international regimes regulate *all* countries' activities that might have a significant adverse impact on the interests of other countries sharing the same waters in order to promote hydropolitical resilience between countries. Adopting a *basin* approach is largely recognised as the most appropriate method of achieving such security (Wescoast, 1992). The most pertinent issues to consider are the inclusion of both surface and groundwater, the coverage of confined groundwater, and the accommodation for relevant linkages between land and water.

In line with the increasing number of uses of Europe's water resources, transboundary agreements have generally broadened their geographic scope to include surface and groundwater, and in some circumstances, the entire drainage basin. The 1992 Helsinki Convention defined "transboundary waters" in Article 1 as, "any surface or groundwaters which mark, cross or are located on boundaries between two or more States; wherever transboundary waters flow directly into the sea."

The main purpose of the 1992 Helsinki Convention is to require contracting parties to take all appropriate measures to prevent, control, and reduce any transboundary impact. Pursuant to the convention, "transboundary impact" is defined as "any significant adverse effect on the environment resulting from a change in the conditions of transboundary waters caused by a human activity, the physical origin of which is situated wholly or in part within an area under the jurisdiction of a Party, within an area under the jurisdiction of another Party." The way in which 'transboundary impact' is defined under the 1992 Helsinki Convention implies a wide geographic scope; not only does the convention cover transboundary surface water and groundwater but it also covers land-based activity affecting the conditions of transboundary waters. Therefore, the convention would cover pollution from agricultural practices, such as the use of pesticides and fertilisers that filter through the soil and into



Vineyards on steep slopes above the Rhine River, Germany. Photo credit: Bryan Pendergrass.

surface and groundwater supplies. Similarly, deforestation that might affect the physical characteristics of the watercourse downstream is covered by the convention.

Aligned with the 1992 Helsinki Convention, the EU WFD also adopts a basin-wide approach whereby the 'river basin' is actually defined in Article 2 as "the area of land from which all surface run-off flows through a sequence of streams, rivers, and possibly lakes, into the sea at a single river mouth, estuary or delta, as well as the associated groundwater." Pursuant of this directive, EU member countries must ensure that international river basins are assigned to an international river basin district, and appropriate administrative arrangements are implemented to ensure that the rights and obligations of the directive are upheld. The EU WFD is arguably unique as an international agreement because it requires member countries to, not only assign connected surface and groundwater, but to identify and assign groundwater that does not "fully follow a particular basin," to the most appropriate river basin district.

Due to the influence of the 1992 Helsinki Convention and the EU WFD throughout Europe, many 'local' transboundary agreements have

adopted a similar basin approach. For instance, at the bilateral level, the 1998 Luso-Spanish River Basin Convention covers all transboundary waters between Portugal and Spain. At the basin level, Article 1 of the 2002 Sava Framework Agreement provides a definition of "transboundary impact" as "any adverse effect on the river environment resulting from a change in the water regime, caused by human activity and stretching out beyond an area under the jurisdiction of a Party, and which change may affect life and property, safety of facilities, and the aquatic ecosystem concerned." It is worth noting that the Sava Agreement places a lower impact threshold on harm than the 1992 Helsinki Convention by not requiring that the adverse effect be significant.

The 1994 Agreements in the Rhine basin on the Meuse and Scheldt rivers were also inspired by the 1992 Helsinki Convention. Article 1 of the Meuse agreements defines not only the Meuse but also the Meuse River basin and the Meuse drainage area; the Meuse being defined as the river and the Meuse River basin as the river and "the waterways and canals which directly or indirectly, run into it." Furthermore, the Meuse drainage area is defined as "the area, the waters of which run into the Meuse or its tributaries."



Mute swans in canal fed by Soestwetering stream, Salland, Overijssel, the Netherlands. Photo credit: Rhh, via Wikimedia Commons.

The 1994 Danube Convention uses the term “catchment area” to describe the geographical scope of the agreement, which covers “the hydrological river basin as far as it is shared by the contracting Parties.” Finally, the 1998 Rhine Convention is worth considering given its very precise definition of the geographic scope of the agreement in Articles 1 and 2. The scope of this convention is stipulated to cover the Rhine, the groundwater interacting with the Rhine, the aquatic and terrestrial environments interacting with the Rhine, and for the purposes of flood management and pollution control, the entire Rhine catchment area. The Rhine is defined in Article 1 as “the outlet of Lake Untersee and in the Netherlands the branches Bovenrijn, Bijlands Kanaal, Pannerdensch Kanaal, IJssel, Nederrijn, Lek, Waal, Boven-Merwede, Beneden-Merwede, Noord, Oude Maas, Nieuwe Maas and Scheur and the Nieuwe Waterweg as far as the base line as defined in Article 5 in connection with Article 11 of the UN Convention on the Law of the Sea, the Ketelmeer and the IJsselmeer.”

In sum, a survey of European agreements relating to transboundary waters shows that a common trend towards adopting a drainage basin-wide approach to the joint management of transboundary waters exists in Europe. Further-

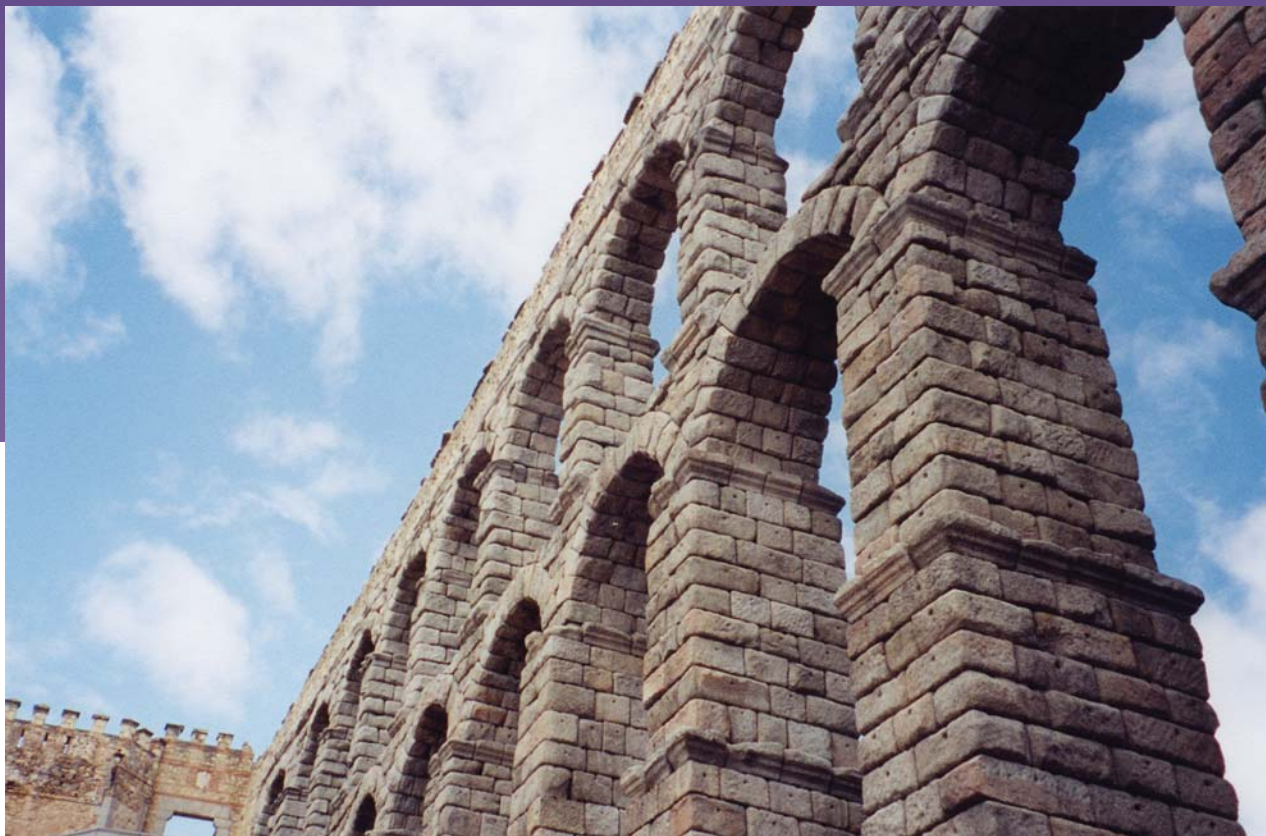
more, the 1992 Helsinki Convention and the EU WFD have been instrumental in influencing the development of such an approach.

4.2 SUBSTANTIVE WATER RIGHTS AND OBLIGATIONS

Generally speaking, substantive rules define the rights and duties incumbent on the subjects of international law. In the context of transboundary waters such rules refer to the rights and obligations that exist to reconcile competing interests between the users and uses of transboundary waters; the most pertinent competing interests being water for domestic, industrial and agricultural purposes, human health issues, hydropower production, flood management, regulation, fisheries, navigation, and the protection of ecosystems.

4.2.1 Equitable and Reasonable Utilisation of Transboundary Water

The substantive rule of equitable and reasonable use is widely considered to be a rule of customary international law and thus binding for all countries (ICJ, 1997). Therefore, it can be



The ancient Roman aqueduct of Segovia, Spain. Photo credit: Sandra Arbogast.

maintained that European countries are under an obligation to ensure that they utilise their international watercourses in an equitable and reasonable manner. The primary substantive rules of international water law are contained in Part II of the 1997 UN Watercourses Convention (1997 UNWC). More specifically, Article 5 of this convention provides that “Watercourse States shall in their respective territories utilise an international watercourse in an equitable and reasonable manner” (UNWC, 1997). While the implementation of equitable and reasonable utilisation will depend on the factors and circumstances of a particular case, in reconciling their competing interests, countries must take into account all relevant factors and circumstances (IWLRI, 2005).

The rule of equitable and reasonable utilisation can be found in numerous international agreements relating to Europe’s transboundary waters. At the Europe-wide level, Article 2(1)(c) of the 1992 Helsinki Convention mandates all contracting parties “to ensure that transboundary waters are used in a reasonable and equitable way.” Similarly, at the basin level, Article 7(1) of the 2002 Sava Framework

Agreement provides that the parties shall be entitled to “a reasonable and equitable share of the beneficial uses of the Sava River Basin water resources.”

Another important legal construct closely linked to equitable and reasonable use of transboundary waters is that of no significant harm. Article 7(1) of the 1997 UN Watercourses Convention provides that “Watercourse States shall, in utilising an international watercourse in their territories, *take all appropriate measures*, to prevent the causing of significant harm to other watercourse States” [emphasis added]. This obligation, considered to be reflective of customary international law, is an obligation of conduct rather than an end-result objective. Therefore, countries’ obligation is not to prevent significant harm *per se* but rather to take all appropriate measures to prevent such harm. If, having taken all the appropriate measures, significant harm nevertheless results, a country will not necessarily have breached this obligation. The “appropriate” measures to be taken would appear to imply a minimum level of legal, administrative, and technical measures to prevent significant harm. Such measures might include

setting emission limits, licensing and permits for waste water discharges based on best available technology, establishing water quantity and quality standards, and ensuring effective monitoring and assessment.

The duty to take all appropriate measures to prevent significant harm is supported both explicitly and implicitly in numerous European transboundary water agreements. For example, Article 5 of the 2002 Sava Framework Agreement stipulates that the contracting parties shall “take all appropriate measures to prevent causing significant harm to other Part[ies].” It can be maintained that the notion of transboundary impact that is contained in various European agreements complements the obligation of no significant harm, and perhaps even imposes a higher standard on countries utilising their transboundary waters. As noted above, the regional 1992 Helsinki Convention places contracting parties under an obligation to “take all appropriate measures to prevent, control and reduce any transboundary impact.”¹

4.2.2 Sustainable Use and the Protection of Aquatic Ecosystems

The previous sub-sections demonstrated that under treaties and customary law, European countries are obligated to ensure that their transboundary waters are utilised in an equitable and reasonable manner. Furthermore, in many cases countries must take appropriate measures to prevent, limit, and reduce transboundary impact. In addition, European countries must adhere to certain rules designed to reconcile competing interests between countries. A question that remains unanswered is whether or not countries are also obligated to balance their economic and social uses with “silent users,” such as the aquatic environment.

Since the 1970s, a discernable shift towards protecting transboundary watercourse *per se*,

regardless of harm being caused by one country or another, has occurred in Europe; most notably following the 1972 Stockholm Declaration on the Human Environment as well as after the 1992 Rio Declaration on Environment and Development. This shift reflects the increased awareness of the need to cooperate over environmental matters (UNEP, 2002). Increasingly, new rules are being developed that require greater cooperation between countries to ensure that not only competing interests between countries are reconciled but also that economic and social uses do not threaten the long-term viability of international basins. At the regional level, the 2000 EU WFD and the 1992 Helsinki Convention serve as clear examples of this trend. The 2000 EU Water WFD sets out its purpose as including the promotion of sustainable water use based on a long-term protection of available water resources. One of the main means of protecting the long-term viability of EU water resources is to mandate that member countries



Wetland restoration, Laguna de Nava, Spain. Photo credit: Sandra Arbogast.

¹The transboundary impact approach has been transposed into many bilateral and basin specific agreement in Europe, including the 1994 Danube Convention, the 1998 Luso-Spanish Convention, the 2001 Agreement between Belarus and Ukraine on the Common Use and Protection of Transboundary Waters and the 2002 Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rations Utilisation of Transboundary Water Resources.

must achieve *good water status* with regards to surface water and groundwater usage by 2015 at the latest, subject to a number of exceptions; good water status is essentially defined as the rate at which the resource is utilised at a sustainable level (Rieu-Clarke, 2004).

Furthermore, the 2000 EU WFD and its supporting legislation requires member countries to adopt a combined approach to point and diffuse sources of pollution whereby a combination of emission controls, emission limit values, and best environmental practices are adopted. In addition, member countries are required to ensure that by 2010 water pricing policies provide adequate incentives for users to utilize water resources efficiently, and that there is an “adequate contribution” of the different water uses to the recovery of the costs of water services taking into account the polluter pays principle.

Following the 1992 Helsinki Convention, contracting parties are obligated to take all appropriate measures “to ensure that transboundary waters are used with the aim of ecologically sound and rational water management, conservation of water resources and environmental protection.” Moreover, contracting parties must take all appropriate measures “to ensure conservation and, where necessary, restoration of ecosystems.” The convention goes further to urge that “sustainable water-resources management, including the application of the ecosystems approach, is promoted.”



Trio of basking turtles, pond in Paris, France. Photo credit: Emily Thomas and Michael Martin.

At the bilateral and basin level a number of more recent agreements recognise the need to protect the long-term viability of transboundary waters. Article 1 of the 1997 Russia-Estonia Agreement sets the primary goal of the agreement as being the “organization of cooperation between the Parties in the field of protection and sustainable use of transboundary waters and their ecosystems.” The contracting parties are to “co-operate with the aim to provide ecologically sustainable management of the use of water resources of transboundary waters and their preservation in the interests of the population and sustainable development.” More specifically, the parties are obligated to:

- cooperate in the development of norms, methods of assessment, and classification of water quality
- adopt the necessary measures to prevent and diminish discharge of polluting substances
- establish effective sewage treatment plants and water saving production technologies
- guarantee the maintenance of hydrotechnological and water protection equipment
- desist from activities or inactivity that may cause deterioration of transboundary water bodies and their ecosystems (among other requirements).

Under the 2002 Russia-Belarus Agreement, the involved parties agreed to refrain from actions or inactions that might result in the deterioration of hydrological and hydro-chemical regimes of transboundary waters. Similarly, under the 1998 Rhine Convention contracting parties agree to pursue the goal of sustainable development of the Rhine River basin, which, under Article 3, includes “ensuring an ecologically sound and rational management of water resources.” Following this obligation, contracting parties have agreed to the following:

- discharge of wastewater is subject to prior discharge consent
- the discharge of hazardous substances is gradually reduced
- regulations will, as far as possible, reduce the danger of pollution due to



Tour boat on canal in Brugge, Belgium. Photo credit: Roger Admiral.

incidents or accidents and emergency measures are taken

- technical intervention that is liable to considerably affect the Rhine ecosystem is subject to prior consent.

The 2002 Sava Framework Agreement adopts a similar goal of sustainable water management under Article 2. Following the goal of sustainable water management contracting parties are obligated to ensure sufficient water quality and quantity for the preservation, protection, and improvement of the aquatic environment. Interestingly, Article 1 of the 1998 Luso-Spanish Agreement, which precedes the Sava Agreement, goes one step further by providing a definition of sustainable use as being, “the use that allows the present generations to satisfy their needs without compromising the possibility of future generations satisfying their own needs.” Under Article 15 of the Luso-Spanish agreement, the parties mutually recognise their right to the sustainable use of the water resources in the Luso-Spanish river basins

and their “duty to protect them, as well as to apply, in their territory, measures for the prevention, elimination, mitigation and control of transboundary impacts.”

4.3 PROCEDURAL RULES AND MECHANISMS FOR DISPUTE AVOIDANCE AND COMPLIANCE

Procedural rules and mechanisms provide the means by which substantive rules are implemented and changes in a transboundary water regime are both recognised and reconciled with existing uses. A range of procedural rules and mechanisms relevant to transboundary water resources exist in Europe. This section identifies the major trends in procedural rules and mechanisms throughout Europe, focusing on the exchange of information, prior notification, and consultation of planned activities, environmental impact assessments, monitoring and reporting, public participation, and compliance strategies.

4.3.1 Exchange of Data and Information

An obligation for countries to exchange data and information relating to the conditions and use of transboundary waters is evident in many legal agreements throughout Europe. Under Article 13 of the 1992 Helsinki Convention riparian parties must exchange reasonable available data on matters including:

- national regulations
- environmental conditions of transboundary waters
- experience gained in the application and operation of best available technology
- results of research and development
- emission and monitoring data
- measures taken and planned to be taken to prevent, control and reduce transboundary impact
- permits or regulations for wastewater discharges issued by the competent authority or appropriate body.

The EU WFD also contains a number of provisions relating to the exchange of data and information between member countries. In particular, under Article 15 of this directive, member countries must send copies of their river management plans—as well as subsequent updates and linked drought and flood management plans—to the European Commission and any other member countries concerned. This is an obligation both on national and international river basin districts. Furthermore, the River Basin Management plan that should be published by 2009 will include a general description of the river basin district, a summary of the pressures and impacts of human activity on the status of waters in the basin, a map of monitoring networks, an economic analysis of water use, a programme of measures adopted in order to comply with EU water law and policy, and a summary the measures taken for public information and consultation. At the bilateral level, Article 5 of the 1998 Luso-Spanish Convention requires countries to “proceed, on a regular and systematic basis ... to the exchange

of available information on matters governed by the convention and on data and records pertaining to them.” Relevant information includes matters relating to the management of the waters of river basins and activities that may cause transboundary impacts. As this convention requires the parties to exchange such information through a bi-lateral commission, it illustrates an important coordinating role that can be undertaken by joint commissions.

A similar role is adopted by a different commission established under the auspices of the 1994 Meuse Agreement among riparian countries in this sub-basin of the Rhine. Among the tasks of the commission is the obligation to define, collect, and evaluate data, as well as exchange information that each party must provide about its respective territory; this serves to identify sources of pollution that may have significant impact on the quality of the Meuse. The commission must also exchange information about the policies of the contracting parties in the field of water management, projects that are subject to impact assessment, best available technologies, and national and regional alert networks. Similarly, pursuant to the 2002 Russia-Belarus Agreement, contracting parties must regularly exchange information on the state of transboundary water resources and the sources of their pollution.

A number of agreements relating to transboundary waters require that information be exchanged when an imminent threat to transboundary waters exists. For example, the 1992 Helsinki Convention requires riparian parties to, without delay, “inform each other about any critical situation that may have transboundary impact.” In addition, riparian parties are obligated to set up, where appropriate, coordinated or joint warning and alarm systems. For instance, in the 2002 Russia-Belarus Agreement the parties agreed to create joint systems for communications, notifications, and signaling of emergency situations, and cooperate in the early assessment and forecasting of such situations. Such an approach is adopted in a large number of other European countries with transboundary water, particularly in transboundary areas that are prone to flooding



Boaters on the Lahn River (Rhine basin), at Weilburg, in Hesse, Germany. Photo credit: Bryan Pendergrass.

such as the Danube, the Rhine, the Elbe, and the Oder river basins.

4.3.2 Notification of Planned Measures

Under customary international law, countries must give prior notification of planned measures influencing a waterway that may have major negative impacts on another country's water; this obligation finds expression in Article 12 of the 1997 UN Watercourses Convention. Such notification must be accompanied by appropriate data and information, including any environmental impact assessment, in order for all the notified countries to evaluate the possible effects of the planned measures. A similar approach is adopted by Article 10(2)(h) in the 1992 Helsinki Convention that requires countries to exchange information on existing and planned uses of water and related installations that are likely to cause transboundary impact. In addition, the 1992 Helsinki Convention mandates riparian parties to enter into consultations on the basis of reciprocity, good faith, and good neighbourliness.

Numerous bilateral and basin specific agreements provide for notification of planned

measures as a proactive tool to prevent conflicts. Article 7 of the 2002 Russia-Belarus Agreement obligates a party to notify the other party of any planned measures likely to cause a transboundary impact as well as to provide all relevant data and information. The notified party then has a six month period to evaluate the planned measures. The agreement also entails that the parties enter into consultations over the planned measures upon the request of the notified party. Similarly, under Article 8 of the 1998 Luso-Spanish Basin Convention, a party considering a project or activity that may cause transboundary impact must notify the other party and provide all relevant data and information. In addition, this convention provides that a party considering a project to cause or potentially cause transboundary impact (and has not been notified of the plans) the right to request the necessary information from the other party in order to evaluate the plans. Furthermore, this convention obliges countries to enter into consultations through a joint commission established under the agreement when there is sufficient evidence that a project or activity causes or may cause a transboundary impact. As the latter agreement provides a forum through which parties can hopefully resolve disputes at an early



Diversion dam on the Douro River near Palencia, Spain. Photo credit: Roger Admiral.

stage, it highlights a further important role of joint commissions.

4.3.3 Environmental Impact Assessment

The mandates of a number of international agreements relating to transboundary waters throughout Europe to conduct environmental impact assessments is closely linked to the duty to notify countries of planned measures. For example, Article 3(1) of the 1992 Helsinki Convention provides that “to prevent, control and reduce transboundary impact, the Parties shall develop, adopt, implement and, as far as possible, render compatible relevant legal, administrative, economic, financial and technical measures, in order to ensure, *inter alia*, that environmental impact assessment and other means of assessment are applied.” This convention goes on to state that one of the tasks of transboundary basin commissions is “to participate in the implementation of environmental impact assessments relating to

transboundary waters, in line with supranational and international regulations or other procedures for evaluation and assessment of environmental effects.”

The most pertinent supranational and international regulations within the European context that relate to environmental impact assessments are the 1991 UNECE Convention on environmental impact assessment in the transboundary context, and the amended 1985 EU directive on the effects of certain public and private projects on the environment that has been subsequently amended in 1997 and 2003. Most UNECE member countries have signed the 1991 UNECE convention that requires them to establish an environmental impact assessment prior to a decision to authorise or undertake certain activities that are likely to cause significant adverse transboundary impacts.² While national environmental impact assessment procedures were in place for many UNECE countries prior to the implementation of the convention, this regional instrument has made significant progress

in harmonising environmental impact assessments at the national and international levels. The 1991 UNECE Convention has recently been supplemented by the 2003 protocol on strategic assessment, which, once in force, will require contracting parties to evaluate the environmental consequences of official draft plans and programmes.

The 1985 EU directive on the effects of certain public and private projects on the environment obliges member countries to “adopt all measures necessary to ensure that before consent is given, projects likely to have significant effects on the environment ... are made subject to a requirement for development consent and an assessment with regard to their effects.”³ Following this directive, the environmental impact assessment shall identify, describe, and assess (in an appropriate manner) direct and indirect effects of a project on human beings, fauna and flora, soil, water air, climate and the landscape, and material assets as well as the cultural heritage. A similar approach was taken in the 1991 UNECE Convention and Protocol, where the EU adopted the Directive 2001/42/EC in June of 2001, which requires member countries to conduct environmental assessments for certain plans and programmes.

Within the transboundary waters context a number of agreements require the contracting parties to carry out environmental impact assessments. For example, Article 8(5)(f) of the 1994 Danube Convention obligates the contracting parties to ensure that “environmental impact assessment in line with supranational and international regulations or other procedures for evaluation and assessment of environmental effects are applied.” This convention links the latter provision to the more detailed EU and UNECE legislation relating to environmental impact assessments. A further example is Article 6

of the 2002 Russia-Belarus Agreement whereby the parties are similarly obligated to conduct environmental impact assessments for planned activities that may cause transboundary impacts.

4.3.4 Monitoring and Assessment

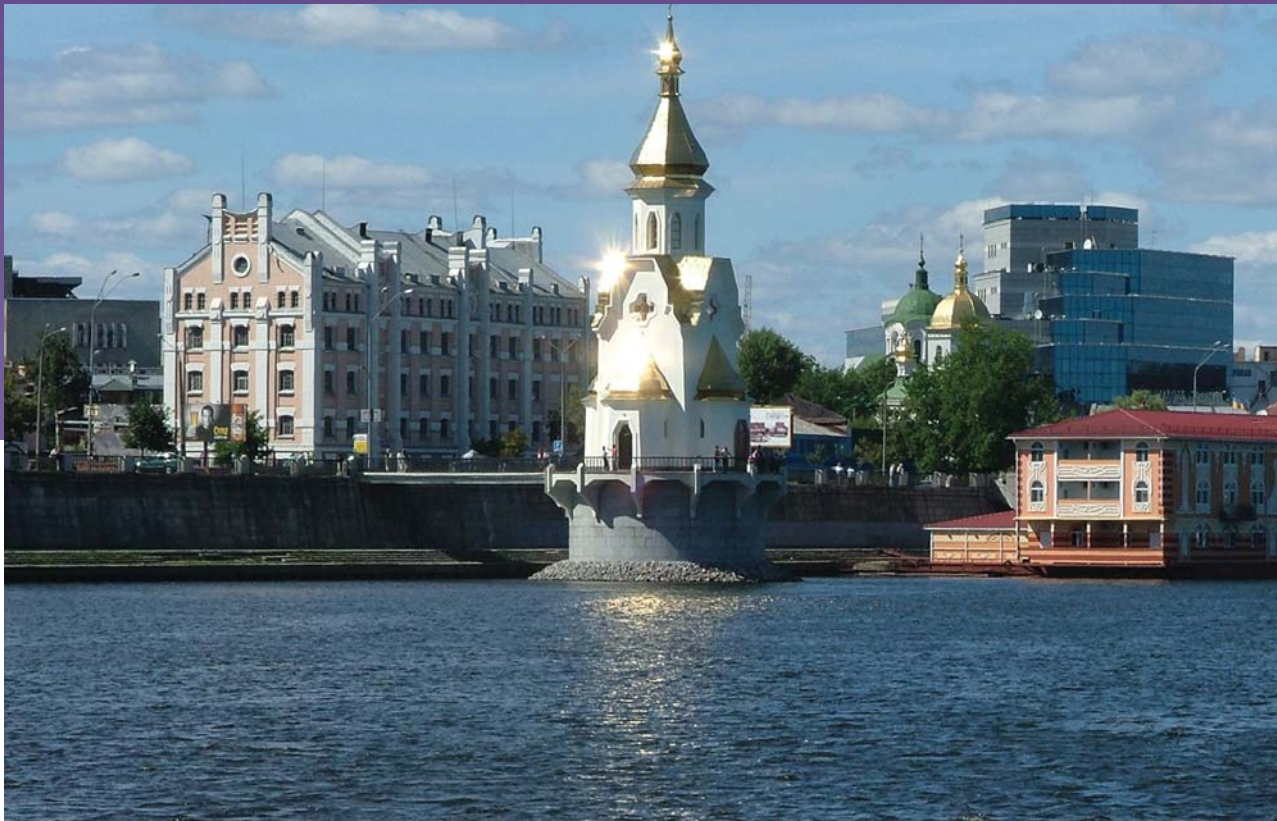
The provision for monitoring and assessing the conditions of transboundary waters in general is closely linked to the procedural requirements outlined above. Such a procedure is vital in order to evaluate whether the substantive rules are being implemented, and if not, what additional measures need to be undertaken. In many Eastern European and South-Eastern European countries water monitoring networks are deficient. While relatively well established monitoring networks existed during the Soviet Era, the break of the union and the resultant economic difficulties have led to a degrading of monitoring infrastructure (UNECE, 2003). Similar problems exist in the Balkans where there has been a lack of public funds to maintain and operate existing networks following the ethnic conflicts in the region.

The UNECE Helsinki Convention is an instrumental legal framework for transboundary water management in Europe; its significance is primarily due to its unique approach to setting up regional monitoring guidelines that have had a positive impact within Central and Eastern Europe. For instance, under Article 11 of the 1992 Helsinki Convention, riparian parties are required to establish and implement joint programmes for monitoring the conditions of transboundary waters, which should include floods and ice drifts. In addition, the riparian parties are to agree upon pollution parameters and pollutants that be monitored in terms of discharges and concentration in transboundary waters. Furthermore, the riparian parties must carry out joint or coordinated assessments of the conditions of the transboundary waters at regular intervals.

Despite its success, problems with the implementation of the 1992 Helsinki Convention occurred in a number of basins throughout the UNECE. While some countries such as the Czech

² The list of activities include thermal and nuclear power stations, construction of transport infrastructure, ports for inland-waterway traffic, waste disposal installations, large dams and reservoirs, groundwater extraction exceeding 10 million m³, pulp and paper manufacturing, major mining, and the deforestation of large areas.

³ A number of countries have failed to fully implement the requirements of this directive into national legislation, including Germany, Ireland, the United Kingdom, and Spain.



Port of Kiev, capital city of Ukraine, on the Dnieper River. Photo credit: Shliahov, via Wikimedia Commons.

Republic, Hungary, Poland, Romania, and Slovakia had an established practice of collecting and storing huge amounts of water monitoring data, the countries did not translate the data into useful, policy relevant information (UNECE 2003). Therefore, following the adoption of the 1992 Helsinki Convention, the UNECE developed guidelines for monitoring the quality of transboundary waters. These guidelines were revised in 1999, and adopted by the meeting of the parties at the convention in March 2000 (UNECE, 2000b). In 2000 and 2003 respectively, the UNECE also supplemented the guidelines on transboundary rivers with additional guidelines relating to transboundary groundwater and lakes. However, as noted above, in some Eastern European countries there remains a general lack of monitoring of water quality and quantity.

An example of a project that supports the implementation of the 1992 Helsinki Convention, and more particularly the provisions relating to the joint assessment of water quality, is the 2002–2004 EU Tacis Project (supported by the UNECE) that focused on the Pripjat, a major tributary of the Dnieper River. More specifically, the project involved the monitoring of four international

ivers, the Kura (Turkey, Georgia, Azerbaijan and Armenia), the Seversky-Donetz (Ukraine, Russia), and the Tobol (Kazakhstan, Russia). Attention had also been paid to ensuring that the guidelines of this project were consistent with the 2000 EU WFD. Key objectives of the project included demonstrating the application of the UNECE guidelines on monitoring and assessment; promoting and assisting monitoring services in Georgia, Armenia, Azerbaijan, Ukraine, Russia, Kazakhstan, and Belarus; evaluating and recommending improvements to the guidelines; training managerial and technical staff on modern systems for monitoring and assessing water quality; and developing competent local experts to produce draft river basin plans for the Pripjat River.

Provisions related to monitoring are also contained in the 2000 EU WFD, wherein member countries must establish programmes for monitoring the status of surface water and groundwater within each river basin district. The monitoring information required for both surface water and groundwater is contained in Article V of the directive. EU member countries developed a common methodology for the monitoring of EU waters (EU, 2004).

At the bilateral or basin level some agreements call for the establishment of joint monitoring systems while others merely require the parties to engage in monitoring and exchanging of information. For example, according to Article 9 of the 1994 Danube Convention, contracting parties are obligated to harmonise their monitoring and assessment methods and develop concerted or joint monitoring systems. Following this obligation, the International Commission for the Protection of the Danube has developed the Trans-National Monitoring Network for the Danube (ICPDR, 2005). In contrast, under the 1997 Estonia-Russia Agreement contracting parties must only monitor the state of transboundary waters, to predict possible changes, and make such data accessible to both parties.

4.3.5 Public Participation

Public participation in the management of transboundary waters provides an effective mechanism for avoiding disputes by improving the quality and implementation of decisions and building public awareness about issues related to

transboundary waters. In Western Europe demand for water-related data is high, with various reports being widely available to the public and decision-makers (UNECE 2003). In Eastern Europe demand for, and access to, information relating to water resources is still relatively low (UNECE, 2003). However, the introduction of a number of regional instruments has improved the situation. For instance, under Article 16(1) of the 1992 Helsinki Convention, riparian parties are required to ensure that “information concerning the conditions of the transboundary waters, measures taken or planned to be taken to prevent, control and reduce transboundary impact, and the effectiveness of those measures, is made available to the public.” Furthermore, the UNECE has developed a guidance document on public participation (UNECE, 2000a). Similarly, the 1999 UNECE Protocol on Water and Health requires contracting parties to provide the public with a variety of information, including the establishment of water management plans and protection against water-related diseases. In addition to the above water-related agreements, the UNECE has also adopted the 1998 Aarhus Convention that ensures the rights of access to



Water conservation display at natural resources interpretive center near Segovia, Spain. Photo credit: Sandra Arbogast.

information, public participation in decision-making, and access to justice in environmental matters (UNECE, 1998).

Public participation is also encouraged under Article 14 of the 2000 EU WFD, as member countries must foster the active involvement of all interested parties in the implementation of this directive. More specifically, member countries must encourage public participation in the production, review, and updating of the river basin management plans. In addition, for each river basin district, member countries are required to publish, make a timetable, and a work programme for the production plan as well as a statement of consultation measures, an interim overview of the significant water management issues, and the provision of draft copies of the river basin management plan (to be made available for comments to the public). The EU WFD is also supplemented by two EU directives; one relating to public participation and access to justice, and the other relating to public access to environmental information (EU 2003, EU 2003a). Both directives seek to implement the provisions of the 1998 UNECE Aarhus Convention.



Watching container cranes loading cargo, Rhine River at Dusseldorf, Germany. Photo credit: Richard Hermann.

Given the influence of regional agreements at the bilateral and basin levels, an increasing number of agreements address public participation. For instance, Article 14 of the Danube Convention requires that the contracting parties ensure that competent authorities make information concerning the state or quality of the aquatic environment in the Danube basin available. In addition, the contracting parties are obligated to make periodic assessments of the Danube's water quality and to provide information to the public (through appropriate publications) regarding the progress made by their measures taken to implement the objectives of the convention. Furthermore, following the convention as well as the requirements of the EU WFD, the International Commission for the Protection of the Danube has adopted a strategy for public participation in river basin management planning (ICPDR, 2003).

Another example of public participation is Article 9 of the 2002 Russia-Belarus Agreement that requires the parties to ensure the right of local authorities and public to access information and be able to participate in the decision-making procedures in matters related to the utilisation and protection of transboundary water resources. A similar provision can be found in Article 12 of the Estonia-Russia agreement that requires parties to guarantee publicity of the discussion of issues covered by the agreement and involve local self-government entities and the public in the decision making process.

4.3.6 Compliance Strategy

A recent trend in international cooperative arrangements for transboundary waters is the introduction of compliance strategies that focus on establishing a mechanism for verifying whether or not countries have implemented and complied with their treaty commitments. In addition, these strategies may adopt non-adversarial and non-judicial methods to assist countries in complying with their international obligations. Therefore, a compliance strategy seeks to avoid traditional options such as treaty suspension or termination. Assigning liability and responsibility may be ineffective given that there



Hydroelectric power plant on the Sava River, at the town of Moste, in Slovenia. Photo credit: Ziga Koselj, Slovenia, via Wikimedia Commons.

might be justifiable reasons for non-compliance, such as ambiguity and indeterminacy of treaty language, or deficiencies in administrative, technical or economic infrastructure. Laying blame in such circumstances will not solve the issue and could prove counter-productive to long-term cooperation. For instance, the Gabčíkovo-Nagymaros Dam Dispute between Hungary and Slovakia is a case in point. Work on this system of dams commenced in 1978; however, due to intense criticism of the project in Hungary, the Hungarian Government suspended work in 1989. To date, no mutually agreeable solution has been sought despite various forms of negotiation, mediation, and a decision of the International Court of Justice in 1997.

At the regional level, the 1999 UNECE protocol on water and health obligates contracting parties to set targets and dates, review and assess progress as well as review the compliance of the involved parties. This protocol goes further by requesting the contracting parties

to establish “arrangements of a non-confrontational, non-judicial and consultative nature for reviewing compliance,” which should allow for appropriate public involvement. Therefore, the role of public participation in assessing compliance is recognised within the agreement.

Pursuant to the requirements of the above protocol, the UNECE has drafted a compliance review mechanism (UNECE, 2004). The mechanism proposes that a compliance committee made up of nine independent experts meet annually. The function of the committee will be to review submissions of non-compliance from countries, the public, or the secretariat. Where a case of non-compliance is identified, various powers will be available to the committee, including providing financial and technical assistance, issuing cautions and declarations of non-compliance, publicising cases of non-compliance, and suspending special rights and privileges accorded to contracting parties under

the protocol. While the committee is in its infancy, it represents an important shift towards developing mechanisms that ensure international agreements are effectively implemented.

At the basin level, only a few international watercourse agreements contain provisions relating to compliance. An example is the 2002 Sava Framework Agreement that, under Article 21, requires parties to agree and establish a methodology for the permanent monitoring of how the agreement as well as related activities are being implemented. A stipulation of such a compliance mandate is providing stakeholders and the general public with access to relevant information.

Several international agreements within Europe make joint institutions responsible for monitoring the implementation of agreements. The 1998 Rhine Convention, for example, provides that contracting parties must regularly report to the Rhine Commission, “on legislative, regulatory or other measures taken with a view to implementing the rules of the Convention and the decisions of the Commission.”



Biking along the Rhine River at Bacharach in the Mainz-Bingen district in Rhineland-Palatinate, Germany. Photo credit: Bryan Pendergrass.

Furthermore, the Rhine Commission has also defined water quality objectives with a joint monitoring programme that provides the basis upon which periodic evaluations of water quality are conducted (UNECE, 2003b). Likewise, the 1994 Danube Convention obligates contracting parties to report to the International Danube Commission on matters relating to the implementation of the convention. However, to date, the assessment of the effectiveness of measures taken pursuant to international basin agreements is relatively weak (UNECE, 2003).

4.4 DISPUTE RESOLUTION

In general, countries implement international agreements without serious problems arising. If the range of mechanisms identified in the previous sub-sections (i.e., the exchange of information, monitoring and assessment, public participation and compliance strategies) have been implemented at the basin level, the likelihood of a dispute arising is minimised. However, a mechanism must be in place to deal with the minority of cases where a legal dispute over the management of transboundary waters occurs. Under international law, countries must resolve disputes in a peaceful manner. Most agreements relating to transboundary waters in Europe follow the UN Charter that requires countries to initially resolve their disputes through negotiation and other diplomatic means (Vinogradov, 2003). For instance, according to the 2002 Sava Framework Agreement a solution to a dispute between two or more parties about the interpretation or implementation of the agreement shall initially be sought by negotiation; failing negotiation, upon request of one of the parties, they may jointly seek mediation or conciliation from a third party, or they may refer the dispute to arbitration. If, within six months from submitting a request, the concerned parties are unable to resolve the dispute, then any party may request an independent fact-finding expert committee to be established.

Similarly, under the 1992 Helsinki Convention, the member countries have discretion over which dispute resolution method



Brewery, Brugge, Belgium. Photo credit: Sandra Arbogast.

they employ, including negotiations, “or any other means of dispute settlement” acceptable to them. However, arbitration and judicial settlement through the International Court of Justice are provided for under this convention only if the contracting parties consent to it.

Disputes arising pursuant to EU water law are decided by the European Court of Justice. The court has the power to settle legal disputes between member countries, EU institutions, businesses, and individuals. Both the European Commission and other member countries can initiate proceedings against member countries for failing to fulfil their obligations under EU water law. If, after investigation the court finds a member country at fault, then that country is obligated to remedy the situation. There have been over 45 cases before the EU Court of Justice due to the failure of various member countries to fulfil the requirements of the EU WFD in the last 25 years. Most cases have been launched by the EU Commission against a range of member countries, including Denmark, Germany, Greece, France, Ireland, Italy, Portugal, Spain, Sweden, and the Netherlands. The most prevalent directives that have not been complied

with are the 1975 Drinking Water Directive, 1976 Dangerous Substances Directive, 1976 Bathing Water Directive, 1980 Directive of Water for Human Consumption, 1991 Nitrates Directive, and 1991 Urban Wastewater Directive.

Besides the EU Court of Justice decisions, a number of disputes concerning transboundary water within Europe have been referred to arbitration by judicial settlement. The 1927 Permanent Court of International Justice heard a case between Belgium and the Netherlands over the diversion of the River Meuse and in 1929 the same court heard a case between Germany, Denmark, France, Great Britain, Sweden, former Czechoslovakia, and Poland concerning the River Oder. In 1957 France and Spain took their dispute over Lake Lanoux and the River Carol to an international arbitral tribunal. More recently, the International Court of Justice heard the dispute between Hungary and Slovakia concerning the Gabčíkovo-Nagymaros Dam system on the Danube. Another recent example is the Permanent Court of Arbitration case between France and the Netherlands decided in March of 2004 that concerned the interpretation and application of a protocol related to the 1976



Pont de Pierre Bridge over the Garonne River at Bordeaux in southwest France. Photo credit: Roger Admiral.

Convention on the protection against pollution by chlorides.

4.5 INSTITUTIONAL ARRANGEMENTS

The above sections have shown that river basin commissions provide an important mechanism by which to ensure that the above substantive and procedural rules are effectively implemented. The main task of such commissions is to act as a forum whereby information can be gathered and assessed, basin-wide decisions made, and the engagement of all stakeholders can be accommodated.

The tasks of joint commissions can vary considerably. A recent UNECE survey concluded that many commissions performed tasks relating to the prevention, control, and reduction of pollution, including identifying pollution sources, inventories, and exchanges of information on pollution sources, establishing joint monitoring programmes, early warning and alarm systems as well as emission limits on waste water (UNECE, 2005). In the case of the Rhine Commission, water quality objectives have been defined,

regularly monitored, and water quality is evaluated against such objectives. Further emission measures are then adopted if water quality objectives are unmet. The UNECE survey also highlights a number of other tasks being undertaken in varying degrees by joint commissions, including the cooperation and exchange of information on the best available technology, the implementation of environmental impact assessment, and acting as a forum for the exchange of information between governments, municipalities, interest groups, and other stakeholders.

The EU WFD requires member countries to coordinate their activities over international river basins. Within the EU around 30% of river basin districts are designated international, accounting for approximately 66% of the total area of river basin districts (Nilsson, 2004); therefore, international river basin districts account for a large percentage of EU waters. Where river basins are shared by member countries, no obligation exists requiring the assignment of a competent authority for the entire river basin; however, member countries may do so if they wish. If member countries choose not to assign a competent international authority to the river basin,



Barges and boats on the River Sava at Belgrade, Serbia. Photo credit: Milan Vatovec.

they are still obliged to ensure that the obligations under the EU WFD are at least coordinated throughout the entire river basin. To date, countries sharing the Danube, Rhine, Elbe, Torne, Oder, Schedlt, and Meuse (both of the latter in the Rhine basin) have agreed that their international river commission will develop joint river basin management plans by 2009 (Nilsson, 2004).

Where river basins extend beyond the borders of the EU, there is no obligation to adopt a river basin approach; however, coordination with non-member countries is encouraged. The influence of the EU WFD can be illustrated by the case of the Danube basin, where all the riparian countries, not just EU member countries, have agreed to implement the EU WFD as an effective mechanism for cooperation in cleaning up the Danube and the Black Sea (Danube, 2001).

Interestingly, under Article 9, the 1992 Helsinki Convention is the only regional transboundary water agreement that requires contracting parties to establish joint bodies. The tasks of such joint bodies include:

- the collection and compilation of data in order to identify pollution sources likely to cause transboundary impact
- elaboration of joint monitoring

programmes concerning water quality and quantity

- drawing up inventories
- exchanging information on pollution sources
- elaboration of emission limits for wastewater
- evaluation of the effectiveness of control programmes
- elaboration of joint water-quality objectives and criteria
- development of concerned action programmes for the reduction of pollution loads from point and diffuse sources
- establishment of warning and alarm procedures
- serving as a forum for the exchange of information on existing and planned uses of water and related installations that are likely to cause transboundary impact
- promotion of cooperation and exchange of information on the best available technology
- participation in the implementation of environmental impacts assessments relating to the transboundary waters.



A cargo ship approaching the Vihreäsaari harbour in Oulu, Finland, while the Bay of Bothnia starts to freeze for the winter Photo credit: Estormiz, via Wikimedia Commons.

A wide variety of joint commissions (Map 7 (A)) for transboundary waters exist throughout Europe, including the commission for the Danube, Dnieper, Elbe, Meuse, and Lake Constance (Rhine), Lake Lemán (Rhône), Oder, Rhine, Saar, Moselle, and Scheldt river basins. Several bilateral commissions have also been set up by countries in order to utilise and protect frontier waters, which include the Finnish-Norwegian transboundary water commission, the Finnish-Russian joint commission on the utilisation of frontier waters, Estonian-Russian joint commission on transboundary waters, and the Luso-Spanish commission.

Many international agreements provide for such joint commissions and stipulate the commission's responsibilities. The International Commission for the Protection of the River Danube (ICPRD), for instance, was set up following the 1994 Danube Agreement. Broadly speaking, the ICPRD oversees the implementation of the convention and enhances cooperation between contracting parties. This commission

consists of delegations from each of the contracting parties, with each party nominating no more than five delegates including a head of delegation and a deputy. The chair of the international commission rotates annually between the contracting parties.⁴

4.6 CONCLUSION

This chapter demonstrated that while international agreements relating to transboundary waters have existed in Europe since before the nineteenth century, disputes between European countries do occur occasionally. However, the chapter also showed that Europe has developed a variety of cooperative frameworks that promote cooperation between European countries and develop mechanisms for dispute avoidance. The analytical framework adopted for this

⁴ The next chapter provides further details on the ICPRD, as well as the commissions established within the Dnieper and Narva Basins.

chapter elucidated that a survey of European agreements relating to transboundary waters points to the fact that a common trend towards adopting a drainage basin approach to the joint management of transboundary waters exists in Europe; with the 1992 Helsinki Convention and the EU WFD being instrumental in influencing the development of such an approach.

With regard to substantive rules, there appears to be a general trend amongst European countries to ensure that their interests in transboundary waters are reconciled in an equitable and reasonable manner; many treaties recognise such an obligation, and even go further by requiring countries to limit transboundary impact. The definition of 'transboundary impact', as contained in the 1992 Helsinki Convention would appear to place countries under a relatively high standard when conducting economic and social activities that may have a negative impact on transboundary waters. Furthermore, there appears to be an increasing movement to adopt rules that ensure that transboundary waters are used in a sustainable manner and that the aquatic and terrestrial environments are protected. Such an approach is particularly evident in the EU WFD and its requirement that, subject to limited exceptions, good water status in all EU waters is achieved by 2015.

This chapter also revealed that a variety of procedural rules and mechanisms have emerged within international agreements. The more established of these rules and mechanisms include the duty to exchange information, prior notification and consultation, and monitoring and assessment. The chapter has also identified emerging trends such as public participation and compliance strategies that seek to ensure that international agreements are implemented in an effective and efficient manner. Central to the success of these measures is the establishment of joint commissions for the management of transboundary waters. Finally, an assessment of practices in Europe has shown that a variety of such commissions exist.



Fountains: Paris, France (top), photo credit: Jame McCauley Thomas; Rome, Italy, photo credit: Keith Davis; and Belgrade, Serbia, photo credit: Milan Vatovec.



*Beacon above Sava River, Serbia.
Photo credit: Milan Votovec.*

CHAPTER 5. HYDROPOLITICAL VULNERABILITY AND RESILIENCE CASE STUDIES

Alistair Rieu-Clarke

Select case studies representing instances of either hydropolitical vulnerability or resilience are discussed below in order to depict the hydropolitical situation in Europe. The hydropolitical vulnerability of the Dnieper, the Danube, and the Narva river basins is discussed below.

5.1 THE DNEIPER (DNIPRO) RIVER BASIN

The Dnieper River basin, or in Ukrainian, Dnipro, is the third largest in Europe (after the Volga and the Danube). Shared between the former Soviet Union countries of Belarus, Russia, and the Ukraine, 33 million people live in the Dnieper basin. The total basin area is 516,300 km² and the river spans 2,200 km in length (see Figure 5.1). This river has a number of transboundary tributaries including the Berezina, Pripjat, Desna, Psel, Vorska, and the Inhulets. The transboundary importance of the river is increased by the fact that the Dnieper empties into the Black Sea; therefore, upstream impacts within the basin affect those countries sharing the Black Sea, i.e., Bulgaria, Georgia, Romania, Russia, Turkey, and Ukraine. The Dnieper is particularly important for Belarus and the Ukraine because around 48% of the Ukraine and 56% of Belarus lie within the basin. Furthermore, both the countries capitals (Kiev, Ukraine, and Minsk, Belarus) are situated within the basin, as is Chernobyl, the site of the 1986 nuclear power plant accident.

In large part due to a legacy of converting a traditionally agricultural region into a mainly industrial one, the Dnieper River has been heavily utilised (UNDP, 2003). Several major dams exist in the basin and 300 hydroelectric plants. Approximately 1,677 km of the river is navigable year-round, except during two months when it is frozen; therefore, it represents a major shipping artery for Eastern Europe.

The countries in the Dnieper basin are relatively poor in terms of GDP per capita, and rely heavily on the water of the Dnieper to improve their economic situation. Major transboundary problems within the basin include intensively farmed areas with a history of over-fertilisation, excessive damming – including six major reservoirs on the main-stem of the river and over 500 smaller dams on the tributaries. Further problems include the draining of wetlands to provide more land for agriculture, large scale and extensive water extraction for agriculture and industry, poorly regulated deposits of tailings from mining complexes – including wastes from uranium mining – as well as industrial accidents, frequent accidental spills of contaminated wastewater, and partial treatment of only 45% of waste waters (UNDP, 2003). In addition, unsustainable practices within the Dnieper basin have resulted in high concentrations of nutrients, biological oxygen demand (BOD), bacteria, heavy metals and toxic organic contaminants leading to very poor water quality.

Despite such threats to the aquatic environment, parts of the Dnieper basin remain unique areas of natural beauty. Approximately 50% of Belarusian territory of the basin is forested; compared to 30%

in Russia and 17% in Ukraine. Wetlands account for around 36% of the basin, of which around 3% are protected. Furthermore, 35 nature reserves exist, of particular interest is the Polessie region in Belarus, which is considered the only remaining floodplain forest within the basin (UNDP, 2003). However, human activities such as land drainage and the construction of reservoirs mean that these areas continue to be depleted; thus, there is an urgent need to improve the environmental conditions of the resources.

In 1999, the Dnipro Basin Environment Programme (implemented by the Global Environment Facility (GEF), and UN Development Programme (UNDP)) led

to a significant shift in direction within the basin. The project is designed to develop a programme of measures and implementation mechanisms to promote sustainable management in the Dnieper basin. The project has been supported by a number of other international organisations, including the UN Industrial Development Organisation, the UN Environment Programme, the International Atomic Energy Agency, and the International Development Research Centre. Key objectives of the programme are to develop a transboundary management regime and coordinating body, as well as to assist countries in the formulation, review and endorsement of a strategic action programme (SAP), improve the financial, legal, and operational mechanisms for

pollution reduction and sustainable resource uses. Further objectives include the formulation of national action plans, improving conservation of biodiversity in the basin, enhancing communication among stakeholders and encouraging public awareness and involvement as well as building capacity in order to implement the SAP (UNDP, 1999).

To date, the project has undertaken a transboundary diagnostic analysis of the Dnieper basin and developed the SAP. The diagnostic identified a number of transboundary socio-economic and environmental issues, including pollution from the Chernobyl disaster, toxic pesticides, herbicides, heavy metals as well as untreated sewage dumped into the river on a

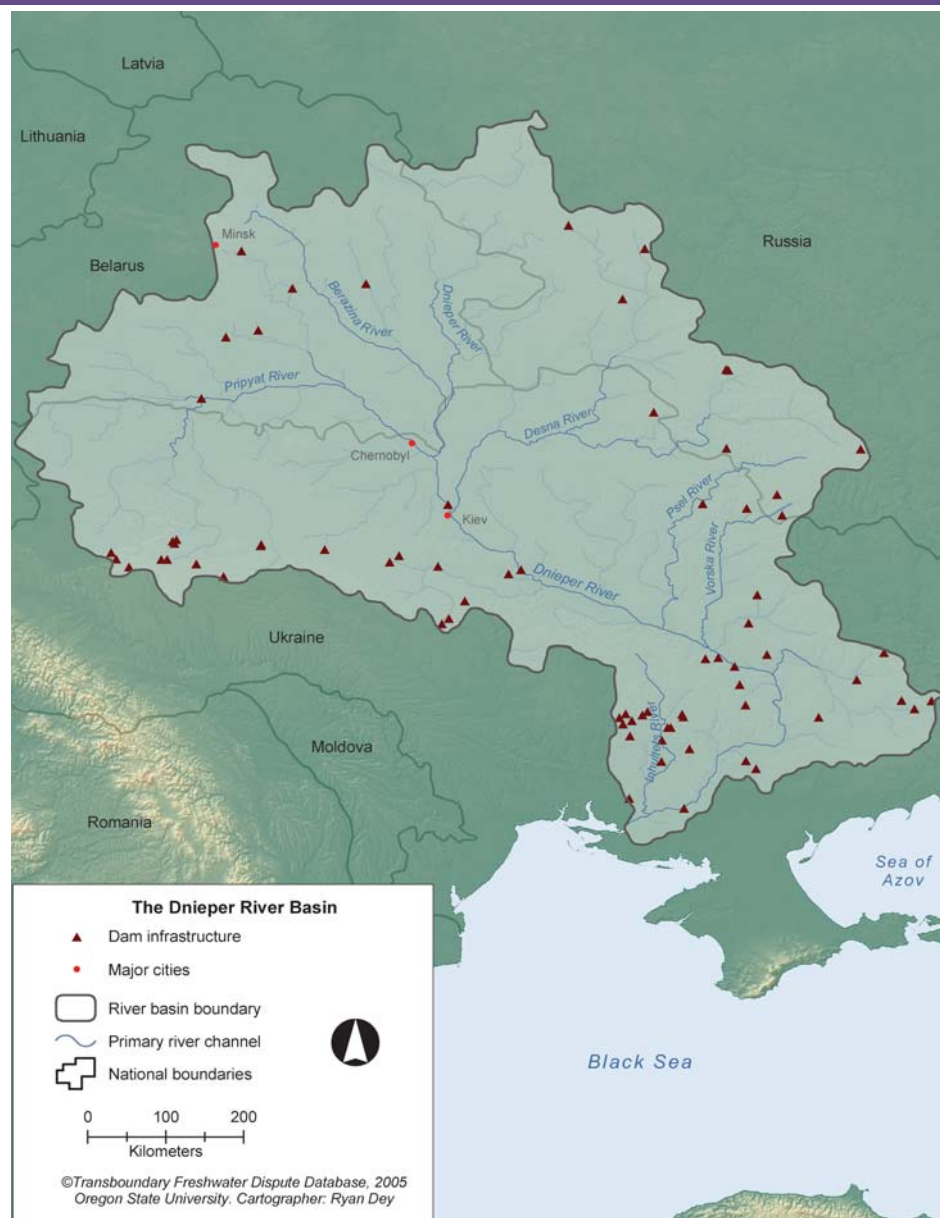


Figure 5.1 The Dnieper (Dnipro) River Basin.



Vop River (tributary of the Dnieper) at Yartsevo, Smolensk Oblast, Russia. Photo credit: Vityaz Red, via Wikimedia Commons.

daily basis. The analysis also identified the institutional, legal and policy issues that need to be addressed, which include developing a basin-wide agreement and joint commission. The production of the draft SAP was the result of a consultative process involving basin countries, the international organisations involved in the Dnieper basin as well as a wider stakeholder forum. The draft SAP includes a strategy for environmental rehabilitation of the Dnieper, proposed financing needs as well as existing financing arrangements, and a legal and institutional framework for the implementation of the SAP.

Adopting the appropriate legal and institutional framework will clearly be central to promoting the joint sustainable management of the Dnieper basin. Currently, the parties are already taking part in a number of international agreements relevant to the Dnieper basin, including the 1992 Helsinki Convention along with subsequent protocols, the 1998 Aarhus Convention on public participation, the 1992 convention on the protection of the Black Sea against pollution, and protocol on protection of the Black Sea marine environment against pollution from land based sources. Furthermore,

Belarus and Russia are parties to the 1998 agreement on the main principles of cooperation in the field of rational use and protection of water resources of the CIS member countries. The 1998 agreement closely follows the rules and principles contained in the 1992 Helsinki Convention, and requires member countries to take measures to cooperate over the joint management of transboundary waters and protect such waters against pollution and unsustainable use as well



Yahotyn Cannery has increased income for both farmers and local residents who now work at the cannery; it is expected to help increase production and expand the market for Ukraine's farmers. Photo credit: Lina Dotsenko, courtesy of USAID.



View of Dnieper River at Kiev, capital of Ukraine. Photo credit: Shliahov, via Wikimedia Commons.

as harmonise the relevant legal, administrative, and technical arrangements—including creating a single system for monitoring transboundary resources and preventing or mitigating the harmful effects of extreme conditions. The agreement also mandates countries to designate competent authorities responsible for the implementation of the agreement, and adopt bilateral and multilateral agreements as necessary. Accordingly, in 2002, Russia and Belarus adopted an agreement in the field of protection and rational utilisation of

transboundary waters, with the objective to “coordinate cooperation of the parties.” This framework agreement requires countries to adopt measures to prevent, limit, and reduce transboundary impacts, such as conducting environmental impact assessments for planned activities, notifying each other of planned measures, and entering into consultations if necessary. Furthermore, the framework requires that countries regularly monitor and exchange information on the transboundary water resources, provide local authorities and the public with access to information, develop and coordinate activities in cases of emergencies, and establish a joint Russian-Belarusian commission for the implementation of the agreement.

A similar agreement was adopted between Belarus and the Ukraine in 2002 on the common use and protection of transboundary waters. In addition, Russia and the Ukraine adopted an agreement on the cooperation of boundary areas. However, to date these countries have not adopted a Dnieper basin-wide agreement, although a draft version exists. The adoption of the latter agreement will be crucial in order to harmonise the various regional and bilateral



Reservoir behind Kachovská Dam, on the Dnipro River in southern Ukraine. Photo credit: Mš, via Wikimedia Commons.



Dnieper Delta near the Black Sea, at Kherson, Ukraine. Photo credit: Uaquantum, via Wikimedia Commons.

legal arrangements and promote the sustainable management of the waters of the Dnieper agreement.

The poor environmental state of the basin as well as the problems related to the provision of good quality drinking water supply and the conservation of the biological diversity of the landscape are highlighted in the preamble of the draft Dnieper agreement. The preamble also recognises that current local, national, and international level efforts are insufficient to ensure the substantial improvement of the environmental state of the Dnieper basin, and that rehabilitation can only be ensured through focused and coordinated action at the international and national level. Interestingly, despite the fact that the Dnieper countries are not EU member countries, the preamble makes reference not only to the bilateral and multilateral agreements (mentioned above) but also to the guiding principles and approaches of the EU WFD.

If implemented, the Dnieper agreement would require the basin countries to implement the SAP for the Dnieper basin in order to achieve sustainable natural use and environmental conservation of the basin. The agreement would

also oblige countries to establish the adequate legal and institutional framework for the international management of the basin, including a sound legislative framework for multi- and bilateral cooperation, enhanced cooperation with international donor agencies in the field of environmental rehabilitation of the Dnieper basin, and the provision of a sufficient framework to encourage and promote public participation in decision-making processes at the national and international level. Furthermore, the draft agreement would require countries to convene a conference with the involved parties as a supreme body responsible for managing the Dnieper basin, and establish the International Dnieper Basin Commission, assisted by a permanent secretariat. A number of related organisations would support the work of the commission, some of which already exist. For example, the International Dnieper Council currently acts as a consultative body to ensure the effective implementation of cooperative arrangements focused on the rehabilitation of the Dnieper basin. Other institutions envisaged include the International Dnieper Basin Thematic Centres and the International Forum of Non-Governmental Organisation.



Danube River from the medieval fortress of Kalemegdan at Belgrade, Serbia. Photo credit: Milan Vatovec.

5.2 THE DANUBE RIVER BASIN

The Danube River basin, encompassing an area of 790,100 km², includes 300 tributaries and spans 2,870 km. Eighteen countries share the waters of the Danube, which is more than in any other basin in the world. The basin includes all of Hungary; almost all of Austria, Romania, Slovenia, Slovakia, Serbia, and Montenegro; significant areas of Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, and Moldova as well as part of Germany and the Ukraine. In addition, Switzerland, Italy, Poland, Albania, and Macedonia share small areas of the Danube basin (less than 2,000 km²; see Figure 5.2). The population of the Danube basin is 81 million people.

Significant environmental, economic, political, and social diversity between the Danube basin countries exists. For instance, the Danube basin includes high alpine zones, large plains, sand dunes, forested and marshy wetlands, and a

unique delta. Such diversity has led the Danube River and its tributaries to become home to a unique mix of habitat and wildlife, with around 2,000 vascular plants and more than 5,000 animal species. The Danube is home to the largest remaining floodplain area in Central Europe, located as the confluence of the Danube and Drava, which is an area of outstanding biodiversity. The floodplain area is shared by



Danube basin wetlands, Serbia. Photo credit: Milan Vatovec.



Figure 5.2 The Danube River Basin.

Hungary, Croatia, Serbia, and Montenegro. The Danube delta, where the Danube discharges into the Black Sea, is a World Heritage site spanning 60,000 hectares, two-thirds of which is seasonally submerged. The delta is Europe's largest remaining natural wetland and one of the continent's most valuable natural habitats.

While the Danube River has played an important role for drinking water supply, industry, transport, energy, tourism, and recreation, the middle and lower reaches of the basin are heavily utilised for agriculture. Industrial use, particularly for mining and energy generation, are especially important in economic terms as they account for a significant share of employment and revenue for the countries of the Danube basin.

The heavy reliance on Danube waters throughout the years has taken its toll on this resource. Over 80% of the Danube has been regulated, with over 700 dams and weirs along its main tributaries. While representing a major

source of income for many people living in the Danube basin, agriculture has had a significant transboundary impact on the waters of the Danube as inappropriate practices have led to degraded water quality and soil erosion, particularly due to pollutants such as fertilisers and pesticides. Furthermore, outdated industrial facilities and inadequate pollution control technologies have caused degradation of the



Fruit stand at outdoor market, Belgrade, Serbia. Photo credit: Milan Vatovec.



Danube River flowing through Budapest, the capital of Hungary. Photo credit: Richard Hermann.

waterways.¹ Such pollution is leading to major problems within the Danube River basin that include excessive nutrients and pollutants, such as cadmium, lead, mercury, DDT, lindane and atrazine, which are disturbing the ecological balance of the Danube River and the Black Sea.

Floods are also a major concern within the Danube basin. For example, the floods of 2002 caused 14.4 billion euro of damage in Germany, Austria, the Czech Republic, and Slovakia. Moreover, the fragility of the Danube's environment is well represented by the Baia Mare cyanide spill in Romania in 2000 that affected the Tisza, one of the main tributaries of the Danube River. Furthermore, the tailing dam burst at Baia Borsa in 2000, which released 20,000 tons of heavy metals into the Novat River, a tributary of the Viseu and Tisza.

In the 1990s the Danube basin countries took significant steps to improve the management of the Danube. In June of 1994, the convention on cooperation for the protection and sustainable use of the Danube River was signed by 11

countries and the EU in Sofia, Bulgaria. The aim of the convention was to initiate sustainable and equitable water management of the Danube River basin, including the conservation, improvement, and rational use of the surface waters and groundwater in the catchment area. Soon after signing the 1994 Danube convention, the parties agreed to adopt an interim strategic action plan for the Danube basin that served as a tool for implementing the provisions of the convention. During these early years, an interim international commission and secretariat was set up that established a joint monitoring system for the Danube.



One of the many volcanic springs in Slovakia, Danube Basin. This one is outside the town of Levoca. Photo credit: Richard Hermann.

¹ Significant polluters include chemical, food, and pulp and paper industries, which have raised the levels of nutrients, heavy metals, and organic micro-pollutants in the river (Danube, 2004).



Danube River flowing through Novi Sad, Serbia. Photo credit: Milan Vatovec.

On October 22nd of 1998, the 1994 Danube Convention entered into force and the International Commission for the Protection of the Danube River (ICPDR) was established. The ICPDR is the main decision-making body established under the convention. This commission is responsible for the implementation of the convention, decision-making, management, and coordination of regional cooperation, approval of the budget and annual work programme, and the joint action programme. The ICPDR is supported by a secretariat, which is also the focal point for information provision about the convention. In addition, a number of expert groups are set up under the convention that reflect its main thematic work areas that include river basin management, ecology, emissions, monitoring laboratory and information management, accident prevention and control as well as flood protection (Danube, 2005).

Since its inception, the ICPDR has proven to be a useful mechanism in fulfilling the objectives of the convention; it has accomplished the following:

- a cooperative strategy for the establishment of the Danube River Basin Management Plan

- cooperated with stakeholder groups to build a common understanding of the Danube
- identified and facilitated funding for 45 projects addressing waste water treatment plants
- set up a network of more than 75 water quality monitoring stations
- developed an emission inventory for pollution originating from municipalities, industry and agriculture
- put into operation a basin-wide accident emergency warning system



Young women on medieval fortress wall overlooking the Danube River, Belgrade, Serbia. Photo credit: Milan Vatovec.



Debris in the water near floating restaurants along the River Sava, Belgrade, Serbia. Photo credit: Milan Vatovec.

- assessed and reduced potential accidental hotspots
- prepared a basin-wide Danube flood action programme.

The ICPDR has also been instrumental in setting the implementation of the EU WFD, including a joint basin management plan, as a goal for *all* Danube Basin countries, not just EU member countries. Parties have agreed to implement the EU WFD as a highest priority (ICPDR, 2001).

Beyond the ICPDR, a major international project focusing on environmental protection and

pollution reduction was implemented in the Danube river basin from 1992 to 2000. The project was supported by UNDP, GEF, and the EU (Phare and Tacis). The international assistance focused on developing appropriate mechanisms and planning tools for implementing the Danube River basin convention and preparing the funding of pollution prevention and reduction activities required to restore both the Danube River basin and the Black Sea. Between the period of 1992 and 2000 the EU Phare and Tacis programmes provided around 27 million USD for the project, and around 12.4 million USD came from UNDP and GEF. The latter project has been supplemented by an ongoing project entitled, Strategic Partnership for Nutrient Reduction in the Danube/Black Sea Basin. The 95 million USD GEF project focuses on supporting the Danube and Black Sea commissions in reducing nutrient and toxic loads to the Black Sea to levels necessary to allow the Black Sea recover to the 1960s conditions. A key component of this project, the Danube Regional Project, seeks to strengthen regional capacity building and technical assistance in cooperation with the ICPDR, and assist all basin countries in adopting the necessary policy, legal, and institutional reforms and enforcement policies.



Water running from a public fountain, downtown Belgrade, Serbia. Photo credit: Milan Vatovec.



Bridge over the Narva River (Estonian-Russian border) between Narva and Ivangorod. Photo credit: Hannu, via Wikimedia Commons.

5.3 THE NARVA RIVER BASIN

The Narva basin, shared between Estonia and Russia spans a total area of 53,000 km², and is 77 km long. The total population of the basin is around one million, with only two large towns,

Pskov (Russia) and Tartu (Estonia) situated in the basin; the majority of the inhabitants live in small settlements.

The basin contains Lake Peipsi, the fourth largest and biggest transboundary lake in Europe (UNESCO, 2003; see Figure 5.3). A number of

wetlands of international significance are also located in the basin. Both the Ramsar Sites of Emajõe Suursoo (Estonia) and Remdovsky (Russia) are home to a variety of globally endangered plants and animal species, such as the corncrake, lesser-spotted eagle and the while-tailed eagle.

Forestry and agriculture represent the main land use practices within the basin; however, an aging population and a



Shoreline of Lake Peipsi at Mustvee, Estonia. Photo credit: Mark A. Wilson (Department of Geology, The College of Wooster), via Wikimedia Commons.

departure of the younger generation to large towns is resulting in a declining economy. More than half the people in the basin do not earn enough to cover their cost of living and a high rate of unemployment exists. Environmental problems are related to the negative impacts of forestry and agriculture, including unsustainable deforestation and non-point-source pollution. A high nutrient content in the basin's river during the 1980s led to a major problem of eutrophication. However, with the dissolution of all collective farms in Estonia and economic depression in Russia in the 1990s, the nutrient load of Lake Peipsi has decreased significantly. It is estimated that nitrogen and phosphorus loads have

decreased by 53% and 44% respectively. The majority of the remaining phosphorus and nitrogen compounds enter Lake Peipsi from the Emajõgi River on the Estonian side and the Velikaya River on the Russian side. The Emajõgi carries biologically treated sewage from Pskov, while the Velikaya transports wastewater from Tartu, which was untreated until 1998. In addition to agricultural uses, Lake Peipsi is also heavily relied upon for commercial fishing, the main commercial fish being lake smelt, perch, pike-perch, ruffe, roach, bream and pike; the annual catch usually amounts to 7,000-8,000 tons.

Within the basin, industrial activities, particularly the oil-shale industry, also have a major impact on the water resources. The

wastewaters and gaseous emissions, including toxic sulphur and nitrogen oxides from power states and pulverized oil shale affect the chemical composition of the water in Lake Peipsi. A significant industrial user of the Narva basin is the Baltic thermal power plant, which uses water for cooling purposes, with an average annual demand of 470 million m³.

The Narva basin is a relatively new resource in transboundary terms, as it became a transboundary waterway when Estonia separated from the Soviet Union in 1991. However, a significant amount of transboundary activities have been developed in this basin over the last 15 years. For instance, on May 4th, 1994 a treaty about the conservation of fish stocks in Lake

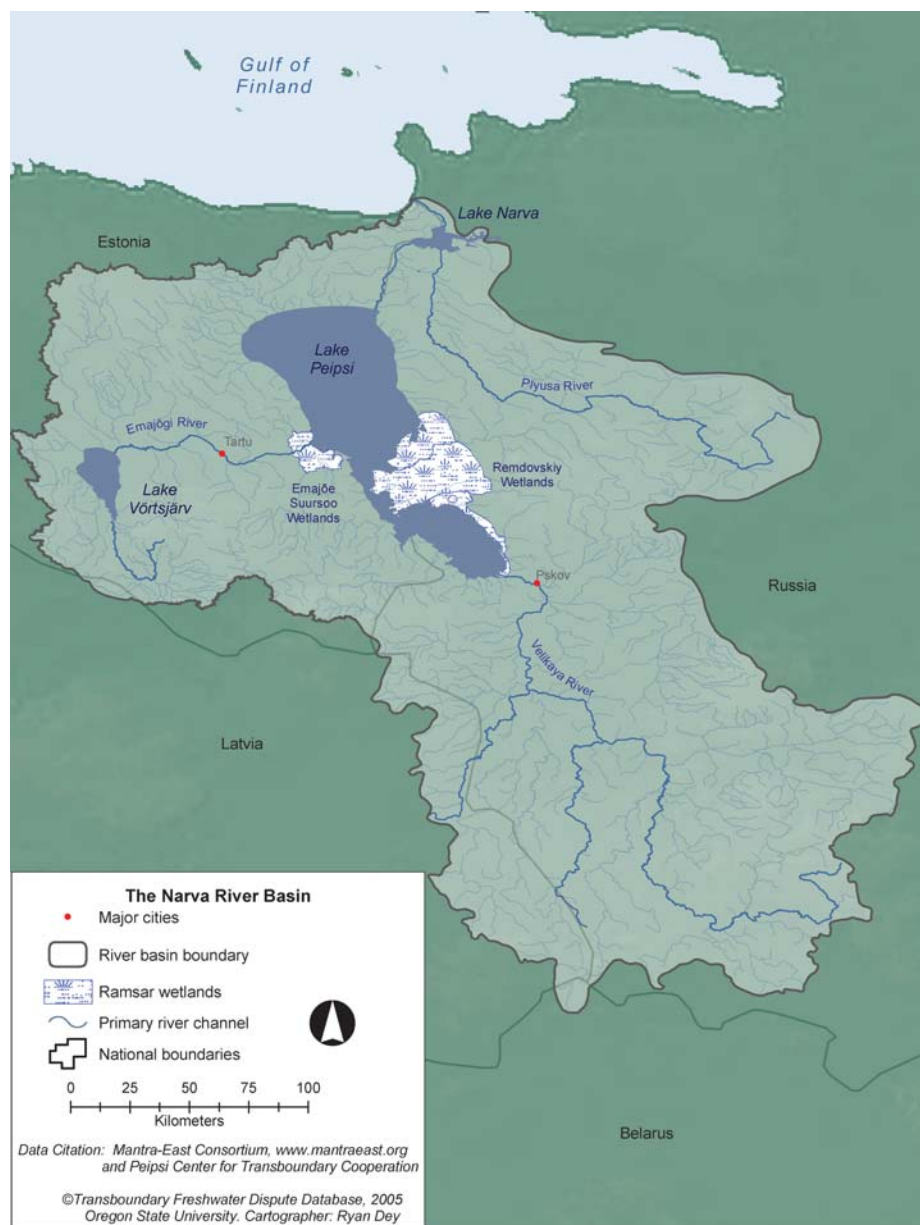


Figure 5.3 The Narva River Basin.



Waterfront club on the Emajõgi River in Tartu, Estonia. The river flows into Lake Peipus. Photo credit: HendrixEesti, via Wikimedia Commons.

Peipsi was concluded between Estonia and Russia. Pursuant to the agreement an intergovernmental Estonian-Russian commission on fisheries was established, with the aim to coordinate management issues of fish stocks, coordinate research of the state of fish resources, establish a common fishing limit, regulate tools and methods of fishing, set up prohibited periods and areas, improve state of and increase the amount of living resources, resolve disputes and incidents relating to fishing activities.

The parties then adopted an agreement of cooperation regarding the environment on January 11th, 1996. This agreement was followed by another agreement about cooperation regarding the protection and sustainable use of transboundary waters, which came into action on August 20th, 1997; an intergovernmental commission was established under the 1997 agreement to coordinate its implementation (Estonia-Russia, 1997). Responsibilities of the commission include the exchange of monitoring data between the parties, defining priority areas and programmes of scientific study, agreeing on common indicators of water quality, facilitating cooperation between various stakeholders (including governmental bodies, local

government, scientific and public interest organisations), and encouraging stakeholder engagement in transboundary issues.

The latter commission is chaired by the Estonian secretary general of the ministry of the



Lake Peipsi harbor at Mustvee, Estonia. Photo credit: Mark A. Wilson (Department of Geology, The College of Wooster), via Wikimedia Commons.



View of the Velikaya River and the city of Pskov, in western Russia, from the Pskov Kremlin. Photo credit: Sergei Rubliov, via Wikimedia Commons.

environment and the Russian first deputy minister of natural resources. A number of joint working groups have also been established under the auspices of this commission covering issues of water protection, water management, monitoring and research, and cooperation with local authorities, population, international, and non-governmental organisations.

In 1999 the commission adopted a decision to start preparing a comprehensive basin management programme in line with regional commitments contained in various agreements including the 2000 EU WFD and the 1992 Helsinki Convention. Preparation of the Lake Peipsi Basin Management Programme started in 2001. The project sought to substitute uncoordinated small-scale projects with coordinated basin-wide projects, as well as provide practical recommendations for the nutrient load reduction and prevention, promote sustainable conservation of habitats and ecosystems within the region, strengthen capacity of all stakeholder groups and promote their engagement in preparation of the programme, promote education and public awareness of the

programme and resulting issues (Peipsi, 2005). Information networks of non-governmental organizations (NGOs) and other community groups, such as the Peipsi Centre for Transboundary Cooperation (Peipsi, 2005a), have taken an increasingly significant role in developing and implementing the programme. Support for the Basin Management Programme has come from the Global Environment Facility, the Estonian and Russian Governments, the EU TACIS Baltic Line 2000 programme, the EU 5th RTD programme project MANTRA East, EU Life Programme in Estonia, MATRA programme from the Dutch government, US Baltic NGO fund, the Swedish EPA project on joint monitoring, and Danish infrastructure projects in Pskov.

5.4 CONCLUSION

This chapter discussed the hydropolitical situation in three European basins, the Dnieper, Danube, and the Narva. While steps toward basin-wide agreements have been taken in the Dnieper River basin, no basin-wide agreements exist. This basin is largely comprised of economically poor



Narva hydroelectric station on the Narva River, Estonia, shining in sunlight with thunderclouds in the background. Photo credit: Hannu, via Wikimedia Commons.

countries and faces major pollution problems from anthropogenic activities that need to be addressed; therefore, increased institutional capacity to address pollution and transboundary problems is needed in the Dnieper basin in order to mitigate conflict. The Danube River basin encompasses diverse countries that have engaged in heavy use of the water resources, which has led to water pollution. However, in this basin, significant steps have been taken to offset pollution problems in the transboundary water; basin-wide approaches have been taken with an international commission (ICPDR) as well as an international project that functions to protect the water resources as well as reduce the pollution of the Danube basin's water resources. The third

basin discussed in this chapter, Narva River basin, faces water pollution from forestry and agricultural practices that have led to eutrophication, particularly in Lake Peipsi; industrial activities also have a negative impact on the basin's water resources. While the Narva basin is a relatively new transboundary basin, significant transboundary activities have occurred, i.e. an intergovernmental commission between Estonia and Russia. In sum, the Dnieper River basin is the most vulnerable of the three basins discussed in this chapter because the heavy agricultural and industrial use as well as transboundary pollution may lead to transboundary conflicts as no basin-wide agreement has been implemented.



*Drinking fountain, Paris train station.
Photo credit: Sandra Arbogast.*

CHAPTER 6. CONCLUSION

Alistair Rieu-Clarke

The introduction noted that institutional capacity, be it water management bodies, treaties, or generally positive international relations, is possibly more important than the physical characteristics of river basins in minimising hydropolitical vulnerability and strengthening resilience. In addition, it was noted that the likelihood of conflict rises as the rate of change within a basin exceeds the institutional capacity to absorb that change, thus emphasising two key factors in hydropolitical vulnerability and resilience: *rate of change* and *institutional capacity*. The key question addressed in this paper is whether or not the institutional capacity for the management of Europe's transboundary waters is sufficient to absorb likely changes and challenges.

An answer to the above question firstly requires an analysis of the likely changes and challenges to Europe's transboundary basins. Chapter two conducted such a study, and highlighted Europe's heavy reliance on transboundary waters for its socioeconomic needs. Increased demands for water and inefficient practices throughout Europe have led to various water-related problems that have the potential to lead to water conflicts between countries. Common problems include over-extraction, especially of groundwater, pollution, soil erosion, landscape changes, and the loss of natural habitats. Moreover, potential threats of climate change and changes in land-use practices have increased the risk of harm both from floods and droughts. The fact that the majority of basins within Europe are transboundary means that many of these common water-related problems are not limited to national boundaries. For instance, the use of fertilisers for agricultural needs upstream may have a detrimental impact on drinking water supplies within a downstream country. Similarly, the draining of wetlands in one basin country may lead to an increase in the likelihood and severity of floods in another basin country. Regional responses are therefore required.

The strong reliance on transboundary waters has inevitably led to tensions between European basin countries. Chapter three highlighted a variety of conflicts that have arisen over transboundary waters in Europe. Most parts of Europe have experienced such conflicts, which have largely been a result of contentious unilateral actions by one transboundary basin country. Examples include Spain's objection to France's proposed development of the Ebro basin in the early twentieth century, or Greece's recent opposition to Macedonian plans to utilise part of the Varda basin for agricultural purposes. Chapter three also illustrated the fact that both qualitative and quantitative characteristics are evident in transboundary disputes in Europe. For example, while Portugal claimed that Spain's 1993 National Water Plan would lead to at least a 13% reduction in the flow of transboundary waters, in the Daugava basin, pollution of the Daugava from large production facilities and intensive agriculture in Belarus and Lithuania has impacted Latvia's water supply. In addition, chapter three noted that international agreements relating to European transboundary waters date back over two centuries.

One aspect of cooperation that makes Europe unique is the significant role played by regional agreements in the continuous evolution of basin-wide legal and institutional mechanisms for dispute avoidance. Both the UNECE and the EU have made a significant contribution to strengthening institutional capacity for transboundary water resource management at the basin level, most notably



The Bidasoa River, Doneztebe-Santesteban, in Navarre, northern Spain. Photo credit: Jorab, via Wikimedia Commons.

within the relatively new ‘internationalised’ basins of the former Soviet Union where legal and institutional frameworks have been established in a relatively short period.

More specifically, two institutions have had a significant impact on the hydropolitical situation of transboundary waters in Europe, namely the EU’s WFD and the 1992 Helsinki Convention under UNECE. In less than 20 years, the 1992 Helsinki Convention, supported by a

strong institutional framework, has proven to be a major influence in establishing and strengthening transboundary water resource management throughout Europe. Not only has the convention assisted European countries in adopting basin-wide arrangements, such as the 1998 Rhine convention, but through the meeting of the parties and related bodies, European countries and other interested parties can assess where gaps and weaknesses exist within the legal framework for the management of transboundary waters in Europe, and act accordingly. The UNECE has consequently expanded its remit into areas such as flood management, water and health, civil liability, and compliance. The flexibility of such a framework agreement leaves the UNECE framework well placed to react to future challenges related to transboundary waters. As a result, the convention provides a useful example of the potential role of such framework agreements—most notably the 1997 UN Watercourses Convention—in the regional management of transboundary waters.

While the EU encompasses fewer member countries than the UNECE and covers both



The Shroud Bridge over the Daugava River in Riga, the capital of Latvia. Photo credit: Philaweb, via Wikimedia Commons.



Rudesheim, Rhine River, Germany. Photo credit: Sandra Arbogast.

national and transboundary waters, it has been just as influential in promoting cooperation over transboundary waters in Europe. Through a combination of key principles, such as achieving good water status in all EU waters by 2015, and detailed procedural rules, such as the production of river basin management plans, the EU WFD is set to bring about significant changes to the way water is managed within Europe. Even beyond the EU region, e.g., in the Dnieper basin, the EU WFD has influenced the negotiation of basin-wide legal agreements. Moreover, through its institutional structure the EU is well placed to address pressing challenges within European water resource management, such as flood management and the protection of groundwater.

Despite such positive trends in institutional capacity building within Europe, from an issue-based perspective, chapter four highlighted a number of areas where the institutional capacity for the management of transboundary waters could be strengthened. On a positive note, treaty law shows that European countries have endorsed the substantive rule of equitable and reasonable utilisation, and also the duty to take all appropriate measures to prevent, control and reduce transboundary impact. However, establishing the practical procedural rules and mechanisms that effectively and efficiently

implement the latter substantive rules has proved to be more problematic. The analysis in chapter four showed that in certain areas such as monitoring and assessment, public participation, and compliance, there were clear gaps within existing agreements. In addition, little work has been done in assessing the *effectiveness* of such agreements in accordance with their aims and objectives as more emphasis has been placed on ensuring compliance with international agreements. Measuring the effectiveness of international agreements is strongly dependent on there being sufficient data of a suitable standard to evaluate the key joint management issues within the basin. Similarly public participation and appropriate compliance strategies can go a long way to ensuring that basin-agreements are both implemented and effective. Useful guidance on how countries can develop these aspects of water resource management can be found within the UNECE and EU framework. However, in many cases lack of financial resources and the absence of capacity development measures will be major impediments to strengthening basin agreements. This issue thus highlights the role that international donors should take in developing basin-wide agreements; a role that has been clearly illustrated within the case studies and list of international projects.



Ugra River, tributary of the Oka River (Volga basin), in Smolensk and Kaluga Oblasts, Russia. Photo credit: Laim, via Wikimedia Commons.


In addition to the above-mentioned issue-based gaps, the study has also highlighted a number of basin specific examples where the current institutional capacity may be incapable of absorbing changes within the basin. For example, despite transboundary pollution for large production facilities and agriculture within the Daugava basin, no basin-wide agreement exists between Belarus, Latvia, and Lithuania; although a positive sign can be seen in the commitment of the basin countries to adopt a river basin management plan in accordance with the provisions of the EU WFD. Similarly, no basin-wide agreements exist between the countries

sharing the Dniester basin (Ukraine and Moldova), and the Dnieper basin (Belarus, Russia, and the Ukraine). Both the latter rivers are particularly vulnerable to transboundary conflicts, largely as a result of heavy agricultural and industrial use, coupled with transboundary pollution. While significant steps have been taken to develop basin-wide agreements for both rivers, at present only a series of bilateral and draft agreements exist.

While a significant record of conflicts over transboundary waters exists within Europe, a strong commitment by European countries to develop the institutional capacity necessary to resolve—and ultimately avoid such conflicts in the future—is evident. Of particular prevalence in this regard is the interface between regional, basin-level and national governance structures. While earlier agreements tended to focus on single uses, a marked evolution towards the integrated management of transboundary waters within treaty practice has occurred. Today, a large body of international agreements relating to Europe's transboundary waters exists, which in itself is testament to the desire of European countries to develop the institutional capacity to accommodate economic, social, and environmental changes within transboundary basins in order to offset hydro-vulnerability in Europe.



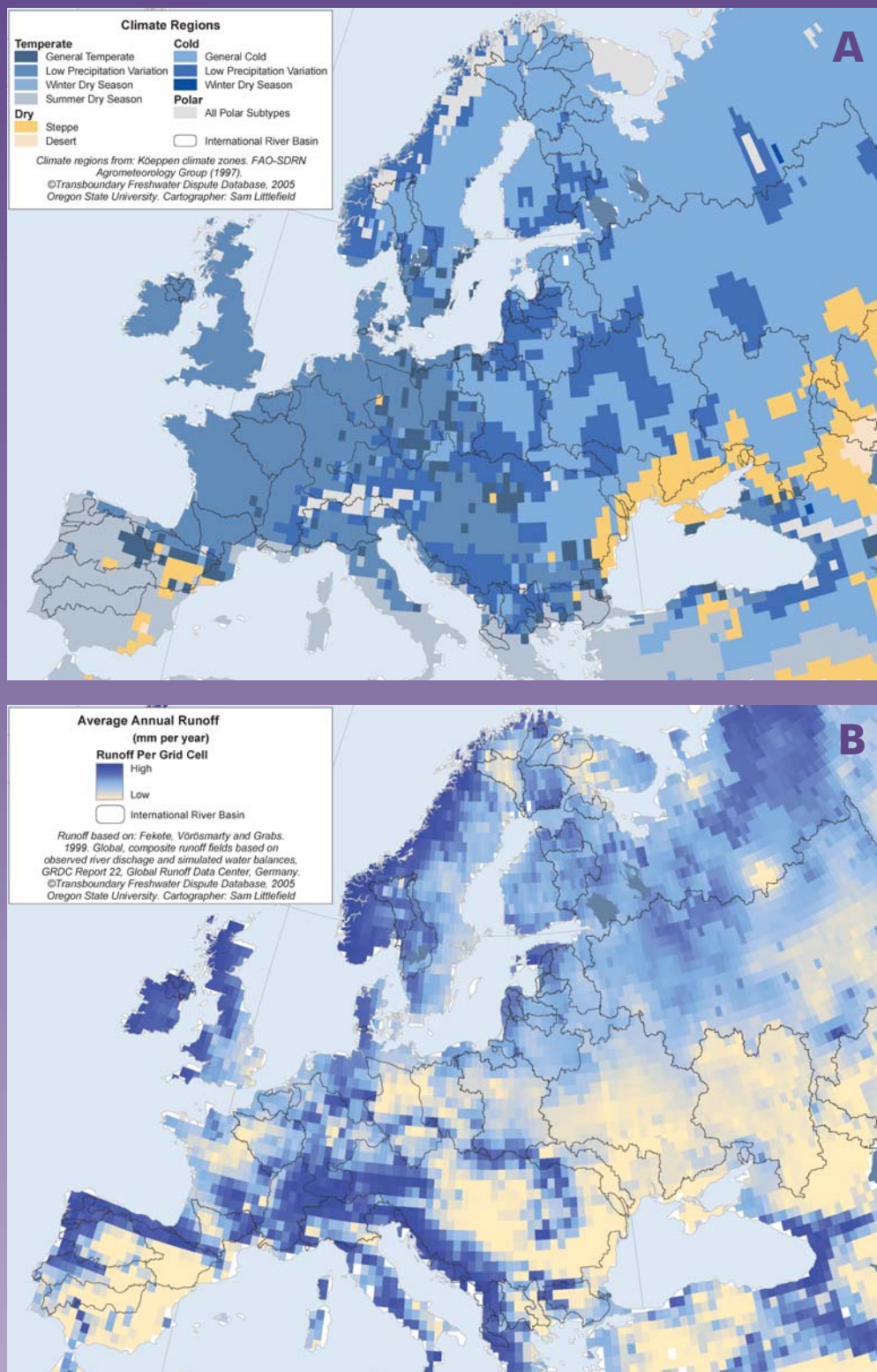
The Ponte Vecchio, a medieval bridge over the Arno River, in Florence, Italy. Photo credit: Keith Davis.



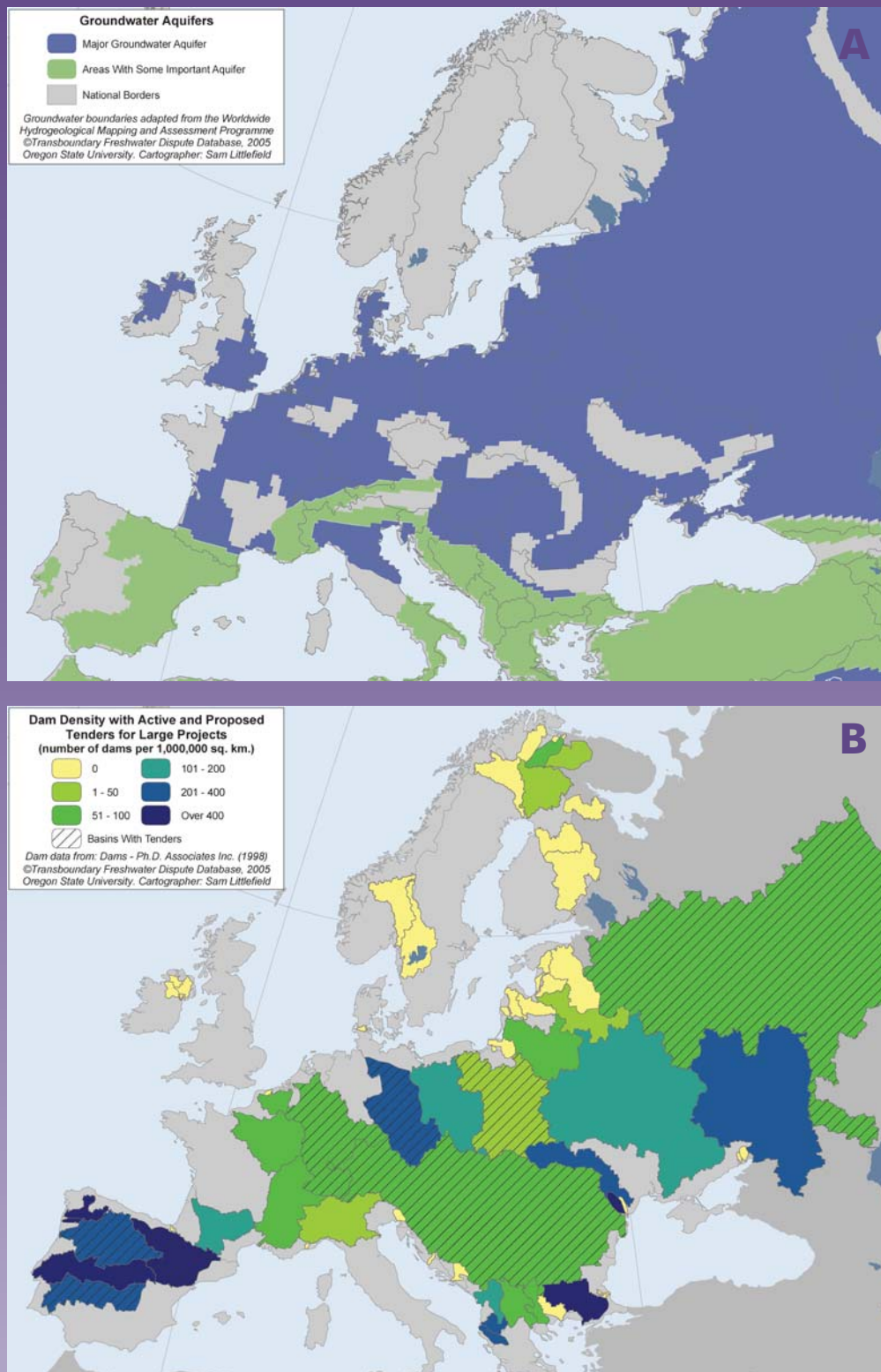
ATLAS OF HYDROPOLITICAL VULNERABILITY AND RESILIENCE: EUROPE

Waiting for passengers, Brugge, Belgium. Photo credit: Roger Admiral.

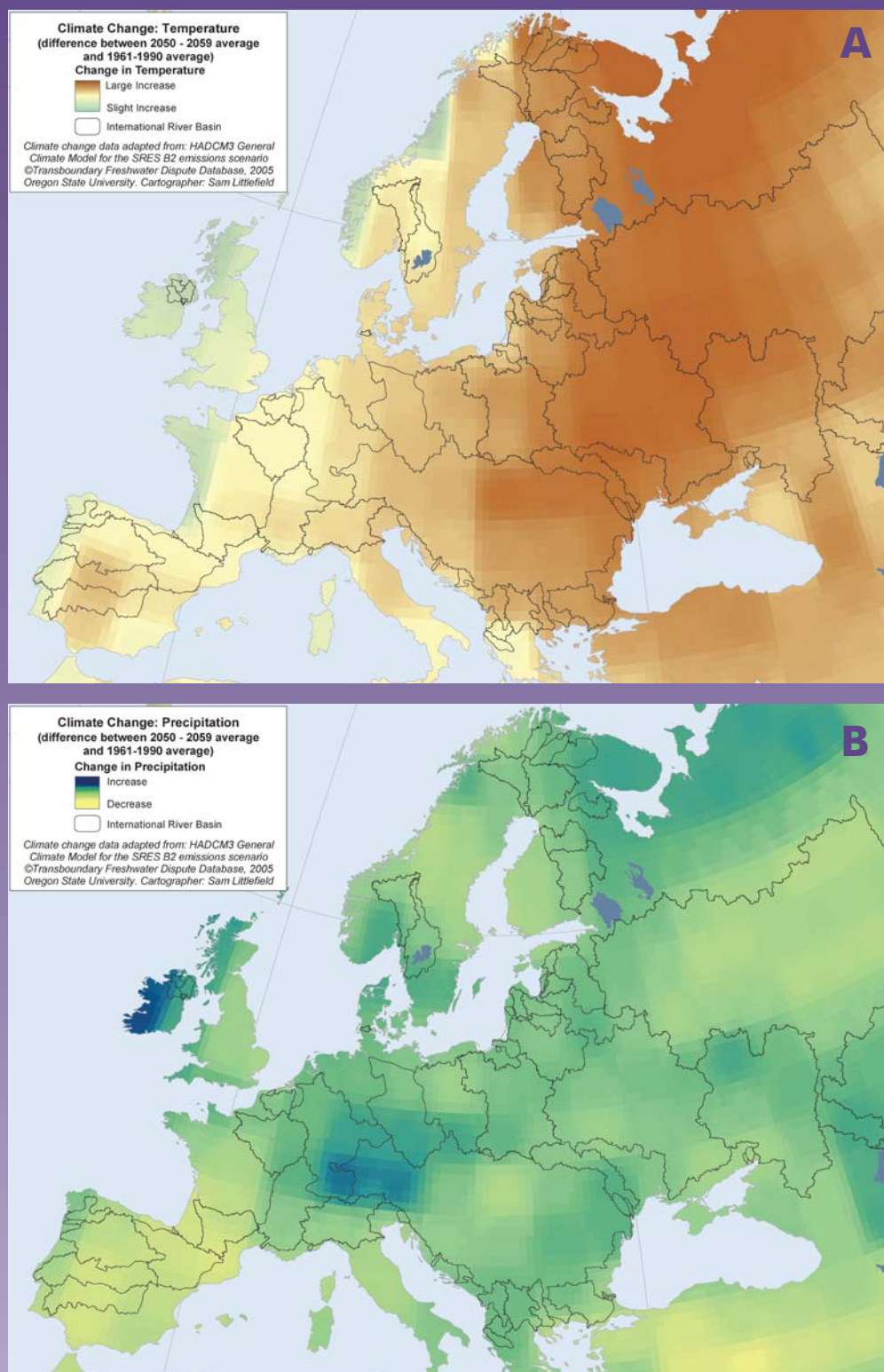
BIOPHYSICAL PARAMETERS



Map 1 (A) Climate Regions. Köppen climate zones based on a 0.5 decimal degree grid by Leemans and Cramer (1991) published by the International Institute for Applied Systems Analysis (IIASA). The Köppen system integrates IIASA average monthly rainfall total and average monthly temperature, in most cases averaged from 1961–1990, to yield five base climate types: tropical, dry, temperate, cold, and polar. Each primary type is divided into sub-classes based mainly on the distribution of rainfall and temperature throughout the year. Not all classes may be represented at the continental level. **(B) Average Annual Runoff.** Fekete et al. (1999) produced composite runoff fields by accessing GRDC discharge data, selecting significant global gauging stations, and geo-registering the discharge information to locations on a simulated topological network. This dataset was deemed accurate for presentation with a 0.5 decimal degree grid. Summary statistics based on the runoff dataset, such as those used for projected water stress (human indicators), may not be considered accurate for basins with an area less than approximately 25,000 km².

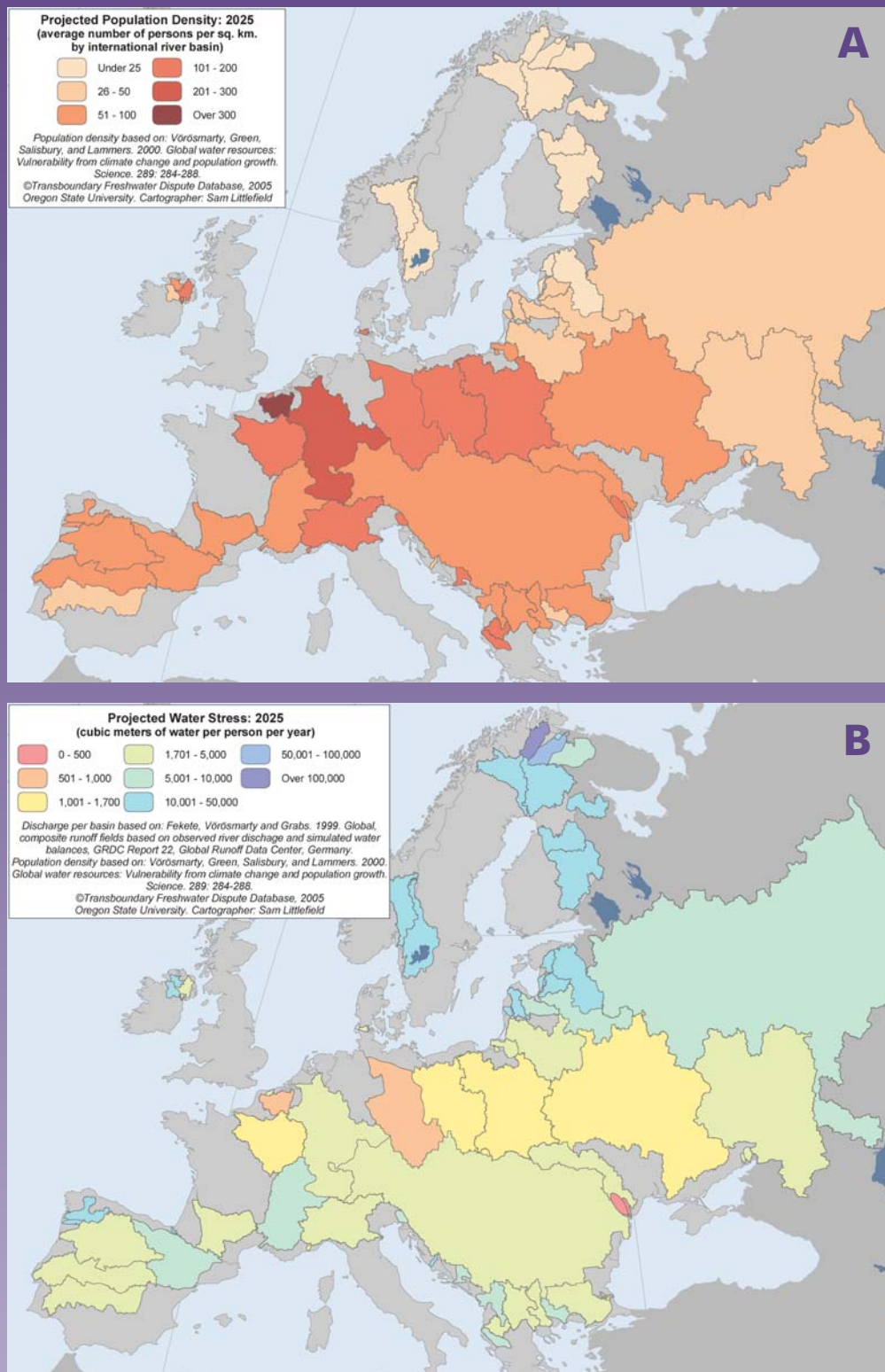


Map 2 (A) Groundwater Aquifers. Adapted from a map developed by the World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP), August 2004. The most important groundwater basins are shown in blue. The green color symbolizes hydrogeological environments of complex structure. Unmarked regions are occupied by local and shallow aquifers in which relatively dense bedrock is exposed to the surface. Hatching has been applied in areas where “fossil” or non-renewable groundwater is stored. The boundaries of the various colored hydrogeologic regions are first order approximations using the best available information. **(B) Dam Density with Active and Proposed Tenders for Large Infrastructure.** Global Dams Data from: Ph.D. Associates Inc. 1998. DCW in ASCII version 3.0. 1998; Density Calculations from Fiske and Yoffee, 2001. Data on tenders is taken from the International Rivers Network “Dams In The Pipeline of Financial Institutions” database, which includes new projects in the lending pipeline from the World Bank, the Asian Development Bank, the African Development Bank and the Inter-American Development Bank, as well as links to ongoing and completed projects on the individual websites.

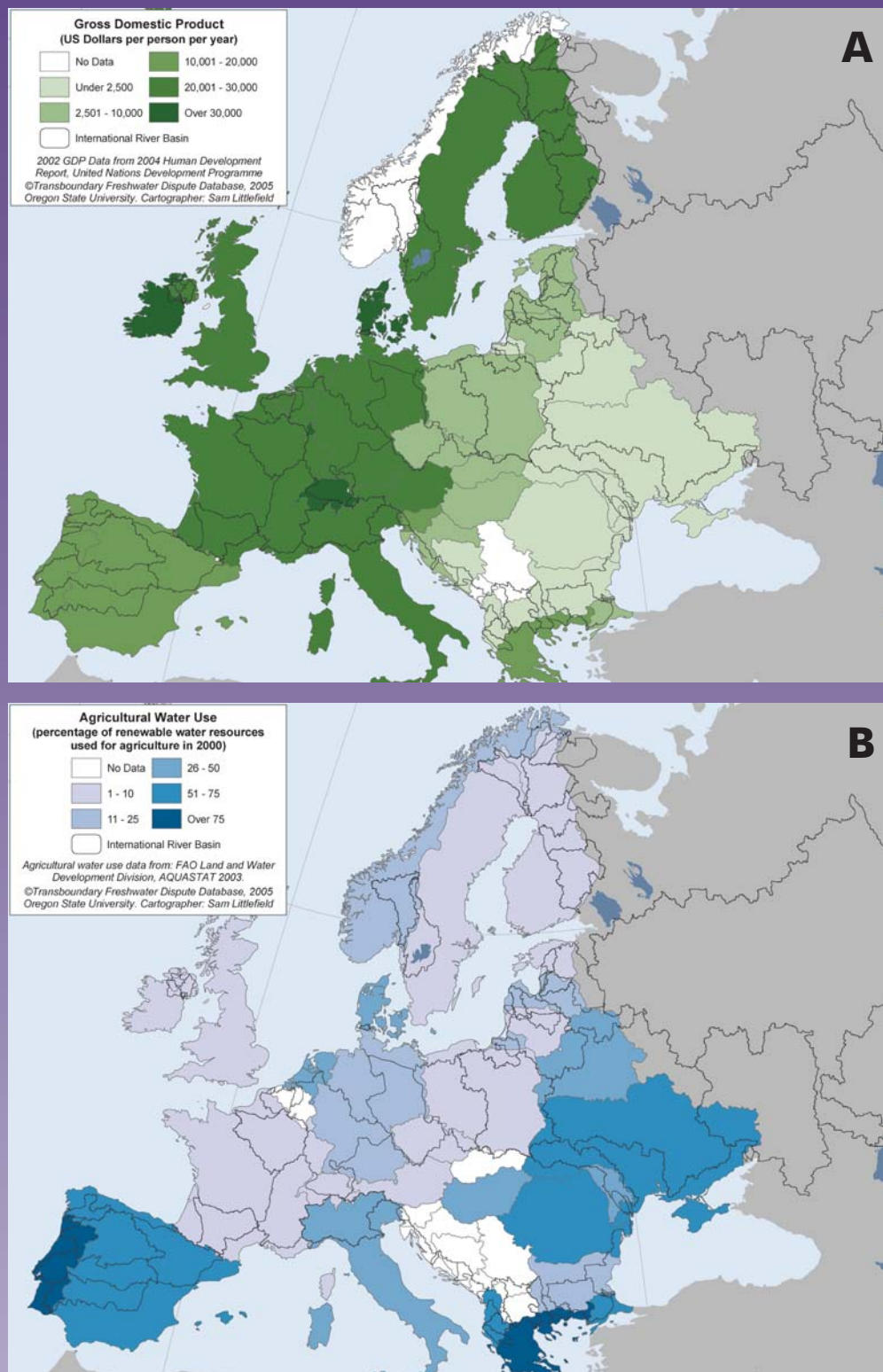


Map 3 (A) Climate Change, Temperature. (B) Climate Change, Precipitation. Based on HADCM3 general climate model using the SRES B2 (moderate emissions, climate change, and technological advancement) emissions scenario. HADCM3 is distributed as 2.5 x 3.5 decimal degree data, which could not be properly projected in a GIS without square grid cells. Cell values were distributed to points at 2.5 x 3.5 decimal degree cell centroids, which were interpolated, using the inverse distance weighted method, at a resolution of 0.5 decimal degrees. The interpolated data used here should not be taken to exactly represent HADCM3 projections, but do provide a reasonable cartographic representation of current HADCM3 climate change predictions.

SOCIOECONOMIC AND GEOPOLITICAL PARAMETERS

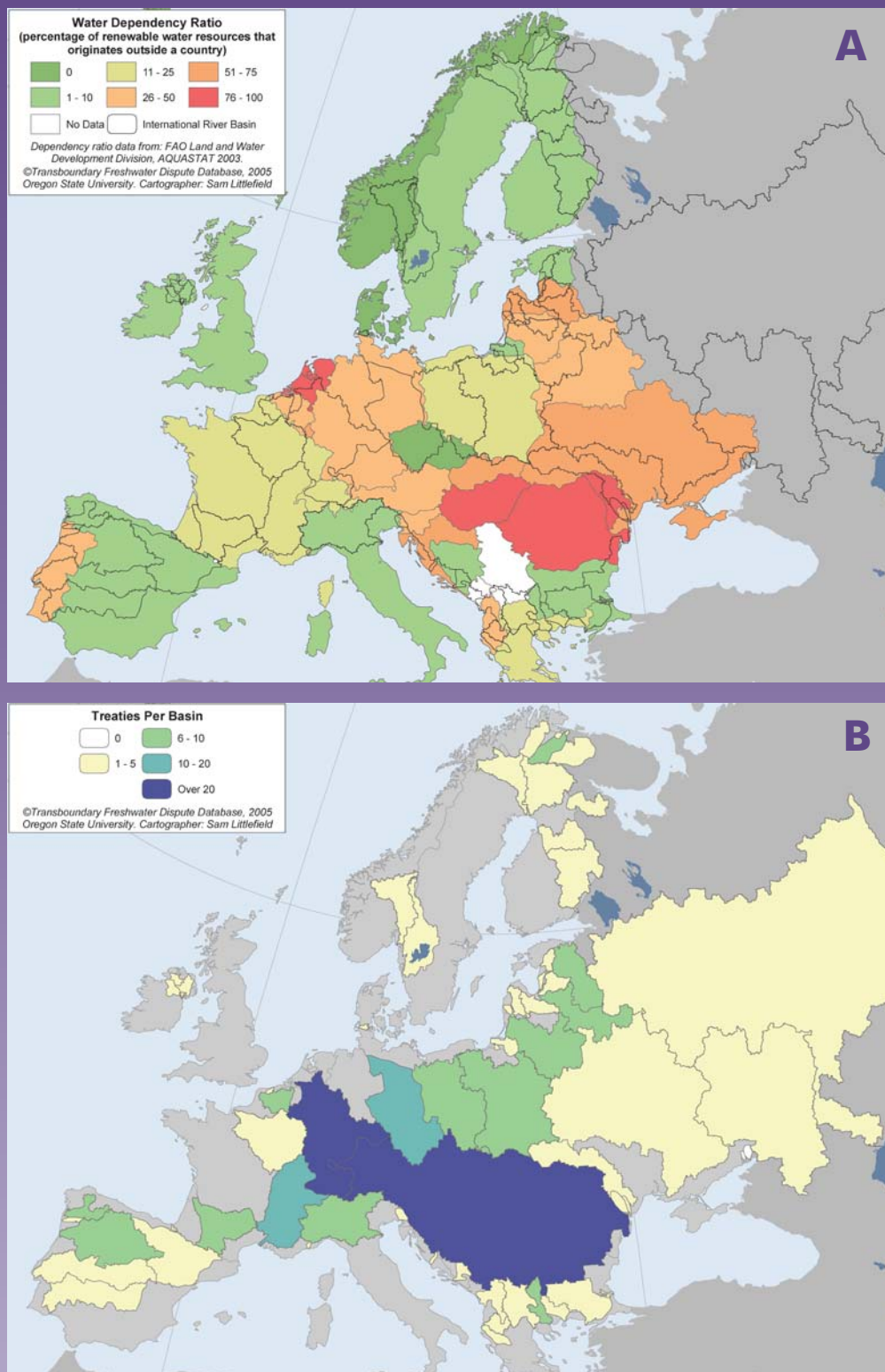


Map 4 (A) Projected Population Density: 2025. The 2025 population dataset is published at a cell size of 0.5 decimal degrees (DD), which places a size constraint for small basin analysis. The raster was resampled at 0.01 DD to overcome the deficiency. This disregards some of the assumptions of the original 0.5 DD cell size, but affords a tentative estimate of predicted population in small basins. Because small basins maintain less area, there is less area to smooth out data errors. Therefore, some basins, especially those with a relatively small area (less than 25,000 km²), may have projected populations significantly lower or higher than they should be. **(B) Projected Water Stress: 2025.** Water stress is the amount of water available per capita. Water stress estimates do not account for spatial variability of water resources, nor for technological or other adaptations affecting how a given population manages water scarcity. The map's calculation of water stress is based on renewable water supply defined by discharge, and does not consider groundwater extraction. Falkenmark's (1989) definition of water stress, calculates water supply based on renewable surface and groundwater flows. According to Falkenmark, a threshold value of 1000 cubic meters per person per year indicates a general point at which water shortages begin to chronically hamper economic development and human health and well-being in moderately developed nations.

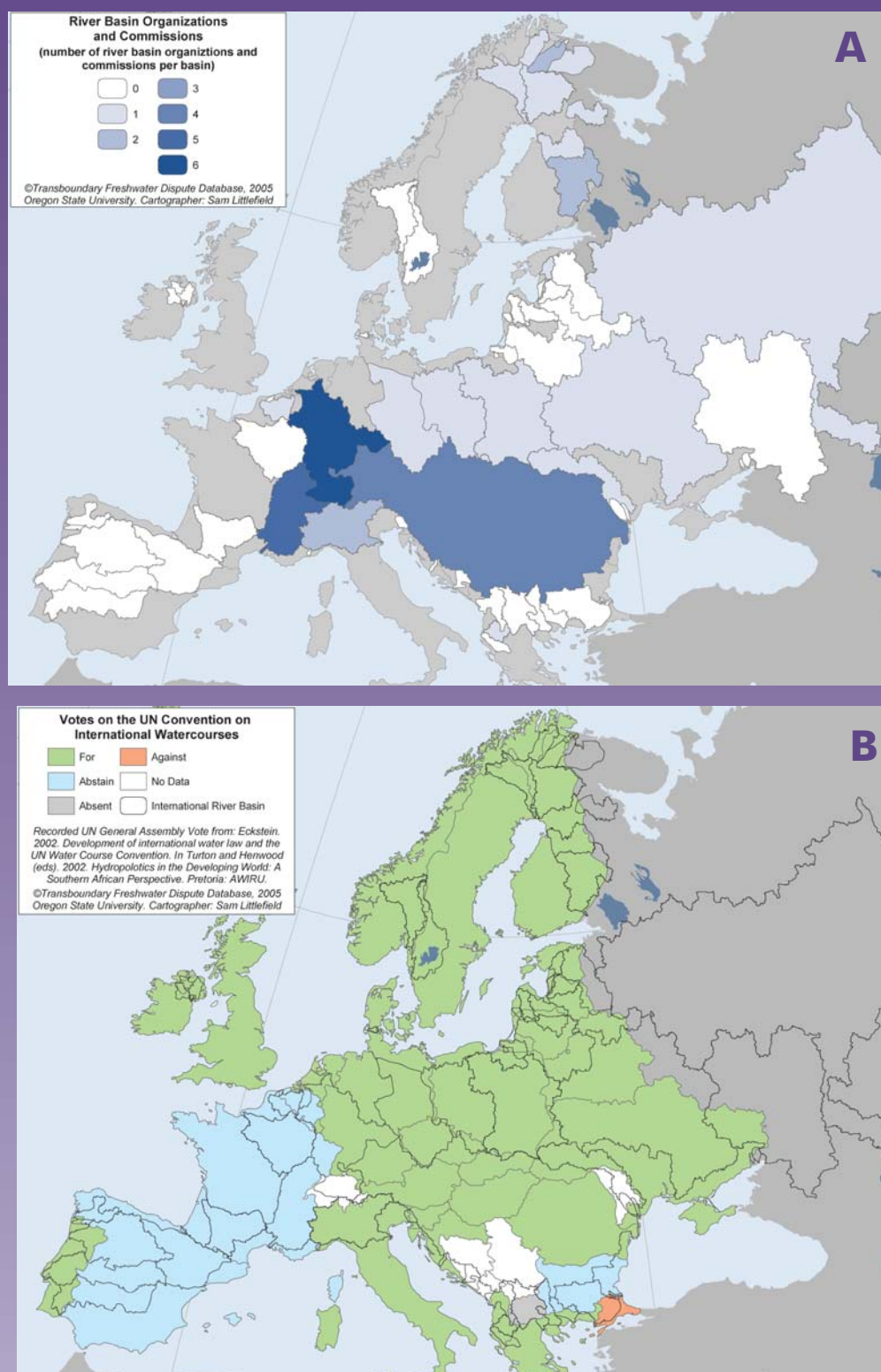


Map 5 (A) Human Development Index. The human development index (HDI) is a composite index that measures the average achievements in a country in three basic dimensions of human development: a long and healthy life, as measured by life expectancy at birth; knowledge, as measured by the adult literacy rate and the combined gross enrolment ratio for primary, secondary and tertiary schools; and a decent standard of living, as measured by GDP per capita in purchasing power parity (PPP) US dollars. The formula to calculate the HDI, as well as specific data on the indicators, can be found at <http://hdr.undp.org/reports/global/2004/>. **(B) Agricultural Water Use.** Agricultural water use is based on a model of irrigation water requirements developed for AQUASTAT by the FAO Land and Water Development and incorporates crop, reference, and actual evapotranspiration, crop coefficient, area under irrigation as percentage of the total area under analysis, and cropping intensity. Renewable water resources available for agricultural use are defined as the sum of internal renewable water resources and incoming flow originating outside the country, taking into consideration the quantity of flows reserved to upstream and downstream countries through formal or informal agreements or treaties.

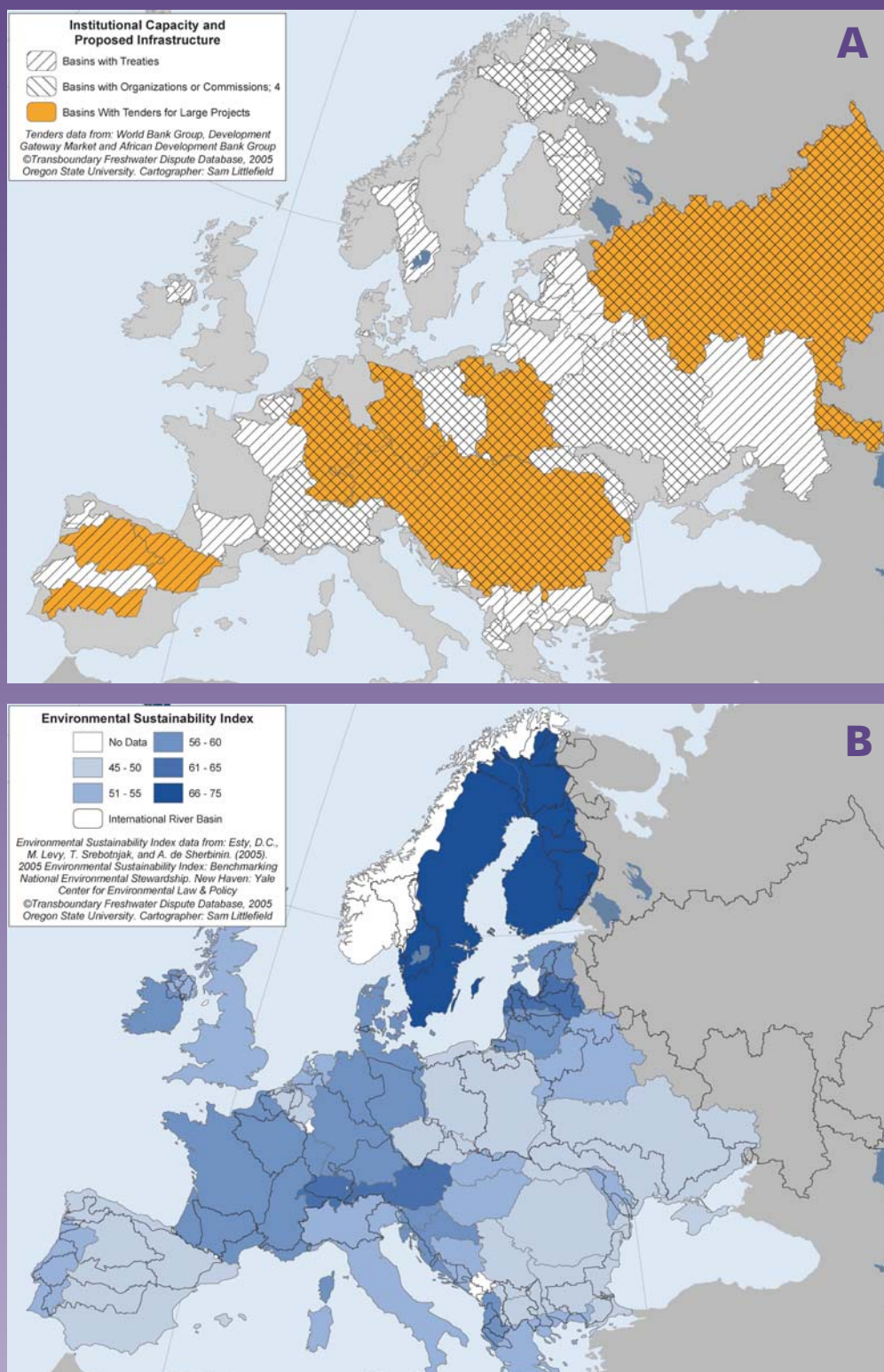
INSTITUTIONAL CAPACITY



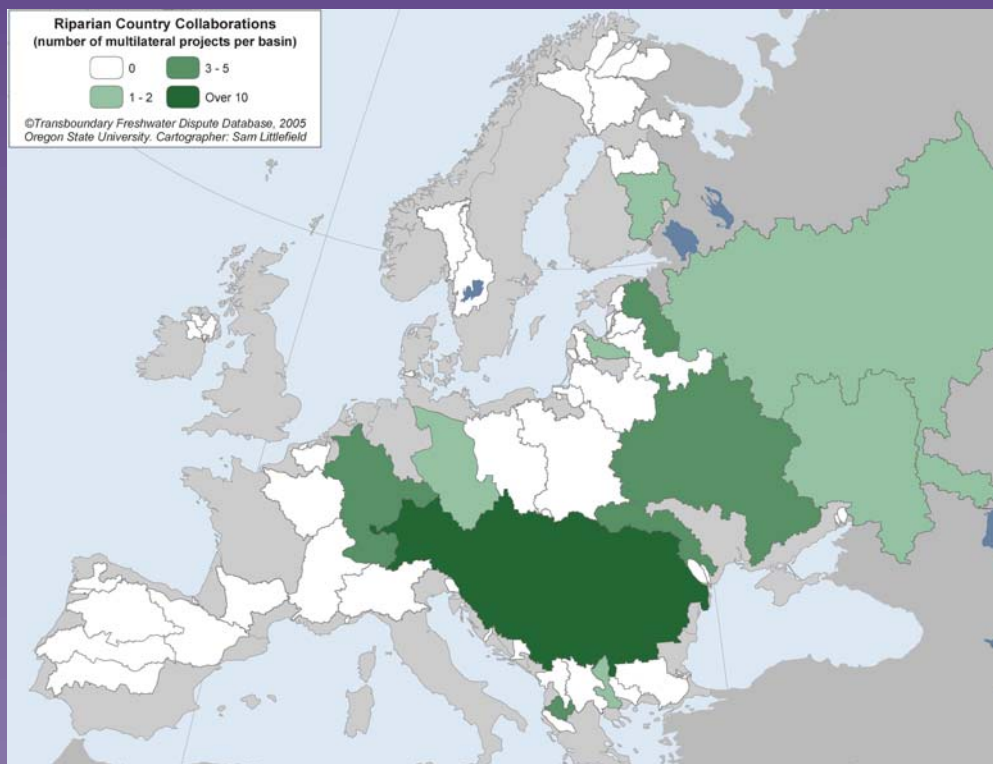
Map 6 (A) Water Dependency Ratio. Water dependency ratio is calculated for AQUASTAT by the FAO Land and Water Development Division. It incorporates total country inflow and outflow of surface water and groundwater after accounting for flow submitted to and reserved by bilateral and multilateral treaties. **(B) International Freshwater Treaties Per Basin.** Number of treaties per basin is the sum of all agreements (historical, present, general) which have been signed by States governing water resources in the basin, either with one another or as part of a regional agreement, where the concern is water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained. Documents concerning navigation rights and tariffs, division of fishing rights, and delineation of rivers as borders or other territorial concerns are not included, unless freshwater as a resource is also mentioned in the document, or physical changes are being made that may impact the hydrology of the river system (e.g., dredging of river bed to improve navigation, straightening of a river's course).



Map 7 (A) River Basin Organizations and Commissions. Data for map was collected over a six month period from July to December 2004, drawing from: a compilation by Johannes Akiwumi at UNEP's Division of Environmental Information and Assessment (Nairobi); and internet searches and email interviews with international waters practitioners and scholars. (See SECTION 4 Tables for sources). We define an RBO/RBC as "a bilateral or multilateral body composed of representatives of national governments acting in an official capacity, created for the purpose of dialogue and/or coordinated management of an international water body." Presence of an RBO/RBC in an international river basin does not imply that all riparian countries are parties to the institution. Zero values do not necessarily reflect an absence of an RBO/RBC. **(B) Votes on the UN Convention on International Watercourses.** Vote records presented are based on data from the original convention voting period, which was open from May 1997 until May 2000. However, though the convention closed in 2000, member states may choose to become party to the convention at any time.



Map 8 (A) Institutional Capacity and Proposed Infrastructure. Treaties and River Basin Organizations and Commissions may serve to increase the hydropolitical resilience of a basin. This may be particularly important in basins with tenders for large projects, which can alter river functions and displace local inhabitants. **(B) Environmental Sustainability Index.** The 2005 Environmental Sustainability Index (ESI) measures the ability of a country to protect the environment over the next several decades. The ESI is an equally weighted average of 21 indicators, grouped into categories such as environmental systems, reducers of environmental stresses, reducers of human vulnerability, societal and institutional capacity and global stewardship. These data are combined from 76 separate data sets of natural resource endowments, pollution levels, environmental management efforts, etc. The ESI is useful for comparative analysis in identifying leading countries in environmental sustainability. The full ESI report is available at <http://www.yale.edu/esi>.



Map 9 Riparian Country Collaborations. Riparian Country Collaborations are defined as projects, programs, or partnerships with a river basin as a geographic focus, involving organizations or representatives (acting in an official or non-official capacity) from two or more countries that share the international water body. Data for the map was collected from internet searches, and compiled over a five-month period from July to December 2004. Due to the short time period in which the study took place, the number of projects represented on the map may not accurately reflect the number of collaborations actually occurring. Detailed information about each riparian country collaboration (including participating countries; principal issue area; level of collaboration; dates of collaboration; and source from which the information was gathered) is compiled in Appendix 2.

APPENDICES



Stone fountain, Rome. Photo credit: Keith Davis.

APPENDIX 1. INTERNATIONAL FRESHWATER AGREEMENTS, RIVER BASIN ORGANIZATIONS, AND RIVER BASIN COMMISSIONS OF EUROPE

The treaties contained in this document were compiled as part of the Transboundary Freshwater Dispute Database (TFDD) project at Oregon State University in collaboration with the Food and Agriculture Organization (FAO) of the United Nations. The documents included are treaties or other international agreements relating to international freshwater resources, where the concern is water as a scarce or consumable resource, a quantity to be managed, or an ecosystem to be improved or maintained. Treaties concerning navigation rights and tariffs, division of fishing rights, and delineation of rivers as borders or other territorial concerns are not included, unless freshwater as a resource is also mentioned in the document, or physical changes are being made to the river system that might impact the hydrology of the river system (e.g., dredging of river bed to improve navigation, straightening of river course).

For ease of reference, the treaties are first categorized by continent, and then by international basin, as delineated in the TFDD Geographical Information System. The treaties listed under each international basin either refer directly to that international basin, or a sub-basin thereof. In cases of multiple spellings or names for the same river system of an international basin, a " / " separates the names (e.g., Asi/Orontes). Where the basin represents the confluence of a set of major rivers, a " - " is used to separate the names of the different river systems (e.g., Ganges-Brahmaputra-Meghna).

It is important to note that the following database of treaties is, by its very nature, a work in constant progress, and makes no claims to completeness. Those interested in updates should follow progress on the relevant sites, such as the Transboundary Freshwater Dispute Database Project (<http://www.transboundarywaters.orst.edu/>).

The area of each basin and its riparian countries' territorial share was calculated using a GIS at 1 km spatial resolution (Wolf et al. 1999). We recognize the limitations of the data sources and process by reporting the size of basins, not as raw data as is common with digital data, but by rounding the last significant figure in basins 1–99 km² and the last two significant figures in basins 100 km² or larger. As a result of rounding the area values, the numbers for areas within each basin do not necessarily add up to the total area for that basin. The percentage areas were calculated based on raw data, and therefore do not reflect the rounding of the areas. An asterisk (*) following a TFDD basin's name indicates notes in Appendix 2 regarding caveats associated with the derivation of the area values. The following is a description of the terms used in the appendices.

DESCRIPTION OF TERMS

Commission—A bilateral or multilateral body, composed of officials appointed by national governments to participate in dialogue, discourse, and negotiations regarding the international water body for which it was created.

Date—The date usually indicates the date on which a treaty document was signed or a river basin commission was instituted. If such information was unavailable, the next choice was the date of entry into force, followed by the date of ratification. For agreements consisting of a series of letters or notes written on different dates, the latest date was used. Dates are represented in a month/day/year format.

Economic program—A bilateral or multilateral economic development project or program which aims to improve investment/trade/economic activities among countries sharing an international water body.

Environmental program—A bilateral or multilateral project or program which aims to improve/protect/conservate the quality and habitat of aquatic systems associated with an international water body.

International initiative—A bilateral or multilateral body, composed of non-official actors who serve a Track 2 function, bringing stakeholders together to dialogue and strategize about transboundary water issues. International initiatives involve stakeholders from multiple countries who are mainly functioning to enhance dialogue and improve stakeholder participation, but do not necessarily implement their own projects, as they do not have funding to do so.

Level of collaboration—Indication of level of international water collaboration form: official or non-official. Official collaboration is acknowledged by the national government while non-official collaboration has no governmental involvement.

Organization—A bilateral or multilateral body, composed of officials acting on behalf of their government (ministerial, technical or other) to conduct coordinated and/or informed management of the international water body. An organization differs from a commission in that it involves the implementation of bilateral or multilateral programs (information sharing, joint management, etc.).

Participating countries—The countries that are party to the international water collaboration form.

Principal issue—Issue area that international water collaboration form focuses on more than on other issues.

Riparian country collaborations—Projects, programs, or partnerships *with a river basin as a geographic focus*, involving organizations or representatives (acting in an official or non-official capacity) from two or more countries that share the international water body.

Signatories—Signatories to the agreement. The formal country names as delineated in the actual treaty are used if that information is readily apparent; otherwise, common country names are listed instead.

Social / health program—A bilateral or multilateral social and/or health project or program which aims to improve the social and/or health conditions of the people living in an international water body.

Treaty basin—Identifies the basin or sub-basins specifically mentioned in the document. If a document applies to all basins shared between the signatories, but no river or basin is mentioned specifically, the treaty basin is listed as “frontier or shared waters.” For frontier or shared waters, a treaty is listed under all the TFDD basins shared between those signatories. A document may therefore appear listed under multiple basins.

Treaty or agreement—The full formal name of the document or best approximation thereof. The place of signature is often included as part of the agreement name. Agreement titles, regardless of the language of the source document, are listed in English. Not all titles are official.

Type of international water collaboration—Form of international water collaborations.

BIDASOA

Total area: 500 km²

Countries	Area of Basin in Country	
	km ²	%
Spain	500	89.33
France	60	10.67



Canal with houses, Paris, France. Photo credit: Jane McCauley Thomas.

TREATIES AND AGREEMENTS

Treaty of Delimitation Between France and Spain, signed at Bayonne

Treaty basin: Canal d'Angoustrine, Raour
Signatories: France, Spain

Date: May 26, 1866

DANUBE*

Total area: 789,800 km²

Area of Basin in Country

Countries	km ²	%
Romania	229,000	28.99
Hungary	92,700	11.74
Austria	81,400	10.31
Serbia	74,300	9.41
Germany	59,000	7.47
Slovakia	45,500	5.76
Bulgaria	41,200	5.22
Bosnia and Herzegovina	38,500	4.87
Croatia	35,700	4.52
Ukraine	29,500	3.74
Czech Republic	20,400	2.58
Slovenia	17,100	2.17
Moldova	13,900	1.76
Montenegro	7,000	0.89
Switzerland	2,500	0.32
Italy	1,300	0.16
Poland	600	0.08
Albania	200	0.03



TREATIES AND AGREEMENTS

Treaty between Austria and Bavaria Concerning the Regime of The Frontier Line and Other Territorial Relations Between Bohemia and Bavaria

Treaty basin: Frontier or shared waters

Date: June 24, 1862

Signatories: Austria, Bavaria

Convention Between the Austrian and Czechoslovak Republics Concerning the Delimitation of the Frontier Between Austria and Czechoslovakia and Various Questions Connected Therewith

Treaty basin: Thaya

Date: March 10, 1921

Signatories: Austria, Czechoslovakia

Convention instituting the definitive statute of the Danube

Treaty basin: Danube

Date: July 23, 1921

Signatories: Belgium, France, Greece, Italy, Romania, Yugoslavia (Serb-Croat-Slovene state), Czechoslovakia, Germany, Austria, Bulgaria, Hungary.

Treaty between Germany and Poland for the Settlement of Frontier Questions

Treaty basin: Frontier or shared waters

Date: January 27, 1926

Signatories: Germany, Poland

Agreement between Poland and the USSR concerning the regime on the Soviet-Polish State Frontier

Treaty basin: Frontier or shared waters

Date: July 8, 1948

Signatories: Russia, Poland

Convention regarding the regime of navigation on the Danube

Treaty basin: Danube

Date: August 18, 1948

Signatories: USSR, Bulgaria, Hungary, Romania, Ukraine, Czechoslovakia, Yugoslavia

Protocol between the Federal People's Republic of Yugoslavia and the People's Republic of Romania Governing crossing of the Frontier by officials of the water control services

Treaty basin: Danube

Date: December 31, 1948

Signatories: Romania, Yugoslavia

Treaty between the Government of the Union of Soviet Socialist Republics and the Government of the Romanian People's Republic Concerning the Regime of the Soviet -Romanian State Frontier and Final Protocol

Treaty basin: Danube

Date: November 25, 1949

Signatories: USSR, Romania

Treaty between the Government of the Union of Soviet Socialist Republics and the Government of the Hungarian Peoples Republic concerning the regime of the Soviet-Hungarian state frontier and final protocol

Treaty basin: Danube

Date: February 24, 1950

Signatories: USSR, Hungary

Convention between the [USSR] and [Hungary] concerning measures to prevent floods and to regulate the water regime in the area of the Frontier River Tisza

Treaty basin: Tisza

Date: June 9, 1950

Signatories: USSR, Hungary

Agreement between the Austrian Federal Government and the Bavarian State Government concerning the diversion of water in the Rissbach, Durrach and Walchen districts

Treaty basin: Isar, Rissbach, Durrach, Kesselbach, Blaserbach, Dollmannbach Date: October 16, 1950

Signatories: Austria, Germany (GFR)

Agreement between [Austria] and [Germany] concerning the Österreichisch-Bayerische Kraftwerke AG

Treaty basin: Inn, Salzach

Date: October 16, 1950

Signatories: Austria, Germany (GFR)

Agreement between the Government of the Republic of Austria and the Government of the Federal Republic of Germany and of the free state of Bavaria concerning the Donaukraftwerk-Jochenstein-Aktiengesellschaft (Danube Power-Plant and Jochenstein Joint-Stoch Company)

Treaty basin: Danube

Date: February 13, 1952

Signatories: Germany (GFR), Austria

Convention between the government of the Union of Soviet Socialist Republics and the Government of the Romanian people's republics concerning measures to prevent floods and to regulate the water regime of the river Prut

Treaty basin: Danube, Prut

Date: December 25, 1952

Signatories: USSR, Romania

Agreement between [Czechoslovakia] and [Hungary] concerning the settlement of technical and economic questions relating to frontier water...

Treaty basin: Danube, Tisza

Date: April 16, 1954

Signatories: Hungary, Czechoslovakia

Convention between the Governments of [Yugoslavia] and [Austria] concerning water economy questions relating to the Drava

Treaty basin: Drava

Date: May 25, 1954

Signatories: Austria, Yugoslavia

Agreement between [Yugoslavia] and [Austria] concerning water economy questions in respect of the frontier sector of the Mura

Treaty basin: Mura

Date: December 16, 1954

Signatories: Austria, Yugoslavia

Agreement between [Yugoslavia] and [Romania] concerning questions of water control on water control systems and watercourses on or intersected...

Treaty basin: Danube, Tisza

Date: April 7, 1955

Signatories: Romania, Yugoslavia

Agreement between [Yugoslavia] and [Hungary] together with the statute of the Yugoslav-Hungarian water economy commission.

Treaty basin: Mura, Drava, Maros, Tisa, Danube

Date: August 8, 1955

Signatories: Hungary, Yugoslavia

Treaty between the Hungarian People's Republic and the Republic of Austria concerning the regulation of water economy questions

Treaty basin: Danube

Date: April 9, 1956

Signatories: Austria, Hungary

Treaty between [Czechoslovakia] and [Hungary] concerning the regime of state frontiers.

Treaty basin: Danube

Date: October 13, 1956

Signatories: Czechoslovakia, Hungary

Agreement between the Government of the Federal People's Republic of Yugoslavia and the Government of the People's Republic of Albania concerning water economy questions, together with the statute of the Yugoslav-Albanian Water economic commission and with the protocol concerning fishing in frontier lakes and rivers

Treaty basin: Crni Drim, Beli Drim, Bojana, Lake Skadar

Date: December 5, 1956

Signatories: Albania, Yugoslavia

Agreement concerning water-economy questions between the government of the Federal People's Republic of Yugoslavia and the Government of the People's Republic of Bulgaria

Treaty basin: Danube

Date: April 4, 1958

Signatories: Yugoslavia, Bulgaria

Convention between the government of the socialist federal republic of Yugoslavia and the government of the Romanian People's republic concerning compensation for damage caused by the construction of the Iron gates water power and navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Agreement between the Socialist Federal Republic of Yugoslavia and the Romanian People's Republic concerning the construction and operation of the Iron Gates water power and Navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Convention between the Socialist Federal Republic of Yugoslavia and the Romanian People's Republic concerning compensation for damage caused by the construction of the Iron Gates water power and navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Convention between the Government of the Socialist Federal Republic of Yugoslavia and The Government of the Romanian People's Republic concerning the preparation of designs for the construction of the Iron Gates Water power and navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Convention between the Government of the Socialist Federal Republic of Yugoslavia and the Government of the Romanian People's Republic concerning the execution of works for the Iron Gates water power and navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Final Act, Agreement and other acts relating to the establishment and operation of the Iron Gates water power and navigation system on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Convention between the Government of the Socialist Federal Republic of Yugoslavia and the Government of the Romanian People's Republic Concerning the Determination of the Value of Investments and Mutual Accounting in Connexion with the Construction of the Iron Gates Water Power and Navigation System on the River Danube

Treaty basin: Danube

Date: November 30, 1963

Signatories: Romania, Yugoslavia

Treaty between the republic of Austria and the Czechoslovak socialist republic concerning the regulation of water management questions relating to frontier waters.

Treaty basin: Danube

Date: December 7, 1967

Signatories: Austria, Czechoslovakia

Agreement between the government of the Czechoslovak socialist republic and the government of the Hungarian people's republic concerning the establishment of a river administration in the Rajka-Gönyü Sector of the Danube

Treaty basin: Danube

Date: February 27, 1968

Signatories: Czechoslovakia, Hungary

Agreement between the government of the socialist republic of Romania and the government of the Union of Soviet Socialist Republics on the joint construction of the Stinca-Costesti Hydraulic Engineering Scheme on the River Prut and the Establishment of the conditions for its operation

Treaty basin: Prut

Date: December 16, 1971

Signatories: USSR and Romania

Agreement between The Federal Republic of Germany and the EEC, on the one hand, and , the Republic of Austria, on the other, on cooperation and management of water resources in the Danube Basin

Treaty basin: Danube

Date: December 1, 1987

Signatories: Germany (GFR), Austria

Agreement on co-operation management of water resources in the Danube Basin, Regensburg 1987

Treaty basin: Danube

Date: December 1, 1987

Signatories: Austria, Germany (GFR)

Agreement between the government of the republic of Croatia and the government of the republic of Hungary on water management relations

Treaty basin: Danube, Drava

Date: June 10, 1994

Signatories: Croatia, Hungary

Convention on cooperation for the protection and sustainable use of the River Danube

Treaty basin: Danube

Date: June 30, 1994

Signatories: Austria, Bulgaria, Croatia, Germany, Hungary, Republic of Moldova, Romania, Slovakia, Ukraine, European Union

Agreement between the government of the republic of Moldova and the government of Ukraine on the joint use and protection of transboundary waters

Treaty basin: Dnestr, Danube, Kogilnik, Sarata

Date: November 23, 1994

Signatories: Moldova, Ukraine

Agreement between the government of Ukraine and the republic of Poland on cooperation in the field of water management in frontier waters

Treaty basin: Danube, Dniester, Vistula/Wista
Signatories: Ukraine, Poland

Date: October 10, 1996

Agreement between the government of Romania and the Government of Ukraine on cooperation in the field of Transboundary water management

Treaty basin: Danube, Tisza, Prut, Siret
Signatories: Romania, Ukraine

Date: September 30, 1997

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International Sava River Basin Commission

The Commission is responsible for the implementation of the agreements, which was ratified by all four countries by June 2004.

Treaty basin: Sava
Bosnia and Herzegovina, Croatia, Slovenia and Serbia

Date: June 1, 2004

Source: <http://www.seerecon.org/infrastructure/sectors/environment/ri/sava.htm>

Joint Commission for the Tisza. For the regulation of water supply

Treaty basin: Tisza
Signatories: Ukraine, Slovakia

Date: September 16, 2003

Source: http://www.coe.int/T/E/Cultural_Co-operation/Environment/CEMAT/List_of_Conferences/DeclarationTisa.asp

Joint Commission established according to the agreement signed by both countries on October 10, 1996

Treaty basin: Danube, Dniester, Vistula/Wista
Signatories: Ukraine, Poland

Date: October 10, 1996

Source: http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf

International Commission for the Protection of the River Danube (ICPDR)

The ICPDR is an international organization consisting of 13 cooperating states and European Union, implementing the Danube River Protection Convention. It is the institutional frame not only for pollution control and the protection of water bodies but it sets also a common platform for sustainable use of ecological resources and coherent and integrated river basin management.

Treaty basin: Danube

October 22, 1998

Signatories: Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Moldova, Poland, Romania, Serbia and Montenegro, Slovakia, Slovenia, Switzerland, Ukraine

Source: http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show

DAUGAVA*

Total area: 58,700 km²

Countries	Area of Basin in Country km ²	%
Byelarus	28,300	48.14
Latvia	20,200	34.38
Russia	9,500	16.11
Lithuania	800	1.38



TREATIES AND AGREEMENTS

Treaty of Peace Between Latvia and Russia

Treaty basin: Frontier or shared waters

Date: August 11, 1920

Signatories: Russia, Latvia

Peace Treaty between Lithuania and the Russian Socialist Federal Republic, and Protocol

Treaty basin: Frontier or shared waters

Date: July 13, 1924

Signatories: Russia, Lithuania

Agreement between the ministry of natural resources and environmental protection of the republic of Belarus and the environmental protection ministry of the republic of Lithuania on cooperation in the field of environmental protection

Treaty basin: Neman, Daugava

Date: April 14, 1995

Signatories: Belarus, Lithuania

Draft agreement on water quality management of Zapadnaya Dvina/Daugava River basin

Treaty basin: Zapadnaya, Dvina, Daugava

Date: November 12, 1997

Signatories: Byelarus, Latvia, Russia

Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rational Utilisation of Transboundary Waters

Treaty basin: Daugava, Dnieper, Narva, Neman, Volga

Date: May 24, 2002

Signatories: Belarus, Russia

DNIEPER

Total area: 516,300 km²

Countries	Area of Basin in Country	
	km ²	%
Ukraine	299,300	57.97
Byelarus	124,900	24.19
Russia	92,100	17.83



TREATIES AND AGREEMENTS

Agreement between the government of the Russian federation and the government of Ukraine concerning the joint use and protection of transboundary waters

Treaty basin: Desna, Seim, Seversky, Donets

Date: October 19, 1992

Signatories: Russia, Ukraine

Agreement between Belarus and Ukraine on the Common Use and Protection of Transboundary Waters

Treaty basin: Dnieper, Vistula/Wista

Date: October 16, 2001

Signatories: Belarus, Ukraine

Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rational Utilisation of Transboundary Waters

Treaty basin: Daugava, Dnieper, Narva, Neman, Volga

Date: May 24, 2002

Signatories: Belarus, Russia

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International Dnieper Basin Council

The Council is consultative in nature and functions as a coordinating body to ensure effective international cooperation focused on the environmental rehabilitation of the Dnieper basin. It plays an active role in the development and implementation of both the regional Strategic Action Plan as well as the three countries' National Action Plans.

Treaty basin: Dnieper

Date: 2003

Signatories: Belarus, Russia and Ukraine

Source: http://www.grid.unep.ch/product/publication/freshwater_europe/dniepr.php

DNIESTER *

Total area: 62,000 km²

Countries	Area of Basin in Country km ²	%
Ukraine	46,800	75.44
Moldova	15,200	24.52
Poland	30	0.05



TREATIES AND AGREEMENTS

Treaty of Peace between Poland, Russia (and Ukraine)

Treaty basin: Frontier or shared waters

Date: March 18, 1921

Signatories: Poland, Russia

Agreement between the government of the republic of Moldova and the government of Ukraine on the joint use and protection of transboundary waters

Treaty basin: Dnestr, Danube, Kogilnik, Sarata

Date: November 23, 1994

Signatories: Moldova, Ukraine

Agreement between the government of Ukraine and the republic of Poland on cooperation in the field of water management in frontier waters.

Treaty basin: Danube, Dniester, Vistula/Wista

Date: October 10, 1996

Signatories: Ukraine, Poland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Joint Commission established according to the agreement signed by both countries on October 10, 1996

Treaty basin: Danube, Dniester, Vistula/Wista

Date: October 10, 1996

Signatories: Ukraine, Poland

Source: http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf

DON

Total area: 425,600 km²

Countries	Area of Basin in Country	
	km ²	%
Russia	371,200	87.23
Ukraine	54,300	12.76



TREATIES AND AGREEMENTS

Agreement between the government of the Russian federation and the government of Ukraine concerning the joint use and protection of transboundary waters

Treaty basins: Desna, Seim, Seversky, Donets

Date: October 19, 1992

Signatories: Russia, Ukraine

DOURO/DUERO

Total area: 98,900 km²

Area of Basin in Country

Countries	km ²	%
Spain	80,700	81.6%
Portugal	18,200	18.3%



TREATIES AND AGREEMENTS

Treaty of limits between Portugal and Spain

Treaty basin: Minho, Douro, Tagus

Date: September 29, 1864

Signatories: Spain, Portugal

Regulations annexed to the Boundary Treaty between Spain and Portugal of 29th September, 1864. Signed at Lisbon, November 4, 1866.

Treaty basin: Minho, Douro, Tagus

Date: November 4, 1864

Signatories: Portugal, Spain

Convention between Spain and Portugal to regulate the hydro-electric development of the international section of the River Douro

Treaty basin: Douro, Huebra, Esla, Tormes

Date: August 11, 1927

Signatories: Spain, Portugal

Exchange of Notes Amending Article 14, Paragraph 2, of the Convention of 11 August 1927

Treaty basin: Douro

Date: September 27, 1951

Signatories: Portugal, Spain

Convenio entre España y Portugal para Regular el Aprovechamiento hidroelectrico de los tramos internacionales de rio Duero y de sus afluentes

Treaty basin: Douro

Date: July 16, 1964

Signatories: Spain, Portugal

Convenção sobre Cooperação para a Protecção e o Aproveitamento Sustentável das Águas das Bacias Hidrográficas Luso-espanholas and Additional Protocol and Annexes

Treaty basin: Lima, Minho, Douro (Duero), Tagus (Tejo), Guadiana

Date: November 30, 1998

Signatories: Portugal, Spain

EBRO

Total area: 85,800 km²

Countries	Area of Basin in Country	
	km ²	%
Spain	85,200	99.36
Andorra	400	0.48
France	100	0.16



TREATIES AND AGREEMENTS

Treaty of Delimitation Between France and Spain, signed at Bayonne

Treaty basin: Canal d'Angoustrine, Raour

Signatories: France, Spain

Date: May 26, 1866

ELBE

Total area: 132,200 km²

Countries	Area of Basin in Country km ²	%
Germany	83,100	62.86
Czech Republic	47,600	36.02
Austria	700	0.54
Poland	700	0.56



TREATIES AND AGREEMENTS

Convention instituting the statute of navigation of the Elbe

Treaty basin: Elbe

Date: February 22, 1922

Signatories: Germany, Belgium, France, UK, Italy, Czechoslovakia

Agreement concerning the Posts of Secretary-General and Assistant Secretary-General of the International Elbe Commission

Treaty basin: Elbe

Date: February 22, 1922

Signatories: Germany, Czechoslovakia

Convention supplementary to the statute of navigation of the Elbe

Treaty basin: Elbe

Date: January 27, 1923

Signatories: Germany, Belgium, France, Great Britain, Italy, Czechoslovakia

Treaty between Germany and Poland for the Settlement of Frontier Questions

Treaty basin: Frontier or shared waters

Date: January 27, 1926

Signatories: Germany, Poland

Convention between the Federal Republic of Germany and the Czech and Slovak Federative Republic and the European Economic Community on the International Commission for the Protection of the Elbe

Treaty basin: Elbe

Date: October 8, 1990

Signatories: Germany, Slovak Federative republic

Convention on the International Commission for the Protection of the Elbe

Treaty basin: Elbe

Date: October 8, 1990

Signatories: Germany, Czech and Slovak Republic

Abkommen zwischen dem Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit der Bundesrepublik Deutschland und dem Ministerium für Umwelt der Tschechischen Republik über die Durchführung des gemeinsamen Umweltschutzpilotprojekts "Kommunale Abwasserbehandlungsanlagen Nordböhmen"

Treaty basin: Elbe

Date: December 19, 1994

Signatories: Germany, Czech Republic

Gesetz zu dem Vertrag vom 12. Dezember 1995 zwischen der Bundesrepublik Deutschland und der Tschechischen Republik über die Zusammenarbeit auf dem Gebiet der Wasserwirtschaft and den Grenzgewässern

Treaty basin: Elbe, Eger

Date: December 12, 1995

Signatories: Germany, Czech Republic

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International Commission for the Protection of the Elbe (ICEP)

The contracting parties shall cooperate in the International Commission for the Protection of the Elbe to prevent the pollution of the Elbe and its drainage area.

Treaty basin: Elbe

Date: 1990

Signatories: Czech Republic, European Union, Germany

Source: <http://rod.eionet.eu.int/show.jsv?id=182&mode=S> and <http://www.ikse.de/>

ENNINGSDALSELVA*



TREATIES AND AGREEMENTS

Traites et Conventions Concernant la Dissolution de L'Union Suedo-Norvegienne

Treaty basin: Frontier or shared waters

Date: October 26, 1905

Signatories: Norway, Sweden

Agreement concerning the salmon and seasalmon fisheries in the Svinesund, the Iddefjord, and the River Enningsdals

Treaty basin: Iddefjord, Svinesund, Enningsdals

Date: December 5, 1991

Signatories: Norway, Sweden

GARONNE

Total area: 55,800 km²

Countries	Area of Basin in Country	
	km ²	%
France	55,100	98.83
Spain	600	1.07
Andorra	40	0.08



TREATIES AND AGREEMENTS

Treaty of Delimitation Between France and Spain, signed at Bayonne

Treaty basin: Canal d'Angoustrine, Raour

Date: May 26, 1866

Signatories: France, Spain

Agreement between the Government of the French Republic and the Spanish Government relating to Lake Lanoux

Treaty basin: Lake Lanoux, Carol, Font-Vive

Date: July 12, 1958

Signatories: France, Spain

Convention Entre le Gouvernement de la République Française et le Gouvernement Espagnol Relative a L'Amenagement du Cours Superieur de la Garonne

Treaty basin: Garonne

Date: July 29, 1963

Signatories: France, Spain

Exchange of letters constituting an agreement between France and Spain amending the arrangement of 12 July 1958 relating to Lake Lanoux

Treaty basin: Lake Lanoux, Carol, Font-Vive, Ariege, Fourats, La Portaille, Courtal-Rousso

Date: January 27, 1970

Signatories: France, Spain

GLAMA

Total area: 43,000 km²

Countries	Area of Basin in Country	
	km ²	%
Norway	42,600	99.00
Sweden	400	0.99



TREATIES AND AGREEMENTS

Traites et Conventions Concernant la Dissolution de L'Union Suedo-Norvegienne

Treaty basin: Frontier or shared waters

Date: October 26, 1905

Signatories: Norway, Sweden

GUADIANA

Total area: 67,900 km²

Countries	Area of Basin in Country	
	km ²	%
Spain	54,900	80.82
Portugal	13,000	19.18



TREATIES AND AGREEMENTS

Convenio y Protocola Adicional Para Regular el Uso y aprovechamiento hidraulico de los tramos internacionales de los rios Miño, Limia, Tajo...

Treaty basin: Miño, Guadiana

Date: May 29, 1968

Signatories: Spain, Portugal

Treaty between Spain and Portugal relating to hydropower construction on the Miño river [Untitled]

Treaty basin: Miño

Date: February 12, 1976

Signatories: Spain and Portugal

Convenção sobre Cooperação para a Protecção e o Aproveitamento Sustentável das Águas das Bacias Hidrográficas Luso-espanholas and Additional Protocol and Annexes

Treaty basin: Lima, Minho, Douro (Duero), Tagus (Tejo), Guadiana

Date: November 30, 1998

Signatories: Portugal, Spain

ISONZO

Total area: 3,000 km²

Countries	Area of Basin in Country	
	km ²	%
Slovenia	1,800	59.48
Italy	1,200	40.09



TREATIES AND AGREEMENTS

Accord Entre le Gouvernement de la Republique Italienne et le Gouvernement de la Republique Populaire Federative de Yougoslavie Concernant L'Alimentation en Eau de la Commune de Gorizia Conformement au Paragraphe 5 de L'Annexe V au Traite de Paix Avec L'Italie et Echange de Notes

Treaty basin: Mrzlek, Fontefredda

Date: July 18, 1957

Signatories: Italy, Yugoslavia

KEMI

Total area: 55,700 km²

Countries	Area of Basin in Country	
	km ²	%
Finland	52,700	94.52
Russia	3,000	5.41
Norway	10	0.01



TREATIES AND AGREEMENTS

Convention between the Republic of Finland and the Russian Socialist Federal Soviet Republic concerning the maintenance of river channels and the regulation of fishing on water courses Forming Part of the Frontier Between Finland and Russia

Treaty basin: Kutajoki, Kutalahti, Kuusamon-järvi, Lake Ladoga, Lake Tulenanjärvi, Lake Tuulijärvi, Lentiera, Lieksa, Luttojoki, Pääjärvi, Paanajärvi, Pistojoiki, Pielisjärvi, Tuntsajoki, Tuntsajoki, Tuulijoki, Tulenmananjoki, Tuulomanjoki, Ulanganjoki, Yla-Kuittijärvi
Date: October 28, 1922
Signatories: Finland, Republic of; Russian Socialist Federal Soviet Republic

Agreement [Between Finland and the Union of Soviet Socialist Republics] Concerning Frontier Watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters
Date: April 24, 1964
Signatories: Finland, USSR

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Norwegian Transboundary Water Commission.

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Naatamo, Olanga, Pasvik, Tana, Torne/Tornealven
Date: 1980
Signatories: Finland, Norway
Source: <http://www.ymparisto.fi/default.asp?node=9813&lan=en>

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

Treaty basin: Kemi, Olanga, Oulu, Pasvik, Tuloma, Vuoksa
Date: 1964
Signatories: Finland, Russia
Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

KLARALVEN

Total area: 51,000 km²

Countries	Area of Basin in Country	
	km ²	%
Sweden	43,100	84.54
Norway	7,900	15.46



TREATIES AND AGREEMENTS

Traites et Conventions Concernant la Dissolution de L'Union Suedo-Norvegienne

Treaty basin: Frontier or shared waters

Date: October 26, 1905

Signatories: Norway, Sweden

KOGILNIK

Total area: 6,100 km²

Countries	Area of Basin in Country	
	km ²	%
Moldova	3,600	57.82
Ukraine	2,600	42.18



TREATIES AND AGREEMENTS

Agreement between the government of the republic of Moldova and the government of Ukraine on the joint use and protection of transboundary waters

Treaty basin: Dnestr, Danube, Kogilnik, Sarata

Date: November 23, 1994

Signatories: Moldova, Ukraine

LAKE PRESPA

Total area: 9,000 km²

Countries	Area of Basin in Country km ²	%
Albania	8,000	88.17
Macedonia	800	8.5
Greece	300	3.32



TREATIES AND AGREEMENTS

Exchange of Notes Between Greece and Yugoslavia

Treaty basin: Vardar, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa Date: May 25, 1954

Signatories: Greece, Yugoslavia

Accord Entre Le Royaume de Grece et al Republique Populaire Federative de Yougoslavie Relatif aux Questions de L'Hydroeconomie Avec Annexe Concernant Le Statut de la Commission Permanente Greco-Yougoslave de L'Hydroeconomie et Echange de Notes, Signe a Athenes

Treaty basin: Vardar, Axios, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa

Date: June 18, 1959

Signatories: Greece, Yugoslavia

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Alliance for Lake Cooperation in Prespa and Ohrid.

Lake Ohrid is a subbasin of Lake Prespa. The alliance focuses on promoting and supporting the cross-border activities in the protection of the environment in the Region of Ohrid and Prespa Lakes aiming at sustainable development of the region. The approach includes development of cross border cooperation and co-ordination between the relevant states and above all local government and NGOs in order to ensure the active participation of the local population.

Treaty basin: Lake Prespa, Lake Ohrid

Date: January 15, 2000

Signatories: Albania, Macedonia

Source: <http://allcoop.org.mk/ALLCOOP.html>

LAVA/PREGEL

Total area: 8,600 km²

Countries	Area of Basin in Country	
	km ²	%
Russia	6,300	74
Poland	2,000	23.84



TREATIES AND AGREEMENTS

Agreement between Poland and the USSR concerning the regime on the Soviet-Polish State Frontier

Treaty basin: Frontier or shared waters

Date: July 8, 1948

Signatories: Russia, Poland-

LIMA

Total area: 2,300 km²

Countries	Area of Basin in Coun km ²	%
Spain	1,200	50.88
Portugal	1,100	49.04



TREATIES AND AGREEMENTS

Convenção sobre Cooperação para a Protecção e o Aproveitamento Sustentável das Águas das Bacias Hidrográficas Luso-espanholas and Additional Protocol and Annexes

Treaty basin: Lima, Minho, Douro (Duro), Tagus (Tejo), Guadiana

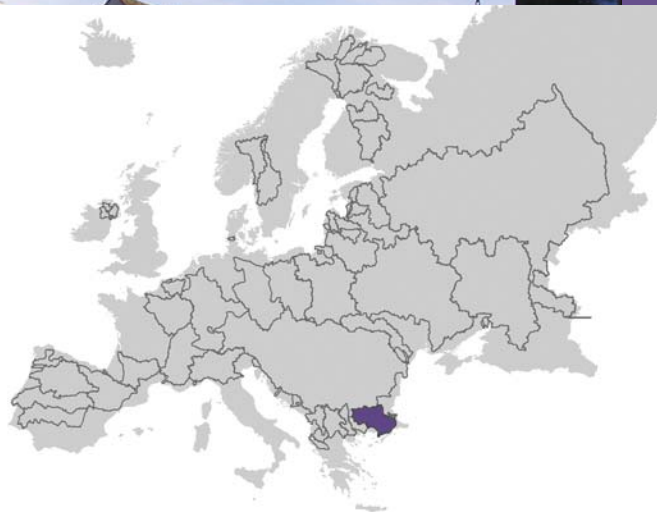
Date: November 30, 1998

Signatories: Portugal, Spain

MARITSA

Total area: 49,600 km²

Countries	Area of Basin in Country	
	km ²	%
Bulgaria	33,000	66.49
Turkey	12,800	25.69
Greece	3,700	7.55



TREATIES AND AGREEMENTS

Agreement between the People's Republic of Bulgaria and the Republic of Turkey concerning cooperation in the use of the waters of rivers flowing through the territory of both countries

Treaty basin: Maritsa, Marica, Tundzha, Veleka, Rezovska

Date: October 23, 1968

Signatories: Turkey, Bulgaria

Agreement between the People's Republic of Bulgaria and the Republic of Turkey concerning cooperation in the use of the waters of rivers flowing through the territory of both countries

Treaty basin: Maritsa, Marica, Tundzha, Veleka, Rezovska

Date: October 23, 1968

Signatories: Turkey, Bulgaria

MINHO/Miño

Total area: 15,100 km²

Countries	Area of Basin in Country km ²	%
Spain	14,500	96.18
Portugal	600	3.7



TREATIES AND AGREEMENTS

Treaty of limits between Portugal and Spain

Treaty basin: Minho, Douro, Tagus

Date: September 29, 1864

Signatories: Spain, Portugal

Regulations annexed to the Boundary Treaty between Spain and Portugal of 29th September, 1864. Signed at Lisbon, November 4, 1866.

Treaty basin: Minho, Douro, Tagus

Date: November 4, 1864

Signatories: Portugal, Spain

Convenção sobre Cooperação para a Protecção e o Aproveitamento Sustentável das Águas das Bacias Hidrográficas Luso-espanholas and Additional Protocol and Annexes

Treaty basin: Lima, Minho, Douro (Duro), Tagus (Tejo), Guadiana

Date: November 30, 1998

Signatories: Portugal, Spain

NÄÄTÄMO

Total area: 1,000 km²

Countries	Area of Basin in Country	
	km ²	%
Norway	600	57.73
Finland	400	41.97



TREATIES AND AGREEMENTS

Agreement between [Finland] and [Norway] on the transfer from the course of the Näätämo (Neiden) river to the course of the Gandvik River of water from the Garsjoen, Kjerringvatn and Forstevannene lakes

Treaty basin: Näätämo, Gandvik

Date: April 25, 1951

Signatories: Norway, Finland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Estonian – Russian Joint Transboundary Water Commission

Treaty basin: Näätämo

Date: 1997

Signatories: Estonia, Russia

Source: <http://www.enviree/jc/eng>

Finnish-Norwegian Transboundary Water Commission

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Näätämo, Olanga, Pasvik, Tana, Torne/Tornealven

Date: 1980

Signatories: Finland, Norway

Source: <http://www.ymparisto.fi/default.asp?node=9813&lan=en>

NARVA*

Total area: 53,000 km²

Countries	Area of Basin in Country	
	km ²	%
Russia	28,200	53.2
Estonia	18,100	34.09
Latvia	5,900	11.13
Byelarus	800	1.57



TREATIES AND AGREEMENTS

Treaty of Peace Between Latvia and Russia

Treaty basin: Frontier or shared waters

Date: August 11, 1920

Signatories: Russia, Latvia

Treaty between Estonia and Russia on the conservation of fish stocks in Lake Peipsi

Treaty basin: Lake Peipsi

Date: 1994

Signatories: Estonia, Russia

Agreement between the government of Estonia and the government of the Russian federation on the protection and rational use of transboundary waters

Treaty basin: Narva, Lake Peipsi/Chudskoe

Date: August 20, 1997

Signatories: Estonia, Russian Federation

Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rational Utilisation of Transboundary Waters

Treaty basin: Daugava, Dnieper, Narva, Neman, Volga

Date: May 24, 2002

Signatories: Belarus, Russia

NEMAN*

Total area: 90,300 km²
Area of Basin in Country

Countries	km ²	%
Byelarus	41,700	46.13
Lithuania	39,700	43.97
Russia	4,800	5.3
Poland	3,800	4.21
Latvia	300	0.36



TREATIES AND AGREEMENTS

Treaty of Peace Between Latvia and Russia

Treaty basin: Frontier or shared waters

Date: August 11, 1920

Signatories: Russia, Latvia

Peace Treaty between Lithuania and the Russian Socialist Federal Republic, and Protocol

Treaty basin: Frontier or shared waters

Date: July 13, 1924

Signatories: Russia, Lithuania

Convention between the German Reich and the Lithuanian Republic regarding the maintenance and administration of the frontier waterways

Treaty basin: Memel, Kurische Haff

Date: January 29, 1928

Signatories: Germany, Lithuania

Agreement between Poland and the USSR concerning the regime on the Soviet-Polish State Frontier

Treaty basin: Frontier or shared waters

Date: July 8, 1948

Signatories: Russia, Poland

Agreement between the environmental protection ministry of the republic of Lithuania and the ministry of environmental protection, nature conservation and forestry of the republic Poland

Treaty basin: Siesupe, Selmenta, Lake Galadusis

Date: March 31, 1994

Signatories: Lithuania, Poland

Agreement between the ministry of natural resources and environmental protection of the republic of Belarus and the environmental protection ministry of the republic of Lithuania on cooperation in the field of environmental protection

Treaty basin: Neman, Daugava

Date: April 14, 1995

Signatories: Belarus, Lithuania

Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rational Utilisation of Transboundary Waters

Treaty basin: Daugava, Dnieper, Narva, Neman, Volga

Date: May 24, 2002

Signatories: Belarus, Russia

NESTOS

Total area: 10,200 km²

Countries	Area of Basin in Country	
	km ²	%
Bulgaria	5,500	53.63
Greece	4,700	46.36



TREATIES AND AGREEMENTS

Minutes of the Greek-Bulgarian Committee for the use of waters of the Nestos river

Treaty basin: Nestos

Date: March 16, 1988

Signatories: Bulgaria, Greece

Agreed minutes of the first meeting of the Greek-Bulgarian joint programming and follow-up Committee

Treaty basin: Not specified

Date: April 22, 1994

Signatories: Bulgaria, Greece

Agreement between the Government of Hellenic Republic and the Government of the Republic of Bulgaria for the use of the Nestos River waters

Treaty basin: Nestos

Date: December 22, 1995

Signatories: Bulgaria, Greece

ODER/ODRA

Total area: 122,400 km²

Countries **Area of Basin in Country**
km² **%**

Poland	103,100	84.2
Czech Republic	10,300	8.38
Germany	7,800	6.33
Slovakia	1,300	1.09



TREATIES AND AGREEMENTS

Convention between the Republic of Finland and the Russian Socialist Federal Soviet Republic concerning the maintenance of river channels and the regulation of fishing on water courses Forming Part of the Frontier Between Finland and Russia

Treaty basin: Tuulomanjoki, Luttojoki, Kutajoki, Tuntsajoki, Kutalahti, Tuntsajoki, Ulanganjoki, Pääjärvi, Paanajärvi, Pistojoiki, Yla-Kuittijärvi, Kuusamon-järvi, Lieksa, Tuulijoki, Pielisjärvi, Lentiera, Lake Tuulijärvi, Tulenmananjoki, Lake Ladoga, Lake Tulenanjärvi

Date: October 28, 1922

Signatories: USSR, Finland

Treaty between Germany and Poland for the Settlement of Frontier Questions

Treaty basin: Frontier or shared waters

Date: January 27, 1926

Signatories: Germany, Poland

Agreement between the Government of the Czechoslovak Republic and the Government of the Polish People's Republic concerning the use of water resources in frontier waters

Treaty basin: Oder

Date: March 21, 1958

Signatories: Czechoslovakia and Poland

Agreement between the federal republic of Germany and the republic of Poland on cooperation in the field of water management at border waters

Treaty basin: Oder

Date: May 19, 1992

Signatories: Germany, Poland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International Commission for the Protection of the Oder River against Pollution (ICPOAP)

The objectives of the ICPOAP are: 1. to prevent the pollution of the Oder and the Baltic Sea by contaminants and to achieve a reduction in the pollution thereof; 2. to achieve the most natural aquatic and littoral ecosystems possible with the corresponding species diversity; 3. to permit utilization of the Oder, in particular the production of drinking water from bank filtrate and the use of its water and sediments in agriculture; 4. to provide for precautions against the risk of flood damage and achieve a sustained reduction thereof; and 5. to coordinate implementation of the Water Framework Directive in the Oder river basin.

Treaty basin: Oder/Odra

Date: April 26, 1999

Signatories: Poland, Czech Republic, Germany

OLANGA

Total area: 18,800 km²

Countries	Area of Basin in Country km ²	%
Russia	16,800	89.37
Finland	2,000	10.62



TREATIES AND AGREEMENTS

Agreement [Between Finland and the Union of Soviet Socialist Republics] Concerning Frontier Watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters

Date: April 24, 1964

Signatories: Finland, Union of Soviet Socialist Republics

Convention between the Republic of Finland and the Russian Socialist Federal Soviet Republic concerning the maintenance of river channels and the regulation of fishing on water courses Forming Part of the Frontier Between Finland and Russia

Treaty basin: Kutajoki, Kotalahti, Kuusamon-järvi, Lake Ladoga, Lake Tulenanjärvi, Lake Tuulijärvi, Lentiera, Lieksa, Luttojoki, Pääjärvi, Paanajärvi, Pistojoiki, Pielisjärvi, Tuntsajoki, Tuntsajoki, Tuulijoki, Tulenmananjoki, Tuulomanjoki, Ulanganjoki, Yla-Kuittijärvi

Date: October 28, 1922

Signatories: Finland, Republic of; Russian Socialist Federal Soviet Republic

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Norwegian Transboundary Water Commission

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Naatamo, Olanga, Pasvik, Tana, Torne/Tornealven

Date: 1964

Signatories: Finland, Norway

Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

Treaty basin: Kemi, Olanga, Oulu, Pasvik, Tuloma, Vuoksa

Date: 1964

Signatories: Finland, Russia

Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

OULU

Total area: 28,700 km²

Countries	Area of Basin in Country	
	km ²	%
Finland	26,700	93.2
Russia	1,900	6.78



TREATIES AND AGREEMENTS

Agreement between Finland and the Union of Soviet Socialist Republics concerning frontier watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters

Date: April 24, 1964

Signatories: Finland, Union of Soviet Socialist Republics

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

Treaty basin: Kemi, Olanga, Oulu, Pasvik, Tuloma, Vuoksa

Date: 1964

Signatories: Finland, Russia

Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

PASVIK

Total area: 16,000 km²

Countries	Area of Basin in Country	
	km ²	%
Finland	12,400	77.46
Russia	2,600	16.15
Norway	1,000	6.39



TREATIES AND AGREEMENTS

Convention between the Republic of Finland and the Russian Socialist Federal Soviet Republic concerning the maintenance of river channels and the regulation of fishing on water courses Forming Part of the Frontier Between Finland and Russia

Treaty basin: Tuulomanjoki, Luttojoki, Kutajoki, Tuntsajoki, Kutalahti, Tuntsajoki, Ulanganjoki, Pääjärvi, Paanajärvi, Pistojoiki, Yla-Kuittijärvi, Kuusamon-järvi, Lieksa, Tuulijoki, Pielisjärvi, Lentiera, Lake Tuulijärvi, Tulenmananjoki, Lake Ladoga, Lake Tulenanjärvi, Date: October 28, 1922

Signatories: USSR, Finland

Convention between [Norway] and [Finland] concerning the international legal regime of the waters of the Pasvik (Paatsjoki) and the Jakobselv (Vuoremajoki)

Treaty basin: Paatsjoki, Vuoremajoki

Date: February 14, 1925

Signatories: Finland, Norway

Treaty between the USSR and Finland on the transfer to the territory of the Soviet Union of part of the state territory of Finland in the region of the Janiskoski Hydroelectric Power Station and the Niskakoski Control Dam

Treaty basin: Paatsjoki

Date: February 3, 1947

Signatories: USSR, Finland

Agreement between Norway and Finland concerning the construction and maintenance of a bridge across the Anarjokka (Inarijoki) River. Signed at Helsinki, on June 28, 1957

Treaty basin: Anarjokka, Inarijoki

Date: June 28, 1957

Signatories: Finland, Norway

Agreement between Norway and the Union of Soviet Socialist Republics on the Utilization of Water power on the Pasvik (Paatso) River

Treaty basin: Pasvik

Date: December 18, 1957

Signatories: USSR, Norway

Agreement between the Government of the Union of Soviet Socialist Republics, the Government of Norway and the Government of Finland concerning the regulation of Lake Inari by means of the Kaitakoski hydro-electric power station and dam and additional protocol

Treaty basin: Paatsjoki

Date: April 29, 1959

Signatories: USSR, Finland, Norway

Agreement [Between Finland and the Union of Soviet Socialist Republics] Concerning Frontier Watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters

Date: April 24, 1964

Signatories: Finland, USSR

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Norwegian Transboundary Water Commission

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Naatamo, Olanga, Pasvik, Tana, Torne/Tornealven

Date: 1980

Signatories: Finland, Norway

Source: <http://www.ymparisto.fi/default.asp?node=9813&lan=en>

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

Treaty basin: Kemi, Olanga, Oulu, Pasvik, Tuloma, Vuoksa

Date: 1964

Signatories: Finland, Russia

Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

Po

Total area: 87,100 km²

Countries	Area of Basin in Country	
	km ²	%
Italy	82,200	94.44
Switzerland	4,300	4.92
France	500	0.54
Austria	90	0.10



TREATIES AND AGREEMENTS

Convention Entre La Confederation Suisse et la Republique Italienne Concernant La Correction de la Roggia Molinara (Communes de Chiaso et de Come), Concluye a Chiasso

Treaty basin: Roggia Molinara

Date: April 15, 1951

Signatories: Italy, Switzerland

Accord Provisoire et Echange de Notes entre La France et L'Italie Relative au Fonctionnement de L'Usine de Gran Scala

Treaty basin: Gran Scala, Lac du Mont-Cenis

Date: January 12, 1955

Signatories: France, Italy

Convention Entre L'Italie et la Suisse au Sujet de la Regularisation du Lac de Lugano et Protocol Additionnel

Treaty basin: Lugano, Rochetta

Date: September 17, 1955

Signatories: Italy, Switzerland

Convention Entre la Confederation Suisse et la Republique Italienne au Sujet de L'Utilisation de la Force Hydraulique du Spol et Protocole Additionnel

Treaty basin: Spol

Date: May 27, 1957

Signatories: Italy, Switzerland

Echange de lettres du 15 juin 1970 entre La Suisse et L'Italie concernant les travaux d'Amenagement du cours d'eau de la Breggia sur la frontiere Italo-Suisse

Treaty basin: Breggia

Date: June 15, 1970

Signatories: Italy, Switzerland

Convention Entre La Suisse et L'Italie Relative a L'Amenagement Hydraulique du Torrent Breggia a la Frontiere Italo-Suisse, Avec Annexes, Berne

Treaty basin: Breggia

Date: June 23, 1972

Signatories: Italy, Switzerland

RHINE*

Total area: 172,900 km²

Countries	Area of Basin in Country	
	km ²	%
Germany	97,700	56.49
Switzerland	24,300	14.05
France	23,100	13.34
Belgium	13,900	8.03
Netherlands	9,900	5.75
Luxembourg	2,500	1.46
Austria	1,300	0.76
Liechtenstein	200	0.09
Italy	70	0.04



TREATIES AND AGREEMENTS

Proces-verbal of Delimitation between Belgium and France, signed at Pussemange

Treaty basin: Facquanont

Date: July 20, 1910

Signatories: Belgium, France

Traite de Limites Entre La France et Les Pays Bas Conclu A Courtray

Treaty basin: Lys, Semoy, Meuse

Date: March 28, 1820

Signatories: France, Netherlands

Convention entre les delegues des Etats riverains du lac de Constance: Bade, la Baviere, l'Autriche, la Suisse et le Wurtemberg, touchant la regularisation de l'ecoulement des eaux du lac de Constance pres Constance

Treaty basin: Lake Constance

Date: August 31, 1857

Signatories: Austria, Bade, Bavaria, Switzerland, Wurtemberg

Traite pour regler le regime des prises d'eau a la Meuse, suivi d'une note explicative, signe a la Haye

Treaty basin: Meuse

Date: May 12, 1863

Signatories: Belgium, Pays-Bas

Revised Convention Relating to the Navigation of the Rhine

Treaty basin: Rhine

Date: October 17, 1868

Signatories: Belgium, Germany, France, Netherlands, Switzerland, United Kingdom of Great Britain and Northern Ireland

Convention pour modifier l'article 6 du Traite du 12 mai 1863, reglant le regime des prises d'eau a la Meuse, suivie d'une Declaration

Treaty basin: Meuse, Dommel

Date: January 11, 1873

Signatories: Belgium, Pays-Bas

- Traite entre la Suisse et l'Autriche-Hongrie pour le redressement du Rhin des l'embouchure de l'Ill jusqu'au lac de Constance**
Treaty basin: Lake Constance, Rhine Date: December 30, 1892
Signatories: Austria-Hungary, Switzerland
- Treaty for the Regulation of the Rhine; for the straightening of the Rhine from the mouth of the Ill until Lake Constance**
Treaty basin: Rhine Date: December 30, 1892
Signatories: Austria-Hungary, Switzerland
- Traite Entre la Confederation Suisse et la Republique D'Autriche pour le redressement du Rhin des l'embouchure de l'Ill jusqu'au lac de Constance**
Treaty basin: Lake Constance Date: November 19, 1924
Signatories: Austria, Switzerland
- Convention pour le reglement des rapports entre la Suisse et la France au sujet de certaines clauses du regime juridique de la future derivation de Kembs**
Treaty basin: Kembs Date: August 28, 1930
Signatories: France, Switzerland
- Accord Entre la Suisse et L'Italie au Sujet de La Concession de Forces Hydrauliques du Reno Di Lei, Avec Protocole Additionnel**
Treaty basin: Reno di Lei, Averserrhein, Madriserrhein, Emetbach Date: June 18, 1949
Signatories: Italy, Switzerland
- State Treaty concerning the construction of a hydro-electric power-plant on the Sauer at Rosport/Ralingen**
Treaty basin: Rhine Date: April 25, 1950
Signatories: Luxembourg, Germany (GFR)
- Traite Entre la Confederation Suisse et la Republique D'Autriche Pour la Regularisation du Rhin de L'Embouchure de L'Ill Au Lac de Constance**
Treaty basin: Lake Constance Date: April 10, 1954
Signatories: Austria, Switzerland
- Convention Entre La République Fédérale D'Allemagne et la République Française Sur L'Aménagement Du Cours Supérieur Du Rhin Entre Bâle Et Strasbourg et Protocole Annexé À La Convention, Signée à Luxembourg Le 27 Octobre 1956**
Treaty basin: Rhine Date: October 27, 1956
Signatories: France, Germany
- Traité Entre la Republique Francaise et la Republique Federale D'Allemagne Sur le Reglement de la Question Sarroise**
Treaty basin: Sarre Date: October 27, 1956
Signatories: France, Germany
- State treaty between Luxembourg and West Germany concerning the construction of hydroelectric power-installations on the Our (with annexes)**
Treaty basin: Our Date: July 10, 1958
Signatories: Luxembourg, Germany (GFR)
- Treaty between the Kingdom of the Netherlands and the Federal Republic of Germany concerning the course of the common frontier, the boundary waters, real property situated near the frontier, traffic crossing the frontier on land and via inland waters, and other frontier questions**
Treaty basin: Frontier or shared waters Date: April 8, 1960
Signatories: Germany, Netherlands

Exchange of notes constituting an agreement concerning the treaty of 12 May 1863 to regulate the diversion of water from the River Meuse and the convention of 11 January 1873 amending that treaty

Treaty basin: Meuse

Date: February 24, 1961

Signatories: Netherlands, Belgium

Agreement withdrawal of water from Lake Constance

Treaty basin: Rhine

Date: April 30, 1966

Signatories: Germany (GFR), Austria, Switzerland

Convention between the French Republic and the Federal Republic of Germany concerning development of the Rhine between Strasbourg/Kehl and Lauterbourg/Neuburgweier

Treaty basin: Rhine

Date: July 4, 1969

Signatories: Germany (GFR) and France

Convention Entre La Republique Française Et La Republique Federale D'Allemagne Additionnelle A La Convention Du 4 Juillet 1969 Au Sujet De L'Amenagement du Rhin Entre Strasbourg/Kehl et Lauterbourg/Neuburgweier, Signée à Bonn Le 16 Juillet 1975

Treaty basin: Rhine

Date: July 16, 1975

Signatories: France, Germany

Accord Entre Le Gouvernement de la Republique Federale D'Allemagne et le Gouvernement du Grand-Duche de Luxembourg Sur L'Entretien, Le Renouvellement et L'Exploitation de la Partie de la Moselle Commune Aux Deux Etats

Treaty basin: Moselle

Date: September 14, 1976

Signatories: Germany (GFR), Luxembourg

Convention on the Protection of the Rhine against chemical pollution

Treaty basin: Rhine

Date: December 3, 1976

Signatories: Germany (GFR), France, Luxembourg, Netherlands, Switzerland, European Economic Community

Convention entre la Royaume de Belgique et le Grand-Duché de Luxembourg au Sujet des Eaux de la Sûre

Treaty basin: Sûre

Date: May 17, 1980

Signatories: Belgium, Luxembourg

Convention Entre La Republique Française Et La Republique Federale D'Allemagne Modifiant et Completant La Convention Additionnelle Du 16 Juillet 1975 a la Convention du 4 Juillet 1969 Au Sujet De L'Amenagement du Rhin Entre Strasbourg/Kehl et Lauterbourg/Neuburgweier, Signée à Bonn Le 6 Decembre 1982

Treaty basin: Rhine

Date: December 6, 1982

Signatories: France, Germany

Convention entre le Gouvernement de la République Française et le Gouvernement du Grand-Duché de Luxembourg pour la Réalisation et l'Exploitation de Certaines Implantations Industrielles sur la Moselle

Treaty basin: Moselle

Date: March 12, 1986

Signatories: France, Luxembourg

Exchange of Notes Constituting an Agreement Concerning the Execution of Improvement Works on the River Gander at Mondorff (France) and at Mondorf-les-Bains (Luxembourg). Paris, 3 and 23 June 1986

Treaty basin: Gander

Date: June 23, 1986

Signatories: France, Luxembourg

Agreement Between the Government of the French Republic, the Government of the Federal Republic of Germany, and the Government of the Grand Duchy of Luxembourg on Flood Warning for the Catchment Basin of the Moselle

Treaty basin: Moselle, Saar

Date: October 1, 1987

Signatories: France, Germany, Luxembourg

Agreement between the government of the Land Badenwurttemberg and the Swiss federal council concerning the joint construction and operation of a monitoring and control station downstream of Basel to monitor the water quality of the River Rhine

Treaty basin: Rhine

Date: May 17, 1990

Signatories: Germany, Switzerland

Supplementary protocol to the convention on the protection of the Rhine against pollution by Chlorides

Treaty basin: Rhine

Date: September 25, 1991

Signatories: France, Germany, Luxembourg, Netherlands, Switzerland

Agreement between the federal republic of Germany and the republic of Poland on cooperation in the field of water management at border waters

Treaty basin: Oder

Date: May 19, 1992

Signatories: Germany, Poland

Agreement on the protection of the Meuse

Treaty basin: Meuse

Date: April 26, 1994

Signatories: France; Netherlands, the Brussels Capital Region, the Walloon Region, the Flemish Region

Convention on the Protection of the Rhine

Treaty basin: Rhine

Date: January 22, 1998

Signatories: Germany, France, Luxembourg, Netherlands, Switzerland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International Meuse Commission (IMC)

The Meuse is a subbasin of the Rhine. The IMC has as most important tasks: coordinating the obligations of the European framework directive water, giving recommendations to the parties for the prevention of high tides and fighting calamitous water pollution (warning - and alarm system). The Commission has an action programme and meets one time per year. For the preparation the IMC has four permanent working parties and some temporary project groups. Non-governmental organizations (NGOs) take part as an observer in meetings of the Commission.

Treaty basin: Meuse

Date: 2002

Signatories: Germany, France, Luxembourg and the Netherlands

Source: <http://www.cipm-icbm.be/default.asp>

International Commission for the Hydrology of the Rhine Basin (CHR)

An organization where the scientific institutes of the Rhine riparian states formulate joint hydrological measures for sustainable development of the Rhine basin. Mission: 1) Expansion of the knowledge of the hydrology in the Rhine basin and 2) making a contribution to the solution of cross-border problems.

Treaty basin: Rhine

Date: 1970

Signatories: Switzerland, Austria, Germany, France, Luxembourg and the Netherlands

Source: <http://www.chr-khr.org/>

International commission for the protection of Lake Constance (IKGB)

Lake Constance is a subbasin of the Rhine.

Treaty basin: Lake Constance

Date: November 10, 1961

Signatories: Austria, Liechtenstein, Switzerland

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint.html

Common commission for the international regularization of the Rhine at its mouth at Ill on Lake Constance

Objectives: • To continue the work to regularize the Rhine at its mouth at Ill on Lake Constance
Sphere(s) of activity: • Continuing the work to regularize the Rhine; • Directing all matters of a technical, administrative and financial nature; • Carrying out regular inspections of the works regulating the flow of the river.

Treaty basin: Rhine

Date: July 22, 1955

Signatories: Switzerland, Austria

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint/water.html

International Commission for the Protection of the Rhine (formerly: International Commission for the Protection of the Rhine against Pollution) (ICPR)

Targets: 1. Sustainable development of the entire Rhine ecosystem 2. Guarantee the use of Rhine water for drinking water production 3. Improvement of the sediment quality in order to enable the use or disposal of dredged material without causing environmental harm. 4. Overall flood prevention and environmentally sound flood protection 5. Improvement of the North Sea quality in accordance with other measures aimed at the protection of this marine area.

Treaty basin: Rhine

Date: 1950

Signatories: European Union, France, Germany, Luxemburg, the Netherlands, Switzerland

Source: <http://www.iksr.org/>

Central Commission for Navigation on the Rhine (CCNR)

The Commission passes resolutions unanimously in line with its terms of reference as follows: % proposals concerning the prosperity of navigation on the Rhine % adoption of technical and administrative regulations (and their amendments) concerning the safety of vessels % complaints arising from the application of the Mannheim Convention.

Treaty basin: Rhine

Date: 1815

Signatories: Belgium, Germany, France, Netherlands, Switzerland

Source: <http://unesdoc.unesco.org/images/0013/001333/133303e.pdf>

RHONE

Total area: 100,200 km²

Countries	Area of Basin in Country	
	km ²	%
France	90,100	89.88
Switzerland	10,100	10.05
Italy	50	0.05



TREATIES AND AGREEMENTS

Convention avec la France pour l'aménagement de la puissance hydraulique du Rhone entre l'usine projetee de La Plaine et un point a determiner en amont du pont de Pougny-Chancy

Treaty basin: Rhone

Date: October 4, 1913

Signatories: France, Switzerland

Convention entre la Suisse et la France au sujet de la concession de la chute du Chatelot

Treaty basin: Chatelot, Doubs

Date: November 20, 1934

Signatories: France, Switzerland

Treaty of Peace with Italy, Signed at Paris, on 10 February 1947

Treaty basin: Lake of Mont Cenis

Date: February 10, 1947

Signatories: Italy, France (primarily), and the Allied Powers

Convention entre la Suisse et la France concernant la correction de l'Hermance

Treaty basin: Hermance

Date: December 3, 1959

Signatories: France, Switzerland

Convention entre la Suisse et la France concernant la correction du ruisseau <<Le Boiron>>

Treaty basin: Le Boiron

Date: December 4, 1963

Signatories: France, Switzerland

Convention entre la Confederation suisse et la Republique francaise au sujet de l'aménagement hydroelectrique d'Emosson

Treaty basin: Emosson

Date: August 24, 1967

Signatories: France, Switzerland

Convention Instituant le Conseil du Léman Lausanne, 19 Février 1987 et Échange de Lettres du 10 Juin 1987

Treaty basin: Lemane

Date: June 10, 1987

Signatories: France and Switzerland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Mixed Franco-Swiss Commission on fishing and the protection of the aquatic environment in the stretches of the River Doubs which form the frontier between the two States

Objectives: Regulate questions concerning fishing and the protection of the aquatic environment in the stretches of the River Doubs which form the frontier.

Treaty basin: River Doubs

Date: July 1, 1993

Signatories: Switzerland, France

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint/fishin.html

Franco-Swiss Consultative Commission on Fishing in Lake Geneva

Objectives: Harmonize the legal provisions between the two States governing fishing, and ensure the effective protection of fish and their habitat.

Treaty basin: Lake Geneva

Date: September 1, 1982

Signatories: Switzerland, France

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint/fishin.html

Joint commission for the protection of Italian-Swiss waters against pollution (CIPAIS)

Area(s) of activity: Examine all problems related to pollution and all other changes to the Swiss-Italian waterways; Organize and ensure the necessary research to determine the origin, the nature of and the scale of pollution, and to make use of the results of this research; Propose to the contracting governments measures to take to treat existing pollution and to prevent all future pollution.

Treaty basin: Rhone

Date: August 7, 1973

Signatories: Italy, Switzerland

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint.html

International commission for the protection of Lake Geneva (CIPEL)

Focus: Lake Geneva. Area(s) of activity: Organize and carry out the necessary research into determining the nature, the scale and the origin of pollution, and make use of the results of this research; Recommend to the contracting governments measures to be taken to treat current pollution and to prevent all future pollution; Examine all other questions concerning pollution of the Lake.

Treaty basin: Lake Geneva

Date: November 1, 1963

Signatories: Switzerland, France

Source: http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint.html

Swiss delegation for the regularization of Lake Geneva

Treaty basin: Lake Geneva

Date: December 15, 1964

Signatories: Switzerland, France

Source: See <http://www.bwg.admin.ch> or http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint/water.html

ROIA/ROYA

Total area: 600 km²

Countries	Area of Basin in Country	
	km ²	%
France	400	67.39
Italy	200	30.45



TREATIES AND AGREEMENTS

Convention Entre La France et L'Italie Relative a L'Utilisation des Eaux de la Riviere Roya et de Ses Affluents

Treaty basin: Roya

Date: December 17, 1914

Signatories: France, Italy

Franco-Italian convention concerning the supply of water to the Commune of Menton

Treaty basin: Roya

Date: September 28, 1967

Signatories: France, Italy

SARATA*

Total area: 1,800 km²

Countries	Area of Basin in Country	
	km ²	%
Ukraine	1,100	63.90
Moldova	600	36.05



TREATIES AND AGREEMENTS

Agreement between the government of the republic of Moldova and the government of Ukraine on the joint use and protection of transboundary waters

Treaty basin: Dnestr, Danube, Kogilnik, Sarata

Signatories: Moldova, Ukraine

Date: November 23, 1994

SCHELDE

Total area: 17,100 km²

Countries	Area of Basin in Country	
	km ²	%
France	8,600	50.03
Belgium	8,400	49.28
Netherlands	80	0.47



TREATIES AND AGREEMENTS

Traite de Limites Entre La France et Les Pays Bas Conclu A Courtray

Treaty basin: Lys, Semoy, Meuse

Date: March 28, 1820

Signatories: France, Netherlands

Convention between the French republic and the Kingdom of Belgium concerning improvement of the common river Lys between Deulemont and Menin [alt. Menen]

Treaty basin: Lys, Leie

Date: February 3, 1982

Signatories: France, Belgium

Agreement on the protection of the Scheldt

Treaty basin: Scheldt

Date: April 26, 1994

Signatories: France, Netherlands, the Brussels capital region, the Wallon Region, the Flemish Region

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

International commission for the protection of the Scheldt /Commission internationale pour la protection de l'Escaut (CIPE) / Internationale commissie voor de bescherming van de Schelde (ICBS) *International cooperation in order to protect the waters of the Scheldt river.*

Treaty basin: Schelde

Date: 1995

Signatories: Belgium, France, Netherlands

Source: <http://www.isc-cie.com/default.asp>

SEINE

Total area: 85,700 km²

Countries	Area of Basin in Country	
	km ²	%
France	83,800	97.78
Belgium	1,800	2.14
Luxembourg	70	0.08



TREATIES AND AGREEMENTS

Protocol to establish a tripartite standing committee on polluted waters, signed at Brussels

Treaty basin: Lys, Haine, Espierre, Escaut/Scheldt

Date: April 8, 1950

Signatories: Belgium, France, Luxembourg

STRUMA *

Total area: 15,000 km²

Countries	Area of Basin in Country	
	km ²	%
Bulgaria	8,700	58.39
Greece	3,900	26.17
Macedonia	1,700	11.41
Serbia	600	4.03



TREATIES AND AGREEMENTS

Exchange of Notes Between Greece and Yugoslavia

Treaty basin: Vardar, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa

Date: May 25, 1954

Signatories: Greece, Yugoslavia

Proces-Verbal des Delegations de la Republique Populaire Federative de Yougoslavie de du Royaume de Grece, Reunions du 23 Au 30 Mars 1956 Pour La Question Du Niveau des Eaux du Lac de Doiran

Treaty basin: Doiran

Date: March 31, 1956

Signatories: Greece, Yugoslavia

Proces-Verbal de la Reunion des Delegations de la Republique Populaire Federative de Yougoslavie de du Royaume de Grece Qui a Eu Lieu du 26 Aout au 1 Septembre 1957 a Stari Dojran pour Elaborer le Mode et le Plan de Collaboration Concernant les Etudes Hydro-Economiques du Bassin D'Ecoulement du Lac de Dojran

Treaty basin: Dojran

Date: September 1, 1957

Signatories: Greece, Yugoslavia

Accord Entre Le Royaume de Grece et al Republique Populaire Federative de Yougoslavie Relatif aux Questions de L'Hydroeconomie Avec Annexe Concernant Le Statut de la Commission Permanente Greco-Yougoslave de L'Hydroeconomie et Echange de Notes, Signe a Athenes

Treaty basin: Vardar, Axios, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa

Date: June 18, 1959

Signatories: Greece, Yugoslavia

TAJO/TEJO

Total area: 77,900 km²

Countries	Area of Basin in Country	
	km ²	%
Spain	51,400	66.06
Portugal	26,100	33.50



TREATIES AND AGREEMENTS

Treaty of limits between Portugal and Spain

Treaty basin: Minho, Douro, Tagus

Date: September 29, 1864

Signatories: Spain, Portugal

Regulations annexed to the Boundary Treaty between Spain and Portugal of 29th September, 1864. Signed at Lisbon, November 4, 1866.

Treaty basin: Minho, Douro, Tagus

Date: November 4, 1864

Signatories: Portugal, Spain

Convenção sobre Cooperação para a Protecção e o Aproveitamento Sustentável das Águas das Bacias Hidrográficas Luso-espanholas and Additional Protocol and Annexes

Treaty basin: Lima, Minho, Douro (Duro), Tagus (Tejo), Guadiana

Date: November 30, 1998

Signatories: Portugal, Spain

TANA

Total area: 15,600 km²

Countries	Area of Basin in Country	
	km ²	%
Norway	9,300	59.71
Finland	6,300	40.23



TREATIES AND AGREEMENTS

Agreement between Norway and Finland concerning the construction and maintenance of a bridge across the Anarjokka (Inarijoki) River. Signed at Helsinki, on June 28, 1957

Treaty basin: Anarjokka, Inarijoki

Date: June 28, 1957

Signatories: Finland, Norway

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Norwegian Transboundary Water Commission

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Naatamo, Olanga, Pasvik, Tana, Torne/Tornealven

Date: 1980

Signatories: Finland, Norway

Source: <http://www.ymparisto.fi/default.asp?node=9813&lan=en>

TORNE/ TORNEALVEN

Total area: 37,300 km²

Countries	Area of Basin-in Country km ²	%
Sweden	25,400	67.98
Finland	10,400	28
Norway	1,500	4.03



TREATIES AND AGREEMENTS

Traites et Conventions Concernant la Dissolution de L'Union Suedo-Norvegienne

Treaty basin: Frontier or shared waters

Date: October 26, 1905

Signatories: Norway, Sweden

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Norwegian Transboundary Water Commission

The Commission acts as a body for cooperation and communication between the two states. Its aim is to preserve the transboundary watercourses and their unique natural conditions. It also safeguards the environmental interests of both states and the residents of the border region. The Commission has an advisory role.

Treaty basin: Kemi, Naatamo, Olanga, Pasvik, Tana, Torne/Torneälven

Date: 1980

Signatories: Finland, Norway

Source: <http://www.ymparisto.fi/default.asp?node=9813&lan=en>

TULOMA

Total area: 25,800 km²

Countries	Area of Basin in Country	
	km ²	%
Russia	23,700	91.85
Finland	2,000	7.93



TREATIES AND AGREEMENTS

Agreement [Between Finland and the Union of Soviet Socialist Republics] Concerning Frontier Watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters

Date: April 24, 1964

Signatories: Finland, USSR

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

Treaty basin: Oulu, Pasvik, Tuloma, Vuoksa

Date: 1964

Signatories: Finland, Russia

Source: <http://www.inwent.org/ef-texte/vilnius/rep1199e.htm>

VARDAR*

Total area: 32,400 km²

Countries	Area of Basin in Country	
	km ²	%
Macedonia	20,500	63.43
Serbia	7900	24.44
Greece	3900	12.07
Bulgaria	20	0.06



TREATIES AND AGREEMENTS

Exchange of Notes Between Greece and Yugoslavia

Treaty basin: Vardar, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa Date: May 25, 1954

Signatories: Greece, Yugoslavia

Accord Entre Le Royaume de Grece et al Republique Populaire Federative de Yougoslavie Relatif aux Questions de L'Hydroeconomie Avec Annexe Concernant Le Statut de la Commission Permanente Greco-Yougoslave de L'Hydroeconomie et Echange de Notes, Signe a Athenes

Treaty basin: Vardar, Axios, Dojran, Ljumnica, Sakuleva, Dragas, Pelagonia, Prespa

Date: June 18, 1959

Signatories: Greece, Yugoslavia

VISTULA/WISTA

Total area: 194,000 km²

Countries	Area of Basin in Country km ²	%
Poland	169,700	87.45
Ukraine	12,700	6.55
Byelarus	9,800	5.03
Slovakia	1,900	0.96
Czech Republic	20	0.01



TREATIES AND AGREEMENTS

Agreement between Poland and the USSR concerning the regime on the Soviet-Polish State Frontier

Treaty basin: Vistula, San

Date: May 27, 1871

Signatories: Austria, Russia

A treaty regarding navigation and hydraulic works along the rivers Vistula and San [no title available]

Treaty basin: Frontier or shared waters

Date: July 8, 1948

Signatories: Russia, Poland

Agreement between the Government of the Polish People's Republic and the Government of the Union of Soviet Socialist Republics concerning the use of water resources in frontier waters

Treaty basin: Vistula

Date: July 17, 1964

Signatories: USSR, Poland

Treaty between the Czech Republic Government and the Slovak Republic government on mutual relations and principles of cooperation in agriculture, food industry, forestry, and water economy under the conditions of the customs union

Treaty basin: Vistula/Wista

Date: November 23, 1992

Signatories: Czech Republic, Slovak Republic

Agreement between the government of Ukraine and the republic of Poland on cooperation in the field of water management in frontier waters.

Treaty basin: Danube, Dniester, Vistula/Wista

Date: October 10, 1996

Signatories: Ukraine, Poland

Agreement between Belarus and Ukraine on the Common Use and Protection of Transboundary Waters

Treaty basin: Dnieper, Vistula/Wista

Date: October 16, 2001

Signatories: Belarus, Ukraine

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Joint Commission established according to the agreement signed by both countries on October 10, 1996.

Treaty basin: Danube, Dniester, Vistula/Wista

Date: October 10, 1996

Signatories: Ukraine, Poland

Source: http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf

VOLGA*

Total area: 1,554,900 km²

Area of Basin in Country
Countries km² %

Russia	1,551,300	99.77
Kazakhstan	2,200	0.14
Byelarus	1,300	0.08



TREATIES AND AGREEMENTS

Agreement between the government of the republic of Kazakhstan and the government of the Russian federation concerning the joint use and protection of transboundary waters

Treaty basin: Ishim, Irtysh, Ural, Tobol

Date: August 27, 1992

Signatories: Kazakhstan, Russia

Agreement between Belarus and Russia on Cooperation in the Field of Protection and Rational Utilisation of Transboundary Waters

Treaty basin: Daugava, Dnieper, Narva, Neman, Volga

Date: May 24, 2002

Signatories: Belarus, Russia

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Joint Russian-Kazakhstan Commission for Utilization and Protection of Transboundary Waters

Treaty basin: Volga

Date: August 27, 1992

Signatories: Kazakhstan, Russia

Source: <http://grdc.bafg.de/servlet/is/2503/?lang=en>, <http://www.oieau.fr/anglais/international/russia.htm>

Irtysh River Basin Sub-Commission, supervised by the Russian and Kazak Commission on the joint use and conservation of shared waters

An International Basin Information System will be set up and supplemented by the development of a hydrological model in particular. It will allow the definition and implementation of joint policy and programs for water resources management in the basin.

Treaty basin: Irtysh

Date: May 10, 2000

Signatories: Kazakhstan, Russia, France

Source: http://www.oieau.fr/anglais/oie/news/news8_18_19.pdf

VUOKSA

Total area: 62,700 km²

Countries	Area of Basin in Country km ²	%
-----------	---	---

Finland	54,300	86.48
Russia	8,500	13.52



TREATIES AND AGREEMENTS

Convention between the Republic of Finland and the Russian Socialist Federal Soviet Republic concerning the maintenance of river channels and the regulation of fishing on water courses Forming Part of the Frontier Between Finland and Russia

Treaty basin: Tuulomanjoki, Luttojoki, Kutajoki, Tuutsajoki, Kutalahti, Tuutsajoki, Ulanganjoki, Pääjärvi, Paanajärvi, Pistojoiki, Yla-Kuittijärvi, Kuusamon-järvi, Lieksa, Tuulijoki, Pielisjärvi, Lentiera, Lake Tuulijärvi, Tulenmananjoki, Lake Ladoga, Lake Tulenanjärvi,

Date: October 28, 1922

Signatories: USSR, Finland

Agreement [Between Finland and the Union of Soviet Socialist Republics] Concerning Frontier Watercourses (with exchange of letters), Helsinki

Treaty basin: Frontier or shared waters

Date: April 24, 1964

Signatories: Finland, USSR

Agreement between the Government of the Republic of Finland and the Government of the Union of Soviet Socialist Republics concerning the production of electric power in the part of the Vuoksi river bounded by the Imatra and Svetogorsk Hydroelectric Station

Treaty basin: Vuoksa

Date: July 12, 1972

Signatories: Russia, Finland

RIVER BASIN ORGANIZATIONS AND COMMISSIONS

Joint Commission for regulation of the rules for the lake Saimaa and the Vuoksa rivers (subbasins of the Vuoksa Basin)

Treaty basin: Vuoksa

Date: October 26, 1989

Signatories: Russia, Finland

Source: http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf

Finnish-Russian Joint Commission on the Utilization of Frontier Waters

This cooperation provides an example of the benefits of sustained activities between two countries sharing common resources. Geographical Scope: The lakes, rivers, and streams intersected by the frontier line or along which the frontier line runs.

See <http://>

Treaty basin: Kemi, Olanga, Oulu, Pasvik, Tuloma, Vuoksa

Date: 1964

Signatories: Finland, Russia

Source: www.inwent.org/ef-texte/vilnius/rep1199e.htm



TREATIES AND AGREEMENTS

EU Water Framework Directive

The Directive establishes a framework for the Community action in the field of water policy. The EUWFD expands the scope of water protection to all waters and sets a clear objectives that “good status” must be achieved for all European waters by 2015 and that sustainable water use is ensured throughout Europe. Members of the EU are bound to implement the Directive.

Treaty basin: Bann, Barta, Bidasoa, Castletown, Danube, Daugava, Dniester, Douro/Duero, Ebro, Elbe, Fane, Flurry, Garonne, Gauja, Glama, Guadiana, Isonzo, Kemi, Klaralven, Lake Prespa, Lava/Pregel, Lielupe, Lima, Maritsa, Mino, Naatamo, Narva, Neman, Nestos, Oder/Odra, Olanga, Oulu, Parnu, Pasvik, Po, Prohladnaja, Rhine, Rhone, Roia, Salaca, Schelde, Seine, Struma, Tagus/Tejo, Tana, Torne/Tornealven, Tuloma, Vardar, Venta, Vijose, Vistula/Wista, Vuoksa, Wiedau, Yser

Date: December 22, 2000

Signatories: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom

UN/ECE protocol on water and health to the 1992 convention on the protection and use of transboundary watercourses and international lakes

Treaty basin: Bann, Barta, Bidosoa, Castletown, Danube, Daugava, Dnieper, Dniester, Don, Douro/Duero, Drin, Ebro, Elancik, Elbe, Erne, Fane, Flurry, Foyle, Garonne, Gauja, Glama, Guadiana, Isonzo, Jacobs, Kemi, Klaralven, Kogilnik, Krka, Lake Prespa, Lava/Pregel, Lielupe, Lima, Maritsa, Mino, Mius, Naatamo, Narva, Neman, Neretva, Nestos, Oder/Odra, Olanga, Oulu, Parnu, Pasvik, Po, Prohladnaja, Rezvaya, Rhine, Rhone, Roia, Salaca, Sarata, Schelde, Seine, Struma, Tagus/Tejo, Tana, Torne/Tornealven, Tuloma, Vardar, Velaka, Venta, Vijose, Vistula/Wista, Volga, Vuoksa, Wiedau, Yser

Date: June 17, 1999

Signatories: Alabania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Germany, Greece, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Republic of Moldova, Monaco, Slovenia, Spain, Sweden, Switzerland, United Kingdom

Convention on environmental impact assessment in a transboundary context, Espoo

The Espoo (EIA) Convention sets out the obligations of Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of States to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across borders.

Treaty basin: General

Date: September 10, 1997

Signatories: Albania, Austria, Belarus, Belgium, Bulgaria, Canada, Czech Republic, Denmark, European Community, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Spain, Sweden, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America

Convention on the protection and use of transboundary watercourses and international lakes, Helsinki

Treaty basin: Bann, Barta, Bidosoa, Castletown, Danube, Daugava, Dnieper, Dniester, Don, Douro/Duero, Drin, Ebro, Elancik, Elbe, Erne, Fane, Flurry, Foyle, Garonne, Gauja, Glama, Guadiana, Isonzo, Jacobs, Kemi, Klaralven, Kogilnik, Krka, Lake Prespa, Lava/Pregel, Lielupe, Lima, Maritsa, Mino, Mius, Naatamo, Narva, Neman, Neretva, Nestos, Oder/Odra, Olanga, Oulu, Parnu, Pasvik, Po, Prohladnaja, Rezvaya, Rhine, Rhone, Roia, Salaca, Sarata, Schelde, Seine, Struma, Tagus/Tejo, Tana, Torne/Tornealven, Tuloma, Vardar, Velaka, Venta, Vijose, Vistula/Wista, Volga, Vuoksa, Wiedau, Yser

Date: March 17, 1992

Signatories: Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Hungary, Germany, Greece, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Sweden, Republic of Moldova, Monaco, Slovenia, Spain, Sweden, Switzerland, United Kingdom

Convention on wetlands of international importance especially as waterfowl habitat (Ramsar) 1971 and Protocol 1972

The Convention on Wetlands is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 146 Contracting Parties to the Convention, with 1436 wetland sites, totaling 125.1 million hectares, designated for inclusion in the Ramsar List of Wetlands of International Importance.

Treaty basin: General

Date: February 02, 1971

Signatories: 145 parties signed. The European signatories are: Albania, Algeria, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia and Montenegro, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom, Uzbekistan, former USSR

Treaty between Belgium, the Federal Republic of Germany, France, Italy, Luxembourg and the Netherlands instituting the European Community of the Atomic Energy (EURATOM)

Euratom calls for support for nuclear power across the EU and is the only Treaty which supports the development of a particular energy source.

Treaty basin: General

Date: March 25, 1957

Signatories: Belgium, Germany, France, Italy, Luxembourg, the Netherlands

APPENDIX 2. NOTES ON BASINS

DANUBE

Disputes are ongoing between Bosnia-Herzegovina and Serbia, over Serbian populated areas. According to the Serbian Republic of Bosnia-Herzegovina (SRBH), the external boundaries are marked by the Una river in the west, the Sava river in the north, the state boundary with the Federal Republic of Yugoslavia in the east, and Croatia and the Serbian Republic Krajina in the south (CIA World Factbook, 2007; IBRU, 1999).

Eastern Slavonia, which was held by Serbs during the ethnic conflict in the former Yugoslavia, was returned to Croatian control by the UN Transitional Administration for Eastern Slavonia on January 15, 1998 (CIA World Factbook, 2007).

Under an International Court of Justice (ICJ) ruling, Hungary and Slovakia were to agree on the future of the Gabčíkovo Dam complex by March 1998. The dispute, however, has yet to be resolved. Completion of the dam system would alter the boundaries between Hungary and Slovakia established under the 1920 Treaty of Trianon (CIA World Factbook, 2007; IBRU, 1999).

DAUGAVA

Border problems between Byelorussia and Lithuania in part lie in the fact that the new boundary is different from the old Soviet administrative division between the two republics. Areas of dispute include the land around the Adutiskis railway station and the Druskininkai resort claimed by Byelorussia. Demarcation of the boundary between Byelorussia and Lithuania is underway (CIA World Factbook, 2007; IBRU 1999).

The 1997 boundary agreement Lithuania and Russia remains to be ratified (CIA World Factbook, 2007).

DNIESTER

Romania considers certain territories of Moldova and Ukraine-including Bessarabia (45,600 km²) and Northern Bukovina-as historically part of Romania. This territory was incorporated into the former Soviet Union following the Molotov-Ribbentrop Pact in 1940 (CIA World Factbook, 2007; Columbia Gazetteer, 1998).

ENNINGSDAELSELVA

No basin area data was available.

NARVA

The December 1996 technical boundary agreement reached between Estonian and Russian negotiators remains to be ratified. Estonia claimed over 2,000 km² of territory in the Narva and Pechory regions of Russia-based on the boundary established under the 1920 Peace Treaty of Tartu (CIA World Factbook, 2007).

Latvia claimed the Abrene/Pytalovo section of the border ceded by the Latvian Soviet Socialist Republic to Russia in 1944, based on the 1920 Treaty of Riga. A draft treaty delimiting the boundary between Latvia and Russia has not been signed. The Abrene/Pytalovo region is crossed by the Utroja River, a tributary of the Vclikaya river (CIA World Factbook, 2007; Columbia Gazetteer, 1998).

NEMAN

Border problems between Byelarus and Lithuania in part lie in the fact that the new boundary is different from the old Soviet administrative division between the two republics. Areas of dispute include the land around the Adutiskis railway station and the Druskininkai resort claimed by Byelarus. Demarcation of the boundary between Byelarus and Lithuania is underway (CIA World Factbook, 2007; IBRU 1999).

The 1997 boundary agreement Lithuania and Russia remains to be ratified (CIA World Factbook, 2007).

RHINE

While the Meuse basin is topographically part of the Rhine basin, European nations treat it as a politically separate basin (Huisman, de Jong, and Wieriks, 1998).

SARATA

Romania considers certain territories of Moldova and Ukraine-including Bessarabia (45,600 km²) and Northern Bukovina-as historically part of Romania. This territory was incorporated into the former Soviet Union following the Molotov-Ribbentrop Pact in 1940 (CIA World Factbook, 2007; Columbia Gazetteer, 1998).

STRUMA

The boundary commission formed by Serbia and Montenegro, and the Former Yugoslav Republic of Macedonia in April 1996 to resolve differences in delineation of their mutual boundary has made no progress so far (CIA World Factbook, 2007).

VARDAR

The boundary commission formed by Serbia and Montenegro, and the Former Yugoslav Republic of Macedonia in April 1996 to resolve differences in delineation of their mutual boundary has made no progress so far (CIA World Factbook, 2007).

VOLGA

The boundaries of the Caspian Sea remain to be determined among Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan (CIA World Factbook, 2007).

APPENDIX 3. RIPARIAN COUNTRY COLLABORATIONS

DANUBE

UNDP/GEF Danube regional project (DRP)

The DPR aims to reinforce regional cooperation of the Danube countries and support development of national policies and legislation and the definition of priority actions for pollution control in order to ensure common approach to protection of international waters, sustainable management of natural resources and biodiversity. The DPR is implementing 22 project components in total.

Participating countries: Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Moldova, Romania, Slovakia, Slovenia, Serbia and Montenegro, Ukraine *Date:* 2001-2006

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.undp-drp.org/jart/projects/unodp/intro2.html>

GEF IW project: Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea - World Bank-GEF Nutrient Reduction Investment Fund: Tranche 3.

The World Bank-GEF Investment Fund (IF) is the investment arm of the GEF Strategic Partnership on the Black Sea/Danube Basin which also funds two regional projects, the Black Sea Ecosystem Recovery Project for the Black Sea littoral countries and the Danube Regional Project in the Danube Basin, both focusing mainly on capacity building activities.

Participating countries: Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Moldova, Romania, Russia, Serbia and Montenegro, Slovak Republic, Slovenia, Turkey, Ukraine

Date: Approved in 2003

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.gefonline.org/projectDetails.cfm?projID=2044>

GEF IW project: Danube/Black Sea Strategic Partnership - Nutrient Reduction Investment Fund: Tranche 2

The GEF World Bank Investment Fund (IF) is the investment arm of the GEF Strategic Partnership on the Black Sea/Danube Basin which also funds two regional projects, one in Black Sea littoral countries and one in the Danube Basin, focusing on capacity building activities.

Participating countries: Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Moldova, Russia, Slovak Republic, Slovenia, Turkey, Ukraine, Romania *Date:* Approved in 2002

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: See <http://www.gefonline.org/projectDetails.cfm?projID=1661>

GEF IW project: Transfer of Environmentally-sound Technology (TEST) to Reduce Transboundary Pollution in the Danube River Basin

The project's objective is to build capacity in existing cleaner production institutions to apply the UNIDO test procedure. The project will demonstrate ways to reduce pollution while remaining financially viable. The project includes the transfer of this technology to 20 pilot enterprises that are contributing to transboundary pollution, primarily nutrients, in the Danube River basin and Black Sea.

Participating countries: Bulgaria, Croatia, Hungary, Romania, Slovak Republic
Level/Type of Collaboration: Official/Environmental program
Date: 2000-2003
Principal Issue: Water quality, joint management
Source: <http://www.gefonline.org/projectDetails.cfm?projID=867>

GEF IW project: Danube/Black Sea Basin Strategic Partnership on Nutrient Reduction, Tranche I

This is Strategic Partnership consisting of capital investments, economic instruments, development and enforcement of environmental law and policy, strengthening of public participation, and monitoring of trends and compliance for the countries of the Danube/Black Sea basin.

Participating countries: Bulgaria, Romania, Georgia, Turkey, Russia, Ukraine, Czech Republic, Slovak Republic, Hungary, Slovenia, Croatia, Moldova, Bosnia-Herzegovina, Serbia and Montenegro
Date: 2001-2007

Level/Type of Collaboration: Official/Environmental program
Principal Issue: Water quality, joint management
Source: <http://www.gefonline.org/projectDetails.cfm?projID=1014>

GEF IW project: Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin-Phase I Project Short Title: Danube Regional Project Phase I

The overall objective of this project is to complement and support the activities of the Danube Commission (ICPDR).

Participating countries: Czech Republic, Slovak Republic, Hungary, Slovenia, Croatia, Bosnia-Herzegovina, Bulgaria, Romania, Moldova, Ukraine, Serbia and Montenegro
Date: July 2001-July 2006
Level/Type of Collaboration: Official/Environmental program
Principal Issue: Water quality, joint management
Source: <http://www.gefonline.org/projectDetails.cfm?projID=1460>

GEF IW project: Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin (Tranche 2)

The overall objective of the Danube Regional Project is to complement the activities of the ICPDR required to provide a regional approach and global significance to the development of national policies and legislation and the definition of priority actions for nutrient reduction and pollution control with particular attention to achieving sustainable transboundary ecological effects within the DRB and the Black Sea area. Taking into account the basic orientations of the Danube/Black Sea Basin Programmatic Approach, the Danube Regional Project, in its Phases 1 and 2, shall facilitate implementation of the Danube River Protection Convention in providing a framework for coordination, dissemination and replication of successful demonstration that will be developed through investment projects (World Bank-GEF Strategic Partnership, EBRD, EU programmes for accession).

Participating countries: Czech Republic, Slovak Republic, Hungary, Slovenia, Croatia, Bosnia-Herzegovina, Serbia and Montenegro, Bulgaria, Romania, Moldova, Ukraine
Date: December 2003-November 2006

Level/Type of Collaboration: Official/Environmental program
Principal Issue: Water quality, joint management
Source: <http://www.gefonline.org/projectDetails.cfm?projID=2042>

GEF IW project: Building Environmental Citizenship to Support Transboundary Pollution Reduction in the Danube: A Pilot Project

The project will be designed to help countries operationalize information access and public participation in a manner that advances the goals of reducing toxics and nutrients discharges to the Danube River Basin.

Participating countries: Hungary, Slovenia
Date: February 2000-August 2001
Level/Type of Collaboration: Official/Environmental program
Principal Issue: Water quality, joint management
Source: <http://www.gefonline.org/projectDetails.cfm?projID=806>

WWF project: Danube-Carpathian Programme

Program aims: to promote the conservation, restoration and sustainable management of nature for the benefit of both people and environment. The work is primarily focused on freshwater and forest resources in the Danube River Basin and Carpathian Mountains.

Participating countries: Romania, Bulgaria, Hungary, Slovakia, Slovenia, Austria, the Czech Republic, Germany and Poland, Ukraine, the Republic of Moldova, Serbia & Montenegro, Croatia and Bosnia & Herzegovina
Date: 1998

Level/Type of Collaboration: Non-official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.panda.org/about_wwf/where_we_work/europe/where/danube_carpathian/about_the_programme.cfm

Danube Environmental Forum (DEF)

The DEF is a network of environmental non-governmental organisations working on nature protection in different parts of the River Danube's watershed area. The aim of this site is to make available to the public all information relating to the environment within the Danube's catchment and to report on the activities of the DEF. The DEF was created as a Danube River Basin-wide platform of non-governmental, non-profit, politically independent, environmental organisations, in order to establish a common approach for the environmental protection of the Danube river. Since 1999 the DEF has also had observer status with the ICPDR.

Participating countries: Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Moldova, Romania, Serbia and Montenegro, Slovakia, Slovenia, Ukraine
Date: 1999

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Water quality, other: research and education

Source: <http://www.de-forum.org>

DANUBE - TISZA SUBBASIN

WWF/DEF project: Public Information and Participation Programme

DEF national focal points in Romania, Yugoslavia and Bulgaria and partners in Hungary and Ukraine manage public information and awareness activities at the national level. They provide and collect information from stakeholders in local communities and disseminate information on the Baia Mare Task Force within their countries.

Source: <http://www.tisaforum.org.yu/defyu/engl/program-wwf.htm>

Participating countries: Bulgaria, Hungary, Romania, Ukraine and Yugoslavia

Date: July 15, 2000-May 31, 2001

Level/Type of Collaboration: Non-official/Environmental program

Principal Issue: Joint management, other: research and education

RAMSAR cooperation

Joint designation of portions of the Tisza (Tisa) River as a transboundary Ramsar Wetland of International Importance.

Participating countries: Hungary, Slovakia

Date: December 4, 2004

Level/Type of Collaboration: Non-official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.ramsar.org/wn/w.n.tisza_transboundary.htm

River Basin Management Plan for the Tisza river supporting sustainable development of the region

The countries agreed to cooperate more closely in the framework of the ICPDR in order to produce a Tisza River Basin Management Plan by 2009 aiming at the objectives set by the EU Water Framework Directive as implemented through the Danube River Protection Convention and the ICPDR Flood action Programme and thereby complementing the efforts of the ICPDR, the bilateral co-ordination and the national level.

Participating countries: Hungary, Romania, Serbia and Montenegro, Slovakia Republic, and Ukraine

Date: 2004-2009

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, water quantity, flood control/relief, joint management

Source: http://www.icpdr.org/pls/danubis/docs/folder/HOME/ICPDR/ICPDR_DOC_CENTRE/ICPDR_BASIC_DOCS/LEGAL_POLICY/FINAL+-+TISZA+-+MOU+-+SIGNATURE.PDF

DANUBE – SAVA SUBBASIN

Sava River Basin: Sustainable use, Management and protection of resources (SARIB)

The EU-funded STREP “SARIB” is a three year international research project between research institutes from the Balkan countries (Slovenia, Croatia, Bosnia and Herzegovina, Serbia and Montenegro), Italy, Austria and Norway. This multidisciplinary project was initiated August 2004 and aims to facilitate the development of methods, exchange of knowledge and establishment of a regional monitoring system for the Sava River.

Participating countries: Bosnia and Herzegovina, Croatia, Slovenia and Serbia *Date:* 2004-2007

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.niva.no/symfoni/infoportal/PUBLIKASJON.NSF/redirect?ReadForm&Url=http://www.niva.no/symfoni/infoportal/PUBLIKASJON.NSF/0/414277F65F146083C1256FD600297573?OpenDocument>

DNIEPER

GEF IW project: Preparation of A Strategic Action Programme (SAP) for the Dnieper River Basin and Development of SAP Implementation Mechanisms

The long-term objectives of the project are to remedy the serious environmental effects of pollution and habitat degradation in the Dnieper River Basin, to ensure sustainable use of its resources, and to protect biodiversity in the basin. This will be catalyzed through the development of both a regional Strategic Action Programme (SAP) as well as individual National Action Programmes (NAP) outlining country and donor commitments to baseline and additional preventive and remedial actions on behalf of the basin.

Participating countries: Belarus, Russia, Ukraine *Date:* 1998-2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.gefonline.org/projectDetails.cfm?projID=460>

UNDP-GEF project: the Dnipro Basin Environment Program

The long-term objectives of the project are to remedy the serious environmental effects of pollution and habitat degradation in the Dnipro River Basin, to ensure sustainable use of its resources, and to protect biodiversity in the basin. The direct output will be the development of a Strategic Action Plan (SAP) to manage the river in cooperation with the other Dnipro nations, Russia and Belarus. The program’s overall objective is to remedy the serious environmental effects of pollution and habitat degradation and contribute to the protection of its regional and global international waters. This project is part of the GEF Black Sea Basin Strategic Approach. Note: An interim phase leading to a second stage of the Program is expected commence April 1, 2005.

Participating countries: Belarus, Russia and Ukraine *Date:* September 1, 2000-March 31, 2005

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.dnipro-gef.net/>

DNIEPER – PIRPYAT SUBBASIN

TACIS project: Pilot Project on Transboundary Water Quality Monitoring and Assessment in Order to Implement Provisions of International Legal Regulations

This project, funded by the European Commission Tacis Inter-State 1999 Programme, is concerned with the monitoring of transboundary waters in four international rivers: the Kura, the Seversky-Donetz, the Tobol and the Pripyat.

Participating countries: Ukraine, Belarus *Date:* 2002-2004

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.jointrivers.org/eng/>

DNIESTER

OSCE / UNECE project: Transboundary Cooperation and Sustainable Management of the Dniester River

The project has been launched to enhance regional cooperation between the Dniester riparian states, Ukraine, and Moldova, including its Transdnestr region. The project also aims to draw international attention to the problems in the river basin.

Participating countries: Moldova, Ukraine

Date: May 2004-October 2005

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.dniester.org/>

Eco-TIRAS project (in partnership with Polish and Ukrainian NGOs): the Dniester-Odra project, a joint project for Dniester

The project entailed a co-operation of NGOs, local and state authorities for the protection of large European rivers, which had the aim to transfer know how of integrated transboundary river basin management from the Odra to the Dniester River.

Participating countries: Moldova, Poland, Ukraine

Date: 2004

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.eco-tiras.org/news.htm>

Eco-TIRAS, the International Environmental Association of River Keepers

Created by environmental NGOs of the Dniester River basin, shared by Moldova and Ukraine, to help and advice authorities and population to manage the river in sustainable way, using Integrated River Basin Management Approach.

Participating countries: Moldova, Ukraine

Date: October 10, 1999

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Water quality

Source: <http://www.eco-tiras.org/news.htm>

DON - SEVERSKY-DONETZ SUBBASIN

TACIS project: Pilot Project on Transboundary Water Quality Monitoring and Assessment in Order to Implement Provisions of International Legal Regulations

This project, funded by the European Commission Tacis Inter-State 1999 Programme, is concerned with the monitoring of transboundary waters in four international rivers: the Kura, the Seversky-Donetz, the Tobol and the Pripyat.

Participating countries: Russia, Ukraine

Date: 2002-2004

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.jointrivers.org/eng/>

ELBE

EU-Project "Integrated Management of Wetlands" (WETLANDS)

The goal of this project is the reclamation, the conservation, as well as the balanced, sustainable, and economic use of wetlands. The term wetlands is used in a broad sense, and includes lakes, banks and floodplains of rivers, coastal waters, lagoons, and swamps.

Participating countries: Germany, Italy, Poland

Date: 1998-2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.regione.emilia-romagna.it/wetlands/indexengl.htm>

EU-Project “Integrated Management of Wetlands (follow-up) (WETLANDS II)

The main purpose of WETLANDS II is the improvement of the operative management of wetlands, through capacity building and pilot projects in the partners’ territories, always with the same objective to reach an integrated management standard, that takes into account the protection of these natural areas as well as the populations’ right to live and develop near and with these wetlands.

Participating countries: Germany, Italy, Poland

Date: 2003-2005

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.wetlandsmanagement.org/>

LAKE PRESPA - LAKE OHRID SUBBASIN

GEF IW project: Lake Ohrid Management

In order to protect the natural resources of Lake Ohrid, like fisheries, and the economic activities associated with the Lake, like tourism, GEF funds will assist the two nations sharing this lake.

Participating countries: Albania, Macedonia

Date: April 1997-April 2000

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.gefonline.org/projectDetails.cfm?projID=113>

Institute for Sustainable Communities (ISC) project: Lake Ohrid LEAPS

ISC was able to secure support to strengthen natural resource management capacities in the three major communities on the shores of Lake Ohrid: Struga and Ohrid in Macedonia and Pogradec in Albania. By working in one Albanian community and two Macedonian communities, all of which contribute to the development and protection of the Lake Ohrid watershed, ISC is helping to strengthen citizen participation in local problem solving, address pressing environmental problems, support the reduction of inter-ethnic tension in the region, and develop a coordinated regional effort to protect a globally significant natural resource.

Participating countries: Albania, Macedonia

Date: 1999-2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.iscvt.org/psalbania.html>

Institute for Sustainable Communities (ISC) project: Lake Ohrid LEAPS

ISC was able to secure support to strengthen natural resource management capacities in the three major communities on the shores of Lake Ohrid: Struga and Ohrid in Macedonia and Pogradec in Albania. By working in one Albanian community and two Macedonian communities, all of which contribute to the development and protection of the Lake Ohrid watershed, ISC is helping to strengthen citizen participation in local problem solving, address pressing environmental problems, support the reduction of inter-ethnic tension in the region, and develop a coordinated regional effort to protect a globally significant natural resource.

Participating countries: Albania, Macedonia

Date: 1999-2001

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.iscvt.org/psalbania.html>

GEF project: Lake Ohrid Conservation Project (LOCP)

The primary objective of the Project is to develop the basis for the joint management and protection of Lake Ohrid by the Albanian and Macedonian Governments and people of two countries.

Participating countries: Albania, Macedonia

Date: March 1999-March 2002

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.iwlearn.net/event/presentations/iwc2000/M_E/selfo.pdf

GEF project: Lake Ohrid Conservation Project (LOCP)

The primary objective of the Project is to develop the basis for the joint management and protection of Lake Ohrid by the Albanian and Macedonian Governments and people of two countries.

Participating countries: Albania, Macedonia

Date: March 1999-March 2002

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.iwlearn.net/event/presentations/iwc2000/M_E/selfo.pdf

LIELUPE

Project: Lielupe River Basin Water Quality Monitoring and Management

The participants are: Environmental Protection Ministries of Latvia and Lithuania, four Regional Departments (Agencies); the Environmental Data Centre and ECAT from Latvia; the Joint Research Centre of EPM of Lithuania and the Environmental Research Institute of Sweden. One of the objectives is the development of water data bases using GIS. The information is to be used to analyze and assess the situation of the Lielupe River Basin Water Quality Management. The information exchange capacities between countries and participants are to be installed and the modern information technology is to be implemented.

Participating countries: Latvia, Lithuania

Date: Data not available

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.ivl.se/en/business/monitoring/monitoring_of_water_quality.asp#

US EPA initiative: the Great Lakes/Baltic Sea Partnership

The objective of this partnership is to improve the water quality of the Great Lakes and the Baltic Sea by sharing information, expertise, and management approaches.

Participating countries: Latvia, Lithuania, Russia

Date: 1999

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.greatlakesbalticseapartnership.org/>

NARVA - LAKE PEIPSI (LAKE CHUDSKOE) SUBBASIN

Sida project: Environmental monitoring project on lake Peipsi

Goal of the project is to strengthen the capacity of regional environmental authorities in the Estonian-Russian transboundary region for quality-assured environmental monitoring and for information exchange. The project is also aimed at developing contacts between environmental experts on the two sides of the border, and establishment of a network of environmental experts for co-operation in the Lake Peipsi and its catchment area.

Participating countries: Estonia, Russia

Date: 1995-1999

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.ctc.ee/index.php?menu_id=245&lang_id=2

UNDP/GEF project Development and Implementation of the Lake Peipsi / Chudskoe Basin Management Program

The overall objective of the Project is to develop and start implementation of a Lake Peipsi/Chudskoe Basin Management Program including practical recommendations for the Lake Peipsi/Chudskoe nutrient load reduction and prevention and the sustainable conservation of habitats and eco-systems in the cross-border region.

Participating countries: Estonia, Russia

Date: January 2003-January 2007

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.peipsi.org/gef/>

GEF IW project: Development and Implementation of the Lake Peipsi/Chudskoe Basin Management Plan

Goal: to develop Lake Peipsi/Chudskoe Basin Management Program (further Management Program) in accord to the Estonian Water Act, European Water Framework Directive, and Russian Water Code.

Participating countries: Estonia, Russia

Date: Approval date January 9, 2002

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.gefonline.org/projectDetails.cfm?projID=1444>

Peipsi Centre for Transboundary Cooperation

An international non-profit institute, which works to promote sustainable development and cross border cooperation in the Lake Peipsi international water basin.

Participating countries: Estonia, Latvia, Russia

Date: July 1, 1998

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Water quality

Source: http://www.ctc.ee/index.php?lang_id=2

RHINE

ICPR Project: Rhine Action Program (RAP)

The overall goal of the program is to improve water quality by meeting the following objectives, by the year 2000: (1) To create conditions that can support the return of higher trophic level species such as Salmon salar; (2) To protect the Rhine River as a source for drinking water; (3) To decrease the contamination of sediments, suspended matter, and the biota due to toxic compounds; (4) To meet water quality standards mandated in the North Sea Action Plan.

Participating countries: Austria, Germany, France, Luxembourg, Netherlands, Switzerland

Date: 1987-2000

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: <http://www.ub.es/medame/rinaccio.html>

ICPR project: Program 2020 on the sustainable development of the Rhine

The program defines general Rhine protection targets for the next 20 years and succeeds the Rhine Action Program. The focal points are the further improvement of the Rhine ecosystem, the improvement of flood prevention and protection and groundwater protection. The continued monitoring of the state of the Rhine and the further improvement of water quality remain essential.

Participating countries: Austria, Germany, France, Luxembourg, Netherlands, Switzerland

Date: 2000-2020

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.iksr.org/GB/bilder/pdf/rhein2020_e.pdf

RHINE - SÛRE SUBBASIN

RAMSAR cooperation initiative: the Ramsar Administrative Authorities in both Parties have jointly submitted the Vallée de la Haute-Sûre site as a transboundary Wetland of International Importance.

Participating countries: Belgium, Luxembourg

Date: March 24, 2003

Level/Type of Collaboration: Non-official/Environmental program

Principal Issue: Water quality, joint management

Source: http://ramsar.org/wn/w.n.belgium_sure.htm

STRUMA

University cooperation project: System for Water Monitoring and Sustainable Management Based on Ground Stations and Satellite Images (WATERMAN)

The WATERMAN project supported a new development for a water monitoring system and sustainable management in the Southern Balkans. To reach this goal, modern technology and software were used, different mathematical models derived, and a decision support system investigated. At the end of the project, research laboratories for water monitoring were established at the Technical University of Sofia and in the National Agency of Environmental Protection in Sofia, where the real data of the Struma river basin are collected. This integrated system assists the development of a modern water management in Bulgaria, following the EU standards.

Participating countries: Bulgaria, Germany, Greece, Italy, Macedonia

Date: October 1998-September 2001

Level/Type of Collaboration: Non-official/International initiative

Principal Issue: Other: research and education

Source: <http://www.ima.ge.cnr.it/waterman/waterman.html>

VOLGA

EU Water Initiative - Water for Life project: Ecosystems of the Volga basin and effects on the Caspian sea - Volgamp

The basic aim is to show the relationships between vegetation, land use and contribution from the catchments to the quality of water and ecosystems in the Caspian Sea and surroundings. Research project funded by EC; includes researchers from France.

Participating countries: Iran, Kazakhstan, Russia

Date: 2000

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://europa.eu.int/comm/research/water-initiative/projects/ic15_ct_1997_00100_en.htm

VUOKSA - RIVER VUOKSI SUBBASIN

EU Tacis project: The Sustainable Use of the Water Resources and Shore Areas of the River Vuoksi (VIVATVUOKSIA)

The aim of the project is to promote and develop sustainable and multiple use of the River Vuoksi and its shores taking into account international agreements and fluctuations in the water level. The target groups are local and regional authorities in Finland and Russia, communes and local people, companies and tourists protecting or making use of the water and shore areas of the River Vuoksi in Finland and Russia.

Participating countries: Russia, Finland

Date: November 12, 2001-June 23, 2003

Level/Type of Collaboration: Official/Environmental program

Principal Issue: Water quality, joint management

Source: http://www.ekarjala.fi/vivatvuoksia/Final_TASK4_Report.doc

APPENDIX 4. TENDERS FOR LARGE PROJECTS

DANUBE

Novo Virje Dam

The hydropower dam Novo Virje, to be located 120 km northeast of Zagreb close to the Hungarian border, would have an installed capacity of 138 MW, with an annual production of 640 GWh (just over 4% of current Croatian electricity demand).

Country: Croatia

Sector: Hydropower

Cost in millions (USD): 533 (in 1999)

Status: EIA completed 1999. Transboundary EIA in progress

Sponsors: Data not available

Source: <http://www.rivernet.org/danube/pdf/Novo%20Virje%20factsheet%20short.pdf>

Nagymaros Dam

In 1977 Czechoslovakia and Hungary agreed to build a barrage complex on the Danube River with large dams at Gabčíkovo (Czechoslovakia) and Nagymaros (Hungary). Czechoslovakia built the Gabčíkovo but Hungary (under public pressure) did not build the Nagymaros. Went to the ICJ which declared that Hungary had no right to act as it did.

Country: Hungary

Sector: Hydropower

Cost in millions (USD): Data not available

Status: Never Completed, work suspended in 1989. In continued discussion.

Sponsors: Data not available

Source: http://wwics.si.edu/index.cfm?topic_id=1422&fuseaction=topics.publications&doc_id=18868&group_id=7427

DUORO

Baixo Sabor Dam

The proposed 125-meter-high Baixo Sabor dam would create a 50 km-long reservoir that would seriously affect a floodplain containing villages harbouring Iron Age art and Roman ruins.

Country: Portugal

Sector: Hydro-power

Cost in millions (USD): Data not available

Status: Proposed

Sponsors: Data not available

Source: <http://www.environmentaldefense.org/article.cfm?contentid=3356>

EBRO

Janovas Dam

Situated in North Aragon. Part of 6 proposed dams in the Pyrenees (which also include Biscarrues, Lechago, El Val, Santaliestra)

Country: Spain

Sector: Hydropower

Cost in millions (USD): Data not available

Status: Proposed in 1999

Sponsors: Data not available

Source: www.dams.org/docs/kbase/contrib/opt172.pdf

Yesa Dam

Reinforces an existing dam with the construction of a loose material dam with a concrete containment wall resting on the existing one. Part of 6 proposed dams in the Pyrenees.

Country: Spain

Sector: Reinforcement

Cost in millions (USD): 6.4 (in 2000)

Status: Ongoing

Sponsors: Directorate General of Hydraulic Works and Water Quality (Ministry of Environment).

Source: <http://www.inocsa.es/inocsa/ingles/realHidraulicas.htm>

ELBE

Talsperre Leibis-Lichte

Gravity Dam along the Lichte River

Country: Germany

Sector: Hydro-power

Cost in millions (USD): Data not available

Status: Under construction, completed in 2008.

Sponsors: Owner: Freistaat Thüringen

Source: <http://www.structurae.net/structures/data/index.cfm?ID=s0012256>

RHINE

Rheinfelden

The project is located at the Rhine river about 20 km east from Basel. The scheme comprises four bulb turbines with a total installed capacity of 116 MW, an average head between 6 and 9 m and a discharge of 1500 m³/s. The construction phase will most likely start in 2007 and will end in 2012.

Country: Switzerland

Sector: Hydropower

Cost in millions (USD): 2.9 (in 2004)

Status: Contract awarded in December of 2004

Sponsors: Data not available

Source: http://www.poyry.com//press/press_1_04.html?Id=1102511621.html

VISTULA

Nieszawa Dam

The Polish Parliament has refused to allocate public spending on building the Nieszawa Dam in the Lower Vistula (2002), showing that there are more and more supporters for alternatives—such as modernization of the existing Wloclawek dam or its decommissioning—that are better from the environmental, social, and economic points of view. In 2001, WWF published a comprehensive analysis which showed that the dam would not be the best technical solution to address problems caused by the aging Wloclawek Dam. The dam would also cause significant damage to the environment and negatively effect the sustainable development of the whole Vistula river valley.

Country: Poland

Sector: Hydropower/reinforcement

Cost in millions (USD): Data not available

Status: Stalled

Sponsors: Data not available

Source: <http://www.waterconserve.info/articles/reader.asp?linkid=18708>

VOLGA

Yumaguzino Hydroelectric Station

Reservoir being constructed on the Belaya River in the Republic of Bashkortostan. The dam construction has continued without a positive verdict of the federal environmental impact assessment committee mandatory for such facilities.

Country: Russia

Sector: Hydropower/reservoir

Cost in millions (USD): Data not available

Status: Construction began in 1998

Sponsors: Data not available

Source: <http://www.greenpeace.org/russia/en/news/on-august-25-2003-greenpeace>

REFERENCES

- Alliance for lake cooperation Ohrid and Prespa (ALLCOOP). 2005. Online information about ALLCOOP and lakes Ohrid and Prespa. <http://allcoop.org.mk/ALLCOOP.html> (accessed 28 June 2005).
- Athens News Agency. 2004. Greek-Bulgarian Meeting on Reducing Pollution of Nestos River, Dec. 6.
- Athens News Agency. 2005. Greek-Bulgarian Meeting in Drama for the Protection of Nestos River, Mar. 19.
- AQUASTAT 2005. Online global database of the Land and Water Development Division, Food and Agriculture Organization of the United Nations (FAO). <http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/main/index.stm> (accessed 28 June 2005)
- Biger, G., in collaboration with the International Boundaries Research Unit, University of Durham, UK. 1995. The Encyclopedia of International Boundaries. Jerusalem, Israel: Jerusalem Publishing House.
- British Broadcasting Corporation. 2005. BBC Monitoring International Reports, Ukraine has NO EU Approval for Danube Canal – Romanian Minister.
- Bulloch, J. and A. Darwish. *Water Wars: Coming Conflicts in the Middle East* (London: Victor Gollancz, 1993).
- Chave, P. 2001. The EU Water Framework Directive, IWA Publishing, London.
- Central Intelligence Agency (CIA). 1998. CIA World Factbook, 1998. Washington, DC: GPO.
- Central Commission for Navigation on the Rhine (CCNR). 2005. Online version of the Additional Protocol No. 3 to the revised Convention on Rhine Navigations. <http://www.ccr-zkr.org/Files/ProtAdd3e.pdf> (accessed 28 June 2005)
- Cohen, S.B., ed. 1998. The Columbia Gazetteer of the Worlds, Vols. 1-3. New York: Columbia University Press.
- Communication on Water Scarcity and Drought (COM/2007/0414 final) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52007DC0414:EN:NOT>.
- Council of Europe (CoE). 2005. Online text of the Declaration on cooperation concerning the Tisza/Tisa River Basin. http://www.coe.int/T/E/Cultural_Co-operation/Environment/CEMAT/List_of_Conferences/DeclarationTisa.asp (accessed 28 June 2005).
- Danube Environmental Forum (DEF). 2005. Online information about the Danube watershed and DEF activities at <http://www.de-forum.org> (accessed 29 June 2005)
- Danube Environmental Forum Yugoslavia (DEFYU). 2005. Online information about the Tisza watershed and activities carried out within the watershed. Specific information about the WWF/DEF project at: <http://www.tisaforum.org.yu/defyu/engl/program-wwf.htm> (accessed 29 June 2005)
- Danube, 2001. ENS, "Revival Planned for the Black Sea and Danube River. ADDRESS: <http://ens-news.com/ens/nov2001/2001L-11-02-03.html> [Accessed February 11, 2009].
- Danube, 2004. International Commission for the Protection of the Danube River (ICPDR), Active for the Danube River Basin. ADDRESS: http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show [Accessed February 11, 2009].
- Danube, 2004. International Commission for the Protection of the Danube River (ICPDR), Action Programme for Sustainable Flood Protection in the Danube River Basin, Dec. 13., ADDRESS: http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show [Accessed April 11, 2005].
- Danube, 2005. International Commission for the Protection of the Danube River (ICPDR). ADDRESS <http://www.icpdr.org/> [Accessed February 11, 2009].
- Economic Reconstruction and Development in South East Europe (SEERECON). 2005. Online information about the Sava River Basin Initiative. <http://www.seerecon.org/infrastructure/sectors/environment/ri/sava.htm> (accessed 28 June 2005).
- Eco-TIRAS. 2005. International Environmental Association of Riverkeepers, homepage: <http://www.eco-tiras.org/news.htm> (accessed 29 June 2005)
- Environmental defense. 2005. Online article database. Specific article about Sabor River, dated 23 March 2003. <http://www.environmentaldefense.org/article.cfm?contentid=3356> (accessed 29 June 2005)
- European Environment Agency (EEA). 2000. Are we moving in the right direction? Indicators on transport and environment integration in the EU. (In preparation). European Environment Agency, Copenhagen
- EEA. 2003. Europe's Environment: the Third Assessment, Copenhagen.
- EEA. 2003a. Europe's Water – An Indicator Based Assessment (EEA, Copenhagen 2003).
- EEA. 2003b. Mapping the Impacts of Recent Natural Disasters and Technological Accidents in Europe

- EEA. 2004. Signals 2004. (EEA, Copenhagen 2004). Available at, <http://www.eea.europa.eu/publications/signals-2004>. Assessed on April 25, 2009.
- EEA. Reporting Obligations Database (ROD), 2005. Online information about the Elbe River Basin. <http://rod.eionet.eu.int/show.jsv?id=182&mode=S> (accessed 28 June 2005).
- EEA. 2005. CSI 021 - Nutrients in transitional, coastal and marine waters - Are nutrient concentrations in our surface waters decreasing? Assessment published Nov 2005 - Available at http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20041007132008/IAssessment1116503188454/view_content. Assessed Feb. 10 2009).
- EEA. 2007. Climate change and water adaptation issues, Technical report No 2/2007. Available at http://www.eea.europa.eu/publications/technical_report_2007_2 Assessed Feb. 10 2009).
- EEA. 2009. CSI 018 - Use of freshwater resources - Assessment published Jan 2009, http://themes.eea.europa.eu/IMS/IMS/ISpecs/ISpecification20041007131848/IAssessment1197887395187/view_content.
- Eidgenössisches Departement für auswärtige Angelegenheiten (EDA) (Swiss Federal Department of Foreign Affairs), 2005. Online information about intergovernmental commissions with cross-border implications. http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint.html (accessed 28 June 2005).
- Estonia-Russia, 1997. Estonian-Russian Joint Commission, available at http://www.envir.ee/jc/eng/rahv_konv_eng.php. Assessed on April 25, 2009.
- Estonian Ministry of the Environment. 2005. Online information about the Estonian – Russian Joint Transboundary Water Commission. <http://www.envir.ee/jc/eng> (accessed 28 June 2005)
- EU. 2003. Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC, June 25, 2003.
- EU. 2003a. Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC, Feb. 14, 2003.
- EU. 2004. Moving to the next stage in the Common Implementation Strategy for the Water Framework Directive - Progress and work programme for 2005 and 2006, 2/3 December 2004, available at, <http://www.europa.eu.int/comm/environment/water/water-framework/strategy3.pdf>.
- EU. 2004a. Communication from the Commission to the Council of the European Parliament, the European Economic and Social Committee and the Committee of Regions, Flood Risk Management – Flood prevention, protection and mitigation, Brussels, 12 July, 2004, COM(2004)472 final.
- EU. 2005. Environment, WFD Scoreboard, available at <http://europa.eu.int/comm/environment/water/water-framework/scoreboard.html>.
- EU. 2005a. Commission from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions on Flood Risk Management; Flood Prevention, protection and mitigation, Brussels, 12th July, 2004, COM(2004)472 final, available at http://europa.eu.int/eur-lex/en/com/cnc/2004/com2004_0472en01.pdf.
- European Rivers Network (ERN), 2005. Online information about European rivers. Specific information about the Novo Virje hydropower plant ("Croatia's Drava dam would contravene EU law") at <http://www.rivernet.org/danube/pdf/Novo%20Virje%20factsheet%20short.pdf> (accessed 29 June 2005)
- EU Water Initiative, 2005. Online database of EU Water Initiative projects. Specific information about the Water for Life project entitled "Ecosystems of the Volga basin and effects on the Caspian sea - Volgmap" http://europa.eu.int/comm/research/water-initiative/projects/ic15_ct_1997_00100_en.htm (accessed 29 June 2005)
- Falkenmark, M. 1989. The massive water scarcity now threatening Africa - why isn't it being addressed? *Ambio*. Vol. 18, no. 2, pp. 112-118.
- Fekete, B.M., C.J. Vörösmarty, and W. Grabs. 1999, Global, Composite Runoff Fields Based on Observed River Discharge and Simulated Water Balances: Koblenz (Germany): Global Runoff Data Center. WMO-Global Runoff Data Center Report #22.
- Fiske, G. and S. Yoffe. 2002. Use of GIS for Analysis of Indicators of Conflict and Cooperation Over International Freshwater Resources. In: *Basins at Risk: Conflict and Cooperation Over International Freshwater Resources*, S. B. Yoffe (Editor), Chapter 3. Available at http://www.transboundarywaters.orst.edu/projects/bar/BAR_chapter3.htm. Accessed June 2005.
- Flärke M., and J. Alcamo. 2004. European Outlook on Water Use, Center for Environmental Systems Research - University of Kassel, Final Report, EEA/RNC/03/007. Available at http://scenarios.ew.eea.europa.eu/reports/fol949029/fol040583/Water_stress_final_report.pdf (visited Feb. 10 2009).
- GEF. 2005. Online database of GEF projects. Specific information about "Regional - Preparation of A Strategic Action Programme (SAP) for the Dnieper River Basin and Development of SAP Implementation Mechanisms" at <http://www.gefonline.org/projectDetails.cfm?projID=460> (accessed 29 June 2005)
- GEF. 2005. Online database of GEF projects. Specific information about the "Regional - Strategic Partnership for Nutrient Reduction in the Danube River and Black Sea - World Bank-GEF Nutrient Reduction Investment Fund: Tranche 3" at <http://www.gefonline.org/projectDetails.cfm?projID=2044> (accessed 29 June 2005)
- GEF. 2005. Online database of GEF projects. Specific information about "Regional - Danube/Black Sea Strategic Partnership - Nutrient Reduction Investment Fund: Tranche 2" <http://www.gefonline.org/projectDetails.cfm?projID=1661>. (accessed 29 June 2005)
- GEF. 2005. Online database of GEF projects. Specific information about "Regional - Transfer of Environmentally-

- sound Technology (TEST) to Reduce Transboundary Pollution in the Danube River Basin" at <http://www.gefonline.org/projectDetails.cfm?projID=867> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about "Regional - Lake Ohrid Management" at <http://www.gefonline.org/projectDetails.cfm?projID=113> (accessed 29 June 2005)
- GEF, 2005. Homepage of the UNDP/GEF project "Development and Implementation of the Lake Peipsi / Chudskoe Basin Management Program" <http://www.peipsi.org/gef/> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about the project entitled "Regional - Development and Implementation of the Lake Peipsi/Chudskoe Basin Management Plan" at <http://www.gefonline.org/projectDetails.cfm?projID=1444> (accessed 29 June 2005)
- Great Lakes/Baltic Sea Partnership, 2005. Online information about this partnership at <http://www.greatlakesbalticseapartnership.org/> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about "Regional - Danube/Black Sea Basin Strategic Partnership on Nutrient Reduction, Tranche I" at <http://www.gefonline.org/projectDetails.cfm?projID=1014> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about "Regional - Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin-Phase I Project Short Title: Danube Regional Project Phase 1" at <http://www.gefonline.org/projectDetails.cfm?projID=1460> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about "Regional - Strengthening the Implementation Capacities for Nutrient Reduction and Transboundary Cooperation in the Danube River Basin (Tranche 2)" at <http://www.gefonline.org/projectDetails.cfm?projID=2042> (accessed 29 June 2005)
- GEF, 2005. Online database of GEF projects. Specific information about "Regional - Building Environmental Citizenship to Support Transboundary Pollution Reduction in the Danube: A Pilot Project" at <http://www.gefonline.org/projectDetails.cfm?projID=806> (accessed 29 June 2005)
- Giordano, M. A., and Wolf, A. T. 2003. Sharing waters: Post-Rio international water management. *Natural Resources Forum*. 27: 163-171.
- Global Runoff Data Centre (GRDC), 2005. Online database of discharge data and RBO's. <http://grdc.bafg.de/servlet/is/2503/?lang=en>, (accessed 28 June 2005).
- Greenpeace, 2005. Press release dated 25 August 2003: "Russia's Largest Hydroengineering Facility Being Built In Violation Of Law But With Support From Natural Resources Ministry." <http://www.greenpeace.org/russia/en/news/on-august-25-2003-greenpeace> (accessed 29 June 2005)
- Huisman, P., de Jong, J., and Wieriks, K. 1998. Transboundary Cooperation in Shared River Basins: Experience from the Rhine, Meuse and North Sea, in H. Savenije and P. van der Zaag, The management of shared river basins: experiences from SADC and EU. Delft, the Netherlands: Ministry of Foreign Affairs.
- Hungarian News Agency, 2005. Croatian Plans for Hydroelectric Plant on Hold, Feb. 8, 2005.
- ICPDR, 2001. Summary Report on the 3rd Plenary Session of the ICPDR, 27 to 28 November 2000, Sofia-Bulgaria, available at <http://www.icpdr.org/>.
- ICPDR, 2003. International Commission for the Protection of the Danube, Danube River Basin Strategy for Public Participation in River Basin Management Planning 2003-2009, available at http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show.
- ICPDR. 2005. International Commission for the Protection of the Danube, Trans-National Monitoring Network, available at http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show.
- Institute for Applied Mathematics and Information Technology (IMAT), 2005. Online information about the project entitled "System for Water Monitoring and Sustainable Management Based on Ground Stations and Satellite Images" <http://www.ima.ge.cnr.it/waterman/waterman.html> (accessed 29 June 2005)
- International Water Law Institute (IWLI), 2003. KAR Provisional Report, Volume I — Parts I,II and III. DRAFT. <http://www.dundee.ac.uk/iwli/Documents/KaR/Volume%201%20Part%202%20DRAFT.pdf> (accessed 28 June 2005)
- International Water Law Institute (IWLI), 2003. KAR Provisional Report, Volume I — Parts I,II and III. DRAFT. <http://www.dundee.ac.uk/iwli/Documents/KaR/Volume%201%20Part%202%20DRAFT.pdf> (accessed 28 June 2005)
- International Boundary Resource Unit (IBRU), University of Durham, England. International Boundaries Database. <http://www-ibru.dur.ac.uk/> (accessed June 2005).
- International Court of Justice (ICJ). 1997. Case Concerning the Gabčíkovo-Nagymaros Project (Hung. v. Slovak.), Sep. 25, 1997, 37 I.L.M. 162.
- International Water Law Institute (IWLI), 2003. KAR Provisional Report, Volume I — Parts I,II and III. DRAFT. <http://www.dundee.ac.uk/iwli/Documents/KaR/Volume%201%20Part%202%20DRAFT.pdf> (accessed 28 June 2005)
- Internationale Kommission zum Schutz der Elbe (IKSE) - International Commission for the Protection of the Elbe River. Online information about this commission (in German and French). <http://www.ikse.de/> (last accessed 28 June 2005).
- Institute for Sustainable Communities (ISC), 2005. Online information about ISC projects at <http://www.iscvt.org/psalbania.html> (accessed 29 June 2005)
- International Waters (IW) Research Center, GEF, 2005. Online information about IW Learn projects at http://www.iwlearn.net/event/presentations/iwc2000/M_E/selfo.pdf (accessed 29 June 2005)
- Internationale Weiterbildung und Entwicklung (InWEnt) (Capacity Building International, Germany), 2005. Online report: Transboundary Water Management: Experience in the Baltic Sea Region. <http://www.inwent.org/publications/2005/01/01/Transboundary%20Water%20Management%20Experience%20in%20the%20Baltic%20Sea%20Region.pdf>

- www.inwent.org/ef-texte/vilnius/rep1199e.htm (accessed 28 June 2005)
- Internationale Maascommissie (IMC) (International Commission for the river Meuse), 2005. Online information about the IMC. <http://www.cipm-icbm.be/default.asp> (accessed 28 June 2005)
- International Commission for the Hydrology of the Rhine basin (CHR), 2005. Online information about the Rhine River Basin. <http://www.chr-khr.org/> (accessed 28 June 2005).
- International Commission for the Protection of the Danube River (ICPDR), 2005. Online version of the Memorandum of Understanding entitled "River Basin Management Plan for the Tisza river supporting sustainable development of the region" at http://www.icpdr.org/pls/danubis/docs/folder/HOME/ICPDR/ICPDR_DOC_CENTRE/ICPDR_BASIC_DOCS/LEGAL_POLICY/FINAL+-+TISZA+-+MOU+-+SIGNATURE.PDF (accessed 29 June 2005)
- International Commission for the Protection of the Rhine (ICPR), 2005. Online information about the ICPR. <http://www.iksr.org/> (accessed 28 June 2005).
- International Commission for the Protection of the Danube River (ICPDR), 2005. Online information about the ICPDR. http://www.icpdr.org/pls/danubis/danubis_db.dyn_navigator.show (accessed 28 June 2005).
- INOCSA. 2005. Online database of latest completed projects, one of which is "Supervision of the Refurbishment Works on Prolongation of the Sewer Network and Construction of the Sewage Processing Systems for the Municipality of Braila in Romania" <http://www.inocsa.es/inocsa/ingles/realHidraulicas.htm> (accessed 29 June 2005)
- Integrated management of wetlands. 2005. Online information about the EU-financed project at <http://www.regione.emilia-romagna.it/wetlands/indexengl.htm> (accessed 29 June 2005)
- Integrated management of wetlands, 2005. Online information about part II of this EU-financed project. <http://www.wetlandsmanagement.org/> (accessed 29 June 2005)
- IPPC. 2007. The physical science basis. In: S. Solomon, D. Qin and M. Manning et al., Editors, *Climate Change 2007, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.*, Cambridge University Press, UK. Cambridge (2007), p. 996.
- International Water Event Database (IWED). 2005. Oregon State University, available at <http://www.transboundarywaters.orst.edu/>.
- International Water Law Research Institute (IWLRI). 2005. *Sharing Transboundary Waters – An Integrated Assessment of Equitable Entitlement* (IWLRI, Dundee 2005), available at www.dundee.ac.uk/iwlri.
- Internationale Commissie voor de bescherming van de Schelde (ICBS-CIPE), (International Commission for the Protection of the River Schelde), 2005. Online information about the ICBS-CIPE. <http://www.isc-cie.com/default.asp> (accessed 28 June 2005).
- International Commission for the Protection of the Odra River against Pollution (ICPOAP), 2005. Online information about ICPOAP. <http://www.mkoo.pl/> (accessed 28 June 2005)
- International Water Law Institute (IWLI), 2003. *KAR Provisional Report, Volume I — Parts I, II and III. DRAFT.* <http://www.dundee.ac.uk/iwlri/Documents/KaR/Volume%20I%20Part%20I%20DRAFT.pdf> (accessed 28 June 2005)
- IVL Swedish Environmental Research Institute, 2005. Online information about IVL projects at http://www.ivl.se/en/business/monitoring/monitoring_of_water_quality.asp# (accessed 29 June 2005)
- International Commission for the Protection of the Rhine (ICPR), 2005. Specific information about the Rhine 2020 project at http://www.iksr.org/GB/bilder/pdf/rhein2020_e.pdf (accessed 29 June 2005)
- Jaakko Pöyry Group, 2005. Press release of 8 December 2004: "Electrowatt-Ekono awarded 2.3 million engineering contract in Switzerland" http://www.poyry.com//press/press_1_04.html?Id=1102511621.html (accessed 29 June 2005)
- Joint River Management Programme on Monitoring and Assessment of Water Quality in Transboundary Rivers, 2005. Specific information about the "Pilot Project on Transboundary Water Quality Monitoring and Assessment in Order to Implement Provisions of International Legal Regulations" at <http://www.jointrivers.org/eng/> (accessed 29 June 2005)
- Krinner, W., et al. 1999. *Environmental Assessment Report No 1, Sustainable Water use in Europe, Part 1: Sectoral use of Water*, Copenhagen, 1999.
- Krinner, W. 2000. et al., *Sustainable Water Use in Europe* (EEA, Copenhagen 2000).
- Lapland Regional Environment Centre, 2005. Online information about the Finnish-Norwegian Transboundary Water Commission. <http://www.ymparisto.fi/default.asp?node=9813&lan=en> (accessed 28 June 2005).
- Leemans, R. and W.P. Cramer, 1991. The IIASA database for mean monthly values of temperature, precipitation and cloudiness of a global terrestrial grid. Research Report RR-91-18 November 1991, International Institute of Applied Systems Analyses, Laxenburg. 61 pp.
- Le-Huu, T. and Lien Nguyen-Duc, *Mekong Case Study*, PCCP Series No. 10 (Paris, France: UNESCO-IHP 2003)
- McCaffrey, S.C. 1993. "The Evolution of the Law of International Watercourses", 45 *Austrian Journal of Public International Law* 87 (1993).
- New York Times*, 10 August 1995.
- Nicol, A. *The Nile: Moving beyond Cooperation*, PCCP Series No. 16 (Paris, France: UNESCO-IHP 2003).
- Nilsson, S., Langaas, S., & Hannerz, F. 2004. "International River Basin Districts under the EU Water Framework Directive: Identification and Planned Cooperation", *European Water Management Online*, EWA, 2004.
- Nixon, S.C., et al. 2000. *Sustainable Use of Europe's Water? State, prospects and issues* (EEA, Copenhagen 2000).
- Norwegian Institute for Water Research (NIVA), 2005. Online information about environmental issues related to

- water. Specific information about the "Sava River Basin: Sustainable use, Management and protection of resources (SARIB)" at <http://www.niva.no/symfoni/infoportal/PUBLIKASJON.NSF/redirect?ReadForm&Url=http://www.niva.no/symfoni/infoportal/PUBLIKASJON.NSF/0/414277F65F146083C1256FD600297573?OpenDocument> (accessed 29 June 2005)
- Office International de l'Eau (OIEAU) (International Office for Water). Online information about the International management of the Irtys river. <http://www.oieau.fr/anglais/international/russia.htm> and http://www.oieau.fr/anglais/oie/news/news8_18_19.pdf (accessed 28 June 2005).
- Peipsi Center for Transboundary Cooperation (Peipsi CTC), 2005. Online information about the project funded by the Swedish Environmental Protection Agency entitled 'Environmental monitoring project on lake Peipsi' at http://www.ctc.ee/index.php?menu_id=245&lang_id=2 (accessed 29 June 2005)
- Peipsi Center for Transboundary Cooperation (Peipsi CTC), 2005. Homepage of Peipsi CTC http://www.ctc.ee/index.php?lang_id=2 (accessed 29 June 2005)
- Peipsi. 2005. Peipsi info-portal, available at www.peipsi.org.
- Peipsi. 2005a. Centre for Transboundary Cooperation, available at <http://www.ctc.ee/>.
- Ph.D. Associates Inc. 1998. DCW in ASCII version 3.0. 1998.
- RAMSAR, 2005. Online information about RAMSAR sites and projects. Online news article about entitled "Hungary and Slovak Republic cooperate on transboundary Ramsar site" at http://www.ramsar.org/wn/w.n.tisza_transboundary.htm (accessed 29 June 2005)
- RAMSAR, 2005. Online information about RAMSAR sites and projects. Online news article about entitled "Belgium and Luxembourg cooperate on transboundary Ramsar Site designation" http://ramsar.org/wn/w.n.belgium_sure.htm (accessed 29 June 2005)
- Rieu-Clarke, A.S. 2004. "Sustainable use and the EC Water Framework Directive: From Principle to Practice?", in Schrijver, N. & Weiss, F., *International Law and Sustainable Development – Principles and Practice* 557 (Martinus Nijhoff Publishers, Leiden 2004).
- South Karelia. 2005. Online information about the business and development opportunities in South Karelia. Specific information about "The Sustainable Use of the Water Resources and Shore Areas of the River Vuoksi VIVATVUOKSIA" at http://www.ekarjala.fi/vivatvuoksia/Final_TASK4_Report.doc (accessed 29 June 2005)
- Starr, J.R. "Water Wars," *Foreign Policy* (Spring 1991): 17–36
- Structurae, 2005. Online information on works of structural engineering, architecture or construction through time. Specific information about the "Talsperre Leibis-Lichte" at <http://www.structurae.net/structures/data/index.cfm?ID=s0012256> (accessed 29 June 2005)
- Swiss Federal Office for Water and Geology (FOWG). Online information about the Rhone River Basin. <http://www.bwg.admin.ch> or http://www.eda.admin.ch/sub_dipl/e/home/thema/scoop/comorg/comint/water.html (accessed 28 June 2005)
- Transboundary Dniester River Project. 2005. Online information about this project at <http://www.dniester.org/> (accessed 29 June 2005)
- TFDD, 2005. Online database: Transboundary Freshwater Dispute Database. <http://www.transboundarywaters.orst.edu/> (accessed 28 June 2005)
- UNDP. 1999. Dnieper Basin Environment Programme, available at <http://www.dnipro-gef.net/about/summary.php>.
- UNDP. 2003. UNDP-GEF Dnipro Basin Environment Programme, Transboundary Diagnostic Analysis of the Dnipro River Basin, available at <http://www.dnipro-gef.net/tda.php>.
- United Nations Development Programme, 2004. Human Development Report 2004. New York: Oxford University Press for UNDP. Available at <http://hdr.undp.org/reports/global/2004/>. Accessed June 2005
- UNDP, GEF, 2005. Online information about the Danube Regional Project. <http://www.undp-drp.org/jart/projects/unodp/intro2.html> (accessed 29 June 2005)
- UNDP, GEF, 2005. UNDP/GEF Dnipro Basin Environment Program web site <http://www.dnipro-gef.net/> (accessed 29 June 2005)
- UNECE. 1993. Bilateral and Multilateral Agreements and Other Arrangements in Europe and North America on the Protection and Use of Transboundary Waters, Jun. 1., 1993, UN Doc. ECE/EN/WA/32 and Add. 1&2.
- UNECE. 1998. Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, Jun. 25, 1998 (entered into force Oct. 30, 2001), reprinted in 38 I.L.M. 517 (1999).
- UNECE. 2000. Sustainable Flood Prevention, UN Doc. MP/WAT/2000/7, Jan. 14, <<http://www.unece.org/env/water/publications/documents/guidelinesfloode.pdf>>.
- UNECE. 2000a. ECE/UNEP Network of Expert on Public Participation and Compliance, Water management: Guidance on public participation and compliance with agreements, March 2000, available at <http://www.unece.org/env/water/publications/documents/guidance.pdf>.
- UNECE. 2000b. Task Force on Monitoring and Assessment, Guidelines on Monitoring and Assessment of Transboundary Rivers, March 2000, available at <http://www.unece.org/env/water/publications/pub74.htm>.
- UNECE. 2003. Transboundary Water Cooperation in the Newly Independent States (Moscow 2003). http://www.unece.org/env/water/documents/transbwatcoopnis_fin_e.pdf (accessed 28 June 2005)
- UNECE. 2003. Water and Sanitation in the UNECE Region: Achievements in Regulatory Aspects, Institutional Arrangements and Monitoring Since Rio, Trends and Challenges, 12 Nov., 2003, UN Doc. ECE/AC.25/2004/5.
- UNECE. 2004. UNECE/WHO, Establishing a Compliance Procedure under the Protocol on Water and Health, UN Doc. MP/WAT/WG.4/2004/7, Oct. 6, 2004, available at <http://www.unece.org/env/documents/2004/>

- wat/wg.4/mp.wat.wg.4.2004.7.e.pdf.
- UNECE. 2005. Cooperation through joint bodies, available at <http://www.unece.org/env/water/partnership/part63.htm#632>.
- UNECE. 2005. Online version of the Draft proposal for a work plan on water management until 2006 and beyond. Working Group on Water Management, working paper no. 8. <http://www.unece.org/env/water/meetings/wgwm/4meeting/wp8e.pdf> (accessed 28 June 2005).
- UNECE. 2005. Online version of the Draft proposal for a work plan on water management until 2006 and beyond. Working Group on Water Management, working paper no. 8. <http://www.unece.org/env/water/meetings/wgwm/4meeting/wp8e.pdf> (accessed 28 June 2005).
- UNEP. 2002. Global Environment Outlook 3: Past, Present and Future Perspectives (Earthscan Publications, London 2002).
- UNEP. 2004. Freshwater in Europe - Facts, Figures and Maps, UNEP/DEWA, Switzerland, 2004. This is available on line: http://www.grid.unep.ch/product/publication/freshwater_europe/intro.php.
- UNEP. 2004. United Nations Environment Programme & DEWA, Europe, Freshwater in Europe – Facts, figures and maps, 2004, available at <http://www.grid.unep.ch>.
- United Nations Environment Programme (UNEP). 2004. Sustainable Development: Priorities for Central Asia. Regional Resource Centre for Asia and the Pacific, Pathumthani, Thailand.
- UNEP, Division of Early Warning Systems (DEWA), Global Resource Information Database (GRID) Europe, 2005. Online publication about the Dniepr watershed. http://www.grid.unep.ch/product/publication/freshwater_europe/dniepr.php (accessed 28 June 2005).
- UNESCO. 2003. World Water Assessment Programme (WWAP), Water for People, Water for Life – UN World Water Development Report (Bergham Books, London 2003).
- UNESCO, IHP, WWAP, IHP-VI, 2003. Online report as part of the PC—>PC studies: Rhine Case Study. <http://unesdoc.unesco.org/images/0013/001333/133303e.pdf> (accessed 28 June 2005).
- Universidad de Barcelona (UB), 2005. Online information about the Rhine at <http://www.ub.es/medame/rinaccio.html> (accessed 29 June 2005).
- UNWC, 1997. Convention on the Law of Non-Navigational Uses of International Watercourses, May 21, 1997 (not yet in force), reprinted in 36 I.L.M. 700.
- Vetemaa, M., Vaino, V., Saat, T., Kuldin, S. Co-operative fisheries management of the crossborder Lake Peipsi-Pihkva. Fisheries Management and Ecology, 2001, 8. Online version of this paper can be found at: http://www.mantraeast.org/pdf/cooperative_fisheries.pdf (accessed 28 June 2005)
- Vinogradov, S., Wouters, P. & Jones, P. 2003. Transforming Potential Conflict into Cooperation Potential: The Role of International Water Law, available at <http://webworld.unesco.org/water/wwap/pccp/cd/role.html>.
- Vinogradov, S. 1996. "Transboundary Water Resources in the Former Soviet Union: Between Conflict and Cooperation", 36 Nat. Resources J. 393 (1996).
- Water Conserve, a water conservation portal. 2005. Press release of 19 December 2002 entitled "WWF welcomes Poland's decision on Nieszawa Dam" <http://www.waterconserve.info/articles/reader.asp?linkid=18708> (accessed 29 June 2005)
- Wescoast Jr., J.L. 1992. "Beyond the River Basin: The Changing Geography of International Water Problems and International Watercourse Law", 3 Colo. J. Int'l Envtl. L. & Pol'y 301 (1992).
- WFD. 2004. Common Implementation Strategy – Progress and work programme for 2005-2006, Dec. 2, 2004, <<http://europa.eu.int/comm/environment/water/water-framework/implementation.html>>.
- Wolf, A. T. "Water and Human Security," *AVISO Bulletin*, Global Environmental Change and Human Security Project, Canada (June 1999).
- Woodrow Wilson International Center for Scholars. 2005. Online summaries of East European Studies. Specific information about "Solving The Gabcikovo-Nagymaros Dam Conflict" at http://wwics.si.edu/index.cfm?topic_id=1422&fuseaction=topics.publications&doc_id=18868&group_id=7427 (accessed 29 June 2005).
- World Commission on Dams. 2005. Online publication database. "Contributing Paper: Dams in Spain, by Enrique Garcia Schiller Abogados, S.C.; Spain. Prepared for Thematic Review IV.5: Operation, Monitoring and Decommissioning of Dams" www.dams.org/docs/kbase/contrib/opt172.pdf (accessed 29 June 2005)
- World Water Council, 2000. Online DRAFT version of Visions for the Rhine. <http://www.worldwatercouncil.org/Vision/Documents/RhineBasinDraftVision.PDF> (accessed 28 June 2005).
- Wouters, P.K., & Vinogradov, S.V. 2004. "Analysing the ECE Water Convention: What Lessons for the Regional Management of Transboundary Resources?", *Yearbook of International Co-operation on Environment and Development* 55 (2003/4).
- WWF. 2005. Online information about WWF projects. Specific information about "The WWF Danube-Carpathian Programme" at http://www.panda.org/about_wwf/where_we_work/europe/where/danube_carpathian/about_the_programme.cfm (accessed 29 June 2005).
- Xinhua News Agency. 12/11/1998
- Yale Center for Environmental Law and Policy, Yale University Center for International Earth Science Information Network Columbia University. 2005. 2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship. New Haven: Yale Center for Environmental Law and Policy. Available at <http://www.yale.edu/esi>. Accessed June 2005.
- YILC. 1972: Yearbook of the International Law Commission, 1974, Vol. II(2), at 213BBC Summary of World Broadcasts, 12/3/98.

INDEX OF BASIN NAMES

Bann	20
Barta	20
Bidasoa	20, 99
Castletown	20
Danube	20, 70, 100, 158, 160, 169
Daugava	20, 105, 158
Dnieper	20, 65, 106, 163
Dniester	20, 107, 158, 164
Don	20, 108, 164
Douro/Duero	20, 109, 169
Drin	20
Ebro	20, 110, 169
Elancik	20
Elbe	20, 111, 164, 170
Enningsdalselva	113, 158
Erne	20
Fane	20
Flurry	20
Foyle	20
Garonne	20, 114
Gauja	21
Glama	21, 115
Guadiana	21, 116
Isonzo	21, 117
Jacobs	21
Kemi	21, 118
Klaralven	21, 119
Kogilnik	21, 120
Krka	21
Lake Prespa	21, 121, 165

Lava/Pregel	21, 122
Lielupe	21, 166
Lima	21, 123
Maritsa	21, 124
Minho/Mino	21, 125
Mius	21
Näätämo	21, 126
Narva	21, 75, 127, 158, 166
Neman	21, 128, 159
Neretva	21
Nestos	21, 129
Oder/Odra	21, 130
Olanga	21, 131
Oulu	21, 132
Parnu	21
Pasvik	21, 133
Po	21, 135
Prohladnaja	22
Rezvaya	22
Rhine	22, 136, 159, 167, 170
Rhone	22, 141
Roia/Roya	22, 143
Salaca	22
Sarata	22, 144, 159
Schelde	22, 145
Seine	22, 146
Struma	22, 147, 159, 167
Tajo/Tejo	22, 148
Tana	22, 149
Torne/Tornealven	22, 150
Tuloma	22, 151
Vardar	22, 152, 159
Velaka	22
Venta	22
Vijose	22
Vistula/Wista	22, 153, 170
Volga	22, 154, 159, 168, 170
Vuoksa	22, 155, 168
Wiedau	22
Yser	22