

*the*  
DANUBE

ENVIRONMENTAL  
MONITORING OF AN  
INTERNATIONAL RIVER

Libor Jansky, Masahiro Murakami, and Nevelina I. Pachova

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# The Danube: Environmental monitoring of an international river

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By Libor Jansky, Masahiro Murakami, and  
Nevelina I. Pachova

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# 1

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## Introduction

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### Water – a blessing or a curse

Spilling water before starting an enterprise is an old Slavonic tradition that symbolizes the hope that the endeavor will flow as smoothly as water in a river. However, that old metaphor may be losing its force, not only because the free flow of water in nearly all the world's major rivers is now restricted by artificial barriers. The fates of waters both harnessed and still freely flowing seem to depend on the resolutions of two ongoing heated debates: Are existing dams to be or not to be demolished? Are rivers to be or not to be dammed? An illustration of these global debates can be seen in the Gabčíkovo-Nagymaros case, which has been the subject of a continuing dispute in an either-or framework over the past decade. A closer look at the complexity of the issues involved, however, raises the question: Is an either-or framework appropriate for even beginning to address water management issues?

Throughout the course of human history and, in particular, during the recent centuries of intensive development of natural resources for the advancement of human well-being, the natural power of water in rivers and streams has been harnessed through numerous artificial lake constructions, also called reservoirs, impoundments, or dams. These water regulation works were originally designed to provide water for humans and agriculture, to control floods, and to provide waterways for navigation. In more recent times, they have been designed for hydropower

generation, for commercial fisheries, and for water-based sports and recreation. An estimated 800,000 reservoirs were in operation worldwide in 1997, and approximately 1,700 more large reservoirs are currently under construction, mainly in developing countries (World Lake Vision Committee, 2003).

The development of water regulation works has been both aided and constructed by the transboundary nature of water. Water crosses various borders: social, political, economic, cultural, scientific. Thus, it requires communication and cooperation among riparian interest groups over long periods of coexistence. Very often, however, the diverging views of stakeholders on allocation, objectives, standards, and methods to be considered and/or applied in the course of implementing various stages of water resources management turn water into an agent of conflict rather than cooperation (UNESCO, 2001). The transboundary nature of freshwater resources, which are usually shared by multiple groups with different values and needs in regard to water, has long determined the conflictual nature of river management and water exploitation. That water has long been a cause of conflict is suggested by the English word *rival*, which comes from the Latin *rivalis*, meaning “one who uses a river [*rivus*] in common with another.” While water-related conflicts have rarely led to violence in the past 4,500 years, acute tensions have escalated on numerous occasions (Uitto and Wolf, 2002) and are expected to turn into the major causes of wars in the future unless a sustainable approach to water resources management is developed and employed (Serageldin, 1995).

### International freshwater management: Conflicts and resolution mechanisms

International freshwater management is a particular case of transboundary water management, which is complicated by usually larger disparities and communication barriers among the riparian parties, by limited existing legal frameworks, and by international security considerations. These constraints have led to a much greater use of domestic as opposed to international freshwater resources. Increasing demands and competition for water, due not only to the scarcity and degraded quality of domestic water resources but even more to the poor management and utilization of these resources for growing populations and economic development needs (WEHAB Working Group, 2002; UNESCO, 2001), suggest a possible rise in domestic, social, and political tensions, as well as increased pressure for the development of international waters in the future (Biswas, 1999).

The redrawing of the political maps of Central and Eastern Europe and of Central Asia at the beginning of the 1990s, which led to the internationalization of a number of previously domestic water resources (e.g., the Dnieper, the Don, and the Volga Rivers), and the changes in the political composition of existing international basins (e.g., those of the Danube, the Ob, and the Aral Sea) also suggest a greater potential for tensions over international water management issues that had previously been accommodated domestically or within the relevant Socialist-bloc institutional frameworks which disintegrated together with the regime.

In the past, conflicts concerning international freshwater systems have arisen mainly in developing regions, where water stress, defined in *Global Environmental Outlook* (UNEP, 2002) as water consumption exceeding 10% of renewable freshwater resources, is manifested at the crossroads of socioeconomic, cultural, and political borders and disparities. Notable examples are the conflicts in the Ganges-Brahmaputra-Meghna and the Indus river basins in South Asia, in the Jordan river basin in the Middle East (Murakami, 1996), the Nile river basin in Africa, and, most recently, in the Aral Sea basin in Central Asia. In most cases, conflicts have arisen from accusations by downstream riparian states of harmful uses of shared water resources by upstream ones. Given the nature of these conflicts, they have been resolved by negotiation at the international level, by negotiation exclusively between two riparian states, or through mediation by a third party. River basin organizations – intergovernmental bodies created by riparian states – have also been instrumental in resolving conflicts among basin countries (Nakayama, 1998a).

Historically, international negotiations and institutional frameworks have been successful in resolving disputes over the navigable uses of international rivers. Claims over nonnavigable uses, however, have proved difficult to settle (Biswas, 1999). The constraints to resolving issues of allocation have been aggravated by the increasing legitimization of water needs for ecosystem and habitat preservation. The lack of reliable information about the environmental impacts of different water management policy options and the scientific uncertainty about them has left additional space for value-based judgments. That uncertainty has made transboundary water management and, as Deets (1998) argues, environmental disputes in general particularly prone to politicization and has raised the need for incorporating appropriate tools for limiting uncertainty in the existing mechanisms for resolutions of international water conflicts.

The major framework for sustainable freshwater resources management – Integrated River Basin Management (IRBM) – promotes the coordinated planning and management of all environmental components on



the geographical basis of a river basin. Concrete tools for promoting and ensuring long-term, holistic water management, however, are lacking in most of the cooperation management agreements currently existing in 106 of the world's 263 international basins (Wolf, 2002). In an attempt to fill that lack, the 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, the development of which can be traced back to the 1966 Helsinki Rules that laid the foundation for the international principles for shared watercourses (UNEP, 2002), established a legal framework promoting the equitable and reasonable utilization and the protection and preservation of shared water bodies by, among other policies, sharing relevant data and information. The practical value of the Convention, however, has been questioned on the basis of its vague, sometimes contradictory language, and the slow progress toward its legal framework's ratification (Giordano and Wolf, 2002). At the same time, the usefulness of the framework's data development and data-sharing approach can be seen as constrained by the lack of appropriate mechanisms for incorporating the relevant stakeholders and the broader public in data-sharing arrangements and in the decision making about and the implementation of water management policies. Although donors have given lip service to and, in some cases, funded elements of public participation projects, mostly in awareness raising and other public relations efforts, it has been argued that many of those actions have been insufficient or misguided (Bell, Stewart, and Nagy, 2002).

The case of the Gabčíkovo-Nagymaros Project provides insight into the effectiveness of the Convention, both legally and in terms of one of the mechanisms the Convention proposes for the prevention and resolution of disputes over nonnavigable and, in particular, environmental uses of international waters. The GNP case was the first international water dispute taken to the International Court of Justice (ICJ) and addressed within the framework offered by the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses – legally, through the Court's reference to the Convention and, in practice, through the system for joint environmental monitoring and exchange of relevant data and information which was established even before the creation of the UN Convention.

### The Gabčíkovo-Nagymaros Project (GNP)

Situated on the borderline of changing institutional structures and public perceptions, the Gabčíkovo-Nagymaros case, born from a half-century-old idea for constructing a system of locks in the middle section of the

Danube flowing between Bratislava and Budapest, the capitals of Slovakia and Hungary, respectively, constitutes a test case of the ability of the existing and potential tools for transboundary water management to respond to the challenges of the rising pressure for the utilization of international water resources. Initially conceived as a joint hydroengineering project, the GNP escalated into a war of words over the environmental consequences of the regulation works on the water resources shared by Hungary and Slovakia. The lack of reliable scientific information in the context of the political and economic transitions progressing at different paces in the two countries allowed for the utilization of the water management debate for political legitimization and led to its transformation into a potentially explosive international security issue (Sukosd, 1998).

International institutions, such as the European Union, with its strong political leverage over the two countries aspiring to membership in the organization, and the International Court of Justice, which examined the case and gave a judgment in 1997, provided the institutional basis for resolution to the dispute. Thus, they filled the post-Socialist institutional vacuum in which the two countries found themselves after the disintegration at the beginning of the 1990s of the formerly existing structures for regional political security and economic cooperation. Ultimately, however, the EU and the ICJ left the water management issues and their actual and potential environmental threats for Hungary and Slovakia to resolve.

A step in the direction of reaching such a resolution on the technical aspects of the water management debate was undertaken by the two countries in 1995 (i.e., before the pronouncement of the ICJ judgment) through an agreement on some temporary technical measures for addressing the most critical environmental consequences of constructing and putting into operation the Gabčíkovo part of the GNP and through the establishment of a system for joint environmental monitoring and exchange of information on the affected areas.

### Environmental monitoring: A possible solution?

Environmental monitoring, an integral part of the Environmental Impact Assessment System, is a costly tool for evaluating the environmental impacts of development projects. In conflict-prone environments, however, its cost may be a justifiable and reasonable price to pay to limit opportunities for the much more costly politicization and internationalization of environmental debates. For monitoring to prove a useful tool for sustainable water management in conflictual environments, however, it has

to be conducted or coordinated jointly. A joint endeavor could provide the following:

- a basis for decision making that limits the scientific uncertainty which makes environmental debates prone to distortions;
- an alternative, i.e., nonpolitical, perspective for water management encouraging a benefit-sharing approach by looking at the examined water basin as an ecosystem unity;
- an institutional framework for addressing the technical and practical aspects of water management debates.

Environmental monitoring, however, is hardly a flawless solution. Two major concerns, its scientific and political functions in conflictual environments, need to be taken into account. Limiting factors in the case of the former constitute methodological uncertainties related to the following:

- difficulties in selecting proper indicators because of the complexity of the interlinkages of different factors in the physical environment;
- data interpretation concerns arising from the difficulty in isolating the causes of observed changes in the complexity of the time- and spatial ecosystem dynamics;
- scientific constraints in making future predictions;
- the subjectivity of determining the value of one plant or animal species as opposed to another and thus of policy-relevant data interpretation.

In addition to these scientific limitations, the effectiveness of monitoring programmes is subject to the inevitable dependency on politics of the use of the monitoring results in conflictual environments. Closely related to that dependency is the danger of an unnecessary continual extension of the monitoring programme itself, driven by the prolonged justifiability of such programmes during a continuing political debate or by the vested interests of lobbying scientists involved in a monitoring programme. An example of the extent to which these limitations are surmountable is offered by the GNP case and the joint monitoring programme associated with it on the affected areas.

### Why and what?

To sum up, our research was driven by practical considerations related to the current state of international watercourses management and the peculiarities and status of the GNP case itself. The former are related to the potential growth of tension in international watercourses and the possible opportunities for dealing with that tension offered by joint environmental monitoring and data sharing, which have been increasingly promoted as tools for transboundary water management in the context of the inter-

national debate on the socioeconomic and environmental implications of water regulations. The latter are associated with the ongoing efforts toward reaching an agreement on the implementation of the 1997 judgment of the International Court of Justice regarding the GNP case and with the accumulated results from the joint monitoring and earlier independent monitoring of the affected areas that could provide a reasonable basis both for an interim, policy-oriented evaluation of the environmental impact of the GNP and for informed public input in support of it.

The mandate of our work with respect to the broader implications of environmental monitoring for managing shared water resources in conflictual environments is determined by the few existing cases of joint environmental monitoring on international rivers and by the limited attention paid to the opportunities and constraints such programmes offer for dealing with potentially disruptive water management disputes. At the same time, the GNP-specific concerns our work attempts to address are related to the fact that, despite the considerable attention that the GNP case has attracted in the region and among political scientists abroad, scientifically backed, systematic, and comprehensive evaluations of the environmental consequences of the operation of the dam are limited.

The available literature focusing on the environmental aspects of the GNP case offers a fragmented picture. Comprehensive environmental studies based on the independent monitoring conducted in Hungary and the Slovak Republic before 1995 are subject to the political divide between the two countries and inevitably to the respective viewpoints on the case. Results from the pre-1995 monitoring in the Slovak Republic are compiled in *Gabčíkovo Part of the Hydroelectric Power Project: Environmental Impact Review Based on Two Year Monitoring*, published in 1995 by the Faculty of Natural Sciences of Comenius University in Bratislava, which was in charge of coordinating the GNP-related monitoring activities at the time, and the Plenipotentiary of the Slovak Republic for the Construction and Operation of the Gabčíkovo-Nagymaros Hydro-power Scheme. A similar report, based on six years of monitoring, was published in 1999. The edited volumes (Mucha, 1995; 1999) constitute compilations of reports by different specialists involved in the monitoring of individual environmental elements on the GNP-affected territories in the Slovak Republic. On the Hungarian side, results from the independent pre-1995 monitoring are compiled in *Studies on the Environmental State of the Szigetköz after the Diversion of the Danube*. Similar to the Slovak publications, the volume edited by Láng, Banczerowski, and Berczik (1997) includes reports based on the results of environmental studies on the affected area and of the monitoring of different environmental indicators presented by the respective specialists involved. As a basis for evaluating the reliability of the independent monitoring practices and

methodology employed by the Hungarian and Slovak specialists, relevant literature from independent sources on the theoretical and practical aspects of the monitoring of the respective components discussed is presented when available.

For the period after 1995, the main sources of the results from the monitoring of the GNP-affected areas and of the environmental impacts of the technical measures jointly agreed and implemented by Hungary and Slovakia in 1995 are the Joint Annual Reports for the years 1996–2001. The reports present information focusing on the short-term changes observed in the environment and are intended for use by the authorities in the two countries who are involved in and well acquainted with the GNP case.

Based on the above main sources, this study presents a history of the development and an overview of the results from the environmental monitoring on the GNP-affected areas. It also provides a synopsis of the legal, technical, as well as hydrogeological and geopolitical aspects of the GNP case, along with relevant original documents, tables, and figures, in order to enable authentic, in-depth studies of specific aspects of the case that are deemed relevant by the individual readers. Such a comprehensive approach is considered necessary in order to provide a reasonable background for understanding the fragmented pieces of the independent and joint environmental monitoring activities and results. The study attempts to put the fragments together with the goal of providing the following:

- 1) Insight into the practical opportunities and challenges in using joint environmental monitoring and relevant data and information exchange as bases for sustainable management of international water-courses in conflictual environments.
- 2) An updated basis, accessible to the public, for decision making to support the evaluation of the environmental impact of the GNP and to encourage public participation in the ongoing search for sustainable solutions and for an agreement on the implementation of the 1997 ICJ judgment on the GNP case.

The text is organized as follows. First, a theoretical overview of transboundary river problems synthesizes the major potentially conflictual issues in the management of international rivers. The second section presents an overview of the Gabčíkovo-Nagymaros project, focusing on the current legal status of the case, the history of the project in the context of the changing geophysical and politico-economic characteristics of the region, and a technical description of the GNP. The third section summarizes the genesis and development of the joint environmental monitoring and the relevant results. Finally, the study draws policy-oriented conclusions both in regard to the GNP case and environmental monitoring in the context of transboundary river conflicts in general.

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Libor Jansky, Masahiro Murakami, and Nevelina I. Pachova

**Libor Jansky** is Senior Academic Programme Officer, Environment and Sustainable Development, at the United Nations University.

**Masahiro Murakami** is Professor of International Development at the Department of Infrastructure Systems Engineering, Kochi University of Technology, Japan.

**Nevelina I. Pachova** is a research assistant in the United Nations University Environment and Sustainable Development Programme.

This book focuses on the hydropolitics surrounding the disputed Gabèkovo-Nagymaros Project on the Danube between Hungary and the Slovak Republic, and it examines the progress of the dispute from the International Court of Justice to the subsequent agreement to joint monitoring and assessment of the environmental implications. It uses a multidisciplinary methodology combining approaches derived from natural resources management, geography, international relations, political science, and international law.

Environmental monitoring is essential to resolving transboundary water conflicts and the authors discuss the extensive monitoring programmes implemented by the two countries, the regular meetings of technical experts to improve monitoring and optimise the programmes, attempts to link various causes and effects of the project, and how monitoring can help enhance public participation for sustainable solutions.

*The Danube* examines the opportunities and constraints of using environmental monitoring as a tool for decision-making in the sustainable management of shared freshwater resources in the context of international environmental conflict, and it proposes possibilities for optimising the environmental monitoring of the middle reaches of the Danube.

The authors conclude that in view of the recent eastward expansion of the European Union, the environmental monitoring programme developed in response to Gabèkovo-Nagymaros Project should be integrated into the environmental management of the Danube River Basin to contribute to its sustainable development.

Based on original documents and research, and including numerous maps, figures, and authentic appendices accompanying the study, this book is an essential resource on the applications of environmental monitoring and data sharing for improving the management of international waters, and a useful reference book about the Gabèkovo-Nagymaros Project.

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