

# Transboundary Water Resources Management

Institutional and Engineering Approaches

Edited by

Jacques Ganoulis

Aristotle University of Thessaloniki  
Department of Civil Engineering  
Division of Hydraulics and Environmental Engineering  
Thessaloniki 540 06, Greece

Lucien Duckstein

University of Arizona  
Systems and Industrial Engineering Department  
Tucson, AZ 87521, USA

Peter Literathy

Institute for Water Pollution Control  
Water Resources Research Centre  
H-1095 Budapest, Kvassay J. u. 1, Hungary

Istvan Bogardi

University of Nebraska-Lincoln  
Department of Civil Engineering  
Lincoln, NE 68588-0531, USA



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## Chapter V: Water Management in Major International River Basins and Enclosed Seas

### V.1 From Recognition towards Implementation: The Danube River Basin Environmental Program

H.P. Nachtnebel

Institute for Water Management, Hydrology and Hydraulic Engineering  
Universität für Bodenkultur  
A, 1190 Vienna, Austria

#### Introduction

The purpose of this paper is to present the Danube River Basin Environmental Programme as an example of cooperation among nations sharing a common watershed. The word, "example" does not intend to mean that this endeavor is necessarily the best approach to follow but as a possible vehicle how environmental degradation in an international river basin can be addressed from the recognition of the environmental issues towards the implementation of the necessary measures in close cooperation of the riparian countries. We will put emphasis on the process of Programme development; therefore hydrological, ecological or economic conditions of the basin will be only briefly described.

The Danube river basin (Kresser, 1973) (see Fig. 1) is the heartland of South Central and South Eastern Europe. The river flows over a distance of 2857 km and drains an area of 817,000 square kilometers including all of Hungary and Romania, most of Austria and of the former Yugoslavia, nearly half of the Czech and Slovak Federal Republics, a third of Bulgaria, significant areas of Germany, smaller areas of the Ukraine and Moldavia.

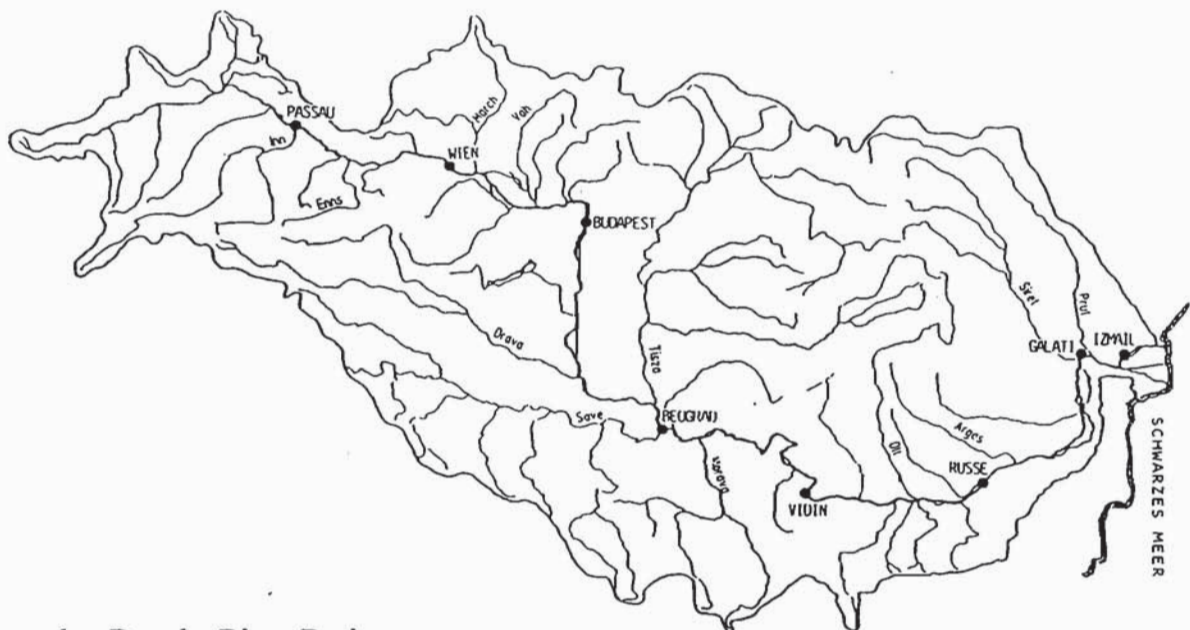


Figure. 1 Danube River Basin.

About half of the average total volume of water of the Danube (216 km<sup>3</sup>/year) comes from Austria and Yugoslavia, and the entire flow of the Danube discharges into the Black Sea through an extensive delta.

According to the geomorphological structure and the longitudinal profile (Fig. 2) of the Danube the basin can be conveniently divided into four regions:

- the stretch from the springs of the Danube down to Bratislava
- the section from Bratislava through Slovakia, Hungary and the former Yugoslavia to the Iron gate
- the third section from downstream the Iron gate to the Delta
- the Delta itself.

Table 1 Characteristics of the three main parts of the Danube catchment.

	gauging station	stream location kilometer	catchment area km <sup>2</sup>	mean discharge m <sup>3</sup> /s	runoff mm
Upper Basin	Bratislava	1869	131 338	2 020	485
Middle Basin	Orsova	955	576 232	5 699	312
Lower Basin	Ceatal Ismail	72	807 000	6 550	256

The delta is a huge region covering an area of 591200 ha. It has the shape of a triangle with sides of 70 km. Almost two thirds of the delta area are permanently submerged due to the low absolute altitude (200000 ha below the mean level of the Black Sea and 150000 ha only slightly above). The three main branches are divided close to the estuary into numerous smaller branches creating their own deltas.

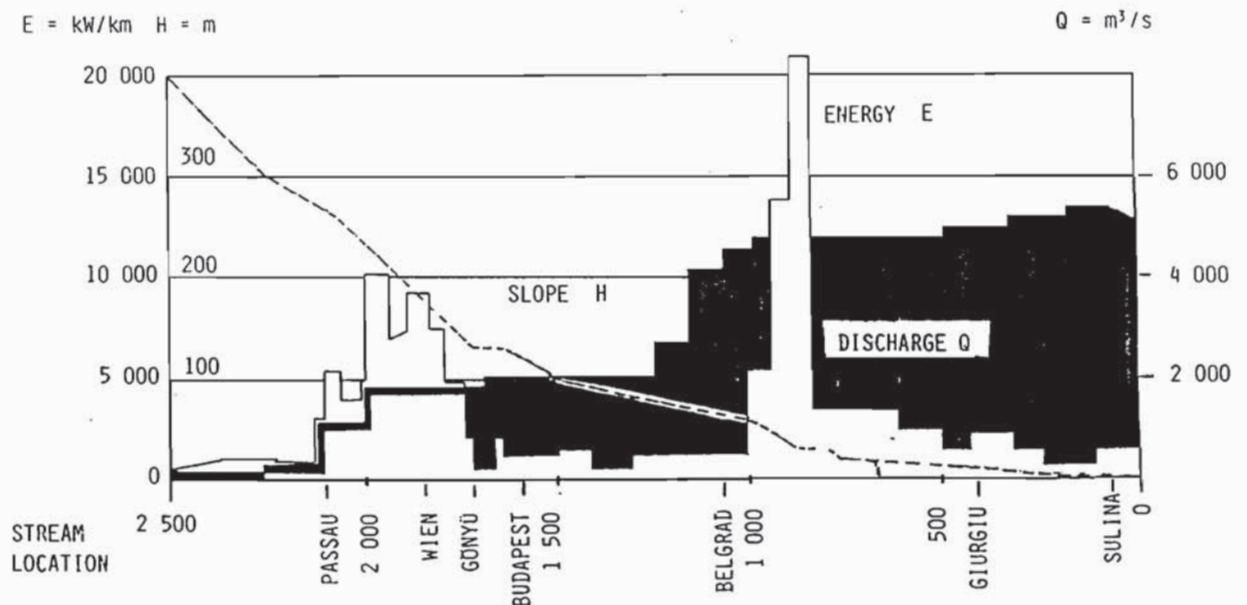


Figure 2 Longitudinal Profile of the Danube.

The delta and the banks of the Black Sea were designated by UNESCO as a "Biosphere Reserve". A part of the delta (53%) has been declared a "wet zone of international significance" in 1991 and designated as a "World Heritage" site under the Ramsar Convention. The seasonality of the discharge and the longitudinal development of the discharge is given in Fig. 3 and 4, respectively.

Land use in this large basin is highly diversified, including a wide range of agricultural practices, forestry, mining, natural areas, settlements and industries. Throughout its length the Danube river provides a vital resource for drainage, communications and transport, power generation, fishing, recreation and tourism, as well as an ecosystem with irreplaceable environmental values. More than 40 dams and large barrages plus several hundred smaller ones have been constructed on the main river and its tributaries. While these facilities provide important opportunities for the utilization of the river's resources, they also are illustrative examples of the difficulties of balancing these important economic activities with environmentally sound and sustainable management.

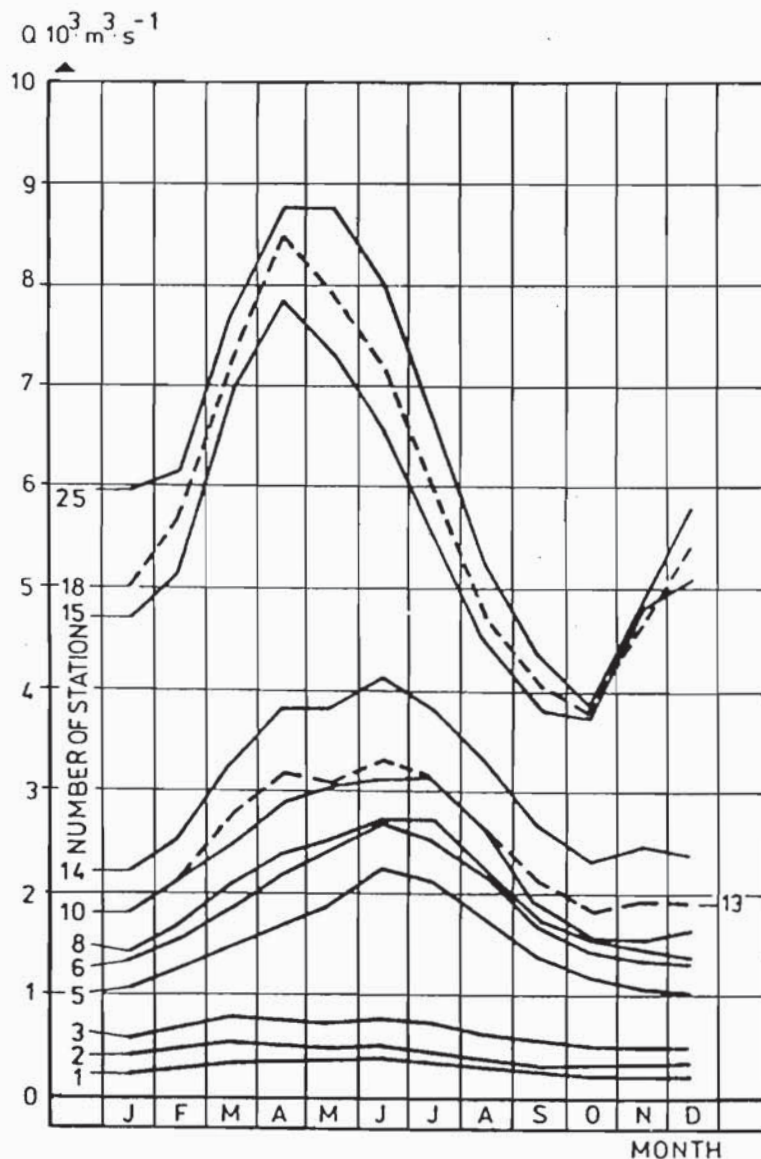


Figure 3 Seasonality of Discharges.

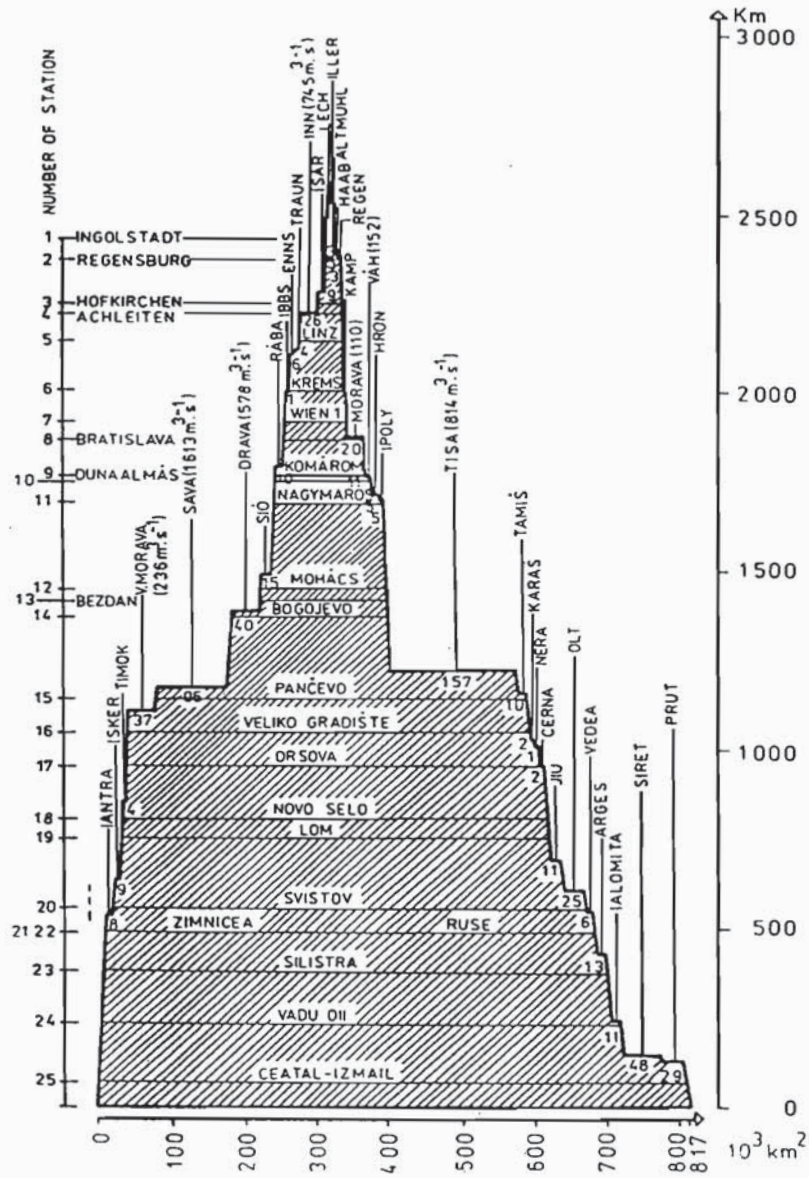


Figure 4 Longitudinal Development of the Discharge.

### Surface Water Quality

In general, the water quality on the main stream is better than in the tributaries where especially during low flow periods, major quality problems are faced. Due to different quality standards in the countries no basin wide classification of the Danube waters is available and therefore a few parameters, including BOD, nutrients and hydrocarbons are described . Fig. 5 includes the BOD concentration of some major tributaries and the respective value in the Danube at the confluence. Fig. 5 exhibits also the buffering and self purification capacity of the main stream which is reflected by a decrease of BOD in its longitudinal profile although some heavily loaded tributaries after the main river. Dissolved oxygen concentrations ranged in the period 88-90 from 10 mg/l in the upstream section to about 8 mg/l at the mouth of the Danube.

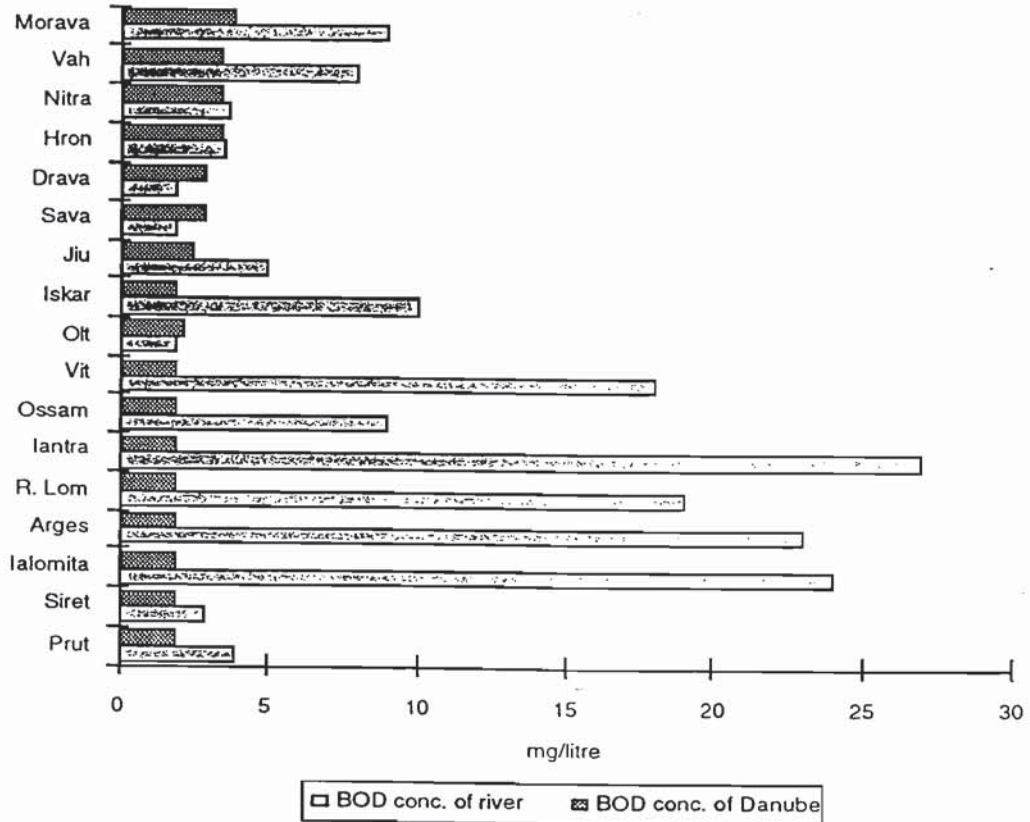


Figure 5 BOD Concentrations in the Major Tributaries and in the Main River.

Nutrient concentrations (nitrate and phosphate) increase along the river course and are at least doubled in the lower sections of the Danube (Weber, 1993). The average annual loads are given in a longitudinal profile in Fig. 6.

Data about microbiological pollutants are available but not published in a standardized format. Mineral oil concentrations show a slight tendency to increase downstream Fig. 7 while some other chemicals (Equipe Cousteau, 1993) indicate an increase downstream (lindane, DDT and some heavy metals). Elevated oil concentrations are observed in three reaches of the main stream; in Germany, in the middle section between Bratislava and Budapest, and in the lower reach from the industrial areas of Bulgaria and Romania.

### Bacteria and Viruses

The Danube is heavily polluted with faecal coliforms, entero viruses, and faecal streptococci. The scarce data base indicates no significant trend of deterioration of river water towards the mouth of the Danube. The worst conditions are found downstream of larger cities lacking adequate waste water treatment. This holds also for the water quality of the tributaries.

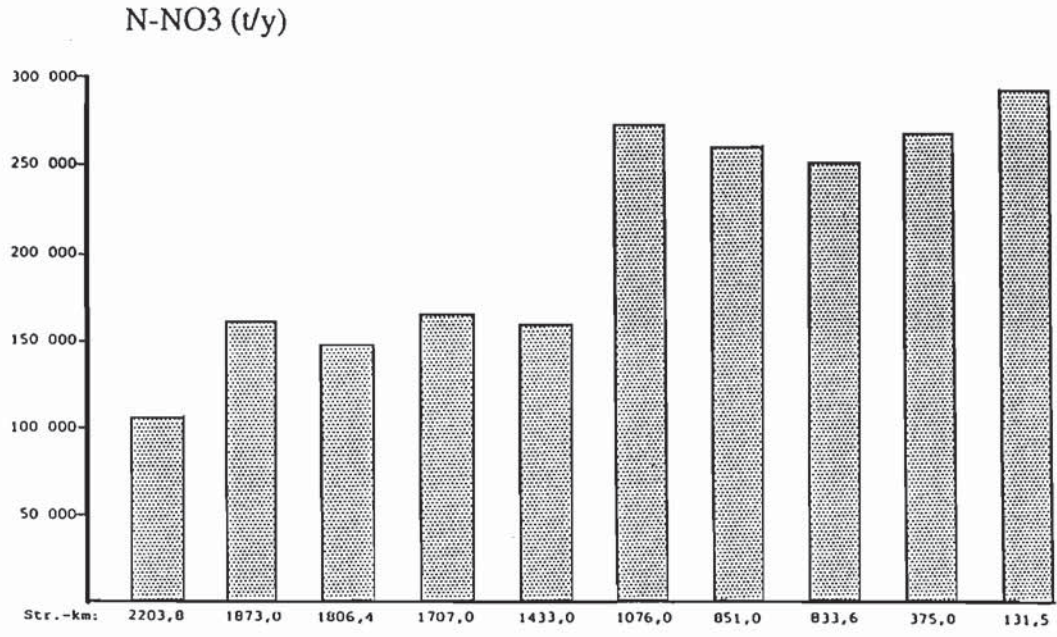


Figure 6 Nutrient Loads in the Danube.

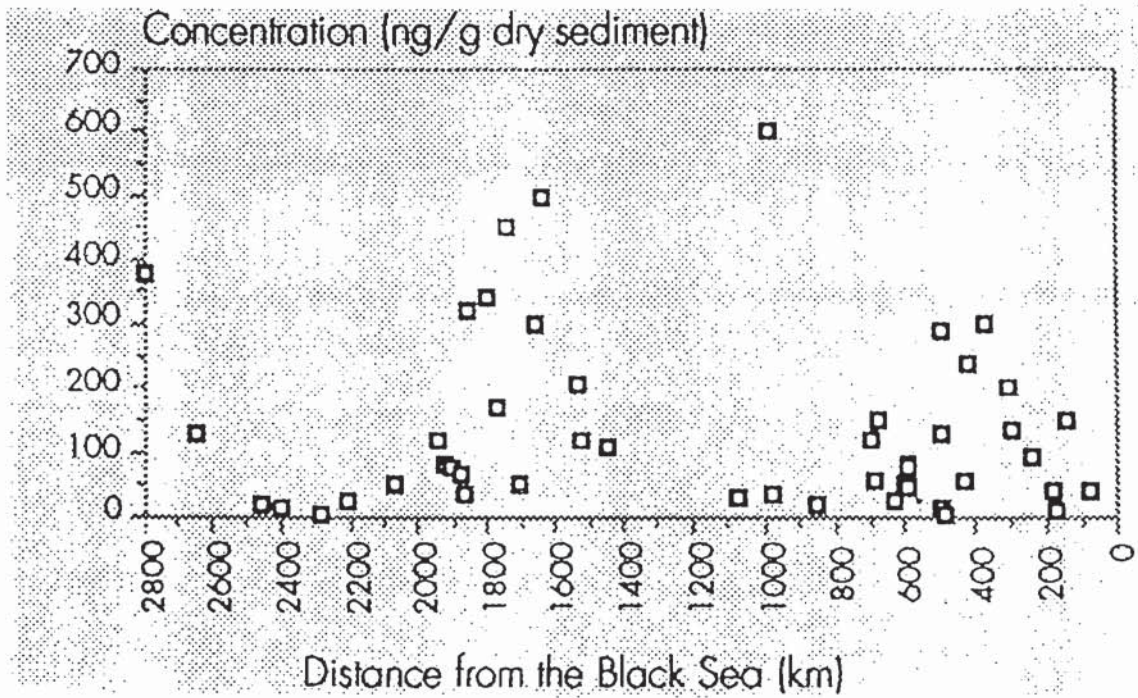


Figure 7 Mineral Oil Concentration.

## Groundwater quality

Major groundwater resources are located in the alluvial plains of the Danube and the tributaries. The spatial distribution of humid zones indicated in Fig. 8 gives a good indication about the location of shallow groundwater bodies which together with deep layered aquifers supply a high percentage of the population (80-95% varying from country to country) with drinking water. Additionally, vulnerable karstic water resources are of special importance for drinking water supply. Due to agricultural practice, landfill sites, inefficient sewage systems and interaction with polluted surface water systems these water resources are endangered. Pollution of groundwater is a common problem and nitrate, chloride, sulfate, ammonia, phenol are often locally exceeding the respective country standards. The low recharge rate of groundwater bodies in the lower part of the basin delays remarkably the sanitation and recovery processes.

## Biological Resources

In the Danube basin there is a broad variety of landscapes ranging from high alpine subcatchments to large alluvial flood plains and further downstream to estuaries in the Delta. Accordingly, an outstanding rich biodiversity was found and is still found in the basin. About 10 to 15 000 species including more than 100 fish species and about 180 bird species are still found in the basin. Only, within the river corridor about 2 000 plant species are reported. There is a distinct gradient in species richness along the river course reaching its maximum in the Danube Delta. Although many sites are under natural protection and several of them are approved by the RAMSAR convention many species are endangered or are already threatened to be extinct.

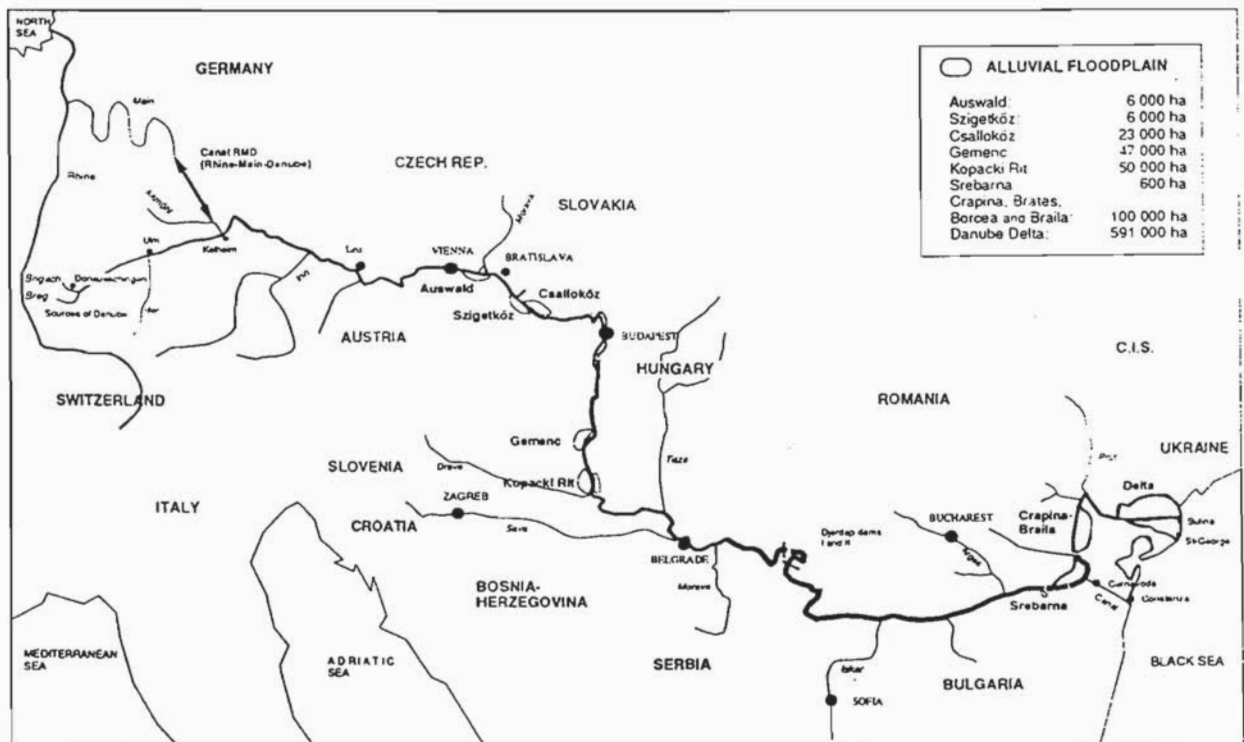


Figure 8 Humid Zones in the Basin.



Local action to control and manage waste discharges and land use is important, particularly on tributaries with limited discharges. However, the quality and sustainability of environmental conditions in most areas of the basin depends also on the effectiveness of practices adopted and implemented upstream by other local and national authorities. The critical interdependence of upstream and downstream neighbors for managing environmental quality can be seen at all levels of the basin, and in the important linkage between the Danube river, its delta, and the environmental quality of the Black Sea. Cooperative action at the regional as well as local levels must therefore be one of the guiding principles of sustainable management of the Danube river basin.

### Soils

*Agriculture and soil conditions.* Agricultural soils are presently heavily loaded by nutrients, metals and pesticides. Cadmium, lead, copper and zinc threaten the quality of top soil through atmospheric deposition and the use of phosphate fertilizers that often contain excessive amounts of cadmium. The limited available data generally show that the agricultural quality of top soil in the Basin is decreasing due to erosion and pollution. Eroded soil carried in the rivers adsorbs metals and phosphorous and is trapped in reservoirs.

### Ecological Sensitive Areas

*Unique Wetland Areas.* Wetlands are among the most threatened ecosystems in the Danube region. Of all habitats, wetlands best reflect the health of the environment, as almost all natural and artificial substances pass through or finish up in them. For this reason their conservation should be given high priority, not only for their unique environmental value, but also for their important and valuable function in maintaining a healthy riverine environment.

*Floodplains.* Many wetlands, especially floodplains, are very fertile but in their natural state are too damp for cultivation of standard crops. In the Danube region this fertility has been exploited by drainage. Most of the Danube valley has been drained or poldered for agriculture despite widespread recognition that these policies are agriculturally short-sighted. Much of drainage works in the Danube River Basin has been ill-planned and poorly-executed.

*Riverine Forests.* The region's riverine forests have been largely felled for farmland. The few that remain are of outstanding importance and careful management is vital. Meadows and fishponds seem the most severely affected. Wet forests, river floodplains and deltas are also particularly badly affected, presumably because the first are subject to management and the latter two are ideally fertile for agricultural uses.

There are still nearly 10,000 sq. km of protected riverine sites including forests, oxbow lakes, marshes, and reed belts. The river continuum concept which is concerned with the biology of running waters implies that the self purification and filtering capacity of the main stem of the river and the general condition of riverine ecosystems is strongly affected by any interruption of the longitudinal and also the transversal connectivity.

In the Danube river system there are more than 500 dams and reservoirs with capacity over 5 million m<sup>3</sup>, and many more smaller seasonal reservoirs. Most of the length of the main stem of

the Danube River and the major tributaries are confined by flood control dikes. Natural alluvial flood plain areas have declined from about 26,000 sq. km to about 6000 sq. km. over the last fifty years. There are also significant reaches with river training works and river diversion structures. These structures trap nutrients and sediment in the reservoirs, cut the ecosystems including habitat both longitudinally and transversely, cause changes in downstream flow and sediment transport regimes, and decrease the efficiency of natural purification processes.

### **Black Sea**

Surface run-off from agriculture together with domestic and industrial effluent is drained via the river network to the Delta area and subsequently contributes about 50 % of the total nutrient load into the Black Sea. These discharges have led to massive and damaging eutrophication of the northwest shelf of the Black Sea and parts of the Delta. About 44 % of nitrogen and 35 % of phosphorous is generated from agricultural land use while municipal sewage contributes 27 and 37 % respectively. Any action to reduce nutrient input into the Black sea must therefore reply on a basin wide approach. A similar spatial scale has to be envisaged when measures are taken to increase sediment input into the Delta region to stop the progressing erosional processes along the Black Sea shore line.

As there is little exchange of water between the Black Sea and the Mediterranean the former accumulates the input of non-degradable contaminants from the various rivers that flow into it, as well as nutrient loads. The Black Sea, like the Danube itself, is a regionally important resource, and since it must absorb all of the pollution load of the Danube which contributes about 50 % of the nutrient load and several other major river basins, its protection can only be assured through regional cooperation.

The immediate consequence of increased nutrient supply by the Danube, was the intensification of phytoplankton blooms, particularly on the shallow northwestern continental shelf where nutrients are readily recycled. Such blooms may have initially been beneficial to the marine food chain but the longer-term effects were devastating.

Until recently, the Black Sea was unprotected by any common policy or legal regime. Efforts to negotiate a legal Convention for the Rehabilitation, Protection and Preservation of the Black Sea began in 1985 and was finally signed in April 1993 (Dogterom, 1993). The countries also requested the UNDP to assist them to design an Action Plan for implementation of the Convention and the Global Environment Facility (GEF) for a three year program for Environmental Management and Protection of the Black Sea with technical and financial inputs essential for fostering sustainable development in the region.

## **The Environmental Program**

### **Background**

The riparian countries of the Danube River Basin have been participating in environmental management activities on a regional, national and local level for several decades (Buijs, 1991; Westing, 1989). In accordance with the recommendations of the Bucharest Declaration of

1985<sup>1</sup> the first steps to create an international water quality monitoring network for the Danube have already been taken. Building on this collaboration, the riparian states decided in February 1951 to elaborate a convention on protection and management of the river and an ecological agreement for the entire basin.

In the context of various programmes of assistance for Central and Eastern European Countries (see Luzerne Declaration, 1993), the idea of launching a series of immediate operational activities to support these legislative initiatives in the form of a Regional Environment Programme was put forward and supported on several occasions. Of particular note was the endorsement given for starting such a Regional Programme in the conclusions of the conference of European Environment Ministers ("Environment for Europe Conference") held at Dobris Castle near Prague in June 1991. In response to this demand, a Programme Coordination Meeting was held in Sofia in September 1991 with the sponsorship of the cooperating international organizations. Important agreements were achieved at the Sofia meeting on the scope and direction of a regional environment programme.

In 1986 the Danube countries signed the Bucharest declaration which had the objective to initiate programs to improve the water quality of the Danube and to establish a network for standardized water quality measurements. Within the first implementation (1988-1990) phase 11 gauging sites were installed between Germany and the Delta to monitor water quality. This first important step provided the basis for a unified evaluation of the main stream. Subsequently, this network is planned to be extended.

Recognizing that new initiatives were needed to address the growing regional water management and related environmental problems in the Danube River basin, the riparian countries together with interested members of the international community met in Sofia in September 1991. The countries agreed to develop and implement the Environmental Programme for the Danube River Basin (hereafter referred to as the Programme) of priority actions and studies in preparation for the eventual agreement on a new convention. In addition, the countries agreed to form a Task Force to oversee this programme.

The international community agreed to assist the countries to develop a three year action plan that would constitute the first phase of international cooperation. The Commission for the European Communities (CEC) agreed to provide support and coordination for the Task Force in its role as G-24<sup>2</sup> Coordinator.

In parallel two conventions related to environmental problems in the basin were prepared from which one the draft convention and Cooperation for the Protection and Sustainable Use of the Danube River, referred to herein as the draft convention (1993), will be signed soon.

The Preamble of the draft Convention identifies *the main problem* as the occurrence and threat of adverse effects on the environment, economies, and well-being of the Danubian States caused by changes in the condition of watercourses within the Danube River basin. Among the main adverse conditions noted in the draft Convention are pollution of water resources

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<sup>1</sup> Declaration concerning the cooperation of Danubian countries regarding water management of the Danube, in particular for the protection of the Danube watercourse against pollution, signed in Bucharest, Rumania on December 13, 1985.

intended for drinking water supplies, and the degradation of riverine ecosystems and water quality by eutrophication (the excess growth of aquatic plants, particularly algae, stimulated by an excess of nutrients - riverine ecosystem degradation is brought about by the cycle of growth, death and decay of these plants):

To deal with these problems, the draft Convention establishes the intention of the contracting parties to intensify water management cooperation, to achieve lasting improvement and protection of the Danube River and of the waters within its catchment area, particularly in a transboundary context; to achieve sustainable water management, and to contribute to the protection of the marine environment of the Black Sea.

Article 2 of the draft Convention establishes three specific goals to be achieved by the actions and arrangements agreed in the draft Convention by the contracting parties.

\* *sustainable and equitable water management*, including conservation, improvement, and rational use of surface and groundwater;

\* *control of hazards* originating from accidental spills of hazardous substances, and natural phenomena such as floods and ice;

\* *reduce the pollution load to the black Sea*

Due to the political and economical changes in central and Eastern Europe (CEE) the resources available for environmental improvement will be severely constrained over the next 5-10 years. An environmental action programme for CEE was developed and signed in Luzern 1993 (Luzerne declaration, 1993) to provide a framework for setting national environmental priorities and to enhance cooperation between East and West.

These documents, the Bucharest Declaration, the Environmental Action Programme, and the Draft Convention are the most recent and important agreements among the Danube countries.

### Goals and Principles

To achieve the long term objective of the sustainable use and development of the Danube basin natural resources the main goal of the Regional Environmental Programme is to establish an operational basis for strategic and integrated management of the Danube river basin environment while focusing initially on priority environmental issues. The strategy is based on several key principles:

- The approach should protect and enhance environmental values, and contribute to economic welfare and safeguard public health;
- The approach should be integrated. To achieve long term benefit, the Danube River Basin must be seen as an ecological system in which the inter-relationships between air, water, soil and biological resources within and outside the basin must be considered. A similar interdependence is seen in the complex pattern of economic activities linked together by the river's course.

- The approach should be participatory. The approach must reflect riparian countries' own priorities and each phase of the programme should emphasize consensus building, information sharing, and joint decision making among the riparian countries including local authorities.
- The approach should promote a mix of actions in the public and private sectors that increases efficiency, reduces the cost of environmental management and protection including capital investment, maintenance and operation, and generally enhances environmental quality and the effectiveness of environmental management.
- The approach should be coordinated and among the international funding sources will be essential because of their interdependence and the large number of projects foreseen throughout the basin. The limited available resources must be allocated where they can have the greatest benefit.

### **Phases of the Regional Environmental Programme**

The objectives of the Regional Environmental Programme will be achieved in two main phases:

- \* Phase I is the Three Year Action Plan which is outlined below; and
- \* Phase II which would serve to implement the recommendations of the Strategic Action Plan and pre-investment studies prepared under the first phase and support further institutional strengthening and human resources development.

The three parts of the Phase I three-year action programme are parallel or concurrent. Part A focuses on short-term, high priority investments, while Part B develops a strategic action plan and phased investment programme and Part C puts in place the essential policy reforms needed to effectively implement the strategic plan.

#### **Part A: Short Term Actions**

Immediate actions will be taken under the programme to address environmental problems of acute concern and obvious high priority including areas of known health hazard or areas where environmental values and critical resources such as water supplies are threatened irreversibly. Initially two activities have been formulated for this part of the programme:

(a) Stage I of Pre-Investment Activities - High Priority Actions. The focus of the Danube Investment Programme will be on the highest priority areas of acute environmental concern. These may include municipal and industrial waste water, solid waste, and surface and ground water pollution from point and non-point sources. Areas and sources of pollution will be screened to identify high priority areas for project preparation during Stage II and to select a small number of pilot demonstration projects.

Pilot projects will include not only civil works but the industrial and policy reforms essential for effective project financing, implementation and operation. This limited number of pilot investment projects would be considered for funding by participating multilateral and bilateral

financing institutions. In view of the time required for project preparation and appraisal, and the uncertainty over priorities, these early investment activities are likely to consist of the completion, rehabilitation, and modernization of existing facilities provided that they are not obsolete. These pilot project would also be closely monitored and reported on to a Task Force in order to ensure the wide dissemination of lessons learned.

(b) Accident Emergency Warning System. As noted earlier, the Danube is the focus of intense economic activity as well as the location of many important settlements. An effective accident warning, alarm, and response system could contribute greatly to minimizing the serious environmental harm caused by industrial accidents such as oil spills and discharges of toxic and hazardous wastes, radioactivity and risks related to hydrotechnical works.

The program will support the formulation of such a system working through a special expert sub-group under the Task force. Communications as well as preparedness are likely to play critical roles in such a system, and the programme will undertake an assessment of current capabilities and facilities.

### **Part B: Development of a Strategic Action Plan**

The Regional Environmental Programme is intended to be a comprehensive multi-year programme. To achieve this objective a Strategic Action Plan for environmental protection and natural resources management will be prepared during Phase I. The Strategic Action Plan would provide a comprehensive and integrated guide with which the riparian countries will be able to jointly coordinate the activities of local and national authorities, international financial institutions, and regional and non-governmental organizations towards a set of common, strategic goals.

The Plan would provide an assessment of the nature, extent and causes of environmental degradation in the Danube River Basin and identify priority areas for intervention in policy and legislation, institutional strengthening, human resources development and investment activities. It would assess the linkages between various activities, systems, and issues and their impacts on ecology, human health and the economy of the region. The Plan would provide a phased multi-year programme of environmental actions to be undertaken and will include preliminary cost estimates for the implementation of these actions.

### **Part C: Institutional and Technical Building Blocks**

This Programme element will identify and implement priority actions to edge of the environmental situation and to strengthen the capacity of authorities, organizations and individuals involved in environmental management in the Danube Basin.

- (a) Inventories. The inventories involve the systematic collection of information and its compilation in a form that facilitates study and analysis. They are an essential and fundamental step in strategic planning. It is anticipated that comprehensive inventories will have to be built up in phases. In this initial phase, the inventories will focus on areas of priority environmental concern. Three comprehensive inventories have been identified for implementation in the Three-year Action Plan. These include an inventory of existing data, infrastructure, and sources of pollution, to be

conducted in two phases; the accumulation of pollutants in soils, groundwater and sediments; and biological resources:

- (b) Analytical tools for planning and management. Effective management requires the efficient collection and storage and retrieval of reliable information on the state of the environment and appropriate standards to assist in the formulation of management programmes. The interdependence of the riparian countries in the basin requires that these data and standards be comparable. The Programme will support the demonstration of new technologies such as geographical information systems (GIS) and strengthen capacities in monitoring and data management, leading to the development of predictive analytical tools, such as models, which are required for effective planning and managing of the environmental resources in the basin.
- (c) Strengthening, Networks, Institutions, Human Resources and Nongovernmental Organizations. The Programme would support a broad series of activities to strengthen institutional and human resource capacities within the region. These activities would be developed on the basis of needs assessments which would be supported by consultations with key parties. The activities under the Programme will place special emphasis on the development and expansion of networks in a variety of areas to link key groups horizontally. Local nongovernmental organizations in the region will receive support under this element which would be interactively designed to address their diverse needs.

The Programme will support these activities in four areas of concentration:

- \* Development of Networks;
- \* Strengthening Institutions;
- \* Human Resources Development;
- \* Enhancing Nongovernmental Organizations; and
- \* Workshops and seminars focusing on key issues such as privatization and financing, exchange of experience, developing strategies, and technology assessment.

- (d) Applied Research. As an integral part of supporting the Programme, a structured series of applied research activities will be conducted. The research findings will be used to help define the legal, policy and management framework required to improve the environmental situation of the Danube river, Danube delta and areas of the Black Sea influenced by the Danube. These research activities will make an important contribution in support of the development and eventual implementation of international legal frameworks for the Danube Basin and the Black Sea. The programme will be coordinated with the Black Sea environmental programme.

### **Programme Phase II: Environmental Investment**

Phase II of the Programme would support a large scale, multi-year investment programme to address a wide range of environmental issues in the Danube River Basin. It would focus on supporting activities to implement the recommendations of the Strategic Action Plan. Phase II would provide funding for policy and legislative measures, large-scale activities in institutional

strengthening and human resources development, and a series of investment projects on both a regional and country specific level. Financial support for these activities would be obtained from a wide range of domestic and international sources. It is anticipated that international funding for Phase II would be provided by a variety of multilateral, bilateral, private sector and nongovernmental organizations. Priority investment activities identified in Phase I may be initiated by participating governments and international funding organizations in advance of the formal beginning of Phase II.

## **Strategic Action Plan (SAP)**

### **Background Material for SAP**

The Strategic Action Plan will be the key element for the Programme. The Strategic Action Plan will be based on a series of regional national and local studies, fact finding inventories and assessments, and analysis of options and integrated strategies to deal with priority problems. The studies outlined below constitute an initial programme intended to provide a comprehensive picture of environmental problems in the Danube River Basin, and to develop an initial phased investment programme.

- (a) National Reviews. The riparian countries prepared a national review of environmental issues and proposed measures and actions within their portion of the Danube River Basin. The national reviews include an initial inventory of pollution sources, an assessment of environmental issues and problem areas, review of available data and studies, and assessment of existing infrastructure.

The national reviews consider also the need for policy, legal, regulatory and institutional interventions as well as infrastructure investments. They provide a comprehensive and integrated evaluation of environmental issues. The national reviews examine issues such as surface and groundwater quality, and wetland and habitat conservation issues. The national reviews are vital to the process of developing the SAP because they represent the initial statement concerning issues and priorities by each riparian country which can be used to guide other activities in the programme.

- (b) Stage II Pre-investment Activities for Priority Areas - Project Preparation and Related Studies. A phased investment programme that responds to immediate needs for actions in areas of high priority and acute environmental sensitivity and provides a longer term programme of investment for Phase II will be developed. The scope of project preparation activities will include, in addition to the appropriate technology, project financing for construction and maintenance, and the overall institutional and policy framework that would enable sustainable project operation. In particular, innovative private sector and public/private sector joint ventures will be considered to overcome the present severe constraints on project financing, and new institutional arrangements proposed which overcome past problems of O&M effectiveness and financing.



- (c) **Regional Studies.** There are a range of other important problems that have a distinctly regional or river basin character, for example, non-point sources of pollution, air pollution, and in some cases groundwater management. The SAP should provide an integrated framework to address these distinctly regional issues as well as local problems. The basis for this integrated framework is being developed through a series of regional and possibly sub-basin studies. The regional studies include systematic studies, surveys, and assessments of existing conditions, causes of problems, linkages among economic and social activities and environmental and natural resource management objectives and issues, and evaluate the range of viable management options and strategies.

### **Drafting group**

The key milestone of the first phase of this international programme is the completion and adoption of an *initial* SAP. The SAP is intended to provide a framework for implementation of the various provisions that will be incorporated in the new Convention on Cooperation for the Protection and Sustainable Use of the Danube River which has now been agreed upon and will be signed in the near future.

To prepare the draft SAP report, the Task Force established a Drafting Group consisting of representatives from four riparian countries: Romania, Bulgaria, Hungary, and Austria, the PCU, the World Bank, and the United Nations Development Programme (UNDP).

Results of the first phase of the consultation process will be used by the Drafting Group to prepare the draft SAP report which will be presented to the Task Force in late May. This will be followed by detailed national reviews of the draft and a second round of consultation on its contents before seeking formal acceptance of a final revised version of the SAP by the Governments of the riparian countries later in the year.

### **Consultation Process**

The consultation process includes at least two opportunities for representatives of various interest groups to provide feedback to the Drafting Group on the contents of the SAP report

\* first, a series of consultation meetings were held in each country in February and March, 1994. The one day meeting provided an overview of the draft SAP report as well as an opportunity for representatives from relevant ministries and municipalities, research institutions and laboratories, private sector enterprises, environmental NGOs, and environmental journalists to discuss and comment on the objectives, principles, problem areas, and priorities being proposed for inclusion in the SAP report. Results of these consultation meetings are used by the Drafting Group to revise and continue drafting the SAP report.

\* second, after the draft SAP report is completed in May, a second phase of the consultative process will include follow-up meetings with the same groups in June.

### **Relationship of the SAP to the Draft Convention**

The SAP is intended to address problems of water quality management, and the related problems of protecting and restoring environmentally sensitive and valuable areas in the

riverine environment. The SAP provides a framework for implementation of the provisions of the draft Convention. Thus, the two should share common goals.

The SAP will include a specific programme of objectives, priorities, and actions to be implemented through the mechanisms established in the draft Convention which stress joint action by the riparian countries to address common and shared or transboundary problems.

The SAP and the draft Convention are *regional* in character, providing a framework of agreements, strategies, and actions that enable the riparian countries to cooperate to achieve common goals and solve transboundary water management problems

### **Specific Objectives of the SAP**

The broad and comprehensive goals of the draft Convention have been translated into specific operational SAP objectives. These SAP objectives specify the key water management problems to be addressed and identify the related and specific conditions to be monitored and measured.

#### **The Goal of Sustainable and Equitable Water Management in the Danube River Basin**

OBJECTIVE A. - Maintain and improve surface and groundwater quality and its availability for drinking water.

OBJECTIVE B. - Ensure adequate water resources of appropriate quality to meet other uses including irrigation, fisheries and recreation.

OBJECTIVE C. - Protect and restore the condition of Danube riverine ecosystems, including wetlands, habitat, and forest plains.

#### **The Goal of Restoring the Unique Ecosystem of the Danube Delta and the Marine Environment of the Black Sea**

OBJECTIVE D. - Reduce the negative impact of activities on the Danube River basin on the Danube Delta and the Black Sea.

#### **The Goal of Controlling Hazards Originating from Accidental Spills**

OBJECTIVE E. - Develop and implement regional systems and measurement to prevent, monitor, and improve the response to accidental spills.

#### **The Goal of Enhanced Regional Cooperation Involves three Interrelated Sub-objectives Incorporated Together in Objective F**

OBJECTIVE F - To introduce a regional approach to Danube water management problems; to provide a framework within which the basin countries can harmonize national objectives, priorities and actions; and to establish a regional framework for action that is agreed to by all countries and the international community.

riverine environment. The SAP provides a framework for implementation of the provisions of the draft Convention. Thus, the two should share common goals.

The SAP will include a specific programme of objectives, priorities, and actions to be implemented through the mechanisms established in the draft Convention which stress joint action by the riparian countries to address common and shared or transboundary problems.

The SAP and the draft Convention are *regional* in character, providing a framework of agreements, strategies, and actions that enable the riparian countries to cooperate to achieve common goals and solve transboundary water management problems

### **Specific Objectives of the SAP**

The broad and comprehensive goals of the draft Convention have been translated into specific operational SAP objectives. These SAP objectives specify the key water management problems to be addressed and identify the related and specific conditions to be monitored and measured.

#### **The Goal of Sustainable and Equitable Water Management in the Danube River Basin**

OBJECTIVE A. - Maintain and improve surface and groundwater quality and its availability for drinking water.

OBJECTIVE B. - Ensure adequate water resources of appropriate quality to meet other uses including irrigation, fisheries and recreation.

OBJECTIVE C. - Protect and restore the condition of Danube riverine ecosystems, including wetlands, habitat, and forest plains.

#### **The Goal of Restoring the Unique Ecosystem of the Danube Delta and the Marine Environment of the Black Sea**

OBJECTIVE D. - Reduce the negative impact of activities on the Danube River basin on the Danube Delta and the Black Sea.

#### **The Goal of Controlling Hazards Originating from Accidental Spills**

OBJECTIVE E. - Develop and implement regional systems and measurement to prevent, monitor, and improve the response to accidental spills.

#### **The Goal of Enhanced Regional Cooperation Involves three Interrelated Sub-objectives Incorporated Together in Objective F**

OBJECTIVE F - To introduce a regional approach to Danube water management problems; to provide a framework within which the basin countries can harmonize national objectives, priorities and actions; and to establish a regional framework for action that is agreed to by all countries and the international community.

## Formulation of Strategies

### Principles and Strategies.

The formulation of strategies and the selection of actions and measures for the SAP would be guided in part by certain principles and lessons developed from recent experience in central and eastern Europe, including a focus on:

- \* Regional and integrated approaches
- \* Control of pollution at the source
- \* Seeking win-win solutions
- \* Effects of economic, social and industrial restructuring on the environment in the countries in transition
- \* Environmental liability for clean up and restoration
- \* Phased approach to long term changes and problems - immediate actions should be those with the largest benefits at least cost
- \* Mobilization of local resources and initiative
- \* The polluter-pays and precautionary principles

### Criteria for Formulating Strategies

The general criteria for the selection of highest priority actions would include the following considerations:

- \* actions which have greatest impact on the priority objectives taking into account that benefits may accrue from more than one objectives
- \* actions which are cost-effective and represent a least-cost approach
- \* viability (institutional, economical and financial): actions and projects that are in an advanced phase of restructuring, with regard to their management structures, procedures and financial independence, will have a higher priority than projects that survive on the basis of state interventions
- \* suitability for a phased approach, projects that can immediately contribute to the solution of problems through a step-by-step approach will have higher priority than projects that need multi-year programmes before impact on the objectives can be observed
- \* availability of needed project preparation studies, projects for which feasibility studies are finished or in an advanced state (assuming they meet other criteria and represent feasible and affordable schemes) will have a higher priority than projects for which studies have yet to start
- \* actions and projects with pilot or demonstration value; projects with important pilot or demonstration value will have a higher priority
- \* risks; projects with a high *risk in respect of its* management, the introduction of new technology operational *complications*, or ability to operate and maintain on a sound financial footing will have a low priority
- \* urgency of measures in regard to irreversibility of damages or risk to human health

\* actions which further international cooperation and primarily address transboundary issues as opposed to those that require only national response or have localized impact

\* actions which have a favorable effect on other environmental resources including air, soil and forests

### **The Scope of Possible Actions and Measures**

Outlined below are possible generic measures and actions grouped into six broad categories. The SAP will include specific actions from these possibilities to address the priority objectives and problems discussed in the previous section.

#### ***Policy, legal and regulatory measures***

Within this group, actions will be identified which will support the development and implementation of international and national environmental policies, laws and regulations. These include - development of the legal and administrative infrastructure, introduction of harmonized ambient and emission water quality objective or standards, planning procedures and economic measures, such as the application of the polluter pays principle, realistic user charges, fines and fees.

#### ***Institutional strengthening and capacity building***

This group of actions will include - enhancement of environmental management capacity at the national and local level, expansion of environmental planning and management measures, regional exchange of information, improvement of enforcement programmes, improvement of monitoring, data collection, analysis and quality control.

#### ***Investment in pollution control***

Investment needs and specific projects will be identified with emphasis on major "hot-spots" of regional and sub-regional importance, on rehabilitation, modernization; and improved efficiency and operation of existing facilities, on clean-up and restoration of hazardous sites, and on phased introduction of new schemes and capacity. Project preparation, financing, and related institutional issues and constraints will be analyzed and steps identified to overcome present constraints.

#### ***Management programmes for the control of water resources and for environmentally valuable areas including wetlands and forested floodplains***

Management practices for the quantitative and qualitative control of groundwater and surface water resources need to be optimized and integrated. This concerns management practices with transboundary as well as with purely national impact. Actions will be included in the Plan directed at optimization of the operation of hydraulic structures with transboundary impact. Actions to support national programmes to improve or develop management of wetlands, forest plains and floodplains will be included. Regional aspects of groundwater management will be considered.

#### ***Public awareness and participation***

Implementation of the Plan will benefit greatly from public support particularly for schemes to be funded locally and to apply the polluter pays principle effectively. In order to obtain broad public support, international and national programmes to increase public awareness will be

integrated into the Plan. Mechanisms to include public participation in decision-making have to be developed.

### ***Applied Research***

Applied research to improve policy-making" to reduce management uncertainty or operational weaknesses will be identified. These programmes will include underpinning strategic research as necessary.

### **Toward Implementing the Programme**

A Task Force, comprised of representatives of the riparians, international organizations, nongovernmental organizations and other relevant parties, was established to oversee Programme development and implementation.

In order to maximize the results and effectiveness of the Programme, the riparian countries and the international donor community should make a strong commitment to ensuring optimum coordination between the activities of the Programme and other relevant national programmes. This should include ensuring the close linkage and synergy between, for instance, the strengthening of national monitoring and data management systems supported through the European Community's PHARE national Environmental Sector Programmes as well as other activities supported by international financing institutions.

The estimated total cost of Phase I ("Three Year Action Plan") 57,6 million US Dollars of which 49,2 million US dollars is required from international sources. Present commitments to fund the proposed budget total 40,8 million US Dollars.

The participation of representatives of cooperating riparian countries is critical to the success of the Programme. Governments are appointing a Country Programme Coordinator and an institution to serve as the national Focal Point for its participation in the Programme. The Country Programme Coordinator is responsible for the day to day operations of the Programme within the country. A major role of the Coordinator is to coordinate the activities of participating ministries, local governments, academic and research institutions, nongovernmental organizations and the public. The participation of local Governments in the Programme is especially important given their increased responsibilities for environmental management as the result of administrative decentralization which is occurring in many of the participating countries.

It would be anticipated that national and local governments would support the activities of the Programme by: (a) preparing national reviews on a timely basis; (b) providing financial and other support to Programme activities; (c) providing full access to information required for the preparation and implementation of Programme activities; and (d) would authorize, subject to adequate prior notification and formal clearance, site visits by technical experts to support preparation and implementation of the Programme.

The Programme specifically includes the involvement of nongovernmental organizations which have or are developing active programmes in the Danube River Basin. On the basis of their current activities, the following organizations have indicated their strong interest: (a) Foundation Cousteau, (b) Regional Environmental Centre for Central and Eastern Europe

("Budapest Centre"), (c) World Conservation Union (IUCN), and (d) World Wide Fund for Nature (WWF). The Programme will include support for institutional strengthening and selected activities of local nongovernmental organizations.

## **Financing**

### **Financial Resources**

Financial resources for investment in new infrastructure, and for rehabilitation and modernization of existing infrastructure, to preserve and protect the river basin environment are limited, even though the likely number of funding sources is quite large. Hence the riparian countries and the international financial institutions will face important choices in deciding how to allocate these limited resources where they can produce greatest overall regional benefit. As well as balancing local needs and priorities with bringing the maximum environmental benefit to the region, the chosen strategy should also fully reflect the results of the ongoing economic and industrial restructuring in the central and lower riparian countries. While restructuring may result in reduced pollution loads from heavy industry, energy and mining, significant increases in pollution loads from agriculture, agro-industry and urban solid waste may occur unless preventive action is taken.

Restructured economies with modern production technology, appropriate prices for inputs, and less intensive energy and raw material use are likely to emerge. This may reduce pollution from ongoing production but will of course not affect pollution which has accumulated from past activities. It is essential that scarce resources be directed to those pollution problems which are likely to remain priorities even after economic restructuring. SAP financing needs fall into three categories:

- \* first, funds for technical activities including studies; demonstration and pilot projects, training and institutional strengthening; data collection and monitoring, programme design and implementation; and project identification, preparation, and feasibility studies.
- \* second, funds for capital investment in facilities to control pollution and improve water management,
- \* third, funds for project implementation including training and institutional strengthening, operation, and maintenance
- \* Domestic Resources - Local financial resources should be used wherever possible to finance SAP activities rather than foreign borrowing in order to avoid pressure on the country's balance of payments. Given the severe strain on public sector expenditures during the current stage of economic restructuring, emphasis should be placed on meeting expenditure requirements from revenues generated at the project level (e.g. municipal water services) before seeking national or international sources of funding. These revenue sources would be based in part on the enforcement of the Polluter Pays Principle which is incorporated in the general environmental laws in each of the riparian countries.

The principal local sources of funds available to support activities under the Programme include: user charges, pollution fees and fines, budgetary allocations and non-budgetary incentives, domestic loans and, potentially, local private sector investment. Domestic loans

may not be a major factor in the near term because local financial mechanisms such as capital markets and banks have not been developed to support environmental improvements and services in the municipal and industrial sectors. Hence the use of so-called environmental or ecological funds as a source of technical assistance and investment financing has been necessary. Mobilization of local private investment is constrained by historical barriers to private ownership, a limited local banking and financial sector, and inexperience of potential investors with the types of activities included in the Programme.

\* External Resources - Due to the present constraints on the availability of local financing and the need for foreign exchange to fund elements of most priority activities, the use of external financial resources will be very important in funding the Programme in the short and medium-term. Given the competing demands for limited external financial resources, particularly during the short-term, it is critical that their use be well planned, properly coordinated, and that available funds be allocated to address priority needs from both a national and regional perspective.

### **Applied Research**

While the SAP is oriented towards taking near-term actions on the basis of available information, the long-term cost-effectiveness of the SAP will depend on overcoming the weakness of current data and knowledge concerning the key processes that affect the Danube environment. It is anticipated that the SAP will be revised periodically to reflect the current economic and social conditions in the basin, progress and achievements under the current Plan, and new data and knowledge. While it is possible to identify a programme of well targeted applied research, financing of such research to improve environment and water management must be considered as a long term commitment. While private sources of environmental research funding are increasing, long-term budgetary support is needed and is probably most efficiently organized and funded from budgetary resources at the national level. The ecological funds which commonly receive discharge fees and pollution fines are also a possibly important source of applied research funding. There are also strong incentives for regional and local authorities to contribute funds to applied research programmes to ensure the strengthening of local technical resources and to ensure that specific and possibly unique local problems are addressed.

### **Summary and Conclusions**

The Danube river basin includes to a larger extent the territories of twelve countries and collects additionally the runoff from small catchments located in four other countries. So, the Danube, although neither the longest nor the largest river in Europe, is the most international river of Europe.

In the last decades several bilateral agreements were signed between neighboring riparian countries and a few international agreements were signed too or are nearly finalized. The Environmental Programme for the Danube river basin together with the Strategic Action Plan have the objective to improve the environmental state, especially water quality, in the basin. The programme is designed to assist the draft convention which is already agreed among the riparian countries. The main environmental problems refer to surface water quality, riverine ecosystems, and the nutrient load into the Black Sea.



The Strategic Action Plan is being developed by a drafting group composed of experts from the World Bank, the Programme Coordination Unit in Brussels and four participating Danube countries. An intensive consultation process ensures that the viewpoints and objectives of the riparian countries are properly considered. The joint goals for environmental management are seen in sustainable and equitable water management, the preservation of unique habitats and wetlands with emphasis on the Danube Delta, the control of hazardous and toxic spills, and of enhanced regional cooperation. To achieve these goals a Task Force supervising the activities of the drafting group and the Environmental Programme has been established. A detailed action plan, including a list of hot spots, is under preparation to improve water quality.

The criteria for formulating strategies and for establishing a priority list for implementation measures are defined. Also nonstructural measures such as institutional strengthening and capacity building will be emphasized. These measures are seen as being important for countries which establish new legislation and administrative structures. The funding of the whole programme is planned to be covered by the Danube nations themselves with support from international sources for selected projects.

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