DANUBE POLLUTION REDUCTION PROGRAMME

Development of a Danube Information System for the International Commission for the Protection of the Danube River (ICPDR)

Overview Report

November 1999

Programme Coordination Unit
UNDP/GEF Assistance

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Vienna, Austria

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A report, developed within the contract C-982417 for the
UNOPS United Nations Office for Project Services, New York,
carried out by the
ISEP International Society for Environmental Protection, Vienna
and financed by the
GEF Austrian Global Environment Facility Trust Fund

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Table of Contents

1 EXECUTIVE SUMMARY

With the first demonstration of the Danube Information System for the ICPDR in June 1999 two goals of the **implementation of a Web-based information system** had been reached. On one hand the successful installation and operation of hard- and software and on the other hand the implementation and continuous expansion of the information system.

The integration of **information provided by the Expert Groups** of the ICPDR and of textual information coming from the **national reviews** as a result of the Danube Pollution Reduction Programme (DPRP) was implemented based on an integrated approach for the different sources. In order to collect and harmonize the information from the different Expert Groups **two ad-hoc meetings** were organized.

The prototype of the Danube Information System is already accessible on the Internet at **http://www.icpdr.org/danubis**. Only registered users with a personal username and password can access the internal part of the system. Members of the Danube PCU and Expert Groups have already been registered as users and have successfully tested the functionality of the system.

The information system offers a **workspace for the ICPDR and its Expert Groups** who have decided to use it for the distribution of information. Registered users can upload documents or other contents to specified folders of the information system using their web browser. Appointed users can also control the access and folder structure of their workspace.

Moreover, an integrated database (**Danube Basin Projects Database**) has been designed, capable of covering the following topics: investment projects, emissions, water quality, financing mechanisms, socio-economic analysis and legislation. Data and results provided by EMIS and MLIM Expert Groups have been already integrated into the database. Example reports and charts have been developed which allow for the first time to access this data remotely.

A preliminary design for the website and a user interface with the task of structuring and indexing of information were elaborated. The **new corporate design** for the ICPDR will be integrated into the website within the next few weeks.

In order to meet specific tasks of the ICPDR, a central **address database** (in testing phase) and a meeting database (which is already used) were implemented. Addresses of Expert Group members, events, etc. can also be updated remotely by appointed users via a web browser. Moreover, the update of the Danube Environment Library has been nearly finished.

In the final project period, the Danube Basin Projects Database will be completed by converting and **updating data from existing data sources** (projects, emissions, water quality) and entering data from National Reviews (financing mechanisms, socio-economic analysis and legislation). Reports and charts for querying and updating these databases will be developed. An overview of the **existing sources of geographic information and maps** of the Danube River Basin will be given. Furthermore a close co-operation with a project financed by PHARE, with the objective of publishing general information on the ICPDR for the public, will lead to the availability of **publicly accessible information** within the DANUBIS information system.

Detailed information can be found in the following reports:

Danube Information System Planning Survey and Inception Meeting Report, March 1999
First Progress Report, May 1999
Second Progress Report, October 1999

2 TECHNICAL CONCEPT OF THE INFORMATION SYSTEM

The main software component of the DANUBIS system is a database (Oracle Database Server 8) which contains all data and functions (Oracle WebDB 2). Additional software consists of a web listener which is the communication link between the database and a standard web browser on the client side, and a firewall which monitors network traffic between the server and the Internet and only allows specified requests to pass.

As contents, structure and layout are separated from each other and stored in a database, changes can be made faster and easier as compared to static web pages.

All web pages are created dynamically as they are requested, adapted to user preferences and user access rights. Changes on the website or in the data are visible to all users instantly. The system comprises also the standard tools to develop these user interface components, as well as web site and database administration and monitoring tools, all remotely accessible from any web browser. This concept is illustrated in figure 2.1.

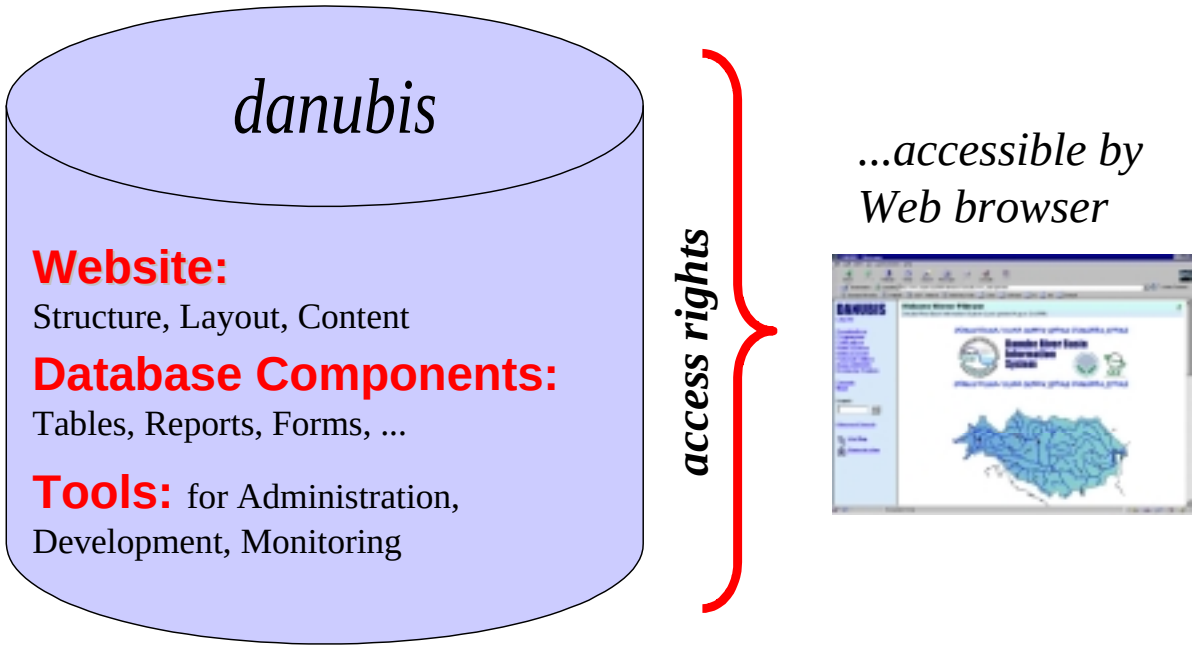


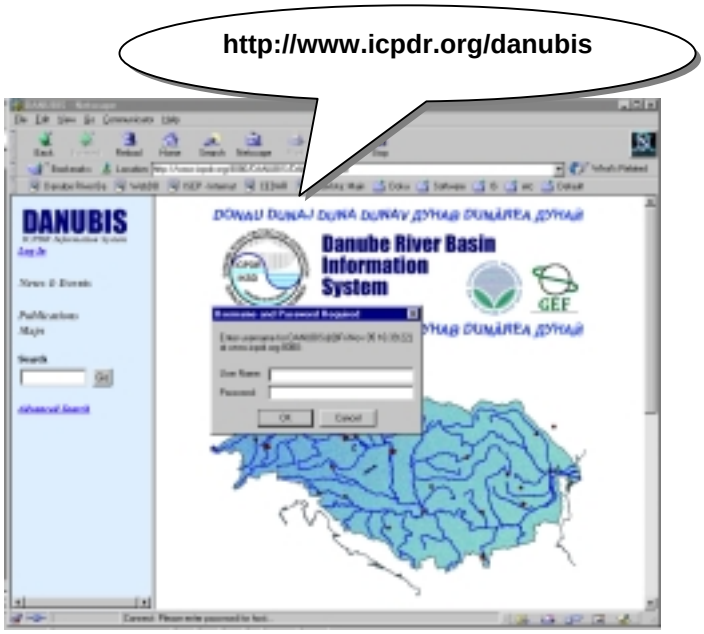
Figure 2.1: Technical concept of the information system

The decentralised management of contents, structure and access rights is an ideal environment for sharing information between users; there is no more need for floppy disks or e-mail, and everyone always has access to the latest versions.

3 CONTENTS OF THE DANUBE INFORMATION SYSTEM FOR THE ICPDR (DANUBIS)

3.1 Contents of the Prototype

The prototype of the Danube Information System web site (http://www.icpdr.org/danubis) contains the following items (overview):



Databases

- Address Database
  (search form, reports, forms)
- Event Database
  (search form, report, form)
- Emissions Database
  (search form, reports, charts)
- Water Quality Database
  (search form, reports, charts)
- PCU Library (search form, report)

Technical Publications

- National Reviews, Project Files (pdf-files)
- Transboundary Workshop Results (pdf-files, maps)

Legislation

- Danube River Protection Convention (hypertext)

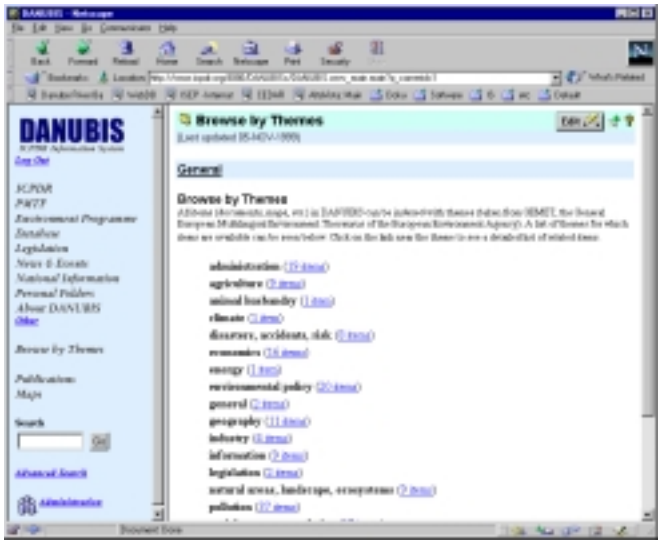
News and Events

- Selection of information for the public from the PCU Homepage (hypertext)
- Danube Watch Magazine (hypertext, pdf-files)
- Danube related news from other sources (links)

General

- System Documentation (hypertext, pdf-files)
- Abbreviations & Acronyms (search form, report)

The content is structured in a logical structure, based on organisations and programmes/projects (see next page). In addition several types of information (e.g. documents, databases, maps) and indexing tools (controlled and free vocabulary) are available for structuring of the contents. A search function is also available. The DANUBIS web site has a fixed navigation bar on the left side of the window to make all these navigation features accessible to the user.



Level 1	Level 2	Level 3
ICPDR		
	(Policy) Instruments	
		Bucharest Declaration
		DRPC
		SAP
	Contracting Parties	
	Delegations, CPC	
		regulations and decisions
	Permanent Secretariat *	
	AEPWS/EG *	
		Danube Basin Alarm Model
	EMIS/EG *	
	MLIM/EG *	
		Nat. Ref. Laboratory Network
		Nat. Inf. Centers Network
	Strategic EG *	
	Water Quality Model`	
	Library	
PMTF		
	Terms of Reference	
	Members	
	Projects (Technical Assistance)	
	Decisions	
Danube Environment Program		
	GEF/UNDP	
	Phare	
	Tacis	
	etc.	
Database		
	Investment Projects	
	Danube Partnership Program	
	Emissions	
	Water Quality	
	Socio-Economic Indicators	
	Financing Mechanisms	
	Addresses	
Legislation		
	EU legislation	
	ICPDR regulations and decisions	
	National legislation	
Technical Publications		
	National Reviews	
	Transboundary Analysis	
	National Action Plans (NAPs)	
	etc.	
Maps		
News and Events		
	Danube Watch	
	News	
	Calendar of Events	
National Information		
	Germany	
	Austria	
	etc.	

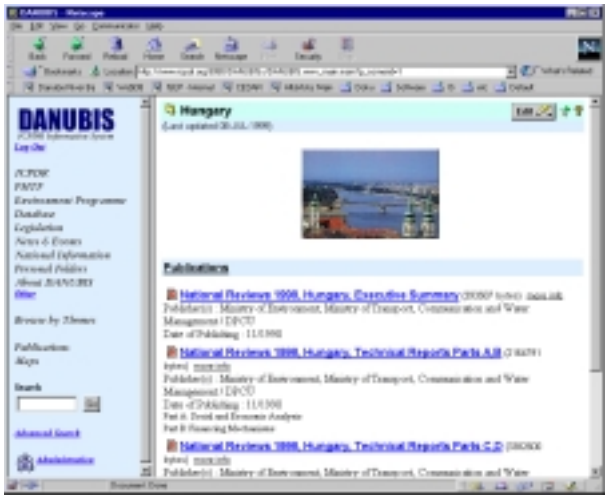
*) clickable organization chart, each body has the following sub-structure:

- Terms of Reference
- Members
- Results

3.2 Integration of information from Expert Groups and textual information from National Reviews (Danube Basin Projects Database)

The National Reviews (NR) which have been compiled in course of the Danube Pollution Reduction Programme represent the latest overview of information on the situation in the Danube Basin countries. Each national review consists of the following four parts:

- Part A: Social and Economic Analysis in Relation to Impact of Water Pollution
  covers the actual and the future development of the population in relation to the quality and quantity of water resources
- Part B: Financing Mechanisms
  describes the financing mechanisms of investment projects implementing pollution reduction measures in each country
- Part C: Water Quality
  consists of an evaluation of the emission sources (hot spots) and a description of the ambient water quality of the main national water resources
- *Part D: Water Environmental Engineering*
  describes the national legal framework and gives a description of the actual and planned investment projects for pollution reduction and their expected effects



In order to facilitate the updating of the information contained in the tables of the national reviews, the goal was to integrate it with the Danube Basin Projects Database.

As a first step the structure of the available national reviews has been analysed. For that purpose the reviews have been stored in a unified format (Portable Document Format) in which they can be easily accessed (DANUBIS, Folder *Danube Pollution Reduction Programme* or *Publications*). Based on the analysis of the structure of the reviews and the available resources from the Expert Groups a structure of the integrated database has been designed which is presented in figure 3.1. The background for the design (conceptual model) was based on a pressure-state-response model.

The existing data resources from the Expert Groups cover the four topics of the national reviews to some extent. As the data from the working groups are regularly updated they can supply the Danube Basin Project Database with the latest information concerning their topic (e.g. water quality data from the Trans-National Monitoring Network (TNMN), data on emissions and their sources from EMIS/EG). Information on the socio-economic background and financing mechanisms will be added.

In order to support the integration of the resources from the Expert Groups and other sources two adhoc meeting with representatives from the Expert Groups, the Secretariat and the Programme Coordination Unit have been organised by ISEP. Furthermore it has been proposed to form a Data and Information Management Expert Group (DM/EG) with representatives from all Expert Groups and the ICPDR Secretariat. The task of such an Expert Group would be to support the flow of information between the Expert Groups and the Secretariat. It would also be responsible for the integration of the ICPDR data resources, the maintenance of the information system and be the 'knowledge pool' of the ICPDR in respect to issues of information management and related development.

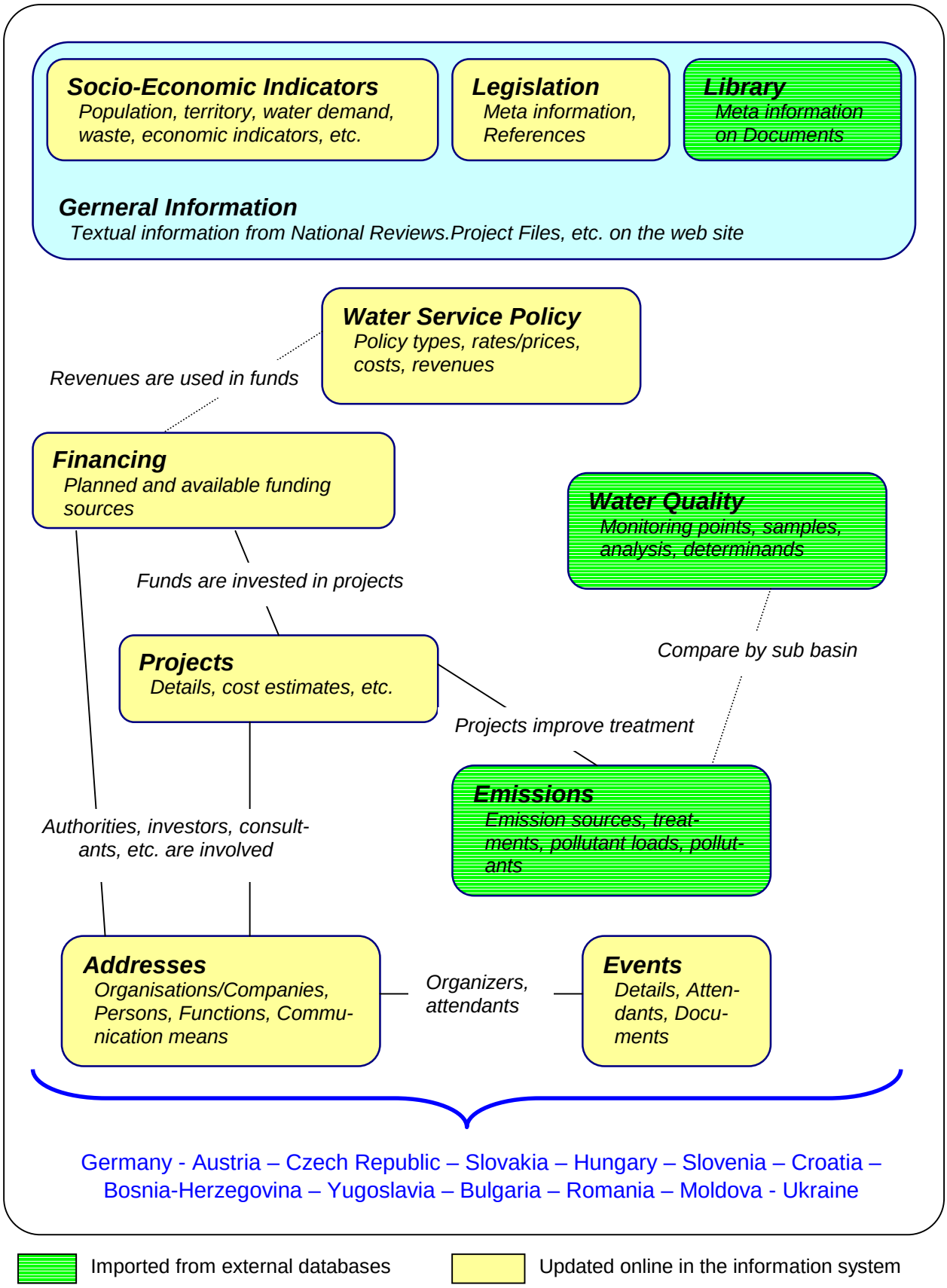


Figure 3.1: Simplified Structure for Danube Basin Projects Database

3.2.1 Investment projects

The investment project database set-up and maintained by PCU/GEF has been restructured and integrated with the relevant parts of the proposed database:

- **Integration with Address Database**
  Information on investors, consultants and other authorities, companies, persons involved is stored in the address database.
- **Integration with Emissions Database**
  Information on emission sources and treatment is stored in the proposed emissions database, emission sources and their treatment should be related to projects.
- **Integration with Financial Mechanisms Database**
  Fields for currencies are introduced, exchange rates and funds are stored separately, as proposed for the integrated database.

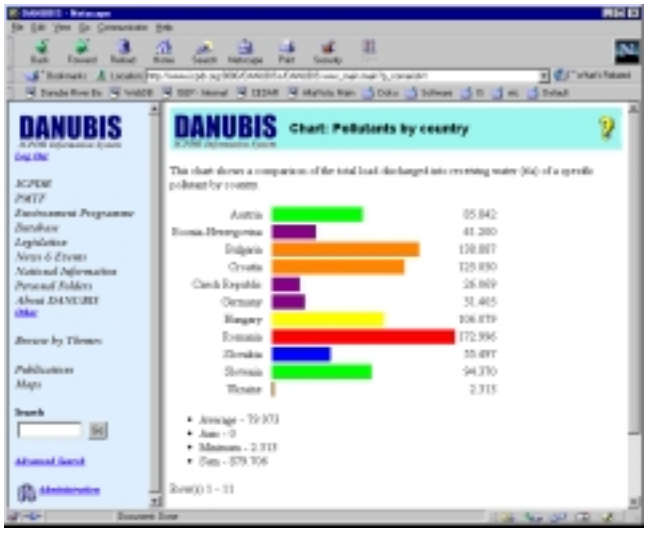
These changes will be made during data conversion to the DANUBIS system. After data conversion, project data can be updated online.

3.2.2 Emissions (Information Sources of the EMIS/EG and from National Reviews)

A proposal for an information structure for emissions and their sources has been prepared on the basis of the following sources:

- National reviews 1998, Czech Republic, Technical reports, Part C (Water Quality) and Part D (Water Environmental Engineering), November 1998, prepared by the Ministry of Environment of the Czech Republic
- Preliminary version of the emissions inventory

Emissions whose sources may be located at a specified point or of diffuse origin pollute water resources within a river basin. Emissions originate from different sectors/sub-sectors (e.g. industrial sectors) whose specific pollutants cause the pollutant load of the waste water (main sectors are municipalities, industry and agriculture). Each emission source has to be identified by a unique location code as the name of the location is mostly not sufficient for identification (e.g. as monitoring stations for water quality data within the TNMN with country code + number).



The waste water coming from the emission sources is usually treated by a combination of mechanical, chemical and /or biological processes with the aim to reduce the pollution load (operational stage). Future treatments in order to improve the efficiency of a treatment plant (e.g. N- and P-removal) are in planning stage.

Projects provide the organizational and financial basis for improving the treatment. Therefore their relation to treatments in planning stage are important for an overview of the planned measures and their effect on the reduction of the pollution load.

A new version of the emissions inventory which will be available in November 99 containing actual and projected values for pollution loads. In course of this inventory a unique identification code for

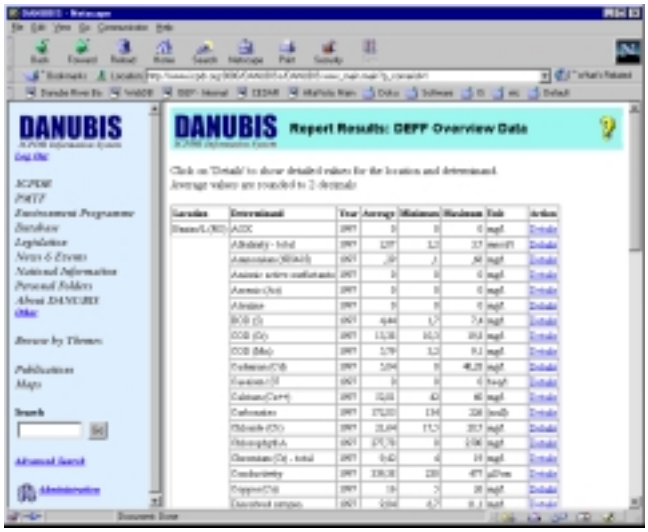
emission sources composed of a code for each river and a code for each emission source will be produced. This code is the basis for aggregating the available information (e.g. pollution load) for one river sub-basin. The EMIS/EG will use the system for river sub-basins resulting from the transboundary analysis in course of the DPRP.

In addition the EMIS/EG intends to include the following information in the information system:

- For the public: a final version of the newly arranged emissions inventory, guidelines and recommendations for the ICPDR
- For the experts: a working copy of the emissions inventory

The emissions inventory currently consists of Excel-sheets which have to be edited manually, exported into text files (CSV), loaded into the database, restructured using stored procedures, in order to import the emission data into the integrated. This batch process has to be done each time new emission data is provided by the EMIS/EG. The EMIS/EG has to decide whether the integrated database will be used to update and analyse the information on emissions and their sources. Examples for reports derived from structured information on emission sources can be tested in DANUBIS, folder *Database - Emissions*. The EMIS/EG has provided a list of questions from the user point of view which will be used for further design of database reports on emission data.

3.2.3 Water Quality (Information Sources of the MLIM/EG and from National Reviews)



As the structure for water quality data from the Transnational Monitoring Network (TNMN) has been used for more than three years for the exchange of data (DEFF Format) the proposal for the information structure of water quality data has been based upon this structure of the MLIM/EG. Data from the TNMN is available in Paradox format which can be directly converted into Oracle format. This batch process has to be done each time new emission data is provided by the MLIM/EG.

The proposed structure has been used by ISEP to store an updated version of the TNMN data from 1996 and 1997. Examples for reports can be tested in DANUBIS, folder *Database –Water Quality*. Forms for entering and updating data are available as a standard function of WebDB. One the one hand the access to the latest information can support the process of validation of data. On the other hand the redistribution of information (e.g. on determinands and analytical methods) can be simplified.

Further information on this topic can be derived from the National Reviews. For each water resource (surface water or ground water) major structures can be listed which describe the state of a water resource and whether it is still in a natural state or influenced by human activities (e.g. a river and its floodplains, wetlands, erosion and degradation, dams and reservoirs, other major structures). The water quality of water resources, which are affected by emission sources, is surveyed by monitoring stations. Water samples are taken in regular intervals and analysed for a specified set of determinands. In addition, the MLIM/EG has announced to store to following information on the information server:

- For the public: MLIM yearbook 1996, Qualco Danube Report
- For the experts: Cook Book (ongoing project), minutes of meetings

3.2.4 AEPWS

The AEPWS/EG intends to store the following information on the ICPDR Information Server:

- For the public: general information on the AEWS (e.g. scope of work, PIACs,...)
- For the experts: large amount of information for internal use of the Expert Group (e.g. manuals, files, ...)

The availability of information in the information system will facilitate the distribution of information within the Expert Group.

3.2.5 Financing Mechanisms in the Danube Basin Countries

ISEP has proposed a flexible information structure in which information on financing mechanisms can be updated easily in the future. This design has been prepared on the basis of the National Reviews, Part B and the Summary Report 'Analysis of Financing Mechanisms', as well as further recommendations by Reinhard Wanninger and Klara Toth.

Although data is differently structured in the database than in the National Reviews, reports similar to the National Reviews' tables and additional reports offering new perspectives can be generated.

Elements in the National Reviews which are changing over time and can be structured are:

- funds (including their source and utilisation)
- tariffs, charges, fees (including revenues generated) which describe the water service policy
- exchange rates
- economic indicators (see Socio-Economic Analysis)

Forms to insert and update data online and reports to generate tables similar to those in the National Reviews will be designed and developed in a further step. Information on the legal basis, policies, or the banking system is very unstructured and should therefore be included as textual information in the web information system.

3.2.6 Socio-Economic Analysis

Economic and socio-economic indicators are both described in part A and B of the National Reviews. There are lots of different indicators, some mentioned in several tables, and not all are available for all countries and years. Therefore a general database structure is introduced making it possible to store all indicators mentioned in the National Reviews by country and year.

It is also possible to add other indicators and indicator types in the future without changing the database structure. Indicators can be combined to reports which will be generated dynamically showing similar information as the tables of the National Reviews.

Information on socio-economic indicators from the National Reviews will be entered manually into the database and can be updated in online forms.

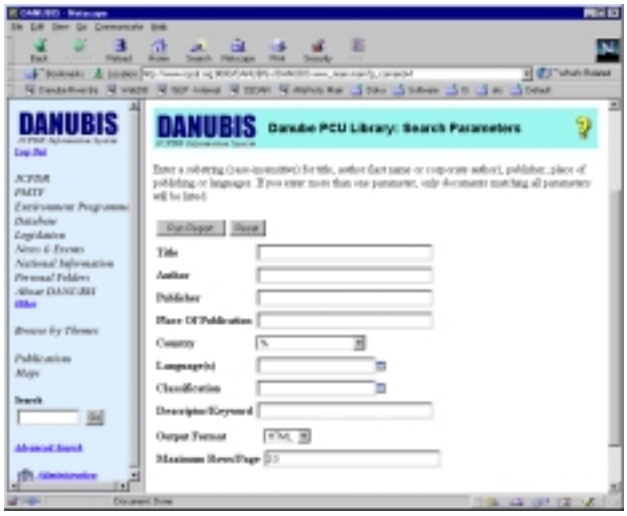
3.2.7 Legislation

The information system contains the text of the Danube Convention (English and German). Furthermore important decisions and recommendations of the ICPDR should be available. Relevant national legislation and standards could be stored in the information system.

ISEP has prepared a list, reviewed by a water quality expert of the Austrian Federal Environment Agency, of relevant EU legislation in the field of water based on an inventory in the CELEX database of the European Commission. An introduction explaining the most important types of EU legislation (directives, regulations, ...) will be added. The legislation texts will be made available either as full text or as a link to an officially available source.

3.2.8 Danube Environment Library

The necessary steps towards a revival of the Danube Environment Library as the basis for a textual information system have been started. In a first step, the accumulated items (approx. 650) have been registered by CEIT Bratislava. The updated library catalogue is available in a local version of the library maintenance system and in DANUBIS (folder *ICPDR*).



Based on a proposal of the Permanent Secretariat an updated classification scheme has been developed which will be applied for the reclassification of all items in the library. The overall work will be finished by the end of October when the Danube Environment Library will be handed over to the ICPDR.

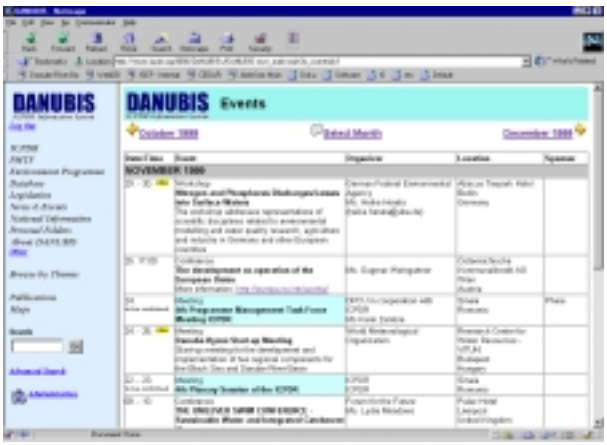
3.3 Design of website and user interface

A designer has been contracted to propose an ICPDR corporate design and a webpage design. The design of the first page of an information system constitutes the first impression for visitors and users. Elements of pictures from the Danube River and impressions from environmental programmes will be used. Once the corporate design is finished, it will also be employed for the Danube Information System.

3.4 Implementation of specific tasks for the ICPDR

3.4.1 Address Database and Event Database

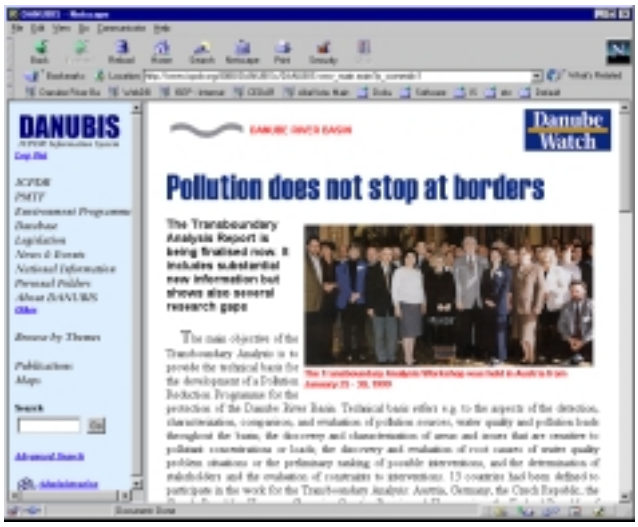
A central address and event database was designed by ISEP based on two MS Access databases provided by PCU/PHARE in order to simplify the updating of addresses and address lists and distribution of information on events (meetings, conferences, workshops, etc.). The address database includes organizations (or companies, etc.) and persons, which can both have an unlimited number of communication means (telephone, email, etc.) and be associated with functions (e.g. Expert Group members). The event database gives an overview of the important events con-



cerning the work of the ICPDR and its Expert Groups and other specific events in the Danube Basin.

Data from the existing databases has been converted to Oracle and can be updated online. The present version of the database can be found at in DANUBIS (folder *Database* and *News & Events*, respectively). Export functions to Excel will be provided, enabling the Secretariat to have a local version of the address database and use the existing reports for address labels, address book, etc. The address database will be integrated with the event database, which means that organizers, contact persons and attendants of events can be selected from the address database.

3.4.2 Information to the public



Besides the information for the experts on the internal level the Danube Information System will also contain general information for the public.

A project financed by PHARE will cover the task to update the existing overview pages describing the environmental programmes in the Danube Basin and the tasks of involved institutions, currently available at the Danube PCU Homepage (http://www.rec.org/DanubePCU). The work will be carried out by an external consultant from Slovenia in co-operation with the Permanent Secretariat and the PCU. The information from the PCU Homepage will be transferred to the ICPDR information system.

Furthermore, technical assistance projects financed by PHARE will be collected in a database. On the one hand the database will contain information for the administration of projects and on the other hand general information on the projects for information of the public.

3.4.3 Model for national information systems

The current structure of the Danube Information System opens the possibility for the Danube Basin countries to present specific national information related to the water quality of the Danube Basin directly on the ICPDR server or to deploy links to national information initiatives (DANUBIS, folder *National Information*).

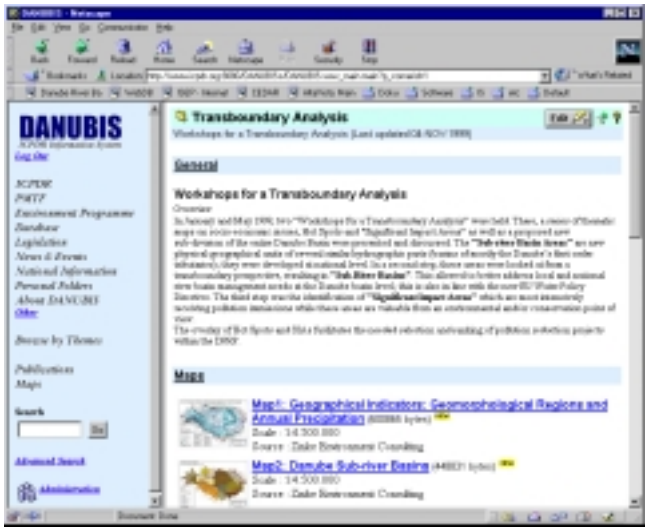
A conceptual model has been designed based a the pressure-state-response approach. The relational database resulting from the implementation of the model (Danube Basin Projects Database) will be used to store information on the situation of water quality and measures related to water quality in the countries of the Danube Basin. As this model is independent from the logical structure of organizations and programmes/projects, it can be used for national information systems as well. Most information in the database (e.g. projects, funds, monitoring points, emission sources, etc) can be related to a country (see figure 3.1). Therefore database report results can be restricted to a selected country, giving a country-specific view of all information. The additional ways of structuring information can also support national information systems (types of information, indexing).

The First Progress Report has been sent out to the Heads of Delegations for their comments. It has to be decided by the ICPDR and representatives of the Danube Basin countries which use should be made of the facilities of the information system.

3.4.4 Geographical information

Several projects within the Danube Pollution Reduction Programme and in course of the work the Expert Groups have produced thematic maps as results. The results of the following thematic maps have been published.

a) Trans-boundary Areas in the Danube River Basin (DPRP)



Geographical Indicators: Geomorphological Regions and Annual Precipitation, Danube Sub-river Basins, Danube Sub-river Basin Areas, Population Density in the Danube Sub-river Basin Areas, Land Use in the Danube Sub-river Basin Areas, Agricultural Indicators I (Livestock/Fertiliser) in the Danube Basin Countries, Distribution of Hot Spots in the Danube Basin Countries, Significant Impact Areas and Priority Wetlands for Restoration, Overlay of Hot Spots, SIAs and Wetlands in the Danube Sub-river Basins, Structural Analysis of Major Danube Basin Rivers (major hydraulic structures)

b) Evaluation of wetlands and floodplain areas in the Danube River Basin (DPRP, World Wildlife Fund)

Symbolized view of floodplains in the Danube River Basin, Ecological potential of floodplains in the Danube River Basin, Restoration potential of former floodplains in the Danube River Basin, Floodplain areas in the Danube River Basin, Geographical Subdivision of the Danube River Basin, Selected Bioindicator Species (Fish, White-tailed eagle), Proposed Restoration Areas

c) Danube River Basin Water Quality Enhancement (EMIS/EG)

Overview Danube River Basin, countries and sub-basins, Overview TNMN, Overview municipal discharge locations per treatment, situation 1996 and 2005, Municipal discharge locations per country, situation 1996 and 2005, Municipal discharge locations per sub-basin, situation 1996 and 2005, Industrial discharge locations per country / sub-basin

d) TNMN Monitoring Stations (MLIM/EG)

e) Danube Basin Map of the Accident Emergency Warning System (AEPWS/EG)

Most of the maps of the DPRP and the Expert Group have been elaborated with the help of a geographical information system (GIS). For this purpose electronic background maps of the Danube Basin have been combined with information from databases (e.g. emissions inventory).

In order to be able to combine the information from different initiatives the meta-information on the original maps, the GIS files and the resulting maps should be known. As this information has not been available it had to be collected by means of a questionnaire which has been sent out to the data producers. In this form the results of the programmes and results of the Expert Groups' work (the GIS files containing the background map and the databases) can be combined and used for later work.