

# A Decision Support System (DSS) for the Elbe River Basin



## Introduction

Over the last decades river basin management has become increasingly complex. Rising demands of society regarding ecological and chemical quality of waters, their use and protection, and pollution with many different substances lead to new views and strategies towards (the making of) a policy for river basin management. So, the new European Water Framework Directive consequently calls for a multidisciplinary approach to river basin management.

## Towards a DSS for the River Elbe

Since methodologies and tools for such a multidisciplinary approach are not readily available, the Federal Institute of Hydrology (BfG) initiated the feasibility study 'Towards a generic tool for river basin management'. The study was carried out by the *Universities of Twente/Enschede and Osnabrück and the institutes RIKS and INFRAM in the Netherlands*. The goal of this project was to develop a *Decision Support System (DSS)* for the Elbe river basin. Such a DSS helps the water managers to formulate a policy for river basin management and to take appropriate measures to realise policy objectives. As such, it could also be a very useful tool for the implementation of the European Water Framework Directive. Furthermore a DSS is especially suited to support participative decision making. The feasibility study will result within recommendations for a pilot study focussing on some selected topics in the Elbe river basin, which could be considered for implementation in a period of three years following the feasibility study. The feasibility study had been completed in the autumn of 2000.

## What is a Decision Support System?

A DSS is a computer based instrument that can be used to support the policy making process. In a DSS, a structured approach towards river basin management is combined with advanced Information Technology like a (Geographic Information System - GIS, numerical models), leading to an instrument that facilitates the processing, analysis, and presentation of information. A DSS helps decision makers to discern which information is relevant at any given time in the policy making process. With this information, the quality of the different actions that are to be taken in the policy making process can be enhanced. On the one hand, these are actions with respect to the contents of the policy like problem analysis, forecasting of future contexts, design and screening of alternatives, impact assessment, and comparing and ranking alternatives. On the other hand, they involve more process-like actions such as communication or interactive and participative decision making processes.

## Themes for the DSS on the River Elbe

The first results of the feasibility study show that many governments of different levels, non-governmental organisations and institutions could benefit from the DSS. In a series of interviews, several potential end-users of the DSS were identified (see box). The interviews revealed the following problems in the Elbe river basin that are to be addressed in the DSS:

### Potential users of the DSS

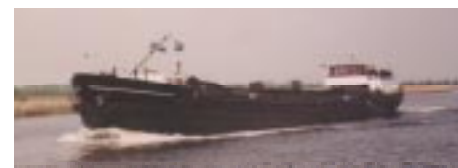
- *Internationale Kommission zum Schutz der Elbe (IKSE)*
- *Arbeitsgemeinschaft zur Reinhaltung der Elbe (ARGE-Elbe)*
- *Ministries of the "Länder" in the catchment area*
- *Biosphere Reservations*
- *Water management associations and authorities*
- *Federal Waterways and Shipping Directorates (WSV)*
- *Federal Institute of Hydrology (BfG)*
- *Federal Waterways Engineering and Research Institute (BAW)*
- *Federal Ministries of Agriculture and Environment (BML, BMU)*
- *Federal Environmental Agency (UBA)*

- How to improve the socio-economic conditions of the different uses of the river and its catchment (shipping, tourism, fisheries, agriculture, etc.)?
- How to provide an acceptable and sustainable water level?
- How to reach a sustainable improvement of the physical, chemical, and biological state of the Elbe and its tributaries?
- How to reduce the nutrient inputs from agriculture, settlements and industries and the chemical load into the North Sea?
- How to increase the ecological value of the river and the floodplains in the Elbe river basin?



A number of measures can be taken to solve these problems. For the pilot study, a definitive selection has to be made. On the basis of the interviews six possible themes were formulated which could be incorporated in the pilot DSS:

1. High water management: relocation of dykes and other measures:
  - dike shifting (giving more space to the river)
  - restriction new buildings and accumulation of property and other treasures in the foreland
  - provide information on flood management
2. Water quality:
  - reducing point- and non-point-sources of pollution by improving agricultural practices (nutrients, pesticides)
  - reducing pollution by hazardous substances
  - improving/building waste-water treatment plants
3. Navigability:
  - groyne modification
  - dredging
4. Reduction of riverbed erosion:
  - artificial bed/sand load supply
5. Nature-Protection:
  - zoning (nature-reserves)
  - development of naturelike floodplains
6. Tourism :
  - diverse activities



### Preliminary system design

A modular structure is suggested for the DSS to deal with different spatio-temporal scales of the processes involved (see box).

The Catchment Module is defined on the river-basin scale and describes the relationship between landuse and runoff.

The River Module pertains to the Elbe river and focusses on water quality, shipping, flood control, and large-scale ecological changes.

The Floodplain Module is defined for a representative section of the floodplains and describes the local ecomorphological consequences of selected river engineering measures.

### Follow-up

The feasibility study has shown that it is both useful and practicable to build a DSS for the Elbe river basin. In addition, the Elbe-DSS could be the prototype for other river catchments. On the basis of the results of the feasibility study, the BfG will start a pilot study in January 2002. In this study, a Pilot-DSS for the Elbe will actually be build, focussing on the themes mentioned above. It is most important to involve future end-users of the DSS in this process. After all, they are the ones who are actually going to work with the DSS. The project will be organised in such a manner that this involvement will be guaranteed. Interested parties are invited to join in the pilot study. It is expected that the pilot study will be completed in a period of three years.

