



## Harmoni-CA

**Joint use of monitoring and modelling when  
implementing the Water Framework Directive.  
Input from Harmoni-CA WP2/WP4 workshops.**

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### **The Water Framework - new monitoring challenges**

The big challenge for the European water and environmental managers these years is to implement the Water Framework Directive (WFD). On basis of the basic characterisation of water districts finalised in 2004, designing surveillance, operational or investigative monitoring programmes will be the next tasks to be solved, as the programmes must be ready for stakeholder involvement in 2006 and operational by 2007.

The use of monitoring data is emphasised to resolve the requirements set up by the WFD. The WFD creates new challenges on the design of monitoring programmes and the analysis of monitoring data. The implementation of the WFD may likewise promote the joint use of monitoring and modelling, where the two disciplines are used for mutual benefit. The water bodies are highly complex systems with many unknowns and uncertainties due to the incomplete understanding of the processes, scaling aspects and to the high variability of the variables in time and space. As no variable can be monitored continuously in time and space, it is not possible to develop a perfect understanding of the physical system. But through the combined use of models and monitoring data our understanding of the physical system and the cause-effect relations may gradually improve. A dynamic approach is therefore needed where models may be used to indicate errors and inadequacies in our understanding and existing monitoring network, and model may be revised and updated as new data become available.

### **Monitoring and modelling – state-of-the-art**

Monitoring has traditionally been the method selected when the state of the environment is to be estimated. Thus numerous time series have been collected and maintained for decades around Europe and the rest of the world. Within the last decades modelling has entered the arena as a supplementary tool to help extracting the information retained in the observation data. Besides research projects, with tailored data collection campaigns, monitoring programmes are rarely designed to support modelling purposes. Common practice in the management world appears to be that modelling studies are carried out on the basis of available data without giving feedback to the data collectors. The need for feed backs between modelling and modelling is essential to many aspects. An important example is the construction of a conceptual model, which is a prerequisite to most tasks that needs to be solved in the WFD, such as an evaluation of the impact of different possible measures. As most models are constructed on the basis of existing data, the model is thus the best possible model on basis of the data available and accessible at the time when the model is constructed. The conceptual model may, however, have to be revised when more data become accessible and a better understanding of the system has been gained. Interaction between monitoring and modelling in terms of using a model and regularly updating it by new data sets, is not seen very often – if ever.

Harmoni-CA seeks to promote the joint use of monitoring and modelling and explore the potentials for the combined used especially in relation to the requirements of the WFD.

## Harmoni-CA WP2/WP4 workshops

To help the process of integrating monitoring and modelling, Harmoni-CA WP2 and WP4 have organised 3 workshops on the topic "Joint use of monitoring and modelling when implementing WFD". The ambition of the workshops has been to come to a concise set of recommendations towards optimisation of monitoring by modelling tools and vice versa. The workshops also aim at promoting the communication and exchange of ideas and experiences between the monitoring and the modelling communities as well as between countries.

Through the 3 workshops it has especially been sought to attract water managers working at a local, regional or national level with the implementation of the WFD in their respective countries. As the individual member states have different approaches in their implementation strategies, this has resulted in a broad range of implementers, from water managers over consultants to scientist etc.

### 1.1 First workshop:

At the **first** workshop, held in Ghent, Belgium in April 2005, the scene was set and the workshop focussed on the state of the art regarding existing monitoring programmes. Thirty participants represented 16 EC-countries as well as the United States. The participants presented national monitoring programmes within different domains (marine, coastal, rivers, lakes and groundwater). From these presentations it became clear that a vast amount of monitoring activities is – of course – already ongoing in the EC-countries. However, in many countries the monitoring networks are designed to focus on hazardous substances, point source outlets (as industrial or domestic waste water) or to focus on the quality and some also on the quantity of water sources for drinking water productions. As the WFD requires monitoring in all (types of) water bodies, monitoring programmes are likely to be re-designed in many countries

An important issue that came up on the workshop was the issue of data availability. In most countries data are collected by different institutes: groundwater quality and quantity data by a geological survey; meteorological data by a meteorological institute; surface water quality data by national or regional authorities; land use by a number of different institutes, agencies or private companies etc.. The majority of the data holder and collectors are public institutes, but also private companies are represented. As a result, data exchange or acquisition is a time and resource consuming task e.g. in the case of modelling. The need for standardised data collection and storage as well as the need for centralised data bases was strongly emphasised.

Finally representatives from the US presented the results of effort done in the US to store data at a national level at the Environmental Protection Agency, which has made the data much more accessible for, e.g., modelling at large river catchment scale on diffuse loads of nutrients.

## 1.2 Second workshop:

In September 2005 the **second** workshop was held in Vilnius with focus on modelling tools that can support monitoring. At the workshop examples of modelling systems and available tool boxes were presented and their potentials to support the implementation of the WFD were assessed, especially with respect to the process of designing or re-designing monitoring programmes, but other useful applications were also addressed. Thirty participants from 17 EC-countries were presented covering a broad range of actors in the WFD, such as modellers, water managers, consultants, policy makers, and scientists. State-of-the-art for modelling were discussed addressing topics like the current data collection for modelling and how this data collection fits in the ongoing process of the implementing the WFD and etc. Besides, modellers were asked to estimate how much models would improve, if data collection/monitoring could be designed to fit the individual model. Issues on optimal experimental design (OED) where models are used to increase the efficiency of monitoring were also addressed.

One of the conclusive remarks from the managers was that good examples on the usefulness of modelling in connection to monitoring are the way to the water managers or policy makers understanding and goodwill.

## 1.3 Third workshop:

The **third** and last workshop will take place in connection to the 3<sup>rd</sup> Harmoni-CA Forum and Conference in Osnabrück in April 2006 in Germany. During the two previous workshops it was stressed that design or redesign of monitoring programmes is not a straight forward or easy task, and changes to the monitoring programme are thus likely to be done gradually in the years to come. No complete redesign of monitoring programmes are thus expected to have been realised at this stage in the WFD cycle, from where experiences can be shared on the use of models in this process. The third workshop will therefore be arranged as a work study where participants will be asked to work intensive on a real-world case study, applying available knowledge and data from existing studies (e.g. modelling results if any). The work should result in a flow chart for the joint use of monitoring and modelling when carrying out the necessary data collection to meet the requirements of the WFD.

At the Harmoni-CA Forum and Conference in Osnabrück in April 2006, the latest results from the joint WP2 / WP4 workshops will be presented and summarised.