Water as a good and a service

Decision-making methods and tools for regional water management with respect to uncertainties

Workshop,

28–29 January 2004,

Wageningen, The Netherlands

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The workshop was organised jointly by the Dutch and German IHP/HWRP National Committees within the framework of the International Hydrological Programme (IHP) of UNESCO. The workshop is a contribution to UNESCO IHP Phase VI, Focal Area 2.4: Methodologies for integrated river basin management and Focal Area 4.2: Value of water.

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The value of water encompasses the complex interactions between human beings and water as a natural resource. Water itself, even drinking water, is not a product in the real sense, also not a normal article of trade, but a heritage (Water Framework Directive - WFD) and an element of the water cycle. The management of water in a catchment therefore requires integrative approaches and assessment criteria in order to be able to adequately record and consider not only the natural features but also the socio-economic conditions of the catchment area. The European WFD views the introduction of the recovery of costs for water services as an important factor for the sustainable use of water. There is a great deal of scope in the proposals for the realisation of these aims. It is, however, important that the price of water should be based on comprehensive economic analyses. This means the inclusion of costs for the conservation of the environment, for the economy and for the resource itself.

European Framework Directive with regard to the value of water

Different standards of water quality lead to varying costs and benefits. The political setting of standards is extremely important. Water from the river Rhine, for example through bank filtration, is used by approx. 12 million people as drinking water and by varied branches of industry as process water. Despite the effective treatment of used water in sewage plants, additional substances such as endocrine substances (pharmaceuticals, etc.) or biologically non-degradable substances (viruses, bacteria) are fed into the river water. The aim of the WFD is not only to preserve the usability of the water and the functional characteristics associated with this, but also to improve the ecological quality of water. The present price of water is often a political price that does not include all the costs incurred, but that can nevertheless be sometimes too high. The quantity and quality of the water available for a certain use have to be ensured subject to the physical-geographical conditions of a catchment area, i.e. not everywhere can every commodity be produced, if the water is to be used cost-effectively. Closer cooperation with water polluters has to be sought. Long-term effects of harmful input decades ago and short-term impact loads as a result of accidents, both at localised points and from diffuse sources in a body of water, require, because of the differing residence times, different standards. This also applies to pollution in groundwater.

Presentations:

J. van Bakel, Alterra, Netherlands: **Valuation of water**

W. Kuehn, TZW, Germany: **Development of drinking water treatment along the Rhine river with special emphasis on riverbank filtration**

E. Ruijgrok, Witteveen en Bos, Netherlands: **Three methods to save money in water management**

R. Dannowski, ZALF, Germany: **Development of an information and simulation system to evaluate nutrients loads into surface waters**

Uncertainties – value of water

For the management of water resources, uncertainties in the relevant input parameters have to be assumed, i.e. when recording quantitatively the components of the water cycle – be it for epistemic, scientific or technical reasons – and thus when assessing the water yield. Uncertainties also arise from projections of population growth, water demand and climate variability. To this are added factors of a subjective nature, such as psychological and hypothetical considerations or plausible reasons. Most of the probable prerequisites provide a range of measures within a certain framework. At the same time reactions resulting from the implementation of measures have to be included in the planning. A sound prediction is complicated by such boundary conditions.

Presentations:

A. Schumann, Universität Bochum, Germany: **Facing uncertainties in water resources management**

L. Menzel, PIK, Germany: **Impact of climate change on precipitation patterns**

J.S. Schou, NERI, Denmark: **Valuation of the effects of groundwater use – methodical issues and uncertainty**

Tools for planning with water

Urban and regional planning with regard to water is based on the interactions between water and the environment. Measures taken in the complex system of a catchment area cause changes that at first are often unrecognised. In order to attain certain goals, different options have to be studied and, if possible, quantified. With simulation and optimisation modelling, measures taken within a catchment can be evaluated, an evaluation which should, in addition, include the socio-economic factors. The value of water depends on its location and its users. A distinction is made between the use of water for recreation and for industrial or agricultural purposes, and the supplier of drinking water makes again quite other demands on the quality and quantity of the water. There is no absolute value for water; the various uses compete with each other. Water is a means of existence just as much for flora and fauna; this requirement needs to be respected by humans but it can be monetarised or subjected to a cost-benefit analysis only under certain conditions. The economic values of an aquatic system have to be categorised and assessed: production and consumption values, symbolic values, functional values, optional values, existing values.

Presentations:

P. van Walsum, Alterra, Netherlands: **Planning with water – an overview**

M. Rode, UFZ, Germany: **Model coupling and object modelling system for an integrated management of river basin**

S. Reinhard, LEI, Netherlands: **Efficient water management: a cost-benefit analysis of a regional water system**

B. Hansjürgens, UFZ, Germany: **Cost recovery and water pricing**

Water as a good and service: practical experience

Does the price of water cover all economic costs and all the costs involved in the protection of water as a resource? Water can be considered not only as a public good, but has also to be regarded as a natural resource that is traded regionally and nationally and thus has its price. The political guidelines and standards are crucial. Land use plays an important role in water resources management, which means that the farmers have to be involved in the process at a local level. The European WFD includes the polluter-pays principle. Under this aspect the compensation payments to farmers who are allowed to farm in water protection areas only under certain conditions can be seen in another light. The added value of water that is exported out of a region has to return to the region in order to guarantee the use of the resource in the long term. Will regions emerge in the future as resource areas or also as flood water retention areas? The socio-economic, physical-geographical and ecological interactions have to be recognised and recorded. Furthermore, it is necessary to reflect constantly on the measures taken during the management of water as a resource.

Presentations:

B. Hansjürgens, UFZ, Germany: **Prices for groundwater and compensation payments for the protection of groundwater resources – lessons from a German case study**

L. Stuyt, Alterra, Netherlands: **Blue services in the Netherlands**

G. Geldof, TAUW, Netherlands: **Values of water**

Main Findings of the Workshop

- Life Cycle Analysis (LCA), Cost Effectivity Analysis (CEA) and Cost Benefit Analysis (CBA) all aim at a comprehensive policy analysis. The difference is in the functions and values that are subject to economic valuation: LCA no valuation, CEA no valuation of the primary environmental functions, CBA everything valued.
- The environmental economic analysis of the value of water is concerned with the interactions between people and water, the analysis of which requires a multidisciplinary approach. The final outcome is ultimately the degree of human wellbeing.
- CEA and CBA enables the inclusion of all relevant functions of the water and hence also facilitates the political analysis. This can lead to appropriate prices for the water.

- The time scale plays a great role in flat catchment areas with long residence times of groundwater and requires long data series of water quality which, however, are mostly not available.
- Early warning, meaning that before new goods are produced, or production procedures changed, information on the substances to be used and discharged should be given. In view of the multitude of substances in water it is vital to draw up priority lists of these substances.
- Essential for the valuation of water are the political standards and guidelines, e.g. how much nitrate is allowed in drinking water? It is then possible to calculate the cost-benefit of unpolluted groundwater and technical procedures for the purification of contaminated groundwater.
- The impact of climate change cannot be transferred directly to catchment areas. Regional physical-geographical factors compensate or reinforce some trends.
- There are no long time series available for a high regional density of measuring stations. This intensifies the uncertainty when assessing the impact of climate on water as a resource.
- Studies for the evaluation of water have to include all the important functions of water. The scope of application of the studies vary from region to region.
- If the price for water as a resource covers the full costs of the resource, these costs are not only an instrument for the protection of the environment, but also for the regional development. The conflict between environmental protection and economic development could thus be resolved.

Research Gaps

- At present hydrological models are not designed for operational application. Moreover they are not applicable on different scales without calibration. More research on the problems of scales is necessary.
- The exchange of experience on the application and further development of integrated model systems is required on an international scale.
- Catchment studies for the assessment of integrated approaches on an international level are necessary in order to achieve a standardisation of methods. The development of GIS-supported hydrological approaches and socio-economic work should be encouraged more forcefully.
- Routines and systems for the analysis of political procedures should be developed. International exchange of experience facilitates regional differentiation.
- Models are normally developed on the microscale. However, models are required on the water management planning level. Methods of model reduction are necessary for optimisation computations as decision-making supports. Uncertainties exist in areas without sufficient data due, for instance, to the lack of observation networks. Here, procedures have to be developed that allow the transfer of models to such areas.
- Quality objectives for chemical and biological parameters of the groundwater and surface water are required.

Recommendations

- To enhance model coupling of economy and hydrology on the basis of studies in pilot areas.
- To develop to a greater extent comprehensive optimisation tools for hydrology and economy.
- To apply increasingly integrated models including economic, hydrological and environmental models.
- To ensure that uncertainty analyses are an essential element in the use of complex hydrological model systems. Suitable tools for uncertainty analysis are therefore to be developed until they can be routinely applied.

Participants

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Thanks are given to all those who made presentations and constructive comments for the final version of this report.

Organisation

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