Common Implementation Strategy
Working Group 2B: Drafting Group ECO1

Information Sheet on River Basin characterization: Economic analysis of water uses (Art 5 Annex III)

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Prepared by DG eco 1

1.- Objectives of the paper and mandate

This information sheet aims to highlight the main operational aspects of the economic analysis of water uses that is to be carried out until 2004. It provides information and examples about data requirements, implementation hints and examples of alternatives for the preparation of the 2004 report.

2.- Scope and purposes of the economic analysis of water use for 2004:

Scope

The WFD in its article 5.1 contains the requirement that each Member State carries out an economic analysis of water use for each river basin district or for the portion of an international river basin falling in its territory.

The economic analysis builds on the information contained in two other reports which requirements are also set in article 5.1. This information refers to:

- The analysis of RBD's characteristics
- The review of the impact of human activity on the status of surface waters and on ground water.

Purpose

The WFD contains the basic requirements that any of these reports must fulfil and, particularly, Annex III, specifies that the economic analysis should contain "enough information in sufficient detail (taking account of the cost associated with collection of the relevant data)" to:

- Perform "the relevant calculations necessary for taking into account the principle of recovery of the cost of water services, taking account of long term forecast of supply and demand for water in the river basin district and where necessary:
- Estimates of the volume, prices and costs associated with water services, and
- Estimates of the relevant investment including forecasts of such investments.

The economic analysis of water uses will play a key role at different stages of the WFD implementation process. In that sense the analysis provides:

- The basic framework for reporting uses to be realized by any Member State (in accordance with article 5 and annex III)
- A starting point for the construction of the baseline scenario.
- Information relevant for the assessment of the economic impact associated with programs of measures. Hence the economic analysis provides basic information for the selection of the most appropriate set of measures.
- Relevant information to assess the economic importance of different water uses in order to facilitate the analysis of the distributive impact of the program of measures and, particularly, the identification of the potential winners and losers

resulting from the improvement in water ecological status. This information is needed when assessing disproportionate costs.

- Inputs useful to determine the economic value of aquatic species that will play a role for the designation of protected areas.
- Additionally, the information offered by the economic analysis of water would be useful in the designation of HMWB, the sustainability of new modifications, and the effectiveness of water pricing measures.

In many aspects the economic analysis is related to the analysis required for the cost recovery report. An example of overlap might be the analysis of the relative importance of the expenditure by the different sectors in water services. Another example of overlap is related to the study of prices as incentives in the cost recovery analysis that may require collecting existing information on the elasticity of demand of different uses.

Beware: The "economic analysis of water use" **is not a mere requirement that could be fulfilled with the calculation of some economic indicators** at basin level (or national level in some countries). On the contrary, it provides valuable inputs into different phases of the river basin planning process.

Base line
In the construction of the base line scenario some relevant questions are related to: macroeconomic and sectoral policy scenarios for some uses (agriculture; energy); structural changes in the composition of economic activity; and importantly with the understanding of the "relation" between the analysis of the socio economic significance of water uses and the analysis of the pressures (see base line paper and later in section 3).

Economic impact of measures and effectiveness of economic measures (i.e.: pricing)
For the analysis of the impact of measures in cost effectiveness analysis there are some specific questions that may need to be answered with information provided by the economic analysis of water use. The types of questions one may want to answer relate to:

- What are the changes in economic margins; of employment; turnover of specific uses (with significant impacts) as a result of implementation of measures that affect them? We might also want to analyse the changes in productive orientation such as types of crops (and associated economic gains/losses) as a result of changes in costs of relative inputs in specific sectors
- What are the indirect impacts related to specific measures on other sectors? These could be measured through sub national input-output tables.
- What are the effects on trade? This could be looked into by analysing the quantities and the value of imports and exports for different types of products. The economic analysis of 2004 can give us a first scan of the available data.
- What are the effects of pricing measures? We will require some knowledge of the structure of the demand function (elasticity), as well as possibilities for input substitution.

Disproportionate cost analysis and designation of protected areas
In the disproportionate costs analysis, it would be important to look into the benefits of water quality improvements as well as the economic and social impacts of the measures (as above) and their costs. This may require looking into benefits that are valued by the market and others that are not (non marketable), and the economic analysis of the latter may vary from case to case, as it can include use values (including recreational) and passive or non use values. There might be different approaches to the information to be collected for the 2004 report on this (considering that it might need updating).

The economic analysis of the aquatic species for the preparation of the register of protected areas will require analysing the fishing activity (both commercial and recreational as above) in internal, transitional and coastal areas. This poses specific challenges since the economic data (value of sales by species/employment) associated to physical data (captures by type, yields of species) may be not be available at central level but through trade associations. It is important to consider that this may relate not just to fishing activity since other aquatic species can have economic significance, eg. through tourism, watching. There are aspects related to the economic significance of aquatic spices for other uses (market on non market) including the importance of aquatic spices for feeding aquatic mammal and bird species, and the importance of breeding habitats (eg. saltmarsh).

Disproportionate costs analysis may call for the analysis of use values that are benefited (i.e.: recreational) and non use values.

Fitting the economic analysis of water use into the planning process

The economic analysis of water use for the 2004 report

The economic analysis of water use for 2004 contributes to fulfil immediate WFD requirements related mainly to the preparation of the baseline scenario. It also provides inputs for the register of protected areas and, in some Member States it could also provide useful inputs for the first designation of potential HMWB and for the ongoing analysis of sustainability of new modifications.

The 2004 report on economic analysis would give more precise inputs into the above 2004 requirements (baseline, register of protected areas, etc.); would focus on data identification, collection and preliminary analysis; and importantly on recommendations on how to deal with the problems that might be encountered in updating and completing this analysis for the other purposes after 2004.

Given the above the specific purposes of the economic analysis of water use in the 2004 include:

- Give an overview of the socio-economic importance of economic uses in the Districts in relation to the pressures mainly for the immediate purposes above.
- Identify and evaluate existing economic information and lacking data making recommendations for data collection for future use in the cost effectiveness analysis and other economic analysis.
- Clarify the links between the economic and technical information and the information on pressures.
- Clarify how to use existing information at different scales that may need to be used to carry out analysis at district and water body level.

In the cases where the economic analysis is relevant for the RBM planning process, the economic analysis report to be accurate would need to be updated/revised (at least for some relevant uses) by the year 2006. In this sense, the 2004 step means also setting the foundations for later work.

The economic analysis of water use after 2004

After 2004 the economic analysis of water use will provide key inputs for the many phases of the RBMP process. The relative importance of these issues will depend critically on whether or not the economic impact is expected to play a role in the cost effective selection of policy measures, and on whether or not the disproportionate cost analysis need to be performed. After 2004 the recommendations of the 2004 report would need to be implemented.

Illustration: The timing and the need for coordination and feedback in the planning process

A big obstacle, considered by the *UK*, to a timely implementation is that much work has to be done in parallel while it should better be done successively in order to provide scope for feedback from the different work streams and learning from each other.

This point has also been stressed by *France*, who indicated that the main challenge is to establish appropriate links at the right time between the parallel work done on the economic analysis and the pressures and impact analysis.

Source: Background Report of the *Workshop on The Economic Analysis According to the WFD- Status of Implementation*. Organised by the Federal Government of Germany. 20-21 November 2003, Berlin

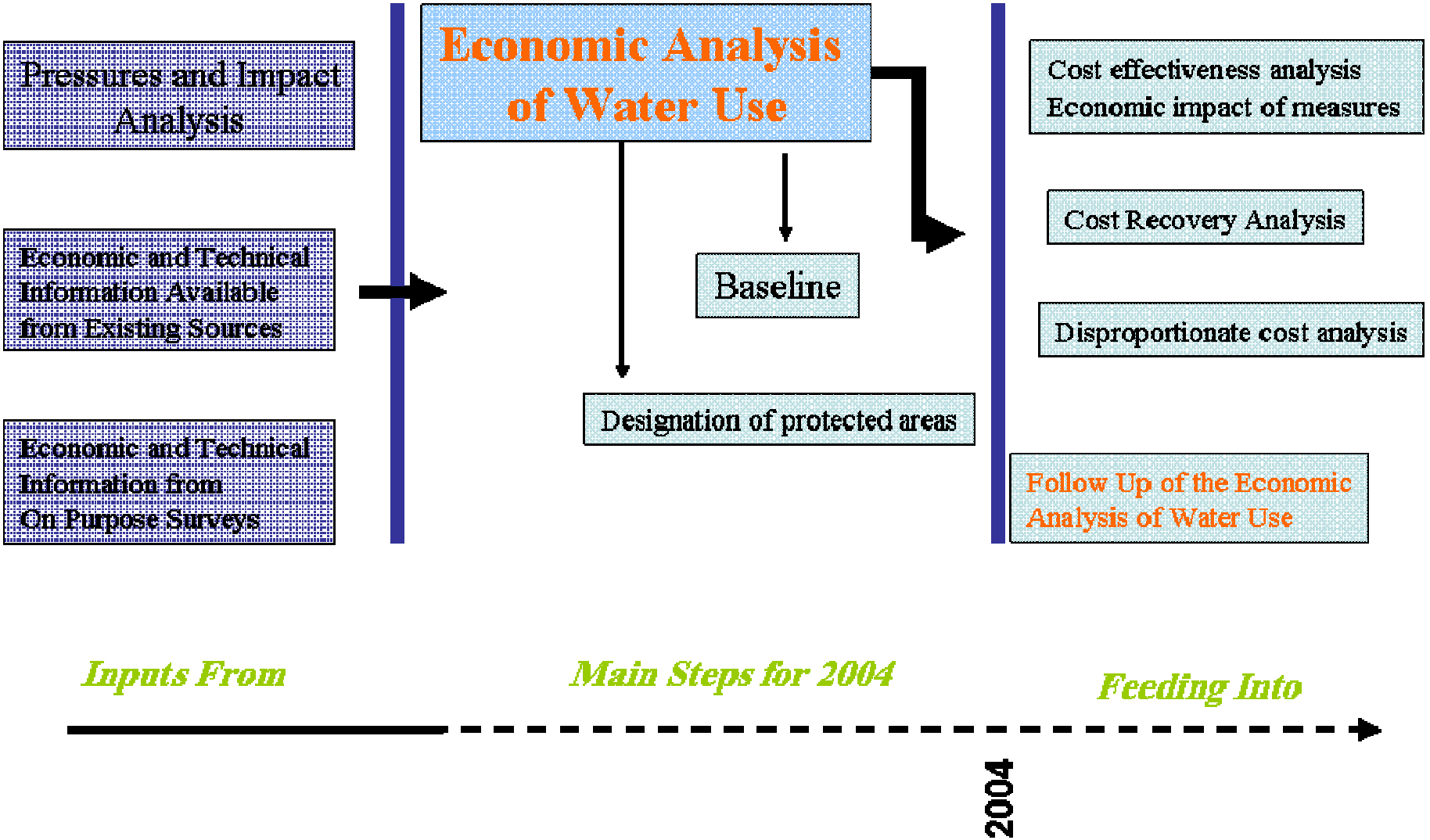
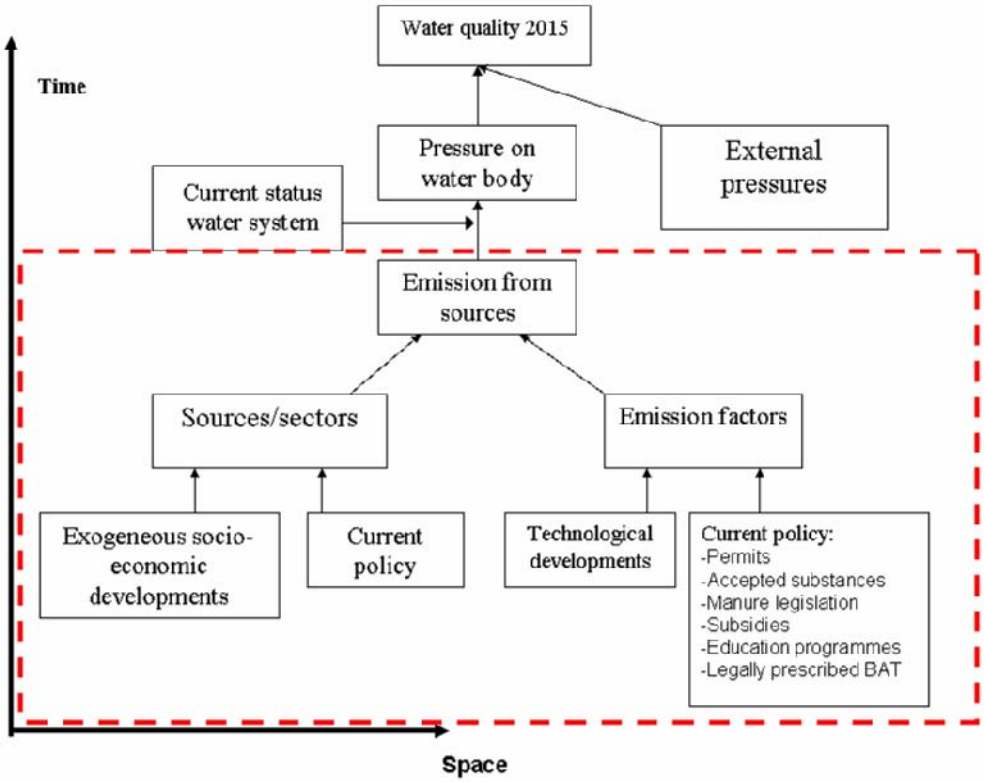

Pressures and Impact Analysis
Economic and Technical Information Available from Existing Sources
Economic and Technical Information from On Purpose Surveys
Economic Analysis of Water Use
Baseline
Designation of protected areas
Cost effectiveness analysis
Economic impact of measures
Cost Recovery Analysis
Disproportionate cost analysis
Follow Up of the Economic Analysis of Water Use
Inputs From
Main Steps for 2004
Feeding Into
2004

Illustration: Key QUESTIONS need to be considered during the preparation of the report

1. Is the current level of co-ordination between the "Pressures and Impacts" Analysis and the economic analysis sufficient? In how far is the comparability and compatibility of information on pressures and impacts and the economic analysis necessary? Where are improvements needed?
2. Which information is needed in order to develop a good view on the economic importance of a certain water use (for after 2004)? In how far do we need to *value* a water use and according to which methodology should / can this be done? Is it already needed for the economic analysis 2004?
3. Is it possible to identify the economic importance of all water uses by 2004 or should we concentrate on the assessments of those water uses creating the major pressures?
4. How far could data management systems support and facilitate the use of the economic analysis *after* 2004? Can they facilitate the establishment of long-sighted approaches as opposed to "one-shot" data compilations?
5. What needs to be done in order to be able to use the compiled data after 2004 (e.g. increase accuracy, level of detail, adapting the scale to the needs)?
6. Since significant time is needed in order to adapt data collection procedures, "how long can we wait" until we initiated such a process?
7. What degree of stakeholder integration is necessary for the 2004 economic analysis on water uses?

Illustration: economic analysis of water use as an input to the baseline scenario in Holland



3.- The steps in the economic analysis of water use

Step 1 The Selection of the relevant uses to be reported

The economic significance of each water use must be judged with respect to both, its importance as a water consumer and also its absolute and relative contribution to the physical and chemical quality of the water in the river basin. Not all the activities in the basin would need to be reported but only those that exert significant pressures (and impacts). Significant uses can vary from basin to basin.

Beware: the selection of the relevant activities to be reported must be coherent with the results obtained in the Impacts and Pressures analysis of each basin. The IMPRESS guidance already indicates how to identify a significant pressure. In addition, although a-priori some sectors may not be judged to be the origin of a relevant pressure and impact, this situation may change by a particular policy measure affecting the sector (e.g. ecotourism is not currently relevant but it, and its impacts, may become important if some restoration measures are taken). Some other water uses (see below) may need to be studied and reported even if they do not exert significant pressures (for example if the potential water uses of a certain area need to be valued as an input to the register of protected areas) .

It is important to consider at least:

- Those activities with "significant impact" (as in IMPRESS), such high water quantity uses (household supply, agriculture and animal husbandry, industries with large demand for water whether for water cooling or in their production processes); also other activities with significant impact such as hydroelectricity and navigation; and other industries that are heavy polluters or that affect the water environment (industries with toxic emissions).
- If possible, consider also recreation and especially fishing (as an input to the analysis of economic value of aquatic species).
- Consider other uses that are likely to gain economic relevance provided the ecological quality of the river basin was improved.
- Note that there will inevitably be uncertainty in the significance of impacts and pressures. Economic analysis would need to cover situations where the significance of impacts is unknown but potentially significant.

Illustration: Different Approaches to Identify the Relevant Water Uses

Latvia

The first attempt to assess economic significance of water uses in the Daugava project followed a general approach and was dealing with overall sectors and impacts in river basin – industry, households and agriculture, without distinguishing sub-sectors. Using Daugava project experience Senter project will go a step forward to deal with subsectors as well and acquire information at more disaggregated scale.

Sweden

The water uses in the Emå river basin were studied in order to test and develop methods to assess monetary values (use and non-use) for water-related goods and services within a catchments area (Water Accounts 2000 – with disaggregation to sea basins). The study presents combined economic and environmental data at the river basin district level.

England and Wales

In England and Wales, the starting point has been the list of pressures from the characterisation work. The Environment Agency's economists have been working closely with the technical experts responsible for assessing risks of failing to achieve good status in the RBC process focussing on their specification of pressures and analysis of their effects on good status. This utilises outputs of the pressures in terms of activity indicators such as tonnes of outputs or numbers of livestock or hectares of crops. The focus has been on the most important problems (water industry demand/abstractions and discharges and agriculture) on 80/20 rule of focusing on most important problems. Analysis has been done using GIS based data as essentially a series of scoping exercises to let the analysis specify the spatial scale of the problem, rather than trying to guess the spatial scales and embarking on major collection and analysis of data for these pre-ordained spatial scales.

Scotland

In Scotland, the intention is to ensure maximum compatibility of information. The intention is to be able to produce indicators such as type of pollution per unit of output by SIC.

North Ireland

In NI, it is planned that the work of the economic analysis will take into account information which is currently being gathered in terms of pressures and impacts. The economic analysis is integral to the WFD characterisation report work programme. This requires the analysis to take into account links with pressures and impacts, and identified areas at risk of failure.

Germany

The economic analysis of water use helps to assess the socio-economic impacts of measures influencing water uses when we design the programme of measures. The importance of individual economic sectors have in the river basin district are analysed to the extent that they constitute water uses within the meaning of the WFD (e.g. agriculture, industry, navigation). The selection of water uses must be made with reference to the description in Annex II. Those economic sectors heavily dependent on waters and their quality (e.g. fisheries) have been considered. The aim is to represent the relative socio-economic significance of these economic sectors associated with water uses. (*LAWA Guidance Document to the Implementation of the WFD - status: 30.04.2003 pp. 72-84 -117)*

Source: Background Report of the *Workshop on The Economic Analysis According to the WFD- Status of Implementation*. Organised by the Federal Government of Germany. 20-21 November 2003, Berlin

Illustration: Identification of relevant water uses in the Netherlands,

The identification of relevant economic uses is an iterative process between the WFD working group on economics and the working group looking at pressures and impact. The preliminary result of this process of common understanding of the main economic pressures is the table presented below. It illustrates the relevant main economic uses about which both working groups are expected to report.

Preliminary overview of relevant sectors, branches and sub-branches commonly identified by the WFD working groups on economics and pressures and impact in the Netherlands

Sector	**Branches**	**Sub-branches**
Primary	1.Agriculture	1. Arable farming
		2. Bulb cultivation
		3. Greenhouse cultivation
		4. Other cultivation
		5. Grassland cattle farming
		6. Indoor cattle, pig and poultry farming
	2. Fishery	7. Inland and coastal fishery
	3. Mining	8. Sand extraction
Secondary	4. Food industry	9. Manufacture of food products and beverages
	5. Metal industry	10. Metal manufacture
		11. Manufacture of metal products
	6. Chemical industry	12. Manufacture of petro-chemical products
		13. Manufacture of chemical products
	7. Energy and water	14. Water and energy companies
Tertiary	8. Service sector	15. Commercial shipping
		16. Environmental cleansing services

Step 2 Identify and evaluate existing economic data related to the main water uses of the basin

Data sources

The contributions of the economic analysis of water use to the immediate requirements of the 2004 report and later to the River Basin Management Plan are constrained by data availability. Several approaches are possible regarding data identification and collection:

- Bottom-up: a first scan on the data availability and collection. Some non trivial technical problems can come from the need to aggregate data at different scales and to make data from different sources originally obtained for different purposes, compatible.

- Directed: decide on the necessary data and search for it or produce it in order to construct the database needed for the immediate 2004 needs and for the later needs in the planning process. The main restrictions in this case may come from the time and the financial resources needed to produce and gather new information.

- Combined: general scan with a purpose of finding specific pieces of indirect information.

Beware: It is also important to consider that for some purposes economic/technical/physical information on water use may only need to be collected for those areas where there is a reason to think that this information will be relevant. In other words where non compliance is likely and is expected to be the subject of cost-effectiveness and disproportionate cost analysis.

Illustration: Approach to data collection in Seinnes-Normandie.

The problem to be solved is selecting the most relevant uses to focus on for data collection. The approach hase been to start with a light screening of the present main water management issues for the basin. RB characterization and economic analysis of water use are the relevant sources for that purpose. Consider first defining major pressures on water quantity and quantity, and major changes during the preceding decades.

In all member States there are many data sources providing information for different water uses at different aggregation levels. These data sources typically include:

- Existing statistics from National Accounts, census, surveys and sectoral/industry/market studies. This information is normally available at the national institutes of statistics, existing in any member State and in some relevant regions.
- Specific sectoral surveys conducted regularly or on purpose by public institutions and particularly with those with any competence in the regulation of the economic sectors with relevant water uses.
- Local and regional sources that usually offer more detailed information relevant to analyze water uses in a reduced spatial scale.
- Different private non profit organizations like commerce chambers, farmers associations, organisations.

Examples:

- In countries/basins where agricultural water use is important, there is likely to be a regular survey of the sector, its evolution, the impact of past and current policies and the relevant past trends.

Illustration: Examples of different approaches to the information to be collected for the 2004 report

- There might be available economic information about some recreational uses such as fishing and other recreation that requires licences (boating, rafting) in some countries. This may not be centralised but available at local and regional level.
- Some countries have been advancing sensibly in the collection of information on the valuation of benefits (market and non market) from water quality improvements and they may incorporate a summary report into the 2004 report. This could also be a valuable input into the " disproportionate costs analysis" but also as a stepping stone for easing the implementation of the programmes of measures to achieve good water status (on the basis of demonstrating benefits).
- Other countries could report on how they expect to advance in setting an agenda for the analysis of this to provide inputs to the RB Plans later on.

- In countries/basins where animal farming is important, it is likely to find GIS supported data including technical information (herd size, concentration, age structure, types of animals). Relevant economic information (on productivity, growth, value added, employment, resources use, turnover) is often available in statistical offices (see scale issues later).

Illustration: Available Information on agriculture in Spain

Results of the information scan for agriculture water use in the Jucar Pilot Basin Study in Spain

Scale	Sources	Technical	Socio-economic
Municipal	Survey on Crops Time Series	Has by crop for irrigated and rainfed agriculture	
GIS 700*700	Survey on Yields of Crops 1990-1995 and onwards	Has and Yields by crop: rainfed; irrigation; greenhouse; type of irrigation technique and inputs	
Municipal	Agrarian Census (every ten years)	Number of Farms; Has by crop and water origin; water use; watering technique.	Rural Employment, Value Added.
Irrigation Unit 3000 ap.	Survey on characterization of Irrigation 1997 and 2000	Crop yields; structure of production; size of holdings; type of management; years of establishment; state of maintenance of irrigation infrastructure; use of inputs	
Irrigation Unit (400)	Socio-economic characterization of irrigation agriculture 1997		Income per crop and subsidies; value of production; cost of inputs (water, fertilizers; pesticides; energy; services; amortizations; labor; net margins)
Municipal	Animal farm survey annual	Number of animals per type; number of farms; inputs; waste	
National	Prices by crop monthly		Prices per crop.

Source: Ministry of Agriculture and Ministry of the Environment Spain

Types of information

Important inputs for the economic analysis are, first, the socio economic data; the technical data on relevant water uses (or the uses that have a significant impact); and the pressures generated by the relevant water users (pollution loads, total water use, morphological pressures) that eventually need to be analysed in relation to their impact over the relevant ecological status indicators of the water bodies (Physical-chemical; hydro-morphological and biological).

Examples of the usefulness of different types of data collected in 2004 for the economic analysis of water use after 2004

- Employment, value added and production in various economic sectors; demographic evolution... ⇨ **Appraise future water use when constructing baseline scenario**
- Volume of effluents discharged; of raw water abstracted... ⇨ **Determine pressures and impacts of uses**
- Income / inhabitant; willingness to pay for higher water quality... ⇨ **Estimate the ability to pay to assess whether costs of possible measures are disproportionate**
- Cost of environmental damages; opportunity cost of water... ⇨ **Assess cost-benefit ratios when comparing / selecting the most cost-efficient measures** ⇨ **Determine whether costs are disproportionate or not**
- Structure of the price of water / m^3; cost of specific treatments for drinking water production (identification…)... ⇨ **Identify cross-subsidies and externalities when assessing the level of recovery of costs of water services**
- Daily expenses by tourists; turnover of fishing industry...⇨ **Assess the benefits linked to a water body**

EXAMPLES OF POTENTIALLY USEFUL INFORMATION

Technical information
allowing description of water uses and services
connected to economic data

Economic information
directly related to water aspects
allowing to describe the economic significance of water uses and services
appraising benefits

For households

Water uses	Technical data	Economic data
Drinking water supply	· volume of raw water abstracted: surface / groundwater · volume of drinking water distributed · leakage rate · population connected to public water system · population with self-supply · number of drinking water supply companies ..	Average price Employement Value added Elasticity of demand Level of adoption of BATs Estimate investments and related forecasts
Wastewater treatment	· population connected to sewerage system · population connected with wastewater treatment plant · number of treatment plants · population with individual wastewater treatment systems · number of wastewater treatment companies …	Average price Employement Value added Elasticity of demand Level of adoption of BATs Estimate investments and related forecasts

For Agriculture

Water uses	Technical data	Economic data
General information	· total farm population ..	Income Employement …
Sector	· total cropped area · cropping pattern · volume of raw water abstracted for irrigation: surface water / groundwater · volume of water supplied by public networks ..	Income of the sector Value added Margins Turnover Employment Prices

For industry

Water uses	Technical data	Economic data
Key industrial sectors	Volume of water used, depending on the origins (public supply, self-abstraction…) Volume of effluents discharged to public or own systems Production volume p.a. ..	Income of the sector Value added Elasticity of demand Level of adoption of BATs employment
Hydropower	· installed power capacity · electricity production …	Employment Value added

For other sectors

Fishing (leisure, professional, fish-farming)	· number of fishermen · annual production Stock/Yield ..	· daily expense by individual fishermen · annual turnover of fishing industry ..
Navigation	· annual quantity of goods transported each year · employment linked to harbor uses / to navigation · number of boats through key points / year ..	- annual turnover - annual value of goods transported each year - local income generated by navigation - value of infrastructure
Water-related tourism	· annual number of tourist-day · total employment · number of bathing areas …	· daily expense per tourist-day · annual turnover ..
Flood protection	· total population protected · annual extension of protected zones ..	· total turnover of protected areas · annual expense for protection of hazardous zones · annual cost of floods damages value of infrastructures ..

Spatial scale of existing information

Data come from different sources and at different geographic levels, e.g. income from tourism may come from local tourism offices and, for example, turnover of water companies from their national headquarters. Other economic data, for example, on product sales and prices of products may only be available at regional or national aggregation levels. But, provided the analyst can link them with the local technical GIS information (for example on crop output, number of cows, labor use, water consumption etc.), this information is still useful to calculate overall economic significance/weight and carry out cost-effectiveness analysis and disproportionate cost analysis.

Illustration: The evaluation of existing data in the UK

In exploring sources of information for the economic analysis it is important to examine the consistency of the available economic data on uses with the technical activity data on pressures used for RBC analysis for example in terms of:

- Specification of uses (i.e. Standard Industrial Classifications may or may not correlate with the pressures that cause the impacts on water states and on which (technical) data needs to be obtained to input into RBC).
- The extent to which valid economic data are available in a GIS form so as to enable appropriate specification of spatial areas at risk of failing to achieve GES (e.g. extent data sources to give reliable data at GIS level)
- Reporting units. For example, farm census is based on farms on the ground; while Farm Bureau Survey data are for agricultural holdings which may not relate precisely to where the farms are on the ground and causing the pressures. Similarly economic data may be by head office location and may not equate to the location of uses and their operating units causing the pressures. Hence the available economic data may not be accurate and relevant for pressure analysis for RBC and also may not be accurate for CEA analysis in River Basin Management.
- Availability and reportability (i.e.: regarding confidentiality constraints)

The common scale at which economic data are available is not the river basin but political or administrative jurisdictions. The constraints for the accuracy of economic analysis is the scale at which data can be meaningfully collected or disaggregated, is statistically valid and the temporal horizon for which its exists. Comparable and homogeneous data available are also common constraints in any applied analysis relying on existing data.

The desirable disaggregation level will depend on the purpose of data collection. Ideally, the analysis of the economic impact of any policy measure may require data to be related to existing pressures and impacts at a very small scale (normally at a water body scale); in that case it may be easier if we have, for example, a GIS supported database on water uses that can be directly related to water bodies. Moreover, to analyze the benefits associated to the improvement in the ecological quality, it will suffice to have information at a river basin or sub-basin scale (but not water body). The baseline scenario could probably be constructed with information on major economic variables and their trends aggregated at the river basin level. This can then be linked to the specific technical/physical information on pressures at water body level. Relating information at different scales may also require to build on typologies (see later).

Given the wide variety of situations regarding the different objectives of data collection and the many forms in which data may be available, the only general advice for the analyst is to mix the best knowledge about the information available with the pragmatism required to adapt the scale of data collection to the needs and the requirements of the different analysis that would need to be performed in the WFD implementation process. For example, if we pretend to describe the relevant pressures and impacts it would be desirable to work at the scale at which water uses/and water services are relevant for the river basin.

Illustration: Potential Problems in Data Collection

In the process of data collection and processing in the Mures River Basin in Romania the following problems have been reported:

- Most of the data received are raw data which need to be processed properly, the load of work for doing this task being very high
- The data are being given at the level of county, therefore there are necessary many estimations which are not very precise
- Many institutions, especially companies refuse cooperation, regarding some economic data about their activity because they consider them secret
- Regarding the trends there are no prevision studies which can be consulted to be applied in economic analysis

Source: *Economic Analysis on Mures River Basin. NAAR Mures River Branch.*

Step 3 Linking the economic and technical information with the pressures for immediate purposes and for clarifying further work after 2004

For the purposes of the economic analysis in the WFD there is a need to relate clearly the economic and technical information to the pressures (as defined, for example, by pollution loads or water abstraction). In the 2004 report this is mainly needed as an input for the baseline scenario.

There might be different approaches to make the links, such as the preparation of indicators or other analysis. All these can be preceded by the preparation of an integrated data base.

Integrated data base

The integrated data base could contain two kinds of information. From one side it may contain descriptive or empirical information (useful as an input for the whole WFD implementation process), and some analytical information connecting technical and economic data in order to assess the economic significance of water uses.

First, in its descriptive content, the database is a useful means to present all the empirical information available in a systematic an comprehensive framework. In other words it contains the results of the previous process of information gathering and give a complete set of references on the information sources and the technical definitions of all the relevant fields included in the database. In the preparation of the data base for the different water uses, special care should be given to the compatibility between economic variables and technical information.

Illustration: Linking Economic and Environmental Data

For the Flemish Region of Belgium, it has been outlined that difficulties in linking technical information and socio-economic data are created by different approaches to inventorying information.
In the case of Sweden and Latvia, scientific or technical data are often available at the river basin level, whereas much of the existing socio-economic data are normally presented at the administrative level, rendering a direct consolidation to the same (compatible) disaggregation level difficult.
Somecountries try to give the **complete picture** on the importance of water uses, while others focus efforts on the analysis of **the "most relevant" water uses**.

Source: Background Report of the *Workshop on The Economic Analysis According to the WFD- Status of Implementation*. Organised by the Federal Government of Germany. 20-21 November 2003, Berlin

In many cases there might be some missing data, on relevant issues at the selected scale. To provisionally fill this information gap, until a sectoral analysis on the economic significance of water use or new information was available, it is possible to "associate" the socio economic information with the technical and physical data in the integrated data base through some fixed coefficients (as the average water per-capita consumption, or the water intake per hectare of a certain crop) or some approximated variables (such as the average economic values/prices per physical or technical unit). In some cases this could be based on typologies (i.e: size of companies; types of crops).

This process may be presented in the technical report in such a way that all the data base users have the possibility to know what pieces of information were obtained empirically and what pieces were "constructed" from previous information. In this process it is also very important to state clearly and justify the assumptions made by the analyst. In the absence of reliable information, better than making ad-hoc assumptions- it may be useful in some cases to conduct a reduced or local survey with a reduced sample of the population in order to obtain results by typologies that could be generalized to the overall population; being aware of its statistical significance.

Illustration: Considerations in the UK about information management and future recommendations

In considering the potential uses of this information there will need to be an assessment of the appropriate form of information management and how this may be adapted to better serve the future economic analysis. This might require for example an assessment of the merits and feasibility of the development of an integrated database relating for each use: total water use, pollution loads (by contaminant) and other impacts on water status (including scarcity), and economic importance. Recommendations should be made for each source of information, noting its possible use, possible adaptations and information management. The work will need to identify gaps in data and consider the existing mechanisms for collecting socio-economic information relevant to the characterisation of river basin and consider how this might be adapted in the future to improve the relevance of the information in the context of the future economic analysis and in particular information relevant to the assessment of disproportionate costs.

Illustration: The Structure of an Integrated Data Base for the Relevant Water Uses in Germany

The existing central data in the *Länder* statistical offices can be compiled for the description and analysis of water uses, where they are significant. This data to beused is set out in the following tables.

Source: LAWA Guidance Document to the Implementation of the WFD - status: 30.04.2003 pp. 72-84

Table 5.1.2: data on water uses in the sub-district survey area

	Water uses		Socio-economic data					
	Water abstraction[1]	Waste-water introduction[2]	Length	No. of employees Total	employment (Vieh)	(e.g. sales, crop volumes, transport volumes energy production in [illegible]	gross value added[3]	No. of farms, operating
Sectors of water uses								
Public waster supply	LDS	0	0	LDS[4]	0	LDS[5]	0	LDS
Local water disposal	0	LDS	0	LDS[6]	0	LDS[6]	0	LDS[7]
Agricultural,	LDS	LDS	LDS[8]	LDS	LDS	LDS[9]	LDS	LDS[10]
of which with own extraction	LDS	0	0	0	0	0	0	0
Forestry	0	0	0	LDS	LDS	0	LDS	0
Fisheries (at B-level only deep sea fisheries)	0	0	0	0	0	Fed. Stats. Office[11]	0	0
Manufacturing industry	LDS	LDS	0	LDS	LDS	LDS[12]	LDS	LDS[101]
of which with own extraction	LDS	0	0	0	0	0	0	0
of which direct discharge	0	LDS	0	0	0	0	0	0
Inland navigation	0	0	0	0	0	LDS[13]	0	LDS[14]
Energy	LDS	LDS	0	0	0	LDS	0	LDS[101]
Economy as a whole[15]	0	0	0	LDS	LDS	0	LDS	0
Hydroelectric power	LDS	LDS	0	0	0	LDS	0	0
Transport	0	0	LDS[16]	0	0	LDS[17]	0	LDS[10]
Private households	LDS	LDS	0	0	0	0	0	0

LDS = data available from the Statistical Offices of the Länder; 0 = no data available/ necessary.

1 water abstracted from nature in million m^3
2 waste-water discharge in million m^3
3 total gross value added by: agriculture, forestry, fisheries, manufacturing industry, domestic trade, tourism, transport, energy, public and private services
4 number of connected residents
5 water charges for consumers, by households and commercial undertakings
6 annual waste-water volume in total
7 number of waste-water disposers and waste-water treatment plants
8 irrigated land in ha
9 harvest in tonnes or livestock in units
10 number of farms
11 landings in tonnes
12 sales in million euros
13 transport performance in tonne-kilometre
14 number and type of vessel
15 data on "economy as a whole" do not correspond with the addition of the various water uses.

Relating technical and economic data with pressures and impacts: the value of indicators and other methods

The database must provide the information needed to assess the economic importance of key water uses at the scale of significant pressures. In principle there is a wide range of methodological options to relate the information of pressures with that on the economic importance of water uses. The options include the calculation of key integrated indicators for meaningful typologies of uses to the more ambitious analysis of the demand for water services. As we will see below:

- The first option of preparing indicators will help understanding the relation between water pressures and the information on the economic significance of the relevant water uses describing the actual situation, and the historical pattern.
- The second, would give information to explain water pressures according to a model of analysis that typically include the prices of other inputs, the available technology, income and people's preferences as explanatory variables.

The choice of one of the two options, or any other mixed alternative, is a decision that must be made on the basis of the available information, expertise and the relative importance of certain water uses (the first alternative being the most feasible and easier to put into practice and the second one being the more information and skilled).

According to the first option, to analyze the economic importance of water use it is necessary to construct and compute a set of integrated indicators relating the economic and technical information available in the data base in order to show the economic importance of water uses. The more general indicators may relate value added produced in the relevant water uses by unit of water pressure (that is to say, value added by cubic meters extracted, or per unit of pollution discharged into the water body or into the river basin), this indicator will give relevant information to evaluate the overall economic importance of water uses in a certain region, and also to compare the average economic productivity of water services in different regions or locations.

Illustration: Indicators in the economic Analysis of Water use in Agriculture in a River Basin

Management Units	Irrigated Surface (ha)	Gross Income €/Ha	Gross Income €/m3
1	19,340	6,808.54	0.39
2	46,227	7,783.78	0.53
3	7,321	7,733.85	0.50
4	46,928	2,707.51	0.94

Illustration linking economic and environmental data in the Netherlands

In the Netherlands, the description of the socio-economic characteristics of the various river basins is based on the integrated information system called NAMWA (National Accounting Matrix including Water Accounts). This new information system was developed in 2001 by RIZA and Statistics Netherlands. NAMWA is based on the System of National Accounts (SNA) including Environmental Accounts (NAMEA), which is a consistent and internationally accepted (institutionalised) economic-environmental accounting framework. Economic transactions at sector level (NACE codes) are linked to the associated physical water flows (water abstraction and (waste) water discharge) and substance flows (emission of pollutants) at national and river basin level.

Hence, in NAMWA the financial transactions registered in a country's economic accounting system (the National Accounts) are linked to related water use (extraction and discharge) and water pollution through emissions of polluting substances such as nitrogen, phosphorous or other chemicals and metals. Linking physical water and substance flows to economic flows and doing this systematically for a number of years, insight is gained into the (nature of the) relationship between our physical water systems and the economy. The integration of this information also allows the construction of combined physical and economic indicators. For instance, water use by various economic sectors can be related to the economic interests involved. Economic data are expressed in monetary terms and data about the water system in physical units such as cubic metres or kilograms nitrogen or phosphate. NAMWA distinguishes between physical surface water and ground water flows as well as physical flows of tap water.

Two important steps in the development of the information system were:

1) linking the available economic data and data about water abstraction, (waste) water discharge and substance flows in a consistent and coherent way to NACE sectors;
2) (dis)aggregating the available data to river basin level (initially to the four main river basins distinguished in the Netherlands: Rhine, Meuse, Scheldt and Ems).

Table 1: The basic structure of NAMWA

Account nr	1-10	11	12
1-10	NAM (economic); mln Euros		
11-12	Water balance; mln m^3		
13-14	Emission balance; kg[1]		

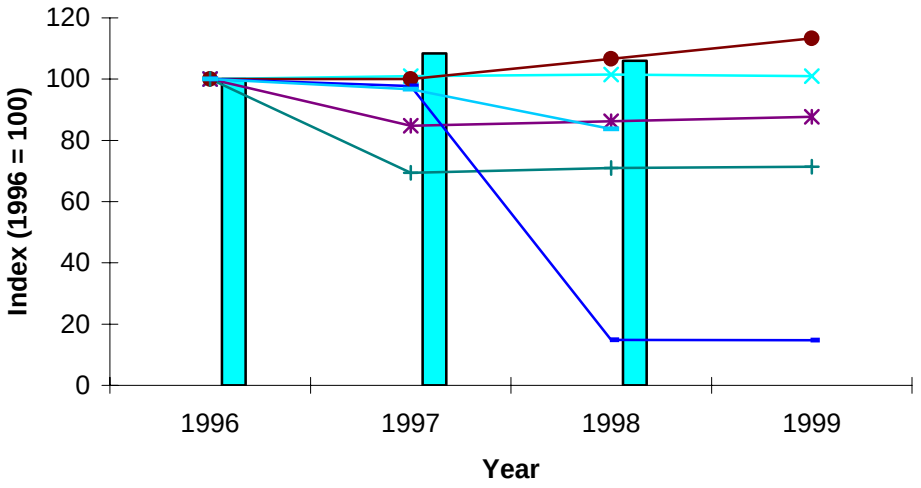
[1] Depending on the substance, emissions are described in mg, kg or mln kg.

Source: van der Veeren, R.J.H.M., Brouwer, R. and van der Stegen, R.H.M. (2004). NAMWA: an integrated river basin information system. RIZA, Lelystad, The Netherlands.

Apart from measuring the economic importance of relevant water uses, the integrated indicators may convey information on how the current ecological status is at least partially explained by current water uses. For this purpose, in many cases it would not only be desirable to compute indicators relating economic values and pressures on the water environment, but also to represent how the economic activity have an impact on the ecological status (for example representing the value added in relation to the average increase in the concentration of a certain pollutants on the water body in € per additional $\mu g/m^3$ of a certain pollutant in the water body). Given the fact that the same pressures may lead to different impacts on different water bodies, this kind of indicator may give some valuable information for the further stages of the WFD implementation process.

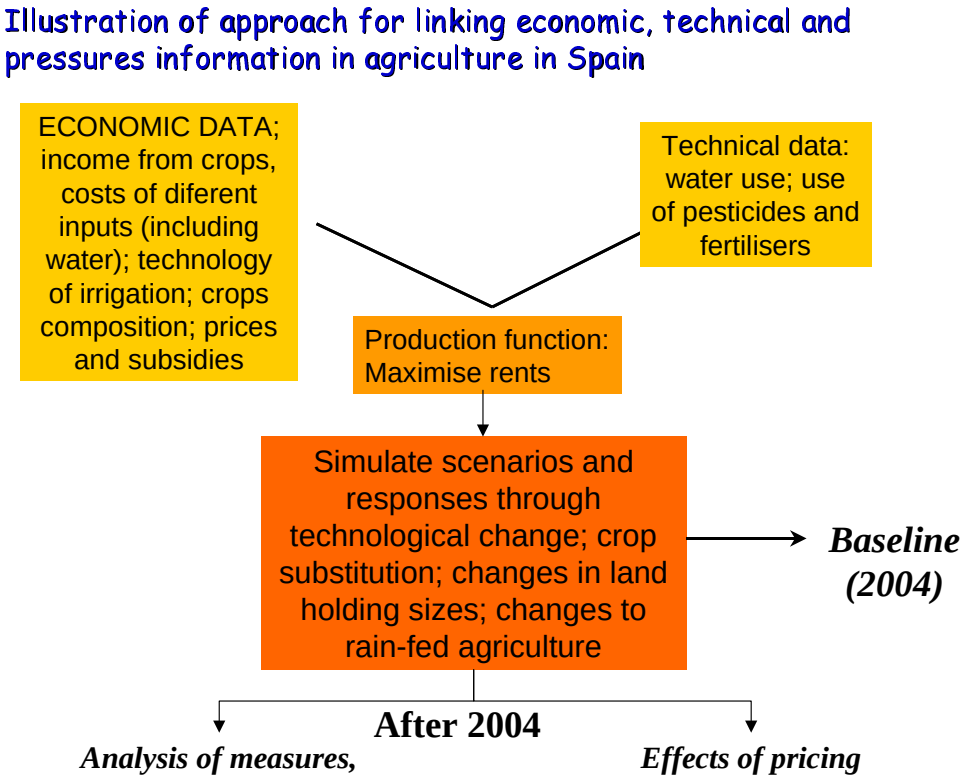
Illustration of linking economic and environmental data in time

Example in the Netherlands from NAMWA allowing the assessment of the efficiency of water use by specific branches of industry at river basin level (development of economic value added (bars) and several substances (lines) in the Rhine river basin in the Netherlands)



Another family of indicators may be constructed to show and compare the efficiency of water uses among regions, sectors or economic units. For example, if there is a significant difference in per capita water consumption between two cities with similar weather and socioeconomic characteristics, this may indicate that in one of this regions water consumption can be reduced. In other case, comparing the water per unit of production used in a certain crop depending on the irrigation technique, may give an indication on how much water may be obtained by a certain new irrigation infrastructure. In another case the difference between the water delivered and consumed in any city and between different cities, will give an indication on the opportunity of improving the efficiency of the water distribution network.

Nevertheless in some countries for specific water uses relating water abstraction and water pollution to specific economic variables may require going beyond an indicators approach. In this case it might be useful to look into the potential for analysing demand functions (i.e.: in agriculture). The main purpose of this kind of analysis is to build on an economic model able to explain the main pressures on the water system (measured by the surface of irrigated agriculture, the pollution load, etc.) as the reaction of water users to a change in the explanatory variables (water prices, prices of complementary and substitutive inputs, irrigation technology, prices of products, income, etc). This analysis could be performed for 2004 in so far as it may provide useful information for the baseline scenario and for the preliminary risk assessment. Otherwise it may be performed after the preliminary assessment of the economic importance of key water uses has been finished and the usefulness of in deep studies for certain pressures is clearly determined.



Step 4 Prepare report considering the different purposes of the economic analysis of water use for 2004

It is worth emphasizing that the 2004 report is an intermediate output that provides the rest of the implementation process with information that may be useful at least for the reporting of 2004, the gap identification, preparing the program of measures, and analysing potential derogations. The report must be constructed taking the value and usefulness of this information into account.

The 2004 report on the economic analysis of water uses will necessarily contain a very important descriptive content. This year the identification of the information available and needed (and the lack of information needed to improve the planning process) would be of great importance even at this early stage in the WFD implementation process. The more demanding task for experts will probably be to establish a clear link between the different pieces of technical and socioeconomic information and to relate all that, with the information about water pressures. The many recommendations about changes of existing sectoral surveys or about the structure of integrated data bases, which will probably come from this task, will likely be a major outcome of the 2004 report.

The five following themes can be addressed in the 2004 report:

- Overview of the socio-economic importance of economic uses in the District in relation to the pressures.

- Existing economic information, evaluation and recommendations for after 2004.
- Analysis of the links between the economic and technical information and the information on pressures.
- Using existing information at different scales.
- Proposals for further economic analysis of water use after 2004 as an input for the cost effectiveness analysis and for the analysis of the disproportionate costs.

It is likely that important parts of the 2004 report (based mainly on existing information) would need to be updated when preparing the draft versions of the river basin management plans. This will give an opportunity to implement most of the proposals on further economic analysis of water use, made in the 2004 report.

Beware: the report on the economic analysis of water uses of 2004 (and beyond) can also be substantially improved/facilitated through experts and stakeholder participation (workshops/seminars/conferences/focus groups) at basin level. This will allow Member States to identify and contrast some key information and analysis on relevant water uses; existing information sources; and what might be the key variables and trends that need to be considered for the different purposes of the economic analysis of water use.

Illustration: Public Participation in economic analysis in Sweden

The Rönne Å river basin project is based on focus group discussions and aims to investigate:

- What conflicts may arise in the context of water use and what methods may be used to solve these.
- How different market agents react to different policy instruments;
- How cost-effective different alternatives of measures are;
- How to evaluate which measures are most likely to be accepted by the water users and which are most practicable.

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