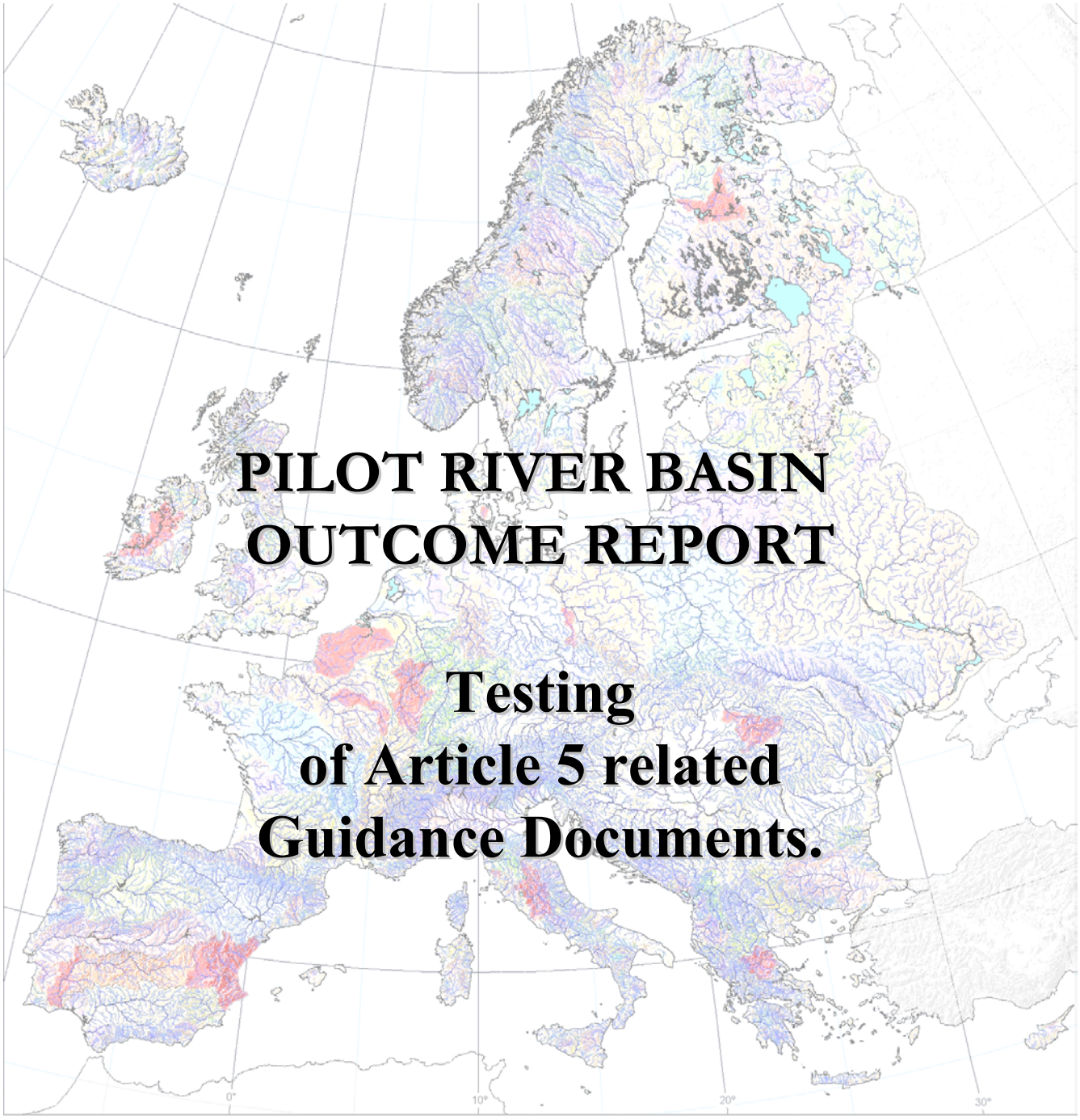
COMMON IMPLEMENTATION STRATEGY
FOR THE WATER FRAMEWORK DIRECTIVE
(2000/60/EC)



PILOT RIVER BASIN OUTCOME REPORT

Testing of Article 5 related Guidance Documents.

DG Environment

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Institute for Environment and Sustainability

2005

EUR: 21517 EN

This document has been jointly prepared by the **Joint Research Centre** and the **Directorate General Environment of the European Commission** based on the work carried out by participant in the exercise:

•CECINA (IT)
•GUADIANA - Portuguese part- (PT)
•JUCAR (ES)
•MARNE (FR)
•MOSEL-SAAR (BE, FR, DE and LU)
•NEISSE (CS, DE and PL)
•ODENSE (DA)
•OULUJOKI (FI)
•PINIOS (EL)
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•SHANNON (IE)
•SULDALSVASSDRAGET (NO)
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Edited By:
Lorenzo Galbiati, Josè Manuel Zaldivar, Faycal Bouraoui, Marta-Cristina Moren-Abat, Giovanni Bidoglio and Joachim D'Eugenio.

2005 EUR: 21517

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European Union is available on the Internet.
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Luxembourg: Office for Official Publication of the European Communities
ISBN 92-894-8979-0

Printed in Italy

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CHAPTER 1. GENERAL INTRODUCTION

During the 2001/2002 Common Implementation Strategy (CIS) of the Water Framework Directive (WFD) a series of Guidance Documents (GDs) concerning all major aspects of its implementation were developed by Working Groups (WG) including representatives of Member States (MS), Accession Countries, National experts and the European Commission.

In order to test and cross validate these GDs, a network of Pilot River Basins (PRBs) has been established. It was foreseen that such a network would contribute to the implementation of the WFD directive, leading in the long-term to the development of River Basin Management Plans. Several countries have proposed river basins and associated coastal zones within their territory taking into account the following objectives:

- Cover the maximum number of Ecoregions
- Commitment and resources for testing the GDs in this voluntary exercise
- Participation of local, regional and national competent authorities, i.e. water management administrations
- Active involvement of NGOs and stakeholders.
- Dealing with the maximum number of pressures and environmental problems
- Include transboundary river basins with all the involved partners
- Representative of the data availability in MS.

Initial Pilot River testing of the GDs started in 2003 and should be finished by the end of 2004. Similarly to the rest of the WFD-CIS process the Pilot River Basin testing is a common exercise of the Commission and Member States, the Institute for Environment and Sustainability of the Joint Research Centre (IES-JRC) acts as the technical secretariat, and constitutes a part of the Working Group 2B for Integrated River Basin Management co-lead by France and Spain. The geographical location of the fifteen Pilot River Basins: Cecina (Italy), Guadiana - Portuguese part- (Portugal), Jucar (Spain), Marne (France), Mosel-Saar (Belgium, France, Germany, Luxembourg), Neisse (Czech Republic, Germany and Poland), Odense (Denmark), Oulujoki (Finland), Pinios (Greece), Ribble (UK, England), Somes/Szamos (Hungary, Romania), Scheldt (Belgium, France, The Netherlands), Shannon (Ireland), Suldalsvassdraget (Norway) and Tevere (Italy), is shown in Figure 1.

The GDs are available at the following address: http://europa.eu.int/comm/environment/water/water-framework/implementation.html

MAIN AIMS OF THE PRB TESTING EXERCISE

For the exercise a Terms of Reference (ToR) document focusing on *Key Issues* felt to be of particular relevance by WG leaders have been developed. The document set out two main objectives for PRB testing:

1) to test whether the guidance responds to the needs of the PRBs, and

2) to test whether the inter-linkages between the guidance documents are sufficiently developed.

During the testing by the PRBs, the implementation of the WFD in some Member States got underway. In the last quarter of 2003 workshops were organised on specific WFD topics, that were attended by members of PRB projects as well as people working on the regular implementing process within the Member States. The discussions in those workshops made the PRB exercise serve as an international platform for exchange of information, experiences and views. In this way, during the PRB testing, a third objective for the exercise developed:

3) to point out valuable learning experiences from outside the PRB exercise, that arose during the testing. Therefore, the results from the workshops are taken into account in the conclusions in Ch. 4.

Considering that actual implementation of the WFD is already taking place in many countries, that the reporting from Member States to the Commission on specific issues of the Directive such as Article 5 and its Annexes is required in a relative short time, and that the WFD implementation should take advantage as much as possible of the Pilot River Basin activities, it was agreed that GDs concerning Article 5 should be tested in a first phase. The remaining GDs were to be tested afterwards and subsequently the Pilot River Basins Network would concentrate on producing a Program of Measures and the River Basin Management Plan (to be presented to the WD meeting in December 2004). This report, therefore, constitutes the first synthesis of results from the integrated testing of the GDs related to Art. 5. In this first phase of testing, the PRBs have mainly considered the following points:

- Characterisation of surface waters and groundwater (delineation, reference conditions and provisional objectives)
- Identification of pressures
- Impact of human activity on the status of surface waters and groundwater (assessment of likelihood of failing to meet environmental objectives)
- Economic analysis of water uses

Guidance Documents reflect the EU common understanding of the WFD implementation and, hence, they are addressed to the national-strategic level of Member States rather than to the

regional or local-operational level. For this reason, some Member States have developed their own national guidelines, sometime based on specific WFD GDs in their national language and with references to regional/local data sources of information. Where possible this report makes appropriate references to these documents.

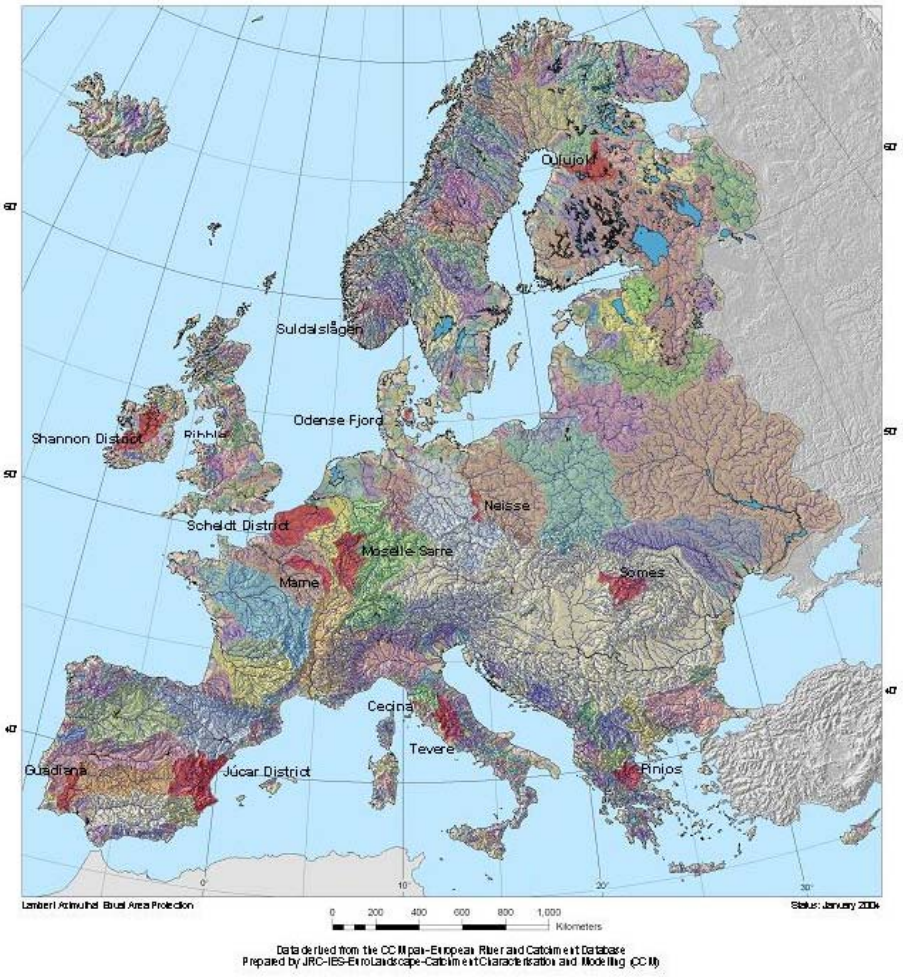


Figure 1. The Pilot River Basin Network.

CHAPTER 2. CONTEXT OF PRB TESTING: A RICH DIVERSITY

The most striking feature found in the PRBs exercise is the rich diversity encountered, which in turn reflects the enormous disparity that one will have to expect during actual implementation of the WFD. This diversity has several aspects that need comment:

- Geographical distribution: The PRBs cover twelve of the 25 ecoregions for rivers and lakes and four of the 6 ecoregions for transitional waters and coastal waters defined by the WFD: Annex XI, maps A and B, respectively. For example, Iberic-Macronesian region for rivers and lakes is represented by the (Guadiana-Portuguese side-and the Jucar rivers) whereas Baltic Sea for transitional and coastal waters is represented by the Oulujoki river. Furthermore, the pilot river basins cover a wide range of sizes from 900 Km^2 of the Cecina (small, Mediterranean, few authorities and high degree of participation) to 37170 Km^2 and 22436 Km^2 of the Scheldt (international, highly industrialised, many authorities, complex river management, involvement of politic) and Jucar respectively.
- Transboundarity: One important characteristic to consider concerns the trans-national versus the national character of the testing. This is related mainly to the amount of additional work needed to co-ordinate the activity between several MS and CC, language barriers, disparity on management approaches and data availability. In the PRB exercise there are four transboundary pilot rivers: Mosel-Saar (Belgium, France, Germany, Luxembourg), Neisse (Czech Republic, Germany, Poland), Scheldt (Belgium, France, The Netherlands) and Somes-Szamos (Hungary and Romania). For example, the Neisse has different water management systems, which makes data difficult to compare.
- Pressures: There is a rich variety from the Suldalsvassdraget with a scattered population within the basin area amounting to approx. 3000 persons but with a strong regulation of the basin for hydropower generation (the river accounts for a 5.4% of total Norwegian electricity production) to the Marne with 2.8 Million of inhabitants.
- Existing data: Another important aspect when testing the GDs was to have several levels of data availability to assess the use of different approaches, from the application of validated models at the basin scale, to statistical analysis of existing data, to expert judgement where data is scarce or not available. For example, the Odense river – small, few authorities, agricultural- has relatively long historical data series due to the appearance in 1973 of the first Danish Environmental Protection Act, whereas the National Surface Quality Monitoring

Network organized by the Greek Ministry of Environment, Physical Planning and Public works was designed in 1992 and consequently the Pinios river basin has much less historical information available.

- Number of GDs to be tested: There are also important differences between the number of GDs to be tested. For example the Ribble proposed to test only the Planning Process and Public participation GDs whereas Tevere, Pinios, Jucar and Scheldt rivers have proposed to test all GDs, from which the Scheldt is the only international PRB. In an intermediate position there is, for example, the Shannon that has tested 5 over the 7 GDs requested for Art. 5. Table 1 gives an overview about the GDs that are being tested by the PRBs.

	ART 5	ART 5		ART 5	ART 5		ART 5		ART 5	ART 5			
River Basin	Water Bodies	IMPRESS	HMWB	REFCOND	COAST	Inter calibration	WATECO	Monitoring	Ground Water	Public Participation	Planning Process	GIS	Wetlands
Odense/Fjord													
Oulujoki													
Mosselle-Sarre													
Marne													
Neisse													
Somes/Szamos													
Scheldt													
Pinios													
Shannon													
Guadiana													
Jucar													
Tevere													
Cecina													
Suldalsvassdraget													
Ribble													
		The PRB is testing the GD.											
Legend		The PRB is not testing the guidance.											

Table 1: Overview GDs tested by the PRBs

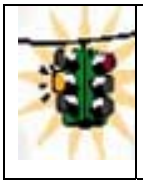
CHAPTER 3 OUTCOME OF THE TESTING

3.1. HOW TO DEAL WITH GUIDANCE DOCUMENTS.

The first question to answer in the PRB testing was: do the guidance documents respond to the needs of the river basins? This issue is briefly discussed in section 3.1, starting with the general usefulness of guidance documents. Although the expectation in advance was that this matter would be the main subject of this report, the PRBs did not experience much trouble with individual GDs. In section 3.2 the second issue, on the linkages between guidance documents is discussed. Because of the time constraints, the different WFD issues were dealt with in different working groups when drafting the GDs. How do these GDs work out when applied together? Finally, a lot of the lessons learned were not foreseen when starting with the PRB exercise. These issues are discussed in section 3.3.

3.2. USEFULNESS OF GUIDANCE DOCUMENTS (IN GENERAL AND SPECIFIC GD).

In general the GD were very well received, and their usefulness acknowledged. However, as these GD aimed at providing some general direction, many PRBs highlighted a need for more specific documents. As a general comment, it seems that these sets of guidance documents are now part of a large body of available information concerning the implementation of the WFD. During the testing phase it has been seen that many sources of information and guidance are used to achieve a successful implementation of the WFD relative to article 5. There were some efforts on transnational basins to use similar sets of information including national documents, however additional collaboration will be needed to reach consensus. There was no major issue raised concerning difference in interpretation. This testing phase is seen as a screening exercise, while a more refined approach will only be possible once impact threshold criteria are defined. Indeed these thresholds will be the key issues for identifying the water bodies at risk of not meeting good ecological status, and thereafter in the development of the River Basin Management Plans. It is expected that more questions will arise once the issue of thresholds is tackled.

	During the testing there were no issues related to difference in interpretation. However, this might change when the issues of thresholds and reference conditions are tackled.

Technical versus legislative quality standards:

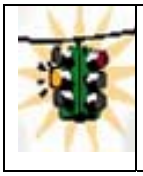
It is known that triggering of threshold values of internal or external variables in the ecological system may affect the ecological status of system. For this reason, the definition of quality standards plays a vital role in the WFD.

During the testing of the guidance documents PRBs have stressed the difficulties encountered caused by the lack of existence of thresholds for impact indicators. They felt also that there is a lack of legislative thresholds, and thus the preliminary testing of the guidance documents should also take into account the uncertainties linked with the absence of these threshold values. However, many of these thresholds, including those for priority substances are still under discussion and will be only available in the coming years. A further difficulty is that there is not always a direct relationship between pressures and impact even if threshold values exist.

	All PRBs stressed the need for thresholds for impact indicators. There is thus the need to go more in detail respect to specific situation in the definition of the threshold. Therefore MS in addition to the EU threshold used also national data as: monitoring data, both physico-chemical and biological, time series for conducting the impact assessment.

The uncertainty embedded in the preliminary analysis of the pressure and impact will have to be estimated, as they have major implication in the identification of water bodies at risk of not meeting the WFD requirements. As illustrated by some PRBs, these thresholds are likely to be defined at MS-level, based both on scientific and political considerations.

Related to this aspect, reference conditions have the same problem; their establishments in some cases are difficult since there are few pristine sites in Europe. Some countries, e.g. Italy are discussing the legislative definition of such reference conditions or thresholds whereas other countries consider that a technical definition needs to be agreed.

	Concerning reference conditions, some PRBs are favouring the adoption of legislative definition while other PRBs prefer a more technical definition.

National versus WFD/CIS GD:

The concern for the national implementation of the WFD lead to the development of guidelines that were available prior to the elaboration of the GDs developed in the framework of the Common Implementation Strategy of the WFD. Two official documents, one German and the other French, are actually available. The German Document produced by LAWA was published in 2002 and deals with the implementation of the whole WFD. In substance this document is similar in intention as the guidance documents produced in the framework of the CIS, and "is intended to make the complex structure of the Directive easier to understand for enforcement purposes across Germany, to ensure a uniform approach to implementing the Directive and to avoid any duplication of effort." (LAWA, 2002). The French document was also produced in an effort to ensure a harmonised compliance with Article 5 of the WFD throughout France. Spain in addition has also produced a Manual for conducting an analysis of Pressures and Impact on Surface water pollution. This illustrates the need of the Member States to produce documents readily usable by local managers that take into account the specificity of the country, including the administrative environment. This is also reflected in the PRB testing where often a combination of national documents and CIS GDs were used.

	CIS Guidance Documents were efficiently used in conjunction with national documents, as the latter are more specific to certain regions, do not present a language barrier, and have often been used for a long time.

The conceptual approaches proposed in the GD seem to be very suitable for all PRBs. For instance, concerning the analysis of Pressures and Impacts, in most cases, the concept of DPSIR[1] seems appropriate. However, as the testing is still at an early stage, the response part of the analysis has not been performed. It is clear that the IMPRESS guidance documents lists potential tools for carrying the Pressure and Impact analysis, however, PRB's are happier using tools for which they have already collected data, and where the whole system has been set up and running. The impact of local conditions is most evident in the definition of the reference conditions and is strongly controlled by the monitoring strategy in place. Local expertise is often used in conjunction with existing data or modelling results to define reference conditions.

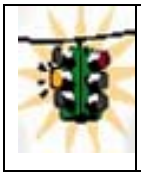
[1] DPSIR, driver, pressure, status, impacts, response

The need to produce national guidance documents based on CIS documentation in the context of national legislation has been underlined by many PRBs. However, agreement is required for transboundary catchments. The experience gained during the testing and the elaboration of the CIS Guidance Documents is being used during the development of the national guidance.

	CIS Guidance Documents are very useful tools, and local adaptation was often performed by the PRBs to take into account the national or regional specificity.

Real life versus virtual testing:

The testing of the guidance documents on PRBs is seen as a front-runner project that will serve for the real implementation of the WFD. Many PRBs have recognised this where the selected catchment is ahead of the national implementation process. Many PRBs have taken the approach that the guidance testing is to be considered as "real life testing" for various reasons including economical and practical considerations. Furthermore, time available between "virtual test" and "real commitment" would be too short to capitalise on the PRB experience gained. For instance it was noted that stakeholders would not be involved in testing the Guidance Document if such an exercise would be conducted as only virtual testing. Furthermore, it was recognised by the PRBs that testing will provide MS with valuable insight on how to comply with the Article 5 requirements, and the other basins will greatly benefit if the testing is conducted as a real case study rather than a "virtual exercise" as the results should provide clear solutions to the problems encountered during the real implementation of the WFD. It should be noted that many PRBs are also involved at a broader level in the National Implementation of the WFD, and that some of the results of the testing are only sub-sets of results produced at a much larger scale. For instance, the tools and methodologies used for Marne PRB cost recovery analysis derive from the works already led at the scale of Seine Normandy basin. Strategies and results developed in the PRB projects can also be modelled on future national activities. In the PRB Neisse virtual approaches from the project were expanded to a larger scale of other river basins in the three countries involved.

	Many PRBs approached the testing as a real life exercise from which other river basins already starting the implementation of the WFD will greatly benefit.

Level of involvement of stakeholders and public participation:

The involvement of stakeholders and public participation in the testing exercise should be done at two different levels:

Testing the public participation GD – 9 PRBs committed to this testing - and fostering the involvement of stakeholders during the testing of all the GD, as an horizontal activity applicable to all the PRBs. During the article 5 phase there were two main positions regarding the involvement of stakeholders. On one hand, most of the PRBs judged that the PRB exercise (article 5) was too early for stakeholders' involvement, on the other hand, some PRBs have started active stakeholder and public involvement at a very early stage, resulting in a satisfying response. The results of this was that there was a scarce involvement of stakeholders in most of the PRBs and that only 2 out the 9 PRBs testing the PP GD actually started active involvement of stakeholders.

The objective of public participation and stakeholder involvement is to bring together key partners, obtain input of new ideas, share the ownership of the WFD implementation process, improve and focus the delivery of results, align goals with stakeholders, manage expectations, raise awareness and identify conflicts at an earlier stage, "before" confirming the definition of water bodies status.

For example the Ribble (UK) PRB considers this aspect essential to create a common vision of what one can expect from the implementation of the WFD between stakeholders and public in general. A soccer analogy for public participation from the Ribble PRB is illustrated in the ANNEX II.

To avoid confusion among stakeholders, Oulujoki PRB organised a workshop together with officials from the recently established River Basin that included both a presentation of River Basin and the first results of testing at the PRB.

The viewpoint of the PRBs that did not involve stakeholders in the process, was to first define the provisional objectives for the water bodies based on actual conditions and then, when the water managers have a better idea of the type of conflicts that are likely to appear start the involvement of stakeholders. This is due mainly to the amount of work river basins managers have to spend for developing the public participation scheme required by the WFD. For example Odense (Denmark) PRB has stressed the need to reduce nutrient loading from agricultural origin to fulfil good ecological status for 2015 and, hence, after this analysis, they have identified the main problem to be addressed together with stakeholders.

Some problems emerge in the identification of stakeholders at the international level, and especially the level (regional, national, international) of involvement of the stakeholders.

Furthermore, there is some disappointment as clear-cut answers are not always possible for very specific questions. However, this dialogue is crucial as it highlights potential future problems.

Workshops:

To support the PRB exercise, a series of workshops were held during the second half of 2003. The issues covered by the workshops were Surface Water bodies Identification, Groundwater Characterisation and Economic Analysis.

- **Workshop on Economics:**

The workshop on Economics took place in Paris on 9 and 10 October 2003. The workshop was organised together with the Agence de l'Eau Seine Normandie under the umbrella of the Common Implementation Strategy (CIS). The purpose of the workshop was to present experiences and examples from PRBs and other national case studies on the implementation of the economic elements of the Water Framework Directive and to hold a brainstorm session on key economic issues related to the implementation of the WFD. Presentations were made by the Odense PRB on their experience of their economic assessment; the Marne PRB on baseline scenario and trends analysis; the Scheldt and Jucar PRBs on cost-recovery analysis (See extended Report on the Workshop on Economics available on CIRCA under: Pilot River Basin/PRB Outcome Report – Phase 1a/ANNEXES). The document concentrates on the input provided by the pilot river basins and the key issues raised during the workshop.

- **Workshop on Initial Characterisation of Groundwater Bodies:**

Under Article 5 of the Water Framework Directive (WFD), Member States have to identify water bodies by 22 December 2004 as part of the first characterisation of the river basin. Member States have to carry out an initial characterisation of all groundwater bodies including their location and boundaries as well as identifying pressures and groundwater bodies at risk of failing to meet the objectives of the WFD. A workshop on Groundwater bodies characterisation took place in Brussels on 13 October 2003. The workshop was organised together with the Ground Water group under the umbrella of the Common Implementation Strategy (CIS). During the workshop the PRBs reported their first experiences when testing the ground water part of the Horizontal Guidance Document on the Identification of Water Bodies. The detailed information on the initial characterisation at the National and PRB levels is available on CIRCA under Pilot River Basin/PRB Outcome Report – Phase 1a/ANNEXES, with an extended Report on the: Initial characterisation of Groundwater Bodies.

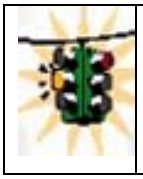
- **Workshop in Water Body delineation:**

The workshop on Surface Water Bodies took place in Brussels on 25- 26 September 2003. The purpose of the workshop was to discuss and analyse the experience gained in specific river basins in Europe on the implementation of the WFD for the characterisation of surface water bodies. Under Article 5 of the Water Framework Directive (WFD), Member States have to identify water bodies by 22 December 2004 as part of the first characterisation of the river basin. The water bodies are the units that will be used for reporting and assessing compliance with the WFD environmental objectives. Twelve out of the 15 Pilot River Basins (PRB) have agreed to test the horizontal Guidance Document on the identification of water bodies during 2003. JRC based the discussion during the two-day meeting on the responses from 12 PRBs to a questionnaire drafted in early September 2003. The PRBs gave presentations on the different approaches used to delineate water bodies. A complete report on this workshop is available on CIRCA under Pilot River Basin/PRB Outcome Report – Phase 1a/ANNEXES .

3.3. TRANSVERSAL ISSUES – COHERENCE BETWEEN GUIDANCE DOCUMENTS

Economics and pressures:

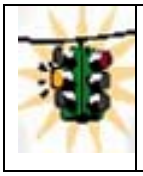
During the phase 1a testing, stress was placed on the necessity to look at economic analysis of water uses in such a way as to provide a basis for the assessments needed for WFD implementation. At the same time, the approach needed to consist of a first step in which a large variety of water uses were considered before focussing on the most important ones. Through this work, PRBs learned that the content of the economic analysis should be driven by the information needed to answer the WFD Guidance Document as well as by the availability of data. In this context, it is crucial to link the work done on "pressures and impacts" and economics, in order to improve decision-making in water management and for the practical implementation of the WFD. During this phase of the testing the PRBs used different approaches to consider jointly the economical evaluation of water uses and the pressures and impact analysis. This transverse relationship should be taken into account in order to guarantee a co-ordinated approach and to avoid duplication of work. The WATECO and IMPRESS Guidance Documents support this approach. However, during the PRBs testing, the practical implementation of the economic analysis in many cases seems to be disconnected from the pressures and impacts analysis.

	Even though an integrated testing of the various GDs such as IMPRESS and WATECO, would have been greatly beneficial, it seems that in many PRBs the testing was conducted using each GD individually.

Among the PRBs, different approaches were applied to link the pressure factors identified, impact on water resources and evaluation of cost recovery and economic impact. Generally all the PRBs report problems in developing cost recovery evaluation at the same scale as that used for the identification of pressures and impact factors. For example, Marne highlight how cost recovery analysis and pressure and impact analysis are not easily comparable because:

- Cost recovery analysis is done at a basin or sub basin level and indicates the monetary transfers between user categories (agriculture, industries, domestic).
- Pressure and impact analysis tries to estimate different sources of pollution at the water body level.

Thus, cost recovery analysis does not need to be conducted at the same scale than pressure and impact analysis. The Jucar River and the Somes/Szamos Basins both reported lack of suitable economic data at river basin scale; this information being available only at the regional scale. In the Scheldt transnational river basin the information related to IMPRESS and WATECO is plentiful but the difference in scale at which the data are available does not allow an economic evaluation and cost recovery analysis of the pressures and impacts. To deal with the scale problem the Tevere River Basin has used a "multi-step" approach. Using the pressure list of the IMPRESS Guidance Document the impact of pressures were identified. In a second step, conflict between these pressures and the basin-specific uses of the water are identified and, on this base, evaluation of economical impact and cost of recovery actions were evaluated. The Moselle/Sarre River Basin used a similar approach, the linkage between the pressures and impacts analysis and the economics evaluation was based on a national management plan, which establishes economic evaluation of the water resources to be preserved.

	When trying to link the testing of various GDs, technical problems appear such as the scale issue between IMPRESS and WATECO.

Pressures and Water Bodies:

The horizontal Water Bodies guidance gives a common understanding of the definition of water bodies and specific practical suggestions for the identification of water bodies under the Water

Framework Directive. Guidance on the analysis of pressures and impacts addresses the question related to the role of this analysis within the implementation process and how it contributes to the characterisation of water bodies, which has to be fulfilled as part of Article 5 of the Directive. It also shows how this analysis feeds into the development of monitoring programs, river basin management plans and programs of measures. In this context the coherence between the horizontal Water Bodies (WB) Guidance and the IMPRESS Guidance is a key point in the implementation of the WFD. The PRBs have taken different approaches towards the relation between WB delineation and IMPRESS analysis. For example the Mosel-Saar and Marne have begun identifying WB using as a first step only natural criteria. Subsequently pressure and impact criteria will be considered to achieve the delineation (and to split as necessary the natural WBs) in order to obtain homogeneous WBs according to both natural and pressure criteria. The Tevere River basin used a similar approach to evaluate the coherence between the IMPRESS and the WATECO GDs. They first identified the water bodies, then determined their typology and finally the pressure and impact analysis was used to identify water bodies which are size-significant but which can negatively affect the quality of water resources. Considering their significant impact on the water quality of the outflow from the whole basin, the Cecina PRB has also identified very small streams as WBs. In this case the IMPRESS Guidance was more useful in the Water Bodies identification than the designation according to typology.

	In many cases the IMPRESS GD results to be a useful in tool in the identification of water bodies within the overall basin. IMPRESS GD was used both as the major factor in some PRBs to identify water bodies and as one discriminatory factor applied after having carried out the water bodies delineation, according to ecological and natural criteria.

Some PRBs (ie. the Walloon part of the Scheldt PRB and the Romanian part of the Somos PRB) have applied a combination of the biological status criteria and pressure analysis to identify WBs. Aggregation seems to be applied in most PRBs for very small WBs if these are not under significant pressures. For example, the Suldal PRB has applied aggregation to a large extent within the basin. The Suldal considered that if pressures and impact factors within a water body do not significantly impact the ecological status, they are not taken into consideration for defining water body borders.

Bottlenecks in the planning process:

All Working Groups and PRBs have been faced with the ambitious and legally binding timetable of the Directive. In principle, deviation from this timetable is not allowed and deadlines cannot be postponed. Several Working Groups and PRBs felt that the timetable, on the one hand, is tight and leaves little time to go through the issues in sufficient detail and on the other hand that the chronological order of the deadlines is not always logical when dealing with the practical implementation. This combination often results in bottlenecks.

Analysis of the actions needed for implementation has allowed the identification of some bottlenecks. For example, the incongruities in planning that occur when comparing the official deadline requirements of the Directive with a pragmatic approach regarding the implementation. To ensure these bottlenecks do not cause problems for implementation, i.e. redundancy of work, the Working Group on Best Practices in Planning summarised the bottlenecks that have been identified by the different Working Groups of the Common Implementation Strategy.

	Bottlenecks appeared during the testing, as the chronological order of the work is not always logical. For instance, the lack of information on reference conditions made the pressure and impact analysis difficult.

Some of the Bottlenecks are specific to a Member State or river basins and are due to: lack of financial or technical means, institutional arrangements, priority setting, habits and/or traditions. The following bottlenecks relevant to the first phase of the RPB testing have been identified.

- The lack of data for the first review and the need for: existing information and data on pressures and impacts, a definition for the significant pressures, relation between pressures and impacts, baseline scenarios before estimating the forecasted impacts, the 2015 objectives to assess the risk of failure.
- Data on reference conditions (RC) are a prerequisite for assigning ecologically relevant typology.
- Need to start monitoring potential RC sites before general monitoring programmes are operational.
- Need for monitoring data from intercalibration sites for calculating EQRs.
- Evaluation of the testing and review of guidance will be too late for the 2005 reporting of status.
- Typology, reference conditions and class boundaries are not available. Draft register based on expert judgement.

- Finishing intercalibration exercise before monitoring programmes are operational.
- The 2004 review of the GDs should be done with data and tools currently available, but these have to be used in a pragmatic manner in order to meet the requirements of the Directive. Making the 2004 review is an opportunity to assess the data lacking and shortcomings to be resolved.

Most bottlenecks can be summarised into a few basic issues or deadlines within the Directive:
Objectives to be achieved are unclear. The Directive refers to the achievement of "good water status" in 2015, which can be defined by the help of Annex II and V. At present this information is general and needs to be elaborated and made operational. This work is planned to be finalised by 2004. As a consequence it is hard to tell if a water body is at risk of failing the environmental quality objectives before 2004 (gap analysis) and which measures would need to be taken.
Data availability: the monitoring programme will unlikely be in place before 2006. Hence recent and complete information (measured values) on parameters of importance to pressure and impact analysis, settings reference conditions, defining ecological class boundaries, intercalibration sites, and indirectly to the designation of heavily modified water bodies, will only be available from 2007. Also a low monitoring frequency is not optimal. As a consequence assumptions will be made about missing data which increases the uncertainties in the analyses and affects the validity of the assessments.
The PRBs worked with three types of solutions for the bottlenecks, applied in an iterative process.

- Use of existing information. In all pilots, data available resulting from the present water management system was used, as well as the present thresholds (fixed via national procedures).
- Expert judgement. A great part of the existing data does not fit into the formal WFD structures. With the use of expert judgement, estimations could be made on the implications of the present knowledge for the WFD requirements.
- Working from coarse to detailed. Most PRBs started a process in which first the main lines were drawn, and after that was zoomed in on the problems and gaps. This made an effective use of (human) resources possible.

These three types of solutions were applied in an iterative process, working from the broad perspective full of uncertainty, to a more detailed view on the aspects that need attention.
The combination of unclear objectives, missing data and the first major deadline in 2004 (Article 5) makes it nearly impossible to give a very exact assessment of current water status and the real risk of failing to meet objectives. Therefore several Working Groups already considered the

process as being an iterative one and are undertaking preliminary analyses and assessments, based on available data (if necessary on assumptions) by 2004, and plan to check these assessments at a later stage when monitoring data become available. It is important to estimate the uncertainty of these preliminary exercises.

Make the process iterative

Although not foreseen in guidance documents, this turns out to be the main solution for many planning problems within the WFD, e.g. the delineation of water bodies will depend on the IMPRESS analysis. At this time, this analysis only can be preliminary. Therefore the delineation of water bodies in the Art.5 report must be open to refinement (if needed) in the subsequent River Basin Management plan.

3.3. PRACTICAL PROBLEMS

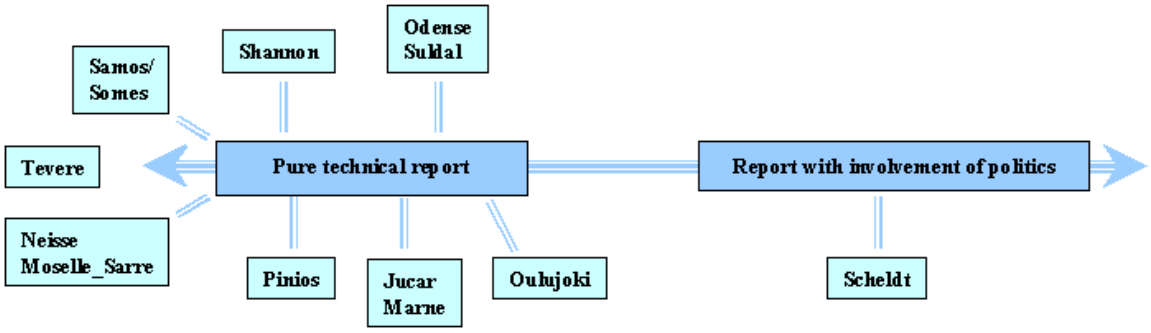
Time issues:

A considerable effort has been put into testing by PRBs, especially considering that the approved versions of the GDs did not become available until the end of 2002, beginning of 2003. Thus the time available for this first exercise has been limited to 6-9 months. Despite the rather demanding time constraints the vast majority of PRBs have delivered a general overview of the issues that other river basins may expect to be confronted with when addressing with Art. 5 requirements. A recurrent issue is the time needed to start the assessment process. It requires a preparatory period to put in place a management structure, which often is not involving only public authorities and water managers but also, stakeholders, NGOs. Public involvement to establish collaboration mechanisms and to gather the needed data that is often spread among several regionals/national administrations. The time needed to implement these steps should not be underestimated. For example, in the case of Pinios River this first step has been more time consuming than subsequent testing of the GDs or implementing Art. 5, since obtaining data owned by several authorities was essential and raising the awareness of public in general and stakeholders in particular required considerable effort.

Technical versus Political Art. 5 report:

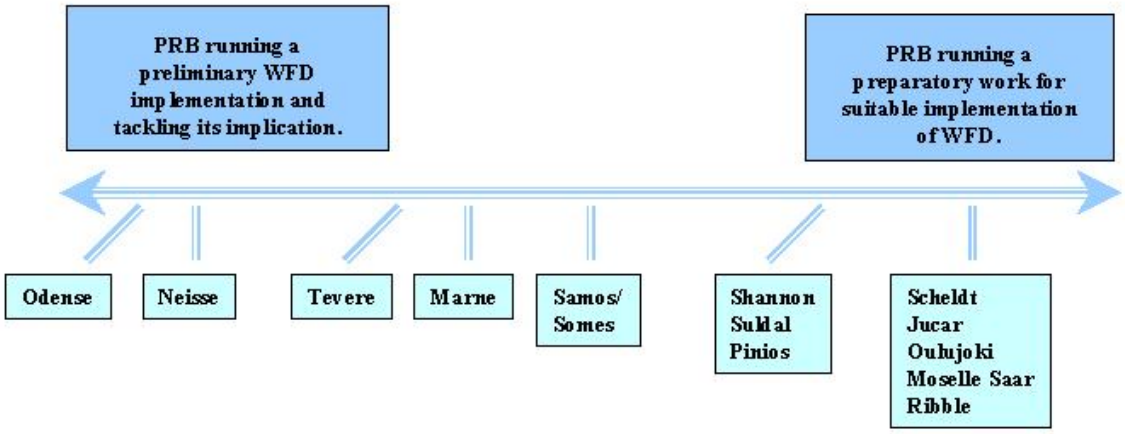
One point of discussion in the PRBs exercise concerning the first report on Art. 5 have been the level of political involvement that should be included. Some PRBs considered that this report is a pure technical testing report developed by water managers and should not include any political

consideration. Other PRBs considered that this testing report has to be discussed at a more political rather than just technical level, because it had a close relation with the real implementation process. Participants were asked at the PRB Workshop at Belgirate (27-28th November 2003) to identify themselves along the axis in the figure below.



Independent or embedded implementation:

Another important issue concerning PRB results (also discussed at the Belgirate Workshop, 27-28th November 2003) is the relationship between PRBs and National implementation processes occurring in MS. Whereas some PRBs are far in advance in the implementation of the WFD (within their pilot river basin) with respect to the more general national implementation in their own country, others are embedded in the National implementation process. This is reflected in the time difference that certain PRBs have compared to the National implementation plans.



Transnational co-ordination:

The PRBs Network comprises four transboundary rivers, i.e. Scheldt (Belgium, France, The Netherlands), Mosel-Saar (Belgium, France, Germany, Luxembourg), Neisse (Germany, Poland, Czech Republic) and Somes (Romania, Hungary). In these PRBs several issues due to their transboundary character have appeared, among them:

- Historical approaches: in transboundary rivers there exist differences between monitoring approaches, in terms of sampling frequency and parameters-, differences in management approaches for example with each country applying their own national standards. These differences may, afterwards, condition the approach one country is following for the implementation of the WFD. For example, for the identification of water bodies in the Lausitzer Neisse, Germany has followed the WBs Guidance Documents whereas the Czech Republic has used the Strahler (stream order) approach. In spite of these principal differences of the approaches both countries have now found an agreement for common transboundary water bodies, as a compromise between both systems aiming at defining homogeneous but not too small common management units. On the same lines, new approaches have emerged that are fully compatible between States, for example in the Somes managers have adopted a common Geographical Information System (GIS) for the entire basin to solve the problems of compatibility.
- Language barriers: Communication between different water managers in transboundary rivers can be a problem that has to be solved before real work starts. For example, in the Scheldt and Mosel-Saar all meetings require simultaneous translation (also for documents, with the extra associated costs) whereas in Somes river it has been decided that all technical reports and meetings are carried out in English.
- Artificial divisions in terms of implementation of the WFD in some basins: As each country is responsible for their own part of the basin some problems may arise when the geopolitical division is in contrast with the geographic division. This occurs mainly when the river acts as a natural border between countries. For example, the Neisse acts for some of its length as a frontier between Germany and Poland. After some initial problems the Czech, Polish and German colleges have been able to define common transboundary water bodies. The "pressure - impact analysis" and the "at risk assessment" will be the result of a real transnational co-operation between the PRB-partners. Concerning the international co-operation the Neisse may serve as a model for the implementation of the WFD for all transboundary surface waters of the three countries (see Neisse case study).
- Decision time: In this case the time between when a decision is prepared and when it is adopted requires a lot of consultation at local and national levels. An advantage underlined by the Scheldt and Mosel-Saar PRBs is that when an agreement has been reached this is seen as providing a very solid basis for future work
- Administrative burdens: Even when there is already an administrative structure (ie a Convention) for river basin management as in the case of major European rivers, e.g. Rhine

(Mosel-Saar), Danube and Scheldt; the accommodation of the WFD may still encounter difficulties. Administration can become even more complex. For example, the International Commissions for the Protection of the Mosel and Saar rivers restructured their organisation in order to implement the WFD. However, this basin is only one among the nine working sectors of the transnational Rhine River Basin, designated within the Rhine. Thus the co-ordination between these sectors, the countries and the achievement of the legal obligations of the WFD implementation becomes a rather complex process.

- In large river basin, there is the risk that sub-districts do not have the same speed in developing specific items in the WFD implementation. This can result in items worked out in different ways. Therefore, also in large river basin, one should concentrate on guaranteeing comparability in the implementation process.

In various international river basins the obligation of international co-ordination of the implementation of the WFD led to a pragmatic approach on how to develop this co-ordination in practice. An example of this approach is the river basin organisations for the Rhine, Danube, Meuse, Scheldt, and the Ems.

In principle all WFD obligations are split in 2 types of subjects:

1) The so-called "A type subjects" that need international co-ordination. These subjects may e.g. be related to pressures that have an impact on the entire international catchment of a river basin.

2) The "B type subjects" can best be handled at local level having only a local impact. In this way the international co-ordination of the implementation of the WFD is reduced to a manageable size.

In this way the international co-ordination of the implementation of the WFD is brought back to a manageable extent. The "A type subjects" results in an internationally harmonised reporting document. Each individual Member State sharing the international river basin district will submit this (same) document to the European Commission. First of all as a proof of successful international co-ordination, but also to demonstrate each Member States' responsibility for his own part of the international district.

Taking into account all these issues one can conclude that the implementation of the WFD in transboundary catchments constitutes a rather challenging process and rivers with these characteristics should consider that they will need more time investments than national river basins to reach the same level of detail in their implementation. However, co-ordinated action to

protect and improve the water environment will be jeopardising without it. Special emphasis should be given to this issue at EU level to facilitate their work.

Level of detail:

As mentioned before, a Terms of Reference (ToR) document focusing on *Key Issues* felt to be of particular relevance by WG leaders for the testing phase was developed and it has served as basis for the testing of GD by PRBs. The level of detail in the answers to this document has shown quite large variability over PRBs reflecting the different problems experienced by them in a complex process with such a tight schedule. However, in some cases the results exceeded expectations and lead to the preparation of preliminary Article 5 reports that will certainly serve as guides for the EU river basins.

Dissemination of results:

An important aspect of the Pilot River Basins Network should be the dissemination of the results at National and European level. There has already been considerable effort devoted to this activity at all levels through:

Web dissemination: In addition to CIRCA "Implementing the Water Framework Directive" where all relevant documents have been made available, including this report and annexes, JRC-IES has developed a Platform for Information Exchange (PIE) at http://viso.ei.jrc.it/wfd_prb/index.html to facilitate the exchange between the groups responsible for testing in the PRBs and the experts from MS, Accession Countries and the EC who have been involved in the development of guidance documents (GDs). This platform is implemented as a document/information space (complementary to the WFD / PRB site on CIRCA), and a set of mailing lists. Furthermore, the vast majority of PRBs have set-up their own Web pages for example:

- Jucar: http://www.chj.es
- Odense: http://www.odenseprb.fyns-amt.dk
- Tevere: http://www.abtevere.it
- Shannon: http://www.shannonrbd.com
- Mosel/Saar: http://www.eau2015-rhin-meuse.fr
- Scheldt-Scheldt: http://www.Scheldt.org
- Pinios: http://www.minenv.gr/pinios_river.html
- Ribble:http://www.environment-agency.gov.uk/regions/northwest/501317/?lang=_e&region=northwest
- Cecina: http://www.comune.cecina.li.it/cecina_prb/

- Suldal: www.nve.no/prb_suldal

National/Regional dissemination: The vast majority of PRBs have been involved at local, regional, national and European scale in the dissemination of their results. PRBs leaders and identified stakeholders, NGOs and public have organised a large number of meetings in general. Furthermore, several meetings to present the results of the PRBs have been organised at National level, e.g. Environment and Agriculture Ministries, etc. An exhaustive list of all these meetings can be found in the progress reports that PRBs have been submitting every 6 months (on CIRCA).

Meetings, Seminars and Workshops organized by DGs Environment and JRC: Meetings between PRBs leaders and the Commission have been held (every 6 months) to discuss work progress and future planning. In parallel, three workshops dealing initially with general aspects and subsequently focusing on specific topics related to Art. 5 have been held (see Belgirate 27-28th November 2003). As the process progressed Seminars with experts that developed the GDs have been held in water bodies delineation, groundwater, economics aspects of the WFD. Reports summarising the main findings as well as the experiences of the PRBs have been produced and are attached to this document. This information is also available on CIRCA.

Participation at International Conferences and publications in peer review Journals: The PRB Network project has been presented as the keynote lecture at several International scientific conferences by PRBs members and EC staff. A complete list is beyond the scope of this document, we only cite a general overview paper:

Murray, C. N., Bidoglio, G., Zaldívar, J. M., Bouraoui, F., 2002, The Water Framework Directive: The challenges of implementation for river basin-coastal research. *Fresenius Environmental Bulletin* **11**, 530-541.

And a journal issue devoted to the subject:

European Water Framework Directive and River Catchment Management, in Physics and Chemistry of the Earth 28 (12/13), 521-563. Guest Editors: E. Mostert, G. Bidoglio and W. Rolland.

Electronic brochure: Information sheets, 2 pages long, on the Pilot River Basins of the Network have been developed and they can be downloaded from: http://viso.ei.jrc.it/wfd_prb/sites.html .

Finally, an important product of this exercise is the Provisional Art. 5 Report that some PRB have already written (Odense) and are in the process of finalizing (Cecina, Jucar, Oulujoki,

Pinios, Shannon, Suldal, Somes/Szamos, Tevere). These reports will certainly help other river basins in the preparation of their Art. 5 report and will constitute a complete collection of case studies where other RB will find inspiration and help when confronted with the real implementation process.

CHAPTER 4. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS:

- The guidance documents developed in the first phase of the CIS process have been of great help in preparing preliminary Article 5 reports. The PRBs concluded in November 2003 that the present guidance documents on the Article 5 subjects are suitable to conduct article 5 analyses. The focus of the guidance documents has shifted during their development from recipe books for the operational level to sketches of outlines for the national scale, but the current level of detail suits well. Less detail would give too little direction, while more detail would mean that not all situations would fit. Of course, this approach implies that specific elements do need development at a national scale.

- Although no revision of the Guidance Documents was felt as necessary at a European level, PRB managers felt that subjects that still lack clarity, or subjects that turn out to be impractical during implementation, should be elaborated through specific workshops leading to fact sheets. People prefer short, focused reports rather than new guidance documents.

- The implementation of the WFD in transboundary river basins constitutes an even more challenging process that requires more effort and time than for national catchments.

- The majority of the PRBs considered the article 5 reporting as a technical exercise – no political decision had to be taken – which might be an explanation for the minor stakeholder involvement in the testing (also within PRBs that were to test the Guidance on Public Participation). The big majority of the PRBs did not consult or actively involve stakeholders in the technical testing and the drafting of the Article 5 report. Hence the exercise did not count with their active contribution or with their external "validation" of the testing results. In some PRBs (i.e. Odense), the stakeholders were involved in public presentation and discussion of the report but not consulted during the drafting of the technical aspect of the document.

- Due to the lack of data and the importance of expert judgement, the results of the article 5 analyses have to be considered as provisional. This is even more the case in international

RBDs, as data are often not comparable and, a a result, co-ordination of these data is very difficult. In particular, the risk analyses in the art. 5 reporting analysis in 2004 are based on provisional objectives for the water bodies.

- Considering the short time available, the PRB exercise can be considered as a positive experience. The amount of effort put in by the PRB network and the results already obtained in terms of increased information, identification of gaps, problems/solutions, pragmatic management approaches, and that the dissemination of the results of this exercise, will, it is believed, provide great help to other river basin managers in the first steps of the WFD implementation.

RECOMMENDATIONS:

- Effective management requires good scientific information for understanding the main hydrological and ecological processes and relevant socio-economic analysis for identifying the drivers behind water uses. The results of the PRB exercise have shown that this capacity needs to be developed by allocating adequate human and financial resources in each river basin district (RBD), and also by including stakeholders and NGOs in the process of implementation and by sharing of information and experience between RBDs, regions, and countries.

- Considering the big challenge of the implementation of the WFD and the importance to learn from as many pilot experiences as possible, the PRBs concluded that the involvement of other river basins in the future testing activities deserves consideration (e.g. the larger international river basins as Danube, Rhine, Meuse, Oder/Neisse, etc.).

- The PRBs have tested some of the GDs and that they have tried to deal as well as possible with the requirements of the WFD implementation. Their status of "front-runner" does not imply that the practices they have implemented can be used as "best practices" to be directly extrapolated to the rest of the country.

- Considering the importance of the involvement of stakeholders for the success of the WFD implementation and considering that the testing exercise should help to gain expertise in relatively 'new' subjects like public participation, it is recommended that the involvement of

stakeholders is tackled in the 'real' implementation of Article 5 and in the remaining part of the PRB exercise.

- The article 5 analyses and objectives should be revised and improved after 2005, as an iterative process, to optimise the design of both the monitoring programmes and the programme of measures.

- No new guidance documents seems to be needed. Also, there seems to be little enthusiasm for radical revision of existing guidance documents. Instead people would like to have fact-sheets with experiences as a reference base, describing the characteristics of the basin together with the outcomes of the implementation of certain parts of the WFD. Moreover, the progress reports and provisional documents available on some dedicated web sites (see above) could provide some useful examples. For these reasons, this report summarising the main findings obtained from the Pilot River Basins Network, together with their detailed reports on their provisional Article 5 assessments, may be of practical use to the other EU river basins who will have to initiate their analysis and characterisation at the beginning of 2004.

ANNEX I: SUMMARIZED EXPERIENCES OF THE PRBs WITH GDs

In ANNEX I the answers to the ToR given by the PRBs were summarised for each GDs in order to highlight the main outcome for each of them.

Since that water bodies delineation is an horizontal guidance a dedicated report was prepared and it is available on CIRCA under Pilot River Basin/PRB Outcome Report – Phase 1a/ANNEXES.

GD 2.1: PRESSURES AND IMPACTS

GENERAL ISSUES:

The Guidance document on pressures and impact was supposed to be tested on the following 12 PRBS: Suldal (Su), Jucar (Ju), Oulujoki (Ou) , Mosel/Saar (MS), Neisse (Ne), Odense (Od), Marne (Ma), Pinios (Pi), Shannon (Sh), Tevere (Te), Cecina (Ce), Scheldt (Sc).

KEY ISSUES:

QUESTION: IS THE LIST OF "PRESSURES" AND THE RELATED "CRITERIA" ADEQUATE AS A BASIS TO DEFINE THOSE SIGNIFICANT PRESSURES AT WATER BODY LEVEL THAT POSE A RISK OF FAILING TO MEET THE ENVIRONMENTAL OBJECTIVES?

The responses are quite mixed however, overall it seems that the list of pressures listed in the IMPRESS documents are adequate.

- It is stressed however that the list strongly focuses on pollution sources while not sufficient attention is given to morphological pressures, and pressures linked with water use and management, which seems to be the case in Norway. This point is also underlined by the Scheldt. In this context a integration of the HMWB analysis and the analysis of potential significant pressures is recommended by Suldal,
- The Mosel/Saar PRB would have preferred a more detailed and more extensive list of criteria for identifying significant pressures, especially when it comes to groundwater. Others

(Marne; Shannon) appear to be more skeptical about absolute criteria for individual pressures and therefore look for integrated approaches that take into account the potential impact. Oulujoki have not determined yet the criteria for assessing the significance of pressures.

- A major issues emerges from the fact that some PRBs can not see how a detailed analysis including the whole list of pressure at a water body level could be conducted considering the large number of water bodies present in their catchments (Odense). Furthermore such detailed analysis would require a huge amount of data that might not be available (Neisse), or could not be done in a timely manner (Scheldt).
- Some of the responses included details about local approaches to identify pressures (Jucar), and how the list of pressures was included into a methodological risk assessment approach (Shannon).
- It appears that the LAWA screening tool has been used in several PRBs to start the pressure and impact analysis

QUESTION: IS THE LIST OF "IMPACT INDICATORS" AND "THRESHOLD SIZES" ADEQUATE TO ASSESS THE RISK OF FAILING TO MEET THE ENVIRONMENTAL OBJECTIVES?

Most of the responses agree that even though the list of impact indicators is quite thorough and complete, there is a lack of specific threshold values. Suldal and Mosel/Saar call for a more specific list of indicators combined with specific threshold values. It seems that many PRBs will rely on already existing national thresholds values when possible for conducting the pressure and impact analysis as no specific values are given in the guidance document or are not yet available.

- several PRBs noted the necessity to include water bodies vulnerability in the analysis process
- several PRBs also stressed the need of data in order to assess the state of water bodies, which are not always available, in particular as far as impacts from changes in the hydrological regime or in the morphology of the water bodies are concerned, whereas the data availability concerning the physico-chemical quality elements is better although quite often not yet desegregated to the water body level.

Marne hints to the limits of indicators with regard to assessing the biological impact and recommends the use of additional sources of information like expert judgement, modelling results, investigative monitoring.

It is highlighted that the criteria and thresholds can be helpful to identify a potential impact but are not sufficient as a basis for a decision whether a water body might be at risk of failing to meet the good status.

QUESTION: IS THE DPSI(R) CONCEPT APPLICABLE IN PRACTICE?

Most of the PRBs agree on the applicability of the DPSI(R) framework even though the various PRBs are at various stages of implementation of the process, especially the response part that should be tested later on.

- One of the major concern is that the distinction between "state" and "impact" is not always clear as mentioned by the Scheldt, Neisse, and the Odense
- Different methodologies are being used going from expert judgement (Odense), to simple and sophisticated models (Mosel/Saar, Odense, Neisse)
- The Czech part of the Neisse states that the DPSI(R) framework is only applicable to large basins, and has limited applicability to small water bodies due to extensive data requirement
- It was also underlined that clear links between impact and pressures do not always exist

QUESTION: HOW WAS DEALT WITH THE PROVISIONAL IDENTIFICATION OF HMWB AND WB?

Many PRB made reference to the HMWB guidance for a detailed answer (Odense, Oulujoki, Scheldt, Suldal, Mosel/Saar and Marne). Work is still under progress for the Scheldt, Shannon. For Suldal, a screening of hydropower installation was carried in the identification of water bodies.

- Many PRBs noted the lack of available definition of good ecological status. For the Jucar, since no definition is available concerning good ecological status, it classified the HMWB only on significant hydro morphological alterations using the following criteria: large reservoir or dams, urban river stretches, water bodies downstream of dams, and artificial channels. The Marne performed the classification of the HMWB independently from the pressure and impact analysis. Mosel/Saar also stresses the lack of available definition of good ecological status in relation to HMWB.

QUESTION: HOW WAS DEALT WITH THE IMPACT OF "AUTONOMOUS DEVELOPMENTS" AND "EXISTING POLICIES" IN THE IMPACT ASSESSMENTS?

Most of the responses state that work concerning autonomous development and existing policies is still underway or has not been assessed yet (Jucar, Oulujoki, Shannon. Scheldt). Some research work is performed on the Odense to assess the trend in agricultural production and expected

trends in wastewater discharge in response to improvement already decided. Mosel/Saar stresses the necessity to take into account the requirements of other EC directives and the respective schedules for implementing these directives, the measures required by existing national or regional legal obligations or political decisions as well as all existing information on already determined developments like the closing down of industrial sites.

QUESTION: HOW IS/WILL THE GAINED INFORMATION BE SYNTHESISED TO BECOME THE OFFICIAL ART. 5 REPORT FOR THE COMMISSION?

- For the Suldal, the gathered information can be presented at different aggregation levels from natural boundaries (basin, sub-basin) to administrative units. Aggregation level will depend upon the EU decision on reporting requirement. Similarly, the Oulujoki waits for guidance from the CIS reporting group. No answer was possible for the Scheldt because work is still under way.
- For the Mosel/Saar information could be aggregated at water body scale, river basin or management unit. The final scale will take into account the clarity of the information to be provided
- Jucar will report results at the water body scale.
- For the Odense and the Shannon the scale of the GIS map will dictate the degree of aggregation. However, guidance on the EU requirement is needed.

QUESTION: HOW TO IDENTIFY SIGNIFICANT WATER MANAGEMENT ISSUES (ART 14.1 WFD)?

Jucar and the Scheldt are still investigating the issue of identification, while for the Odense this process will only be possible once the pressure analysis is completed.

- For the Marne PRB, the most significant problems linked with human activities are already known and have been identified independently from the WFD implementation. Similarly, for the Shannon some issues are known a priori, the human impact analysis will confirm a posteriori the significant issues in a consistent and transparent manner.
- For the Suldal, the major issue is the need of a tool for data collection and management, with the requirement that all data be linked to the River Network.
- For the Mosel/Saar, common modelling approach (PEGASE model) will be used on the whole international basin to asses (and to simulate) the impact of the point pollution sources

(organic matter, nutriments), taking into account the diffuse sources (agricultural) as a background.

- Oulujoki has organised stakeholder workshop concerning this issue
- Odense underline that the most significant problems linked with human activities are already known, and have been identified independently of the WFD, during the national legislation since 1974. This is clearly mentioned in the Art-5-report Summary and conclusion, and is also to be extracted from the Odense ToR - answers. Odense also underline how management details related to all specific water bodies will first be identified through the water management planning

QUESTION: CLARITY OF THE GUIDANCE

Suldal and Mosel/Saar gave answers to this question. For the latter, the shortcoming of the guidance is that no threshold is given for groundwater, and it is expected that the groundwater daughter Directive will remedy this. For Suldal, the guidance lacks clarity and could be improved in the link between IMPRESS and HMWB guidance. Suldal also requests to provide a better description of what the recommendations are concerning the assessment of the impact of different pressures.

GD 2.3: REFERENCE CONDITIONS.

GENERAL ISSUES.

It emerges from the answers that the establishment of reference conditions for surface water bodies in the pilot river basins is at the early stages of the implementation due to different reasons. Firstly because the spatial based approach seems a priori the most desirable way to proceed for PRB since it is the most direct, suitable and trustful of them, and so this method is applied whenever possible. But the main difficulty for its implementation, besides the requirement of infrastructure, depend on finding sites within basins for all the homogeneous regions (ecoregions) with no or very minor deviation from undisturbed conditions. Secondly because as a result of it, PRB have to use indirect methods as predictive models or temporally based techniques like historical data or paleo-reconstruction which are time-consuming to set up since they need to be calibrated and validated for each ecoregions and water body type they are created for. This has led to adopt expert judgement or the use of the practical pressure criteria approach as the interim last resorts in many cases, while the others methods are tuning. And finally because the final step of setting RC is the validation and the establishment of value for the boundary between classes will be established through the intercalibration exercise to be finished by the end of 2006.

KEY ISSUES.

AVAILABILITY OF INFRASTRUCTURES.

The availability of infrastructure on expertise, databases, models and organisational structure is present in more or less extent in all River Basin, though its grade vary from basin to basin. The next conclusions can be drawn from the responses to the ToR.

Several PRB (e.g. Sudal, Odense) agree that while their infrastructure provide good level of information for the broad surface of the basin, there is a need for improvement in some parts of the basin because "...almost no data exist." or some type of information "is well known for major catchments, but not for small areas", or that monitoring network provide not enough information for small streams, and so on. Others PRB giving the intricacy of the subject have

set up an expertise group for dealing specifically with the establishment of RC (Odense, Shannon and Scheldt)

There are a diversity in the use of the monitoring network, some PRB are using the monitoring network for surface waters which is run and established at level state (Neisse), while others is using its own network specially set up for the follow-up of its currently in force Water Management Plan in its territorial domain (Jucar).

The joint apply of models and land use coverage as a practical pressure criterion seems the more common and appropriated approach adopted by PRB for assessing the impact associated to pressures on diffused pollution (Oulujoki, Odense)

WATER BODY DELINEATION SYSTEM.

There is a common position of the majority of Pilot River Basins for all types of water bodies on the use of System B (Annex II, WFD).

Obligatory factors of system A are also being used as a regular basis for this matter, though some basins report there is a lack of information (e.g. in the Suldal basin depth data are not available for Norwegian lakes).

Some of the PRB (Jucar, Odense) are still deciding which factors of system B will use jointly with the obligatory factors of system A. For instance the Jucar PRB is conducting a spatial analysis technique for the defining and characterisation of ecotypes/ecoregions prior to the selection of the factors, while the Odense due to the abundance of relatively small waterways have proposed the use of special factors and tested an alternative typology in a particular sub-basin.

It is to note that some of the pilot basins (Shannon, Jucar) are doing the delineation of water types within the context of an ongoing national program.

Finally the Flanders part of the Scheldt basin reports that it has not been decided yet which system to use for lakes.

PRACTICAL PRESSURE CRITERIA.

From the answers it follows that the majority of basins are making use of this criteria in greater or lesser detail for the identification of reference conditions sites and the quality class boundaries. Yet, this is an ongoing activity and no final results are available for any basin.

In the Odense basin the criteria are used, and in general about half of the river courses, 75% of the lakes and all the coastal waters are at risk to fulfil the good environmental quality in 2015, because of high impact of nutrients, physical disturbance and for the coastal waters also influence of hazardous substances.

On the other side is interesting the proposal adopted by the Jucar basin as a preliminary evaluation of reference sites that will use models for carrying a quantitative analysis of pressures and impacts, which produce a pre-ordination list of water bodies indicating the level of pressure.

Generally it may be concluded (Scheldt, Jucar) that the list provided by table 2 covers all possible spectrum of pressures which lead to assessment of ecological impact.

On the other hand drawbacks were reported for the implementation related to:

Subjective interpretation and should consider also water quality trend criteria (Oulujoki),

Practical Pressure Criteria is "a useful initial screening tool but not a basis for reference condition establishment" (Shannon), and finally

Not enough data to characterise all quality elements mentioned in table 2 (Odense).

In addition, the practical pressure criteria is been considered as a tool for risk assessment of failing to achieve the GES, as an alternative and parallel method than more direct and suitable techniques (spatial analysis, predicted modeling), but it is also clear by the answers that the method to put it in practice is still being developed (Suldal, Jucar).

SETTING REFERENCE CONDITIONS.

It follows from the answers that whenever possible the spatially based method is the most desirable option for the establishment of Reference Conditions (Suldal, Jucar, Oulujoki, Odense, Shannon, Scheldt). Nevertheless, two simultaneously conditions are needed for its implementation: enough monitoring data and sites with low pressure and impact.

Since usually one of the two conditions fails some pilot basins foresee the use of different techniques (indirect methods, paleo-reconstruction, regionalisations etc), but as a regular basis almost all basins agree in the use of expert judgement (Suldal, Jucar, Oulujoki, Odense, Pinios, Scheldt). In particular the Pinios basin allege that due to the lack of biological monitoring data "RC will be based mainly on expert judgement", or in the case of the Scheldt "...in most cases using expert judgement".

VALIDATION

It seems from the answers that the process of establishment RC is in the early stages for all pilot river basins and no validation process has been carried out yet. Nevertheless some of the basins specifically point out that once the RC are set out, the validation practice will be done (Jucar, Shannon and Scheldt).

STATISTICAL TECHNIQUES.

The responses to this matter are quite similar to the previous one, it seems that is too early for this question since RC are not set yet. Anyway it seems that no pilot river basin is considering this technique useless in future implementation of WFD.

QUALITY ELEMENTS SELECTED FOR ECOLOGICAL ASSESSMENT.

Many of the PRB are not reporting this matter since RC are not yet established, nevertheless Suldal and Oulujoki basin give some biological quality elements as a reference (phytoplankton, macroinvertebrate, etc), while Jucar and Odense basin have not especially disregard any quality elements since the process of setting RC is being carried out and the natural biodiversity is high and "many elements are needed to ensure a robust classification".

SETTING CLASS BOUNDARIES.

Many of the PRB are not reporting this issue, only Oulujoki specifically states that will use the "a priori" method but only the phytoplankton data was sufficient enough to test the setting of the class boundaries. It seems that is too early for this question to be asked and should be addressed during the intercalibration exercise.

GD 2.4: COAST.

INTRODUCTION

The Pilot River Basins network has been established to test the Guidance Documents for the implementation of the Water Framework Directive (FWD). There are 15 Pilot River Basins (PRB) proposed to date and 8 PRBs, i.e. Jucar, Oulujoki, Odense, Pinios, Shannon, Guadiana, Tevere, Scheldt, had agreed to test the Guidance Document on Typology, Reference Conditions and Classification Systems for Transitional and Coastal Waters (COAST).
The report is based on the responses from the PRBs submitted through the questionnaire Terms of Reference (ToR).
This is a preliminary report as not all PRBs have completed this exercise (6/8 answers).

KEY POINTS RAISED FROM THE ANSWERS RELATED TO THE TESTING OF THE GUIDANCE DOCUMENT

GENERAL ISSUES

According to the PRBs answers, the GD is well written but there are three important aspects that could be improved:
Even though in the GD is stated that regular interaction with experts from other Working Groups of the CIS had occurred the PRBs felt that cross references and a common approach between GD 2.2 (HMWB, coastal part) and GD 2.3 (REFCOND) is not fully developed.
Concrete examples are needed on:
How to define the limit between transitional and coastal waters?
Which are the best practices?
The GD does not answer in how to establish Reference Conditions

KEY ISSUES.

DEFINING SURFACE WATER BODIES

There are several different responses to this question. The Directive defines coastal waters (Article 2(7)) as "surface water on the landward side of a line, every point of which is at distance of one nautical mile of the seaward side from the nearest point of the baseline from which breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters". This is the Jucar answer based on already national legislation (Decree 627/1976) and Oulujoki using GIS-based data. This is the first step as proposed for the hierarchical approach to the identification of water bodies, but then it is necessary to divide the coastal/transitional waters into types using factors listed in Annex II (System A and B). For example Odense and Pinios have chosen system B. Shannon is also using System B because this typology is largely being derived from a joint UK and Ireland typology for Ecoregion 1.

ASSIGNING COASTAL WATERS WITHIN THE RIVER BASIN DISTRICT

This assignation has been carried out following existing administrative boundaries (Jucar, Oulujoki, Odense, Pinios and Shannon). No problem of cross influence between river basins has been reported yet. However, there is no answer for the case of big watersheds as Guadiana and Scheldt where its influence may extend to boundary river districts.

COASTAL LAGOONS

The question of the ToR concerning the differentiation of lagoons between coastal and transitional has not been answered because there were no lagoons (Oulujoki, Odense or Scheldt) or because its identification has not been completed yet. A clear example is missing and could help other river basins on this issue.

COASTAL AND TRANSTITIONAL WETLANDS

The answers to the question concerning the association between transitional and coastal waters and wetland have been answered in different ways. Some PRBs like Jucar and Odense ensures a high degree of registration of wetlands, due to the national legislation and also because the

wetlands are part of the Nature 2000 Network. Other basin, i.e. Pinios, Shannon and Oulujoki did not answer due to lack of data or not presence of wetlands in the basin.

DEFINING TRANSITIONAL WATERS

Several problems have appeared in this aspect. Pinios and Odense have chosen to define only coastal waters. In the first case due to physiographic features of the river mouth whereas in the Odense because there is no a clear indication in the Guidance for what is meant by "substantially influenced by fresh water flows" in the WFD definition and the special salinity situation in the Baltic Sea. Oulujoki employed a mixture of the first three approaches suggested by the GD: using the boundaries defined under other European and national legislation such as the Urban Waste Water Treatment Directive (method 1), Salinity gradient (method 2) and Physiographic features (method 3). Jucar has still not identified their transitional waters but there is an study being conducted. The modelling method (method 4), was not use by any PRBs. Odense reports some critics to the GD especially in the lack of consistent quantitative approach.

SIZE OF TRANSITIONAL WATERS

The minimum size of transitional waters of 1 km^2 suggested by the GD was considered useless. Shannon report minimum size of 0.1 km^2 and maximum size of 124 km^2. Jucar, Pinios and Oulujoki did not report with quantitative data to this question while Odense did not comment the issue for similar reasons as stated above.

DESCRIPTORS FOR TYPOLOGY/ OPTIONAL DESCRIPTORS.

Oulujoki and Scheldt did use the descriptors in the GD, but the Scheldt PRB did not consider the order as a ranking. Oulujoki introduced several modifications, i.e. 30m depth is high for the definition of shallow waters, they used 20 m instead; salinity 3‰ was used. Odense underlines that they applied the Danish national typologization proposal, which was launched before the GDs were prepared. This national legislation is comparable with the descriptor listed in the GD for system B and, based on this proposal, there are 16 types in Denmark of which 3 occur in Odense PRB. Jucar, Pinios and Shannon did not answer to the question.
No additional descriptors have been used in the PRBs.

REFERENCE CONDITIONS

About the methods used to define reference conditions all the PRBs answer that RC have not been established or that there is a problem with lack of data. Oulujoki could not apply the method a), b/ and c/, i.e. existing undisturbed site or with minor disturbance, historical data and models, therefore they applied the method d) expert judgement.

Odense reported that dynamic as well as empirical modelling has been used based on existing biological (macrophytes) data to establish some sort of reference conditions but further verification is needed since there is no a clear procedure to define RC in coastal waters. Being an agricultural catchment their main pressure is nutrient load on the fjord and hence simulation has been employed to study different nutrient loads on macrophytes biomasses (Ulva sp.). They also plan to use data from similar river basins for other types of biota. i.e. macrobenthos. Furthermore, they explain that the relationships between nutrient load and response in the marine ecosystem is poorly known for several variables, i.e. HAB, fisheries, priority substances, etc.

CLASSIFICATION TOOLS

The question if any of the classification tools suggested in the Annexes were used only Oulujoki and Odense have answered. Odense report that the suggested tools are not applicable to Danish coastal waters, but some might be useful after adaptation to local conditions. Oulujoki has to adapt the methods because of highly different nature in Bothnian Bay.

CLASSIFICATION SCHEMES

There are also problems on combining all the quality elements into a single score. Again only Oulujoki and Odense answered this question. Oulujoki could use only chlorophyll a data whereas Odense stressed the need to keep the concept "one out- all out" since there will be only few variables well documented and measured for many marine ecosystems. They propose to use a running 6-year mean (which coincides with the EU reporting interval) instead of the 5 year running mean they are using in Denmark.

GD 2.6: WATECO

GENERAL ISSUES.

Pilot River Basins have not reported on difficulties in testing that could be linked to the content of the Guidance on Economics itself. The difficulties encountered seem to be more likely related to an overall lack of data or lack of methodology, particularly in the assessment of resource costs and environmental costs. In practice, most of the PRB seem to be at the beginning of their reflection on cost recovery assessment and evaluation of environmental costs.

To fulfil this gap, some further development could be useful for some specific issues. This could be addressed within the two Drafting Groups on Economics under the umbrella of Working Group 2B (Integrated River Basin Management), especially to the drafting group "environmental costs" created under the WFD CIS, which will give a common approach regarding the environmental and resource cost in the future weeks.

All reporting PRBs are currently involved in the data collection on water uses and water services. This data collection is well advanced in some PRBs. However in most PRBs, the analysis has not really begun concerning the repartition of costs between categories of users (cost recovery assessment). The methodologies for trend analysis have been set up or are being set up in most PRBs. For the cost recovery, lack of data on environmental costs and resource is often noticed. For the moment, no work has been done about cost-effectiveness analysis (except in Odense PRB).

KEY ISSUES.

Some specific key issues can be distinguished:

- a lack of data for the description of water services and water uses
- a lack of data for the assessment of environmental and resource costs
- cost recovery assessment
- trend analysis
- scale (for data collection, for analysis)

LACK OF DATA FOR THE DESCRIPTION OF WATER SERVICES AND WATER USES

A list of these water services and water uses are the basis for the cost recovery assessment. In general, PRBs have used the list provided by the WATECO Guidance but they mention problems of data availability.

- Public statistical data have been used (Somes/Szamos and Odense): For the Hungarian part of Somes/Szamos, a huge amount of detailed data has been collected for the characteristics of water services concerning water production, water supply, water demand, wastewater treatment, irrigation water supply, other services (storage, reservoirs). The water uses have been identified and will be characterised with a number of indicators concerning agriculture, industry, gravel and sand extraction from Somes, flood control. For the Romanian part of the Somes/Szamos, general socio-economic indicators have been collected according to Romania Statistic Annual (2001). Also data regarding the water uses and water services like water demand, water supply irrigation, flood protection and other services (storage, reservoirs) was collected from the National Administration "Apele Romane" (Somes Tisa branch) data base which are in charge which such kind of services. A large number of data regarding the water production, waste water treatment, was collected from the Local Councils. The Odense PRB used statistical information from the national Statistic Bureau.
- Existing public statistics need to be complemented: Some specific data provided by other sources are necessary (from water companies in Odense or Somes). Specific models and studies are used in Jucar, Marne or Tevere.
- The description of water uses has been more difficult than the description of main water services: Thus, for Odense, the description of water uses and the assessment of their economic importance has been a difficult task. The main water uses identified are households, industry, public institutions, agriculture and nursery gardens, and leisure and tourist activities. There is in general a few data available, particularly for the agricultural sector, for which the Guidance document does not give suggestions or examples. In general, the water uses issues are less addressed in the Guidance than other issues. A similar difficulty is noticed in Romanian part of Somes particularly when looking at subbasin level. Some other lacks related to hydropower activities and material abstractions as well as some leisure activities such as hunting and fishing were pointed out in Marne.
- Links were made with the IMPRESS activities: The WATECO guidance indicates that internal private costs of services should be taken in the analysis where necessary. In the

Marne process, it was assessed that "where necessary" would apply to services that have a significant impact on water status. As a consequence, this assessment was co-ordinated with the inputs from pressures and impacts. The French part of the Mosel Saar PRB underlines that works on economics and works on pressures are closely co-ordinated.

LACK OF DATA FOR THE ASSESSMENT OF ENVIRONMENTAL AND RESOURCE COSTS

The lack of available information about environmental and resource costs has been outlined by all reporting PRBs. Moreover, Tevere is considering that, at the present stage, cost recovery of environmental and resource costs can be noticed only indirectly.

To fulfil the gaps, PRBs used several types of methodologies for evaluating the environmental and resource costs.

- Simulation models: Jucar used simulation models both for evaluation of resource costs and environmental costs. The Flemish part of the Scheldt will also develop an environmental costs model.
- Expert judgement: For the Somes/Szamos, these costs have been evaluated based on the assessment of experts' panels.
- Economics methods: Marne uses a combination of three methods: current economic transfers from agriculture, industry and households towards environmental protection, assessment of willingness of citizens to pay for a better environment, assessment of costs for restoration (wetlands, river flow, treatment of pollution, etc).

Odense mentions that there is no comprehensive collection of data on environmental expenditure in Denmark because these costs are often integrated into changes in production process. Odense underlines also the lack of methodology to take into account subsidies and incentives to agriculture and the lack of suggestions / examples of the Guidance Document in this field.

COST RECOVERY ASSESSMENT.

Pilot River Basins gave only few informations about the methodology they used for cost recovery assessment. It seems that most of them did not conduct these works to the end.

The work which has been done by the Somes/Szamos PRB (shared by Hungary and Rumania) should be especially underlined. Data for year 2000 have been investigated and collected for a number of indicators. But cross-subsidy between the different economic sectors (agriculture,

industry and households) could not be defined. In particular, an interesting work concerning data on efficiency of water bills collection has been conducted with Water Companies.
Some PRBs (Mosel-Saar, Odense) are considering that annex IV- 1 of the guidance document is an excellent tool for calculating cost-recovery.

TREND ANALYSIS

For the Mosel Saar PRB, Rheinland Pfalz has not begun with the trend analysis. The French part will base its analysis upon past tendencies so to be able to forecast as much as possible the future tendencies. The list of indicators is not definitive but these indicators will concern the evolution of population, agriculture and industry. The Land of Saar will study the same indicators plus the environmental evolution and underlines that these evolutions will be quite unprecise due to uncertainty about climate change, technological improvements, globalisation and therefore the impacts about the resource and water demand cannot be forecast.
For the Jucar it is not foreseen to conduct a trend analysis since this issue is not a competence of water administration but of the Ministry of Economics and its Departments in Autonomous Regions to which information will be requested.
The Somes/Szamos PRB is defining the methodology for the trend analysis. For the Hungarian part, an expert panel was established to identify the drivers. A qualitative description will be given for each driver in co-operation with the Romanian part. The Romanian part has evaluated the importance of the economic increase and the corresponding evolution of water demand and the necessary investments in water sector to meet the requirements of the European Directives. Also data regarding the water uses and water services like water demand, water supply irrigation, flood protection and other services (storage, reservoirs) was collected from the National Administration "Apele Romane" (Somes Tisa branch) data base which are in charge which such kind of services. A large number of data regarding the water production, waste water treatment, was collected from the Local Councils. They have then taken into account the regional developments tendencies in the main economical sectors but they face a high uncertainty with regard to the consequences of the restructuring process of economy to the market conditions that make more difficult policy projections.
Odense used the list of potential drivers provided by WATECO guidance and considers it is as a good checklist. The business as usual scenario was developed based on the statistical forecasts of population growth, the current water consumption level for each sector, the evolution of price

elasticity and income elasticity, in order to have a forecast of the total consumption level. Losses in the pipes and unaccounted for water were also taken into account.

Marne has organised three meetings dealing with future studies to identify driving forces. Studies and forum were also conducted to determine the evolution of point source and non point source of pollution as well as the impacts on ecosystem.

After a first general analysis related to the characterisation of different water uses, Tevere is focusing on the geographical areas dealing with actual or future scarcity of water resources.

SCALE

- Scale for data collection: The scale at which data are available (or not) is an important issue. The Jucar reports that lots of data needed are not known at the level of the river basin and must be requested to other levels. For the Romanian part of Somes/Szamos, data about costs are available at the level of the entire Water Division and Water Management Systems and most of data concerning socio economic indicators are available only at administrative level (county). For water user characteristics, data are mainly available at district level and there is a lack of data at sub-basin level. Economic data are often available at an administrative level when technical data (pressures and impacts) can be collected at district level.
- Scale for analysis: Jucar considered two scale for analysis (Jucar and each one of the Agriculture and Urban Units) and will compare the results after aggregation. Somes/Szamos (both parts) succeeded in restructuring the available information according to hydrological boundaries and this provides high quality information but is very costly and time consuming. This was done using the publicly available statistical information and calculation of weight averages in proportion of number of population or geographical territory. For Odense, reporting on economic analysis and trend scenario were made at the Odense River Basin level but lower spatial scales have been investigated during the collection of data (municipal level) and have been aggregated at the Odense RB level. In the Mosel Saar PRB, the data were also collected at the lowest level possible (municipality) in order to use them at the level of the management unit / water body. The Marne PRB used mainly the district level but used the sub-basin level for the establishment of the baseline scenario. For the Scheldt, the economic analysis is assessed at the scale of river basin district and when possible some information can be provided at the sub-basin or regional level. It is underlined that it would be really useful to have an assessment at the level of some water bodies but this is not

possible on account of cost or data confidentiality. Tevere will provide an overall analysis for the entire basin; studies in depth will be focused on geographical areas for which a critical state of water resource (scarcity) will be assessed.

GD 2.8 TOOLS ON ASSESMENT AND CLASSIFICATION OF GW

GENERAL ISSUES

Guidance document related to the assessment and classification of groundwater is focusing on the statistical methods and procedure to be undertaken in order to assess pollution trends and aggregate monitoring results.

This procedure was tested in the seven following PRBs:

- Denmark (Odense)
- Finland (Oulujoki)
- Spain (Júcar)
- Marne (France)
- Pinios (Greece)
- Tevere (Italy)
- Shannon (Ireland)

KEY ISSUES FOR THE TESTING OF "TOOLS ON ASSESSMENT AND CLASSIFICATION OF GROUNDWATER"

The following key issues have been identified by the PRBs that responded to the questionnaire:

UNDERSTANDING OF THE TOOLS

- At this stage, the statistical methods proposed in the technical report of the WG 2.8 are not tested (Oulujoki PRB), being considered too complicated and difficult to use.
- The groundwater directive orientations are considered to be generally understandable (Odense PRB), although it would benefit from more illustrative examples. The choice of the arithmetic mean rather than the median has been questioned.
- The accompanying software GwStat is difficult to use with respect to converting data from other tools (e.g. Excel95) for calculating the representativity index and status, and other tools were used e.g. by the Odense PRB (MapInfo and Excel). GwStat could be used for studying trends.

- Marne and Pinios PRBs consider the description of tools in the guidance document is understandable even if in Marne some language problems appeared.
- In Shannon PRB, the applicability of those tools is rather limited due to specific geophysical conditions.

SPATIAL REPRESENTATIVITY OF MONITORING SITES

- Efforts for upgrading the groundwater level network in theJúcar PRB will enable to improve the assessment of the quantitative status of groundwater bodies, which represent one of the key issues of groundwater management within the WFD. This involves the establishment of new piezometers (measurement stations) and the full use of historical data.
- Waterworks in the Oulujoki PRB are focusing on monitoring groundwater quality especially in areas without any risk activities. Monitoring in the PRB will hence focus on two waterworks and one national monitoring station.
- The Odense PRB monitoring network will not be able to fulfil the requirements of the technical report of WG 2.8 with respect to the reprentativity index (0.56 in comparison to 0.80 required under the WG 2.8 report). Shannon PRB points on many gaps to fulfil all the requirements. Marne PRB focus on the difficulty to ensure a spatial representation for each groundwater body.
- Pinos PRB considers they have no problems with the guidance document proposed procedure.
- Tevere PRB is checking if the specific criteria used to define the networks will ensure consistency with recommended procedure.

QUALITY DATA

- The monitoring of groundwater in the Oulujoki PRB (areas with low risks of pressures) is not adequate for a proper assessment of groundwater chemical status.
- On the basis of the status description of the individual groundwater bodies, data availability and coverage are considered appropriate in the Odense PRB for the description of groundwater status, which is not the conclusion reached when using the representativity index for each groundwater body. This is due to the placement of some boreholes which does not represent an ideal monitoring network. The removal of some wells would enable to

comply with the requirement of a representativity index of 0.8 at the expense, however, of a far lower data coverage.

- The use of the quantification limit (LOQ) as stipulated in the GWD proposal may represent a difficulty for historical data for which it was not reported (instead a value of 0 was given).
- Marne, Pinios and Tevere PRBs are considering that available data can meet the minimum requirement of the tool whereas Shannon PRB is still examining data in the context of pressures and impact assessment.

TIME SERIES

- Monitoring by waterworks in the Oulujoki PRB would allow establishing trends for parameters such as nitrates, chloride, ammonia and conductivity but not for other parameters.
- In the Odense PRB, insufficient data collection would hamper a clear identification of trends. The GWD proposal does not describe how to deal with fragmented or temporally limited time series. The only attempt of trend study could focus on nitrates and chloride.
- Another problem noted in the Odense PRB is linked to the use of an average for the whole groundwater body and not to look for time series at individual locations. This aspect will be further discussed in the light of the negotiation process of the Commission proposal of groundwater directive.
- Marne, Shannon and Tevere PRBs are considering it is rather difficult to clearly assess the various trends whereas Pinios PRB is more optimistic even if this issue is still under consideration.

GD 2.9 PUBLIC PARTICIPATION

GENERAL ISSUES.

1. On the one hand PRBs that seem to judge the PRB-exercise too early for stakeholder and public involvement, on the other hand PRBs that started the active involvement at a very early stage in a satisfying way. No clear explanation for the reasons to take the first or second position. Yet, the more hesitant attitude towards public participation seems to be dominant (only 2 of the 9 PRBs testing the PP guidance started early in the beginning with involvement).
2. The little 'real' experiences with participation make it difficult to draw firm conclusions from the pilots. PRB exercise gives some examples to lean on.
3. A thorough stakeholder analysis at the beginning of the process is helpful, together with an analysis of their positions (in this process the stakeholders optimally are involved). It helps in managing the expectations, but at the same time plans might be adjusted at a very early (and therefore easy to perform) stage (e.g. Ribble changed from virtual to 'real' testing after comments from stakeholders).
4. At this stage, PRBs feel little need to involve the 'general public'. Stakeholders are the first priority.
5. Stakeholders are involved through direct contact, or via intermediates like a 'stakeholder forum'.
6. The expectations of stakeholders towards the implementation of the WFD can be high. Some PRBs make the formal margins in which they operate very clear from the beginning.
7. What's the use of the Internet? On the one hand, PRBs see it as 'involving the public', on the other hand, PRBs realise that it's a 'public place', but no guarantee that the public will find or use it.
8. No PRB seems to have developed a method of giving access to background documents.

KEY ISSUES

SCALE ISSUES; PP APPLIED AT WHICH SCALE?

Stakeholder analysis; how to guarantee that no stakeholders are missed?

- Stakeholder analysis performed by the project team/competent authority
- District and basin level analyses were undertaken. For this approximately 50 regional and local external and Agency partners have been put together in a group called the Stakeholder Forum. They have undertaken an exercise to put in priority order the stakeholders that need to be involved (stakeholders themselves determine whether parties are missing)

What techniques were used to contact the stakeholders? (direct contact via a stakeholder board)

- Directly addressed to stakeholders, in combination with attention in regional media (Oulujoki)
- Fyn County has established a homepage for the Odense Pilot River Basin through which members of the public can learn about the progress and nature of the project. The homepage address is: http://prb.fyns-amt.dk From the homepage it can be seen, for example, that two advisory boards were established in spring 2003 – a National Scientific Advisory Board and a Regional Political Advisory Board. These two boards have different aims, but among other things shall help ensure that public in-terests are incorporated in the coming management plan for the Odense River Basin.

What techniques were especially useful (at which scale?)

- Internet
- Bilateral meetings, workshops of approx 12-15 people and presentations at larger gatherings

How to organise the comments between the different scales?

- No comments

GENERAL PUBLIC; HOW INVOLVED WITH WHAT EFFECT?

- Website
- Not yet developed; only for raising awareness of the WFD
- Lack of willingness of the public to participate, and no history in PP within the country
- Too early in the process to analyse the effects
- Public not involved. Our Stakeholder Forum is happy that the public is too wide a group to be involved in everything – yet.

MANAGEMENT OF EXPECTATIONS

- The role of stakeholders is regulated by legislation.
- A broad public has huge expectations on implementation of WFD. In order to prevent disappointments the participants have been informed of their role, of the content and meaning of WFD and of the frame in which changes in practices at local level can be waited.
- The regulation of the International Commission of the Scheldt determines that representatives of NGO's can be involved as observers. This involves that NGO's can make suggestions but that they can't vote nor make decisions. Expectations are managed as follows
    1. The Communications Plan sets out the role of the directive and the project.
    2. Expectations form a major risk in or project. The risk register is reviewed monthly and actions to reduce them are actively pursued.
    3. Work wil be done to develop with priority regional and local stakeholders (governmental and NGO) a basin "vision" describing what they wish to see happen in the basin. This will be used to align as far as possible these aspirations with the directive and to manage expectations of what can and cannot be delivered.

TIMING

Two opinions seem to be predominant:

- Once the scale of the process has been finally established (now it is only temporarily) the process designed will provide all the appropriate information on the implementation to the stakeholders with the maximum possible anticipation.
- In order to improve social learning and create co-operation networks, every party should be involved in the beginning of the process. Local actors at local level, regional actors at regional level etc. Parties that are needed in the successful implementation of WFD must be involved in the beginning of the planning process.
- In general: in the beginning of the project only the directly involved public (administrations, NGO's) a determined group, once the project is developing informing a broader public.
- The visioning work with the priority stakeholders (see above 2.9-5) is good at this early stage. We need to manage expectations right from the start. Later, when we start planning individual actions, participation will be more focussed around what can be done and who needs to pay.

MANAGEMENT OF COMMENTS

- Collecting comments by feedback forms, by writing down the comments and suggestions given in face-to- face meetings or by phone. Number of responses in two local meetings: over 40 feedback forms and several face-to-face comments; in addition: dozens of comments in information meetings, in seminars, in expert meetings, in project team, by phone etc. No systematic approach for giving feed-back on the comments has been established but responses have been taken into account e.g. by arranging meetings which have been wanted
- We have set up a web site for the project and an email address. This is carefully managed. We have regular team meetings to ensure key messages are fed back in to the project.

INFORMATION SUPPLY

- No PRB understood this as 'access to background documents'.

EVALUATION

- Not developed yet

KEYS TO SUCCESS

We hope that early engagement, especially of NGOs is very important. Many of these groups have specific issues they want addressed. If you wait too long in the implementation before engaging them then you run the risk that they will object to what you are doing. It is far easier to build a positive relationship with stakeholders with time and when they understand the constraints you are working within.

ANNNE II: CASE STUDIES

ANNEX II is a collection of the case studies proposed by the PRBs to illustrate the procedure and the work carried out during the testing of the article 5 related GDs.

SCHELDT:

A) PRESSURES AND IMPACT ANALYSIS

Within the Scheldt IRBD, the pressures and impact analysis, as well as the economic analysis is based on following driving forces:

- Households
- Industry
- Agriculture, horticulture and forestry
- Fishery and aquaculture
- Tourism and recreation
- Transport
- Natural land use

These driving forces are linked to NACE-codes for both the pressures and impact analysis and the economic analysis. In this way, data on pressures can be more easily linked to economic data. Following table gives an overview of the NACE-codes considered per driving force.

	Sectors considered within Scheldt	NACE-codes
Agriculture	Agriculture, horticulture, forestry and fishery	01+02+05

Industry	Agro-food industry	15+16
	Textile	17+18+19
	Paper & cardboard, wood & furniture	20+21+22+36
	Chemistry	23,2+24+25
	Materials	10+11+12+13+14+23,1+23,3+26 +37,2+45
	Metallurgy	27+28+29+30+31+32+33+34+35 +37,1+50
	Energy	40
Households	Commerce & services	51+52+55+60+61+62+63+64+65 +66+67+70+71+72+73+74+75+8 0+85+91+92+93+95+96+97+99
	Public utilities	41+90

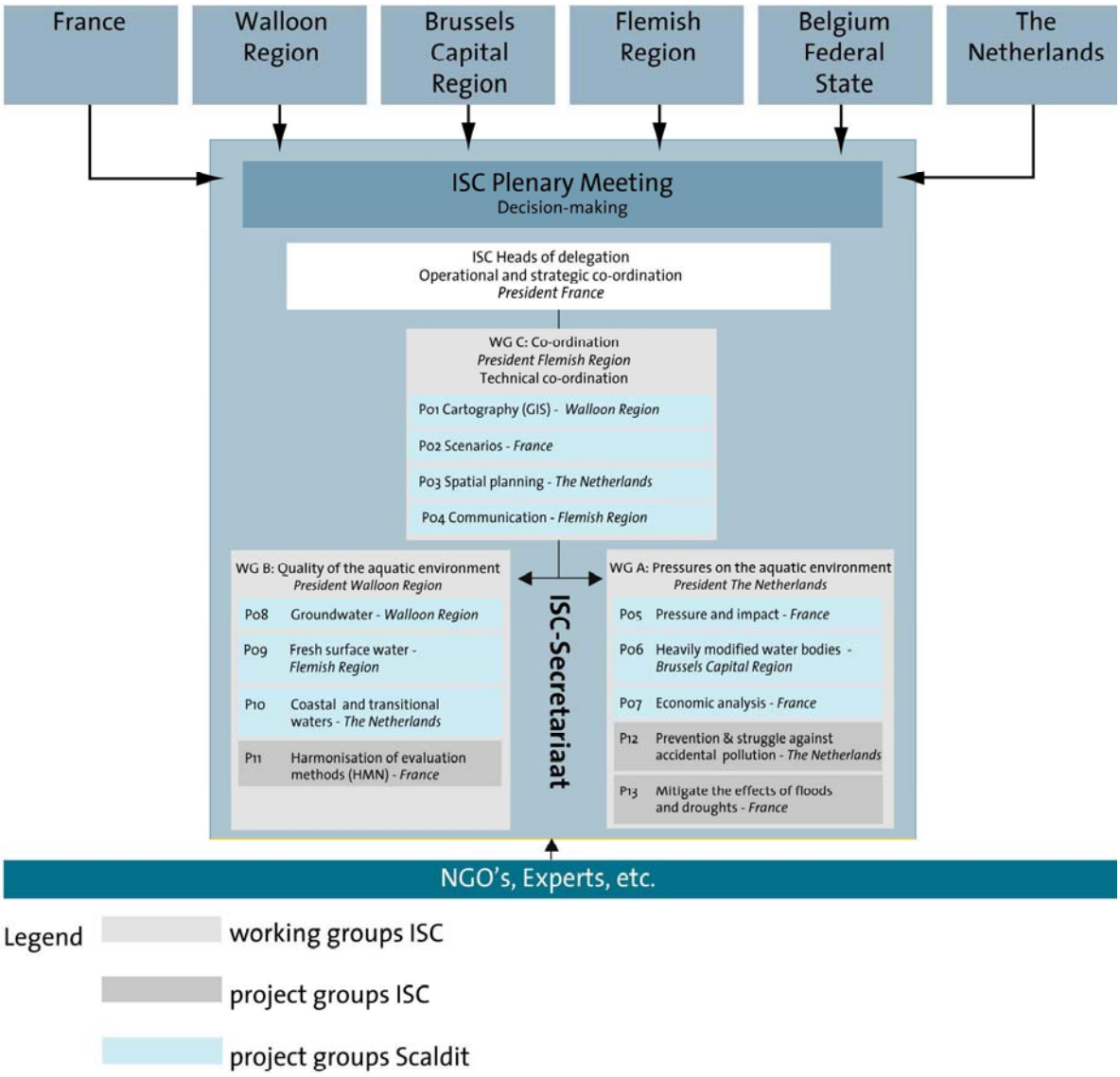
B) PRESSURES AND WATERBODIES

When carrying out the pressures and impact analysis on the scale of an entire river basin district, the waterbody level turned out to be not the appropriate level for the presentation of driving forces and pressures, due to differences between the partners with regard to data availability and to the level of detail of the data. Therefore, the partners decided to present the data on driving forces and pressures on the sub-basin scale.

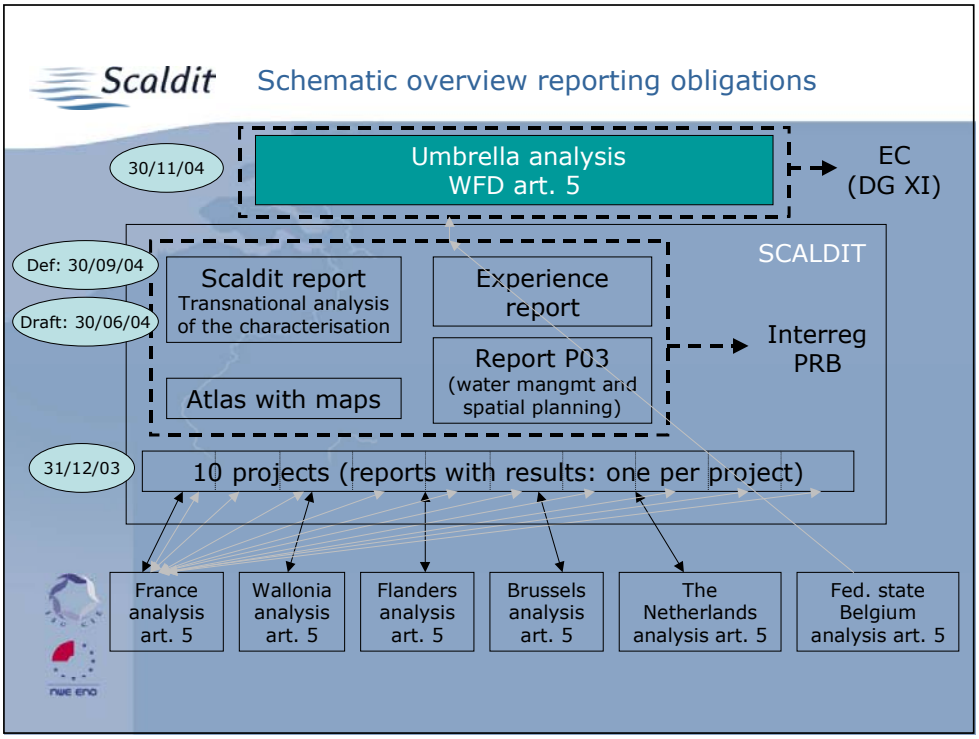
However, the information is gathered on a waterbody scale (or, if this is not possible, on the most appropriate scale) by each partner. Then this information is aggregated on a sub-basin scale for the purpose of the transnational characterization and analysis.

C) TRANSNATIONAL CO-ORDINATION.

Scaldit - name made up of Scaldis, latin name for Scheldt and Integrated Testing- is an Interreg III B North- West Europe project that is contributing in the PRBs Network by testing the feasibility of the GDs developed in the CIS. Due to its transboundary nature it poses quite a task as the political and administrative cultures of the riparian states differ greatly and operate on different levels (central, regional, provincial, local). Furthermore, different monitoring and evaluation systems for determining the status of water exists in the area as a whole and hence, the need for a harmonisation strategy is essential. For these reasons, the project has been embedded in the International Scheldt Commission. However, this embedding complicates considerably the taking of decisions within the framework of the Scheldt project and slows down the progress of the project, but the advantage of the political basis that is created in this way for all decisions taken and results achieved within the context of the project may not be underestimated.



The organisation chart of the International Scheldt Commission.



The different reports that will be produced within the context of the Scheldt project and how they are related to each other.

ODENSE:

The Odense Fjord PRB-study includes (a.o):

- Estimates of reference water quality in streams, reference nutrient loading to - and nutrient concentrations in - the Odense Fjord
- Agricultural Pressure and Impact on diffuse nitrogen loading to streams
- Assessment of the risk of failing to achieve good ecological quality in the Odense Fjord by 2015

[*the case studies were provided by:* **Jørgen Windolf, Mikael Hjorth Jensen and Harley Bundgaard Madsen** - Fyn County –Denmark]

A) REFERENCE CONDITION

The quantitative definition of reference environmental quality is a key issue in the WFD implementation process. However, no quantification tools are provided in the WFD-guidance's. In the preliminary Art. 5 report for the Odense River Basin (ORB) several approaches have been used including

- sparsely historical information

- distribution of eelgrass, palaeolimnological data from lakes, abundance of wetlands 100 years ago…
- simple as well as complex models
- linking pressure/impact variables with ecological indicators
- information of water quality and ecological status in areas with no major antropogenic impact

Reference nutrient concentrations in streams are very important to estimate in order subsequently to evaluate the reference nutrient load to – and hence the reference nutrient status of – lakes, fjords and coastal marine waters.

Monitoring results from Danish streams draining catchments with no agricultural activity and no outlets of sewage can be used to assess the Reference nutrient load from Odense River Basin (ORB) to the Odense Fjord, (Tabel 1). However monitoring results from these Danish streams has to be corrected to represent reference values on nutrient concentration and loadings in streams , because the ecological/chemical status of these streams is still anthropogenic affected by airborne pollutants ex. ammonia from agricultural activities. Figures in Table 1 on reference nutrient loadings and concentrations in streams are tentatively corrected taking into account the impact of airborne pollutants, where the upper range values represent the uncorrected values.

Tabel 1. Estimated reference nutrient loading and concentrations in streams draining the Odense River Basin

	Transport per ha ORB	Concentrations In watercourses	Riverine load To Odense Fjord
	Kg/ha y	Mg/l	Tones/y
Total N	2.5-5	0.7-1.5	250-500
Total P	0.08-0.17	0.022-0.050	8-17

The range in Table 1 representing the estimate of the reference concentrations and nutrient loadings indicates uncertainty. In example phosphorus concentrations (Table 1) might in some cases even be higher than stated in the Table by receiving waters rich in phosphorus from old marine deposits in the catchments. In such cases reference concentrations might be as high as 0.15-0.20 mg P/l. However, such high concentrations is rare and does not reflect the general reference concentrations in most streams.

Major experience gained:

More scientifically sound information of reference nutrient concentrations and loading in streams including the natural spatial variation due to difference in hydrological cycle and geomorphology is needed based on cross border investigations/collection of data from undisturbed areas within ecoregions ie the Baltic sea area .

B) AGRICULTURAL PRESSURE AND IMPACT

The major source of nitrogen in streams and hence the major source for the nitrogen loading of Odense Fjord is nitrogen leaching from agricultural areas. There is a strong correlation between the quantity of nitrogen flowing in streams and the amount of fertilizer used in the catchments. This can be demonstrated by relating the measured nitrogen concentrations in different streams in the region to the total amount of nitrogen applied in the specific catchments (manure + artificial fertilizer), Figure 1.

This pressure/impact analyze has also included the use of a simple, empirical nitrogen leaching model, (GIS). These modeled results are shown in the figure as well.

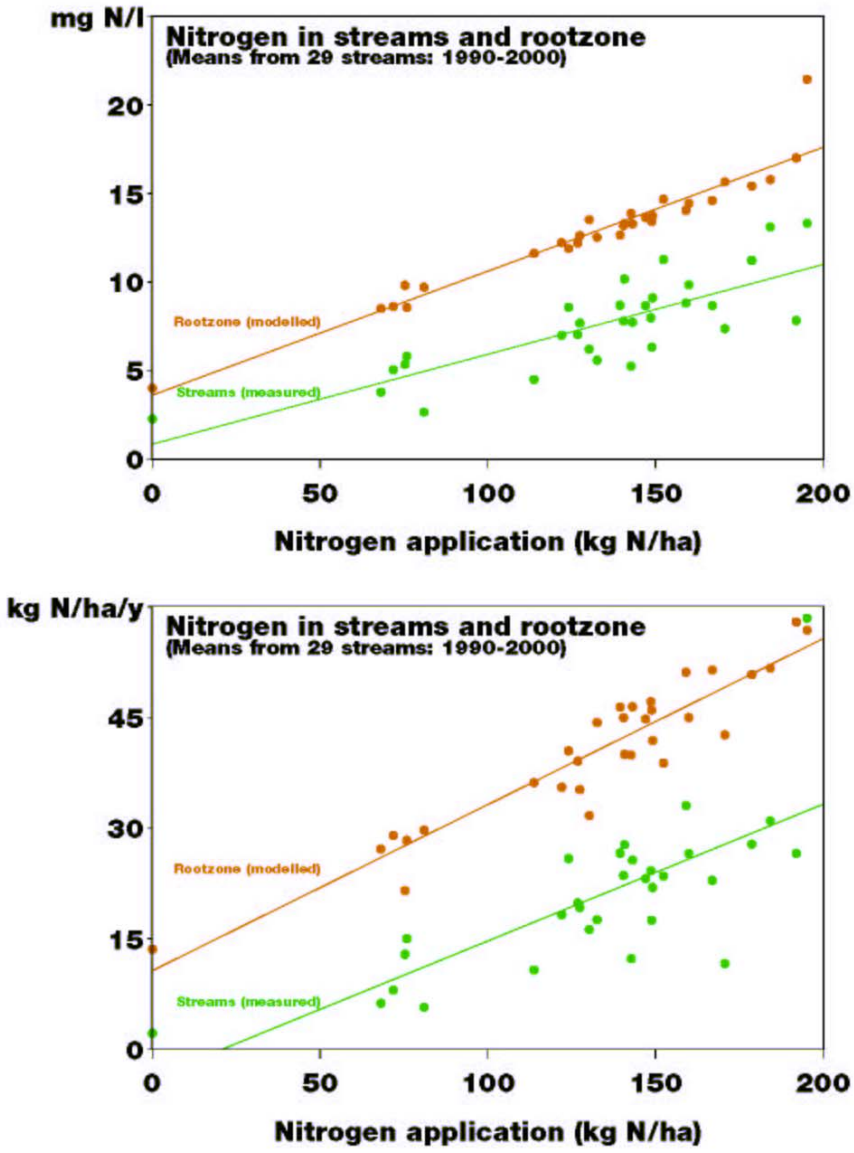


Figure 1. Relations between Nitrogen application (manure + art. fertilizer) in different catchments and measured nitrogen concentrations in these streams. Modeled mean catchment specific nitrogen concentrations in root zone (1 m) are shown as well.

Major experience gained:

The models used so far demonstrate the overall impact of the pressure from agriculture (Nitrogen). However, in the management plans, which have to be developed in the coming implementation steps of the WFD, it will be necessary to develop more complex models enabling proper scenario analyses of different agricultural farming practices to combat diffuse nitrogen pollution.

C) RISK ASSESSMENT.

The WFD Art. 5 report shall include an assessment of the risk of not achieving good ecological quality in the different water bodies by the year 2015.

In the Odense PRB report such risks have been preliminary evaluated. For the Odense Fjord it has been demonstrated that an improvement in the ecological quality of the fjord will imply a reduction in the nutrient loading of the fjord. This evaluation is based on the results of the comprehensive eutrophication model for the fjord using different external nutrient loadings as driving variables (scenarios). Examples of the relation between nitrogen loading and model derived quality in the fjord are shown in Figure 2 (upper), using amount of macro-algae as an indicator for ecological quality. However, neither in the WFD nor in the Guidance documents specific quantitative definition of good ecological quality is included. In Figure 2 good ecological quality has been indicated using reference state + 50% as a preliminary definition.

Furthermore it is shown in Figure 2 (lower) that the annual measured concentrations of total Nitrogen in surface waters in the fjord are correlated to the measured annual Nitrogen loading to the fjord. The measured concentrations are lesser in the outer part of the fjord than in the inner part due to exchange of more nutrient poor sea-water.

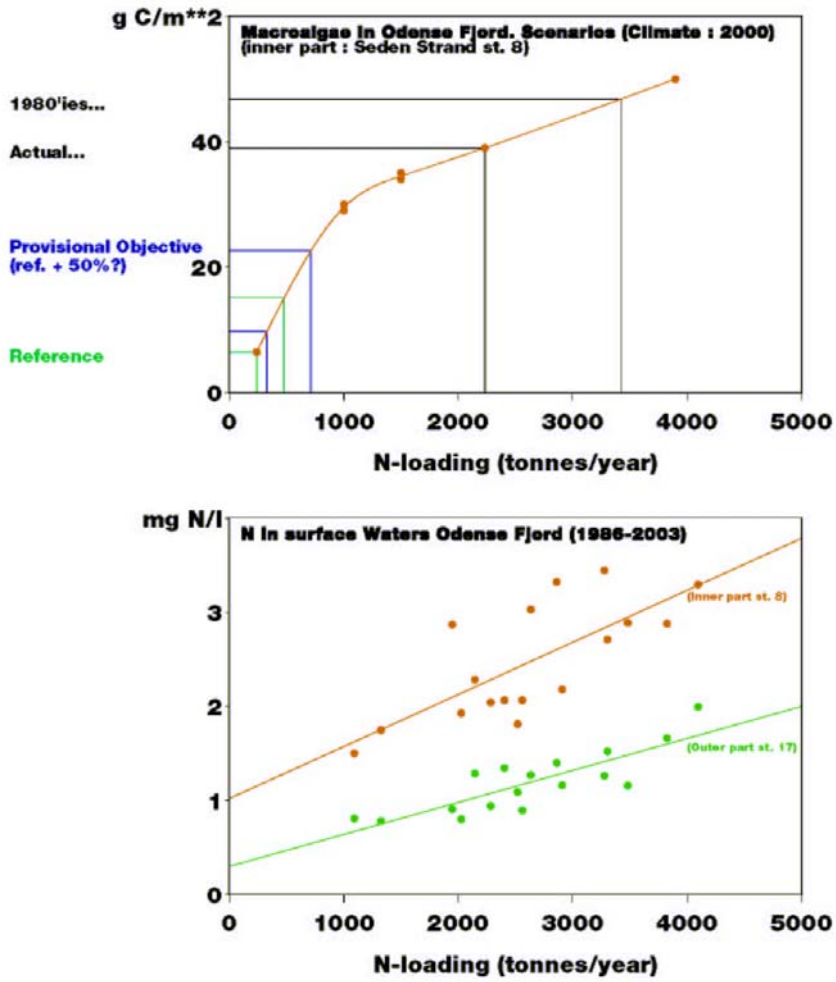


Figure 2. Relations between different external nutrient loading (scenarios) and modelled abundance of macro-algae (upper) and relations between annual measured nitrogen loading and measured nitrogen concentration (Total N) in surface waters at two monitoring stations in Odense fjord (lower).

Major experience gained (a.o):

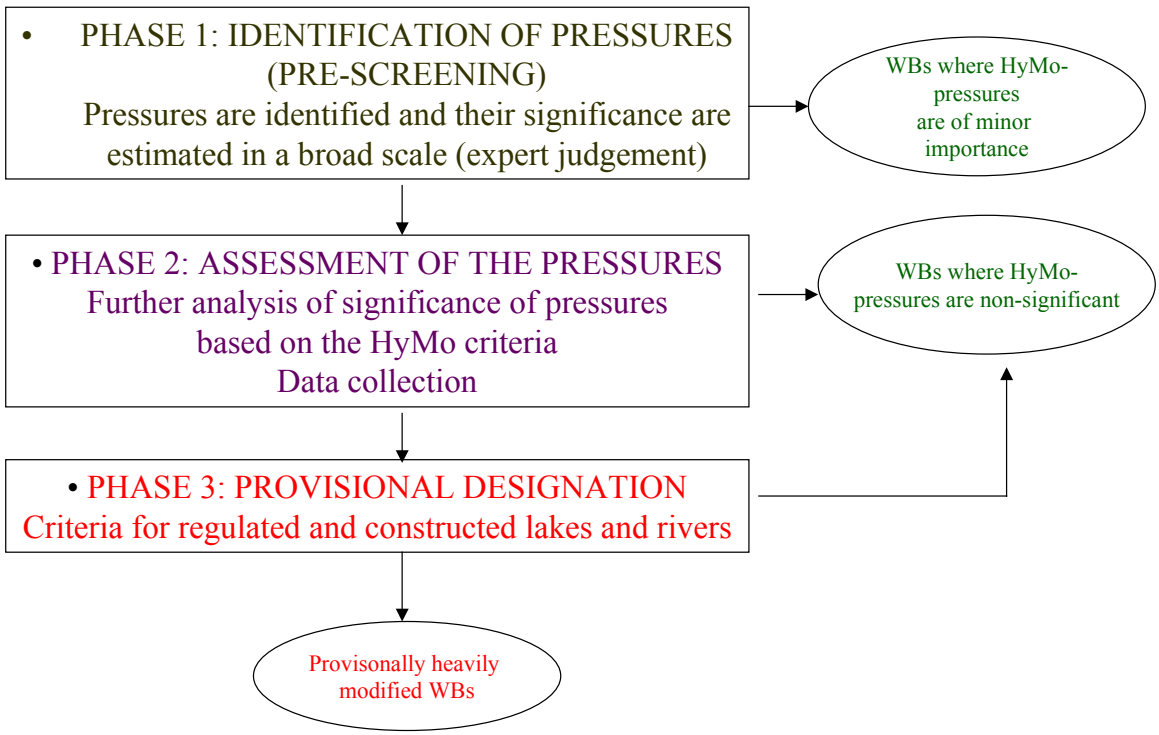
The WFD Basic Analyse (form and content) is a very good platform for the following making of Water Management Plan's including the public involvement and experience of potential areas of conflicts..

- Quantitative definition of the 'Good Ecological Quality' is lacking both at European and national scale as well.
- The WFD Basic Analyse (form and content) is a very good platform for the following making of Water Management Plan's including the public involvement and experience of potential areas of conflicts.
- More simple models linking ecological quality in near coastal waters and fjords and the pressure variables have to be developed.

OULUJOKI:

PROVISIONAL DESIGNATION OF HEAVILY MODIFIED WATER BODIES AT OULUJOKI PILOT RIVER BASIN.

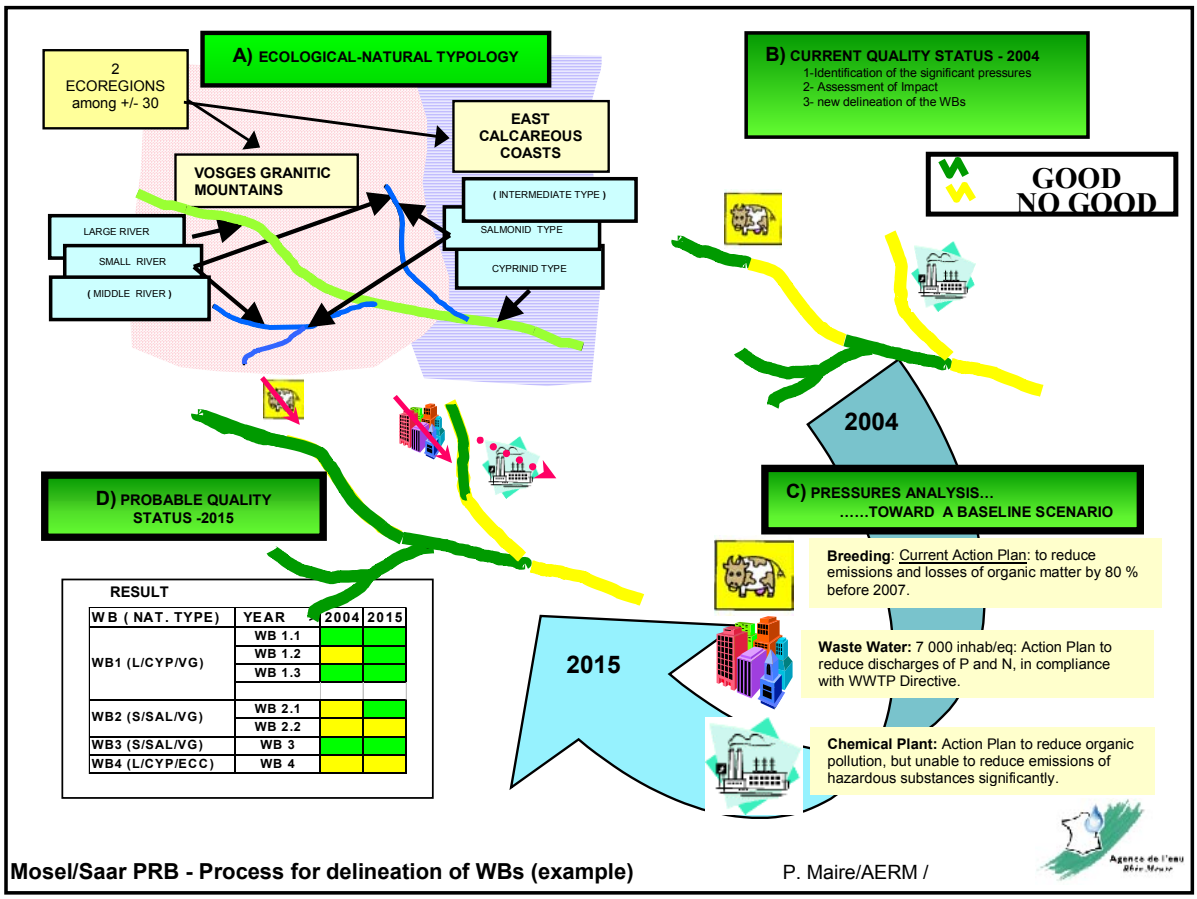
Hydro power production plays an important role in Fennoscandinavian water systems. Following three phase approach was developed at Oulujoki PRB. It follows the principles of HMWB guidance and takes into account a scarcity of relevant biological data. Based on this scheme main river branches were provisionally designated as heavily modified, whereas in most of regulated lakes and in smaller rivers hydromorphological pressures were non-significant.



MOSEL-SAAR:

PROCESS FOR DELINEATION OF WBS:

The icon drawn from different views of a presentation shows, on the basis of a theoretical situation, the different steps to delineate the river Water bodies according to the natural criteria and the risk to reach or not the good status by 2015.



Mosel/Saar PRB - Process for delineation of WBs (example) P. Maire/AERM /

MARNE:

A) PUBLIC PARTICIPATION:

Following the publication of the CIS guidance on public participation, the French mirror group wrote a national guidance to adjust the methodology to the French water management context.

The Marne river basin is about 12 000 km2. The population of the basin amounts to 2.8 Millions of inhabitants. At Marne basin level, works of WFD implementation integrate 3 levels of public participation as shown below and many different tools. The main organisation involved in public participation is the water parliament of about 40 permanent members and 160-200 invited members from different sectors (1/3 local authorities, 1/3 users, consumers, NGOs and 1/3 of representatives of State).

The three steps of public participation are gradually implemented from the elaboration (as soon as 2001) to public information (2004) and consultation (2005). The different actions are presented below, as well as the time table.

	Action	Means	Reached people	Results	Main difficulties
Elaboration	Elaboration of RBD characterization	Web Site Lots of meetings	Experts	Second draft in 11/2003	No NGO involved.
Participation and active consultation	Consultation of local state offices	Web Site Meetings	All state offices (20)	Shared vision of the basin characterization.	Very difficult to share the WFD vocabulary (technical documents to support consultation)
	Consultation of interested parties	parliament of water (2/year) Questionaires	250 people	Very good attendance Good sharing of information	Necessity of short documents. Too many people for debate.
Information	Focus group	Meeting	12 people	Sample of broad public consultation	Not representative of the whole population
	WFD on the Internet	Web Site	Broad public	On going	Need synthesis
	Consultation of local authorities	Mail Web Site	Local authorities	Implement progressively the WFD at local level	Manage numerous answers
	Public consultation	To be defined	Broad public	To be done	

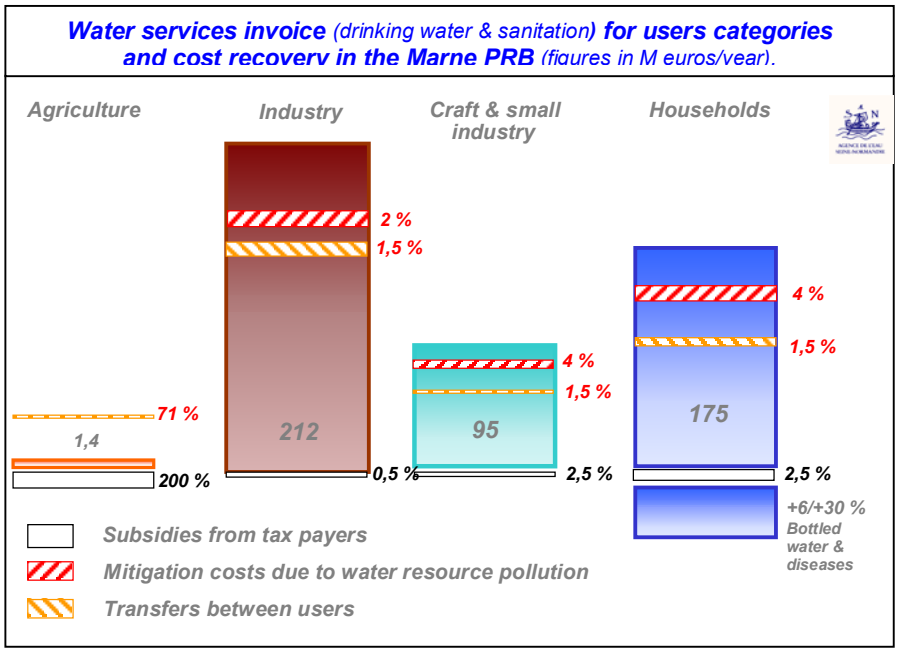
B) COST RECOVERY:

Overview of the users:

The invoice: water & sanitation invoice paid yearly amounts to 175 M € for households, 95 M € for Craft and small industries connected to domestic water supply and sanitation systems, 212 M € for industries (including their own water supply & sanitation system) and 1.4 M € for agriculture (considering irrigation systems and breeding effluent management systems).

The Wateco guidance underlines that three kinds of economic transfers may lower the cost recovery rate. Moreover these macro-economic costs have to be calculated at the basin level (or sub basin). We implemented these recommendations at Marne basin level as follow :

Source of non cost recovery	IMPLEMENTATION
Direct transfers	*Subsidies from the tax payer* Tax payers subsidise the water invoice from 0,5 to 2,5% for households, "craft & small industry" and industry, and for 200% for agriculture. Nevertheless the amount is quite low for agriculture (Cf diagram). *Transfers between users* These transfers are mainly due to the attribution of subsidies by the Water Agency (balance between contributions and aid received). Net transfers originate from households and "craft & small industry" (1,5% of their water invoice) towards industry and agriculture for 1,5% and 71% of the cost of their water use.
Mitigation costs	These additional treatment costs include nitrogen & pesticides specific treatment costs, new uptakes because of pollution. According to our calculation, these costs represent 2 to 4% of the water services costs. We can add the cost of bottled water and the cost of diseases deriving from water (estimation through the cost of sick leave…) which represent from 6 to 30% of the water invoice.
Environmental costs	Current expenditure in favour of the environment (do not include sanitation) : 4 M € per year Willingness to pay : 80 M € Cost to avoid nearly all pollution : on going



Conclusions:

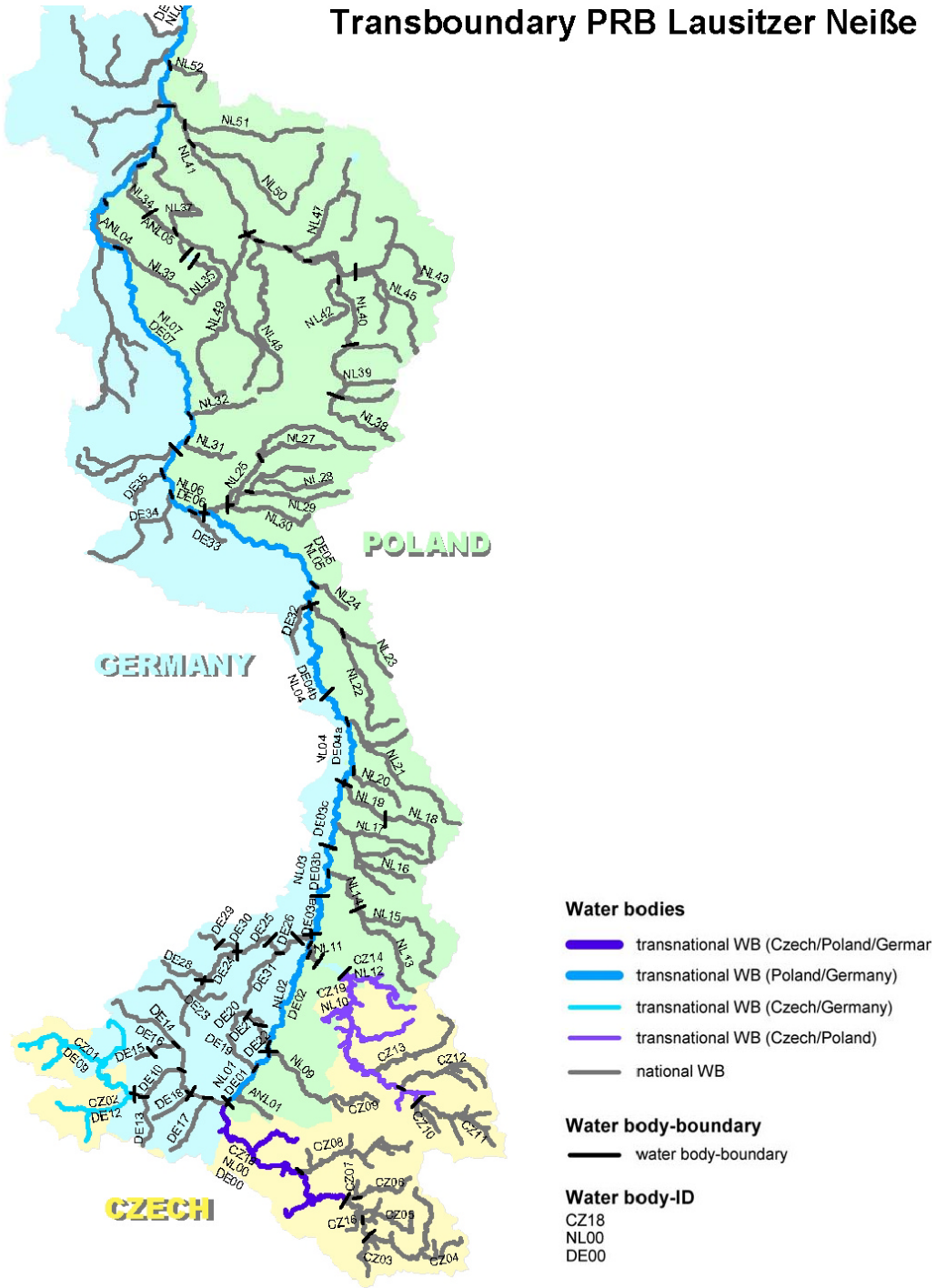
On this basis, the comprehensive cost recovery rate arises to 90% on average in the Marne basin putting aside environmental costs. The weight of environmental costs may reduce the cost recovery rate.

NEISSE:

TRANSBOUNDARY WATER BODIES:

The implementation of the WFD in transboundary catchments has to be coordinated between the countries involved. In the Neisse basin three different national approaches on water body delineation already existed and, therefore, starting with a common approach was not feasible. The implemented strategy was to merge the three national sub-basins with delineating transboundary water bodies by expert judgement (i.e. no common method, but common, comparable results). In general when a river stretch was delineated to water bodies in different national ways, the larger scale was accepted as water body with national subdivision into "sub-water bodies". For the risk assessment also the national results basing on different methods were merged. In transboundary water bodies with different national risk assessment results, the final

judgement was done by expert judgement in a trilateral discussion. No general strategy to deal with these different results was developed.



SHANNON:

MANAGING GROUNDWATER BODIES IN THE SHANNON PILOT RIVER BASIN FOR THE WATER FRAMEWORK DIRECTIVE

Introduction:

The Shannon Pilot River Basin (PRB) is the largest river basin in Ireland draining a land area of some 18,000 km^2 in central Ireland. It includes part of 18 local authorities in the Republic of Ireland and has a small transboundary component of approximately 6 km^2 in County Fermanagh, Northern Ireland.

Carboniferous rocks dominate the bedrock geology of the Shannon PRB. Of these, highly karstified pure bedded limestones predominate in the upper reaches of the basin. Groundwater flow in these rocks is dominated by conduit flow. In contrast, in most of the rest of the basin, groundwater flows through fissures and faults in relatively low transmissivity aquifers. In the west, on either side of the Shannon estuary, bedded shales and sandstones of Namurian age dominate. Between the upper & lower reaches of the basin, unbedded pure limestones and impure limestones are folded around cores of older rocks.

Agriculture is the principal activity in the River Basin (73% of total area); the dominant land use being pasture. There are some significant areas of wetland (12%), mainly peatland. The catchment is not notably industrialised and agri-industries, such as milk and meat processing are the most prominent.

Groundwater Body Delineation:

The Geological Survey of Ireland (GSI) has carried out the delineation of groundwater bodies in Ireland, including the Shannon PRB. The delineation process involved several stages.

Mapped rock units were assigned an aquifer class based on the existing GSI aquifer classification system. These aquifer classes were then grouped into four aquifer types based on groundwater flow regime, i.e. Karst aquifers, Gravel aquifers, Productive fissured bedrock aquifers and Poorly productive bedrock aquifers.

Preliminary groundwater bodies were then delineated using no-flow geological boundaries, as well as boundaries based on groundwater highs, differing flows and flow lines. Final delineation incorporated major surface water catchment boundaries except in areas where the influence of topography is diminished (e.g. karstic or confined aquifers).

This process resulted in the delineation of 97 bedrock groundwater bodies with a median size of 53 km^2 (Figure 1).

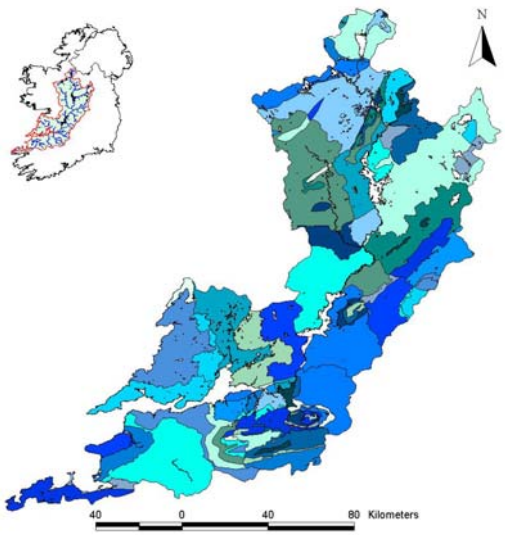


Figure 1. Groundwater Bodies in Shannon PRB (Geological Survey of Ireland).

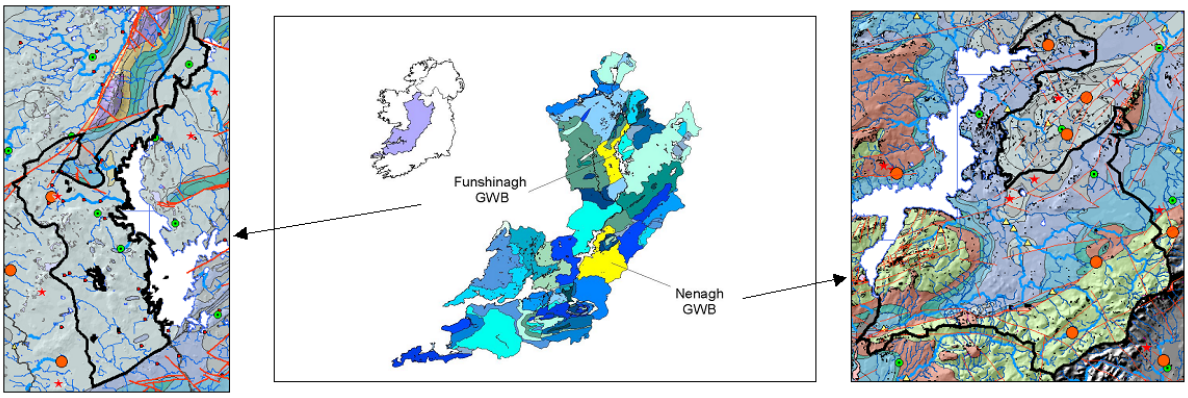
GROUNDWATER MANAGEMENT FOR THE WATER FRAMEWORK DIRECTIVE:

The first requirement of WFD is to identify groundwater bodies at risk of failing to meet the environmental objectives set out in Article 4. To achieve these objectives requires making operational the programme of measures specified in the River Basin Management Plan. A proposed risk assessment methodology to identify GWBs at risk is presented overleaf. This process will allow for the prioritisation of resources in the River Basin Management Plan. The focus of the programme of measures should be on the high impact potential areas of "at risk" GWBs. Different aquifer types will require different management responses appropriate to their spatial extent, flow regime, degree of groundwater-surface water interaction, and connectivity with groundwater-dependent terrestrial ecosystems. This approach will require a detailed conceptual understanding of each GWB to ensure the most suitable programme of measures are applied and the use of limited resources is optimised.

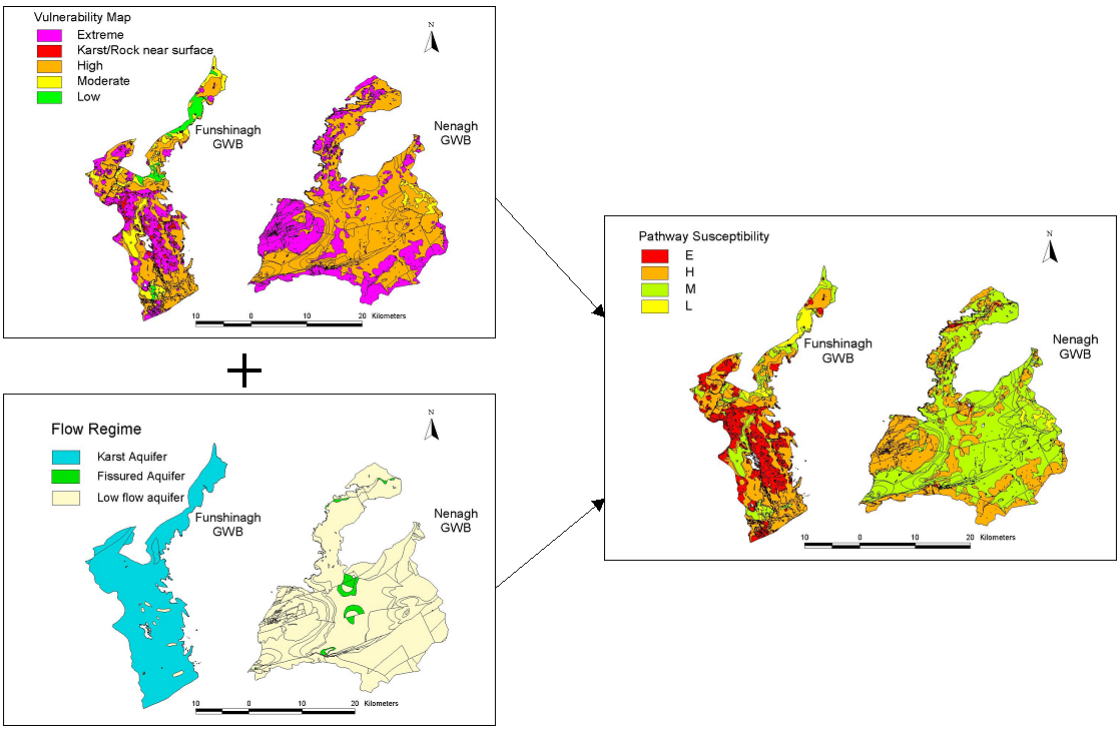
Example of risk assessment methodology for diffuse groundwater pollution in the Shannon PRB:

The following approach is a screening exercise using available GIS layers and follows the 'source-pathway-receptor' model. The objective is to identify groundwater bodies at risk and allow for prioritisation in the programme of measures and river basin management plan.

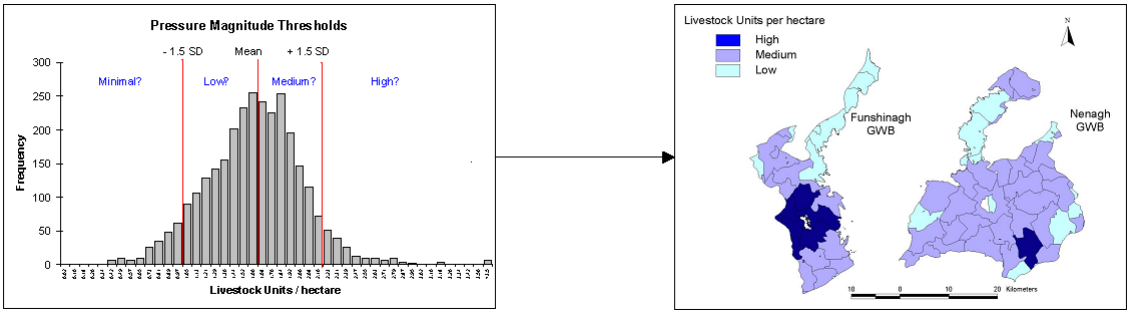
Step 1 Develop a good conceptual understanding of each groundwater body.



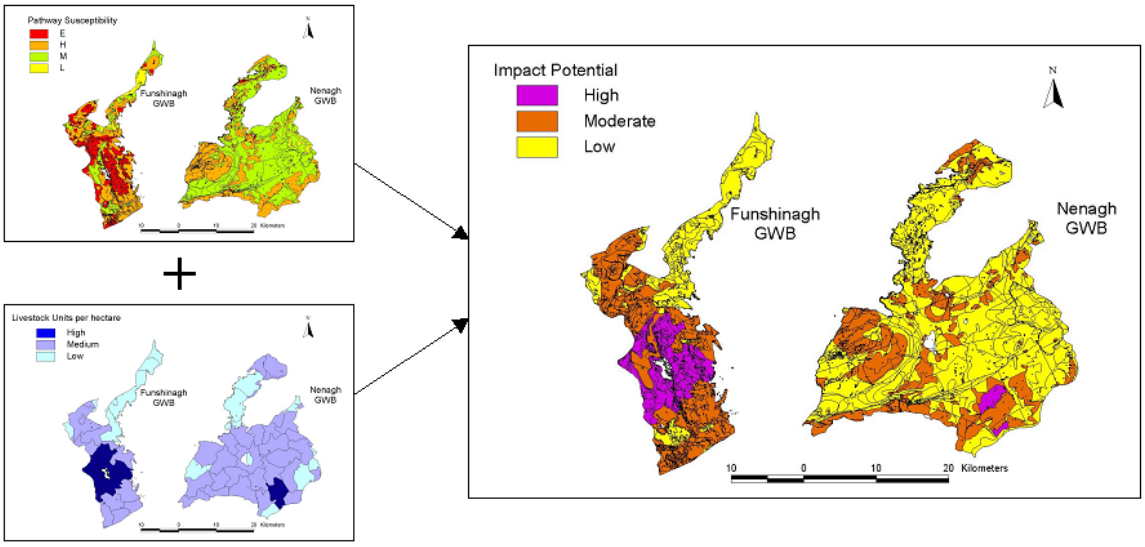
Step 2 Combine information on groundwater vulnerability with aquifer flow regime characteristics using risk matrices to identify the degree of pathway susceptibility to diffuse pollution.



Step 3 Set pressure magnitude thresholds e.g. for stocking density. Thresholds will need to be developed for all pollutant types.



Step 4 Combine Pathway Susceptibility and Pressure Magnitude using risk matrices to produce an Impact Potential Map.



Step 5 Final risk designation

Identification of whether a groundwater body is "at risk" will be determined by percentage area thresholds for all pollutant types combined with verification using monitoring data. Lack of monitoring data and pressure layer information will affect the confidence in the risk designation. Further assessment may be required to determine whether associated surface waters or groundwater-dependent terrestrial ecosystems are adversely impacted.

JUCAR:

RESOURCE AND ENVIRONMENTAL COST ASSESSMENT FOR ECONOMIC ANALYSIS.

The provision of Article 5 and Article 9 of WFD, requires carrying out an economic analysis (Annex III of WFD) which allows assessment of the accomplishment of the principle of cost recovery for water services, including environmental and resource costs, taking account of the long term forecast of supply and demand for water.

The Jucar PRB apportions the total cost into three separated components: financial, resource and environmental. The financial cost is evaluated by means of the expense assessment for all water services. The marginal opportunity cost of the resource (MOCR) in a certain location and time can be defined as the cost for the system of having available one unit less of resource. The assessment of the MOCR, is made by means of hydro-economic models at the river basin, able to represent dynamically the marginal economic value in different locations in the basin, taking into account resource availability, storage capacity, losses, return flows, surface and ground water interactions, and willingness-to-pay (or marginal economic value) of the various demand units. Monthly economic value functions that express the relation between the supplied water and the marginal value for each month of the year are defined for the water uses. The integration of the demand economic function up to a certain level of supply (area under the demand curve) provides the economic benefit imputed to this supply level. Operating cost to be considered include variable cost of intake, distribution and treatment of the resource for both surface and groundwater supply.

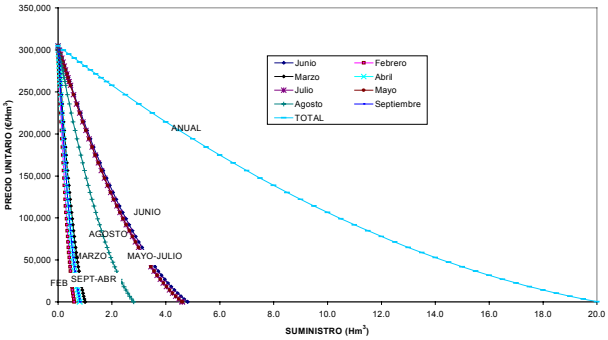


Figure 1.- Schematic of the hydro-economic models for Júcar RB.

Figure 2.- Annual and monthly disagregated demand economic functions.

Two complementary approaches are followed. The *optimization approach* assumes that perfect market conditions exist, which allow for economically optimal water use, and the analysis of shadow prices or dual values yields an upper bound of the MOCR at different locations and times. The *simulation approach* assumes that the system is operated with allocation rules established a priori. These rules can correspond to the priorities and historical rights, hence reproducing the current *modus operandis* of the system. The MOCR is obtained by comparing the aggregated benefits of the system with the benefits that would occur if a unit less of water were available at a given location and given time. The gap between the results corresponding to the economically optimal water use and to the current water allocation system allows assessing the "distance" between the optimum and any management analyzed.

The proposed approaches can be applied to the Júcar PRB since hydrological models for water management have been previously developed and successfully applied on Júcar Hydrological Plan, and the computation modules for incorporating the economic analysis have been recently developed and tested. Finally, it has to be noticed that, once the hydro-economic models are in service, they can provide additional interesting economic outputs. For instance, a similar approach could be applied in order to assess the opportunity costs incurred by the society as a consequence of the use of the resources to achieve and implement the environmental regulations and the resulting reduction in production. Given the difficulty in assessing environmental cost as the costs of damages to the ecosystem, an indirect partial assessment of the environmental costs could be the marginal opportunity cost of the environmental measures that allow maintaining the good ecological status. For example, the maintenance of ecological flows in a reach of the river represents a cost for the system, which corresponds to the economic losses for supply reduction in the affected demands.

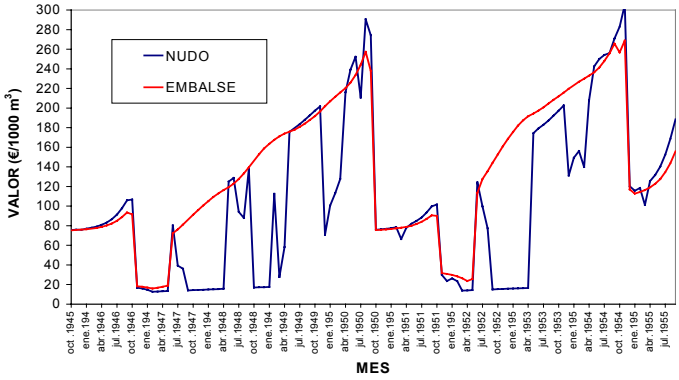


Figure 3.- Time evolution of MOCR at a reservoir (red) and at a diversion point (blue).

SULDAL:

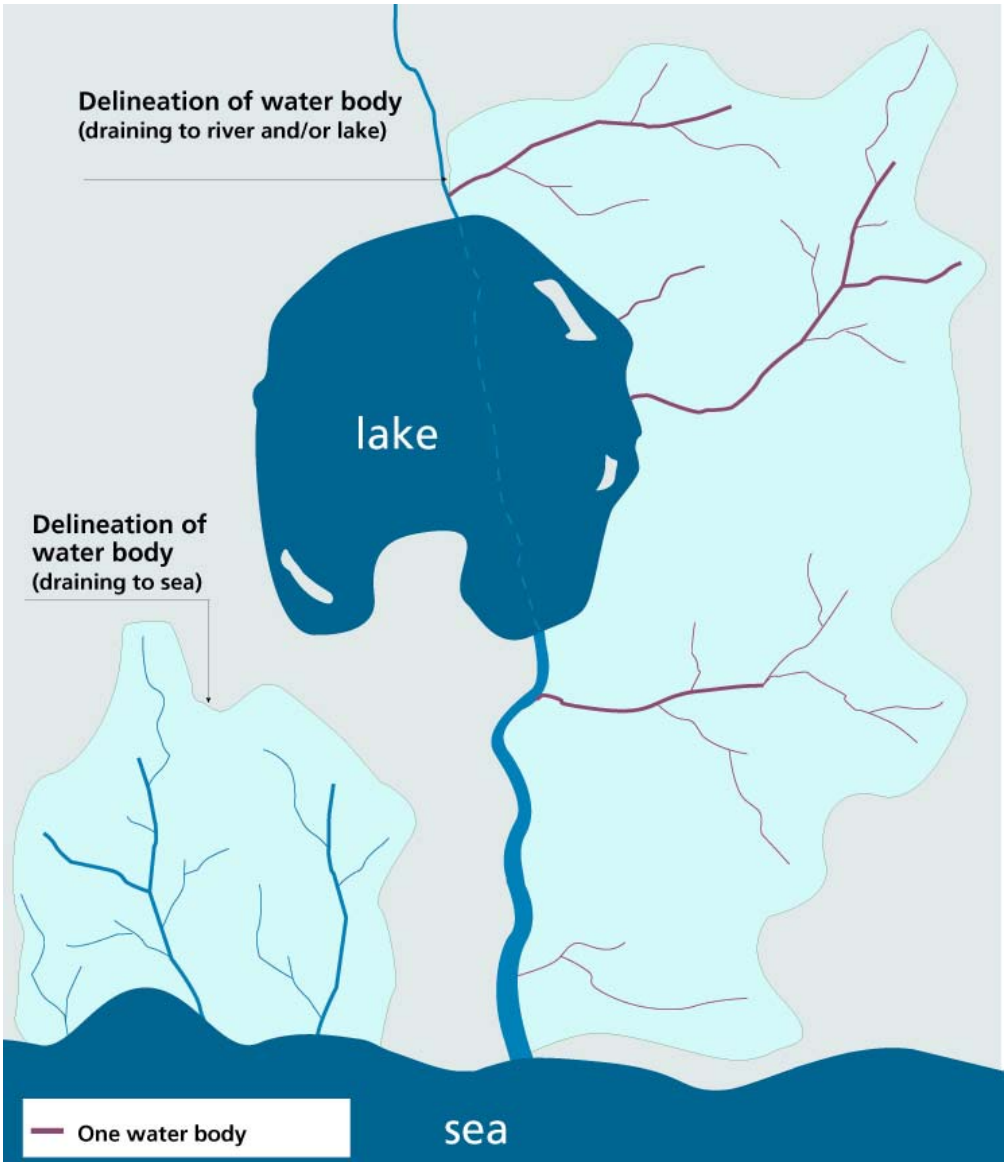
DELINEATION OF SURFACE WATER BODIES (WBS) - AN APPROACH APPLIED TO NORWEGIAN FRESHWATERS:

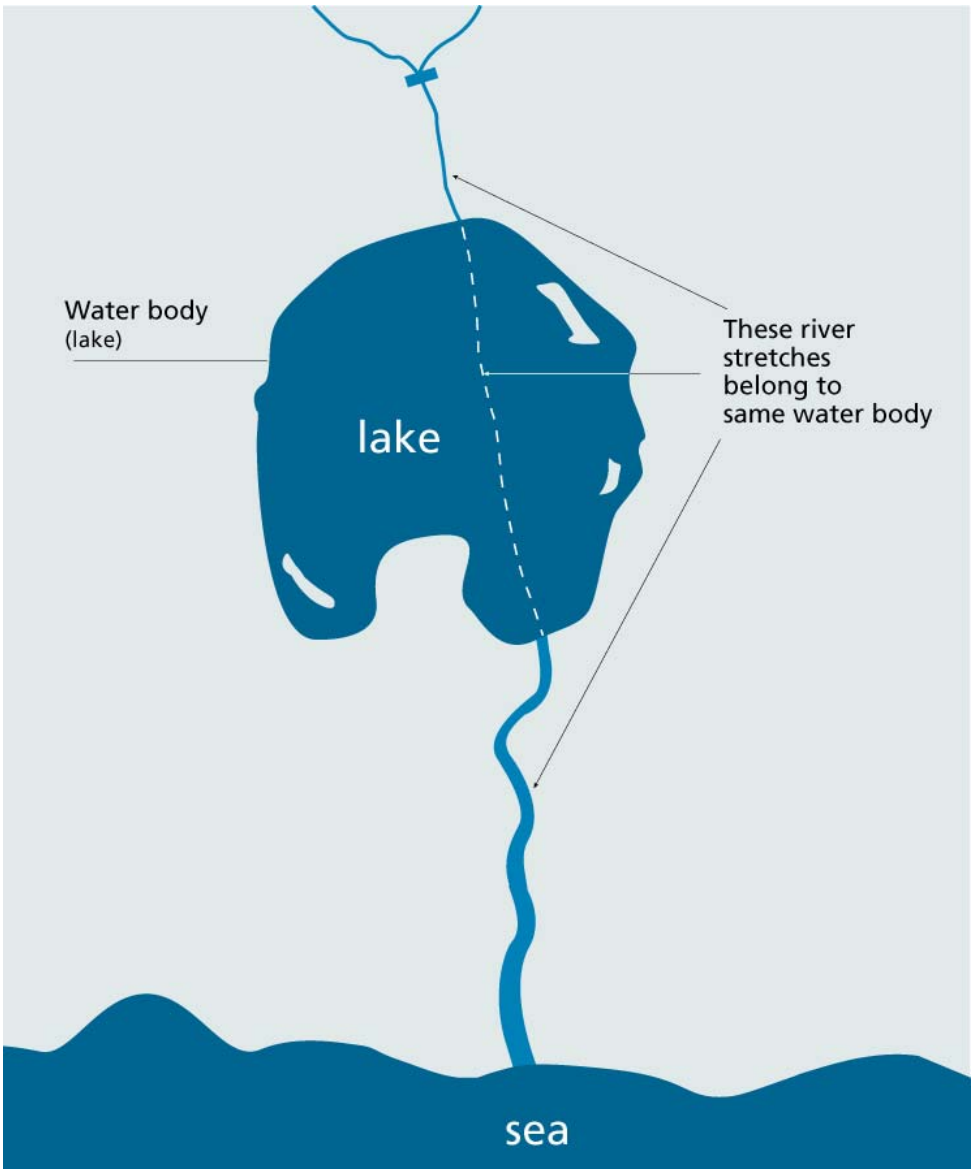
The Norwegian climate and topography has created a large number of small and large lakes, as well as a complex network of streams and rivers. The anthropogenic influence and present-day pressure to many of these waters are low or insignificant, with a consequently low risk of deteriorated status according to the WFD. It is subsequently a challenge to divide these waters into reasonable WBs for management purposes, appropriately meeting the WFD requirements, as well as designing appropriate hydrographical units, avoiding a huge number of small WBs with no significance for practical purpose. Norway has applied the following main adaptations during the first phase of characterization (8 pilot studies) according to Article 5.

- Lakes < 0.5 km^2 are generally included in the river network and are merged into the adjacent river WB. Single, small lakes may still be selected as separate WBs if there are significant management issues.
- Lakes > 0.5 km^2 (which number approx. 4500 in Norway) are always identified as a separate WB. However, the associated river may still be a continuous WB through the lake, joining the upstream and downstream part of the river into one single WB.
- Catchments with homogeneous ecological typology, as well as facing comparable pressures and impacts throughout, should not be divided into subunits even if the size is >> 10 km^2. Consequently, the river network within a large catchment may consist of one single river WB.
- Small rivers which drain separately into the sea, a large river or a lake, are merged with neighbouring catchments into one single WB if typology, pressure and impact are alike throughout. The resulting WB might be >> 10 km^2, but is separated from the WB it is draining into, which has a different type and/or category
- When an insignificant part of a catchment crosses type-borders (e.g. timber line, post Ice Age marine boundary), it should be assessed whether a new WB should be defined or not. This assessment needs to be based on whether there are significant changes in ecology and also the size and importance of the potential new WB. As an example where a new WB

should not be identified is when a tributary runs a few hundred meters in the valley below the marine boundary before it reaches the main river. A change from above to below the marine boundary would normally lead to another type of WB and consequently a new WB. However, in this example, the tributary would still be dominated by the upstream ecology.

- The WBs will be identified as far as possible based on management units. WBs will be grouped into larger units for management practices, such as monitoring, reporting and classification.
- The size of a WB will depend on identified pressures. However, there needs to be a minimum limit on how small a WB can be. This has to be decided based on qualified judgement like how serious the environmental problem is and how suitable the unit is for management purposes. An example of a minimum limit is that it needs more than a 100 meters reach of reduced river water quality caused by pollution or encroachments before a new WB needs to be identified.




Water body
(lake)
lake
These river
stretches
belong to
same water body
sea

TEVERE:

Case Study: Tevere

The Tevere River Basin developed a methodology based on hydromorphological reference conditions in order to identify the base flow that must be maintained in the river in carbonate areas that are strongly impacted from abstraction for hydropower use (Fig. 1).

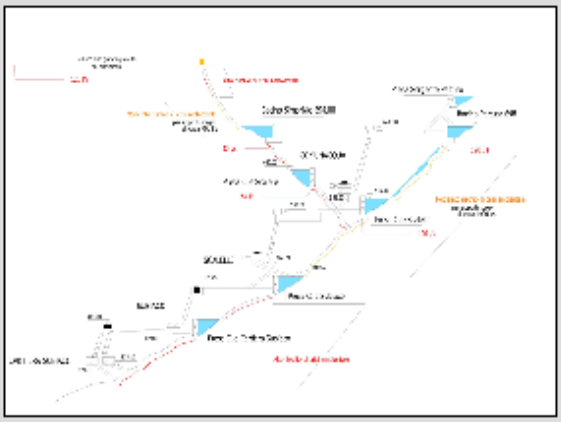


Figure 1 – Hydropower diversions along the river

This method allows us to identify the characteristic curve representing the natural flow fed by point and linear springs. Then, in some significant sections, the optimal base flow for fish life (considering trout as target species) is identified and the characteristic curve representing the minimum flow supplying water to depending ecosystems is produced and adjusted according to the characteristic curve, which represents the hydrological reference conditions (Fig. 2).
A comparison with the flow left in the river consequently to hydropower diversions, allows us to identify the quantity of water resource that must be restored (Fig. 3).

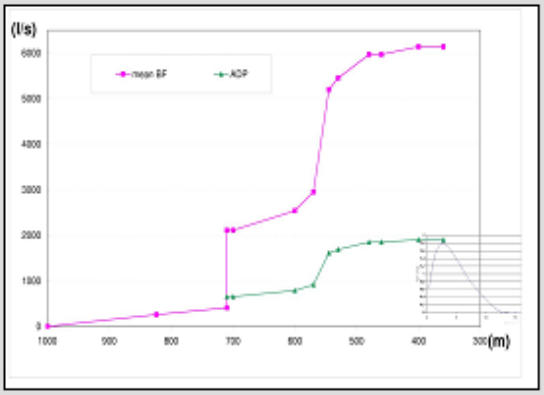


Figure 2

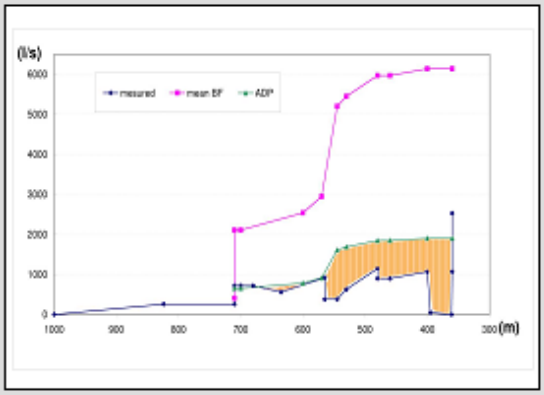


Figure 3

Case Study: Tevere

In the context of the first phase of groundwater body characterization, the Tevere PRB proposed a method for the identification of groundwater bodies, with particular reference to volcanic hydrogeological structures. The method is based on an accurate reconstruction of the hydrogeological balance and it takes into account the interaction of groundwater bodies with surface water bodies (Fig. 1).
The aquifer's hydrogeological balance and the abstraction/recharge ratio are identified and considered in relation to the base flow of surface water bodies (Fig. 2).
Taking account of the interaction between GWB/SWB, the Tevere PRB underlines the necessity of considering together the objectives for surface and groundwater bodies in the planning phase.

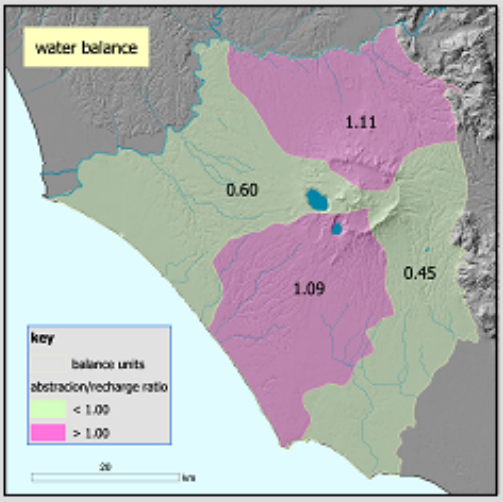


Figure 1 – Water balance

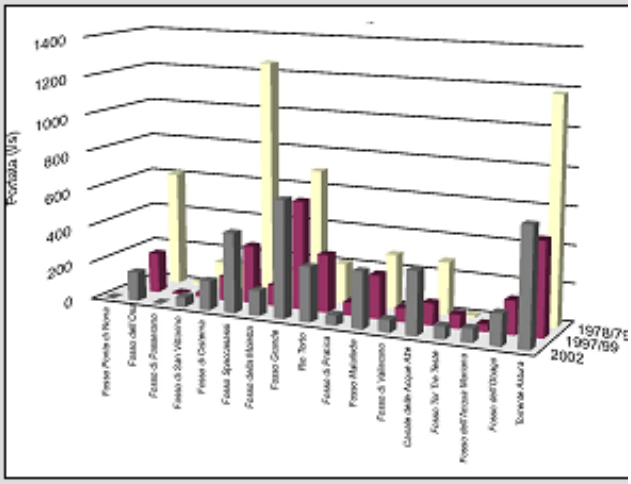
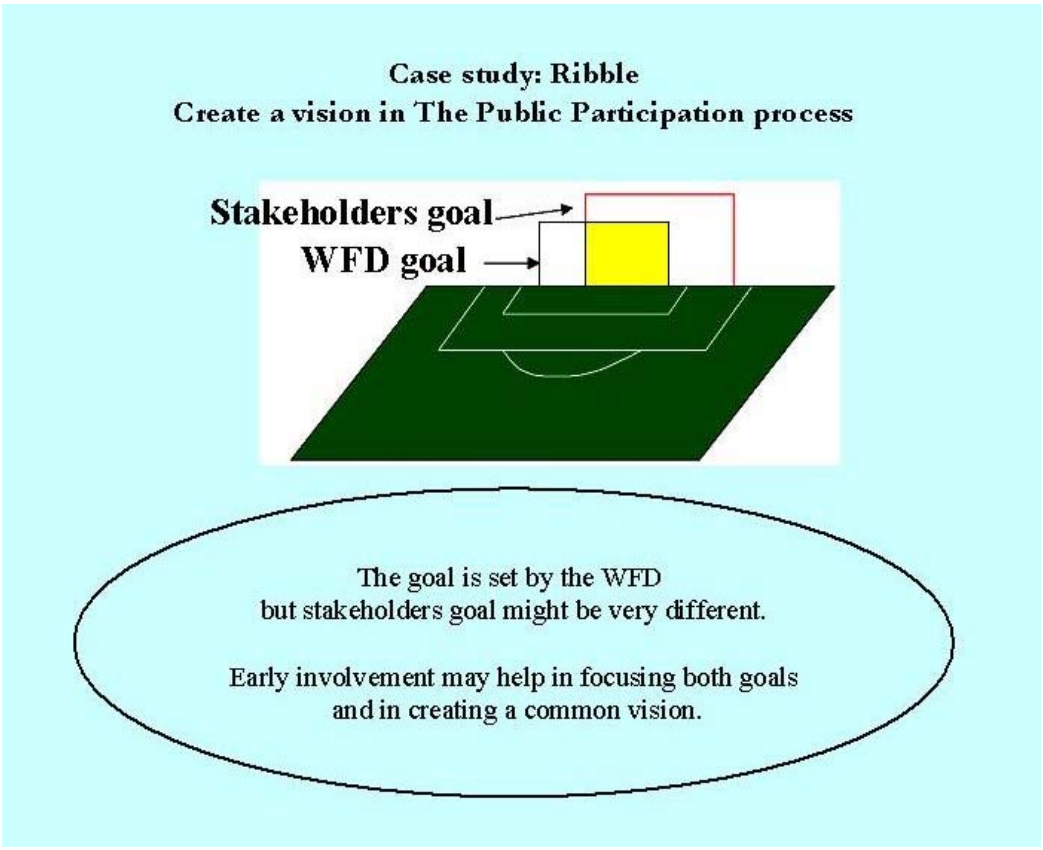


Figure 2 – The river's flow from 1979 to 2002

RIBBLE:

PUBLIC PARTICIPATION.



ANNEX III: COMPLETE ANSWER TO THE ToR GIVEN BY THE PRBs

ANNEX III is the collection of the complete answers to the ToR as given by PRBs. The complete document is available in a electronic format under on CIRCA under:

Pilot River Basin/PRB Outcome Report - Phase 1a/PILOT RIVER BASIN OUTCOME REPORT-Testing of Art.5 related GDs/ANNEXES/Annex III-complete answer to the ToR given by the PRBs

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14 LB-NA-21517-EN-C

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

ISBN 92-894-8979-0

Publications Office
Publications.eu.int