



REPORT SNO 5379-2007



## **WFD-Related Changes in Water Management of EU National- and NOLIMP-Pilot Projects**



Experiences from North Sea Regional and Local Implementation of the Water Framework Directive (NOLIMP-WFD)



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**Abstract**

WFD prescribe a strong public participation in decision making processes. One common experience among the NOLIMP project partners is the importance of involving stakeholders at an early stage. A well established contact network will ease the process of solving controversies and agreeing on measures to meet environmental targets. The development of demonstrations sites create interests from other areas and exchange of know-ledge/experience on the national level is stimulated.

WFD supply some general rules on monitoring. It has been experienced that monitoring needs to be relatively comprehensive to enable proper abatement planning and to be able to follow the environmental effects/improvements of implemented measures. The use of numerical models to better understand the dynamics and interactions between different factors as well as climate is beneficial for water management. Another aspect of monitoring is to enable transparency and objectivity regarding the quantification of pollution load from different sources/sectors.

The use of cost efficiency analysis is recommended in WFD, but its use has different status and history among the partners. The ranking of measures according to cost and the possibility to discard measures that obviously have a low efficiency is experienced as very useful

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# **WFD-Related Changes in Water Management of EU National- and NOLIMP- Pilot Projects**

Experiences from North Sea Regional and Local  
Implementation of the Water Framework Directive  
(NOLIMP-WFD)



# Preface

The *North Sea Regional and Local Implementation of the Water Framework Directive (NOLIMP-WFD)* is a project funded under the European Regional Development Fund INTERREG IIIB - North Sea Programme and aims at showing in a practical way how the Water Framework Directive can be implemented, regarding procedural, management and practical aspects.

This report summarises the project partners project experiences that may lead to changes in their water management practises. The report also extracts some of the experiences made during the international activity on testing EU Guidelines related to WFD implementation in a European network of pilot basins defined under the Common Implementation Strategy (CIS).

Oslo, 16 March 2007

*John Rune Selvik*

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# Summary

The *North Sea Regional and Local Implementation of the Water Framework Directive (NOLIMP-WFD)* is a project funded under the European Regional Development Fund INTERREG IIIB - North Sea Programme and aims at showing in a practical way how the Water Framework Directive can be implemented, regarding procedural, management and practical aspects. Focus for NIVA in the NOLIMP-WFD-project has been to make available experience of implementation based on the national and regional pilot projects and other WFD-related activities in Norway. Also, as part of the exchange programme, NIVA took on the obligation to register and document WFD-related changes in water management of EU national pilots and compare with changes within the NOLIMP partner projects. This report summarises the findings emerged as a result of NIVA's efforts under this task.

The first part of the report extracts some of the experiences made during the international activity on testing EU Guidelines related to WFD implementation in a European network of pilot river basins (PRB) defined under the Common Implementation Strategy (CIS). Testing the WFD Guidelines was handled at a national management level with a minor stakeholder involvement. A general conclusion is that the Guidance Documents (GDs) developed in the first phase of the Common Implementation Strategy (CIS) process have been of great help in preparing preliminary Art.5 reports submitted to the EC. Although no revision of the GDs was felt 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 with experiences as a reference base. It appeared that PRBs were reading the GDs with different perspectives, which would lead to regional diversification. The need for regional case-studies, information exchange etc. were regarded beneficial and a tool to increase further harmonisation. Further conclusions were that 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. It followed that Member States should try to harmonise their monitoring competences in such a way that the information needed for the implementation of the WFD reach the competent authorities at each river basin that have the task of its implementation

The second part of the report summarises the NOLIMP project results on WFD-related changes, including partners' project experiences that may lead to changes in their water management practises. A common experience is the importance of involving stakeholders at an early stage. It is easier to be proactive and solve controversies when the contact is good and well established. But efforts and resources are required to establish and to maintain involvement of stakeholders. Building awareness on environmental topics is necessary to establish a platform where active involvement can develop, but it takes time and will benefit from a structured and planned approach. The previous experiences with this way of working differs between partners, but those having experiences in this direction do not consider this as "extra costly", but as a necessary way of approaching complex environmental topics.

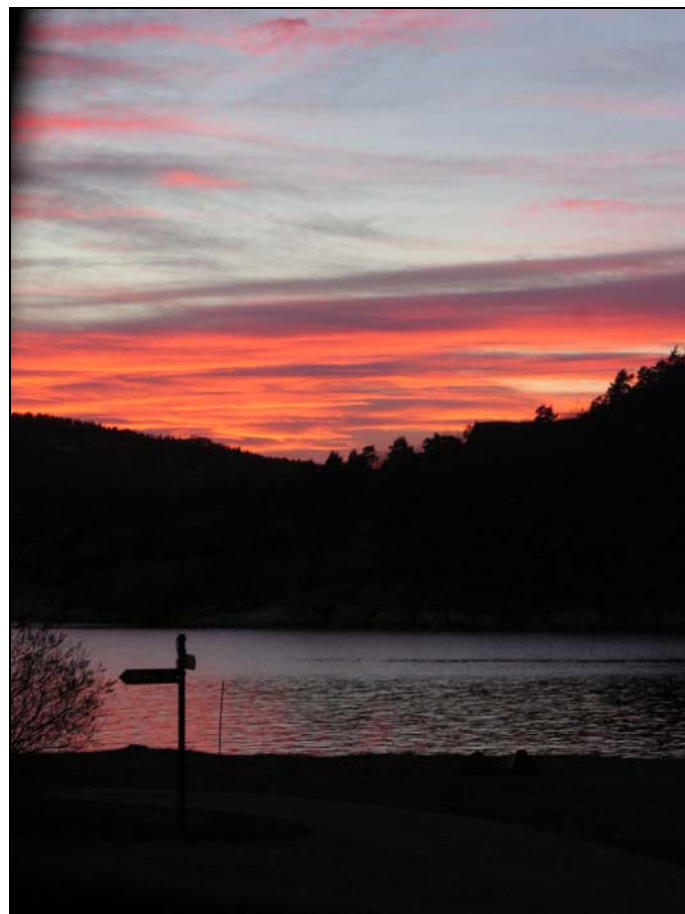
The implementation of WFD in national legislation ranges from actual changes in specific laws to putting into force national regulation based upon the existing laws. In Denmark, a large reorganisation of the environmental administration and responsibility is taking place, focusing more on 'state level' and 'local level'.

Monitoring the NOLIMP pilot areas has different history and different completeness compared with WFD requirements, and it differs to what extent NOLIMP was engaged in the monitoring as such. It has been demonstrated that monitoring needs to be relatively comprehensive to enable proper abatement planning, to be able to follow effects of implemented measures and to enable the use of models to better understand the dynamics and interactions between different factors as well as climate.

Another aspect of monitoring is to enable transparency and objectivity regarding the quantification of pollution load from different sources/sectors.

The use of cost efficiency analysis has also different status and history among the partners. The ranking of measures according to cost and the possibility to discard measures that obviously have a low efficiency is experienced as very useful. In situations with solid public participation, a number of creative ideas and proposals on new measures will appear. CEA represent one rather objective method of handling all measures in a transparent way. However, there are often external factors (e.g. changing agriculture subsidies) that may influence which measures are easy to implement and which are hard to implement, and we need to adapt to actual situations. The cost of not achieving environmental targets may also have economic consequences which can be introduced into the debate and increase complexity of the questions in debate.

The development of demonstration sites create interests from other areas and exchange of knowledge/experience on the national level is stimulated. WFD requires a holistic approach and elements that for years have been seen as separate now need to be connected quantitatively and qualitatively. This requires considerable resources to improve knowledge and develop/implement tools to handle these topics. One example is the link between surface waters and groundwater, where anthropogenic activity may influence the quality of pumped groundwater many years later. It appears to be a general vision to enable knowledge based decisions, but it is clearly a challenging and resource demanding vision. The ability to handle uncertainty in decision-processes and at the same time achieve common accept for the solutions/decisions is something we need to handle through many years and this will continue to be a challenge for authorities aiming at the WFD targets in the years to come.



# **WFD-related changes in water management of EU national- and NOLIMP- pilot projects**

## **1. Introduction**

Focus for NIVA in the NOLIMP-WFD-project has been to make available experience of implementation based on the national and regional pilot projects and other WFD-related activities in Norway. Also, as part of the exchange programme, NIVA took on the obligation to register and document WFD-related changes in water management of EU national pilots and compare with changes within the NOLIMP partner projects. NIVA planned to report on the progress of at least 10 national pilot projects in Europe, most of them in the North Sea Region (mainly Sweden, Denmark and UK), after reading reports, making interviews of key personnel and participating in the EU implementation process, especially the working groups. This report summarises the findings emerged as a result of NIVA's efforts under this task.

## **2. EU national pilots and projects**

### **2.1 The Pilot River Basins (PRBs) Network**

The European Water Framework Directive (WFD) challenges the Member States to achieve a good chemical and ecological surface water status no later than 2015. Since the Directive entered into force in 2000, its consequences and meaning for the organisation of the water management are studied especially on the national level. A special Network of Pilot River Basins (PRBs) and associated coastal zones has been established to support national implementation of the WFD. This network has been joined by fifteen river basins all across Europe, and has reported on their testing of the WFD Guidance Documents (GD). The PRB Network addressed the following points:

- River Basin Information
- Commitment and Resources
- Institutional Aspects
- NGOs and Stakeholders
- Guidance Documents to be tested
- Related Projects

The fifteen PRBs participating in the Network are listed in the following:

- Belgium, France, The Netherlands (Scheldt transboundary river basin),
- Denmark (Odense river basin),
- Finland (Oulujoki river basin),
- France, Germany, Luxembourg (Moselle-Sarre transboundary river basin),
- France (Marne river basin),
- Germany, Poland and Czech Republic (Neisse transboundary river basin),
- Greece (Pinios river basin),
- Ireland (Shannon river basin),
- Italy (Cecina and Tevere river basins),
- Norway (Suldalsvassdraget river basin),

- Portugal (Guadiana river basin, Portuguese side),
- Romania, Hungary (Somos transboundary river basin),
- Spain (Júcar river basin),
- UK (Ribble).

## 2.2 Results from the Pilot River Basins (PRBs) Network Exercise

The PRB exercise was structured into two phases. **Phase 1a** focused on the implementation of Article 5 of the Directive and tested the Guidance Documents affected by this Article (Water Bodies Identification, Pressures and Impacts, and some parts of Heavily Modified Water Bodies, Reference Conditions, Coast, Public Participation, and Economics). **Phase 1b**, focused on testing the Guidance Documents not addressed during the previous phase, and on finishing the testing on several issues not included in Art.5, i.e. some parts of Heavily Modified Water Bodies, Reference Conditions and Public Participation; Intercalibration, Monitoring, Geographic Information Systems (GIS), Planning Process, and Wetlands. Other specific issues emerged in Phase 1a, were considered in this phase.

The results and recommendation are described in Galbati et al. 2005, and give important information on the national experiences during implementation of the first activities of the WFD. Main focus in the exercise and the consecutive report is testing of the GD's, but the results reported also have significance for the NOLIMP-project as discussed in the following text.

Conclusions from phase 1a states that in general the GDs developed in the first phase of the Common Implementation Strategy (CIS) process have been of great help in preparing preliminary Art.5 reports. Although no revision of the GDs was felt 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. It is also stated that 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 Art.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. Due to the lack of data and the importance of expert judgement, the results of the Art.5 analyses have to be considered as provisional. This is even more the case in international River Basin Districts (RBDs), as data are often not comparable and co-ordination of these data is very difficult. In particular, the risk analyses in the Art.5 reporting in 2004 are based on provisional objectives for the water bodies. The big majority of the PRBs did not consult or actively involve stakeholders in the technical testing and the drafting of the Art.5 report. Hence the exercise did not count on their active contribution or on their external “validation” of the testing results. Considering the short time available, the PRB exercise was 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.

### 2.2.1 Recommendations from phase 1a

- 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 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. 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 Art.5 and in the remaining part of the PRB exercise.
- The Art.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 GDs seems to be needed. Also, there seems to be little enthusiasm for radical revision of existing GDs. Instead river basin managers 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 could provide some useful examples.

The outcome of Phase 1a of the PRBs exercise has shown at river basin level the practical implications related with the WFD implementation. The exercise has proven to be a powerful aid for communication and raised awareness on topics related with the implementation of the directive. Conclusions from phase 1b state that the GDs developed in the first phase of the CIS process have been of great help in planning and implementing the WFD. However, PRBs are reading the GDs with different perspectives. This gives room for regional diversification, which could lead to the need for regional case-studies, information exchange, etc. The definition of River Basin District boundaries is perceived by PRBs as a fundamental issue to be fixed early in the process. Furthermore, these boundaries should be defined as much as possible so as to follow the actual watershed delineation rather than the administrative boundaries, as sometimes done for greater convenience. The same criterion should be adopted where possible also in the case of international water bodies. There is a strong need for integrating existing monitoring networks and for complementing the actual deficiencies, from the point of view of meeting the WFD requirements. The structure of many administrations with tasks in water management does not fit the WFD requirements. This could often raise problems during the implementation of the directive.

### **2.2.2 Recommendations from phase 1b**

- Member States should try to harmonise monitoring competences in such a way that the information needed for the implementation of the WFD reach the competent authorities at each river basin that have the task of its implementation.
- PRBs agreed on the fact that there is no need of introducing changes in the GDs or produce new GDs. On the other hand PRBs highlight the needs for documents related to the national level of the implementation and local scale problematic related to this problem.
- PRBs generally highlight the necessity to improve linkage and communication with other groups and initiatives involved in the Common Implementation Strategy (CIS). For example PRBs stress on the importance of the intercalibration process in relation with the design of the Programme of Measures. In this context an information exchange with the ECOSTAT group would be useful.

During the conference on Active Involvement in River Basin Planning, including presentations on

lessons learned in public participation from the Ribble, Jucar, Scheldt and Danube, 10 key points for active public participation were highlighted:

1. Good involvement takes time, start early!
2. Develop and share a sense of ownership for the river basin.
3. Work to build and maintain trust with your partners.
4. Undertake “mapping” of stakeholders to find out more about them and their interests.
5. Learning from mistakes is as important as sharing successes.
6. Listening is as important as talking.
7. Be passionate for your cause, passion persuades.
8. Work with each other and build a common vision for your basin, to put the management plan into context.
9. Nobody can do it alone. True partnership leads to shared responsibility and decision making for shared actions.
10. Where cultures and traditions vary, agree key messages and adapt to their needs.

The PRB Network started a Phase 2 exercise at the beginning of 2005, building upon the experience gained in Phase 1 and it is expected to cover the period 2005-2006. Key issues for this period have emerged from the analysis of the reports from PRBs on Art.5 implementation.

## **3. The NOLIMP project**

### **3.1 NOLIMP-pilots**

As an additional activity to the existing national pilots and studies, the NOLIMP-WFD project aims to gain experience with the Directive on regional and local level by applying its concepts and procedures in pilot projects that are aimed at achieving concrete water quality improvements. Important questions to be answered are: what efforts are needed to realise the good status in a water system and how can the process best be organised?

Each NOLIMP partner has executed pilots in which innovative techniques for improving the water quality and more in particular for reduction of emissions are tested. Since all partners face similar problems with emissions from agricultural and sewage systems, eutrophication and deteriorated ecological conditions, most pilots are aimed to reduce emissions and improve water quality and ecological conditions.

The WFD prescribes an active involvement of all interested parties. In the project experiments have been done with involvement of stakeholders in a management group, stimulating them to develop additional activities that go further than the NOLIMP project. All partners are searching for ways to handle the WFD, to improve water quality and to organise the process in the most cost-effective way involving public and stakeholders. Intense exchange of experiences on all these subjects has taken place and findings reported and presented to interested parties and public through a number of canals.

Compared to the experience reported from the PRB Network exercise, NOLIMP aims and activities seem to be very much in line with the request in the Network conclusions on the need for regional case studies, information exchange etc.

The NOLIMP pilots and are the following

- Fryslân, the Netherlands
- NIVA, Norway
- Lake De Leijen
- Morsa Watercourse (national pilot)

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>➤ Nordjylland, Denmark</li> <li>➤ Aberdeenshire, United Kingdom</li> <br/> <li>➤ Västra Götaland, Sweden</li> </ul> | Suldal River basin (national Pilot)<br>Gjeving Watercourse<br>Mariager Fjord<br>Tarland Burn<br>Lock Davon<br>Elrick Burn<br>Gullmarn Fjord |
|--|---|

### 3.2 Gathering info on WFD-related changes

For reporting on the WFD-related changes in Water Management of the NOLIMP pilots, meetings were arranged with partners during May/June 2006. These meetings and fruitful discussions on experiences gained turned out to be most valuable to gather necessary information for reporting purposes. Specific NOLIMP topics on the agenda for these meeting are listed in the following text.

Also used was the time table for the WFD implementation, where parts that according to this plan should have been finished by the end of 2005/2006 were included in the meeting agenda.

#### **NOLIMP topics:**

The following topics have been especially dealt with and discussed during the NOLIMP project and will be reported on:

- Public participation
- Cost/Efficiency Analysis, CEA
- Abatement strategy and planning, including artificial wetlands
- Monitoring

With regard to these topics the following questions are central:

- What has been done?
- Where did you meet the biggest challenges?
- What about the costs?
- What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?
- What are the changes or aberrations you have accomplished in relation to your former working methods?
- Future plans, including some thoughts and ideas about the possible difficulties and how to face them?
- EAB/any other advice you would like to pass on to your fellow water experts

These questions are also central for discussions on the topics listed in the WFD implementation time table.

Table 1. The WFD implementation time table for the period 2003 – 2006.

Activity	Deadline	Deadline for review
Classification of districts and appointment of responsible authority	2003	
Implementing WFD in national legal framework	2003	
Characterising River Basin Districts	2004	2013
Analysis of pressures and impacts	2004	2013

Activity	Deadline	Deadline for review
Economic analysis of water consumption	2004	2013
Register protected areas	2004	Current
Monitoring programmes operating	2006	

## 4. NOLIMP project results on WFD-related changes

### 4.1 Meeting Aberdeen, Scotland, May 10<sup>th</sup> 2006 - Nolimip and the 3 Dee Vision project

#### *Participants:*

Barry Dunn, Scottish natural Heritage  
Chris York, Project manager  
Linda Mathieson, Aberdeenshire Council  
Simon Langen, Macaulay Institute,  
Vicky White, Macaulay Institute,  
David Ogilvy, Scottish Environment Protection Agency  
Mark Williams, Scottish Water  
John Rune Selvik, NIVA  
Bente M. Wathne, NIVA

#### 4.1.1 Starting the international and national cooperation and finding partners and pilot catchments

Based on earlier experience, the Aberdeenshire Council was interested in the Interreg programmes and projects with special focus on river catchments, and combined with the national interest for WFD and its requirements, the NOLIMP project was a good solution. Combining these rural catchments used in the 3 Dee Vision project and understanding the Council's role in the WFD was important to them.

There was an existing initiative that fitted well in with the NOLIMP plans. Contact was first established with Fryslând, then the NIVA initiative came along and there was a combined project. SEPA (Scottish Environment Protection Agency), Scottish Water, Scottish Natural Heritage (SNH), Macaulay Institute and the University of Aberdeen were interested in the cooperation. In some other countries there are not so many agencies involved. This is a special challenge in Scotland.

The Habitat Directive was of interest already and the institutions had an interest in nitrate and the Nitrate Directive. Also there was some experience from earlier work on the EU directives, and on the basis of this they knew that they had to work together to reach the goals set. How to deliver according to the different directives was a topic for cooperation. This project also gave an opportunity to monitor how the agencies work together as a multi-Agency group. A Life project was the first project with a need for cooperation as a multi-agency group to some extent, but NOLIMP is the first project where there has been working groups on the real working level, not only as contact on administrative level. Each agency was interested, had some ideas and found the common possibility through the Interreg and NOLIMP. The inter-agency development was important in itself and there was an interest in monitoring how the agencies worked together.

The Tarland catchment initiative was already there, so a pilot was preparing already when the project started, and work was also started on the Dee River catchment management plan.



#### **4.1.2 Awareness rising and public participation**

Public awareness work was established at an early stage. A Public Awareness team was set up especially for this task. They realised this was important for successful results of the WFD work. There was a wish for clear visibility from Scottish Water to all activities under WFD.

Working together in such a broad group was new for some of the partners. More local information was introduced. It was realised that it is important to establish contact with stakeholders and the public before the controversies start, not only do fire fighting afterwards, but to be proactive. Stakeholders are better involved. People have appreciated that they can speak to all the organisations in one room. It was also stated that relevance of research for the public is more and more important for Macaulay as a research institute.

When validating participation against awareness, how much of the work was dedicated to peoples participation compared to awareness rising? There has been more input on awareness than participation. Farmers have been the most active parts. If you want participation you first need awareness, then you can have participation. How to deal with this in the future? Will you need extra money/resources due to more public participation? The community planning process needs all agencies and stakeholders to work together. The project has provided a good basis for the inter-agency working processes needed in the future. It will take time and money to perform the actions.

A special farmer's questionnaire has been produced, and this pamphlet has been highly evaluated for information purposes.

#### **4.1.3 Management and knowledge transfer**

In Scotland there are one National Advisory Group and eight appurtenant Area Advisory Groups, each responsible for an area and as a total covering the whole country. Results from the project work will be fed in through the Area Advisory Group to the National Advisory Group. The Aberdeenshire Advisory Group area covers more than Aberdeenshire County. River Spee and River Dee are within the same Advisory Group Area, because they are much of the same character. Forums to advice the Advisory Groups will be formed.

Results for the project will also feed into the catchments management plan.

Funding under this project did not necessarily give rules for the costing of the works under WFD.

#### **4.1.4 Characterisation and analysis of pressures and impacts**

Characterisations have been done at the national level, whereas the project work has been done at the local level. SEPA is the responsible institution and coordinates nationally. Classification is performed using a standard format on how to do the evaluation. Detailed documents were prepared, describing the results. The characterisation report is available at the SEPA website (<http://www.sepa.org.uk/wfd/index.htm>).

The pressures are given to some detail, some are quantified. Environmental and ecological quality is described, but not the costs to bring it back to original state. Actions and pressures were pretty much as they were expected to be. Issues were known locally, but not to the same extent at the national level. The Council has taken on the responsibility to develop the wetlands for the next 5 – 10 years, but on a long-term basis it will have to be decided what will be the responsibility for the Council and what will be the responsibility for the developer for an area.

#### **4.1.5 Cost-efficiency analysis (CEA)**

An economic analysis has to be done at a later stage. A full analysis of the measures implemented through the NOLIMP-project will be worked out and a paper produced.

#### **4.1.6 Monitoring**

Monitoring in the area is building on the existing network, which has been running for a long time. Local ecologists and chemists have been involved in planning the existing network, and the monitoring plan is now expected to develop with time to fulfil the need for more data for the different areas. There is a lack of info on ground water, and one priority is to set up a ground water network.

Long-term monitoring has been part of research work at Tarland, starting before the NOLIMP project activities, and there will now be monitoring for the next 5 years, so the possibility to follow the area before, during and after the measures introduced in NOLIMP are very good. Pre-project, project and post-project data will be available.

#### **4.1.7 WFD and existing laws**

The existing laws had to be changed, as WFD has higher demands than the existing laws created in the 70-ties. Control activities and regulations are stricter within WFD, and many activities (i.a. regulations for obstructions, engineering works) now need Group licenses. WFD is transferred into the Scottish law, and a new law was put into action 1. April 2006.

#### **4.1.8 Lessons learned**

Important things they have noted/learned:

1. The farmer's questionnaires will be taken to the national level.
2. There are expectations from SEPA and SNH to know more about what sorts of works on the river banks can be accepted.
3. Local rules have to be set while they wait for the national rules.
4. Site visits will be arranged for demonstrations. This is an important tool for spreading information.

## **4.2 Meeting Ålborg, Denmark May 29<sup>th</sup> 2006 - NOLIMP and the local WFD implementation project**

#### ***Participants:***

Susy Lauesen, Nordjyllands Amt  
Peter Hahn, Nordjyllands Amt  
John Rune Selvik, NIVA  
Bente M. Wathne, NIVA

#### **4.2.1 Starting the international cooperation**

The NOLIMP participation and project cooperation was started on the basis of earlier co-operation with the Netherlands and an interest in water quality. Basic water quality surveillance and a plan for Mariager fjord gave a possibility to produce the Management Plan for Mariager fjord within the NOLIMP project.

#### **4.2.2 Public participation**

A web site is produced in Danish, holding many pictures, easy to read and understand for the public.

Intentional use of press releases in local newspapers has been important for awareness raising on the project activities and in general, and public meetings have been arranged both in-house for colleagues and directly for the public to inform about “Nature plan projects”.

Farmer’s organisation, Landmandsforbundet, has been an important partner for informal contact and discussions. “Kitchen table meetings” have given direct contact with the farmers. “Nature plan projects” have been introduced in small areas for testing, as also the wetlands activities, where financial support from the project has made the necessary investments possible. Wetlands activities through this project have been important, also for the local farmers, who can see practical results of the efforts and investments. For most efficient public participation, it is a good advice to concentrate in a small area and talk to the people with direct interest in these small areas.

An important remedy is the exhibition wagon, holding a transportable exhibition with information about the project and activities. This remedy moves the office outside for a period (i.a. one week) and makes it possible to talk to people, not only to special organisations or dedicated groups. Large meetings are easily “taken over” by a few prominent persons not necessarily representing the majority. The ideas and input registered during the exhibition wagon sessions will be brought back to the office and used to check the Management Plan and do corrections if necessary. This way of informing the public has been used for a long time with the Amt, and with good results.

Keeping up good contact with the local farmers and others is not giving any extra costs; Nordjyllands Amt has been working with this form of information also earlier. This will save money in the long run. They also do Stake holder analysis and register this as important for success, it saves money in the long run.

#### **4.2.3 Cost-efficiency analysis (CEA) and abatement planning**

CEA of Mariager fjord was done after the “break down” of the fjord. The local politicians needed decision support information. A lot of ideas came in on how to save the fjord, and they had to be sorted out and given priorities. This was reported by a consulting firm, and the report comprised cost-efficiency analysis (CEA) of all the proposals, so the politicians can follow the list and start to decide. The report was used as part of the Management Plan for Mariager fjord. A CEA is very well suited for this kind of work, and will be used in the future.

All the sewage treatment plants necessary for this area have now been built, and measures covering other areas have to be realized for further improvements. Treatment of drainage is i.a. too costly compared to other possible cleaning processes or activities. Other ways of farming, is i.a. an interesting remedy for reducing polluting runoff in many areas.

The fish dams bought by the Amt have been important. Some owners have been prepared to sell, and it has been easy to negotiate for the price, but others have been difficult, as they were planning for extended activities and working with these dams in the future. Also the change of land use from farming to other activities has been difficult for some people with traditions within farming and obligations to their ancestors’ efforts. The biggest challenge of the NOLIMP project work has been to get the some of the people owing the land to accept to sell it.

One of the most positive experiences from NOLIMP is that there has been practical work, not only theoretical studies.

#### **4.2.4 Monitoring**

This part of NOLIMP has been the self-financing part of the project. The monitoring for surveillance has been carried out for the last 25 years; and has been intensified both on chemistry and biology during the later years and after the collapse of the fiord. In general there has not been much automatic

monitoring performed, the surveillance is mostly based on sampling and then analysis in the lab. Some places automatic water level indicators are used. This monitoring programme has been the most intensive and comprehensive programme in Denmark, and due to this intensive monitoring, the water quality modelling could be done. Monitoring has also given the basis for the Management Plan.

When models are available, you can monitor for some typical measures and use the results to predict the results for equivalent areas.

#### **4.2.5 Characterisation**

Legal Act on Environmental Goals (Miljømål/Miljømålsloven) is passed to cover the WFD and the Habitat directive. Now the legal act has to be partly revised to follow the new reorganisation of the Danish state and municipal level, where the Amt level is eliminated.

Everything is covered in the Miljømålsloven. Due to the reorganisation there has not been much interest to hear what the Amt had to say in different matters.

In the first plan there were 13 water districts and now there are 4, one area towards Germany, one at Bornholm and the rest of Denmark is divided in two.

The Amts have done the basic analysis for characterising for the WFD. Amts have had different ways to characterise the water ways. One question regarding e.g. a fish obstruction/fish step, is it a problem or not? This topic has been handled differently in different Amts. Ground water has also been differently handled. There is no reference areas in Denmark, because all the land are used for different purposes and therefore influenced and not at a natural state, reference conditions are taken from other areas (i.a. Balticum).

The experience gained through the project period will be passed on to colleagues that will be transferred to municipalities and other local authorities. The former colleagues at the Amt and project work will keep in touch for networking as a follow up activity.

The Danish project manager will be an employee of the central government and bring her experience along to her new assignment.

Miljømålsloven shall cover both the WFD and the Habitat directive. This might bring along some challenges. Wetlands, coastal zones and sea areas shall have a water plan to solve the Habitat directive and an environmental management plan to reach good environmental status. This has to be coordinated and the goals may differ. Should one keep the existing state or endeavour to change the state to good ecological status? Following the directives could mean to reconcile activities between different goals. This could be challenges for a new co-operative project between the EU and Interreg member countries. Projects to get the two directives synchronised, could be a programme for the next project. Amts has had responsibilities both for environment and the water surveillance and management; this will now be divided between the central government and the municipalities.

#### **4.2.6 Economic analyses of water use**

Economic use of the water has been a topic for 20 years, there is not much more to gain within this field. Water meters has had the effect that people has reduced the consumption. Then the price had to be increased to get the necessary money to operate the water works, and as a result the price is mostly a fixed price now.

Farms discharge is calculated by the Amt for each year and reported from the amt. After the reorganisation it will be calculated by the state and reported to the state

Danish guide for farming with as little pollution as possible (Veiledning for dyrking med minst mulig forurensning) is produced within the project.

#### **4.2.7 Reporting**

Reporting will be done through a small internal report, the EU report and a small insert as special part of the newspaper for the public.

### **4.3 Meeting Leeuwarden, Netherlands May 31<sup>st</sup> 2006 - NOLIMP and the local WFD implementation project**

#### ***Participants:***

Jesler Kiestra, Province Frislân  
Folkert Kuipers, Province Frislân  
John Rune Selvik, NIVA  
Bente M. Wathne, NIVA

#### **4.3.1 Starting the international and national cooperation**

Representatives from Frislân and NIVA met at a North Sea meeting and discussed i.a. topics for an Interreg project co-operation. Frislân wanted a project connected to the WFD and to test the WFD implementation through a pilot. Some projects, suitable for combined activity with NOLIMP, were going on, i.a. upgrading of the environment connected to one special lake, Leijen, for reducing transport of nutrients. Combining ongoing projects and NOLIMP was done on top of existing plans to strengthen the total results. (As part of the total project input, a waste water treatment plant has been rebuilt and has been started 3-4 months ago.) NOLIMP is used as a national pilot for implementation of the WFD in the Netherlands. Monitoring, CEA and public involvement can be used as good examples for other areas. A promotion presentation on CD of three pilot projects in the Netherlands for the WFD has been produced, and NOLIMP is one of these three pilot projects. Examples are also in the "Hanse passage project", which is reported now, and the report will be available at the website.

The money used for the implementation work is coming both from existing budgets and the NOLIMP budget.

#### **4.3.2 Public participation**

The Leijien project involved several organisations, making better conditions for tourists in the area. Project work brought the organisations together to agree on the goals and then it was easier to get the things into action. A nature organisation, a bird organisation and a tourist organisation were involved. More walking paths (area) were wanted and the mud taken out when preparing the wetland pond was used to make a small hill with a view of the lake and the landscape. Work to prepare the wetland during project phase 1, included introduction of more meanders before the water enters the lake. This solution with meanders gives more storage space for the rain water and removing the mud created more heights in the landscape.

Improvements of rain water/storm water handling have been an important activity. In Smallerland one municipality was very active visiting every household, and 80 – 90 % of the households disconnected their rainwater drainage from the sewer system. Now they handle the rainwater in other ways and do not transport it to the sewer system; they are not combining the sewage with the rainwater. In the Netherlands combining these two are rather common.

Farmers wanted to be involved and wanted to use simple measures to improve the water quality. The water board was involved in the considerations, and to improve the water quality they found it helpful to use the simple measures for all farms in the pilot area. Discussion evenings with the farmers were very useful. Public authorities are controlling the farmers with several laws and regulations now. This could include several visits by different official entities. The farmers were asking for one visit to check all the parts that shall be checked, and this seems to be a good solution for efficient governmental and municipal procedures.

There has not been produced any new law to follow the WFD in The Netherlands. There are a lot of organisations involved for the implementation, and they are used to work together. The stakeholder involvement is new for all organisations. The water management plans came before the WFD, but not all areas had them. Now they are obliged to make water management plans everywhere. Water boards have to be consulted for planning of an area/city. The stakeholder involvement is new also for the water boards. Earlier the plans were prepared and then given for comments, now the stakeholders will be involved in the planning process in quite another way.

The biggest challenge was to make the people realise that the implementing the WFD could make a difference. When people see that something is going on in their lake they want to be involved. People are generally interested in improving the water quality. The bird organisation had a strong idea on how to improve the bird habitat, and on the same time improve the water quality. Involving schools are also important. Many families will be involved through their children. The NOLIMP project has supported a run for school children and a walk arrangement around the Leijien. Small pamphlets with information about the NOLIMP work are available for information for all participants.

The water board will have a more proactive approach towards the people. This will be general for authorities in all kinds of their work implementing all directives.

An advice, based on the experience from the project, is to make sure that people can see that they can make a difference in the decision process. Then they will be interested. If the decisions are not following their advice, be sure that they understand why the decisions are made. Be sure that all the sayings have been heard and then explain why the final decision was taken.

#### **4.3.3 Cost-efficiency analysis (CEA) and abatement strategy planning**

When the project started they didn't use CEA, but planned some measures after their best knowledge of them. The CEA and how to use it for the Lake the Leijien was a main challenge for the university. The method had only been used on the more theoretical level for larger areas. The procedure was first listing the measures then go through what would be the results and see what this will cost. Does the method work and can we use the results? (We think that the effects will be like this and the costs will be like this, then we have to see what will be the truth.) The CEA is very depending on the expert evaluation. It works well at the local/small level, but is not so efficient on a larger scale. The water board needs methods for smaller scale projects and project on a local scale. More time should be used on the expert evaluation; that was one of the experiences after this first test of the method.

The measures chosen and used for NOLIMP were not included in the plans for the whole area. If not for the NOLIMP project these measures would not have been tested out in this area. The state forestry as land owners was very interested in the measures; it would have been more difficult to do the project work if it had been farmers that owned the land. Farmers should have been compensated for the land used for the project work. You can not force some private person to co-operate. NOLIMP measures could not have been tested without the NOLIMP money, at least not very easily.

Working together between many water organisations has a long history in the Netherlands. Real integration is really more difficult.

#### **4.3.4 Monitoring**

Some special monitoring was put up for NOLIMP. Monitoring water chemistry and ecological status (fish monitoring, vegetation, water plants, macro benthos) resulted in one report on the ecological status. They measured the toxic algae/toxicity of water, pesticides by bio-essays, surface water of the lake and effluent waters from the treatment plant. They also monitored the measures to see the effects for the measures taken. This will be the first summer where all the measures are working, so it will be interesting to see the water quality improvements after this summer. To this date the sedimentation effects are not as big as expected. Sedimentation ponds have to be evaluated; it may be done input to raise the sedimentation rate, also for the smaller particles. Lake Leijien is part of the normal surveillance programme, but not at this detailed level where the effects of the measures can be seen.

Monitor the pressure of recreation activities are also of interest. They register the numbers of persons using the area; how many swimmers, how many boats and how many times the bridges are taken up for boats and how many staying over night in the area, and more touristic measures. The area will be more attractive for tourists and where do they move around? Are the tourists going where they want them to go, or are they going where they are not expected? Bird counting is done by the bird organisations.

They wish to test new measures to learn more about the effects of the different measures and then to chose the best measures for the next project.

There has been testing of some special toilets suited for the small islands were there is no water or no electric power. There it is local water used, combined with solar energy.

On-line control of the waste water plant is working. It is necessary to use on-line sensors to control the treatment process and calculate the optimum treatment and additive in the treatment process.

The read bed method was tested as new for this area after the technology used in Norway, also the farms with the closed water cycle is new.

The farmers as group are taking responsibility for improving the water quality.

#### **4.3.5 Characterising**

All of the waters in the area are heavily modified and artificial, the Wadden sea is a nature reservation area and important for birds habitat. It is at risk. After discussions they followed the German way and called the main river ways natural. Coastal zone is not natural because of the dikes, the dike will be but outside the dike it will possibly be some land where there can be "nature".

#### **4.3.6 Possible new projects**

Integration of WFD, habitat and nitrate directive

#### **4.3.7 Local WFD implementation**

The water management structure in the Netherlands is quite complicated. The province of Fryslân is responsible for the strategic type of plans. The waterboard and the municipalities work on the operational level.

The province of Fryslân is part of the Rhine river basin. This very large river basin starts in Switzerland and finds its way through Germany and the Netherlands to the Northsea.

Some figures of the Rhine river basin are given below:

1320 kilometers long

185.000 square kilometers large

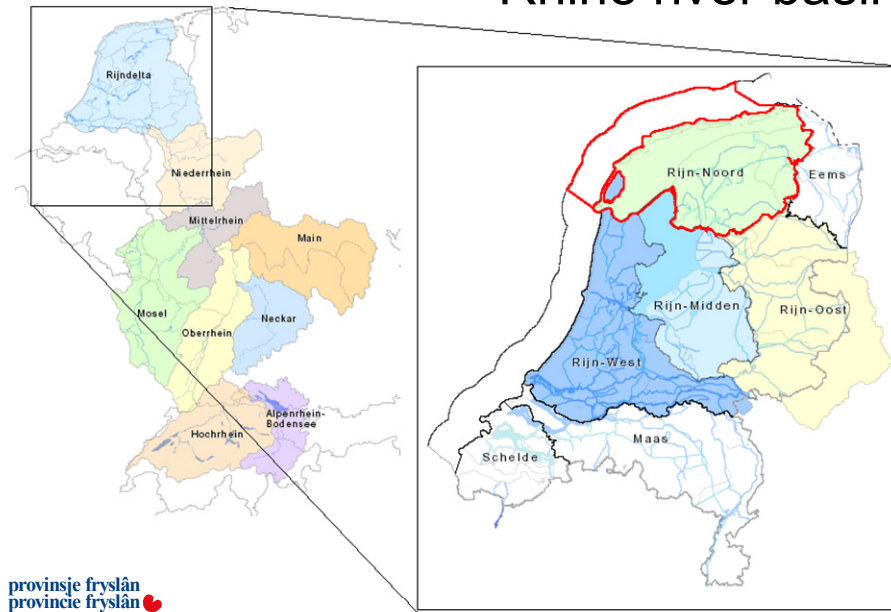
Average drainage in the Netherlands is 2.200 cubic meters per second

Highest drainage 12.060 cubic meters per second in 1995

Normative drainage is 16.000 cubic meter per second

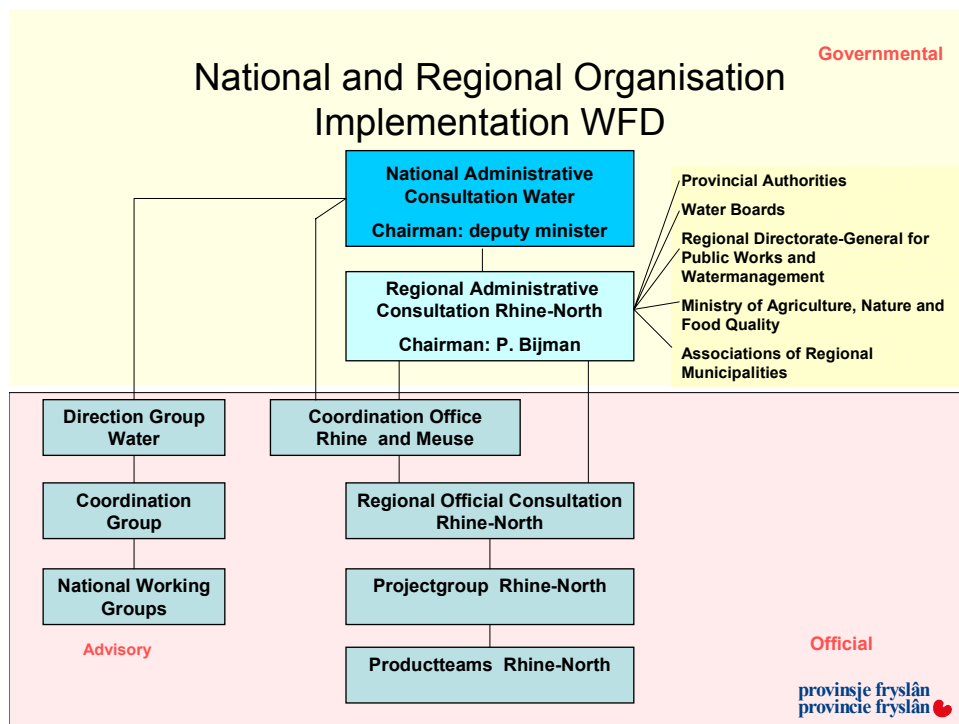
The River Rhine North basis includes the province of Fryslân, a small part of the province of Drenthe and about half of the province of Groningen. It also includes the Wadden Sea and the Wadden Islands.

## Rhine river basin



On national level the deputy minister of Transport, Public Works and Water Management is chairman of the National Administrative Consultation Water. On regional level there is administrative consultation water for every part of the river basin. The participants in the River Rhine North region consultation water are: the province of Fryslân, Groningen, Drenthe and Noord Holland (only for the region of the Waddensea), the waterboards of Fryslân and Groningen, the regional directorate-General of Public Works and Watermanagement, the ministry of Agriculture, Nature and Food Quality and about 40 municipalities.





This group work together with the co-ordination office Rhine and Meuse. On official level there are several project groups for specific items.

Further more there are the direction group water and co-ordination group, responsible for adjusting the WFD on regional level like setting the standards, describing good ecological status/potential etc.

#### 4.4 Meeting Göteborg, Sweden June 1<sup>st</sup> 2006 - NOLIMP and the local WFD implementation project

##### *Participants:*

Hans Oscarsson, Länsstyrelsen Västra Götaland  
 Dirk Hamsen, Länsstyrelsen Västra Götaland  
 Håkan Lagesson, Länsstyrelsen Västra Götaland  
 Anna Ek, Länsstyrelsen Västra Götaland  
 John Rune Selvik, NIVA  
 Bente M. Wathne, NIVA

##### 4.4.1 Starting the international and national cooperation and organisation

Sweden has no national pilot projects for implementing the WFD. NOLIMP was selected as a regional project. National authorities did not think the WFD could be implemented in Sweden, but the regional authorities realised that the WFD was important and saw this as a good solution for testing WFD. Västra Götaland has some very active municipalities that have been participating in the NOLIMP project, and Örekilsälven was chosen for this project due to these active municipalities.

The WFD adapted Water Boards “Vattenråd” shall have the responsibility for water management, but the selection of the management area is not decided. They will have their own Vattenråd for Örekilsälven probably, but this is not decided. The Swedish Munkedal, Färgelanda and Dals Ed municipalities had worked together. The old Dalsland area has worked together. They now have a common policy for sewage treatment, and the municipalities had not established this common policy without the NOLIMP project. The inter-municipality co-operation and contact between the

municipalities are improved due to the NOLIMP project. In Färgelanda municipality there was a fiery soul that has been very important for the project from the start. Based on earlier experience, he contacted Länsstyrelsen and wanted a new project. Then the possibility came up with NOLIMP. Without NOLIMP all the measures and activities now performed had not been accomplished. A model has been developed for the area and this is a result of NOLIMP this had not been prepared without this project.

Existing Water Boards - Vattenvårdsförbund have already an important role in the municipality (the first started 1957), and they didn't want to lose their role there. They have been responsible for the surveillance in the area, but did not do any evaluation or prepare water management plans. Vattenvårdsförbund is built on members as municipalities and industries, and after the new law came, they could be "pressed" to go in as members, if not they should prepare their own surveillance programmes. Vattenråd shall represent the most important stakeholders in an area. It has been natural to expect the Vattenvårdsförbund to act as Vattenråd, as the municipalities normally are members there, and they don't want two parallel organisations.

#### **4.4.2 WFD and existing laws**

Vattenrådet shall be a discussion forum and participate in preparation of the rules and regulations. The national law - Vattenförordningen exists – but the laws have to be adapted to the WFD.

#### **4.4.3 Public participation**

In Munkedal 20-25 houses had a direct discharge to the river Örekilsälven, and this has been changed. Also the sewage treatment plant has been upgraded. This is a result of the NOLIMP project. This has been showed to the public and an opening of the sewage treatment plant was by invitation to the local public. They also have separated the sewage and drainage, and send only sewage to the treatment plant, while the drainage is sent to a wet land for extra treatment.

School engagement has been made, the children have been given equipment to monitor the fresh water quality, and they will follow the water quality in their area.

Plans for information and discussions through the Vattenråd will be important for public participation and awareness. They will be important for the implementation of the WFD. Länsstyrelsen has not been very popular due to introduction of water protection areas - vattenskyddsområden, where land has been given restrictions without any compensation to the owners. Better information and contact with the stakeholder and farmers has changed the attitude during the project period.

Vattenråd shall not only discuss, they shall also decide about actions. This is very important and has contributed to the change of attitude. It has been realised that if you are not participating, the decisions will be taken anyhow, and this is important. Goals for the water quality should be discussed with the local persons. The characterisation is done at the regional level and should now be discussed with the local vattenråd. It is important to listen to their advice. More interest is created with the implementation of the WFD than through Agenda 21 activities.

Wood management authority - Skogstyrelsen has been involved in discussions; they had planned to have some areas as examples for wood management close to water courses. This has not been very successful, even though there has been some contact with managers in Skogstyrelsen. There have been efforts for a project for changing wood management for better water management.

The national final meeting in NOLIMP was held in Uddevalla and created good interest for the results.

All planning has been done in the same way as in Norway, where planning was done first by the municipality, and then sent out to the public and stakeholders for commenting. Now through the WFD

this procedure will change, with more public and stakeholder participation at an earlier stage during planning. There are costs connected to this changed working method, and this is necessary to take into consideration. It will cost more for the municipalities, but the management base will be much better. It has to be worked out how to provide the resources or extra money. It is not decided where the money for the measures shall be taken from. But if the value of the water courses is stipulated, it will be easier to cover the costs to improve and protect them.

The biggest challenge within this working area is to have the Water Boards (Vattenråd) work tight with the public and provide the information they need in an educational correct manner. Using colours for classification is the best way to present the water quality to the public.

The farmers very often feel “run over” by the system and the changing conditions they have to face. They need to be taken seriously and participate in the Water Boards (Vattenråd). One solution could be to have the farmers’ organisations pay their part centrally.

The five Water Management Authorities – Vattenmyndighetene, are relatively coordinated and will discuss with the National Pollution Authorities - Naturvårdsverket about rules.

#### **4.4.4 Cost-efficiency analysis (CEA) and abatement planning**

One pilot project has been performed, ranging two sewage treatment plants after their effects. This is a new method in Sweden. The method is tested for a river in Skåne to evaluate different solution after their cost-efficiency analyses.

If for an area all partners should divide the costs between them, even if the measures are done by one stakeholder, this would be a new working method for the authorities. CEA is tested in Norway for “Nordsjøplanen” for reduction to 50% of P transported to the North Sea. But there the costs have not been divided.

Today money paid in N-tax is given back after how good you are in cleaning for N. This principle can be used also for other areas. New support for the farmers will be more tailored to the environmental profile. Support could be used as carrots to change existing habits and working methods. (Support for wetlands creations, and other types of support). Wood managers have to produce a N-book to document how much N they use and produce, very detailed.

Measures through NOLIMP has been extra financing for most of the activities, so it is partly financing of planned activities, and it gave possibilities for earlier accomplishment. The wetlands had not been accomplished if not through this project. The approved discharges and the common policy for a larger area are also important results. Showing the status for a Water Board area - vattenrådsområde, is important to explain why there has to be measures in the same area. If a wetland is prepared, the land used should be bought by the authorities and the owner paid after the quality of the land.

It is important to work with physical obstacles in addition to nutrients and acidification. The physical obstacles are important; this is known to the authorities. Special money has been given for many years to improve the fish passing by fish ladders i.a. Many physical arrangements have been done in earlier times that now should perhaps be taken away, e.g. log driving arrangements (fløtningsled).

#### **4.4.5 Monitoring**

Extra surveillance has been performed through NOLIMP of biological parameters to compare with the chemical water quality. The surveillance will be evaluated this autumn on the basis of the NOLIMP results and then updated. The extra monitoring through NOLIMP is not necessary to fulfil the WFD, and on a regular basis the surveillance programme will not be changed. But the results through characterisation (where some results are stipulated) and modelling will be checked through the extra

sampling in NOLIMP. The WFD has not impacted the surveillance programme for water chemistry yet. (Phytoplankton and others).

#### **4.4.6 Characterising**

Characterising for WFD is done by Länsstyrelsen through this project for the pilot area. It will be updated after local input.

#### **4.4.7 Reporting**

Several reports have been produced during the project and they will now be published. A hierarchical structure with a geo database is produced. NOLIMP has given experience that made this work easier.

#### **4.4.8 Lessons learned**

There are some lessons learned through his project that can be used for other projects and in other countries. Sweden was a “late starter” when it comes to the WFD, and there has not been much information on how to work with the directive, or the working methods to follow. NOLIMP has developed experience that will be useful for further work with WFD and its implementation. Länsstyrelsen in Vestra Götaland will through the NOLIMP project accomplish pilot activities of interest to other local managements in Sweden. Länsstyrelsen in Vestra Götaland is the largest Länsstyrelse in Sweden (Vestra Götaland). Naturvårdsverket has not been very active and was very late to react towards the WFD.

If necessary data should be gathered for the whole country after sampling and water analysis, it would cost a lot (approximately 2 milliarder S.kr.) and this is unrealistic, so the expert and his/hers estimates have become more important.

“Vattenmyndigheten” (the new regional water administration) has become more important through the WFD. Industry, energy producers, wood organisation (skogföreningen), water and sanitation organisation (VA-föreningen) and others have come to LS for co-operation and advice.

The farmer organisations consider reorganising after the watersheds.

### **4.5 Meeting Oldenburg, Germany June 13<sup>th</sup> 2006 - NOLIMP and the local WFD implementation project**

#### ***Participants:***

Johanna Even, since 2006: Chamber of Agriculture of Lower Saxony - LWK (before Chamber of agriculture Weser-Ems)  
Heinrich Höper, State Authority for Mining, Energy and Geology, Geological Survey of Lower Saxony and Bremen (since 2006: LBEG before NLfB))  
Christina Aue, OOWV (Oldenburgisch-Ostfriesischer Wasserverband)  
Stephanie Wienhaus, LBEG  
John Rune Selvik, NIVA  
Bente M. Wathne, NIVA

#### **4.5.1 Starting the international and national cooperation**

When the NOLIMP project started, there was a reorganisation of the local authorities (district Government disappeared) and who should be responsible for the WFD was not clear. In Lower Saxony, the Ministry of Environmental Affairs is main responsible for WFD, and the State Service for Water Management, Coast Protection and Nature Conservation (NLWKN) is responsible for

implementation of the monitoring programme. The Geological Survey of Lower Saxony (LBEG) is advising the Government within their working area. They came in to estimate emissions and imission of N and nitrate, as they have responsibility to estimate emission for agriculture and other important sources for groundwater pollution. The LWK is not responsible for implementation, they are responsible for defining the “good practise in agriculture” (Expertise on agricultural questions and themes) and give advice to farmers, institutions, government etc. in this sector. The Water Board OOWV is one of the main drivers of groundwater protection in Lower Saxony, due to the diffuse pollution and groundwater contamination in its supply area. The OOWV acts as a stakeholder within the implementation process

Lower Saxony uses ground water for drinking water, and therefore focus has been on the groundwater resources.

The catchments of River Ems are dominated by agricultural areas. In general ground water could amount to up to 80% of the river water in the lower reaches, and this means that the nutrients could be higher upstream than down stream due to dilution. During summer a lot of rain is falling in Lower Saxony, 700 – 800 mm annual rainfall is a normal value.

When joining the NOLIMP project, they focused on protection of the groundwater. There were programmes/projects for protection in special water protected areas, but not for protection of groundwater in general. The LWK planned at that time also other Interreg projects (i.a. Hanse-Passage, Farmers for Nature), which gave information and contact with the partners in the NOLIMP project. An advantage of the NOLIMP was their focus on measures that could be usable for the water protection. The Germans joined the NOLIMP project a bit late, but was included by extending the project. A main reason for joining was the situation with reorganisation of the local authorities, where the situation and responsibilities was insecure. They didn’t know what the administration rules would be and they didn’t want to lose the possibility for impact. The general activities of the WFD were not part of their NOLIMP activities in Lower Saxony, they only work with the measures. The LWK focused especially on agricultural measures. The public water supplier OOWV focussed on public information regarding groundwater protection and WFD during the NOLIMP project. The third German partner; the LBEG, focused on monitoring and modelling.

#### **4.5.2 Public participation**

At the Training centre Bakenhus from the OOWV seminars have been arranged for stakeholders regarding the WFD, and a lot of people are coming to these seminars. The seminars have been held during spring 2006 and will continue during autumn 2006. They are funded with NOLIMP money for public participation. Offering the teaching trail on groundwater protection and Water Framework Directive for all pupils in the area has been popular. This activity will continue also after the finalisation of the NOLIMP project. Teachers from the agricultural schools in the area participating in these seminars are important, as they will teach the coming farmers in this topic. Building awareness in this way at an early stage is useful. The farmer organisation also meets regularly with the LWK about the impacts and importance of the WFD. They realise it is important to have information at an early stage on what is coming up as topics and what will be expected of them.

Pilot activities have been running at 5 farms, and information and results from these activities will feed into other projects. A list of measures are proposed, and farmers can chose if they will participate or not in the different activities. For ground water protection the participation will be voluntarily. The scepticism from most farmers has more or less disappeared and their attitude changed during project work. They also now come to the LWK and ask questions for the WFD activities. A task of the LWK will be to inform the farmers in such a way that they can participate in the implementation of the WFD and contribute as stakeholder.

### 4.5.3 Cost-efficiency analysis (CEA) and abatement planning

The LWK did cost-efficiency analysis concerning the diffuse pollution of N and P, but had problems with this. They tried to calculate what will be the costs to change the 5 pilot farms into water protection farms. They had to evaluate where the level is where you can say the farms are “water safe” and that you are satisfied with the status. They did this only for the 5 pilot farms. These farms i.a. have animal production and the nutrients produced by the animals have to be used in a way that diffuse pollution of the water is minimized.

A Handbook is available from the State Agency, where they have evaluated the environmental state and the costs for the measures necessary to reach the correct environmental status. This evaluation results are available only for surface water not for groundwater. Another question regards water quality information. When you shall use the Handbook, how do you find the correct data to use for the status evaluation?

How to use the cost efficiency plans or ranking of the different activities? CEA can be difficult. In the agencies they like to plan, but does not use cost efficiency planning to choose the methods they use. There are many considerations to take. In this area farming is very intensive and the costs are important for the whole area. If the farmers have to implement expensive measures, they may have to close down in some areas if the goals should be reached. This is important for the environmental agency too. It is important to be aware of the costs for all parties in this process.

You can calculate the costs of the measures, but it is difficult to calculate the cost of the pressures if they persist. If the water cannot fulfil the needs for the threshold values, what will be the consequences and the costs? If you have to drill deeper to get the water quality you need, what will be the cost of that? The daughter directive on nitrate has impact. How to calculate and estimate the impact is easier to handle for surface water than for groundwater.

They measure water quality and register the water into classes. But how you measure the values and use calculation rules to find the correct mean values are important for the classification. In Lower Saxony the first priority will be for ground water and the second will be for surface water. In the first characterisation of the surface water the biggest problem was the physical structure or morphology, not the nutrients, for the classification for the WFD. This could also be because there is a lack of information about the water quality of surface water, and the information about the structure is easier to gather. So the fact that structure was regarded as the biggest problem could be due to lack of monitoring results.

The Water management, Coastal Defence and Nature Conservation Agency of Lower Saxony (NLWKN) gave order to prepare a central databank now for all the monitoring results and gather all the information about the rivers. A lot of plans have been prepared and the information they hold is collected. This will be an important basis i.a. for abatement planning.

For phosphorus - P there has been a reduction due to better waste water treatment, but the diffuse pollution by nitrogen is still high. There should be something done to improve the water quality with respect to nitrogen. The link between the algae blooms and harmful situations in the North Sea and the pollution discharge from their farms or household is not clear to the public. The questions some of the farmers have put up are what is our pressure on the rivers and what does it mean for the individual farmers if, i.a., measured concentration are 10 mg N in a river? What if we work well, but our neighbour does not? Here the North Sea is very close and it should be easy to link the diffuse sources to the results in the North Sea.

Water quality is also important for fishing. If not for the fishery clubs there would not be many fish in the rivers here. The angling is depending on the working of these clubs, putting small fish into the rivers.

If the farmers should change their ways of working, it would impact the farm economy. In the project the cost for the possible changes and costs for this new way of working were calculated theoretically, but the change in their practical work was not possible, because the project is only for two years. One possibility was to change buffer strips and set them up where they didn't have them before, but the question is who will pay for this? The maintenance (water and soil) boards, which are an important stakeholder in the region are organised by the landowners (mostly farmers). In former times a lot of money was used to straighten the brooks to get rid of the water and create better conditions for flood protection and land, now they don't want to change them again for ecological reasons. They are also afraid that they will not get rid of the water.

Also agricultural policy has an influence on the situation because until 2004 the EU subsidies for farms were paid on the production of the farm meaning the farmers used all their land for agricultural production, because they received money for every square meter used for cultivation. Now this is changed in Germany, you get the subsidies for the whole farm and maybe this will also change the pressure on farms to cultivate every square meter.

Farmers with the right to withdraw water don't have to pay for it. (They are not a public organisation/institution and the amount of water is not so high). Also in the south of Lower Saxony where they need more water for irrigation, they don't have to pay.

The economy is important, and pressure on the economy of the agricultural sector puts pressures on the economy of whole area.

#### **4.5.4 Monitoring**

Monitoring is normally done by sampling and analysis in the lab. There are no sensors in the wells or surface waters for continuous monitoring. Monitoring has been done of the end emission, based on statistics. They are following the change of land use by looking into statistics. They follow transport through air emission of ammonium also from The Netherlands. The real observed concentration in surface water may differ 50% from the calculated due to denitrification.

Soil maps exist and they are relatively good, but they need some updating because of the change in land use. But for denitrification it is not too bad when used for estimation.

On local level in the water protection area of Thülsfelde there has been soil mapping during Nolim, which showed that the peat soils are disappearing due to change in land-use.

As mentioned, State Service for Water Management, Coast Protection and Nature Conservation (NLWKN) is responsible for the surface water monitoring. The WFD focus more on biology than chemistry, compared to the former monitoring programme. The change is mostly within the end-balance monitoring and emissions. Now they are trying to link the groundwater quality to what is happening at the top of the soil, and this is new. They also try to find out where the water is coming from. To answer these questions the OOWV tried to get data about transfer time and a flow-model for the groundwater towards the monitoring wells.

Monitoring is also important for the farmers. They want to know if the pollution is coming from their farm or not. In general it is important not only to look at water quality itself, but also look into where the water comes from and attack pollution as close to the source as possible.

Data from monitoring is put into decentralised databases, but they started some years ago to prepare a centralised database.

The ministry of environment is responsible for the environment and the water quality, but the pollution sources connected to i.a. agriculture are under the ministry for agriculture.

Waste water treatment plants are not a problem in Germany. When it comes to N and P, they are all working well. In the pilot area where the NOLIMP project is working, there are no other important point sources. Rules are given for handling pollution from farms, and there are e.g. special rules for storing of manure. There is not any important industry and the standard of industry is normally very high. They normally have their own treatment plants.

#### **4.5.5 Reporting**

Information will be given to all farmers through a special brochure containing information about the WFD implementation in Lower Saxony, NOLIMP results and results from other projects concerning the WFD implementation. The brochure is distributed with an agricultural magazine called "Land und Forst" in whole Lower Saxony.

#### **4.5.6 WFD and existing laws**

German laws were changed to fit the WFD. The water law of Lower Saxony was changed according to the WFD. Every state (the 16 German Länder) does it differently, but according to the WFD. The characterisation has been done separately in each state and there has been some coordination at the central level. There might be changes again due to flooding protection, but there is also a special law for flooding protection in preparation in Lower Saxony.

#### **4.5.7 Further work**

More data is necessary to calculate the efficiency of buffer stripes and the use of wetlands and riparian zones. Monitoring before and after installing the measure is necessary, to be able to say something about the efficiency of the measures. More data about the water quality of the surface water, more awareness and more information is necessary. Drinking water is produced mostly from groundwater in Lower Saxony, so it is a hidden resource and information of the public is necessary that surface waters are connected to the groundwater and that land use in general has an impact on groundwater quality. More information is needed not only on the big rivers but also on the small rivers and how they impact the water quality in the bigger rivers and the North Sea. In the Harz mountain area where the drinking water is coming from the surface water, the public is more concerned about the water quality in the surface water. Also for leisure activities like bathing and fishing the quality is important and linking to this is important when discussing with the public. On the river Hunte the city of Oldenburg is opening the bathing again and this will increase the pressure on the water quality for this river.

If there is no real pressure from the impact side it is more difficult. The Hunte River is running in to a shallow lake (Lake Dümmer), and they have constructed a bypass for this lake. Every year it costs a lot of money to take out the mud and to make the bypass work.

Calculation of P input into rivers by sedimentation irrigation could be of interest. There is little information on surface water quality.

Adding to these notes are valuable written comments from Höper and colleagues in a special paper.



## **4.6 Norway Project discussions - NOLIMP and the local WFD implementation project**

### ***Participants:***

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### **4.6.1 Starting the international and national cooperation**

NOLIMP and NIVA's participation was initiated when NIVA's Atle Hindar and Hans van Merendonk from the Friesland Province met on an Interreg 'marketplace meeting' related to the North Sea Programme and joined ideas on WFD and regional cooperation.

The Morsa, a catchment organisation with 8 municipalities as members, had been in operation for some years and an abatement plan was underway. However, resources were limited and the participation in an international programme with exchange of experience was considered very beneficial. The idea was also to look into WFD-implementation in two other Norwegian catchments, where no active local organisation was established yet – the small Gjeving catchment in the municipality of Tvedestrand and the Suldal catchment in Rogaland county. The deviating timetable that emerged for Norway's implementation of WFD, delayed the establishment of local organisations in these catchments and it follows that activity has been much lower than expected in these two catchments. Resources were reallocated and more activity than originally planned took place in the Morsa catchment. The environmental situation in Morsa was considered rather acute with annual blooms of toxic blue green micro algae, and the need for increasing knowledge of lake-ecology/hydrology, organising data and finding efficient measures were expressed as urgent from the catchment organisation. This situation received considerably engagement from stakeholders, media, local administration and politicians on all levels up to the national parliament. In good cooperation with the Morsa organisation, the Norwegian NOLIMP project - component complemented activities in the catchment and enabled more work to be done than otherwise.

### **4.6.2 Public participation**

The need for public participation was considered important already from the start of the Morsa catchment organisation. In the NOLIMP project period Morsa organised several meetings/seminars regarding Morsa, and NIVA researchers contributed on a large number of topics related to the ongoing activities funded by NOLIMP and other sources.

A successful public participation requires access to information on the topics at stake. The organisation of environmental data and subsequent public access to this source of information by NOLIMP was very welcomed in Morsa. Over the years data had been collected by many parties, but limited harmonisation/coordination had taken place, and considerable effort was required to gather and organise historical data. A map base web-application was developed to distribute old and new data – and has been used successfully by many interested parties over the last two years. This facility will be continued after the NOLIMP project period.

### **4.6.3 Cost-efficiency analysis (CEA) and abatement planning**

Cost- efficiency analysis (CEA) has been used in abatement planning for several years in Norway, and was also one of the tools used when planning measures in the Morsa catchment. The cost-efficiency analysis was revisited during NOLIMP and the potential for using new techniques in this context, e.g. Bayesian belief networks, were investigated. Cost efficiency will clearly be used as a tool in all abatement planning where different sources are involved. In addition to cost efficiency, the knowledge of retention/self-cleaning in the catchment is relevant for planning measures related to environmental

problems in a specific part of a catchment. Measures upstream in the catchment will most likely have less effect on a lake in the lower part of the catchment when compared to local sources near the lake.

#### **4.6.4 Monitoring**

The effort to collect, organise historical monitoring data and distribute both new and old data on web is mentioned above.

The knowledge of several quality elements in the Morsa catchment were missing or very fragmented because they had not been monitored or investigated for years. Nolimp supported monitoring action initiated in Morsa and made a separate mapping of submerged aquatic vegetation in the whole catchment.

Monitoring was also initiated in the Gjeving catchment in order to establish a platform useful in the characterisation of this catchment in accordance with WFD. The mapping of aquatic vegetation was also conducted here.

All available information was used in the characterisation of the catchment and selecting those parts of the catchments that was 'at risk'.

Establishment of adequate monitoring in Norwegian catchments is a challenge because of the high number of lakes and rivers, but the Morsa case has demonstrated the need to put necessary resources into monitoring of water bodies that are at risk in order to be able to make firm decisions regarding abatement measures.

#### **4.6.5 Reporting**

Technical reports are usually available for download from The State Pollution Control Authority, the Morsa catchment organisation or from the research institutes themselves. The open web-service for access to recent monitoring data in Morsa will continue, see [www.aquamonitor.no/ostfold](http://www.aquamonitor.no/ostfold).

#### **4.6.6 WFD and existing laws**

WFD has not led to direct changes in Norwegian laws, but the directive is implemented in Norwegian legislation in the form of an administrative regulation. This regulation was not brought into force before late in 2006. For a long period it was uncertain whether the directive would sort under the Ministry of Environment or the Ministry of Petroleum and Energy (hydropower belongs to the latter) and this caused a considerable delay on the regulative side. However a coordinating body organised at the directorate level has been in operation and organised national pilot studies and other activities related to the preparation for Norwegian implementation as well as participation in international working groups, e.g. CIS.

#### **4.6.7 Further work**

The Morsa catchment organisation has become a "vannområdeutvalg", a subdivision of the larger water region "Glomma-regionen", and will continue its work on improving the status for Lake Vansjø and the surrounding catchment. For a period extra resources will be available from the State to accelerate implementation of measures and further investigation on ecology, hydrology and other topics of importance for understanding lake behaviour and its response to implemented measures. Experiences from Lake Vansjø will be presented in various forums dealing with the exchange of information regarding WFD processes in Norway.

# 5. Conclusions

## 5.1 National Pilot River Basins (PRB)

The network of Pilot River Basins (PRBs) and associated coastal zones were been established under the Common Implementation Strategy (CIS) to support national implementation of the WFD. The testing WFD Guidelines for these PRBs were handled at a national management level with a minor stakeholder involvement in the testing of WFD guidelines.

Due to the lack of data and the importance of expert judgement, the results of the Art.5 analyses have to be considered as provisional. 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/countries.

A general conclusion is that the GDs developed in the first phase of the Common Implementation Strategy (CIS) process have been of great help in preparing preliminary Art.5 reports submitted to the EC. Although no revision of the GDs was felt 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 with experiences as a reference base. People prefer short, focused reports rather than new guidance documents. It appeared that PRBs were reading the GDs with different perspectives, which would lead to regional diversification. The need for regional case-studies, information exchange etc. could be beneficial and increase further harmonisation.

Further conclusions were that 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. It followed that Member States should try to harmonise their monitoring competences in such a way that the information needed for the implementation of the WFD reach the competent authorities at each river basin that have the task of its implementation.

10 key points for active public participation were developed. See section 1.2 for more details.

## 5.2 Common experiences from the regional and local implementation project (NOLIMP)

Bringing different authorities and science together with a common goal / common problems/ common project tasks has been a new challenge for most partners. The WFD require cooperation in a new way and this has been a new and interesting way of working.

A common experience is the importance of involving stakeholders at an early stage. It is easier to be proactive and solve controversies when the contact is good and well established. People seem to appreciate that they can speak to all the different authorities/organisations in “one room”. In such a context it is also easier to understand the relevance of research for decision processes, and merging of different disciplines to solve a common goal becomes more obvious.

Efforts and resources are required to establish and to maintain involvement of stakeholders. Building awareness on environmental topics is necessary to establish a platform where active involvement can develop, but it takes time and will benefit from a structured and planned approach. The previous experiences with this way of working differs between partners, but those having experiences in this

direction do not consider this as “extra costly”, but as a necessary way of approaching complex environmental topics. The biggest challenge in this new way of cooperation seemed to be the process of convincing people that their opinion and contribution was appreciated and really had an effect on the decisions taken. When that hurdle was overcome the “ball started to roll” and a positive dialogue took place.

The implementation of WFD in national legislation ranges from actual changes in specific laws to putting into force national regulation based upon the existing laws. In Denmark, a large reorganisation of the environmental administration and responsibility is taking place, focusing more on ‘state level’ and ‘local level’.

Monitoring the NOLIMP pilot areas has different history and different completeness compared with WFD requirements and it differs to what extent NOLIMP was engaged in the monitoring as such. It has been demonstrated that monitoring needs to be relatively comprehensive to enable proper abatement planning, to be able to follow effects of implemented measures and to enable the use of models to better understand the dynamics and interactions between different factors as well as climate. Another aspect of monitoring is to enable transparency and objectivity regarding the quantification of pollution load from different sources/sectors.

The use of cost efficiency analysis has also different status and history among the partners. The ranking of measures according to cost and the possibility to discard measures that obviously have a low efficiency is experienced as very useful. In situations with solid public participation, a number of creative ideas and proposals on new measures will appear. CEA represent one rather objective method of handling all measures in a transparent way. However, there are often external factors (e.g. changing agriculture subsidies) that may influence which measures are easy to implement and which are hard to implement, and we need to adapt to actual situations. The cost of not achieving environmental targets may also have economic consequences which can be introduced into the debate and increase complexity of the questions in debate.

The development of demonstration sites create interests from other areas and exchange of knowledge/experience on the national level is stimulated. WFD requires a holistic approach and elements that for years have been seen as separate now need to be connected quantitatively and qualitatively. This requires considerable resources to improve knowledge and develop/implement tools to handle these topics. One example is the link between surface waters and groundwater, where anthropogenic activity may influence the quality of pumped groundwater many years later. It appears to be a general vision to enable knowledge based decisions, but it is clearly a challenging and resource demanding vision. The ability to handle uncertainty in decision-processes and at the same time achieve common accept for the solutions/decisions is something we need to handle through many years and this will continue to be a challenge for authorities aiming at the WFD targets in the years to come.

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## 7. Appendix 1: Results from the NOLIMP Questionnaires

### 7.1 NOLIMP Questionnaire – Aberdeenshire, Scotland

Question\Topic	Public participation	Cost/Efficiency Analysis, CEA	Abatement strategy and planning, incl. artificial wetlands	Monitoring
What has been done?	<ul style="list-style-type: none"> <li>a) Awareness work established at an early stage</li> <li>b) More local information used</li> <li>c) Special pamphlet – Farmers questionnaire</li> <li>d) Special contact with farmers</li> <li>e) Awareness day arranged</li> </ul>	A full analysis of the measures implemented through the NOLIMP-project will be worked out and reported on.	<ul style="list-style-type: none"> <li>a) Wetland construction</li> <li>b) Programme of remedial management works to reduce diffuse and point source pollution</li> <li>c) Biodiversity enhancement</li> <li>d) Flood elevation</li> <li>e) Landscaping</li> <li>f) Community engagement</li> </ul>	Monitoring in the area is building on the existing network. Pre-project, project and post-project data will be available to evaluate the measures implemented during NOLIMP. .
Where did you meet the biggest challenges?				
What about the costs?			Funding through Interreg has been crucial for the measures implemented.	Special research grants have supplemented existing monitoring activities.
What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?	<ul style="list-style-type: none"> <li>a) If you want participation you must start with awareness</li> <li>b) Be proactive. Establish contact with stakeholders and the public before the controversies start.</li> </ul>			
What are the changes or aberrations you have	Real working level multi-agency co-operation, not only		WFD has higher demands than the existing laws created	Monitoring continues as before, but is expected to

<b>Question\Topic</b>	<b>Public participation</b>	<b>Cost/Efficiency Analysis, CEA</b>	<b>Abatement strategy and planning, incl. artificial wetlands</b>	<b>Monitoring</b>
accomplished in relation to your former working methods?	administrative contact.		in the 70-ties. Control activities and regulations are stricter within WFD, and many activities now need Group licenses. A new law was put into action 1. April 2006	develop over time to fulfil the WFD needs.
Future plans, including some thoughts and ideas about the possible difficulties and how to face them?	Site visits has shown to be valuable as a tool to inform both specialist and the public. This activity will probably continue after the project closing.			
EAB/any other advice you would like to pass on to your fellow water experts				

## 7.2 NOLIMP Questionnaire – Ålborg, Denmark

<b>Question\Topic</b>	<b>Public participation</b>	<b>CEA</b>	<b>Abatement strategy and planning, incl. art. wetlands</b>	<b>Monitoring</b>
What has been done?	<ul style="list-style-type: none"> <li>f) website</li> <li>g) newspaper announcement</li> <li>h) public meetings</li> <li>i) Workmen's Hut</li> <li>j) Involving local agricultural advisers</li> </ul>	<ul style="list-style-type: none"> <li>- A report on the cost effectiveness of a range of activities in the eligible area.</li> <li>- A tool for decision making</li> </ul>	<ul style="list-style-type: none"> <li>a) wetland areas</li> <li>b) Folder for erosion restricting activities in agriculture</li> <li>c) Nature management plans</li> </ul>	An intensive monitoring programme has been carried out since the ecosystem of the fjord suffered from severe oxygendefency in the late

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
			d) Action plan for Mariager Fjord e) Afforestation	90ties. Includes both biological as well as chemical parameters
Where did you meet the biggest challenges?	To ensure that you reach the public in the community	To balance the reduction of uncertainties in the data processing with a transparent output that is readable for the politicians.	To persuade the landowners to give up land areas for nutrient reduction	None as we have had this rather intensive monitoring programme within the catchment area of Mariager fjord for years
What about the costs?				In order to set up models for the fjord the costs of collecting the necessary data are very high
What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?	a) Make a strategy for communication b) Analysis of stakeholders c) Ensure a proper promotion of the project and the activities d) Concentrate the effort in the local community – that is where the interests in the activities are.	Prepare a CEA in the project. With this analysis you can separate essential uncertainties from non essentials and give the politicians a tool in the decision making process.	Make a strategy for communication when dealing with information folders and nature management plans.	Learn from experiences from other systems that are alike or similar to the ones you have monitored very intensively.
What are the changes or aberrations you have accomplished in relation to your former working methods?	Be more aware of informing the public about the project at the right time using the right media.	Prepare the analysis as early as possible in the project, so you can use the CEA as a guide.		
Future plans, incl. some thoughts and ideas about the possible difficulties				The monitoring programme will in the future be part of a programme to cover all of



<b>Question\Topic</b>	<b>Public participation</b>	<b>CEA</b>	<b>Abatement strategy and planning, incl. art. wetlands</b>	<b>Monitoring</b>
and how to face them?				Denmark. Hopefully the things we have learned in Mariager fjord can be used in that perspective.
EAB/any other advice you would like to pass on to your fellow water experts				

### 7.3 NOLIMP Questionnaire – Provincie Frislan

<b>Question\Topic</b>	<b>Public participation</b>	<b>CEA</b>	<b>Abatement strategy and planning, incl. art. wetlands</b>	<b>Monitoring</b>
What has been done?	<ul style="list-style-type: none"> <li>k) Involving local organisations</li> <li>l) Discussions evenings with farmers</li> <li>m) Visiting households</li> <li>n) Pamphlets with information</li> <li>o) Involving schools</li> <li>p) Supporting a run for school children to have their attention</li> </ul>	- A report on the cost effectiveness of a range of activities in the eligible area.	<ul style="list-style-type: none"> <li>a) Preparing wetland ponds</li> <li>b) Landscaping</li> <li>c) Introduction of more meanders</li> <li>d) Improvements of rain water/storm water handling</li> </ul>	Some special monitoring was put up for Nolimp, monitoring water chemistry and ecological status (fish monitoring, vegetation, water plants, macro benthos).
Where did you meet the biggest challenges?	To make people realise that implementing the WFD could make a difference	<ul style="list-style-type: none"> <li>a) Handling the high dependency of CEA on the expert evaluation</li> <li>b) Scaling up from the local/small to a larger level</li> </ul>	Working together between many water organisations has a long history in the Netherlands. Real integration is really more difficult.	To perform monitoring that could register the effects of measures introduced during the project.

<b>Question\Topic</b>	<b>Public participation</b>	<b>CEA</b>	<b>Abatement strategy and planning, incl. art. wetlands</b>	<b>Monitoring</b>
What about the costs?			Costs are shared between NOLIMP and existing budgets	Costs are shared between NOLIMP and existing budgets.
What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?	Make sure that people realise that their engagement can make a difference in the decision process	The CEA is very depending on the expert evaluation. More time should be used on this evaluation process.	Coordinating visits from several agencies for efficient governmental and municipal control of farming activities.	Learn from experiences from other systems that are alike or similar to the ones you have monitored very intensively.
What are the changes or aberrations you have accomplished in relation to your former working methods?	Better involvement of the public.			On-line control of the waste water plant is working. It is necessary to use on-line sensors to control the treatment process and calculate the optimum treatment and additive in the treatment process.
Future plans, incl. some thoughts and ideas about the possible difficulties and how to face them?		The water board needs methods for smaller scale projects and project on a local scale.		e.
EAB/any other advice you would like to pass on to your fellow water experts	Procedures followed in Nolimip resulted in farmers as group taking responsibility for improving the water quality.			

## 7.4 NOLIMP Questionnaire – Västra Götaland, Sweden

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
What has been done?	<ul style="list-style-type: none"> <li>q) Improved information of the public and better contact with stakeholders</li> <li>r) Direct contact with farmers</li> <li>s) Direct contact with Water Boards</li> <li>t) Involving schools</li> </ul>	One pilot project has been performed, ranging two sewage treatment plants after their effects to a river in Skåne.	<ul style="list-style-type: none"> <li>a) Upgrading a sewage treatment plant</li> <li>b) Separating sewage and drainage</li> <li>c) Individual sewage outlets connected to the local sewage plant</li> <li>d) Wetlands construction</li> <li>e) Model development</li> </ul>	Extra surveillance has been performed through NOLIMP of biological parameters to compare with the chemical water quality. On a regular basis the surveillance programme will not be changed
Where did you meet the biggest challenges?	To make the Water Boards (Vattenråd) work tight with the public and provide the information they need in an educational correct manner.	Divide the costs between all partners, even if the measures are done by one stakeholder.	Wood management authority - plans to have some areas as examples for wood management close to water courses have not been fulfilled. (Changing wood management for better water management)	
What about the costs?	There are extra costs connected to working methods with more public and stakeholder participation. It will cost more for the municipalities, but the management base will be much better.		Measures have been possible due to extra financing in addition to existing means for most activities - combined financing gave earlier accomplishment. The wetlands had not been accomplished if not through this project.	Costs are shared between NOLIMP and existing budgets.
What is the best	Ensure people that their engagement	Today money paid in N-tax		

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
advice you would like to pass on to your colleagues facing the same situation in other areas?	can make a difference in the decision process. If you are not participating, the decisions will be taken anyhow.	is given back after how good you are in cleaning for N. This principle can be used also for other areas.		
What are the changes or aberrations you have accomplished in relation to your former working methods?	Better involvement of the public and stakeholders at an early stage in the planning process.			WFD has not impacted the surveillance programme for water chemistry yet.
Future plans, incl. some thoughts and ideas about the possible difficulties and how to face them?	The farmers very often feel “run over” by the system and the changing conditions they have to face. They need to be taken seriously and participate in the Water Boards. One solution could be to have the farmers’ organisations pay their part centrally.	New support for the farmers will be more tailored to the environmental profile. Support could be used as carrots to change existing habits and working methods.		The surveillance will be evaluated this autumn on the basis of the NOLIMP results and then updated.
EAB/any other advice you would like to pass on to your fellow water experts	Goals for the water quality should be discussed with the local persons. Characterisation is done at the regional level and should be discussed locally.		Stipulate the value of the water courses is to make it easier to cover the costs to improve and protect them	

## 7.5 NOLIMP Questionnaire – Weser-Ems Region, Germany

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
What has been done?	<ul style="list-style-type: none"> <li>u) Seminars for stakeholders, including teachers at agricultural schools. Offering the teaching trail on groundwater protection and WFD for all pupils in the area has been popular. This activity will continue also after the finalisation of the project.</li> <li>v) Regular meetings with farmer organisations.</li> <li>w) Special brochure for farmers.</li> </ul>	<p>Cost-efficiency analysis concerning the diffuse pollution of N and P for five pilot farms.</p>	<ul style="list-style-type: none"> <li>a) Reduce discharges from diffuse sources, especially from agricultural land use.</li> <li>b) Methods and tools for monitoring/ modelling discharges in the saturated and unsaturated zones (surface run-off and groundwater run-off).</li> </ul>	<p>Diffusive nitrogen input into groundwater was considered.</p>
Where did you meet the biggest challenges?	<p>Get the public to realise the link between algae blooms and harmful situations in the North Sea and the pollution discharge from their farms.</p>	<ul style="list-style-type: none"> <li>a) Evaluate where the level is where you can say the farms are “water safe” and that you are satisfied with the status.</li> <li>b) You can calculate the costs of the measures, but it is difficult to calculate the cost of the pressures if they persist.</li> </ul>		<ul style="list-style-type: none"> <li>a) To combine soil and hydro-geological information</li> <li>b) To predict denitrification in the subsoil and to interpret measured values</li> <li>d) To estimate the N-balance on a community level (especially, as part of the balance, the nitrogen fertilizer input)</li> <li>e) restricted number of present monitoring wells for groundwater quality, not all hydro-geological type areas are covered by</li> </ul>

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
				<p>the present wells</p> <p>f) A compromise has to be found between what is technically desirable and what is financially affordable</p>
What about the costs?		They tried to calculate what will be the costs to change the 5 pilot farms into water protection farms.		Costs are shared between NOLIMP and existing budgets.
What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?	Participation of teachers from the agricultural schools in seminars is important; as they will teach the coming farmers. Building awareness at an early stage is useful.			<p>a) Denitrification is an important process and cannot be neglected if N emission is to be linked to groundwater quality.</p> <p>b) Kriging of groundwater quality data is possible, but in general only in drinking water catchment areas the data density is high enough to get reliable information</p> <p>c) The monitoring network is based as far as possible on existing groundwater monitoring networks</p> <p>d) Polluting substances (e.g. nitrate, pesticides) as well as problems with</p>

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
				<p>the quantitative status have clearly to be defined</p> <p>e) Methods for the choice of the monitoring sites and for the operation of these sites have to be as clear as possible in order to convince the different interest groups and the State authorities, financing the monitoring</p>
<p>What are the changes or aberrations you have accomplished in relation to your former working methods?</p>		<p>In the agencies they normally plan activities, but have not used cost efficiency planning to choose the methods they selects for implementation.</p>		<p>a) Need for information covering the whole project area</p> <p>b) Combination of statistical and geological information</p> <p>c) Combination of hydrogeological and soil information, using different scales.</p> <p>d) To establish an emission monitoring to validate the selection of the monitoring sites and to get a short-term control of success of the measures to be implemented</p> <p>e) To validate the choice of the monitoring sites and</p>

Question\Topic	Public participation	CEA	Abatement strategy and planning, incl. art. wetlands	Monitoring
				the concept model with the monitoring results
Future plans, incl. some thoughts and ideas about the possible difficulties and how to face them?	A task of the LWK will be to inform the farmers in such a way that they can participate in the implementation of the WFD and contribute as stakeholder.			<ul style="list-style-type: none"> <li>a) To validate the estimations on denitrification in subsoils by further measurements</li> <li>b) To get information on denitrification in aquifers,</li> <li>c) To model surface runoff with nitrogen and phosphorus transport into surface waters</li> </ul>
EAB/any other advice you would like to pass on to your fellow water experts	The scepticism from most farmers has more or less disappeared and their attitude changed during project work. They also now come to the LWK and ask questions for the WFD activities.	A Handbook is available from the State Agency, where they have evaluated the environmental state and the costs for the measures necessary to reach the correct environmental status. This evaluation results are not available for groundwater.		When you measure water quality and register the water into classes, it is important how you measure the values and use calculation rules to find the correct mean values for the classification.



## 7.6 NOLIMP Questionnaire – ”Morsa” Vannsjø-Hobøl catchment, Norway

	<b>Public participation</b>	<b>Cost/Efficiency Analysis, CEA</b>	<b>Abatement strategy and planning, including artificial wetlands</b>	<b>Monitoring</b>
What has been done?	In Morsa the catchment organisation conduct annual meetings regarding the situation. Open meetings and involvement of stakeholder organisations enabled public participation. NOLIMP made information easily available.	A cost-efficiency analysis was made as part of an abatement plan. The cost-efficiency analysis was revisited during NOLIMP and the potential for using techniques as Bayesian belief networks was investigated.	The abatement plan for Morsa included mostly measures for agriculture and for the private households sector. NOLIMP contributed to establishment of a pilot ‘aftercleaning pond’ for sewerage and two artificial wetlands for handling agriculture diffuse pollution. Innovative algae traps were tested.	Several investigations have taken place in Morsa over the years, several monitoring activities have taken place and involved several different actors with limited coordination. NOLIMP made a large effort to collect, digitise and organise historical data and create a map-based website available for public access. NOLIMP also enabled monitoring of quality elements which had not been investigated for years and also enabled public web-access to monitoring data in real time from a site in lake Vansjø.
Where did you meet the biggest challenges?	To accept cause – effect relationship and thereby realise the need to implement measures that are costly for each household/farm.		Biggest challenges are linked to public participation and establish a common accept for the action plan.	To get a fully coordinated monitoring activity including coordinated flow/ storage/maintanance of data. This is still not established in regulation, but all actors see the benefits of continuation of this activity.
What about the costs?	Need to use sound judgement	Cost-efficiency analysis has		Monitoring and

	<b>Public participation</b>	<b>Cost/Efficiency Analysis, CEA</b>	<b>Abatement strategy and planning, including artificial wetlands</b>	<b>Monitoring</b>
	on where and when a full public participation is required, but acceptance of actions plans in the other end of such processes justify costs for the activity.	been used as a tool for establishing abatement plans in Norway for several years, and give good guidance on how to approach the problem. There are of course several factors that cannot be taken into account in such an analysis, but which will influence choice of measures.		implementation of measures has too often been seen as separate activities in Norway. A 'cheap programme' will often lead to high uncertainties in conclusions or need a very long time period to supply adequate results. The risk of investment failures due to lack of knowledge receive less worries, but these two topics should be strongly linked.
What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?	Start involment processes early – take into account also the long term perspective. Make your own initial assessment of what different stakeholders want from a participation process and how they can influence your process.	Even a simple version of cost-efficiency analysis will be of help in putting various groups of measures into perspective.	There is a general trend in Norway to believe that artificial wetlands will solve all problems, but you should investigate carefully the local conditions and clairify the nature of the problem you want to solve before deciding on technology/design.	Use the necessary resources to coordinate monitoring activities and establish easy access to data. for all parties.  Investigate the statistical power of your programme to be sure that you can answer the relevant questions after x years.
What are the changes or aberrations you have accomplished in relation to your former working methods?	The need to establish good public participation has been demonstrated as an important step in order to succeed with 'difficult abatement plans'.		Abatement plans are important tools to 'get things done', but at the same time as you search for common acceptance for your plan, you must also establish a common understanding that knowledge and experiance will	Increased understanding and willingness to participate in a common monitoring programme.

	<b>Public participation</b>	<b>Cost/Efficiency Analysis, CEA</b>	<b>Abatement strategy and planning, including artificial wetlands</b>	<b>Monitoring</b>
			change/grow as we go along and that we need to revise the plan regularly.	
Future plans, including some thoughts and ideas about the possible difficulties and how to face them?	Distribute Vansjø-experiences to other catchments in Norway as the implementation of WFD in Norway proceed.	NIVA: continue to develop the methodology.	Revise the abatement plan taking into consideration recent findings on the importance of the small local sources around lake Vansjø. Maintain public acceptance for planned measures and develop the understanding that 'saving lake Vansjø' take time.	If the response-time of the lake/catchment is longer than expected, it will be a challenge to maintain the enthusiasm regarding implementation of costly measures.
EAB/any other advice you would like to pass on to your fellow water experts			The knowledge basis on which you base your decisions, may change. In Vansjø it has proven necessary to invest considerable resources in improving our understanding of catchment/lake ecology and behaviour. Increasing knowledge will influence abatement plans as we go along.	New emerging techniques will improve monitoring capabilities, but there must be a will to take it into use. Sometimes it can be difficult to 'think new' because there is always a risk of losing something if budget restriction don't allow you to have an overlap between old and new activities. The role of projects like NOLIMP is therefore clearly important to demonstrate and show the way forward.

## 8. Appendix 2: Additional comments received from Germany

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### **NOLIMP: Norwegian Request**

#### **NOLIMP (Heinrich Höper)**

1. Public participation
2. Cost/Efficiency Analysis, CEA
3. Abatement strategy and planning, including artificial wetlands
4. Monitoring

##### **4.1. What has been done?**

- Essentially, the diffusive nitrogen input into groundwater was considered, using the emission-immission approach. Emission can be considered as the pressure on groundwater quality and immission is the impact indicated by the nitrate content of the groundwater.
- Emission: The nitrogen balance was calculated for the 5 communities in the project area. The atmospherical nitrogen deposition into forest and open land was estimated. Denitrification in soil was considered as a nitrate eliminating process. Taking surface run-off into account the annual groundwater recharge rate was calculated. Finally a potential nitrate concentration at in leaching water was estimated based upon land-use, climatic and geological information.
- Immission: Water quality and groundwater level data of the local water board were used to map the nitrate, ammonium and sulphate concentrations in shallow wells (<10 m below groundwater table)
- Areas of similar potential nitrate concentration were delineated
- Monitoring wells are attributed to the delineated areas

##### **4.2. Where did you meet the biggest challenges?**

- To combine soil and hydro-geological information
- To predict denitrification in the subsoil and to interpret measured values
- To estimate the N-balance on a community level (especially, as part of the balance, the nitrogen fertilizer input)

##### **4.3. What about the costs?**

- Mostly internal costs through regrouping of personal
- Project costs financed by Interreg III, co-financement by LBEG

##### **4.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

- Denitrification is an important process and cannot be neglected if N emission is to be linked to groundwater quality.
- Kriging of groundwater quality data is possible, but in general only in drinking water catchment areas the data density is high enough to get reliable information. Moreover, kriging is based on the assumption of patterns, i.e. the relation between water quality data and geological or land-use information. Nevertheless, this relation is very weak and not all parameters conditioning water quality are available for kriging.

**4.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

- Need for information covering the whole project area
- Combination of statistical and geological information
- Combination of hydro-geological and soil information, using different scales.

**4.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them? (After NOLIMP)**

- To validate the estimations on denitrification in subsoils by further measurements
- To get information on denitrification in aquifers,
- To model surface run-off with nitrogen and phosphorus transport into surface waters.

**4.7. EAB/any other advice you would like to pass on to your fellow water experts**

**WFD** (Jochen Goens, Michael Eisele, Heinrich Höper)

**General Remarks:**

In Germany the WFD falls into the responsibility of the 16 States. On the national level there is a committee (LAWA) to co-ordinate these activities. Reports are published under [www.wasserblick.net](http://www.wasserblick.net).

Nevertheless, the guidelines of the LAWA are rather weak and the evaluation of the groundwater bodies differs from state to state, sometimes even within River basins. In Lower Saxony the Ministry of Environmental Affairs is responsible for the WFD. The Geological Survey of Lower Saxony (LBEG) is advising the Government concerning the geological, hydrological and pedological background. The State Service for Water Management, Coast Protection and Nature Conservation (NLWKN) is responsible for the implementation of the monitoring programme.

The following answers are given from the perspective of the Geological Survey of Lower Saxony (LBEG)

**5. Classification of districts and appointment of responsible authority**

**5.1. What has been done?**

- States are responsible
- Politically responsible: Lower Saxony Ministry of Environment
- Technically responsible: NLWKN (leading), LBEG
- Classification of districts: 3 river basins (Ems, Weser, Elbe), several sub-basins (upper, middle, lower), 120 groundwater bodies (based upon surface water catchment areas and geology – hard rock vs. granular rock)

**5.2. Where did you meet the biggest challenges?**

- To combine technical, scientific knowledge with administrative guidelines
- To work on a state-wide scale with the need to cover the entire area of Lower Saxony. Formerly mostly regional and local information were needed (e.g. within water catchments)

**5.3. What about the costs?**

- Mostly internal costs through regrouping of personnel

**5.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

- As you need to work on the scale of the whole regional or state area (scale 1:200.000), you need to generalize more than usual.
- The smallest scale of your base data determines the accuracy of the result.
- It has to be stated, that the procedures and the results used for WFD can generally not be used for considerations on larger scale, e.g. water catchment areas

**5.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

- No work covering the whole area of Lower Saxony has been performed before in the scale of 1:200.000.
- Information completely covering the state area had to be assembled.

**5.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

**5.7. EAB/any other advice you would like to pass on to your fellow water experts**

## **6. Implementing WFD in national legal framework**

### **6.1. What has been done?**

The WFD has been implemented into the Federal Water Law (Wasserhaushaltsgesetz) and the Water Law of Lower Saxony (10.06.2004)

### **6.2. Where did you meet the biggest challenges?**

### **6.3. What about the costs?**

### **6.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

### **6.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

### **6.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

### **6.7. EAB/any other advice you would like to pass on to your fellow water experts**

## **7. Characterising River Basin Districts**

### **7.1. What has been done?**

- This has been done by the NLWKN (Lower Saxony State Service on Water Management, Coast Protection and Nature Conservation)
- 3 big River Basins (Ems, Weser, Elbe) were defined for Lower Saxony with each about 3 sub-basins (upper, middle, lower)
- For the left and right side of rivers separate catchment areas were defined
- Hard rock and granular rock structures were differentiated
- about 120 catchment areas were defined for Lower Saxony

### **7.2. Where did you meet the biggest challenges?**

### **7.3. What about the costs?**

### **7.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

### **7.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

### **7.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

### **7.7. EAB/any other advice you would like to pass on to your fellow water experts**

## **8. Analysis of pressures and impacts**

### **8.1. What has been done?**

- Diffusive sources: emission – immission approach: emission (i.e. nitrogen) from agriculture and deposition as pressure; immission: especially nitrate concentrations in shallow groundwater
- Water abstraction: Reporting based on actual water abstraction (statistical data) instead of abstraction rights. Evaluation of groundwater level subsidence.

- Point sources: Evaluation of the impacts on point sources on ground water quality in ground water bodies. In general no significant influence (exceptions: Osnabrück, Hannover, Harz Mountains – mining area)
- Surface waters: Nitrogen and phosphorus input into surface waters was estimated. Nitrogen was calculated from surface run-off and potential nitrate concentration in leaching water. Phosphorus was calculated from potential water erosion into rivers and mean total phosphorus contents in soils as well as phosphorus contents in drainage water from peatland or marsh areas.

### **8.2. Where did you meet the biggest challenges?**

- To get actual data covering the whole area of Lower Saxony
- To start to build up a uniform data base on water quality data
- To establish pedo-transfer functions in order to derive needed information from available information (e.g. run-off and surface run-off, denitrification, potential nitrate concentration in soil water, phosphorus contents of soils.
- Even if a good long-term State Monitoring Network on ground water quality exists, the monitoring wells were too sparsely distributed within the state area to be able to characterize groundwater quality for all groundwater bodies in a satisfying way.
- To calculate mean values on groundwater quality for the groundwater bodies: to do this, mean values for hydro-geologically derived sub-areas were calculated, and based on the proportion of these sub-areas a mean concentration was calculated for the “groundwater bodies”.

### **8.3. What about the costs?**

- Mostly internal costs through regrouping of personal
- Some projects were co-financed by the State of Lower Saxony (WAgriCO) and the EU (LIFE, NOLIMP)

### **8.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

- Data preparation is the main work to be done.
- Methods to define emission (pressure) and immission (impact) should be as conclusive as possible to be able to convince farmers, water boards and policy makers. They should be as complete as technically necessary but as easy as possible to be understood by all participants.
- To build up one uniform data base on groundwater data.
- To characterize wells hydro-geologically to be able to attribute groundwater quality data to groundwater storeys.

### **8.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

- The need for a state-wide evaluation of pressures and impacts was new. Up to now only information for drinking water catchment areas was available.
- A kriging of groundwater quality data from wells was performed.

### **8.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

- To include data from the water boards, especially of data which are voluntarily assembled by the water boards
- The problem of little groundwater quality data outside of drinking water catchment areas will remain.



**8.7. EAB/any other advice you would like to pass on to your fellow water experts**

**9. Economic analysis of water consumption**

**9.1. What has been done?**

Has to be done by the water boards and the State Service for Water Management, Coast Protection and Nature Conservation (NLWKN)

**9.2. Where did you meet the biggest challenges?**

**9.3. What about the costs?**

**9.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

**9.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

**9.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

**9.7. EAB/any other advice you would like to pass on to your fellow water experts**

**10. Register protected areas**

**10.1. What has been done?**

- All water catchment areas are registered
- Definition of groundwater associated terrestrial ecosystems (nature protection areas, FFH- areas with groundwater association)

**10.2. Where did you meet the biggest challenges?**

- Evaluation of the groundwater influence
- To get evidence on adverse effects of groundwater abstraction on terrestrial ecosystems. In general no groundwater monitoring wells are placed in such areas.

**10.3. What about the costs?**

**10.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

-

**10.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

- On the contrary to former work now whole groundwater bodies, the combined effects of groundwater wells, including farmers' wells for irrigation, have to be evaluated.

**10.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

-

**10.7. EAB/any other advice you would like to pass on to your fellow water experts**

**11. Monitoring programmes operating**

**11.1. What has been done?**

- Hydro-geological type areas (based on six criteria) were defined within the groundwater bodies as a tool for the regional selection of representative monitoring sites.
- An integrated concept model was established to help with the choice of the monitoring sites based on information on emission and immission
- Potentially appropriate monitoring wells have been selected by the NLWKN
- Criteria for the choice of sites for a general monitoring of groundwater chemical status have been defined (1 per 50 km<sup>2</sup>, to cover all hydro-geological type areas, to cover shallow and deep aquifers, to be representative for the nitrate concentration). These monitoring wells shall also be considered to decide whether a groundwater body is in a “good groundwater chemical status”
- Sites for the operative monitoring will also be chosen from the above selected sites

#### **11.2. Where did you meet the biggest challenges?**

- restricted number of present monitoring wells for groundwater quality, not all hydro-geological type areas are covered by the present wells
- A compromise has to be found between what is technically desirable and what is financially affordable.

#### **11.3. What about the costs?**

- Mostly internal costs through regrouping of personal
- Some projects were co-financed by the State of Lower Saxony (WAgriCO) and the EU (LIFE, NOLIMP)

#### **11.4. What is the best advice you would like to pass on to your colleagues facing the same situation in other areas?**

- The monitoring network is based as far as possible on existing groundwater monitoring networks.
- Polluting substances (e.g. nitrate, pesticides) as well as problems with the quantitative status have clearly to be defined.
- Methods for the choice of the monitoring sites and for the operation of these sites have to be as clear as possible in order to convince the different interest groups and the State authorities, financing the monitoring.

#### **11.5. What are the changes or aberrations you have accomplished in relation to your former working methods?**

- This has never been done before for the whole state of Lower Saxony

#### **11.6. Future plans, including some thoughts and ideas about the possible difficulties and how to face them?**

- To establish an emission monitoring to validate the selection of the monitoring sites and to get a short-term control of success of the measures to be implemented. This will be based firstly on a baseline emission estimation (calculation of a potential nitrate concentration at the groundwater surface from agricultural statistics and soil / geological as well as climatic information) and secondly on an emission monitoring network, based on field measurements of shallow groundwater quality, deep nitrate profiles and nitrogen balance calculations for model farms
- To validate the choice of the monitoring sites and the concept model with the monitoring results.

#### **11.7. EAB/any other advice you would like to pass on to your fellow water experts**