



# NORDIC COLLABORATION ON IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE

- STATUS AND FURTHER CHALLENGES

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## Table of contents

1. Summary .....	4
2. Glossary of Terms .....	6
3. Introduction .....	7
4. WFD in Finland .....	8
5. WFD in Iceland .....	12
6. WFD in Norway .....	14
7. WFD in Sweden .....	18
8. Comparison of WFD implementation in selected comparable countries .	22
9. Nordic WFD collaboration on specific WFD topic .....	25
10. Concluding remarks .....	31
11. References .....	32
12. Appendix .....	33

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# 1. SUMMARY

Implementation of the EU Water Framework Directive (WFD) has led to a certain degree of alteration of water management in the Nordic countries. WFD has also increased focus on water issues and integrated water management, and public participation. To get the water management as knowledge based as possible, there is a common need to develop or adapt management tools for e.g. assessment of ecological and chemical status, ICT solutions (Information Communication Technology), national guidelines etc. Some countries are ahead of others, and different approaches, management systems and applied aquatic R&D have made it valuable to have international collaboration on many of the common challenges.

European wide strategies such as the EU Common Implementation Strategy (CIS) provide valuable arenas for sharing good examples. However, the northernmost countries in Europe; Finland, Iceland, Norway and Sweden have for several reasons, including both aquatic environment and administrative systems, found it feasible to establish regular workshops for sharing knowledge and experience in the region, supported by the Nordic Council of Ministers (NCM). This report summarises the results of a workshop series in an established Nordic network for water managers.

Based on funding from the Aquatic Ecosystem group (NCM), the Nordic collaboration project on WFD implementation has initiated and enhanced a more widespread knowledge exchange and networking between water managers and aquatic scientist in the Nordic countries on common water issues related to the implementation of the WFD. Five international Nordic workshops on WFD issues have been arranged in series. The main focus have been on inland waters and sharing experiences on ecological status assessments, monitoring, measures related to pollution and hydro morphology, ICT solutions and best approaches for these issues as basis for River Basin Management Plans (RBMP) for each country including the international river basins they share. The two last workshops (Oslo and Reykjavik) started with an open Nordic conference, and also extended the scope to cover priority

substances, mitigation measures libraries and on modelling tools.

The European Commission has identified both best practice on implementation of WFD articles in some RBMPs, and several shortcomings in the WFD implementation for Finland, Norway and Sweden regarding characterization, status assessment, monitoring and handling of hydro morphological alteration. All these countries, including Iceland, have large rural areas and share several common water types, handling similar ecological communities and pressures. These are some of the features fostering a further collaboration on these issues. Several collaboration activities, projects and new Nordic WFD workshops are already planned for 2013 and 2014.

# PREFACE

This report is based on a number of workshops and exchange of knowledge and experience as part of the established network on water management issues related to the implementation of the EU's Water Framework Directive (WFD) in the Nordic countries. This workshop series started as a result of a funding from the Nordic Council of Ministers (NCM), to carry out the project; "Harmonisation and operationalization of WFD in the Nordic countries with emphasize on lakes/ rivers and heavily modified water bodies in Northern GIG".

Budget from the Nordic Council of Ministers has financed parts or all of the travel and accommodation for the workshop in Gothenburg and in Brekstad and Helsinki (cf. the table 7). The main funding has been used to finance cost for all participants to the first two workshops in Brekstad (mid-Norway, May 2008) and Helsinki (Finland, October 2009). Due to enthusiasm and outcome of the first workshop, and the established network, national funding's from several institutions made it possible to arrange annual Nordic WFD workshops also in Sigtuna (Sweden, September 2010), Hurdal (Norway, September 2011) and finally in Reykjavik (Iceland, September 2012). The cost for the workshops in Sigtuna, Hurdal and Reykjavik was financed by each participant (travel expences) and the Swedish Water Authorities (Sigtuna) and Norwegian Directorate for Nature Management (DN), (Hurdalsjøen). In Reykjavik there was a conference fee for each participant, while the Environment Agency of Iceland sponsored parts of the program.

In August 2007 NCM (different program) also supported a Nordic workshop in Gothenburg on WFD issues with a focus on coast and sea, and several of the participants have taken part in the workshops regularly after this gathering. The Nordic WFD network has expanded since the first workshop in Gothenburg and the interest for participation was at its highest at the Reykjavik workshop. The program committee decided therefore a quota of max 15 participant from each country. Participants from several non-Nordic countries have been invited and given valuable input for the workshops, such as water managers from

Austria, Scotland and Ireland. Also in these countries many of the same water challenges need to be solved to fulfil the requirements and principles from WFD. We may also point out, that we have invited representatives from water management in Denmark for all the workshops. However, they have not given this collaboration any priority and therefore not really taken part. When we use the term "the Nordic countries" in this report, we refer to the Nordic countries except Denmark who have not really taken part in this collaboration.

Many water related issues are trans boundary. The Nordic countries have many similarities and mutual challenges that need to be solved in collaboration. Thanks to committed contribution from all participants we have had lively discussions, fruitful knowledge transfer and enjoyable social exchange during our workshops since the beginning in 2007.

A special thanks to valuable contributions to this report from Anders P. Iversen, Niklas Holmgren and Steinar Sandøy. We express our gratitude to NCM for financial support to our initiative to strengthen the Nordic network on water management related to WFD, by starting this workshop series.

*Trondheim, Norway (December 2012)*

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## 2. GLOSSARY OF TERMS

Term	Definition
Basic Measure	A Basic Measure is any Measure that can be categorised under the 22 pieces of legislation or articles in the WFD
Characterisation	To identify the location and boundaries of bodies of surface water, and all groundwater bodies to assess their uses and the degree to which they are at risk of failing to meet the objectives as defined in WFD.
Chemical Status	Good chemical status is the chemical status achieved by a body of water in which concentrations of specific pollutants do not exceed the environmental quality standards and condition sets of which is different for surface and groundwater.
Coastal water	Surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.
EC	European Commission
Ecological status	An expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters.
GEP	Good Ecological Potential: is the status of a body of HMWB.
GES	Good Ecological Status; is the status of a body of surface water
GIG	Geographic Intercalibration Group
HMWB	Heavily modified water body: A body of surface water which as a result of physical alterations by human activity is substantially changed in character.
HYMO	Hydro-morphology: Hydrological regime – quantity and dynamics of water flow. Morphological conditions (shape) – width & depth variation of a water body, structure and substrate of bed, structure of riparian zone.
ICT	Information and Communication Technology
IRBD	International River Basin District; water shed crossing one or several national borders.
Key Measure	A Key Measure is any Supplementary Measure that is regarded by the competent authorities, as the most likely and viable Measure to improve water quality.
Measure	An event or series of events used to achieve the objectives of the WFD
NCM	Nordic Council of Ministers
Objective	These are the environmental objectives outlined in Article 4 of the WFD which are to be realised by implementing POM.
POM	Programme of Measures.
RBD	River Basin District.
RBMP	River Basin Management Plan.
River	A body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course.
River basin	The area of land from which all surface run-off flows through a sequence of streams, rivers and, possibly, lakes into the sea at a single river mouth, estuary or delta.
Sub-basin	The area of land from which all surface run-off flows through a series of streams, rivers and, possibly, lakes to a particular point in a water course (normally a lake or a river confluence).
Supplementary Measure	A Supplementary Measure is any Measure which cannot be classified under the 22 Basic Measures outlined in the WFD.
Surface Water	Inland waters, except groundwater; transitional waters and coastal waters, except in respect of chemical status for which it also includes territorial waters.
Surface water status	The general expression of the status of a body of surface water, determined by the poorer of its ecological status and its chemical status.
Water pricing	Economic incentives to ensure recovery of costs for water services in accordance with WFD Art 9.
WFD	Water Framework Directive.



The Participants at the 5th Nordic WFD conference in Reykjavik, Iceland, 26 September 2012.

## 3. INTRODUCTION

The Water Framework Directive (WFD) introduced in 2000 new and ambitious objectives to protect and restore aquatic ecosystems as a basis for ensuring the long term sustainable use of water for people, business and nature. The WFD has incorporated into a legally binding instrument the key principles of integrated river basin management bringing together economic and ecological perspectives into water management.

Implementation of the WFD has been supported since 2001 by an informal cooperative effort under the Common Implementation Strategy (CIS), led by Water Directors of the Member States and the Commission with the participation of all relevant stakeholders. The CIS has delivered guidance documents and a large number of policy papers and is a valuable platform for the exchange of experience and best practices.

The expectations from stakeholders for harmonisation of the WFD between River Basin districts are high, although there is a national perspective on most issues. However, the international perspective is even higher after the publication of the EU Commissions compliance check of submitted national River Basin Management Plans (RBMP) and Programme of Measures (POM) (EC 2012). All countries with completed RBMPs have received recommendation for further actions and informed on shortcomings in their RBMPs and POM. Therefore, despite the effort on EU level to ensure common implementation understanding and standards, there have been and still are further needs for sharing best practice examples and for adapting strategies from EU level to country-wise regional/national level, such as among the Nordic neighbouring countries.

Acknowledging the work done within the EU context by different working groups, still a lot has to be done by the member states. Basically there are also several advantages in promoting a similar development of e.g. different classification systems and analyses for the Nordic countries. Realizing the expectations, the Nordic countries

have established a forum for exchange of experience, since many of our water bodies are of similar types. Further steps can be taken to harmonize the WFD River Basin Management Plans for forthcoming planning cycles.

### PROJECT FUNDING BY NORDIC COUNCIL OF MINISTERS

This project report handles collaboration on WFD implementation issues among the Nordic countries (hereafter mainly Finland, Iceland, Norway and Sweden), with main focus on inland waters (lakes and rivers). Funding of the Nordic WFD project "Harmonisation and operationalization of WFD in the Nordic countries with emphasize on lakes/streams and heavily modified water bodies in Northern GIG" from the Nordic Council of Ministers (NCM), became in 2008 a boost for a more regular collaboration and networking among water managers and researchers on WFD related tasks. A number of Nordic WFD workshops, conferences and topic meetings have been arranged and carried out. For a good WFD implementation in the Nordic countries, several crucial topics, cooperation and knowledge exchange have also been initiated with other countries with similar characteristics, such as Austria, Ireland and Scotland. Status in WFD implementation and some results from the established Nordic WFD network are presented in this report. In the following chapters we summarize the status of the WFD implementation, and identify some of the main challenges in the Nordic countries.

# 4. WFD IN FINLAND

## 4.1. LEGISLATIVE FRAMEWORK OF WFD

The European Union Water Framework Directive has been implemented in Finland via the Act on Water Resources Management (1299/2004), the Government Decree on Water Resources Management Regions (1303/2004), and the Government Decree on Water Resources Management (1040/2006). Another relevant decree issued is the Government Decree on Substances Dangerous and Harmful to the Aquatic Environment (1022/2006). The Directive on the Protection of Groundwater against Pollution and Deterioration (2006/118/EC) has been implemented nationally through amendment of the above mentioned decrees. In accordance with Section 17 of the Act on Water Resources Management, the Government approves river basin management plans.

Since approving the first river basin management plans, the Government has issued a decree on amendment of the Government Decree on Water Resources Management (869/2010) and a decree on amendment of the Decree on Substances Dangerous and Harmful to the Aquatic Environment (868/2010), both in October 2010. In the spring of 2011, the Act on Water Resources Management was amended by means of a new chapter, on management of the marine environment management. Consequently, the name of the act was changed to 'Act on Water Resources and Marine Environment Management' (272/2011).

River Basin Management plans are not binding for single actors. Obligatory measures related to individual projects requiring a permit will continue to be specified in the permit procedures, which are based on substantive law, such as the Water Act (264/1961 and 587/2011), the Environmental Protection Act (86/2000), the Land Use and Building Act (132/1999), and the Nature Conservation Act (1096/1996). As necessary, the permit procedure shall take in account what is priority in a river basin management plan with respect to elements related to the condition and use of waters in the activities' area of impact of activities. The decision making is guided by the environment-related objectives defined in the river basin management plans.

## 4.2. WFD IMPLEMENTATION IN FINLAND

For the purpose of River Basin Management planning, Finland has been divided into eight River Basin Districts (Figure 1). The river basin management plans have been drawn up by the regional environment centres, whose tasks were transferred to the Centres for Economic Development, Transport and the Environment (ELY Centres) since 1 January 2010. Five of these are defined as Competent Authorities according to WFD, one for each of the eight water districts (including Åland islands) in which Finland is divided, additionally three districts in Lapland are coordinated by one ELY Centre. Two of Finland's river basin districts are international, shared with Sweden and Norway. In co-operation with the cooperation groups, the ELY Centres advance the regional river basin management planning and monitor its implementation.

The Ministry of Environment (MoE) steers and monitors the implementation of the Act on Water Resources Management. MoE is also responsible for reporting to the European Commission in accordance with the Water Framework Directive. The Ministry also coordinates Finnish participation in the Common Implementation Strategy (CIS) for the WFD. The Ministry of Environment has

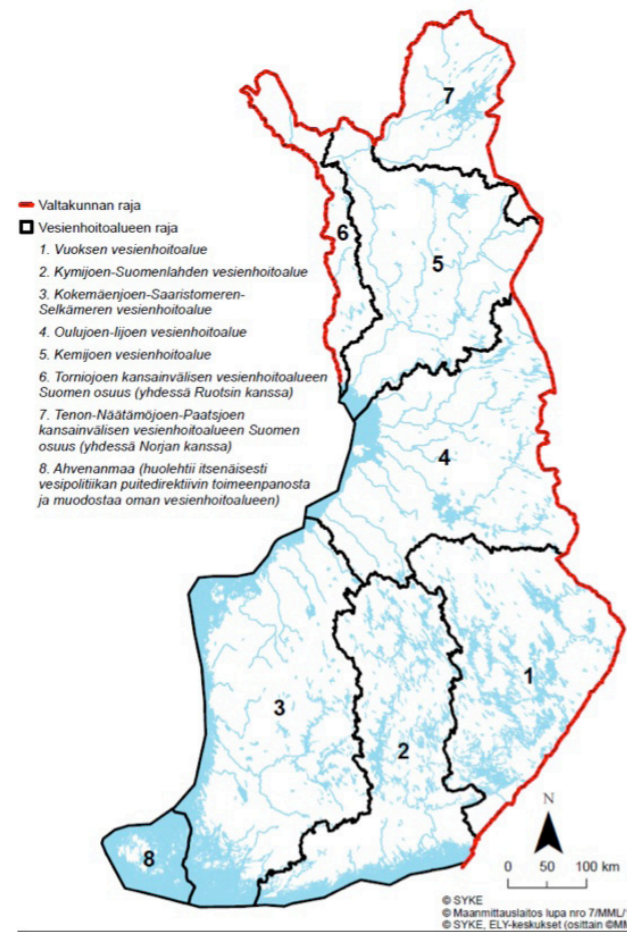


Figure 1. The eight river basin districts in Finland (including Åland).

consultations with the Ministry of Agriculture and Forestry on water resources management issues of WFD.

The Finnish Environment Institute (SYKE) provides expert advice on implementing the river basin management plans by both preparing national guidance and by taking part on national coordination of WFD implementation. SYKE also coordinates research and development projects which support implementation of WFD. The Finnish Game and Fisheries Research Institute acts as a special adviser in activities related to fish stocks, as specified by the Ministry of Agriculture and Forestry.

Finally, The Government approves the river basin management plans. The first river basin management plans were approved on 10 December 2009.

### COOPERATION ON REGIONAL AND NATIONAL LEVEL

Regional cooperation in each area is organized by the relevant ELY-centre. The ELY Centres call the meetings of the regional cooperation groups involved in river basin management and participate in the steering group work for the river basin district. Most of the regional cooperation groups have established subgroups which are based on sub river systems or main field of operation like agriculture, forestry and so on. How these sub groups are organized differs for each ELY-centre, depending on former cooperation within the area. Those few cooperation groups which don't have established subgroups will organise workshops and thematic meetings for certain issues such as

	Lakes			Rivers			Coastal areas			In total		
	S	O	SO	S	O	SO	S	O	SO	S	O	SO
Finland												
RBD1	266	48	51	84	18	32	0	0	0	350	66	83
RBD2	163	82	13	52	78	14	0	50	15	215	210	42
RBD3	62	42	7	21	28	25	27	36	17	110	106	49
RBD4	42	31	0	26	28	6	3	6	0	71	65	6
RBD5	30	6	6	22	15	1	2	2	2	54	23	9
RBD6	19	5	0	17	7	0	1	2	1	37	14	1
RBD7	20	0	0	22	0	4	0	0	0	42	0	4
In total	602	214	77	244	174	82	33	96	35	879	484	194

Table 1. Monitoring sites of RBD's in Finland divided to lakes, river and coastal areas and also to surveillance (S), operational (O) and surveillance and operation (SO) sites.

heavily modified waters, point load discharges etc. Some regions have long history of local cooperation with stakeholders and this existing organizational culture has been harnessed to support river basin management planning. For example in Southwest Finland, an old river basin organisation called the "river delegations" has a long history of cooperation within the river basins.

National cooperation is implemented through several working groups. The committee of six ministries, three ELY-centres and SYKE, chaired by the Ministry of Environment, settle on and discuss political issues, cross sector integration and government financing. It also monitors implementation of those policy measures of 1st River Basin Management Plans, when the government is responsible. National coordination group of River Basin Management, chaired by ELY-centre of Uusimaa, settles and manage all the relevant issues concerning planning guidance, public hearing, monitoring, implementation of measures, EU-reporting and so on. Representatives of coordination group consist of competent authorities; Ministry of Environment, Ministry of Agriculture and Forestry and SYKE. Moreover, Ministry of Environment has established several specific working groups for limited time duration to prepare specific task to support WFD process. National cooperation with stakeholders has been organized with regular meetings and seminars. Finally, many day to day issues are discussed and solved in close cooperation with key persons of Ministry of Environment, ELY-centres and SYKE.

### MAIN PRESSURES

On national level the dominating pressure on the ecological status is nutrient loading from diffuse sources (Figure 2). However, in north and southwest Finland hydro-morphological pressures often have a significant impact on water status. The most significant pressure in diffuse nutrient loading is agricultural runoff, while the most significant hydro-morphological pressure is hydropower.

### MONITORING AND ECOLOGICAL CLASSIFICATION OF WATER STATUS

Monitoring programs of River Basin Districts have altogether 1557 monitoring sites which are divided to river basin districts, lakes, rivers and coastal areas according to table 1. Of those sites 879 belongs to surveillance monitoring, 484 to operational monitoring and 194 sites to both monitoring programs.

In Finland, enterprises which need environmental permissions for their activities have to comply with and finance recipient control programs. The programs are often executed by consultants and

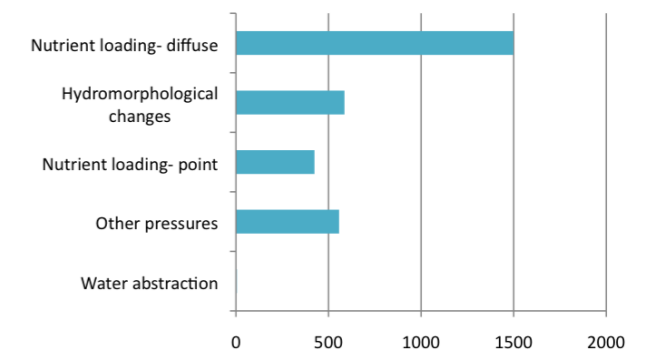


Figure 2. Number of water bodies at risk based on pressure types according to first river basin management plans.

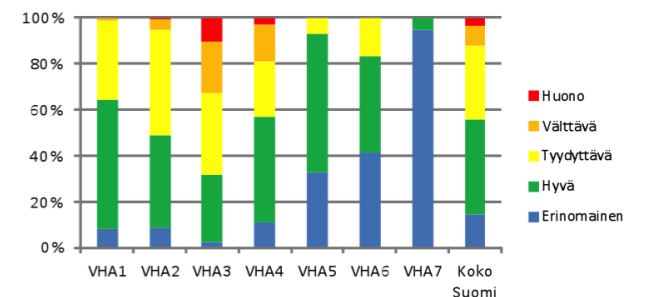


Figure 3. Ecological status (blue= high, green = good etc.) of Rivers divided into RBD's (VHA 1-7) and in Finland (Koko Suomi) as total.

sometimes the ELY centre in the region. For diffuse discharges, state-financed national monitoring programs have been established for the WFD work. All data from the 20th century until now is gathered in a central database. In this database also water bodies and classification are defined. The database is also accessible for the public, but mainly used by authorities, universities and municipalities.

Currently, the ecological status of most of Finland's inland waters is either good or high. However, approximately 40 % of the total river length and 60 % of the coastal water areas are classified as moderate; poor or bad (Figure 3 and 5). The water quality of lakes is generally better (Figure 4).

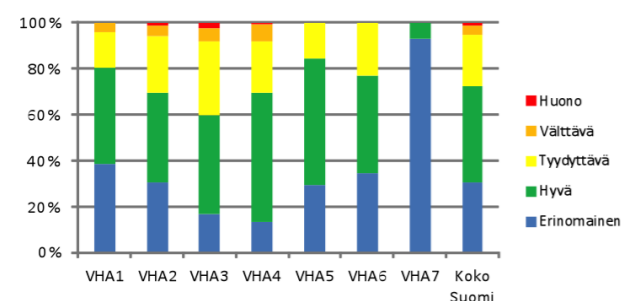
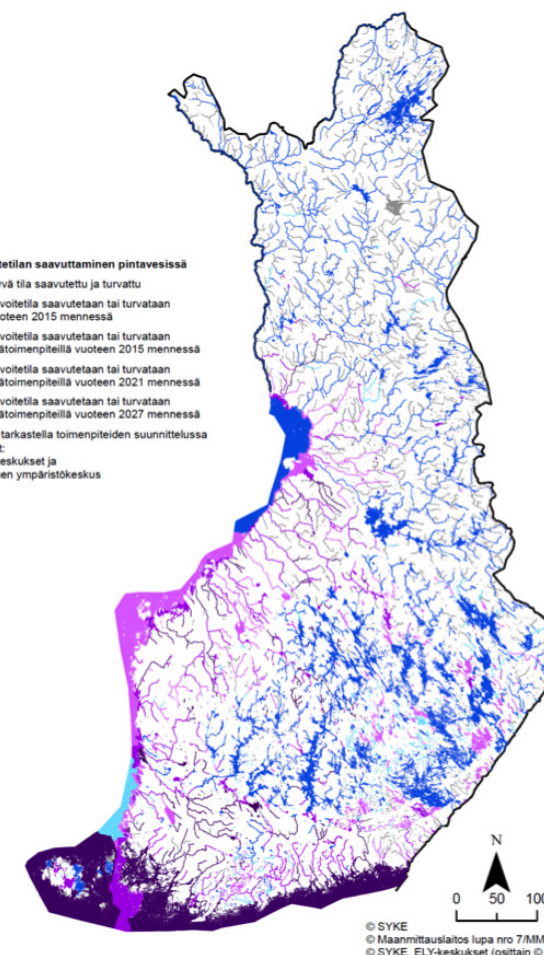


Figure 4. Ecological status of Lakes divided into RBD's and in Finland as total.

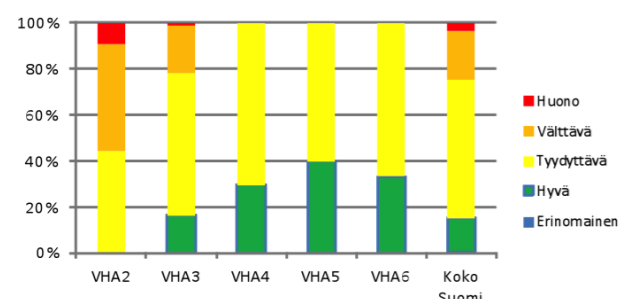


Figure 5. Ecological status of coastal areas divided into RBD's and in Finland as total.

### PROGRAMME OF MEASURES

The ELY-centres have prepared altogether 34 Programs of Measure for surface and ground waters in Finland. They have planned more than 5200 measures (policy measures are excluded). As numbers, most of the measures are planned to decrease agricultural runoff (Table 2). However, there are scale differences in level of planning. Some ELY-centres have planned measures at water body level. Other ELY-centres have planned measures on more general regional level. There are also differences in e.g. details between different sectors etc.

Sectors	Number of measures
Scattered and holiday settlement	549
Acidity control	31
Agriculture	1316
Forestry	482
Fur production	85
Peat production	406
River system restoration	631
Municipalities	251
Chemical and oil tanks	79
Traffic	211
Soil extraction	89
Polluted land and sediments	400
Monitoring and surveillance of groundwater's	317
Groundwater conservation plans	347
Water abstraction	53
<b>In total</b>	<b>5247</b>

Table 2. Number of measures in Finnish RBMP for 2010, excluding administrative and policy measures.

Most of the mitigation measures included in the plans are based on existing legislation and instruments (basic measures). Per year, the total cost of these measures is approximately € 1.5 billion. The additional measures presented in the plans will increase this cost by approximately 15 % (table 3).

SECTOR	PRESENT MEASURES (1000 €/YR)	ADDITIONAL MEASURES (1000 €/YR)	TOTAL (1000 €/YR)
MUNICIPALITIES	652 000	12 000	664 000
SCATTERED AND HOLIDAY SETTLEMENT	244 000	5 000	249 000
INDUSTRY	194 000	0	194 000
FISH FARMING	17 100	0	17 100
PEAT PRODUCTION	12 500	400	12 900
FUR PRODUCTION	10 200	300	10 500
AGRICULTURE	316 000*	171 000	494 000
FORESTRY	8 300	3 900	12 200
ACIDITY CONTROL	0	24 800	24 830
TRAFFIC	3 600	4 600	8 200
SOIL EXTRACTION	4 200	800	5 000
POLLUTED LAND AND SEDIMENTS	4 000	3 700	7 700
RESTAURATION, REGULATION AND CONSTRUCTION OF WATERS	11 700	6 900	18 600
GROUNDWATER CONSERVATION PLANS	540	1 700	2 240
<b>TOTAL</b>	<b>1 474 000</b>	<b>235 000</b>	<b>1 709 000</b>

\* present costs for farmers are not included.

Table 3. Estimation of annual costs of present and additional measures. Annual costs of additional measures are realized as such when river basin management plans are fully implemented.

### IMPLEMENTATION IS AN ADMINISTRATIVE CHALLENGE

The implementation of WFD is supposed to be financed by existing financing systems. This means that the River Basin Management Plans are not fully financed, which is a challenge to the water administration of Finland. Therefore it is important to get people to understand that

Figure 6. Reaching the environment objectives in Finnish surface waters.

everyone benefits from improved ecological and chemical quality of water. In order to do that, both dissemination of information and cooperation with stakeholders and enterprises are essential tasks. One example is the work of the river delegations and other subgroups. Stakeholders with considerable resources, as for example the forest- and agricultural organizations, can easily participate in local meetings and argue for their interests, while for example NGOs and smaller organizations with limited resources are not able to participate in the same extent. For that reason they cannot advocate their interests in the same extent.

### ACHIEVING THE ENVIRONMENTAL OBJECTIVES

Article 4.4 of WFD (extended deadlines) is applied for 786 SWB and 42 GWB. For surface waters, high nutrient loads, large hydropower or other large scale modifications and large internal pollution loads are cited. Time lags due to the effects of measures are also mentioned as a reason. According to river basin management plans, good ecological status can be secured or reached by 2015 in over 90 % of the lake area under review, and in approximately 70 % of total river length. Improving the state of coastal waters will be slower, but the goal is still to achieve good ecological status by the year 2027 at the latest (Figure 6).



## 5. WFD IN ICELAND

Iceland is connected to the European Union through the Agreement on the European Economic Area (the EEA agreement) together with Norway and Lichtenstein. The Water Framework Directive was formally taken into the EEA agreement in 2009, and fully transposed into Icelandic legislation in 2011 by Act No. 36/2011 on water management, as well as Regulation 535/2011 on classification, characterisation, pressure analysis and monitoring of water bodies and Regulation 935/2011 on the management of water issues. The latter regulation puts forward the institutional structure concerning the administration of the Directive. Iceland reports its obligations to the European Surveillance Authority (ESA).

Iceland has only one single river basin district, divided into four sub-districts according to the legislation as shown in figure 7. The Environment Agency of Iceland is the competent authority for implementing the WFD. In accordance with regulation 935/2011, the Environment Agency has been working with five state institutes/agencies (Icelandic Met Office, Institute of Freshwater Fisheries, National Energy Authority, Icelandic Institute of Natural History and Marine Research Institute), local authorities, water district committees and consultation groups to analyse and classify the water bodies of the River Basin District. According to the timeframe detailed in Act No. 36/2011, the River Basin Management Plan and a proposal for programmes of measures shall be completed by 1 January 2018. However, in order to align the completion of the first phase in Iceland in line with the completion of the second phase in the EU, authorities are working on a shorter timeline in order to finalise the first RBMP by 1 January 2015.

### 5.1. STATUS OF RBMP AND POM

The preparations for implementation of the WFD in Iceland started formally in 2008. It began with setting up the institutional arrangement, collect information about the river basin district and preparations for the implementation in the different regions. In 2011 a

preliminary pressure analysis and an economic analysis of water uses in Iceland were performed. The preliminary pressure analysis indicates that the sewage discharge, particularly into the coastal water and impact from hydropower, mainly due to hydro power plants, reservoirs and road constructions, are probably causing the biggest pressures on the water bodies. The analysis did not detect pressure of chemical pollutants in Icelandic water bodies. The main result of the economic analysis indicates that Iceland has more water resources than any other European country per capita and uses more water than any nation per capita. The work on identification (characterization) and collection of information on ecological status of water bodies is on-going as well as preliminary pressure analysis. Main rivers and lakes are shown in figure 8. Water bodies identification has until October 2012 resulted in total 2319 surface water bodies on land. Rivers water bodies are 1866, lakes water bodies are 387 and transitional water bodies are 66. Groundwater bodies are 309. Work on coastal water bodies is still on-going. Development of a programme of measures (POM) is delayed until 2015/2018 and information about ecological status will be available in mid-year 2013. The budget for the implementation is 110 million ISK/year.

### 5.2. ORGANISATION OF WFD

Iceland is one River Basin District, with four sub-districts as earlier mentioned. One Water Council and four sub districts water region committees have been established. Municipalities, consultants, stakeholders and the general public are important actors in the water region committees.

Some of the main challenges in the WFD implementation process at Iceland are:

- Voluntarily speeding up the work so that the RBMP is indicated to be ready in 2015 instead of the obligatory time limit 2018 in order to be in the same six year cycle as the other EEA countries.
- Existing monitoring programmes give a good overview of the chemical status and long transported pollutants into Icelandic

surface water and show that the pollutants are well below limits. The programmes have to be reviewed and a probably new programme need to be put in place in year 2015 to fulfil the requirements of the WFD.

- There is a lack of information regarding ecological status in most rivers, lakes and the coastal waters, although more information exists about the coastal zone.

In addition to this limited manpower can create problems to finish ecological classification, type specific classification as well as hydro-morphological classification and classification of coastal water in time.

### OTHER RELEVANT INFORMATION FOR WFD IMPLEMENTATION.

Iceland has relatively good expertise on groundwater, due to exploitation of the drinking water and geothermal water utilization for decades. Figure 9 shows the groundwater as utilised for drinking water and geothermal utilisation. Most research has been performed in connection to impact assessment and building of new hydropower plants and geothermal power plants and Iceland has a draft master plan on energy utilisation, with 53 existing hydropower plants and 40 new potential hydropower projects are evaluated, there of 14 are designed to be appropriate to conservation. The master plan is now under consideration of the Icelandic Parliament. Preparation on IT and data centres are under development in cooperation with Norwegian and Swedish institutes.

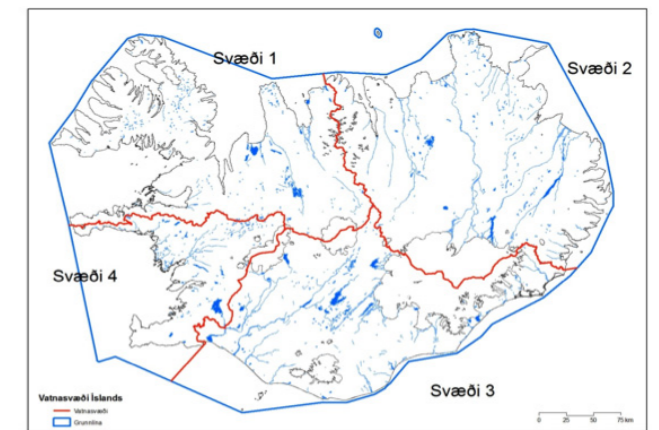


Figure 7. Iceland's river basin district with coastal water and four sub districts.



Figure 8. The River basin district with coastal zone and main lakes and rivers.

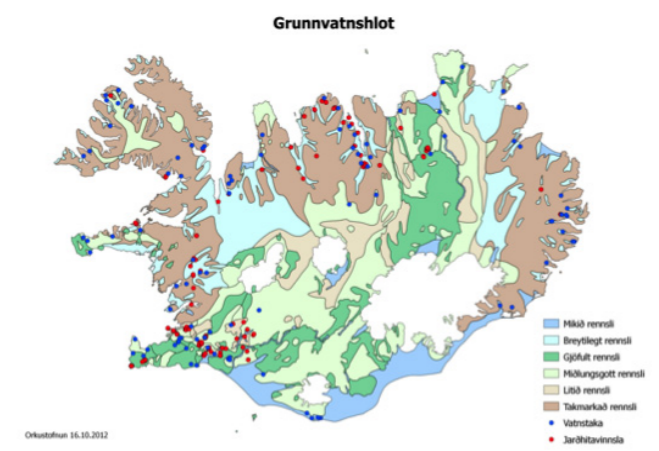


Figure 9. Groundwater bodies. The blue dots indicate the wells for drinking water and the red dots are geothermal utilisation.

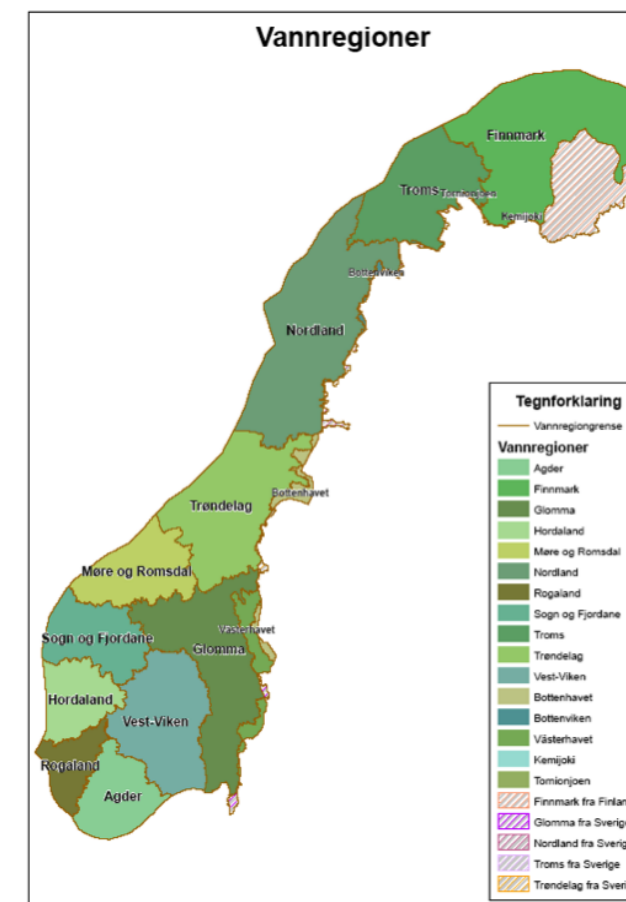


Figure 11. River basin districts in Norway from 1st of January 2010.

## 6. WFD IN NORWAY

### 6.1. NORWAY AND THE EUROPEAN ECONOMIC AGREEMENT

Norway is connected to the European Union as an EFTA country, through the Agreement on the European Economic Area (EEA). The Water Framework Directive (WFD) was formally taken into the EEA-agreement in 2009, granting the EFTA countries extended deadlines for the implementation. EFTA-countries reporting obligations are to the European Surveillance Authority (ESA).

The WFD was transposed into the Norwegian Regulation on a Framework for Water Management in 2007, usually referred to as Vannforskriften (The Water Regulation). Norway has taken full part in the Common Implementation Strategy (CIS) for the WFD since 2001.

Norway performed a voluntary implementation of the WFD in selected sub-districts across the country from 2007 until 2009, thus gaining the experience of River Basin Management planning. River Basin Management Plans (RBMP) for the selected sub-districts were adopted by the County Councils in 2009, and approved by the national Government in June of 2010.

RBMPs covering the entire country will be prepared from 2010 until 2015, synchronized with the time schedule of the second cycle of implementation in the EU.

### 6.2. WFD IMPLEMENTATION AT NATIONAL LEVEL

#### NATIONAL AUTHORITIES

The national authority for the implementation of the WFD is the Ministry of Environment (MD) which also represent Norway at the European Water Directors Meetings. Administrative coordination and the day-to-day

support of the River Basin Districts (RBDs) have been delegated from the Ministry of Environment to the Norwegian Directorate for Nature Management (DN). The directorate also coordinates Norwegian participation in the Common Implementation Strategy (CIS) for the WFD.

#### SECTOR INTEGRATION COMMITTEES

To ensure sufficient sector integration, a Committee of Ministries has been established, chaired by the Ministry of Environment. The Committee of Ministries settles political issues concerning cross sector integration in water management. It embraces a total of eight ministries.

The organization structures for the implementation of WFD in Norway are shown in figure 10. To assist the ministries at national level,

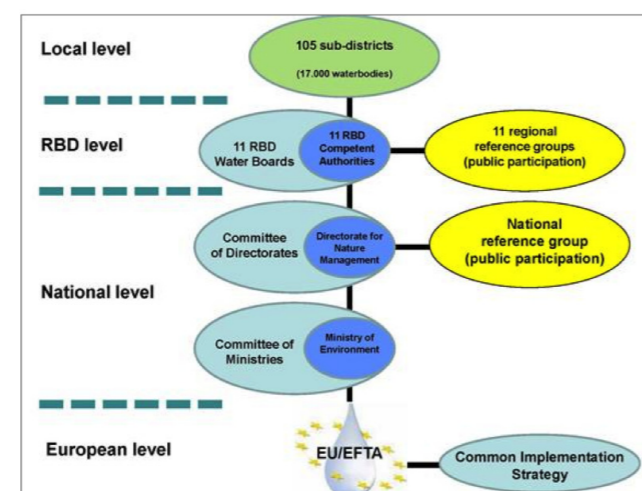


Figure 10. Organisation chart of the WFD implementation in Norway.

a Committee of Directorates (National Agencies) has been established, chaired by DN. The Committee of Directorates has been delegated the task of preparing national guidance for the River Basin Districts (RBDs), and ensure administrative cooperation across sectors. It also organises the annual National Water Environment Conference, and the national web-site Vannportalen.no. The Committee includes 12 central government agencies.

The Committee of Directorates also has a National Reference Group allowing for the participation of national industry associations, NGOs and civil society representatives.

#### RIVER BASIN DISTRICTS

The Water Regulation divides Norway into 11 River Basin Districts, and 5 international RBDs with neighbouring Finland and Sweden (figure 11). In Norway the RBDs are referred to as vannregioner (River Basin Districts). Selected County Councils are appointed as Competent Authorities for their respective River Basin Districts, some of which cover several counties. In Norway the Competent Authorities are referred to as vannregionmyndigheter (River Basin District Authority).

In each River Basin District, the Competent Authority chairs a District Water Board, ensuring the participation and sector integration of all municipal and district authorities. In Norway the District Water Boards are referred to as vannregionutvalg (Water District Board).

Participants in the RBD Water Board are typically:

- The County Council (in some cases several)
  - The local municipalities
  - The County Governor's Office: Department of Environment and Department of Agriculture
  - District offices of: the Water Resources and Energy Directorate, the Directorate for Fisheries, the Coastal Administration, the Public Roads Administration, the Food Safety Authority etc.
- Each District Water Board also has a District Reference Group providing

for the public participation of industry associations, NGOs and civil society in general.

#### THE NORWEGIAN WATER INFORMATION SYSTEM

The Norwegian Water Information System Vann-Nett collects all available data and information from the databases of different agencies and institutes, and projects them on an electronic map. This allows for an integrated management of the knowledge base, and the aggregation of tables, maps and statistics at water body, sub-district, river basin district or national level.

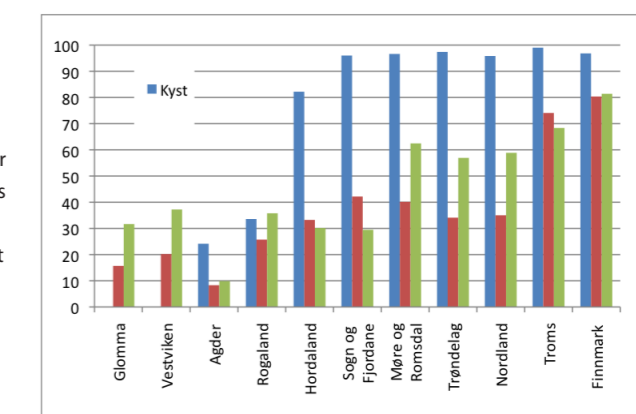
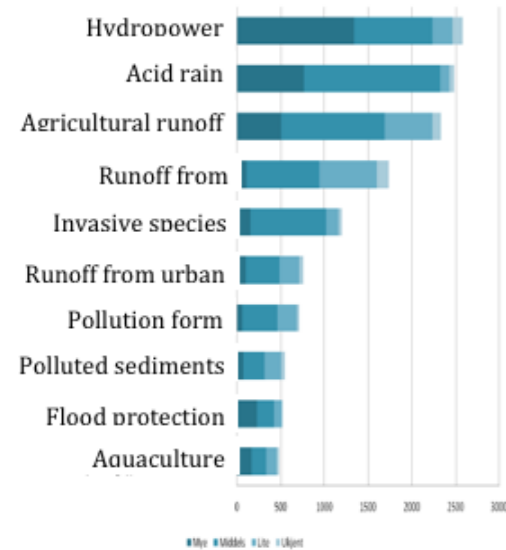


Figure 12. The percentage of water bodies (river=elv (blue), lakes=innsjø (brown) and coast water=kyst (green)) not at risk, divided into the 11 river basin districts draining to the Norwegian coastline (Vann-nett, January 2010).





**The 10 dominating pressure types on water bodies in Norway**



**Figure 13.** The ten most frequent occurring pressures on river and lake water bodies in Norway. Increased darkness in the blue bars indicates significance of pressure. Chart based on a preliminary pressure analyses per January 2010 (Vann-nett.no).

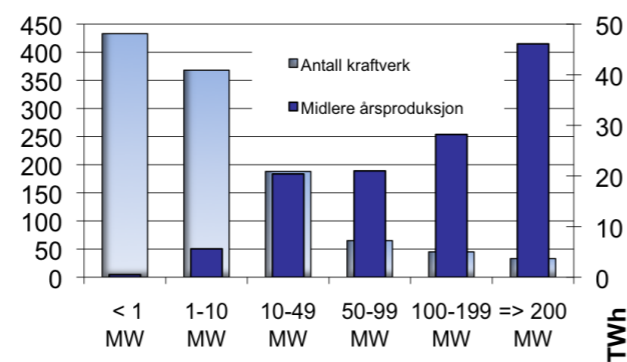
Vann-Nett is an important tool for preparation of the River Basin Management Plans (RBMPs) and Programme of Measures (POM), but will also facilitate reporting from Norway to the European WISE system. From Vann-nett you may obtain detailed information regarding water status, main drivers, pressures and impacts on Norwegian water bodies. Some key statistics on water status are given in the figure 13.

The dominating pressure for the ecological status for rivers and lakes are hydropower and acid rain. The other 10 most frequently occurring pressures are shown in figures 13 and 14. There is an on-going update of these data to get as good as possible characterization, analysis and risk assessment of Norwegian rivers, lakes, groundwater and coastal waters.

### 6.3. PILOT RBMPs AND POMs

The initial nine RBMPs and POMs in Norway were approved by the Central Government through a Royal decree of June 2010. These plans are only valid for 29 sub-river basins in Norway as shown in figure 15. The Norwegian RBMPs and POMs have been assessed and compared with other countries by ESA, published by EC (2012).

Important sector wise measures to be implemented are e. g. for



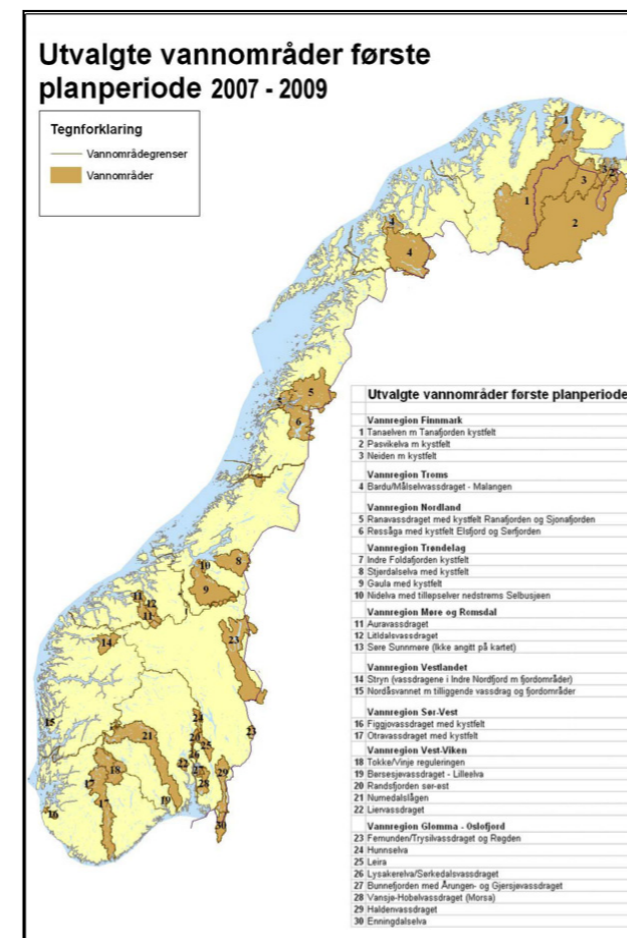
**Figure 14.** Hydropower is one of the most frequent pressures in Norwegian inland waters. This figure shows in light blue no of hydropower plants (left axis) pr MW-size intervals and in dark blue cumulated TWh/yr (right axis) the same no of hydropower plants produce (based on 2008 data from NVE).

the hydropower sector, agriculture, continue liming due to acid rain, re-establishment of migration past barriers caused by roads but also pressure from alien species have been addressed in these plans. There are still uncertainties regarding the total costs for implementing the additional measures needed to reach the environmental objectives.

### 6.4. REMAINING CHALLENGES AND WFD BUDGETS

In 2009 the Norwegian government stated that the additional budget needs for implementing the WFD were considerable, both for administrative costs, and for increased monitoring to fulfil the WFD requirements, as illustrated in figure 16. Budget needs for implementing measures have not been calculated in Norway. The Ministry of Environment forwarded ca 60 mill NOK for the WFD implementation on the national, regional and local arena in 2012 (excluded costs for measures). In addition other sector authorities also contribute for the WFD implementation.

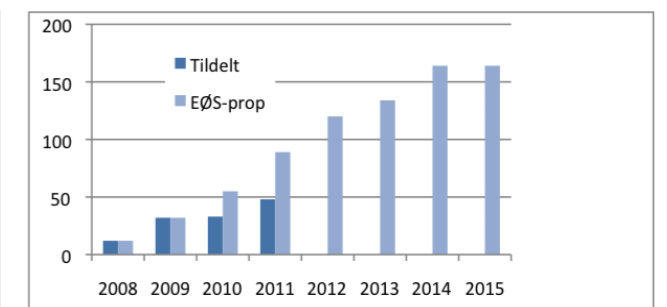
Until 2012, the budget needs have not been fully implemented (figure 16). However, it is not so easy to separate WFD costs and needs from other water management issues.



**Figure 15.** Selected sub river basin district (in dark brown) with pilot RBMPs and POM in Norway, approved in June 2010, and submitted to ESA.

Some remaining challenges for implementing WFD in Norway of relevance for the Nordic WFD collaboration, as recommendation from the EC assessment report (2012):

- Further need for development of complete classification system
- Ensure sufficient monitoring of all required quality elements, as well as establishment of all necessary reference conditions in place for the 2015 RBMPs.
- Improve transparency and provide more information regarding



**Figure 16.** Estimated budget administrative and monitoring cost requirements (as stated as a minimum by the Norwegian parliament in 2009) vs. actual budgets through Ministry of Environment in mill NOK. In addition other sector authorities also contribute for the WFD implementation.

Environment Quality Standard (EQS) and chemical status, and identify river basin specific pollutants.

- Include all significant pressures including biological impact factors in further RBMPs.
- Technology, means and measures to ensure that the aquaculture industry is environmentally sustainable, allowing it to co-exist with the Wild Atlantic Salmon.
- Ambition level for use of art 4.7 (new modifications and new activity) across all sector authorities and in combination with national legislation for licenses and permits must be demonstrated in compliance with the WFD requirements.
- Designation and classification of HMBW including environmental standards for good ecological potential in HMWBs due to hydropower impact are still vague.
- Work further with POM and cost for implementation and financial commitment for sectors involved.
- Improve coordination in international river basin districts with Sweden and Finland.

# 7. WFD IN SWEDEN

## 7.1. ORGANISATION AND RESPONSIBILITIES

Sweden has five water districts and three of these are shared with Norway and Finland, figure 17.

The north and northwest parts of Sweden are characterized by a low density of people and big watercourses. Most of these watercourses are modified with dams for hydropower production. The south parts of Sweden are characterized by a high density of people and agricultural activities, and most rivers are physically altered for hydropower, agriculture or other society use.

The Water Framework Directive (WFD) has been implemented by the Parliament and the Government, with legislation (Environmental Code and Ordinances, and organization) and decides about the economy of the water management. The Ministry of Environment is responsible for the WFD.

For each of the five water districts, a County Administrative Board (länsstyrelsen) has been appointed as the Competent Authority (Vattenmyndighet). The Competent Authority consists of a Board (Vattendelegationen) who makes the decisions about the River Basin Management Plan, Environment Quality Standards and Programme of Measures, and an Office of experts who produce the plans and programmes for the River Basin district. The Competent Authorities coordinate the operative work that is done by the County Administrative Boards in the district.

To support the WFD work done in the River Basin districts, two national authorities are responsible for developing regulations and

guidance: The Swedish Agency for Marine and Water Management (HaV, surface waters) and the Swedish Geological Survey (SGU, groundwater). They define in regulations what should be done by the Competent Authorities, e.g. the boundaries for Environmental Quality Standards (EQS), the Programme of Measures and the river Basin Management Plan. They support the Competent Authorities with guidelines and manuals, and coordinate the work on a national level.

## 7.2. COOPERATION AND PARTICIPATION

Cooperation between the national guiding authorities and the Competent Authorities have been intensive during the first cycle of WFD work. Several other governmental authorities have been involved in the work, depending on their sectorial responsibility. On national level, several stakeholder meetings with business associations, NGO's and others have occurred over the years. Some of them have been quite regular, more or less as a reference group.

The regional work, in the river Basin districts, has been intensive between the Competent Authorities and the County Administrative Boards. Other governmental authorities have been involved in the work, depending on their sectorial responsibility. An important part has been the international co-operation and coordination with Finland and Norway within the shared watersheds. Reference groups have been established in most River Basin districts with different stakeholders.

The Competent Authorities have promoted the establishment of "river basin organisations", as a stakeholder forum to involve municipalities, landowners, agricultural organisations, forestry associations, NGO's and the public. In parts of Sweden, "river basin



Figure 17. The five water districts of Sweden.

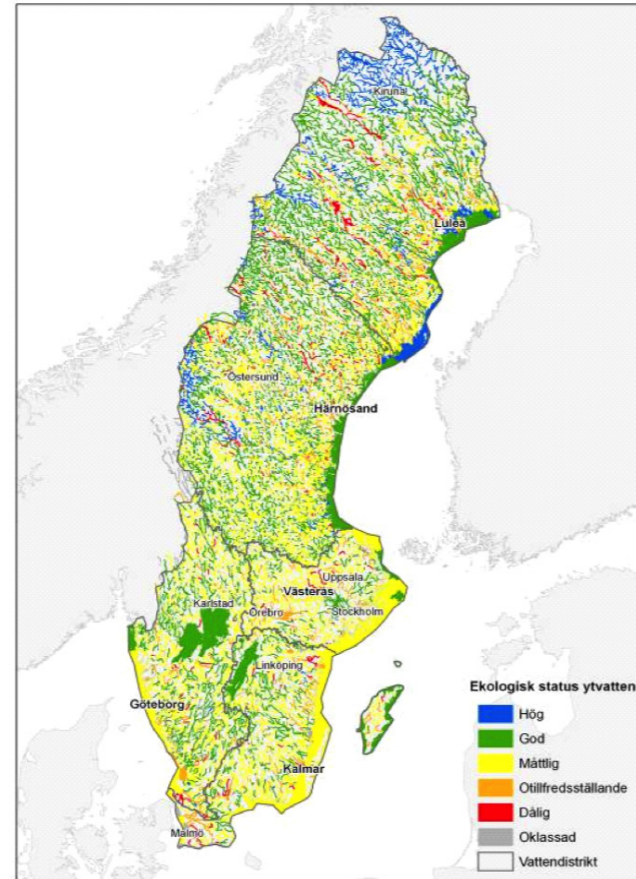


Figure 18. Ecological status classification for surface water in Sweden.

Stapeldiagrammen visar hur många av distriktets vattenförekomster som är påverkade av olika miljöproblem. Notera att fysiska förändringar i vattenmiljön delas upp i tre kategorier: flödesförändringar, kontinuitetsförändringar och morfologiska förändringar.

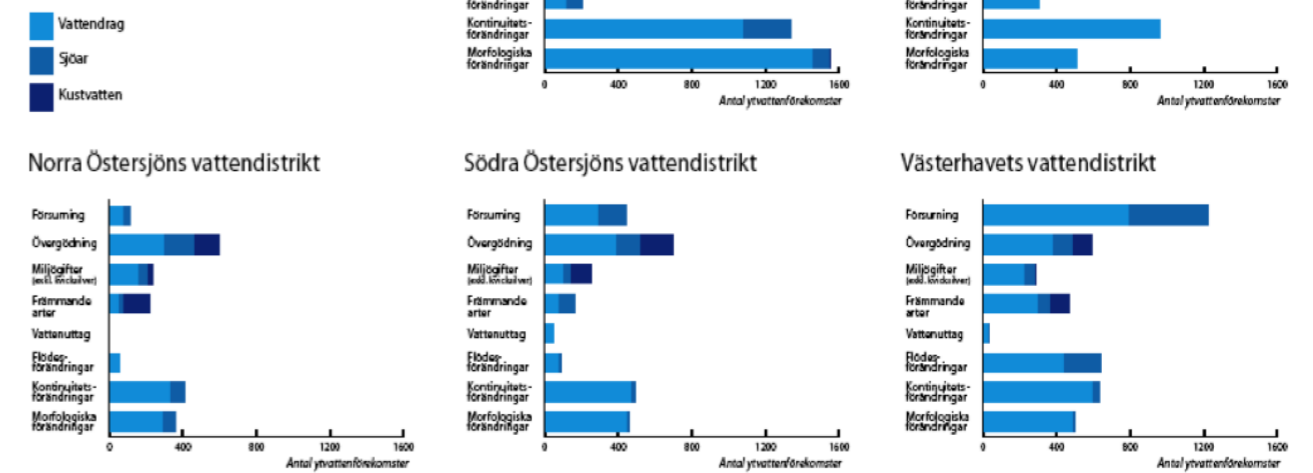


Figure 19. Dominating pressures on surface water (Vattendrag= rivers, Sjöar=lakes, Kustvatten = coastal water) in each of the water districts in Sweden.

organisations" already existed, and these were asked to bring in WFD issues into their work. The County Administrative Boards have led the process of public participation and co-operation with the municipalities, to bring in local knowledge and opinions about all issues concerning River Basin Management.

The major pressures in southern Sweden are physical alteration and eutrophication. In some areas, especially in south-western Sweden, acidification is an important pressure. Chemical pollutants are important pressures in some areas. The dominating pressures are illustrated per water district in figure 19.

## 7.3. STATUS OF SWEDISH RBMP AND POM

River Basin Management Plan, Environment Quality Standards and Programme of Measures were decided in December 2009 by the Competent Authorities, and reported to EU Commission in March 2010.

The Programme of Measures (POM) included a measure (no 1) noting that all authorities and municipalities should report to the Competent Authority their progress in reaching the Environment Quality Standards and performing their measures. A compilation of the reporting has been presented by the Competent Authorities, showing that only small progress has been achieved so far.

The Competent Authorities are now preparing for the second generation of River Basin Management Plan.

## 7.4. ECOLOGICAL AND CHEMICAL STATUS IN SURFACE WATERS

In general, 50 % of Swedish water bodies do reach Good Status (figure 18). The surface water bodies (approximately 22 000) do not include all waters in Sweden, but mainly the big rivers and lakes, includes though about 82 % of inland waters. The main problems in Sweden concerns surface waters, and it varies between 20 – 80 % for the different River Basin districts.

## 7.5. OVERVIEW OF THE MOST IMPORTANT PRESSURES

The major pressures in northern Sweden are physical alteration. In some areas eutrophication, acidification and chemical pollutants are also important pressures.

## 7.6. PROGRAMME OF MEASURES

According to the Swedish law (Environmental code), the Programme of measures (POM) shall define what authorities and municipalities have to do to reach the Environment Quality Standards. It also means that prioritisation is small, or rather, related to the EQS. Similarly, the POM should be fulfilled by 2012, so that Good status can be reached 2015 or 2021/2027, i.e. several hundred measures have to be done by different operators in a short time. The main conceptual model for the Swedish POM therefore was designed so that national authorities have to change their regulations for different operators, leading to a fairly quick reduction of emissions/pressures. At the same time, the inspection and control had to be enhanced by the authorities to promote the change.

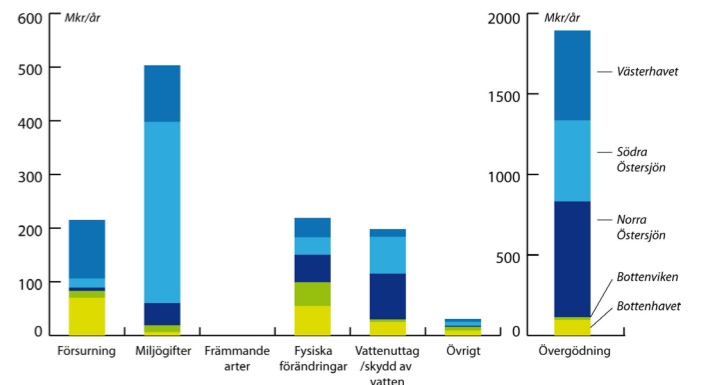


Figure 20. Estimated budget needs in million SEK/yr for mitigation measures for various pressures and water districts in Sweden.



Other parts of pressures, were this design did not match present legislation, had to be designed in another way. There was also a need for better knowledge to support the measures, and the next generation of POM.

The main focus in the POM, have been measures against eutrophication (Urban Waste Water Treatment Plants (UWWTP), rural households, industry and agriculture) and physical alteration (hydropower plants and other dams), and in some places priority substances.

Calculated costs for Sweden are about 3-6 billion euros over 10-20 years (figure 20).

## 7.7. MONITORING AND CHARACTERIZATION

In Sweden, data from monitoring programs are collected from databases of County Administrative Boards, municipalities, river basin organisations, national institutions and others. All data is quality checked and stored at a national data host. Information on monitoring stations are also collected in the database: Water Information System Sweden (VISS) ([www.viss.lansstyrelsen.se](http://www.viss.lansstyrelsen.se)).

Today, assessments of the water bodies are made out of information from monitoring and characterization surveys. To meet the demands of the WFD, the monitoring programs have to be reviewed. Use of modelling to support the monitoring is discussed. Modelling can also constitute as a base in expert judgements to increase the credibility of assessments and classification.

A model for indicative Ecological status assessment have been developed and applied widely in northern Sweden.

## 7.8. FINANCING

Financing, administrative budgets and to implement the WFD (characterization, monitoring, measures) are vital to fulfil the objectives of the WFD. National and regional (governmental) budget are approx. 15 – 20 M euros for administrative costs and characterisation.

Man-years, including environmental management, are assumed to be:

- Water management at authorities; approximately 100 pers.,
- Environmental officers national, regional and local; approximately 1000-3000 pers.

## MONITORING

National and regional (governmental) budget for monitoring 5 M euros/ year,

Recipient control and other types of monitoring are on top.

## THE SWEDISH WATER INFORMATION SYSTEM

The Swedish Water Information System, VISS, is a mixed database and web-map service. It includes all information on classification, monitoring stations, pressures and Environment Quality Standard about water bodies. The database links data from different agencies and institutes. It allows for an integrated management of the knowledge base, and the aggregation of tables, maps and statistics at water body, sub-district, river basin district or national level.

VISS is an important tool for preparation of the River Basin Management Plans (RBMPs), Environment Quality Standard (EQS) and Programme of Measures (POM). It also facilitates reporting from Sweden to the European WISE system.

## 7.9. FURTHER IMPLEMENTATION

The EU Commission has recently addressed questions concerning the Swedish River Basin Management Plans in the national RBMP report (EC 2012). Several of the issues were already known to the Swedish administration, but have to be dealt with within the 2nd management cycle. Some of the main issues are:

- 1. Governance** – unclear about decentralized Swedish organisation
- 2. Characterisation** – unclear how the status can be classified, since the monitoring program is so limited.
- 3. Monitoring** – unclear about the limited monitoring programme
- 4. Classification of ecological status** - unclear about significant pressures, HMWB, lack of biological monitoring
- 5. Classification of chemical status** - unclear about chemical classification due to lack of chemical monitoring
- 6. Designation of heavily modified water bodies and definition of Good ecological potential** - unclear about criteria for HMWB and establishment of GEP
- 7. Assessment of groundwater status** - unclear about threshold values, trend analysis, lack of monitoring
- 8. Exemptions to the environmental objectives** - unclear about exemptions due to disproportionate costs and mercury in fish
- 9. Programme of measures general** - designation of general measures addressed to authorities and municipalities and not to more precise physical measures

The Ministry of Environment has replied to the EU Commission that some of the questions are in progress and will be better described in the RBMP 2015, and have also explained some details in the Swedish implementation of WFD.

# 8. COMPARISON OF WFD IMPLEMENTATION IN SELECTED COMPARABLE COUNTRIES

In 2010 a juridical study by Eklund Entson and Gipperth (2010) on the WFD implementation in the Scandinavian countries was published and concluded that:

1. Necessary legal instruments are not yet in place by 2010,
2. No over implementation was seen in any of the countries. On the contrary, all Scandinavian countries (Finland, Sweden, Norway and Denmark) have problems to fulfil the requirements. They did therefore see that new legal adoptions are crucial for reaching WFD objectives

Since then the countries have adopted necessary legislation for the implementation of the WFD as described in the country chapters above. The organisational structure, manpower and implementation cost in different countries up to 2012 (except Denmark) is shown in following tables.

## 8.1. COMPARATIVE STUDIES ON WFD IMPLEMENTATION IN THE NORDIC COUNTRIES

	RBDs Nat. (IRB)	Organisation structures	WFD coordination National level	Regional level
<b>Finland</b>	8 (2)	Ministry group National coordination group Steering groups and working groups of River Basin Districts Cooperation and subgroup(s) in each ELY-centre	National coordination: Ministry of Environment and SYKE	River Basin District coordination: Competent ELY-centres - Regional coordination: ELY-centres
<b>Sweden</b>	5 (3)	Water Board (Vattendelegation) The Competent Authorities (Vattenmyndigheterna)	Swedish Agency for Marine and Water Management Swedish Geological Survey	The Competent Authorities (Vattenmyndigheterna) County Administrative Board (Länsstyrelserna)
<b>Norway</b>	11 (6)	Ministry group Directorate group County level - FK/FM/VRU Local project leaders	Ministry of Environment and Ministry of Energy and Petroleum DN	- FK (County governor)
<b>Iceland</b>	4 (0)	Similar to Norway but except county level	Environment Agency of Iceland	Environment Agency of Iceland

**Table 4.** An overview of key WFD information in Finland, Sweden, Norway and Iceland.

	Unit	Finland	Iceland	Norway	Sweden
<b>Man years involved</b>					
National coordination	Persons	~50	12 - 15	15-20	~50
Regional - local level	Persons			>50@	~50
<b>Budgets</b>					
Administrative costs	mill Euro/yr	~5		6-8	15-20
Monitoring (state)					
-Existing		8-9 <sup>α</sup>		6	8
-«New» WFD	mill Euro/yr	0	0.7	~2	
<b>Measures - POM</b>	mill Euro/yr	1,700	?	?	350-700

**Table 5.** Key figures on man years, WFD budgets and estimated POM cost in each country. Figures for 2012 in mill Euro/yr. Be aware of difficulties of separating WFD related figures from other water management issues in each country. **Due to different institutional structure and governance, direct comparison between countries may be misleading.**

<sup>α</sup> Hour salary for sampling not included for Finland, but covered in man years involved.

@ Many project leaders in Norway are hired on contemporary positions working at sub-basin level.



## 8.2. ASSESSMENT OF RBMP REPORTING

The European Commission published in November 2012 (EC 2012a), both a review report and national-wise assessment reports with their evaluation and recommendations on submitted RBMPs (EC 2012 c-h). Several of the main recommendations from the review report promote further knowledge exchange on specific mutual WFD challenges between the Nordic countries. The following key messages and recommendations seem to be most relevant for the focus of this project:

1. There are good examples of implementations off all aspects of the WFD. Therefore, chance of learning from others
2. The Commission promote a fruitful informal cooperation with Member States and stakeholders
3. The majority of RBMPs concerns are these of trans boundary river basins
4. Take action to overcome obstacles hindering the implementation in the first cycle, decrease use of exemptions
5. Step up ambitions in taking measures to achieve good status
6. Find the right balance; adapt when necessary legal and administrative approaches to ensure integrated multidisciplinary water management. A robust legal framework and appropriate governance structures are essential success-factors.
7. Improve and expand monitoring and assessment tools, e.g. gaps are significant for biological assessment methods sensitive to hydro morphological pressures.
8. Comprehensive assessment and robust monitoring is essential, and the cost of monitoring is much lower than the cost of inappropriate decisions.
9. Apply ecological flow regimes. Sound water management integrate quantitative and qualitative aspects

## EC EVALUATION OF RBMPs FOR SELECTED COUNTRIES (AT, FI, NO, SE, UK)

In 2012 the EC published an evaluation of RBMPs and key points in that evaluation for Austria, Finland, Norway, Sweden and Ireland (from table for each country) are shown here in table 6:

Based on the comparison shown in the table 6, best practise in implementation of each article of the WFD is seen in several RBMPs. However, shortcomings are also seen for parts of WFD implementation. It would therefore be of importance to learn from each other, and find “good enough” solutions on shortcomings done by many countries.

Some general strength in Nordic RBMPs is identified:

- Considerable effort made
- Lessons to be transferred from best practice RBMPs are:
- Climatic change (FI)
  - Hydro-morphology (AT, UK)
  - Characterisation guidance and methodology.
  - POM (FI)

Common shortcomings in Nordic RBMPs:

- Water pricing
- Lack of monitoring data
- Gaps in ecological status assessment methods
- Hydro-morphology
- Extensive use of exemptions, without good explanation
- Lack of transparency for allowing deterioration of status due to new modifications to the physical characteristics (Use of WFD Art 4.7)

## MONITORING

Some Member States such as Denmark and the UK show significantly higher numbers than the benchmark (EC 2012). The very low number

for Sweden is influenced by the large unpopulated areas in the North. In general, pressures resulting from human activity can be linked to population density in the RBD and thus used as a surrogate of pressures, related to urban wastewater discharges but also to other economic activities such as transport and urban development. Figure 21 presents the number of operational sites in relation to population density. The figure gives a rough indication of the level of effort in operational monitoring but should be interpreted with care. Member States that show a high number of sites in relation to population density are UK, Sweden and Denmark.

The main findings regarding monitoring:

- The monitoring network in Member States is a key WFD element and information source that should be maintained and further developed in a consistent way.
- There are significant gaps in the monitoring of the relevant quality elements in surface water bodies. This should be improved in order to reduce the risk that certain impacts arising from one or several pressures would not be detected.

		Austria	Finland	Ireland	Norway	Sweden	UK
<b>RBMP status</b>	Date of submission	March 2012, all IRBD	March 2010, 5 of 8 IRBD		June 2010, Pilot plans for parts of 9 RBD,	March 2010, 3 of 5 IRBD	
	IRBD	ok.	Need to extend international co-ordination		Need to extend international co-ordination	Need to extend international co-ordination	
<b>Characterisation</b>	General		High uncertainties, needs to clarify methodology and thresholds for significant pressures, reduce WBs size	For some WBs- high uncertainties in the characterization and assessment of status, actions need to be taken	All significant pressures incl biological pressures must be encompassed	High uncertainties in the characterization and assessment of status. Reduce threshold of lake WBs size	For some WBs- high uncertainties in the characterization and assessment of status, actions need to be taken
<b>Monitoring</b>		Impressive work, but need to further reducing uncertainty, Further details needed	Improve monitoring, to cover all WBs, incl small.	Monitoring programmes need to be fully developed, incl all relevant QEs	More monitoring sites and BQEs needed	Very few WBs monitored with BQEs	Need to review monitoring network
<b>Ecostat</b>	Ecostat assessment		Large uncertainties and proportion WBs unknown	Need to complete fully	Further development of a complete classification system needed	Large uncertainties and WBs classified without monitoring data. Improvements needed, several gaps in Ecostat system	Methodologies for ass of BQEs need to be developed
<b>Chemical status</b>			All substances				
<b>HYMO alteration</b>	HMWB designation	Comply with all requirement of Art. 4(3)	Comply with all requirement of Art. 4(3)		Approach need more comprehensive explanation	Procedures for designation not been followed	The process need to be completed for all RBMPs. For Scotland impact of measures on status finalized for hydropower schemes
	GEP	Phase approach for reaching GES/GEP, including ecological flow requirements	No assessment on the expected effects of measures. Ecological flow not included.		Unclear method for defining GEP, link HYMO measure and BQE missing.	Measures for defining GEP not been defined	Significant adverse effect and better env options should be specifically mentioned
<b>Environmental objectives</b>	Exemptions	Prioritisation made. High no, cause of concern. Clearer and more transparent reason should be justified	Provide more transparency	Provide more transparency and decrease the use thereof	All significant pressures incl biological pressures must be encompassed	Significant no of exemptions - cause of concern	Provide more transparency and decrease the use thereof
	Art 4(7)	Ok - applied for 2 WBs.	All conditions in 4(7) must be included and justified	All conditions in 4(7) must be included, justified and assessed	All conditions in 4(7) must be included, justified and assessed	All conditions in 4(7) must be included and justified	All conditions in 4(7) must be included, justified and assessed
<b>POM</b>	General	POM incl details WB unit to national level	Well presented	Decrease uncertainty	Clarify link status - objective and need for improvement	No clear link between status and need for pressure reduction.	
	Shortcoming	Scope, timing and funding should be made clearer	Make clear/ transparent the approach to achieve the objectives and ambitions	Scope, timing and funding should be made clearer	Cost and financial commitments for measures should be included	Many measures are “administrative”. More explicit on the specific measures with meaningful information.	
	Agriculture	A clear commitment at political level needed	Need for measure needed should be transferred into a clear strategy	Need for measure needed should be transferred into a clear strategy	More information need for when and who pays for agro measures	Need for measure needed should be transferred into a clear strategy	Need for measure needed should be transferred into a clear strategy
<b>Climatic change</b>			Good approach, climate check carried out		Lacking, should be demonstrated in next RBMPs	Limited extend, no explicit climate check	
<b>Water pricing</b>		Cost-recovery for broader range of water services, provide information on use of polluter pays principle	Apply cost-recovery for broader range of water services	Apply cost-recovery for broader range of water services	Lack of national guidelines and tools	Apply cost-recovery for broader range of water services	Apply cost-recovery for broader range of water services

Table 6. Comparison between the Nordic Countries, Austria, United Kingdom and Ireland.

### 8.3. EU'S BLUEPRINT FOR WATER AND NORDIC RELEVANCE

The same date as the RBMPs assessment was published, the European blueprint for water resources was also launched (EC 2012b). The long-term aim of the Blueprint is to ensure the sustainability of all activities that impacts water, by identifying obstacles and ways to overcome and ensure good-quality water throughout Europe.

The Blueprint is a new EU strategy on the use of water resources. It sets the agenda for EU action for the years to come. Water quality and quantity are two sides of the same coin. Good water status not only requires that pollution is controlled (quality) but also that the ecological water flow (quantity) is guaranteed for ecosystems to continue to deliver their services.

Also this strategic document encourages further international cooperation of common water management challenges such as:

- Reducing hydro morphological pressure from e.g. hydropower, by water related green infrastructure, implementation of water accounts, ecological flows and targets settings, and develop CIS guidance for this.
- Improvement of governance
- Better calculation of costs and benefits
- Better knowledge base, e.g. hydro-economical modelling, upgrading WISE

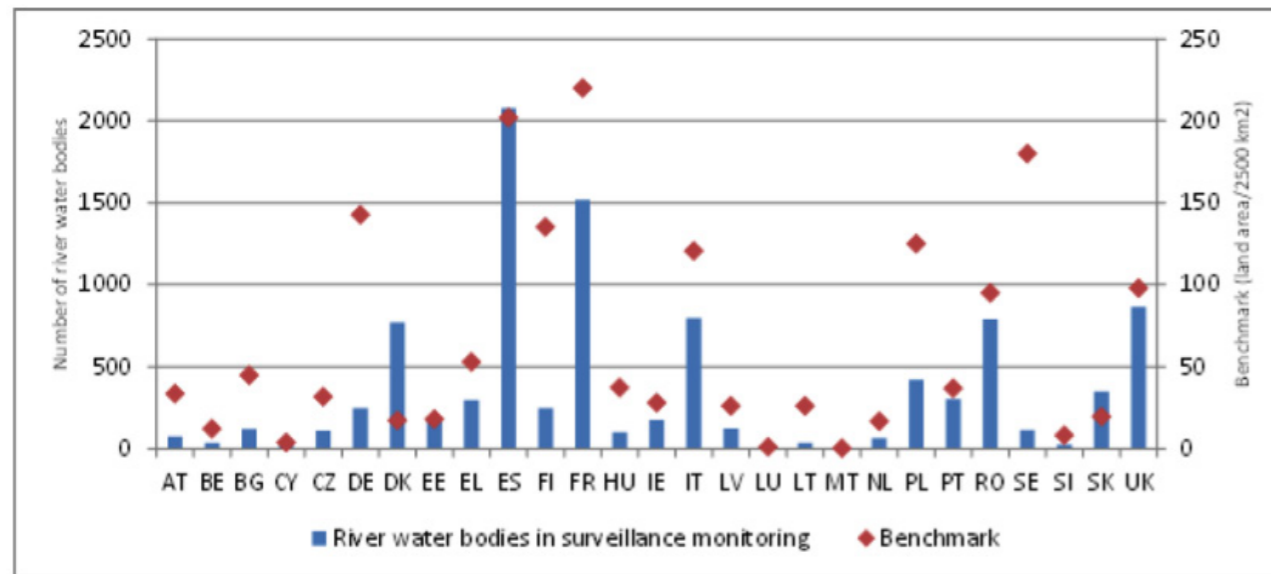


Figure 21. Number of river water bodies included in surveillance monitoring. The diamonds indicate a benchmark calculated by dividing the area of each Member State by 2500 km<sup>2</sup> (criterion given by Annex V, 1.3.1) Source: WISE, EC 2012.

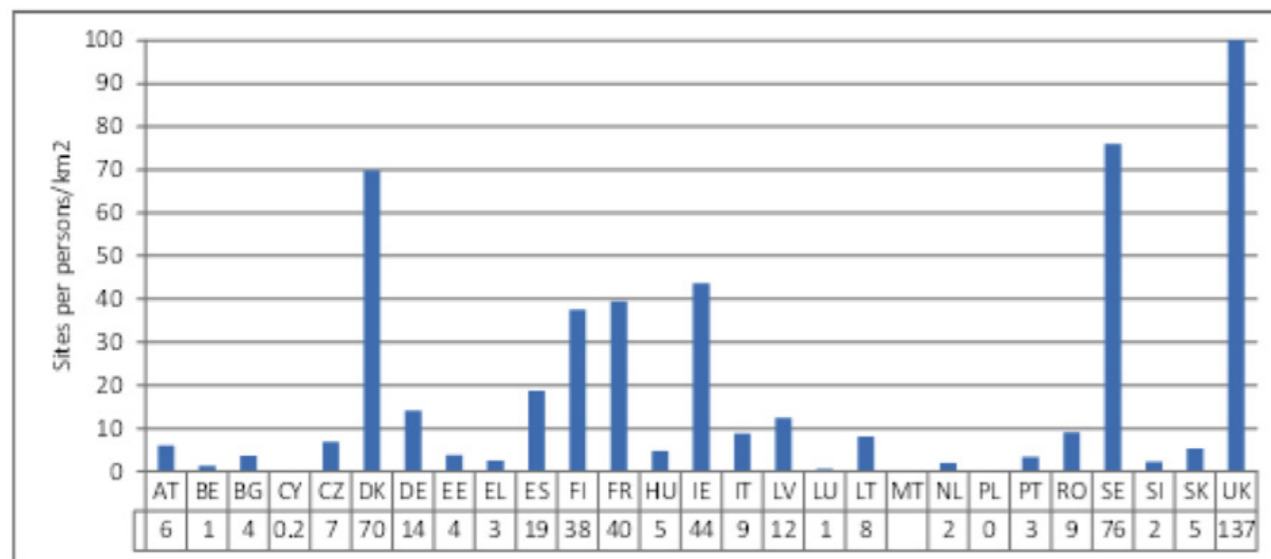


Figure 22. Number of operational sites in relation to the population density of the Member State; population density is used as an indicator of the amount of potential pressure from human activity. No report on number of sites from MT. Source: WISE, EC 2012.

## 9. NORDIC WFD COLLABORATION ON SPECIFIC WFD TOPICS

In this chapter we handle more in detail specific highlighted WFD related topics as part of the Nordic collaboration. For some issues collaboration was on-going before 2008, while other got intensified attention in 2008-2012. The ECs RBMPs assessment reports (2012) also give recommendation for further improvement in the RBMPs for the next cycle, by identification of shortcomings in tools, knowledge basis and national guidelines for the implementation of WFD. In addition FI-NO-SE share several of the same challenges, so all this foster a further Nordic collaboration on several WFD related topics.

The following sub-chapters are not intended to give complete nor very objective or official statements from the countries involved, but highlight some suggestions for further priorities and needs in the view of water managers involved in this report.

The Nordic water management systems have much in common and many similarities. The same pressures and impacts frequently occur in two or more of the Nordic countries, at least for parts of the countries. The water types, climate and hence the ecological conditions are also comparable in this northernmost part of Europe. Some of the pressures, impacts and species compositions are also quite unique in the Nordic Countries. An example of this is the severe impact from acid rain leading to acidification and need for large scale liming of lakes and rivers especially in Norway and Sweden but also parts of Finland.

In a European context (excluding Russia), Sweden, Finland and Norway have the largest lake areas in Europe. The Nordic countries involved in this WFD collaboration are also quite unique by having large rural areas with few inhabitants per km<sup>2</sup> and a high number of water bodies. The EEA assessment report has also found clear relationship between water status and population density. Figure 23 below shows the highest percentage of good-high ecological status in areas with low population.

Denmark has in many ways the same challenges as the rest of the Nordic countries, but the character of e.g. hydro morphological alterations may differ. Denmark will hopefully take part in the Nordic WFD collaboration in the future, e.g. concerning eutrophication measures.

Some of the features (not to be considered as a complete list) enhancing Nordic collaboration on water issues in a European context are listed below:

- The largest lake areas in Europe
- Hydropower (HP) is an important source for electricity supply
  - o Widespread impact for water regulation for hydropower generation
  - o High percentage of HMWBs due to HP (FI, SE, NO, IS)
  - o Potential for sharing tools and exchanging experience on mitigation measures
- Large rural areas with lots of water bodies and few monitoring data
  - o Need for a common voice in European working groups on water issues, e.g. get acceptance for grouping of rivers and lakes with no/little anthropogenic pressures.
- Sub-arctic climate and partly same species composition, water types and pressures
  - o Take parts in the same N-GIG (Northern Geographical Intercalibration Group)
  - o Potential for sharing monitoring sites
- o Challenges with acid rain, and sharing experience with mitigation measures (especially liming) but also monitoring and classification systems
- Sharing and applying management tools and gaining applied results from R&D from each other, such as
  - o Modelling tools
  - o ICT tools (e.g. Vann-nett, VISS)
  - o National guidelines, adaptations of European guidance
  - o Mitigation measures; concepts, strategies and experience
- Management systems and practice comparable
  - o Legal framework much in common
  - o Management structure
  - o Traditions for public participation and stakeholder involvement
- Neighbouring countries
  - o Sharing river basins (bi- and even three-lateral)
  - o Linguistic advantages

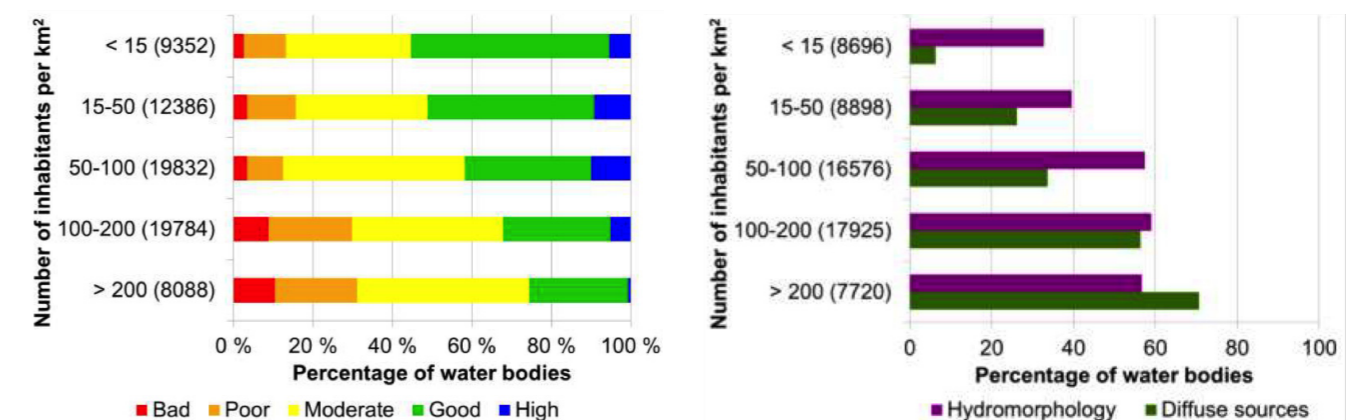


Figure 23. Coupling of population density vs ecological status (left) and vs pressure density (right) from EEA 2012 reports (EEA 2012a and b).



## 9.1. THE WFD WORKSHOP SERIES

Support from the Nordic Council of Ministers has financed parts or all of the travel and accommodation for the workshop in Gothenburg (Smidt, 2006), in Brekstad and Helsinki (cf. the table below), while cost for workshop in Sigtuna and at Hurdalsjø was financed by each participant and Vattenmyndigheterna (Sigtuna) and DN (Hurdalsjøen). As seen from the overview, the number of participants has increased considerably since 2007, both in total and from specific countries. Several non-Nordic participants have taken part in several of the workshops.

The participants have been a mix of water managers, research scientist and some consultants. However, the majority of the participants have their origin from regional or national water management level in the Nordic countries.

Workshop place	Date	Nordic						Other		Tot
		DK	FIN	IS	NO	SE	AT	SC/IR		
Gothenburg (SE) <sup>α</sup>	Aug.07	1	3	1	6	8	0	0	19	
<b>Brekstad (NO)#</b>	May 08	0	3	1	10	11	1	0	26	
<b>Helsinki (FIN)#</b>	Oct. 09	0	14	1	8	14	0	0	37	
Sigtuna (SE)	Sep.10	0	9	3	10	23	0	0	45	
Hurdalsjøen (NO)	Sep.11	1	13	8	19	15	1	1	58	
Reykjavik (IS)	Sep.12	0	12	15	18	15	0	3	63	
<b>Total</b>		<b>2</b>	<b>54</b>	<b>29</b>	<b>71</b>	<b>86</b>	<b>2</b>	<b>4</b>		

**Table 7.** Overview and number of participant for the Nordic WFD workshops 2007-2012.

The text in bold are workshops financed by project funding from NCM # Aquatic group (this project), <sup>α</sup> Marine group

All programs, presentations and summaries from the workshops are available on the project website at [www.vannportalen.no](http://www.vannportalen.no), together with selected relevant reports and publication.

Workshop place	Date	Classification and assessment					Measures		ICT
		Characterisation/ pressure analysis	Monitoring	Ecostat	Priority subst	Coastal issue	HYMO	Pollution	GIS
Gothenburg (SE) <sup>α</sup>	Aug.06		X			X	X		
Brekstad (NO)#	May 08		X	X			X		
Helsinki (FI)#	Oct. 09	x	X	X			X		
Sigtuna (SE)	Sep.10		X	X			X	X	
Hurdalsjøen (NO)	Sep.11		X	X	X		X	X	
Reykjavik (IS)	Sep.12	X	X	X		X	X	X	
<b>Total</b>									

**Table 8.** Overview of specific tasks handled in working groups during the Nordic WS series

## OVERVIEW OF SUMMARIES AND CONCLUSIONS FROM THE NORDIC WFD WORKSHOPS;

- Gothenburg (SE) – [Report from the workshop](#)
- Brekstad (NO) – [Summary surveillance monitoring networks, Summary reference conditions, Summary HMWB](#)
- Helsinki (FIN) – [Monitoring and classification](#) and [HYMO](#)
- Sigtuna (SE) – [Summary from all sessions at the Sigtuna workshop](#)
- Hurdalsjøen (NO) – [Monitoring and classification, Modelling, GIS and ICT solutions, Priority substances](#)
- Reykjavik (IS) – [Marine and coastal issues, HYMO measures, Pollution measures, ICT solutions and modelling, Classification and monitoring of inland waters](#) (see appendix)

## 9.2. HYDRO MORPHOLOGY, HYDROPOWER AND HMWB ISSUES

### NORDIC COLLABORATION BEFORE 2008

An ad hoc group work on HMWB and hydropower issues in collaboration also with Austrian colleagues was active until 2006. That work was reported by Martunen et al (2006).

Hydro morphological (HYMO) pressures are one of the main pressures on ecological status in European water (EIA, 2012). If the reason for less than good ecological status is related to HYMO caused by navigation, harbours, water supply, hydropower etc., then the WFD state that water bodies can be designated as heavily modified water bodies (HMWB), and hence good ecological potential (GEP) should replace good ecological status (GES) as the environmental objectives. Many states implementing WFD have also decided to use the Prague or mitigation method for defining GEP (Kampa et al, 2011). For using the mitigation method a good overview of Best Available Techniques (BAT) and hence relevant measures and combinations thereof are needed. Of importance is e.g. a measures library with sufficient description of measure and likely ecological effect.

The Water Framework Directive defines the boundaries for sustainable water use via its 'good status' objective for water bodies. This is an essential target for impact decoupling, conveying the conditions that ecosystems require to function and support human wellbeing, health and prosperity. In this context, the 'environmental flows' concept is an essential tool for securing that aquatic ecosystems have a good quantitative and hydro morphological status (EEA, 2012).

Recent assessment of HMWBs in Europe, showed that NO, SE, FI have the highest percentages in Europe of water bodies designated as HMWBs due to impact from hydropower (HP) (Kampa et al, 2011). Electricity generated from HP is also of major importance for NO, AT, SE and FR in particular as shown in the figure from this report.

In a European context it has been carried out separate workshops dealing with HMWB and hydropower issues in particular. The reason for this is probably due to the fact that demand for ecological improvements have been challenging from a science-policy perspective. Demands for renewable energy due to e.g. the linkage to the Renewable Energy Directive, lack of management or legal framework for ecological caretaking in regulated rivers and lack of robust ecological methods for assessment of HYMO are also a likely reason for this special focus on these issues from a European perspective.

The European commission (EC, 2012) states that designation of HMWBs generally for most countries, is not transparent and does not follow CIS guidance. The main concerns is weak or lack of assessment of 'significant adverse effects' and of 'significantly better environmental options'. Many states have widely based designation on expert judgment. The compliance check of RBMPs by the EC, have inquired for additional information regarding HMWBs issues in several countries, including FI, NO and SE, but to a large extent accepted the approaches used in AT and EC. There is also an on-going complain on the Norwegian government from Norwegian NGOs to ESA regarding these issues. The complainers are claiming that basic principles in the WFD not are being followed for water bodies affected by hydropower.

In most European countries the remaining potential for hydropower (HP) is quite limited. However, NO has had a steep increase in HP production during the last decades, and it seems like a substantial amount of new HP projects will be given licenses in the years to come. So far, no separate systems or procedures for implementing WFD article 4.7 have been developed in the Nordic countries.

As part of the Nordic cooperation on HYMO, there has been an exchange of

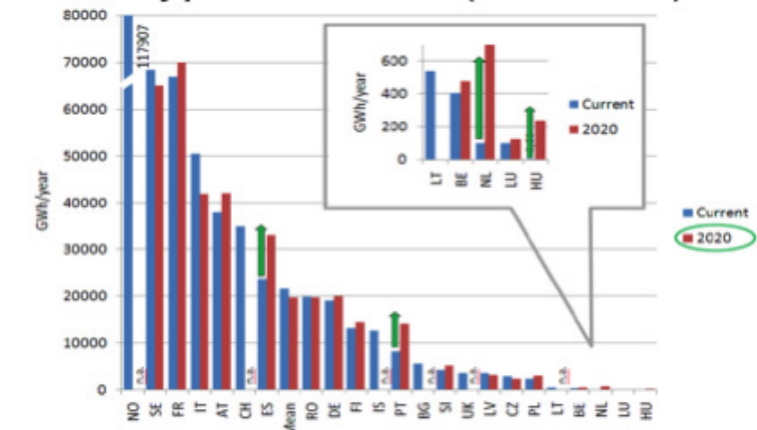
- Assessment methods for HYMO alterations
- Fruitful discussions on use of ecological potential and mitigation method
- Exchange experiences on systematic work on HP related mitigation methods
- Sharing R&D results such as Bakken et al (2012).

See the national answers on key HYMO issues as agreed upon at the last workshop in Reykjavik (Appendix)

### FURTHER NEEDS / PLANS FOR COLLABORATION

In the appendix the preliminary answers to key questions addressed on HYMO challenges are given. It is obvious that further knowledge exchange and networking on HYMO questions will continue both between the Nordic countries and on the European level. There are still several open questions both from a scientific and a management/political perspective. The EU Blueprint (EC 2012) for water also addresses

## Electricity production from HP (current – 2020)



**Figure 24.** Electricity production until 2020.

the need to develop a CIS standard on ecological flow before 2014. As the Nordic countries have a considerable proportion of HYMO alteration due to hydropower and experience for environmental flow, we should have valuable contributions to such a process on the EU level.

## 9.3. MONITORING

### NORDIC COLLABORATION BEFORE 2008

Before 2008 the Nordic countries had only sporadic contact regarding monitoring in freshwater and coastal water. There has been cooperation on monitoring methods also before the implementation of the Water Framework Directive started, e.g. on macro invertebrates, through Nordic Benthological Society, and fish in lakes, through the Nordic Fish Group. Norway, Sweden and Finland have participated in the European work to reduce human impacted acidification of freshwater, coordinated through ICP-Waters (The international Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes). Through this work the three countries carried out coordinated monitoring of water chemistry of freshwater in 1995. In a NCM-project in 2002-2004 typology and monitoring methods for freshwater in the Nordic countries were summarized as a preparation for the future monitoring initiated by the WFD implementation (NMD project report, TemaNord 2007:610).

### Liming

Sweden and Norway have in more than 20 years had an extensive liming activity in acidified lakes and rivers. Liming projects have been followed up by chemical and biological monitoring and R&D projects. Norwegian and Swedish authorities have had a quite close cooperation on these issues, financing some common projects and arranging seminars and conferences where scientists and managers from the two countries have met.

### Salmon rivers

Norway and Finland share two salmon rivers in the northern region. There is a cooperation on the management of salmon fisheries in these rivers and scientists from the two countries cooperate in monitoring (mainly salmon) the rivers.

## OUTCOME OF WORKSHOP SERIES (2008 - 2012)

Monitoring has been on the agenda at four of the meetings in the workshop series. There have been presentations and discussions on:

- Common reference sites
- Development and coordination of monitoring methods
- Common system for quality assurance and quality control
- Design of surveillance monitoring,
  - quality elements,
  - number of monitoring sites
  - monitoring frequency

## COMMON REFERENCE SITES

With several common freshwater types, the Nordic countries will have the opportunity to share reference sites. Monitoring data from the common sites can be used in all the countries having the relevant types in establishing reference values for the different quality elements and in the surveillance monitoring of long term natural variations. This will increase the amount of available reference data for all participating countries. A preliminary list of common reference sites was worked out during an NMR-project in 2004.

## DEVELOPMENT AND COORDINATION OF MONITORING METHODS

In general, monitoring methods and methods used in the intercalibration process and for classification are the same. See discussion in next paragraph.

## COMMON SYSTEM FOR QUALITY ASSURANCE AND QUALITY CONTROL

Systems for quality control are usually well developed for chemical labs and chemical monitoring, less so for biological quality elements. Some countries have systems for some elements, as e.g. ring tests for labs doing phytoplankton analysis in monitoring programmes. A Nordic cooperation on developing systems for ring tests for biological labs, mandatory courses in field methods and lab methods, included taxonomic analyses, would be advantageous for all countries. A common implementation of a quality control would also be appropriate as we have a (partially) common Nordic market for monitoring consultants.

## DESIGN OF SURVEILLANCE MONITORING

EU Commission has in their report on RBMP for Sweden and Finland made comments on number of monitoring sites and use of quality elements (QE) in the monitoring programmes. Norway and Iceland are in the planning phase of their monitoring programmes. Therefore all countries will gain from a coordinated planning and design of the future monitoring programmes.

## RELEVANT EC RECOMMENDATION – MONITORING NETWORK FOR FI, SE, NO

European Commission has identified several shortcomings in the monitoring programmes for Finland, Norway and Sweden regarding

both the number of monitoring sites and relevant QE to monitor (EC 2012). All countries, including Iceland, also have large rural areas so a pragmatic system for representative monitoring of water bodies needs to be solved. This should foster a further collaboration on these issues.

## 9.4. CLASSIFICATION AND STATUS ASSESSMENT TOOLS

### NORDIC COLLABORATION BEFORE 2008

The common work on monitoring methods and on freshwater typology described above, constitute the main collaboration related to development of classification tools between Nordic countries before 2008. The European coordinated intercalibration of ecological classification boundaries started in 2004. That work evolved into a Nordic cooperation (+ England and Ireland), and gave as a spin-off development of national classification systems and an opportunity to harmonize the systems in different countries.

### INTERCALIBRATION EXERCISE

The European intercalibration activity has given an invaluable contribution to the national work on developing classification systems. This work has also “forced” the Nordic countries to cooperate in these issues, share related datasets, discuss monitoring methods and come up with similar or comparable classification methods. The work has also resulted in cooperation beyond the Nordic countries, e.g. with UK and Ireland, which have water types and biological systems comparable to the Nordic countries.

## OUTCOME OF WORKSHOP SERIES (2008 - 2012)

Ecological classification has been on the agenda at all the Nordic workshops since 2008. There have been presentations and discussions on:

- Development of specific classification systems
  - Phytoplankton
  - Macrophytes
  - Fish
- Methods for estimating reference condition
- Use of “one-out, all-out” in classification of water bodies
- Common Nordic follow up of the intercalibration process
- Common R&D-projects for improving/developing classification systems for Nordic waters.

### FURTHER PLANS / NEEDS

The intercalibration process will continue until the end of 2016. All Nordic countries still lack classification systems for one or more parameters. At the last meeting in Reykjavik in September 2012 there was a common agreement that increased cooperation on these issues would be advantageous to all countries. Classification system on freshwater fish was mentioned particularly. The inland fish fauna in the Nordic countries are so similar, and different from the rest of Europe, that a cooperative effort to develop common, or harmonized systems, seems inevitable! This cooperation can also include Ireland and UK.

For macrophytes in rivers, a cooperation between Finland, Sweden and Norway is already initiated. Harmonized and intercalibrated classification systems are planned to be in place within the next two years.

For coastal waters, especially concerning phytoplankton, an intercalibration are planned for NO and SE for Skagerrak, SE and DK for Kattegat and between SE and FI for the Baltic Sea.

### EVALUATION OF CLASSIFICATION SYSTEMS

The intercalibration has been a rapid process. The supply of data has been variable and a need for improvement and revisions of classification systems are foreseen as new monitoring data become available and the experience in using the systems is gained. A Nordic cooperation in the evaluation process will be highly valuable from the same reasons as mentioned above: harmonized classification systems, same water types, comparable ecology, comparable pressures and increased access of data from other countries. Nordic workshops will be a valuable forum for this work in the future, in addition to smaller groups for more specific issues which should be arranged in between the yearly workshops.

### RECOMMENDATION FROM EC REGARDING ECOSTAT

Especially Norway and Sweden have got identified shortcomings in their WFD implementation regarding classification systems and relevant QE to monitor (EC 2012). The Nordic countries are sharing the same water types and ecotypes. This should foster a further collaboration on further development and improvement based on new experiences of ecological classification assessment systems.

## 9.5. GIS/ICT SOLUTIONS AND REPORTING

FI, SE and NO started development of separate databases and GIS solutions devoted for the implementation of WFD many years ago. Both SE and NO have for several years had their map based database with data on characterization of water bodies, pressures, status and risk assessment. These systems are named VISS (SE) and Vann-nett (NO), and are available for the public by user-friendly Internet applications. During the last years several new applications have been shared between SE and NO, and open sources have been the programming platform enabling exchange between countries. FI have also has a separate database and GIS tool, mainly designed for water managers and is not so publicly available as for NO and SE. Iceland has also adopted the best of the ICT solution from the other Nordic countries. Separate working groups on GIS/ICT solutions have been part of the Nordic WFD workshop at the last three annual meetings. This GIS/ICT collaboration has also dragged attention from other non-Nordic countries such as Ireland.

A more comprehensive summary of the last working group on GIS/ICT solutions and reporting are given in the appendix.

## 9.6. MEASURE MITIGATIONS LIBRARY

The first generation measure library has been developed and implemented in FI and published on [www.ymparisto.fi/oiva](http://www.ymparisto.fi/oiva). Similar libraries are in progress both in SE, NO and also in Ireland. An ad-hoc expert group is also working for EC on creating fact sheet on HYMO measures. Beforehand an agro measure database has been created at EU level.

In a valuable meeting at Arlanda in the spring of 2011 with ICT specialists from Norway, Sweden, Finland and Iceland, the “best” ICT system was identified based on the best modules from each country. During 2011 Iceland also launched their WFD ICT tools, mainly based on experiences and design already developed in NO and SE, based on this “best” ICT system approach as an outcome of the Nordic WFD collaboration and networking. The first generation measure library in NO was published on [www.vannportalen.no](http://www.vannportalen.no) in September 2012, mainly focusing on measures related to polluted sediments, sewage and HYMO alteration (hydropower).

Collaboration is currently on going on design and content of a mitigation measure library designated to be linked up into the WFD country wise ICT solutions. Separate dedicated workshop and Nordic WFD network are therefore collaborating on measure library issues in 2012-2013.

## 9.7. CHEMICAL STATUS - PRIORITY SUBSTANCES

WFD focus on chemical status assessment and achieving good chemical status related to a list of priority substances listed in a separate appendix. On the EU level, a separate working group are handling this issue. As part of the Nordic WFD collaboration, a separate working group on priority substances discussed the handling and progress at the meeting in Hurdal in 2011. The main outcomes of the meeting are that FI has implemented the EQS directive (2008/105/EC) and added some national substances, SE has implemented the directive only as a reference to the Directive with no national substances, while NO and IS are preparing for the implementation. No mixing zones for the priority substances have been designated so far.

Information and exchange on the progress of implementation in each country would be valuable both from a management and measure perspective, but also concerning the industry etc. Issues for further exchange are:

- Legal implementation
- National substances – River Basin Specific Substances, including matrices
- Designation of mixing zones
- Measures
- Monitoring

A more comprehensive description on the Nordic and Austrian exchange on priority substance issues is available at [www.vannportalen.no](http://www.vannportalen.no).

## 9.8. COASTAL AND MARINE WATER MANAGEMENT ISSUES

Coastal and marine management issues have not been in focus in the Nordic workshop series between 2007 and 2011. At the Reykjavik workshop a dedicated working group focused on following issues for coastal and marine water; characterization, pressure, monitoring, classification and WFD and MSFD, with the main outcome shown in appendix.

## 9.9. GOVERNANCE ISSUES

Collaboration and comparison of governance have not been in focus so far as part of this project. New initiatives are taken to promote this, as it is juridical status of POM, RBMPs, environmental objectives and institutional structure are likely to be crucial for an effective and successful implementation of WFD. Further collaboration on governance, e.g. based on extension on going R&D as WAPABAT and GOVREP lead by Norway is expected from 2013.

## 9.10. OTHER RECENT NORDIC WATER MANAGEMENT COOPERATION ON WFD RELATED ISSUES

### THE NORTHERN CALOTTE WATER AUTHORITY MEETINGS

Northern calotte water authority meetings have been held in Kiruna (March, 2011) and in Abisko (April, 2012). The focused topics in these meeting series have been; HYMO-alteration, characterisation and status assessment in remote areas, mining activity and WFD and the other relevant issues for the northernmost part of Finland, Norway and Sweden. The Kiruna meeting was coordinated by the County Governor of Troms, while the Abisko meeting was coordinated by the Water Authority of Bottenviken. Next meeting is planned to be arranged in Finnish Lapland, Mid-April 2013.

### BILATERAL COOPERATION ON IRBDS

Several international river basins have crosscutting borders between two or three Nordic countries. The largest ones are; Tana, Neiden and Pasvik (NO-FI, see map), Torneelv (SE-FI), Trysil/Klarelven (NO-SE). For several of these rivers there has been bilateral contact even before WFD implementation started. For Finland, several river basins are also shared with Russia as a non-EU country, which also is the case for Pasvik (shared also with Norway). Efforts have been taken to coordinate river district boards to the process following WFD. In the RBMPs assessment report from EC (2012) both FI, NO and SE have been recommended to; "extend international co-ordination" (FI), "put effort into ensuring the correct and mutual management of IRBDS" (NO), "ensure full co-operation with neighbouring countries" (SE).



WFD co-ordinations have been arranged from the national level in Norway and Sweden since 2008. Separate meetings involving also the Ministries of Environment, national coordinating authorities and regional level have been arranged. The aims of these meetings at Selbusjøen (May, 2008), and Oslo (March, 2012) have been to harmonize the approach such as characterisation, monitoring, status assessment, RBM planning for the NO-SE IRBMs. As a concrete action, the Swedish and Norwegian Ministries of Environment agreed upon establishing a project to bring back the Atlantic salmon to the uppermost part of Trysil/Klarelven. Therefore, the "Vänern-laxen" project was launched as an InterReg project, to assess possibilities and measures needed to get migrating fish back into this physically altered river system.

Other examples on a science-management collaboration NO-SE is the InterReg project on status assessment and comparison of tools in Enningdalen RBD (Walseng et al, 2011).

NO-SE liming cooperation have been on-going for many years with regular seminar sharing experience and praxis on liming as mitigation measures against effects of acid rain on aquatic flora and fauna. The last meeting was in autumn 2012.

A common strategy document for collaborative management of the transboundary watercourses between Norway and Sweden was agreed in 2012.

Another WFD related project for the Nordic countries is WATERPRAXIS; "From theory and plans to eco-efficient and sustainable practices to improve the status of the Baltic Sea" aimed to improve the status of the Baltic Sea by assisting the implementation of river basin management plans into practice in the region. WATERPRAXIS was also partly funded by the InterReg Programme ([www.waterpraxis.net](http://www.waterpraxis.net)).

The two River Torne International Watershed projects (TRIWA I 2003-2006 and TRIWA II 2006-2008) have produced, for example, a common typology for surface waters and a suggestion for a common monitoring program of the ecological status of surface water bodies

and evaluation of related biological tools. Trans boundary cooperation continues in the InterReg project "Forestry impact and water management in Torne River International River Basin" (2011-2013)

Finland and Norway share the Tana, Neiden and Pasvik river basins. The Tana (Teno) river with its headwaters forms 283 km of the Finish-Norwegian border. An agreement establishing a Finnish-Norwegian Commission on Transboundary Watercourses was signed already in 1980. A new Finnish-Norwegian agreement establishing an IRBD consisting of Tana, Neiden and Pasvik river basins is under preparation, expected to be signed in 2013.

See also summary of other collaborative activities mentioned in other sub-chapters.

# 10. CONCLUDING REMARKS

The main focus of the Nordic WFD cooperation has been on sharing experiences, networking and harmonization on the implementation of the Water Directive in the Nordic countries. Implementation of WFD has been and still is a major challenge for the Nordic countries. WFD affect many sectors of the Nordic societies and several water management development projects are foreseen for increased understanding and better tools and guidance for a holistic implementation.

The benefits of sharing experiences are valuable, and there will be a significant mutual gain of collaboration on the development of governance, best practices, management tools and sharing reference-monitoring network. It will also be useful to have closer cooperation and common positions between the Nordic countries in the European WFD work.

### Similar water challenges

Acknowledging the work done within the EU context by different working groups, still a lot have to be done by the member states. Basically there are several advantages in promoting a similar development of e.g. different classification systems and analyses for the Nordic countries. Realizing the expectations, the Nordic countries have established a forum for exchange of experience, since many of our water bodies are of similar types as in the other countries.

The Nordic collaboration project on WFD implementation has initiated and enhanced a more widespread knowledge exchange between water managers and aquatic scientist in the Nordic countries on common water issues related to the implementation of the WFD. In total five international Nordic workshops on WFD issues have been arranged in series. The last also extended the scope to priority substances, mitigation measure libraries and more focus on modelling tools than previous gatherings.

A major outcome of the Nordic collaboration project is also that:

- Examples of best practice for implementations of various articles of WFD are identified between countries.
- Similar challenges and issues are handled in other countries, and solutions partly solved with different approaches, which needs administrative, scientific or environmental solutions
- The similarities are more common than the differences
- A common interpretation, handling and approach is more accepted than a single country approach
- Further common development of e.g. monitoring, classification, measures and ICT are needed
- Further exchange on the WFD implementation is needed and asked for from all participants (and several others wants to participate)





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[med store forsuringsproblemer. VANN 04 2011. \(In Norwegian\)](#) (Ecostatus, Nordic collaboration)

## USEFUL WFD LINKS ON THE WEB:

### Nordic WFD project web site:

<http://www.vannportalen.no/enkel.aspx?m=59821&amid=2956148>

### WFD in Sweden

<https://www.havochvatten.se/miljopolitik-och-lagar/forvaltning-av-sveriges-vatten/vattendirektivet.html>

<http://www.vattenmyndigheterna.se>

<http://www.sgu.se/sgu/sv/samhalle/grundvatten/ramdirektiv/index.html>

<http://www.vattenmyndigheterna.se/Sv/Pages/default.aspx>

GIS – ICT for Swedish water: <http://www.viss.lansstyrelsen.se/>

### WFD in Finland

In English: <http://www.ymparisto.fi/default.asp?node=17794&lan=en>

In Finnish: <http://www.ymparisto.fi/vesienhoito>

### WFD in Norway

RBMPs and national guidance:

In English: [www.vannportalen.no/english](http://www.vannportalen.no/english)

In Norwegian: [www.vannportalen.no](http://www.vannportalen.no)

GIS – ICT for Norwegian water: Characterisation and water status: <http://vann-nett.no/statistikk/>

[NO-SE strategy document for collaborative management of the transboundary watercourses: http://www.vannportalen.no/fagom.aspx?m=31769&amid=3620731.](#)

### WFD on Iceland:

<http://www.ust.is/atvinnulif/haf-og-vatn/stjorn-vatnamala/> WFD in Iceland (water management)

### Selected WFD/water management issues of relevance for Nordic countries:

[WFD in Europe](#)

[The Alpine convention](#)

EU workshops and main conclusions from HMWBs events

[Water Framework Directive and Heavily Modified Water Bodies, 12 - 13 March 2009, Brussels](#)

[2nd Workshop on Water Management, Water Framework Directive and Hydropower, 13-14 September 2011, Brussels](#)

# 12. APPENDIX

Here follows the main conclusions from each working group at the workshop in Reykjavik, September 2012.

## 12.1. SUMMARY FROM WORKING GROUP 1 ON COASTAL AND MARINE ISSUES AT THE REYKJAVIK WORKSHOP 2012.

Coastal and marine management issues have not been in focus in the Nordic workshop series between 2007 and 2011. At the Reykjavik workshop a dedicated working group focused on following issues for coastal and marine water; characterization, pressure, monitoring, classification and WFD and MSFD, with the following main outcome.

### CHARACTERIZATION

In Finland where the number and size of water bodies are determined by natural conditions the Finnish coastal typology is estimated by latitude and longitude, salinity, wave exposure, depth variations, mixing conditions, residence time, bottom substratum and duration of ice cover. Characterization of water bodies is based on the typology, where boundaries like river basins and administrative units have been taken into account. FI use maps and charts, GIS data on point sources, remote sensing data like Secchi depth and turbidity, distribution maps of salinity, marine charts with depth variations and many more information. FI used as well extent of the influence of riverine waters, inclusion of most important bays and estuaries and areas with restricted water exchange with adjoining water areas. Water areas receiving nutrient loading from the coast may be defined as separate water bodies.

The coastal water in Sweden is divided into types that are based on physical, morphological and sedimentological factors. These factors are salinity, mean spring tidal range, exposure, depth, mixing, intertidal area, residence time of deep water, substratum, current velocity and duration of ice cover. The size of the coastal water bodies in Sweden varies greatly, from 7 km<sup>2</sup> to over 1000 km<sup>2</sup>. Heavily modified water bodies in coastal water in Sweden are 19.

Norway introduced their work on coastal waters which is mainly based on their Fjord catalogue and regime drainage basins. Due to very extending coast from south to the north, NO has divided the coastal zone into six eco-regions and nine water types. These are open exposed coast, moderate exposed coast/fjord, freshwater influenced fjord, strongly freshwater influenced fjord, oxygen depleted fjord, straits with strong currents, oxygen depleted fresh water influenced fjords and special water bodies like lagoons. Used data were geographic information and typology already explained, pressure analysis and environmental conditions.

Iceland is an island in the North Atlantic Ocean and its coast is exposed to the ocean waves. Short fjords and open bays characterize the west and north coast, the east coast is characterized with short open fjords and the south coast is open and sandy. Based on the origin of the seawater, the coastal water is divided into two eco-regions. The

typology is problematic, as all seawater around Iceland is euhaline and mesotidal. Wave exposure based on expert judgement is the only factor being used. The result is 4 types of water bodies.

Regarding pressure, Finland introduced application of LLR internet tool for coastal catchment management in River Vantaa estuary to make predictions for loads reductions and probabilities for cyanobacterial blooms. To use this LLR tool, the flushing rate of River Vantaa as well as the water flows and nutrient fluxes in the surface and bottom water layers of the Vantaa estuary were calculated using Knudsen's equation. Logistic regression model was used for phytoplankton biomass and probabilities for cyanobacterial blooms increased along with the increase phosphorus and the decrease in nitrogen concentrations due to light limitations caused by river driven suspended solids. Future development of the modelling will extend the model to cover different types of estuarial water along the Finnish coast.

Sweden uses DPSIR system to map pressure in the country. Outside this system they estimate eutrophication, hydro morphological alternations and priority substances. Internet tools; the database VISS is used to map eutrophication, contamination by PS and specific pollutants, alien species and morphological alternations. Impacts according to COM are nutrient and organic enrichment, PS, contaminated sediments, altered habitats, elevated temperatures and other significant impacts. The main pressures are according to VISS mainly point sources as IPPC and NON-IPPC companies, diffuse sources and morphological alternations.

Norway uses the same DPSIR system as Sweden to map pressure in the country. They have as well developed a Norwegian system, based on Norwegian guidance document on characterization including analysis of pressures and impact. They identify potential and significant pressures and rank the pressures based on the extent it has on the water body. They use several categories to rank the pressures; unknown, unessential, small, medium, large or very large. To evaluate the pressure they use information from monitoring, investigation, estimates or calculated expert judgement. The result of the pressure identification is in the Vann-nett database.

Iceland uses the population density along the coast line to estimate the pressure in coastal water in the country where 75% of the population lives along the coast in bay Faxaflói (South-west Iceland). Based on monitoring of several heavy metals in blue mussels and cod at six locations in the marine area, some trend has been found. There are decreasing linear trend of Cd and POP's in cod liver samples, and same trend is detected in organochlorine compounds and Hg in blue mussels at same and different locations since 1991-2010. The pressure from these pollutants is due to long range transport of the pollutants as these do not have sources in Iceland.

Monitoring of marine waters in Finland started 1965 and at present national monitoring is carried out in cooperation with several organisations and is a part of international monitoring as HELCOM. Mandatory monitoring stations are about 1000 along the coastal area and monitor salinity, temperature, pH, alkalinity, turbidity, total and inorganic nitrogen, phosphorus silicate, iron, TOC oxygen and chlorophyll a. Phytoplankton species and biomass as well as benthic macrofauna and macrophytes.



Monitoring in coastal waters in Sweden is based on existing monitoring programmes, and new monitoring programmes 2012 and 2015, long term plans, where what, where and how is decided. Monitoring in Sweden is composed of different programmes run by different organizations with lack of coordination. All monitoring stations in waters are in the database VISS they have chosen the best stations for surveillance and operational monitoring 2012. The new monitoring programmes must be in line with the demands in WFD.

Norway has started monitoring in one area in the coastal water and the group of directorates has started the work on establishing a new monitoring network. Existing monitoring programmes in coastal water in Norway do not fit with the WFD demands and the aquaculture is not contributing to the programmes, as they will suggest separate program for the ministry of the environment and agriculture. Regarding investigating monitoring the programmes will be focused at the most sensitive quality elements and all water bodies not reaching good ecological status – until good status is in place.

The monitoring programmes in marine water in Iceland are regarding to the OSPAR convention, mainly marine biota as blue mussel and cod. Physical monitoring performed by Marine Research Institute, with series from last 55 years are the basis for the monitoring. Overall the existing monitoring of Cadmium and Hg shows a decreasing trend in coastal water.

## ECOLOGICAL CLASSIFICATION

Ecological classification in Finnish coastal waters is mainly based on chlorophyll a along with zoobenthos index and growth limit of Fucus zone, supported with quality elements like nutrients (TN and TP) and Secchi depth. This means that 30% of the coastal water is at good status. Summertime concentration of phytoplankton chlorophyll a is intercalibrated with Sweden and Estonia. Fucus vesiculosus forms a solid submerged belt on most shores at the depth range of 0,5 to 6 m. Separate Fucus belt develop class boundaries on exposed and sheltered shores. In the end, expert judgement is used to assess the reliability of the classification results.

Classification of coastal waters in Sweden is based on models and information about pressure. They use as well monitoring data and national guidelines or methodology. Sweden use benthic invertebrates, phytoplankton and macroalgae and angiosperms to estimate eutrophication. Fish is only used in transitional waters. Nutrient and transparency, as well as oxygen depletion, are further used to estimate eutrophication. Priority substances are used to estimate chemical status in water bodies, using EQS directive as benchmark.

Classification of coastal waters in Norway is mainly based on biological quality elements and supporting parameters, according

to the WFD. Pollution alters community structure and biodiversity so they use soft bottom fauna index, macroalgae (in Skagerak) and phytoplankton. They use phytoplankton chlorophyll a as well as nutrients, Secchi depth, temperature and salinity. There are 6 biographical zones along the coast line in Norway. Norway intercalibrate with Scotland and Sweden (NEA-GIG). The IC is partly based on expert judgment as common metrics is not developed.

Iceland has not classified its water bodies yet nor developed a classification system.

## WFD COASTAL WATER AND MARINE STRATEGY FRAMEWORK DIRECTIVE.

Finland follows the MSFD timeline, with transposition 2010 and GES achieved 2020. It was transposed in the Finnish legislation with the same act as WFD. That means that they use the same administration structure, but additional clause as expert group to coordinate the work and coordination group to give high level guidance. They do not have new classification system, as coastal water classification is based on WFD assessments and the open sea is based on the HELCOM assessment, ICES assessment for fish and social-economic assessment. GES is described in a quantitative way, indicators with quantitative targets and general targets are basis for programmes of measures. Finland will have only one marine strategy. The WFD and MSFD should give consistent assessment of eutrophication in the same coastal areas, and it is easiest if WFD and MSFD use similar indicators with harmonized boundaries.

Sweden implemented MSFD in a similar way as WFD, but they have two marine basins and several sub-basins. They have the same authority as WFD, i.e. SWAM. The marine areas are added to the coastal areas with some overlapping. They use the same classification system as WFD with some additional EQS. There is coordination with HELCOM and OSPAR convention.

Norway will not implement the MSFD but they have developed National Management plans for sustainable use of all the Norwegian Sea areas. They will cover the areas in Norway's exclusive economic zone outside the baseline. Iceland will not implement the MSFD.

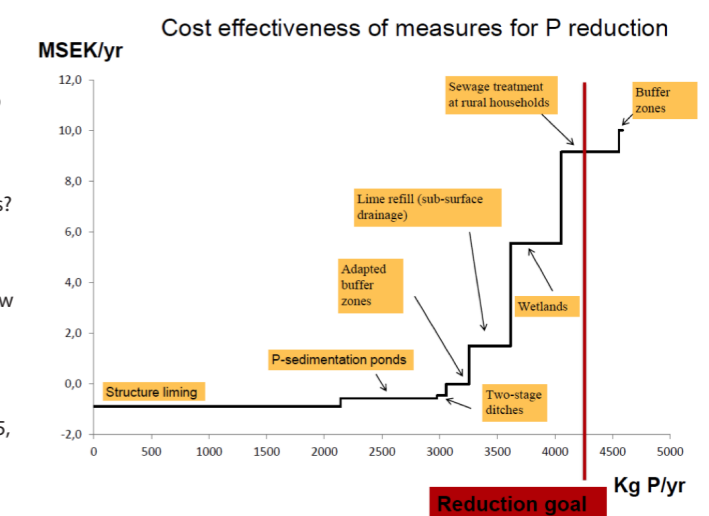
## 12.2. OVERVIEW OF NATIONAL ANSWERS ON KEY QUESTIONS IN WORKING GROUP 2 B HYMO SESSION AT THE REYKJAVIK WORKSHOP 2012.

	Question	Finland	Sweden	Norway	Iceland
1.	Which measures are relevant and demanded to fulfil environmental objectives?	No common approach which measures are relevant	No common approach which measures are relevant. Package of required measures?	All realistic mitigation measures are relevant. Package of required measures? at those having adverse negative impacts.	
2.	What should be the ecological functionality demands for GEP in Nordic WBs?	No demands on ecological functionality. List of important salmon and trout rivers existing, higher requirements for their restoration. Demand on continuity.	Also other fish species than salmon are important, both ecological (migration and spawning) and hydro morphological functionality important.	Rivers will be divided to hydropower production rivers (abiotic) and rivers being important for fish migration and spawning.	
3.	How to define significant adverse impact on use when defining environmental objectives?	A common national percentage value for significant adverse impact was seen unreasonable, definition has to be done case by case in every water body. EC criticized this approach. Climate change impact should be included.	Not decided yet. At least 5 TWh from base load production, maybe more because of climate change, 0 from regulatory power.	Not decided yet, stepwise prioritization process going on, it will be more than 0. Hydropower sector will not get any compensation. Climate change impacts included into discussion.	
4.	How to define alternative use?	There are no alternative use for hydropower production.	For less than 24-hour regulation there are no alternatives than hydropower, for longer timescale regulation alternatives exist (for example changing of nuclear power production)	Hydropower has the smallest environmental costs compared to other energy production forms with existing technology.	
5.	Feedback from the EC assessment report, should we assess GEP via MEP or GEP directly?	GEP was assessed directly. Maybe we should go for MEP in order to know which measures are possible.	MEP not applied at all, good and moderate EP's have been applied. EC criticized the approach.	Going directly to GEP, no use for definition of MEP.	-
6.	Which policy measures should be promoted at Nordic level to speed up WFD implementation process (legal issues, management systems, economical incentives)?	- Utilising/improving the legislation for habitat compensation instead of fish stocking (EC initiative: salmon stocking should be stopped in 7 years) - Natural reproduction and sustainable fishery policy approved in the Baltic Sea Region	- Improving the energy efficiency - Reduction of peak loads - Increasing of transmission capacity - Pump storage power plants	- Modernisation of hydropower licenses (revision of 420 old licenses by 2022) and licension for unlicensed hydropower plants - National policy guidelines for linking the WFD and renewable energy goals - Similar possibilities to all Nordic countries, how hydropower production can be changed	Consultations on HWMB designation and classification with hydropower industry, Land Conservation Services and NGO's
7.	What should be required when a hydropower station is situated in a water body aiming for GES?		- Best available technology - Environmental flow = static and dynamic component - River continuity (like fauna passages) according to BAT - Spawning areas		

## 12.3. ANSWERS ON KEY QUESTIONS IN WORKING GROUP 2 C ON POLLUTION MEASURES AT THE REYKJAVIK WORKSHOP 2012.

1. What measures have been identified as the most important ones?
  - enforcement of current legislation/regulation
  - "old measures" but targeted to right locations
2. How will measures be implemented (e.g. business as usual or new delivery mechanisms in place)?
3. Are there new financing for measures available?
  - No, nothing substantial that will make a big difference
4. Will enough measures be in place to reach the objectives to 2015, 2021 or 2027?
  - Yes for Iceland, no for FI, NO, SE

5. If no, how will this be dealt with? Exemptions?
  - Not in this cycle, but presumably in the next, especially for some environmental chemicals



## 12.4. MINUTES FROM WG 3 (27.09.2012) – MODELLING, GIS AND INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) SOLUTIONS

**Author:** Bogi Björnsson, Icelandic Meteorological Office

**Written for:** WFD Nordic Workshop 2012 – Niklas Holmgren WG 3 Coordinator

**Presentation 1:** *Status in Sweden on interim report on measures, Niklas Holmgren (CA Södra Östersjön RBD).*

- Currently at halftime between reporting phases so time to take a break and assess the road behind and in front
- Comments from EU were discussed and one of the criticisms was that there was too little structure for Sweden's measures
- Sweden needs to find common measures to implement which will be the key measures to use
- Also it needs to identify the main indicators for each of these key measures
- Niklas presented a new reporting tools based on the xml reporting schemas
- The reporting tools have been integrated into the VISS system which Niklas gave a demonstration about.
- Based directly on the xml reporting schemas from the EU circa website so it should be always current schemas.
- Some comments from EU were complaints about the content and technical issues in the reports from Sweden. With the new reporting tool this should be minimized since they are using the most current EU reporting schemas.
- However there is more need for reporting coordination in Sweden especially between different directives because EU sometimes crosschecks information reported for different directives to see if it is correct. Coordination between national institutions could be better for this to reduce inconsistencies in all these reports.

**Presentation 2:** *Status in Finland on interim report on measures, Lasse Jarvenpaa (SYKE)*

- Finland has developed reporting tool that extracts data directly from the HERRTA system databases. Uses an export function to export to xml based on mapping between database and xml schemas. Uses 3rd party software for the mapping.
- Plan is to have a separate reporting database for each reporting cycle since reporting schemas could change between cycles. Best to keep each cycle separate because of this.
- Finland has also developed a quite detailed measures module to keep track of the cost of measures. Most information is calculated automatically based on data from the measures library but users can input the final actual cost when a certain measure has been completed. This can then be compared and used to adjust or evaluate unit costs in the measures library for future measures.
- In the measures module users can assign measures to a single WB, a group of WBs or to a particular catchment.
- Finland has experienced problems with getting good data about measures from users and/or stakeholders.
- Finland does most of programming of new modules in house and discussed that the benefit of this was that the knowledge gained from this did not end up with independent consultants that might not be hired again. The bad thing about in house programming is that sometimes the documentation of the programs is not finished or is not detailed enough. Consultants will usually deliver detailed documentation as part of the job however.

**Presentation 3:** *Reporting from Iceland, Bogi B. Björnsson (IMO)*

- Iceland has reported Article 3, CA's, RBD, main rivers and lakes.
- Iceland plans to report first RBDMP in 2015 when other countries are reporting second RBDMP.
- Work is on-going on WB identification and characterization.

**Presentation 4:** *Using NHM (New Swedish Digital Elevation Model) for hydro morphological modelling, Mats Svensson*

- The NHM is not public data per se but municipalities have access to it and so do institutions.
- The dataset has presented new challenges because of both the data volume and the accuracy. Seems that the standard ArcGIS tools on standard computers crash when trying to work with it. Need to split it up into manageable chunks and what is best in that regards. Rectangles or other borders, such as catchments can also be used. However this might not suit everyone. Splitting needs to be in a way that suits most user groups so that rectangles seem the most logical. Then they can be combined based on the user area of interest.
- IMO has used LIDAR to map the Icelandic glaciers and the head of this project is Tómas Jóhannesson. Could be interesting for Mats to get in touch with him to discuss his processing methods using R.

**Presentation 5:** *New tools for assessing phosphorus reduction as a tool for evaluating measure cost efficiency, Vincent Westberg (RBD of Western Finland)*

- The new tool is not live yet but is currently in beta testing
- The tool combines input data and models and the LLR model is the core and heart behind the new tool.
- It is setup to model Algal bloom for the public but the main gain to WFD is that it provides information on cost of measures as sort of a by-product.
- That can be used as input in the cost-effectiveness of measures later on.
- The results can also be used in the Ecological classification of water bodies in regards to WFD.
- The weakest point of the tool is that currently there are not many coastal water bodies included.
- Feedback and cooperation between public, NGO's and stakeholders has mostly been achieved through direct meetings.
- Niklas pointed out that public often might want to participate earlier in the process for example at the start where data is collected and aggregated. This would result in more up to date data and better trust on the final product of the tool i.e. the results. However be aware of conflicts of interest where sometimes ecological status vs. cost or profit comes into play.
- It is important to get the public and stakeholders to think of the tool as theirs so that they can trust it and accept the cost of measures for example.
- Finland trying out a software package from China called Supermap which was a lot cheaper than other commercial software.

**Presentation 6:** *Ideas for future modelling of Iceland, Jórunn Harðardóttir (IMO)*

- IPA application has been accepted and now there is a tender on the way for the hardware and software needed. IMO is considering various software packages for modelling.
- Possible challenges for modelling of ecological classification in Iceland are that data is limited and the Icelandic geology is rather unique.

- IMO has an agreement with SMHI about getting the HYPE model and is also using a calibrated WASIM model for hydrologic modelling.
- Discussions arose about the need to buy hardware vs. buying into the cloud. Modelling demands a lot of computational intensive processes so a lot of expensive hardware is required. IMO has an agreement with University of Iceland regarding time on their new supercomputer that could also be used.
- Mats pointed out that it is best to prioritize since you can almost never do everything at the same time. So instead of going for both ecological and hydrological modelling maybe it is better to prioritize on one or the other.
- Most likely IMO will go for the MIKE21 package and not the ecological models.

**Presentation 7:** *Vann-Nett – upgraded technology and user interface, Lars Stalsberg (NVE)*

- User interface migrated and updated to use Silverlight
- Flex was not thought to be viable in the long run and Javascript not robust enough to handle the business logic of the application. Also there were no Javascript developers available to do that kind of application.
- NVE thought about HTML5 but there was unfortunately not enough time to go down that road at present time.
- A fundamental change was implemented in the application so that more strict rules were put up regarding assignment of pressures and designation of HMWB. Users can for example not put in a pressure on a WB without putting also a relevant impact.
- NVE's experience was that you need all this data to finish the characterization but users were not supplying it. Even "best guess/expert judgment" is needed to begin with so you can report final status.
- So users are forced to complete the registration but can always go back later and change it when they have better information and/or data.

**Presentation 8:** *Open data – latest development in Sweden (RDF, Open API, Trust, dbpedia.org), Niklas Holmgren (CA Södra Östersjön RBD)*

- The Swedish situation is quite complex and distributed with a lot of data coming from different sources. Therefore it is important to open up access to a lot of this data in a simple way.
- Open API systems getting more and more popular in Sweden for these sort of purposes where users can connect to API and ask questions through standard language (html) and get answer back.
- Recently SMHI has created an Open API for time series that could be useful in regards to WFD work.
- Mention of RFD (Resource describable framework) and how it has explosively expanded over the last few years. Niklas has tried putting WFD data into this with exporting simple xml files.
- Mention of dbpedia, the database part of Wikipedia and how it is linked together with/in the RDF and how it can read the xml data so you can read about WB in Wikipedia.
- The options available are always increasing and it is very hard to keep up with the developments in this technology. This is why they have chosen to implement Open API and let the public/wiki crowd access the data and do what they like with some interesting results.

**Presentation 9:** *User interfaces in Finland, where to go – Wikileaks or Santa Claus?, Vincent Westberg (RBD of Western Finland).*

- There is a new kind of web maps interface on the way for the whole

environmental sector of the government. At this point there is nothing more to say on that.

- Discussions on what to do about web map interfaces and future in general instead.
- Vincent said that often users want simplicity and simple views. Too much information or complex presentations can hurt the user experience and reduce the usefulness of the interface.
- Need to split interfaces up into different looks and content based on the user type, for example public, expert user etc. Thus you can go from more simple interfaces and maps to more complex interfaces for public vs. experienced/expert users.
- A very important point is to have a legible base map to begin with because it should be as neutral as possible so that the data you present does not get lost or overwhelmed by the base map.
- When designing the user interfaces it needs to be clear what are the "must have" and "nice to have". Many projects fail to identify what exactly is the user requirement and what are the must have and nice to have. Furthermore sometimes you have to accept, instead of must have, what is "good enough" to have based on time and/or budget.
- There seems to be that in the future users might start to make their own mash up from map services and web services thus bypassing a predefined user interface. However these will not be entirely replaced by customized project specific web map interfaces.
- Now also there is a shift towards total websites where a web map interface is only one way of presenting the data and information. For example the VISS system and later this year the Vannportalen in Norway which is modelled after the VISS system. Not everything can be accomplished in a web map application alone.

**Presentation 10:** *A makeshift user interface for water body identification – an example, Bogi Björnsson (IMO)*

- IMO is behind the other countries in adopting the WFD so it needs to catch up quickly so it can report in 2015. Not much time to develop from scratch.
- Strategy was to learn from other countries and get help from them to get up to speed. Reuse knowledge and technology that had been developed over a much longer period.
- Agreement with NVE to use their new user interface and water portal website (modelled from Swedish VISS system).
- Temporary solution to setup a makeshift WEB ADF application for water body identification. Based on ArcGIS server 10 web map services. Functionality added on demand from experts but not much time put into looks or complex processing. Only a few query tools etc. and one or two geoprocessing tools to help with creating watersheds (helps with minimal RWB size limit 10km2).
- Also used ArcGIS.com website to setup a very basic web map application hosted in the cloud made up of a mash up of web map services from other institutions. Marine Research Institute needed this to help with identification of coastal water bodies and it took one afternoon to setup. After they finish it will be deleted without any real amount of time taken to set it up but the benefit has been great for them.



Nordic Council of Ministers

A report for the Nordic Council of Ministers



Swedish Agency  
for Marine and  
Water Management

