

## Policies for water and river basin management in the North Sea Region

### Introduction

The increasing demand by citizens and environmental organisations for cleaner rivers and lakes, groundwater and coastal waters has been evident for a considerable amount of time. This demand is one of the reasons why the EU established a Water Framework Directive (2000/60/EC) for water protection and management, in order to prevent and reduce pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the effects of floods and droughts<sup>1</sup>.

The Water Framework Directive (as it is commonly known, or WFD) came into force on 22 December 2000 and establishes a framework for the protection of all bodies of surface water (rivers, lakes, transitional and coastal) and groundwater on an EU level and aims to achieve a 'Good Ecological Status' and a 'Good Chemical Status' by 2015. It provides a framework for EU water policy to establish an integrated approach to the protection, improvement and sustainable use of water in Europe. Management is at the level of River Basin Districts, designated by national authorities to ensure an ecosystem based approach. The WFD aims to streamline EU policy on water; this is expressed in the Programme of Measures, which takes into account the measures set out in other legislation directed at water bodies or water related issues (such as protected habitats depending on water). Each member state must produce a plan for each of the river basin districts within its territory; River Basin Management Plans (RBMPs). Plans must include: objectives for each water body; reasons for not achieving objectives where relevant; and the programme of actions required to meet the objectives. River Basin Management Plans were published for several member states in December 2010.

WFD Objectives are to:

- Prevent deterioration and enhance aquatic ecosystems
- Promote sustainable water use
- Reduce priority pollutants
- Reduce groundwater pollution
- Mitigate floods and droughts

The WFD requires characterisation of the chemical and ecological status of water bodies. Specific criteria for determining the water status are stipulated in Annex V of the directive and are further specified nationally. The national water district authorities will adopt management plans for six-year periods (the current period is 22 December 2009 – 22 December 2015), including both water quality standards and programmes of measures to achieve the standards. The implementation of the programme measures is monitored and evaluated although the WFD allows the Member States a certain freedom to choose how they will attain environmental objectives.

Similarities and differences between river basin policies and their implementation are examined for seven EU countries situated in the North Sea Region.



## Belgium

Belgium is approximately 35, 000 km<sup>2</sup> in area with some 10 million inhabitants. It is located between France, Germany and the Netherlands. Although a relatively small country, water management in Belgium is quite complex due to both its geography and political and institutional arrangements.

Belgium is a federal state with three regions: Flanders, Brussels-Capital and Wallonia. Coastal water matters are managed by the federal state; ground and surface water are managed by the three regions. The country is located in the central part of 2 international districts, the Meuse and the Scheldt (i.e. between the Seine and the Rhine river basins). Integrated Water Resources management in Belgium is organized at local and regional levels (and co-ordinated between the three regions) also at national and international level. The Water Act of 1999 – the Code de l'eau states that water is designated as a common good and that water must be managed in an integrated and holistic manner<sup>ii</sup>.

The three Belgian regions and the federal government are working on integrated river basin management plans for the Scheldt, Meuse, Rhine and Seine districts and on programmes of measures appropriate for each water body. The major measures seek to prevent deterioration, restore and improve the quality of aquatic environment (water resources and ecosystem) and associated wetlands, reduce and eliminate discharges of hazardous substances, achieve good chemical and ecological status and ensure a balance between groundwater abstraction and replenishment.

Water supply is generally continuous and of good quality but Belgium faces major water pollution challenges because of intensive agriculture, industrial activity and densely populated areas. A large and increasing proportion of groundwater aquifers have high levels of nitrates and pesticides, however the share of the population connected to a wastewater treatment plant grew from 42 % to 69 % between 2000 and 2007. Reforms in the financing of water infrastructure have led to a more consistent application of the polluter pays principle. Overall, Belgium's pricing policy reflects the fact that water is an economic commodity with a social dimension.

The four international river basins in Belgium also provide water resources to the Netherlands, France, Luxembourg and Germany. Responsibility for implementing the WFD is divided between the Federal State (in charge of coastal waters) and the three regions (rivers, lakes, transitional waters and groundwater). Consultations are organised by the regions and the Federal State. The RBMPs for the Flemish part of Belgium were adopted and published on 08/10/2010; consultation on the draft plans took place between 16/12/2008 and 15/06/2009<sup>iii</sup>. Flanders is divided in 11 sub-basins. In each sub-basin there is a common consultative and organisational structure, i.e. the basin management (political consultation between the Flemish Region, the provinces and the municipalities), the basin secretary (technical-official) and the basin council (social consultation with the stakeholders). At the local level district water boards are operating on the level of sub-sub-basin or per cluster of sub-subbasins. The other two regions submitted their RBMPs late due to differences over definitions, leaving uncertainty as to the scope of the legislation and obligations of the Directive at national level.

At the current stage of the analysis, 62 % of the Belgian surface water bodies (348/559) run the risk of not achieving a good qualitative status by 2015. The problems are mainly in the district of the Scheldt and in certain sub-catchments in the Meuse district (e.g. Sambre and Vesdre). Regarding ground waters, the situation is quite similar in the sense that approximately 58 % of water bodies run the risk of not achieving a good chemical and quantitative status by 2015.



The current plans propose several measures mainly geared towards the agricultural and industrial sectors as well as towards protecting zones which are at risk (Natura 2000, bathing zones, groundwater catchment protection zones etc.). A large proportion of the actions proposed are already included in regulations (basic measures). High concentrations of nitrate in Belgian groundwater remain a point of concern and Belgium still has a long way to go in order to achieve a good status by 2015<sup>iv</sup>

## Denmark

Denmark is a low-lying country covering around 43,000 km<sup>2</sup> of which 60 % is agricultural farmland, 16 % is forest or heath, 7 % is lakes, rivers and wetland areas, and 11 % is covered by roads and built-up areas. There are 7,300 km of coastline with many fjords and inlets and 65,000 km of open water courses. The population is some 5.5 million. The country consists of the peninsula of Jutland and 443 named islands, of which 72 are inhabited.

The WFD is transposed into Danish legislation in the national Environmental Objective Act of 2003. Seven national environmental centres have prepared RBMPs for the four Danish river basins (River Basin District 1 : Jylland and Fyn, River Basin District 2 : Sjælland, River Basin District 3 : Bornholm, River Basin District 4 : International RBD ), the latter shares water courses with Germany to the south. Draft River Basin Management Plans have been issued for 15 sub-districts of RBD 1, and 6 sub-districts of RBD 2<sup>v</sup>. The 23 Danish River Basin Management Plans were approved by the Environment Minister on 15 December 2011, were published and entered into force on 22 December 2011. These were late due to issues over non-transposition of the definitions of water services and water use, leaving uncertainty as to the scope of cost-recovery for water services and water use. As a Danish addition to the provisions of the directives, the 98 Danish municipalities have prepared action plans, containing specific directions for the implementation of the RBMPs within their geographical area. Strategic Environmental Assessment in accordance with the EU directive from 2001 and resulting in the Danish Law on Environmental Assessment of Plans and Programmes from 2001 applies to both the state RBMPs and the municipal action plans. The Danish programmes are drafted by an agency under the Ministry of Environment, and enacted by the Minister<sup>vi</sup>.

The environmental quality of lakes and rivers in Denmark has improved since the 1990s. However, nearly two-thirds of the lakes and half of the rivers do not have a sufficient ecological quality. The ecological quality of the Danish lakes is affected by nutrient input, of which there has been a significant decrease since the 1990s. In 2008, the water quality in 54 % of the Danish rivers was classified as good or very good, compared to 42 % in 2000. However, pesticides were detected in 70 % of the monitoring water samples. The improvement in the ecological quality of rivers is mainly due to better sewage treatment and more careful physical maintenance. Groundwater abstraction for drinking water is often stopped due to high concentrations of pesticides or nitrates above the drinking water limit values.

Efforts to further improve the ecological quality of freshwaters are defined by reduction goals for the leaching of phosphorus to lakes and nitrogen to marine waters, by improving the physical condition of rivers and reducing the use of pesticides. The initiatives are defined in the Government action plan 'Green growth' from 2009.

An example is the national implementation of initiatives, defined in the EU Framework for community action, concerned about the sustainable use of pesticides from 2009. These initiatives are concerned with issues such training professional users of pesticides, general pesticide storage procedures, application and disposal procedures for residues and packaging as well as the introduction of compulsory inspection of sprayers, the inclusion of integrated



pest management (IPM) and notification obligations for spraying. The Green Growth plan also set standards for improvement of sewage treatment facilities in the countryside and better treatment of rainwater overflow. Regional environmental centres were mandated to provide regional action plans by the end of 2009. At the national level, several measures have been identified including, for example, an increased pesticide tax and the introduction of a market-based nitrogen quota system.

## Germany

Germany is a federal republic comprising 16 federal states, or Länder. Germany covers an area of 357,021 km<sup>2</sup> and with 81.8 million inhabitants; it is the most populous member state and the largest economy in the European Union. The partition of Germany came to an end on 3 October 1990 with the accession of the Länder of the German Democratic Republic (DDR), and Berlin became the capital of the reunited Germany. The German Federal Water Act defines ten river basin districts to be managed as coherent units, ignoring political boundaries. Six river systems: the Maas, Rhine, Ems, Weser, Elbe and Eider flow mainly into the North Sea. Co-ordination of activities is usually undertaken at a lower organisational level than the river basin district level. (BMU, 2001<sup>vii</sup>).

The Federal Water Act (WHG) came into force on 1<sup>st</sup> March 2010. It creates the first comprehensive national regulations for the management of waterbodies in Germany based on the modified constitutional competency regulations resulting from the Federalism Reform. The Act does not prescribe any specific structures for river basin management and competence lies within individual Länder. Because of the large size of German river basins, they are subdivided into sub-basins (Teileinzugsgebieten). Two or more Länder are often involved in each sub-basin, requiring a level of co-ordination. In the different river basin districts, the subdivision into sub-basins is arranged differently. For example, in the river basin district of the Elbe, five co-ordination regions (Koordinierungsräume) have been set up to structure the necessary work for the WFD implementation in a meaningful way. For each of these co-ordination regions, one state takes the lead on completion of tasks. The river basin district of the Rhine has been subdivided into nine working areas (Bearbeitungsgebiete)<sup>viii</sup>. River Basin Management Plans were adopted in December 2009. Consultation on the draft RBMPs took place between 22/12/2008 and 22/06/2009.

Water resources management policy in Germany has adjusted to the focus of the WFD. It considers the rivers and their catchment areas as uniform ecosystems and organises water body management on a cross-regional and cross-country basis, requiring close co-operation at all levels. Water policy is based on three fundamental principles:

- Priority of prevention
- Co-operation between all parties concerned
- Allocation of costs on the basis of the polluter pays principle and full recovery of costs



Germany is a water-rich country but recent years have shown that not even Germany is immune to the effects of climate change, such as more frequent flooding and periods of drought. Protecting groundwater from pollution has always been important in Germany because around 65.5 % of the country's drinking water is taken directly from groundwater supplies. The main causes of chemical pollution in groundwater are high discharges of nitrogen and pesticides, often from agriculture, as well as point-source pollution from residual contamination and landfill sites. One traditional problem is the high level of pollution of lakes and rivers with nutrients and other substances, and use-related hydro-morphological changes which threaten the natural functions of water-bodies. Monitoring programmes have been adapted to new WFD targets, so that biological water monitoring is much more intensive.

The discharge of wastewater from municipalities and industry has fallen considerably in recent years, partly because chemical plants in the new Länder have stopped production, leading to a reduction in discharges into surface waters. In addition, changes to the Federal Water Act required municipal authorities and industry to take measures that led to an overall reduction in emissions from point sources. Alongside the reduction in point-source discharges into water-bodies, a number of measures have been taken in recent decades to reduce diffuse, widespread discharges. Huge efforts have been made to reduce the high nitrogen discharges from agriculture and diffuse pesticide discharges in particular. Even though these have already delivered significant reductions in water pollution, they are still not enough to achieve the aims of the Water Framework Directive – good water quality – everywhere in Germany. These measures therefore need to be continued and, in some cases, intensified<sup>ix</sup>.

## Netherlands

The Netherlands is a densely populated country with an area of 37,400 sq km (including inland water) and a population of 16.3 million. The country lies in the delta of the three major North-West European Rivers: the Rhine, the Meuse and the Scheldt. More than half of the country is prone to sea or river floods or to water logging. The WFD has been implemented, keeping the pre-existing legal, financial and institutional framework intact as much as possible. This has meant that objective setting, selection of measures for reaching objectives and funding are aligned well, but there is complexity in the co-ordination between different sectors. This has led to Programmes of measures that consist primarily of water management measures<sup>x</sup>.

Dutch water boards (Dutch: 'waterschappen' or 'hoogheemraadschappen') are regional government bodies charged with managing the water barriers, the waterways, the water levels, water quality and sewage treatment in their respective regions. These regional water authorities are among the oldest forms of local government in the Netherlands, some of them having been founded in the 13<sup>th</sup> century. Water boards hold separate elections, levy taxes and function independently from other government bodies. Water board structure varies, but they each have an elected general administrative body, an executive board and a chair. The Rijkswaterstaat (the State Water Management Agency) is a centralised body with responsibility over many major water control structures, in addition to its other infrastructural functions of building railroads and motorways.

River basin management plans have since been drawn up for the Dutch parts of each of the international river basins of the Ems, Meuse, Rhine and Scheldt. A number of steps preceded the formulation of the river basin management plans. First the surface water and groundwater in the Dutch part of a river basin was divided into water bodies on the basis of several criteria. The smallest waters, i.e. streams with a river basin smaller than 10





km<sup>2</sup>, or waters with a surface area smaller than 50 hectares, were excluded. In total 724 surface water bodies and 23 groundwater bodies were categorised.

Consultations have taken place between the authorities involved and the interest groups. Citizens have been informed and consulted. Because water management in the Netherlands is strongly decentralised and the water boards have their own management and financing system, it was decided to set up a new collaborative structure in which the central government marks out the national framework and is responsible for international coordination. The water boards have been given the role of formulating objectives and measures for each water body with which to meet the obligations under the Water Framework Directive.

The Nationaal Wateroverleg (NWO) is a consultative body in which the central government (VenW, VROM, LNV)<sup>1</sup> and the umbrella organisations of the provinces, water boards and municipalities participate. The different levels of government also hold administrative coordination meetings for each (constituent) river basin (Regional Administrative Consultation Committees, RBO). The Netherlands is divided into four river basins: Ems, Meuse, Rhine and Scheldt. The Rhine river basin is subdivided into four constituent river basins: Rhine-West, Rhine-East, Rhine-Central and Rhine-North. The Ems river basin is subdivided into two constituent river basins: Lower Ems and Ems- Dollard. This means that there are eight (constituent) river basins in the Netherlands.

Environmental quality requirements for bodies of groundwater and surface water are laid down in the Decree on the quality requirements and monitoring of water (Besluit kwaliteitseisen en monitoring water, Bkmw 2009). An exception is made for ecological objectives for artificial and heavily modified surface water bodies, which are included in the water plans. For the main water system, this is the Management and Development Plan for National Waters, for the regional waters the provincial water plan or provincial spatial plan.

Expectations are that for a significant proportion of the waters in the Netherlands not all objectives will be achieved by 2015. Of the 724 surface water bodies, 99 are expected to meet the objectives in 2015, while the target objectives for 625 water bodies (86%) will not be achieved until after 2015.

The objectives for a number of pollutants are not expected to be achieved even by 2027, therefore it has been indicated that they will probably have to be lowered in the river basin management plans to be formulated in 2021. Implementation of the measures is a step-by-step process, so that the targets may, if necessary, be lowered in 2021 based on advanced knowledge and understanding. Examples of pollutants to which this may apply are PAHs, TBT, nitrogen, phosphate and a number of pesticides. Of the 23 groundwater bodies, 15 are expected to reach the objectives by 2015. The other 8 (35%) will not reach their objectives until after 2015.

The 2009 Decree on the quality requirements and monitoring of water (Bkmw 2009) stipulates that, in adopting the water management plan and the provincial water or spatial plan, the water management authorities and the provinces, respectively, take the environmental quality requirements of the WFD into account. These plans should, therefore, indicate what measures are being taken to meet these requirements.

The central government is responsible for an effective regulatory framework, including the implementation of European directives. It also ensures effective coordination with other policy fields, so that any measures taken in other areas can contribute to improving the water quality. The water management authorities are responsible for most of the programme of supplementary measures. Rijkswaterstaat manages the main water



system, the water boards manage the regional surface water system and shallow groundwater, and the provinces manage the deep groundwater system. Municipalities are responsible for measures relating to sewers, the disconnecting rainwater from the sewer system, and the management of urban water.

Provinces and municipal councils also play a key role in the spatial incorporation of measures, for example creating space for restoring the meanders of streams. Municipalities grant building permits and inform citizens about water quality. They also take into account the importance of surface water protection through execution of the Watertoets (Water Test). All these activities are in line with current municipal policy.

The environmental impact on surface water resulting from nutrients and pollutants (such as pesticides and heavy metals) is primarily reduced by means of national measures and licensing, although supplementary regional measures also contribute. The key supplementary measures in the first planning period (2009-2015) include:

- modifying 115 sewage overflows;
- removing approx. 6 million m<sup>3</sup> of polluted dredge (from aquatic sediments);
- improving purification of 50 wastewater treatment plants;
- establishing manure- and fertilisation-free zones over and above the statutory minimum along 791 km of ditches and streams.

Licensing and (generic) measures reduce the environmental impact on groundwater resulting from pollutants (such as pesticides and nutrients) and groundwater abstractions. The drastic hydromorphological changes of most surface waters are a particular impediment to proper ecological development. Supplementary sets of regional measures are aimed primarily at adjusting the hydromorphology, management and maintenance of water systems. For the first planning period (2009 – 2015), a comprehensive programme has been established that includes the following measures:

- construction of 1,734 km of nature-friendly banks (nfb) along standing waters;
- construction of 806 km of nature-friendly banks along flowing waters, and re-meandering streams;
- widening over 1,100 m of watercourses and constructing them as wetlands;
- modifying 628 structures to improve fish migration.

## Norway

Norway has a long rugged coastline which stretches over 2,500 km, broken by fjords and thousands of islands. Norway is also a mountainous country with many glaciers and some of the highest waterfalls in the world. The mountains draw Arctic terrestrial species all the way from the north to the southern part of the country. It has a population of about 5 million. Norway is implementing the WFD as part of the European Economic Area (EEA) Agreement, and a specific timetable for implementation has been agreed<sup>xi</sup>. In Norway, implementation of the Water Framework Directive is directed by a Ministerial Group and a Directorate Group. In October 2004, the Ministry of the Environment took responsibility for the overall coordination of implementation of the Directive in Norway. The Directive was implemented in Norwegian law by the Water Regulations of 15 December 2006 which entered into force on 1 January 2007. However, the Regulation was not formally incorporated into the EEA-agreement until 2009 and entered into force in May 2009. Water resource management is based on catchment areas independent of municipal, county, or national borders.

The Water Management Regulations divides Norway into river basin districts (RBDs) managed by 11 river basin district authorities. Initially, water management plans and programmes of measures have been made for a pilot group of 30



selected sub-districts representing about 20 per cent of Norway's watercourses. Assessment of pressures and predicted environmental status in water bodies in 2015 have been performed for all water bodies. However, at present only water bodies in the selected sub-districts have been assessed according to whether they have good, moderate or poor environmental status according to criteria for status set in the directive.

The EU Ground Water Directive is planned to be incorporated into the Norwegian Water Management Regulations. The directive is not yet part of the EEA Agreement. Norway has implemented the Urban Waste Water Treatment Directive by establishing national regulations. The Nature Diversity Act of September 2009 contains important environmental principles such as the precautionary principle, the ecosystem approach and the polluter pays principle, extending beyond the scope of pollution. Designation of selected habitat types and pointing out priority species and their natural habitats will influence activity in these areas.

There are also five international basin districts with the neighbouring countries of Finland and Sweden. In Norwegian the RBDs are referred to as 'vannregioner'. Selected County Councils are appointed as Competent Authorities for their respective River Basin Districts, some of which cover several counties. In Norwegian the Competent Authorities are referred to as 'vannregionmyndigheter'. 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 Norwegian the District Water Boards are referred to as 'vannregionutvalg'. Participants in the RBD Water Board are typically:

- The County Council (in some cases several)
- The local municipalities
- The County Governors 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.

Water regulations are pursuant to the Planning and Building Act, Pollution Control Act and the Water Resources Act, and can be amended by the Ministry of the Environment and the Ministry of Petroleum and Energy. The Water Regulations are meant to reflect the Directive's requirements and do not impose obligations beyond those following from the Directive. Through the regulations Norway has chosen to follow EU member deadlines for just under 20 per cent of the water areas. For the remaining water areas the regulations call for implementation in Norway in step with the second planning period in the EU countries. This means that the monitoring programme will be implemented from 2013 and that management plans with associated program of measures will be laid down in 2015 in line with the deadlines for the EU countries' second planning period.<sup>xii</sup>

For administrative purposes, the 17,000 waterbodies in Norway have been grouped into 105 sub-districts. In Norwegian these sub-districts are referred to as 'vannområder'. The majority of the sub-districts involve more than one municipality. All relevant authorities and stakeholders are invited into the local Water Boards at sub-district level. In Norwegian these local Water Boards are referred to as 'vannområdeutvalg'.

This structure aims to facilitate a participatory and effective collection of knowledge, as well as to promote innovation at the local level. The local Water Boards contribute with information from their respective sub-district into the RBD planning process, in order to create a knowledge base with high level of local support.

The preparation of the River Basin Management Plan (RBMP) and Program of Measures (PoM) is a collaborative exercise in the District Water Board, chaired by the Competent Authority. This involvement of all sector authorities in the whole process of characterization, classification, setting of objectives and prioritizing is intended to facilitate increasing sector integration, allowing for the final RBMP to be a product that has the backing of the whole District Water Board.





Each District Water Board also has a District Reference Group providing for the public participation of industry associations, NGOs and civil society in general. Public consultation of important documents during the process also ensures the information and allows for the participation of the general public. The consultations are made in line with the requirements of both the Norwegian Planning and Building Act, and the Water Framework Directive<sup>xiii</sup>.

Environmental conditions in Norwegian rivers and lakes are good compared with those in most other countries in Europe, though around 25% of Norway's water courses are at risk of not obtaining good ecological and chemical status by 2015. Long range transboundary pollution causes acidification and brings hazardous substances to lakes and rivers, most severely in the south and in the north eastern part of the country. Partly as a result of this, concentrations of mercury are so high that advice against consumption by pregnant and breastfeeding women has been issued. Despite the introduction of numerous measures in recent years, problems with acidification and eutrophication still remain. In the future, climate change is likely to escalate the problems, particularly with regards to increased run offs and the spreading of alien species.

## Sweden

Sweden covers over 440,000 square kilometers and is sparsely populated. About half the land area is covered with forest and there are a large number of lakes (96,000 over one ha in size) and watercourses (about 300,000 km). There have been extensive changes in land use over the last century, particularly in the agricultural sector.

The 1918 Water Act paved the way for extensive exploitation of rivers for hydro power purposes. Protection of nature and ecosystems became more important after legislation in 1983 (Water Act), 1987 (Natural resources Act) and 1998 (Environmental Code). Similar to pollutions licenses, the water operation licenses gave strong rights to the operator. Reconsideration was and is possible, but the license holder is then often entitled to economic compensation. The large hydro-electrical constructions and dams in northern Sweden cause enormous impact on the environment. The hydromorphology of many smaller rivers and lakes has also been changed due to hydropower, timber floating, trenching, etc. These changes are often quite old and can be difficult to evaluate. They are also expensive to remediate. Agriculture and forestry have their greatest impact on lakes and watercourses through increased concentrations of eutrophication substances and organic carbon (humus material).

The Environmental Code includes the fundamental provisions on environmental quality standards and programmes of measures for implementation of the WFD. Other WFD relevant chapters of the Code regulate substantial environmental requirements (such a Best Available Techniques), licensing and other preconditions for polluting activities and water operations. The national government has issued more detailed provisions related to WFD and further delegated the Swedish Environmental Protection Agency (SEPA) to issue regulations on how to characterise waters and to set chemical and ecological water quality standards. The five water district authorities are empowered to adopt the management plans for the water basins and the particular waters, including water quality standards and programmes of measures.

Sweden's water bodies are mostly not rich in nutrients, except in agricultural and metropolitan areas. Acid rain has decreased by more than 90 % during the past ten years. Sweden has a long tradition of monitoring water quality, both chemically and biologically. There is a well-developed system of environmental quality criteria. This system was the model for the quality criteria that have now been incorporated in the Water Framework Directive. Yet there are still no clearly established explanations for some high levels of nutrients and low levels of biodiversity in Sweden's water bodies when compared to southern Europe. Sweden has action programmes for acidification, eutrophication and many inorganic and organic pollutants hazardous to the environment. Programmes are under



way to detect the establishment of alien species as well as to note impacts on surface water caused by climate change at an early stage. Work is underway to increase cooperation with the government agencies for agriculture and forestry in water management work. Information and education on water-related issues are important parts of the agenda for the Swedish Water Authorities<sup>xiv</sup>.

## United Kingdom

The United Kingdom is an island state consisting of four countries: England, Northern Ireland, Scotland and Wales, and spanning an archipelago including Great Britain, the north-eastern part of the island of Ireland, and many small islands. The total area of the UK is approximately 243,610 square kilometres. There are RBMPs for 10 river basin districts (RBDs) in England and Wales. Scotland is designated a single RBD and has a single draft plan, with an additional cross border plan for the Solway-Tweed RBD. In Northern Ireland, there are three river basin districts, two of which are cross-border (International RBDs). Government agencies (Environment Agency, Scottish Environmental Protection Agency and the Northern Ireland Environment Agency) are the “competent authorities” for drawing up the RBMPs. The RBMPs set out environmental objectives for all groundwater and surface water bodies and Protected Areas within a RBD. The plans include a programme of measures to meet these objectives. Draft English RBMPs were approved by the Department of Environment, Food and Rural Affairs in the latter half of 2009, after a six month public consultation exercise between 22 December 2008 and 22 June 2009. The devolved administrations approved plans in Scotland, Wales and Northern Ireland<sup>xv</sup>.

The drivers and pressures on water quality experienced by different geographical areas within the United Kingdom vary, for example due to population densities and land use. Governments across the UK have identified the need for new homes as the result of a changing population. Diffuse pollution is a major pressure on the water environment, and can come from urban areas as well as rural areas. Further improvements are also needed in farm practices to protect water quality and allow wildlife to thrive. Rivers and estuaries have been highly modified physically, to facilitate development, flood and coastal risk management or navigation. Physical modification needs to be addressed in order to achieve more natural functioning of wetland ecosystems, and protect fish and their habitats into the future. The aquifers that supply drinking water also have to provide flow for rivers and wetlands. It is therefore essential to safeguard supplies and the environment by protecting groundwater from pollution. The water environment is constantly under threat from new invasive non-native species. These have an often rapid and adverse affect on the natural fauna and flora. Monitoring and prevention is important as some species can be extremely difficult to eradicate once they have taken hold. The percentage of water bodies with ‘good’ status in 2015 is predicted to be for England 30; for Wales 40; for Scotland 71 and for Northern Ireland 59. Flooding causes significant economic, social and environmental damage. It is estimated that flooding costs the UK, on average, £1 billion a year in damages as well as causing social disruption with destroyed infrastructure, health implications and negative impacts on the environment and biodiversity. The probability and severity of flooding is likely to increase in the future due to climate change and human actions. In England and Wales, The Flood and Water Management Act (2010) allows more comprehensive management of flood risk for people, homes and businesses<sup>xvi</sup>.



## Common features and differences

NSR Country	Main policy drivers	Similarities with other NSR countries	Differences
Belgium	Intensive agriculture, industrial activity and densely populated areas causing pollution.	Like the UK water management is complex due to political and institutional arrangements. Agricultural diffuse pollution a problem.	Water infrastructure still in need of upgrading, particularly continuing to increase the population connected to wastewater treatment
Denmark	Agricultural practices creating nutrient input to water bodies	Agricultural diffuse pollution a problem.	Extensive use of pesticides to be addressed.
Germany	Heavily modified water bodies Ground water protection from agricultural diffuse pollution	Agricultural diffuse pollution a problem. Dense population highlights climate change issues.	Re-unification provided opportunity to restructure water management.
Netherlands	Heavily modified water bodies	Dense population highlights climate change issues. Agricultural diffuse pollution a problem.	Water bodies mostly man made, difficult to 'naturalise'
Norway	Transboundary pollution Threats to salmon farming		Generally good environmental conditions, problems coming from outside the country. Not strictly held to deadlines as not in EU.
Sweden	Hydromorphology & eutrophication	Agricultural diffuse pollution a problem.	Extensive use of hydropower.
United Kingdom	Dense and increasing population unevenly distributed. Flooding.	Agricultural diffuse pollution a problem. Dense population highlights climate change issues.	Different problems to address in different locations within the constituent countries.



## Conclusions and future prospects

Compliance thus far with the Water Framework Directive has not been easy for countries in the North Sea Region but has improved integration within water management. Programmes of measures have had to be developed in a very context specific manner yet with a consideration of transboundary issues. Planning water management at the river basin level has enabled more of a systems perspective than was previously held in many cases. Whilst good status in surface water bodies will not be achieved across the board by 2015, good practice has been put in place and issues have been identified that will take longer to tackle, such as the very common problem of diffuse pollution from agricultural and urban sources. Problems particular to certain countries such as policies developed in line with technology, the need for upgraded infrastructure, large numbers of heavily modified water bodies and flooding point the way to knowledge sharing across the North Sea Region. In this short review of river basin management policy, good work towards the stated objectives of the WFD is apparent in each country examined. Whilst this has no doubt greatly raised awareness of the objectives among professional stakeholders, greater engagement with the public in future would enhance prospects for reaching these objectives. Consideration must also be given to continuing compliance under changing conditions of climate and population.

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