



postnote

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RIVER BASIN MANAGEMENT PLANS

The EU Water Framework Directive (2000/60/EC) seeks to protect, improve and maintain the environmental condition of surface and ground waters. Under the directive, all inland, estuarial and coastal waters must aim to achieve “good ecological status” by 2015. More than 80% of water bodies in England and Wales currently fail to reach this status. This POSTnote outlines some of the challenges in implementing River Basin Management Plans (RBMPs) in the UK to meet Water Framework Directive (WFD) objectives.

Background

Concerns about implementing the WFD in the UK were raised by the House of Commons Environment, Food and Rural Affairs Select Committee in 2003.¹ In the UK, past improvements in aquatic ecology have been delivered through regulating gross organic pollution and the deoxygenation this caused. However, aquatic ecology continues to be affected by:

- diffuse pollution from multiple sources including agriculture, urban areas and transport systems;
- pollution originating from a single point such as a sewage treatment work's pipe outfall;
- the impact of physical modification on water bodies, such as flood defences;
- amounts and rates of water taken from the environment for human use (abstraction) leading to low river flows and depleted groundwater levels (POSTnote 259); and,
- invasive alien species (POSTnote 303).

All of these impacts will need to be addressed to fulfil the Water Framework Directive (WFD) objectives of:

- halting deterioration, and protecting and enhancing aquatic ecosystems and associated wetlands;
- promoting the sustainable consumption of water;
- reducing pollution of surface and ground waters; and,
- reducing the effects of floods and droughts.

River Basin Management Plans

Under the WFD, all river catchments (rivers, streams, lakes and the land that drains into them) are assigned to administrative River Basin Districts (RBDs) by member states. Within in each RBD, “water bodies” must be identified as ground water or as discrete and significant elements of surface water (rivers, lakes, canals, estuaries and coastal waters). Protected Areas are defined as all those water-dependent areas that are designated under other EU directives (such as the Habitats Directive 92/43/EEC). Member states must produce river basin management plans (RBMPs) for all RBDs in the EU by 2009 (WFD Articles 11 and 13). The planning process should include an economic analysis of all the water uses in each RBD, as well as determining the pressures and impacts on the water environment.²

There are draft RBMPs for 10 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 RBDs, 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 should include a programme of measures to meet these objectives. There will be a further cycle of review and planning in 2015 and every six years thereafter. The draft English RBMPs will be signed off by the Department of Environment, Food and Rural Affairs in the latter half of 2009, after a six month public consultation exercise on the Environment Agency's website. The devolved administrations will sign off plans in Scotland, Wales and Northern Ireland.

Water Body Classification and Objectives

Surface water bodies are grouped into different types according to their physical and chemical characteristics. The definitions of water body types were agreed by the WFD UK Technical Advisory Group (WFD UKTAG), drawn from regulatory environment agencies and statutory nature conservation bodies. UKTAG then developed standards for the different types of water bodies, including the plants and animals expected to be present if the water bodies were not impacted by human activities (Box 1).

The River Basin Districts Surface Water Typology and Environmental Standards (Water Framework Directive) Direction 2008 sets out the process for assigning water bodies to a type and the status assessment standards and other criteria that apply to each in England and Wales. The environmental objectives for the water bodies set out in the RBMPs are derived from these standards and assessments.

Box 1 Classification Schemes³

Surface water bodies have been assigned to one of the Directive's five status classes – High, Good, Moderate, Poor or Bad, with confidence in this status classification expressed as high, medium or low. This includes ecological, chemical and quantitative criteria for assessing the overall status of surface water bodies. There are more limited criteria for assessing the status of heavily modified and artificial water bodies, while groundwater status is assessed on quantitative and chemical criteria alone. There are differing criteria for assessing the ecological status of rivers, lakes, transitional waters and coastal waters, but they all include consideration of:

- biological quality (including presence or absence of various algae, plants, fish and invertebrates).
- physical and chemical quality, including oxygenation and nutrient conditions.
- environmental quality standards for levels of specific pollutants, such as pesticides.
- the physical aspects that support the biological quality of the water body, such as the quantity and dynamics of water flow (hydromorphological quality).

Water bodies must aim to achieve “good” status by 2015 or maintain “good” or “high” status where this already exists. Groundwaters will also need to achieve “good” chemical status and be present in amounts that meet quantitative criteria, through measures such as reducing rates of abstraction. The exception to achieving “good” status is water bodies that are defined as “heavily modified” or “artificial” such as ports or canals, which will have to achieve only “good ecological potential”, consistent with how they are used. The WFD sets out the circumstances in which failure to achieve objectives is permitted (Box 2).

In England, 237 water-dependent Special Areas of Conservation and Special Protection Areas for birds have been established under Article 6 of the Habitats Directive. These may need to meet higher standards than “good” ecological status, in line with the precautionary requirements of the directive. For example, abstraction can continue only if it is shown that it does not adversely affect the ecology of these sites. Relevant water bodies will also have to fulfil national requirements to bring Sites of Special Scientific Interest (SSSIs) into favourable condition. All statutory bodies and Water Companies have

a duty to further the conservation and enhancement of SSSIs (CROW Act 2000).

Issues

There are acknowledged gaps in the evidence base on achieving “good” ecological status. Under the WFD, the Competent Authority undertakes surveillance monitoring to characterise pressures on water bodies and to detect long term trends, as well as operational monitoring to classify their status (Box 1). In England and Wales, data is only sufficient to deliver a medium rather than high level of certainty in the status of most water bodies. In addition, widespread investigative monitoring of water bodies is needed to determine the cause and effects of failures to meet “good” status under the WFD.

Box 2 Failure to Meet Objectives

The Environment Agency estimates less than 30% of water bodies in England and Wales will meet “good” status in 2015, with possible deterioration in the status of some. In certain circumstances, a lower objective for some water bodies or an extended period to achieve the “good” status objective can be set, for example, where there is uncertainty about the causes of a problem or the measures to deal with it or where disproportionate costs will be incurred. Infraction proceedings are triggered under the WFD after 2015 if the mechanisms for delivery are deemed insufficient to achieve WFD objectives, rather than whether all water bodies meet “good” status. Existing directives have already brought into force measures that are relevant to the implementation of the WFD. These include some under which the UK has previously been infringed, most recently the Urban Waste Treatment (91/271/EEC), Shellfish (79/932/EEC) and Nitrates (91/675/EEC) Directives. Other directives also clarify and co-ordinate WFD objectives to be met in RBMPs, such as the Groundwater Directive (2006/118/EC). Catchment Flood Management Plans, produced to meet the requirements of the Floods Directive 2007/60/EC, must be coordinated and synchronised with RBMPs.

Pollution Sources

There are technical difficulties in apportioning the source of pollutants within critical periods. Low river flows (usually dry periods in spring and summer) will result in less dilution of pollutants entering the water body, increasing their impact. Seasonal low river flows are likely to increase due to climate change.

For example, phosphate pollution is assessed on an annual basis, while the biological impact is confined to spring and summer. Pollutants usually arise from a range of sources, which may vary in the relative proportion they contribute throughout the year. The major source of phosphorus compounds entering rivers is sewage effluent in spring and summer, rather than agriculture.

A high level of phosphates or nitrates can cause excessive growth of river plants. As these plants die and decay, oxygen levels drop, affecting river water quality and biology (eutrophication). However, the effects of nutrients on aquatic ecology can be more complex (Box 3).

Urban run-off is the volume and rate of surface water entering rivers and streams, caused by impermeable surfaces in urban areas. Typical pollutants in run-off include oil, household chemicals, faecal material, nutrients and sediment from a wide range of sources. Mis-connections of domestic and commercial sewers into

storm drains in urban areas are also a source of pollutants (POSTnote 289).

In rural areas, septic tanks, oil tanks, and drains from individual properties can be significant sources of pollutants. Sewage plants that serve less than 10,000 people are also not required to remove phosphates from effluent, as they are too small to incorporate the technology.

Chemical pollution also arises from historical industrial sites that contaminate ground and surface waters, such as old tin mines in Cornwall. The location of such sites and the pollutants they generate are not always well characterised.

Box 3 Lowland Catchments

Lowland, groundwater-dominated, catchments cause a particular set of challenges; pressures are great; the scientific understanding of the major UK aquifers is poor; and tools for the integrated modelling of surface water-groundwater interactions and associated hydro-ecological processes are limited.⁴ Findings of a recent interdisciplinary Natural Environment Research Council (NERC) research programme on three UK lowland river catchments include:⁵

- ecological assessments of rivers, based on the diversity and type of animals found in them, fail to identify key changes in river bed sediments resulting from the build up of nutrients.
- phosphorus compounds are taken up by river sediments, reducing river water phosphorous concentrations downstream of sewage effluent discharges. If phosphate levels are reduced in sewage effluent, this stored phosphorus released, leading to a time lag in improving water quality.
- the main source of sediment in the study catchments is silt from agricultural land, particularly ploughed fields. The silting up of river channels can damage biological quality, as well as transferring pesticides and nutrients.
- the movement of agricultural chemicals, such as nitrate fertilisers and pesticides, through groundwaters in porous rock catchments is complex.
- the increasing amount of groundwater pollution in the studied catchments will result in future deterioration of river water quality.
- the vegetation in rivers and their banks is critical to maintaining a complex of habitats, by influencing the speed of the current, the deposit and erosion of sediments, where nutrients are recycled and by providing habitats for other species.
- types of vegetation cover within a catchment area affect how much water from rainfall reaches water courses through differences in evaporation rates.
- side channels, such as ditches, associated with rivers and streams are crucial to the biodiversity of aquatic systems, especially fish species. However, highly engineered, heavily dredged ditches are of low value to fish.

Impacts of Land Management Practices

Some land management practices can negatively affect aquatic ecology. For example, nitrates from agricultural activities dissolve in rainwater as it moves through the soil. As over 60% of nitrate that enters watercourses is from agriculture, predicting the rate of water movement through groundwaters to watercourses is important for estimating future water quality (box 3).

Sediments entering rivers due to erosion processes are a normal part of aquatic systems. However, excess levels of sediment arising from soil erosion (POSTnote 265), can

negatively impact on fish, plants and invertebrates in watercourses. They are particularly detrimental to certain catchment types, such as chalk streams and also a vector for transfer and fate of a range of pollutants (Box 3), including pesticides. Land management practices that reduce the rate of surface run-off and soil erosion could theoretically benefit aquatic ecology (Box 4).

Physical Modification of Surface Water Bodies

This is done for reasons such as navigation, urban development, agricultural drainage and flood defence. Over 80% of lowland and 60% of upland rivers have been modified in England. These activities can result in overly wide or artificially deep channels that contribute to low flows as well as causing rapid changes in the volume and velocity of flow during high rainfall periods. Physical structures can also impede flow, affecting sediment deposition. For example, in the River Wensum, in Norfolk, the removal or lowering of fourteen redundant weirs is part of the ecological restoration plan for the river.

Box 4. Land Management Measures

Actions that benefit aquatic ecology could also deliver other benefits. For example, the removal of hedgerows, ponds and woodlands or the draining of wetlands can increase surface run off and the risk of flooding, contribute to erratic river flows and reduce water quality through transfer of sediments, nutrients and pollutants. Measures to restore such features could improve rainwater drainage into the soil, raise low river flows, decrease flooding and enhance water quality.⁶ Floodplains could also be used for the storage of flood discharges, to maintain flows through prolonged water release from the floodplain back into the river, as well as to cause biodiversity/habitat gain through re-connecting rivers to their floodplains.⁷ However, the Centre for Ecology and Hydrology has suggested that the evidence base for the effectiveness of specific land based measures is insufficient. This is compounded by the difficulties of modelling all the effects of land uses on aquatic ecology at the catchment level.

The impacts on aquatic ecology vary according to the nature of the physical modification and the catchment type. Impacts that affect the diversity of fish species present will be key to whether water bodies attain "good" ecological status. There is evidence that appropriate habitat management is critical for biodiversity and organic matter processing within lowland rivers (Box 3).

Implementation of RBMP Measures

RBMPs will be implemented through a mix of regulation, incentives and voluntary measures in England and Wales. In Scotland, the Water Environment (Diffuse Pollution) (Scotland) Regulations 2008 allow the Scottish Environmental Protection Agency to control specified polluting activities in all areas. In England and Wales, Water Protection Zones (WPZs) are the government's preferred means of dealing with diffuse pollution in areas where advice and incentives have failed (Box 5).

More targeted measures, such as catchment management measures (Box 6), will be adopted on a plan by plan basis, if partner organisations, such as the National Trust or water companies, have the resources to undertake the measures.

Box 5. Water Protection Zones

Under the Water Resources Act 1991, Water Protection Zones (WPZs) may be designated to protect 'controlled waters' by Defra in response to an Environment Agency request. Only one WPZ has been designated, to protect the River Dee from stores of industrial chemicals. The government intends to introduce regulations to make WPZs compatible with the objectives of the Water Framework Directive. How regulatory measures will be implemented will depend on the level of risk to the environment, with specific actions or prohibitions relevant to individual WPZs. Their scope will be extended to include regulation of nitrate pollution, following Environment Agency pilot projects. This is currently regulated by designation of Nitrate Vulnerable Zones under the Nitrates Directive. Such zones have restrictions on fertiliser use and the application of animal manures to land.⁸ WPZs can also be used in conjunction with Works Notices, which allow the Environment Agency to restore controlled waters that have been damaged by polluting discharges

The RBMPs are required to set out the management measures to be applied to individual water bodies to achieve "good" ecological status. However, the priority issues for individual water bodies have not been identified to target measures.

Box 6. Catchment Management Schemes

The National Environment Programme, overseen by the Environment Agency, sets out the environmental improvements to be made by water companies in England and Wales. The extent of expenditure is agreed with the Water Services Regulation Authority (Ofwat) under the 2009 Price Review for the Asset Management Plan for 2010-15. Many of the actions that water companies have proposed in their draft business plans could contribute towards WFD objectives. They include 40 catchment management schemes to improve the quality of raw drinking water. For example, South West Water is involved in an Exmoor National Park project to restore mires. Severn Trent Water and United Utilities are also involved in the 'Moors for the Future' project, restoring moors in the High Peak Area, as these projects will reduce drinking water treatment requirements as well as having other environmental benefits (box 4). The National Trust and the Countryside Land and Business Association have suggested payments to landowners to deliver environmental benefits, such as water protection measures, through a range of options including markets for ecosystem services, POSTnote 281.⁹ Ofwat, however, believes that, where landowners' practices are the cause of pollution, water companies paying landowners would contravene the polluter pays principle. Many of the schemes suggested by water companies consist of free advice to landowners on water protection measures. Further advice to farmers comes from the Catchment Sensitive Farming delivery initiative in England, via Catchment Sensitive Farming Officers based in 66 priority river catchments, coordinated at RBD level and funded by Defra.¹⁰

Decisions on the management measures at the catchment level will need to balance competing local priorities, which cannot be achieved through consideration of the scientific advice alone. They will require appropriate mechanisms of engagement between public bodies, local stakeholders and the wider public (Box 7).

Overview

- RBMPs set environmental objectives for groundwaters, surface water bodies and all "Protected Areas" within

Box 7. Rural Economy and Land Use Programme

Decisions on water and land management measures to meet RBMP objectives also need to take account of political, economic and social issues. The Rural Economy and Land Use Programme (RELU) sponsors interdisciplinary research on managing land and water use for sustainable water catchments.¹¹ Issues arising from these ongoing projects include:

- identifying users is a key part of the process of engaging stakeholders in the planning process from the outset. An ecosystems approach (POSTnote 281) to land and water management can be used to identify different stakeholder uses and interests and the influence these stakeholders can deliver in terms of effective measures.
- there is much greater public awareness in countries where there have been campaigns related to implementing water protection measures, such as Germany. Most EU countries have more public participation and more developed arrangements for public partnerships on water protection measures.
- other European EU countries have looked beyond the ecological objectives of the WFD to achieve additional social and economic benefits, through an approach to spatial land use planning that identifies measures which deliver multiple benefits.
- any built development that impacts on water bodies needs to be written into RBMPs. RELU project studies in Norfolk, Devon and Cornwall have shown the difficulties in engaging planning authorities.
- a case study of the Humber catchment, using hydrological-economic models of the physical and economic impacts of policies, suggests there may be substantial costs arising from required major land use changes.

an administrative RBD, and a programme of measures to meet those objectives.

- The WFD recognises that there are several technical challenges to establishing effective measures to achieve "good" ecological status in water bodies.
- Land management practices are a key impact on the ecological status of water bodies, but there are uncertainties about the processes involved.
- There will be public engagement issues to be addressed in the implementation of RBMPs.

Endnotes

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- 4 Wheeler et al. 2007. *Hydrol. Earth Syst. Sci.*, 11(1), 108-124.
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- 6 Jackson et al. 2008. *Journal of Flood Risk Management*, 1(2) 71-80.
- 7 Morris et al. 2005. *Intl. J. River Basin Management*. 3(2), 1-11
- 8 HoC EFRA Committee. *Implementation of the Nitrates Directive in England*. Seventh Report of Session 2007-08.
- 9 The National Trust. 2008. *From Source to Sea*.
- 10 <http://www.defra.gov.uk/farm/environment/water/csf/index.htm>
- 11 <http://www.relu.ac.uk/research/Water%20catchments%20and%20flood%20projects.html>

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POST is grateful to all contributors and reviewers of this POSTnote. For further information on this subject, please contact Dr Jonathan Wentworth at POST.

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