493 MILLION PEOPLE AND 1 WATER FRAMEWORK DIRECTIVE FOR INTEGRATED AND SUSTAINABLE WATER RESOURCE MANAGEMENT IN EUROPE – A LOOK BEYOND THE RIM OF THE TEACUP

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ABSTRACT

New Zealand's water quality and quantity issues, e.g. declining water quality, over-allocation of freshwater and groundwater resources, conflicting water uses, poor pricing of water supply and wastewater services etc. are identical or similar to those in European countries.

Recent assessments estimate that at least 40% of the EU's surface water bodies are at risk of not meeting the objectives of the European Water Framework Directive (WFD). Enacted in the year 2000, the WFD sets the goal of achieving a "good status" for all of EU's surface waters (incl. transitional and coastal waters) and groundwater by 2015. In principle it is designed to

- reduce pollution of water, especially by so-called 'priority' and 'priority hazardous' substances,
- promote the sustainable and economic use of water,
- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands and
- ensure progressive reduction of groundwater pollution.

In view of New Zealand's urgent and diverse water resource challenges, an integrated "water perspective" deems advisable. Such strategies and approaches, like the WFD, are readily available and adaptable. They provide concepts and a good starting point to deal with those challenges. However they may not be well-known or understood abroad. This paper offers a brief insight into the European milestone water legislation that emerged from an urge to tackle diverse water problems and that has changed not only the water sector(s) in the 27 EU member states and beyond, but also the mindsets of professionals and the public involved. The overview sketches the goals, general philosophy, main pillar stones, governance, process and timeframe of this legislation and describes certain aspects, e.g. the holistic inter-disciplinary approach, the initial characterisation of the river basins and review of the environmental impact of human activity, the monitoring programmes (to classify the status of water bodies), the economic instruments and the River Basin Management Plans in more detail. Additional examples of how Europe is tackling water pollution from urban storm- and wastewater, and diffuse pollution from agriculture complement the overview.

KEYWORDS

Integrated Water Management, European Water Policy, Water Framework Directive, River Basin Management, Water Pollution, Good Agricultural Practise

1 INTRODUCTION

New Zealand is well endowed with water resources and it is recognized that water is fundamental to New Zealand's social, economic, environmental and cultural wellbeing. Communities, businesses and industries depend on long-term reliable and sufficient water supplies of adequate quantity and quality. Water is fundamental for

future economic development and growth. Ecosystems also require specific flows, water levels, water qualities, water recharges and surface-groundwater-interactions to sustain themselves.

However, rapidly increasing demand, which has accelerated in the last two decades, is jeopardizing New Zealand's water resources. Numerous rivers and streams are now fully allocated - some argue over-allocated. Groundwater resources are progressively becoming "red zones" with allocations at or above sustainable levels. In many areas water is becoming an increasingly scarce resource, and there is a growing competition for water, ecological flows, recreation, energy, public services and commercial needs.

Water quality is also declining, particularly in lowland rivers, streams, lakes and groundwaters, which threatens biodiversity, community and cultural values, the coastal environment, and freshwater and inshore fisheries. Half of New Zealand's lowland rivers and streams are stated to consistently fall below quality guidelines (IPENZ, 2009). Poor or declining water quality has already created direct costs, such as the nearly $450 million allocated over the next 10 to 20 years to the clean-up of Lake Taupo, Rotorua Lakes and Waikato River, and can constrain economic opportunities, e.g. tourism, fishing and aquaculture (MfE, 2009). Media coverage of declining water quality, e.g. the non-compliance of water quality at 42% of 300 monitored popular swimming spots with guidelines (NZ Herald, 2009), and the water allocation issues also seems to be becoming more frequent.

Poor pricing of water supply and wastewater services in New Zealand is acknowledged to result in a lack of encouragement to use water efficiently and not incentivise financial provisions for capital investment (IPENZ, 2009). Water metering is also inconsistent throughout New Zealand, resulting in certain councils applying inequitable uniform annual charges for water and wastewater. Moreover there is also little accurate and comparable information available on water consumption and water-system losses throughout New Zealand which impedes water asset management and future planning.

Since the Resource Management Act (RMA) was passed in 1991, New Zealand has generally not adopted a proactive approach to determining the national interest in freshwater. There is no general statement of the national interest in freshwater. The approach for individual water bodies has been largely reactive, and involves responding to projects and regional plans as they arise rather than providing a national context. This has resulted in a lack of certainty for local government and stakeholders, and ad-hoc decision-making (MfE, 2004).

The Sustainable Water Programme of Action (SWPOA), led jointly by the Minister for the Environment and the Minister of Agriculture, was established in 2003 to deal with water quality, allocation and use, and water bodies of national importance. Today even the Government admits that many of the milestones were not met in the programme and the programme was widely perceived as ineffective in tackling the big issues (MfE, 2009). Several main deliverables of the SWPOA, such as the National Policy Statement (NPS) for Freshwater Management, the National Environmental Standards (NES) for Measurement of Water Takes, the NES on Ecological Flows and Water Levels and the Water and Primary Sector Water Partnership are still outstanding, but are being progressed.

In recent years the water issues facing New Zealand are being discussed more broadly. In 2008 organizations such as the Institution of Professional Engineers New Zealand (IPENZ) and the New Zealand Business Council for Sustainable Development (NZBCSD) addressed the water issues and presented their views and solutions (IPENZ, 2008 and NZBCSD, 2008). Other organizations have issued guidelines and recommendations, e.g. Irrigation New Zealand's "Irrigation Code of Practice and Irrigation Design Standards" (Irrigation NZ, 2007), to set out best practice in specific sectors.

On 8 June 2009 at the Annual Conference of the Environmental Defence Society, the Minister for the Environment announced an 'Agenda for Fresh Water Reform'. The Cabinet paper "New Start for Fresh Water" outlines the Government's new direction for water management in New Zealand, and sets out some of the choices New Zealand faces and the implications of those choices. A subsequent paper was also announced that will outline a programme of work to run until 2011 and beyond. The reform agenda has a number of elements:

- Recognition that economic and environmental policies need to be more closely linked;
- Shift to a more collaborative style of environmental governance;
- Stronger leadership role for central government;
- Stronger scientific and technical underpinning of policies and plans;
- Enhancement of the role of Maori in resource management.

From a global point of view New Zealand's water issues are nothing new or singular, but are identical or similar to those in many other countries, for example in Europe. In principle they are all man-made effects and processes derived from human activities, i.e. of anthropogenic nature, for example due to unsustainable and poorly controlled urban development, agriculture or forestry. However it is acknowledged that the general conditions and the framework to manage or even resolve the water issues in New Zealand are special, e.g. the comparatively small population density and limited funding potential, and will therefore require a particular and focused approach.

The motivation of this paper is to provide a look beyond the borders of New Zealand, to illustrate how other nations have addressed and are dealing with these kind of urgent and diverse water (resource) challenges. In Europe, the so-called 'Water Framework Directive[1]' (WFD) (European Commission, 2000) enacted in October 2000 establishes the legal framework to protect and restore clean water across Europe and ensure its long-term, sustainable use. This paper aims to offer a brief insight into the European milestone legislation that emerged from an urge to tackle diverse water problems and that has changed not only the water sector(s) in the 27 European Union (EU) member states and beyond, but also the mindset of professionals and the public involved. The overview sketches out the goals, general philosophy, main pillar stones, governance, process and timeframe of this integral legislation and describes certain aspects, e.g. the holistic inter-disciplinary approach, the monitoring programmes (to classify the status of water bodies), the economic instruments and the River Basin Management Plans in more detail. It also outlines difficulties that were encountered during the initial process phases and how they were overcome.

2 HISTORY AND OVERVIEW OF EUROPEAN WATER POLICY

Water and water pollution were among the first environmental concerns in the EU. The first pieces of EU water legislation were accepted by the European Council as early as 1973. Since then, European water legislation has taken a leading and innovative role in the design of national water policy in many EU Member States. There have been two important periods of EU water legislation (Ecologic, 2008).

The first period occurred between 1975 - 1980, with standards for rivers and lakes used for drinking water abstraction in 1975, and resulting in a number of Directives and Decisions that either lay down water quality objectives for specific types of water (e.g. the Surface Water, Fish Water, Shellfish Water, Bathing Water and Drinking Water Directives) or establish emission limit values for specific water uses (e.g. Dangerous Substances Directive and the old Groundwater Directive). In the Water Quality Objective (WQO) approach, minimum quality requirements of water are defined in order to limit the cumulative impact due to emissions, both from point sources and diffuse sources. In the Emission Limit Value (ELV) approach, focus is on the maximum allowed quantities of pollutants that may be discharged from a particular source into waters. This approach looks at the end product of a process (wastewater treatment, discharges from industry) or what quantities of pollutants may enter into water. The concept of best available technology (BAT) has developed as a key element of setting ELVs, especially for the larger, more polluting industries. BAT denotes the most effective and advanced techniques that are currently available and that are sufficiently developed to allow implementation under economically and technically viable conditions. The concept is used to define how practical individual techniques are for preventing or reducing emissions of pollutants, and can serve as a basis for the definition of ELVs.

The second major period of EU water legislation, between 1980 and 1991, introduced additional Directives, including the Nitrates Directive (addressing water pollution by nitrates from agriculture), the Urban Waste Water Treatment Directives (UWWTD - providing for secondary (biological) wastewater treatment, and even more stringent treatment where necessary), the Integrated Pollution Prevention and Control Directive (IPPC Directive - addressing pollution from large industrial installations), as well as several Daughter Directives implementing the Dangerous Substances Directive. These second-period Directives mainly followed the ELV approach with respect to water pollution control at the source, both from point and from diffuse sources.

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[1] The WFD's official title is 'Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy'.

However, this piecemeal evolution on a problem-by-problem basis has led to a complex picture of water Directives with differing and often conflicting methodologies, definitions and aims. Furthermore, the water Directives were often less successful in environmental outcome than expected. The need for new and more co-ordinated EU water legislation was recognised, and a major revision of EU water policy was launched, finally resulting in the adoption of the WFD. The WFD provides a framework for the protection of all water bodies and is based on a combined approach of WQOs and ELVs.

The current water policy of the European Union recognises the following over-arching principles:
- High level of protection, taking into account the diversity of situations in the various regions of the Community;
- Precautionary principle;
- Preventative action;
- Rectification of pollution at source;
- Polluter pays principle;
- Integration of environmental protection into other Community policies, e.g. agriculture, transport and energy;
- Promotion of sustainable development.

All principles are reflected in the WFD. Placing these principles at the centre of water policy has major implications for further policy development and implementation, as they support the following policy objectives and elements:
- the development of integrated policies for the long-term sustainable use of water, and its application in accordance with the principle of subsidiarity[2];
- expanding the scope of water protection to all waters: surface waters, including coastal waters, and groundwater;
- achieving "good status" for all waters by a certain deadline, and preserving such a status where it already exists;
- water management based on river basins, with appropriate co-ordination provisions for international river basin districts;
- setting prices for water use, taking into account the principle of cost recovery and in accordance with the polluter pays principle;
- encouraging greater participation by citizens; and
- streamlining legislation.

3 OVERVIEW OF THE EC WATER FRAMEWORK DIRECTIVE

The overall purpose of the WFD[3] is to establish a framework for the protection of European inland surface water, transitional waters, coastal waters and groundwater which

1. prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
2. promotes sustainable water use based on a long-term protection of available water resources;
3. aims at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
4. ensures the progressive reduction of pollution of groundwater and prevents its further pollution, and
5. contributes to mitigating the effects of floods and droughts

and thereby contributes to
- the provision of the sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use,

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[2] Subsidiarity is an organizing principle in which a central authority should perform only those tasks which cannot be performed effectively at a more immediate or local level.

[3] In principle a Directive is a law of the EU that is binding in its objectives but leaves freedom for policy decisions in the Member States; it is an instruction to all Member States to initiate policies and legislation.

- a significant reduction in pollution of groundwater,
- the protection of territorial and marine waters, and
- achieving the objectives of relevant international agreements, including those which aim to prevent and eliminate pollution of the marine environment, to cease or phase out discharges, emissions and losses of priority hazardous substances, with the ultimate aim of achieving concentrations in the marine environment near background values for naturally occurring substances and close to zero for man-made synthetic substances.

The environmental objective of the WFD is to achieve 'good status' for all groundwaters and surface waters by 2015 at the latest. 'Good status' is a concept that on the one hand ensures protection of all water bodies in a holistic way, and on the other hand integrates quality objectives for specific bodies of water derived from other legislation, e.g. the Drinking Water and the Bathing Water Directives. For surface water, it consists of a general requirement for ecological protection ("good ecological status"), and a general low level of chemical pollution ("good chemical status").

Good ecological status is defined in terms of the quality of the biological community (e.g. phytoplankton, macrophytes and phytobenthos, benthic invertebrate fauna and fish fauna), the hydromorphological characteristics (supporting the biological community e.g. hydrological regime, river continuity, channel patterns, width and depth variations, flow velocities, substrate conditions, and both the structure and condition of the riparian zones), and the chemical and physico-chemical characteristics (e.g. thermal conditions, oxygenation conditions, salinity, acidification status, nutrient conditions). The controls are specified as allowing only a slight variance from the biological community that would be expected in conditions of minimal anthropogenic impact, thus accounting for ecological variability between different waters. Good chemical status is defined in terms of compliance with all the quality standards established for chemical substances at European level.

For groundwater, the WFD takes a precautionary approach, and defines 'good status' both in terms of chemical purity and of balance between abstractions and natural recharge. Direct discharges are generally prohibited. To control pollution from indirect discharges, there is a requirement to monitor groundwater bodies in order to detect changes in chemical composition and reverse pollution trends. In addition, the Directive also deals with groundwater quantity. There is only a certain amount of recharge back into groundwater each year; of this recharge, some is needed to support connected ecosystems (whether they be surface waterbodies, or terrestrial systems such as wetlands).

One advantage of the WFD approach, in its own way a significant one, is that it will rationalise the Community's water legislation by replacing seven of the "first wave" directives: those on surface water and its two related directives on measurement methods and sampling frequencies and exchanges of information on fresh water quality; the fish water, shellfish water, and groundwater directives; and the directive on dangerous substances discharges. The operative provisions of these directives will be taken over in the framework directive, allowing them to be repealed.

The key requirements of the WFD related to its implementation are the following.

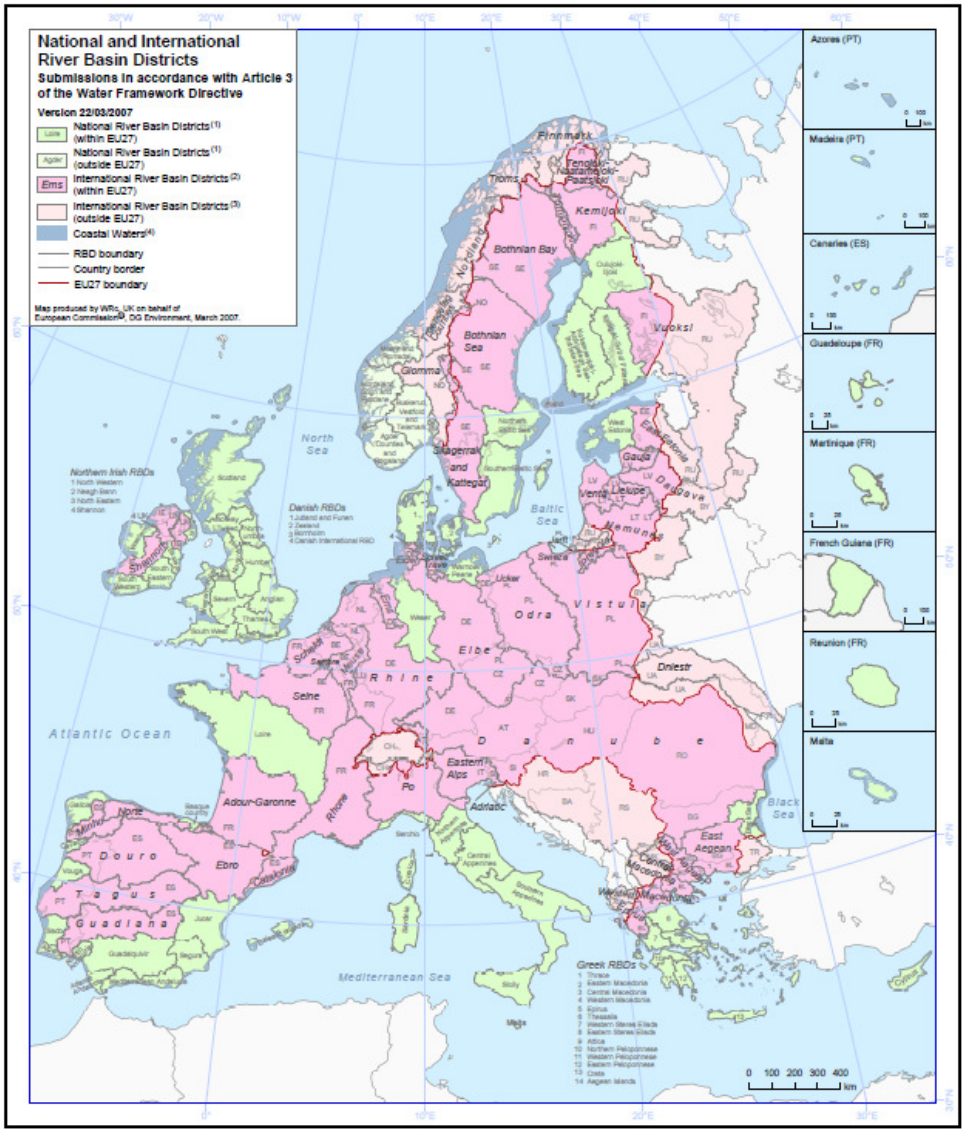
3.1 RIVER BASIN MANAGEMENT

The new approach to water management requires water to be managed at the river basin level (Figure 1), rather than according to administrative, geographical or political boundaries. This enables assessment of all activities that may affect the waters, and their control by measures which may be specific to the conditions of the river basin. River Basin Management Plans (RBMP) must be drawn up for each river basin; however, larger river basins may be sub-divided into smaller units. The adoption of suitable institutional structures to achieve river basin management is one of the major challenges facing Member States. Some options include:

- Utilizing existing regional structures, but organized and adapted to ensure co-ordination of functions related to the river basin;
- Appointing a central oversight body with river basin-based subsidiary departments or institutions to organize and undertake day-to-day work in the river basins; or
- Appointing individual river basin institutions with direct control over the activities of each river basin.

International co-ordination is also required for those river basins that cross international boundaries.

Figure 1: National and International River basin Districts in accordance with Article 3 of the WFD (http://ec.europa.eu/environment/water/water-framework/facts_figures/index_en.htm)



3.2 PROGRAMME OF MEASURES

Central to each River Basin Management Plan is a Programme of Measures to ensure that all waters achieve good water status. This requires, at least, the full implementation of all national and Community legislation on water and related issues. If this basic set of measures is not sufficient to reach the goal of good water status, then the programmes must be supplemented by additional measures, such as stricter controls on pollution from industry or agriculture or from urban waste sources. This may also require consideration of land use planning measures.

3.3 IMPLEMENTATION PROCESS AND COMMON IMPLEMENTATION STRATEGY

The WFD sets deadlines for individual requirements. For instance,

- the requirements of the WFD had to be transposed to Member States' national legislation by 2003,
- River Basin Districts and Authorities had to be identified by 2003,
- the river basins had to be characterised (pressures, impact and economic analysis) by 2004,
- in 2006 the monitoring network had to be established and public consultation had to be started (at the latest),
- first draft RBMP had to be presented in 2008,
- the RBMP (including Programmes of Measures) need to be finalized in 2009,
- pricing policies need to be implemented by 2010,
- Programmes of Measures are to be made operational by 2012, and

- by 2015 the environmental objectives need to be met, the first management cycle ends and the second RBMP & first Flood Risk Management Plans need to be developed. (The RBMP will be reviewed every six years.)

The implementation of the Water Framework Directive raises a number of shared technical challenges for the Member States. In addition, many of the European river basins are international, crossing administrative and territorial borders; therefore, a common understanding and approach is crucial to successful and effective implementation of the Directive. For this reason, the Member States, Norway and the Commission agreed on a Common Implementation Strategy (CIS) for the Water Framework Directive only five months after the entry into force of the Directive.

The main aim of the Common Implementation Strategy is to allow a coherent and harmonious implementation of the WFD. Focus is on methodological questions related to a common understanding of the technical and scientific implications of the WFD.

3.4 COMBINED APPROACH

Pollution control should take a combined approach. Water quality objectives and emission limit values must be established, with the stricter approach applying in any given situation. WQOs and/or ELVs already set in Community legislation have to be taken into account, such as the IPPC Directive, the Urban Waste Water Treatment Directive and the Directive on Discharges of Dangerous Substances to Water. Water used for the abstraction of drinking water is subject to greater protection.

The WFD addresses water quantity in so far as it is relevant to water quality. Any abstraction of surface water or groundwater, except minor abstractions, has to be subject to a permitting procedure.

3.5 MONITORING

The monitoring of all waters in terms of quantity and quality, especially surface waters (Figure 3) and groundwater, is an essential feature of the WFD. The directive specifies three types of monitoring:

- Long-term surveillance monitoring provides a broad understanding of the health of water bodies and tracks slow changes in trends such as those resulting from climate change.
- Operational monitoring focuses on water bodies which do not meet good status and on the main pressures they face – pollution where this is the main problem, water flow where extraction creates risks. Operational monitoring thus tracks the effectiveness of investments and other measures taken to improve the status of water bodies.
- Member States also undertake investigative monitoring when they need further information about surface water bodies that cannot be obtained via operational monitoring, including information on accidents.

Monitoring is the main tool used by Member States to classify the status of each water body. The WFD sets a five-class scale - high, good, moderate, poor and bad status. Once Member States have determined the current status of their water bodies, monitoring then helps them to track the effectiveness of measures needed to achieve good status. The WFD sets a common approach for monitoring water quality across all Member States but does not specify the methods to be used. It is up to Member States to decide the best method based on local conditions and existing national approaches. Data on monitoring must be made available to the public.

3.6 WATER PRICING AND COST RECOVERY

The need to conserve adequate supplies of a resource for which demand is continuously increasing is also one of the drivers behind what is arguably one of the WFD's most important innovations - the introduction of pricing. Adequate water pricing acts as an incentive for the sustainable use of water resources and thus helps to achieve the environmental objectives under the Directive.

The WFD requires Member States to apply the principle of cost recovery for providing water services, including environmental and resource costs, based on an economic analysis and in accordance with the polluter pays principle. Costs must therefore be considered for the consumer/user of water, whether domestic, industry or agriculture. These costs should include construction, financing and maintenance of such measures as drinking

water treatment and supply, the collection, treatment and discharge of wastewater and water used for irrigation purposes.

Whereas this principle has a long tradition in some countries, this is currently not the case in others. However, derogations will be possible, e.g. in less-favoured areas or to provide basic services at an affordable price.

3.7 PUBLIC CONSULTATION AND INFORMATION

An important aspect of the RBMP is the need to involve the public. The authorities must inform the public of the proposals contained in the plans and obtain the opinions of the public and relevant stakeholders such as local communities, industry, other water users, water utilities, and relevant government departments and institutions. The authorities must ensure public access to draft and finalized RBMP, results of monitoring and permit conditions and state of the environment reports, so that stakeholders and NGOs are enabled to participate actively in the discussion process.

3.8 COSTS FOR IMPLEMENTING THE WFD

The main costs, apart from administrative costs, for implementing the WFD include costs for an appropriate monitoring system, wastewater treatment beyond the provisions of the UWWTD, compliance with the IPPC Directive and compliance with new standards and requirements on the priority substances list. Moreover, the real cost impact of the WFD depends on the extent to which a country has already embarked on the charging of water costs closely aligned to financial costs, or even taking into account true environmental and resource costs.

4 MAIN OUTCOMES, EXPERIENCES AND SUCCESSES OF THE WATER FRAMEWORK DIRECTIVE TO DATE

The following sections outline some of the main outcomes, experiences and successes of the WFD to date (European Commission, Water information notes 1-12). For further information there is a vast of amount of literature and information available, for example on the internet pages of national authorities (see references).

4.1 WATER BODIES AT RISK

In one of the first tasks under the WFD, Member States made a preliminary identification of all their water bodies in 2005. More than 70,000 surface water bodies were designated[4] across the EU. About 80% of these are river water bodies, 15% lakes and the remaining 5% coastal and transitional water bodies. At the same time, Member States assessed which bodies are at risk of not reaching “good status” by 2015.

This preliminary review found about 40% of surface water bodies at risk, and a further 30% need additional data for assessment. The results vary significantly across Member States. In the Netherlands, over 95% of surface water bodies are considered at risk. In contrast, in Estonia less than 20% of surface water bodies are considered at risk, though a further 40% need additional data for assessment. Several factors contribute to the high level of surface water bodies at risk. These include point-source pollution, for example from industrial plants, as well as diffuse pollution such as agriculture. The WFD also addresses pressures that previous EU water legislation neglected, including the influence of water extraction and of morphological changes such as dams and weirs on the health of surface waters. Finally, many Member States took a precautionary approach in this preliminary identification: some did not factor in existing initiatives that should improve water bodies in coming years.

In the preliminary assessments the Member States also reported that 30% of the EU's groundwater bodies are at risk of not achieving good status by 2015. Again the situation varies considerably across Europe. A few Member

[4] In designating individual water bodies, Member States consider factors, from the physical differences - including altitude, geology and size - to the levels of pollution, extraction and other pressures. By designating separate water bodies along the course of a river, Member States can focus monitoring activities on problems affecting specific water bodies. They can then tailor measures to improve conditions in the water bodies at risk. Governments, stakeholders and the public will be able to track the progress of these measures in improving the status of the bodies at risk.

States, including Belgium, the United Kingdom and the Czech Republic, estimated that about 60% of their groundwater bodies were at risk. Others, such as Austria, Estonia and Portugal, saw a much brighter picture with 80% or more of the bodies expected to maintain or achieve good status by 2015. The risk factors also vary greatly across Europe. In Mediterranean countries with low summer rainfall, extraction for drinking water and other purposes can deplete groundwater. In many parts of the EU, contamination from both industrial sites and agricultural chemical pollution threatens groundwater. The largest share of the EU's groundwater bodies - 45% - requires additional data to be properly assessed. Member States are currently carrying out detailed monitoring of these bodies and those at risk to understand better the pressures they face.

Member States have refined their preliminary designations of water bodies and the identification of those bodies at risk. They are also preparing the management plans for their river basins. These plans, due in 2009, will specify the measures to achieve "good status" in all water bodies by 2015 (see Article 13 and Annex VII of the WFD). Thus, measures will focus on the water bodies at risk.

4.2 ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES

Across Europe human activity and economic development have physically altered rivers and other waters for navigation, flood control and other purposes. For example canals and hydroelectric reservoirs have been created where no water bodies previously existed. Examples of such changes can be seen in the Rhine River Basin. Over the past two centuries the Rhine has been straightened and dredged so that barges could transport goods along the river. Stopbanks have cut off the Rhine from its former floodplains, many of which are now used for farming, industry and settlements. Dams along the river and its tributaries generate electricity and control water levels and in many parts of the basin, such as in the Alsace region in France, a number of canals were built to bring barge traffic to major cities and to the Rhine itself.

The WFD allows Member States to designate some of their surface waters as heavily modified water bodies or artificial water bodies whereby they will not need to meet the same quality criteria required of other surface waters. They will need to meet the "good ecological potential" criterion for these ecosystems rather than "good ecological status". However, artificial and heavily modified bodies will still need to achieve the same low level of chemical contamination as other water bodies. Member States must meet a series of tests[5] to designate water bodies in these categories. By allowing Member States to classify water bodies as artificial or heavily modified, the WFD provides a mechanism to reconcile economic activity with environmental goals.

In their initial assessments Member States identified about 15% of the EU's surface water bodies as being heavily modified and a further 4% as artificial (Figure 2). As a surface water body is a section of a river, lake, or transitional or coastal water, Member States can decide to designate only specific sections of a river as heavily modified. In the United Kingdom (UK), for example, upper stretches of the Thames River remain largely in their natural state. But the lower stretches of the Thames, which are modified by embankments and other public works as they flow through London were identified in the UK's 2005 river basin report as heavily modified.

The situation varies widely between Member States. Belgium, the Czech Republic, the Netherlands and Slovakia designated over 40% of their surface water bodies as heavily modified. In contrast, Latvia and Ireland indicated that less than 2% of their water bodies are heavily modified or artificial.

The Netherlands, for example, have been modifying their rivers, lakes and other waters for centuries. Stopbanks, coastal defences and other works provide flood protection to this low-lying territory. The country's many artificial water bodies include the network of small canals that weave across the landscape. In 2005 the Netherlands provisionally reported over 90% of its water bodies as either heavily modified or artificial. For all of these water bodies, the aim is to achieve good chemical status and good ecological potential.

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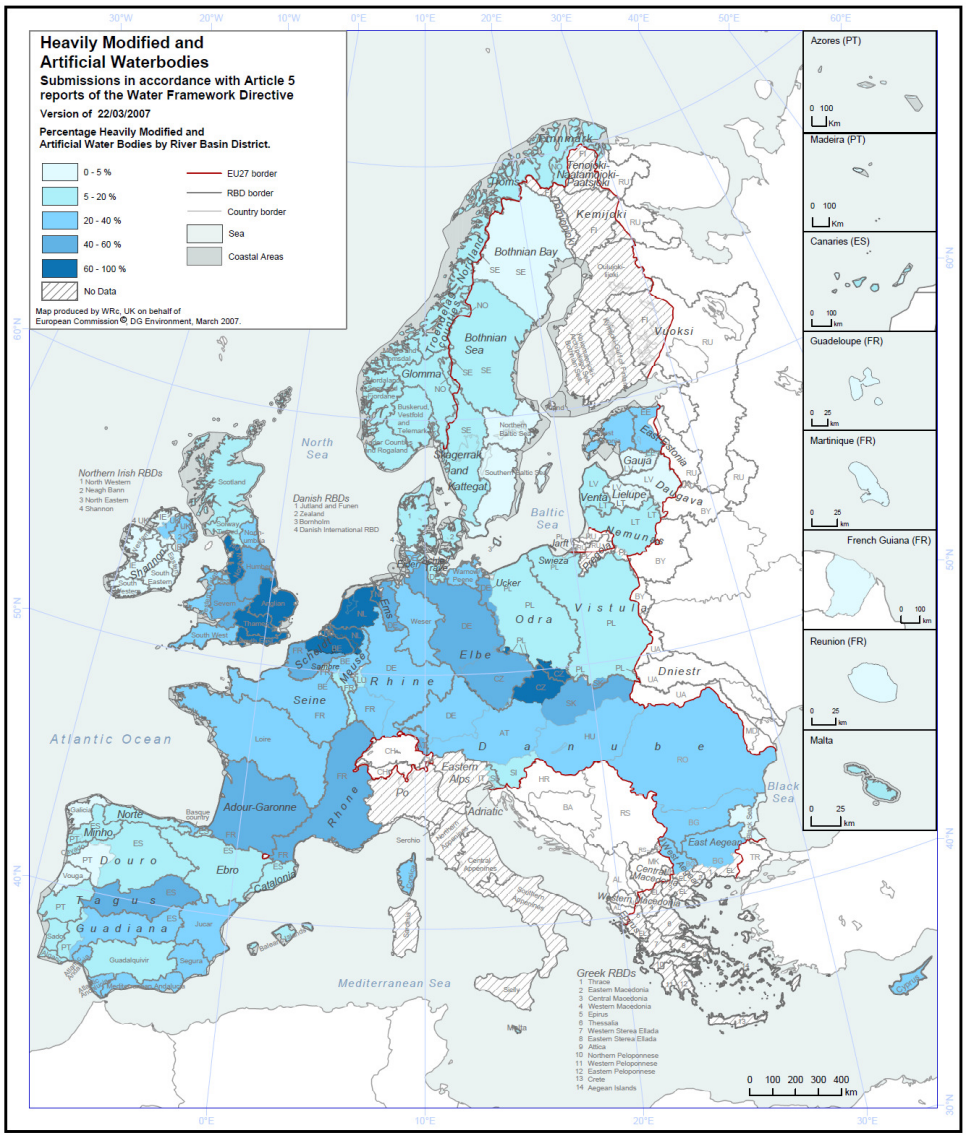
[5] An artificial water body is defined as a body of water created by human activity while a heavily modified body is one that has undergone man-made alterations that have substantially changed its character. There are a number of key tests Member States have to meet before designating surface waters as artificial or heavily modified (Article 4(3)). One of these tests is whether the body of water in question will be able to meet the objective of good ecological status by 2015. If it can meet this objective, there is no need to classify it separately from other surface waters. Another test is whether the beneficial objectives of the artificial or heavily modified water body could be met in other ways. For example, if a section of a river was dredged and straightened for navigation in the past and current traffic could be easily transferred to rail it would not meet the criteria as a heavily modified water body.

Figure 2: Heavily modified and artificial waterbodies in accordance with Article 5 of the WFD (http://ec.europa.eu/environment/water/water-framework/facts_figures/index_en.htm)



4.3 MONITORING PROGRAMMES

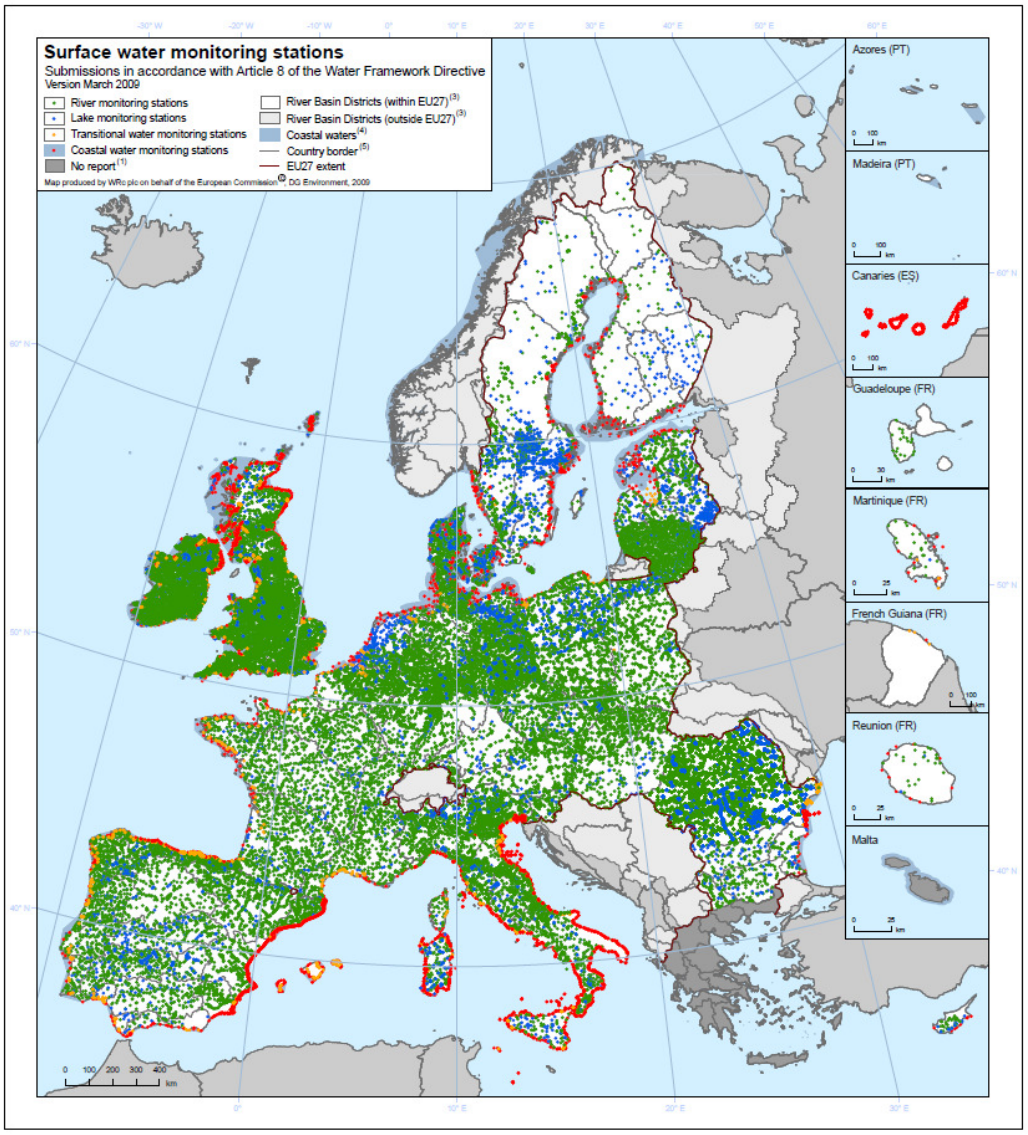
Member States were required to set up monitoring programmes by December 2006. The key task was to adapt existing monitoring systems to meet the needs and goals of the directive. Member States also worked together on monitoring in international river basins, such as the Danube or Rhine Rivers.

While prior European legislation considered chemical contamination in water, the WFD provides a major innovation by addressing aquatic ecosystems and human impacts on hydromorphology as well. This is a complex task, as ecosystems differ across Europe, and therefore an intercalibration process was required to ensure harmonised results.

For some Member States, measuring these changes is a new monitoring activity. The monitoring of surface waters thus covers the chemical composition of water, a number of key biological elements, and the hydrological and morphological characteristics of water bodies in order to provide a comprehensive overview of the health of Europe's waters. Groundwater monitoring programmes cover water quality and water quantity.

The WFD required Member States to provide an overview of their monitoring programmes in 2007. The reports show that Europe's water monitoring programmes have more than 54,000 surface water stations (Figure 3) - around 24,000 for surveillance monitoring, 40,000 for operational monitoring and around 12,000 common to both - and more than 51,000 groundwater stations.

Figure 3: Surface water monitoring stations in accordance with Article 8 of the WFD (http://ec.europa.eu/environment/water/water-framework/facts_figures/index_en.htm)



Member States have made good progress in establishing monitoring programmes for aquatic ecosystems. All of the countries reported on some, if not all, of the essential biological parameters in their monitoring programmes. These parameters include phytoplankton, macrophytes, bottom-living invertebrate and fish. In the latter area, however, further work is needed as only a few countries monitor fish.

4.4 INTERCALIBRATION

Work on intercalibration provides a common scale across Europe to measure progress towards the goal to achieve "good ecological status" of all surface waters by 2015. While Member States have a great deal of experience in monitoring the chemical status of their waters, measuring good ecological status brings new challenges. Given the wide range of ecosystems found across Europe, using one method to assess all water bodies does not make sense. Instead, the directive establishes a common definition of good ecological status, which Member States must use when developing their national assessment methods. To ensure that national assessment methods to measure good ecological status deliver comparable results and are consistent with the directive, an intercalibration exercise was required between Member States with the assistance of the European Commission.

The intercalibration exercise took place between 2003 and 2007 and involved hundreds of experts across Europe. The experts first identified and then studied almost 1,500 sites in rivers, lakes and coastal and transitional waters across Europe. These water bodies formed a first network of intercalibration sites in 2005. This network was later expanded, and the intercalibration exercise has used data from many thousands of sites and water bodies across Europe.

The species of fish, invertebrates and plants in Baltic rivers differ from those in Alpine rivers, which in turn differ from those found in Mediterranean rivers. Because aquatic ecosystems vary so widely across Europe, experts set up 14 different Geographical Intercalibration Groups (GIGs). For example, experts from Italy, France, Germany, Austria and Slovenia collaborate in the GIG for Alpine lakes. Waters also differ within each intercalibration group. Experts in the Alpine group identified two types of Alpine lakes with distinct ecological characteristics, one at lower and one at higher altitude. Eleven countries participate in the intercalibration group for North-East Atlantic coastal and transitional waters, comparing the ecosystems of seven different types of waters, from shallow coastlines to deep northern fjords.

The goal of intercalibration is not to establish common assessment systems. Each Member State chooses its own methods according to the provisions of the directive. Intercalibration ensures that the different national systems achieve comparable results. The work focuses on defining the upper and lower boundaries of good status. The line between “good” and “moderate” status is particularly important, as it defines whether or not a water body will meet the directive's 2015 goal of good status.

Intercalibration for the Water Framework Directive is a very complex scientific and technical exercise. Considering its scale and ambition, there is no comparable precedent for the assessment of ecosystem health in Europe or elsewhere. Many experts doubted whether such an exercise would be possible within the given timeframe and with the limited amount of information that was originally available.

The intercalibration expert groups delivered their results in June 2007, and a Commission Decision published them in 2008. The years of intense work have brought a major step forward in protecting European aquatic ecosystems. But much remains to be done. Member States have agreed to continue the exercise to fill the gaps of the work achieved to date. Current work includes the intercalibration of methods for transitional waters such as estuaries: these are found where fresh and coastal waters meet, and they have particularly complex ecosystems.

Member States will use the results of the intercalibration work to prepare and implement their RBMP. These plans will identify waters that do not achieve the environmental objectives set out in the WFD, along with the measures necessary to improve conditions and reach good status. Intercalibration thus plays a crucial role in identifying where action is needed to restore the quality of Europe's waters.

4.5 POLLUTION: REDUCING DANGEROUS CHEMICALS IN EUROPE’S WATERS

The WFD aims to ensure the good chemical status of both surface water and groundwater bodies. For surface waters this goal is defined by limits on the concentration of specific pollutants of EU relevance, known as priority substances. To date, 33 priority substances have been identified. A new Priority Substances Directive (European Commission, 2008), establishes limits, known as Environmental Quality Standards (EQS), for these 33 substances and for an additional 8 substances regulated under previous legislation. To achieve the good ecological status, Member States may need to ensure that additional pollutants of national relevance are controlled.

The WFD also requires good chemical status for groundwater. It is reinforced by the 2006 Groundwater Directive, which specifies measures to assess, monitor and control groundwater pollution.

In designing measures to control the chemical pollution from point sources (e.g. waste waters from industrial installations), and diffuse sources (e.g. pesticide runoff from agricultural lands and leaching from unprotected landfills), the WFD takes a combined approach. It considers pollution in terms of what is released into the environment and the resilience of the receiving waters.

Releases of chemical pollutants are controlled through a number of pieces of legislation targeting specific activities. At the same time, the requirement to meet EQS for priority substances prevents the deterioration of waters by the accumulation of pollution from multiple sources. If the quality for a particular water body is jeopardised, stricter controls going beyond the measures specified in European legislation are need to be imposed on pollution sources. (In addition, the Bathing Water Directive establishes further controls to protect human health in recreational waters.)

By targeting priority substances, the WFD focuses on individual pollutants or groups of pollutants that present significant risk to or via the aquatic environment. The substances are identified through rigorous risk assessments,

which involve examining scientific evidence of the hazardous properties of the substances, their contamination of European waters, and other factors such as volumes used.

Two types of EQS are set for priority substances: annual average concentrations and maximum allowable concentrations. The former protects against long-term chronic pollution problems, and the latter short-term acute pollution. Member States are responsible for monitoring the concentrations of priority substances in surface waters as part of their monitoring programmes

Among the 33 chemicals categorised as priority substances, 13 are designated as priority hazardous substances due to their persistence, bioaccumulation and toxicity. The European Commission will review this list every four years, to allow for the inclusion of additional substances of concern. The WFD seeks to progressively reduce emissions, discharges and losses of priority substances to waters. Priority hazardous substances are to be phased out completely within 20 years.

4.6 PUBLIC PARTICIPATION IN RIVER BASIN MANAGEMENT

The WFD acknowledges that its success relies on close cooperation with the public and stakeholders at local level and their involvement in key decisions (Article 14). Participation is especially important for the development of RBMP, which are at the heart of the WFD's implementation.

To ensure the participation of the public and stakeholders in establishing and updating RBMP, the WFD recognises that it is necessary to provide proper information to the public of planned measures before final decisions on the measures are adopted. In addition, access should be given to all background documents and information used for the development of the RBMP. Once a plan is in place, authorities need to report on the progress of its implementation to the public and stakeholders.

Public participation extends to all water users, to non-governmental organisations, such as local and national environmental groups, and to other stakeholders. Key organisations and citizens' groups likely to be affected by the plan need to be identified and involved. In some cases, such as in large or geographically varied districts, authorities put in place consultation mechanisms for individual sub-basins. For Europe's many international river basin districts, consultation extends across Member States and to some neighbouring countries. The following two bullet points outline examples of public participation:

- In France the government organised a national consultation on draft RBMP in 2008, which involved activities in each river basin district. In the Loire-Bretagne basin, for example, consultation included open discussions, exhibitions, information centres and activities such as guided tours and theatre productions (see: www.prenons-soin-de-leau.fr).
- In Northern Ireland, a national Stakeholder Forum was established in 2005. The membership of the Forum covers a wide range of interests, including the environment, industry, agriculture and conservation. In addition to the Forum, nine Catchment Stakeholder Groups have been set up to provide an opportunity for anyone interested in local water issues to identify their concerns to both Statutory Agencies and non-governmental organisations, and to have these addressed at local level (www.doeni.gov.uk/index/protect_the_environment/water/water_framework_directive_/wfd_participation_forum.htm).

Many participants appreciate the requirement for stakeholder involvement because it has - amongst other things - introduced transparency and flexibility into water management which is expected to lead to better and more cost-effective solutions (Riley & Tyson, 2006).

4.7 THE EC FLOODS DIRECTIVE

Since 1998, floods have caused about 700 deaths across Europe, displaced about half a million people and led to at least €25 billion worth of insured damage in addition to uninsured costs. Therefore planning for droughts and floods also forms an integral part of the WFD's river basin approach to water management.

On 26 November 2007 'Directive 2007/60/EC on the assessment and management of flood risks' (European Commission, 2007) entered into force. This directive requires Member States to assess if water courses and coast

lines are at risk from flooding, then to map flood risks and finally to take adequate and coordinated measures to reduce the risk.

4.8 CLIMATE CHANGE

Climate change will create wide ranging impacts, which Member States can address through their RBMP. Member State Water Directors recommend making "climate checks" of the programmes of measures in the first RBMP that are to be in place by the end of 2009. These climate checks should identify the measures best suited to strengthening river basins' capacity to adapt to climate change and which measures will weaken that capacity or be less effective.

Further work to incorporate climate change in river basin management planning will be needed when the management plans are revised in 2015 and every six years thereafter. Measures will need to be resilient to climate change impacts. This will be especially important for expensive and long-term investments such as large infrastructure projects. Planning for droughts, water scarcity and flood prevention will also become increasingly crucial.

5 SOLUTIONS FOR WATER ISSUES IN EUROPE - EXAMPLES FOR NEW ZEALAND

One of the major pollution problems facing European waters is eutrophication due to an excess of nutrients, such as nitrogen and phosphorus compounds. Eutrophication symptoms are found in some 40% of European rivers and lakes, and in the North, Baltic, and Black Seas and significant parts of the Mediterranean Sea. Nutrients come from a variety of sources. Diffuse pollution from agriculture such as nitrogen fertilisers, manure from rearing of livestock and the erosion of soil containing nutrients are responsible for 50 to 80% of all water pollution. The second largest source of water pollution is the wastewater originating from sewage treatment plants. Both of these sources are addressed by EU legislation adopted in 1991.

Countries that operate sophisticated and effective wastewater infrastructure, such as Germany or the UK, are already concentrating on measures to remediate or alleviate hydromorphologic changes to surface waters. A number of river restoration projects, such as the re-naturalization of streams and rivers, or the restoration of river continuity for the aquatic fauna (by means of decommissioning of impounding structures or the construction of fish passes at weirs) have already been carried out; and many more will be required.

5.1 TACKLING URBAN WASTE WATER

The UWWT Directive is one of the most costly EU legislation to implement and affects more than 22,000 urban areas across Europe. It also sets requirements for pre-treatment of industrial wastewater entering collecting systems and the disposal of sewage sludge. The specific requirements depend on the size of the so-called "urban agglomerations", areas where population or economic activities are concentrated and on how sensitive the waters are into which they discharge. "Sensitive areas" (which have to be designated by Member States) are eutrophic areas or areas at risk of eutrophication, areas used for drinking water extraction or areas where further treatment is necessary to fulfil other directives (such as the Bathing Water Directive). In certain areas wastewater discharges can lead to more serious environmental consequences unless nutrients and other pollutants are removed.

The UWWT Directive requires all urban areas with the equivalent of more than 2,000 inhabitants to conduct at least secondary (biological) treatment of their wastewater. For those in sensitive areas, or those with more than 10,000 inhabitants, more stringent treatment is required (e.g. tertiary treatment such as nutrient removal).

At present, the main challenge is for the 12 new Member States that became EU members in 2004 and 2007 to comply with the directive. Approximately €35 billion will be required to implement the UWWT Directive in these 12 countries, and the two most populous, Poland and Romania, need to invest over €10 billion each. EU funds will help finance these investments, but users will also have to contribute.

Because of the high cost of the investments needed, especially in the 12 new Member States, the EU is supporting the construction of drinking water facilities, wastewater treatment plants and sewerage networks through its Structural and Cohesion Funds. Between 2007 and 2013 a total of about €22 billion will be available for such investments. Over 60% of the resources will go to new Member States and the remainder to the poorer regions in the 15 older Member States.

Under the WFD, Member States are required to ensure that the prices charged to water consumers for services, such as for the delivery of fresh water and the collection and treatment of wastewater, reflect the full costs of extracting, treating and transporting it to consumers. However, the WFD also allows certain derogations for less favoured areas or to ensure affordability of basic services.

5.2 TACKLING STORMWATER DISCHARGES

The WFD has resulted in a shift in the definition of performance indicators for urban wastewater systems, and its requirements for river basin management will also have implications on urban wastewater system management within Europe. Traditionally, major elements of such systems (sewer system, wastewater treatment plant, and receiving water body) were considered separately, and emission-based criteria formed the basis for legislation and standards in many countries.

Thus, traditional engineering / design approaches need to be adapted to address the paradigm shift. The exclusive consideration of combined sewer overflow (CSO) volume, frequencies, and pollution load minimisation, for instance, are no longer adequate objectives, since they do not guarantee the achievement of the desired quality of the receiving water body. It is generally accepted that optimal management of the individual components of the urban wastewater system does not necessarily yield optimum performance of the entire system. More and more the integrated assessment and management of urban wastewater systems, accounting for various sources of pollution and impacts on receiving water bodies, is becoming state-of-the-art in Europe. A number of guideline documents and manuals have become effective, e.g. the Urban Pollution Management Manual in the UK (FWR, 1998) and the immission-oriented German Guideline M3 to assess combined sewage and stormwater discharges into surface waters (BWK, 2001).

5.3 TACKLING DIFFUSE POLLUTION FROM AGRICULTURE

5.3.1 THE EC NITRATES DIRECTIVE

The European Community has been taking measures concerned with nitrogen pollution in waters for over 20 years. Whilst the initial directives concerned themselves mainly with water for human consumption, more recent directives, such as those on nitrates from agricultural sources and urban waste water treatment have placed increased emphasis on the environmental effects of excess nitrogen, in particular eutrophication. These recent directives are currently in the process of implementation.

The Nitrates Directive (European Commission, 1991) is aimed at preventing nitrates from agricultural sources from affecting ground and surface waters. It requires Member States to (1) detect waters that are already affected or likely to be affected by nitrate pollution, (2) designate all those areas that drain into waters that are polluted as "nitrate vulnerable zones" (NVZ), (3) develop action programmes within the vulnerable zones, and (4) monitor and assess the action programmes and revise them as needed to achieve the directive's goals.

The mandatory action programme of measures must be followed by farmers with land in NVZs to tackle nitrate loss from agriculture. The Directive requires that the action programme contain rules relating to:

- periods when the land application of certain types of fertilizer is prohibited;
- the capacity of storage vessels for livestock manure;
- the land application of fertilizer to steeply sloping ground;
- the land application of fertilizer to water-saturated, flooded, frozen or snow-covered ground;
- the conditions for land application of fertilizer near water courses;
- procedures for the land application, including rate and uniformity of spreading, of both chemical fertilizer and livestock manure;
- limitation of the land application of fertilizers based on a balance between the foreseeable nitrogen requirements of the crops, and the nitrogen supply to the crops from the soil and from fertilization; and

- the amount of livestock manure applied to the land each year, including by the animals themselves, shall not exceed 170 kg N per hectare.

There is an obligation on member states to review the effectiveness of the action programme measures at least every four years.

Member States must also establish codes of good agricultural practice to be implemented by farmers on a voluntary basis. The action programmes for NVZs must include measures set out in the codes of good practice and those needed to limit the application of any nitrogenous fertilisers to soils, which may require investing in livestock manure storage facilities.

The Nitrate Directive's approach is proving effective. A recent report on its implementation noted that from 2000 to 2003 nitrate concentrations were stable or decreasing at 86% of monitoring sites.

5.3.2 IMPLEMENTATION OF THE NITRATES DIRECTIVE AND DEVELOPMENT OF A CODE FOR GOOD AGRICULTURAL PRACTICE IN ENGLAND

66 Nitrate Vulnerable Zones, covering some 600,000 hectares (8%) of England, were designated in 1996 to protect drinking waters from nitrate pollution. An Action Programme of measures was applied in these NVZs from December 1998. In December 2000, the European Court of Justice ruled that the UK had failed to properly implement the Directive because they had only designated NVZs for the protection of drinking water sources, rather than for all surface and groundwaters. As a result of this ruling, a further 47% of England was designated as an NVZ in October 2002, bringing total coverage to approximately 55%. The same Action Programme of measures that applied in the original NVZs entered into force within these additional NVZs in December 2002.

In 2006, the Department for Environment, Food and Rural Affairs (DEFRA) completed a review of action taken to date to implement the Nitrates Directive in England, including the extent of current NVZs and the effectiveness of the current Action Programme. This review highlighted the need for further action if England were to tackle water pollution caused by nitrogen from agricultural sources. A consultation was launched in August 2007 and ran until December 2007; over 600 individuals/organisations responded. The DEFRA carefully considered the issues raised in response to the consultation before it took decisions on how to progress implementation of the Nitrates Directive in England – a number of changes were made to the original proposals. Regulations implementing the refined proposals were laid before Parliament in September 2008 and came into force on 1 January 2009.

Farmers with land located in Nitrate Vulnerable Zones (NVZs) must now comply with a number of rules (www.defra.gov.uk/environment/water/quality/nitrate/action-nvz.htm). The rules promote best practice in the use and storage of fertiliser and manure, and build on the guidelines set out in the 'Code for Good Agricultural Practice for the Protection of Water' (DEFRA, 2009). The Government encourages farmers outside of the NVZs to follow these voluntary Codes of Good Practice, for the protection of the environment. This will help to prevent nitrate levels rising to the point where regulation becomes necessary. It will also help to reduce other pollution, including phosphate losses and microbiological contamination of bathing waters.

5.3.3 RIPARIAN BUFFER ZONES IN GERMANY

Riparian buffer zones are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, biodiversity, and the influence they have on aquatic ecosystems. The zones are important natural biofilters, protecting aquatic environments from excessive sedimentation, polluted surface runoff (e.g. from agricultural fields) and erosion, and through subsurface or groundwater flow. Particularly the attenuation of nitrate or denitrification of the nitrates e.g. from fertilizers in buffer zones is important. The use of wetland riparian zones shows a particularly high rate of removal of nitrate entering a stream and thus has a place in agricultural management. Buffer zones also supply shelter and food for many aquatic animals and shade that is an important part of stream temperature regulation.

In order to counteract diffuse pollution, water legislation in many States in Germany therefore prescribes the preservation, facilitation and development of riparian buffer zones, usually around 5 to 10 m wide beyond river banks (e.g. § 50 Sächsisches Wassergesetz and § 68 b Wassergesetz Baden-Württemberg).

5.4 ECONOMICS - THE NEW APPROACH TO WATER MANAGEMENT

The WFD introduces economic principles and methods for the management of Europe's waters. Indeed, it is the first piece of EU water legislation to explicitly integrate economics into its measures. For many Member States the directive's use of economics has brought a new approach to water management.

The WFD introduces two economic principles. First, it calls on water users - such as industries, farmers and households - to pay for the full costs of the water services they receive. Second, the directive calls on Member States to use economic analysis in the management of their water resources and to assess both the cost-effectiveness and overall costs of alternatives when making key decisions.

One of the key innovations of the WFD is its call for water services - such as supplying clean drinking water, irrigation for agriculture, reservoirs for hydropower and wastewater treatment facilities - to be charged at a price which fully reflects the services provided.

Under the WFD the recovery of costs refers to several elements. The prices users pay for water should cover the operational and maintenance costs of its supply and treatment and the costs invested in infrastructure. The directive goes further and requires that prices paid by users also cover environmental and resource costs. This is a key step towards implementing the economic principle that polluters and users should pay for the natural resources they use and the damage they create.

Environmental costs include damage to ecosystems such as pollution that harms fish and wildlife in rivers. Extracting water for human causes repercussions such as reducing water levels in rivers and lakes and this may harm ecosystems. These costs do not appear on financial balance sheets, but they can be measured. When a water resource is partly or fully depleted and less water is available for other users the cost of that resource goes up. Recovering such resource costs is especially important in river basins where water is scarce. To implement these principles fully Member States need to consider all activities that use water resources. Recovering costs from only certain activities does not guarantee the sustainable use of water. Collective water systems and individual factories and farms that pump groundwater must pay in equal measure.

The WFD also states that water pricing should create incentives for the efficient use of water resources. If users pay the real costs of the water they use they will certainly waste less of it. This brings economic efficiency and reduces the financial burden on public authorities while improving the environment. Member States are introducing this approach. In the United Kingdom many households do not have water meters and payments for water consumption are not tied to the level of use. A 2008 government strategy for England foresees an increase in metering to promote more efficient water use, as a step to ensure sufficient water remains available in view of future population growth and climate change trends. In France, irrigators have to be equipped with water meters whenever they go beyond extraction thresholds. Between 2000 and 2003, the share of irrigators with equipment rose from 54% to 71%, representing 85% of the overall irrigated area. Portugal has increased water prices for agricultural and industrial users to tackle water scarcity.

As the above examples indicate, it is the role of Member States to implement cost recovery, which they can do with some leeway according to national conditions. For all Member States, putting cost recovery mechanisms in place starts with a good economic analysis of current water prices and of the pressures and impacts of each river basin. The 2005 reports submitted by Member States on the characteristics of their river basins revealed that many Member States did not provide complete economic information, especially in the areas of industrial and agricultural users and the resource and environmental costs of water services. Results show that in many Member States households pay for a large share of the costs needed to provide them with water. Most Member States still have significant work to do to introduce water pricing policies by the target date of 2010.

6 CONCLUSIONS

New Zealand is facing water quality and quantity issues, e.g. declining water quality, over-allocation of freshwater and groundwater resources, conflicting water uses, poor pricing of water supply and wastewater services etc. From a global point of view these water issues are nothing new or singular, but are identical or similar to those in many other countries, for example in Europe.

In 2000 the European Commission established an integrated framework for the protection of European inland surface waters, transitional waters, coastal waters and groundwater. The Water Framework Directive (WFD) sets the goal of achieving a "good status" for all of Europe's waters by 2015. The WFD is binding in its objectives but leaves freedom for policy decisions in the Member States. In principle it is designed to

- reduce pollution of water, especially by so-called 'priority' and 'priority hazardous' substances,
- promote the sustainable and economic use of water,
- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands and
- ensure progressive reduction of groundwater pollution.

This paper offers a brief insight into the milestone water legislation that emerged from an urge to tackle diverse water problems. The overview sketches the goals, general philosophy, main pillar stones, governance, process and timeframe of this legislation and describes certain aspects, e.g. the initial characterisation of the river basins and review of the environmental impact of human activity, the monitoring programmes (to classify the status of water bodies), the economic instruments and the River Basin Management Plans in more detail. Additional examples of how Europe is tackling water pollution from urban storm- and wastewater, and diffuse pollution from agriculture complement the overview.

The WFD has established the concept of integrated water management in Europe and introduced many new strategies (e.g. the holistic inter-disciplinary approach, the combined approach of water quality objectives and emission limit values, and the economic water management principles), but also challenges that need to be overcome in the process (e.g. the intercalibration to ensure the different national assessment systems achieve comparable results, and the participation of the public and all relevant stakeholders). The implementation of the WFD is well under way and has changed not only the water sector(s) in the 27 European Union member states and beyond, but also the mindsets of professionals and the public involved.

In view of New Zealand's urgent and diverse water resource challenges, an integrated "water perspective" also deems advisable. A holistic approach has, in principle, recently been acknowledged and announced with the 'New Start for Fresh Water' by the Environment and Agriculture Ministers.

The European example illustrates that it requires fundamental changes in legislation, codes of practice, best practise engineering, professional (tertiary) education and finally the mindsets of everybody involved to achieve a new sustainable direction in water management. A strong central government leadership is a prerequisite. It has also proven crucial to integrate all stakeholders, from polluters to water users, right from the start of the reform process. In the case of New Zealand, the integration of the agriculture, irrigation and forestry sectors will be indispensable. The new 'Primary Sector Water Partnership' represents an ideal stakeholder platform. The integration of Maori, a sound understanding of Maori interests and enhancement of the role of Maori in water management will also be essential for the success of the freshwater reform in New Zealand. The WFD has shown that cultural differences are no reason to impede challenging water management objectives.

The setting of binding objectives that are consistent throughout New Zealand, and an achievable timeframe are vital elements to measure freshwater reform success on the one hand, and for the process and associated risks to be transparent and calculable (e.g. for businesses) on the other. In Europe the overall goals of the WFD and the timeline are very ambitious. Until now, the timeline has proven to be attainable. However it seems unlikely that the overall goal, "good status" for all of Europe's waters, will be achieved by the end of the first management cycle in 2015. It will, most certainly, need to be resumed in the following six-yearly management cycle(s). The funding of measures is also a matter of debates as the first River Basin Management Plans are currently being finalized. It will be interesting to see (a) what measures the individual EU Member States will propose, and if and how they will make use of the available tools following the systematic socio-economic appraisal to react to insufficient affordability, and (b) if and how European funding mechanisms (e.g. linking financial support for farmers to compliance with environmental standards and best agricultural practices) will be adapted to achieve the WFD objectives.

In conclusion, the WFD represents a concept for integrated water management. Its strategies and approaches, and recent direct or indirect outcomes, such as the 'Codes for Good Agricultural Practice', are readily available and adaptable. They provide concepts and a good starting point to deal with water management issues. New Zealand requires smart and focused ideas and approaches; however it is not necessary to reinvent the wheel.

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