Volkmar Hartje and Axel Klaphake

Implementing the Ecosystem Approach for Freshwater Ecosystems – A case study on the Water Framework Directive of the European Union

Federal Agency for Nature Conservation

BfN-Skripten 183

2006

Implementing the Ecosystem Approach for Freshwater Ecosystems – A case study on the Water Framework Directive of the European Union

Volkmar Hartje
Axel Klaphake

BfN
Federal Agency for Nature Conservation

Cover photo: River Ahr near Ahrbrück (Photo: B. Engels, BfN

Authors's addresses:

Prof. Volkmar Hartje
Dr. Axel Klaphake
Berlin University of Technology
Department on Landscape Economics
Sekr. EB 4-2
Straße des 17.Juni 145
D-10623 Berlin

The study was realised in collaboration with Brit Zelinski

Scientific supervisor of BfN: Jutta Stadler
Federal Agency for Nature Conservation
Unit I 3.1 Biological Diversity
Island of Vilm
18581 Putbus, Germany

This publication is included in the literature database "*DNL-online*" (www.dnl-online.de)

BfN-Skripten are not available in book trade but can be downloaded in a pdf version from the internet at:. http://www.bfn.de/0502_skripten.html

Publisher: Bundesamt für Naturschutz (BfN)
Federal Agency for Nature Conservation
Konstantinstrasse 110
53179 Bonn, Germany
URL: http://www.bfn.de

Printed by the printing office of the Federal Ministry of Environment, Nature Conservation and Nuclear Safety.

Printed on 100% recycled paper.

Bonn, Germany 2006

Contents

List of Abbreviations

CBD	Convention on Biological Diversity
COP	Conference of Parties
EEA	European Environment Agency
EEB	European Environmental Bureau
EsA	Ecosystem Approach
EU	European Union
GIS	Geographical Information System
HMWB	Heavily Modified Water Bodies
IfGG	Institut für Gewässerforschung und Gewässerschutz
IMPRESS	Analysis of pressure and impacts (Guidance Document WFD)
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PoM	Programme of Measures
RBD	River Basin District
REFCOND	Reference conditions and ecological status class boundaries for inland surface waters (Guidance Document WFD)
SEA	Strategic Environmental Assessment
TRANSCOAST	Typology, reference conditions and classification systems for transitional and coastal waters (Guidance Document WFD)
WATECO	Economic analysis (Guidance Document WFD)
WFD	Water Framework Directive
WWF	World Wildlife Fund

1 Introduction and Main Research Questions

In the past, the use and management of the natural riverine environments in Europe has largely been of a sectoral character, which has not only resulted in an inefficient use of freshwater ecosystems, but also in a widespread transformation of riverine landscapes and the degradation of water and ecological quality and fluvial dynamics. However, the parallel, yet not interconnected, development of two integrated and ecosystem-oriented management approaches show the potential to constitute a new management and water policy framework to guide European water management in the direction of improved and more-integrated management practices in the years to come. These management approaches are the Ecosystem Approach (EsA) of the Convention on Biological Diversity (CBD) and the Water Framework Directive (WFD) of the European Union (EU).

The general objective of this report is to analyse the consideration of the Ecosystem Approach in the Water Framework Directive with an emphasis on the correspondences (and the potential discrepancies) on the conceptual level of both approaches. In particular, we want to discuss whether, and if so to what extent, the WFD can serve as an example for the application of the EsA in the area of freshwater ecosystem management in Europe. In addition, we attempt to identify opportunities for a mutual support and improvement of both concepts, as well as to identify chances to develop closer links between the EsA and the WFD in order to form a more comprehensive base for decision-making. Accordingly, our study can be seen as a contribution to the implementation of the recent decision of CBD VII/11 para. 9 (in particular 9 (a)) that explicitly calls for the analysis of existing tools and approaches in order to share experience and to identify gaps in the coverage of such tools.

Our methods for this discussion are:
an analysis of the text of WFD and the consideration of several non-binding guidance documents that were developed to facilitate and guide the implementation of the WFD in the EU member states; and a consideration of current tendencies in water management in the EU in order to roughly assess the potential ways of implementing the WFD in the member states. This information is particularly considered in the discussion of each of the 12 principles of the EsA and their consideration in the WFD.

Accordingly, the report is structured as follows. We start with a brief presentation of the Ecosystem Approach of the CBD and the main objectives of this management concept (chapter 2). This will be followed by some introductory remarks on the state of European freshwater ecosystems (chapter 3) and on policy-making and the history of water policy in the EU (chapter 4.1 and 4.2). Subsequently, the logical structure of the WFD and its main requirements will be presented (chapter 4.3). The following chapter 5 comprises a more detailed discussion of the consideration of each of the twelve principles of the EsA in the WFD. Chapter 6 will summarise our main results and draw conclusions for the development of a closer interconnection between both concepts.

2 Ecosystem Approach of the Convention on Biological Diversity

The Ecosystem Approach (EsA) of the Convention on Biological Diversity (CBD) is a strategy for management of land, water, and living resources that promotes conservation and sustainable use in an equitable way (see HARTJE et al. 2002; SMITH & MALTBY 2003). The Conference of Parties (COP) has adopted the EsA as a primary framework for action under the CBD. The COP 5 adopted the 12 principles (see box 1), including annotations to the rationale and five operational guidelines, in May 2000 in Nairobi. In 2002, the COP 6 (The Hague) assessed the development of further refinement of its principles (HARTJE et al. 2002). The seventh Conference of Parties in Kuala Lumpur in 2004 agreed on the implementation guidelines to each principle for refinement and elaboration of the EsA. The COP noted that the principles were not always precisely worded. Therefore, advice and elaboration to overcome the problems of clarity and interpretation were added. However, the EsA still has to be regarded as a general framework for holistic decision-making and action. The EsA includes ecosystem processes, functions, and interactions among organisms and their environment. It recognises that humans and cultural diversity are an integral component of ecosystems (MORTIMER 2004). Further, the ecosystem approach of the CBD involves a wide range of stakeholders at different scales of application (MALTBY 2003).

The 12 principles are the key elements of the ecosystem approach. The principles are perceived as being complementary to each other in an interactive context. The principles imply that objectives are a matter of societal choice (Principle 1), and recommend that management should be decentralized to the lowest appropriate level (Principle 2). Effects of activities on neighbouring ecosystems are to be considered (Principle 3). Ecosystems should be understood and managed in an economic context (Principle 4). However, conservation of ecosystem structures and functions is a priority target (Principle 5). Management needs to be carried out within limits of ecosystem functioning (Principle 6). Management must include consideration of the appropriate spatial and temporal scales (Principle 7), while objectives have to be set for the long-term (Principle 8). Furthermore, management must recognise that some changes are inevitable (Principle 9). The above objectives are the preconditions for an appropriate balance between conservation and use of biodiversity (Principle 10). To achieve these objectives it is necessary to consider all forms of relevant information (Principle 11) and involve all relevant sectors of society and scientific disciplines (Principle 12) (see MALTBY 2003, HARTJE et al. 2002). In this report, we will use the 12 principles to assess similarities and divergences between the EsA and the WFD.

Box 1: The 12 Principles of the Ecosystem Approach of the CBD

1. The objectives of management of land, water and living resources are a matter of societal choice.
2. Management should be decentralized to the lowest appropriate level.
3. Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.
4. Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

a) Reduce those market distortions that adversely affect biological diversity;
b) align incentives to promote biodiversity conservation and sustainable use;
c) internalise costs and benefits in the given ecosystem to the extent feasible.

5. Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
6. Ecosystems must be managed within the limits of their functioning.
7. The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.
8. Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.
9. Management must recognize that change is inevitable.
10. The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.
11. The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovation and practices.
12. The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Clearly, there is no single way to achieve the EsA for management of land, water, and living resources. It depends on local, regional, national, and global conditions (MORTIMER 2004). In order to address management issues in different social contexts, the principles have to be translated in a flexible manner. The EsA is a holistic concept including an integrated land use planning that seeks the appropriate balance between nature conservation and use of biodiversity (MALTBY 2003). This implies a “high degree of complexity in management” (HARTJE et al. 2002), which includes ecological, socio-economic, cultural, and political issues. The term ecosystem is generally used more as a construct of a complex system rather than a geographic entity (HARTJE et al. 2002). This term is not to be used in any particular spatial unit or scale and it should be determined by the frame of reference (see COP V/6 A para. 3).

In the context of freshwater management and the preservation of aquatic and water-dependent ecosystems, several coordination mechanisms with other international conventions and bodies were established, and the CBD adopted a specific programme of work (programme of work on the biological diversity of inland water ecosystems). In this policy area, the close cooperation with the Ramsar Convention appears particularly relevant (see KLAPHAKE et al. 2001). Both conventions have launched, inter alia, a so-called River Basin Initiative with the objective to stimulate the international diffusion of

innovative management approaches to freshwater ecosystem management. CBD's current programme of work on inland waters calls for the application of the EsA and underlines the necessity to reach integrated forms of management.

3 European Rivers

3.1 Description

The area of the enlarged European Union is a share of a relatively small continent, with mostly a temperate, humid climate and a long coastline. Although the EU is densely populated, it has a high proportion of agricultural areas. The rivers of the EU are numerous, yet relatively small and short (EEA 1994). The larger rivers are located in the central part of Europe reaching from the Vistula in the East, to the Rhone in the West. The larger rivers are mostly transboundary rivers with a high share of settlements along their banks. The countries with a long coastline in relation to size of area, e.g., Norway, the UK, Italy, and Greece, have large numbers of small rivers and concentrations of settlements along their coastlines.

3.2 Ecological Conditions

The river flows have an annual pattern following a seasonal pattern of precipitation and are regionally influenced by the thawing of snow and ice, resulting in a regionally typical flow regime, e.g., the Alpine flow regime or temperate lowland regime in Southern Europe. With extensive swamps, lakes, and forests, the natural fluctuation is attenuated naturally and by man-made structures. The rivers are intensively used for hydropower generation in the mountainous regions and for inland shipping and hydropower along the major rivers in the central lowlands from the Volga to the Rhone. As a result of the heavy physical modifications, inland fishing has become of minor importance compared to the end of the 19th century.

Water abstraction in the EU is, on average, relatively small in relation to total renewable resources, but there is considerable regional variation. Freshwater availability is low (i.e. below 5000 m^3/cap) not only in Mediterranean countries as in Spain or Greece which one would expect, but also in Western European countries, e.g., Belgium, the UK, and Germany, as well as in the Czech Republic and Poland (EEA 1999). Freshwater use is dominated by public water supply and industrial use. Agricultural use is important only in the Mediterranean countries, varying between 50 and 80%, whereas in the rest of Europe agriculture consumes less then 10% of water abstracted. In the most highly stressed countries, there are signs of groundwater overuse with groundwater tables declining and saltwater intrusion on coastal aquifers. Water abstractions continue to be high in the Mediterranean countries, while they declined slightly in Western Central Europe and considerably in the Eastern accession countries to the EU.

Groundwater pollution from nitrates is a major problem in Western Central Europe and pesticides in a broad range of countries (EEA 2003a). The nutrient and organic pollution of inland and coastal waters improved with heavy investment in wastewater treatment plants since the 1970s. Actual reductions occurred in Central and Eastern Europe, but there are still problems with non-point sources, particularly from agriculture. As a consequence, nutrient discharges into the seas changed with improvement of emissions from point sources into the North Sea and the Baltic, but little improvement in the Mediterranean and the Black Sea occurred. With respect to hazardous substances (heavy metals, pesticides, and other organic pollutants), there has been improvement in the Nordic and Western European countries with respect to mercury and cadmium. The sale of pesticides has been declining over the

last ten years, but the level of sales is still high in Western Europe, particularly the Netherlands (EEA 2003a).

Besides water pollution, European natural riverine environments in general – and wetlands in particular – came under heavy pressure. Today, almost all the larger rivers are to some degree regulated, and many rivers were even massively transformed in the context of industrialisation and infrastructure development in the past decades. The effects and the intensity of pressures depend on the type of wetlands (marshland, floodplains, etc.) and the human interventions, as well as on the population density in the respective areas (EEA 2003b). The long history of European settlement, permanent agriculture, and industrialization has changed the natural freshwater ecosystems of regions including the species of flora and fauna, which are an integral part of them. Because of the drainage of lowland areas for agriculture and urban development, wetlands were particularly threatened. In addition, the massive transformations of river systems for navigation, flood control, power generation, and water storage led to an impoverishment of river ecosystems, in particular as regards floodplain ecosystems. Some figures might serve as an illustration: In Greece, 60,000 ha of wetlands disappeared in the late 1940s and 1950s due to the construction of dams and drainage tunnels and a further 390,000 ha because of partial drainage. In France, the sites of 78 major wetlands were degraded more than 85% in the period from 1960 to 1990. Bulgaria had 200,000ha of wetlands at the beginning of the century and only 11,000ha have survived until today. However, many important wetlands were preserved and political attention to this topic has been increasing in the last years, even though many of the remaining wetlands are fragmented and much altered compared to the original conditions (JONES 1996). There are several river restoration projects in many European countries with the aim to regain hydrological dynamics and to remove constructions such as dams, channels, embankments, etc. However, the effects remain somewhat isolated and significant improvements have proven to be difficult to achieve, mainly due to economic, institutional, and political reasons.

4 European Water Framework Directive

4.1 Environmental Policy-making and Implementation in the European Union: Some Introductory Remarks

The competences of the European Union,[1] as well as the duties and the rights of the different European institutions, are laid down in the treaties of the EU. The founding treaties from the 1950s have been substantially reformed on several occasions. The latest amendment is the treaty of Nice that entered into force in 2003. Relevant implications of the different amendments for environmental policy-making explicitly empowered the EU to move into the environmental policy area with the Single European Act (1987), the increasing application of (qualified) majority decisions in the European Council (again enlarged with the treaty of Nice), the strengthening of the role of the European Parliament, and the emphasis on the subsidiarity principle (see Treaty of Maastricht, 1993). The subsidiarity principle underlines that member states should be given freedom to enforce EU environmental policy regulations through means that they prefer. While the EU clearly has gained importance in environmental policy-making in the last decades – in fact, the impact of the EU on a member state's domestic environmental policy is more than significant – there still are some particularities that are worth keeping in mind.

First, there are (legal and factual) limits of the decision-making power of the European Union relating to environmental policy in general and water management in particular. For instance, the EU is not in a position to precisely prescribe several implementation tools with the consequence that instruments such as water-related taxes, water charges, or land-use regulations can barely be regulated or harmonized throughout Europe. Binding decisions would still demand unanimity in the European Council. Consequently, the WFD (like all other EU directives) does not only reflect the state of expertise on water management and the respective national experiences, but also the imponderables stemming from complex European decision-making processes. In this context, it is also worth noting that the member states partly pursue very different regulatory approaches to environmental management in general and to water management in particular. For instance, there is a long-lasting and sharp debate on the issue of whether environmental legislation should regulate the sources of potential damages or focus on environmental quality. These contrasting approaches lead to different regulatory preferences and the EU environmental policy has suffered for a long time from somewhat inconsistent regulatory approaches (see chapter 4.2). Even though this controversy has somewhat softened in the last years, most of the EU directives – and the WFD is no exception – are still characterized by these different positions.

Second, all EU directives have to be transposed into national law and, furthermore, need a national or regional implementation on the ground. The transposition into national legal systems, by whatever national arrangement, is often a time-consuming and complex process. In this context, it is particularly important that the regulation style has somewhat changed in the last years with the effect that, mean-

[1] In the following, the term "European Union" (EU) will be used for reasons of simplicity, although in several cases the term "European Community" would be the correct term from a historical or legal perspective.

while, the EU environmental policy relies more on framework directives with the objective to better coordinate the 'regulation patchwork' in the different environmental policy fields (water, air, etc.) and to leave room for detailed regulations on the national level. In practice, however, the quality of national approaches to implementation varies a great deal between countries and from case to case. This is particularly true for the EU water policy regulations because non-compliance with a couple of water-related directives or delayed implementations were significant in the past. The consequences of these tendencies for our discussions are twofold. On the one hand, EU directives should generally not be equated with national law because the latter is generally more comprehensive and precise than EU directives, in particular regarding administrative procedures and the allocation of competences. On the other hand, one of the main striking features of EU environmental and nature protection policy is the widespread lack of implementation with the greatest shortfalls occurring in cases of those EU directives which demand huge investments, innovative administrative procedures, and/or new interactions of political and administrative actors (see KNILL 2003). In face of the challenging character of many requirements of the WFD (see below), the 'real' implications of the directive are not easy to predict, but implementation obstacles are to be expected.

4.2 Water Policy of the European Union and the Development of the WFD

In the past three decades, the water policy of the European Community had a core consisting mostly of regulations against urban and industrial pollution to protect human health and to harmonize national policies for competition reasons. These regulations consisted of two types of directives:

a. Directives regulating the ambient quality of waters according to the intended uses were mostly issued in the early phase of the Community's environmental policy: Drinking Water Abstraction Directive (75/440/EEC), Freshwater Fish Directive (78/659/EEC), Shellfish Waters (79/923/EEC), Groundwater Directive (80/68/EEC), Bathing Water (76/160/EEC), and Drinking Water (80/778/EEC).

b. An emissions based approach under the Dangerous Substances Directive (76/464/EEC) and a number of daughter directives for specific pollutants/ industries. The Dangerous Substances Directive was conceptualised as a framework directive with two lists of substances: List I for substances for which the EU must come up with emission limit values and List II for which the member states must develop their own reduction programmes. The EU managed to agree on 8 daughter directives for 18 substances (KALLIS & NIJKAMP 2000).

Yet, the general approach remained a matter of conflict among member states. A group of member states, e.g., the United Kingdom, favoured the ambient quality approach where the consensus has to be achieved on the European Community level and the resulting reduction obligation has to be developed on an individual or member country level. This was opposed by countries, e.g., Germany, committed to a uniform emission limit value approach based on the precautionary principle and the best available technologies. The conflict was resolved when a combined approach could be agreed upon. The role of emissions limits uniformly applied gained momentum when two major water pollution control directives were passed in 1991. The Urban Waste Water Treatment Directive (91/271/EEC) which sets limits for municipal treatment plants and the Nitrates Directive (91/676/EEC) which obliges the member states to introduce programmes of reduction for vulnerable zones that they have identified.

The coverage of the water directives has been patchy and their implementation record varies considerably. The Drinking and Bathing Water directives are considered successful because they gained public attention in the member states (KALLIS & NIJKAMP 2000). The Urban Waste Water Directive is considered effective as well despite the high costs of 150 bil. Euros estimated for 1993 to 2005 which it has imposed on urban residents, while the Nitrate Directive with a more complex structure of instruments and implementation is regarded as being poorly effective.

The debate about sustainability in the early nineties and the limited success of the EU water policy, including the results of the Dobris Assessment on the European Environment in 1992 (EEA 1995), gave way to review of the whole approach of water management in the mid-nineties. It started with a proposal of the Commission in 1993 to introduce a directive about the ecological quality of surface waters (COM (93) 680), but this proposal was not pursued further. Instead, the Commission presented a communication to Council and Parliament in 1996 (COM (96) 59) that contained an analysis of the existing directives and developed the basic structure of a water framework directive. It already had the main elements of the WFD: broader goals, the integration of all water types, the integration of water quality and quantity, the organization on a river basin basis, transparency, and public participation. In addition, it included practical improvements: consolidation of the existing quality-oriented directives, and less reporting, yet more effective monitoring. In 1997, the Commission presented its proposal for the WFD (COM (97) 49) as an input into the European Community decision-making procedure with the Council members trying to avoid additional specific environmental standards and the Parliament trying to make the directive stricter. It took four years to negotiate the final text of the framework directive, which differs from the original Commission proposal by granting more time and more lenient exceptions to the member states in implementing the directive, and by leaving the administrative set-up to the member states instead of having river basin organisations as a standard and obligatory solution. The Community obligation to provide a risk assessment for hazardous substances with the aim of a progressive reduction was introduced, but for the WFD no agreement on those substances to be included could be reached.

4.3 Structure, Objectives, and Instruments of the Water Framework Directive

As the name indicates, the Water Framework Directive of the European Union issued in October 2000 is a directive which establishes a framework for Community action in the field of water policy, in particular for the management and use of freshwater and coastal water ecosystems and for those terrestrial ecosystems directly dependent on aquatic ecosystems in the member countries within the European Community. The previous water related directives of the European Union, which were specific with respect to pollutants, protected water use. In setting either ambient water quality or source specific emission standards, the WFD defines the objectives for the protection and sustainable use of all the water ecosystems in a holistic manner. It sets a timetable to achieve the goals, and provides a framework for the implementation in terms of organization and instruments. The overall objective is to achieve good ecological and chemical status of surface water and good quantitative and chemical status of groundwater. For those waters currently not achieving the good status, a river basin plan and

a program of measures have to be developed to achieve this objective by 2015. Furthermore, the deterioration of those water bodies currently having good or better status has to be prevented.

4.3.1 The protection objective

The novelty of the protection objective is that it is based on ecological criteria, i.e. the requirements of fauna and flora concerning their aquatic habitat, and no longer on certain human uses, e. g., for bathing or drinking water, as in previous directives. The directive requires good status for surface water in terms of ecological and chemical status and regulates the process of defining these criteria which are referred to as a very good ecological quality. The categories of water bodies (rivers, lakes, estuaries, and coastal) are classified into types according to their geological, geographical, and hydrological characteristics and then described in their natural state, i.e. without anthropogenic degradation. As a high portion of the European water bodies does not reach that high ecological quality, the objective of the WFD is then to achieve good ecological quality (the second in a five category classification system) within 15 years after the WFD entered into force, i.e. in 2015. The ecological status is evaluated by biological and hydro-morphological criteria. The management of this process is required to take place in the member countries on a river basin basis.

For chemical status, a three-tiered procedure is incorporated:
(a) Priority hazardous substances (Art. 16 (2)) have been identified by the EU in 2001 (first list of 33 substances) and they have been added as Appendix X to the WFD, for which zero emissions are targeted for 2020 to protect ocean waters;
(b) For a number of priority substances (Art. 16 (7)), which are discharged in significant amounts, the Commission will identify a list of priority substances and propose ambient quality objectives, based on the protection of aquatic communities and human health; and
(c) For the remaining substances, member states set ambient quality standards according to a procedure set in Annex V (1.2.6), based on aquatic ecotoxicity.
If the assessment of the ecological and chemical status of a water body leads to the conclusion that it does not achieve good status, the member states have time until 2009 to start a set of activities and combine them to an action programme in order to achieve good status by 2015.

In Art 4 (3) an exception from the above formulated EU-wide objectives has been made for the category of artificial water bodies (channels, surface mining lakes, as defined in Art 2 (8)) and heavily modified water bodies (as defined in Art 2 (9)). While there is a consensus that there are no natural reference conditions for artificial water bodies, the implications of the exceptions for the heavily modified water bodies (HMWB) from the overall objective of the WFD are seen with suspicion. The designation of HMWB is possible if the achievement of good status would require hydro-morphological changes which would have significant adverse effects on human water uses such as navigation, power generation, storage for irrigation, flood protection, and land drainage (Art 4 (3a)), or the beneficial effects of the modification cannot be achieved by other means technologically feasible, at reasonable costs, or with better environmental effects (Art 4 (3b)). All these conditions have to be met and the associated processes of screening and assessing have to be standardized in a guidance docu-

ment. If they are all met, an alternative set of objectives has to be defined in the form of a Maximum Ecological Potential based on a comparison with the closest surface water body and in consideration of all feasible mitigation measures. The Maximum Ecological Potential is then used to derive the Good Ecological Potential, which will be used as the objective to achieve for these water bodies by 2015. An exception relates mostly to physical alterations of rivers such as dams, locks, dredging, and bank fixation. The mitigation measures consist of low cost measures which do not require changing the basic alteration e.g., dam removal, but do require changes in water quality discharges.

For groundwater, the WFD establishes a ban on further deterioration and aims to ensure good status as well. “Good Status” is defined in quantitative terms as achieving a balance between abstraction and recharge and in terms of groundwater quality. For defining the quantity dimension also the status of terrestrial ecosystems which depend directly on the groundwater body has to be considered (Annex V No. 2.1.2). The quality dimension is defined by the chemical status of the groundwater, by introducing ambient quality objectives, and by obliging the member states to reverse trends in groundwater pollution. There are only a few EU-wide ambient standards in force (nitrates, pesticides) in separate directives; consequently, there is a lack of standards for the remaining pollutants and there is no regulation in the WFD for lack of a consensus. The WFD in Art 17 (2) requires the Commission to develop a proposal for a separate directive to deal with the remaining ambient standards and the criteria to define the starting point for trend reversals in groundwater pollution. The Commission published a proposal in 2003 (COM (2003) 550 final) which will leave the process of identifying the pollutants and of defining the specific standards up to the member states for the bodies of groundwater at risk.

4.3.2 Sustainable use

The use of water and of water bodies is covered in a variety of ways without explicitly referring to sustainability. However, sustainability is strongly implied.
The WFD is most definitive about the sustainable use of groundwater, as sustainable use requires the balance between abstractions and recharges in order to attain good status for groundwater (Art 4 (1bii)). This objective is measured against variations in the groundwater level and the direction of water flow to detect the inflow of saltwater.
There are no explicit objectives concerning abstractions from surface water bodies, but the requirements for the protection of freshwater habitats imply that minimum water flows are protected and total abstractions remain below that level. A similar argument can be made for those discharges into freshwater that will still be allowed after the protection objectives have been followed (nutrients, heat, etc.) and are not subject to zero emissions goals.

An indirect reference to the sustainability of use is made by the requirements of cost recovery for water services (Art 9 (1)), including the environmental and resource-based costs. In the economic aspect, the main focus is on the recovery of financial costs for infrastructure that provides drinking and irrigation water and sewage collection and treatment, because there are a number of regions in Europe where the recovery of these costs from the user deviates from the polluter (user) pays principle. A higher recovery is expected to lead to a corresponding adjustment of water consumption and waste-

water discharge. This can be considered as the application of conventional well-established economic reasoning. More innovative is the intention of the WFD to apply this principle to a wider range of water and river uses, called water services in the directive. In Art 2 (38) they include not only water abstraction, treatment, and discharge, but also storage and impoundment as well. The advising "Working Group Economics" has specified this as including hydropower and use of water bodies for shipping. The cost recovery principle is established in a relatively soft manner. The WFD requires that until 2010 the member states oblige the main water using sectors (agriculture, industry, and public water supply) to contribute their adequate share to the costs of water services which is less than a full cost recovery, taking into account the social, ecological, and economic implications of the principle. It is established in a relatively wide manner as it mentions environmental and resource costs as part of the general principle of cost recovery in Art 9 (1), but this principle is subject to the same relatively soft implementation requirements.

4.3.3 Common Implementation strategy

The WFD as a framework directive leaves considerable space for decisions to be made by the member states. The process of organising the water management on a river basin basis is basically left to the member states. Only the milestones of the planning process are specified, but here the basic principles of integration, of public participation, the application of the polluter-pays principle, the objective of good status, and the use of economic analysis are laid down. The member states have to transform the directive into national law, designate the River Basin Districts (RBDs), and ensure that they meet the deadlines. To ensure a comparable level of implementation they have to adhere to the Common Implementation Strategy of the Commission and cooperate with each other in the international RBDs.

Because the WFD leaves considerable autonomy to the member states with respect to a number of topics in implementation which are technical in nature, the Commission and the member states (plus Norway) decided to devise a common strategy for the implementation of the WFD. The strategy consists of the creation of an expert network, the common sharing of information, as well as the development of guidance documents and their testing in pilot river basins (EUROPEAN COMMUNITIES 2001a). The most important output has been the common development of the guidance documents that focused to a large extent on the interface of scientific and regulatory issues:

No 1: Economics and the environment (WATECO) (see references),

No 2: Identification of Water Bodies (Water Bodies) (see references),

No 3: Analysis of pressures and impacts (IMPRESS) (see references),

No 4: Identification and designation of Heavily Modified and Artificial Water Bodies (HMBW) (see references),

No 5: Transitional and coastal waters - Typology, reference conditions and classifications systems (COAST) (see references),

No 6: Establishment of the Intercalibration Network and the Process on the Intercalibration Exercise (Intercalibration) (see references),

No 7: Monitoring under the Water Framework Directive (Monitoring) (see references),

No 8: Public Participation in Relation to the Water Framework Directive (Public Participation) (see references),
No 9: Implementing the GIS Elements (GIS) (see references),
No 10: Rivers and Lakes – Typology, Reference Conditions and Classification Systems (REFCOND) (see references),
No 11: Planning Process (see references),
Technical Report No 1: Statistical aspects of the identification of groundwater pollution trends, and aggregation of monitoring results (see references),
Wetlands Horizontal Guidance: Horizontal Guidance Document on the Role of Wetlands in the Water Framework Directive (see references).
After these guidance documents were completed and accepted by the water directors of the member states[2], these documents and the efforts of the member states to use them were put into a testing exchange. One important area relates to the definition of good ecological status. In this regard, developing a comparable classification of water bodies and of their classification with respect to ecological status resulted in the establishment of a network of sites to assess the comparability of the national classification systems and the performance of a meta-analysis of the results on a community wide basis. A similar effort goes into the exchange about and testing of the methodologies for integrated river basin management.

4.3.4 Implementation by the member states

As the WFD went into force in October 2000, the then 15 member states had to transpose it into national legislation by the end of 2003 (Art 24). The new acceding states had to achieve this goal by May 2004, their date of membership. Not all member states have achieved this goal. An EEB survey in May 2004 found that in 10 of the 25 current member states, the WFD has been transposed into national law (WWF & EEB 2004). In September 2004, the European Commission established its WFD scoreboard, which showed that 15 member states had fulfilled their obligation to the satisfaction of the Commission, and five countries had not submitted information[3].

At the same time, the member countries had to identify the river basins within their territories and assign them to individual River Basin Districts (RBD) (Art 3 (1)) and to identify appropriate competent authorities (Art 3 (2)).

The WFD establishes the river basin as the regional basis for the definition of the objectives and as a basis for the action plans to achieve the objectives. As this basis does not exist in all member countries (only a few countries have river basin management agencies), the WFD has to establish a process for defining water bodies and river basins in order to form River Basin Districts. While, the water bodies are geographic areas that are defined hydrologically (rivers, lakes, aquifers, and artificial, transitional and coastal waters) and for reporting purposes (differences in ecological quality), the RBD is

[2] The documents are legally non-binding, but in case of a dispute, they will influence the decision the European Court might take (KNOPP 2003).
[3] See recent public publishing at: http://europa.eu.int/comm/environment/water/water-framework/scoreboard.html

the legal management unit for a set of water bodies. A river basin includes not only rivers and lakes but also aquifers, and artificial, transitional, and coastal waters. A River Basin District consists of these river basins (one or more), which are not only made up of the hydrological system, but also of the land and sea (Art 2 (15))[4]. In member states with long coast lines, usually relatively short rivers exist and more than one river basin will belong to a RBD (e.g., Sweden, Italy, and Greece), whereas other countries with short coastlines and sizable country areas will usually have one River Basin District for one basin (e.g., Germany, France, and Poland). This is explicitly formulated as guidance in Art 3 (1).

The member states designate administrative units, which are responsible for the functions assigned to the RBD in the WFD, and ensure appropriate coordination for the organizations (national or subnational) contributing to the adequate fulfilment of the RBD functions. The RBDs have responsibilities for the aquifers in river basins and for the coastal waters as well. Groundwaters have to be identified and assigned to the nearest and most appropriated RBD, an explicit classification of the delimitations is not required (Art 3 (1). The coastal waters are defined as all waters landward from a line 1 nm seaward of the baseline (Art 2 (7)).

Because of the geography of the EU and its member states, a number of river basins are international and in these cases, the WFD requires the member states to establish an international RBD (Art 3 (3)). In a case in which the international river basin is shared with non-member states, the EU member states concerned “shall endeavour to establish appropriate coordination with the relevant non-Member States”. The aim is the achievement of the objectives of the WFD throughout the RBD (Art 3 (5)). Thus, the WFD covers the area of the EU member countries including the countries that acceded in May 2004. It has an influence on river basin management of transboundary rivers, which have a share of their basin inside and outside the EU territory, as is the case for the Danube and the Baltic and Finnish International RBDs[5]. The member states have to provide a list of their competent authorities and of the competent authorities of international bodies in which they participate by June 2004 (Art 3 (8)). The WFD Scorecard of the Commission shows that by September 2004, 12 member countries had submitted the required information.

4.3.5 Functions of the River Basin Districts

The RBD will perform a number of functions to implement the requirements of the WFD on the river basin level for which the directive has a set of deadlines. The member states are required to ensure that the designated authorities will perform these functions. In Germany, the existing water management Laender ministries and agencies responsible for water management have been assigned specific tasks by the Laender. Public law agreements about cooperation among the Laender have been signed by the Laender to aggregate the results of every step from the Laender level up to the RBD level. The functions basically conform to the standard progress of steps in any planning process (guidance document No 11). The following table relates the steps to the deadlines and articles of the WFD:

---

4 The objectives and the instruments of the WFD, however, are set basically for the hydrological system.

5 In case of a Turkish membership, a number of additional river basins would have to be added.

Table 1: Steps and deadlines of the Water Framework Directive

Year	Action	Art WFD, guidance document
2004	Analysis of current situation: Analysis of natural characteristics, pressures, and human impacts Economic analysis of water use Register of areas needing special protection	 Art 5 (1), Annex II *2.1 IMPRESS; 2.2. HMWB;* 2.4 COAST; 2.3 REFCOND 2.6. WATECO Art 6
2006	Operational water monitoring programmes Publication of work plan for management plan	Art 8, Annex II 1.3; 2.2 (2.7 Monitoring) Art 14 (1a)
2008	Draft of management plan Basic measures Complementary measures	Art 11 (2), (3) Annex VII 2.6 WATECO
2008	Public consultation	Art 14 (1c) 2.9 Public Participation
2009	Designation of HMWB Finalise plan	Art 4 (3c) Art 13, Annex VII
2009-2015	Implement programme of measures	Art 11, Annex VI Annex III, b
2010	Water pricing in place; Reporting in management plans	Art 9 (2) 2.6 WATECO
2015	Achieve good status	

With the relatively tight schedule, the WFD creates enormous pressure within the water management agencies to assemble all the necessary data, to make them useful for the objectives, and prepare them for further analysis, planning, monitoring, and reporting.

The first steps on a RBD basis to be completed by December 2004 can be summarised as the assessment of the status quo as required by Art 5 and 6 and specified in Annex II, of which a summary then should be reported to the European Commission (Art 15 (2)):

General description of the RBD and the reference conditions for the surface waters,

Identification of significant pressures,

Assessment of their impact,

Economic analysis of water use, and

Register of protected areas.

For every single step, a guidance document has been developed (guidance document No. 2, 10, 5 and one for wetlands later on). The water bodies have to be characterised according to eco-region types including reference conditions according to chemical and hydro-morphological characteristics. It may include a provisional identification of heavily modified water bodies. The current and foreseen anthropogenic pressures have to be identified and their impacts on environmental quality have to be

assessed. This implies that their influence has to be predicted and the risk of the water bodies failing to meet their environmental status objectives assessed. If the answer to the risk assessment is uncertain, then in 2005 to 2006 a monitoring phase is required (Art 8 and Annex II).

The register of protected areas under Art 6 does not provide the power to designate protected areas, but it requires the RBD to summarise areas already protected under separate directives. There are five categories of protected areas, four of which are protected under water specific directives (Nitrates Directive, Bathing Water Directive, Shellfish Waters Directive, and Surface Water Abstraction Directive). Nature protection areas are designated under the Birds Directive and the Habitats Directive if the status of water is important for their protection (Annex IV). Besides the listing of the purposes in Art 1 and the definition of the quantitative status of groundwater in Annex V No. 2.1.2, this is the place where the WFD mentions wetlands.

The last component of the analysis of the status quo is the economic analysis of water uses, which is characterised as the first milestone for the economic analysis. Here, the importance of water and water use for the economy is to be assessed, the development of the economy as a basis for future pressures is to be analysed, and the current level of cost recovery is to be estimated as well (Annex III).

The second phase has only the deadline for the monitoring to be operational in 2006 as required by Art 8 and Annex V. The Annex distinguishes between surveillance and operational monitoring. The latter is required to establish the status of those water bodies at risk of failing to meet their environmental objective. In some cases, the member states may also need to establish programmes of investigative monitoring, e.g., where the reason for any exceedances of the environmental objectives are unknown or where a risk of failing the environmental objectives is indicated but an operational monitoring has not already been established. Combined with the setting up of the environmental objective, for which there is no explicit deadline, the monitoring serves as the basis for the next step of developing the Programme of Measures.

The core instruments of the WFD are the Programme of Measures (PoM) according to Art 11 and the River Basin Management Plans (RBM plans) according to Art 13. The RBM Plan as the final output is conceptualised as a summary of all the planning activities: description of the status, significant pressures and impact of human activities on the status, a list of the objectives, a summary of the programme of measures, a register of detailed programmes and management plans for sub-basins, and a summary of the public information and consultation activities (Annex VII). Because this plan has to be reported to the Commission in five years, the description of its content is still rather general. The text of Art 11 and Annex VI are the only available documents produced so far, and indirectly guidance document No 1 WATECO is of relevance. In Art 11, the PoM is divided into basic measures, required as a minimum (Art 11 (3)), and supplementary measures, required if the basic measures do not suffice to achieve the objectives (Art 11 (4)). The first element of the basic measures is the implementation of Community legislation for the protection of water, which will continue to remain in force. Eleven direc-

tives are listed in Annex VI, of which five have direct relevance for water quality by setting emissions or ambient water quality standards: Bathing Water from 1976, Drinking Water from 1980, Sewage Sludge from 1986, Urban Wastewater Treatment from 1991, and the Nitrates Directive from 1991. As these directives have already been in force for quite a period, the PoM of the WFD thus serves as a mechanism to enforce their implementation. The reviews of the European Commission on the implementation of the two major directives (Nitrates and Urban Wastewater Treatment) showed considerable deficits. The designation of vulnerable zones by the member states was mostly more restrictive than assessed by the Commission. The installation of treatment plants – with considerable variation - remained behind the directive's obligations (Com (2004) 248). Similar results were reported for the action programmes of the Nitrates directive (Report COM. (2002) 407).

The next set of measures concerns the control over abstractions and discharges (Art 11 (3e, f, and g)). The WFD asks for a register of abstraction of freshwater, artificial recharges of groundwater, and point pollution discharges as well as their prior authorisation and a periodical review. Exemptions are allowed based on risk evaluations.

In addition, the PoM should include those measures, which ensure the recovery of costs for water services including environmental and resource costs as required by Art 9. Costs of water services include the treatment and delivery of freshwater, and the collection, treatment, and disposal of wastewater. This applies to use by private household, commercial, and agricultural users. Implied – not explicitly stated in the WFD- is that the prices should be linked to the water quantity used and/or the pollution produced to provide an incentive structure to the user. In a note to the European Parliament, the Commission defined the various cost categories: financial, environmental, and resource costs (Com (2000) 477), but the WFD remains rather vague concerning the degree of cost recovery and whether differences for the three categories are allowed. The guidance document on economic analysis is helpful in providing an overview of the use of economics and in the assessment of the current levels of cost recovery to be reported by the end of 2004.

If all of these measures combined are not sufficient to achieve the good quality as required, then additional supplementary measures have to be developed, nationally or on a river basin level. The WFD provides only a provisional list in part B of Annex VI, but in part B of Annex III (Economic Analysis), it states that these measures are to be selected based on cost effectiveness criteria. Major shortfalls are expected in meeting the goals for chemical status of surface and groundwater because of pollution from non-point sources (mostly from agriculture). The existing programmes of member states that deal with the nitrates directive (e.g., to support changes in agricultural practices, cropping pattern, vegetation cover, and type of agricultural land use) will have to be modified and expanded. The trends towards converting wetlands will have to be stopped and wetlands will have to be restored. To deal with deficiencies in ecological status, a number of water bodies will have to be changed towards a more natural state, by recreating wetlands, natural morphological conditions, by building more fish ladders, by removing barriers and a number of similar measures as well. The list of these measures will depend on the economic tests of designating HMWB, the cost effectiveness of the whole programme,

and on the derogation test of Art 4 (4) and (5) based on the assessment of the disproportionateness of the associated costs. The final programme of measures will depend on a number of calculations (economic tests) to be taken between 2005 and 2009, for which the results are far from being predictable.

The management process is rather complex in those member countries that have to reorganise their water management administration. These member countries do not have an administrative structure with river basins as the major organising principle. The need for cooperation among federal units is exacerbated in federally structured countries (e.g., Germany). Another change required in most member countries is the need to involve nature protection agencies via the requirement to protect wetlands and to include protected areas with nature protection objectives in the analysis of the current situation.

In addition, the WFD requires that the decision-making process in the implementation phase is characterised by active involvement of all interested parties (Art 14 (1)). It focuses on the river basin management plan and thus on the River Basin District, and not on the objectives and instruments of the WFD itself. Article 14 distinguishes three levels of participation in terms of the binding character: 'information', 'consultation', and 'active involvement'. Member states have to ensure consultation and access to background information, but only have to encourage active involvement. In addition, the WFD distinguishes between 'interested parties' and the wider 'public' in the sense that information and consultation are prescribed for both categories, whereas active involvement only for interested parties. The obligation is most specific for the information level. The member states have to complete the following in three phases: First, a timetable and work programme for the production of the RBM plan, including a statement of the consultation measures to be taken, have to be published and made available for comments to the public, including users. Then, there is an interim overview of the significant water management issues identified in the river basin that also has to be published. Finally, the member states are required to publish and make available for comments the draft copies of the RBM plan, at least one year before the beginning of the period to which the RBM plan refers. Access shall be given to background information for the draft, upon request. For the next level of participation and consultation, the WFD requires that the documents listed above are made available for comments and that the authorities shall allow six months to submit comments in writing. Other forms of consultation, e.g., hearing and public fora, are not required, but they are not excluded. The organisation of these levels of participation is up to the member countries. As these steps are tied to the implementation schedule of the WFD, there is a timetable for consultation, which starts in the middle phase of the overall schedule:

Table 2: Timetable for consultation (Article 14 of the WFD)

Time frame	Requirements / Consultation steps
December 2006	Timetable and work programme for the production of the plan, including a statement of the consultation measures to be taken
July 2007	Comments in writing
December 2007	Interim overview of the significant water management issues identified in the river basin
July 2008	Comments in writing

December 2008	Draft copies of the river basin management plan available
July 2009	Comments in writing
December 2009	Start implementation of the plan

Source: EUROPEAN COMMISSION (2003h)

On the third level, the WFD obliges the member countries to encourage the active involvement of all interested parties, but does not elaborate this point further in the article. In Annex VII, describing the content of the river basin management plans, a section specifies that a summary of the public information and consultation measures taken, their results and changes made to the plan as a consequence is to be included. As the plan is to be reported to the Commission (Art 15 (1)), the WFD provides for transparency about public participation to the Commission. The guidance document on public participation defines as the core of active involvement that "interested parties participate actively in the planning process by discussing issues and contributing to their solution" (EUROPEAN COMMUNITIES 2003h, p.13). These activities are likely to play a role in the early phases of the implementation process. Further forms of participation – shared decision-making and self-determination- are not required by the WFD, but are classified as best practice in the guidance document. It refers to a number of examples in member countries which can be considered as best practice.

The River Basin Management plans have to be decided upon and published in 2009. The PoM has to be established in the same year and made operational three years later in 2012 (Art 11 (7)). By 2010, the member states ensure that the pricing policies are in place to contribute to the environmental objectives of the WFD. They decide whether they are applicable for all or individual river basins. The relevant planned measures will be reported within the PoM (Art 11 (3b)) in 2009.
There is a period of three to five years, during which the measures are expected to work based on the appropriate administrative arrangements in each RBD to achieve good ecological status for the water bodies. Then, all of these activities have to be reviewed in 2015 and repeated every six years thereafter (Art 5 (2), 11 (7), and Art 13 (7)).

5 Consideration of the 12 Principles of the Ecosystem Approach in the European Water Framework Directive

In the following section, the consideration of each of the twelve principles of the Ecosystem Approach in the WFD will be discussed in detail. The discussion is largely based on the text of the WFD; in addition we consider several guidance documents mentioned above. Furthermore and to the extent possible, a rough assessment of the national implementation prerequisites are given in order to derive tendencies concerning the expectable effects of the directive on the ground.

In order to facilitate the interpretation of this chapter, it is useful to indicate some general differences between the CBD's Ecosystem Approach on the one hand, and the EU Water Framework Directive on the other. While both concepts relate to the governance and management of natural resources, the potential application area of the EsA is much broader because it relates to all kinds of ecosystems. It is a worldwide concept under the umbrella of a global convention, and it is intended to develop basic management principles for all management levels (from the local to the global level). Consequently, the wording of the EsA – in spite of some recent clarifications –has to be rather unspecific and is not meant to lay out concrete objectives to be achieved by the parties. Therefore, we encounter the problem that the EsA allows a number of different interpretations and the twelve principles are not accompanied by a set of assessment or 'consideration' criteria. Consequently, a precise assessment of the extent of consideration of a specific principle does not appear feasible. Therefore, our 'consideration rankings' must remain on the level of general evaluations and the identification of tendencies.

On the other hand, the WFD shows several particularities stemming from the fact that the directive is a legal piece of the European Union and should not be equated with national law (see chapter 3.1). For our discussion, it is particularly important to note that the implementation of the directive is still in a very early stage and, more generally, the effectiveness of all EU directives arises from the interaction of the European law with national regulations and institutions. Insofar, our discussion clearly shows a preliminary character because the effects of the directive on the implementation level are not yet fully predictable.

5.1 Principle 1

The objectives of management of land, water and living resources are a matter of societal choice

Rationale:
Different sectors of society view ecosystems in terms of their own economic, cultural and society needs. Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and for the tangible or intangible benefits for humans, in a fair and equitable way.

As a general rule, water administration in most EU member states traditionally holds considerable influence regarding both the targets and the way water management is carried out, whereas the immediate influence of society on management decisions is comparatively low. However, there is a huge variety of institutional approaches to water management within the borders of the European Union: several member states already show a systematic and formal participation of stakeholders via water parliaments on the level of river basins (e.g., France) whereas in other countries (e.g., Germany and the Netherlands) the direct involvement of stakeholders is rather the exception than the norm and, if at all, more common on the local level and/or restricted to selected management tasks. Against this background, it is important to consider that the WFD explicitly calls for public participation in river basin management and the directive will thus potentially demand new procedural approaches to the integration of the public and stakeholders in the decision making process, at least in those member states whose water laws and practice do not – or only very limitedly – provide for similar regulations.

The phrase “public participation” does not appear explicitly in the WFD. However, it requires public participation as an integral element of the river basin planning and management process. Preamble WFD para. 14 acknowledges that the implementation success of the directive relies, inter alia, “…on information, consultation and involvement of the public, including users”. The specific norm addressing the role of “societal choice“ in the water planning process is Art 14 of the WFD, which specifies the requirements relating to the involvement of the general public and the relevant stakeholders (see below). However, it is worth mentioning that the public participation requirements of the WFD should not be interpreted as an isolated norm, but rather in the context of relevant international conventions and complementary European directives.
In this context, the Aarhus Convention[6] is the most relevant piece of international law because Art 14 of the WFD is – albeit not explicitly mentioned in the directive – the legislative implementation of this convention in respect to the interface between water management and environment protection in EU

[6] The ‘UN-ECE (United Nations Economic Commission for Europe) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters’ was adopted on June 25, 1998 in the Danish city of Aarhus and entered into force on October 30, 2001.

legislation.[7] Aside from the Aarhus Convention, the European Directive on Strategic Environmental Assessment (SEA Directive, 2001/42/EC) complements the WFD as regards public participation in the planning procedure.[8] In particular, a strong interaction of the WFD and the SEA Directive on the implementation level is expectable because the Programme of Measures will also fall under the regime of the SEA Directive. The Programme of Measures is to be implemented by the member states according to Article 11 WFD in order to achieve the environmental objectives of the directive.[9]

In Article 14 WFD 'Information' is understood to mean access to background information that is used for the development of the draft river basin management plans (required by Art 13 of the WFD). It is an open question whether the WFD's provision for 'information' should already be classified as 'participation' because information can be provided by means of press releases, brochures, etc. Yet, these means are a one-way communication flow because people do not have the opportunity to express their opinion (see KERKHOF & HUITEMA 2003).

Article 14 of the WFD calls for 'consultation' in relation to the three key steps of the planning process (see table 2). In the context of the WFD, consultation aims at "learning from comments, perceptions, experiences, and ideas of stakeholders" (European Communities 2003h). Article 14 WFD explicitly mentions written consultation as a minimum standard for implementation, but member states could – and probably should – consider oral or active consultation (e.g., workshops and forums) in addition.

According to Annex VII the river basin management plans under the rules of the directive should cover "a summary of the public information and consultation measures taken, their results and the changes to the plan made as a consequence." Therefore, the competent authorities in the member states have to report and publish the results of their respective activities.
In contrast to mere information and consultation, active involvement implies that stakeholders are invited to contribute actively to the planning process by discussing issues and contributing to the development of solutions. Clearly, active involvement is much more in line with the spirit of Principle 1 of the EsA than a participation strategy strictly limited to 'information' or 'consultation' only. According to Art 14 (1), member states "shall encourage the active involvement of all interested parties in the implementation of this Directive, in particular in the production, review and updating of the river basin management plans." Therefore, the encouragement of active involvement is explicitly contemplated for, but not limited to, the whole planning cycle regarding the river basin management plans. The notion "shall encourage" can be judged as a rather weak and unspecified wording. Although it leaves much room for different interpretations and styles of implementation in the member states, active involvement is not a mere voluntary exercise. Member states have to report their respective activities. Furthermore,

7 The Aarhus Convention grants the public rights and imposes on parties and the public authorities obligations regarding access to information, public participation and access to justice.

8 The SEA Directive is to be implemented by all member states by July 2004 and requires public participation to accompanying the process of the environmental assessment for certain plans, programs, and policies.

9 There are further legal tools that implement the Aarhus convention, e.g., the EU directive on public access to environmental information (2003/4 – OJ L 41 14.02.2003) or the new EU directive providing for public participation in respect to the creation of certain plans and programmes relating to the environment (2003/35 OJ L 156, 25.06.2003)

some commentators expressed the opinion that the need to gain support from various actors for water protection measures required by the WFD will make some forms of active involvement in the planning process unavoidable regardless of the weak wording of Art 14 (see MOSS 2001).

There are no legally binding documents that specify the requirements of Art 14 of the WFD, but the present guidance document on public participation provides some indications and points out broad principles of "why, what, who and how" stakeholders should be involved (see European Communities 2003h). In addition, several member states did (or intend to) develop their own national guidelines on the procedural requirements with the objective to facilitate and harmonise implementation. However, a few open questions remain on the implementation level: which groups are 'interested parties' (respective stakeholders in the sense of the guidance document)[10], what are the effects of the different geographical scales (local, regional, national, and transboundary) in the design of participation procedures, how should the active involvement be shaped, which competences should eventually be transferred directly to user groups, etc. In particular, the 'problem of scale' for the organisation of participation procedures is far from being fully solved and experience in large-scale or even transboundary participation in Europe is scarce.[11] However, context specific approaches in the member states are expectable. These approaches are largely dependent on the respective public participation traditions and administrative styles.

Generally, the implementation of the Art 14 is a highly challenging issue in those member states where the self-perception of the water administration is far from the recognition of the need to actively involve the society in water management decisions. In addition, in many cases a lack of sufficient administrative resources in terms of staff, financing, and expertise is to be expected. Therefore, an effective implementation of Art 14 is not granted per se (see PATEL & STEEL 2004). On the other hand, there are a couple of encouraging examples in the member states which demonstrate the feasibility and the fruitfulness of active involvement of stakeholders in river basin planning mechanisms.

Summing-up: Principle 1 of the EsA is broadly considered in the WFD in that "societal choice" in the WFD is mainly equated with public participation on the three different levels mentioned in Art 14 of the WFD. In addition "societal choice" may already exist presently through the traditional role of the water administrations and the elected representatives in the democratic European political systems. Compared to previous EU water legislation, the WFD is the first piece of water law that specifically calls for public participation and underlines its importance for the success of the directive on the ground. In contrast to other (rather technical) provisions of the directive, the wording of Art 14 remains somewhat unspecified and leaves much room for different interpretations and approaches in the member states.

[10] The aforementioned guidance document on public participation uses the term 'stakeholders' synonymously with 'interested parties.' Stakeholders are defined as "any person, group or organisation with an interest in an issues, either because they will be directly affected, or because they may have some influence on its outcome." In spite of this definition it remains rather unclear which groups concretely will fall under this category and how they should be identified and contacted in practice.

[11] The Danube-Case principally demonstrates the feasibility of transboundary public participation, even in a complicated international political environment, but also underlines the need for adequate (financial and administrative) resources.

Clearly, member states restricting the implementation to the minimum requirements of the directive will not experience a dramatic shift in their water management decision procedures. Furthermore, which participation procedures will stand in time, particularly in the face of the expected complex – and often controversial – negotiations within the River Basin Districts, is an open question. Some guidance can be found in the relevant document of the Common Implementation Strategy.

5.2 Principle 2

Management should be decentralized to the lowest appropriate level.

Rationale:
Decentralized systems may lead to greater efficiency, effectiveness and equity. Management should involve all stakeholders and balance local interests with the wider public interest. The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

One of the most critical challenges of water management is to match the physical boundaries of the ecosystems with the boundaries of the political or administrative systems, which hold the competences in respect to ecosystem management. Non-integrated policies or management strategies address only a part of the water system, such as a river stretch or a single type of pollution source. Not considering the broader context and the interdependencies within the natural system would seriously risk of insufficiently taking physical externalities into account. This includes upstream and downstream effects relating to water quality, quantity, or adjacent land-use. Consequently, it is a broadly shared view in the international debate on water management that the river basin is the most appropriate scale for an integrated management approach. The argument that river basin management – in combination with catchments/ watershed initiatives – is the best way of protecting water resources in an integrated manner is broadly reflected in the work programme on inland waters of the Convention on Biological Diversity, too.

Because the WFD promotes the river basin as the adequate management scale, the directive generally is in line with the requirements of principle 2 of the EsA. Even the wording of the WFD is close to the CBD's ecosystem approach because the directive explicitly calls for "decisions to be taken as close as possible to the locations where water is affected or used" (Preamble, para. 13). The concept of river basin management is institutionalised in Art 3 of the WFD. This article requires member states to identify river basins within their territory and to assign them to so-called River Basin Districts. These River Basin Districts are the key spatial unit for all environmental objectives and the specification of measures under the WFD, comprising the development and implementation of river basin management plans, the programmes of measures, the river basin and economic analyses, public information and consultation, monitoring programmes, etc. River basins covering the territory of more than one member state are to be assigned to an international River Basin District. In case of international River Basin Districts within the territory of the European Union, member states are required to ensure the necessary coordination and may, for this purpose, use existing institutional structures such as interna-

tional river commissions, transboundary working groups, etc. In the case of River Basin Districts extending outside of EU territory, the relevant member states 'shall endeavour to establish adequate coordination with the relevant non-member states with the aim of achieving the objectives' of the WFD.[12]

Albeit the river basin is the general norm for institution building, there are exceptions in case of small river basins. According to Art 3 (1), such smaller basins may be combined with larger river basins or joined with neighbouring small basins to form larger River Basin Districts where appropriate. Herewith, the WFD acknowledges that the institutionalisation of river basin management should not only take into account the hydrological circumstances but administrative requirements also. The consequence of this regulation is that in member states with long coast lines, where usually relatively short rivers exist, more than one river basin will belong to a RBD (e.g., Sweden, Italy, and Greece), whereas other countries with a short coastline and sizable country areas will have one RBD for each basin (e.g., Germany, France, and Poland).

It is obvious that the WFD puts the main emphasis on surface waters, while groundwater is not of prime importance in the process of institutionalisation. According to Art 3, groundwater bodies (and coastal waters) that do not fully follow a particular river basin shall be identified and assigned to the nearest or most appropriate River Basin District. Therefore, the wording of Art 3 with respect to groundwater bodies clearly leaves room for national implementation and it is obvious that the directive does not require particular institutions for the governance of groundwater bodies.

Generally, the WFD does not specify how member states should implement the River Basin Districts internally in terms of organizational set-up and coordination of the relevant administrations. In particular, member states are not obliged to set up a specific type of organisations – such as river basin authorities – but rather they are only obliged to ensure "the appropriate administrative arrangements, including the identification of the appropriate competent authority, for the application of the rules of this Directive within each river basin district..." (Art 3 (2)). This relatively vague requirement is the result of a highly controversial debate relating to an earlier draft of the directive that intended to make river basin authorities obligatory. Compared to this early proposal of the European commission, the current formulation of Art 3 was chosen to better reflect national administrative traditions and sub-national allocations of competences. In particular, the federal political systems within the European Union that do not possess their own river basin management tradition strongly opposed a compulsory obligation to create river basin authorities.

In this context, it is worth mentioning that there is a huge variety of the hitherto existing approaches to river management in the European Union. Although some member states possess a long river basin

[12] Clearly, riparian states which are not members of the European Union are not legally obliged to implement the WFD. In case of river basins extending beyond the EU territory, however, there are several international conventions which specify the requirements for the non-member states. In this context, the UNECE Convention on the protection and use of transboundary watercourses and international lakes (UNECE Water Convention, Helsinki 1992) is the most relevant agreement.

management tradition with well established administrative structures (e.g., the French model with water agencies accompanied by river parliaments), there are only very few experiences in a couple of other member states where river basin organisations, if existing, are limited to sub-basins (see MOSTERT 2000). Germany, for instance, is an example of a country where water management is extensively organized around political-administrative units. Therefore, the rather vague requirement of the WFD ('appropriate administrative arrangements') apparently reflects this institutional diversity and the diverging national points of departure.

Against this background, the establishment of administrative units, which are responsible for the functions assigned by the WFD, means for some countries assigning the function to already existing river basin organisations (e.g., France, Spain, and United Kingdom). For other countries, it means devolving national authority to RBDs (e.g., Italy, Greece, and Finland) or creating coordinative mechanisms for federally structured member states with large RBDs (e.g., Germany and Austria).
In a 2003 survey, Nilsson et al. found that 96 RBDs have been designated in the member states of the enlarged EU (without data on Italy, Greece, Malta, Cyprus, and Wallonia), plus those in cooperating Norway and Romania. Of these RBDs, 29 are international: 16 among the 25 members and 13 with non-members. The non-members are Norway, which signed an agreement with the EU and participates in the common implementation strategy,[13] and the neighbouring countries in the East (Russia, Belarus, the Ukraine, and Moldavia) and in the Balkans, forming the Danube river basin.

In addition to the institutional promotion of regionalisation, the WFD also shows greater sensitivity to regional circumstances in another way. In reaction to past criticism of EU-wide uniform standards, the directive emphasizes more regional differences on the level of environmental objectives and better respects regional differences in the regional natural endowments and ecosystem qualities. For instance, the environmental objectives – to be determined according to the provisions of Art 4 of the WFD – may vary because the reference parameters for the "very good status" of surface waters may vary according to the different river types. These different reference types will result in regionally differentiated objectives and, consequently, context specific programmes of measures.

While the experiences with institutional innovations in reaction to the WFD still are limited, it is foreseeable that several member states will organize the implementation of the directive in a logic of "nested" institutions. Although the planning process is dominantly organized as a bottom-up process, the form of coordination within the River Basin Districts is not yet clarified. In Germany for the purpose of preparing for the river basin management plans, the larger River Basin Districts are sub-divided into smaller sub-basins in order to ease data gathering, the river basin analysis, and the administrative procedures associated with the development of the plans. The criteria used for the sub-division of the River Basin Districts are partly hydrological, but administrative criteria also played an important role which is justified as a way of minimizing administrative upheaval and easing coordination with other sector plans and programmes (see MOSS 2003). However, it remains unclear how the (potentially con-

[13] Switzerland as another non-member cooperates with the members of the Rhine Commission, but does not implement the WFD.

flictive) process of aggregating sub-basin plans will be managed in the future, in particular, the determination of cost-efficient programmes of measures in cases of upstream-downstream externalities. Some critics warn that by focusing on the sub-basin in this stage of implementation, coordination across the whole river basin could potentially be neglected. On the other hand, the sub-division of large river basins, such as the Rhine, clearly shows an advantage in that (local and regional) stakeholders can be more easily involved in the planning process.

Summing-up: Principle 2 of the EsA is explicitly considered in the WFD but the directive is rather vague in terms of institutional and organisational requirements. Member states are currently in an early process of institution building; therefore the relative effectiveness of different options is not yet clear. A huge variety of institutions in the EU member states is, as expected, strongly influenced by the previous institutional approaches to water management.

5.3 Principle 3

Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

Rationale:
Management interventions in ecosystems often have unknown or unpredictable effects on other ecosystems; therefore, possible impacts need careful consideration and analysis. This may require new arrangements or ways of organization for institutions involved in decision-making to make, if necessary, appropriate compromises.

Traditionally and not different from most national water policy approaches, the water legislation of the European Union was characterized by fragmentation in that the various directives focused on different (mainly user-specific) water quality and water quantity objectives. Furthermore, the EU water policy did not only suffer from weak implementation records in a couple of member states but also from negative impacts stemming from the incongruence of water management institutions and the water bodies (see above). Also, other EU sector politics had negative effects (e.g., agriculture and transport), which were partly in contradiction with the water protection objectives. Consequently, the complex interactions between aquatic and terrestrial ecosystems, surface waters and groundwaters, as well as freshwater bodies and the marine environment were not sufficiently taken into account. In particular, regulations relating to fluvial dynamics and the interaction between water and land were, if they existed at all, selective and insufficient in respect to the achievement of environmental objectives.
Compared to this traditional approach, the WFD clearly represents a substantial progress towards integration and comprehensive management of water and water-dependent natural resources and ecosystems. On the level of the general objectives, the WFD aims to build up a framework for the protection of not only inland surface waters, but also transitional waters, coastal waters, and groundwater (Art 1). Furthermore, Art 1 calls for the protection and enhancement of the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems, and wetlands directly depend-

ent on the aquatic ecosystems. Equally, the WFD explicitly aims to contribute to the general protection of the marine environment and to achieve the concrete objectives of international agreements aiming to prevent pollution of the marine environment. Furthermore, the definition of 'good status,' which is the overall objective of the directive for the surface waters, can only be reached if member states take on an integrated perspective that respects interdependencies in water use and protection of the ecosystems.

Against this background, the WFD illustrates the application of Principle 3 of the EsA in several ways. First, the directive focuses on the whole river basin as its functional unit. Accordingly the environmental objectives, management plans, and programmes of measures should be defined or integrated on the level of the river basins. Therefore, the directive will give water managers (institutional and instrumental) means to protect aquatic ecosystems in a way that takes into account effects of their activities on other aquatic ecosystems within the same catchment. In particular, the WFD offers room to deal with upstream-downstream externalities and the key relationships among the elements of the hydrological networks not only within the borders of the member states but also between the riparian states of the respective water bodies. The WFD, however, offers only few provisions and guidance on how expectable upstream-downstream conflicts between or within member states can be solved, e.g. in the context of the programmes of measures and the distribution of costs.

Second, the directive explicitly acknowledges the interaction and interdependencies between the different 'water types' (surface waters, transitional waters, coastal waters, and groundwater) in terms of quality and quantity. For instance, river basin management plans should not only reflect surface water conditions, rather quality and quantity objectives relating to groundwater should also play an important role[14]. In addition, the directive shows strong sensitivity to the protection of the marine environment, particularly via the control of the use (respectively the phasing-out) of hazardous substances which are to be determined according to the provisions of Art 16 of the WFD. The required reduction of diffuse sources explicitly aims at a protection of the marine environment from eutrophication. Also, the directive encompasses the full implementation of a couple of previous water directives inter alia the Nitrates Directive.

Third, the WFD deals not only with water quality but also with the quality of freshwater ecosystems in terms of aquatic habitats (morphology of rivers, meandering, etc.). This aspect is closely related to the protection or restoration of wetlands, which are explicitly mentioned in Art 1 of the WFD. However, the directive neither includes a definition of wetlands nor does it imply specific objectives or recommendations for their protection. However, the WFD provisions in relation to wetlands (and floodplains) offer plenty of room for a strengthening of wetland protection in the EU member states.

[14] In the context of groundwater regulation, it is important to note that – in response to the requirements of Article 17 WFD – the European Commission already has adopted (on September 19, 2003) a proposal for a new directive to protect groundwater from pollution (COM(2003)550). Based on an EU-wide approach, the proposed directive introduces, for the first time on the EU level, quality objectives, that oblige member states to monitor and assess groundwater quality on the basis of common criteria and to identify and reverse trends in groundwater pollution.

Examples are the obligations (see the Wetlands guidance document, European Communities 2003l):
to protect surface waters according to Art 4 (1a) which applies to 'open water' wetlands as far as they are identified as water bodies,
to reach good hydro-morphological conditions of surface water bodies because the quality elements of a surface water body include the structure and conditions of riparian, lakeshore or inter-tidal zones, and hence the conditions of any wetlands encompassed by these zones. Equally, member states are required under Art (11 (3)) to establish measures to control and mitigate modifications to the structure and the condition of the riparian zones,
to protect or restore wetlands because of their contribution to the achievement of the environmental objectives relating to surface waters (good ecological status, good ecological potential, etc.) or groundwater, and
to protect wetlands according to the EU Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC). Wetlands that fall under the protection regime of these directives must be included in the register of protected areas following Annex IV and will be part of the River Basin Management plans.

Against this background, the directive offers plenty of opportunities to better protect and respect the connectivity between the river channels and the floodplains in dynamic fluvial systems and complex terrestrial-hydrological boundary interactions.
Despite the various requirements relating to wetlands and the interaction of land-use and water management, the text of the directive appears somewhat unspecified and vague. The reason is most likely that some member states feared the additional cost implications of including wetlands in the water management objectives in a more stringent and detailed manner. However, the guidance document on wetland management which was published only recently, offers some definitions and clarifications which show the potential to raise the profile of wetlands in the implementation of the WFD, even if some NGOs still judge the state of discussion as 'minimalist' (WWF & EEB 2004).

Summing-up: the WFD broadly considers Principle 3 of the WFD even if some requirements remain unclear concerning their implications on the implementation level, e.g. the conciliation of diverging interests in the context of upstream-downstream inter-linkages. In any case, the WFD represents an important progress compared with the rather fragmented approaches of the previous regulations.

5.4 Principle 4

Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:
(a) Reduce those market distortions that adversely affect biological diversity;
(b) Align incentives to promote biodiversity conservation and sustainable use;
(c) Internalise costs and benefits in the given ecosystem to the extent feasible.

Rationale:

The greatest threat to biological diversity lies in its replacement by alternative systems of land use. This often arises through market distortions, which undervalue natural systems and populations and provide perverse incentives and subsidies to favour the conversion of land to less diverse systems. Often those who benefit from conservation do not pay the costs associated with conservation and, similarly, those who generate environmental costs (e.g. pollution) escape responsibility. Alignment of incentives allows those who control the resource to benefit and ensures that those who generate environmental costs will pay.

It is not an overstatement to say that the WFD is not only ambitious on the level of environmental objectives but that the directive represents an important "economic" approach to water management in parallel. The directive aims at the integration of a wider range of measures, including pricing and economic and financial instruments, to achieve the environmental objectives with a common management approach. Interestingly, the term "economic" is used 22 times in the text of the WFD, which demands the application of economic principles or analysis in different respects, namely:

First, as part of the analysis of the river basin characteristics, an economic analysis of water uses must be carried out (Art 5 of the WFD). Details are specified in Annex III of the WFD. The economic analysis aims at an assessment of the demand for and the valuation of water in its alternative uses.

Second, the polluter pays–principle (or user pays-principle) shall be regarded and Art 9 of the WFD requires to follow account the principle of the recovery of costs of water services, including environmental and resource costs. More precisely, member states shall ensure by 2010 that water pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of the directive. Furthermore, an adequate contribution by the different water users, at least disaggregated into industry, household, and agricultural users, to the recovery of costs is expected (see Art 9). In applying cost-recovery principles, member states may have to regard to, inter alia, the social, environmental, and economic effects involved.

Third, economic appraisal methods must be used to guide water resource management decisions according to the requirements of Art 11, which describes the necessary steps to develop the programmes of measures. Inter alia, member states are required to establish the programmes with references to the economic analyses (Art 5) – note that the economic analyses include judgments about the most cost effective combination of measures – and to develop measures deemed appropriate for the purpose of achieving cost recovery.

Fourth, Annex VI of the WFD ('list of measures to be included within the Programmes of Measures') mentions 'economic or fiscal instruments' as supplementary measures which member states may chose to integrate in the Programmes of Measures in order to achieve the environmental objectives of the directive.

Fifth, the economic analyses play a role in the designation of surface waters as heavily modified water bodies – note that this designation involves less stringent environmental objectives – because, according to Art 4 (3), disproportionate costs may justify this decision. Equally, disproportionate costs may be accepted as a reason for an extension of the deadline for meeting the environmental objectives (Art 4 (4)) and may justify the establishment of less stringent objectives according to procedures and prerequisites prescribed in Art 4 (5).

Against the background of these broad requirements, the WFD includes a highly challenging economic approach. From the viewpoint of the member states, several requirements are not easy to comply with or are in contrast to the hitherto existing practice. Here we can distinguish those requirements that demand the application (or even development) of new scientific methods (e.g., for the forecast of water availability and use, the economic valuation of water uses, and the determination of environmental and resource costs) from the implementation of new water pricing strategies or new incentive measures. Whereas the former is an important challenge for the scientific economic community and some methodological problems appear far from being fully solved (valuation of environmental costs via the application of non-market based methods, handling of uncertainties, etc.), the latter relates to the effective implementation of new water pricing strategies and incentives schemes.

In this context, it is important to note that water prices in most EU member states do not fully cover the costs and this fact probably explains why the regulations of the WFD relating to water pricing were heavily disputed during the decision-making process. As a general rule, pricing structures for municipal and industrial water services in Europe increasingly reflect the full economic costs (infrastructure, operation, and maintenance) of providing the services, but still with an important variability between the EU member states (see OECD 2003, EEB 2001). For instance, some member states still do not (or only partly) integrate capital costs in the calculation of the water prices for industrial and domestic water users. In addition agricultural water use – primarily for irrigation – remains heavily subsidized, which surely encourages inefficient water use. Furthermore, environmental and resource costs are better reflected in water prices where water abstraction and/or pollution charges are levied. Yet, these instruments are not common in all member states and even in those states where they exist, current rates are generally too low to cause measurable incentive effects (OECD 2003). In addition, there is a broad lack of incentives schemes for the agricultural sector and all other land-use related aspects of water management. There is no debate yet on the economic analysis of inland fisheries (commercial and recreational) beyond an assessment of the regional importance as an economic sector. An economic analysis of this “water” use similar to analyses of abstraction and discharges is still wanted. On the contrary, investments in aquaculture and hatcheries are subsidised nationally and by the EU.

Concerning the implementation timetable, the major issues to be resolved before 2010 will be whether quantitative and pollution-related water prices will be required and what degree of subsidies (probably only for a share of capital costs) will be allowed. This will constitute a major political problem for agricultural uses in the southern member countries. Because the Programme of Measures (PoM) will probably cause additional mitigation costs for a number of users, it will be unlikely that there will be a

recovery of the remaining environmental costs beyond the current level. There is a debate among economists (e.g., in Germany and the UK) on the recovery of user costs by establishing tradable water rights but with little positive response from policy actors. However, abstraction charges for bulk raw water to recover administrative costs are in place.

Against the background of the current water pricing practices in most EU member states, it is not surprising that there are several wordings in the directive – in particular the introduction of the possibility not to comply with the cost recovery principle for social reasons – that will considerably soften the effect of the requirement on the national implementation level. Germany is one of the member countries where the level of cost recovery is close to full cost, but it is understood that the existing application of the polluter-pays principle and the existing (relatively low) wastewater effluent fee already are an adequate implementation of the requirements of Art 9 (paragraphs 1, 2 and 3). Furthermore, there still are different perceptions regarding the application range of several requirements. One of the most debated issues was the definition of water services, which fall under the cost recovery requirement. In this context, it is particularly controversial whether – and if so, how – infrastructure measures would fall under this requirement. Albeit the guidance document of the WATECO group could somewhat clarify these issues, the WFD leaves much space for national interpretations.

Summing-up, because the WFD demands an economic analysis of river basins and, in principle, cost-recovery pricing, as well as the consideration of further economic incentive schemes, the consideration of Principle 4 is largely assured. However, it remains to be seen whether, and if so to what extent, EU member states will change the parts of their current water pricing approaches that are clearly at odds with the requirements of the WFD.

5.5 Principle 5

Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

Rationale:
Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significant for the long-term maintenance of biological diversity than simply protection of species.

The water policy of the European Community has developed into a patchwork of directives with different instruments applied, pollutants covered, and environmental objectives pursued. The WFD constitutes a major reversal of the past piecemeal approach as it makes the functioning of aquatic ecosystems a priority of its approach. The traditional concern with chemical water quality for particular water uses has been replaced by a complex process of defining objectives in reference to the natural condi-

tions of water bodies and to use chemical, morphological, and biological criteria to specify the objective. This process fits into a change of scientific and public perceptions of water issues towards viewing aquatic ecosystems as a part of a cycle that includes variability and interaction with terrestrial ecosystems. National water policies were broadened to encompass the restoration of river systems, including efforts to restore single species habitats, but remained limited due to financial restrictions. The high frequency of flooding in the 1990s contributed to a better understanding of the role of wetlands and floodplains.

Compared to this background, the overall objectives of the WFD, to protect and restore ecological quality, which are defined in the Preamble para. 11 correspond to this principle without using its wording. Particularly relevant are Art 1, Art 4, Art 5, and Art 16. Further, different guidance documents, such as the guidance documents addressing wetlands and heavily modified water bodies, also contribute to guiding the application of this principle.

The Art 1 ‘Purpose’ describes why it is necessary to establish the Water Framework Directive. The aim is to protect and improve the aquatic environment for a sustainable water use. An assumption required for protection is a certain level of ecological quality. A claim of Principle 5 (implementation guidelines) is to take account of or to minimize risks to ecosystem functions and structures. Art 5 calls for a general review of environmental impacts resulting from human activities at the level of the river basin district. In this context Art 16 calls for the European Community to adopt specific measures against pollution of water by pollutants presenting a significant risk to the aquatic environment and to progressively phase out the discharges of priority substances, based on an established risk assessment procedure. As the European community has agreed on the procedure for a few pollutants so far, the WFD requires the Commission to submit a list of priority substances. A consensus on these pollutants could not be reached during the formation of the WFD. Thus, the potential risk which these hazardous pollutants pose has not been addressed at the European level.

The most important article of the WFD for Principle 5 is Art 4. This article about ‘environmental objectives’ says the member states have to protect, enhance, and restore all surface water bodies with the aim of achieving good surface water status. Further, member states must protect and enhance all artificial and heavily modified water bodies with the target of good ecological potential and good surface water chemical status. Equally, member states must prevent or limit the input of pollutants into groundwater and prevent the deterioration of the status of all groundwater bodies. In addition, member states shall protect, enhance and restore all groundwater bodies and ensure a balance between abstraction and charge of groundwater, with the aim of achieving good groundwater status.

The ecological status of the surface water bodies will be classified with biological quality, hydromorphological quality, and physico-chemical quality elements. This shows that not only one aspect determines ecological status, but rather the interactions of the ecosystem. The sum of all quality elements indicates the ecological quality of surface water bodies. The assessment of the ecological status classification includes the aim of Principle 5, because this principle says ecosystem functioning

is an inter-relationship within and among species, between species and their abiotic environment, and includes physical and chemical interactions. In this context, it is also important to emphasise the link between the WFD and the EU-legislation for protected areas. For instance, Art 4 (1c) requires the member states to comply with any standards and objectives for protected areas under community legislation within 15 years while Art 6 requires the establishment of a register of protected areas in all river basins. The most relevant effect of these provisions is the integration of the protected areas on the level of water management objectives and of the level of RBM plans. This is clearly a step forward compared to the previous provisions where EU water directives and nature protection directives were barely integrated.

To achieve good ecological quality in river basins is it particularly necessary to integrate wetlands, because they are an essential link between surface and ground water bodies and between water and land. They are also a part of the water environment (see the guidance documents on reference conditions, No 10, on Transitional and coastal waters, No 5 and the Technical report on the identification on groundwater trends No1). The WFD does not use the words “to protect wetlands” as a specific objective, but it formulates the equivalent in protecting aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems (Art 1 (a)). During the WFD implementation, the guidance document on ‘Wetlands’ has the function of ensuring that member states take into account the links between the ecological quality objectives and the functions and values of wetlands (WWF & EEB 2004).

Furthermore, the guidance document ‘Identifying and Designating Heavily Modified and Artificial Water Bodies’ (HMWB) is important. If a water body is designated as heavily modified, the ecological status must only have good potential. This is a result of the hydro-morphological changes which are reason for HMWB designation. A river with good ecological potential implies lower biological status, yet still a good chemical status.

The specific strategy and policy of the WFD is the holistic mindset. Issues are not only about reduction of water pollution but also about integrating surface and ground water bodies with their aquatic and terrestrial ecosystems, as well as their transitional and coastal waters. However, wetlands as an important component of aquatic ecosystems are not explicitly mentioned in substantive articles such as Art 4. However, the planning procedure according to WFD follows Principle 5 quite well: The assessment of the current status covers the situation of water bodies. The interaction of species and their abiotic environment is covered in the definition of the reference conditions, in the classification of the current status, and in the analysis of the impact of human pressures. The identification of water bodies at risk of not complying with good status will initiate the search for restoration measures of components currently not reaching good ecological status.

It remains an open question whether all member states will fully accept the priority of the objective to conserve ecosystem structure and functioning. As mentioned before, there are national differences regarding the priority of environmental objectives in general and the ecosystem goals for rivers and

lakes in particular. There is a North-South difference on the relative importance of agricultural water use and protecting freshwater ecosystems for ecological purposes. This difference became obvious during the negotiations of the WFD. The options that the WFD provides to use the exemption of HMWB or to delay the implementation will be used quite differently, as the implementation of the other water-related directives shows.

Summing-up, the WFD corresponds with Principle 5 quite well. The emphasis is clearly on structures, processes, and the dynamics of freshwater ecosystems but not on individual species. The focus on the conservation of species (and equivalently on habitats) is the core of two earlier directives, the Habitat Directive and the Birds Directive. The link to the dynamic interaction with wetlands and floodplains is rather indirect, and the appropriate consequences for land use are not integrated into the WFD. Consequently, recognition of all functions and roles played by floodplains and wetlands (e.g. groundwater recharge, protection of water quality) is not fully assured in the implementation process of the WFD.

5.6 Principle 6

Ecosystems must be managed within the limits of their functioning.

Rationale:
In considering the likelihood or ease of attaining the management objectives, attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity. The limits to ecosystem functioning may be affected to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, management should be appropriately cautious.

The aim of this principle is not explicitly mentioned in the Water Framework Directive, but the approach is based on an understanding of the limits of aquatic ecosystems as the requirements of aquatic species and the functioning of their habitats are explicitly set. The objectives for inland and coastal surface waters, as well as for protected areas should be used to limit human use of water bodies. The common understanding within the European Community is that some of its waters have been used beyond their limits, particularly with respect to groundwater pollution and physical modification of surface waters. Water abstractions have been reduced in Western Europe, but the Mediterranean area shows signs of groundwater overexploitation, with a high degree of agricultural water use and plans for further expansion with financial support from EU funds. Nitrates and pesticides are often a problem in groundwater used for drinking water. The latter are still a problem in surface waters whereas there are successes in reducing eutrophication (EEA 2003c). The surface waters have been modified to protect against floods and to be used for shipping. River beds have been used for mining (sand & gravel). Commercially used fish stocks of inland waters that are dependent on natural habitats have become depleted or overfished in wide stretches of water. Viewing the rivers together with their floodplains has led to a number of cases of restoration efforts. In this sense, the scientific community

and environmental groups share a perspective that we are already beyond the limites of functioning for many aquatic ecosystems, at least for the aquatic ecosystems in Western and Southern Europe.

The understanding of Principle 6 is reflected particularly in Art 4, Art 5, Art 8 and Annex V. With respect to the effects of pollution, the precautionary principle has been given high priority in Art 10, Art 13 and Art 16. In accordance with Art 16, a new directive has been proposed by the Commission in 2003 (EUROPEAN COMMISSION 2003a).

Central to this principle is the understanding of the limits of ecosystem functioning and the effects of various human uses on the ability of ecosystems to deliver goods and services. Although the water ecosystems in Europe are well researched, there are still problems in understanding and knowing their ecosystem limits. However, the WFD reflects this consideration as it establishes a multiphase process for the implementation of an River Basin Management plan (RBM plan), which requires a separate phase to assess the status of the water ecosystem concerned, a review of the impact of human activities in Art 5, and a monitoring system staged according to the degree of uncertainty in Art 8. In addition, the WFD includes obligations for the European Parliament and the Council to adopt measures aiming for the progressive reduction and, for the cessation or phasing-out of discharges or emissions of priority hazardous substances (Art 16 (1)). Here, a conflict among member states about the content of the list of these substances has prevented a regulation within the WFD.

The regulation contained in Art 4 (1a iii) for heavily modified surface water bodies is a mechanism to identify potentially unsustainable water uses with respect to ecological status. Art 4 (3 a and b) provides a mechanism to test whether and to what extent the HMWB can be restored or modified via changes to the hydro-morphological characteristics of the water body. It is a relatively explicit procedure to evaluate alternatives with an economic reasoning. If properly followed, it amounts to a reversal of the burden of proof on what has to change: Now the degraded status quo has to be justified, not the environmental objective any more. At the same time, there is suspicion that the regulation might be used by member states as a backdoor to avoid the stronger environmental objective of good ecological status. It will be difficult to assess the actual outcome because the conditions will vary among the member countries and the methods to designate the water bodies will be different according to the particular circumstances as can be seen in the pilot river basins (KAMPA & HANSEN 2004).

The need for adaptive management strategies is a central consequence of Principle 6. Besides understanding ecosystem limits and avoiding adverse impacts, adaptive management implies a focus on active learning through environmental assessment and monitoring. In the implementation process of the WFDthis will be ecosystem–based as the assessments of the current status, the analysis of the pressures and impacts, and the monitoring will be performed on the level of river basins and will be included in the required river basin management plans (Art 13, Annex VII).

The ecological guidance documents (No 2, 10, 5, and 4), the monitoring guidance document (No 7), and the guidance document ‘Analysis of pressures and impacts’ (No 3) are all relevant to this principle

because they help to identify and to understand the limits of water ecosystems functioning and to develop an adaptive management approach. The WFD includes a much wider range of pressures on aquatic ecosystems in contrast to previous EU water legislations which focused mostly on point discharges. The WFD and guidance document No 3 on pressures and impacts emphasise to identify all factors that affect the ecological quality, including land-use patterns, morphological change to water bodies and diffuse pollution (WWF & EEB 2004).

Summing-up: This principle is reflected to a considerable extent in the WFD, particularly with respect to the need to understand ecosystem functioning and to learn about assessing ecological and chemical status of the water bodies. As this is the first step in the planning process for river basins in the EU, it currently implies considerable administrative efforts in the member states. Despite the expectable shortcomings on the implementation level and some little ambitious specifications in the hitherto prepared guidance documents, the WFD can be described as an adaptive management strategy. However, the WFD does not embody the principle to its fullest extent possible as it allows several exceptions in the formulation of its environmental objectives, the most important being the designation of water body as heavily modified. However, in such cases it foresees restoration measures to be included in the RBM plan. This could be seen as an important step in the direction of managing the aquatic ecosystems of Europe within the limits of their functioning.

5.7 Principle 7

The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

Rationale:
The approach should be bounded by spatial and temporal scales that are appropriate to the objectives. Boundaries for management will be defined operationally by users, managers, scientists and indigenous and local peoples. Connectivity between areas should be promoted where necessary. The ecosystem approach is based upon the hierarchical nature of biological diversity characterized by the interaction and integration of genes, species and ecosystems.

Temporal Scales

In general, the factor time is an important parameter in water management. For instance, seasonal patterns of rainfall and water availability shape the regional approaches to water use (e.g., navigation, and agriculture) and water management. The same is true for periodic events such as flooding and the respective protection efforts. From an ecological point of view, river systems are highly dynamic systems because the water flow regime (in connection with sediment flow and the general flooding regime) continually changes the natural conditions and the ecosystem's development and qualities. Not surprisingly, the ecological objectives of many river restoration projects emphasize the long-term effects. For instance, the development of an alluvial forest is a natural, long-term process. In river systems, very different time scales are important ranging from a couple of days to those processes that occur in intervals of up to several decades. As a background variable, expected long-term climate

changes increasingly attract attention and will influence the management decisions in the years to come because of the potential effects on the general water availability and the expected accentuation of flood and drought events.

Another dimension of time involved in water management is the path dependency of water infrastructures and the institutional dimension of water management. Technical infrastructure systems that provide basic services such as drinking water supply and/or waste water collection and treatment are very capital intensive and therefore can not easily be changed in the short-term for economic reasons. Rather, the investment cycles are characterised by time intervals amounting to several decades with the consequence that some water management options, although potentially desirable in the short-term, are economically realistic only in the very long-term. The same is true for the path dependency and persistence stemming from the interaction of settlement structures and water management. Because of the past settlement activities in floodplains, restoration of their ecological functions in urban areas is regularly hampered by current forms of land-use that can not be changed in the short-term unless enormous economic obstacles and political resistance can be overcome.

Despite these obvious time dimensions of water management, the WFD does only scarcely recognise time as an explicit parameter. The explicit time dimension of the WFD is the schedule for the implementation of the directive (see above) and the deadline for the achievement of the ecological objectives (good status, etc.), which is 15 years after the date of entry into force. In addition, the WFD explicitly demands a process of review and updating the PoM every six years thereafter. However, there is a rather implicit acknowledgement of time in the definition of the environmental objectives and the PoM. While some objectives and measures show a rather short-term character, others can only be realised in the long-term. Clearly, measures aiming to restore fluvial dynamics in many rivers can only be realised in several decades due to the aforementioned economic reasons and long-term ecological processes. In several cases, the pursuance of long-term objectives (e.g., the restoration of floodplain ecosystems for flood control purposes) might be at odds with potential short-terms gains and benefits that result from an intensive economic use of the areas (e.g., building of residential or industrial complexes on floodplain areas. In this context, the implementation of the WFD might change respective land-use decisions in favour of the recognition of long-term objectives. An explicit consideration of lags-effects that regularly characterise ecosystem processes, however, can not be found in the text of the directive.

Spatial Scales

As already mentioned, the directive is a deliberate effort to put the water policy in the EU on the appropriate spatial scale. Crucial requirements can be found in the Articles 2, 3, 4, 5, 8, and Art 14. The WFD develops a nested approach to spatial scales and it will demand at least from some member states, new institutional mechanisms. It requires the member states to designate river basins and coastal waters, to form river basin districts, and to assign the river basins and coastal waters to the nearest river basin district (Art 3) with the corresponding definitions in Art 2.

The WFD uses a nested approach to the spatial scale of water ecosystems as well as water management. A starting point is the river basin and its assigned groundwater, and surface, transitional, and coastal waters. A water body is defined as a distinct part of these water categories, which differ according to environmental status (Art 2 paragraphs 8, 9, 10, and 12). The WFD takes this as a starting point in Art 4 for achieving a good ecological water status. The guidance document 'Identification of Water Bodies' (No 2) describes how to define a water body (European Communities 2003b). The boundaries are defined on a scientific basis for the water bodies and the river basins. Here, there is no stakeholder involvement. Art 3 (1) provides a pragmatic approach to the combination of river basins and river basin districts as it distinguishes between small and large river basins and it allows for the combination of small river basins to be assigned to a district. The same procedure is applied to the definition of groundwater bodies and their assignment to RBD. The WFD leaves the organisation of large river basins up to the member states because the member states could not agree on a common institutional structure which would have required constitutional changes in the federal states (e.g., Germany). The question of the optimal level of decision-making remains unanswered (Compare Principle 2).

Summing-up: Previously, water management in a number of member states stopped on intra-national administrative borders and international borders. Now with the WFD, all the member states have to manage their water ecosystems in river basin districts, even if they extend across administrative regional or national borders. However, the WFD does not define the spatial water management structure; it leaves it up to the member states. It only requires the member states to assign transboundary river basins to international river basin districts (Art 3 (3)) and obliges the member states to produce a single international river basin management plan (Art 13 (2)) if the basin fully falls within EU territory. If the river basin extends beyond the EU territory, it obliges the member states to search for an international RBM plan (Art 13 (3)). The analysis of issues, pressures, and status will occur on the appropriate spatial scale as well as the setting of the objectives and the implementation of measures and plans. There is no explicit incorporation of the appropriate temporal scale, only a tight schedule for implementation. The provisions for repeating of the planning cycle after 2015 can be viewed as an implicit recognition of the long-term character of the restoration challenges lying ahead for European aquatic ecosystems.

5.8 Principle 8

Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Rationale:
Ecosystem processes are characterized by varying temporal scales and lag-effects. This inherently conflicts with the tendency to favour short-term gains and benefits over future ones.

Because there is considerable overlap with Principle 7, see the discussion of principle 8 under Principle 7.

5.9 Principle 9

Management must recognize that change is inevitable.

Rationale:
Ecosystem change, including species composition and population abundance. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. Traditional disturbance regimes may be important for ecosystem structure and functioning, and may need to be maintained or restored. The ecosystem approach must utilize adaptive management in order to anticipate and cater for such changes and events and should be cautious in making any decision that may foreclose options, but, at the same time, consider mitigating actions to cope with long-term changes such as climate change.

Changes in European freshwater ecosystems occurred naturally in the past quite frequently because of the dynamics of morphological parameters of rivers. These changes occurred with considerable variation on a spatial and temporal scale (KERN 1994), and altered habitat structure and species composition. This process has been modified due to anthropogenic changes of land use and due to human-made modifications of rivers and river beds over the last 200 years. The expected changes in the global climate regime will alter precipitation and runoff regimes in Europe, modifying river morphology. The development of river engineering in Europe resulted partially from the desire to take advantage of the use potential of rivers and to control the vagaries of rivers, especially the effects of floods on settlements. The current scientific and political debate on watershed management focuses on a change of direction by creating more space for floodplains.

Because the WFD focuses on the restoration or mitigation of man- made degradation of the EU water ecosystems, it does not explicitly refer to the inevitability of change in ecosystems as a conceptual basis for its management approach. The WFD uses the natural condition of its water bodies as a reference for the quality objectives to be pursued and it implicitly recognizes the need to adapt to natural changes. It deals with changes arising from socio-economic factors as well, which more explicitly determine the ability and willingness of member countries to reach the stated objectives. The topic of flood and drought management is mentioned only in Art 1 as the fifth purpose of the WFD, but it is not specified further at another place in the directive.

The WFD deals explicitly with changes that can be expected from human pressures. It requires the member states in Art 5 to review the impact of human activities on the status of surface waters and groundwater. The WFD also specifies the types of pressures to be identified and estimated in Annex II 1.4. This can be implemented by developing scenarios about human pressures (until 2015) and then

modelling their impacts. This is a plausible way of dealing with socio-economic uncertainties. The exemptions listed in Art 4 may be seen as another element of adaptive management, but they are exemptions from the obligation of achieving good water status. Two of them have socio-economic reasons: the heavy modification of the water body (Art 4 (3)) and technical and economic feasibility (Art 4 (4)). Only one exemption refers to natural changes (Art 4 (6)). A third element of adaptive management is the monitoring requirements in Art 8, which are designed to achieve the desired objective of good water status. Natural ecosystem changes will be registered by the monitoring programs as well, but they will be mostly designed to grasp the need for the Programme of Measures and then to monitor their effect as required by Art 11 (5). The flexibility of the WFD can be seen in its reiteration of obligations of member states to repeat certain steps after they have been performed for the first time. Usually, the update period is set for six years.

The guidance document on the "Planning Process" (European Communities 2003k) provides an overview of the planning approach of the WFD beyond the text of the directive. It reiterates the cyclic nature of the planning process as a general principle and relates it to the schedule set by the directive. It emphasizes that there are points for adaptation, particularly in the early phase of implementing the WFD. The first step, the assessment of the current status includes a preliminary analysis of the gap between status and objective and a preliminary designation as a heavily modified water body. Then, there are steps of risk assessment, which are based on the results of the monitoring activities in the middle of the implementation schedule. These assessments mainly focus on the goal of achieving good water status, and less on identifying natural perturbations. For the purposes of the WFD, it becomes important to take changes of the socio-economic drivers and their impacts into account. The identification of significant water issues and the development of a baseline scenario can illustrate the economic dynamics in the river basin.

All these points are analysed in more detail in the relevant guidance documents: the guidance documents on the reference conditions and ecological status for inland surface waters (No 10) on the typology, reference conditions, and classification systems for transitional and coastal waters (No 5), on the identification and designation of heavily modified and artificial water bodies (No 4), on economics and the environment (No 1), and monitoring (No 7). The guidance document about the analysis of pressures and impacts (No 3) provides more information on the analysis of pressures. The references for changes are pressures which influence well known sources of pollution and other alterations of water bodies. This aspect is explicit in the guidance document, developed on the "statistical aspects of the identification of groundwater pollution trends and aggregation of monitoring results," (EUROPEAN COMMUNITIES 2001 b) because one sub-objective for groundwater has to be operationalised "to reverse any significant and sustained upward trend in the concentration of any pollutant" (Art 4 (1biii). In all these guidance documents, the preliminary nature of the first assessment is emphasized, but it is expected that this assessment eventually will lead to decisions.

The visible implementation efforts on a national and RBD scale show that the assessment of the current status of the water bodies is subject to a number of uncertainties, particularly with respect to the

ecological status of surface waters and the development of pollutant concentrations in groundwater on the scale and complete coverage required by the WFD. The available documents in the German state of Hesse show a high share of uncertain assessment (HMULV 2004). This it due to the lack of available information rather than to the lack of understanding of a complex ecosystem.

Summing-up, the WFD implicitly provides for the recognition of the inherent change in freshwater ecosystems by forcing water managers to take a broader view of surface and groundwater status and assessing the status of their waters in a comprehensive manner. The term “status” is not associated with a dynamic perspective, but based on the status quo. A projection of pressure-induced changes and measures to improve the situation have to be made in order for the river basin management plan to be effective. This can only be accomplished with an understanding of the dynamic nature of the ecosystem concerned. The WFD makes the anticipation of human-induced changes a required task by demanding the analysis of pressures and impacts. The planning process, particularly the design of the Programme of Measures, itself will create additional uncertainty demanding flexibility from all parties involved.

5.10 Principle 10

The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Rationale:
Biological diversity is critical both for its intrinsic value and because of the key role it plays in providing the ecosystem and other services upon which we all ultimately depend. There has been a tendency in the past to manage components of biological diversity either as protected or non-protected. There is a need for a shift to more flexible situations, where conservation and use are seen in context and the full range of measures is applied in a continuum from strictly protected to human-made ecosystems.

Biological diversity in European freshwater ecosystems is low in a global comparison, but the available components (e.g. fish, water birds, reeds) are heavily used and their composition and abundance has been heavily modified. At the same time, there are considerable efforts for the conservation of wetlands biodiversity and for individual species (e.g. salmon, mussels). Pollution and the modification of rivers, lakes, and coastlines over the last two centuries changed the habitats for many species considerably, so that the spectrum of usable components was reduced and modified as well. The total number of species has been reduced on a limited scale, while the genetic diversity of the species in aquaculture is lower due to the use of hatcheries. But for several important species in aquaculture, the genetic resources reside in natural populations (EUROPEAN COMMISSION 2001, EEA 2003b). Abundance of fish stocks improved as water quality and the ecological quality of rivers improved (UK ENVIRONMENT AGENCY 2004). The use of biodiversity focused on fish and shellfish consumption on a commercial scale and to a limited extent on wild waterfowl. Aquaculture has been introduced as a substitute

for wild fisheries, which has reduced the level of catch from the wild. The remaining wild stocks have been overused and require restocking based on hatcheries. Recreational fishing has gained importance, but it relies to a large extent on hatcheries as well. Waterfowl hunting is of recreational importance, but national conservation laws and an EU regulation (Birds Directive from 1979) are in place to limit the use of and to protect endangered species.

Protection of biodiversity in freshwater ecosystems is scattered over regional and national nature protection regulations and supported by international conventions such as the Ramsar Convention for wetlands of international importance. In addition, the Habitat Directive of the European Union protects habitats and species of European significance. The WFD does not regulate the use of elements of biological diversity, neither for commercial nor for recreational purposes. The EU is responsible for the common fisheries policy, which focuses on marine fisheries, but covers inland fisheries as well. It supports inland fisheries by a number of instruments: e.g., product specification and standardization, price support, investment subsidies, and marketing support, which targets the market side of the fishing industry with the aim of supporting income and employment. The resource side of the industry - water, fish, shellfish stocks, sites, and fishing rights - is regulated on a national or state level in contrast to the marine part of the EU fisheries. Parallel to isolated national river restoration efforts, the reintroduction of endangered species is becoming a topic on a national level, which tends to attract public attention particularly for salmon in European rivers where they have become extinct. Here, the International Commission for the Protection of the Rhine has been particularly active to reintroduce salmon population (IKSR 1999).

The WFD does not deal with these issues because it is conceived as a directive to design the framework to protect water bodies and to use the water in a sustainable manner. The WFD does not specify biodiversity protection and/or sustainable use among its objectives nor does it provide instruments for it. It only supports this protection by requiring the listing of protected areas according to the Habitat Directive in Art 6 and Annex IV. It supports the conservation of biological diversity indirectly by defining its objectives via good ecological status, which includes biological elements, hydromorphological elements, and chemical and physico-chemical elements supporting the biological elements (s. Annex V). Aquatic flora, phytoplankton, benthic invertebrate fauna, and fish fauna are to be assessed in relation to their species composition, abundance, biomass, and age structure for the four types of surface water bodies: rivers, lakes, and transitional and coastal waters. For groundwater, quantitative status and chemical status are to be assessed by determining whether there is “any significant damage to terrestrial ecosystems which depend directly on the groundwater body” (Annex V).

The guidance documents on reference conditions for inland waters (No 10) and on coastal waters (No 5) specify the criteria for the assessment further by including pressure screening criteria and by providing interpretation for the normative criteria for reference conditions and the related “good ecological status.” To a limited extent, this can be seen as an attempt to define a set of biodiversity objectives in terms of taxonomic composition and abundance. This link is emphasized by an additional horizontal guidance document on wetlands, which was endorsed by the water directors in November 2003

(EUROPEAN COMMUNITIES 2003l). It clarifies the relationships among the water bodies for which objectives are defined. The guidance document on wetlands also clarifies the functional role of wetlands within the hydrological cycle and the river basin ecosystem. It lists and defines the main wetland elements covered by the WFD:
wetland ecosystems identified as water bodies,
riparian, shore and intertidal zone quality elements of surface water bodies,
the terrestrial ecosystems directly depending on groundwater bodies,
Small elements of surface water connected to water bodies but not identified as water bodies
Ecosystems significantly influencing the quality and quantity of water reaching surface water bodies, or surface waters connected to surface water bodies

By reiterating the environmental objectives of the WFD, by specifying the biological quality elements for each wetland/ water body, and by providing best practice examples, this guidance document provides an indirect link to biodiversity planning without ever giving it such a name. In the same style, it analyses the implications of the designation of HMWB for the role of wetlands, their role in the analysis of pressures and impacts, as well as in the programme of measures.

By explicitly including a list of protected areas, and by broadening the objectives of water management by including ecological quality (biological elements and their hydromorphological and physico-chemical prerequisites), the WFD supports the conservation side of principle 10, particularly on the level of ecosystems and species. However, it does not cover the use side of biodiversity and it does not address the balance or integration of conservation and use. The guidance document on the Analysis of Pressures and Impacts (EUROPEAN COMMUNITIES 2003c) includes aquaculture as a point source and fishing and fish stocking as pressures with an impact on living resources, but does not help with tools to perform the analysis (cp. p. 59). There is also a recommendation to include an analysis of the pressures from the biological quality elements on the potential reference conditions or sites (guidance document No 10, EUROPEAN COMMUNITIES 2003j p.47/48). But performing these analyses will not amount to the balancing or integration of conservation and use of biodiversity.
The use side (i.e. inland fisheries) has been regulated by the EU, but mostly by the member states according to their national priorities, but this is mostly done according to sectoral objectives (competitiveness, marketing considerations, etc.). There are signs for a change, particularly on the EU-level, when the Commission decided to integrate environmental concerns into its Common fisheries policy (EUROPEAN COMMISSION 2001c) which concerns mostly its marine fisheries, but in 2002 it developed a strategy for sustainable development of European aquaculture (EUROPEAN COMMISSION 2002c). Here environmental effects on the receiving waters and public health effects are included as a concern to be dealt with under proposed actions, but the chapter, which deals with resource conflicts, nearly exclusively focuses on marine and coastal aquaculture and neglects freshwater fish farming and ignores freshwater fisheries based on natural populations. The view is towards integrated coastal zone management, but not towards river basin management.

Aquaculture and inland fisheries are highly diverse and consist of a broad spectrum of species, habitats and harvesting practices in Europe, which is accompanied by a broad range of fishing rights and regulation by its member states, often on a regional level (EEA 2003c). The regulations tended to be of a sectoral focus, but in a number of cases, integration is progressing: Aquaculture, river and lake fisheries and recreational fisheries are seen together, their stocking activities are coordinated and biodiversity considerations play a role in the stocking decision as well (for the German state of Brandenburg see Knösche 1998). But a consistent integration on the basis of river basins is still lacking. There are signs that the fishing stakeholders are increasing their attention to the implementation of the WFD on a regional level, but their main concern is still sectoral. The only exception here is on a species level:

The development of an action plan for the management of the European eel by the European Commission can be seen as a species-specific approach to the integration of conservation and sustainable use (COM (2003) 573)(EUROPEAN COMMISSION 2003 b). It remains an open question whether the path towards integration will be limited to a species-specific approach or whether the political demands for more conservation and the potential opposition by the fisheries stakeholders will be balanced by the upcoming planning process of the WFD.

Summing-up: While the WFD mentions sustainable quantitative water management as a key objective of the directive, the balance between use and conservation of biodiversity elements and services is not explicitly treated. However, there is a certain indirect consideration because of the interaction of the WFD with EU nature protection directives, and because of the provisions for the determination of environmental objectives.

5.11 Principle 11

The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Rationale:
Information from all sources is critical to arriving at effective ecosystem management strategies. A much better knowledge of ecosystem functioning and the impact of human use are desirable. All relevant information from any concerned area should be shared with all stakeholders and actors, taking into account, inter alia, any decision to be taken under Article 8(j) of the Convention on Biological Diversity. Assumptions behind proposed management decisions should be made explicit and checked against available knowledge and views of stakeholders.

Depending on the national starting point, quantitative knowledge about the status and use of surface and groundwater including ecological status is available within governmental agencies, but not always well shared among the agencies. Quite often information about water availability, quality, and use is kept in agencies separate from other agencies that have information about biological elements, biodi-

versity use, and water-relevant land use. Considerable knowledge is available at governmental and university research institutes. In some member states, there are segments of water use and use of biodiversity elements which are self-governed, for example in recreation and inland fishing, in which cases information is not available in a comprehensive manner to central governmental agencies.

The WFD is a consistent effort to bring all relevant information from all sources to the appropriate level of decision-making, in this case the River Basin District. Yet, as a European instrument, it does not relate to indigenous sources of knowledge that are not part of the established network of know-how. The WFD asks the member states to encourage the active involvement of all interested parties in the implementation of the directive (Art 14 (1)). More specific requirements relate to the duty to publish the timetable and work programme for the production of the plan, an interim overview of the significant water management issues, and a draft of the river basin management plan, as well as to make them available for comments to the public and the users (Art 14 (1)). The designation of the water bodies, the establishment of the reference conditions, the assessment of impacts in Annex II, and the definitions and classifications in Annex V are all science-based.

The guidance documents that are relevant to the first step of the assessment of the current status, pressures, impacts, and the economic analysis of current water use are all based in the relevant sciences. The definition of ecological status and the calibration of the testing at the various sites is a pan-European effort of the relevant scientific organizations involved. This process is basically open, but it is not of interest to the wider public or the media. It is basically a governmental inter-organisational effort to search for the necessary data, provide them in an appropriate spatial format, and make them manageable on the basis of electronic data management. In Germany, the challenge of coordination is higher then in centralised states, because data and information systems have to be made consistent between the different Laender administrations (SRU 2004).

The national implementation of public participation has led, so far, to a broad presentation of the regulations, and the publication of the planning process, and schedule on the websites of the authorities in the member countries. In Germany, one NGO with federal funding has tried to provide a critical Internet-based forum to make the implementation a topic among the local organizations of environmentalists.

A second element of public information strategies has been the establishment of advisory councils, where they did not exist before as in Germany. The purpose of these advisory councils is to represent stakeholders, i.e. user organizations and environmental protection organizations in the decision making process. Under different circumstances in which participatory decision-making procedures had already been established, advisory councils have been in place since several decades, for example in France and in the UK. It depends on the tradition of cooperation in each member state between governmental agencies on one side and nature protection organisations, fishery organisations, and recreational associations on the other side to what extent the latter's knowledge of water bodies and biological elements is integrated beyond the two mechanisms mentioned above. The knowledge of the

non-governmental side tends to be considerable as these organisations include more than a hundred thousand individuals who have close and frequent contact with the water bodies in question. Still, there is criticism in Germany that their potential has not yet been fully utilized (BORCHARDT et al. 2003, SRU 2004).

Summing-up, the WFD initiates a major effort to bring all forms of relevant information together on the level of the river basin district. As a first step, this means the collection and integration of governmental and scientific information about ecosystem functioning, status, and human pressures and their impacts. With established communication channels to non-governmental organisations, their knowledge is actually used. Although there are still gaps in information and information exchange, the WFD has led to a significant improvement and a remarkable increase in the amount of available data. With the provisions of the WFD for public participation, chances are good that the stakeholders will be more integrated into the planning process.

5.12 Principle 12

The ecosystem approach should involve all relevant sectors of society and scientific disciplines.

Rationale:
Most problems of biological-diversity management are complex, with interactions, sides-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

The consideration of Principle 12 is closely related to Principle 1 (participation) and Principle 11. The WFD does not explicitly have requirements for the involvement of other relevant societal sectors and scientific disciplines. However, we can express the opinion that a full implementation of all requirements of the WFD will clearly demand the active involvement of different sector policies and broad scientific support and involvement regardless of the WFD's lack of an explicit norm.

Two examples might serve as an illustration: Because diffuse pollution is mostly stemming from agricultural sources there is a clear need for an integrated perspective on both the water management instruments on the one hand and the agro-environmental regulations and financial instruments such as voluntary contracts with individual farmers on the other hand. The same is true for the envisaged renaturation and restoration of rivers. In these cases, significant progress cannot be reached without an active coordination with the sector policies such as energy, navigation, and agricultural policy. In addition, inter-sectoral planning instruments and land-use provisions in the form of regional and local land-use schemes will play an important role.

However, it is largely an open question as to how the involvement of the various sectors might be achieved. A large variety of models in the EU is expectable because, as of today, member states have very different administrative and political conditions. In this context, the requirement to encourage the

active involvement of all relevant stakeholders as discussed in Principle 1 might play an important role in the years to come. Yet, many obstacles can be expected because coordination of water management with other sectors is largely a new challenge compared to the hitherto existing practices in many member states. This assessment is also relevant for the demanded active integration of water administrations and nature protection agencies. Since the directive cannot be implemented unless respective mechanisms are in place, many member states still are lacking adequate communication and coordination tools.

The involvement of the different scientific disciplines in the development of water management concepts in the EU already appears highly advanced. Clearly, the directive demands a far-reaching involvement of natural science and science-based modelling of river basins for the demanded river analysis and the determination of environmental objectives. In addition, the involvement of social sciences and economics is, at least implicitly, stipulated. Economic analysis of river basins and the determination of environmental and resource costs clearly can not be realized without the involvement of the relevant disciplines. Also, economic analysis should reflect the respective methodological state of the art. The same is true for the implementation of the public participation requirements of the WFD, which needs input from social sciences for the development of participation designs and adequate methods.

In this context, it is worth mentioning that the European Commission has financed a couple of interdisciplinary water-related research projects over the past years, some explicitly with the objective to support the implementation of the WFD. Equally, on the national level important interdisciplinary projects were carried out. Their results deliver valuable information for the implementation of the WFD. However, with respect to the communication of scientific results to management and the coordination and cooperation of various disciplines in large research projects, there still is room for improvement in light of the requirements of both the WFD and the EsA. Furthermore, and in spite of the integrated perspective of the WFD, some important aspects of the management of aquatic ecosystems (e.g. flood risk management, fisheries) are still dealt within other fora.

Summing-up, the WFD clearly pushes ‘state of the art’ water research including both natural sciences and social sciences disciplines. However, integration of scientific results in water management is still a matter of concern.

6 Summing-up:

6.1 Consideration of the EsA in the WFD

Table 3 summarises the consideration of each of the 12 principles of the EsA and thus sketches some strengths and shortcomings of the directive.

As a general assessment, the ambitious environmental objectives in combination with the integrated perspective are the main strengths of the WFD and are clearly in line with the intentions of the EsA. In this context, the use of biological and morphological criteria represents a new and more holistic understanding of freshwater ecosystems in the EU water policy especially compared to the previous, more sector and user-specific regulations. Here, it is worth mentioning that the protection and sustainable use of wetlands and water-dependent terrestrial ecosystems are integrated in the determination of management objectives, even if there remains some room for improvements (e.g. specific obligations relating to the management and the monitoring of wetlands and floodplains). Yet compared to the previous EU legislation, we assess that the WFD represents an enormous progress in regards to the consideration of Principle 5 and 6 (ecosystem structure and functioning/ functional limits) in EU water law. In this context, it is an important aspect that the water quality objectives of the WFD ('good status') not only imply the control and/or reduction of harmful immission but also the protection of fluvial dynamics in general and the restoration of rivers and wetlands in particular. Consequently, the practical implication of the directive on the implementation level will go far beyond the impacts of previous EU regulations because, for instance, the channelisation of rivers and the regulation of the water flow would be hampered by the new EU requirements.

An equally positive appraisal applies to the broad and strict monitoring requirements and the requirements for a regular review of the planning that clearly support the consideration of Principle 9 (change is inevitable). Because the ecological objectives have to be set for the long-term, the consideration of Principle 8 will be supported also even if we only have a few WFD provisions that explicitly deal with time scales. These requirements go hand-in-hand with the promotion of research on water management issues. The WFD, in general, requires a strong integration of ‘state of the art’ methods and results from various scientific disciplines for the analysis of the river basins and the determination of management objectives and programmes of measures. A major effort of the WFD is to bring all relevant information together on the level of the river basin district. This means to collect and to integrate governmental and scientific information with regard to the Principles 11 and 12 (relevant information/ involvement of all sectors).

However, the other side of the ambitious, area-wide requirements for the ecological quality of the waters are the many and far-reaching exemptions – probably the most relevant is the designation of the so-called ‘Heavily Modified Water Bodies’ - that could considerably reduce the effects of the WFD in practice. Another drawback is the lack of precise regulations for groundwater quality and of specific objectives for the management of wetlands and floodplains. From an ecosystem management perspective, floodplains and wetlands are certainly not sufficiently emphasised in the WFD. Alike,

Principle 10 (balance between conservation and use) of the EsA calling for a balance between sustainable use and conservation of biodiversity is not sufficiently considered in the WFD. For instance, the WFD largely ignores the challenges emerging in the context of an ecosystem-based and sustainable inland fishery management. While the directive mentions sustainable water use as an objective, the whole range of freshwater ecosystem goods and services are not comprehensively treated.

In contrast, the institutional (River Basin Districts) and instrumental provisions (e.g. emphasis on water pricing) of the WFD are on the positive side of the appraisal, albeit the effects on the implementation level will largely depend on the very different national prerequisites and respective traditions. Therefore, implementation failures or shortcomings are expectable. In this context, it is worth to emphasize that implementation of the directive in the EU member states is not only a legal and technical exercise but also an administrative and political process, whereby implementation takes place in the context of potentially diverging administrative and economic interests. In general, it is worth to remember the particular character of the directive as a legal piece of the European Union's water law: the WFD provides for a legal framework that leaves much room for national and regional manoeuvres and implementation styles, and this fact is associated with both risks and opportunities on the implementation level.

However, the pure fact that the WFD, for instance, demands an economic analysis of the river basins, cost-recovery water pricing, and the river basin management approach can serve as examples for the consideration of Principle 2, 4, and 7 (decentralisation/ economic context/ temporal and spatial scales). While the somewhat weak requirements for administrative reforms ('appropriate administrative arrangements') and for economic incentives could considerably soften the effectiveness of the directive in practice, these regulations must be interpreted against the background of very different perceptions of water management problems and various instrumental approaches in the EU member states. In this context, the somewhat vague administrative requirements could also be interpreted as strength of the directive because national administrative traditions in the member states are not overruled. It remains to be seen, how the member states and the competent administrations on the different decision levels (national governments, sub-states or regions, municipalities, etc.) will deal with expectable (upstream-downstream) conflicts because the WFD does not describe, let alone prescribe, specific measures to coordinate and integrate water management in face of diverging interests based on the respective 'hydropolitical positions' of states or regions. Equally, while the directive implies a much stronger intersectoral coordination, in particular between land use and water management, it is doubtful whether the member states can easily implement the necessary administrative and planning procedures. Taking into account the current state of intersectoral coordination, there clearly is much room for improvements and a need for innovative approaches.

In any case, the WFD will change the water policy style in the European Union because the implementation of the WFD will lead to differentiated environmental objectives and instrumental approaches among the EU member states and the respective river basins. Clearly, water policy will be

close to the particularities of the respective rivers and groundwater bodies while the former EU water policy approach was much more characterised by uniformity. However, even if the WFD gives considerable leeway for the determination of environmental objectives and the development of management plans, there are also limits because, the overall environmental objectives of the directive are not negotiable and the "combined approach" of the directive (see Article 10) pushes the European wide application of uniform emission standards also.

Anyway, the river basin management approach of the WFD and the explicit consideration of the interaction of aquatic and terrestrial ecosystems will support the consideration of effects on adjacent ecosystems according to Principle 3 (adjacent and other ecosystems) of the EsA. The intention to improve the protection of the marine environment was an important driving force in the development of EU water law and, consequently, the relevant provisions of the WFD also support the consideration of Principle 3. Yet, the hitherto promoted strategy regarding the reduction of priority substances (according to Article 16 of the WFD) leaves much room for improvement.

Taking into account that the first principle of the EsA (societal choice) implies effective societal mechanisms – including (but not limited to) public participation, the relevant provisions of the WFD appear somewhat unspecified and less accentuated. On the one hand, the fact that the WFD has integrated a public participation requirement clearly represents an important progress compared to the previous EU water law that largely ignored the positive functions of open decision-making. On the other hand, the wording of the Article 14 of the WFD alone will not guarantee an effective implementation of innovative participation strategies in the member states.

6.2 Some Implications for the Further Development of the EsA

The WFD is a special case of (implicitly) applying the ecosystem approach as it covers “only” one type of ecosystem, but on both national and international scales. Complete coverage of all inland waters is a legal obligation with a compulsory implementation schedule. The explicit objective is to improve the ecosystem quality within 15 years, i.e. to change the existing balance of protection and use considerably. With these characteristics, it is unique internationally and among industrialised countries. The one only similar approach is in the United States where a number of large scale river basins are being restored based on an ecosystem approach as well. But here the approach is selective and open-ended as it covers seven larger river basins with an existing regional history to think and act based on the ecosystem approach. It is open in terms of schedule, but some of them were explicit in calculating costs and in obtaining funding from the federal level to implement the necessary measures.

The WFD could serve as a case for implementing the EsA on a national or multinational level. It shows all the legal changes necessary to make it work on this scale. It illustrates the need to change the administrative and legal structures before the planning process on the level of the river basin can take place. The WFD shows the minimum of regulation to change towards the institutional fit in ecosystem

management. The European Union has to deal with a variety of institutional approaches to water management in its member countries and, thus, the WFD is unspecific about the necessary changes, but the member states and their adaptation to the WFD can serve as a laboratory of approaches to any other country thinking about introducing a full-scale adoption of the EsA to inland water management. The EU member countries vary according to the basic institutional criteria for interested governments: existence and varying competences of river basin institutions, different degrees of integration of sectoral ministries, and variation in the vertical distribution of governmental authority.

A further note about the transferability of the approach of the WFD concerns the fact that there was a considerable degree of experience which a number of member states had with some of the innovative elements of the WFD: few countries have had river basin based authorities; some have a history of stakeholder involvement; some have considerable experience with the use of economic instruments and cost recovery in water service pricing; and some have experienced wetlands/ floodplain restoration efforts.

As a general rule, the WFD as an area-wide legal approach to water management will not easily be transferable to other regions in the world due to the particularities of the EU environmental policy, the specific multi-level regulation system in the EU, the particular administrative traditions, and the advanced economic development stage of most of the regions in the EU member countries. Apart from this, the WFD, as a piece of environmental legislation, emphasizes the general need to develop a coherent and far-reaching legal framework for the protection of freshwater ecosystems. Clearly, ecosystem management approaches on the project level should be accompanied and supported by a comprehensive legal framework. Against this background, the WFD might serve as an example for the development of a progressive water law whose effectiveness, strengths and weakness should be compared with the effects of recent reforms of the water law in other countries.

Table 3: Consideration of the EsA in the WFD

Principle of the EsA	General consideration	WFD Article(s)	Strengths of the Consideration	Shortcomings / potential pitfalls
Principle 1 Societal Choice	Public participation in the production, review and update of the river basin management plans	Art 14	WFD is the first piece of EU water law that calls specifically for public participation. Art. 14 supports introduction of new participation procedures because it requires not only information and consultation but active participation of stakeholders also.	Lack of precise regulations – weak wording concerning active participation No specific requirements in the assessment phase and for the implementation of the programme of measures. Risk of implementation failure because of weak capacities in the member states.
Principle 2 Decentralisation	River Basin Management Approach / Designation of River Basin Districts / 'appropriate administrative arrangements'	Art 3 / Art 4	Institutionalisation of the river basin management concept. WFD does not overrule national administrative traditions. Regional differences in environmental objectives according to the characteristics of the river basins.	Coordination procedures within the river basin districts remains to be developed – treatment of expectable (upstream-downstream) conflicts not specified. Lack of clear responsibilities in several member states
Principle 3 Adjacent and other ecosystems	Protection not only of aquatic ecosystems but also of terrestrial ecosystems and wetlands depending on them. Marine environment / coastal waters considered.	Art 1, 3, 4, 16	Whole river basin is the relevant management unit. Integration of wetlands/floodplains inasmuch as necessary for the achievement of the environmental objectives. Interaction of groundwater use and terrestrial ecosystems considered. Integration of protected areas in the management plans. Water Quality regulations refer to the protection of the marine environment.	No specific environmental objectives for wetlands / floodplains. No explicit reference to floodplain restoration. Still insufficient regulations for priority substances to protect the marine environment.

Principle of the EsA	General consideration	WFD Article(s)	Strengths of the Consideration	Shortcomings / potential pitfalls
Principle 4 Management of ecosystems in an economic context	Economic analysis of river basins Polluter-Pays-Principle Cost-Recovery Water Prices	Art 5, 9, 11	Emphasis on the importance of economic analysis and water pricing. Explicit mention of resource and environment costs to be covered by pricing of water services.	No strong requirement to introduce cost-recovery pricing. Some unclear definitions (e.g. water services). No provisions for other economic incentive schemes.
Principle 5 Conservation of ecosystem structure and functioning	Environmental objectives of the directive / ecological quality (e.g. good status of surface waters). Inclusion of protected areas in river basin management	Art 1, 4, 5, 10, 16, 17	Strict and area-wide requirements for the ecological quality of waters. Assessment of waters shows an ecosystem perspective. Environmental objectives according to the particularities of the respective ecosystems. 'Good status' for surface waters implies river restoration / protection of fluvial dynamics.	Possible exemptions and derogations (heavily modified water bodies etc.) might considerably soften the implementation requirements. Lack of precise quality goals for groundwater bodies.
Principle 6 Manage within functional limits	The understanding of this principle is indirectly reflected in the overall objectives of the WFD and the definition of the water quality objectives.	Art 1, 4, 5,8, 14, 16	WFD pushes comprehensive assessment of freshwater ecosystems and the impacts of human activities. Comprehensive monitoring requirements. Regular updates of management plans are prescribed (adaptive management).	Several exceptions in the formulation of the environmental objectives possible. Lack of precise requirements for wetland protection.

Principle of the EsA	General Consideration	WFD Articles	Strength of the Consideration	Shortcomings / potential pitfalls
Principle 7 appropriate temporal and spatial scales	River Basin Management Approach (see principle 2) Ambitious deadlines for implementation of the WFD and the achievement of environmental objectives.	All articles relating to the time schedule of implementation, Art 3,4	River Basin Management Approach in combination with activities on further scales (sub-basins, tributaries). Ambitious time frame for the achievement of the environmental objectives. All management objectives clearly must be set for a long-term perspective.	See principle 2 for the spatial dimension. Consideration of the time dimension of ecosystem development is only indirect, no explicit treatment of different time scales.
Principle 8 Long-term objectives	Environmental objectives, principle of sustainable water use	See above	Long-term environmental objectives. Repeat of the planning cycle after 15 years.	See above
Principle 9 Change is inevitable	No explicit consideration but environmental objectives and the structure of the required planning cycle imply a certain consideration.	Art 1, 4, 5, 8	Regular review of planning, strict and broad monitoring requirements. Reference to natural conditions and the use of morphological parameters for the determination of quality objectives implies consideration of the principle.	Regain of fluvial dynamics might intersect with existing nature conservation objectives in several cases (floodplain management), No specific objectives / requirements for floodplain management (e.g., for the reduction of flooding risks). Weak links to flood protection

Principle 10 Balance between conservation and use	No explicit consideration, partly implicitly acknowledged (environmental objectives, biological parameters). Interaction of the WFD with the EU Habitats and Birds Directive	Art 1, 3, 4, 6	Normative criteria for reference conditions imply consideration of biodiversity components. Consideration of protectied areas might indirectly support 'sustainable use' programmes. Requirements for quantitative water management involve long-term conservation of freshwater ecosystems and terrestrial ecosystems. Use of some wetland depending species (e.g. hunting of waterfowl) are regulated by specific directives	Risk of weak implementation because of exemptions such as 'Heavily Modified Water Bodies' No specific requirements for fisheries or recreational use of biodiversity components. Impacts of the use of freshwater ecosystems on the genetic composition of a population (e.g., fish) not mentioned.
Principle 11 Consideration of all relevant information	Implicit consideration because of the broad requirements for the analysis of river basins and the public participation requirements	Art 5, 14	WFD clearly pushes 'state of the art' analysis of river basins. Natural and social sciences are integrated in the assessment. Accompanying research financed by the European Commission and national governments.	Soft wording regarding active involvement of stakeholders. Integration of scientific know-how in water planning practice still challenging.
Principle 12 Involvement of all sectors	Public participation. Full achievement of WFD objectives implicitly demands close interaction with sector policies and land use planning.	Art 1, 3, 5, 11, 14	WFD clearly supports interdisciplinary research and the set-up of intersectoral programmes and projects (e.g., diffuse pollution, river restoration)	Intersectoral coordination and cooperation with land use planning not guaranteed. Different and partly insufficient administrative prerequisites in the member states

7 References

BFN (Bundesamt für Naturschutz) 2003: Die Relevanz der Wasserrahmenrichtlinie für Flussauen aus naturschutzfachlicher Sicht. Positionspapier. R. Mühlinghaus, N. Korn, B. Jessel, B. Hasch. Bonn.

BORCHARDT, D., WILLECKE, J., EHMANN, H., KÜLLMAR, I., RICHTER, S. & VÖLKER, J. 2003: Überprüfung der Ausweisung des staugeregelten Mains als „erheblich verändertes Gewässer“ im Sinne der EU-Wasserrahmenrichtlinie im Hinblick auf die Berichterstattung im Jahre 2004 – Abschlussbericht. Universität Kassel.

EEA (European Environment Agency) 1994: European Rivers and Lakes, Assessment of their Environmental State. Copenhagen.

EEA (European Environment Agency) 1995: Europe’s Environment The Dobris Assessment, Ed. by D. Stanners, P. Bourdeau. Copenhagen.

EEA (European Environment Agency) 1999: Sustainable Water Use in Europe, Part 1 : Sectoral use of Water, Environmental Assessment report no 1, Copenhagen.

EEA (European Environment Agency) 2003a: Europe’s Environment: the third assessment. Chapter 8. Water. Copenhagen. p.165-197.

EEA (European Environment Agency) 2003b: Europe’s Environment: the third assessment. Chapter 11. Biological diversity. Copenhagen. p.230-249.

EEA (European Environment Agency) 2003c: Europe’s Environment: the third Assessment. Chapter 2.5. Fisheries and aquaculture. Copenhagen.

EEB (European Environmental Bureau) 2001: Water Pricing in the EU – A Review. Brussels.

EUROPEAN COMMISSION 2001: Biodiversity Action Plan for Fisheries, Communication from the commission to the Council and the European Parliament, COM (2001)162 final. Brussels, 27.3.2001.

EUROPEAN COMMISSION 2003a: Proposal for a Directive of the European Parliament and of the Council on the protection of groundwater against pollution. COM (2003) 550.

EUROPEAN COMMISSION 2003b: Communication on the development of a Community Action plan for the management of European eel, Brussels, COM (2003), 573, Oct 1st 2003.

EUROPEAN COMMUNITIES 2001a: Common Implementation Strategy for the Water Framework Directive (2000/60/EC) Strategic Document as agreed by the water directors under Swedish Presidency. Brussels.

EUROPEAN COMMUNITIES 2001b: Technical Report No 1. The EU Water Framework Directive: statistical aspects of the identification of groundwater pollution trends, and aggregation of monitoring results. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003a: Guidance Document No 1. Economics and the Environment. The implementation challenges of the WFD. Working Group 2.6 - WATECO. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003b: Guidance Document No 2. Identification of Water Bodies. Working Group on Water Bodies. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003c: Guidance Document No 3. Analysis of Pressures and Impacts. Working Group 2.1 - IMPRESS. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003d: Guidance Document No 4. Identification and designation of heavily modified and artificial water bodies. Working Group 2.2 -HMWB. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003e: Guidance Document No 5. Transitional and Coastal Waters - Typology, Reference Conditions and Classification Systems. Working Group 2.4 – COAST. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003f: Guidance Document No 6. Establishment of the Intercalibration Network and the Process on the Intercalibration Exercise. Working Group 2.5 - Intercalibration. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003g: Guidance Document No 7. Monitoring under the Water Framework Directive. Working Group 2.7 – Monitoring. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003h: Guidance Document No 8. Public Participation in Relation to the Water Framework Directive. Working Group 2.9 – Public Participation. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003i: Guidance Document No 9. Implementing the Geographical Information Systems Elements (GIS). Working Group 3.1 - GIS. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003j: Guidance Document No 10. Rivers and Lakes – Typology, Reference Conditions and Classification Systems. Working Group 2.3 - REFCOND. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003k: Guidance Document No 11. Planning process. Working Group 2.9 – Planning Processes. Common Implementation Strategy for the Water Framework Directive (2000/60/EC).

EUROPEAN COMMUNITIES 2003l: Wetlands Horizontal Guidance. Horizontal Guidance Document on the Role of Wetlands in the Water Framework Directive. Common Implementation Strategy for the Water Framework Directive (2000/60/EC). Brussels, Version as of Dec 17th, 2003.

HARTJE, V., KLAPHAKE, A. & SCHLIEP, R. 2002: Consideration of the Ecosystem Approach of the Convention on Biological Diversity in Germany. Bonn (Federal Agency for Nature Conservation). BfN – Skripten 69.

HMULV (Hessisches Ministerium für Umwelt, ländlichen Raum und Verbraucherschutz) 2004: Stausbericht Umsetzung WRRL.

IKSR (International Commission for the Protection of the Rhine) 1999: Lachs 2000. Ist der Rhein wieder ein Fluss für Lachse? Koblenz.

JONES, T. 1996: The European Region. An Overview of European Wetlands. In: Hails, A.J. (ed.) Wetlands, Biodiversity and the Ramsar Convention: the role of the Convention on Wetlands in the

Conservation and Wise Use of Biodiversity. Ramsar Convention Bureau Ministry of Environment and Forest. India.

KALLIS, G. & NIJKAMP, P. 2000: Evolution of EU Water Policy: a critical assessment and hopeful perspective. Journal of Environmental Law and Policy, 3, 302-335.

KAMPA, E. & HANSEN, W. 2004: Heavily Modified Water Bodies- Synthesis of 34 Case Studies in Europe. Berlin, Heidelberg.

KERKHOF, M. van de & HUITEMA, D. 2003: Public participation in River Basin Management: A methodological perspective. Paper for the Conference Monitoring Tailor-Made IV. Information to support sustainable water management: from local to global levels, 15-18 September. St. Michielsgestel, the Netherlands.

KERN, K. 1994: Grundlagen naturnaher Gewässergestaltung Geomorphologische Entwicklung von Fließgewässern. Berlin-Heidelberg.

KLAPHAKE, A., SCHEUMANN, W. & SCHLIEP, R. 2001: Biodiversity and International Water Policy. International Agreements and Experiences Related to the Protection of Freshwater Ecosystems. Study by order of Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Bonn, Berlin.

KNILL, C. 2003: Europäische Umweltpolitik Steuerungsprobleme und Regulierungsmuster im Mehrebenensystem. Opladen.

KNOPP, G.-M. 2003: Abhandlungen – Die Umsetzung der EG-Wasserrahmenrichtlinie aus der Sicht der Länder. Zeitschrift für Wasserrecht, 42, 1: 1-16.

KNÖSCHE, R (1998): Ordnungsgemäße fischereiliche Bewirtschaftung natürlicher Gewässer – unter besonderer Berücksichtigung der Verhältnisse im norddeutschen Tiefland. Bearbeitet vom Institut für Binnenfischerei e.V. im Auftrage des MELF (Ministerium für Ernährung, Landwirtschaft und Forsten des Landes Brandenburg) Frankfurt/Oder.

MACALISTER, ELLIOTT & PARTNERS LTD. 1999: Forward Study of Community Aquaculture, Summary Report, Prepared for the European Commission, Fisheries Directorate General, Lymington, Hps.

MALTBY, E. 2003: The Ecosystem Approach: What does it mean? Royal Holloway. University of London. National Stakeholder Forum.

MORTIMER, D. 2004: The Ecosystem Approach. Joint Nature Conservation Committee. http://www.ukmab.org/minutes/pdf/ea-present040902.pdf 04/10/04

MOSS, T. 2001: Solving Problems of 'Fit' at the Expense of Problems of 'Interplay'? The Spatial Reorganisation of Water Management following the EU Water Framework Directive. Working Paper. Institut für Regionalentwicklung und Strukturplanung (IRS). Erkner.

MOSS, T. 2003: Die Umsetzung der EU-Wasserrahmenrichtlinie: „problems of fit", in: MOSS, T. (ed.): Das Flussgebiet als Handlungsraum. Institutionenwandel durch die EU-Wasserrahmenrichtlinie aus raumwissenschaftlichen Perspektiven, Münster, pp. 127-176.

MOSTERT, E. 2000: Models for River Basin Management. Experience from the Eurowater Countries. In: Water Resources Management: Brazilian and European Trends and Approaches. ABRH. Porto Algere. Pp. 193-207.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT – OECD – 2003: Performance and challenges in OECD countries. Paris.

PATEL, M. & STEEL, J. H. 2004: Public Participation in River Basin Management in Europe. A National Approach and Background Study synthesising experiences of 9 European countries, report of the EU-funded HarmoniCop Project. http://www.harmonicop.info/_files/_down/WP4SynthesisReport.pdf

SMITH, R.D. & MALTBY, E. 2003: Using the Ecosystem Approach to Implement the Convention on Biological Diversity: Key Issues and Case Studies. IUCN. Gland, Cambridge.

SRU (Rat von Sachverständigen für Umweltfragen) German Advisory Council on the Environment) 2004: Environmental Report 2004. Stuttgart.

UK ENVIRONMENT AGENCY 2004: Our nations' fisheries – The migratory and freshwater fisheries of England and Wales – a snapshot. Bristol.

WWF & EEB 2004: 'Tips and Tricks' for Water Framework Directive Implementation. A resource document for environmental NGOs on the EU guidance for the implementation of the Water Framework Directive.

7.1 Internet-Links:

Convention on Biological Diversity & Ecosystem Approach

Homepage of the Secretariat Convention on Biological Diversity:

http://www.biodiv.org/default.shtml

Ecosystem Approach Introduction (Secretariat CBD):

http://www.biodiv.org/programmes/cross-cutting/ecosystem/default.asp

Latest decision on the Ecosystem Approach (Secretariat CBD):

http://www.biodiv.org/decisions/default.aspx?m=COP-07&id=7748&lg=0

Water Framework Directive

Text of the WFD (in English):

http://www.umweltdaten.de/down-d/wrrl-e.pdf

Text of the WFD (in German):

http://www.umweltdaten.de/down-d/wrrl-d.pdf

Implementation of the WFD, Guidance Documents (CIRCA)

http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents&vm=detailed&sb=Title

General information about water protection and management of the EU (European Union):

http://europa.eu.int/scadplus/leg/en/s15005.htm

Information on the WFD in German (Grüne Liga):

http://www.wrrl-info.de/site.php4?navione=home&content=home

Implementation of the WFD in Germany (German):

http://wasserblick.net/

BfN- Skripten

BfN- Skripten series as pdf files:

http://www.bfn.de/en/09/090203.htm

BfN- Skripten as pdf files (German):

http://www.bfn.de/09/090203.htm

BfN- Skripten on the Ecosystem Approach (German and English):

http://www.bfn.de/01/0102_131.htm