The way forward

Germany's river basin management plans were submitted to the European Commission on 22 March 2010 following extensive consultation with water users, various interest groups, and interested members of the general public. The measures for the initial river basin management plan period must be implemented by 2012. The environmental objectives promulgated by the Water Framework Directive must be met by 2015; and by 2027 all such objectives must be met, including in cases where deadlines were extended.

The mandated Water Framework Directive deadlines are nothing if not ambitious, particularly in view of the uncertainty that remains concerning some of the assessment procedures and forecasts in connection with measure effectiveness. Monitoring will also be a major challenge, since questions such as the following have to be answered: To what extent is monitoring of agricultural measures necessary? How many investigations are needed to obtain representative data concerning water body status?

Moreover, we need to integrate more effective water protection instruments into the agri-environment. A decision needs to be made as to the point at which voluntary measures no longer suffice and thus usage restrictions need to be imposed and possibly compensated for. The EAFRD (European Agricultural Fund for Rural Development) Regulation calls for just such a procedure.

A major problem we face is a shortage of nature conservation and water protection areas. For example, sufficiently wide buffer strips along water bodies would promote the development of more natural habitats and would act as a retention platform for pollutant inputs. Land use pressures are being further intensified by biomass cultivation – for example in Northern Germany, where considerable tracts of erstwhile extensively farmed cropland are being used for energy crops.

Chemical status assessments should be based on the requirements laid out in the new Environmental Quality Standard daughter directive of the Water Framework Directive, which have yet to be implemented in all river basins. The threshold value for mercury in biota is probably being exceeded throughout Germany owing to elevated emissions from incineration plants, and the debate as to whether further measures are needed for mercury and other toxins is already underway. Any minimization measures that are adopted in this regard would benefit not only rivers and lakes, but also oceans.

Water is a crucial economic factor. Economic programmes may make a growing contribution in the coming years to achieving sustainable water protection and should be incorporated more extensively into water resource management models. We need to build methods that allow for the identification and assessment of cost efficient measures, and simple and practical methods that factor in environmental and resource costs. The Water Framework Directive stipulates that the member states must develop efficient water pricing policies by 2010. This will entail implementation of water prices that allow for the recovery of all operational, environmental and resource costs, which in turn must be allocated to the main user groups in accordance with the polluter pays principle.

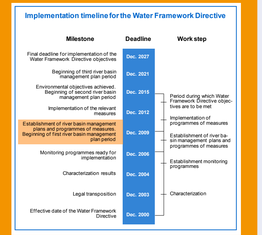
Climate change is set to take on increasing importance when it comes to implementing river basin management plans, which currently contain no indication to the effect that climate change is relevant for water resources. Nonetheless, the effects of climate change such as lengthy droughts, increased flooding, and the necessary adaptation strategies will inevitably become relevant for future action plans. The water protection policies of tomorrow will centre around agriculture, energy generation, and transport policy (shipping). In order for us to achieve our ecological objectives, new ways must be found to reconcile the interests and concerns of the whole spectrum of water users. Classic methods alone will not suffice here because water protection necessitates the participation of all political actors, as well as constructive input from water users, state and federal water and agricultural authorities, municipalities, parties responsible for maintenance, and volunteers. If we can all pull together in this fashion, the Water Framework Directive offers us an opportunity to achieve outstanding water protection in an optimally efficient manner, and in so doing harmonize sustainable water management with other environmental protection objectives.

RIVER BASIN MANAGEMENT PLANS AND PROGRAMMES OF MEASURES IN ORDER TO ACHIEVE THE GOOD WATER BODY STATUS

The river basin management plans and programmes of measures have been developed in close cooperation for the ten German river basin districts.

The Water Framework Directive stipulates that river basin management plans are to cover the following key elements:

- a general description of the characteristics of the river basin district and a summary of significant anthropogenic pressures and their impact on the status of surface water and groundwater bodies,
- a map of the relevant monitoring networks,
- a presentation in map form of the results of the monitoring programmes,
- a list of the relevant environmental objectives for water bodies
- a summary of the programmes of measures, including the ways in which the mandated objectives are thereby to be achieved,



The programmes of measures show the need for action to achieve the good water body status. The measures must be individual for each water body pressure as well as in accordance with the existing uses.

THE KEY MEASURES FOR ACHIEVING THE OBJECTIVES ARE:

Reduction of nutrient and pollutant inputs:

- improved municipal rainwater and waste water treatment
- implementation of good practice in agriculture (e.g. use of tillage methods that protect the soil)
- water buffer strips

Improvement of water body structure and continuity:

- restoration
- relocation of dykes
- establishment of fish passes or dismantling of transverse structures

Dyke relocation at the Elbe


Fish pass at the Geesthacht weir, part of Hamburg

„Water Framework Directive – The way towards healthy waters" (short version) is based on the brochure of the same name. The full version is available for free download at: http://www.umweltdaten.de/publikationen/fpdf-l/4021.pdf

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river Oder, Lebuser Land: Stephan Naumann, UBA
dyke relocation Elbe: http://www.flussdialog.at/index.php?id=84 (16.7.2010)
fish pass at the Geesthacht weir: Wassergütestelle Elbe (2006)

Special regulations
ship: PhotoDigital
fishes (title photo): Werner Rohrmoser

IMPRINT
Published by: Federal Environment Agency (Umweltbundesamt UBA)
Wörlitzer Platz 1
06844 Dessau-Roßlau
E-Mail: wasser@uba.de
Internet: http://www.umweltbundesamt.de/index-e.htm
Draft: Hannah Post (BMU)
Last update: March 2011
Design and layout: Bernd Kreuscher (UBA)
Printed on recycled paper made from 100% recovered paper

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

Umwelt Bundes Amt
For our Environment

WATER FRAMEWORK DIRECTIVE

THE WAY TOWARDS HEALTHY WATERS

Short version

Official implementation of the Water Framework Directive on 22 December 2000 marked the beginning of a new era in the annals of water management. The Water Framework Directive sets the ambitious goal of attaining "good status" for Europe's rivers, lakes, groundwater bodies and coastal waters by 2015 in accordance with a clearly defined timeline.

Strenuous efforts have been made in Germany to comprehensively characterize the status of our water bodies and to plan measures to achieve the objectives in 2015, via a process involving the following activities: countless water samples were analyzed; thousands of kilometres of water bodies were mapped and evaluated.

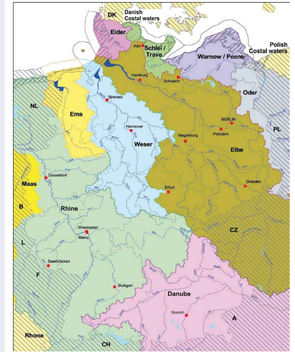
The focus of the Water Framework Directive lies on quality and biodiversity improvement and maintenance for water bodies. However, the Water Framework Directive is also user-oriented. The programmes of measures ensure the successful coexistence of water uses such as water supply, wastewater treatment, shipping, hydro power or flood protection and the ecological requirements. Both ecological matters and water use will form the basis for river basin management planning in the coming years.

Jochen Flasbarth
President, Federal Environment Agency

The Directive promulgates a unified water body protection framework. Unified in this context means that European water bodies have been consolidated into large river basins that are managed collaboratively by the state and national governments concerned. This mechanism is clearly evidenced by the large Elbe and Rhine river basin districts, the latter of which is managed jointly by nine nations and eight German states.

A river basin district covers all waters in the catchment area of a large river. Ten river basin districts were defined in Germany: Danube, Rhine, Meuse, Ems, Weser, Oder, Elbe, Eider, Warnow/ Peene and Schlei-Trave. Eight of these are cross-border. Only the Weser and Warnow/Peene are managed purely nationally.

River basin districts in Germany



Sections of international river basins that lie outside the borders of the Federal Republic of Germany have been labelled for illustrative purposes only; this does not in any way affect the provisions of other countries and international regulations.

Map basis:
LAWA, Federal Agency for Cartography and Geodesy

Source: Federal Environmental Agency, 2004

The **status of natural surface waters** is classified as "good" if the ecological and chemical status are both deemed "good". All over Germany, 9.5 % of water bodies have achieved a "good status".

Surface waters, meaning rivers, lakes, transitional waters, and coastal waters, are assessed as water bodies, which can be a river, river reach, lake, reservoir or portion of a canal.

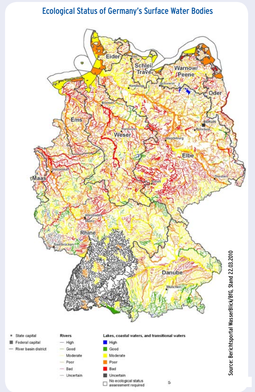
Main objective of the Water Framework Directive is to ensure water quality and structures which do not effect the aquatic fauna and flora to re-establish or maintain a high level of biodiversity. The composition and diversity of species depend on the water body status and reflect the status at the same time. The degree of ecological intactness of a surface water body is chiefly determined by its biological quality elements. The quality of the water body's chemical, physicochemical and hydromorphological elements must be such that its biota exhibit "good status". The water body's biota are only deemed to be intact insofar as its hydromorphological and chemical characteristics are favourable.

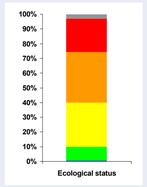
According to the Water Framework Directive, the **ecological status of surface waters** is to be assessed in accordance with the following quality elements:

- **Biological quality elements** (fish, benthic invertebrates, aquatic flora)

in conjunction with the following elements that support the biological elements:

- **Hydromorphological quality elements** such as river bank structure, river continuity or substrate of the river bed
- **Physicochemical quality elements** such as thermal, oxygenation and nutrient conditions
- **Chemical quality elements** that refer to environmental quality standards for river basin specific pollutants. These standards promulgate maximum concentrations for specific water pollutants. If even one such concentration is exceeded, the water body will fail "good ecological status".





The role of biological quality elements in ecological status assessment:

Fish fauna are particularly susceptible to hydromorphological factors – that is, river bank constructions, inadequate root shelter, barriers, inadequately structured water beds – and pollutants. In addition, salmon and many other fish that migrate from the sea to river headwaters to spawn are dependent on river continuity.

Numerous in vivo studies going back decades have been realized on benthic invertebrates (fauna such as aquatic insects, crabs, snails and worms), using, inter alia, the saprobic index, which is probably the best known method for assessing water body deoxygenation. Benthic invertebrates are also used to assess the water body hydromorphology and acidification.

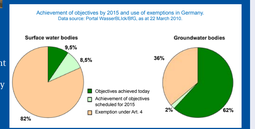
Water body flora is particularly susceptible to elevated water body nutrient concentrations, particularly phosphorus. Water body flora include free floating microscopic algae (phytoplankton); small algae that are visible with the naked eye and that grow upon rocks and other substrates (phytobenthos); and large aquatic plants (macrophytes, large algae, and angiosperms).

Methods for biological quality elements have been developed that allow for identification of various anthropogenic pressures based on biota composition. The research in this regard, which focused on which biological species are missing in the presence of which anthropogenic pressures and how specific biological group compositions are altered by specific anthropogenic pressure levels, allowed for the elaboration of standardized assessment methods such as MarBIT and PERLODES for invertebrates or FIBS for fish.

Special regulations: A distinction is made between natural water bodies, heavily modified and artificial water bodies. The latter are water bodies such as a canal that were artificially constructed, or whose hydromorphological characteristics have been modified to such an extent that "good ecological status" is not achievable without significantly compromising their long-term and economically significant use. For these water bodies, **"good ecological potential" is the environmental objective in lieu of "good ecological status".**

37 percent of Germany's surface waters are classified as heavily modified and 15 percent are classified as artificial. Hence 52 percent of our surface waters need to attain "good ecological potential".

The use of exemptions is possible for both natural and heavily modified water bodies. Most of the cases where Germany has made use of the possibility of such exemptions take the form of extensions of deadlines (until 2021 or 2027). It is permissible to apply less stringent environmental objectives in exceptional circumstances if water bodies are so polluted or have been morphologically modified to such an extent that it is not possible to improve their condition in the foreseeable future (i.e.by 2027) using proportionate measures.



Exemptions, which are subject to review at six year intervals in the river basin management plans, can be made for the following reasons:

- The objectives in question cannot be met on the grounds that they are unfeasible from a technical standpoint, or can only be met in stages, or the cause of the pressure is not identified.
- Implementation of the objectives by 2015 would entail disproportionate costs.
- The existing natural conditions would not allow for timely improvement of the relevant status.

A key goal of European water protection efforts is to keep the water bodies free of substances of concern and hazardous substances and to reduce nutrient inputs.

German water bodies contain numerous substances that stem from either point sources or diffuse sources. Significant point sources are municipalities with commerce, industry and households or abandoned industrial sites. Much more difficult is to identify and locate inputs from diffuse sources such as rainwater inputs or agriculture.

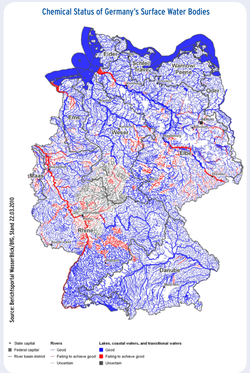
Apart from pollutants such as pesticides or heavy metals high nutrient concentrations of phosphorus or nitrogen may entail eutrophication problems in surface waters.

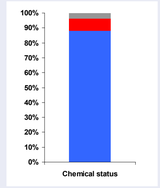
The chemical status of surface waters is classified as either ●„good" or ●„failing to achieve good".

Most recently survey of water body status in 2009 shows that 88% of surface water bodies have achieved "good chemical status". This classification will be less positive in future surveys when it becomes mandatory to implement the new and extended requirements for assessing chemical status. In addition it should be noted in this regard that suitable analytic methods are currently lacking for some chemical substances.

Chemical status is assessed in accordance with EU quality standards. Environmental quality standards are limit values of specific pollutants which must not be exceeded.

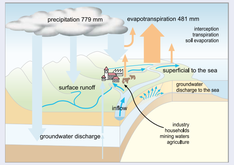
The Water Framework Directive lists 33 priority substances which are a significant risk to the aquatic environment or humans, such as heavy metals (e.g. mercury or cadmium), pesticides and other - mainly industrial - pollutants.
The environmental quality standards are defined in the new daughter directive 2008/105/EC, which requirements are used since July 2010. Other directives set quality standards for other pollutants and nutrients, e.g. the Directive 91/676/EEC relating to nitrate pollution.





Groundwater status

is assessed in terms of groundwater bodies. A groundwater body is a volume of groundwater with fixed boundaries within one or more aquifers. Aquifers are the water-permeable layers of rock containing the groundwater. They are limited upwards by the groundwater level and downwards by the groundwater bottom.



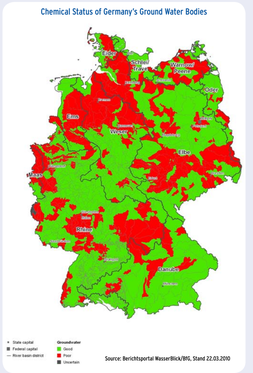
The Water Framework Directive stipulates that groundwater must achieve "good quantitative status" and "good chemical status" by 2015.

Groundwater bodies are classified as either ●„good" or ●„poor".

63 percent of Germany's groundwater bodies currently achieve "good chemical status", whereas the remaining 37 percent do not (the status of only two groundwater bodies, i.e. less than 1 %, is classed as "uncertain").

The **chemical status of groundwater** is assessed on the basis of environmental quality standards and threshold values. Groundwater must meet the following requirements in order to achieve "good chemical status":

- No sign of salt or other intrusions.
- The environmental quality requirements and threshold values in accordance with the Water Framework Directive are adhered to.



"Good quantitative" groundwater status

is achieved if the groundwater level meets the natural conditions.

Therefore the allowable groundwater abstraction should be substantially lower than the recharge rate. Quantitative deficiencies occur, for example, in connection with mining activities, particularly in lignite and salt mining regions, whose groundwater levels had in many cases been subject to substantial reduction for decades. Moreover, even after mining comes to a halt, restoration of the natural groundwater level takes decades.

Only relatively few of Germany's 1,000 groundwater bodies are over-used and only 38 (4 percent) fail "good quantitative status".

The quantitative status of a groundwater body in the Tideelbe working area was classed as "poor" owing to the presence of saltwater, which had entered the water body owing to an increase in salty deep groundwater secondary to unduly high groundwater abstraction. Here too it will presumably take a long time for the natural water level of this groundwater body to be restored and for it to return to "good status".

Many German groundwater bodies are subject to pollution from nitrate, which is highly water soluble and percolates into groundwater. In the case of groundwater bodies "poor chemical status" is almost always due to the limit value for nitrates of 50 mg/l having been exceeded as a result of high nitrate input from fertilization and intensively livestock farming. In addition, a substantial portion of nutrients in groundwater is input into surface waters, causing additional pollution there. Thus "good chemical status" of groundwater ensures that the groundwater itself exhibits good quality, and the quality of surface waters and terrestrial ecosystems that are dependent on groundwater is not degraded.

The main criterion for assessment of "good quantitative status" is groundwater level,

whereby the following requirements apply:

- Long-term mean annual abstraction is not to exceed the available groundwater resources,
- the groundwater level is not to be subject to anthropogenic changes that
  - result in failure of the ecological quality for the associated surface waters,
  - significantly degrade the quality of these water bodies,
  - significantly harm terrestrial ecosystems that are directly dependent on groundwater bodies.
- No saltwater or other intrusions are allowed.

A cross sectional diagram showing qualitative flow times for various pathways through a typical aquifer system.
Source: US Geological Survey (Wikimedia Commons)