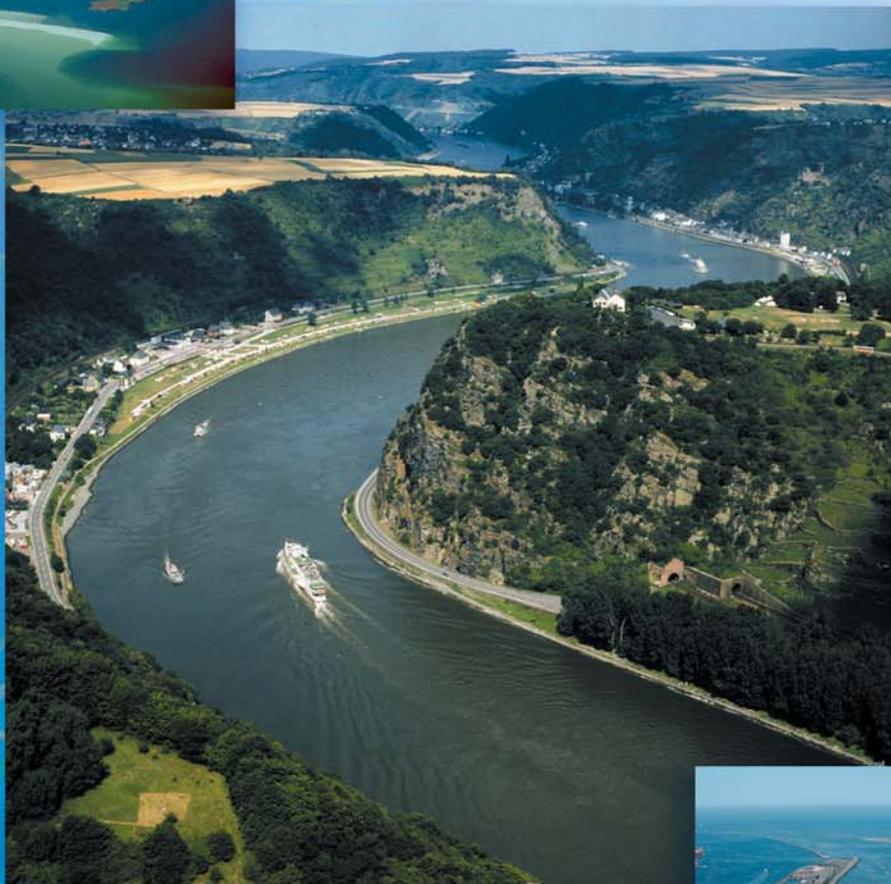


No frontiers for the Rhine

Inventory 2004 in the Rhine river basin



Co-ordinating Committee
R H I N E

INVENTORY ALONG THE RHINE

CHANCES OFFERED BY AN EU DIRECTIVE



The Falls of the Rhine at Schaffhausen

Photo: Sjariko Petek, www.turfbild.com

In 2004, a large scale inventory of the Rhine and the waters in its catchment was concluded. Nine states were involved in this work to which the European Water Framework Directive had given rise. This directive modernises and standardises European water law and requires transboundary management of waters in river basin districts. The target for all waters is to achieve a good status. By 2015 they are not only to be clean, but ecologically intact. The implementation of this directive introduces a new era in water protection – in future there will be closer co-operation throughout Europe.

Uniform European law on water

Water is vital for man, animals and plants. Therefore, it must be placed under particular protection. With the Water Framework Directive (WFD), the member states of

the European Union aim at water protection at a high level, no matter, whether groundwater, rivers, lakes or coastal waters are concerned.

The target is the good status

By 2015, rivers, lakes, coastal waters and groundwater are to have reached a good status. The reference is the natural state of water bodies with their variety of plants and animals, an unaltered form and water regime and the natural quality of surface waters and groundwater. Distinctions are made between:

- the good ecological and chemical status for surface waters (rivers, lakes, transitional and coastal waters).
- the good chemical and quantity status for groundwater.

Reduce pollution

The status of waters may not deteriorate under any circumstances. The EU Member States must take appropriate measures to improve waters which are expected to probably not meet the environmental objectives by 2015. All uses must be taken into account which directly or indirectly affect the state of waters, no matter whether industry, navigation, the use of hydroelectric power or agriculture is concerned. A central task in the Rhine river basin will be to reduce polluting agents and to keep dangerous substances away from waters. Apart from that the



The Rhine as an experience of nature

Photo: A. Schmitt



map: European Rivers Network (ERN)

European river districts

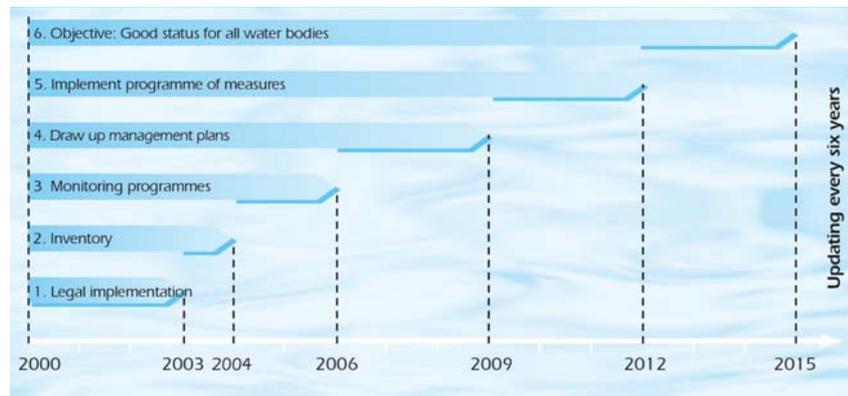
character of the river banks and its bottom, the interaction between the river and its alluvial area and free fish migration are seriously affected along the Rhine and its tributaries and need to be improved.

Protection beyond frontiers

One of the greatest chances and challenges of the WFD is the obligation to manage waters across the frontiers: River basins are natural entities, from their source to their outlet into the sea: they do not only comprise the main stream, but also its catchment, that is the entire above and underground drainage area.

Water protection must pay

Another new aspect is that, in order to reach the environmental objectives, economic principles, such as recovery of costs for drinking water supply and waste water discharge have for the first time been integrated into an EU-directive. The most cost efficient measures targeted at improving the water bodies will be chosen on the basis of cost-benefit analyses.



Implementation phases of the WFD

Photo: Pro Natur GmbH

Implementation schedule

The implementation follows precise guidelines and schedules: According to the risk assessed within the inventory, waters are under targeted surveillance. By 2009, management plans must have been drawn up for all European river systems. The measures fixed in these plans must take effect by 2012 at latest.

Public involvement

Water protection can only be successful, if the public is informed and involved. Interest groups play a key role, since they represent the entire range of pressures on water bodies, no matter whether economic uses, nature protection or leisure uses are concerned.

River water uses along the R. Main

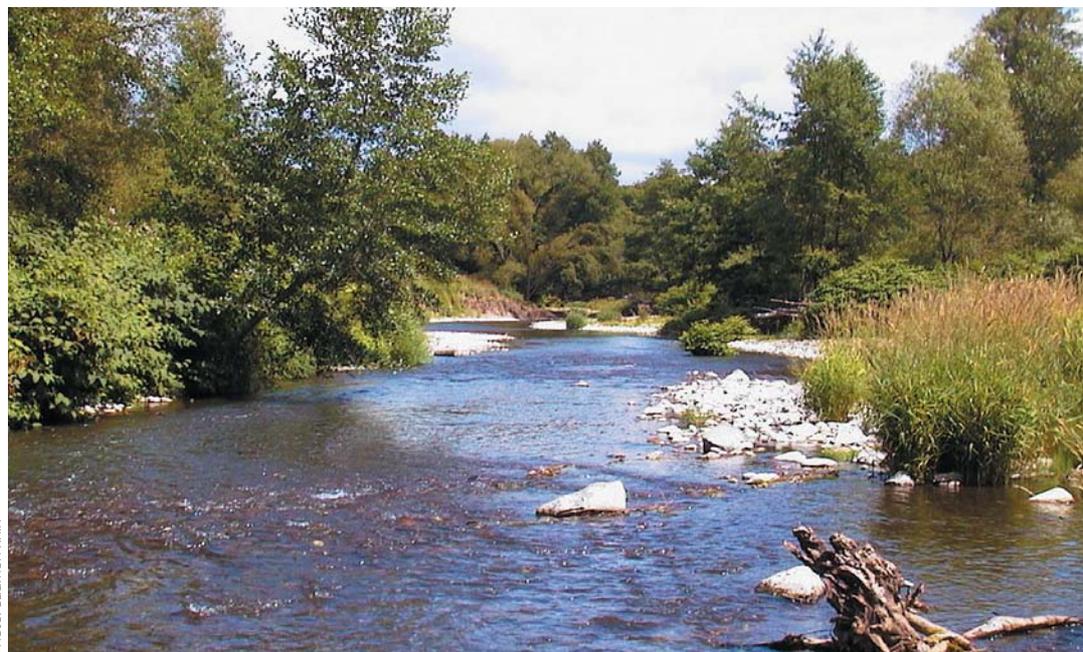


Photo: Pro Natur GmbH



Photo: Saumon-Rhin

Salmon patrons in France



Doller near Schweighouse in Alsace

THE RHINE AND ITS CATCHMENT

A NETWORK

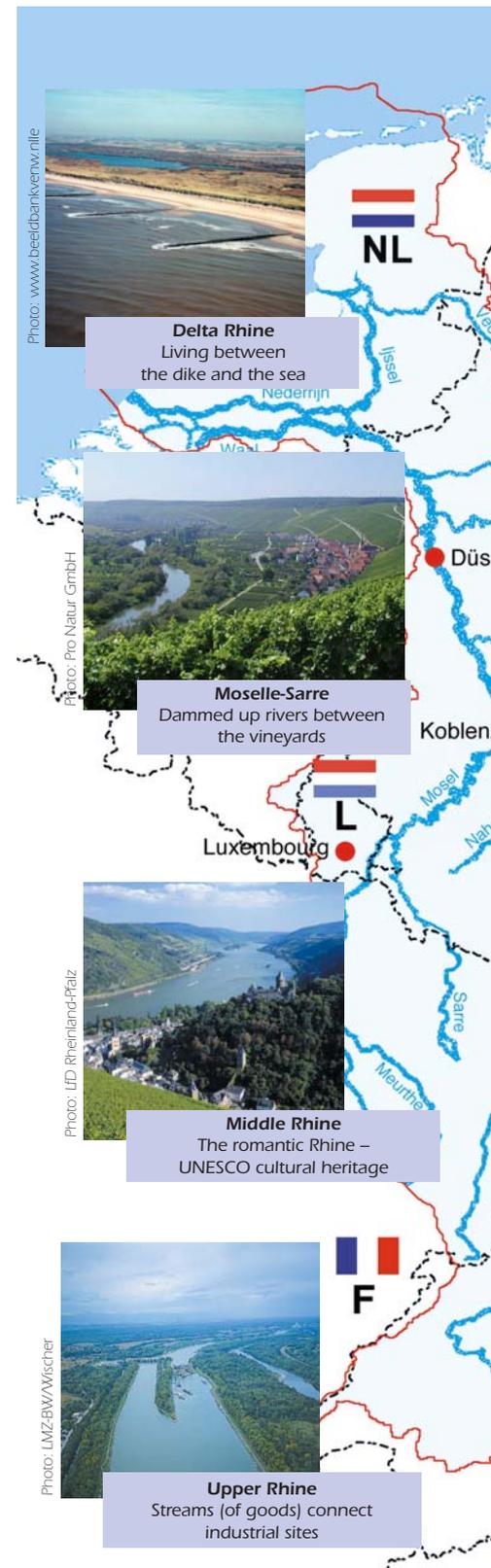
The Rhine is the only river to connect the Alps with the North Sea. It represents the most important cultural and trade axis in Central Europe. Some 58 million people live in its catchment. Together with its tributaries, innumerable brooks, lakes and wetlands it constitutes a highly branched network of waters. Rivers give a final touch to the landscape, but landscapes also lend their character to their rivers. The groundwater, too, is part of this natural system

The Rhine from source to estuary

The Rhine has its source in the Sankt-Gotthard massif, as Alp Rhine it runs through the Sargans valley before flowing into Lake Constance. Between the falls of Schaffhausen and Basel the High Rhine constitutes the frontier between Switzerland and Germany. North of Basel it turns into the Upper Rhine flowing through the lowlands of the Upper Rhine. As Middle Rhine it continues from Bingen to Bonn where the Lower Rhine enters the bay of the Lower Rhine. Beyond the frontier between Germany and the Netherlands it splits into several arms and, together with the Meuse, it forms a gigantic delta. The Rhine flows into the North Sea some 1320 kilometres downstream its source.

Data on the Rhine river basin

Surface	ca. 200 000 km ²
Inhabitants	ca. 58 million
Important uses	Navigation, use of hydroelectric power, industry, agriculture, drinking water supply, flood protection, local recreation
Main stream (length)	Rhine (1320 km)
Important rivers	Rhine (Alp Rhine, High Rhine, Upper Rhine, Middle Rhine, Lower Rhine, Delta Rhine), Aare, Ill, Neckar, Main, Moselle, Sarre, Nahe, Lahn, Sieg, Ruhr, Lippe, Vechte
Important lakes	Lake Constance, IJsselsea
Countries concerned	EU members (7): Italy, Austria, France, Germany, Luxemburg, Belgium, Netherlands Others (2): Liechtenstein, Switzerland
Co-ordinating the WFD implementation	Co-ordinating Committee Rhine in co-operation with the International Commission for the Protection of the Rhine (ICPR)



Sub basins and their natural borders

Hydrological and natural characteristics were applied when splitting the Rhine river basin district into nine mainly international sub basins where the different countries and German Länder involved or the regions concerned will agree upon all questions relating to water management.

The many faces of the good status

When assessing the status of a water body, the first step is to fix its good status. The great variety of water bodies between the Alps and the North Sea brings about great differences: in size, oxygen and nutrient content as well as in the characteristics of its banks and bottom. A bubbling mountainous stream will be clearly different from a lazily flowing river. We dispose of a description of the ideal status, generally reflecting a historic status for each type of water. The good status is obtained, once the present situation of a water body only slightly differs from this description of the ideal status.



Co-ordinating Committee Rhine, 2003 Vaduz (Liechtenstein)

Co-ordination in the Council of Nine

Within the Co-ordinating Committee, representatives of nine states take the decisions required for the implementation of the WFD in the Rhine basin. They closely co-operate with the International Commission for the Protection of the Rhine (ICPR) and fall back on its many years of experience. In 1950, the five Rhine bordering countries Switzerland, France, Luxemburg, Germany and the Netherlands founded the ICPR. Thanks to its activities, the state of the Rhine and its floodplain has improved. This also applies to the international co-operation on the Alp Rhine, Lake Constance, the Moselle and the Sarre.

RIVERS, LAKES AND THE COAST

INTENSIVELY USED HABITAT

Today, the Rhine figures among Europe's most intensively used rivers. The former natural river has turned into a cultural river. With a view to serving navigation, hydroelectric power generation and flood protection it was forced into a fixed river bed interrupted by transversal structures. Right up to the 1980ies the river was so heavily polluted with wastewater that it was generally called the sewer of Europe. Already before, but in particular after the chemical accident at the Sandoz plant near Basel in 1986, the Rhine bordering countries invested large sums into developing wastewater treatment plants and the technical security of industrial plants. Since then, the Rhine water quality has considerably improved so that today even salmon can live in the river. We now have the possibility to further improve the ecological

state of the Rhine and its tributaries – to the benefit of man and nature protection.

Water bodies on the way towards their good status?

Unfortunately, the Rhine, its tributaries and the North Sea coast have lost much of their natural character – river valleys and coasts are much appreciated as settlement areas, and this has a variety of consequences for the water bodies. The Wadden Sea is the last retention basin for all noxious substances transported by the Rhine. The inventory concluded in 2004 analysed the chemical and ecological status of rivers, lakes and coastal waters and assessed, whether they will reach the environmental aims. In the higher regions of the Alps and the Vosges this will probably be the case, while it today seems rather unlikely in densely settled areas with industry and intensive use. The same applies to the coastal region. The water quality of Lake Constance is again very good and the lake serves as an important drinking water reservoir.

Chemical status – much has already been achieved

Up to the 1980ies, wastewater inputs from industry and households were the most important source polluting rivers with nutrients and noxious substances. The development of wastewater treatment plants considerably reduced pollution from these point sources.

Diffuse water pollution through the air or the soil continues to be problematic. Nitrate washed out from agricultural surfaces and reaching rivers and lakes through the soil



Dutch Wadden Sea

and ground-water is a classical example. Present analysis has shown that the nutrient and pollutant content in the Rhine basin is still too high. Problematic pollutants are heavy metals such as chromium, copper, zinc and nickel as well as PCB and hexachlorobenzene which are largely remnants of former inputs or of diffuse origin.

Ecological status – a great need for action

A water body must meet more than chemical conditions in order to be able to function as habitat for animals and plants. The structure of water bodies, that is the nature of the river bed, the banks and floodplains has been immensely changed throughout the entire Rhine basin. During the past 100 years almost the entire Rhine and its tributaries – above all Neckar, Main and Moselle - have been dammed and straightened for purposes of navigation, hydroelectric power generation and flood protection. Dikes separate the floodplains from the river. All this



Island Pfalz near Kaub in the Middle Rhine



Photo: RWS/MD

IJssel km 952

Programmes on the protection of the Rhine

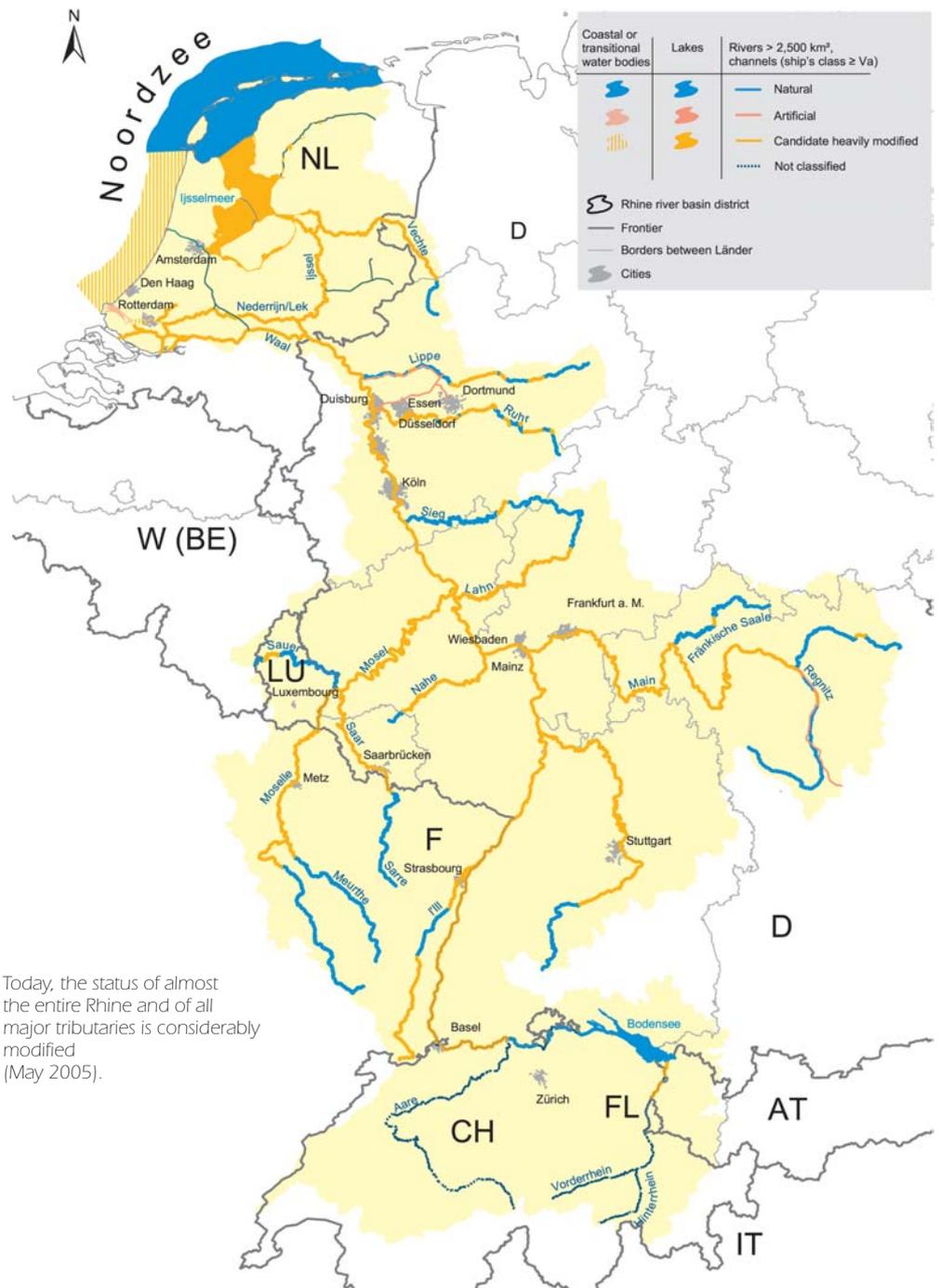
The Rhine Action Programme:
1987 – 2000 with the salmon as symbol of the rehabilitation of the Rhine

Rhine 2020:
including the Action Plan on Floods 2001 - 2020

has serious consequences for the river ecosystem. In order to improve the ecological state, water bodies must be more nature near and free fish migration must be re-established, e.g. with the help of fish ladders.

Natural, artificial and considerably modified

Even though, due to present uses many constructions are irreversible, the waters concerned should be ecologically revalued to the greatest possible extent. At least the best possible status permitted by the existing uses should be reached. This is true of considerably modified waters – that is, almost the entire Rhine and all of its most important tributaries – as well as of artificial waters such as channels or flooded gravel pits. Only the character of the river Sieg and of the upper reaches of Neckar, Main, Moselle, Sarre, Ruhr, Lippe and Vechte is largely still natural.



Today, the status of almost the entire Rhine and of all major tributaries is considerably modified (May 2005).

Biology as indicator

Fish and other organisms serve as indicators of the ecological status. The inventory of fish in the Rhine showed that, for the first time since 1970, 63 fish species again

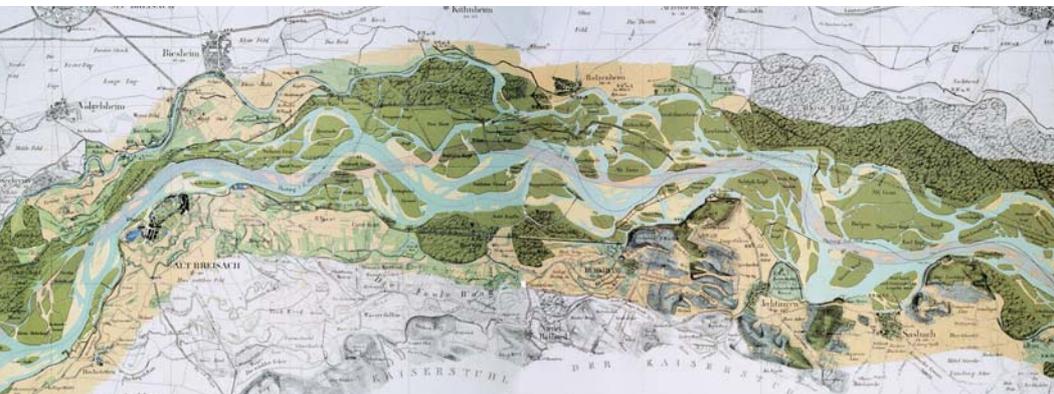
live in the Rhine. Many species, such as salmon, sea trout, sea and river lamprey have returned. Today's fish and invertebrate fauna, among others snails, insect larvae and mussels are far from having reached a stable balance. Due to



Young salmon

Photo: LOBE, U. Hauke

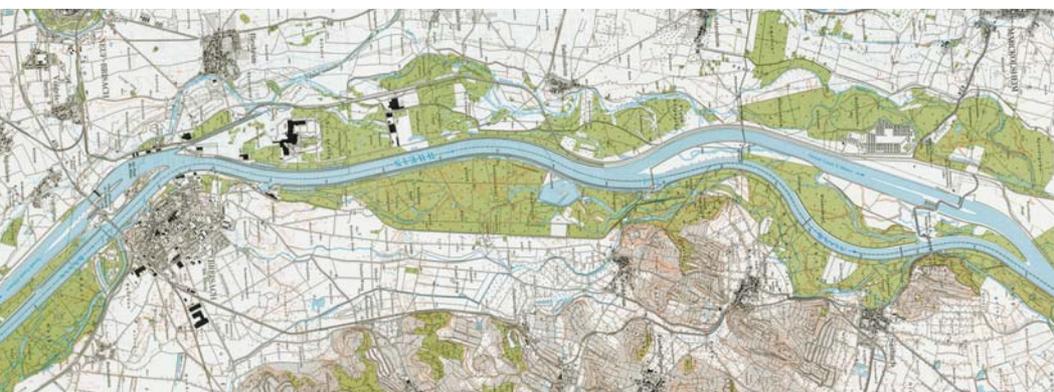
Changing river landscape: The Rhine at Breisach 1838, 1872 and 1980: As recently as 160 years ago, the river freely moved through the floodplain; it topped the banks and changed its river bed. Today it is forced into a fixed bed and deprived of its natural dynamics.



Rhine 1838, source: Generallandesarchiv Karlsruhe



Rhine 1872, source: Generallandesarchiv Karlsruhe



Rhine 1980, source: Landesvermessungsamt Stuttgart

the unnatural and monotonous state ubiquitous with low demands to the ecological state dominate in the Rhine and its tributaries. With a view to improving biological diversity, rivers must become more varied and sub natural.

A state nearer to nature englobes more flood protection

Along the Rhine, flood protection is a permanent subject. Here, too, the ecological targets of the Water Framework Directive give new perspectives. Ecological diversity increases where rivers are re-natured, dead river branches are reconnected and alluvial areas are re-established as floodplains. At the same time, natural flood retention areas form. Preventive flood protection is modelled on natural river landscapes: Flood waves of rivers with enough space to brake the banks are less high.

GROUNDWATER

A VULNERABLE TREASURE IN THE UNDERGROUND

Nobody sees it, nobody hears it, but it is everywhere: groundwater is the treasure beneath our feet.

There is a continuous exchange between groundwater, rivers and lakes. A huge part of our drinking water is derived from groundwater. It must be particularly protected, since it is much more vulnerable to pollution than rivers and lakes are. Groundwater has a long term memory. Once substances have contaminated the groundwater, the degradation process is extremely slow, if at all

Groundwater on the way towards the good quality status?

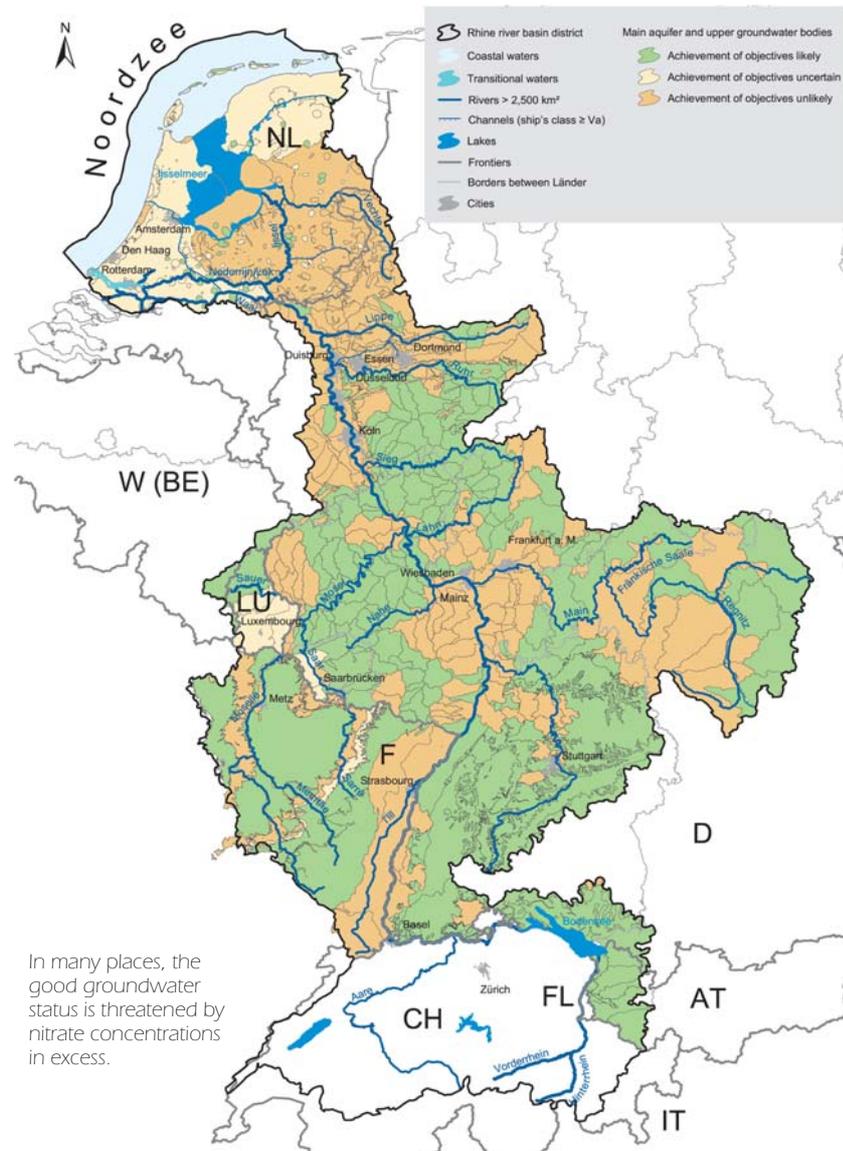
Groundwater is in the headlines once the damage has been done that is, once too high concentrations of nitrate or other noxious substances are found in a drinking water well. Then threshold values can only be respected by applying costly purification procedures. Groundwater is essential for man as well as for nature, e.g. in wetland sites. Therefore, in future, it will be exhaustively protected. The current inventory proves that there are sufficient groundwater reserves in almost all regions of the Rhine valley and that they are sufficiently recharged. There are isolated critical areas along the Moselle/Sarre, on the Lower Rhine and Delta Rhine. The situation regarding the chemical status is different: parts of the groundwater are endangered almost everywhere.

Chemical status – no all clear signal to be expected

Locally, historic pollution or accidents implying substances noxious to water may put a pressure on groundwater. Exhaustive pollution, particularly with nitrate and plant protection agents from agricultural surfaces is considerably more problematic. Agricultural practice must be further optimised with a view to avoiding or at least reducing nitrate leaching. This also applies to the use of plant protection agents.

Quantity status – unproblematic almost everywhere

The maintenance of the stock of groundwater is based on sustainable groundwater management which means that, on the long run, groundwater abstraction must not exceed natural recharge due to precipitation. Generally, in the Rhine river basin, the groundwater quantity status is not under threat. In particular in mining areas drawdown poses a problem.



NEW WAYS IN ENVIRONMENT POLICY

COMBINING ECOLOGY AND ECONOMY

The good health of rivers, lakes and of groundwater largely depends on how intensively they are used. Therefore, investigations have been made not only into the status of water bodies, but also into the economic importance of water uses. In the Rhine area the different uses put a high pressure on waters. Therefore, it is all the more important to weigh benefits against costs. Water users will have to reasonably contribute to the costs entailed by drinking water production and wastewater treatment

Stresses and strains ...

arise, wherever water bodies are used. This does not only apply to activities along the waters themselves, such as navigation or use of hydroelectric power. Agriculture, too, impacts on groundwater when nitrate and plant protective agents are washed out. Even the air poses a threat, particularly due to vehicle and industrial emissions. With a view to assessing which uses of water bodies pose a threat to their good status the most important ones were closely analysed and a prognosis of their future development was drawn up.

... and costs!

All citizens need drinking water and produce wastewater. Both have an effect on water bodies – and cause expenditure. Some 58 million people live in the Rhine basin. 99 percent of them are connected to public drinking water supply and 96 percent to a wastewater treatment plant. Assuring

this supply requires constant high investments. Expenses are largely covered by income from water taxes upon households, industry and agriculture. In future, the use of the environment will to a larger extent be considered as part of the expenses.

Considerations are required

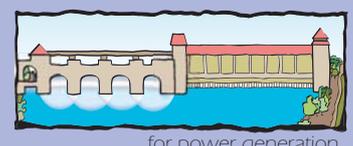
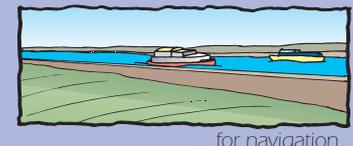
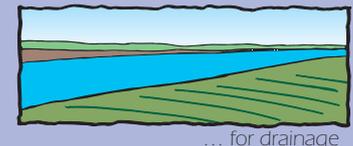
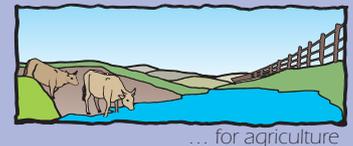
The Rhine river district is a densely settled economic area with an average of 290 inhabitants per square kilometre. More than six million people work in industry. Half a million people work in agriculture. When choosing measures it must be taken into consideration, how environmental objectives can best be reached at best possible cost efficiency. These considerations may lead to restricting certain uses in favour of water protection.

Flooding may be expensive

During the last 100 years, more than 85 percent of the natural floodplains of the Rhine were lost due to river development, straightening and diking of the river; the situation is almost the same along all tributaries. The result is that flood waves are higher and flow more rapidly. Additionally, the damage potential rises with each new built up surface in the floodplain. During an extreme flood along the entire Rhine damages may amount up to 165 billion Euros. Therefore, preventive flood protection is one of the focal points of action of the Rhine bor-

dering countries. It means keeping floodplains free from constructions, creating retention areas, re-naturing water bodies as well as flood warning and preventive construction.

The ideal river



PROSPECTS

FURTHER DEVELOPMENT

By 2015, the waters in the Rhine river basin are supposed to have reached a good status. The results of the present inventory form the basis for the further implementation of the Water Framework Directive. Water bodies under pressure must be put under more intensive surveillance, measures must be planned and uses must be adjusted. Environment authorities, nature protection associations and water users must come to an agreement as to which measures make ecologically make sense along which waters and at acceptable costs.

Check results and plan measures

The states involved in the present inventory have based themselves on different data material and procedures, so that the results of the present inventory can only be converged and compared to a limited extent. With a view to enabling such convergence and comparison in future, national and international experts must develop comparable procedures and criteria. Where it today seems improbable or unclear whether waters will reach the environmental objectives, detailed monitoring programmes will start in 2006 and pressures will be closer analysed. Comparable biological and chemical methods of measurement will lead to a definite classification of water bodies and appropriate measures will be planned until 2009.

The most important already emerging measures are

- to restore free migration through the rivers and to increase the habitat diversity along the waters
- to reduce diffuse pollution, in particular from nutrients, plant protective agents, metals, dangerous substances derived from historic pollution
- to further reduce point source pollution, in particular due to industrial and municipal inputs
- to harmonize water uses and the environmental objectives set out in the WFD: navigation, use of hydroelectric power, flood protection and others.

Public participation

In future, environment authorities will closer co-operate with users and environmentalists, as, today more than ever, it is important to let all water users participate in reflections and actions. Public participation in drafting management plans is obligatory from 2006 on. Important interest groups have already been informed, in order to create acceptance and co-responsibility. In the Rhine area, associations and organisations may participate in international working and expert groups and express their ideas and wishes. In many places advisory boards and fora have additionally been created. Today anybody can use internet for information on the state of the water bodies in his immediate neighbourhood.

Photo: Ruden Remens, Middelburg



Walking on the beach

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Photo: BIG

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