



Bavarian Environment Agency

The European Water Framework Directive and its implementation in Bavaria

River basin analysis Results

State April 2005



An information on the implementation of the
European Water Framework Directive in Bavaria

River basin analysis accomplished in Bavaria

How does Bavaria fulfil the requirements of the Water Framework Directive?



„Bavaria is implementing the European Water Framework Directive on a one-to-one scale. Today already, the overall quality of our rivers and lakes is good. This is due to the fact that, in Bavaria, more than 95 per cent of all wastewater is being duly treated. According to new European law not only water chemistry and biology but also the structure of waters is further improved and our objective is to reach an overall good ecological status of waters in Bavaria by 2015.

Dr. Werner Schnappauf
Bavarian Secretary of State
for Environment, Public Health
and Consumer Protection

Bavaria's Reports to Brussels

In March 2005, the results of the analysis were reported to the European Commission. These reports refer to entire river basin districts. Therefore, the Länder and countries concerned co-ordinated their work and delivered their results in joint reports. Bavaria co-operated in the reporting for four river basin districts:

- Danube river basin district: 68 % of Bavaria's surface
- Rhine river basin district: 29 % of Bavaria's surface
- Elbe river basin district: 3 % of Bavaria's surface
- Only small shares of the Weser river basin district are located in Bavaria.

Results show where monitoring is required

The submission of the reports to the EU Commission in March 2005 concluded the river basin analysis, the second phase of the implementation of the Water Framework Directive (WFD). For the purposes of this comprehensive survey rivers, lakes and groundwater had to be divided into so-called water bodies. The water management administration assessed each of these water bodies by applying uniform methods with respect to the question, whether, by 2015, it will presumably achieve the objectives of the WFD without any additional measures.

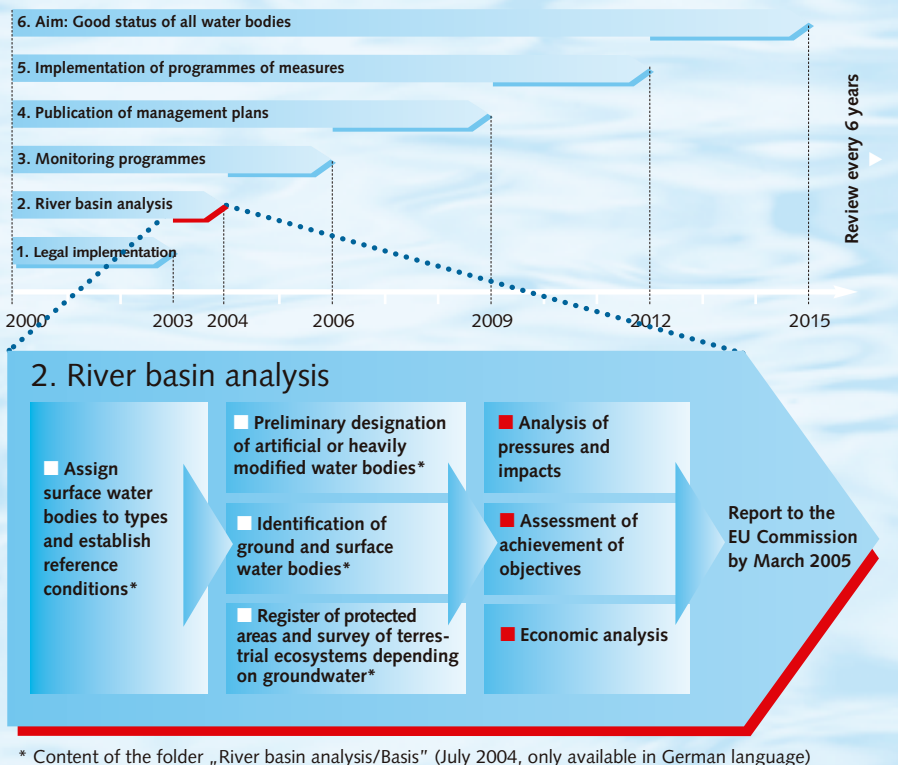
This first evaluation prepares the next steps within the implementation procedure: Detailed monitoring programmes will be carried out at all sites where, today, it is improbable or still uncertain whether the objectives of the WFD will be achieved. There will thus be a more in depth analysis of pressures.

The folder published in this series entitled „River basin analysis/Basis“ described basic notions and methods of the analysis. The present folder „River basin analysis/Results“ explains the ► **Evaluation of water bodies** and includes a first assessment with respect to the question whether the objectives of the WFD will be achieved. Furthermore, it summarises substantial cornerstones concerning the ► **Description and structure of waters** and submits precise figures. The ► **Economic analysis** and the information and consultation of the public represent further tasks.

All results and maps as well as the folder „River basin analysis/Basis“ are available (only in German language) under:

www.wasserrahmenrichtlinie.bayern.de

Planning phases within the European Water Framework Directive



Economic analysis

The water framework directive is the first European wide regulation which explicitly requires the use of economic instruments to achieve water-related environmental objectives. When setting the programmes of measure economic analysis is to enable a rational discussion on the cost-effectiveness of measures. In addition, it is required to ensure that the price charged for water services (water supply, wastewater disposal) takes account of the principle of cost recovery, including environmental and resource costs.

The purpose of the initial economic analysis was to provide a preliminary data basis for assessing the economic significance of water uses as well as for their impact on water status. The analysis concerned

- the economic significance of water uses,
- the future development of significant water uses until 2015 and
- the degree of cost recovery for water services.

In future, economic analysis should therefore support decisions which involve balancing the interest of various groups related to water uses.

The present economic significance of water uses for each river basin district is described using comparable socio-economic criteria. As for households, industry and agriculture activities like drinking water supply from groundwater, wastewater disposal or other significant uses of surface water are considered relevant. Clearly, there is a close relationship with the analysis of impacts and pressures for water bodies.



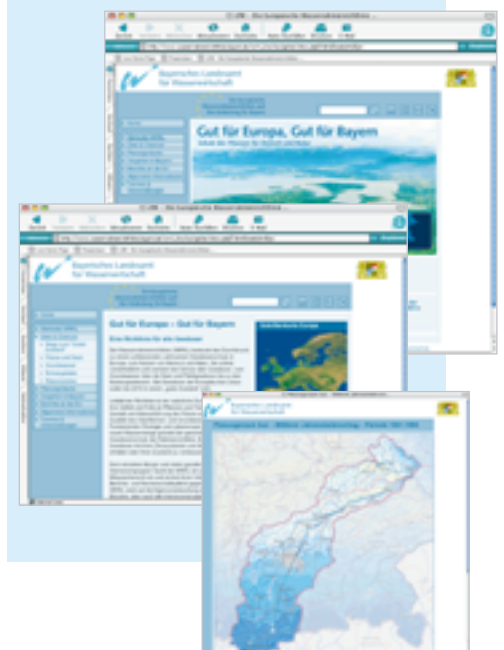
Apart from the analysis of the current situation statements will have to be made to interpret long term developments of key economic drivers (baseline scenario). For example, demand for drinking water was simulated using models based on population development. It is worth mentioning that the principle of cost recovery has a long tradition in Germany and is already embedded in legislation. Current levels of cost recovery were analysed in three representative regions outside Bavaria obtaining results that could be applied to Bavaria as well. The results show a high degree of cost recovery.

Extended offer of information

The water framework directive attaches particular importance to public information and participation, in particular when establishing management plans starting in 2006. With a view to preparing this procedure, and since work started on the analysis, the Bavarian water management administration regularly informs on current developments. The internet site on the implementation of the WFD in Bavaria is the focal point of information. It provides

- basic information for interested newcomers,
- regional information with thematic maps of planning areas,
- most recent results of the analysis in Bavaria for experts.

Since 2003, the „Wasserforum Bayern“ has been informing associations and the organised public and gives authorities advice on the implementation. On a regional scale, public participation will be further enhanced within the next planning steps.



Description and classification of waters

Water bodies and ecological types

The first result of the river basin analysis is the identification of water bodies for rivers, lakes and groundwater. In future, management plans and the classification of waters will refer to these units. Moreover, rivers and lakes have been classified according to types of waters. Reference conditions apply to each type, fixing the high ecological status. The present status of a water body is judged against these reference conditions. In Bavaria, there are 17 natural types (including subtypes) of rivers, six natural types of lakes and one artificial type of lake.

Water bodies are sections of waters with similar characteristics which, at the same time, must not be too small, so that the monitoring and management efforts remain acceptable. Thus, Bavarian water bodies have been identified as follows:

- 900 water bodies in relation to rivers with a watershed from 10 km² and upwards, representing a total length of 23 435 km.
- 54 water bodies in relation to the 54 lakes with 0.5 km² surface and more. Each water body corresponds to a lake.
- 56 water bodies in the groundwater and one transboundary deep groundwater body in Bavaria and Austria.

The identification of river water bodies is considerably finer than that of groundwater bodies, as different types of rivers and artificial as well as heavily modified river sections must be delimited.

Protected areas

A register of protected areas in Bavaria protecting waters or habitats and species depending on water has been established.

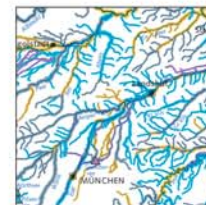


Natural, artificial or heavily modified?

Artificial or heavily modified water bodies are rivers or lakes presenting substantial changes in hydromorphological characteristics which, if changed into a more natural structure, would have significant adverse effects on permanent uses. The analysis 2004 provisionally designated 23 per cent of the rivers and 23 lakes in Bavaria as artificial or heavily modified. The final designation is due by 2009. For these water bodies, a less stringent environmental objective applies: the good ecological potential. The question, whether a structural modification of waters or a flow regulation is really significant can only be answered from 2006 on, once the methods for the classification of the ecological status have been established. In particular aspects such as river continuity for water organisms at obstruction features (impounding dams, weirs) and culverts will have to be taken into account.

Terrestrial ecosystems depending on water

The analysis of Bavarian waters also includes terrestrial ecosystems depending on water (wetlands). The result is that, in Bavaria, all 56 groundwater bodies have terrestrial ecosystems depending on water. According to the standards set out in the WFD, the status of these wetlands must not deteriorate considerably. Beginning in 2006, the monitoring of waters will include the impact of groundwater on these areas.



◀ The maps of artificial or heavily modified waters in Bavaria are to be found in the map service of: www.wasserrahmenrichtlinie.bayern.de

Artificial or heavily modified waters: provisional designation¹

Water bodies	Rivers [%] ²	Lakes [number]
Not heavily modified	46	31
Possible candidate for heavily modified	31	0
Heavily modified	20	12 ³
Artificial	3	11

¹ The final designation of artificial or heavily modified waters will not be established before 2009.

² referring to 23 435 km rivers

³ mostly storage reservoirs (impounded rivers).

Analysis of water bodies

Pressures and their impacts

The central task of the river basin analysis is to look into the impacts of human activities on waters. To this end, a combined approach is applied, considering the pressures (emissions) on the one hand and their impacts (pollutant input) on the other. In a first step, data and information on possible pressure sources have been gathered, in particular with respect to:

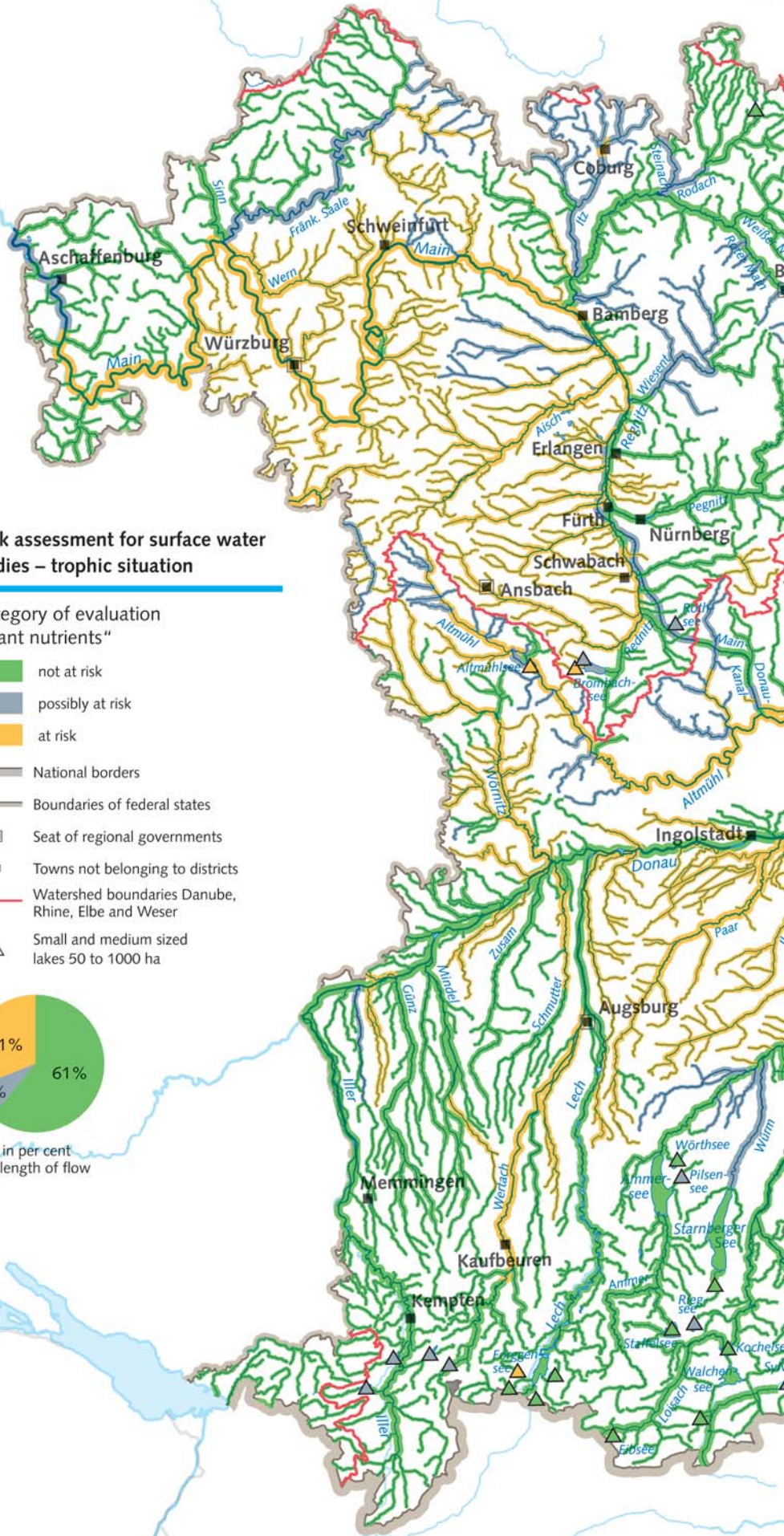
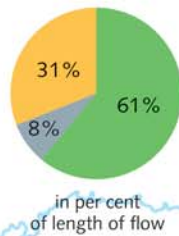
- inputs from point sources, such as pollution from municipal and industrial wastewater treatment plants,
- inputs from diffuse sources, in particular agricultural use, e.g. with the help of a balance of nitrogen surpluses and the assessment of erosion potential,
- hydromorphological alterations, such as encroachment on the quantity, flow dynamics or the structure of waters.

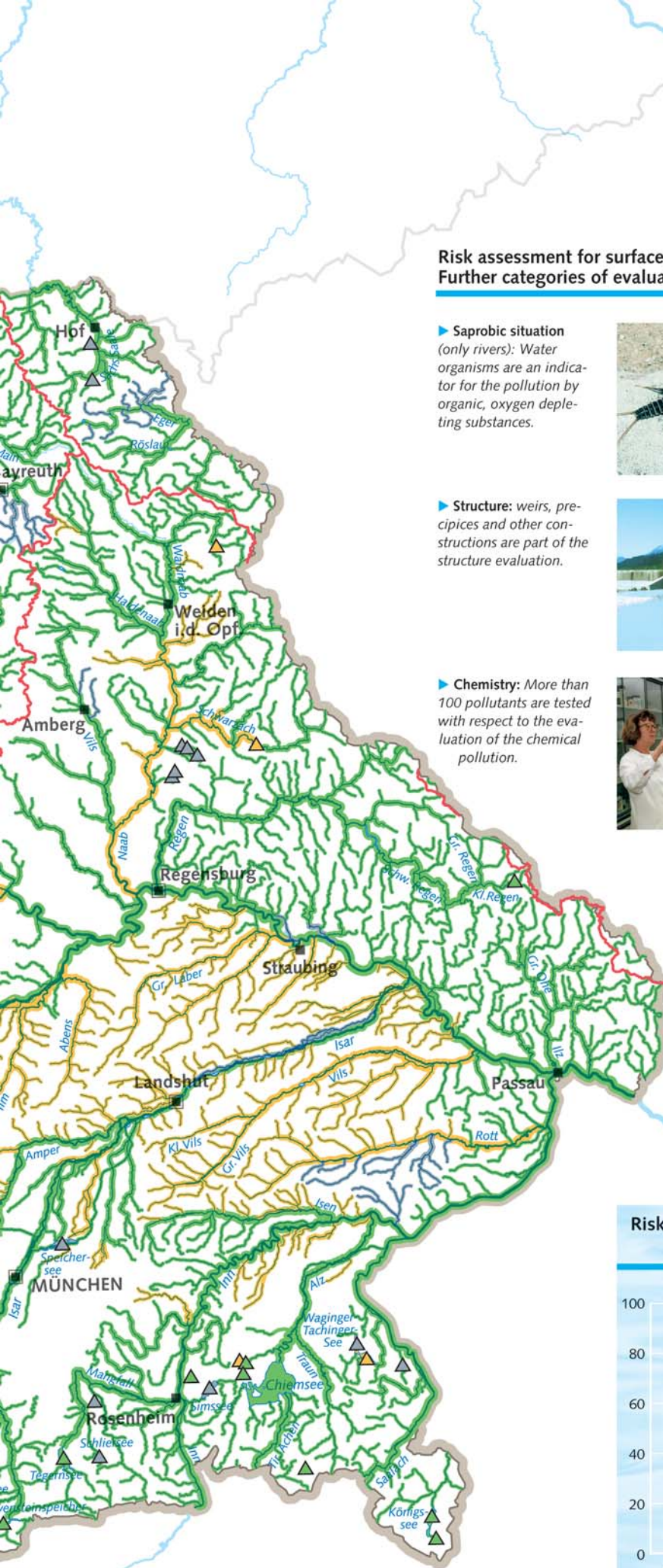
The evaluation of how sensitive the waters react to these pressures is based on an observation of impacts. For Bavaria, these have already been surveyed: The map of saprobity shows pressures due to easily degradable organic compounds mainly of point source origin. Nutrient pollution is mainly of diffuse origin. In larger waters often dominated by plankton impacts are determined by mapping the nutritional situation. For smaller water bodies, the nutritional situation is estimated by determining the phosphate and nitrate concentration. Hydromorphological alterations are recorded by mapping the structure of waters and flow regulations. Additionally, pressures on waters due to pollutants (WFD, annex VIII, IX and X) are evaluated.

Risk assessment for surface water bodies – trophic situation

Category of evaluation „plant nutrients“

- not at risk
- possibly at risk
- at risk
- National borders
- Boundaries of federal states
- Seat of regional governments
- Towns not belonging to districts
- Watershed boundaries Danube, Rhine, Elbe and Weser
- △ Small and medium sized lakes 50 to 1000 ha





Risk assessment for surface waters Further categories of evaluation

► **Saprobic situation** (only rivers): Water organisms are an indicator for the pollution by organic, oxygen depleting substances.



► **Structure:** weirs, precipices and other constructions are part of the structure evaluation.



► **Chemistry:** More than 100 pollutants are tested with respect to the evaluation of the chemical pollution.



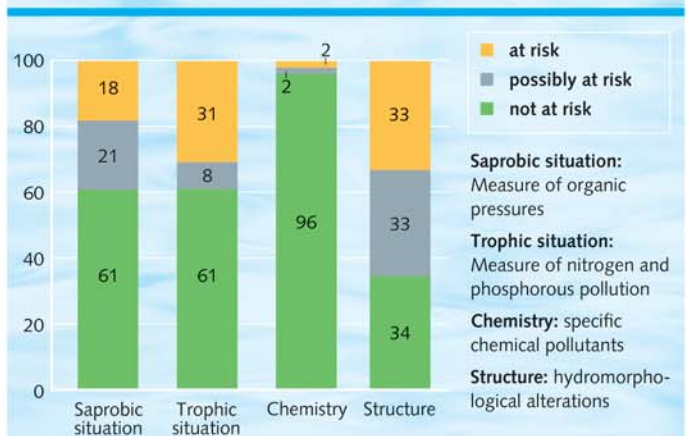
Risk assessment ...

The most important result of the river basin analysis: For the first time, there is a risk assessment of all water bodies, whether or not they will reach the objectives the water framework directive sets out for 2015. This is no anticipated classification of their status. On the contrary, on the basis of the results it will be determined, where a closer monitoring and investigation into causes is required.

If a water body is not at risk, surveillance monitoring will be sufficient. Water bodies at risk must be monitored more intensively (operational monitoring). Water bodies possibly at risk – for which due to lacking data or unresolved questions of evaluation it is not clear, whether or not they will reach the objectives – will be subjected to further survey. From 2006 on they will then be assigned to surveillance or operational monitoring.

If the result of the assessment is “at risk” or “possibly at risk”, this does not mean that achievement of objectives is believed to be impossible or is no longer strived for. However, these water bodies do present particular risks to be taken account of within further planning in order to equally achieve WFD objectives.

Risk assessment for rivers [in %]



... of rivers



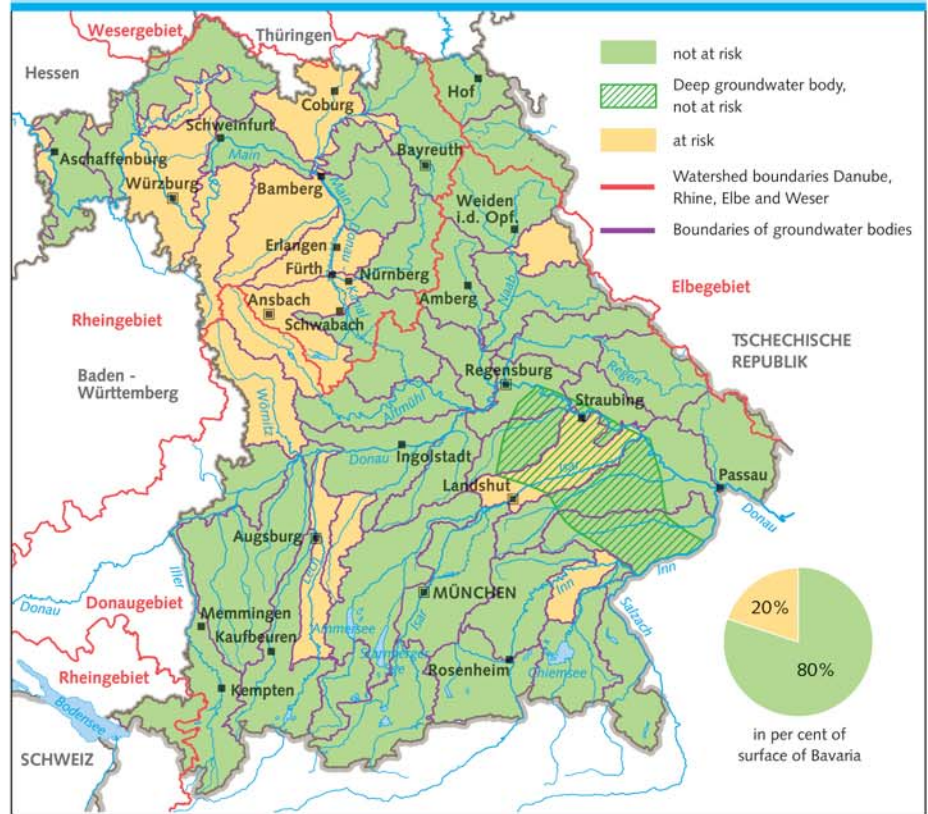
The risk assessment for rivers is based on four categories of evaluation: the biological categories of the saprobic situation (pollution by organic, oxygen depleting substances) and the trophic situation (pollution due to plant nutrients), chemistry (pollution due to specific chemical pollutants) and structure or flow regulations (hydromorphological alterations).

The four categories were evaluated separately in order to point out the different problems and pressures. Additionally, the significance of the four categories greatly varies. Biological and chemical criteria are decisive for the status of waters, structure is an additional criterion.

For the categories „saprobic situation“ and „trophic situation“ the achievement of objectives is expected for more than 60 per cent of rivers. With respect to chemistry the percentage even amounts to 96 per cent. The percentage is lower for the structure of water bodies: The achievement of objectives is only expected for 34 per cent. This is due to the multiple uses of Bavarian rivers. But rivers with structural problems are not automatically designated as heavily modified. This designation – which also means less stringent environmental objectives – requires significant permanent uses, such as navigation or hydropower plants.

The LAWA (Länderarbeitsgemeinschaft Wasser – working group of the federal Länder) has recommended methods for the analysis. On an international level, these were adapted according to the different watersheds, in the federal Länder they were adapted according to the existing data. Additionally, in Bavaria, the State Offices for Water Management have evaluated and eventually corrected the risk assessment on the basis of their knowledge of the situation on site. A survey of methods including the procedure adopted for Bavaria has been published on the net.

Risk assessment for groundwater bodies



... of lakes



24 of the 54 lakes surveyed are expected to achieve the objectives, 8 of them are at risk. For the examination of lakes, nutrient pollution

(trophic situation) proves to be the most important criterion. There are only two cases in which possible effects of bank protection works or of chemical pollutants have been estimated to pose a risk.

Risk assessment for lakes

	Natural lakes	Reservoirs and flooded quarry ponds
not at risk	20	4
possibly at risk	10	12
at risk	3	5

... of groundwater



Nitrate pollution proves to be the decisive risk assessment criterion for groundwater: Therefore, if no further measures are taken, 15 groundwater bodies (20 per cent of the surface of Bavaria) will presumably not achieve the objectives set out in the WFD.

Among the plant protective agents it is mostly atrazine and its derivatives which pollute groundwater. Due to the fact that, in Germany, application of this agent has been forbidden since 1991, it is expected that residues of this substance accumulated in the soil will, by 2015, have decreased to such an extent that they no longer pose any risk. As far as the quantitative status of groundwater is concerned, there is no known risk for not achieving objectives.

The next steps: focal points become apparent

The analysis of Bavaria's waters reveals that, in particular with respect to organic and chemical pollution, the objectives of the WFD have largely been achieved – this is above all due to progress made in wastewater treatment. Thus, an important condition for further ecological improvement of waters is given. Two focal points for future programmes of measures become apparent:

- **Diffuse inputs of nutrients** must further be reduced in order to counteract over-fertilisation of inland waters and the seas. As far as drinking water supply in Bavaria is concerned, the protection of groundwater against nitrates and plant protective agents remains an important issue.

- **River structures**, in particular river continuity for fish must be improved. Additionally, rivers require more room for natural development, as buffer against substance inputs and for flood retention purposes. According to the WFD artificial or heavily modified



waters which may only be renatured to a very limited extent must be ecologically re-valourised within the scope of what is possible.

All results of the analysis are preliminary. The monitoring results will be decisive for a final classification. By 2006 monitoring programmes must be designed for waters and monitoring networks must be adjusted to the requirements of the WFD. Biological and chemical monitoring will result in a definite classification and measures will be planned by 2009.

Starting in 2006, results of the analysis will then be checked against the monitoring programmes implemented and the status of waters will be classified according to five classes.

The WFD on the internet

- www.wasserrahmenrichtlinie.bayern.de
- www.wrll.bayern.de

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Bavarian
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