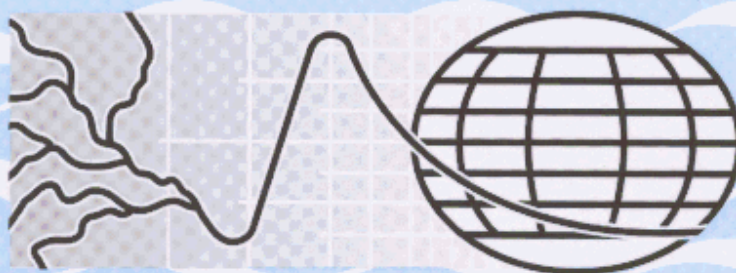


Report No. 27

**Water Resources Management
Country Profile Germany**

A contribution to the
Global Water Information Network
WWW.GLOBWINET.ORG



GRDC



GRDC operates with the support of the Federal Republic of Germany under the auspices
of the World Meteorological Organization (WMO)

Weltdatenzentrum Abfluss
Bundesanstalt für Gewässerkunde
Koblenz, Deutschland

Global Runoff Data Centre (GRDC)
Federal Institute of Hydrology (BfG)
Koblenz, Germany

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July 2002

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Preface

Information Networks are essential tools for most ongoing activities seeking to promote the Rio/Dublin principles on Integrated Water Resources Management, as they facilitate communication and provide easy access to documents and geophysical data related to water.

The GRDC has been contributing for several years to the implementation of a Global Water Information Network (GLOBWINET). In this project GRDC is a subcontractor of the German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit, GTZ) in the scope of a Global Water Partnership (GWP)-Associated Programme (AP) funded by the German Federal Ministry for Economic Cooperation and Development (BMZ).

At first sight, the mission of GLOBWINET seems to be different from that of the GRDC as GLOBWINET provides information on three inter-linked objects, namely

- Organisations,
- People,
- Published Materials,

related to the following "water-topics":

- Transboundary River Basin Organisations,
- Water Policy and Legislation,
- Water Sector Reform,
- Catchment Management,
- Prevention of Conflict over Water Use,
- Regional Water Resources Situation.

However, GRDC as well as GLOBWINET are working on the integration of already existing information which is hard to track down and even harder to acquire. Both GRDC and GLOBWINET are in-line with many recently flourishing initiatives on building information networks or meta-databases. As such they contribute to the development of an even further integrated system that hopefully will arise in the future.

GLOBWINET uses an architecture to input, quality-control and store the information in an open and participatory way, easy to access from distributed sites by means of a web-based client for input, retrieval and decentralised administration by many focal points. Stakeholders and decision-makers in water business, as well as water engineers and scientists from all over the world are invited to use the information services of GLOBWINET free of charge and to cooperate with it in providing and updating information for the further development of its database.

So far, two regional networks have been developed under the roof of GLOBWINET: the Southern African Water Information Network (SAWINET) and the German Water Information Network (GEWINET). The GRDC took over the task to trigger the provision of quality information on the German water resources sector for GEWINET. The report presented here is one major product of this project.

The "Country Profile Germany" is a concise compilation that provides easy access as a whole to various scattered and fragmented sources already reporting on different aspects of the German water management sector.

Koblenz, July 2002

Thomas Maurer
Head, GRDC

The Global Water Information Network
WWW.GLOBWINET.ORG



WATER RESOURCE MANAGEMENT

COUNTRY PROFILE GERMANY

Compiled by the Global Runoff Data Centre (GRDC)
in the Federal Institute of Hydrology (BfG)

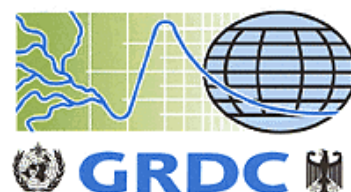
By contract of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)

Within the project "Global Water Information Network" (GLOBWINET)

Financed by the German Federal Ministry for Economic Cooperation and
Development (BMZ)

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Koblenz, July 2002

WATER RESOURCE MANAGEMENT COUNTRY PROFILE GERMANY

The authors hereby declare that they made extensive use of original material from the cited websites, as many facts can hardly be summarised more precisely. It is the intention of the given country profile not to develop a new view but to derive a synopsis of the available material regarding Water Resource Management in Germany.

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1. General

Germany as a Federal Republic is sub-divided into 16 Federal States (*Länder*). The Federal States of the Federal Republic of Germany have their own sovereignty, which is not derived from the federation. They are public entities with their own authority, not merely subordinate administrative agencies. Unless authority has been vested in the federation by [the Basic Law](#) (*Grundgesetz*), the German Constitution, the Federal States are responsible for legislation, government and the administration of justice.

The Federal States, too, have considerable law-making powers, primarily in the fields of culture, education and internal security. Generally speaking, while the vast majority of laws are those of the federal government, they are administered by the state governments. The federal government has only very limited administrative powers of its own.

([German Information Center, New York, website as of Oct. 2001](#))

German federalism can also be seen as the consequence of regional cultural diversity, which in turn has been shaped historically and maintained, to this time by differing bioregional conditions.

Federalism and the application of the subsidiarity principle are the most prominent features of water management institutions in Germany that are revealed in comparison with other Member States of the European Union. These and many other features of water management and policy, and water culture seem to follow from the constitutional structure of the Federal Republic of Germany.

The term *Kulturbau*, literally 'culture construction', is used to denote integrated water and land management including the protection, development, and improvement of water and soil. It encompasses more than mere agriculture enveloping landscape development, nature conservation, and many functions of water management. The term *Kulturbau* is a reminder of the close and reciprocal relationship between bioregional conditions and culture, and of the tension between them which is the driving force behind landscape (and 'waterscape') development. In recognition of this relationship, competence for water resource protection and management in Germany is located in the Federal States level.

The Federal States have established co-operation procedures among them, for instance for the purpose of co-ordinated river basin management. This can be seen most prominently in the Working Group of the Federal States on Water Problems (*Länderarbeitsgemeinschaft Wasser LAWA*). There, co-operation among themselves and their common participation in the affairs of the European Union is organised. This can also be seen in marine protection and the river basin commissions in which the Federal States as well as - with the exception of the domestic Weser basin - federal institutions, foreign entities, and the European Union co-operate.

Federalism as a principle forms the character of the municipal autonomy (*kommunale Selbstverwaltung*) of water management in Germany. The Basic Law, as well as the constitutions of the Federal States guarantee municipal control over local affairs and the right to manage public services such as water supply and sewerage. For this, municipalities have a high degree of freedom to choose institutional or organisational arrangements to suit their specific circumstances.

(Kraemer R., Jäger F., 1998)

2. Geography and Hydrology

2.1. Natural features

The Federal Republic of Germany is situated in the heart of Europe. It has nine neighbours: Denmark in the north, the Netherlands, Belgium, Luxembourg and France in the west, Switzerland and Austria in the south, and the Czech Republic as well as Poland in the east. This central location has been more pronounced since 3rd October 1990, when Germany was reunited. The Federal Republic is more than ever a link between East and West, but also between Scandinavia and the Mediterranean. As an integral part of the European Union and NATO, Germany is a bridge to the countries of Central and Eastern Europe.

The Federal Republic of Germany covers an area of about 357,000 km². The longest distance from north to south as the crow flies is 876 km, from west to east 640 km. Its extremities are List on the island of Sylt in the north, Deschka, Saxony, in the east, Oberstdorf, Bavaria, in the south, and Selfkant, North Rhine-Westphalia, in the west. The total length of the country's borders is 3,758 km.

Germany has a population of about 82.0 million, the largest in Europe after the Russian Federation, followed by the United Kingdom (58.9 million), France (58.5 million) and Italy (57.5 million). In size, however, Germany is smaller than France (544,000 km²) and Spain (506,000 square km²).

([Foreign Ministry, website as of Oct 2001](#))

2.2. Geographical features

Germany has an extraordinary variety of charming landscapes. Low and high mountain ranges intermingle with upland plains, terrace country, hilly regions and lakelands as well as wide, open lowlands. From north to south Germany is divided into five regions with different topographical features: the North German Plain, the Central Upland Range, the terrace panorama of the Southwest, the Alpine foothills in the south and the Bavarian Alps.

In the north are dry, sandy lowlands with many lakes as well as heaths and moors. There is also the fertile land stretching southward to the Central Upland Range. These lowland penetrations include the Lower Rhenish Bight, the Westphalian Bight and the Saxon-Thuringian Bight. The marshes along the North Sea coast extend as far as the geest. Characteristic features of the Baltic Sea coastline are in Schleswig-Holstein the fjords, in Mecklenburg-Western Pomerania the lakes and the counterbalancing coastline. The main islands in the North Sea are the East Frisian Islands, among them Borkum and Norderney, the North Frisian Islands of Amrum, Föhr and Sylt (and the Halligen), as well as Helgoland in the Helgoland Bight. Situated in the Baltic Sea are the islands of Rügen, Hiddensee and Fehmarn. Some parts of the Baltic coast have flat, sandy shores; others have steep cliffs. Between the North Sea and the Baltic Sea lies the low-hill country called Holsteinische Schweiz (Holstein Switzerland).

The Central Upland Range divides northern Germany from the south. The central Rhine valley and the Hessian depressions serve as the natural north-south traffic arteries. The Central Uplands include the Rhenish Schist Massif (Hunsrück, Eifel, Taunus, Westerwald, Bergisches Land and Sauerland), the Hessian Mountains, and the Weser and Leine Mountains in western and central Germany. Right in the heart of Germany are the Harz Mountains. Toward the east are the Rhön Mountains, the Bavarian Forest, the Upper Palatinate Forest, the Fichtel Hills, the Franconian Forest, the Thuringian Forest and the Ore Mountains.

The terrace landscape of the Central Uplands in the Southwest embraces the Upper Rhine valley with the adjacent mountain ranges of the Black Forest, the Oden Forest and Spessart, the Palatinate Forest with the Haardt, and the Swabian-Franconian terrace country with the Alb.

In a narrow valley between Bingen and Bonn the river Rhine, the main north-south axis, slices through the Rhenish Schist Massif, whose highland areas are less densely populated than the sheltered wine-growing areas on both sides of the Rhine valley which are very frequented by tourists.

The Alpine foothills embrace the Swabian-Bavarian highlands with their hills and large lakes in the south, broad gravel plains, the hilly landscape of Lower Bavaria, and the Danube valley. Characteristic features of this region are the moors, dome-shaped hill ranges and lakes (Chiemsee, Starnberger See) as well as small villages.

The German part of the Alps between Lake Constance and Berchtesgaden is limited to the Allgäu, the Bavarian Alps and the Berchtesgaden Alps. In this Alpine world lie picturesque lakes such as the Königssee near Berchtesgaden and popular tourist resorts such as Garmisch-Partenkirchen or Mittenwald.

([Foreign Ministry, website as of Oct 2001](#))

2.3. Climate

Germany is situated in the moderately cool west wind zone between the Atlantic Ocean and the continental climate in the East. Sharp changes in temperature are rare. There is precipitation all the year round. In the winter the average temperature is between 1.5°C in the lowland areas and -6°C in the mountains. In the warmest month of the year, July, temperatures are between 18°C in low-lying regions and 20°C in the sheltered valleys of the south. Exceptions are the Upper Rhine Trough with its extremely mild climate, Upper Bavaria with its regularly occurring warm Alpine wind (*Föhn*) from the south, and the Harz Mountains, a climatic zone of its own with cold winds, cool summers and heavy snow in winter.

([Foreign Ministry, website as of Oct 2001](#))

2.4. Water resources

2.4.1. Major river catchments

[Figure 1](#) represents the above-ground river basins with a surface of more than 500 km². Basic data describing the major catchments are given in following table:

Table 1. Characteristic values of the River Basins

River basins and coastal regions	Catchment area surface total (km ²)	Catchment area German segment (km ²)	River length total (km)	Mean annual discharge 1961-1990 (m ³ /s) at gauging station	
Rhine	185 300	104 660	1 320	2 382	Rees
Elbe	148 270	96 930	1 091	877	Cuxhafen
Danube	817 000	59 630	2 857	1 426	Achleiten
Weser	46 300	46 300	432	332	Intschede
Ems	15 600	13 200	370	82	Versen
Odra	118 860	5 590	850	558	Hohensaaten

(BMU 2000)

The Danube

With a length of 2857 km and a long-standing average discharge of approx. 6500 m³/s the Danube is the second largest river of Europe after the Volga. Its source rivers, the Breg and Brigach, rise in the southern Black Forest (*Schwarzwald*). From the unification of the small rivers in Donaueschingen until Ulm, the Danube is regarded as a low mountain river. As the tributaries from the Northeast Alps flow in from its right, the Danube below Ulm metamorphoses into a river with alpine regime, and leaves the Federal Republic of Germany at Passau after flow through the country for 625 km. The largest tributary of the Danube in the northern Alpine foothills is the Inn River, 515 km long. At their junction near Passau, the Inn carries more water than the Danube itself.

(BMU 2000)

The Rhine

The Front Rhine (*Vorderrhein*) and the Rear Rhine (*Hinterrhein*) as the two source rivers of the Rhine have their springs at Piz Badus (2928 m), Switzerland and the Paradise Glacier at the Mascholhorn. The source rivers join in Reichenau, near Chur. The alpine Rhine, or the course until Lake Constance (*Bodensee*), is a high mountain river. Below Lake Constance, the river flows west as the High Rhine (*Hochrhein*) over a distance of 142 km until Basle.

After Basle, the Upper Rhine (*Oberrhein*) flows through the Upper Rhine Rift.

In Mainz the tributary with the largest surface, the Main, joins the Rhine after a distance of 524 km.

The section that extends from Bingen to south of Cologne is called the Middle Rhine (*Mittelrhein*). South of Cologne the Rhine discharges into the Lower Rhine Bight (*Niederrheinische Bucht*). Immediately after the German/Dutch border, the Rhine Delta begins, the area where the Rhine and the Maas dovetail; that is why the catchment area of the Maas might also be regarded as belonging to the Rhine.

(BMU 2000)

The Ems

The Ems, a lowland river of some 370 km in length, rises from the Senne at the southern foot of the *Teutoburger Wald*, in a spreading, sandy region. Until the tide mark at Papenburg, the Ems flows mainly through geest landscapes of the Northern Münsterland and the Lower Saxon *Emsland*. The watersheds on its right bank have been artificially fixed in a number of areas, e.g. in the Massholt depression of the Emsland moors.

(BMU 2000)

The Weser

The Weser springs from the junction of its source rivers Werra and Fulda near Münster. Until the mouth of the river at the North Sea it covers a distance of 432 km; from the Werra springs at the Thuringian Forest (*Thüringer Wald*) to the river mouth the distance is 725 km. Below the Porta Westphalica the Weser is a plains river. There is little landscape and hydrographic change along its course to the mouth of the Aller, 128 km away. The river basin deviates into the ice marginal valley of the Aller below Verden, which causes a sudden rise in the discharge rate.

(BMU 2000)

The Elbe

The River Elbe rises in the Czech Republic, on the southern slope of the Riesengebirge Crest, at 1383 m above sea level, and flows through the basin of Northeast Bohemia in a wide bend. The Elbe reaches the German/Czech border above Pirna. From the national border to the mouth, the Elbe first flows through the Elb Sandstone range (*Elbsandsteingebirge*). Upon quitting the widening valley of the Dresden basin, the Upper Elbe reaches the North German Lowlands at Castle Hirschstein, 96 km into its course. From there to Geesthacht Weir, below Lauenburg, the river - now called the Middle Elbe - is a plains river. The part of the river from the Geesthacht Weir to the location where the Elbe flows into the North Sea near Cuxhaven-Kugelbake (Elbe km 727) is called the Lower Elbe (Tidal Elbe).

(BMU 2000)

The Odra

The source of the Odra lies in the Odra range, in the Czech part of the Eastern Sudeten Mountains near Olomouc, at 634 m above sea level. The German segment of the Odra catchment is a relatively small one.

Over a continuous length of 376 km the Lausitzer Neisse, Odra and West Odra constitute the national border between the Polish Republic and the Federal Republic of Germany. The Odra flows completely back onto Polish territory slightly above Stettin. (BMU 2000)

2.4.2. International Commissions

International Commission for the Protection of the Danube River (ICPDR)

The efforts of the ICPDR are based on the "Internationale Übereinkommen über die Zusammenarbeit zum Schutz und verträglichen Nutzung der Donau / Donauschutzübereinkommen (DSÜK)" (International Agreement on the Co-operation for the Protection and Acceptable Use of the Danube), which was signed on the 29 June 1994 and has been in force since 22 October 1998.

The commission's basic aim is the promotion of co-operation of its members with respect to trans-boundary consequences in the domains of:

- Water quality protection in the river itself (continuous and accidental pollution, point and non-point fluxes of matter and energy and their control);
- Water quality protection in the catchment (interactions between the river and the catchment and their control);
- Protection against floods and ice damage;
- Sustainable use of the quantitative water resources.

Participating countries are Austria, Bulgaria, Czech Republic, Croatia, European Union, Germany, Hungary, Moldova, Rumania, Slovakia, Slovenia, Ukraine.

International Commission for the Protection of the Rhine (ICPR)

The mandate of the ICPR is defined as follows:

- Sustainable development of the entire ecosystem of the River Rhine;
- Guarantee the use of Rhine water for drinking water supplies;
- Improvement of the sediment quality in order to enable the use or disposal of dredged material without causing environmental harm;
- Flood mitigation and environmentally sound flood protection;
- Improvement of the North Sea quality in combination with other measures of sea protection.

Participating countries are France, Germany, Luxembourg, The Netherlands, Switzerland

International Commission for the Protection of the Elbe (IKSE)

The aims of the IKSE member states regarding the river and the basin consist in:

- Enabling uses, especially the supply of drinking water from bank filtration and the agricultural use of the water and the sediments;
- Establishing an ecosystem with a sound diversity of species as near to natural conditions as possible;
- Achieving a lasting reduction of pollution load to the North Sea from the Elbe/Labe basin.

Participating countries are Czech Republic, European Union and Germany

International Commissions for the Protection of the Rivers Moselle and Saar (IKSMS)

General aim of the IKSMS is the co-operation of the competent bodies of the treaty members for the protection of the water bodies of the Rivers Moselle and Saar against pollution. Within this task, they may:

- Plan and request research studies for the proof of pollution;
- Submit to the governments of the treaty members proposals concerning the measures against pollution;
- Be committed by the governments to tasks yet to be defined.

Participating countries are France, Germany, Luxembourg.

International Commission for the Protection of the Lake Constance (ICPLC)

The aims of the Commission is to protect the Lake Constance, to collect environmental data and propose measures on water protection. This include

- Assessment of the state of Lake Constance, e.g. by continuous monitoring of the water quality and the lake sediment;
- Statements on planned measures within the catchment;
- Recommendations and consulting services for the riparian states.

Participating countries are Austria, Germany, Liechtenstein, Switzerland.

International Commission for the Protection of the River Odra (IKSO)

Aim of the IKSO is an immediate action plan to reduce the pollution of the River Odra within the time period from 1997 to 2002.

Reduction of pollutants content in the waste water discharged from municipalities as well as industries

Establishment of an "International Warn and Alarm Plan"

Common strategy for the action plan "Flood protection in the Odra catchment"

Prepare IKSO to function as a common platform for the co-ordination of the establishment of an international water management plan according to the European Water Framework Directive for the Odra catchment.

Participating countries are the Czech Republic, European Union, Germany and Poland. The Secretariat of IKSO is seated in Wroclaw (Poland).

(2000/2001) ed.: Hydrological Atlas of Germany, Berlin. Project co-ordination: Federal Institute of Hydrology, Koblenz (BfG) and Institute of Hydrology, University of Freiburg

2.5. Water Balance

This chapter is based on excerpts taken from the [Hydrological Atlas of Germany](#).

The Federal Ministry for the Environment, Nature Protection and Nuclear Safety (BMU) decided to support the edition of a hydrological atlas comprising a collection of high-quality-reference maps encompassing the whole country with uniform data quality and presentation available after the reunification. The project implementation was assigned to the [Federal Institute of Hydrology \(BfG\)](#), while the scientific project management was shared between the Federal Institute of Hydrology and the [Institute of Hydrology at the University of Freiburg \(IHF\)](#), with the BfG being responsible for the digital version and the IHF for the scientific and graphic aspects.

With the Hydrological Atlas of Germany a modern and up-to-date source of information is made available. The Atlas is published as conventional graphic atlas and in the form of several digital modules in order to address different users and forms of usage. This strategy takes account of the new technological options and expectations (digital data, application of Geographic Information systems - GIS) as well as the advances in scientific knowledge and methodologies. The themes based on time series are presented with reference to the standard series 1961-1990 recommended by the WMO.

The plates of the Atlas serve as basic information. They give a general overview, represent the latest knowledge available and provide information on data sources and methodologies. Scientists, water managers, administrators, politicians and even the layman interested in environmental issues are thus provided with an instrument which enables them to understand large-scale phenomena and interrelations easily, to evaluate and interpret them and to find additional sources of information.

2.5.1. Precipitation

The precipitation map ([Figure 2](#)) shows a mean annual precipitation depth (non-corrected) in the form of a gridded structure with a resolution of 1 km² with class amplitudes of 50 mm or 100 and 200 mm. The mean annual precipitation totals for Germany for the period of 1961-1990 vary from around 400 mm on the leeward side of the Harz Mountains to 3,200 mm in the Alps, although values between 500 mm (in the east) and 800 mm (in the north-west) are typical for most of Germany. The precipitation pattern is significantly dependent on the influences of the westerly drifts and on the orography.

In the north of Germany up to the northern edge of the low-mountain regions, where the precipitation total is not significantly dependent on altitude, decreasing mean annual precipitation totals are the result of the influence of the increasing continentality from the west to the east. But there is also less precipitation in relation to altitude in the eastern low-mountain regions, such as the Thuringian Forest, Bavarian Forest and the Ore Mountains, than there is in the western low-mountain regions, such as the Black Forest and the Sauerland, due to the increasing continental influence. Moving from the north to the south, the decreasing cyclonic nature of the weather conditions causes the precipitation to subside and low-pressure areas occur less frequently. In Germany this effect is added in the south by a higher level of precipitation caused by increasing orographical altitude.

Low precipitation areas with less than 600 mm/a can be found in the east of Germany, due to the continental influence there, and on the leeward side of such elevated areas as the Eifel plateau, Spessart hill range and Haardt. Mean annual precipitation below 500 mm/a are observed on the leeward side of the Hunsrück mountains and in Odenwald, where even the minor elevations of the Odenwald have rain shadow effects. In the Altmark, on the leeward side of the Lüneburger Heide and in Uckermark too, low elevations cause mean precipitation totals below 500 mm/a. The lowest values can be seen in the south-easterly foothills of the Harz Mountains (Atzendorf 399 mm/a). As would be expected, the greatest mean annual precipitation totals occur in the Alps. With its meridional orientation, the Black Forest also experiences mean annual precipitation totals of more than 200 mm/a in its high areas. (BMU 2000)

2.5.2. Runoff

[Figure 3](#) shows the mean annual runoff depth in grid cells representing 1 km² each for the period 1961 - 1990. The values are below 100 mm/a in north-east Germany and over 2000 mm/a in the higher regions of the Alps. The class amplitudes shown are 50 mm/a for the values below 200 mm/a, 100 mm/a for the values up to 1000 mm/a and 500 mm/a for the classes above 1000 mm/a.

Despite the actual evapotranspiration depth ([Figure 4](#)) varying significantly within a small area, the large-scale differences in the corrected precipitation depth determine the overall runoff depth. This is made particularly clear by the high values on the ridges of the upland regions and the Alps with its special status due to its snowpack and a partial absence of vegetation. Within the areas with lower runoff values in the low-precipitation north-east region of Germany, where, for instance, the groundwater recharge in the unconsolidated sediments of the glacial valleys is

limited by the runoff depth and where the groundwater is often discharging through evapotranspiration when it is close to the land surface, there are urban pockets of high runoff values. Leeward of the upland regions (east of the Harz Mountains, Thüringer Becken), the climatic influence (low precipitation depths with high values of grass reference evapotranspiration) on the runoff generation becomes very evident.
(BMU 2001-Hydrological Atlas of Germany)

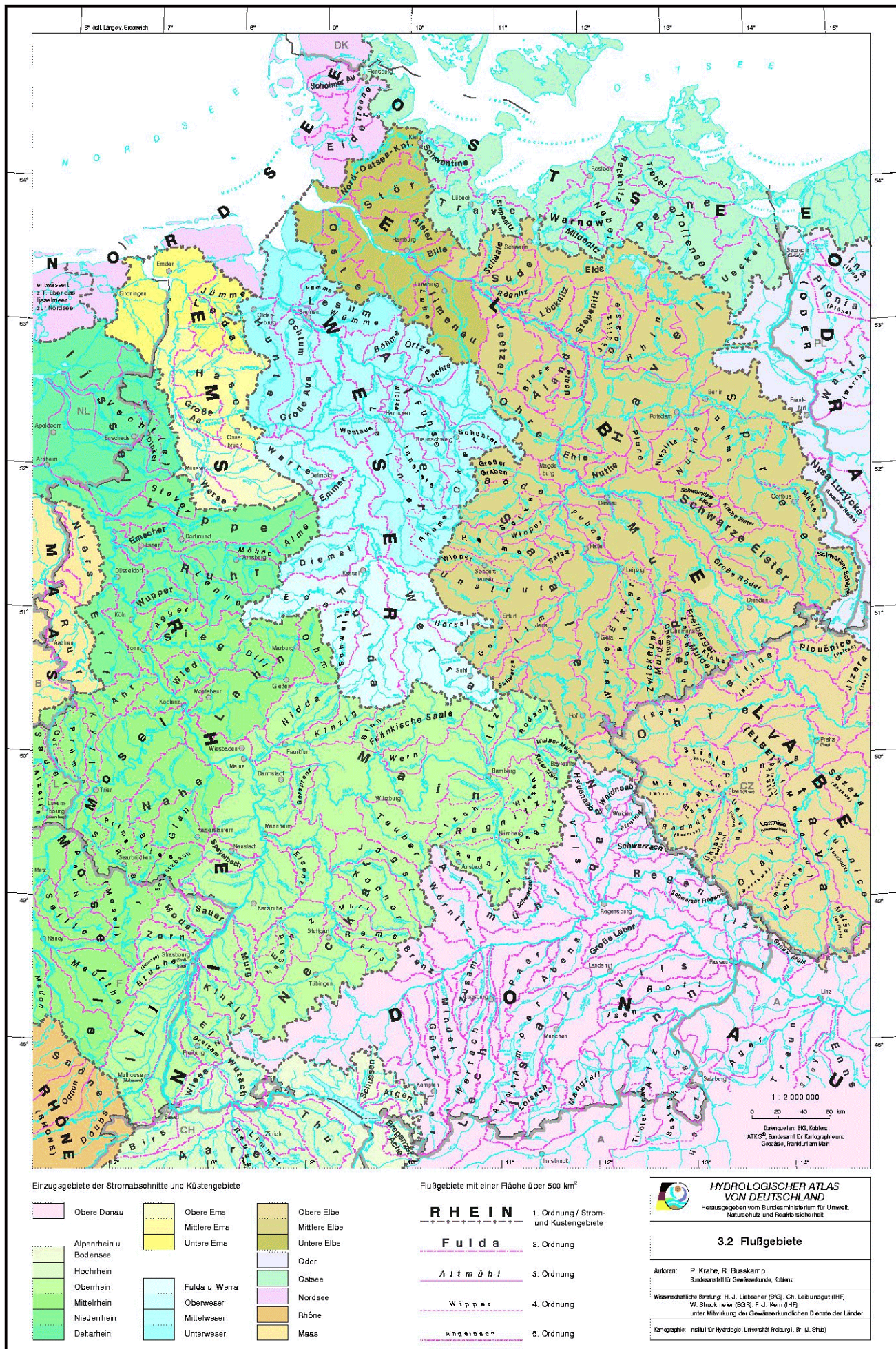
2.5.3. Evaporation

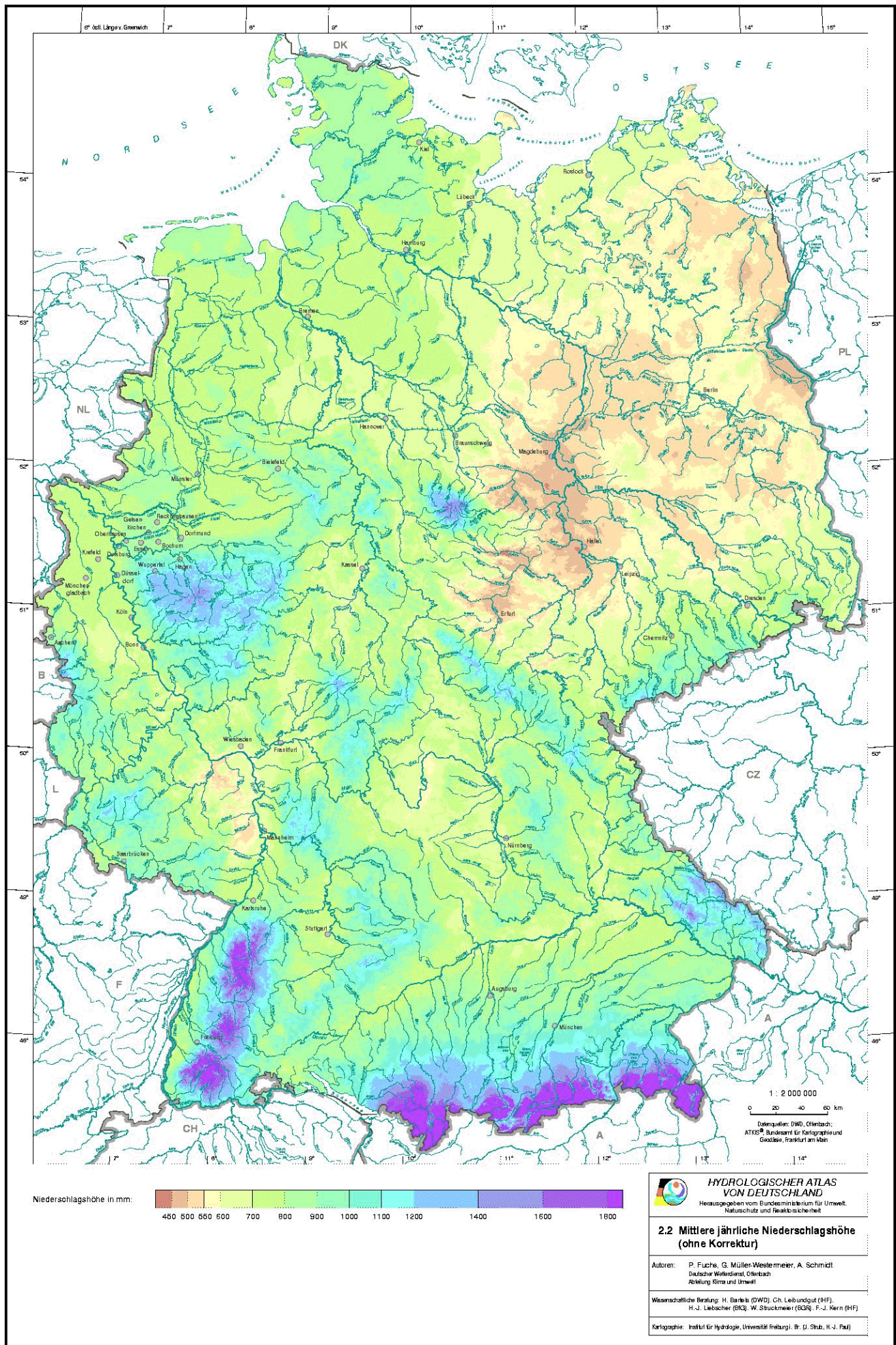
[Figure 4](#) shows the mean annual actual evapotranspiration depth in the time series 1961 to 1990 in the form of a gridded structure with a resolution of 1 km². The mean evapotranspiration depth for Germany is thus 532 mm/a. The assignment code can be seen from the colour column in the map's legend. As in the maps of precipitation depths, the graduation is in 50-mm steps. Intermediate steps of 25 mm are used only in the range from 500 to 600 mm to improve the presentation of regional differences.

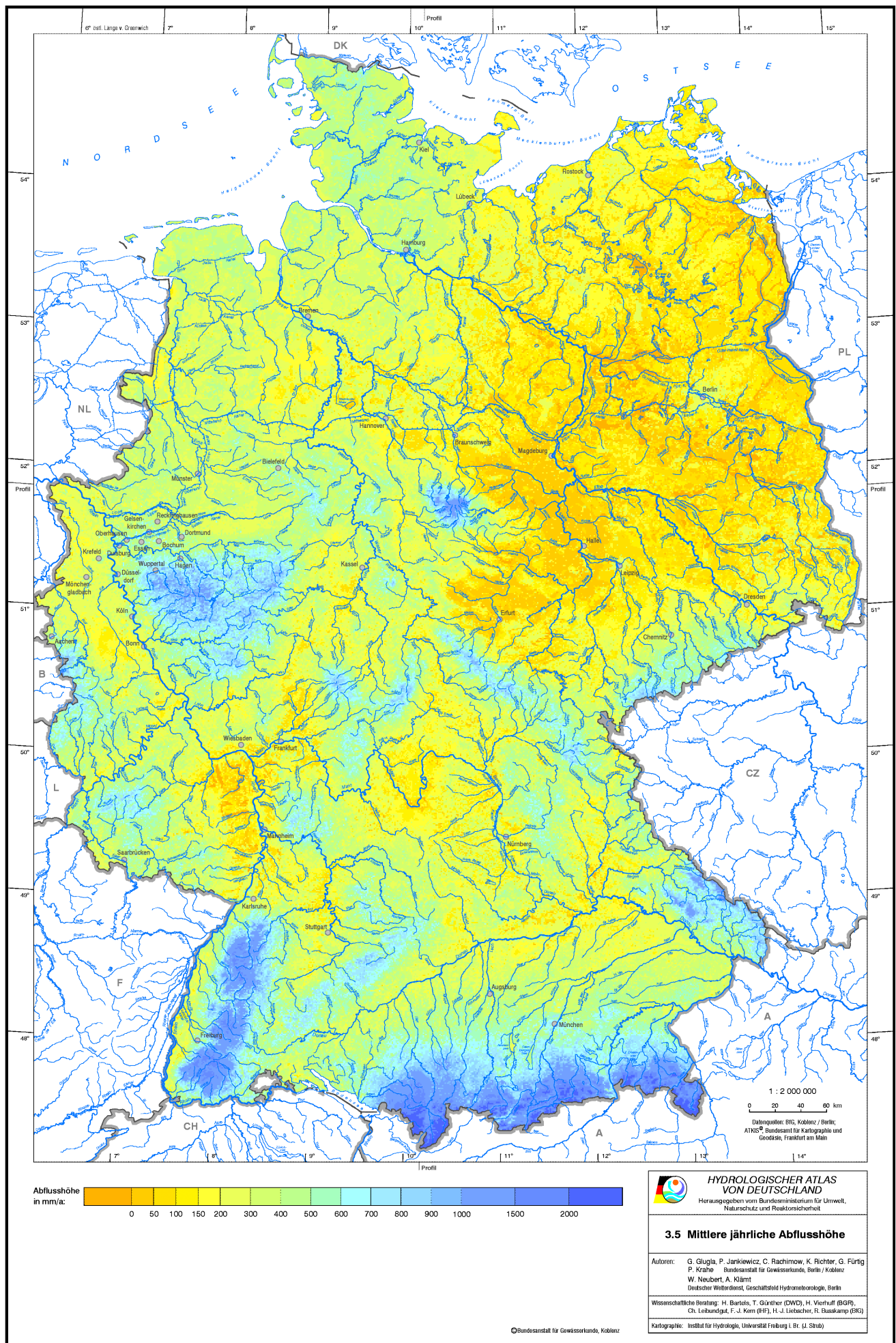
The actual evapotranspiration depth varies more from location to location than the grass reference evapotranspiration. In addition to precipitation and evapotranspiration requirements by the atmosphere (as expressed by the grass reference evapotranspiration), the actual evapotranspiration depth is largely determined by soil and land-use factors, which vary much more.

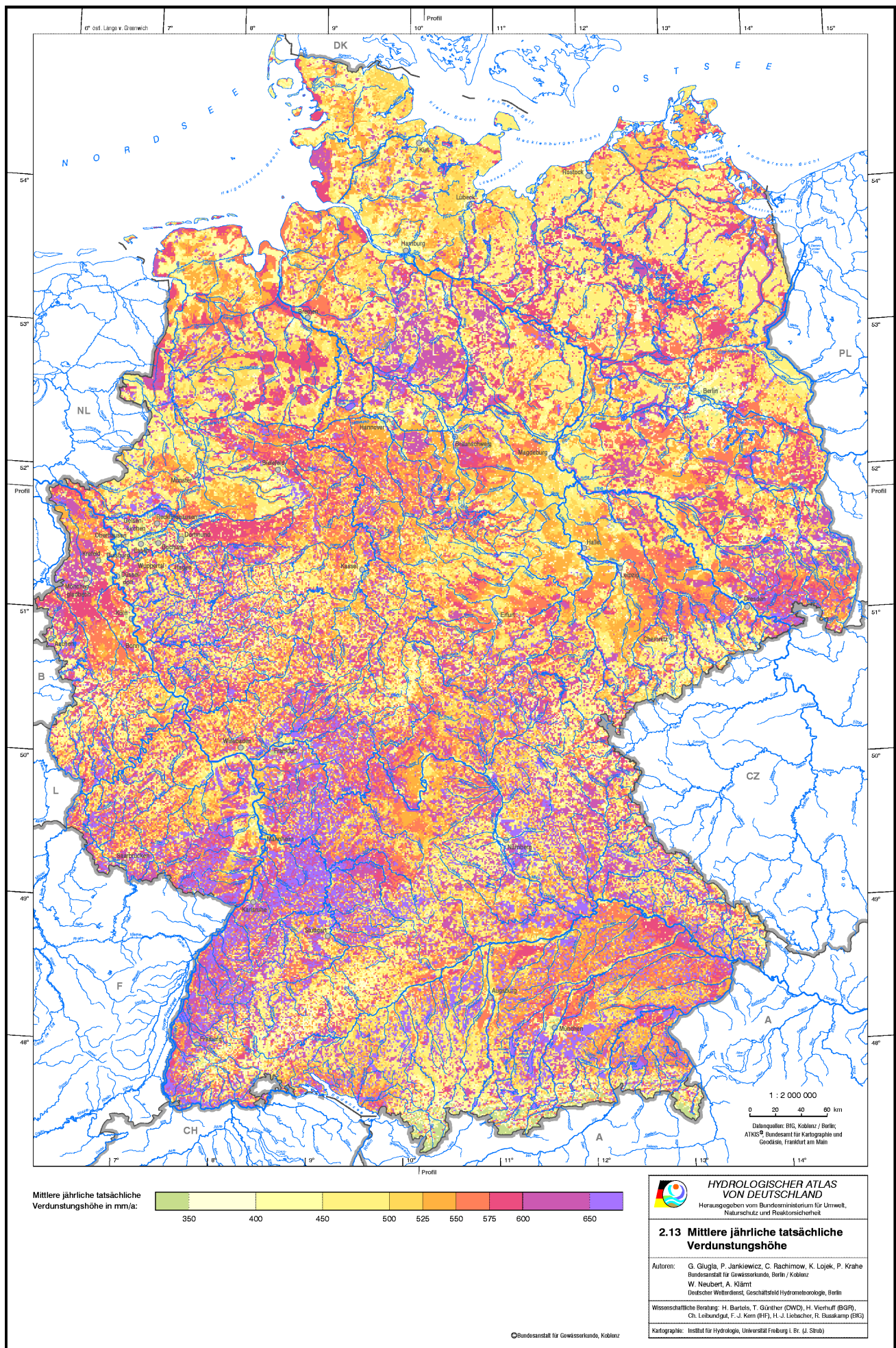
The actual evapotranspiration values are below 350 mm/a in urban areas and the higher locations in the Alps, the Erzgebirge mountains and other upland regions, and above 700 mm/a primarily in the Upper Rhine plain (Ober-rheinebene) and in areas with a groundwater level close to land surface. Due to their extensive impermeable areas with low water-storage capacity, urban area actual-evaporation values are low which means that, apart from the cities of Berlin, Hamburg and Munich and the Ruhr district, smaller towns such as Rostock or Münster also record low actual evaporation. Lakes, on the other hand, stand out for their higher depth of evaporation.

(BMU 2001- Hydrological Atlas of Germany)

Figure 1: River Catchments (BMU 2000) - ([back to text](#))

Figure 2: Mean Annual Precipitation Depth (non corrected), (BMU 2000) - ([back to text](#))

Figure 3: Mean Annual Runoff Depth (BMU 2001-Hydrological Atlas of Germany) - ([back to text](#))

Figure 4: Mean Annual Actual Evapotranspiration Depth (BMU 2001-Hydrological Atlas of Germany) - ([back to text](#))

3. Structures and Co-operation in water resources management

This chapter is based on excerpts taken from the publication of the [Federal Ministry for the Environment, Nature Protection and Nuclear Safety](#): "Environmental Policy – Water Resource Management in Germany, 2001". This publication, among others, can be ordered free of charge on the website of the Federal Ministry for the Environment, Nature Protection and Nuclear Safety. On the same website the publication of the [Federal Ministry for the Environment, Nature Protection and Nuclear Safety](#) and the [Federal Environmental Agency \(UBA\)](#): "The German Water Sector – Policies and Experiences, 2001" might be ordered. A lot of extended information as well as practical examples can be found to enhance knowledge in German water management.

The Federal Republic of Germany is based on a federal system, i.e. public functions are distributed between the Federal Government and the Federal States. Under the Basic Law, the communities (towns, districts and municipalities) are parts of the respective Federal State. However, in dealing with local matters the communities can act to a certain extent at their own discretion (right of self-government) under constitutional law.

The Basic Law also regulates the distribution of legislative powers, of functions and of financial responsibility between the Federal Government and the Federal States. Expenditure incurred in the discharge of their functions is borne separately by the Federal Government and the Federal States.

(BMU 2001-Environmental Policy)

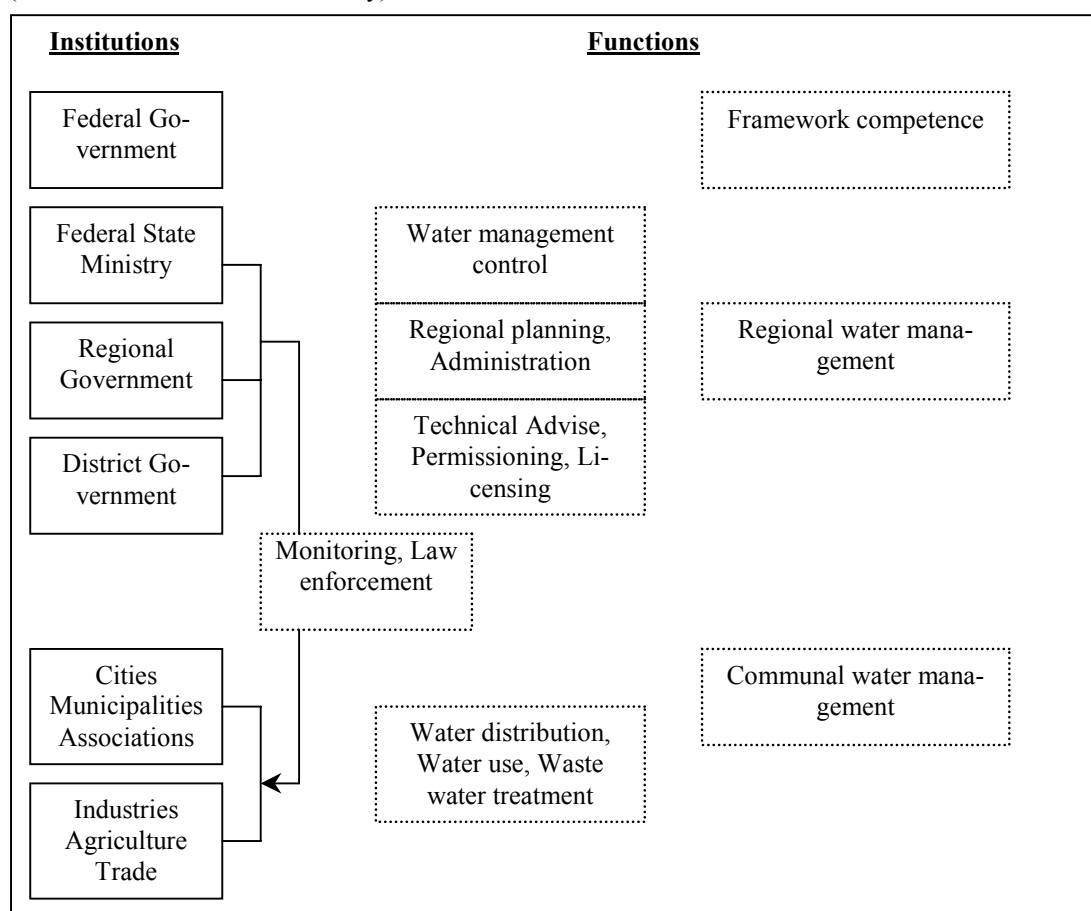


Figure 5: Institutions and functions, Water management in Germany

3.1. Co-operation between Federal Government and Federal States

The Federal Government has the right to enact general provisions concerning water resources management (framework competence). This means that the Federal Government is empowered to specify a general legal framework for the Federal States. The Federal States must replenish such general laws of the Federal Government by enacting their own laws at Federal State level, and they may also enact supplementary regulations.

Administrative enforcement of all the provisions relating to water including the Federal laws, and hence the fulfilment of public functions in water resources management, are a matter for the Federal States.

An exception to this are the development and maintenance of the Federal waterways, which are exclusively under the control and administration of the Federal Government. In this function, the Federal Government is required to safeguard the concerns of land improvement and water resources management in agreement with the Federal States. The Federal Government performs further important functions in the fields of research and data collection.

Only technical co-operation between the Federal Government and the Federal States can ensure progressive water protection. For example, monitoring of ground water quality is an important task of the administrative authorities for Water Resources Management in the Federal States. The duty to report to the European Union on this matter, however, lies with the Federal Government. As a measure affecting all Federal States, it therefore helps to extend and harmonise existing measurement networks, e.g. within the framework of research and development projects for the New Federal States. The aim of future activities should be to build up a nation-wide ground water monitoring network. (BMU 2001-Environmental Policy)

In order to discuss detailed questions arising in the areas of water management and water legislation, to formulate solutions and to put forward recommendations for their implementation, the Working Group of the Federal States on Water Problems (Länderarbeitsgemeinschaft Wasser [LAWA](#)) was set up. In addition however, topical questions in the national, supranational and international sphere are also adopted, discussed on a broad basis and the findings are submitted to the relevant organisations.

Five permanent working parties and topic-related working groups have been built to deal with the topics of water legislation, hydrology, inland waters and sea conservation, ecology, flood prevention, coastal protection, ground-water, water supply, municipal and industrial sewage and handling with water polluting substances.

The different Regional Ministries of the Federal States can be reached using the homepage of [LAWA, addresses, website as of Dec. 2001](#)

3.2. Organisation of Water Resources Management within the Federal Government

The [Federal Ministry for the Environment, Nature Protection and Nuclear Safety](#) deals with basic questions of Water Resources Management as well as with transboundary co-operation in the field of water resources management as part of environmental policy.

The Federal Ministry for the Environment is responsible, inter alia, for the Federal Water Act, the Waste Water Charges Act, the Detergents and Cleaners Act and the Federal Nature Conservation Act. It is responsible within Germany for European Union water protection provisions, protection of the marine environment and for the river basin commissions of waters crossing national borders.

Proposed legislation on environmental protection, like all legislation proposed by the Federal Government requires agreement between the different Federal ministries. Environmental projects, comments, programme aspects etc. are discussed with the Federal departments concerned.

The principal partners of the Federal Minister for the Environment with to some extent independent tasks in the field of water resources management are:

The [Federal Ministry of Consumer Protection, Food and Agriculture](#) deals with and promotes water resources management projects in the rural sector including measures for flow regulation, flood protection, irrigation, coastal protection at the North Sea and the Baltic. It is also responsible for legislation related to water and soil boards and for fertiliser and plant protection legislation.

The [Federal Ministry of Health](#) is responsible for matters of drinking water supply, with the focus on drinking water quality as part of a precautionary health policy, and — together with the Federal Ministry for the Environment — for matters relating to the quality of water for bathing.

The [Federal Ministry of Transport, Building and Housing](#) is responsible for the administration of federal waterways and all matters relating to navigation on maritime and inland waterways and is, jointly with the coastal regions, responsible for combating pollution of coastal waters with oil and other contaminants. It is in charge of the Waterways and Navigation Administration.

The [Federal Ministry of Education and Research](#) co-ordinates the Federal Government's research promotion efforts and supervises fundamental research as well as application-oriented research; technological development and innovation, including in the field of water research and water technology.

The [Federal Ministry of Economics and Technology](#) safeguards economic interests in relation to all environmental measures.

The [Federal Ministry for Economic Cooperation](#) is responsible for basic issues and co-ordination of all bilateral and multilateral German development co-operation.

In executing his tasks in the field of water resources management the Federal Environmental Minister is assisted by other Federal authorities and research institutions:

The following report to the Federal Ministry of the Environment:

[Federal Environmental Agency \(UBA\)](#),
[Federal Nature Conservation Agency \(BfN\)](#),
[Federal Office for Radiation Protection \(BfS\)](#).

The following report to the Federal Ministry of Transport, Building and Housing:

[Federal Institute of Hydrology \(BfG\)](#),
[Federal Maritime and Hydrographic Agency \(BSH\)](#),
[Federal Institute for Hydraulic Engineering \(BAW\)](#),
[German Weather Service \(DWD\)](#).

The following report to the Federal Ministry of Health:

[Federal Institute for Health-Oriented Consumer Protection and Veterinary Medicine \(BGVV\)](#),
[Federal Institute for Pharmaceuticals and Medical Products](#).

The following report to the Federal Ministry of Economics:

[Federal Institute of Geosciences and Natural Resources](#) (BGR),
[Federal Institute for Materials Research and Testing](#) (BAM).
(BMU 2001-Environmental Policy)

3.3. *Water resources management by the Federal States*

The implementation of water resources management regulations is exclusively a matter for the Federal States and the municipalities. The water management administrations of the Federal States are mostly integrated in the general administrations of the relevant Federal State; in the New Länder special environmental administrations have been introduced in some cases.

In most Federal States, water resources management is carried out on three levels just like general administration. However, the assignment of tasks varies from state to state:

Supreme Water Authority

Ministry with a water resources department; predominantly Ministry for the environment functions: water management control and superior administrative procedures

Upper Water Authority

Usually regional government, responsible for regional water resources management planning, important procedures under the water acts, administrative procedures

Lower Water Authority

Rural districts or cities not belonging to a county, as well as technical authorities (e.g. water resources authorities). Functions: procedures under the water acts like permitting and licensing as well as technical advice, monitoring of water and waste water discharges

Exemptions exist in some smaller federal states which have a two-level administration, i.e. no intermediate-level authority, and in City-states with only one level of water resources management.

Most Federal States have, in addition to water resources authorities, central state authorities for the extensive technical functions of water resources management. The technical functions of these Federal State bodies are mostly in the fields of water resources management planning, official technical advice and preparation of technical guidelines. Partly the Federal State Authorities are also in charge of enforcement functions (e.g. flood warning services, monitoring of water levels and discharges, waste water charges).

For the purpose of co-ordinating common problems and handling legislative instruments under the water acts, the supreme Federal State authorities working in the field of water resources management have joined forces to form the Working Group of the Federal States on Water Problems ([LAWA](#)).

[\(Federal Ministry for the Environment, Nature Protection and Nuclear Safety, technical information \(german\), web-site as of Nov 2001\)](#)

3.4. *Communal water resources management*

Central water supply and waste water discharge are traditional duties of the communities under Federal State water acts. Germany has around 6700 small and medium sized water suppliers. The smallest 5000 of these suppliers provide water to only 17% of the population.

3.4.1. Organisation forms

The communities are responsible for the maintenance of the water sources. To cover the costs incurred for that purpose, they collect charges (contributions and fees) from the users. For independent and effective implementation of water supply and waste water disposal the municipalities may use various forms of enterprises listed here with increasing degree of private sector participation.

- Non-autonomous Municipal agencies (*Regiebetriebe*):
Water is financed, owned and operated by a department within the local government.
- Semi-autonomous Municipal agency (*Eigenbetriebe*):
Water is still part of the local government, but it has independent accounts.
- Inter-municipal Associations (*Zweckverbände*):
An association of municipalities into a single water supplier.
- Water Management Associations (*Wasser- und Bodenverbände*):
An association of municipalities and other groups concerned with water use into a single water supplier.
- Public Law Corporation (*Anstalten öffentlichen Rechts*):
Legally and financially independent of local government but still organised like a public department.
- Municipal Enterprise (*Eigengesellschaften*):
Legally and financially independent of local government and organised like a joint stock company, but with 100% of shares owned by the municipality.
- Public private Partnership (*Kooperationsmodelle*):
A joint stock company owned in part by the municipality and in part by a private company. Responsibilities between partners are negotiated using a wide variety of forms of contract.
- Private Models (*Private Modelle*):
Various forms of contracts with private companies, e.g. Management and service contracts, leasing, build-operate transfer (BOT), concession contracts.

The small-scale structure and the tradition not to regard water supply and sewerage as commercial services which should be provided with a profit motive are on the one hand the basis for the effectiveness of service provision in the public sector and on the other hand one reason for the low presence of German water companies on world markets. (Kraemer, Jaeger, 1998)

3.4.2. Associations

Water management associations can be formed by land owners, private enterprise and public corporations for a wide variety of functions sized from small neighbourhood schemes to large territories on regional level. They are based on the principle of user participation and local autonomy.

Water associations play a special role in the institutional landscape of Germany. Municipalities co-operate in associations either voluntarily or, to some extent arranged by the Federal States, to ensure an efficient organisation of water supply and sewerage in their working area. The technical, economical and ecological aspects of water management are tackled by the association. They differ in their organisational form, their regional extent and the tasks assigned to them:

Special associations under public law

Water and soil boards under the Water boards act

Water boards for river basins like the [Ruhrverband](#)

([Federal Ministry for the Environment, Nature Protection and Nuclear Safety, technical information \(german\), website as of Nov 2001](#)))

Table 2. Economic, technical and scientific associations:

Bund der Ingenieure für Wasserwirtschaft, Abfallwirtschaft und Kulturbau	www.bwk-bund.de
Bundesverband der Deutschen Gas- und Wasserwirtschaft (BGW), Bonn	www.bgw.de
Bundesvereinigung der Firmen im Gas- und Wasserfach e.V. (FIGAWA), Köln	www.figawa.de
Deutsche Gesellschaft für Limnologie (DGL), Neuglobsow	dgl.igb-berlin.de
Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e.V. (ATV-DVWK), Hennef	www.atv.de
Deutscher Verein des Gas- und Wasserfaches e.V. (DVGW), Bonn	www.dvgw.de
Deutsches Institut für Normung, Fachausschuss Wasserwesen (DIN/NAW), Berlin	www.din.de
Emschergenossenschaft	http://www.eglv.de/

Erftverband	http://www.erftverband.de/
EURAWASSER GmbH Aufbereitungs- u. Entsorgungs GmbH	http://www.eurawasser.de/
Fachvereinigung Betriebs- und Regenwassernutzung e.V. (FBR), Darmstadt	www.fbr.de
Harzwasserwerke GmbH	http://www.harzwasserwerke.de/
Kommunale Vereinigung für Wasser-, Abfall- und Energiewirtschaft e.V. (VEDEWA), Stuttgart	www.vedewa.de
Ruhrverband	http://www.ruhrverband.de/
Verband kommunaler Unternehmen e.V. (VKU), Köln	www.vku.de
Verein für Wasser-, Boden- und Lufthygiene e.V., Berlin	www.wabolu.de
Vereinigung Deutscher Gewässerschutz e.V., Bonn (besonders auch Materialien für Schulen und Vorschulen)	www.vdg-online.de
Wupperverband	http://www.wupperverband.de/
Zentralverband Sanitär Heizung Klima (ZVSHK), St. Augustin	www.zentralverband-shk.de
Zweckverband Bodensee- Wasserversorgung	http://www.zvbvw.de/
Zweckverband Fernwasser Südsachsen	http://www.suedsachsenwasser.de

Source: [Federal Ministry for the Environment, Nature Protection and Nuclear Safety, association information \(german\), website as of Nov 2001](#)

The table is extended and by far not complete, most websites are in german language only

4. Legal Framework for Water Planning and Management

The Legislation related to water in Germany consists mainly of the Water Management Act and the Effluent or Waste Water Charges Act. Most of the administrative instructions and federal ordinances are based on the Water Management Act, which sets a legal frame for the water resources legislation of the Federal States. The Waste Water Charges Act sets economic incentives to reduce water pollution and provides financial resources for water resource protection measures.

4.1. Federal Water Management Act (*Wasserhaushaltsgesetz*)

As framework legislation, the Water Management Act (*Wasserhaushaltsgesetz*) is designed to work in conjunction with the water laws of the Federal States which fill in the framework it provides. The Act applies to surface water bodies including their beds, coastal (territorial) water bodies and ground water. Land water laws may exempt minor water bodies from the regulations of the Act and most Federal States have made use of this possibility. No such exemptions can be made, however, for liability for damage to aquatic ecosystems and water quality requirements (based on Article 22 of the Federal Water Management Act). The Federal States have divided water bodies into 'flowing' and 'stagnant' water bodies, 'natural' and 'artificial' and into two or three classes depending on their importance. Positive lists identify all water bodies that fall into the first, or first and second class (the remainder being in the last class); this classification has consequences for the ownership of water bodies and their maintenance, but not for their use. (Kraemer, Jäger, 1998).

An almost complete translated English version of the Water management Act is available in the [German Water Information Network GEWINET](#), looking for 'Water Policy and Legislation', 'in Germany'.

4.2. Waste Water Charges Act (*Abwasserabgabengesetz*)

The Waste Water Charges Act was enacted on 13.09.1976 (German Civil Code (*Bürgerliches Gesetzblatt BGBl. I*, p. 2721, amended p. 3007), came into force on 01.01.1978, and provides for the levying of charges as of 01.01.1981. The act was last amended on 06.11.1990 (*BGBl. I*, p. 2432). On the basis of the act, communities or industries which discharge harmful waste water are subject to the levying of a charge. The rate of the charge is determined by the harmfulness of the waste water discharged.

In determining the level of harmfulness, an assessment is based on the volumes discharged, the levels of oxidizable substances (as Chemical Oxygen Demand COD), mercury, cadmium, nickel, chrome, lead, copper and organic halides (AoX), as well the toxicity to fish of the waste water (§3 with Appendix A). The harmfulness is then expressed in terms of "unit harm" SE (*Schadeinheit*). One SE corresponds roughly to the harm caused by the raw waste water produced by one inhabitant in one year (inhabitant equivalence). The less harmful the discharges, the lower the charge levied. Thus the waste water charge is intended to provide an incentive to reduce the harmfulness of waste water through preventive measures, namely pre-treatment, the introduction of less waste water intensive, or even waste water-free production methods and of environmentally friendly products. The charge to be levied on one SE of waste water discharged (the charge rate) was € 6,- in 1981. The rate of the charge has risen annually, and has been at € 35/SE since 1994.

If the volume and harmfulness of the waste water are reduced by preventive measures to a level corresponding to the minimum requirements laid down in §7a of the Federal Water Act (*Wasserhaushaltsgesetz*), or to any stricter requirements imposed in the discharge license, the waste water charges are reduced by 75% per SE (§9 V). Further progressive reductions, according to appropriate treatment measures, are also possible, and the possibility of reducing charges to 20% of the standard level if the Best Practicable Means (BPM) is always used offers an additional incentive. The revenue raised from waste water charges is reinvested, and to be spent only on measures to maintain or improve the quality of water resources.

([Federal Environmental Agency \(UBA\), waste-water-charges-act, website as of Nov. 2001](#))

An almost complete English version of the Water management Act is available in the [German Water Information Network GEWINET](#), looking for 'Water Policy and Legislation', 'in Germany'.

Legal Limits

Under the Federal Water Act, every water use, in particular any discharge of waste water, requires permission or a licence from the competent authority. Waste water may then only be discharged into a body of water if its pollutant content is kept as low as possible, according to recognised technical standards. For a variety of production sectors, nation-wide minimum requirements for the discharge of waste water are in force. When discharging hazardous substances, the Best Practicable Means (BPM) must be used.

([Federal Environmental Agency \(UBA\), legal-limits, website as of Nov. 2001](#))

The Construction Administration under the [Federal Ministry of Transport, Building and Housing](#) as the competent organ of the public authorities has to ensure the observance of the regulations under public law during the execution of construction projects. In the course of precautionary environmental protection on the basis of the state water acts (*Landeswassergesetze*), self-surveillance ordinances and municipal regulations, the construction administration is particularly obliged to document the state of waste water systems at regular inspection intervals, to maintain and manage them in compliance with the state of the art and to take steps to have remedial measures carried out, if required.

In 1991 the "Technical information system for waste water" ("*Fachinformationssystem (FIS) Abwasser*") was introduced to manage technical measures relating to waste water on federal property. The findings of the FIS Waste Water Working Group were compiled in the "Waste Water Guide" and have been applied since March 1996 in the construction administration under the Federal Ministry of Transport, Building and Housing.

The information in the Waste Water Guide is tailored to meet the requirements of the sequence of steps involved in planning and construction work. The guide therefore contains instructions and quality requirements necessary for the most important working steps. The Waste Water Guide is designed in loose-leaf form. The updating of existing and the processing of new chapters depends on priority. It is available in the internet on the English pages of the website of the [Federal Ministry of Transport, Building and Housing](#).

4.3. Groundwater Ordinance (*Grundwasserverordnung*)

Based on § 6a Federal Water Act of 18th March 1997 the Ordinance for the implementation of the EEC-directive 80/68 of 17th December 1979 on the protection of groundwater against pollution caused by certain dangerous substances was enacted. The ordinance regulates the application of prescriptions to examine and control ground water reserves and to define minimum requirements regarding the contents of ground water. Annex I and II of the EEC-directive list up certain substances, which need special precautions whenever they might come into contact with ground water.

A special report on groundwater protection titled "[Countrywide Groundwater Protection Towards Sustainable Development \(1998\)](#)" of the [German Council of Environmental Advisors \(SRU\)](#) states the opinion that groundwater protection in Germany suffers from certain deficits. Despite provisions in current water legislation for maintaining groundwater's natural state, the SRU regretted that Germany had no comprehensive water protection policy. Since much of Germany's groundwater had been affected by human activities, the SRU suggested a more realistic qualitative objective of reducing anthropologic inputs as far as possible. Current water protection policy concentrates on protecting drinking water sources, neglecting other areas. The SRU, therefore, called for nation-wide water protection, based on avoidance or reduction of pollution.

4.4. Water Resources Legislation within the Federal States (*Wasserrecht der Bundesländer*)

Since the most important federal acts in the field of water resource management (Federal Water Act and Federal Waste Water Charges Act) are only framework laws, the water resources regulations in the Federal States (state water laws, state waste water laws and various statutory orders) also contain important provisions which supplement the federal regulations or define them in greater detail. For example, the Federal States regulate ownership of waters, supervision of waters, maintenance of waters, licensing and control procedures for uses of waters, and indirect dis-

charges (i. e. discharges via waste water treatment plants) into waters. A number of federal states have also enacted provisions on charges payable for the extraction of groundwater and surface water, the so-called “water use charges”.

Finally, the local authorities have laid down charges within the limits of their bylaws for water supply and waste water disposal. Supplementary regulations have been enacted for discharge into the communal waste water treatment plants.

(BMU2001-Environmental Policy)

4.5. Detergents and Cleaners Act (*Wasch- und Reinigungsmittelgesetz*)

The Detergents and Cleaners Act of 1975 (last amended in 1994) lays down requirements for the environmental compatibility of detergents and cleaners. The use of substances contaminating water can be prohibited or restricted. Under this law, the producers of detergents and cleaners are bound to inform the Federal Environment Agency about the formulations of their products. Moreover, consumer information must be provided on the packing of the products about the most important constituents and the proper dosage.

The Surfactants Ordinance and the Phosphate maximum Values Ordinance were enacted pursuant to the Detergents and Cleaners Act. The Surfactants Ordinance stipulates that at least 90% of the surfactants contained in the product must be biodegradable. Phosphate-free detergents have come to dominate the market. By changing the composition of detergents, discharges of phosphate into waters from domestic waste water have been reduced from 42000 tons of P in 1975 to 2000 tons of P in 1993 (Old Federal States).

(BMU 2001-Environmental Policy)

4.6. Federal Epidemics Act (*Bundesseuchengesetz*)

The requirements for drinking water quality are described in § 11 of the Federal Epidemics Act. The act prescribes that drinking water must satisfy certain quality requirements which come under the supervision of the health authorities. No harm to human health, in particular by pathogens, shall result of the consumption of drinking water.

§12 prescribes the safe disposal of solid and liquid waste substances. Local authorities or associations under the local authorities have to take action to ensure the safe disposal of waste water without creating any risk to human health.

(BMU 2001-Environmental Policy)

4.7. Drinking Water Ordinance (*Trinkwasserverordnung*)

The Drinking Water Ordinance contains provisions on drinking water quality. Drinking water has therefore to be free from pathogens, and that certain heavy metals, cyanides, polycyclic aromatic hydrocarbons, nitrates and pesticides not exceed prescribed limits. The limits correspond to the regulations of the EC Water Framework Directive.

The Ordinance regulates the obligations for operators of water supply schemes and the regular monitoring of the schemes by the health authorities.

5. Usage of Water

Germany is a region with a plenty of water resources. In the annual average 164 billion cubic meters water are available, which is the difference between precipitation and evaporation. Only 29 % of the water resources is required for human use. The most important consumers are power stations, mining, industry, and agriculture.

5.1. Water Quality

The Organisation for Economic Co-operation and Development (OECD) Series of Environmental Performance Reviews scrutinise efforts to meet both domestic objectives and international commitments and assess progress in reducing the pollution burden, improving natural resource management, integrating environmental and economic policies, and strengthening international co-operation.

Within the latest OECD review for Germany, published in May 2001, the water quality in Germany has been assessed as follows:

During the 1990s, the quality of surface waters (rivers and lakes) continued to improve. The coverage and level of municipal and industrial waste water treatment also continued to increase, particularly in the New Federal States. Major improvements to the quality of the Elbe were partly due to declining industrial activity in the New Federal States.

Full cost recovery of public water services is well implemented in the case of both households and industry, although further exemptions from waste water charges were introduced in 1994 and some investment in municipal

water infrastructure benefits from financial transfers. Monitoring of water quality has been expanded to the New Federal States, including for toxic contaminants. Germany has set the very ambitious policy objective of having 100% of its rivers in quality class II by 2010.

Significant steps towards achieving the quality class II target have nonetheless been made for organic pollution only. In the case of nutrients, heavy metals and toxic contaminants, there is a general need for progress in the New Federal States, while problems persist in the old Federal States. The 1993 OECD environmental performance review of Germany identified water pollution from diffuse agricultural sources as an environmental challenge facing the country. The 1996 fertiliser ordinance was enacted to harmonise German legislation with the EU's 1991 Nitrate Directive. However, there are still regions with very high nitrogen surpluses from farming.

Diffuse pollution of rivers and groundwater by nitrates persists, and international commitments related to releases in the North Sea have not been met. Progress has been made in reducing concentrations of heavy metals and other toxic contaminants in water, but there is still room for improvement. The incentive function of waste water charges has been weakened.

Flood damage has increased, resulting from lack of integration between water management, transport policy and nature conservation objectives. There is a need to revitalise river banks, especially those of the Rhine and Danube. The EU Water Framework Directive reinforces the need to meet water quality standards, within defined time horizons and through river basin management, which should facilitate dialogue and co-operation among stakeholders.

By the OECD it is recommended to:

- develop a comprehensive strategy to address diffuse pollution of surface and groundwater, including a mix of measures to further reduce nutrient surpluses from agriculture and to implement specific, more stringent requirements for farmers in vulnerable areas;
- further reduce point source pollution of water through further investments in advanced treatment facilities, and through increasing the incentive function of waste water charges;
- address diffuse water pollution by heavy metals in a comprehensive manner, through extension of charging for rainwater collection and treatment;
- enhance flood prevention in the main river basins by developing partnership approaches among stakeholders, and by including flood plain areas in regional land use planning and nature conservation;
- pursue efforts to develop water quality monitoring, particularly for pesticides and nutrients in groundwater and lakes;
- take further steps towards implementation of water resource management using a river basin approach.

([OECD Environment Directorate, Environmental Performance Review – Germany, May 2001, website as of Dec 2001](#))

5.2. Water Demand and Supply

5.2.1. Water Supply at a glance

In 1996 the public water supply used approximately 5.66 billion cubic meters.

Groundwater is the most common raw water source for drinking water utilities in Germany (Table 3). Approximately 64 % of the total amount of drinking water is produced from groundwater. The other raw water sources are spring water (8 %) and surface water (28 %). The surface water is divided into reservoir, river and sea water as well as bankfiltrate and infiltrate. As the table shows river water is commonly used indirectly as bankfiltrate or infiltrate.

Table 3. Raw water sources for drinking water treatment in Germany

water source	usage	
ground water	64 %	
spring water	8 %	
surface water	28 %	
bankfiltrate, infiltrate		16 %
reservoir water		9 %
sea water		2 %
river water		1 %
total	100 %	

The drinking water quality in Germany is regulated with one national standard.

([Water Technology Centre, website as of Dec 2001](#))

Table 4. Water supplied to consumers 1990 - 1999

Year	Households and small industries	Industries	Others	Total
	Mio. m ³			
1990	4 234	1 132	616	5 982
1991	4 145	1 024	579	5 748
1992	4 085	929	524	5 538
1993	4 011	820	413	5 244
1994	4 020	777	375	5 172
1995	3 999	736	359	5 094
1996	3 976	703	341	5 020
1997	3 946	704	311	4 961
1998	3 894	678	291	4 863
1999p	3 892	650	278	4 820

(Federal Ministry for the Environment, Nature Protection and Nuclear Safety, water statistic (german), website as of Nov 2001)

In 1998, about 81,1 million inhabitants (98,9% of the population) were connected to the public water supply. 1991 78,6 million were connected (97,9% of the population).

Water supply companies supplied 3,8 bio. m³ of water to the households in Germany. 1991 this amount had been 4,1 bio. m³. 1,0 bio m³ have been supplied to the industry and other consumers, this is in total 0,6 bio m³ less than 1991. Between 1991 and 1998 the water supply companies were able to reduce water losses (leakages, pipe damages) by 20 % to an amount of 0,6 bio. m³.

As a result of the reduced demand, water production for the public sector declined by 14% from 6,5 billion m³ in 1991 to an amount of 5,6 billion m³ in 1998.

5.2.2. Water Consumption

According to provisional results of the [Federal Statistical Office](#) (Press release 30.11.2000), the establishments in manufacturing, mining and quarrying used about 7.4 billion m³ of freshwater in 1998. That was a decline by 0.6 billion m³ (-7.2%) on 1995 and by 2.5 billion m³ (-25.2%) on 1991. Overall water use, i.e. including circulation and multiple use, amounted to over 35 billion m³. About 26 billion m³ of that amount (74%) were needed for the cooling of power generating and production plants, 7.0 billion m³ (20%) for production-specific purposes and 2 billion m³ (6%) as boiler feedwater and for staff purposes.

Table 5. Development of water consumption 1990 – 1999 (Household and small industries)

Year	Specific water consumption Germany in litre/capita/day	Old Federal States	New Federal States
1990	145	147	141
1991	139	145	118
1992	136	143	108
1993	136	140	107
1994	134	139	103
1995	132	139	100
1996	128	135	98
1997	130	137	96
1998	130	137	93
1999p	130	137	93

(Federal Ministry for the Environment, Nature Protection and Nuclear Safety, water statistic (german), website as of Nov 2001)

By economising on the use of freshwater, the water balance was further disburdened. In 1998, industrial establishments withdrew 8.9 billion m³ of water from the resources, which was a decrease by 2.1 billion m³ or 19.3% compared with 1991.

According to the Federal Statistical Office, the average water consumption per capita and day in 1998 was 129 litre, that is a decrease of 15 litre compared to 1991. 81.1 million inhabitants were connected to public water supply (98.9% of total population). Nevertheless, the water consumption per capita varies in the various Federal States between 154 l in Schleswig-Holstein and 86 l in Thuringia.

Water abstraction for public water supply decreased 14% from 6.5 billion m³ in 1991 to 5.6 billion m³ in 1998. The supply of households decreased from 4.1 billion m³ to 3.8 billion m³ during the same period.

Table 6. Use of drinking water

Use	Average percentage of supplied water
Bath/shower/body wash	36 %
Toilet flushing	27 %
Laundry	12 %
Dish-washing	6 %
Room- and car cleaning, garden	6 %
Eating and drinking	4 %
use in small industries	9 %
Total	100 %

[Federal Ministry for the Environment, Nature Protection and Nuclear Safety, water statistic \(german\), website as of Nov 2001](#)

5.2.3. Drinking Water Protection

The [Federal Ministry of Health](#) is responsible for drinking water quality as part of a precautionary health policy. The drinking water program in Germany is well grounded in law with the Foodstuff and Consumer Goods Act. German legislation in this area is frequently updated, most recently in August 1998.

The arrangement between the Federal States and the Ministry of Health with respect to reporting on compliance with federal drinking water requirements is of particular interest: the Federal States have agreed to voluntarily report to the Ministry of Health on a quarterly basis on the status of compliance of all water systems. The water suppliers must report any instance of non-compliance to their customers. Where there is non-compliance, the water supplier and the Federal States negotiate the necessary rehabilitation program, which includes a full list of action needed to correct the problem. The negotiated agreement also contains dates for completion of each action.

Intense agricultural practices on farmland are significantly and adversely affecting ground water due to the application of pesticides and of fertilisers. This problem is particularly serious because approximately 50 per cent of land is being farmed. The problem of nitrate contamination of ground water has been recognised and is being addressed by the Ministries for the Environment, Health and Agriculture. The first measures taken led to a reduction of the rate of application of fertiliser.

Since the 1960s major efforts have been undertaken to protect the aquatic environment with the construction of municipal waste water treatment plants and the installation of treatment equipment at industrial facilities: more than 50 billion € were invested over the 1970s and 1980s in the construction and renewal of sewers and waste water treatment plants, and this was followed by increasing current expenditures. (Keil, 1999)

5.2.4. Price

The legal framework governing the pricing of water services is based on a number of principles derived foremost from the Municipal Charges Acts (*Kommunalabgabengesetze*) of the 16 Federal States. Other relevant legislation includes municipal budget legislation. Additionally, as result of a growing influence of privately governed companies on markets for water services, competition law has an increasing role to play. Water pricing principles essentially prescribe that water prices and sewerage fees shall not exceed the real costs of providing water services (including operational costs, maintenance, depreciation), nor remain substantially below a real-cost threshold.

On the one hand, implementation of the named requirements is supervised by the higher authorities in the Federal States (*Kommunalaufsicht*) and on the other hand through competition agencies (*Kartellaufsicht*). Also, under German law there are ample possibilities for water users, competitors, municipalities etc. to challenge an existing price scheme in court.

Statistical evidence proves that subsidies in the water supply sector are very low in Germany. Prices are not set according to the economic strength of the water user, but according to the real cost situation. For example, the prices for water supply are significantly higher in the Eastern part of Germany, where high investments were needed after the reunification of Germany, even though the average private household earnings are significantly lower. Continuous and high investment in the water supply sector also prove that water prices are not artificially reduced by bad maintenance of the infrastructure.

([Kessler, 1999, website as of Dec 2001](#))

In January 1998 a German customer paid for one cubic meter drinking water 1,64 Euro. This is an average of the mean water prices in the western part of Germany (1,59 Euro) and the eastern part of Germany (1,96 Euro). All prices include 7 % VAT. This means for the western part of Germany an increase of 3.4 % in comparison with the previous year 1997. For the eastern part of Germany no data for comparison were available.

([Water Technology Centre, website as of Dec 2001](#))

A direct comparison of prices for drinking water in Europe is very difficult because of different tariff structures with variable components, taxes and levies, different write-off systems and subsidy schemes. However, the following table presents an overview for water pricing in certain European countries. Evaluating the figures, the distinct frame conditions, financial and economic aspects have to be considered.

Table 7. Price of water in different European countries

Country	Year	Average price in € / m ³	Costs per capita in € / year	Water loss in distribution scheme
Germany	1996	1,45	72	9%
Denmark	1993	0,41	28	17%
England/Wales	1995	0,87	59	24%
France	1994	1,02	54	25%
Italy	1992	0,36	38	27%
Netherlands	1995	1,38	69	No figures
Spain	1992	0,20	No figures	30%

([Water Technology Centre, website as of Dec 2001](#))

5.3. Waste Water Disposal

5.3.1. Amount and Type of Waste Water

Although the new Federal States have a very high demand in waste water purification plants of all kinds, it has always been and still is very difficult for Canadian companies to penetrate into this market, for instance in order to participate in public invitations to tender for the construction of waste water treatment plants used by industry or municipalities. The reasons for this are to be found rather in organisation and administration than on the technological or financial side. The major part of waste water treatment plants are being constructed by local companies which are in fact looking for opportunities of co-operation with foreign companies. The possibilities for co-operation are mostly centred on technology and only to a lesser degree on building and construction.

The current waste water situation and consequently the water pollution situation has been defused by partial closures and production cutbacks of companies. This also lead to a reduction of the quantity of sewage waters mainly caused by industry in Eastern Germany. The quantities of discharge of organic pollutants into East German rivers has decreased by 70-80% in comparison with figures available for 1989. Especially as far as the Elbe is concerned, the mercury content could be decreased from 22 tons per year in 1989 to currently 3 tons per year. In addition to the 58 sewage purification plants already being built, alone within the German Elbe-region 30 larger municipal sewage treatment plants plus smaller plants are to be constructed. This also offers an opportunity for Canadian companies to launch their technologies, know-how and services and to penetrate into this difficult, but also very interesting and rewarding market with regard to the developments in Eastern Europe. As most companies in Germany have a lot of experience in the construction of large-scale plants, there are good chances for foreign firms to enter the market for the construction of smaller-sized plants. Following the reunification of Germany, many municipalities had plants constructed which proved to be too large and therefore too expensive. This fact is now reflected in the level of waste water fees charged by some communities. The prices per m³ of waste water fluctuate between € 0.30 and € 5.50.

([Canadian Embassy Bonn, 1996, website as of Nov 2001](#))

5.3.2. Type of Treatment

The [German Association for Water Management, Wastewater and Waste ATV-DVWK](#) is an association representing German specialists working in the fields of wastewater, waste and water management. The main activities of the association cover both technical-scientific subjects and the economic and legal aspects of environmental protection. The politically and economically independent association operates, at national and international level, within the fields of water pollution control, wastewater, water-hazardous substances, waste, hydraulic engineering, hydro-power, hydrology, soil conservation and the rehabilitation of contaminated sites. The some 16,000 members work in municipalities, engineering consultancies, public authorities, companies, associations and also in universities. Of these there is an individual membership of 10,000 specialists made up from engineers, scientists, lawyers, businessmen, operating personnel and technicians. Through the ATV-DVWK corporate membership there is access to ca. 160,000 specialists. Each member of the ATV-DVWK, whether individual or corporate, is assigned to one of the seven regional groups. Central tasks of the Association are the preparation and updating of the ATV-DVWK Standards, the carrying out of professional training and keeping members up to date.

The German ATV-DVWK Set of Rules and Standards provides information on these and other questions. The range of subjects extends from planning via construction and operation out to management systems in the field of wastewater and waste engineering. Generally accepted rules of technology are described, and recommendations and in-

formation for practice are given. It is of particular importance to the ATV-DVWK that competent specialist groups are correctly represented within the working groups formed. This means that scientists, planners, manufacturers, operators and also supervisory authorities are represented in the bodies.

The drafts of ATV-DVWK Standards and Advisory Leaflets are discussed according to a laid down procedure before their final publication in specialist circles.

Currently the German ATV-DVWK Set of Rules and Standards, including translations, embraces ca. 225 publications. Many Standards and Advisory Leaflets have already been translated into English and other languages.

The 11th ATV Performance Comparison of German Municipal Sewage Treatment Plants in 1998 came to following results:

In 1998 6117 municipal sewage treatment plants with a capacity of 138.5 million total inhabitants and population equivalents (PT) took part in the Federal Republic of Germany-wide ATV performance comparison. The 91 % participation, referred to the total capacity of ca. 152 million PT of all sewage treatment plants in Germany, emphasises the high informative value of the results.

The effluent quality has improved, particularly in the new Federal States, which is substantiated by the evaluation of both five stage definition systems "Oxygen Demand Levels" and "Nutrient Loading Levels".

The number of sewage treatment plants for which an oxygen demand level could be determined lies significantly above 6,000. The oxygen demand level is 1.7. The improvement over the previous year is primarily to be explained by the retrofitting of sewage treatment plants for nitrogen elimination.

An essential reason for the significant improvement of the individual parameters from 1996 to 1998 is the implementation of relevant EU Directives. The development programme of the German Federal States for nitrogen elimination are showing its effect. In particular, considerable improvements could be achieved in the new Federal States.

The outstanding overall result of the performance comparison should not obscure the fact that, regionally, still differing demands for action exist. In order, in the future, to be able to represent the success with wastewater treatment and the reduction of the loading of lakes and rivers through sewage treatment plant effluents according to river basin districts (EU Water Framework Directive), it is sensible to develop the performance comparison further on an European level.

([German Association for Water Management, Wastewater and Waste ATV-DVWK infobase, website as of Dec 2001](#).)

5.3.3. Wastewater fees and contributions

All of Germany's Federal States, in their own laws on municipal fees and levies, have defined local authorities' framework for levying fees and contributions for wastewater-management and wastewater-treatment services.

Local authorities, and the waste-management agencies they engage, collect wastewater-management fees and contributions on the basis of statutes and within the framework of the relevant Federal States laws on municipal fees and levies.

Fees are collected to cover costs of operating and maintaining wastewater-treatment facilities; they are collected in the form of

- dirty-water and rainwater fees, in accordance with the amount of fresh water used,
- dirty-water fees based on the fresh-water standard, and partly based on the degree to which the wastewater is polluted,
- rainwater fees, based on features of the relevant property, and
- basic fees, based on various calculation criteria.

The number and nature of the various fee components, and the overall amounts of the wastewater fees, vary. They depend on the structure of the wastewater-management area, the local organisational and technical framework and the policy objectives of the local authorities or wastewater-management agencies they engage.

Contributions are collected in order to ensure that citizens participate appropriately in financing necessary investments for adequate wastewater management. They must be paid by property owners as compensation for the economic advantages they enjoy in having access to wastewater-treatment facilities. The contribution amounts are calculated on the basis of the property area available for construction, multiplied by a usage factor that depends on the permitted number of floors.

([Federal Ministry of Finance, Press and Information Division \(2000\), website as of Nov 2001](#))

Table 8. Prices for waste water in each Federal State in €

Baden Württemberg	from 0,82	up to 3,58
Bavaria	0,36	2,99
Bremen	2,02	2,43
Lower Saxony	0,72	4,07
North Rhine-Westphalia	0,51	5,85
Rhineland-Palatinate	0,77	3,17
Saarland	1,56	3,63
Schleswig-Holstein	0,31	4,35
Brandenburg	1,25	5,10
Mecklenburg-Vorpommern	1,42	3,57
Saxony	0,51	3,19
Saxony-Anhalt	1,32	2,45
Thuringia	0,69	2,81
Berlin	2,25	-
Hamburg	2,40	-

Source: VDI-Nachrichten i.e. newsletter of the Association of German Professional Engineers: Nr. 32; 11.08.1995

5.4. Industry

The main share of water abstraction goes into cooling power stations. In 1991, a total of 29 billion m³ was used for 286 power stations.

After water use for cooling power stations, industrial water use is by far the most important water use in Germany. In 1991, water use amounted to just under 12,2 billion m³. About 11 billion m³ came from self-supply. The coefficient of water use was 4,3, i.e. water was used 4,3 times before returned to the natural water cycle. The main sectors are: Chemical industry (4,4 billion m³), Mining (3,2 billion m³), Iron and steel (1,2 billion m³), Pulp and paper (0,7 billion m³). (Kraemer, Jäger, 1998)

5.5. Agriculture

Agricultural water use in Germany for 1993 was estimated at around 1 billion m³. This is significantly lower than the approximately 2.3 billion m³ for 1989. This reduction is largely due to the decrease of agricultural activity in the Eastern Federal States. Only estimated volumes can be given since water abstraction for agriculture comes largely from private wells.

Irrigation in Germany takes place primarily in regions with intensive agriculture or horticulture having precipitation less than 700 mm per annum. (Kraemer, Jäger, 1998)

6. Outlook

6.1. Implementation of the Water Framework Directive

The Water Framework Directive (WFD) reforms EU water legislation by introducing a new model for water management. It was officially adopted by the EU decision-making bodies in September 2000, but it did not enter into force until 22 December 2000, the date of its publication in the Official Journal of the European Communities.

From an environmental point of view, the WFD's ultimate aim is preventing further deterioration and achieving "good status" in all waters. The WFD's managerial approach - integrated water management at the river basin level - aims at ensuring overall co-ordination of water policy in the EU.

Being a "framework", the Directive focuses on establishing the right conditions to encourage efficient and effective water protection at the local level, by providing for a common approach and common objectives, principles, definitions and basic measures. However, the mechanisms and specific measures required to achieve "good status" will take place at the local level and are the responsibility of competent (national, regional, local, or river basin) authorities.

The implementation of the WFD should lead to a more rational water protection and use, to reduced water treatment costs, to increased amenity value of surface waters and to a much more co-ordinated administration of waters. The ultimate benefit is that the sustainability of water use should be ensured. The WFD is, therefore, much needed as the different pieces of EU water legislation - as developed over the past 25 years - have been fairly unrelated, often lacking consistency with one another, and not designed for sustainability but mainly for pollution control in certain waters or by certain pollutants.

Source: [World Wildlife Fund \(WWF\) – European Freshwater Programme, website as of Dec 2001](#)

Germany is a country where water management is traditionally organised around political-administrative units.

As stated above, responsibility for water management in Germany is divided between public authorities at Federal States and communal level in accordance with the federal structure of government. Legislative authority over water issues rests primarily with the 16 Federal States. The Federal Water Management Act provides merely a legal framework which allows considerable scope for substantiation in the water legislation of each state. The principal advantage of this multi-level system of governance is that it ensures a high degree of formal political legitimacy to institutions of water management in Germany. Each water authority – whether at federal, state or municipal level – is politically accountable to a democratically elected parliament or council. The main drawbacks – besides the lack of spatial fit with river basins – lie in institutional diversity between the 16 Federal States and problems of vertical institutional interplay, in particular between federal and state levels.

The main new approaches of the Water Framework Directive in water management include the provision that river basins will in future be managed jointly by the neighbouring countries or, in case of Germany, by the neighbouring Federal States. Elements of river basin management do exist in Germany but they are supplementary, not central, to the above water management institutions and their impact is often limited by spatial misfit to political-administrative territories. Within Germany, inter-state co-operation is partially institutionalised in the form of working groups of state water authorities for each of the major river systems, such as the Elbe, the Rhine and the Weser. Like the international river commissions, these working groups produce action plans and programmes which are not legally binding but are designed to give guidance to water authorities. Inter-municipal co-operation along river reaches or catchments is institutionalised in several forms, albeit limited to specific territories or tasks. The nine statutory river associations (*sondergesetzliche Wasserverbände*) of the state of North Rhine-Westphalia are the closest operational organisation forms in direction to river basin management.

Given the importance of political-administrative territories to water management in Germany and its limited experience with river basin management, the WFD will necessitate major changes of the way water protection is spatially organised in the future. The challenge is to reform existing institutions in such a way that they are compatible with both the WFD and the country's federal system of government. It is necessary to identify a "competent authority" for each full or partial River Basin District on German territory.

Key questions to be answered are:

which existing body will be entrusted with responsibility for each River Basin District and
what kind of co-ordinating and planning authority will be allowed to exercise.

Water management under the WFD will require greater co-operation and co-ordination within and beyond the water sector. The need to cultivate better relations within and beyond the water sector will be particularly apparent when it comes to allocate costs of implementing the WFD within a River Basin District. As yet, very little consideration has been given to suitable mechanisms for funding the WFD. It is widely expected that the WFD will give rise to substantial additional costs necessary to cover both new administrative tasks (e.g. monitoring) and the water protection measures themselves. New mechanisms for allocating costs across state boundaries will need to be found which offer adequate incentives for the most cost-effective measures for the whole river basin.

([Moss, Timothy, 2001, website as of Dec 2001](#))

The legal implementation of the Water Framework Directive will be carried out in Germany by amending the Federal Water Management Act (*Wasserhaushaltsgesetz*) and the water laws of the Federal States and by adopting ordinances. Implementation must be completed by the end of 2003, i.e., three years after the Directive has entered into force.

Since the German constitution (Art. 75 GG, Basic Law) only allows the Federation to enact skeleton provisions in this field, the Federal Water Management Act can only be amended to include the general intent of the Water Framework Directive. Its main purpose is to lay down the regulatory tasks to be performed by the Federal States.

The provisions of the water legislation of the Federal States are to be brought into line with the skeleton provisions contained in the Federal Water Management Act. The Federal States also have to adopt all those provisions required to implement the Water Framework Directive which cannot, for constitutional reasons, be incorporated in the Federal Water Management Act. In particular, this concerns not only the procedural requirements, e.g. arrangements to set up the programmes of measures and the management plans (or sub-plans, sub-programmes at Federal States level), and especially the conducting of comprehensive public consultation with multi-stage hearings as called for under the Directive, but also the standards for monitoring the status of waters. Moreover, there will be Federal States-specific tasks, e.g. concerning transitional or coastal waters, which the respective Federal States will have to regulate.

[LAWA Guide to the Implementation of the EC Water Framework Directive / Part 2 - status: 12.02.2001](#)

6.2. *Liberalisation of the water market*

While the liberalisation of the energy and gas market is proceeding, the branch is reserved regarding the liberalisation of the water market. Reasons are the high degree of security in supply of water and the excellent drinking water quality comparing the standards on international level. Moreover, as contrasted with the energy or telecommunication market, drinking water is substantial for life and need therefore conscientious and attentive care. Nevertheless, ways to save expenditure have to be considered and the existing deficits in the international competition are to be removed as soon as possible.

Therefore, the Federal Ministry of Economics procures an expert opinion, to examine the economical as well as the hygienical and ecological consequences of a liberalisation of the water market.

(Yearly Water Management Report (*Jahresbericht der Wasserwirtschaft*) 1999, p. 20)

6.3. *Recommendations of the Action plan "Improving the competitiveness of the German water and sewage sector"*

EU-Regulations determine increasingly the German Water law situation. The regulations focus on the equal combination of the environmental concept and the target of liberalisation of the European water market.

The eased access of international companies to the German water market as well as the tightened budget situation of the public households has lead to an increased influence of private industries to the originally communal organised water and waste water sector. On the other hand, energy supply companies are more and more interested in the economic sector "water", which leads to a restructured management of supply systems on national and international level. The economical aspect of tasks related to water supply and waste water receives increased importance. The adaptation of organisational form, internal structure and legislation to the altered frame conditions is a necessary consequence to keep the German organisations competitive on the growing market.

Therefore, the co-ordination of the German water policy and their mediation in Brussels has to be intensified. Instruments are to be created to synchronise the work of professional associations, industry, Federal and Federal States authorities. On one hand, they provide the means to represent German interests via the European institutions, on the other hand the international acquaintance of German water technology will be increased.

Globalisation increases comparison of technology. Keeping this fact in mind, the development of new techniques should be tailored on demand. Research and development requirements have to be evaluated regularly.

Waste water technology should be improved under the aspects of expansion, flexibility and costs of maintenance and investment to stand the competition on the German market.

The introduction of the Water Framework Directive should be taken as a chance to develop the structures of water management in a way to achieve a solid stand on the European market of water technology. Steps in this direction are the use of synergy effects combining water supply and waste water disposal under one association, improve the allocation of capital, change of organisation form towards increased entrepreneurial freedom of action as well as tightened decision structures. Strategies to combine smaller units to larger water associations may help to assure competence, efficiency and economy of German enterprises.

International competitive contestants are to be formed offering water management projects as a whole on the World market, including planning, developing, building, operating and financing schemes out of one hand. This type of global player should see water as a core business and should be oriented towards long-term profit maximisation.

(Water Technology Centre, 2001)

7. Glossary

Basic Law	Grundgesetz
Drinking Water Ordinance	Trinkwasserverordnung
Federal Epidemics Act	Bundesseuchengesetz
Federal States	Länder
Federal Water Management Act	Wasserhaushaltsgesetz
Groundwater Ordinance	Grundwasserverordnung
Integrated water and land management	Kulturbau
Inter-municipal Associations	Zweckverbände
Municipal autonomy	Kommunale Selbstverwaltung
Municipal Charges Act	Kommunalabgabengesetz
Municipal enterprise	Eigengesellschaften
Non-autonomous Municipal agencies	Regiebetriebe
Private model	Privates Modell
Public Law Corporation	Anstalten öffentlichen Rechts
Public private Partnership	Kooperationsmodelle
Semi-autonomous Municipal agency	Eigenbetriebe
Statutory river associations	Sondergesetzliche Wasserverbände
Waste Water Charges Act	Abwasserabgabengesetz
Water management associations	Wasser- und Bodenverbände

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