

## THE ELBE RIVER AND ITS BASIN

- International Commission for the Protection of the Elbe River
- Flood protection
- Action programmes and Water Framework Directive
- Warning and alarm system
- Monitoring network, monitoring programme and water quality

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## THE ELBE RIVER AND ITS BASIN

The Elbe (Labe) rises at an elevation of 1,386 m above sea level in the Giant Mountains (Krkonoše, Riesengebirge) and reaches the North Sea after 1,094 km. The Elbe river basin, which comprises about 148,000 km², is inhabited by about 25 million people. The Elbe's major tributaries are the Vltava, the Ohře, the Schwarze Elster, the Mulde, the Saale and the Havel rivers.



The Elbe has the fourth largest **river basin** in Central and Western Europe after the Danube, Vistula and Rhine basins and is inhabited by about 25 million people. More than 99% of the river basin is located in Germany and the Czech Republic, with less than 1% in Austria and Poland.

From its source in the Giant Mountains to its mouth in the North Sea, the Elbe river can be divided into three **sections** (Upper, Middle and Lower Elbe).

| Classification of the Elbe | Elbe sections  | Section length [km] | River basin [km²] |
|----------------------------|--|---------------------|-------------------|
| Upper Elbe                 | Source of the Elbe up to Hirschstein Castle  | 463                 | 54,170            |
| Middle Elbe                | Hirschstein Castle up to Geesthacht Weir   | 489                 | 80,843            |
| Lower Elbe                 | Geesthacht Weir up to the mouth in the North Sea at the maritime border near Cuxhaven-Kugelbake (Elbe km 727.7); this segment is also denominated "Tidal Elbe" as it is influenced by low and high tide; the segment downstream of Elbe km 654.9 is transitional waters. | 142                 | 13,255            |
| Elbe in total              | Source of the Elbe up to its mouth in the North Sea  | 1,094               | 148,268           |

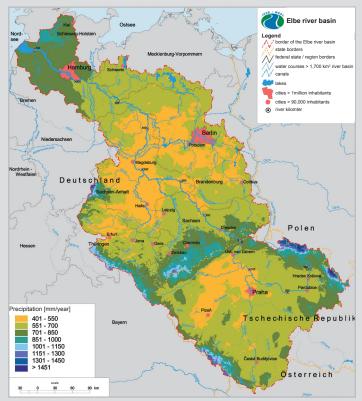
The largest **tributaries** of the Elbe are the Vltava, the Saale and the Havel rivers which occupy more than 51% of the river basins.

The Elbe river basin belongs to the temperate climate zone and is located in the **transition zone** from maritime to continental climate. The continental influence manifests itself by relatively low precipitation levels and large differences between summer and winter temperatures. This is the case for the largest part of the Elbe river basin, whereas precipitation levels rise the higher you get into the low mountain ranges. The Lower Elbe section is characterized by a more balanced temperature and relatively high precipitation levels in comparison with other lowland areas, which are typical of a maritime climate.

The annual average **air temperatures** are  $8-9^{\circ}\text{C}$  in the lowlands and  $1-3^{\circ}\text{C}$  at the summits of the low mountain ranges. The absolute extreme values of the river basin were measured in its southern part with a rather continental climate at +40.4°C in Dobřichovice near Prague on 20 August 2012 and at -42.2°C in Litvinovice near Česke Budějovice (Upper Vltava river basin) on 11 February 1929. But also the maritime climate of the northern Elbe region has experienced extreme temperatures ranging from +39.2°C, measured in Lübben (Spree river basin) on 09 August 1992, to -28,9°C, measured in Gardelegen (Aland river basin) on 24 February 1956.

The average annual **precipitation levels** range from 1,700 mm at the ridges of the Giant Mountains and the Jizera Mountains (Jizerské hory, Isergebirge) as well as in the Upper Harz Mountains and 450 mm in areas located in the rain shadow of the low mountain ranges. The average annual precipitation level of the complete Elbe river basin is 628 mm.

However, the map shows significant differences in the individual regions. For about one third of the Elbe river basins the precipitation level is below 550 mm. These are mainly parts of the Vltava, Ohře, Saale and Havel river basins. Particularly low precipitation is recorded in areas located in the rain shadow of the low mountain ranges during cyclonic westerly and northwesterly weather situations. As a result, the Lower Saale region with an average of approx. 430-450 mm per year, the Žatec region in the Ohře (Eger) river basin and the Thuringian Basin (Thüringer Becken) in the Unstrut region with 450 mm per year are the driest areas. By contrast, annual precipitation of more than 1,000 mm is only to be found at the higher elevations of the lower mountain ranges.



Average annual precipitation in the Elbe river basin for the 1961 – 1990 series (Source: BfG, ČHMÚ, ICPER)

The highest daily precipitation in the Elbe river basin amounting to 345 mm was recorded in Nová Louka in the Jizera Mountains on 29 July 1897. The 312 mm of rainfall measured in Zinnwald-Georgenfeld in the eastern part of the Ore Mountains (Krušné hory, Erzgebirge) on 12 August 2002 has been the highest precipitation in one day in Germany since the start of regular measurements.

The rain-snow-type **runoff regime** is characteristic for this transition climate. Part of the winter precipitation is snow, which normally melts in the lower mountain ranges only in spring and which in the long-term average results in a runoff maximum in the months of March and April. Floods are often caused by regional heavy precipitation in summer, such as in the event of the floods in August 2002 and in June 2013.

The **lower mountain ranges** only occupy a small part of the Elbe river basin. Only 2% of the Elbe region is located at altitudes of more than 800 m above sea level, more than half of the river basin is at altitudes of up to 200 m above sea level. Due to these conditions, there is a significant runoff decrease in the summer months as - in contrast to the Alpine waters - the snow and the mountain glaciers do not continue to melt in these months. The lowest runoff is usually registered in September and October.

The **multi-year average runoff** of the Elbe river at the mouth to the sea is 861 m³/s. With reference to the Neu Darchau gauge, which represents 89% of the complete Elbe river basin, the average annual runoff rate amounts to 5.4 l/s/km². Thus the Elbe region is one of the European river areas with the lowest runoff rates.

This fact is reflected in the large number of dams in the Elbe river basin. There are 312 dams with a reservoir volume of more than 0.3 million m³, 175 are located in Germany and 137 in the Czech Republic. They comprise a total reservoir volume of approx. 4.12 billion m³.

According to the data analysed within the framework of the CORINE Land Cover project in 2012, 39.7% of the area in the Elbe river basin is used as agricultural land. Forests cover 30.8%, among them is 22.1% coniferous and 8.7% deciduous and mixed forest.

General description of the international Elbe river basin district

| Area of the Elbe River basins  | 148,268 km²   |  |
|--|---|--|
| German share   | 65.54%  |  |
| Czech share  | 33.68%  |  |
| Austrian share   | 0.62%   |  |
| Polish share   | 0.16%   |  |
| Area of the coastal waters   | 2,558 km <sup>2</sup>   |  |
| Length of the Elbe   | 1,094.3 km  |  |
| German share   | 66.4%   |  |
| Czech share  | 33.6%   |  |
| Austrian share   | 0%  |  |
| Polish share   | 0%  |  |
| Important tributaries (in hydrological order)                              | Vltava, Ohře, Schwarze Elster, Mulde, Saale, Havel  |  |
| Important bodies of water lake category                                    | Natural lakes: Müritz, Schweriner See, Plauer See, Kölpinsee, Schaalsee Dams: Lipno, Orlík, Švihov, Slapy, Nechranice, Hohenwarte, Bleiloch, Bautzen, Eibenstock, Spremberg and the flooded open-cast lignite mine Goitzsche  |  |
| Inhabitants  | 24.4 million  |  |
| German share   | 74.3%   |  |
| Czech share  | 25.4%   |  |
| Austrian share   | 0.2%  |  |
| Polish share   | 0.1%  |  |
| Precipitation  | 628 mm (annual average value of the 1961 – 1990 series)   |  |
| Evaporation  | 445 mm (annual average value of the 1961 – 1990 series)   |  |
| Runoff rate at Neu Darchau gauge )   | 5.4 l/s/km² (annual average value of the 1961 – 2005 series)  |  |
| Large cities<br>(>approx. 90,000 inhabitants,<br>sorted according to size) | Berlin, Hamburg, Prague, Leipzig, Dresden, Chemnitz,<br>Halle, Magdeburg, Erfurt, Plzeň, Potsdam, Jena, Cottbus,<br>Gera, Ústí nad Labem, České Budějovice, Hradec Králové,<br>Zwickau, Schwerin, Pardubice   |  |
| Important industrial sites   | Chemical industry: Pardubice-Semtín, Ústí nad Labem, Neratovice, Litvínov, Lovosice, Schkopau, Leuna, Stade, Bitterfeld-Wolfen, Bernburg, Stassfurt, Hamburg Pulp and paper industry: Štětí, Blankenstein, Glückstadt, Arneburg Metal processing industry: Mladá Boleslav, Mosel, Hamburg |  |

<sup>\*)</sup> the last water level gauge without tidal influence, 89% of the Elbe river basin area