MINISTRY OF AGRICULTURE
OF THE CZECH REPUBLIC

Ministry of the Environment
of the Czech Republic

REPORT ON WATER MANAGEMENT IN THE CZECH REPUBLIC IN 2022

Report on Water Management in the Czech Republic in 2022

Ministry of Agriculture of the Czech Republic
Ministry of the Environment of the Czech Republic

Obsah

Dear readers,

you are holding in your hands the 27th edition of the water management yearbook traditionally known as the Blue Report. The history of the Blue Report began in 1997 when the Ministry of Agriculture, in cooperation with the Ministry of the Environment, published it for the first time. Its main mission is to acquaint readers with a number of facts concerning water management in the year under review, to compare them with previous years, to show trends of development and changes achieved. Water management cuts across many disciplines and affects all areas of life. That is why the Blue Report provides information on hydrology, water quality and water pollution, the activities and management of major water managers, water supply and sewerage, water financing and planning, research and development and international relations in the water sector.

The current report introduces you to the situation in 2022, which was an above-normal temperature year in our territory, with an average annual air temperature of 9.2 °C, making it the 5th warmest year in terms of average annual air temperature since 1961. Precipitation was normal this year, with an average annual rainfall of 634 mm, 93% of normal for the period 1991-2020. Hydrologically, last year was mostly average or below average, but still relatively rich in flood situations.

The main objective in 2022 was long-term water retention in the landscape and erosion protection, i.e. building ponds, small reservoirs or wetlands. Land improvements are an important priority for our ministry's support. As of last year, we have built water management measures on more than 793 hectares and erosion control measures on about 885 hectares under land improvements that have been in place since 1991. In total, we have supported these measures with CZK 406 million.

In the chapter on water supply and sewerage, you will learn that water consumption in Czech households has fallen by 3.8 litres per person per day to 89.4 litres per person per day. Compared to the developed societies of the world, this is a low consumption of water, which may be difficult to reduce further in the future by cost-saving measures, including with regard to the quality of the drinking water transported and the reliable disposal and treatment of waste water.

The average price excluding VAT for water was CZK 46.10 per cubic meter last year, and for sewage CZK 41.00 per cubic meter. The level of prices for water and sewerage charges is significantly influenced by the responsible approach of water and sewerage system owners to the renewal of their assets and ensuring the sustainability of the technical condition of this infrastructure.

Thanks to the further extension of the water supply and sewerage network last year, the length of all registered water supply lines reached 81,005 kilometres, an extension of 808 kilometres. In relation to the number of inhabitants supplied, there is therefore an average of 8.04 metres of water mains per inhabitant supplied. In 2022, 10.7 million inhabitants in the Czech Republic were thus supplied from water mains, i.e. almost 96% of the population. The length of the sewerage network was extended by 1,014 km in 2022, reaching a length of 51,568 km. Last year, 9.191 million inhabitants of the Czech Republic, 87.3% of the total population, lived in houses connected to the sewerage system.

You will also read in the Blue Report that last year our Ministry supported a number of actions with CZK 4.6 billion, for example, in the field of water supply and sewerage, flood protection, drought prevention, management of small watercourses and small water reservoirs, and land improvements.

The Yearbook also includes information on support for research and development under the Ministry of Agriculture, the Ministry of the Environment and the Ministry of Education, Youth and Sports. The report includes illustrative photographs showing water management through the eyes of river basin managers or other ministries. The individual chapters are also enriched with images of the nominated entries of the children's competition launched by the Ministry of Agriculture as part of World Water Day, the theme of which in 2023 was Honour Water - Get Involved and Show What You Can Do.

I believe that thanks to the yearbook your awareness of water and its natural resources will be expanded. The Czech Republic is said to be the roof of Europe, meaning that almost all surface water from our territory flows into neighbouring countries. This makes us all the more appreciative of the work of water managers, to whom we owe the water wealth we have, even though our water resources are limited. Water is the basis of life and it is the duty of all of us to protect it, retain it and ensure its quality and abundance for future generations. My goal is to continue to extend the water and sewerage network so that more and more people have access to healthy drinking water.

Marek Výborný
Minister of Agriculture

Dear readers,

As every year, you are receiving the Report on the State of Water Management in the Czech Republic in 2022, traditionally referred to as the Blue Report. This report presents a comprehensive overview of the water management system and water quality care in the Czech Republic for the period in question and is one of the basic publications of the environment and agriculture ministries.

I am honoured to present this report to you, together with the Minister of Agriculture, Mgr. Mark Výborný this year, because the issue of water management is an essential part of our strategic inter-ministerial cooperation, but also one of my priorities at the head of the Ministry of the Environment.

Important activities of both ministries in 2022 included the approval of updates to the Flood Risk Management Plans and National River Basin Plans at the beginning of the year, as the two most important strategic documents in the field of water management. Through the flood risk management plans, the most flood-prone areas in the country are identified in regular six-year cycles. This concept document sets out in a binding manner the objectives and measures for flood risk management in areas with significant flood risk, leading to a reduction of the adverse effects of floods on the environment, cultural heritage and economic activity. National river basin management plans set objectives for the protection and improvement of surface and groundwater and aquatic ecosystems, for the reduction of the adverse effects of floods and droughts, for the management and sustainable use of surface and groundwater for the provision of water services and for the improvement of water conditions and for the protection of the ecological stability of the landscape.

The provisions of the so-called „dry" amendment to the Water Act have also been implemented. All regional drought and water scarcity management plans were prepared, discussed and agreed by both ministries. In addition, an alert information system has been introduced under the HAMR forecasting system, which warns in weekly increments of the occurrence of natural (unaffected) hydrological drought for surface and groundwater in the territory of each municipality with extended jurisdiction.

Work continued on the preparation of an „emergency" amendment to the Water Act, which aims to clarify the competences of entities dealing with accidents. The amendment also introduces a completely new obligation of continuous measurement for selected surface water polluters and establishes a register of all wastewater discharges into surface waters.

The year 2022 was also significant in connection with the Czech Presidency of the Council of the European Union, which took place in the second half of this year. From the perspective of water protection, the publication of two key legislative proposals of the European Commission, on which the Czech Presidency started discussions in the EU Council working group, was particularly important. These are the revision of Directive 91/271/EEC on urban waste water treatment and the draft directive amending Directives 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy, 2006/118/EC on the protection of groundwater against pollution and deterioration and 2008/105/EC on environmental quality standards in the field of water policy. The revision of these documents will be both a challenge and a priority for water protection in the years to come. During the Presidency, a number of important water-related events took place in the European format, such as the meeting of the Groundwater and Floods Working Group and the informal meeting of Water Directors in Prague.

Last but not least, I would like to mention our subsidy support for water management projects. The Ministry of the Environment provided a total of CZK 5.963 billion, which was directed towards improving water quality, reducing the risk of flooding and taking care of nature and landscape protection. Support is mainly provided through the Operational Programme Environment, but also through the National Environment Programme, the National Recovery Plan and the EEA and Norway Grants.

I hope that this report will give you a comprehensive overview of what is happening in the field of water management and will also contribute to raising awareness of water as a valuable component of natural resources and an irreplaceable raw material. Water is often treated as if it is not that important, because there is seemingly enough of it everywhere. But the truth is that water is the most precious thing we have, and it should be treated as such.

Petr Hladík
Minister for the Environment

A. Pospíšilová – Colourful Miracle, Primary School, Otevřená, Brno

1. HYDROLOGICAL BALANCE

1.1 Temperature and precipitation

The year 2022 was above-average in terms of temperature in the Czech Republic, the average annual air temperature (9.2°C) was 0.9°C higher than the 1991–2020 average. 2022 was the 5th warmest year in terms of average annual air temperature since 1961. The four warmer years were 2014 and 2015 (9.4°C), 2018 (9.6°C) and 2019 (9.5°C).

In 2022, two months were strongly above-average in terms of temperature in the Czech Republic, namely June with an average air temperature of 18.7°C (+2.2°C deviation from the average) and October with an average temperature of 10.7°C (deviation of +2.5°C). The winter months of January and February (deviations of +2.0 and +3.2°C) and May and August (both deviation of +1.2°C) were assessed as above-average. The very cold month of April, with an average temperature of 6.4°C (deviation of -2.1°C), was rated as strongly below-average. The other months were assessed as normal in terms of temperature.

The Well, The Žlabský Stream, Žlutava (Author: Klajn Lubomír)

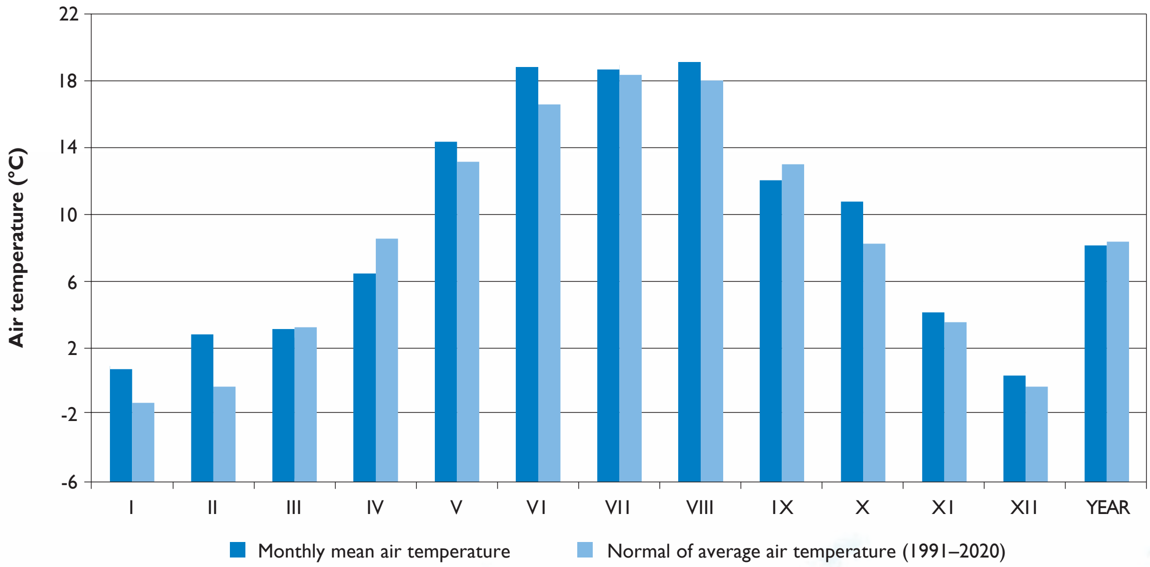
Interval limits for assessing normality (or abnormality) are defined for each month separately, meaning the limits may vary for different months. The table below shows what the intervals mean and how they are determined. Abnormality of a phenomenon is generally defined by quantile values Q_p, for which the following is true: $P(X \leq Q_p) = p$ (i.e., the probability that a phenomenon reaches the quantile value of Q_p or lower equals to p). Temperature and precipitation are assessed in accordance with the classification in Table 1.1.1.

Table 1.1.1
Interval limits for assessing normality (abnormality)

Degree	Interval limits by quantiles	Exceedance probability (climate hedge in %)
Extremely below-average	$<Q_{0,02}$	>98
Strongly below-average	$<Q_{0,02}, Q_{0,10})$	(90, 98>
Below-average	$<Q_{0,10}, Q_{0,25})$	(75, 90>
Average	$<Q_{0,25}, Q_{0,75}>$	<25, 75>
Above-average	$(Q_{0,75}, Q_{0,90}>$	<10, 25)
Strongly above-average	$(Q_{0,90}, Q_{0,98}>$	<2, 10)
Extremely above-average	$>Q_{0,98}$	<2

Source: CHMI

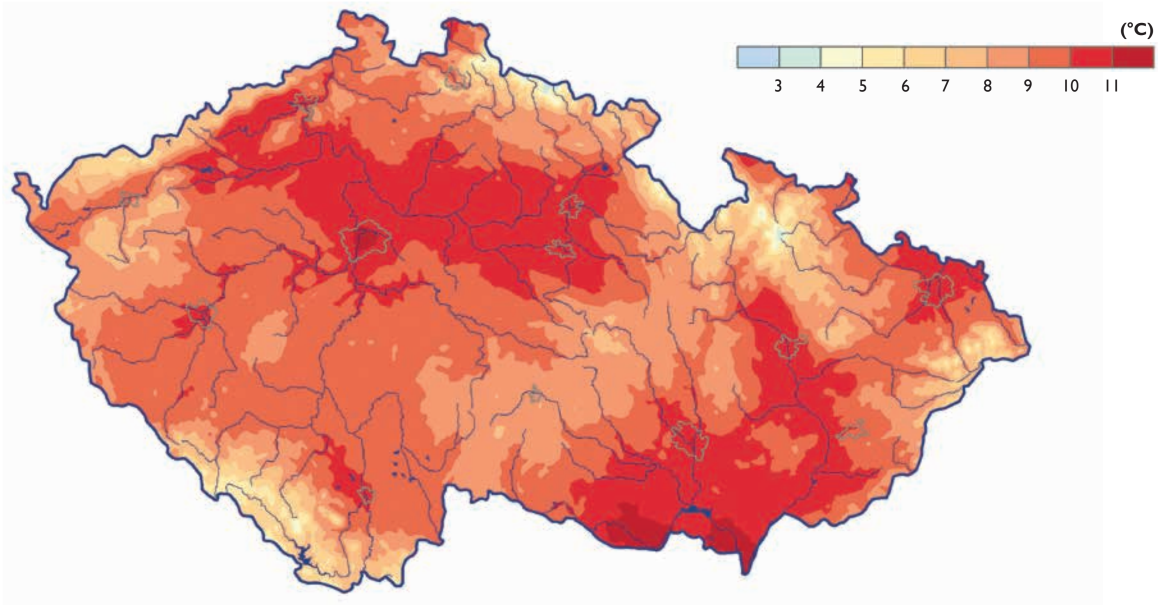
Graph 1.1.1
Average monthly air temperatures in the Czech Republic in 2022 compared to the 1991–2020 average



Source: CHMI

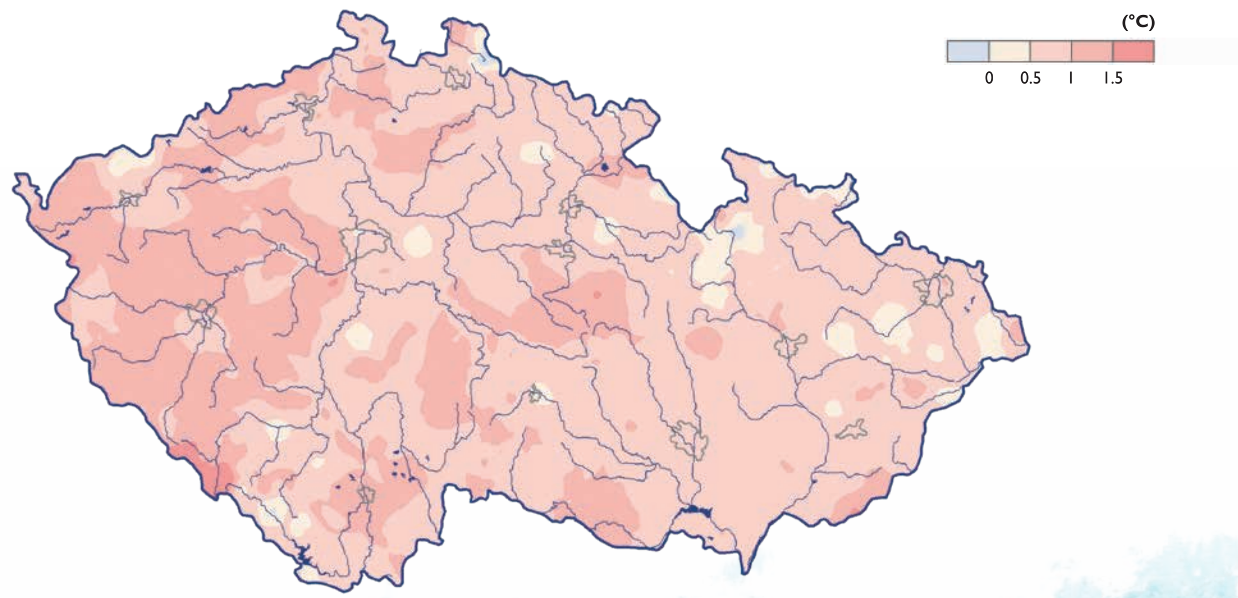
The winter of 2021/2022 was very warm in the Czech Republic. The average air temperature in the winter season (+1.3°C) was 2.0°C higher than the 1991–2020 average. All winter months had a positive deviation of the average monthly air temperature in the Czech Republic from the normal. December 2021 was assessed as normal (deviation +0.8°C), January and February 2022 were above-average (deviation +2.0 and +3.2°C). The lowest daily minimum air temperature in the winter season 2021/2022 was measured on 26 December 2021 at the Kořenov/Jizerka station (Jablonec nad Nisou District): -25.5°C. Taking into account also stations outside the standard CHMI network, the minimum (-27.7°C) was recorded at the Březník station (Klatovy District) on 12 January 2022. The spring as a whole was normal in terms of temperatures, the average air temperature in the Czech Republic (7.9°C) was 0.4°C lower than the normal. Temperature-normal March (deviation of -0.1°C) was followed by very cold April (deviation of -2.1°C), while May was warm (deviation of +1.2°C). The first summer day (i.e., the day with the maximum air temperature of 25°C and above) was recorded in the Czech Republic as late as on 9 May at the Doksany station (25.6°C). In the following days, daily maximum air temperatures exceeded 25°C at several stations. The hottest day was 20 May, when the first tropical day of 2022 in the Czech Republic was recorded (the day with the maximum air temperature of 30°C or higher). The daily maximum air temperature exceeded 30°C at 20 CHMI stations. The highest temperature was measured at the stations of Doksany, Průhonice, Kuchařovice (31.1°C) and Dobřichovice (31.0°C). This was the only tropical day recorded in the spring of 2022.

Figure 1.1.1
Average annual air temperature in 2022



Source: CHMI

Figure 1.1.2
Deviation of the annual mean air temperature in 2022 from the 1991–2020 average



Source: CHMI

The summer as a whole was above-average, with an average temperature of 18.8°C (+1.2°C deviation from the average). June was strongly above-average in the Czech Republic (mean temperature deviation from the average +2.2°C), July was average (deviation +0.3°C) and August was above-average (deviation +1.2°C). Maximum air temperatures exceeding 35°C were recorded on 18, 19 and 30 June. The highest temperatures were measured on 19 June at the stations of Husinec, Řež (39.0°C) and Doksany (38.9°C). The autumn as a whole was average in terms of temperatures, the average temperature of 8.9°C was 0.7°C higher than average. September was relatively cold, bordering on a below-average month (with average temperature deviation from the average -1.0°C). This was followed by a strongly above-average October (deviation of +2.5°C). November was average (deviation of +0.6°C). A colder period as compared to the average did not occur until 18–21 November. On these days, daily minimum air temperatures dropped below 0°C almost throughout the country. On 19 and 20 November, more than 100 CHMI stations even recorded an ice day (a day when the maximum air temperature does not reach 0.0°C). December 2022 was assessed as average in the Czech Republic, the average monthly temperature (0.3°C) being 0.7°C higher than the average.

Precipitation in 2022 was average in the Czech Republic, with an average annual precipitation of 634 mm, 93% of the 1991–2020 average.

There were only 4 months during the year that were not rated as average in terms of precipitation. Above-average months in terms of precipitation were June with 102 mm (124% of the average) and September with 81 mm (135% of the average). By contrast, March was very dry, with average precipitation of only 16 mm (35% of the average) and was rated as severely below-average. It was the third driest March since 1961. October was below-average with monthly precipitation of 23 mm (47% of the average).

On average, 656 mm of precipitation (96% of the average) occurred in Bohemia in 2022, whereas 591 mm (85% of the average) in Moravia and Silesia. Most of the precipitation, as compared to the average, occurred in the Prague and Central Bohemian and South Bohemian Regions, where the annual precipitation values were slightly higher than the average (106% and 107% of the average). In the other regions, annual precipitation was below-average. The Zlín Region had the lowest precipitation compared to the average (79% of the average).

In January, an average of 40 mm of precipitation occurred in the Czech Republic, which is 91% of the average. The spatial distribution of precipitation in January was uneven. While the Karlovy Vary Region recorded 126% of the average precipitation, the South Moravian Region recorded only 59% of the average. Snowfall in most of the Czech Republic, including lower altitudes, occurred only on 20, 21 and 31 January. Precipitation was again distributed unevenly in the country. In January, the lowest precipitation as compared to the average was recorded in the South Moravian Region (48% of the average) and the highest in the northern and north-western regions of Bohemia. The highest precipitation was in the Liberec Region (196% of the average). Precipitation occurred in lowlands mostly in the form of rain, with snow in the mountains.

March was very dry, while April and May were rated as average in terms of precipitation. However, the precipitation total in March in the Czech Republic was much lower than the average. On average, only 16 mm of precipitation occurred in March (35% of the average), compared with 42 mm in April (108% of the average) and 50 mm in May (71% of the average). In March, significant precipitation occurred in the Czech Republic only on 3 days, namely on 15, 30 and 31 March. Most of the precipitation was in the form of rain. In April, precipitation values were higher in Bohemia (46 mm, 124% of the average) than in Moravia and Silesia (35 mm, 83% of the average). Snowfall also occurred in the first decade of April, but rather at higher altitudes. In April, the highest snow cover was on 6 April at the Labská Huť station (151 cm), where it reached a height of over 120 cm throughout the month. In May, precipitation totals were below-average in all regions, most significantly in the Ústí nad Karlovy Vary Regions (45% and 46% of the average). The second half of the month was richer in precipitation. The most precipitation fell in the Czech Republic on 24 May, when the daily precipitation exceeded 20 mm at more than 70 CHMI stations. The highest daily totals were recorded in South Moravia.

June, the first summer month, was relatively rich in precipitation (102 mm, 124% of the average). July and August were considered average. However, the average precipitation in July was much lower than usual (63 mm, 71% of the average) and was slightly higher in August (91 mm, 117% of the average). In June, the highest precipitation totals were recorded in the South Bohemia Region (186% of the average) and Prague and Central Bohemia Region (173% of the average), while in the Karlovy Vary Region it was only 53% of the average precipitation. Monthly precipitation in the east of the country in the Olomouc, Moravian-Silesian and Zlín Regions was also below-average (less than 90% of the average). Heavy thunderstorms linked with torrential rainfall occurred in June. The highest precipitation totals were recorded on 24, 27 and 29 June. The highest values of daily precipitation totals were recorded on 24 June at the Prague, Komořany (109.7 mm) and Jíloviště stations in the Prague-West District (104.5 mm) and on 27 June at the Katovice station in the Strakonice District (187.5 mm). In July, very low precipitation totals were recorded in the north and east of Bohemia. In the Ústí nad Labem, Liberec and Pilsen Regions, on average less than 50% of the average precipitation fell. Still, July had several days with high precipitation totals. The highest precipitation values were recorded on 30 July, when it rained in most of the Czech Republic and 10 CHMI stations recorded daily totals over 50 mm, mainly in the east of the country, in the Beskids. In August, precipitation totals were above-average in most regions. The lowest precipitation was recorded in the north and north-east of Bohemia, with less than 80% of the average in the Karlovy Vary and Ústí nad Labem Regions. Precipitation occurred mainly in the second half of the month and was often accompanied by thunderstorms. Daily precipitation totals of more than 100 mm were recorded on 19 August at the Holoubkov, Medový Újezd station in the Rokycany District (102.4 mm) and on 20 August the Zdobnice station in the Rychnov nad Kněžnou District (110.5 mm). Very intense rainfall also occurred in other areas.

Precipitation was uneven in the autumn month in the Czech Republic. While September (81 mm, 135% of the average) was above-average, October (23 mm, 47% of the average) was below-average and November (36 mm, 80% of the average) was average. In September, monthly precipitation totals were mostly above-average throughout the country, highest in the Pilsen (213% of the average) and Karlovy Vary (176% of the average) Regions. The exception was the South Moravian Region, where precipitation only reached 88% of the average. In October, precipitation totals were below-average in the Czech Republic, the lowest in the east of the country. In Moravia and Silesia, October precipitation total was below 40% of the average. Similarly, the eastern part of the country was much poorer in precipitation in November. While 96% of the average precipitation occurred in Bohemia, it was only 44% of the average in Moravia and Silesia. The first significant snow episode, when new snow fell on a larger area of the Czech Republic, occurred on 18 November. However, totals of new snow were not high, typically ranging between 1 and 10 cm. Snow cover remained at most stations only until 20 November.

December was average in the Czech Republic, the average precipitation (51 mm) was 111% of the average. More precipitation than usual fell in the east of the country, in Moravia and Silesia (128% of the average) than in Bohemia (100% of the average). Precipitation in December occurred in the form of rain and snow, with snowfall primarily in the first half of the month, even at lower altitudes. Snow cover was present in most of the country (at monitoring stations) from 12 to 22 December.

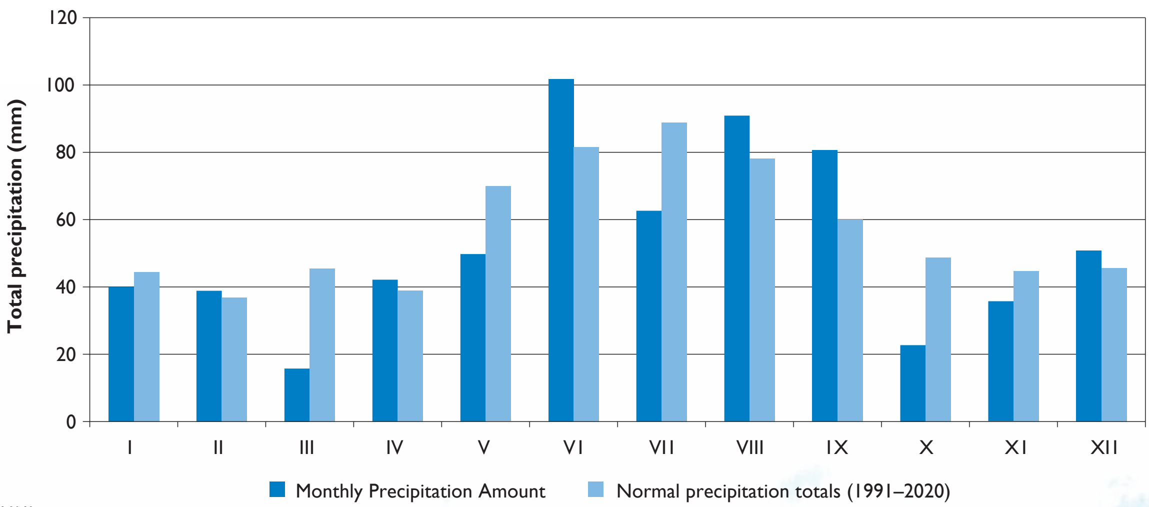
Former homestead Lísek, Prague – Bohnické valley (Author: Hubalová Petra)

Table 1.1.2
Renewable water resources 2015–2022

Item	Annual values (millions of m³)							
	2015	2016	2017	2018	2019	2020	2021	2022
Precipitation	41,957	50,240	53,868	41,170	50,004	60,411	53,674	49,984
Evapotranspiration	32,165	40,223	43,424	33,305	40,369	47,477	41,719	41,365
Annual inflow to the Czech Republic from neighbouring countries	398	402	339	320	405	840	785	593
Annual runoff from the territory of the Czech Republic	10,190	10,419	10,783	8,185	10,040	13,774	14,035	10,043
Exploitable surface water resources [1)]	3,591	4,421	4,258	3,355	3,732	5,000	5,692	4,771
Exploitable groundwater resources	939	925	911	765	789	978	1,213	817

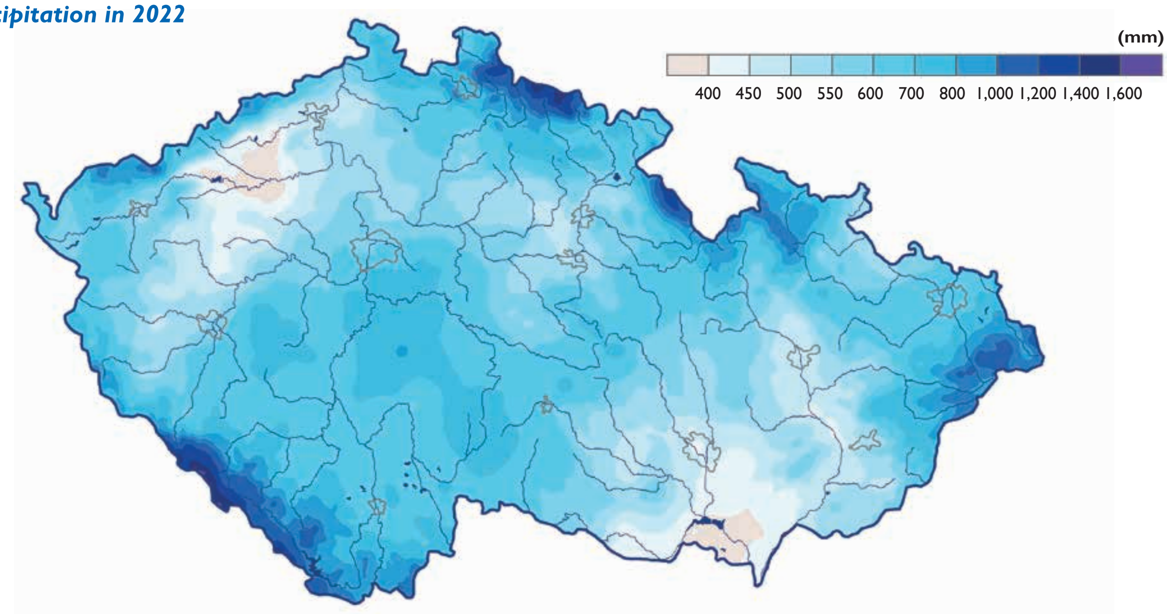
Source: CHMI
Note: [1)] Flow rate in the main river basins with 95% confidence.

Graph 1.1.2
Average monthly precipitation in the Czech Republic in 2022 compared to the 1991–2020 average



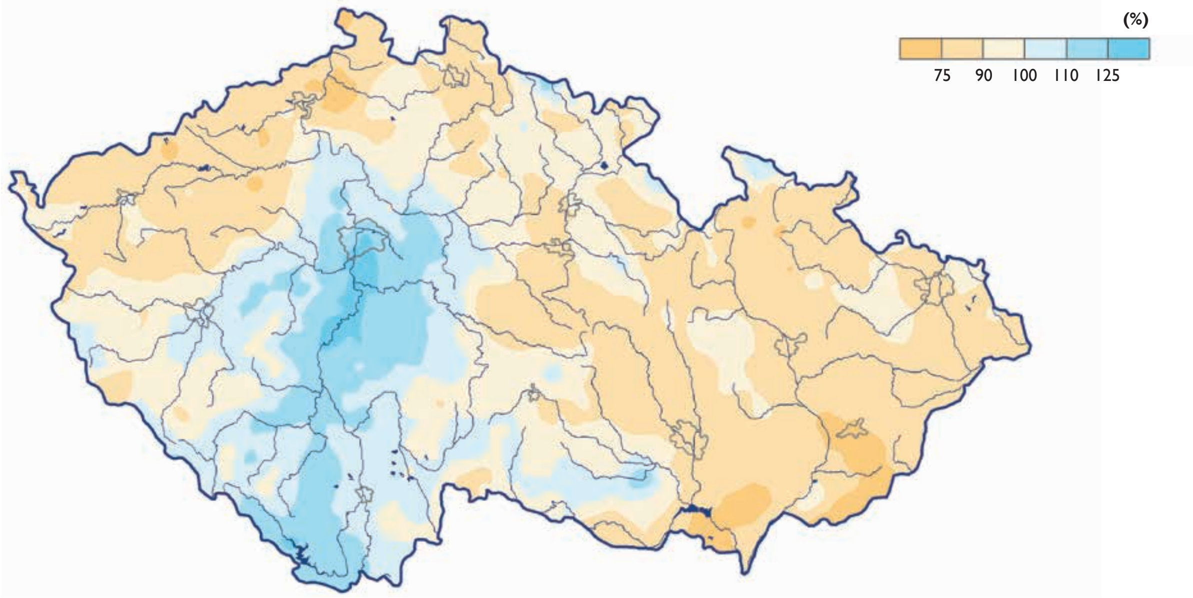
Source: CHMI

Figure 1.1.3
Total precipitation in 2022



Source: CHMI

Figure 1.1.4
Total precipitation in 2022 as a percentage of the 1991–2020 average



Source: CHMI

1.2 Runoff

Overall, 2022 was a mostly average and below-average year from the hydrologic perspective. In January and February, on watercourses draining mountainous areas until May, watercourses were supplied with water from snowmelt, which, along with precipitation and strong winds, led to repeated flood situations. On other watercourses, the spring months were rather below-average and more significant runoff events occurred during the summer. In June, extreme rainfalls repeatedly resulted in swollen watercourses in the Upper Vltava and Berounka River Basins, with significant rises on smaller tributaries of the Vltava in Prague. On the Zlatý Stream, the peak flow at the end of June reached the recurrence interval of $Q_{20–50}$, which was also the highest flow (in terms of recurrence) achieved in 2022. Further significant rises in levels were recorded in the last decade of August, again on the tributaries of the Vltava in Prague, in the Berounka Basin and also in the Oder Basin. No other significant rises occurred until the end of the year, with the exception of the last decade of December, when all the snow that had built up melted.

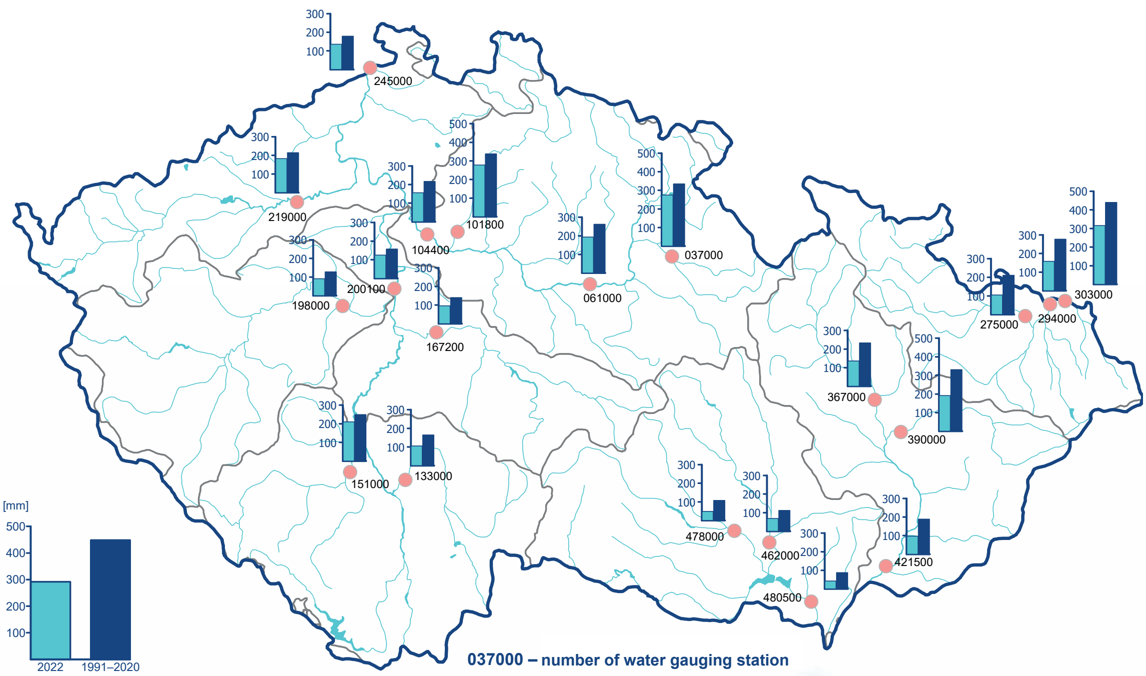
In September 2022, the construction of a new supplementary safety spillway at the Orlík HS, which affected until the end of the year the situation at the Vrané HS and the overall runoff from the Vltava Basin, especially at lower flow rates. Completion of the construction is scheduled for November 2026.

The winter months (January, February) were mostly average or slightly below-average in terms of runoff, and slightly above-average in the case of watercourses draining mountainous areas. In both months, due to precipitation and snowmelt, significant runoff situations occurred with numerous FAD exceedances. In January, such a situation occurred at the beginning of the month, and in February in the second half of the month. In contrast, almost no watercourses were near the hydrological drought threshold (Q_{355d}) during that period.

January was between slightly below-average and average in terms of runoff, with flows typically between 40% and 130% of Q_I. Flow rates were highest at the beginning of the month, most commonly between 50% and 250% of Q_I, with flow rates in some swollen watercourses even 4 times higher. During the month, the flow rates gradually decreased to below-average values of 30% to 85% of Q_I. At the beginning of the month, the situation from the end of the previous year receded and swollen watercourses in the Upper Jizera and Upper Elbe Basins peaked above the level of FAD I. On 3 and 4 January, heavy precipitation occurred in most of the area and as temperatures rose, watercourses were supplied with water from melting snow. As a consequence, rapid rises in levels exceeding FADs occurred on watercourses draining the Šumava, Krkonoše, Jizera and Orlické Mountains and Jeseníky. The most significant rises were in the Upper Otava Basin, where FAD III was exceeded on the Otava in Rejštejn (Q_2) and in Sušice ($Q_{<2}$) on 4 January, FAD II was reached on the Vydra in Modrava (Q_2) and on the Křemelná in Stodůlky ($Q_{<2}$). FAD III was slightly exceeded on the Elbe in Vestřev and Stanovice on 4 January (at Q_2), while in other profiles in the Upper Elbe and Vltava Basins only FAD I was reached. On the Orlice in Týniště nad Orlicí and on the Ohře below the Skalka HS, FAD II was exceeded. In the rest of January, watercourse levels decreased slowly or were stable. Watercourse levels were highest at the beginning of the month and were in the range of $Q_{180–30d}$. By the end of January, they gradually decreased to $Q_{300–120d}$. The highest flow rates of Q_{30d} were mostly in the northeast and southwest of Bohemia, with occasional high flows elsewhere in the mountains.

February was mainly average in terms of runoff, with values ranging widely from 60% to 170% of Q_{II}. On the watercourses draining the mountains in the north, northeast and west of Bohemia, flow rates were 2 to 3 times the average, reaching 3 to 4 times Q_{II} at the turn of the second and third decade. In the first half of February, most watercourse levels remained stable or fluctuated slightly. Level rises occurred mainly on mountain and submontane watercourses in the north and northeast of Bohemia. The levels of the Mandava, Stěnava and Metuje exceeded FAD I (at $Q_{<2}$) in the first decade of February. The most pronounced level rises were recorded on 17 February in the north and northeast of Bohemia due to a combination of significant warming, strong winds, intense rainfall and snowmelt from the mountains. At numerous profiles, especially in the Upper Elbe, Jizera, Lusatian Neisse, Stěnava and Ploučnice River Basins, FAD I was exceeded. On 17 February, FAD III was exceeded on the Elbe at the Vestřev, Les Království and Brod profiles and on the Stěnava at the Meziměstí and Otovice profiles (all at Q_2). FAD II was exceeded on the Lusatian Neisse in Liberec ($Q_{<2}$), on the Metuje in Maršov, Hronov and Krčín (Q_2) and on the Jizera in Bakov ($Q_{<2}$). Besides the northeast of Bohemia, the Teplá Vltava, Otava, Middle Elbe, watercourses in the Upper Ohře and Upper Sázava River Basins and occasionally some watercourses in the Morava River Basin and in the Moravian section of the Oder Basin also reached FAD I. Further significant rainfall occurred on 21 February, and it was again most abundant in the mountains in the north and northeast of Bohemia. Watercourses in the Upper Elbe, Upper Jizera and Lusatian Neisse Basins exceeded FAD I at some profiles on 21 February (most frequently at $Q_{<2}$).

Figure 1.2.1
Annual runoff compared to the 1991–2020 long-term average



Source: CHMI

The Bavorovský Stream, small water reservoir Bavorov – reconstruction and de-mudding – condition after repair (Author: Bušek Jan)

In the following days, watercourse levels gradually decreased. Watercourse levels were lowest at the beginning of February, when they were mostly in the range of $Q_{270–90d}$. They gradually increased during February, reaching values of $Q_{180–30d}$ in the second half of the month on most watercourses. Watercourses draining mountain and submontane areas, supplied with water from snowmelt and abundant precipitation, had the highest flow rates (Q_{30}).

Compared to the previous period, the spring months (March, April and May) were mostly between below-average and strongly below-average. Slightly above-average flows occurred until mid-May on smaller mountain streams supplied with snowmelt. As in the previous period, almost no watercourses displayed indications of hydrologic drought.

March was a strongly below-average month in terms of runoff in all basins, with flow rates typically between 15% and 70% of Q_{III}. Watercourses draining mountains with snow deposits continued to be more watery, yet their flow rates were below-average for most of the month, with only slightly above-average values prevailing late in the month. The levels remained steady or slightly decreased in March, and slightly fluctuated in the second half of the month. Mountain flows fluctuated more significantly as a result of changing temperatures and snowmelt. On the Hvozdnice in Jakartovice, FAD III was reached on 12 March due to ice occurrence. Furthermore, FAD I was exceeded on the Thaya River due to the planned discharge on 17 and 18 March. The flow rates were highest at the beginning of March, when they were mostly in the range of $Q_{240–90d}$. During March, they gradually decreased and at the end of the month they were mostly in the range of $Q_{300–120d}$. Watercourses draining mountain and submontane areas were more watery ($Q_{60–30d}$).

April was also a below-average to strongly below-average month in terms of runoff, with flows most often between 20% and 75% of Q_{IV}. Only watercourses draining mountains where snow deposits were still present had average to slightly above-average flows. Most watercourses remained steady or fluctuated slightly in April. Mountain watercourses continued to fluctuate due to changing temperatures and snow deposits melting from the mountain ridges. More pronounced fluctuations and larger rises without reaching FADs were recorded on watercourses draining the Šumava in the first decade when snowmelt was supported by heavy precipitation. An isolated rise slightly above FAD I was repeatedly recorded on 29 April – 1 May on the Upper Elbe at the Labská Reservoir profile, which was due to water discharge before scheduled wildwater races on the section of the river below the reservoir. The water levels of the monitored watercourses were mostly within the range of $Q_{300–90d}$, the watercourses draining the mountain and submontane areas, especially the Šumava, Krkonoše, Jizera Mountains, Orlické Mountains and Jeseníky Mountains, where snow cover was still present on the ridges at the end of April, were more watery with $Q_{60–30d}$.

As in the previous two months, runoff in May was below-average to strongly below-average in all river basins, with average monthly flows typically between 20% and 80% of Q_V. From mid-May onwards, profiles with Q_{355d} flows started to appear at 10% of the profiles in the Lower Elbe and Oder Basins. Average to slightly above-average flows continued to occur on watercourses draining mountains where snow was still present on the ridges in the first half of the month. Most watercourses in the country remained stable or fluctuated only slightly in May, with mountain watercourses still fluctuating in the first half of May due to changing temperatures during the day and snowmelt from mountain ridges. The watercourses monitored were mostly in the $Q_{330–90d}$ range, with $Q_{330–180d}$ by the end of May. The watercourses draining the mountain and submontane areas ($Q_{150–60d}$) continued to be have higher water flow, especially those flowing from the Šumava and Krkonoše Mountains, where snow cover remains on the ridges until about mid-May.

The summer months (June, July and August) followed the previous period with mostly below-average flows. In July and August, the highest number of watercourse profiles indicated hydrological drought, at times even above 50% of them. The below-average values were interrupted mainly by short-term local rises, a longer period of rainfall only occurred at the end of June. Heavy rainfall at the beginning of June led to numerous short-term FAD exceedances, especially in the Otava Basin and the Vltava tributaries in Prague. At the end of the month, after extreme rainfall, the peak flow on the Zlatý Stream at the Hracholusky profile reached a recurrence interval of 20 to 50 years. Numerous FAD exceedances also occurred in August.

Runoff in June was below-average in most of the river basins, mostly ranging from 25% to 90% of Q_{VI}. There was an increase at the number of profiles reaching the hydrological drought level at 20%, most notably in the Lower Elbe and Oder Basins. Average to slightly above-average flows occurred in the Upper Vltava, Blanice and Otava Basins (95% to 175% of Q_{VI}), and flows were 2 to 14 times higher in the smaller tributaries of the Lower Vltava. The first significant rainfalls occurred on 4–6 June in southern Bohemia. In response to the precipitations, the Otava, Volyňka, Vydra and Blanice Rivers rose above FAD I (all at $Q_{<2}$). On the Blanice in Podedvory, FAD II was briefly exceeded on 6 June. A local storm also resulted in the Botič Stream exceeding FAD I on 4 June ($Q_{<2}$). Further rises in water levels occurred in the east of the country on 10 June, after precipitation in Ostrava, Frýdek-Místek and also in the Upper Bečva Basin. After strong storms, the level of Olešná and Litava rose to FAD I (both at $Q_{<2}$). On 24–29 June, the highest wave of precipitation occurred. On 24 June, the rainfall raised the level of the Lusatian Neisse above FAD I ($Q_{<2}$). On 25 June, the Botič at the Jesenice-Kocanda profile (Q_5) and Průhonice (Q_2) rose above FAD III, as did the Pitkovický Stream at the Kuří profile (Q_{10}). Botič in Prague-Nusle (Q_2) and Rokytka ($Q_{<2}$) rose above FAD II. Extreme rainfall was also recorded on 28 June in southwest Bohemia. After these precipitations, FAD II was exceeded on the Klabava ($Q_{<2}$), Úslava ($Q_{<2}$) and Holoubkovský Stream, FAD I was exceeded on the Zubřina and Bradava (Q_5). In southern Bohemia, it rained heavily also on 29 and 30 June. Given the previous soil saturation with water, many wjatercourse levels rose. FAD III was exceeded on 29 or 30 June on the Křemžský Stream in Brloh, the Bezdrevský Stream in Netolice, the Polečnice in Český Krumlov (Q_5), the Blanice in Blanický mlýn (Q_2), Bavorov and Podedvory (Q_2), the Botič in Průhonice (Q_5) and Jesenice-Kocanda (Q_{10}) and the Pitkovický Stream in Kuří (Q_2). On the Zlatý Stream in Hracholusky, the peak flow on 29 June reached a recurrence period of 20 to 50 years. FAD II was exceeded on the Botič in Prague-Nusle (Q_2), the Polečnice in Novosedly and the Blanice in Heřmaň ($Q_{<2}$). Levels peaked above FAD I on the Volyňka, Jihlava, Blanice, Vltava, Otava and Smutná (at $Q_{<2}$). Watercourses were mostly in the $Q_{355–180d}$ range at the beginning of the month. Precipitations in the second week of June significantly increased water levels in the Upper Vltava ($Q_{120–30d}$), Oder ($Q_{300–90d}$) and Morava ($Q_{300–150d}$) Basins. Due to heavy rainfall, water levels were the highest at the end of June ($Q_{300–60d}$), on the tributaries of the Vltava in Prague, in the Upper Vltava and Berounka Basins reaching even $Q_{60–30d}$. For more detailed information, see the chapter on Floods, and a separate report on the situation was issued.

Also, the month of July was below-average in terms of runoff, in the Vltava Basin slightly above-average, mostly between 20% and 100% of Q_{VII}, in the Vltava Basin between 95% and 300% of Q_{VII}. At the beginning of July, the runoff situation from June was receding in the Czech river basins. After heavy rainfall on 1 July, the levels of watercourses in the Oder Basin rose, with the level of the Lučina River in Horní Domaslavice rising to FAD II at Q_{10}. Flows in the Lužnice and Malše River Basins rose significantly on 5 July due to storms. FAD I was exceeded on the Svinecký Stream. In the following days, watercourse levels slowly decreased. More heavy rainfall occurred on 30 and 31 July and led to rises in the levels of smaller watercourses near Prague and on 31 July in northeast Moravia. The level of the Botič Stream rose again to FAD I at $Q_{<2}$ and in Moravia the Ropičanka and Lučina Rivers exceeded FAD I ($Q_{<2}$ to Q_2). The watercourses draining the Beskids also rose significantly, but did not exceed FADs. Watercourses were in the range of $Q_{355–60d}$ at the beginning of the month, gradually decreased in all river basins to $Q_{364–270d}$ and in the second half of the month more than 50% of the profiles were at the hydrological drought threshold. At the end of the month, water levels increased slightly ($Q_{355–210d}$).

The month of August was mostly average in terms of runoff, but rather below-average in the Morava and Thaya Basins. In the first half of August, flows were mainly between 15% and 85% of Q_{VIII}, and in the second half of the month, due to repeated rainfalls, between 30% and 250% of Q_{VIII}. Rainfall-affected flows reached 4 to 7 times of Q_{VIII} at some places. Watercourse levels fluctuated in August, with frequent reaches of FAD I in the second half of August (mostly at $Q_{<2}$). More pronounced fluctuations were recorded after intense rainfall on 6 August. FAD I was exceeded on the Blanice River in Bavorov. Further precipitation fell throughout the country from 19 to 23 August and resulted in levels rising, especially in the Vltava Basin. On the Botič Stream, FAD II was exceeded on 19 August at the Jesenice-Kocanda (Q_2) and Prague-Nusle (Q_5) profiles. On 20 and 21 August, the level of the Klabava rose to FAD III in the Hrádek and Nová Huť profiles, at Q_5 and $Q_{<2}$, respectively; the Klabava exceeded FAD II at the Rokycany-Na Pátku profile, same as the Holoubkovský Stream. At many other profiles, FAD I was exceeded at $Q_{<2}$. Extreme precipitation also occurred in the Orlické Mountains, where FAD II was exceeded on the Bělá on 20 August. FAD II was also exceeded on 21 August on the Skalice (Q_2). On 21 August, the level of the Černý Stream at the Černá Kraš profile (Q_2), the Úsobrnský Stream in Jaroměřice (Q_5) and the Romže in Stražisko (Q_2) also rose to FAD II. On 23 August, the rainfall was heavies on the northern windward side of the Jeseníky Mountains, where FAD II was exceeded on the Vidnavka and again on the Černý Stream (both at Q_2). In the Třinec and Frýdek-Místek Districts and also near Český Těšín, watercourse levels rose after the rainfall on 24 August and FAD III was exceeded on the Stonávka in Hradiště on 24 August (Q_{20}). Local storms on 26 August significantly disrupted water flows in the Czech part of the Oder Basin, with FAD II being exceeded on the Lusatian Neisse on 26 August ($Q_{<2}$). Watercourses levels also rose again in the heavily saturated catchments around Pilsen, with the Klabava in Hrádek exceeding FAD III (Q_5) on 27 August and FAD II in Nová Huť ($Q_{<2}$). FAD II ($Q_{<2}$) was exceeded on the Botič Stream on 26 August. Further strong storms on 28 August in eastern Moravia and Silesia raised the levels of smaller watercourses to FAD I (all at $Q_{<2}$). For more information see the Floods chapter. Watercourses were mostly within the $Q_{364–210d}$ range at the beginning of the month, with almost 55% of the profiles below the hydrological drought threshold. This was an annual maximum. Gradually, the water levels increased to $Q_{355–60d}$, and overall, the watercourses with highest discharge were mostly in the Vltava, Thaya and Morava River Basins (Q_{30d}).

The autumn months (September, October and November) were generally average to slightly below-average in terms of runoff. Watercourse levels remained mostly stable or fluctuated slightly in autumn due to occasional precipitations that briefly increased flows and disrupted the downward trend in watercourse levels. The number of profiles indicating hydrological drought decreased significantly.

September was mostly average in terms of runoff, rather below-average in the Morava and Thaya River Basins, with flows mostly between 30% and 180% of Q_{IX}. Precipitation-affected watercourses, mostly in the Vltava and Bečva Basins, reached 3 to 7 times Q_{IX} at some places. In the first half of September, most watercourses were stable or with only slight fluctuations. The most significant rises occurred on 9 September on the Botič at the Prague-Nusle profile (Q_5), where FAD II was exceeded after an intense storm. Further significant rises occurred on 15 and 16 September after heavy rainfall in the belt from southwestern Bohemia to eastern Moravia. The precipitation-affected watercourses reacted with rising levels, with FAD I being exceeded on the Klabava, Juhyně, Holoubkovský Stream, Bystřice and Mastník on 15 September, FAD I was also reached on the Chotýšanka and Lower Klabava on 16 September (both at $Q_{<2}$). Further precipitation, especially on the ridges of the Šumava, caused significant rises in levels on 19 September, especially in the Upper Otava Basin, where FAD I was exceeded at several profiles (all at $Q_{<2}$). Watercourses were mainly in the range of $Q_{330–120d}$ in September, only temporarily increasing slightly due to precipitation.

October was below-average from the runoff perspective in all the main river basins except for the Vltava Basin, where it was rather average. Flows were mostly in the range of 40% to 100% Q_X. Most flows remained stable or fluctuated slightly in October, mostly with a decreasing tendency. More pronounced declines were evident particularly in the first decade of the month. Temporary rises in smaller watercourse levels were sporadically caused by pond discharges in October. The average weekly water levels of the monitored watercourses were mostly in the range of $Q_{330–150d}$, with more watery watercourses occurring in the Vltava Basin ($Q_{300–90d}$).

Table 1.2.1
Runoff in 2022 as percentage of long-term average monthly runoff in 1991–2020

River	Profile	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
		[%]												
Orlice	Týniště nad Orlicí	131	158	49	74	61	52	39	81	96	74	41	88	82
Elbe	Přelouč	106	152	54	71	71	49	43	60	65	59	41	71	74
Jizera	Tuřice-Předměřice	135	184	62	79	85	60	48	50	64	56	44	63	82
Elbe	Kostelec nad Labem	103	148	52	68	69	46	45	55	61	62	42	69	72
Lužnice	Bechyně	66	81	28	23	31	34	88	50	128	87	84	160	65
Otava	Písek	102	87	43	69	64	103	104	50	139	105	90	128	85
Sázava	Nespeky	60	105	31	36	45	43	51	74	131	87	85	173	69
Berounka	Beroun	75	91	36	67	57	56	59	67	136	83	78	88	71
Vltava	Praha-Chuchle	71	65	43	45	60	58	119	107	140	105	79	136	79
Ohře	Louny	106	166	63	91	117	65	64	50	69	78	51	49	86
Elbe	Hřensko	87	108	49	58	67	55	88	86	102	87	65	94	76
Opava	Děhylov	56	56	30	51	54	36	29	80	58	59	46	81	50
Oder	Bohumín	70	79	31	56	43	47	29	95	66	57	41	123	57
Olše	Věřňovice	128	106	42	76	41	49	30	110	74	80	39	133	72
Morava	Olomouc-Nové Sady	90	113	41	50	53	51	31	63	58	51	36	60	59
Bečva	Dluhonice	99	117	25	40	29	38	28	62	96	49	24	129	58
Morava	Strážnice	87	102	33	41	36	36	20	52	62	39	28	81	51
Svratka	Židlochovice	92	91	35	40	56	66	49	72	64	55	76	75	61
Jihlava	Ivančice	56	65	25	23	38	39	47	51	58	58	56	79	45
Dyje	Ladná	79	70	28	26	39	45	43	53	66	54	52	72	49

Source: CHMI

Note: % of the average	30	40	50	60	80	100	120	150	200	300

November, same as October, was below-average in terms of runoff in all basins, with flows mostly between 20% and 110% of Q_{XI}. Slightly above-average flows occurred at some places in the Vltava River Basin. Most flows were slightly fluctuating or stagnant in November. More significant rises in levels, but without reaching FADs, occurred after precipitations in the first decade. Watercourses in the north of Bohemia and some tributaries of the Middle Elbe, as well as watercourses in the south and southwest of the Czech Republic were affected. The following period was without significant rises and only in the last week did watercourse levels in the Upper Jizera and Upper Elbe Basins rose, due to a combination of precipitation and gradual melting of snow cover from the lower areas of the Krkonoše and Jizera Mountains, not reaching FADs either. The average levels of the monitored watercourses in November were mostly in the range of $Q_{330–90d}$. Smaller watercourses in the Vltava Basin were more watery with $Q_{90–60d}$.

The last month of the year was very volatile. In the middle of December, temperatures dropped significantly and ice formed on smaller watercourses, while a relatively large amount of snow fell in the course of a few days. During the Christmas thaw, almost all the snow melted and, together with heavy precipitation, raised the levels of most rivers.

In terms of runoff, December was an average to slightly above-average month, with flows typically between 50% and 160% of Q_{XII}, at some places in the Vltava Basin 2 to 3 times higher flows. In the Morava and the Thaya Basins, flows were rather slightly below-average. Average to above-average values, with peaks of up to 4 times, were reached in the middle of the third decade of December. Most flows were steady or fluctuated slightly in the first half of December. In response to low air temperatures, ice caused levels rise on smaller mountain watercourses in the middle of the month, and FAD II was exceeded on the Svratka in Dalečín due to ice cumulation. Also, on the Úpa in Horní Maršov on 12 December and on the Malé Labe in Horní Lánov on 18 December, FAD III was exceeded due to significant swelling. Significant rises in levels, even with FADs being exceded, were caused by a 'Christmas' thaw accompanied by heavy rainfall from 21 to 24 December, especially in the Šumava, Jizera and Krkonoše Mountains. The most significant rises occurred in the Otava Basin, where FAD II was exceeded at the Rejštejn profile at $Q_{<2}$. On the Upper Elbe, Vydra, Křemelná, Otava, Botič and Bystřice Rivers, FAD I was also exceeded (all at $Q_{<2}$). In the last week of December, the flows were on the decline. Until the end of the second decade of December, the average levels of the monitored watercourses were mostly in the range of $Q_{330–150d}$. The watercourses in the Vltava Basin had the highest discharge ($Q_{270–90d}$).

The Vydří stream in winter, Borová Lada (Source: Vltava River Board, s.e.)

1.3 Groundwater regime

The level of groundwaters with shallow circulation and spring yields were generally slightly and strongly below-average, respectively, in 2022, but conditions varied regionally, see Figure 1.3.1 and Figure 1.3.2. The normal annual maximum was achieved by the level and yield in February (Graph 1.3.1 and Graph 1.3.3). Subsequently, the level declined and the yield kept decreasing until August, when the annual slightly below-average minimum occurred for the shallow wells. Both the level and the yield were strongly below-average from March onwards and kept deteriorating until June, when the yield was even extremely below-average overall. From July onwards, the water level started to improve to average in some basins (the Upper and Lower Vltava) and the improvement to overall average occurred in September. However, the situation was regionally different. In the Ohře, Lower Elbe and other tributaries of the Elbe and Lusatian Neisse Basins, moderate or even severe drought persisted until the end of the year. In contrast, in the Upper and Lower Vltava and Berounka Basins, the level rose and was moderately or strongly above-average in December. In most of the basins, with the exception of the increase to average in September, the yield decreased to the annual strongly below-average minimum in November. In the Upper and Middle Elbe, Ohře, Lower Elbe and other tributaries of the Elbe, Lusatian Neisse and Morava and tributaries of the Váh, the severely or extremely below-average state of yield lasted from April to December. On the other hand, in the Upper and Lower Vltava, Berounka and Thaya River Basins, yields were average or above-average from June (or September in the case of the Berounka) to December.

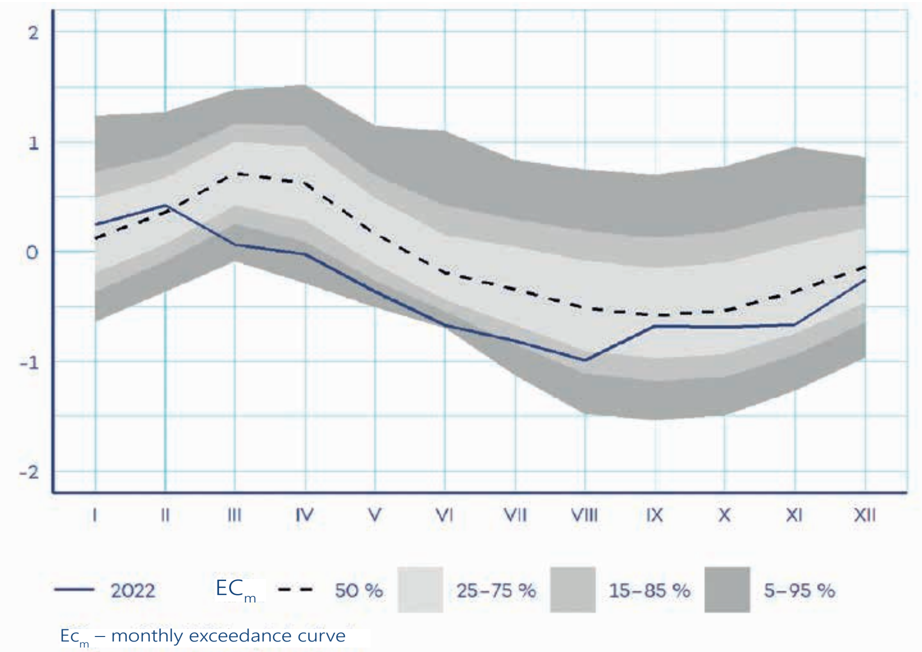
In the deep wells in the Czech Republic, the drought of the previous years continued again, with only in eastern Bohemia and Moravia the improvement of the previous year's water levels continuing during the spring (Figure 1.3.6). Overall, the level of deep aquifers in the Czech Republic was strongly below-average in 2022 (Table 1.3.3). Levels were extremely below-average in the North Bohemian Cretaceous and South Bohemian basins. Normal levels were only in the Cenomanian of the North Bohemian Cretaceous and the Permo-Carboniferous of eastern Bohemia. In the other groups of hydrogeological (hereafter HGR) regions the level was strongly or slightly below-average. Overall, 22% of the objects were extremely, 24% strongly and 12% slightly below-average, 38% of the objects were average and only 3% were slightly above-average. Nationally, deep aquifer levels were slightly below-average and average in January and February, respectively. From a strongly below-average annual maximum in March, the level stagnated, then began to decline, so that from June to August it was extremely below-average. Thereafter, the level was more or less stagnant, the annual minimum in November was strongly below-average and in December the level was again extremely below-average (Figure 1.3.5). In the North Bohemian chalk, the level was extremely below-average throughout the year. Levels in the South Bohemian basins were also strongly or extremely below-average throughout the year. In contrast, in the North Bohemian Cretaceous Cenomanian, which has a strongly perennial regime, the level was average throughout the year (Table 1.3.3 and Figure 1.3.6).

Shallow wells

At the beginning of 2022, average conditions prevailed in most of the country and the annual maximum level occurred in the Thaya (24% of EC_m) and Berounka (31% of EC_m) basins. The normal state continued in February, when the level in a part of the basin reached an average (the Upper and Middle Elbe, Ohře, Lower Elbe and other tributaries of the Elbe, Upper Oder, Figure 1.3.2) or strongly above-average (the Lusatian Neisse: 11% of EC_m) annual maximum. In March, the level declined in all basins and the situation deteriorated to strongly below-average (92% of EC_m). The most significant deterioration, from average to extremely below-average, occurred in the northeast of Moravia in the Oder, Olše and Ostravice Basins. In April, the level was mostly decreasing, but in the Upper Oder and Berounka River Basins it rose to slightly below-average (76% of EC_m) and average (69% of EC_m), respectively. The decline in the level and the overall strongly below-average state continued until June (94% of EC_m), when at the same time the annual minimum (94% of EC_m) occurred in the Lower Vltava catchment. Despite a further decline in level to the overall annual slightly below-average (80% of EC_m) minimum in August (Figure 1.3.1), the situation improved from June to September. The level then remained generally average from September to the end of the year, but regionally the situation varied greatly. In the Upper and Lower Vltava River Basins, the situation improved to average in July and from August onwards the level (including the Berounka Basin) mostly rose significantly and remained average until the end of the year, when it became slightly or strongly above-average, even reaching an annual maximum in the case of the Upper and Lower Vltava (12% and 17% of EC_m, respectively). The Upper and Middle Elbe River Basins were also average from September to December. The Morava River also showed an improvement in the second half of the year and was average from August to October. At the end of the year, the level in Moravia was mostly slightly below-average, with the exception of average levels in the Upper Oder Basin (50% of EC_m) in December. In contrast, in the Ohře and Lower Elbe Basins and in other Elbe and Lusatian Neisse tributaries, the situation was extremely below-average from June to August and the severe drought continued until the end of the year, with the exception of a rise to slightly below-average levels in October and November (the Ohře and Lower Elbe Rivers and other Elbe tributaries) (Table 1.3.1).

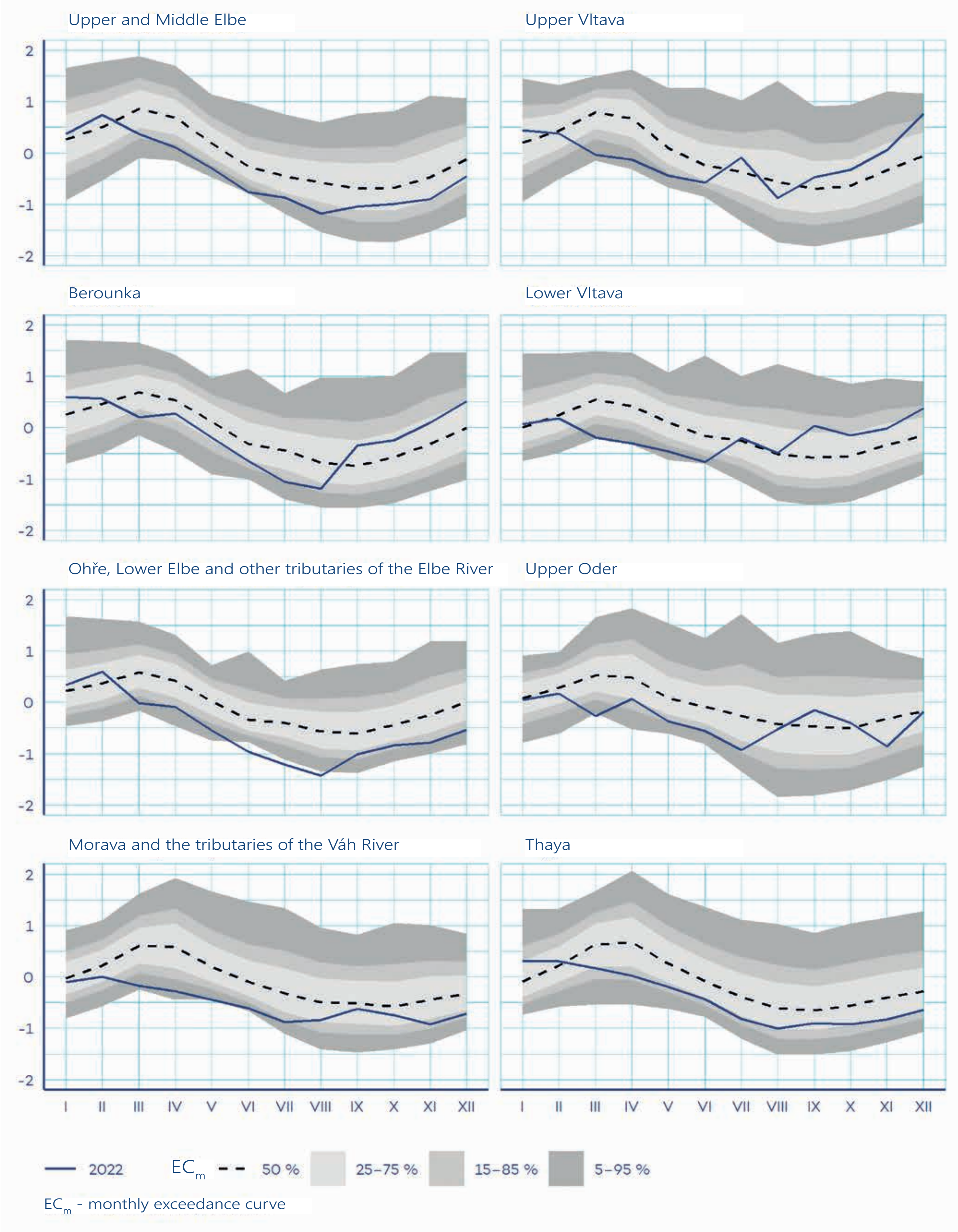
Something's missing (Author: Hubalová Petra)

Graph 1.3.1
Average standardised groundwater levels at shallow aquifers in the monitoring network of the Czech Republic in 2022 compared to the 1991–2020 long-term average



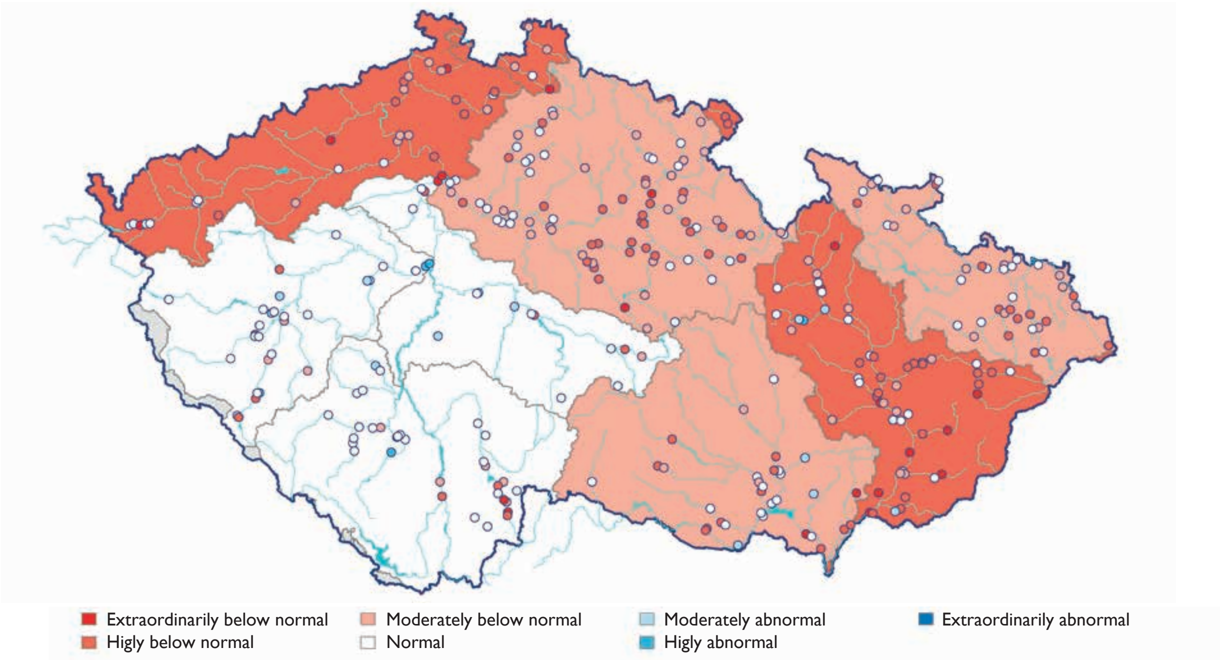
Source: CHMI
Note: The graph also shows quantiles of monthly exceedance probability curves (EC_m)
The vertical axis shows the standard deviation.

Graph 1.3.2
Average standardised level of shallow wells in the monitoring network in river basins in 2022 compared to the 1991–2020 long-term average



Source: CHMI
Note: The graph also shows quantiles of monthly exceedance curves (EC_m).

Figure 1.3.1
Groundwater levels in shallow wells in 2022, compared to the 1991–2020 period



Source: CHMI

Table 1.3.1
Probability of exceeding the average groundwater level in 2022 in river basins in % of EC_m (monthly exceedance curve for the 1991–2020 period)

Basin	Level ranking on EC_m in %												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	2022
Upper and Middle Elbe	44	35	82	88	89	94	82	85	71	68	74	70	84
Upper Vltava	36	54	93	92	87	79	34	66	38	34	30	12	56
Berounka	31	43	84	69	72	76	86	82	29	32	29	24	56
Lower Vltava	45	55	94	94	90	94	46	49	21	27	30	17	60
Ohře and Lower Elbe	41	34	91	84	90	100	97	97	79	81	87	86	92
Upper Oder	53	60	96	76	84	84	83	55	36	45	78	50	81
Lusatian Neisse	51	11	64	89	96	100	99	97	86	88	93	91	93
Morava	56	68	93	92	96	92	86	73	56	61	81	81	88
Thaya	24	44	77	82	80	77	79	74	67	73	78	76	79
Czech Republic	**40**	**44**	**92**	**89**	**90**	**94**	**84**	**80**	**56**	**60**	**70**	**60**	**84**

Source: CHMI
Note: The red colour scale corresponds to the categories slightly (75–85%), strongly (85–95%) and extremely (95–100%) below-average levels. Blue colours indicate slightly (15–25%), strongly (5-15%) and extremely (0-5%) above-average yield.

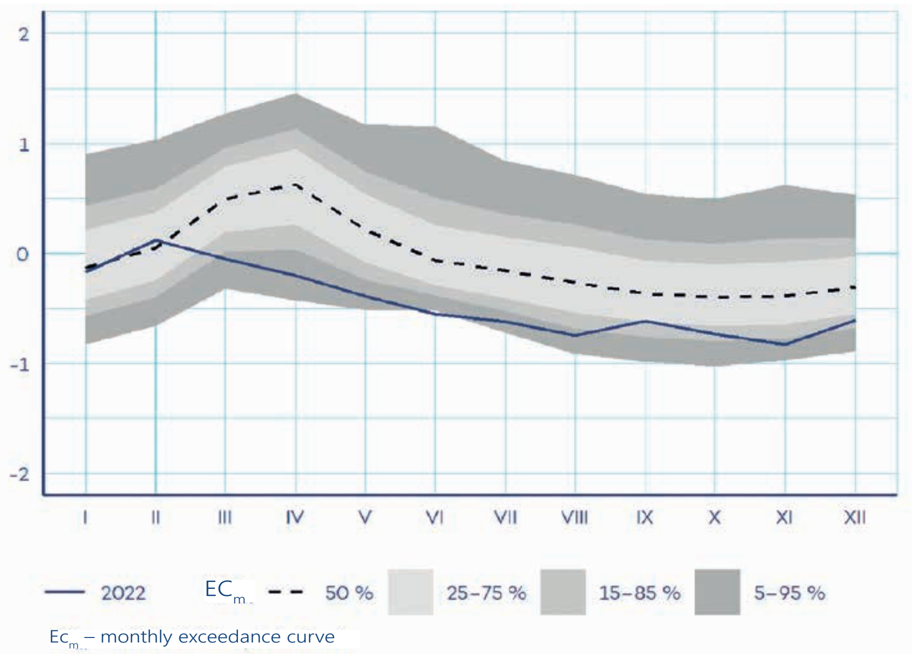
Springs

In January 2022, spring yields were generally normal in the Czech Republic, with only the Ohře, Lower Elbe and other Elbe tributaries displaying strongly below-average yields (94% of EC_m). Generally, the normal annual maximum was reached in February (41% of EC_m, Figure 1.3.3), but regionally the maximum occurred only in the Upper and Middle Elbe, Berounka and Ohře, Lower Elbe Basins and in other Elbe tributaries basins (Figure 1.3.4). Thereafter, yields mostly decreased gradually, almost until the end of the year in some river basins. However, the situation varied considerably regionally, particularly in the second half of the year. In the Upper and Lower Vltava River Basins, yields increased from May onwards to a slightly and strongly above-average annual maximum, respectively, in July (the Upper Vltava, 22% of EC_m) and September (the Lower Vltava, 6% of EC_m). In the Lower Vltava Basin, the discharge was above-average from October and even extremely above-average in December (5% of EC_m). In the Upper Vltava and Berounka Basins, normal discharge prevailed from September until the end of the year (Table 1.3.2). In contrast, in the Upper and Middle Elbe and Lusatian Neisse River Basins, yields were strongly below normal from April until the end of the year. In the Ohře and Lower Elbe

Sunrise, Thaya, Bulhary (Author: Procházková Lenka)

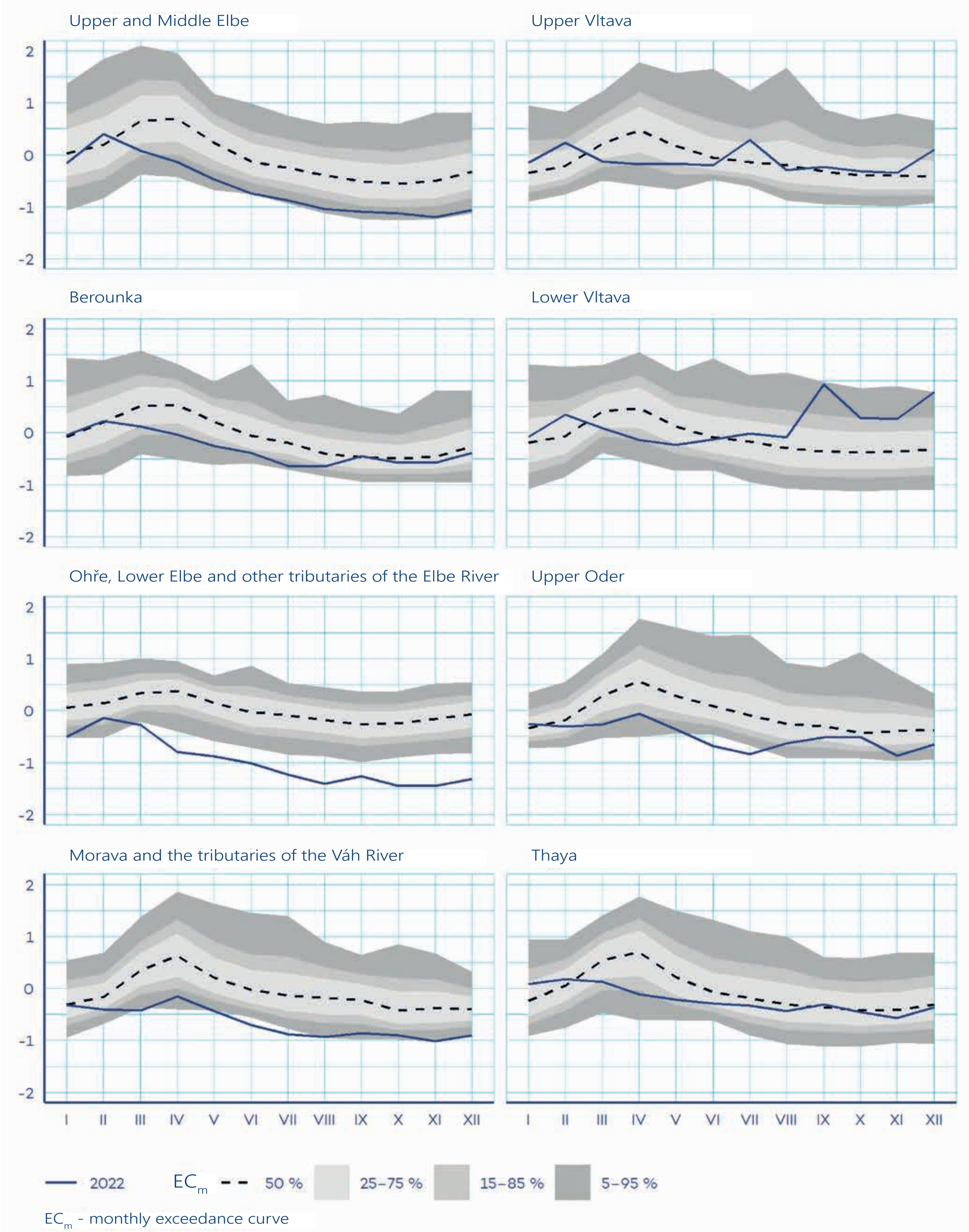
Basins and in other tributaries of the Elbe, yields were even extremely below-average from March to December. This was particularly influenced by the situation in the Ploučnice Basin, where the yield was extremely below-average throughout the year. The situation in Moravia also varied regionally in the second half of the year. In the Thaya Basin, the yield was average from June to the end of the year, while in the Morava Basin and the tributaries of the Váh River the situation was strongly or extremely below-average from March to the end of the year. In the Upper Oder Basin, the overall yield was extremely below-average, but the yield increased from July to October to average values in September and October and decreased again to strongly below-average in November (91% of EC_m) and was slightly below-average in December.

Graph 1.3.3
Average standardised yield of springs in the monitoring network of the whole Czech Republic in 2022 compared to the 1991–2020 long-term average



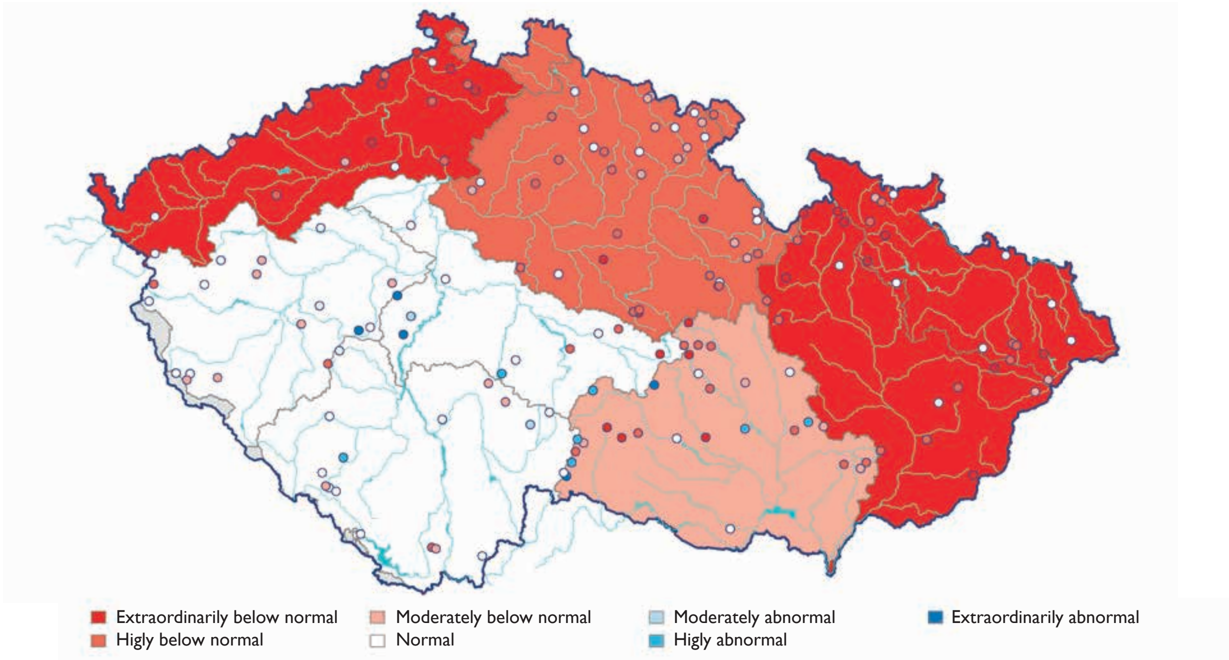
Source: CHMI
Note: The graph also shows quantiles of monthly exceedance curves (EC_m).
The vertical axis represents the standard deviation.

Graph 1.3.4
Average standardised yield of springs in the monitoring network in river sub-basins in 2022 (blue) compared to the 1991–2020 long-term average



Source: CHMI
Note: The graph also shows quantiles of monthly exceedance curves (EC_m).

Figure 1.3.2
Spring yield in 2022, compared to the 1991–2020 period



Source: CHMI

Table 1.3.2
Probability of exceedance of spring yield in 2022 in sub-basins in % of EC_m (monthly exceedance curve for the 1991–2020 period)

Basin	Water yield values in % of EC_m												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	2022
Upper and Middle Elbe	61	39	82	89	91	94	93	93	91	91	94	94	91
Upper Vltava	34	18	79	85	73	65	22	57	43	42	46	16	45
Berounka	48	49	77	84	84	82	92	79	48	61	62	61	74
Lower Vltava	43	26	76	85	76	53	39	37	6	15	16	5	37
Ohře and Lower Elbe	94	77	97	99	98	99	99	99	98	100	100	99	98
Upper Oder	39	65	88	84	93	100	99	81	70	56	91	79	97
Lusatian Neisse	69	46	50	86	88	85	87	88	86	88	90	91	87
Morava	51	76	96	90	96	99	98	94	92	91	95	94	97
Thaya	27	40	78	87	80	70	61	60	45	53	65	55	76
Czech Republic	**54**	**44**	**88**	**92**	**92**	**97**	**91**	**89**	**74**	**81**	**89**	**80**	**91**

Source: CHMI
Note: The red colour scale corresponds to the categories slightly (75–85%), strongly (85–95%) and extremely (95–100%) below-average levels. Blue colours indicate slightly (15–25%), strongly (5-15%) and extremely (0-5%) above-average yield.

Deep aquifers

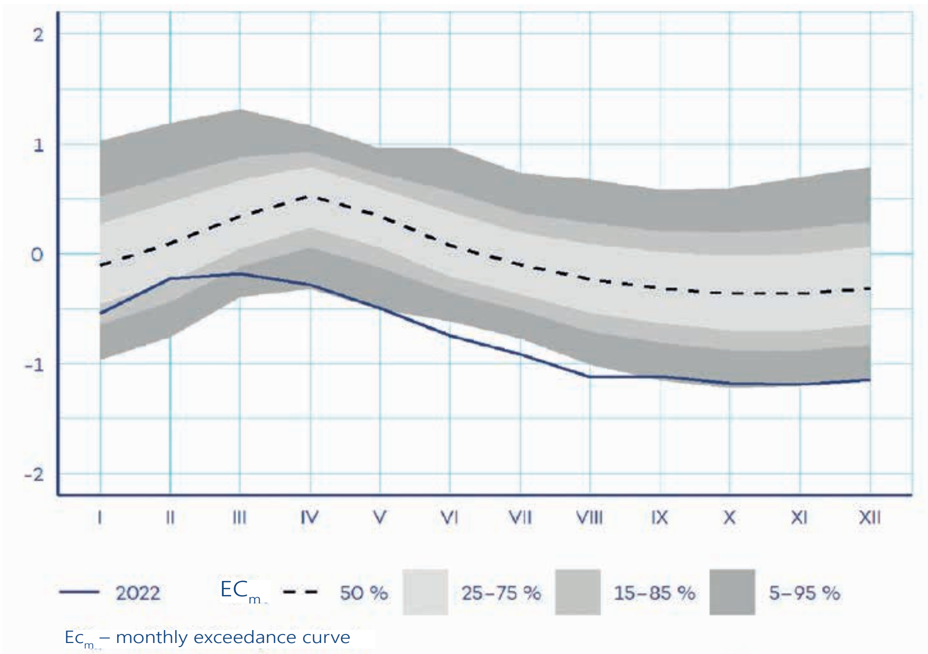
The levels of deep aquifers in many parts of the hydrogeological groups were strongly or extremely below-average in 2022. The most drought-affected area was the North Bohemian Cretaceous (HGR group 4), where extremely below-average levels persisted throughout the year (Figure 1.3.6). 56% of the aquifers were extremely below-average and 22% of aquifers were severely below-average, with not a single one being above-average. All-year-round strongly and extremely (March to August) below-average levels were also the case in the South Bohemian Basins, with 50% of aquifers being extremely below-average and 50% of them being average. Only a part of the South Bohemian Basins 2B was predominantly average (Figure 1.3.3). For most of the year, the condition of a part of the Central and Western Bohemian Permo-carboniferous basins was also extremely below-average (8A, 8B). The situation in the basins below Ore Mountains was mostly average or slightly below-average in the first half of the year, and moderately or strongly below-average in the second half. In eastern Bohemia, the situation was better especially from January to March, when part of the Permo-carboniferous (9A) was slightly above-average and other HGR groups had average levels. Later, the levels decreased and by the end of the year they were mostly slightly or strongly

Rock-solid turning, The Vranov Reservoir – Chvalkovická bay (Author: Merunková Iva)

below-average, including the East Bohemian Cretaceous Cenomanian. Part of the Moravian Tertiary 3A was slightly above-average in January and February and average for the rest of the year. In the other parts of the Tertiary (3B, 3C), levels were mainly average at the beginning of the year, but strongly or extremely below-average for the rest of the year. Levels in part 6A of the North Bohemian Cretaceous Cenoman were slightly below-average throughout the year, while in other parts of the Cenomanian the levels were average (6C) or slightly below-average (6D) until April, and strongly (6D) and extremely (6C) below-average from June until the end of the year. The exception was again the part of the North Bohemian Cretaceous Cenomanian, which has a strongly perennial regime, where the level was strongly above-average all year round. Given the usual annual regime of levels, the condition of deep aquifers was worst in June and August, when the levels in 50% and 51% of them were strongly or extremely below-average, respectively, and aquifers with strongly or extremely above-average levels were only 2% and 4%, respectively. Most extremely below-average aquifers (28%) were recorded in July. In contrast, the best overall condition was recorded in January and February, when aquifers with strongly or extremely below-average levels accounted for 27% and 29%, respectively. Compared to the previous year, 28% of the aquifers experienced a large drop in level, 13% of them experienced a decline, and 37% of them stagnated or declined slightly. Only 3% of the aquifers experienced a rise in level.

Graph 1.3.5

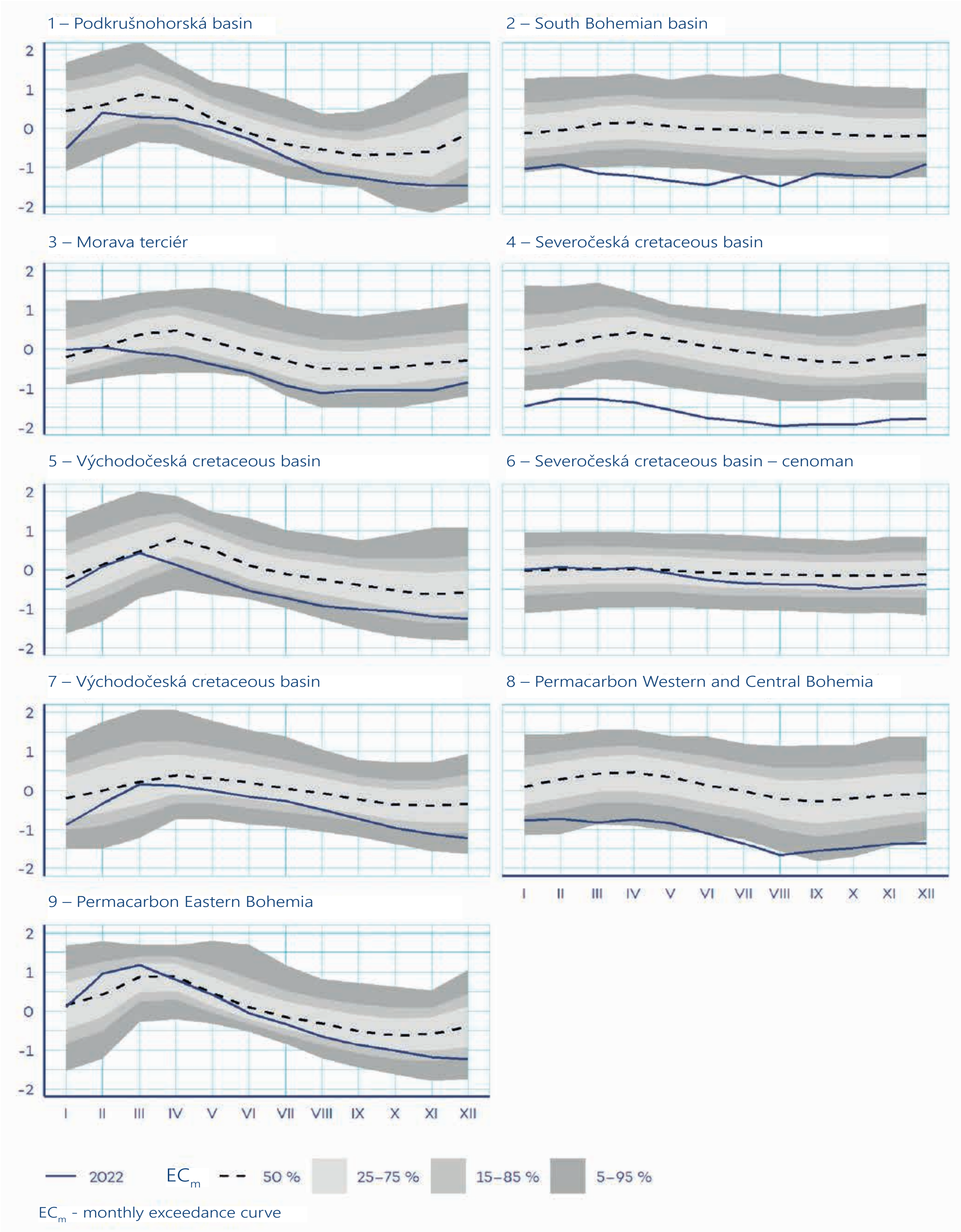
Average standardised deep aquifer level in the monitoring network in the Czech Republic in 2022 compared to the 1991–2020 long-term values for average



Source: CHMI

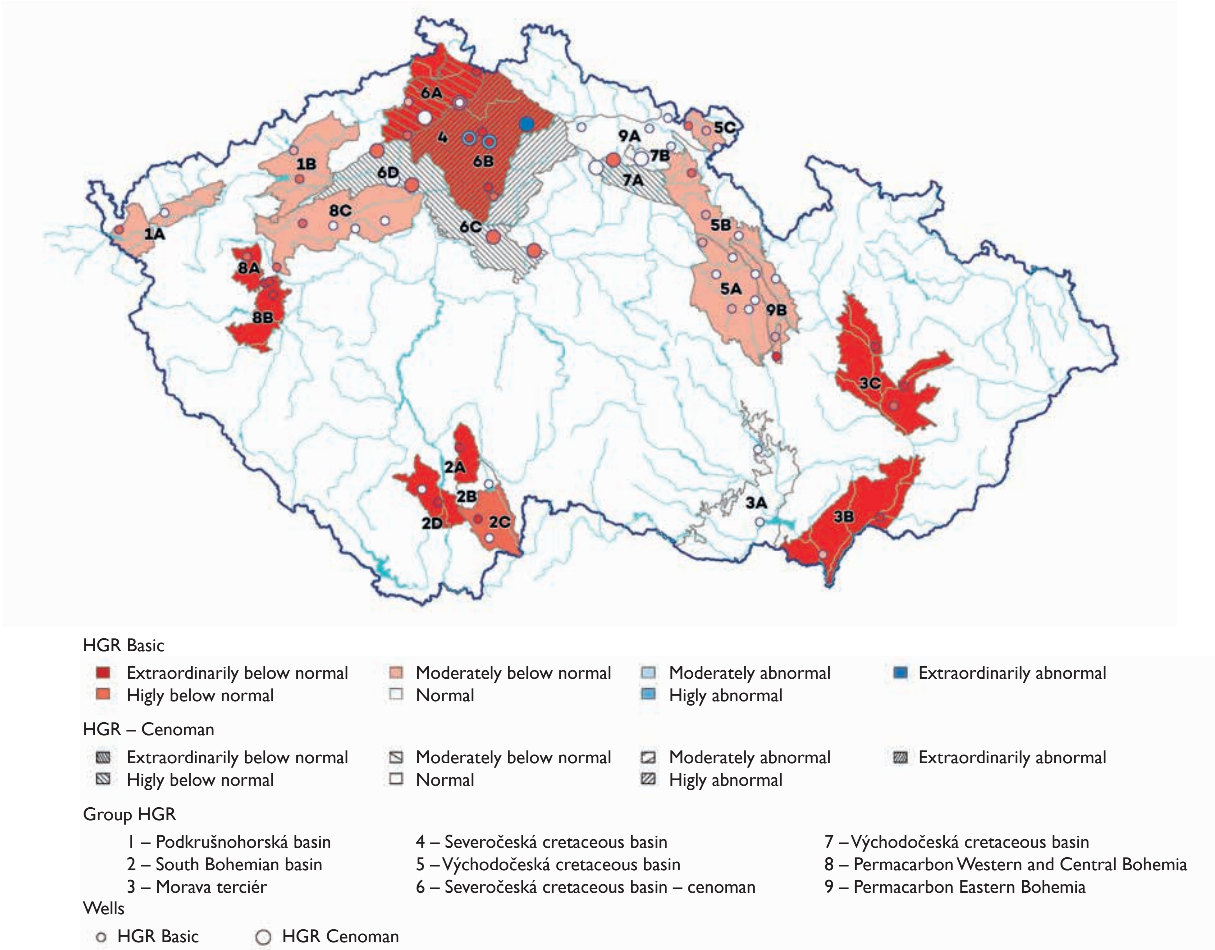
Note: The graph also shows quantiles of monthly exceedance curves (EC_m).

Graph 1.3.6
Average standardised deep aquifer levels in the monitoring network in groups of hydrogeological regions in 2022 (blue) compared to the 1991–2020 long-term average



Source: CHMI
Note: The graph also shows quantiles of monthly exceedance curves (EC$_m$).

Figure 1.3.3
Groundwater levels in deep aquifers in 2022, compared to the 1991–2020 period



Source: CHMI

Table 1.3.3
Probability of exceedance in deep aquifers in hydrogeological groups (HGR) in 2022 in % of EC_m (monthly exceedance curve for the 1991–2020 period)

HGR Group	**Level ranking on EC_m in %**												
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**2022**
Ore Mountains Basin	87	61	80	78	66	61	74	87	88	83	83	91	86
South Bohemian basins	93	93	97	98	98	99	95	98	94	94	95	88	97
Moravia – Tertiary	38	50	79	86	88	90	87	84	81	83	87	84	89
North Bohemian chalk – Turon	99	98	99	98	98	99	99	99	99	100	99	99	99
East Bohemian chalk – Turon	61	52	53	83	87	89	88	87	84	79	78	82	81
North Bohemian chalk – Cenoman	49	45	52	47	56	64	67	69	67	73	70	67	64
East Bohemian chalk – Cenoman	81	66	53	64	69	72	71	78	82	85	86	88	77
Permocarbon of central and western Bohemia	89	90	95	93	93	95	96	96	92	93	94	96	94
Permocarbon of eastern Bohemia	52	25	28	57	53	62	65	73	73	75	82	86	62
Czech Republic	**80**	**73**	**88**	**95**	**95**	**97**	**97**	**97**	**94**	**94**	**95**	**95**	**93**

Source: CHMI
Note: The red colour scale corresponds to the categories slightly (75–85%), strongly (85–95%) and extremely (95–100%) below-average levels. Blue colours indicate slightly (15–25%), strongly (5-15%) and extremely (0-5%) above-average yield.

J. Rob – I'm water, Special and Practical Primary School Březinova, Jihlava

2. HYDROLOGICAL EXTREMES

2.1 Flood situations

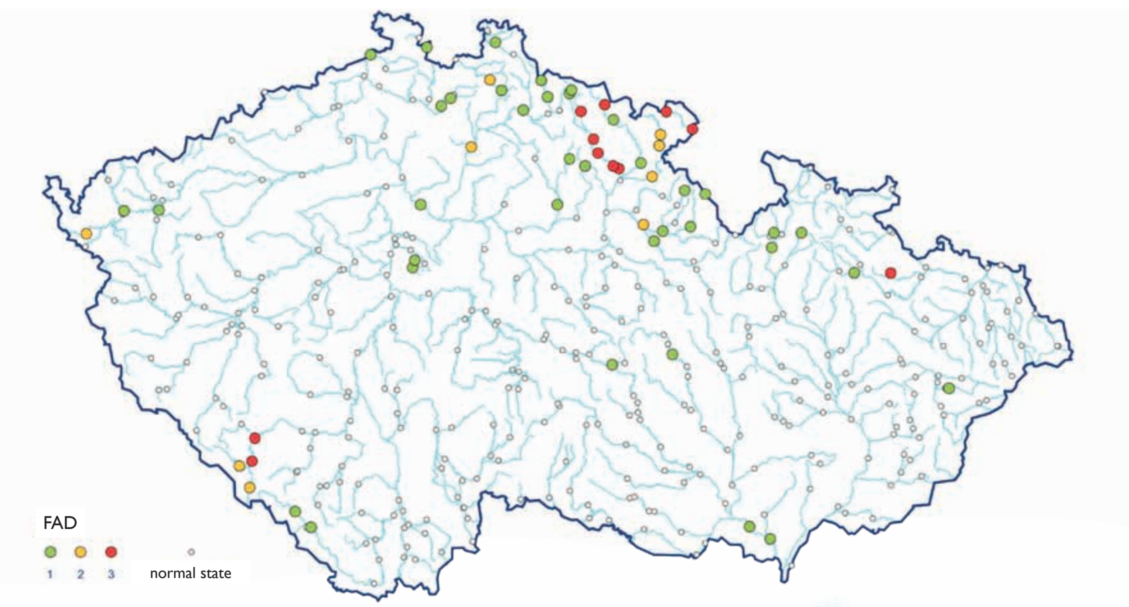
Generally, 2022 was a mostly average or below-average year in terms of hydrology, yet relatively rich in flood situations. As a result of snowmelt, the very first months of the year saw rising water levels with numerous exceedances of flood activity degrees, particularly in the catchment areas of watercourses draining mountainous areas. Snowmelt flooding also occurred towards the end of the year, when snow cumulations that had built up in the first half of the month melted in the last decade of December. In terms of magnitude and water levels, summer flood events were most extensive, in June in the Vltava River Basin and in August in the Vltava, Upper Morava and Oder Basins, when strong storms with very intense downpours, often of a local nature, had a major impact on the rise of watercourse levels. In the second decade of June, a prolonged spell of intense rainfall led to a strong saturation of the soil and as a result some watercourses in the Vltava Basin reached higher FADs. It is worth noting that levels of smaller tributaries of the Vltava repeatedly rose significantly in Prague in the summer. The highest peak flow in terms of recurrence interval was reached on 29 June 2022 on the Zlatý Stream at the Hracholusky profile, and the recurrence interval was assessed to be between 20 and 50 years.

In the winter period (January–April and November–December), the first week of January, the second half of February and the end of the year were the richest in flood events, when traditionally the Christmas thaw caused several significant rises in watercourse levels with FAD being reached due to a combination of rainfall and snowmelt from mountain and submontane areas. Exceptionally, FAD exceedances also occurred due to freezing of streams and rising river levels. In terms of the spatial distribution of floods, most stations with FAD exceedances were in the south and northeast of Bohemia.

In January, in response to the prolonged warming of the previous month, rainfall and the subsequent thawing of the snow cover, water levels rose most on the watercourses draining the Šumava, Krkonoše, Jizera and Orlické Mountains and the Jeseníky Mountains in the first week of January. On 4 and 5 January there were rapid rises in levels exceeding FAD. The most significant rises were recorded on 4 January in the Upper Otava Basin, where FAD III was exceeded on the Otava in Rejštejn (Q_2) and Sušice ($Q_{<2}$), FAD II on the Vydra in Modrava (Q_2) and Křemelná in Stodůlky ($Q_{<2}$). On the Elbe at the Stanovice and Vestřev profiles, FAD III (Q_2, respectively $Q_{<2}$) exceeded FAD II ($Q_{<2}$) on 4 January and the level of the Orlice River in Týniště nad Orlicí ($Q_{<2}$) exceeded FAD II (Q) on 5 January. A number of watercourses in the Upper Elbe, Jizera, Orlice, Cidlina, Upper Vltava, Czech part of the Oder and Upper Morava Basins rose above FAD I (at $Q_{<2}$ and only sporadically at Q_2). Depending on reservoir handling at the reservoir, FAD II ($Q_{<2}$) was exceeded on the Ohře River at the Skalka HS. Due to cooling down towards the end of the first week of January, the levels of the swollen watercourses decreased rapidly.

In February, areas of the northern and northeastern border mountains were most affected, with flows repeatedly rising to FAD during three rainfall episodes (averaging 20–50 mm/24 h). On 6 February, FAD I was exceeded in the Mandava and Stěnava Basins and on 10–11 February in the Metuje Basin (both at $Q_{<2}$).

Figure 2.1.1
Highest flood activity levels reached in winter 2022



Source: CHMI

The Švihov Reservoir on the Želivka Stream (Source: Vltava River Board, s.e.)

At the end of the second and the beginning of the third decade of February, depending on the warming and the thawing of the snow pack, water level rises were recorded on 17 February not only in the already affected areas but also in south-west Bohemia (here at precipitation averaging 15–25 mm/24 h). On 17 February, the water level rose above FAD III on the Elbe at the Vestřev, Les Království and Brod profiles and on the Stěnava at the Meziměstí and Otovice profiles (both at Q_2). FADs were exceeded on the Lusatian Neisse in Liberec ($Q_{<2}$), on the Metuje in Maršov nad Metují, Hronov (both at Q_2) and in Krčín ($Q_{<2}$) and on the Jizera in Bakov nad Jizerou ($Q_{<2}$). On 17 February, FAD I was exceeded at a large number of stations in the Elbe, Divoká Orlice, Cidlina, Jizera, Ploučnice, Kamenice, Lusatian Neisse and Krupá River Basins at water levels of $Q_{<2}$ and only sporadically of Q_2. Increased flows exceeding FAD I were also recorded in other areas of our country in the Teplá Vltava, Otava, Sázava, Svatava, Teplá, Ohře, Moravice, Bystřice and Svratka River Basins. The water levels achieved at the aforementioned profiles were below the two-year flow rate. The third wave of precipitation came on the night of 21 February. The still-drained watercourses from the previous precipitation episode responded with rapid rises in levels. On a number of watercourses in the Upper Elbe, Úpa, Bystřice, Metuje, Divoká Orlice, Upper Jizera and Lusatian Neisse River Basins FAD I were exceeded on 21 February (at $Q_{<2}$, sporadically at Q_2).

As a result of the impact of ice occurrence, FAD III was temporarily exceeded on 12 March on the Hvozdnice in Jakartovice (at Q_{10}) in March, and FAD I was exceeded on 17 and 18 March as a result of the planned water discharge on the Thaya below the Nové Mlýny HS and at the Břeclav-Ladná profile (both at $Q_{<2}$).

In April, a sporadic rise slightly above FAD I ($Q_{<2}$) was repeatedly recorded on 29 April–1 May on the Upper Elbe at the Labská Reservoir profile, due to discharge of water for the scheduled international wildwater racing on the river below the reservoir.

In the second decade of December, day air temperatures were well below freezing, leading to the formation of ice on a number of watercourses. On 12 December, FAD III was exceeded on the Úpa in Horní Maršov and on 18 December on the Malé Labe in Horní Lánov due to significant swelling, and on 19 December, FAD I was exceeded on the Křemelná in Stodůlky. The traditional Christmas thaw caused melting of watercourses and intensive melting of the snow cover, which was present all over the country at the time. From 22 December, it rained in most of the country, most of all in the mountains in the north and northeast of Bohemia and also in Šumava (rainfall totals of 15–25 mm) and the water levels of watercourses rose rapidly. On Christmas Eve, 24 December, the Otava River in Rejštejn exceeded FAD II ($Q_{<2}$) and at several stations in the Upper Otava, Upper Elbe, Middle Vltava, Bečva and Svratka Basins FAD I ($Q_{<2}$ to Q_2) was reached.

June was the richest month in flood events in the summer period (May to October). August also brought a number of flood episodes, especially the second half of the month, given by intense rainfall and local storms. In terms of the spatial distribution of the number of flood events, floods occurred most frequently in southern and southeastern Bohemia, in eastern Moravia and Silesia, and in Prague and its surroundings. In terms of the frequency of flood events, the rises were generally most distinct in June and August.

Heavy precipitation in June with totals of around 30 mm (up to 57 mm in the Filipova Huť station) occurred at the beginning of June, on 4–6 June in southern Bohemia. FAD III was exceeded very briefly on the Blanice River in Podedvory on 6 June (Q_2). FAD I was exceeded at a number of stations in the Vydra, Otava, Volyňka and Blanice River Basins (both at $Q_{<2}$). After a local storm on 4 June, the water level also rose to FAD I on the Botič Stream at the Jesenice-Kocanda profile ($Q_{<2}$). At the end of the first decade on 10 June, in response to strong storms, the level of the Olešná and Litava Rivers reached FAD I ($Q_{<2}$). Most of the precipitation fell in the third decade, on 24–29 June. By the morning of 25 June, 25–80 mm of precipitation fell in a belt from southern Bohemia through central Bohemia, Prague to northern Bohemia, and occasionally up to 110 mm in Prague. On 24 June, rainfall raised the level of the Botič Stream at the Jesenice-Kocanda (Q_5) and Průhonice (Q_2) profiles and the Pitkovický Stream at the Kuří profile (Q_{10}) above FAD III. In the Lusatian Neisse and Rokytka River Basins, FAD I was exceeded ($Q_{<2}$). In response to extreme rainfall on the night of 28 June in southwest Bohemia (up to 100 mm/hour), the Klabava in Nová Huť, the Úslava in Koterov (both at $Q_{<2}$) and the Holoubkovský Stream in Rokycany-Dvořákova exceeded FAD II. The Klabava, Úslava, Řasnice (both at $Q_{<2}$) and the Bradava in Žákava (at Q_5) reached FAD I. Precipitation moved in a wide belt from southern Bohemia and the Bohemian-Moravian Highlands through central Bohemia to the north and northeast of Bohemia also during the night of 29 June and by the morning an average of 20–50 mm fell there, with peaks of up to 80 mm in Prachatice. On 29 June, FAD III was exceeded by the Křemžský Stream in Brloh, the Zlatý Stream in Hracholusky (Q_{20-50}), the Bezdrevský Stream in Netolice, the Polečnice in Český Krumlov (Q_5), the Blanice in Blanický mlýn (Q_2), the Blanice in Bavorová and Podedvory (Q_2), Botič in Jesenice-Kocanda (Q_{10}) and Průhonice (Q_5) and Pitkovický Stream in Kuří (Q_2). FAD II was exceeded on the Botič Stream in Prague-Nusle (Q_2), the Polečnice in Novosedly and the Blanice in Heřmaň ($Q_{<2}$). A number of watercourses in the catchment areas of the Volyňka, Jihlava, Blanice, Vltava, Otava and Smutná reached FAD I with water levels below the two-year flow. The Blanice in Heřmaň peaked above FAD II on 30 June ($Q_{<2}$).

At the beginning of July, in the Blanice and Botič Basins, the level at some profiles was still at FAD levels. On 1 July, storms with heavy precipitation moved from Bohemia to Moravia and Silesia. At Lučina in Horní Domaslavice the level reached FAD II (at Q_{10}) on 1 July. At the end of the month, the watercourse levels rose mainly on the night of 30 July in the vicinity of Prague (with rainfall up to 50 mm) and on 31 July in northeast Moravia (50–85 mm). The level of the Botič Stream exceeded FAD I at Jesenice-Kocanda, Ropičanka at the river profile (at $Q_{<2}$) and Lučina in Horní Domaslavice (Q_2).

The first significant fluctuation of water flows was recorded at the beginning of August, when after intense rainfall in southern Bohemia the Blanice River in Bavorov rose above the level of FAD I on 6 August. Significant precipitation occurred in 19–23 August, with rain almost throughout the whole area (in peaks of over 100 mm). In response, flows rose, especially in the Vltava Basin and also some flows in northern Bohemia. On 19 August, the Botič Stream exceeded FAD II at the Jesenice-Kocanda (Q_2) and Prague-Nusle (Q_5) profiles, while FAD I was exceeded on the Zubřina in Domažlice. Another wave of rainfall raised the watercourses in the Pilsen and Rokycany Districts and Prague. On 20 August and at night on 21 August the level of the Klabava reached FAD III at the Hrádek (Q_5) and Nová Huť ($Q_{<2}$) profiles and FAD II at the Rokycany-Na Pátku profile.

Kadaň HS (Source: Ohře River Board, s.e.)

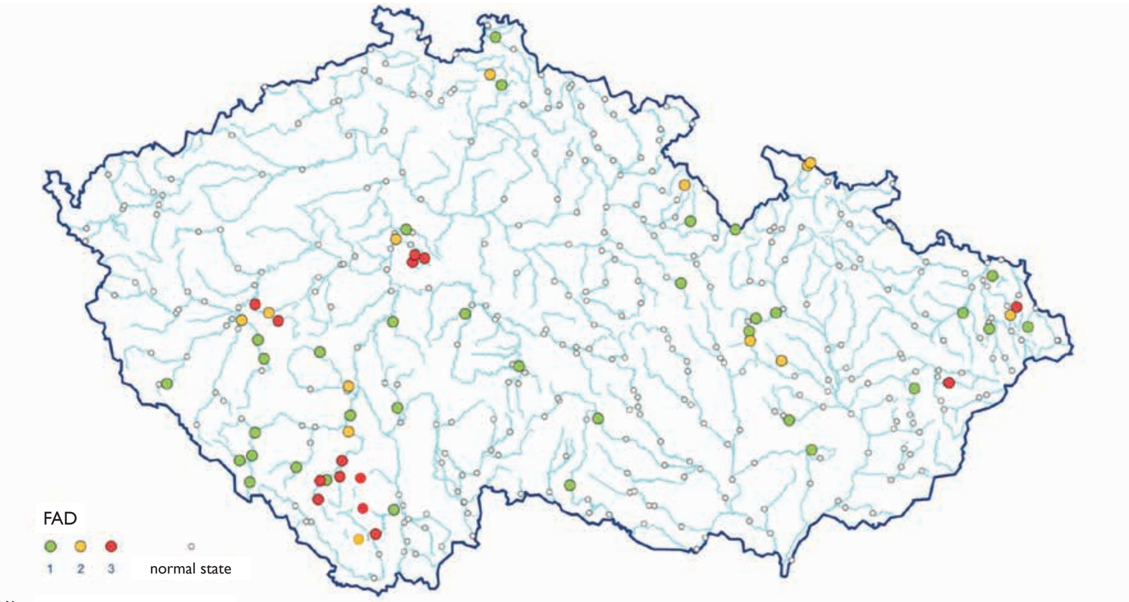
The Janov Reservoir (Source: Ohře River Board, s.e.)

The Holoubkovský Stream at the Rokycany-Dvořákova profile also reached FAD II on 20 August. The Skalice River was also rising, reaching FAD II (Q_2) in Varvažov and FAD I in Zadní Poříčí on 20 August. In Prague, the Botič was repeatedly on the rise, peaking above FAD II in the afternoon of 20 August in Prague-Nusle (Q_5), in Jesenice-Kocanda ($Q_{<2}$) and in the evening in Průhonice ($Q_{<2}$).

Further extreme precipitation occurred in the area of the Orlické Mountains and in the evening of 20 August there was a sharp rise in the level of Bělá at the Jedlová profile in the Orlické Mountains exceeding FAD II. The Zdobnice River at the Slatina nad Zdobnicí profile reached FAD I ($Q_{<2}$). On the night of 21 August, the precipitation moved to the eastern part of the country, especially to the Orlické Mountains, Javorník Hook and Zábřež and Drahany Highlands (with totals of 30–70 mm). On 21 August, the level of Černý Stream in Velká Kraš (Q_2), the Úsobrnský Stream in Jaroměřice (Q_5) and the Romže in Stražisko (Q_2) peaked above FAD II. Other significant level rises were observed on 23 August on streams in southeastern Bohemia, in the Bohemian-Moravian Highlands, in Prague and its surroundings and in the Jeseníky region. In the area of the Bohemian-Moravian Highlands, daily rainfall totals were around 50–70 mm (with a maximum of 100 mm/24 h at the Humpolec station). The Vidnavka at the Vidnava station and Černý Stream in Velká Kraš (both at Q_2) rose repeatedly to FAD II on 23 August. FAD I was exceeded at a large number of profiles on the Botič, Chotýšanka, Želivka, Žirovnice and Želetavka (all at $Q_{<2}$). Local thunderstorms accompanied by torrential downpours occurred every day in the period 24–28 August across the country. On 24 August, due to strong storms in Třinec, Frýdek-Místek and in the vicinity of Český Těšín (at the Ropice station the total precipitation was 72 mm in 3 hours), watercourse levels rose sharply exceeding FADs. The Stonávka in Hradiště exceeded FAD III (Q_{20}) and at several stations in the Lučina, Tichá Orlice and Bělá Basins the water reached FAD I (Q_2). In the Vltava Basin, watercourse levels rose again in the heavily saturated catchments around Pilsen. On 26 August the Klabava exceeded FAD III (Q_5) in Hrádek and FAD I in Rokycany-Na Pátku, the Holoubkovský Stream exceeded FAD I in Rokycany-Dvořákova. On 27 August, the Klabava at the Nová Hut' profile rose to FAD II ($Q_{<2}$). After torrential rain, the Botič Stream was again swollen on 26 August and exceeded FAD I at the Prague-Nusle profile. In the Oder Basin in North Bohemia, the Lusatian Neisse rose above FAD II ($Q_{<2}$) at the Liberec profile on 26 August and above FAD I (Q_2) at the Proseč nad Nisou profile. Strong storms on 27 and 28 August resulted in significant fluctuations of the levels in eastern Moravia and Silesia resulting to FAD I being exceeded on the Stružka, Lubina, Jevíčka and Haná (all at $Q_{<2}$).

The first significant rise in September was recorded on 9 September on the Botič Stream in Prague-Nusle, where an intense storm led to exceeding of FAD II (Q_5). Further rises in water levels occurred on 15 and 16 September. The affected watercourses in the Berounka, Sázava and Bečva River Basins responded with rises above FADs level. On the Bystřička River in the Bečva Basin, FAD III was exceeded on 15 September at the Bystřička profile above the reservoir and FAD II at the Bystřička profile below the reservoir (both at $Q_{<2}$). Exceedances of FAD I were recorded on 15 and 16 September at stations on the Klabava, Holoubkovský Stream, Sázava, Mastník and Bečva ($Q_{<2}$ to Q_2). On the night of 19 September, the heaviest rain fell on the ridges of the Šumava (maximum rainfall over 50 mm). The precipitation reflected in significant rises in water levels, especially in the Upper Otava Basin. On 19 September, FAD I was exceeded on the Vydra in Modrava, on the Křemelná in Stodůlky and on the Otava in Rejštejn and Sušice (at $Q_{<2}$).

Figure 2.1.2
Highest flood activity degrees reached in summer 2022



Source: CHMI

2.2 Remedying flood damage

The Ministry of Agriculture administered two programmes aimed at flood damage repair. Programme 129 320 'Support for Remedying Flood Damage to the Infrastructure of Water Supply and Sewerage Systems II', and programme 129 370 'Remedying Flood Damage to State-owned Water Management Assets III'.

Since 2017, programme 129 320 (a follow-up to completed programme 129 140), has been ready to respond quickly to consequences of damage or even destruction of water and sewerage infrastructure as a result of a natural event. In 2022, no support was provided for remedying flood damage to water supply and sewerage infrastructure. Programme 129 370 was initiated in 2021 to remedy flood damage to watercourse systems, including associated facilities, hydraulic structures, and state-owned riparian vegetation damaged by extreme stresses during flood events and implementation of purposeful stabilization structures and modifications to structures to ensure continued functionality of watercourse channels and associated facilities at failure points. In 2022, a total of 26 projects were supported under the programme with a total amount of more than CZK 163 million.

For the case of flood damage, the Ministry of Agriculture administers subsidy programme 129 284 'Remedying Flood Damage to Ponds and Reservoirs'. As there were no significant floods in 2022, the programme was not activated and no funds were provided.

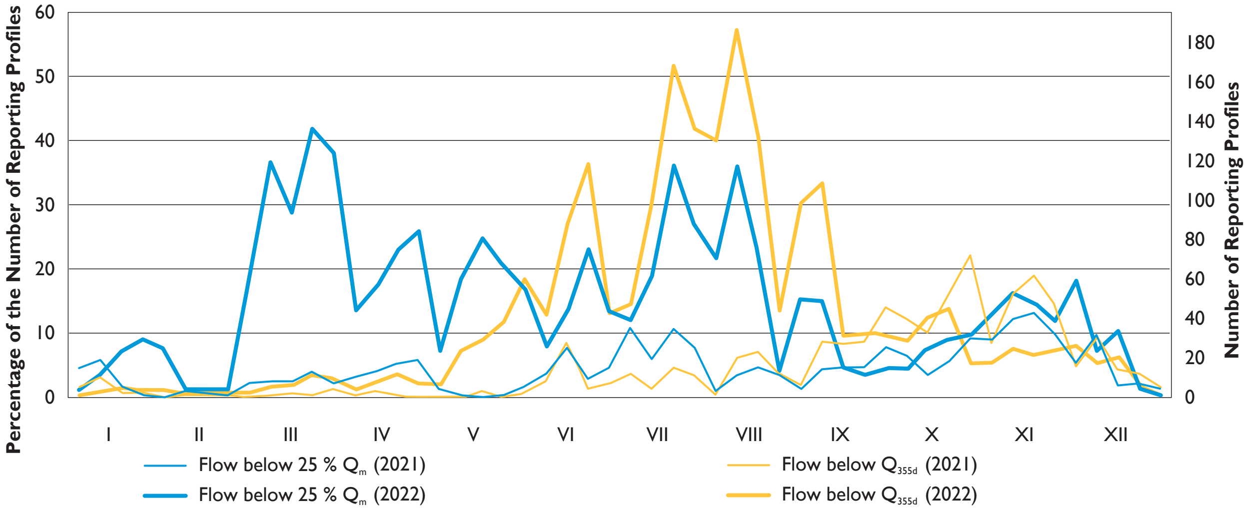
More detailed information, including financial implementation, is provided in Chapter 11 Financial support for water management.

2.3 Drought situation

In terms of drought, 2022 was a different and often significantly drier year compared to the previous year and could be divided into three periods. In the first period (until the end of the first decade of May), similar to 2021, no water levels were below the hydrological drought level (Q_{355d}), or only sporadically. However, average flows gradually decreased and, due to the almost rainless March, occasionally fell below a quarter of the monthly normal at 40% of all monitoring profiles (up to 8 times higher than in 2021). In the second period (from the second decade of May to mid-September), profiles below Q_{355d} started to increase, even though local intense showers and thunderstorms occurred quite frequently. River levels did rise rapidly in response to precipitation (and FADs were reached – see Floods chapter), but often only temporarily, decreasing quite rapidly, often to Q_{355d}, or even below. Most such low water levels were reached in July and August (up to 55% of all monitoring profiles, up to 10 times more than the previous year). The third period (from mid-September to the end of the year) was very similar to 2021. Profiles below the Q_{355d} level were generally indicated in 10% of the monitoring profiles. Profiles below a quarter of normal increased slightly until November. In November and late December, such low flows occurred at 15% of the monitoring profiles. At the end of the year, the traditional Christmas thaw occurred, which resulted in no flows being below the hydrological drought threshold (Q_{355d}) or flow rates below 25% of Q_{XII} to occur at the end of December (Figure 2.3.1).

From the second decade of May, water levels began to reach the hydrological drought threshold more frequently (Q_{355d}). Water levels Q_{364d} occurred mainly only in the Lower Elbe and Ohře Basins, in 10% of the monitoring profiles. The number of profiles with flows less than 25% of Q_V varied between 10% and 25% during the month. Most such low flows were recorded in the Morava Basin down to the Thaya (sporadically up to 50% of the profiles). At the beginning of June, 20% of all the

Graph 2.3.1
Weekly changes in the average water level in the Czech Republic in 2021 and 2022

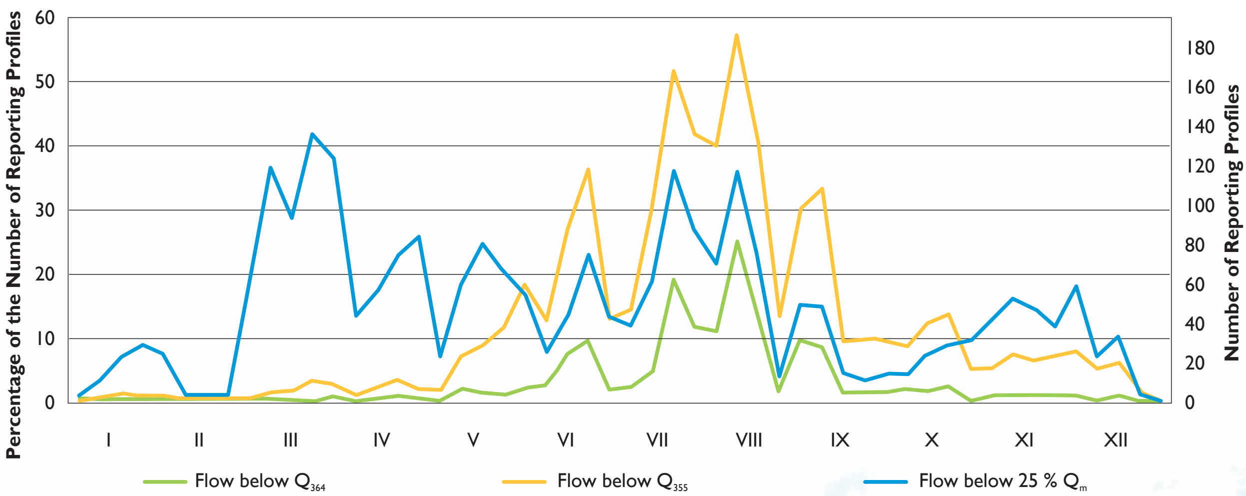


Source: CHMI

monitoring profiles were below the hydrological drought level (Q_{355d}) (most notably 30% in the Lower Elbe and Ohře River Basins and the Oder River Basin). The drought mainly intensified later in the month and was detected at one third of all the monitoring profiles in the fourth week (10% of the profiles were below Q_{364d}). The largest number of 'dry' profiles was in the Lower Elbe and Ohře Basins (70%, and 30% below Q_{364d}). In the last week, the situation improved significantly in all river basins due to heavy rainfall (most of all in the Vltava Basin). The highest number of profiles indicating drought (Q_{355d}) remained in the Lower Elbe and Ohře Basins, as well as in the Morava Basin down to the Thaya (a third of the profiles). The share of profiles with flows below 25% of Q_{VI} remained similar as in the previous month, typically at 10% to 25% of all monitoring profiles (in the Morava Basin down to the Thaya occasionally at 50% of the profiles sporadically).

At the beginning of July, the runoff situation from the end of June was still receding. From the second week of the month on, rainfall was almost non-existent and the number of 'dry' profiles increased again. At the turn of the second and third decade, 50% of all the monitoring profiles were below Q_{355d}, while 20% of the profiles were below Q_{364d}. The largest number of profiles with flow Q_{364d} was in the Lower Elbe and Ohře Basins (50% of the profiles) and in the Morava Basin down to the Thaya (35% of the profiles). The situation improved after heavy rainfall at the end of the month. The number of profiles below Q_{355d} decreased to 40% of the monitoring profiles (only in the Lower Elbe and Ohře Basins did the situation worsen, with almost 90% of the profiles still below Q_{355d} at the end of the month). The number of profiles with flows below 25% of Q_{VII} also increased during the month and peaked at the turn of the second and third decade, when such low flows were observed in one third of all the monitoring profiles (in the Morava Basin down to the Thaya up to 70%, in the Oder Basin up to 65% of the profiles). At the end of the month, the total number of flows below a quarter of the normal decreased slightly due to precipitation.

Graph 2.3.2
Changes in average water levels at the monitoring profiles in the Czech Republic in 2022



Source: CHMI

By mid-August, watercourse levels had gradually declined and the number of profiles below the hydrological drought threshold (Q_{355d}) had increased to 55% of all the monitoring profiles (25% of the profiles were below Q_{364d}). Both values were annual highs (Figure 2.3.2). The highest number of profiles indicating drought (Q_{364d}) was still in the Lower Elbe and Ohře River Basins (50% of the profiles). The heavy and widespread precipitation at the end of the month led to rising water levels, meaning 'dry' profiles were almost absent at the end of the month. Profiles below a quarter of the normal also increased initially and by mid-month were present at one third of the monitoring profiles. By the end of the month, such low flows were rare. In late August and September, the number of profiles below the hydrological drought threshold (Q_{355d}) increased significantly for the last time in the year (to one third of the monitoring profiles, with 10% of the profiles below Q_{364d}). Similarly, the number of profiles below 25% of the monthly normal increased slightly to 15% during this period.

2.4 Interdepartmental commission WATER-DROUGHTO

In 2022, the Interdepartmental commission WATER-DROUGHT resumed fully its activities. The main tasks included preparation of an evaluation of the implementation of the Concept, which resulted in a summarizing Report on the Implementation of the Drought Protection Concept for the Czech Republic for 2017–2022.

The Concept of Protection Against Drought Consequences in the Czech Republic (the 'Concept') was adopted by the Government by Resolution No. 528 in 2017. The Resolution defined task III.3, which consists in providing information on the implementation of the Concept and submitting it to the Government by 31 December 2022. Therefore, the Interdepartmental commission WATER-DROUGHT (the 'Commission') coordinated preparation of the summarizing information. The Commission used materials from the ministries involved, i.e., the Ministry of Agriculture, the Ministry of the Environment, the Ministry of Industry and Trade, the Ministry of Regional Development and the Ministry of the Interior, for which measures were defined that lead to reducing the impacts of drought and water scarcity. In addition, the Commission prepared 'Position Reports' for each year, which assessed the progress of implementation of the measures taken in a given year.

The presented 'Report on the implementation of the Concept of drought protection for the Czech Republic for 2017–2022' (the 'Report') briefly assesses the hydrological situation, dominated until 2020 by drought and water scarcity, given by the unevenness of precipitation distribution and high summer air temperatures, which are the accompanying phenomena of climate change corresponding with the scenarios of its future development.

Chapter 2 briefly describes the fulfilment of the objectives set by the Concept and lists the priority results achieved by implementation of the measures under the responsibility of the ministries involved. The Concept does not explicitly set out evaluation indicators for assessing the extent to which the strategic objectives have been achieved. Instead, the quality of many measures is assessed verbally, especially in the case of activities aimed at improving water conditions in the landscape and in agricultural activities. As to the implementation of technical measures, data on the number of projects are given, including selected indicators of their implementation and results. The qualitative verbal assessment based on the description of implementation of individual measures was therefore complemented by a proposal of appropriate indicators for future assessment of the progress in the resilience of the Czech Republic against drought.

In order to support the implementation of the measures, the ministries allocated financial resources, provided both from the EU funds and the state budget, often with involvement of financial resources from entities that benefit from the measures reducing the impact of drought. An overview and use of the fuds is presented in the tables contained in the description of measure 4.6.7. They show that in 2017–2021, an average of CZK 13.2 billion was spent annually on the measures of the Ministry of Agriculture and CZK 2.7 billion on the measures of the Ministry of Environment aimed at implementing the Concept. Financial reporting for 2022 is incomplete. In the Report, the MoE provides for each programme the date at which the costs were determined, while the MoE reports fund allocation as of 10 December (EU funds) and as of 16 December (national funds). Disbursement for rehabilitation and construction of ponds and small water reservoirs (for municipalities) was particularly successful, with 2,138 projects implemented since 2016 with support of CZK 7.4 billion. For development of water and sewerage infrastructure, CZK 1.6 billion was provided for implementation of 188 projects. Significant was the implementation of land development plans, which include plans for common facilities improving water retention and cumulation in the landscape as well as reducing the rate of surface runoff. In 2021, the support amounted to CZK 3.4 billion.

The reports on the implementation of the measures show that the objectives set out in the Concept are continuously and gradually being met. Many of the measures are long-term and need to be continued. At the same time, the experience from implementing some of the measures leads to their integration and/or to proposals of adjustments, which are included in Chapter 4 – Status of implementation.

It is obvious that the Concept should continue, even though no significant dry spells occurred in 2021 and 2022. Trends in the effectiveness of mitigation measures aimed at limiting greenhouse gas production and particularized climate scenarios suggest that the first manifestations of mitigation policies, as specified in scenarios with global CO_2 reductions, cannot be expected before 2050. Thus, situations of drought, uneven precipitation distribution and rising air temperatures should be perceived with precaution and effective adaptation measures should be pursued. In the conclusion of the Report, the Commission proposed to submit to the Government, by the end of April 2023, an adjustment of the Concept, including a proposal for an indicator system to monitor its progress in meeting the strategic objectives.

More information on the drought, the WATER-DROUGHT Commission and the Concept of Protection Against Drought Consequences in the Czech Republic can be found on the website www.suchovkrajine.cz.

K. Manhalterová, L. Golářová, A. Fránková – The most precious treasure, Primary School Otevřená, Brno

3. QUALITY OF SURFACE WATERS AND GROUNDWATERS

3.1 Surface water quality

Current surface water quality under ČSN 75 7221 compared to the 1991–1992 biennium

The map of surface water quality on selected watercourses in the Czech Republic was first prepared for the 1991–1992 biennium under ČSN 75 7221 Water Quality – Classification of Surface Water Quality. From this biennium onwards, the same maps have been produced annually so that they can always be compared with the current water quality status. With regard to the extent of the indicators monitored in the 1990s, only a basic classification could be used for this comparison. As of 1 December 2017, an amendment to ČSN 75 7221 standard Water Quality – Classification of Surface Water Quality entered into force, having replaced the previous standard (ČSN 75 7221 Water Quality – Classification of Surface Water Quality), which had been in force for the previous 19 years.

The subject of the amendment was to take into consideration the requirements concerning the current situation in surface water protection, both in terms of pollution indicators as well as the degree of acceptable pollution. The range of monitored indicators and limit values of the quality classes were reviewed. As a result, a new map of the quality of surface waters was produced for 1991–1992 (Figure 3.1.1) in accordance with the amended ČSN 75 7221 for the sake of objective comparison.

The indicators used to assess the surface water quality were COD_{Cr}, BOD_5, $N\text{-}NH_4$, $N\text{-}NO_3$ and P_{total}. Figure 3.1.2 shows that water quality has improved over the last 25 years, however, there are still watercourse sections classified in Class V.

For the preparation of the abovementioned map of water quality in the watercourses of the Czech Republic for the period 2021–2022, the resulting assessment from selected profiles of the water quality monitoring network in watercourses provided by the Czech Hydrological Monitoring Institute (from primary data sent by the individual River Boards, s.e.) was used. The classification of the monitored profiles in terms of contamination according to the amended ČSN 75 7221 is as follows:

Class I — unpolluted water – surface water status that was not significantly affected by human activity, with water quality indicators do not exceed values corresponding to the common natural background of the respective watercourse,

Class II — slightly polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values allowing for the existence of a rich, balanced and sustainable ecosystem,

Class III — polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values that may not be conducive to conditions allowing for the existence of a rich, balanced and sustainable ecosystem,

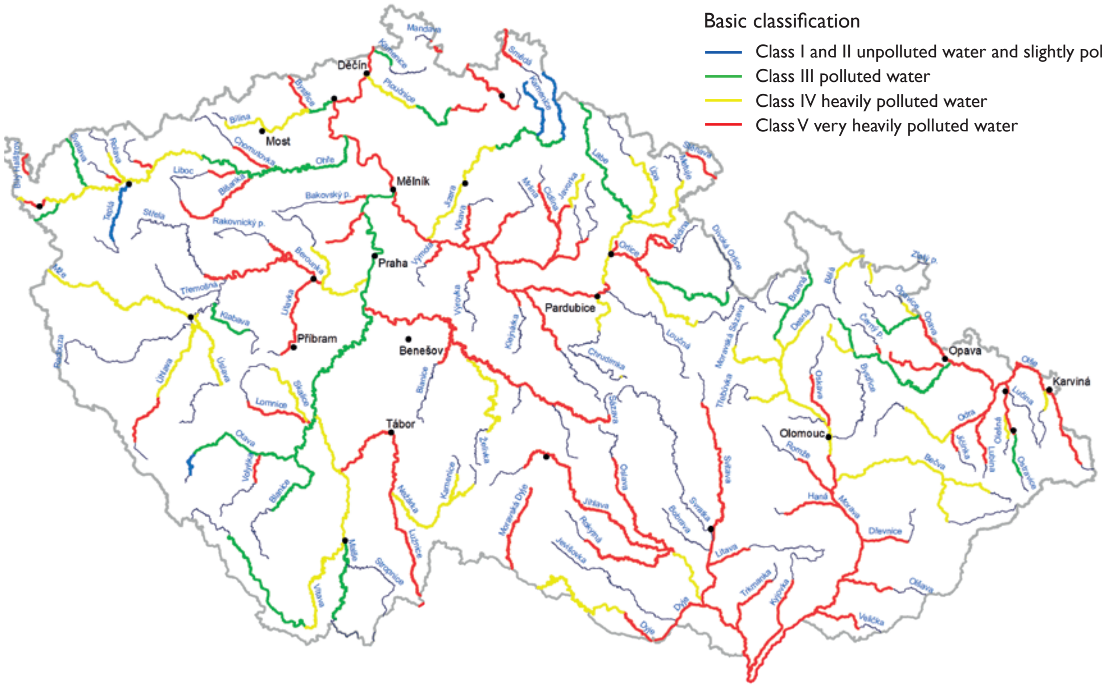
Class IV — heavily polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values that are conductive to conditions allowing for the existence of only an unbalanced ecosystem,

Class V — very heavily polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values that are conductive to conditions allowing for the existence of only a heavily unbalanced ecosystem.

The Lock Chamber Střekov (Source: Elbe River Board, s.e.)

From the selected profiles of the watercourse quality monitoring network, 23% were classified in Class I and II as unpolluted or slightly polluted water, 42% of the profiles were classified in Class III as polluted water, 28% of the profiles were classified in Class IV as heavily polluted water and 7% of the profiles were classified in Class V as very heavily polluted water.

Figure 3.1.1
Surface water quality in the Czech Republic in 1991–1992



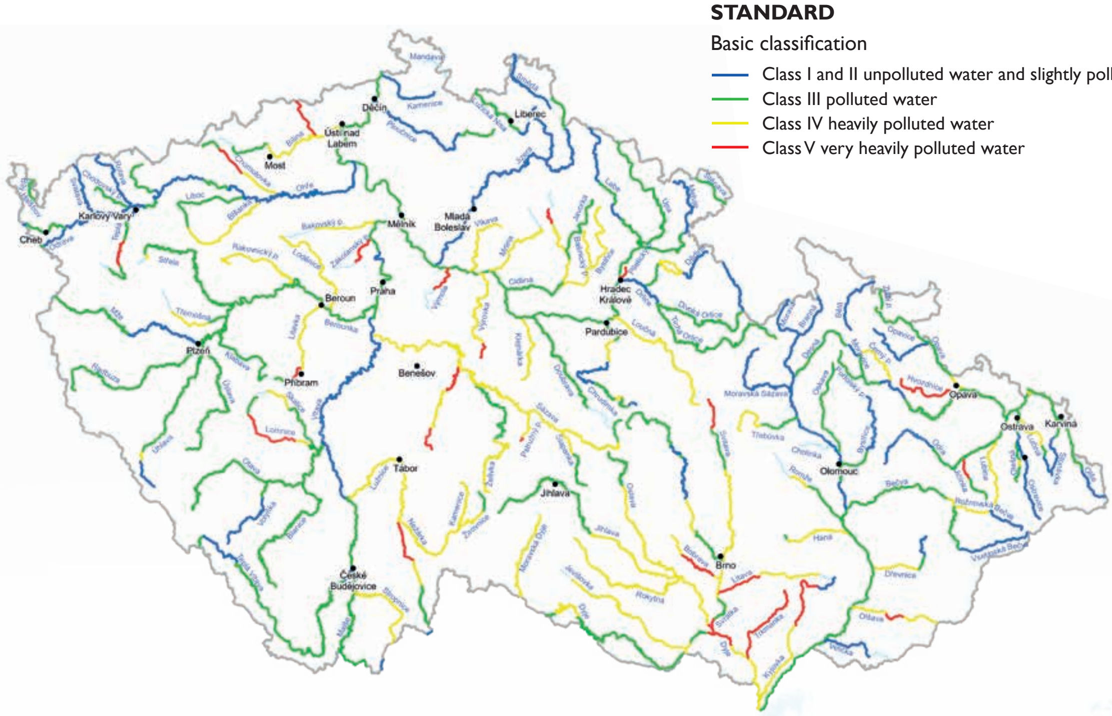
CLASSIFICATION UNDER CSN 75 7221 STANDARD

Basic classification

- Class I and II unpolluted water and slightly polluted water
- Class III polluted water
- Class IV heavily polluted water
- Class V very heavily polluted water

Source: CHMI

Figure 3.1.2
Surface water quality in the Czech Republic 2021–2022



CLASSIFICATION UNDER CSN 75 7221 STANDARD

Basic classification

- Class I and II unpolluted water and slightly polluted water
- Class III polluted water
- Class IV heavily polluted water
- Class V very heavily polluted water

Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by the Czech National Water Management Institute and the CHMI

Radioactivity

At selected profiles of the state monitoring network, radiological indicators are monitored in surface waters on a long-term basis. The profiles are situated at sites of existing nuclear facilities and in watercourse stretches affected by mine water discharges and seepage from refuse dumps at locations where uranium ores were formerly mined or processed.

In surface water of the Vltava River (significant watercourse) at the Solenice profile, downstream the Temelín Nuclear Power Plant wastewater outfall, the highest tritium activity value was detected on a single occasion in 2022 of 222 Bq/l. The highest acceptable pollution limits for tritium in surface waters under the environmental quality standard (the 'EQS') as per Government Regulation No. 401/2015 Coll., on indicators and limits of permissible surface water and wastewater pollution, requirements for permits for discharge of wastewaters into surface water and sewage systems, and on sensitive areas, as amended, were not exceeded.

In the surface waters of the Jihlava River at the Mohelno profile downstream of the wastewater outfall from the Dukovany Nuclear Power Plant, a tritium activity value in the range of 113-408 Bq/l was detected, the values being higher than in 2021. In this case, the average value exceeds the EQS limit value for tritium in surface water as specified in Government Regulation No. 401/2015 Coll. According to the characteristic value for tritium from the updated ČSN 75 7221 Water quality, this profile and the profile downstream in Ivančice are ranked in Class III – polluted water.

The highest uranium concentrations of up to 236 μg/l were found in surface waters in the vicinity of the Dolní Rožínka uranium mine. Based on the uranium content, the quality of surface water at the Skryje profile on the Hadůvka River corresponds with Class V – very heavily polluted water according to ČSN 75 7221. The elevated uranium content in the surface water is the source of elevated total alpha activity reaching a value of 8,470 mBq/l. The maximum value of the indicator of volumetric activity alpha exceeding the limit value of the EQS as per Government Regulation No. 401/2015 Coll. was detected at this profile, at the Boudy profile on the Loučka River and in Veverská Bítýška on the Svratka River.

Significant pollution with uranium and radioactive indicators persists at a number of profiles in the vicinity of the Příbram deposits. Maximum uranium concentrations of 19-72 μg/l were found in the surface waters of the Příbramský Stream at the Brod profile, in the Drásovský Stream at the Drásov profile and in the Kocába River at the Višňová profile. Due to such typical values of uranium at the profiles, the watercourses are ranked in Class V – very heavily polluted water according to ČSN 75 7221. According to the typical value of the total volumetric activity alpha, the Štěchovice profile on the Kocába River is also ranked in Class V, including the profiles mentioned above.

The quality of surface waters of the Ploučnice River at a number of profiles (Stráž pod Ralskem, Horka, Noviny pod Ralskem, Mimoň) near the Stráž pod Ralskem deposit is rated according to ČSN 75 7221 in Class V – very heavily polluted water, based on the characteristic value of total volumetric activity alpha. The average annual values and the maximum values of the total volumetric activity alpha exceed the limit value of the EQS as per Government Regulation No. 401/2015 Coll. The activity of the radium 226 isotope was higher than in 2021 at the Ploučnice – Stráž pod Ralskem profile. According to ČSN 75 7221, the quality of surface water is classified in Class IV – heavily polluted water, at the other profiles mentioned above it is classified in Class III – polluted water.

In the Jáchymov District, in Ostrov nad Ohří on the Bystřice River and on its tributary, the Jáchymovský Stream, radioactive contamination from the former mining and processing of radioactive raw materials persists. The quality of the surface water according to total alpha activity and uranium content corresponds to class V – very heavily polluted water.

In the Tachov District, at the profiles of the Hamerský Stream (Brod nad Tichou, Broumov), the surface water quality is affected by the activity of radium 226 isotope and total alpha activity. On the basis of lower activities of radium 226 isotope, reaching 25 mBq/l at most, the surface water is classified according to ČSN 75 7221 in Class II – moderately polluted water.

At the site of the former uranium mines in the Jindřichův Hradec District, contamination of surface water with uranium and elevated alpha activity persists at the Nekrasín profile on the Račí Stream. Both of the indicators exceed the limit values for the annual average EQS values as per Government Regulation No. 401/2015 Coll. Total alpha activity in surface waters in the vicinity of the Okrouhlá Radouň deposit in the Jindřichův Hradec District reaches values of around 1300 mBq/l, activity of the radium 226 isotope was measured to be 37 mBq/l and uranium concentrations with a maximum of 52 μg/l, the detected values decreased year-on-year. In the area of the uranium ore deposit near Licoměřice on the Kurvice Stream at the Ronov profile, the total volumetric alpha activity decreased, the highest value being 496 mBq/l.

Raw water samples are analysed once in 3 months and radioactivity is detected based on total volumetric alpha and beta activity at several water treatment plants. The highest total alpha activity of up to 471 mBq/l was detected at the Kamenička water treatment plant. This value of alpha activity exceeds the maximum and annual average limit value of permissible pollution as per Government Regulation No. 401/2015 Coll. Given the high annual average value of total volumetric alpha activity, the limits set by Government Regulation No. 401/2015 Coll. were exceeded. The annual average limits for total volumetric activity alpha set by Government Regulation No. 401/2015 Coll. were also exceeded at the water treatment plants Šumná on the Bílý Stream, Merklín on the Eliáš Stream and Plavno on the Plavenský Stream. The highest total volumetric activity beta (150 mBq/l) in the raw water samples monitored that complied with the limit values was found in the raw water from the Vrchlice Stream and in the raw water for the water treatment plant in Hulice taken from Želivka. The total beta activity of raw water from the Kamenice Stream for the Josefův Důl HS and the activity of raw water from the Černá Desná Stream for the Souš Water Structure in the Jizera Mountains reached a maximum value of 37 mBq/l. The total volumetric beta activity did not exceed the permissible pollution limits for surface waters used for water supply purposes. The detected value of total volumetric activity alpha for these waters meets the condition of the annual average of the EQS as per Government Regulation No. 401/2015 Coll., so such surface water can be treated and converted to drinking water.

Water quality in water supply and other reservoirs

The water quality in vast majority of reservoirs (except ponds) is relatively stable, which means the water quality does not fluctuate much in the long term, but traditional problems persist. The year-on-year variability depends not only on hydrological conditions of a given year, but also on the situation in each reservoir.

The year 2022 was generally normal for the reservoirs in the Vltava Basin, which was for the third consecutive year. The hydrological situation therefore did not significantly affect water quality. Only some reservoirs had an increase in the input of humic substances around mid-summer, so that deterioration of raw water quality was detected in some reservoirs (the Lučina, Římov, Karhov). In general, water quality is still threatened or affected by eutrophication (i.e., too intense growth of algae and especially cyanobacteria) caused by excessive input of phosphorus compounds from the catchment area, especially from point sources of pollution. In some sub-basins, e.g., the Orlik Reservoir or the Hracholusky Reservoir, the influence of highly eutrophic ponds is also present. In 2022 deteriorated conditions were only detected in the Lučina Reservoir on the Mže River, where more intense cyanobacterial blooms were found that had an impact on deterioration of the raw water quality. In the sphere of threats and impacts on water quality from pesticides, the situation in the Švihov Reservoir on the Želivka River remains unfavourable. There is also an ongoing burden of pesticide breakdown products. High concentrations of highly hazardous PFOS substances were detected in the Velešínský Stream, which is a left-side tributary of the Římov water supply reservoir on the Malše River. Therefore, targeted monitoring of not only water quality but also sediments has been planned for 2023. Although monitoring the situation is important, it is not the solution. Above all, uncompromising remediation of the source of such substances is necessary, which in this case are the premises of Jihostroj, a. s. in Velešín. The intake of erosion material from agricultural areas is also a persistent factor. The phenomenon is not linked to eutrophication, but to sedimentation in the upper parts of the reservoirs. Due to climate change, reservoirs are more vulnerable to eutrophication processes and their consequences, affecting especially their oxygen regime. In order to maintain at least the current water quality in the future, it is essential to reduce systematically the inflow of phosphorus compounds into the aquatic environment. Water treatability is regularly impaired by eutrophication in the Lučina and Žlutice Reservoirs, and to a lesser extent in the Římov and Karhov Reservoirs. The Švihov Reservoir is significantly threatened, however, constant improvement is expected after completion of the reconstruction of the Pelhřimov WWTP that collects a significantly higher volume of wastewaters from rainfall/runoff episodes, and after the efficiency to remove phosphorus compounds is increased at most municipal WWTPs. In other reservoirs (Orlík, Lipno, Hracholusky, České údolí), eutrophication impairs their recreational use. Basic studies have been prepared for for the Orlík and Hracholusky, including a proposal for measures aimed at improving their condition. For the České Údolí Reservoir, there is a feasibility study concerning allocation of a part of the reservoir with better water quality for recreational purposes. Particular attention should be paid to the Lipno Reservoir, especially in view of the new plans to build more recreational areas, whose wastewaters will be discharged directly into the reservoir, which, moreover, would be inadequately treated, as the current legislation does not allow to deal with cases in such exposed locations. The Lipno Reservoir is very vulnerable to eutrophication due to its morphology, recurring cyanobacterial blooms and its chemistry (virtual absence of nitrate ions). All these aspects favour recycling of phosphorus in the aquatic ecosystem, where cyanobacterial water blooms can grow intensively. The Lipno Reservoir is a textbook example where excessive pursuit of commercial recreational use threatens the recreational use itself, as the attractiveness of the location fades. In order to reduce eutrophication in the reservoirs, it is necessary to reduce the volume of phosphorus compounds in the water by approximately 50%. These are the conclusions of the studies assessing the situation of the Hracholusky and Orlík Reservoirs, but the same applies to other water supply reservoirs (the Švihov, Žlutice, Římov). In order to achieve such an objective, it is necessary to reduce continuous phosphorus emissions from point sources of pollution with the aim of achieving concentrations below 0.5 mg/l of total phosphorus in treated wastewaters, to minimise the impact of diluted wastewaters from the unified sewerage system and to limit phosphorus outflow from ponds both during the entire year and at the time of fish harvesting, including phosphorus bound to resuspended sediments. Such measures are not sufficiently supported by legislation: Act No. 254/2001 Coll., on water and amendments to some acts (the Water Act), as amended, Government Regulation No. 401/2015 Coll., on indicators and values of permissible pollution of surface water and wastewater, the requirements permits for the discharge of surface water and wastewater into sewers and on sensitive areas, and in particular the lack of a decree of the Ministry of the Environment and the Ministry of Agriculture regulating management of ponds (Article 39(8) of the Water Act). It is, however, possible to find ways of cooperation between the state-owned water supply companies and regional authorities and mayors of individual municipalities, and also with other entities. This way appears to be feasible and deserves support. There are 12 separate water bodies (ponds) administered by the Vltava River Board. The situation concerning ponds has long been a neglected issue, even though they are very important links in the hydrographic network, transforming material flows in river basins. There is not even a methodology for assessing the ecological potential of ponds, which is a major shortcoming and actually a debt towards meeting the requirements of the Framework Directive. There is a fundamental lack of a decree regulating management of ponds, as stipulated in Section 39(8) of the Water Act. Climate change, as observed in the territorial jurisdiction of the Vltava River Board, state enterprise, also entails changes in the behaviour of ponds. Ponds currently tend to have poorer phosphorus retention, which means, in consequence, an increased eutrophication risk for reservoirs located downstream in the catchment. Therefore, pond management needs to be paid increased attention.

At the beginning of spring, water reservoirs administered by the Elbe River Board, state enterprise, with the exception of the Vrchlice Reservoir, were sufficiently filled in accordance with the valid manipulation set of rules. In the growing season, water inflows to all the reservoirs were strongly above-average. In terms of temperatures, 2022 was a strongly above-average year. The long-term trend of increasing water temperature and the related fact that the period of elevated temperatures is becoming longer every year has implications for evaporation from the reservoir surface and its chemistry. The effects of eutrophication were intensively evident in the Křižanovice, Vrchlice and Hamry Reservoirs. The quality of raw water in the Hamry Reservoir was improved again by biomanipulation consisting in regulating the composition of fish stock. Regularly repeated distinct oxygen stratification linked with development of increased manganese concentrations in deeper oxygen-free layers of the reservoir was detected at the Vrchlice HS. Also in 2022, high primary production (maximum values of chlorophyll-a of 101.7 μg/l at the inflow section) was detected at the end of July. Regular inspections of microscopic screening in situ upstream of the hydraulic structure dam were conducted in order to determine optimal time intervals for sample-taking for the wastewater treatment plants. Monitoring the movement of xenobiotics (especially pesticides) in the tributaries as well as in the reservoir itself was intense throughout the year. The data obtained are used as important comparative evidence for proposals concerning agricultural farming in the area above the water abstraction point. The water quality at the Josefův Důl and Souš Water Reservoirs was very good in 2022. Concentrations of chlorophyll-a were below 15 μg/l (Josefův Důl). From water supply perspective, these two reservoirs are almost problem-free sources of raw water. At the Labská Reservoir, which is important for water abstraction for Vrchlabí in Herlíkovice, the water quality fluctuated. Transparency dropped from 400 cm in April to 120 cm in September. There was also a significant development of primary production in the summer period with a maximum chlorophyll-a value of 52 μg/l. In the Seč Reservoir, which is the water supply source for the Seč water supply, the significant effect of eutrophication in the upper half of the reservoir did not become apparent until the beginning of September. The maximum chlorophyll-a values were as high as 200 μg/l. In 2022, monitoring of surface waters intended for bathing conducted by the hygienic authorities identified bathing water with impaired quality at the Pastviny Reservoir in the Pardubice Region. In the Mšeno Reservoir, the bathing water quality was good throughout the season. However, there was a slight deterioration at the turn of August and September. Sonar equipment and floating vegetation islands were installed on the reservoir to improve water quality. The impact of these devices on water quality can only be objectively assessed after several seasons. The water in the Harcov Reservoir was suitable for bathing throughout the bathing season. A slight deterioration was detected only at the beginning of September. As extensive repairs of the entire Harcov Reservoir began in September, the reservoir was being discharged completely from 19 September to 15 October. In order to avoid endangering aquatic organisms, the level in the reservoir decreased very slowly and with constant monitoring of the water quality in the reservoir and at the outlet. The reconstruction is expected to last approximately two years. A relatively significant deterioration in water quality was detected in the Bedřichov Mountain Reservoir. Chlorophyll-a concentrations there are typically below 10 μg/l. In July, however, concentrations of 110 μg/l were reached and August values exceeded 60 μg/l. The usual low values were not reached even in September. The water quality in the Fojtka Reservoir was deteriorated (transparency below 200 cm in most of the growing season). The lowest water quality was in the Pařížov Reservoir (transparency deep below 100 cm in June–August and chlorophyll-a concentrations exceeding 254 μg/l in September) and the Les Království Reservoir (transparency deep below 100 cm in June–August and chlorophyll-a concentrations exceeding 445 μg/l). Deteriorating water quality was also evident at the Oplatil Sand Lake, where an important water intake of Vodovody a kanalizace Pardubice, a. s., is situated. This fact prompted a detailed investigation of the conditions affecting the water quality at the site.

Water reservoirs administered by the Ohře River Board, state enterprise, are located mainly in the upper parts of watercourses in the Ore Mountains. Due to the lower population density, there is a lower anthropogenic impact on water quality, in particular the input of pollution (nutrients) from municipal wastewaters is limited. Pollution of the tributaries of the reservoirs is specified by the natural conditions in their catchment areas, e.g., the presence of peat bogs. TOC, COD, humic substances, iron and manganese regularly exceed the limit values set out in Government Regulation No 401/2015 Coll., as amended, and the limits for treatability of raw water to drinking water of category A3 according to Decree No 448/2017 Coll., as amended. In 2022, the water quality was comparable to previous years. Except for the Stanovice Reservoir, where microbiological pollution remains higher (category A2), the reservoirs experienced a decrease in microbiological pollution values. In the Stanovice Reservoir, there was an overall increase in the number of indicators exceeding category A3 (AOX, humic substances, BOD_5, COD_{Mn}, aluminium, iron and manganese). Due to increased turbidity, the Horka HS was de-mudded in September 2022. The largest reservoirs in the Ohře River Basin not utilised for water supply systems are the Skalka, Jesenice and Nechranice Reservoirs, and Lake Mácha and Stráž pod Ralskem Reservoirs in the Ploučnice River Basin. Despite being burdened by phosphorus, pesticides, halogens and other substances (municipal and agricultural pollution), the water quality in the reservoirs is generally good. In August 2022, the water in the Skalka and Jesenice Reservoirs was declared unsuitable for bathing due to the presence of cyanobacteria and water bloom. In addition, consumption of the fish caught in the Skalka Reservoir is prohibited due to high mercury concentrations. The situation with flooded pits, created by brown coal surface mining is rather specific. Such sites have no natural inflow and outflow. Their management (especially concerning fish management) is strictly regulated and their water quality is thus very high. They exhibit indicators of natural pollution. Medard Lake contains manganese and iron, Barbora Lake contains phosphorus and arsenic, while halogens are literally omnipresent in Milada Lake. The water quality in the reservoirs is regularly monitored by measurements. Given the development of the climatological and hydrological situation in the past year, no significant threat to the quality of the raw water occurred. Detailed information on possible problems with water treatment can be obtained from the individual operators of raw water treatment plants (SčVK, a. s. Teplice, Vodárny a kanalizace Karlovy Vary, a. s., Vodárna Sokolovsko, s. r. o., CHEVAK, a. s.).

The year 2022 was characterised by a dry and moderately warm spring and summer in the Morava Basin, followed by very rich precipitations in September and then again by a very dry autumn. Eutrophication affected mainly the recreational reservoirs whose condition in 2022 can be described as hypertrophic: Jevišovice, Middle and Lower Nové Mlýny Reservoirs, the Farářka profile at the Vranov Reservoir, Moravská Třebová, Plumlov, Podhradský and Novoveský Ponds, Luhačovice and, Fryšták, a reservoir intended for water supply. The Výrovice Reservoir and the Bítov profile at the Vranov Reservoir were strongly eutrophic, almost reaching hypertrophic values. The eutrophic reservoirs detected were the Brno Recreational Reservoirs at the Hráz profile, Nové Mlýny (Upper), very surprisingly the Vodárna and Hráz profiles at the Vranov Reservoir and the Bystřička Reservoir. Slightly eutrophic were the Upper Bečva and the water reservoirs of Hubenov, Mostiště, Znojmo, Vír and Ludkovice. The Koryčany Reservoir was slightly eutrophic. Only the Nová Říše and Bidelec Reservoirs were mesotrophic.

Probably the greatest improvement was recorded at the Landštejn Reservoir, which almost achieved the quality of the Karolinka Reservoir, which is oligotrophic. Slušovice, Bojkovice and Boskovice could also be described as oligotrophic in 2022. There was a strong deterioration especially in the Nové Mlýny (Lower) Reservoir, where a mass cyanobacterial bloom developed with a direct negative impact on the river downstream of the dam, and the situation worsened at the Brno Reservoir-Dam profile, in the Jevišovice, Letovice and Upper Bečva Reservoirs, at the Bítov profile near the Vranov Reservoir and in the Hubenov and Ludkovice Reservoirs. The situation in some water supply reservoirs improved significantly, primarily in the Landštejn and Bojkovice. Improvements were also recorded at Mostiště, Vír, Nová Říše, Opatovice and Boskovice. The intensity of phytoplankton development in the other reservoirs corresponded approximately with the situation in 2021. Several hypertrophic and strongly eutrophic reservoirs showed strong development of invasive dinoflagellates, Ceratium furcoides species (the Letovice, Výrovice, Plumlov, Upper Bečva, Luhačovice). The main development of cyanobacteria and cyanobacterial aquatic blooms occurred at the Nové Mlýny Reservoirs (Lower and Middle), Jevišovice, Výrovice, Farářka and Bítov profiles near the Vranov Reservoir, Podhradský Pond and near Moravská Třebová. Overall and in general, the condition of water supply reservoirs improved in 2022, while recreational reservoirs deteriorated.

The water quality in water supply reservoirs of Kružberk and Šance, administered by the Oder River Board, was good and stable in 2022 throughout the entire growing season. The water met the limits of category A1 as per Annex 13 to Decree No 428/2001 Coll. in most of the monitored parameters. The situation in the Morávka Reservoir deteriorated during the season due to extensive cyanobacteria in the second half of the growing season. However, the fact did not affect the raw water quality abstracted for treatment for public water supply. Speaking of reservoirs not intended for water supply systems, water quality deteriorated only in the Těrlicko Reservoir in 2022, which was, however, not due to abundance of cyanobacteria, but because of the risk of cercariae occurrence. In the Baška and Olešná Reservoirs, the water quality deteriorated at the end of the growing season due to excessive cyanobacteria occurrence. In other reservoirs (not intended for water supply systems) under the management of the Oder River Board, state enterprise, the water quality was ranked in the first or second class as per the methodology of the Regional Hygienic Station, meaning as water suitable for bathing or as water suitable for bathing with deteriorated sensory properties.

Quality of water used for bathing in the 2022 bathing season

Act No. 258/2000 Coll., on the protection of public health and on amendments to some related acts, as amended, regulates the rights and obligations of natural and legal persons, which must be met in the field of protection and promotion of public health; it further establishes a system of public health protection bodies, their scope of activity and authority. One of the spheres that is protected by the Act, is outdoor bathing, operation of outdoor bathing pools, artificial bathing pools, swimming pools and saunas. Decree No. 238/2011 Coll., on defining hygienic requirements for swimming pools, saunas and hygienic limits for sand in sandpits in outdoor playgrounds, regulates the equipment of outdoor bathing sites and the requirements for the sample-taking and frequency of inspections as well as bathing water quality requirements.

For each recreational season, the Ministry of Health, in cooperation with the Ministry of Agriculture and the Ministry of the Environment, draws up a list of natural bathing sites on surface waters where the operator offers bathing services and other surface waters for bathing. It is a list of sites where the quality of the water will be monitored throughout the summer recreational season with respect to its intended use for bathing.

In the 2022 bathing season, a total of 292 bathing sites were monitored by public health protection authorities, including 169 outdoor bathing sites and 123 bathing areas. 1,044 water samples were taken by public health protection authorities and 961 samples were taken by the operators. On the basis of the laboratory analyses carried out, the public health authorities issued a ban on bathing at 15 sites in the Czech Republic in the summer recreational season 2022. Water quality assessed as unsuitable for bathing was found at 35 sites. Thus, a total of 50 sites, i.e., 17.1% of all the sites monitored, had water considered unsuitable for bathing.

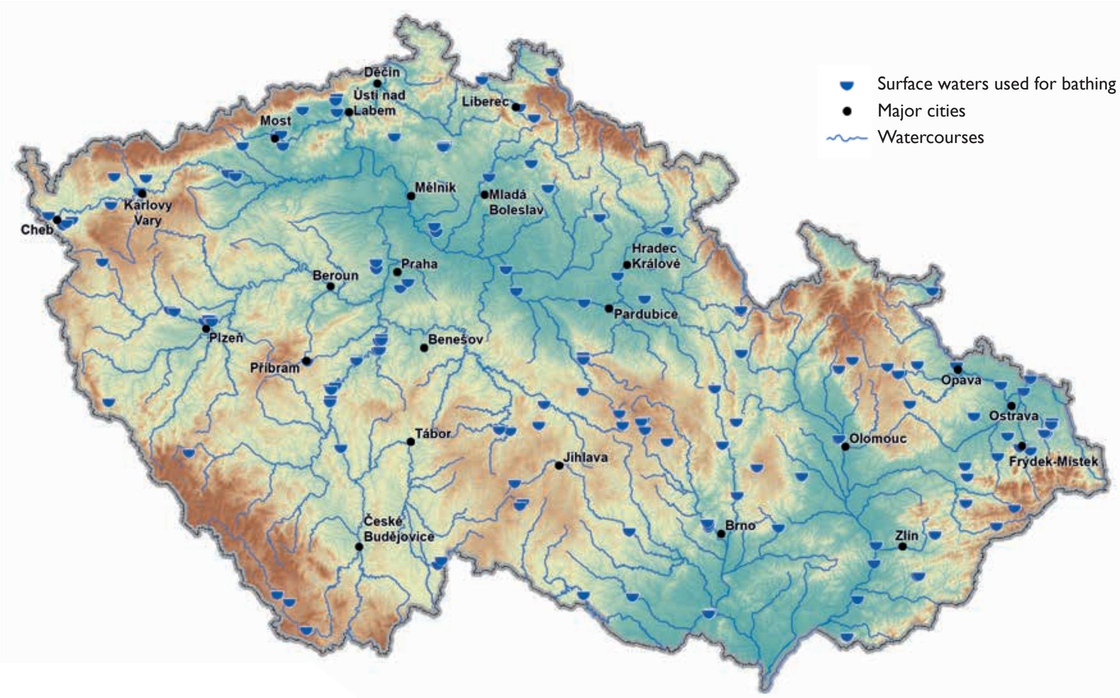
Also in the 2022 recreational season, many bathing sites faced problems primarily with excessive cyanobacteria growth, which was the main reason why bans on bathing were issued. Cyanobacteria are present in our waters due to surface water pollution, mainly in the indicator phosphorus, which contributes to their excessive growth when the temperature and duration of sunlight are increased. In order to improve water quality, priority should be given to preventing nutrients, especially phosphorus, from entering surface waters: this can be achieved by completing the third wastewater treatment stage at all existing wastewater treatment plants and by building new wastewater treatment plants in municipalities that do not yet treat wastewater thoroughly. Other measures (e.g., change in fish stocking, promotion of aquatic plant growth, clotting phosphorus by using coagulants) can be implemented directly at the reservoir. Elimination of developed cyanobacterial blooms by algicides is highly risky with respect to protecting the health of bathers and the aquatic ecosystem (use of such substances is – in accordance with Section 39(7) of Act No. 254/2001 Coll., on waters and amendments to some acts (the Water Act), as amended – subject to authorisation by the competent water authority). Furthermore, it does not eliminate the cause, which is excessive nutrient supply, and it offers only a short-term solution.

Some areas also faced the occurrence of cercarial dermatitis. Cercarial dermatitis is a parasitic disease that manifests itself in humans by formation of stains, blisters and even skin reddening and is accompanied by intense itching. It is caused by small parasitic animals whose life cycle is linked to water gastropods and water birds (e.g., mallards).

The water quality of 50 monitored sites (17.1%) was unsuitable for bathing in the 2022 recreational season. All bans on bathing were issued by public health authorities due to excessive cyanobacteria.

The number of bathing facilities and water bodies intended for bathing monitored by regional hygienic stations did not change much in comparison with previous years.

Figure 3.1.3
Surface waters used for bathing



Source: T. G. Masaryk Water Research Institute, p.r.i. using data provided by River Boards, s.e., MoA and ©ZABAGED

Quality of suspended matters and sediments

Suspended matters (insoluble solids) and sediments are an important part of the aquatic environment. Inorganic and organic pollutants are adsorbed on them and they subsequently negatively affect life in fluvial ecosystems. Analyses that provide information on the presence of hazardous foreign substances in the aquatic environment subsequently allow for the causes of pollution at individual sites to be analysed. Long-term monitoring of the condition of fluvial ecosystems is highly desirable and allows the development and environmental impacts of pollution to be assessed. Monitoring the quality of wash load and sediments makes an important contribution to the overall assessment of the quality of surface waters in watercourses in the Czech Republic.

EU Directives 2000/60/EC (the 'Water Framework Directive'), 2008/105/EC and 2013/39/EU require long-term trend monitoring for a set of 25 selected priority hazardous substances for solid matrices. For this purpose, concentrations of heavy metals, metalloids and specific organic substances were monitored at 48 profiles in 2022, with a focus on the water policy priority substances for a total of 130 chemicals, of which 20 are listed as priority substances (for the remaining 5 substances, trend analyses were not performed due to low concentrations, which were mostly below the detection limit, or short time series). These substances are hazardous to the health of humans, animals and to the entire ecosystems. They are often carcinogenic (e.g., polyaromatic hydrocarbons, perfluorooctane sulfonate), mutagenic (e.g., organochlorine pesticides) and harmful to the nervous, hormonal and immune systems (e.g., hexabromocyclododecane, polybrominated diphenyl ethers, tributyltin). The level of contamination was assessed on the basis of the average annual concentration of contaminants in a given matrix with the ICPER sediment quality limits (International Commission for the Protection of the Elbe River sediment quality indices), as these limits are not currently anchored in Czech legislation.

The contamination of sediments, wash load and sedimentable and floatable solids is highly heterogeneous across the country and between catchments, related to geomorphology, land use and settlement. Often, excessive concentrations of individual foreign substances are found under industrial and urban agglomerations as well as areas affected by resource extraction.

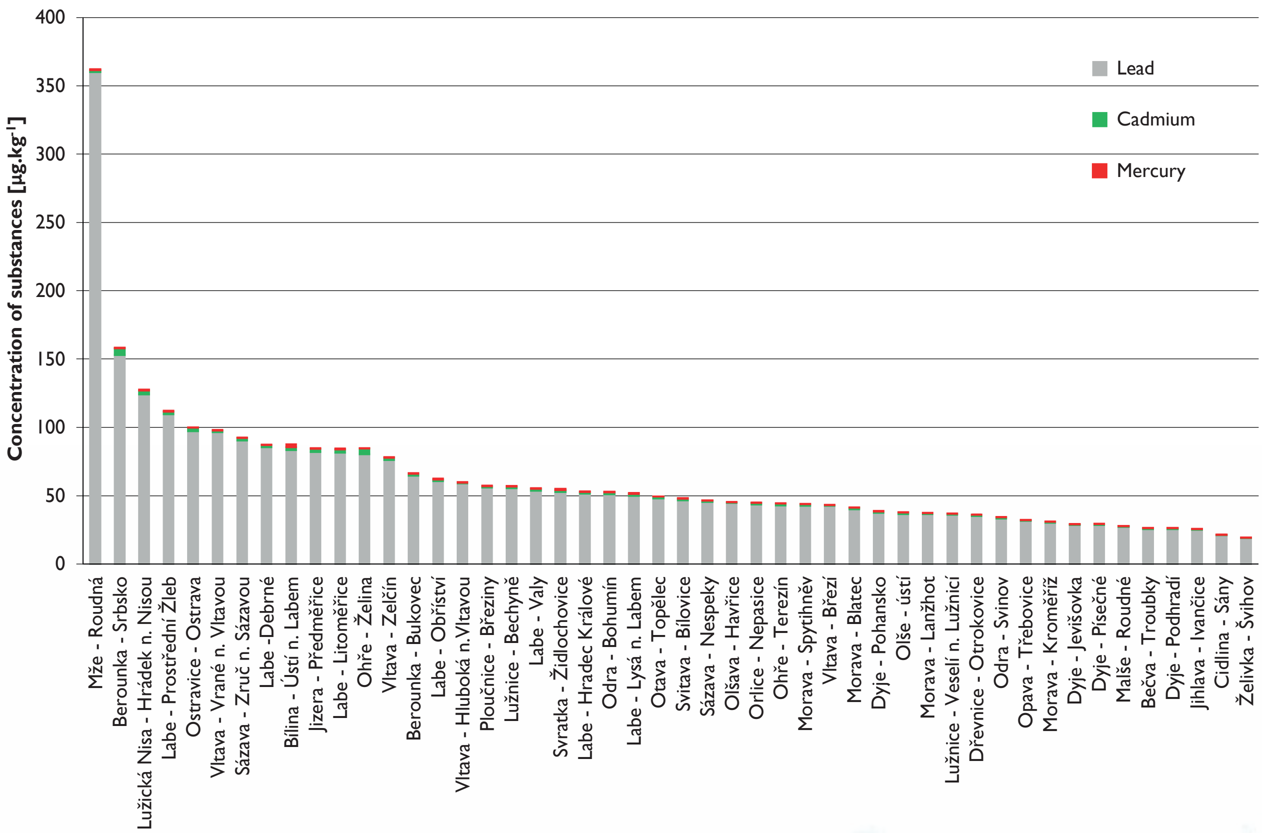
The highest concentrations of heavy metals in sediments were found in northern, western and central Bohemia (Figure 3.1.1). Above-limit values of lead and cadmium were recorded on the Mže River in Pilsen, on the Berounka River in Srbsko and on the Lusatian Neisse River in Hrádek nad Nisou. In contrast, high concentrations of mercury were found in the Bílina River in Ústí nad Labem, on the Elbe River in Litoměřice and Prostřední Žleb. For organic pollutants contained in sediments, the situation was somewhat different, with the majority being substances from the group of polyaromatic hydrocarbons (which are mainly produced by imperfect combustion and enter watercourses by leaching from the surrounding landscape). These substances were again found in high concentrations in the Morava (Svitava – Bílovice, Svratka – Židlochovice, Bečva – Troubky) and Oder (Olše – estuary, Oder – Bohumín) Basins. On the other hand, their lowest values were recorded on the Ohře in Terezín, the Želivka upstream from the Švihov reservoir and the Vltava in Hluboká nad Vltavou (Figure 3.1.2). The highest concentrations of phthalates (DEHP), which are used as plastic softeners, were recorded on the Bílina in Ústí nad Labem and on the Ohře in Želina. The highest levels of: chloralkanes, perfluorooctane sulfonates (PFOS – used as an impregnating agent), DDT and hexachlorobutadiene (which was found at the remaining sites only in very low concentrations – below the detection limit) were also found in the sediment at Bílina in Ústí nad Labem. Organic substances used as flame retardants (PBDEs) were found in the highest concentrations on the Elbe River in Hradec Králové and Lysá nad Labem. The highest levels of polychlorinated biphenyls (PCBs) were recorded on the Vltava River in Zelčín (the remaining sites were below the detection limit). Tributyltin was detected in sediment on the Elbe River in Litoměřice and Lysá nad Labem, but its concentration was well below the ICPER at both sites.

Similarly to sediments, elevated levels of lead and cadmium were found in suspended matters in the Berounka River in Serbia and the Lusatian Neisse. Similarly, high concentrations of mercury were found on the Bílina River in Ústí nad Labem. For priority organic substances, the situation was slightly different than for sediments. The highest concentrations of polyaromatic hydrocarbons were found on the Oder River in Bohumín and the Lusatian Neisse in Hrádek nad Nisou. The highest concentrations of phthalates (DEHP) were recorded on the Lusatian Neisse in Hrádek nad Nisou and on the Bílina in Ústí nad Labem. The highest concentrations of: pentachlorobenzene, PFOS, PCBs and organochlorine pesticides (DDT and hexachlorobenzene) were also found at the same time at Bílina. However, the highest levels of PBDEs and chloroalkanes were found on the Lusatian Neisse in Hrádek nad Nisou. High levels of tributyltin (compared to sediments) were found on the Svratka River in Židlochovice and the Lusatian Neisse River in Hrádek nad Nisou.

The highest concentrations of lead and cadmium were detected in suspended matters in the Ostravice River in Ostrava and in the Ohře River in Želina, where the highest mercury concentrations were also found. Among the organic pollutants monitored, substances from the group of polyaromatic hydrocarbons were again found at above limit values. Their highest loads were found in the Svitava River in Bílovice and the Ostravice River in Ostrava. The highest concentrations of polychlorinated biphenyls were found on the Elbe River in Litoměřice (values were well below the MCL). Organochlorinated pesticides (DDT) were found at the highest concentrations on the Elbe River in Litoměřice and on the Svitava River in Bílovice. The organic compounds dicofol, quinoxyfen, nonylphenol trifluralin, trichlorobenzene and hexachlorobutadiene were also recorded in sediments, sedimentable wash load and floating solids, but these substances were below the limit of quantification at most sites.

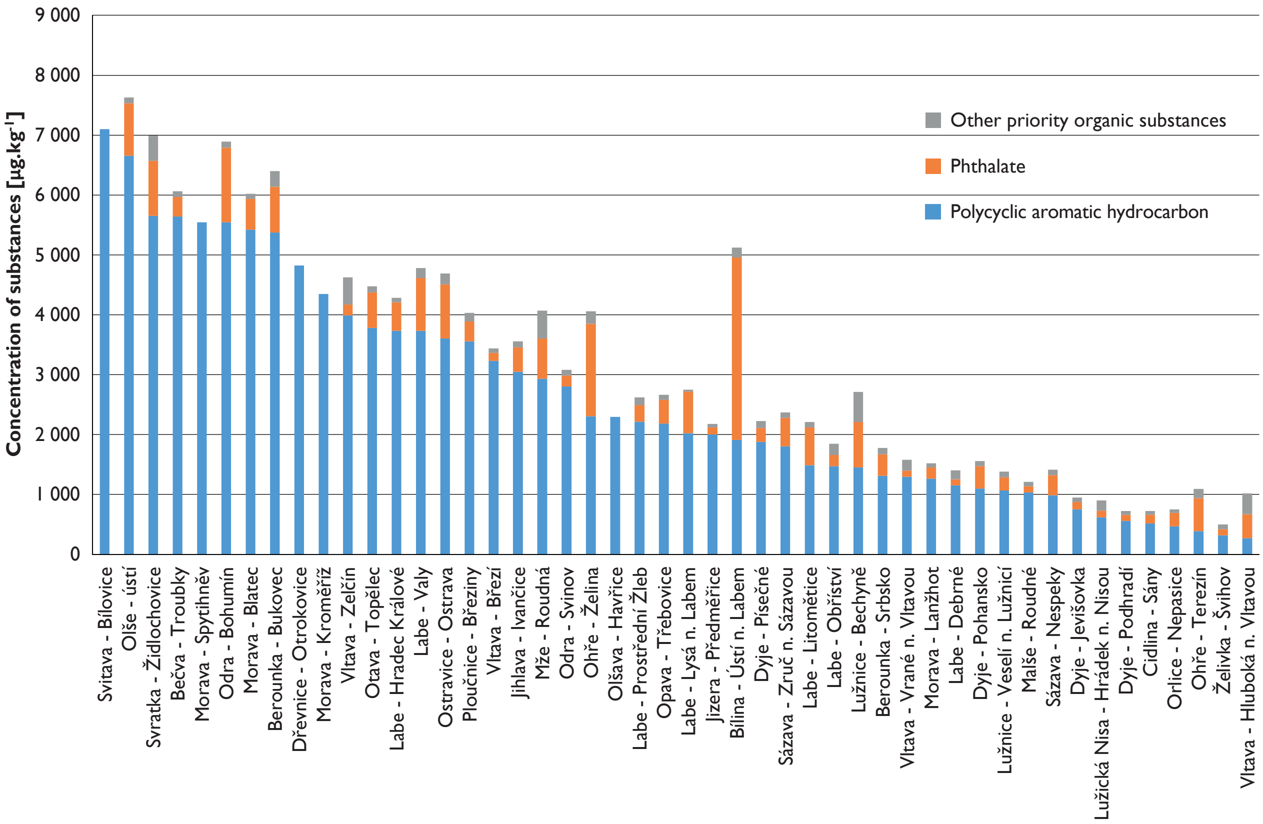
The MannKendall test was used for analyses of long-term trends in sediments (time series 2000–2022) and sedimentable floatables (2013–2022). An increasing trend in sediment was statistically confirmed at 9 sites (Fig. 3.1.4) for cadmium (the Thaya – Podhradí, the Dřevnice – Otrokovice and the Oder – Svinov), anthracene (the Elbe – Debrné, the Ploučnice – Březiny, the Vltava – Vrané nad Vltavou), indeno[1,2,3,-cd]pyrene (the Vltava – Hluboká nad Vltavou), sum 5PAHs (the Elbe – Debrné), hexachlorobutadiene (the Ohře – Terezín) and tributyltin (the Elbe – Litoměřice). Significantly increasing trends were observed in sedimentable floatables for cadmium (the Bílina – Ústí nad Labem, the Vltava – Zelčín), lead (the Bečva – Troubky),

Graph 3.1.1
Average concentrations of selected heavy metals in sediments at the monitored sites



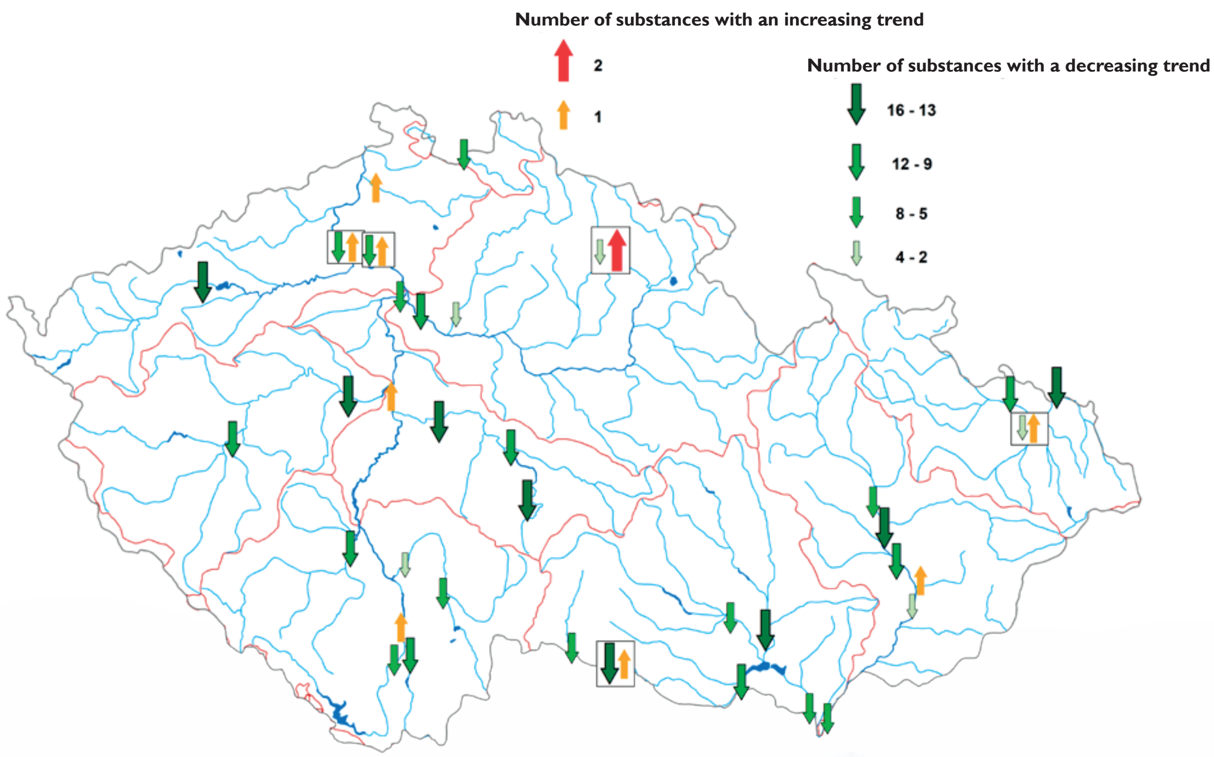
Source: CHMI

Graph 3.1.2
Average concentrations of priority organic pollutants in sediments at the monitored sites



Source: CHMI

Figure 3.1.4
List of sites with statistically confirmed trends for the priority substances monitored in sediments



Source: CHMI
Note: The arrows in the squares show the location where both increasing and decreasing trends were observed.

mercury (thee Olše – Ústí nad Labem), chloralkanes (the Svratka – Židlochovice), benzo[ghi]perylene, dicofol and tributyltin (the Thaya – Pohansko). A decreasing trend was observed at most of the monitored sites for almost all monitored substances. Statistically confirmed cases of decreasing trend were recorded: in sediments 330 (Fig. 3.1.4) and in sedimentable floatables 131.

Raw water quality

Data from 3,020 raw water abstraction points (133 surface water abstraction points and 2,887 groundwater abstraction points) from 591 operators were used to assess raw water quality in 2022. The treatability of raw water was assessed in 4 treatability categories according to Decree No 428/2001 Coll., as amended, see table with definitions of treatability categories.

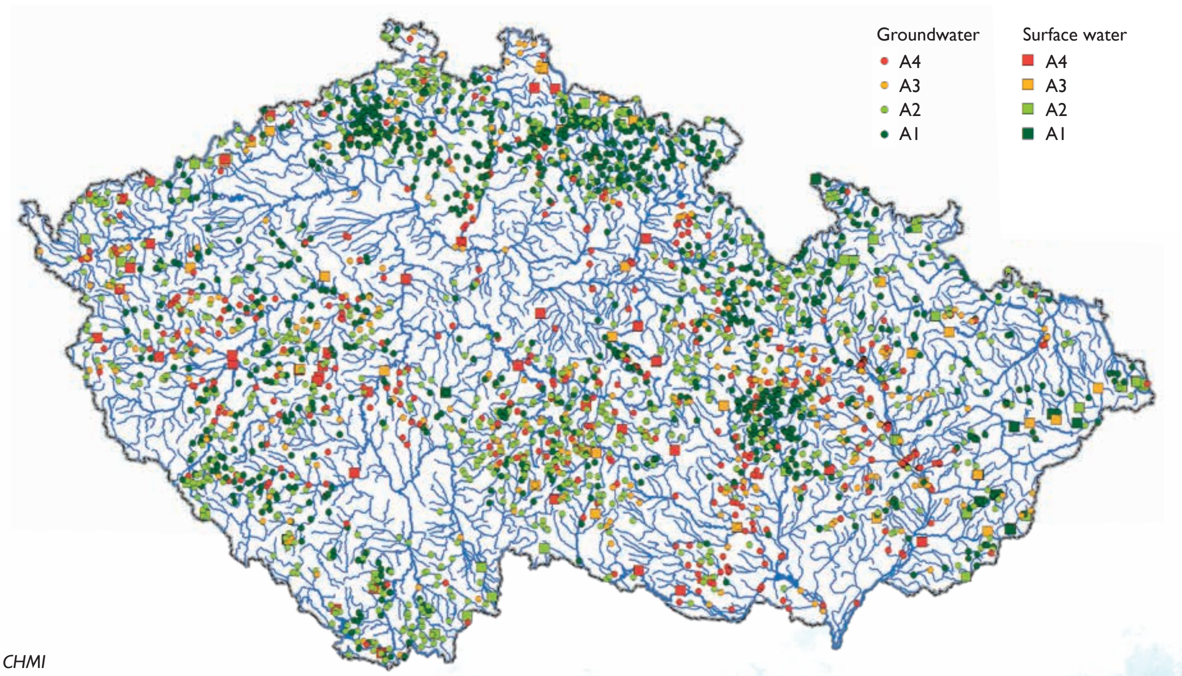
In total, more than 71% of abstraction points were of A2 or better quality in 2022. Surface sources of raw water are usually of worse quality than groundwater sources, hence the higher share of surface water abstraction points with worse treatability categories (only approximately 44% of the surface abstraction points were of A2 or better quality). When comparing the quality of raw water by regions, it can be observed that the best raw water quality (more than 80% of

Table 3.1.1
Editable categories and corresponding edit types

Category	Types of modifications
A1	Raw water treatment, possibly with disinfection to remove compounds and elements that may affect its further use, aimed particularly at decreasing the aggressiveness towards the water supply system materials including household installations (chemical and mechanical deacidification) together with elimination of smell and gas compounds by aeration. Simple filtration to remove suspended matters and improve quality.
A2	Raw water requires simpler treatment, e.g., coagulation filtration, single-degree de-ironing, demanganization or infiltration, slow biological filtration, treatment in rock environment together with final disinfection. Water stabilization is suitable for improving the water quality.
A3	Raw water treatment requires two- or multi-stage treatment through clearing, oxidation, de-ironing and demanganization with final disinfection or a combination of such processes. Other suitable processes include, e.g., use of ozone, active charcoal, auxiliary flocculants and flotation. More expensive methods (e.g., adsorption onto special materials, ion exchange, membrane processes) are only used exceptionally.
A4	Water of this quality can be exceptionally abstracted for production of drinking water under an exemption granted by the relevant regional authority. In order to become drinkable, such water needs to be treated through technologically demanding processes consisting in a combination of water treatments defined for the A3 category, while it is necessary to ensure stable quality of the water produced. Nevertheless, the preferred solution in such cases is the elimination of pollution causes or finding a new water resource.

Source: CHMI

Figure 3.1.5
Categories of raw water treatability at abstraction points in 2022

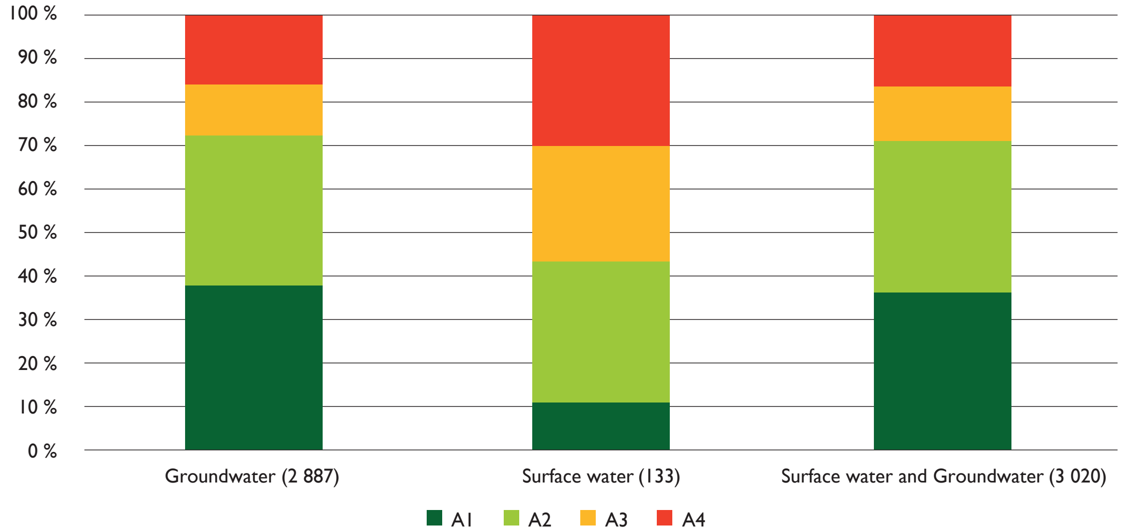


Source: CHMI

abstraction points in category A2 and better) in 2022 was in the Zlín Region (only 50% of abstraction points in category A2 and better).

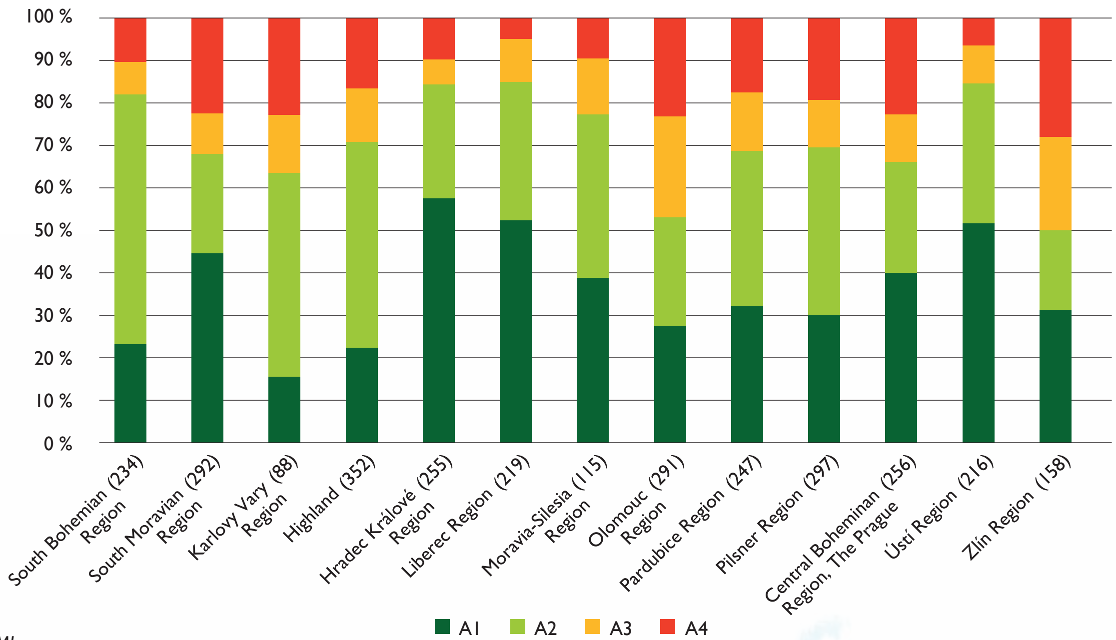
The most problematic for the quality of raw surface water in 2022 were microbiological indicators such as total organic carbon, adsorbable organically bound halogens (AOX), COD-Mn, metals such as iron and manganese, humic substances, pesticides such as metazachlor ESA and metazachlor OA (metabolites of the metazachlor herbicide used for treating oilseed rape), metolachlor ESA (metabolite of the herbicide metolachlor used for treating maize), AMPA (metabolite of the total herbicide glyphosate) and chloridazon-desphenyl (a metabolite of the herbicide chloridazon for treating beetroot until 2020). In the case of groundwaters, these are adsorbed organically bound halogens (AOX), metals such as iron and manganese, pesticides such as chloridazon-desphenyl and chloridazolam methyl-desphenyl (metabolites of the herbicide chloridazon used for treating beetroot until 2020), alachlor ESA (metabolite of the alachlor herbicide used for treating oilseed rape that has been banned since 2008), metazachlor ESA (metabolite of the metazachlor herbicide used for treating oilseed rape) and metolachlor ESA (metabolite of metolachlor herbicide used for treating maize) and acetochlor ESA (a metabolite of the herbicide acetochlor banned since 2014 and used mainly for treating maize). Nitrates were only of concern for 5.4% of the groundwater sources in 2022.

Graph 3.1.3
Categories of treatability by types of raw water sources



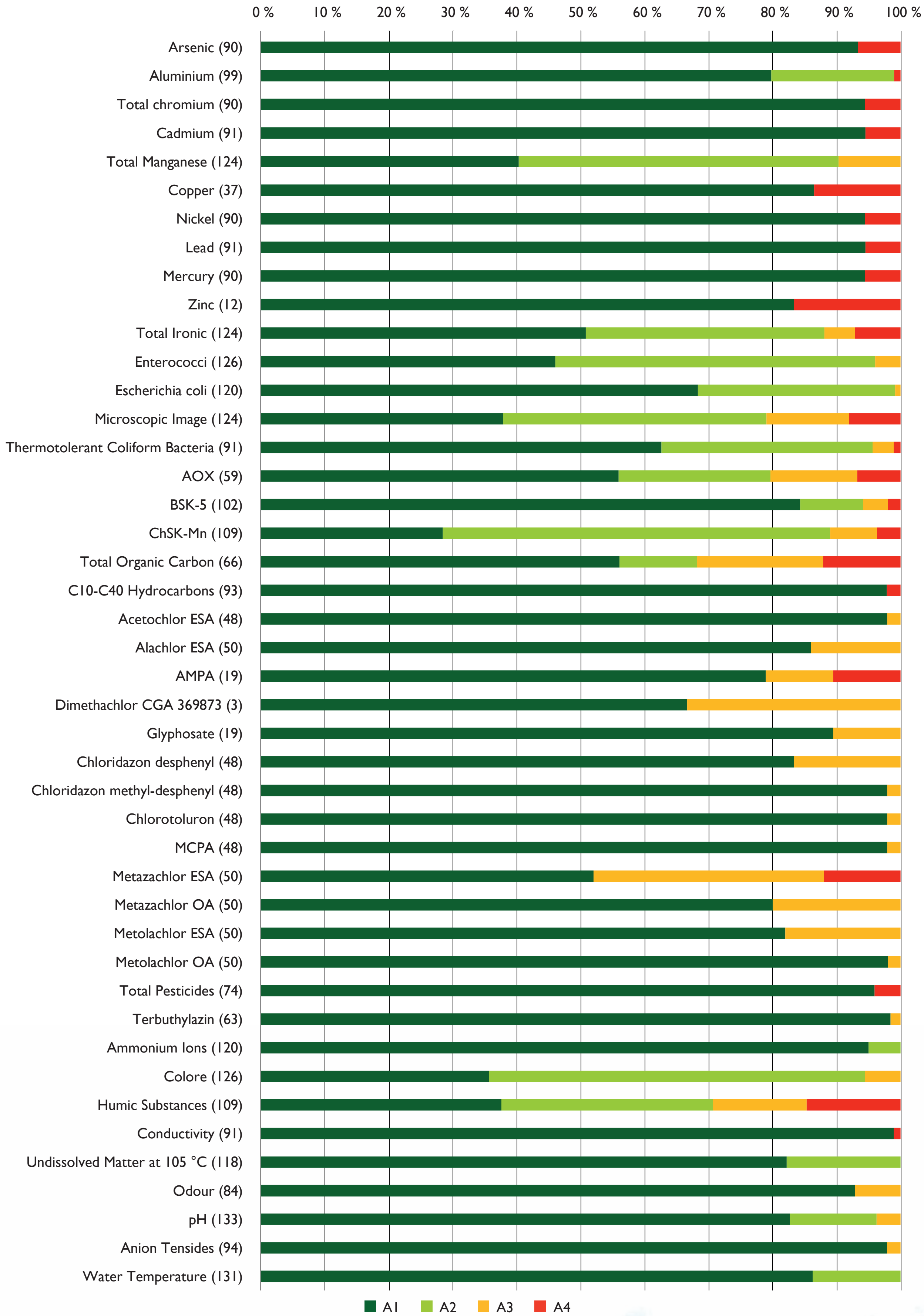
Source: CHMI
Note: The number of collection points is given in brackets.

Graph 3.1.4
Categories of treatability by regions



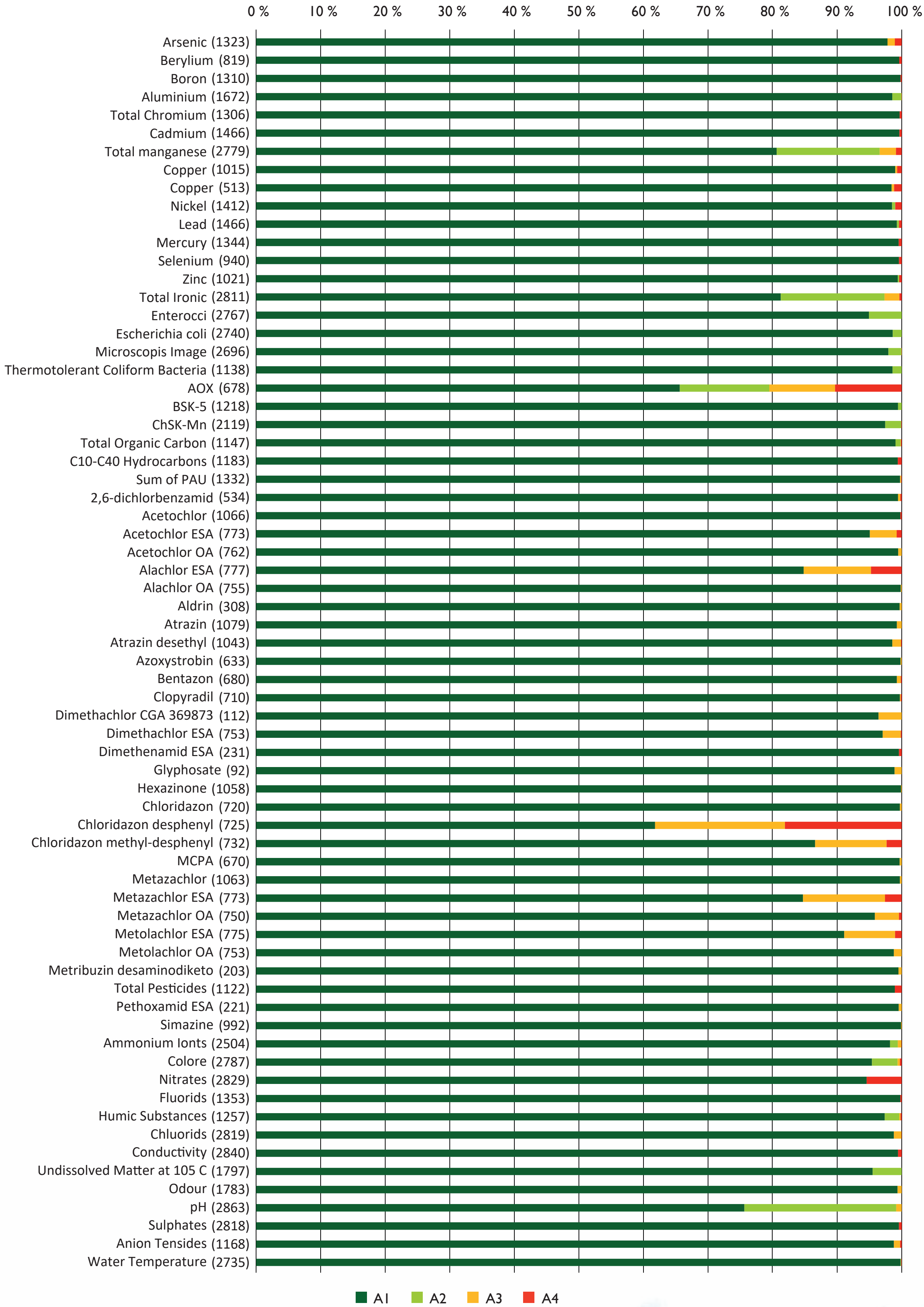
Source: CHMI
Note: The number of collection points is given in brackets.

Graph 3.1.5
Categories of surface water treatability for indicators most affecting water quality



Source: CHMI
Note: The number of collection points is given in brackets.

Graph 3.1.6
Categories of groundwater treatability for indicators most affecting groundwater quality



Source: CHMI
Note: The number of collection points is given in brackets.

Microcontaminants of surface water

Organic microcontaminants of surface waters are nowadays among the substances that have long been present in the whole territory of the Czech Republic for a long time. These are mainly residues of pesticides, which originate mainly from agriculture, and pharmaceuticals, radiopharmaceuticals, anti-corrosives and other specific substances from wastewaters discharged into watercourses. For two most important groups of such substances, an assessment of their occurrence in surface waters in 2022 was conducted.

Pesticides

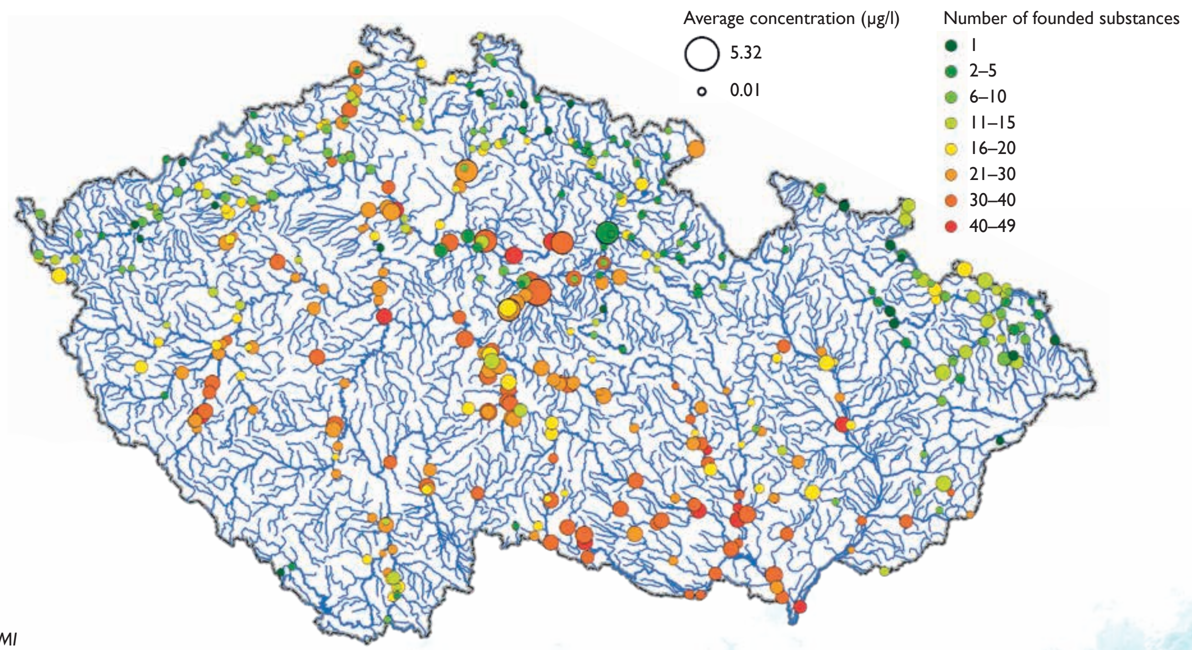
Pesticide substances and their metabolites are the most monitored by the water management laboratories of River Boards, s.e., from microcontaminants. For 2022, results from a total of 593 profiles (a total of 5,541 samples) for 262 individual analytes were processed. Pesticides were found at 562 profiles (94.7% of the profiles monitored) in a total of 4,688 samples (84.6% of samples). In 2022, a total of 153 pesticides and their metabolites were found in surface waters, of which 41 substances were found in more than 5% of the samples. The results are also consistent with the monitoring setup for these substances by individual River Boards, s.e. Where a wider range of substances are monitored, pesticides are found more frequently. Similar to 2021, metabolites of herbicides used to treat oilseed rape were found most frequently, both those currently used (metazachlor, pethoxamid, dimethoxamid) and those already banned (alachlor, acetochlor), maize (used: metolachlor, terbuthylazine, pethoxamid, dimethenamid; banned: atrazine, acetochlor), beet (metabolites of chloridazon banned since 2021), or total herbicide glyphosate and its metabolite AMPA. Of the fungicides, the most frequent was the banned substance tebuconazole.

Most substances were found at the profiles Sány – the Cidlina (49 substances), Senomaty – the Rakovnický Stream (48 substances), Luková – the Cidlina, Rajhrad – the Svratka (46 substances), Ivančice – the Rokytná, Kokšín – the Točnický Stream, Obříství – the Elbe (45 substances), Židlochovice – the Litava (44 substances), Havlíčkův Brod – the Šlapanka, Hradčany – the Lubě, Lanžhot – the Morava, Pod Bihankou – the Želetavka, Tovačov – the Blata, the mouth – the Svitava (43 substances), Vlásenický Dvůr – the Cerekvický Stream (tributary of Želivka) (42 substances), Pikovice – the Sázava, Rančice – the Třeboninský Stream (41 substances), Valy – the Elbe, Veverská Bítýška – the Svratka, Lysá nad Labem – the Elbe (40 substances).

The highest total concentrations of pesticides were found at the profiles Rohozec – the Brslenka (maximum 9.63 μg/l, average 5.16 μg/l), Hradec Králové – the Piletický Stream (maximum 17.5 μg/l, average 4.98 μg/l), Bykáň – the Opatovický Stream (maximum 8.17 μg/l, average 4.53 μg/l), Nový Bydžov – the Králický Stream (maximum 14.3 μg/l, average 4.32 μg/l), Bakov nad Jizerou – the Kněžmostka (maximum 10.09 μg/l, average 4.31 μg/l), Vrchlice HS – the Švadlenka tributary (maximum 9.61 μg/l, average 4.04 μg/l), Senomaty – the Rakovnický Stream (maximum 22.66 μg/l, average 3.89 μg/l) and Kokšín – the Točnický Stream (maximum 13.12 μg/l, average 2.88 μg/l).

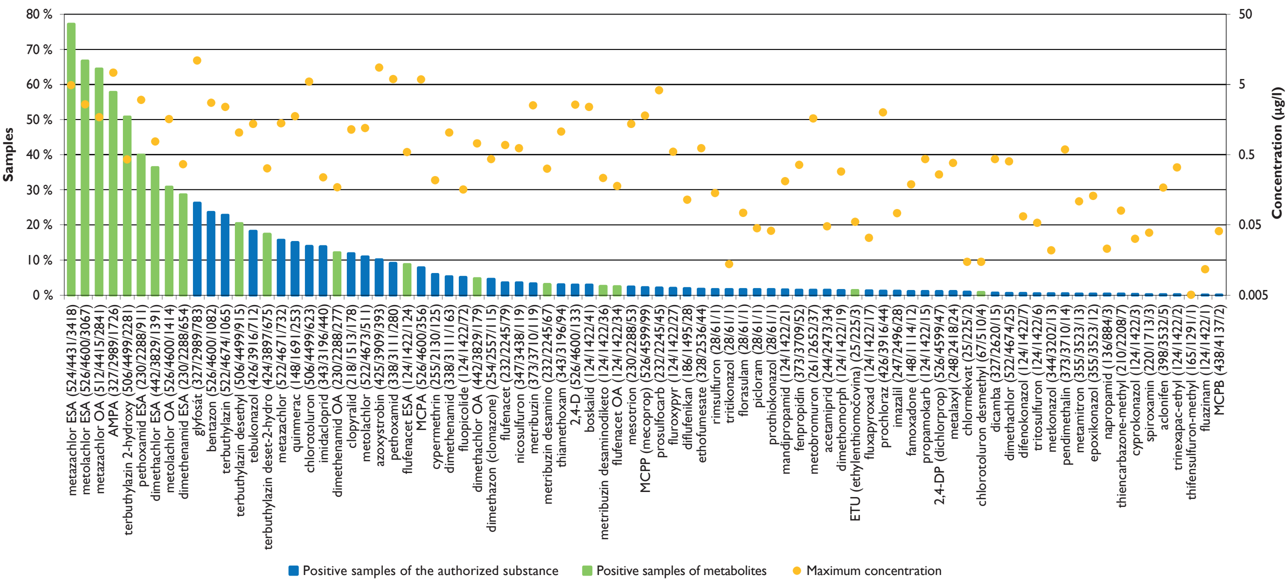
Terraced run-off, The Vír Reservoir, The Písečenský Stream (Author: Merunková Iva)

Figure 3.1.6
Pesticides in the Czech Republic by number and concentration in 2022



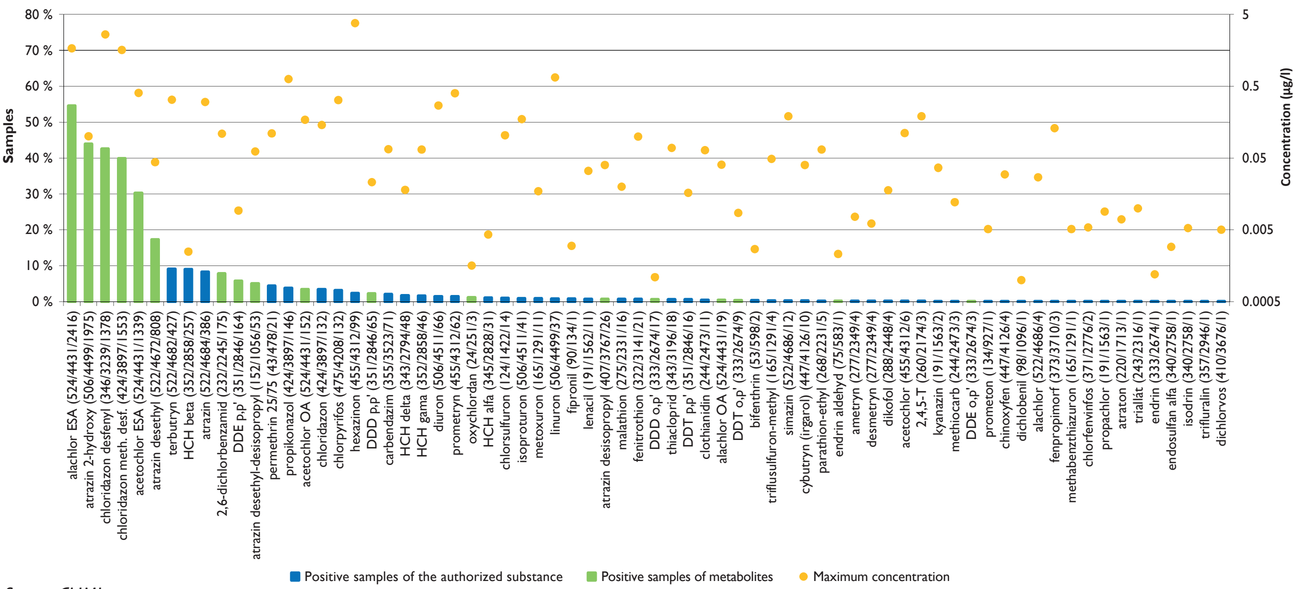
Source: CHMI

Graph 3.1.7
Frequency of occurrence of permitted pesticides and their maximum concentrations in surface waters in the Czech Republic in 2022



Source: CHMI
Note: Brackets for each substance indicate the number of profiles / number of samples / number of positive samples.

Graph 3.1.8
Frequency of occurrence of banned pesticides and their maximum concentrations in surface waters in the Czech Republic in 2022



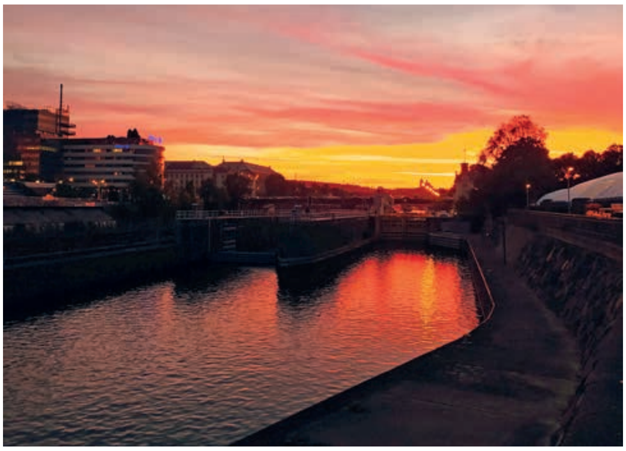
Source: CHMI
Note: Brackets for each substance indicate the number of profiles / number of samples / number of positive samples.

By the water of the Hrabětice Stream, Hrabětice (Author: Procházková Lenka)

Pharmaceuticals

Considerable amounts of pharmaceuticals and their metabolites enter surface water from municipal sources. In 2022, monitoring results from 355 profiles (a total of 2,910 samples) for 80 different analytes were processed by the River Boards, state enterprises. The results partly reflect how monitoring of the substances is set by the River Boards. Where a wider range of substances are monitored, pharmaceuticals are found more frequently. Similar to 2021, the occurrence of pharmaceuticals was most prominent in smaller watercourses that drain large urban areas. Pharmaceuticals were found at 332 profiles (93.5% of the profiles monitored) in a total of 2,626 samples (90.2% of the samples). The most frequently found substances were oxypurinol (gout drug), telmisartan (antihypertensive), oxazepam (antidepressant), metformin (diabetes drug), gabapentin (antiepileptic, analgesic), tramadol (analgesic), diclofenac (antirheumatic, analgesic), iomeprol (contrast agent), valsartan (antihypertensive), ibuprofen and its metabolites 2-hydroxy and carboxy (analgesic, antipyretic, antiphlogistic), carbamazepine (antiepileptic), metoprolol (antihypertensive), hydrochlorothiazide (diuretic), venlafaxine (antidepressant), paracetamol (analgesic, antipyretic), the antibiotics clarithromycin and sulfamethoxazole, irbesartan (antihypertensive), sulfapyridine (antibiotic), fexofenadine (antihistamine), naproxen (analgesic), iopromide (contrast agent) and furosemide (diuretic).

The highest number of pharmaceuticals was found at the profiles of Trhové Dušníky – the Příbramský Stream (55 substances), Benešov – the Benešovský Stream, Humpolec – the Pstružný Stream (48 substances), Dolní Chlum – the Rakovnický Stream (46 substances), Vlašim – the Blanice (45 substances), Dolní Kramolín – the Kosový Stream (tributary of the Mže), Klatovy – the Drnový Stream, Rokycany – the Klabava (44 substances), Kralupy nad Vltavou – the Zákolanský Stream, Senešnice – the Novoveský Stream (43 substances), Běleč – the Živný Stream,

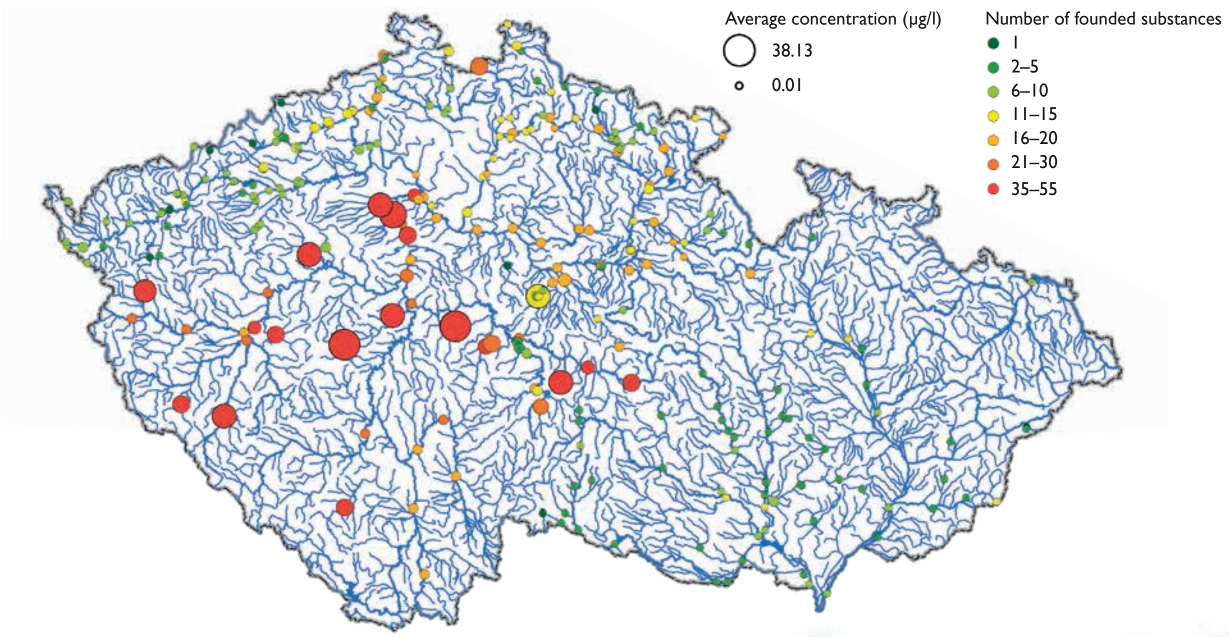


The Štvanice (Author: Hubalová Petra)

Radonice – the Zubřina (40 substances), Nové Dvory – the Sázava, Slaný – the Červený Stream (37 substances), Bavoryně – the Červený Stream, Roztoky – the Únětický Stream (36 substances), Pilsen Bukovec – the Berounka (35 substances).

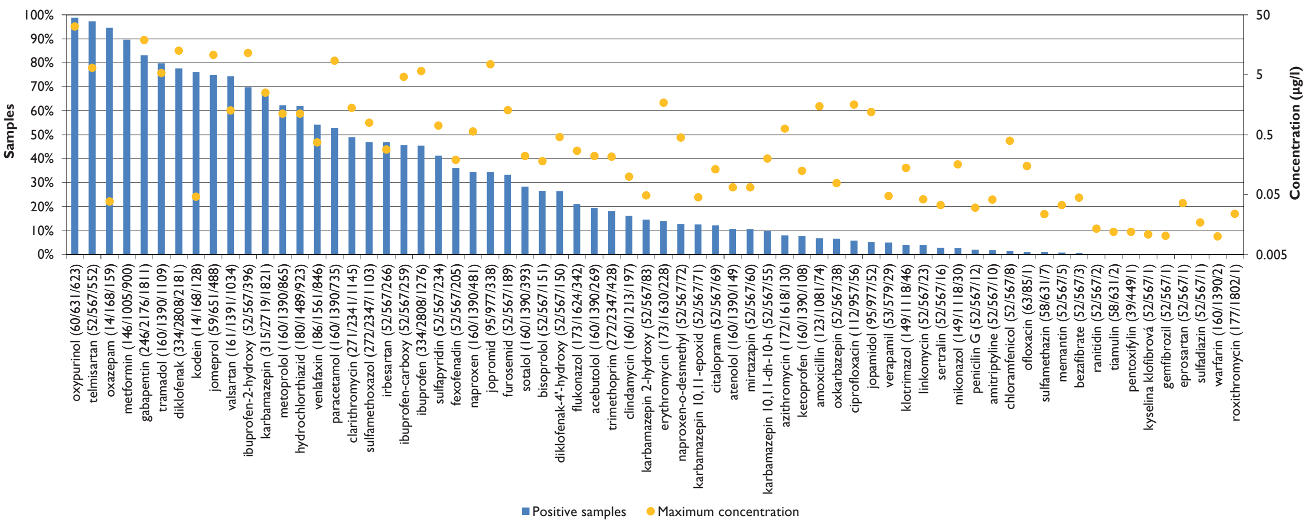
Similarly to 2021, the highest total pharmaceutical concentrations were found at the profiles of Trhové Dušníky – the Příbramský Stream (maximum 106.09 µg/l, average 38.06 µg/l), Benešov – the Benešovský Stream (maximum 81.09 µg/l, average 26.29 µg/l), Klatovy – the Drnový Stream (maximum 45.38 µg/l, average 19.8 µg/l), Humpolec– the Pstružný Stream (maximum 38.76 µg/l, average 19.77 µg/l), Slaný – the Červený Stream (maximum 37.96 µg/l, average 18.87 µg/l), Vrchlice – the Vrchlice HS (maximum 108.87 µg/l, average 18.05 µg/l), Velvary – the Červený Stream (maximum 35.59 µg/l, average 16.87 µg/l), Dolní Chlum – the Rakovnický Stream (maximum 41.86 µg/l, average 15.59 µg/l), Senešnice – the Novoveský Stream (maximum 39.03 µg/l, average 15.26 µg/l) and Dolní Kramolín – the Kosový Stream (maximum 38.26 µg/l, average 12.53 µg/l).

Figure 3.1.7
Pharmaceuticals found in the Czech Republic by number and concentration in 2022



Source: CHMI
Note: The results of the monitoring are affected by the fact that the individual River Board, s.e., monitors a different range of pharmaceuticals and a different number of profiles.

Graph 3.1.9
Frequency of occurrence of pharmaceuticals and maximum concentrations in surface waters in the Czech Republic in 2022



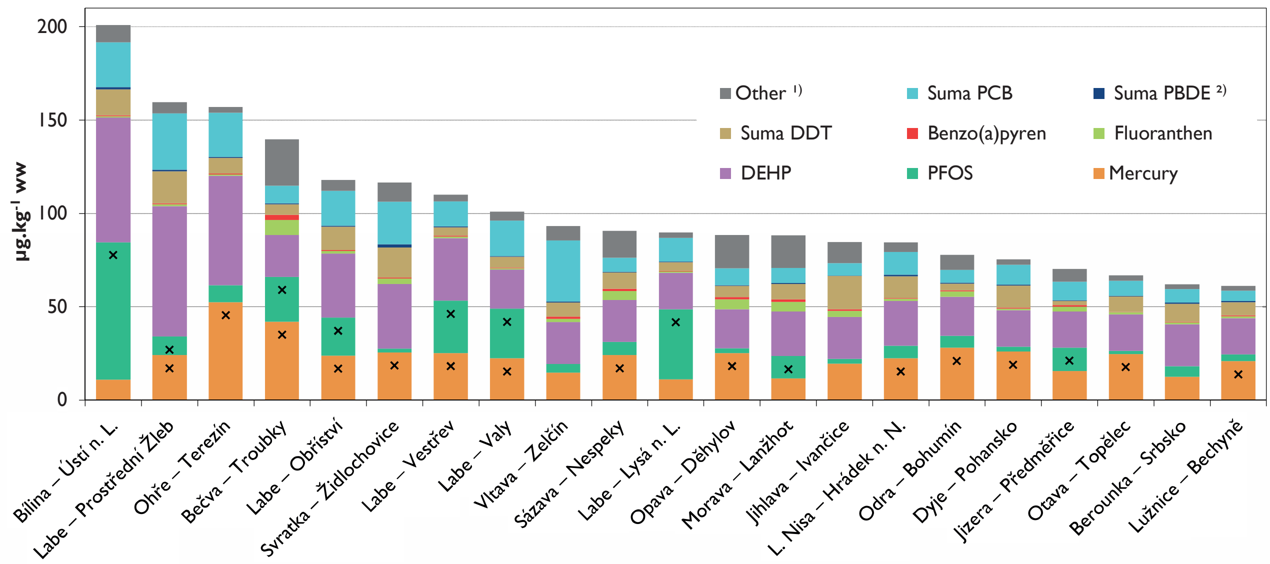
Source: CHMI
Note: Figures in the brackets indicate the number of profiles / number of samples / number of positive samples.

Accumulation biomonitoring of surface waters in 2022

In 2022, aquatic organism contamination by dangerous substances was monitored at 21 river profiles of significant Czech and Moravian rivers, which are covered by surface water situational monitoring. The occurrence of substances that are mostly below the limit of quantification in water samples but accumulate well in aquatic organisms is monitored. The monitoring concerns fish (common chub), fish fry and benthic organisms mainly larvae of caddisflies (Hydropsyche sp.), leeches (Erpobdella sp.) and barnacles (Gammarus sp.).

A total of more than 60 hazardous substances were analysed, of which eight were selected for more detailed evaluation. These are polychlorinated biphenyls (sum of PCBs), which have been intensively used industrially in the past. Furthermore, DDT and its metabolites (DDT sum) as representatives of chlorinated pesticides. Polybrominated diphenyl ethers (sum PBDEs) used in many materials as flame retardants. Di(2-ethylhexyl)phthalate, used at the same time mainly as a plastic softener. Perfluorinated compounds (PFOS), used in the past for example for impregnation. Fluoranthene and benzo(a)pyrene as representatives of polyaromatic hydrocarbons which are formed during incomplete combustion. The other organic pollutants monitored that were found at concentrations exceeding the limit of quantification (16 substances) are listed as the sum of the other hazardous substances and represent on average 8% of the total content of substances detected at the profiles.

Graph 3.1.10
Findings of hazardous organic substances in fish fry in 2022



Source: CHMI
Note: [1] Sum of other hazardous substances monitored at the sites.
[2] Exceeds the EQS at all sites.
x Exceeds the NEC.

The metal monitored was mercury, as its distribution in the environment is a current global concern. Most of the substances are classified as human carcinogens and endocrine disruptors with serious adverse effects on the reproductive system and fetal development. All the substances are persistent and accumulate in the environment and food chains. The measured values are converted to wet weight (ww) and summarised for fish fry in Graph 3.1.10.

For indicators that have environmental quality standards (EQS) set in Government Regulation No. 401/2015 Coll., a comparison with these standards was made for all monitored matrices. The highest total concentrations of the monitored substances were found at the Bílina – Ústí nad Labem profile (highest measured PFOS content), then at the Elbe – Prostřední Žleb profile (highest measured DEHP content) and Ohře – Terezín, where the highest mercury concentration was measured. As regards polyaromatic hydrocarbons, the EQS for fluoranthene (30 $\mu g.kg^{-1}$) and for benzo(a)pyrene (5 $\mu g.kg^{-1}$) were determined, which were not exceeded in either case in the matrix of the fish fry. This is in contrast to the matrix of benthic organisms where the EQS was exceeded in 43% of the profiles for benzo(a)pyrene and in 14% for fluoranthene. For PFOS, the EQS (9.1 $\mu g.kg^{-1}$) was exceeded in 43% of the profiles monitored in the matrix of gastropods and only in benthic organisms and fish at the Bílina – Ústí nad Labem profile. The mercury concentration in the fish fry matrix exceeded the NEC (20 $\mu g.kg^{-1}$) at all monitored profiles, in the fish fry at 67% of the sites and in the benthos the value of 20 $\mu g.kg^{-1}$ was exceeded at 5 sites (24%). The PBDE sum indicator exceeded the NEC (0.0085 $\mu g.kg^{-1}$) at all profiles by several orders of magnitude, similarly to previous years.

Monitoring of aquatic organisms provides information that cannot be detected by analysis of water samples, and results from several matrices confirm complex contamination of the aquatic ecosystem. The information obtained is used to assess the chemical and ecological status of water bodies and to decide on measures to be taken to improve their status.

3.2 Groundwater quality

In 2022, 704 sites were observed in the state groundwater quality monitoring network, including 202 springs, 226 shallow wells, and 276 deep aquifers. A total of 321 quality indicators were monitored. Indicators from four main groups (basic indicators, metals, polar pesticides and pharmaceuticals) were monitored at least once a year at most sites. Other groups of indicators were analysed at a selected smaller number of sites where a higher number of samples were taken in 2022 as part of the extended situational monitoring in spring. The number of sites exceeding limit values of monitored substances in groundwaters was slightly lower compared to previous years, with a slightly decreasing trend from 2020 onwards.

Monitoring of springs documents natural drainage of groundwaters, particularly in from the basement and local drainage of chalk structures. Shallow aquifers are concentrated mostly in the alluviums of the Elbe, Orlice, Jizera, Ohře, Thaya, Morava, Bečva, Oder and Opava Rivers – these groundwaters are harm-prone due to their higher hydraulic conductivity and thus with fast progress of pollution. Deep aquifers are concentrated particularly in the areas of the Bohemian Cretaceous Basin, České Budějovice Basin and Třeboň Basin and they monitor quality of groundwaters with deep water circulation.

The results concerning groundwater quality in 2022 were assessed by comparing the values of groundwater quality indicators with limit values for groundwater in accordance with Decree No. 5/2011 Coll., and in accordance with Directive of the European Parliament and of the Council 2006/118/EC – Annex I. An output of the assessment is also a map for indicators from two groups of pollutants monitored in groundwaters, namely nitrogenous substances and pesticides. The assessment included pollutants that exceeded the aforementioned criteria in groundwaters at least at two monitoring sites in 2022. The frequency of some pesticide occurrence (e.g., glyphosate, AMPA, metabolites of dimethachlor and chlorothalonil) may be affected by the fact that the scope of monitoring is limited to selected sites.

The most significant indicators of groundwater pollution compared to the limit values are pesticides (metabolites of herbicides and fungicides used mainly for treating crops such as oilseed rape, maize, beetroot and cereals), inorganic substances (nitrates, ammonia ions, nitrates and phosphates), determination of organic substances in aggregate (COD_{Mn} and DOC), metals (barium, manganese, cobalt, arsenic and cadmium), TOL (toluene and 1,2-cis-dichloroethylene) and PAHs (phenanthrene and chrysene).

The results of the groundwater quality assessment in 2022, with respect to the most frequently occurring monitored substances of each group, are a confirmation of results from the previous years. The percentage of exceedances of limits for given substances is affected by the significantly lower extent of groundwater quality monitoring in the autumn monitoring cycle, when monitoring extent was given by reduced funds available. Such influence on the assessment was partially

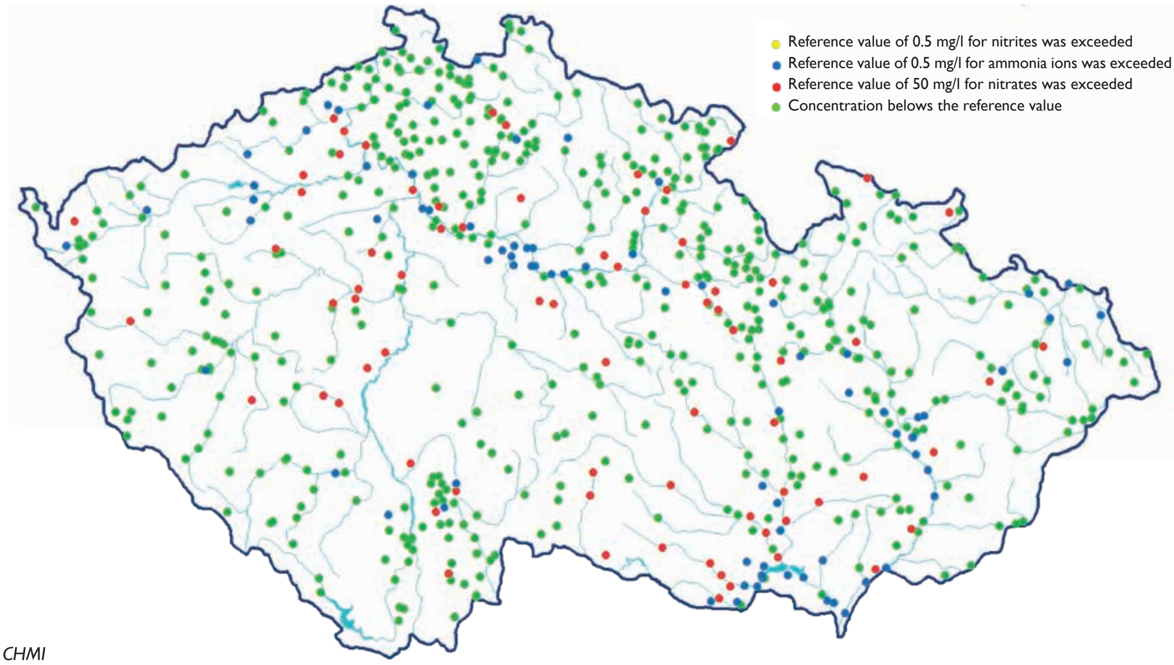
Table 3.2.1
Number of sites exceeding limits for groundwater in at least one indicator in 2022, comparison with 2021 and 2020

Objects	Number of sites	Number of sites exceeding limits for groundwater	% of sites exceeding limits for groundwater		
			2022	2021	2020
Shallow aquifers	226	212	93.8	96.0	95.5
Deep aquifers and springs	478	350	73.2	75.2	76.2
All sites	**704**	**562**	**79.8**	**81.9**	**82.4**

Source: CHMI

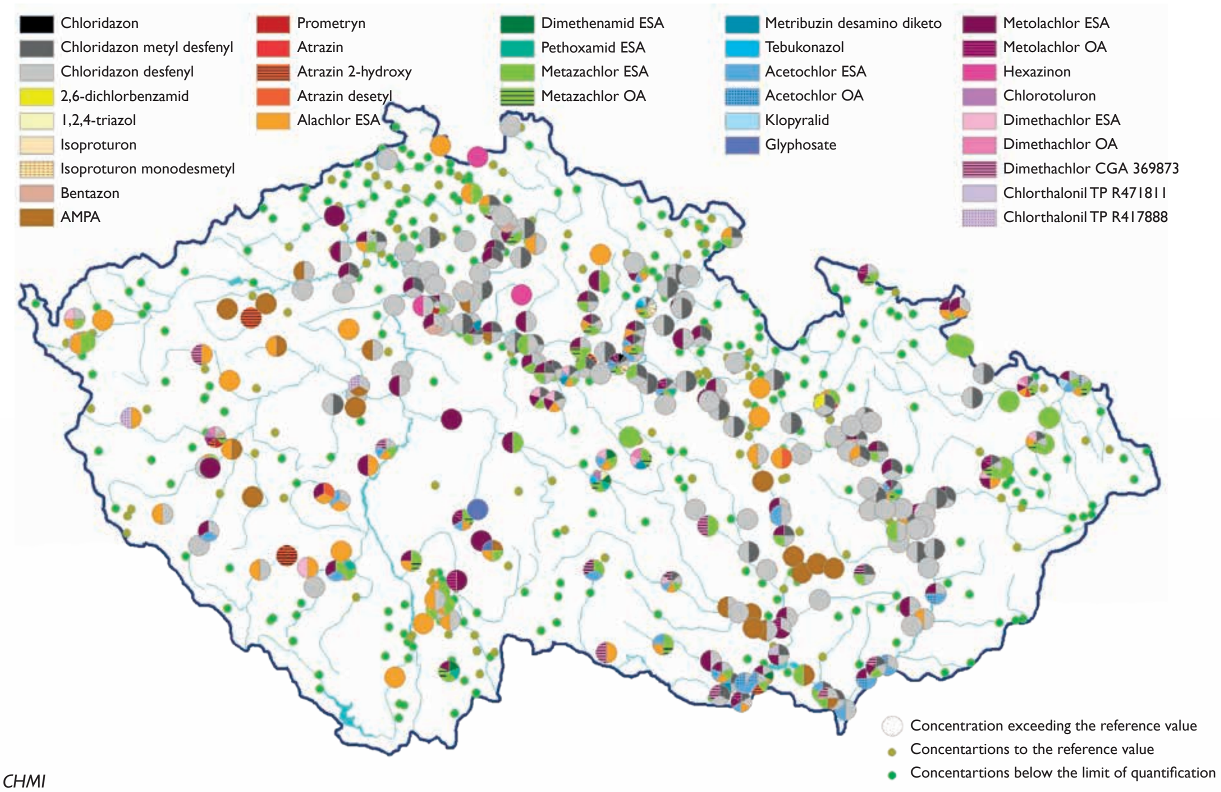
eliminated in 2022 by the fact that the monitoring in spring was, by contrast, quite extensive. In 2022, all groundwater types of sites, including shallow wells, where groundwater is more vulnerable to contamination, showed slightly better groundwater quality values in terms of foreign substance content compared to the previous three years. The assessment of groundwater monitoring in the following years will be important for possible confirmation of this trend.

Figure 3.2.1
Nitrogen concentrations in groundwaters in 2022

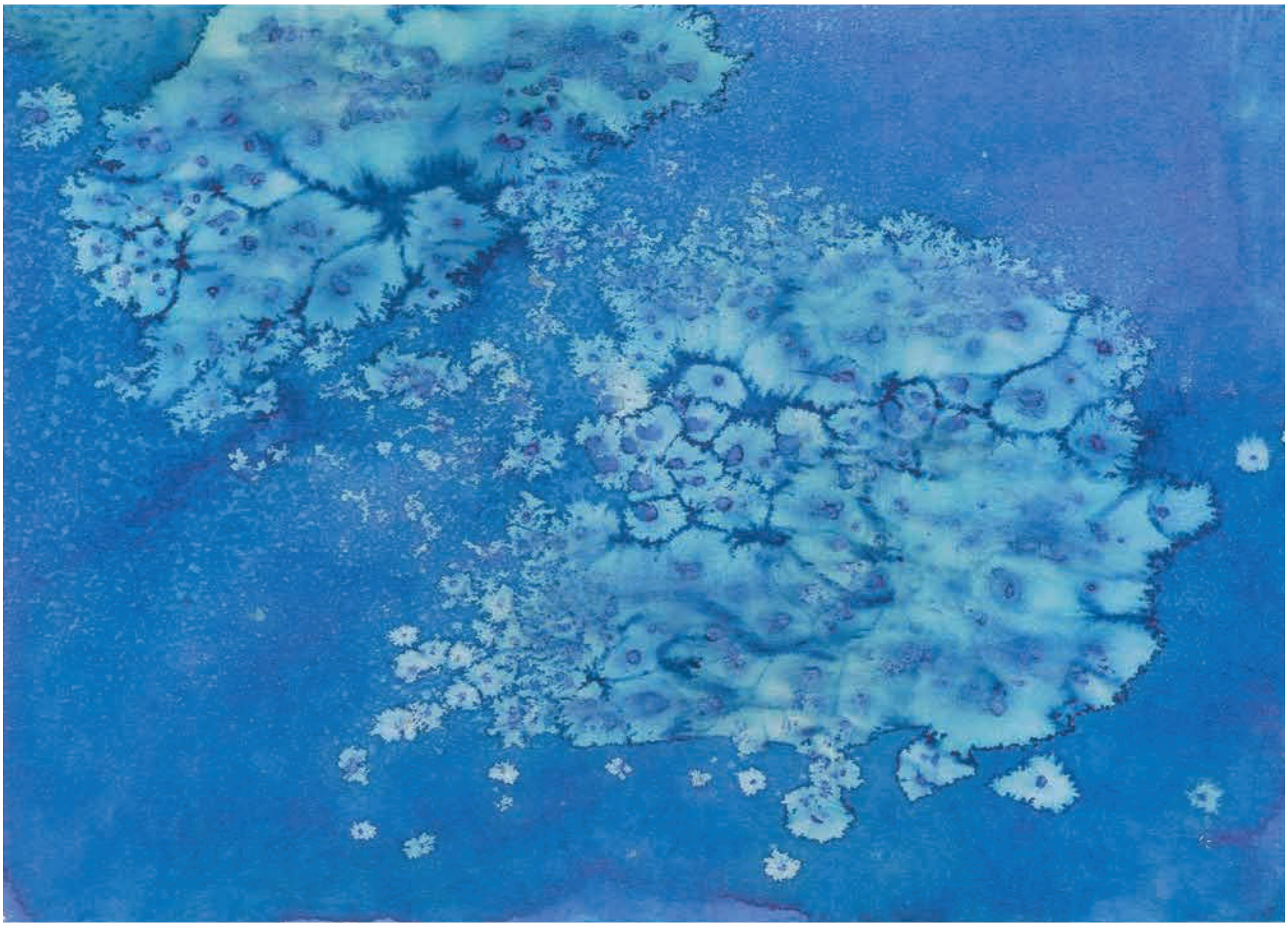


Source: CHMI
Note: Exceeding the limits set by Decree No. 5/2011 Coll.

Figure 3.2.2
Pesticide concentrations in groundwaters (substances with more frequent exceedances) in 2022



Source: CHMI
Note: Exceeding the limits set by Decree No. 5/2011 Coll., on defining hydrogeological regions and groundwater bodies, the assessment method of the status of groundwaters and requirements for programmes ensuring and assessing groundwater situation, as amended, and Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration.



M. Doležal – The transformation of water, Special and Practical Primary School Březinova, Jihlava

4. WATER USE

The monitoring of data on groundwater and surface water abstractions and on discharged waters is governed by Decree No. 431/2001 Coll., on the content of water balance, the method of its compilation and on data for the water balance. In 2022, we saw a year-on-year increase in the amount of surface water and groundwater abstraction, while the volume of groundwater abstraction and discharged waters decreased.

Pursuant to Section 10 of Decree No. 431/2001 Coll., the extent of reported data changed after 2001 – water abstractions, waste water and mine water discharges exceeding 6,000 m³ per year or 500 m³ per month are registered. The source documents for ascertaining the data are the reports submitted to the Czech Statistical Office (the 'CSO') by the respective river basin administrators before 31 March of the following year. The data for 2022 were classified based on the CZ-NACE according to Eurostat. The comparison of data for 2021 and 2022 was based primarily on final official data of the Czech Statistical Office (www.czso.cz). Table 4.1 shows detailed information about classification of surface water and groundwater abstractions, wastewater and mine water discharge in surface waters under the CZ-NACE. The classification also applies to Tables 4.1.1, 4.2.1 and 4.3.1 below.

Table 4.1
Classification of users in groups under the CZ-NACE classification

Public water supply networks	CZ-NACE 36
Public sewerage systems (excl. transfers)	CZ-NACE 37
Agriculture (incl. irrigation), forestry and fishing	CZ-NACE 01 – 03
Energy sector (electricity and heat generation and distribution)	CZ-NACE 35
Industry (incl. extraction of mineral resources – excl. energy sector)	CZ-NACE 05 – 33
Other (incl. construction industry)	CZ-NACE 38 – 96
Total (excl. fishponds and transfers)	CZ-NACE 01 – 96

Source: CSO

4.1 Surface water abstractions

From the longer-term perspective, the annual volume of surface water abstracted decreased every year since 2016. However, the trend reversed in 2022, the total volume of surface water abstracted increased from 986.8 million m³ to 1,089.5 million m³.

The decrease in surface water abstractions compared to 2021 was only in the industry sector (by 2.9%). Abstractions for agriculture increased by 33.2% (by 6.9 million m³) and for energy sector by 22.4% (by 98.6 million m³), in the category of other abstractions including construction, it increased by 4.8%, and for water supply for public use by 0.9%.

The significant increase in surface water abstraction in the energy sector was mainly due to the increased abstraction for flow cooling at the Mělník power plant and at the Opatovice power plant (administered by the Elbe River Board, s.e.), where it was necessary to increase the production of electricity from coal as a result of the energy crisis on the European market caused by the Russian aggression in Ukraine and the subsequent shortage of natural gas.

Surface water abstraction only deceased in the territory administered by the Oder River Board, s.e., in 2022 (by 2.8%), while the other River Boards, s.e., saw increases, most notably the Elbe River Board (by 25.3%), the Ohře River Board (by 4.8%), the Morava River Board (by 2%) and the Vltava River Board (by 1.9%).

Exploitation of water sources dropped significantly at all levels after 1990 when valuation of water management services was adjusted and the structure of industrial and agricultural production changed. This trend can be seen in Graph 4.1.1. Surface water abstractions for public water supply networks dropped from 744.9 million m³ in 1990 to 309.0 million m³ in 2022, which means in 2022 was consumed only 41.4% of the 1990 abstraction volume. Abstractions in agriculture decreased from 97.2 million m³ in 1990 to 27.7 million m³ in 2022, i.e., only to 28.4% of the abstraction in 1990. The most significant drop was in industry from 830.1 million m³ in 1990 to 201.5 million m³, i.e., only to 24.2% of the 1990 abstraction volume. In comparison with 1990, abstractions fell also in the energy sector: from 1,060.9 million m³ in 1990 to 538.1 million m³, i.e., to 50.7%.

Table 4.1.1
Surface water abstractions by customers over 6,000 m³ /year or 500 m³ /month in millions of m³ in 2022

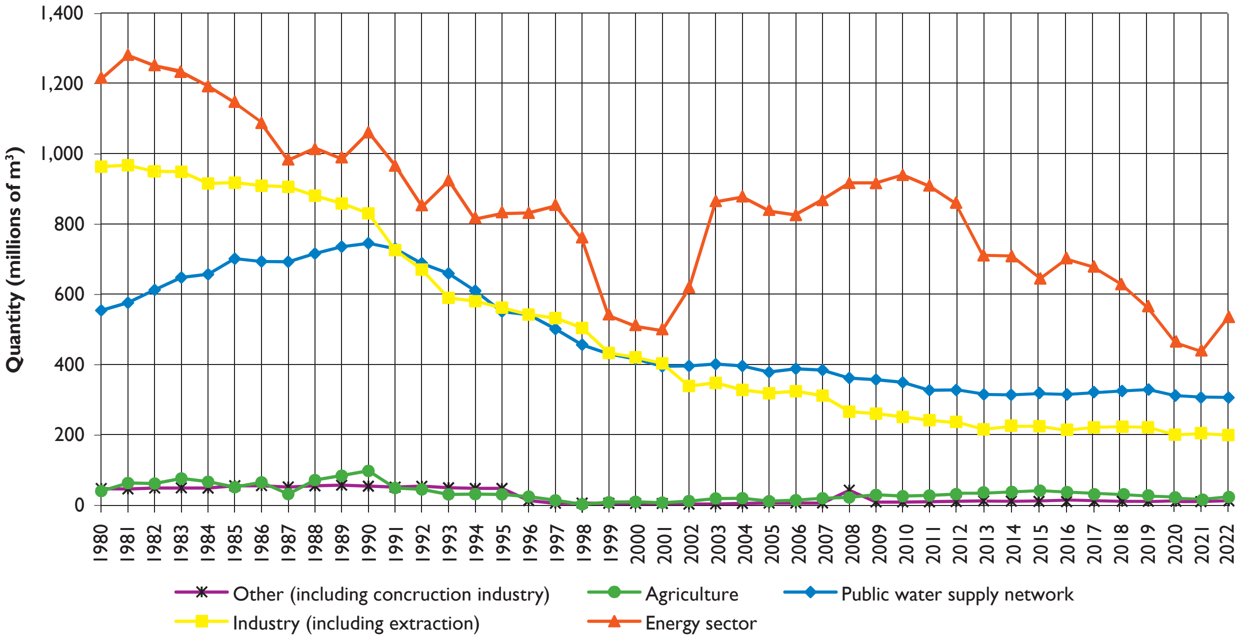
River Board, s.e.	Public water supply networks		Agriculture incl. irrigation		Energy sector		Industry incl. extraction		Others incl. construction and public sewerage systems		Total	
	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number
Elbe	33.1	25	9.4	67	332.5	11	83.6	62	2.4	92	**461.0**	**257**
Vltava	139.7	39	1.8	21	53.9	14	26.6	55	8.2	83	**230.2**	**212**
Ohře	40.2	19	2.1	44	34.5	7	34.1	43	0.8	31	**111.7**	**144**
Oder	59.2	23	0.0	1	7.1	15	46.3	32	0.5	25	**113.1**	**96**
Morava	36.8	36	14.4	43	110.1	9	10.9	53	1.3	60	**173.5**	**201**
Total	**309.0**	**142**	**27.7**	**176**	**538.1**	**56**	**201.5**	**245**	**13.2**	**291**	**1,089.5**	**910**

Source: River Boards, s.e.

Nevertheless, the abovementioned facts do not imply reduction in anthropogenic impact on water resources. For instance, so-called 'irreversible consumption' (the difference between abstracted and discharged volumes caused mainly by evaporation in cooling towers of thermal and nuclear power plants) in the energy sector has grown (which is due to increasing production of electricity in the Czech Republic). Annual assessment of the impact on water sources is conducted as part of water balance compiled under Decree No. 431/2001 Coll., whose principle is overall assessment of the requirements for maintaining the minimum balance flow rate with flow rates at monitoring profiles, which include all activities linked with water management.

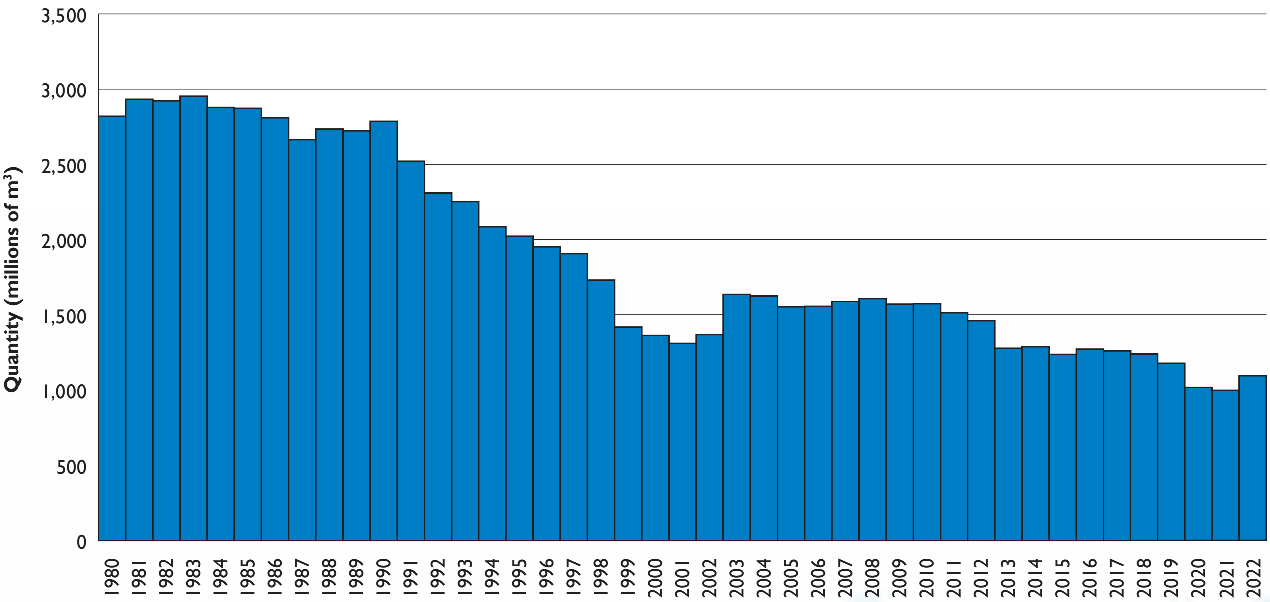
From the longer-term perspective, there has been a significant drop in the volume of surface water abstracted since 1990, which is due to economic and environmental factors, modernisation of production which has lower water demand, and cutting losses in the water supply network. In 2022, in contrast to previous years, there was an increase in surface

Graph 4.1.1
Surface water abstractions in the Czech Republic by sectors 1980–2022



Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by River Boards, s.e.

Graph 4.1.2
Surface water abstractions in the Czech Republic in 1980–2022



Source: MoA using data provided by the T. G. Masaryk Water Research Institute, p.r.i., and River Boards, s.e.

water abstractions, especially in the energy sector. The impact of drought and the resulting availability of surface water resources can also be observed in the last five years. In 2022, surface water abstractions increased unexpectedly.

Table 4.1.2 shows reported surface water abstractions for technical snowmaking where more than 6,000 m³/year or 500 m³/month (in thousands of m³) were abstracted, broken down for each of the River Board, s.e.

Table 4.1.2
Surface water abstractions by customers over 6,000 m³/year or 500 m³/month for snowmaking in 2022

River Board, s.e.	Snowmaking *)	
	Volume in thousands of m³	Number
Elbe	1,752.6	67
Vltava	446.3	15
Ohře	424.5	15
Oder	305.2	14
Morava	979.1	37
Total	**3 907.7**	**148**

Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by the River Boards, s.e.
*Note: *) Ascertained using internal code VHB '410 – technical snowmaking' used by the River Boards, s.e., or by the name of the abstraction*

The Dlouhé Stráně Hydro Power Plant (Source: MoA)

4.2 Groundwater abstractions

Groundwater abstractions decreased to 356.5 million m³ in 2022. In 2021, groundwater abstractions amounted to 362.1 million m³.

The only increases in groundwater abstractions in 2022, compared to 2021, were in the following categories: agriculture by 3.1% and other abstractions including construction by 10.4%. Groundwater abstractions for the energy sector decreased by 7.7%, while industry saw a decrease of 4.8%, and public water supply abstractions by 2%.

The highest share of total groundwater abstractions was in the Morava River Basin (33.7%), the lowest in the Oder River Basin (5%).

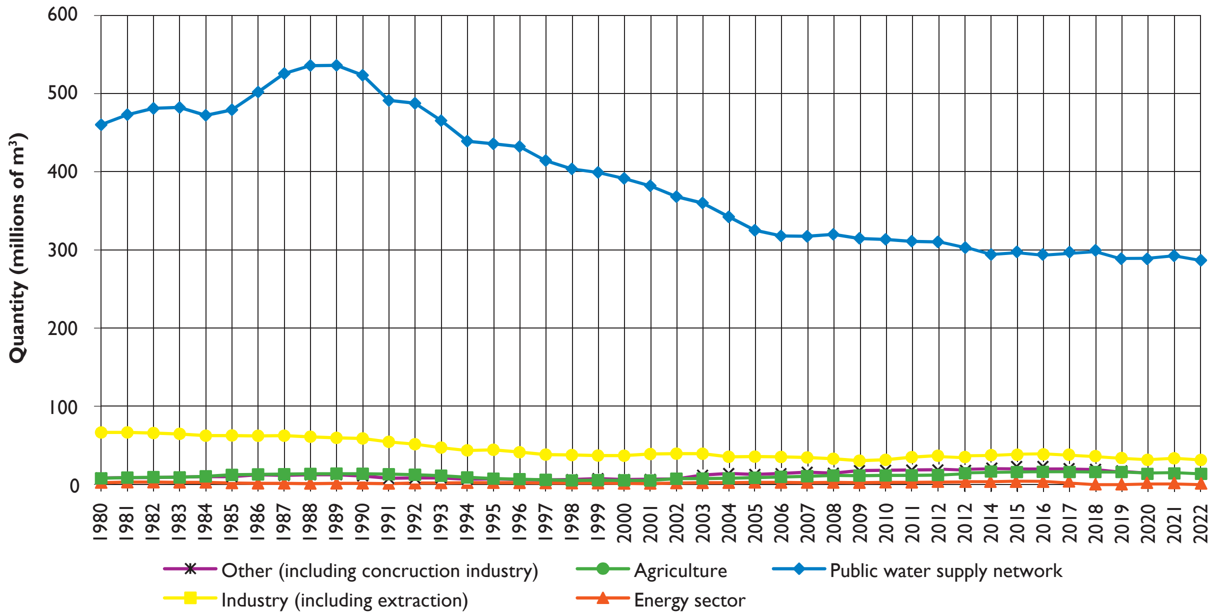
From the perspective of abstracted volumes, a tiny increase of 0.2% was recorded in the Vltava River Basin. The other river basin saw a decrease in abstractions: the Oder Basin by 6.3%, the Morava Basin by 2.6%, the Ohře Basin by 1.6% and the Elbe Basin by 0.4%.

Table 4.2.1
Groundwater abstractions (in millions of m³) by customers exceeding 6,000 m³/year or 500 m³/month in 2022

River Board, s.e.	Public water supply networks		Agriculture incl. irrigation		Energy sector		Industry incl. extraction		Others incl. construction and public sewerage systems		Total	
	Volume	Number	Volume	Number	Volume	Number	Quantity	Volume	Number	Volume	Number	Volume
Elbe	91.4	707	3.3	227	0.5	8	7.6	136	2.4	106	**105.2**	**1,184**
Vltava	32.8	592	6.0	375	1.0	12	9.4	112	10.3	473	**59.5**	**1,564**
Ohře	42.7	315	0.7	29	0.8	5	8.2	113	1.6	34	**54.0**	**496**
Oder	15.8	153	0.5	26	0.0	0	1.1	30	0.3	22	**17.7**	**231**
Morava	104.2	691	6.1	350	0.1	8	7.3	169	2.4	107	**120.1**	**1,325**
Total	**286.9**	**2,458**	**16.6**	**1,007**	**2.4**	**33**	**33.6**	**560**	**17.0**	**742**	**356.5**	**4,800**

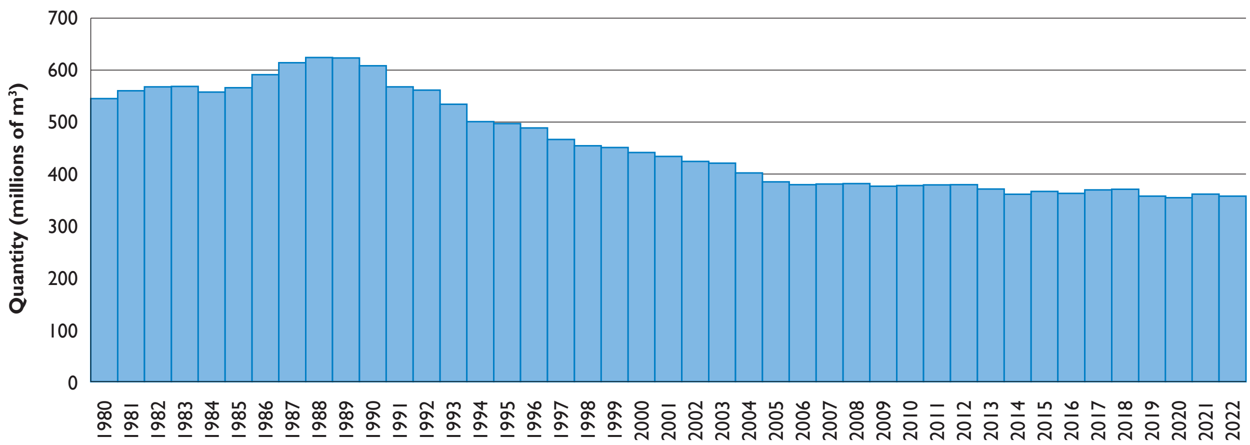
Source: River Boards, s.e.

Graph 4.2.1
Groundwater abstractions in the Czech Republic by sectors in 1980–2022



Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by River Boards, s.e.í

Graph 4.2.2
Groundwater abstractions in the Czech Republic in 1980–2022



Source: MoA using data provided by T. G. Masaryk Water Research Institute and River Boards, s.e.

A comparison of the data from the long perspective shows that the peak abstraction was recorded in 1988 and 1989, and that abstraction has been declining since then. Since 2006, the abstraction rate has stagnated. In 2022, the abstracted volume was approximately the same as in 2020 (354.9 million m³).

Table 4.2.2 shows groundwater abstractions for technical snowmaking exceeding 6,000 m³/year or 500 m³/month (in thousands of m³) reported by the Elbe, Vltava and Morava River Boards.

Table 4.2.2
Groundwater abstractions by customers exceeding 6,000 m³/year or 500 m³/month for snowmaking in 2022

River Boards, s.e.	Snowmaking *)	
	Volume in thousands of m³	Number
Elbe	10.2	1
Vltava	4.0	1
Morava	6.2	1
Total	**20.4**	**3**

Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by the River Boards, s.e.
*Note: *) Ascertained using internal code VHB '410 – technical snowmaking' used by the River Boards, or by the name of the abstraction.*

4.3 Wastewater discharges

In 2022, 1,496 million m³ of wastewaters and mine waters were discharged into watercourses, which means a year-on-year decrease of approximately 1%.

As in previous years, the total volume did not include water discharged from fishpond systems (due to uniformity of the data from individual River Boards, s.e.).

The increase in discharges in 2022 occurred in the energy sector (by 27.9%), see increased abstractions for the Mělník and Opatovice power plants and in the 'others including construction' category (by 0.2%). A decrease in discharges compared to 2021 occurred in the industry (by 10.9%) and sewerage for public use (by 9%) categories. In the category agriculture, discharges were the same as in the previous year.

In terms of the volumes discharged, only the Elbe River Basin saw an increase (by 15.6%) compared to 2021, while the other river basins saw a decrease in discharges compared to the previous year – the Oder River Basin (by 12.2%), the Ohře River Basin (by 11.2%), the Morava River Basin (by 10.6%) and the Vltava River Basin (by 4.4%).

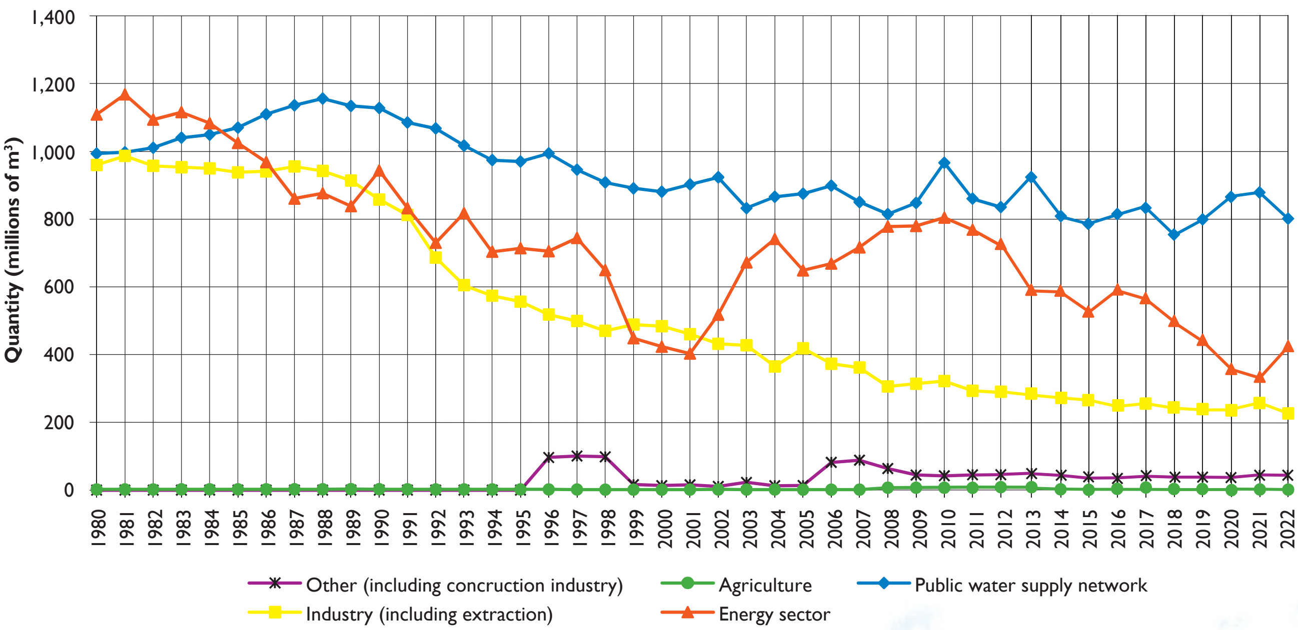
The long-term development of wastewaters and mine waters discharges shows a slight decrease in recorded discharges. This is mainly due to the system of reporting discharges, when previously free discharges directly to surface waters without connection to a WWTP prevailed and discharges were mostly estimated from invoiced water consumption. By extending the sewerage system, construction of new WWTPs with accurate discharge measurement and the adoption of new Water Act in 2001 led to more accurate reporting on discharges. The past three years have been relatively stable, with no significant fluctuations.

Table 4.3.1
Discharges of wastewaters and mine waters to surface water (in millions of m³) for sources exceeding 6,000 m³/year or 500 m³/month in 2022

River Board, s.e.	Public sewerage		Agriculture incl. irrigation		Energy		Industry incl. mining		Others incl. construction and public water supply		Total	
	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number
Elbe	169.9	771	0.0	2	308.3	21	76.4	157	2.4	67	**557.0**	**1,018**
Vltava	272.4	806	0.7	5	19.5	25	30.1	139	28.2	756	**350.9**	**1,731**
Ohře	74.5	290	1.1	3	13.6	19	56.9	136	5.9	37	**152.0**	**485**
Oder	89.3	325	0.0	2	6.5	12	45.8	83	4.6	61	**146.2**	**483**
Morava	194.0	1185	0.3	6	75.1	14	19.0	138	2.4	99	**290.8**	**1,442**
Total	**800.1**	**3,377**	**2.1**	**18**	**423.0**	**91**	**228.2**	**653**	**43.5**	**1,020**	**1,496.9**	**5,159**

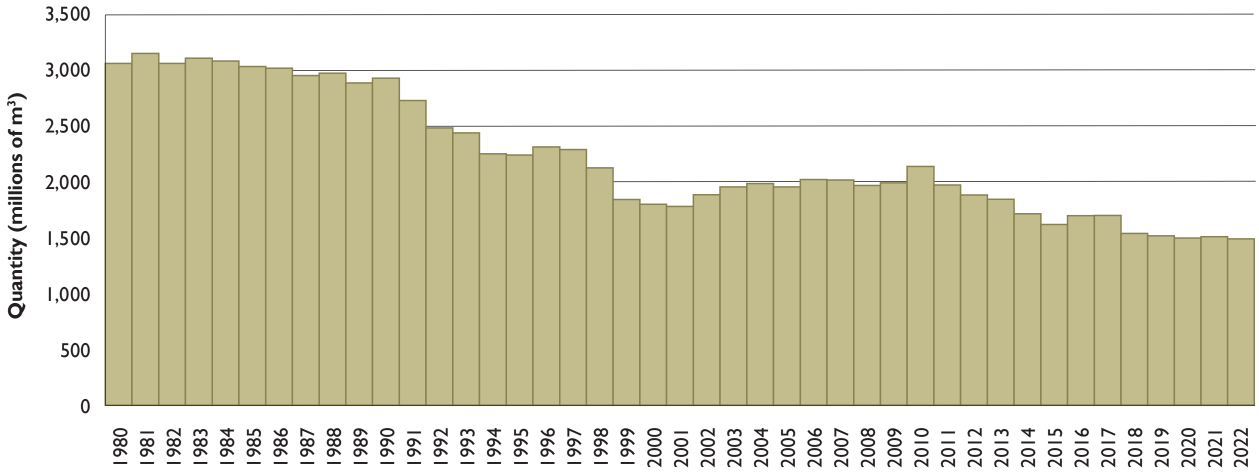
Source: River Boards, s.e.

Graph 4.3.1
Discharges of wastewaters in the Czech Republic in 1980–2022



Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by River Boards, s.e.

Graph 4.3.2
Discharges of wastewaters in the Czech Republic in 1980–2022



Source: MoA using data provided by T. G. Masaryk Water Research Institute, p.r.i., and River Boards, s.e.

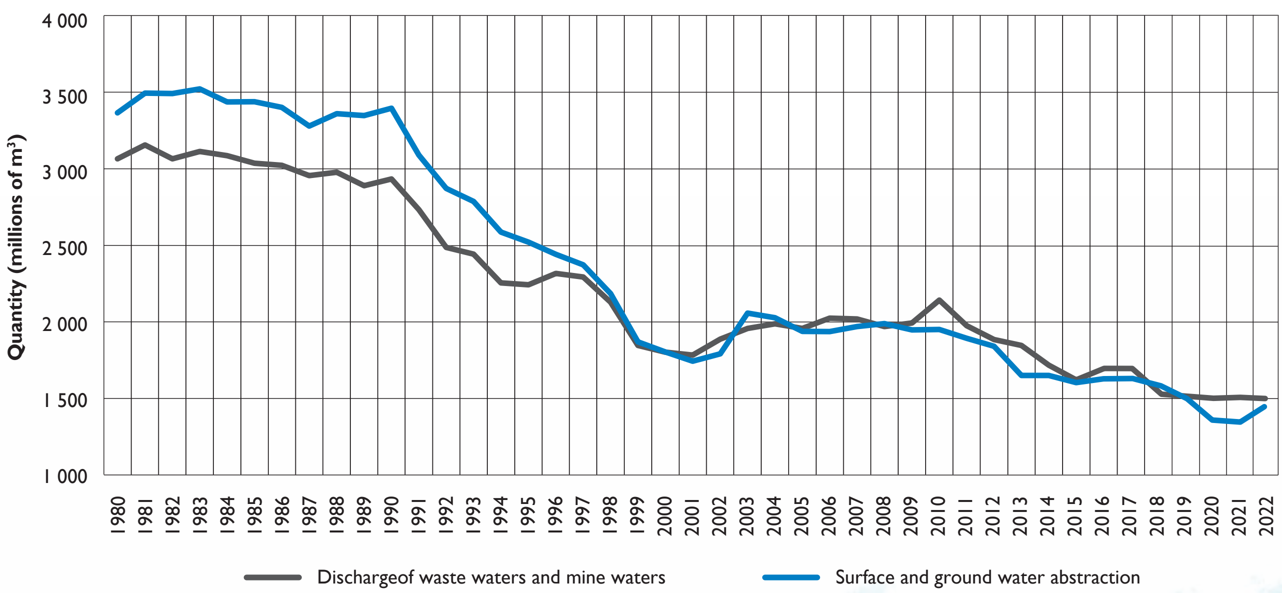
4.4 Overall comparison of water management

In 1980–2022, there was a very significant decrease in water abstractions and discharges after 1990, while there was a slight growth for some time after 2001. However, after 2010 we saw another decrease in the volume of abstractions and discharges. The volumes of surface waters abstracted and discharged in 2022 increased compared to the previous year, mainly due to increased abstraction for the energy sector. Groundwater abstractions decreased from 362.1 million m³ in 2021 to 356.5 million m³ in 2022. Discharges in 2022 were approximately 15.1 million m³ higher than in 2021. Discharges were again slightly higher than abstractions.

The significant difference between the abstracted and discharged volumes before 1995 can be attributed to different methods of reporting on discharges, higher leakages from water supply systems and non-uniformity of sewerage networks in many smaller towns (agglomerations with more than 2,000 equivalent inhabitants were only equipped with sewerage systems after the Czech Republic joined the EU in 2004).

In dry years, the values of abstracted and discharged volumes of water are similar, while in more abundant years we notice higher volumes of discharged water than water abstracted which is given by the fact that a part of rainwater ends in the sewerage system and thus exceeds the measured consumption in the water supply system.

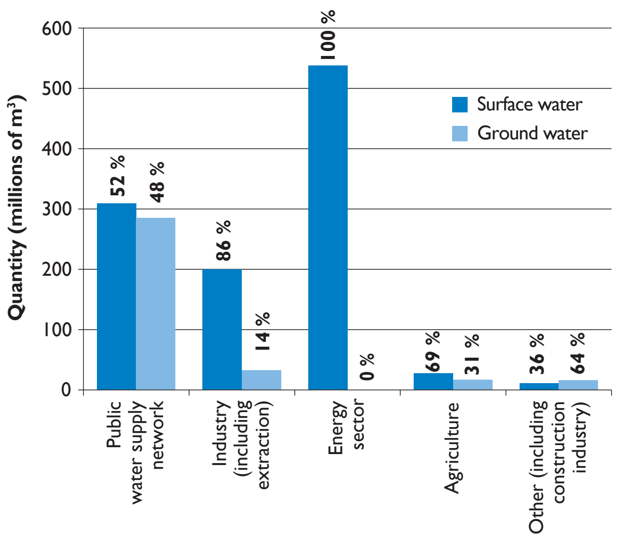
Graph 4.4.1
Water abstractions and discharges in the Czech Republic in 1980–2022



Source: MoA using data provided by T. G. Masaryk Water Research Institute, p.r.i., and River Boards, s.e.

Small Hydropower Plant Štvanice (Author: Hubalová Petra)

Graph 4.4.2
Comparison of surface and groundwater abstractions by sectors in 2022



Source: MoA using data provided by T. G. Masaryk Water Research Institute, p.r.i., and River Boards, s.e.

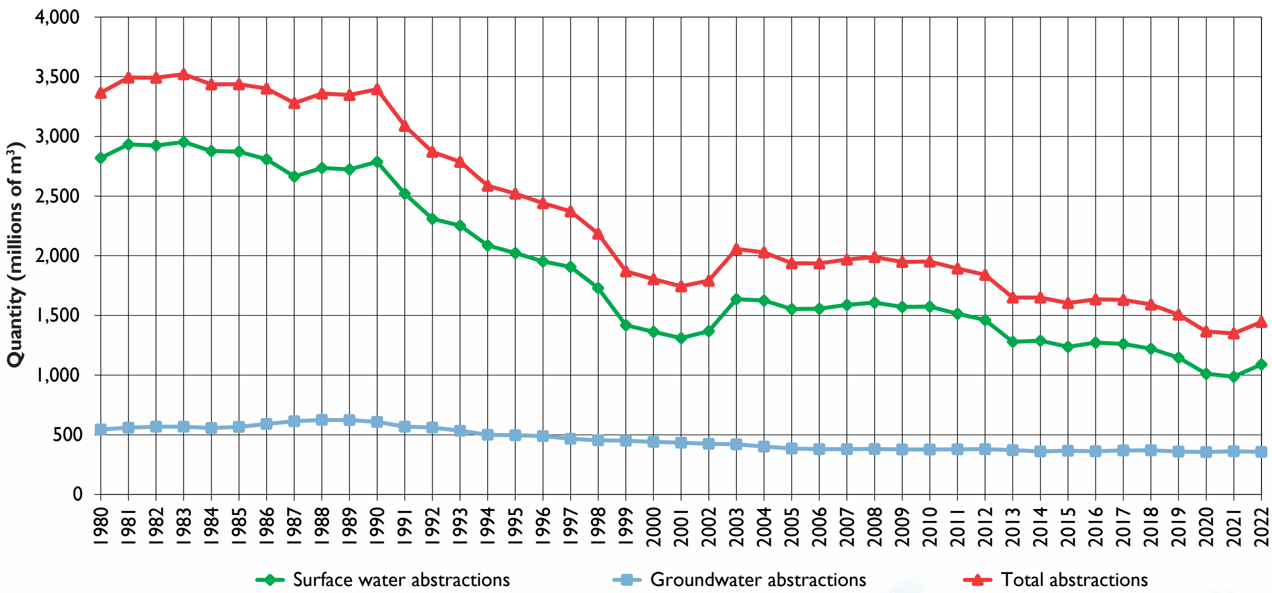
As 2022 was average in terms of precipitation, the volume of water discharged again slightly exceeded water abstractions, meaning discharged and abstracted volumes were almost equal. A total of 1.50 billion m³ of waters were discharged, whereas, the volume of surface water and groundwater abstractions amounted to 1.45 billion m³.

When comparing surface and groundwater abstractions by different sectors, we can conclude that abstractions for the water supply sector are almost identical, while most other sectors use mainly surface water. However, the exception is 'others including construction' category, which has traditionally used more groundwater.

In 2022, as the case was in previous years, more water was abstracted for public water supply from surface sources. The water used by the energy sector is almost 100% surface water, similarly to other industry sectors. Agriculture covers its needs with almost two thirds of surface water. The only industry – others incl. construction – abstracts larger volumes of groundwater than surface water. This is probably also given by the price of groundwater that is significantly lower than the price of surface water.

Graph 4.4.3 shows that the majority of abstractions are from surface water, with surface water abstractions declining more significantly than groundwater abstractions since 1990.

Graph 4.4.3
Water abstractions in the Czech Republic in 1980–2022 (groundwater, surface water, total)



Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by River Boards, s.e.

M. Rizaeva – We honour water, Primary School Weberova, Prague 5

5. SOURCES OF POLLUTION

5.1 Point sources of pollution

Surface water quality is affected primarily by point sources of pollution (towns and municipalities, industrial plants and farms with intensive agricultural livestock production). The degree of water protection against pollution is most often assessed based on the development of produced and discharged pollution.

The 'produced pollution' refers to the amount of pollution contained in produced (untreated) wastewaters. In line with EU requirements, the Czech Republic pays increased attention to data collection and analysis of the situation concerning pollution. In particular, data are collected from a larger number of reporting entities under so-called water balance in line with requirements of Decree No. 431/2001 Coll., on the content of the water balance, the method of its compilation and the data for the water balance.

The produced pollution improved in 2022 in comparison with the previous year in three indicators: DIS (dissolved inorganic salts) by 10.9%, N_{inorg} (inorganic nitrogen) by 2.8% and NM (non-dissolved matters dried at 105°C) by 1.2%. There volume of production of BOD_5 (biochemical oxygen demand) increased by 2.1%, COD_{Cr} (chemical oxygen demand) by 0.3% and P_{total} (total phosphorus) by 0.3%.

In 2022, the production of discharged pollution, i.e., pollution contained in wastewaters discharged to surface water, decreased in all monitored indicators: DIS (by 12.8%), NM (by 10.2%), N_{inorg} (by 9.7%), BOD_5 (by 3.6%), COD_{Cr} (by 3.4%) and P_{total} (by 2.9%). The volumes of discharged and invoiced pollution for each indicator since 1990 are shown in Graph 5.1.1.

Between 1990 and 2022, there was a drop in discharged pollution of BOD_5 by of 96.8%, the production of COD_{Cr} decreased by 91.1% and NL by 95.7%. At the same time, discharges of hazardous and particularly hazardous pollutants were also reduced. There was also a significant decrease in macronutrients (nitrogen, phosphorus) due to the introduction of biological removal of nitrogen and biological or chemical removal of phosphorus in wastewater treatment technologies applied in new and intensified WWTPs.

Together, Jinošov, Hubert's Well (Author: Pavlíková Eliška)

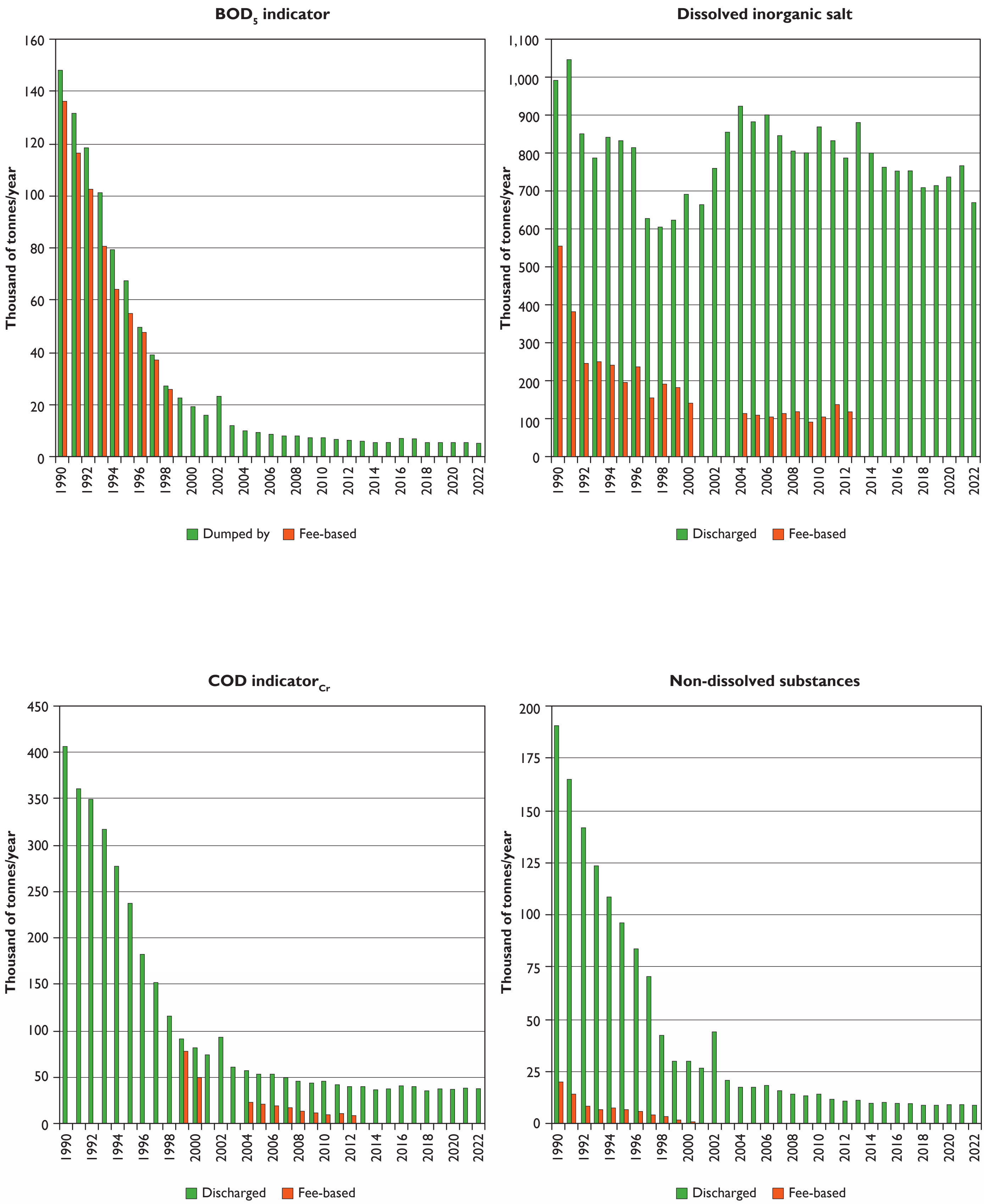
Table 5.1.1 shows that monitored DIS values in discharged pollution in the Vltava River Basin and the Oder River Basin are higher than the produced pollution. Such a deviation in the resulting value of discharged pollution may be due to doses of salt used when reducing phosphorous chemically or when adding defoaming salts. Furthermore, indicators in the inflow and outflow to/from WWTPs are not monitored with the same frequency and/or not in the same type of samples, or the data about produced pollution might not be complete.

Table 5.1.1
Pollution produced and discharged in 2022

River Boards, s.e.	Pollution produced in tonnes/year						Pollution discharged in tonnes/year					
	BOD_5	COD	NM	DIS	N_{inorg}	P_{total}	BOD_5	COD	NM	DIS	N_{inorg}	P_{total}
Elbe *)	56,523	129,871	56,703	194,332	7,720	1,359	1,171	10,448	2,190	188,221	2,081	227
Vltava	93,062	222,688	101,771	113,833	9,768	2,408	1,438	9,906	2,175	118,241	2,511	270
Ohře *)	19,191	38,473	17,253	89,063	2,399	783	428	3,327	1,082	86,875	1,333	261
Oder *)	29,221	60,403	23,278	149,149	3,774	657	581	4,907	1,279	142,841	1,060	129
Morava *)	66,052	154,907	73,416	133,296	7,976	1,720	1,189	7,636	1,529	131,054	2,024	197

Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by the CSO and River Boards, s.e.
*Note: *) Some values of produced pollution were calculated on the basis of the volume of discharged pollution due to some notifiers' failure to report produced pollution.*

Graph 5.1.1
Discharged and invoiced pollution in 1990–2022



Source: T. G. Masaryk Water Research Institute, p.r.i., using data provided by the CSO and River Boards, s.e.

The Elbe River – The Jizera River confluence (Source: Elbe River Board, s.e.)

5.2 Area sources of pollutioní

Surface water and groundwater quality is also significantly affected by area sources of pollution – such as pollution from farming, from atmospheric deposition and from erosive runoff of the landscape. While pollution from point sources keeps decreasing, the contribution of area pollution is on the rise. Surface water and groundwater quality is most significantly affected by nitrates, pesticides and acidification, less by phosphorous.

The most important measures aimed at decreasing area pollution of water from agricultural sources are Government Regulation No. 262/2012 Coll., on the designation of vulnerable areas and the action programme, as amended. This legal regulation reviews so-called vulnerable areas and initiates the Action Programme.

Direct funding and some subsidies from the Rural Development Programme (the 'RDP') and support intended for restructuring and transformation of vineyards under the joint organization of the wine market is conditioned by maintaining soil in 'Good Agricultural and Environmental Condition' (the 'GAEC') and adhering to 'Compulsory Requirements for Farming' (the 'CRF') in the areas of Environment, Climate Change and Good Agricultural and Environmental Condition of Soil, Public Health, Health of Animals and Plants and Animal Welfare.

In case applicants fail to comply with the requirements at any time during the calendar year in which they file the application for payment, the support may be decreased or refused.

The requirements related to water pollution are CRF 1 – protection of water against nitrate pollution from agricultural sources, CRF 10 – introduction of plant protection products to the market and GAEC 1 standards – unfertilized buffer strips along watercourses, protection distances for application of plant protection products with the aim of protecting aquatic organisms and GAEC 3 – handling hazardous substances.

Agricultural land erosion and hydroamelioration aspects

The Czech Republic, like other countries, is increasingly exposed to hydrological extremes, which is due to climate change. It can be expected that regions affected by such extremes will expand significantly in the future. One of the key factors that can mitigate the impact of the climate change is suitable farming on agricultural land.

The occurrence of water erosion in the Czech Republic is significantly affected by many factors, particularly by the fact that the blocks of soils are the largest in the EU soil plots, the lack of organic matter in the soil, very low share of landscape elements with soil protective (anti-erosion) function and inconvenient relation of farming subjects to the farmland. Water erosion results in soil loss and loss of topsoil and siltation of watercourse and reservoir beds. During prolonged periods of drought, sediments in watercourses may be subject to accelerated mineralization and once the water levels increase, water quality is deteriorated. This means that water erosion deteriorates water quality, contributes to eutrophication and complicates the use of water. Together with some extensive single-functional drainage systems, water erosion decreases water retention and accumulation in the land.

Since 2012, Research Institute for Soil and Water Conservation, p.r.i. has been monitoring farmland erosion (https://me.vumop.cz) with the aim of gathering relevant background materials about the extent of farmland erosion, causes of erosion, ascertaining whether the current policies in the field of fighting erosion are correctly aimed and about effectiveness (or ineffectiveness) of some anti erosion measures.

Decree No. 240/2021 Coll., on the protection of agricultural land against erosion, which is directly related to this system, came into force in 2021. As a result, it will be possible to assess the impact of this legislation on water pollution in the coming years.

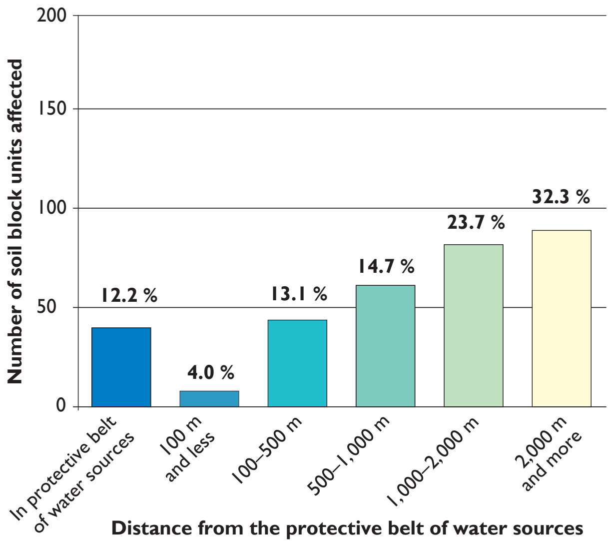
Damage to water bodies was recorded in 14% of the 2022 monitored events. Thus, in 2022, the damage caused by erosion events was well below the long-term average. The following years will confirm whether the positive decline that occurred in 2022 can be considered a longer-term trend due to the higher priority assigned to protection against water erosion. The monitoring identified especially visible damage – sediments. Runoff of sediment erosion carries other substances (pesticides, fertilizers, nutrients, etc.) that can reach water sources through the hydrographic network, which implies that the negative impact of erosion events on the quality of water resources has several different levels.

As Graph 5.2.1 shows, over 29% of affected land blocks were within 500 m from water source protection zones and 12.2% of the blocks were inside the zones in 2022. It means that there was a decrease in the threat to the protection zones in 2022. It is the third consecutive year when this assessment shows a slight decrease in the order of single-digit percent.

Runoff of erosion sediments (according to the analyses, about 1.4 million m³ of sediments from the agricultural land gets to watercourses) and introduction of other substances (pesticides, nutrients) that enter water resources through the hydrographic network and drainage systems affect adversely the water resource quality. Their quality is also negatively affected by the majority of erosion events and by inputs of pollution through drainage systems: the amount of $N\text{-}NO_3$ offtake from arable drained land in the long-term average is approximately 30 kg/ha^{-1}/year^{-1}.

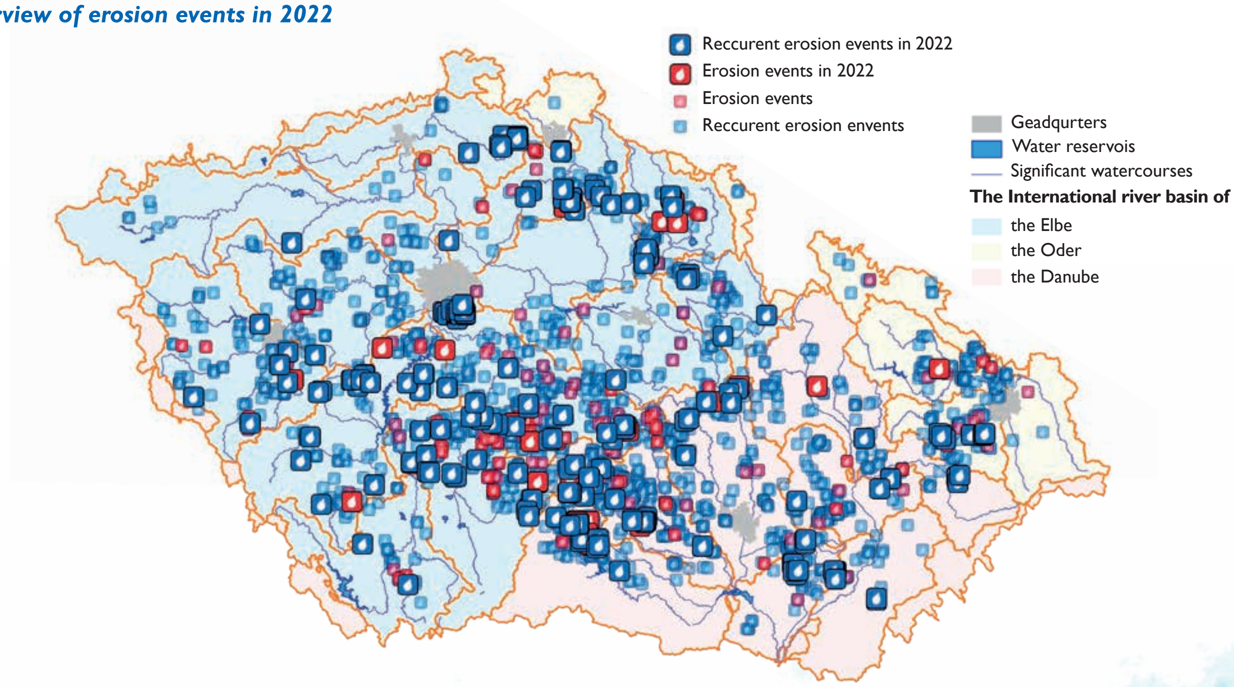
In order to mitigate the impacts and effects of hydrological extremes in the landscape, it is necessary to adapt farming methods and use of agricultural landscape. Tools such as those

Graph 5.2.1
Recorded erosion events by distance from the water resource protection zone in 2022



Source: Research Institute for Soil and Water Conservation
Note: Number of soil block units affected = number of soil block units where erosion was detected.

Figure 5.2.1
Overview of erosion events in 2022



Source: Research Institute for Soil and Water Conservation


Špindlerův Mlýn in Winter (Author: Hubalová Petra)

published at https://geoportal.vumop.cz, in particular the water need calculator https://vlaha.vumop.cz, which can be used to calculate water balances for specific cropping methods and locations (with precision to a single soil block), to define areas threatened by different degrees of drought, and to determine values of water needs and/or irrigation volumes. Using this tool, it was found that the water deficit in the water balance, i.e., the difference between the crop water need (as per FAO-56) and the available resources of soil water (precipitation, amount of rising water, total water in soil at the beginning of the growing season), increased significantly in 2009–2018 compared to the current climatic average of 1981–2010. The largest increases in areas with moderate and severe water stress were found in maize (from 9,746 to 11,383 km^2) and semi-early potatoes (from 10,077 to 12,125 km^2). Crop water stress is defined as a lack of freely available water in the soil that can be used by plants, defined by the value of the so-called point of reduced availability, which varies considerably for different soil types and crops at different stages of their development.

Crop water stress, as well as increased runoff and pollutant input from the soil through subsurface runoff, can be mitigated by water retention measures at existing agricultural drainage structures. What has great potential in terms of agricultural drought reduction on drained soils are measures regulating the drainage runoff. In the Czech Republic, drainage control systems (using an external water resource for irrigation) or systems with drainage runoff control (control of autochthonous water) have considerable potential for retaining water in a soil profile, its volume ranging between 800-1,500 m^3/ha^{-1}/year^{1}. Out of the total area of registered drainage structures in the Czech Republic (1.2 million ha), the areas with suitable conditions for application of these principles are estimated to be around 450 thousand ha (for drainage runoff control) and about 150 thousand ha (for drainage control). The potential for effective drainage runoff control is applicable to a total of approx. 195 thousand ha of the existing agricultural drainage structures.

For small sub-basins (50-300 ha) in the Vltava River Basin (28,000 km^2), an analysis of the need for biotechnical measures including upgrading or elimination of drainage systems aimed at dealing with hydrological extremes, increasing water retention and improving water quality has been carried out (https://atlaspvl.vumop.cz/).

Measures taken at agricultural drainage structures are included in the new land consolidation methodology. The systematic consideration of drainage in the plans of common facilities, as defined in the material 'Plan of measures for drought management through land consolidation and adaptation of hydroamelioration in the 2030 horizon' by the Ministry of Agriculture, Research Institute for Soil and Water Conservation, SLO (30 June 2020), is being carried out partially. However, Research Institute for Soil and Water Conservation provides methodological support in this respect and, in some cadastral areas, it actually prepares documents and proposals for measures.

5.3 Accidental pollution

Surface water and groundwater quality is also affected by adverse impacts of accidental pollution. In 2022, the Czech Environmental Inspectorate registered a total of 139 accidental releases of hazardous substances into surface waters and 9 accidental releases into groundwaters. The CEI imposed 421 fines totalling to CZK 30.5 million in the area of water management.

According to the Water Act, the Czech Environmental Inspectorate (the 'CEI') has maintained a central register of accidents since 2002. In 2022, 210 accidents were recorded in the register, which fulfilled the definition of an accident under Section 40 of the Water Act. In 2022, additional accidents were reported to the CEI, which were not included in the central register of accidents, because of their insignificant scale, having no impact on water quality.

The number of accidents caused by traffic decreases every year. In 2022, 50 such accidents were registered, which accounts for 24% of the total number of accidents. Fish mortality was an accompanying phenomenon in 41 cases, representing 19% of the total number. Groundwater pollution occurred in 7 cases, while in 2 other cases groundwaters and surface waters were polluted simultaneously. The origin of the accident was known in 89 cases.

Of the 210 cases recorded, oil was the most frequent pollutant: in 103 recorded cases, accounting for 49.1%, followed by wastewaters: 8.1% and chemicals (excluding heavy metals): 7.1%. The nature of the pollutants was not detected in 42 accidents (20%).

In terms of the breakdown by the sector of accident originators (CZ-NACE), the most frequent accidents were in section H – transportation and storage (12.9%), followed by accidents in section C – manufacturing (5.7%) and then accidents in section E – water supply; sewerage, waste management and remediation activities (3.8%). The industry of accident originators could not be classified in 64.2% of the cases.

In 2022, the CEI imposed a total of 421 fines for breaches of legal regulations in water management, of which 383 fines became legally effective in 2022. The total amount of fines resulting from decisions that became effective in 2022, regardless of the date of the decision, including decisions of appeal bodies, amounted to CZK 30.5 million.

V. Maníčková – My rain pond, Primary School Masarykova, Hnojník

6. WATERCOURSE MANAGEMENT

6.1 Professional management of watercourses

The inland position of the Czech Republic at the heart of Central Europe predetermines its relation to the European river network. The basic hydrographic system is constituted by more than 100,000 km of watercourses with both natural and regulated watercourse beds. Watercourses in the Czech Republic are divided according to the Water Act into two categories: significant watercourses and minor watercourses. Professional management of watercourses is carried out in accordance with the provisions of Section 47 of the Water Act.

Important watercourse administrators under the MoA are River Boards, state enterprises, namely: Elbe River Board, s.e., Morava River Board, s.e., Oder River Board, s.e., Vltava River Board, s.e., and Forests of the Czech Republic, s.e. These administrators manage 94.4% of the total watercourse length in the Czech Republic. The remaining 4.6% of watercourse lengths are managed by other administrators (the Ministry of Defence, national park administrators, municipalities, other natural persons and legal entities).

Table 6.1.1
Professional management of watercourses

Category	Administrator	Length of watercourses (km)	
		2021	2022
Significant watercourses	Elbe River Board	3,640	3,640
	Vltava River Board	5,540	5,546
	Ohře River Board	2,377	2,377
	Oder River Board	1,111	1,111
	Morava River Board	3,762	3,762
	River Boards in total	**16,430**	**16,436**
Minor watercourses	Forests of the Czech Republic	38,442	38,439
	River Boards in total	38,858	38,742
	Other administrators [1)]	5,411	5,539
	Total	**82,711**	**82,720**
Watercourses in total		**98,941**	**99,156**

Source: MoA
Pozn.: Digital lengths of watercourses from the Central Registry of Watercourses are presented.
[1)] Including National Park Administrations, the Ministry of Defence (authorities of military districts), municipalities and other natural and legal persons.

All significant watercourses are listed in Annex No. 1 to Decree No. 178/2012 Coll. that defines a list of significant watercourses and methods for conducting activities linked with watercourse

In the forest (Source: MoA)

management. It is an overview of 819 watercourses including their identifiers (watercourse ID); the overview also includes minor watercourses that are so-called 'transboundary' watercourses. Significant watercourses with total length of 16,436 km are administered by the respective River Boards, s.e., under the provision of Section 4 of Act No. 305/2000 Coll., on river basins. The backbone watercourses are the Elbe River (370 km), the Vltava River (431 km) and the Ohře River (254 km) in Bohemia, the Morava River (269 km) and the Thaya River (194 km) in the south of Moravia and the Oder River (135 km) and the Opava River (131 km) in the north of Moravia and Silesia.

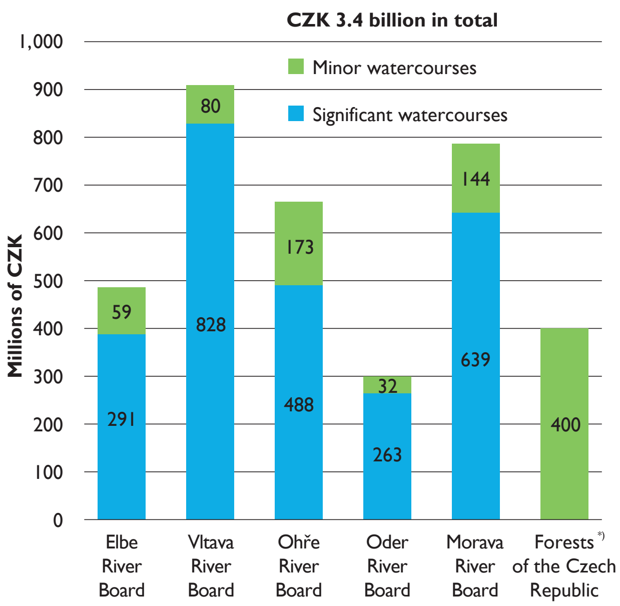
All the other watercourses are classified as minor watercourses pursuant to Section 43 of the Water Act; they are administered based on the respective appointment by the MoA (provision of Section 48(2) of the Water Act). If no administrator of a minor watercourse is appointed, such a watercourse is administered in accordance with the provision of Section 48(4) of the Water Act, by the administrator of the recipient into which such a watercourse flows. It is administered by such an authority until watercourse administrator is appointed in accordance with Section 48(2) of the Water Act. Minor watercourses may be administered by municipalities through which minor watercourses flow, natural persons or legal entities or organizational body that either use such a minor watercourse or is related to their activity. The template and content of an application to appoint the administrator of a minor watercourse is specified in detail in the abovementioned Decree No. 178/2012 Coll. According to the Central Registry of Watercourses (the 'CRW'), the total length of minor watercourses is 82,719 km. The drawings of minor watercourses are reassessed, refined and reclassified on a continual basis.

The CEVL web application, available at the MoA website (www.eagri.cz) and on the Water Management Information Portal (www.voda.gov.cz) provides detail information about the management of the watercourses to the public administration as well as to the general public.

At the end of February 2022, the MoA and the MoE, with strong support of the organisations under their management, launched a new joint website of the so-called Information System for Public Administration in Water Management (ISVS WATER) on the existing website www.voda.gov.cz, which replaced the version operated by CENIA, formerly available on the eAGRI website. The main objective of the website is to present information on water management at a single place in a comprehensive and unified way, independently of the division of competences in water management.

In 2022, the administrators of watercourses under the jurisdiction of the Ministry of Agriculture spent funds from their own and other sources in the total amount of CZK 3.4 billion on the management of major and minor watercourses, i.e.

Graph 6.1.1
Funds spent on watercourse management in 2022



Source: MoA
*Note: *) The item includes funds for the management of watercourses and reservoirs.*

The acquisition value of tangible fixed assets related to watercourses increased by CZK 2.15 billion to almost CZK 58 billion in 2022 compared to the previous year.

The year-on-year growth is mainly caused by an increase in the tangible fixed assets generated by the renewal and planned development of entrusted property in the form of routine investment construction and by inclusions of assets taken over and completed hydraulic structures. Even in 2022, none of the watercourse administrators completed, approved or took over a hydraulic structure that would significantly influence the indicators expressing the acquisition value of the tangible fixed assets.

Table 6.1.2
Acquisition value of tangible fixed assets related to watercourses

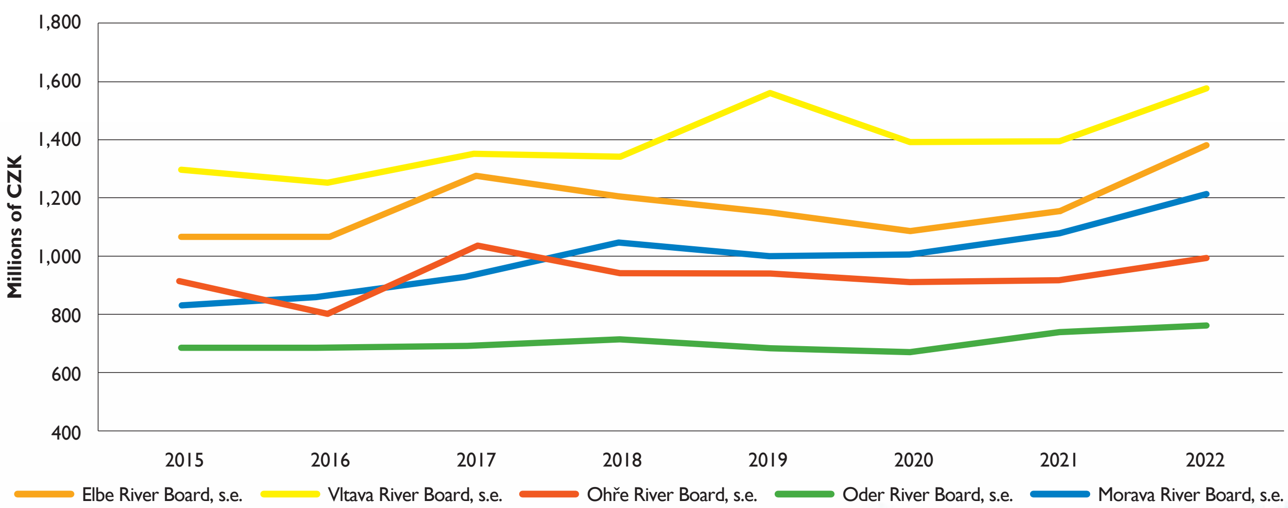
Watercourse administrator	2021	2022
	in billions of CZK	
Elbe River Board	10.86	10.92
Vltava River Board	11.82	11.95
Ohře River Board	10.65	10.76
Oder River Board	6.43	6.58
Morava River Board	9.00	9.10
River Boards in total	**48.76**	**49.31**
Forests of the Czech Republic	6.90	8.50
Total	**55.66**	**57.81**

Source: MoA

6.2 River Boards, state enterprises

Total revenues generated by River Boards, state enterprises in 2022 amounted to CZK 5,923 million, which means a year-on-year increase of more than CZK 640 million, i.e., by 12.2%. The biggest increase was in revenue from the use of lifting devices and electric power generation decreased.

Graph 6.2.1
Revenues of River Boards, s.e., in 2015–2022



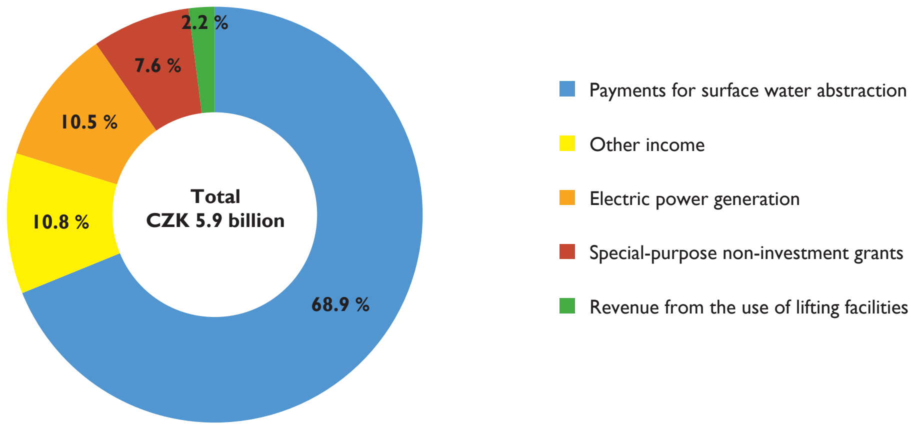
Source: MoA

Table 6.2.1
Structure of revenues of River Boards, s.e. in 2022

Indicator	River Boards, s.e.					Total
	Elbe	Vltava	Ohře	Oder	Morava	
	in thousands of CZK					
Payments for surface water abstractions	1,103,417	907,810	636,081	627,925	808,284	**4,083,517**
Electric power generation	67,568	299,907	162,454 [*)]	75,162	15,237	**620,328**
Revenue from the use of lifting facilities	7,488	113,794	1,733	0	4,956	**127,971**
Other income	162,782	214,169	176,029	58,640	30,286	**641,906**
Special-purpose non-investment grants [1)]	34,653	38,721	19,668	500	355,284	**448,826**
River Boards in total	**1,375,908**	**1,574,401**	**995,965**	**762,227**	**1,214,047**	**5,922,548**

Source: River Boards, s.e.
Note: [*)] The item includes revenue from photovoltaic power plants.
[1)] Includes all special-purpose non-investment grants for minor watercourses, grants from the STIF and other non-investment grants.

Graph 6.2.2
Structure of revenues of River Boards, s.e. in 2022



Source: MoA

Total costs of River Boards increased year-on-year by 7.9% to CZK 5,616 million in 2022. The greatest increase was in the energy and fuels item, while financial costs decreased significantly.

Costs increased in the following items: energy and fuels (by CZK 44.2 million, i.e., by 37%), other costs (by CZK 42 million, i.e., by almost 34%) and repairs (by almost CZK 165 million, i.e., by 14%). Compared to the previous year, financial costs (a decrease of almost 8%) and depreciation were lower.

The financial result reached by all River Boards, s.e. in 2022 was profit, the total amounted to CZK 306 million, which means a significant year-on-year increase of more than 310%, in the amount of CZK 231.6 million. The increase was mainly due to high revenues from unplanned surface water abstractions in the Elbe River Basin.

In 2022, all the River Boards, s.e. except for the Ohře River Board, which recorded a significant drop in profit by almost 100%. The result of the Ohře River Board reflects the development in the national and international economy, especially the rapid increase of input prices. At the same time, the result is in line with the planned result for 2022 and does not endanger the long-term management of the state enterprise. The Elbe River Board saw a year-on-year increase of almost CZK 232 million, i.e., by 311%), which was due to unplanned water abstraction by customers. The plan for 2022 had expected consumption of approx. 332 million m³, while the actual abstraction was 458 million m³. The profit of the Vltava River Board was almost four times higher, having risen by more than CZK 72.4 million, i.e., 298%), the Oder River Board recorded an increase in profit of almost CZK 3.8 million, i.e., by 22%, and the Morava River Board saw an increase of CZK 0.4 million, i.e., by almost 10%.

Holasovice (Source: Oder River Board, s.e.)

Table 6.2.2
Costs of River Boards, s.e. in 2021 and 2022

Type of costs	Year	River Boards, s.e.					Total
		Elbe	Vltava	Ohře	Oder	Morava	
		in millions of CZK					
Write-offs	2021	190.9	340.0	181.4	147.9	168.6	**1,028.7**
	2022	186.4	327.6	178.8	156.2	167.0	**1,016.0**
Repairs	2021	196.9	271.4	202.1	143.5	338.9	**1,152.7**
	2022	176.9	303.9	209.4	136.0	491.1	**1,317.4**
Material	2021	35.9	33.0	19.8	33.3	45.3	**167.4**
	2022	36.6	31.6	19.2	35.4	52.8	**175.6**
Energy and fuels	2021	36.4	36.1	24.2	6.2	16.5	**119.4**
	2022	48.3	46.0	39.6	6.4	23.4	**163.6**
Personnel costs	2021	602.9	550.0	446.9	306.8	455.5	**2,362.0**
	2022	639.4	579.4	473.4	324.3	479.8	**2,496.3**
Services	2021	68.9	81.3	47.0	27.5	29.2	**253.9**
	2022	70.1	88.5	63.1	31.2	30.6	**283.5**
Financial costs	2021	0.4	1.1	0.2	0.2	0.9	**2.1**
	2022	0.4	0.6	0.1	0.1	0.7	**1.9**
Other costs	2021	11.8	60.1	-21.5*)	55.2	15.1	**120.7**
	2022	34.0	100.1	12.3	51.7	-35.9 *)	**162.2**
Total costs	**2021**	**1,144.2**	**1,373.0**	**900.0**	**720.5**	**1,070.0**	**5,207.7**
	2022	**1,192.1**	**1,477.7**	**995.9**	**741.3**	**1,209.5**	**5,616.4**

Source: River Boards, s.e.
*Note: *) The negative value is due to the drawdown of the accounting provision for repairs of assets.*

Table 6.2.3
Economic results of River Boards, s.e. (profit, loss) in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	in thousands of CZK						
Elbe	22,026	60,276	22,880	15,631	9,534	10,563	183,809
Vltava	13,711	73,880	49,221	67,123	74,489	24,379	96,751
Ohře	27,422	169,652	73,346	41,380	25,387	18,262	104
Oder	20,845	22,291	53,053	9,503	14,826	17,224	20,973
Morava	112,916	11,721	17,875	12,300	8,619	4,098	4,498
Total	**196,920**	**337,820**	**216,375**	**145,937**	**132,855**	**74,526**	**306,135**

Source: River Boards, s.e.

Table 6.2.4
Distribution of profits of River Boards, s.e. in 2022

River Board, s.e.	Profit	Distribution of profit or coverage of loss						
		Reserve Fund	FCSN – basic allocation	FCSN – extra allocation	Social Fund *)	Remuneration Fund *)	Own capital	Unreimbursed loss from previous years
	in thousands of CZK							
Elbe	**183,809**	54,412	9,961	4,981	55	4,400	110,000	0
Vltava	**96,751**	59,532	8,271	4,135	0	24,813	0	0
Ohře	**104**	0	104	0	0	0	0	0
Oder	**20,973**	1,401	4,371	2,186	15	13,000	0	0
Morava	**4,498**	0	4,498	0	0	0	0	0

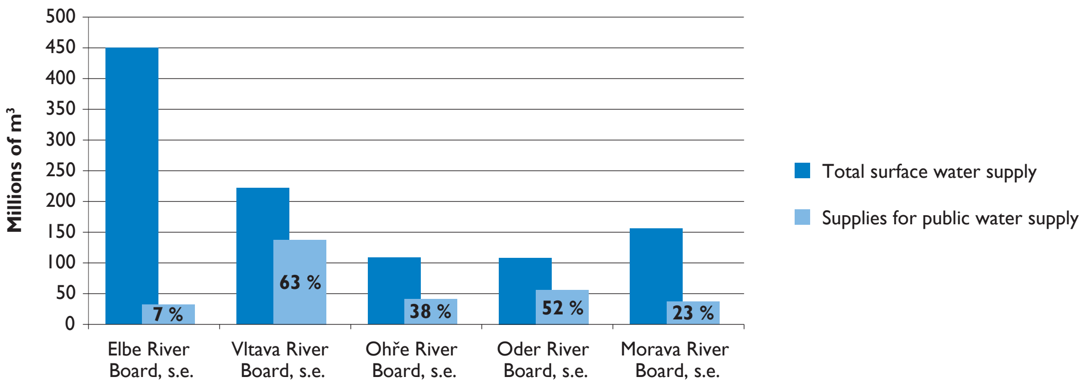
Source: River Boards, s.e.
*Note: *) Created in accordance with Section 19(5) of Act No. 77/1997 Coll., on state enterprise, as amended.*

Table 6.2.5
Surface water supplies in the territorial jurisdiction of the River Boards, s.e. for a fee in 2016–2022

River Board, s.e.		2016	2017	2018	2019	2020	2021	2022
		in thousands of m³						
Elbe	a)	614,377	583,838	526,598	460,970	372,872	357,935	448,241
	b)	37,707	38,873	39,017	38,861	35,806	34,705	32,458
Vltava	a)	204,885	219,138	224,819	224,871	216,160	217,840	220,701
	b)	134,333	139,485	142,813	140,292	135,106	135,765	138,775
Ohře	a)	119,384	122,837	124,054	122,628	109,849	103,809	107,993
	b)	40,305	40,953	40,919	42,243	42,955	40,504	40,561
Oder	a)	127,995	124,144	125,379	115,696	108,655	112,874	109,450
	b)	62,306	60,592	60,901	60,204	57,150	57,529	56,739
Morava	a)	151,857	156,666	168,582	176,873	162,369	155,580	155,429
	b)	32,816	35,763	37,715	39,478	37,144	33,321	36,146
River Boards in total	**a)**	**1,218,498**	**1,206,623**	**1,169,432**	**1,101,038**	**969,905**	**948,038**	**104,1814**
	b)	**307,467**	**315,666**	**321,365**	**321,078**	**308,161**	**301,824**	**304,679**

Source: River Boards, s.e.
Note: a) for a total fee,
b) of which for water supply for public use.

Graph 6.2.3
Water supplies invoiced by River Boards, s.e., by purpose in 2022



Source: River Boards, s.e.

Emergency exercise, The Vltava River, České Vrbné (Author: Roldán Hugo)

The average price for other surface water abstractions per m³ in 2022 was CZK 6.51, a year-on-year increase of 18.2%. It is a cost-based regulated price, which can only include justified costs, a reasonable profit and tax according to the relevant tax regulations.

In addition to flow-through cooling and other abstractions, abstraction volumes and prices of surface water intended for charged agricultural irrigation and flooding of artificial depressions in the landscape have been monitored since 2003. Water for agricultural irrigation was abstracted in 2022 in areas administered by all the River Boards, s.e. with the exception of the Oder River Board and Morava River Board. These abstractions totalled to 203 thousand m³, which means a year-on-year increase by 50%. Surface water abstractions intended for flooding artificial depressions in the landscape were not recorded by any River Board, s.e., in 2022.

The current surface water abstraction prices reflect the costs of the River Boards linked with administering the watercourses and river basins, not the value of surface water. The prices are subject to regulation pursuant to Act No 526/1990 Coll., on prices, and to the rules stipulated by decisions of the Ministry of Finance on price regulation, i.e., to the relevant notifications issuing a list of goods with regulated prices published in the Price Bulletin.

Table 6.2.6
Price of surface water abstraction for flow-through cooling in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	CZK/m³						
Elbe	0.72	0.74	0.77	0.79	0.82	0.96	1.1
Vltava	1.27	1.32	1.32	1.34	1.37	1.41	1.45
Morava	1.21	1.22	1.23	1.25	1.28	1.38	1.44

Source: River Boards, s.e.
Note: The unit price per m³ does not include value added tax.

Table 6.2.7
Price for other surface water abstractions in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	CZK/m³						
Elbe	4.49	4.58	4.72	4.82	4.99	5.38	5.57
Vltava	3.69	3.84	3.84	3.9	3.98	4.1	4.22
Ohře	4.69	4.92	4.97	5.07	5.17	5.61	5.89
Oder	4.33	4.46	4.62	4.78	4.97	5.47	5.74
Morava	6.65	6.68	6.69	6.79	6.93	6.99	7.19
Average price of River Boards, s.e. *)	**4.64**	**4.77**	**4.88**	**4.97**	**5.10**	**5.50**	**6.50**

Source: River Boards, s.e.
Note: The unit price per m³ does not include value added tax.
**) Calculated using weighted average.*

Revenues from surface water abstractions are the most significant source of income. In 2022, they increased by 7.3% compared to 2021, i.e., by CZK 297 million. The total amount of this type of revenues was CZK 4,083 million.

Table 6.2.8
Payments for surface water abstractions in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	in millions of CZK						
Elbe	996	1,001	1,027	993	882	976	1,103
Vltava	745	832	852	861	838	872	908
Ohře	560	604	617	622	568	582	636
Oder	554	554	579	553	540	617	628
Morava	672	715	804	827	786	759	808
River Boards in total	**3,527**	**3,706**	**3,879**	**3,856**	**3,614**	**3,806**	**4,083**

Source: River Boards, s.e.

Another significant source of revenues of the River Boards, s.e. is electric power generation, accounting for more than 10% of the total income. The number of small hydropower plants in operation in 2021 increased by two, bringing the total number to 106. Total revenue in this item decreased year-on-year by more than 3.3% and amounted to almost CZK 618 million.

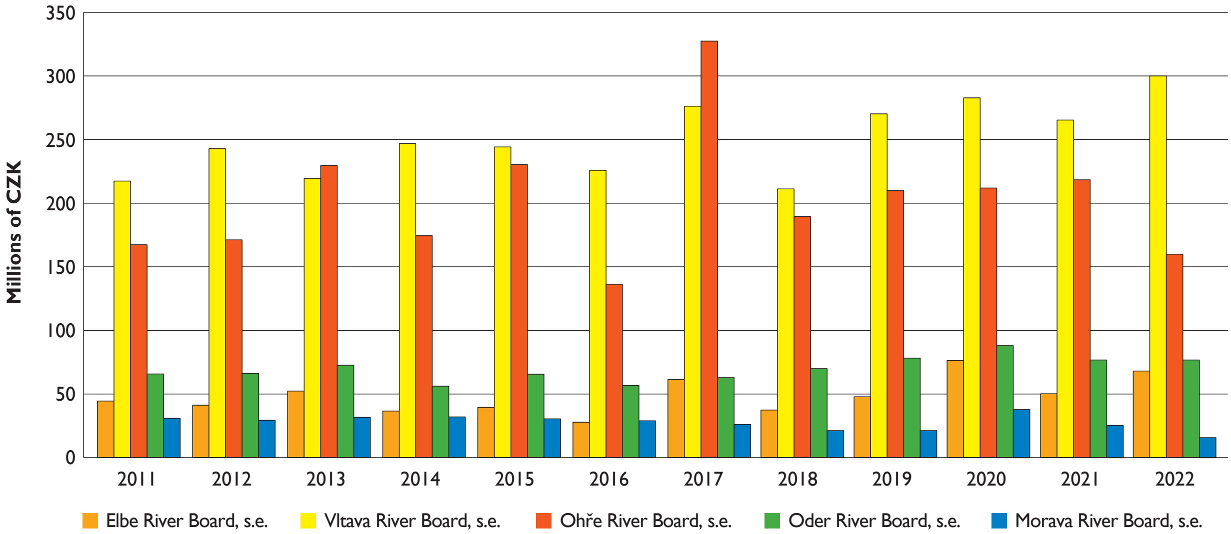
The highest revenues from electric power generation are repeatedly reported by the Vltava and Ohře River Boards, s.e. Details about the small hydropower plants owned by the River Boards, s.e. are provided in Table 6.2.9 and Figure 6.2.4.

Table 6.2.9
Small hydroelectric power plants owned by River Boards, s.e. in 2016–2022

River Board, s.e.	Indicator	2016	2017	2018	2019	2020	2021	2022
Elbe	Number of small hydroelectric power plants	20	20	20	20	20	20	20
	Installed capacity (kW)	6,795	6,819	6,819	6,989	7,001	7,001	7,001
	Electricity generation (MWh)	12,288	22,440	13,835	16,327	24,796	23,343	20,632
	Sales (thousands of CZK)	27,754	61,268	38,012	48,758	76,808	50,914	67,568
Vltava	Number of small hydroelectric power plants	19	19	20	20	21	21	22
	Installed capacity (kW)	22,128	22,128	22,328	22,328	21,950	21,950	22,040
	Electricity generation (MWh)	99,497	77,475	77,922	91,123	91,693	102,569	106,526
	Sales (thousands of CZK)	225,704	276,114	211,048	271,244	283,769	265,892	299,867
Ohře	Number of small hydroelectric power plants	21	22	22	22	22	22	23
	Installed capacity (kW)	16,966	17,091	17,091	17,091	17,091	17,091	17,113
	Electricity generation (MWh)	84,910	84,244	72,908	76,484	67,024	92,537	73,279
	Sales (thousands of CZK)	136,223	327,221	189,511	211,005	212,222	218,543	160,079
Oder	Number of small hydroelectric power plants	23	23	26	25	26	26	26
	Installed capacity (kW)	6,236	6,236	6,352	6,262	6,524	6,524	6,714
	Electricity generation (MWh)	21,569	23,181	25,073	27,612	29,943	26,673	24,793
	Sales (thousands of CZK)	56,669	62,813	69,487	79,630	89,112	77,183	75,162
Morava	Number of small hydroelectric power plants	15	15	15	15	15	15	15
	Installed capacity (kW)	3,497	3,497	3,497	3,551	3,635	3,588	3,567
	Electricity generation (MWh)	11,008	9,609	8,239	7,566	14,614	15,576	10,747
	Sales (thousands of CZK)	28,812	26,039	22,279	22,215	38,744	26,748	15,237
Total	**Number of small hydroelectric power plants**	**98**	**99**	**103**	**102**	**104**	**104**	**106**
	Installed capacity (kW)	**55,622**	**55,771**	**56,087**	**56,221**	**56,201**	**56,154**	**56,435**
	Electricity generation (MWh)	**229,272**	**216,949**	**197,977**	**219,112**	**228,070**	**260,698**	**235,977**
	Sales (thousands of CZK)	**475,162**	**753,455**	**530,337**	**632,852**	**700,655**	**639,280**	**617,913**

Source: River Boards, s.e.

Graph 6.2.4
Development of revenues of small hydroelectric power plants owned by River Boards, s.e. in 2011–2022



Source: River Boards, s.e.

Minor watercourse Mourový stream – riverbed stabilization, condition before repair (Author: Žáčková Anna)

Minor watercourse Mourový stream – riverbed stabilization, condition after repair (Author: Žáčková Anna)

Other revenues of the River Boards, s.e. in 2022 increased year-on-year by more than CZK 244 million and their total amount exceeded CZK 641 million.

The other revenues item is an aggregate of less significant items such as leases of land, non-residential premises and water areas and other business activities. The most significant items are revenues from the performance of machinery and road haulage, from the performance of laboratories and for designing and engineering work. Other revenues are often significantly affected by a number of unplanned items (insurance payments, increased interest received and transfers of certain specified sales from previous periods that were only effectuated in the current year. As such unplanned items cannot be always anticipated, they may display considerable year-on-year fluctuations.

Table 6.2.10
Other revenues of River Boards, s.e. in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	in thousands of CZK						
Elbe	73,388	149,163 *)	91,122	86,446	69,515	70,926	162,782
Vltava	71,409	78,738	120,231	108,072	96,952	112,483	214,169
Ohře	75,702	85,264	108,496	96,623	111,563	89,726	176,029
Oder	41,191	49,013	61,595	45,375	34,989	40,101	58,640
Morava	56,462	48,295	130,084	61,124	52,585	84,013	30,286
Total	**318,152**	**410,473**	**511,528**	**397,640**	**365,604**	**397,249**	**641,906**

Source: River Boards, s.e.
*Note: *) The item includes the settlement of the proceeds from the sale of an Oberbank AG security in the amount of CZK 50 million.*

In order to ensure crucial activities of the River Boards, various special-purpose non-investment and investment subsidies are used every year. The total amount of subsidies provided in 2022 decreased year-on-year by almost 3.5% to a total of CZK 2.2 billion.

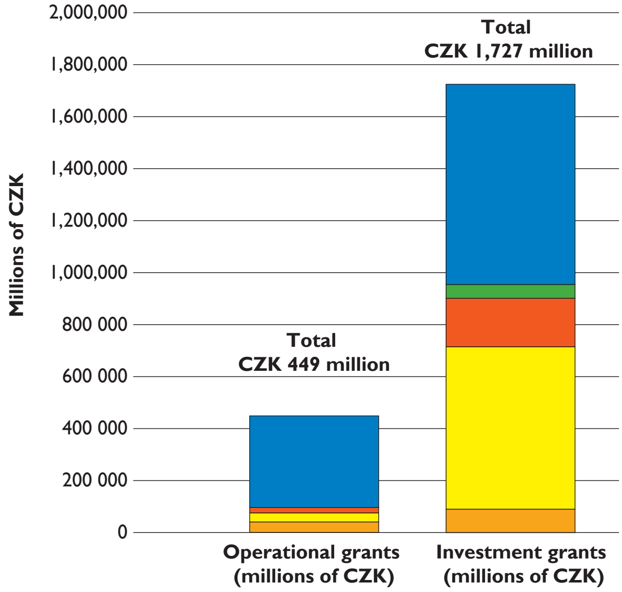
State subsidies are necessary for systematic activities ensuring the implementation of state priorities, such as implementation of flood control measures, delineation of flood zones, preparation of conceptual studies, remediation of consequences of floods, etc. In 2022, investment subsidies fell significantly, recording a 51% year-on-year decrease (i.e., a decrease of CZK 998 million), as did special-purpose non-investment subsidies (a decrease of almost CZK 207 million).

Grants were allocated for programmes focusing both on prevention and remedying of flood damage from previous years. In 2022, the grants were provided from the budget of the MoA, the Operational Programme Environment (the 'OPE'), the EU Solidarity Fund (the 'SF'), European Regional Development Fund (the 'ERDF'), while flood control measures were co-funded by some regional authorities and municipalities..

Investments of River Boards, s.e. in 2022 saw a 7% decline. Almost CZK 2.8 billion was spent on their implementation, with 61% from other sources and 39% from own sources.

The decrease in the total investments of River Boards, s.e. compared to 2021 represents a decrease of CZK 203 million. Other sources to covering investment construction amounted

Graph 6.2.5
Grants used by River Boards, s.e. in 2022



	Operational grants (millions of CZK)	Investment grants (millions of CZK)
Morava River Board, s.e.	355,284	775,792
Oder River Board, s.e.	500	52,844
Ohře River Board, s.e.	19,668	184,003
Vltava River Board, s.e.	38,721	629,788
Elbe River Board, s.e.	34,653	84,774

Source: MoA, River Boards, s.e.

The Kunov Weir on the Opava River (Source: Oder River Board, s.e.)

to almost CZK 1.7 billion, of which 95.1% were financial sources from the state budget and 4.9% from other sources. Other sources included funds from the OPE, regions, cities and gratuitous transfers. Own sources intended for investments amounted to more than CZK 1.0 billion.

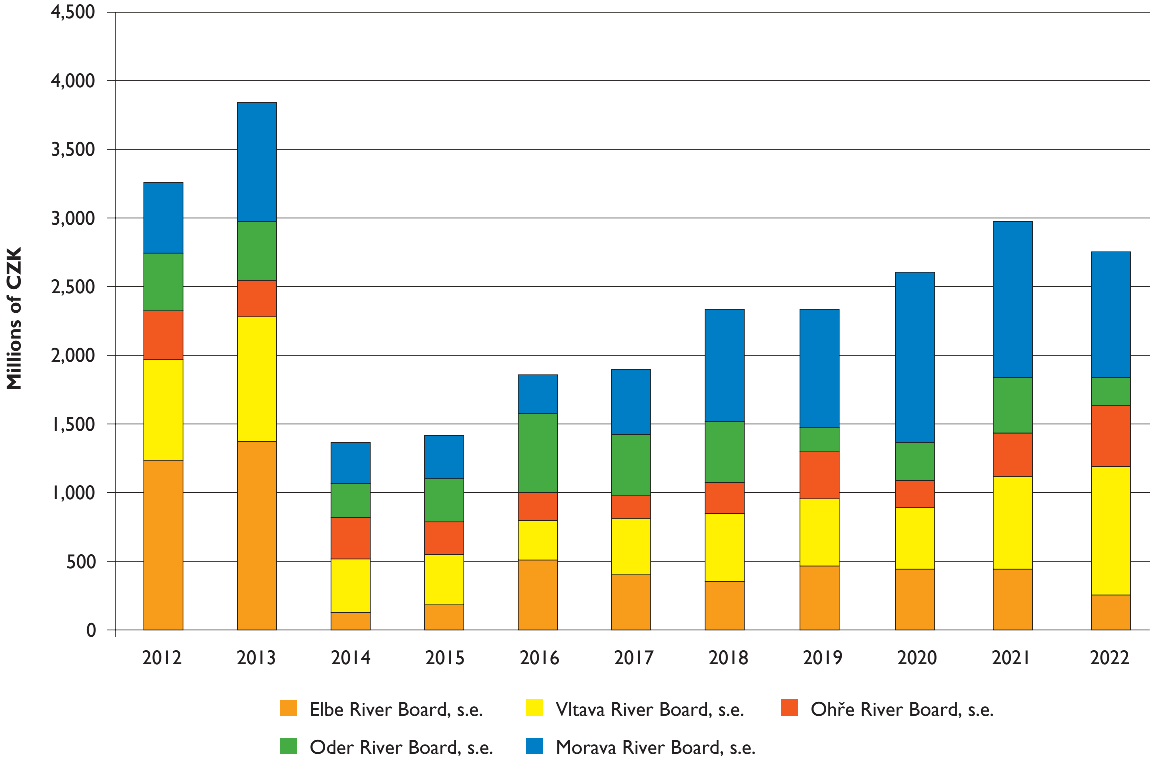
The largest increase in investments was reported by the Vltava River Board (39%, an increase of CZK 260 million). Compared to 2021, the Ohře River Board recorded a significant increase in investments (40%, an increase of CZK 128 million). The other River Basins, s.e. saw a decrease in their investments: the Oder River Basin by 50% (i.e., by CZK 206 million), the Elbe River Basin by 42% (i.e., by CZK 187 million) and the Morava River Basin by 18% (i.e., by CZK 200 million).

Table 6.2.11
Investments of River Boards, s.e. in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	in millions of CZK						
Elbe	514.6	401.2	360.0	461.6	447.9	448.1	261.5
Vltava	286.0	410.9	493.0	495.3	452.8	670.4	930.4
Ohře	210.7	161.6	221.2	346.1	188.8	323.4	451.8
Oder	568.2	453.4	445.5	176.2	284.2	411.7	205.8
Morava	283.7	468.0	823.7	851.7	1,243.0	1,118.8	919.3
Total	**1,863.2**	**1,895.1**	**2,343.4**	**2,330.9**	**2,616.7**	**2,972.4**	**2,768.8**

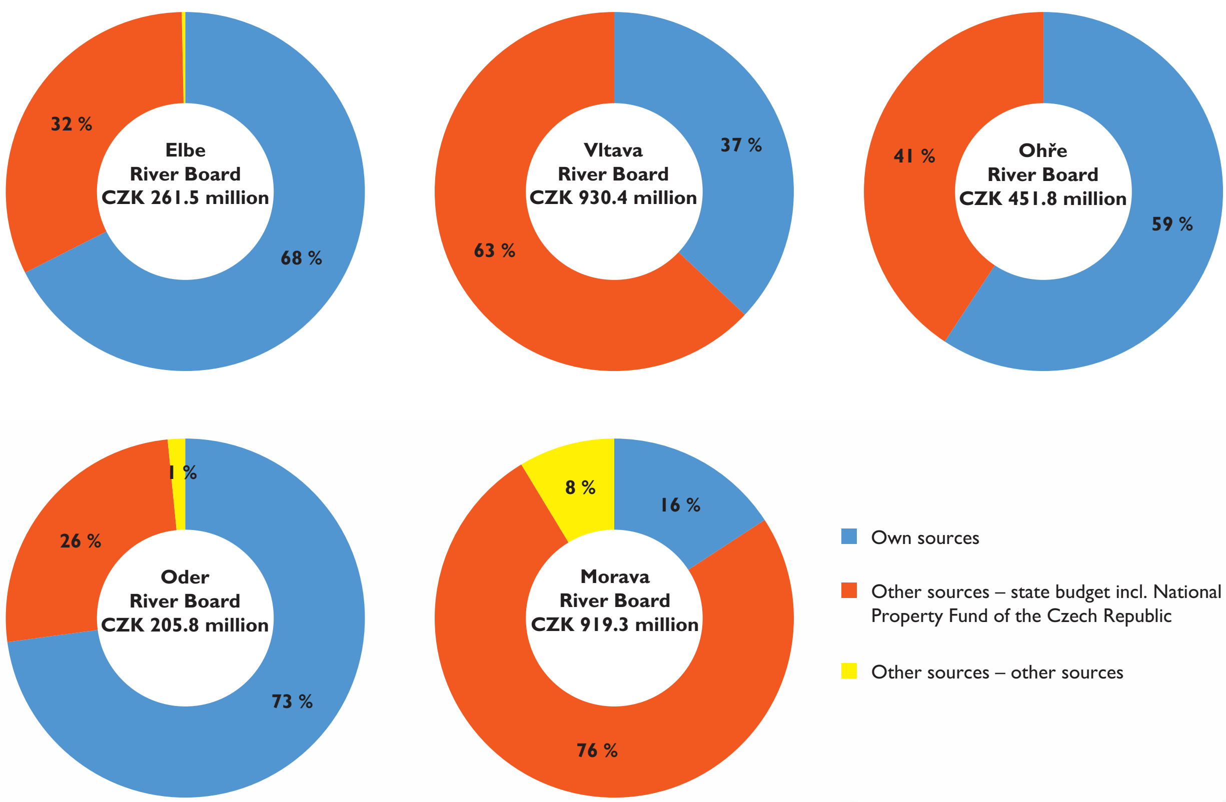
Source: River Boards, s.e.

Graph 6.2.6
Development of investment construction of River Boards, s.e. in 2012–2022



Source: MoA, River Boards, s.e.

Graph 6.2.7
Structure of the use of investment funds by sources in River Boards, s.e. in 2022



Source: MoA, River Boards, s.e.

The number of employees was reduced by 52 in 2022, with a total of 3,494 employees working for the River Boards, s.e.

Table 6.2.12
Number of employees of River Boards, s.e. in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
Elbe	904	894	884	878	874	865	863
Vltava	855	861	867	873	865	863	866
Ohře	614	605	617	614	611	611	598
Oder	465	463	464	458	452	446	442
Morava	737	742	739	746	744	742	725
Total	**3,575**	**3,565**	**3,571**	**3,569**	**3,546**	**3,527**	**3,494**

Source: River Boards, s.e.
Note: Average headcount, rounded to whole numbers.

In 2022, the average monthly salary in River Boards, s.e. increased by 6.7%, the average salary being CZK 42,099.

The year-on-year increase in the average monthly salary in River Boards, s.e. was CZK 2,639, while in the Ohře River Board it increased by almost CZK 3,500, and in the Oder River Basin by CZK 2.7 thousand, the increase in other River Boards was lower. The average salary in the Ohře River Board has long been the highest while the lowest is in the Morava River Board.

Table 6.2.13
Average wages in River Boards, s.e. in 2016–2022

River Board, s.e.	2016	2017	2018	2019	2020	2021	2022
	CZK/month						
Elbe	32,538	33,653	35,050	37,472	39,074	40,686	43,342
Vltava	31,087	31,550	32,740	35,017	37,131	39,044	41,292
Ohře	33,505	34,541	37,079	38,365	39,683	40,490	43,929
Oder	31,787	32,629	34,409	36,695	38,232	40,040	42,782
Morava	28,392	29,782	32,464	34,981	36,674	37,320	39,661
Average salary in River Boards, s.e.*)	**31,497**	**32,357**	**34,221**	**36,383**	**38,094**	**39,460**	**42,099**

Source: River Boards, s.e.
*Note: *) Calculated using weighted average.*

Flood control measure Hranice (Source: Morava River Board, s.e.)

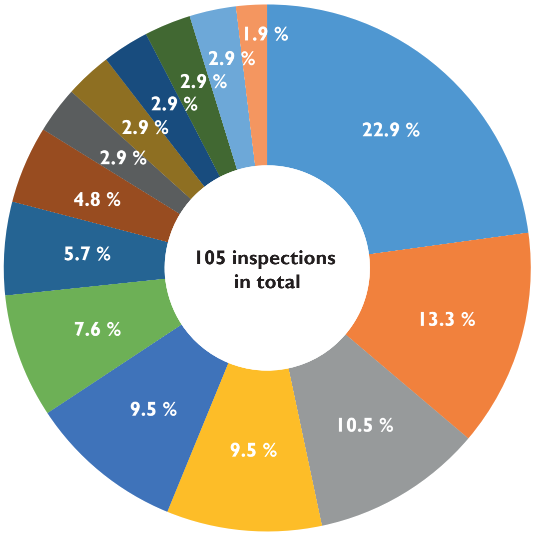
Activities of the River Boards, s.e., is regularly inspected by competent inspection bodies. In 2022, 105 inspections were carried out.

The other inspection bodies include those that carried out one inspection in 2022: the Customs Office, the Energy Regulatory Office, the Institute for Forest Management, the Nature Conservation Agency of the Czech Republic, the SEF, the Tax Office, the Czech Office for Standards, Metrology and Testing and the State Regional Archive Prague each carried out one inspection.

Minor deficiencies identified were corrected during the inspection.

An overview of the inspections is shown in Graph 6.2.8.

Graph 6.2.8
Inspection bodies carrying out inspections in River Boards, s.e. in 2022



Source: River Boards, s.e.

6.3 Forests of the Czech Republic, s.e.

Forests of the Czech Republic, s.e., administers specified minor watercourses and torrents as one of the non-production forest functions. In 2022, Forests of the Czech Republic administered more than 38.4 thousand km of watercourses and 1,032 small water reservoirs.

Watercourse management carried out by Forests of the Czech Republic, s.e. includes management of assets relating to watercourses, with acquisition value of CZK 8.5 billion (especially

Spring of Dřevnice (Author: Dostálová Martina)

watercourse modification, torrent and ravine damming, flood control measures, water reservoirs). Watercourse management was performed by seven watercourse organisational units – regional directorates.

In 2022, the activities performed by Forests of the Czech Republic in the field of water management focused in particular on the following:

- implementation of both capital investment projects and non-investment projects aimed at remedying flood damage, flood control measures, river channel stabilization and erosion control measures,
- construction, restoration and repairs of water reservoirs, pools and wetland with the aim of decelerating surface runoff and retention of water in the landscape and preparation of other projects aimed at mitigating negative impacts of drought and lack of water in the Czech Republic,
- carrying out repairs and maintenance of property,
- other activities aimed at riparian stand management, revitalization of watercourses which were improperly adjusted in the past, non-production forest functions, support for endangered species, elimination of non-indigenous invasive plant species, etc.,
- administering the Central Registry of Watercourses and Water Reservoirs and inventory of assets.

Watercourse management, preparation and implementation of measures were mainly financed from the organization's own resources and from subsidies. As regards subsidies, the funds were aimed at support for measures carried out in the public interest pursuant to Section 35 of the Forest Act, and funding from the state budget allocated for programmes of the Ministry of Agriculture pursuant to Section 102 of the Water Act, namely 'Support for Flood Prevention' and 'Support for Measures on Minor Watercourses and Small Water Reservoirs'. In addition, EU funds – the OPE and RDP and landscape programmes of the MoE were used. Activities linked with watercourse management are of a non-commercial nature and they generate virtually no profit with respect to the funds expended.

In connection with the management of watercourses and water reservoirs, Forests of the Czech Republic, s.e., expended in 2022 a total of CZK 627.0 million, of which expenditures of capital investment nature amounted to CZK 274.1 million; the amount includes investments in construction as well as in purchase of land necessary for ensuring care of watercourses. Own sources used for these investments amounted to CZK 93.0 million. A total of CZK 352.9 million, of which CZK 307.0 million of own sources, was expended on management of designated minor watercourses and repairs and maintenance of fixed assets linked with management. A total of CZK 29.3 million, of which CZK 21.3 million of own sources, was expended on remedying flood damage. The funds expended include all costs related to watercourse and water reservoir management. The funding structure is shown in Table 6.3.1.

The revenue collected from surface water abstractions intended for covering the costs of watercourse management amounted to CZK 23 million in 2022. The development of revenues from surface water abstractions and unit prices is shown in Table 6.3.2.

Graphs 6.3.1 and 6.3.2 show total annual investment costs of water management and funds spent on repairs and maintenance of water management assets by Forests of the Czech Republic on a longer timeline.

Table 6.3.1
Forests of the Czech Republic, s.e. – Funding structure – water management in 2022 (total costs)

Events	Total	Total own sources	Total subsidies	Of which flood damage	
				Subsidies	Own sources
	in millions of CZK				
Investments	274.1	93.0	181.1	6.4	4.8
Non-investment	352.9	307.2	45.7	1.6	16.5
Total	**627.0**	**400.2**	**226.8**	**8.0**	**21.3**

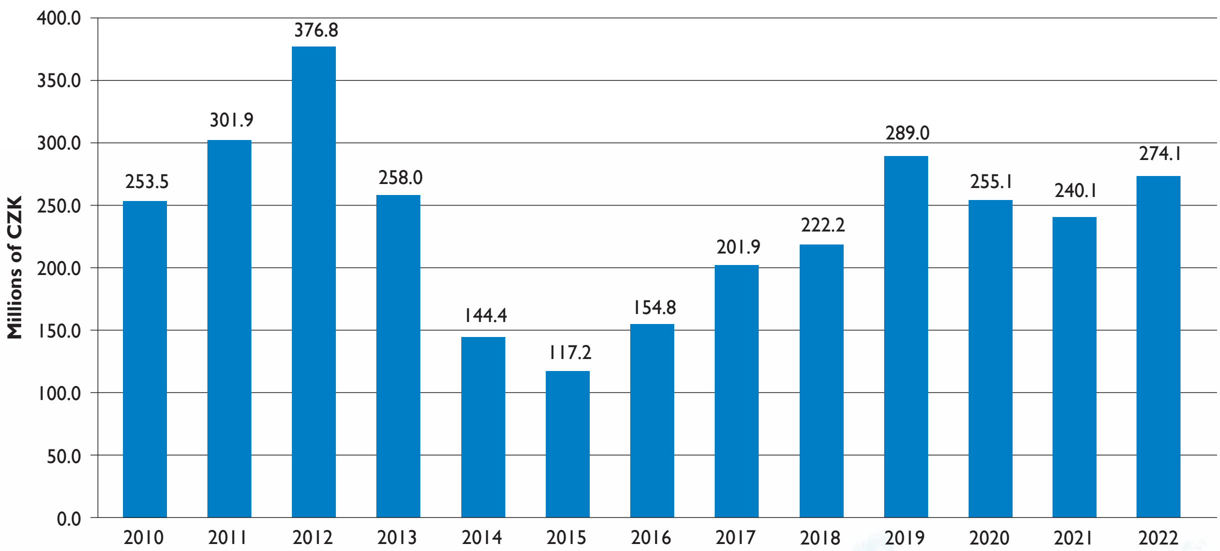
Source: Forests of the Czech Republic

Table 6.3.2
Forests of the Czech Republic, s.e. – Revenues from surface water in 2012–2022

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	in thousands of CZK										
Revenue	13,679	12,211	11,544	10,682	13,192	15,106	15,481	15,610	14,946	18,035	23,000
Price per m³ *)	1.96	2.00	2.05	2.06	2.26	2.52	2.65	3.06	3.47	4.00	4.57

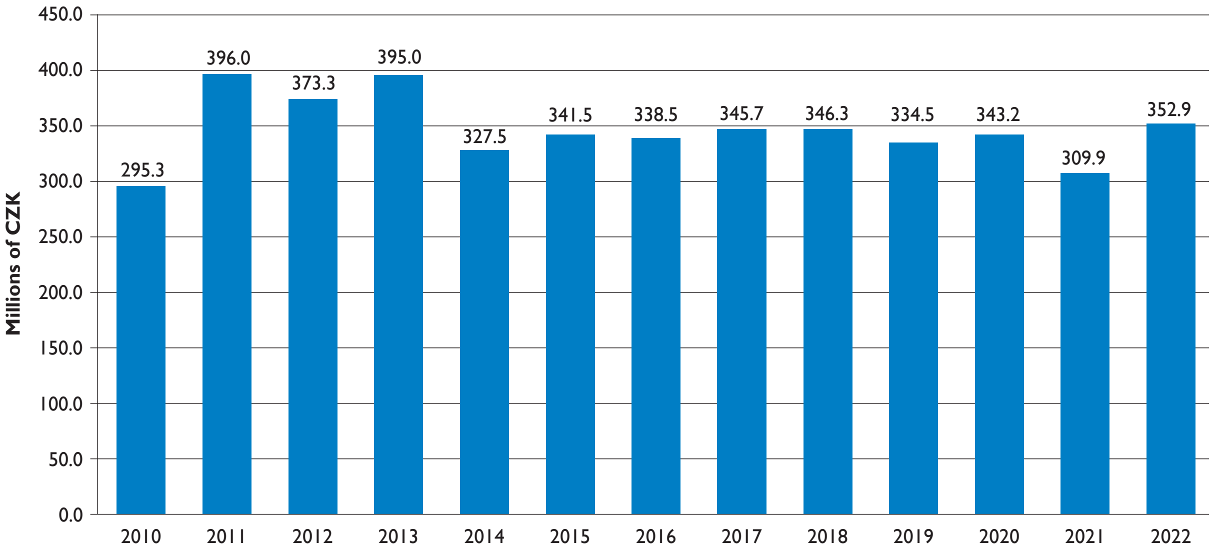
Source: Forests of the Czech Republic
*Note: *) The unit price per m³ does not include value added tax and is in CZK.*

Graph 6.3.1
Forests of the Czech Republic, s.e. – Investment costs in 2010–2022 – water management



Source: Forests of the Czech Republic

Graph 6.3.2
Forests of the Czech Republic, s.e. – Expenditures in 2010–2022 – repair and maintenance of watercourses and reservoirs (total costs)



Source: Forests of the Czech Republic

In June 2022, a flash flood passed through South and Central Bohemia, resulting in a rise in the levels of minor watercourses and reaching FAD II and FAD III. More than CZK 5 million was spent on immediate safeguarding works and flood damage repair. This involved implementation of 18 projects. The most extensive and financially most demanding flood damage was dealt with on the Melhutka in southern Bohemia in the Prachatice District, followed by the Břežanský, Chotouňský, Mokřanský and Zahořanský Streams in the Prague-West and Benešov Districts.

In the context of the ongoing climate change, the 'Returning Water to the Forest' programme continued to contribute to water retention in the landscape. The programme aims to implement measures to mitigate the negative effects of drought and water scarcity. This includes measures aimed at slowing down surface water runoff (revitalisation of forestry drainage and watercourses), creating and restoring water features in the landscape, such as pools, wetlands and small water reservoirs. In total, 100 constructions and 90 minor measures in the landscape were completed in 2022, which encompass 373 pools with a total area of more than 5.2 ha. Another 40 more constructions were started and preparation of others is ongoing.

Major measures implemented within the competence of individual Regional Directorates:

In North Moravia, flood protection measures in the municipality of Třemešná in the Bruntál District and in the municipality of Nové Sedlice in the Opava District were completed in 2022.

Other important projects included reconstruction and repair of the beds of the Novoveský Stream in Žárová in the Šumperk District, reconstruction of the fortification of the tributary of the Hoštický Stream, Černý Stream, Bílá voda Stream and removal of deposits from the Javornický Stream. The construction on the Kozlovická Ondřejnice Stream in the Frýdek-Místek District was started. Reconstruction of the sediment barrier on the Postřelmovský Stream near Zábřeh na Moravě and removal of deposits on the Vrtůvka in Velká Bystřice. In the Šumperk District, implementation of 2 projects aimed at removing flood damage from 2020 was started.

In addition, two water reservoirs are being restored near the village of Albrechtice near Český Těšín and new water reservoirs are being built in Adamov above the village of Karlovice near Bruntál and a water reservoir above the town of Vítkov in the Opava District. Other reconstructed reservoirs are the Loučka Reservoir in the Olomouc Region near Litovel and the Sýkořinec Reservoir in Mošnov in the Kopřivnice District.

In the Frýdek-Místek District, two watercourses in the municipality of Řeka and Pazderna were revitalized.

In South Moravia, the existing property on the Rokytenka in Liptál near Vsetín was reconstructed, the fortification was reconstructed and cleaned on the Blazický Stream in Mrlínek near Bystřice pod Hostýnem, and the stone weir and longitudinal fortification on the Pivný Stream in Bystřice pod Lopeníkem were reconstructed. In the municipalities of Žďárná and Sukovec, the longitudinal and transverse fortification of the watercourse bed was repaired, deposits were removed from the Svodnice in Blatnice pod Sv. Ant. in the Hodonín District and damming was built on the Rakovec Stream in Brno – Bystrc.

Attention was paid in particular to restoration of small water reservoirs such as the Kulatý Palouk Reservoir near Moravský Krumlov, the Moravský Lačnov Reservoir near Svitavy and reconstruction of the Rakovec Reservoir in Brno commenced.

In Vysočina, the most important water management projects completed in 2022 were repairs and reconstruction of several small water reservoirs: the Blažkov Reservoir near Bohdalov in the Žďár nad Sázavou District, the Bransouze Reservoir near Brtnice in the Jihlava District, the Liščina Reservoir near Moravské Budějovice, and two reservoirs in the South Bohemian Region near Tabor, the Mlýnský and Černý rybník Reservoirs. The longitudinal fortification of the Hrabovec Stream near Žďár nad Sázavou was repaired.

Near Nové Město na Moravě, the existing drainage network was modified by the implementation of the EU subsidy programme 'Improvement of the water regime of drained forest soils – Měkušina, Pod Horkou'.

In South Bohemia, the Zdíkovec Reservoir in Prachatice, the Jaroměř Reservoir near Kaplice and the Mydlářka Reservoir near Benešov u Prahy were completed and construction works were started on the U Vrby I–III Reservoir System near České Budějovice and on the Rybná Reservoir in the Třeboň District. In the forests, construction of three reservoirs near České Budějovice (Hořejší Strouha, Prostřední Strouha, Dolejší Strouha), Drsla near Tábor and Kamenný mostek near Kutná Hora was completed.

The completed watercourse modifications include the Kunický Stream, Lomnický Stream and Mokřanský Stream in the Říčany District and the Pěnenský Stream in the Jindřichův Hradec District. On the Melhutka Stream in Prachatice, rehabilitation of the embankments and damaged landscaping after flood was carried out. In addition, the dam on the Všenorský Stream near Černošice was cleaned.

Within the framework of the Interreg V-A Austria-Czech Republic programme 'Cultural and Natural Heritage Schwarzenberg Navigation Canal – Bavarian Riverside', which was carried out in joint partnership with the Military Forests and Estates of the Czech Republic and the Tourismus Verband Böhmerwald, the construction of the fortification of the Světlá Stream was completed in 2022.

In West Bohemia, the Oborák Reservoir near the municipality of Kralovice in the Pilsen Region was restored. The dam body of this historical water reservoir was reconstructed and technical objects were restored. In addition, reconstruction of two reservoirs near Mariánské Lázně (Bahenní I and II) and the V Olšinách Reservoir in the Tachov District and three ponds in the Sokolov District was completed.

As part of the protection of municipalities against floods, the fortification of the Rakovský Stream in Rokycany was reconstructed and a retention dam was built on the right-side tributary of the Bystřický Stream in the municipality of Újezd u Svatého Kříže. Repairs were also carried out on the Struhařský Stream in the Podbořany District and the Jindřichovický Stream near Kraslice in the Sokolov District.

In North Bohemia, the reconstruction of the Na Druhém Luhu Reservoir took place near the town of Lužná. In the Ústí nad Labem Region, above the municipality of Povrly, the Mírkov Reservoir was reconstructed, which enhanced flood protection and water retention in the landscape. In the Ore Mountains near the border with Germany, the Gabrielka Reservoir was restored.

In the Újezdec built-up area in the Rakovník District, the left-bank tributary of the Slábecký Stream and its tributary were repaired and the longitudinal fortification of the watercourse channel was constructed, supplemented by transverse stabilization objects. Repair of longitudinal fortifications was also carried out on the bed of the Pryský Stream in Česká Kamenice in the Děčín District and on the Ludvíkovický Stream in Děčín. In the municipality of Velké Březno in the Ústí nad Labem Region, the Suchý Stream bed was reconstructed and repaired to ensure better migratory permeability in the area. Near the town of Chomutov, near the municipality of Vysoká Pec, a new sedimentation barrier was built on the Drmalský Stream in order to protect the village's built-up area.

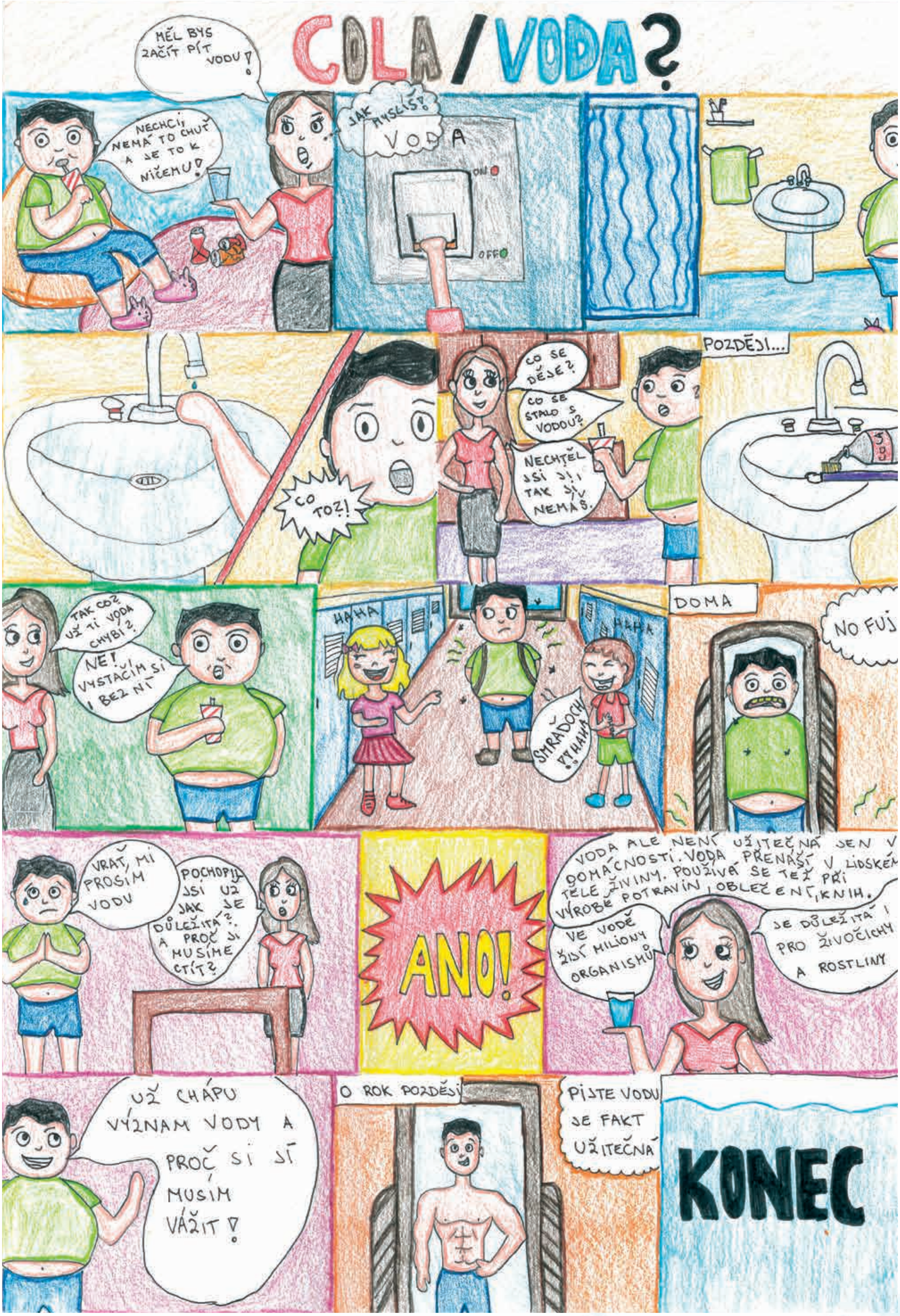
In East Bohemia, flood protection measures were completed on the Markovický Stream in the municipality of Sobětuchy in the Pardubice District, consisting in the capping of the watercourse and in the municipality of Poříčí in the Holice District in order to ensure the stability of the Desná riverbed. On the Horský Stream near Žamberk, the fortification of the channel was repaired, and on the Končinský Stream near Litomyšl, silt was removed.

In the Liberec Region, near the municipality of Dětřichov, on the left-side tributary of the Oleška River, a retention dam and bottom slip thresholds were built to stop the flow of sediments. A retention barrier with permanent water retention was built in the non-built up area of Oldřichov v Hájích on the right-side tributary of the Jeřice.

Near the municipality of Nový Ples in the Hradec Králové Region in the Rasošský Forest, the water regime was modified by revitalizing the drainage network by building a system of dams to retain water in the landscape.

A small water reservoir (Na Pískách) was built near Frýdlant and the reconstruction of the Chmelnický Pond was completed in the municipality of Lhota u Potštejna in the Rychnov n. Kněžnou District. The Machovice Pond near Žamberk was restored.

Improvement of the water regime of drained forest soils – locality of Měkušina u Žďáru nad Sázavou (Source: Forests of the Czech Republic, s.e.)



Z. Putnová, S. Florová – Water / Cola, Primary School Otevřená, Brno

7. LAND CONSOLIDATION AND AMELIORATION STRUCTURESY

Land consolidation

In 2022, the priority within the framework of land consolidation a was again long-term water retention in the landscape and erosion protection, i.e., construction of ponds, small water reservoirs, wetlands and elements ensuring erosion protection. As of 31 December 2022, water management measures, part of land consolidation improvements implemented since 1991, were built on an area of more than 793 ha and erosion control measures on an area of approximately 885 ha. In 2022, water management measures worth CZK 352.4 million and erosion control measures CZK 53.6 million were implemented as part of land consolidation.

Fortification of the watercourse bed Světlá Stream, Český Krlumlov District (Source: Forests of the Czech Republic, s.e.)

Transport and green infrastructure were developed, i.e., measures ensuring access to plots and environmental measures. Such measures (called 'common facilities') are typically designed as multifunctional, e.g., unpaved roads are supplemented with draining and retaining ditches, newly designed plots are divided by boundary strips, swales and anti-erosion dykes complemented with planting of shrubs and trees, green vegetation is also planted around water reservoirs under construction and alongside paths/roads. In addition to the transport and environmental function, such measures serve the purpose of soil protection and improve water management in the landscape. A total of CZK 1,353 million was spent on common facilities in 2022.

In order to allow for building such measures in the landscape, it is first necessary to have suitable plots. The most effective instrument for new arrangement of plots in the landscape is land consolidation that rearranges ownership of land and creates conditions so that land owners can manage them rationally. At the same time, land consolidation provides conditions for improving the environment, protection and reclamation of land resources, forest and water management, particularly in reducing adverse effects of floods and drought and addressing runoff conditions and improving the ecological stability of the landscape.

The authority competent for implementation of land consolidation under No. 139/2002 Coll., on land consolidation and land offices, and amending Act No. 229/1991 Coll., regulating the ownership of land and other agricultural property, as amended, and implementing Decree No. 13/2014 Coll. is the State Land Office (the 'SLO').

Land consolidation is carried out either as comprehensive or simple consolidation. Currently, simple and comprehensive land consolidation has been completed for almost 39.6% of the total agricultural land, while land consolidation is underway in 12.4% of agricultural land. Over CZK 450 million was spent on designing land consolidation including non-investment activities in 2022.

One of the main outputs of comprehensive land consolidation, in addition to the new digital cadastral map, is a plan of the aforementioned common facilities that is closely linked to municipality master plans. It is subject to approval by municipal

Table 7.1
State Land Office – Use of funds for land consolidation in 2022

Non-investment activities		Implementation							Total non-investment activities and implementation
			of which						
Total	of which land development proposals	Total	roads	anti-erosion measures	water management measures	environmental measures	Other *)		
in thousands of CZK									
450,239	386,212	1,353,378	749,855	53,621	352,380	88,466	109,056		1,803,617

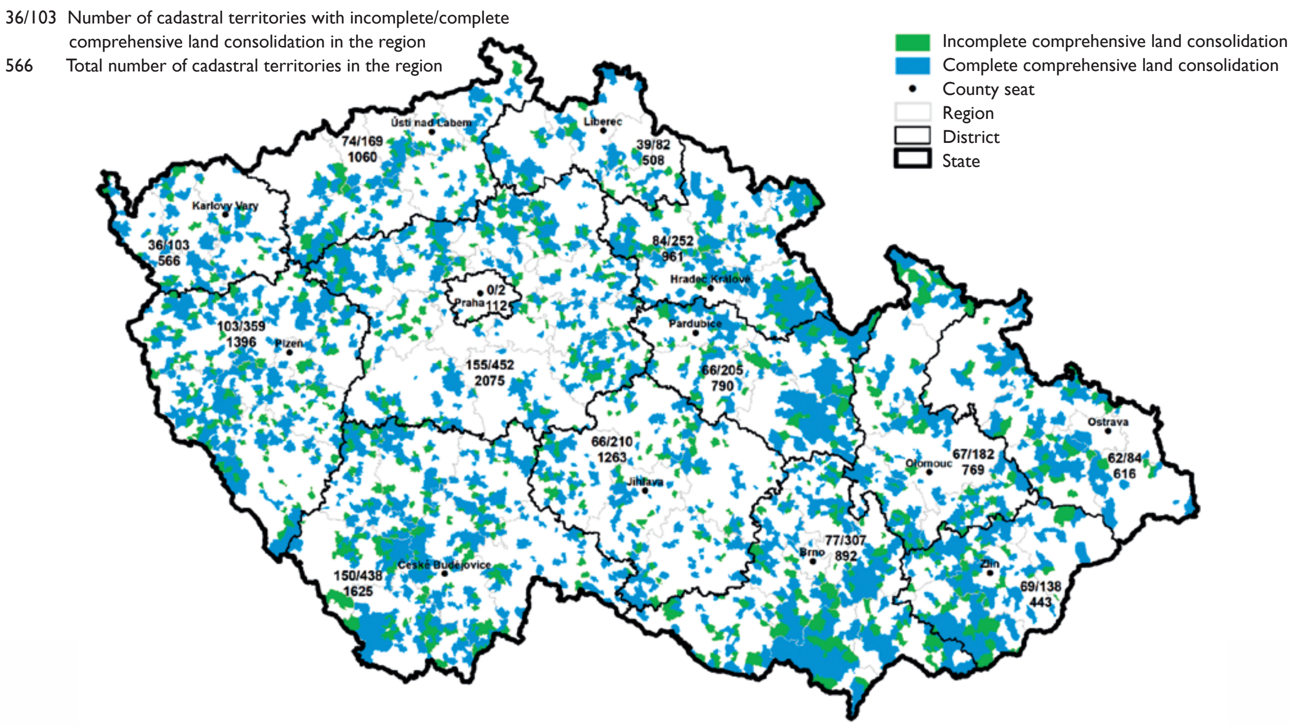
Source: SLO
Note: *) Operational and technical activities.

councils and the land designated for placement of joint structures is typically transferred to the ownership of the given municipality. If a master plan is drawn up first in a given area, then the comprehensive consolidation respects the solutions of the master plan; conversely, if the comprehensive consolidation is drawn up first in a given area, the master plan respects the solutions of the consolidation.

Thanks to land consolidation and clearly defined ownership, the SLO may subsequently implement proposed measures. The SLO ensures proposals of land consolidation and implementation of joint structures through funds from the General Treasures Management, SLO budget, relevant EU funds (RDP, OPE) and the National Restoration Plan since 2021 and others (Road and Motorway Directorate, budgets of municipalities and towns, private entities). For the next programme period, disbursement of funds for land consolidation under the Common Agricultural Policy Strategic Plan for 2023–2027 is set to give priority to projects helping to reduce the negative impact of climate change. Grant support for land consolidation projects from the National Recovery Plan is provided under activity/investment 2.6.4. Implementation of land consolidation with a positive effect on erosion prevention and precipitation retention.

The Horka Reservoir (Source: Ohře River Board, s.e.)

Figure 7.1
Overview of comprehensive land consolidation measures by regions as of 31 December 2022



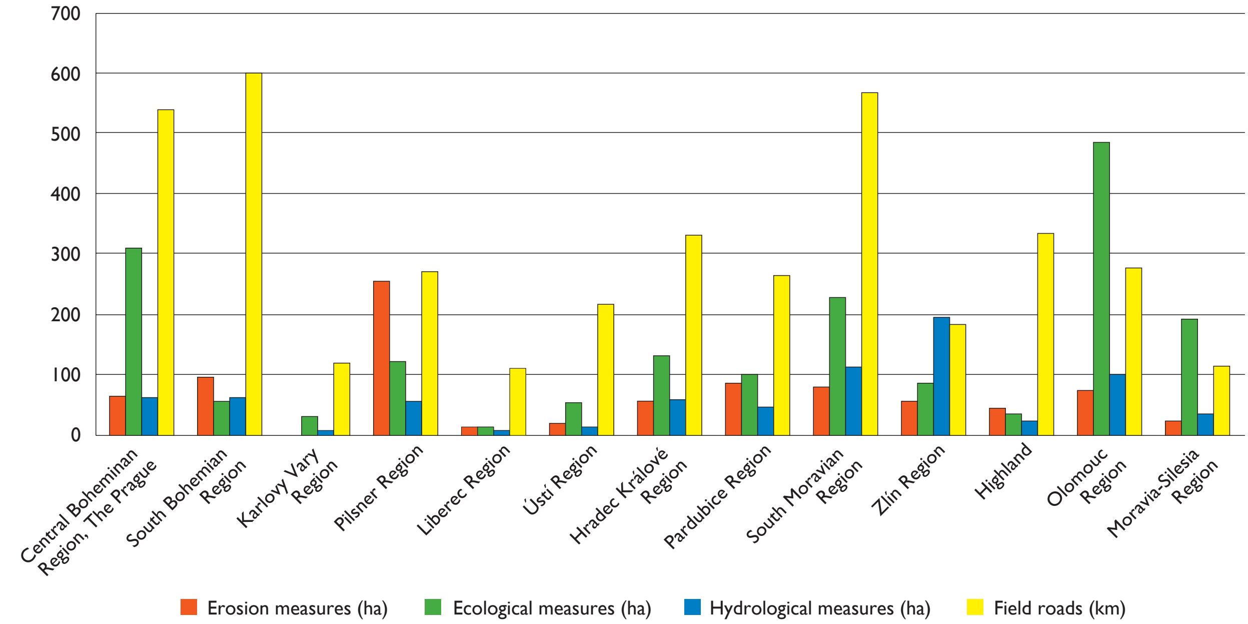
Source: SLO

Table 7.2
State Land Office – Total implemented common facilities – as of 31/12 2022

Measure	Anti-erosion measures	Environmental measures	Water management measures	Roads
	(ha)			(km)
Total	884.64	1,861.00	793.34	3,943.68

Source: SLO

Graph 7.1
Implemented common facilities in land consolidation by regions as of 31 December 2022



Source: SLO

Amelioration structures

In 2021, the State Land Office expended CZK 39.3 million from the MoA state budget section on management, maintenance and operation of amelioration structures of state-owned land and land that the state is authorised to manage. Maintenance and repair costs reached a total of CZK 14.2 million, costs of operation and repairs of pumping stations (drainage and irrigation) including consumption of electric power were CZK 25.1 million.

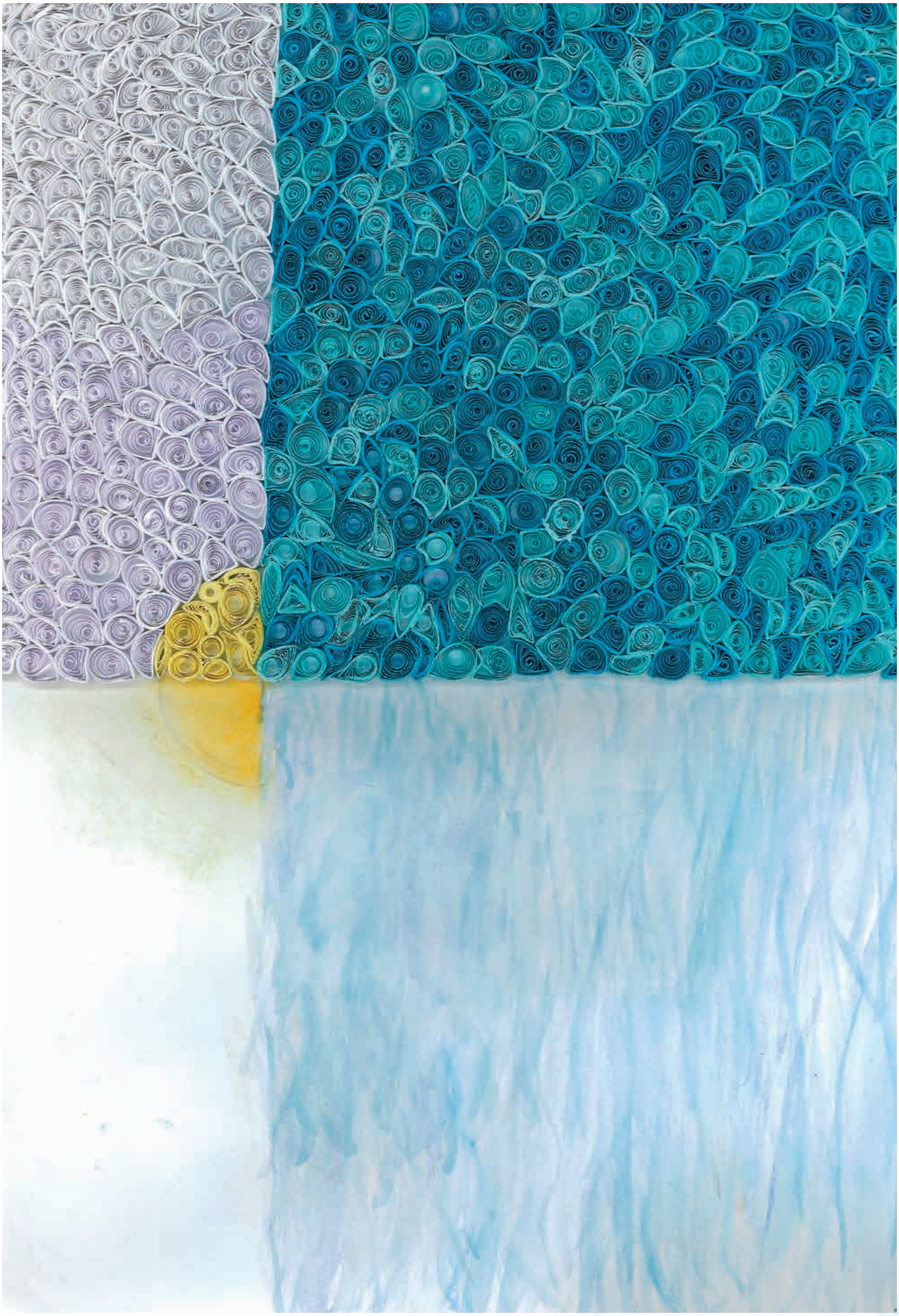
The SLO is authorized to manage structures used for amelioration of land and related hydraulic structures pursuant to Section 56 (6) of the Water Act, as amended, and Section 4(2) of Act No. 503/2012 Coll., on the State Land Office and on amendment to some relevant acts, as amended. The SLO thus ensures management, maintenance, repairs and operation of major drainage facilities, major irrigation facilities and erosion control measures. As of 31 December 2022, the total acquisition value of the property administered by the SLO amounted to CZK 2,58 billion, consisting of 18,943 items of tangible fixed assets, of which 8,907.74 km of channels (5,149.31 km of open channels and 3,758.43 of piped channels), 21 water reservoirs and 129 pumping stations.

Agendas linked to administration of structures used for land amelioration are ensured by the Department of Water Management Structures of the State Land Office. In addition to the routine operation, activities of the employees of the Department focused on modernization of the current irrigation systems and building new ones. Modernization of irrigation systems administered by the State Land Office is funded through MoA programme 129 310 'Support for Competitiveness of Agri-food Complex – Irrigation – Stage II' and sub-programme 129 313 'Support for Optimization of Irrigation Networks Administered by the State Land Office' from which funds totalling to CZK 3,591,773 million were used for 5 projects (3 implemented projects, 2 project documentations) in 2022.

In 2022, the SLO carried out pilot project works of selected linear structures of the main drainage facilities and identified structures suitable for revitalisation and water retention in the landscape. The proposed measures will be implemented through the land consolidation institute. The SLO thus gradually fulfils tasks arising from the Plan of Measures for Drought Management through Land Consolidation and Adaptation of Water Amelioration with the view of completion in 2030.

In 2021, the State Land Office implemented over-the-limit public contracts for operation of the main drainage facilities under its management. The implementation of these contracts will ensure operation of the main drainage facilities under its management from 2023 through 2026. The Water Structures Department also started implementing public contracts consisting in maintenance through the dynamic purchasing system.

The Bavorovský Stream, The Bavorov Reservoir – Reservoir reconstruction and de-watering reservoir, condition before repair (Author: Bušek Jan)



T. Šimánková – Sunrise by the sea, Primary School Františka Krupky, Dobruška

8. WATERWAYS

Pursuant to Act No. 114/1995 Coll., on inland navigation, as amended, the Ministry of Transport is responsible for the development and modernisation of significant waterways. The activities concern in particular the development of the Elbe-Vltava waterway, which is the most significant waterway in the Czech Republic in terms of transport and is the only navigable link between the Czech Republic and the West European waterway network.

Under the 'European Agreement on Main Inland Waterways of International Importance' the E 20 main European waterway on the Elbe and its branch E 20-06 on the Vltava River, is an internationally important waterway. As defined in Regulation No. 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network, the entire Elbe waterway from the state border between the Czech Republic and Germany to Pardubice and the Vltava waterway from Mělník to Třebenice is included in the TEN-T network. In Annex 1, Part 1 of this Regulation, this waterway is included in the 'Eastern and East Mediterranean' corridor and into predetermined projects 'Hamburg – Dresden – Prague – Pardubice' – 'work on improved navigability and modernization'.

From this perspective, it is a project of highest importance. The necessity to increase the parameters is also documented by the Corridor Study of December 2014 prepared for the European Commission and by the work schedule of the European coordinator for this corridor which identifies as critical the fact that the parameters of the Elbe and the Vltava Waterways fail to meet the requirements for waterways of Class IV.

From the Ústí nad Labem – Střekov HS to Přelouč on the Elbe River and to Třebenice on the Vltava River, navigability is ensured by a system of hydraulic structures constituting a fully functioning transport system, independent of external natural conditions. However, navigation traffic in the regulated stretch from Střekov down the stream to the Czech Republic/Germany state border depends on the momentary flow rates and on the overall water situation in the entire Elbe and Vltava River Basins. In order to ensure trouble-free navigation on the Elbe–Vltava Waterway, it is essential to improve the navigation conditions in the 40 km long section between Ústí nad Labem and the state border.

The strategic material of the Ministry of Transport entitled 'Water Transport Concept for 2016–2023' has been under discussion for a long time.

Operation and maintenance of waterways including operation of lock chambers is ensured by the Vltava, Elbe and Morava River Boards, s.e. For more detailed information including funding see Chapter 11.1 of this Report.

The Lock Chamber, Kostomlátky on the Elbe waterway (Source: Elbe River Board, s.e.)

A. Chovancová – Turtle water world, Primary School Weberova, Prague 5

9. PUBLIC WATER SUPPLY AND SEWERAGE

9.1 Drinking water supply

In 2022, 10.069 million inhabitants in the Czech Republic, 95.6% of the total population, were supplied from water supply systems.

A total of 584.3 million m³ of drinking water was produced in all water supply systems. 478.1 million m³ of drinking water was supplied (invoiced) for payment, of which 328.7 million m³ of drinking water was supplied to households. Drinking water losses amounted to 84.4 million m³, i.e., 14.7% of the water intended for implementation.

The data provided by the CSO was based on a sample of 1,659 respondents, i.e., 349 professional water supply and sewerage operators and a selected sample of 1,346 municipalities that operate their own water infrastructure. The published outputs for the regions and the Czech Republic are the result of a mathematical calculation.

The Water Treatment Plant, Lázně Bělohrad (Author: Hubalová Petra)

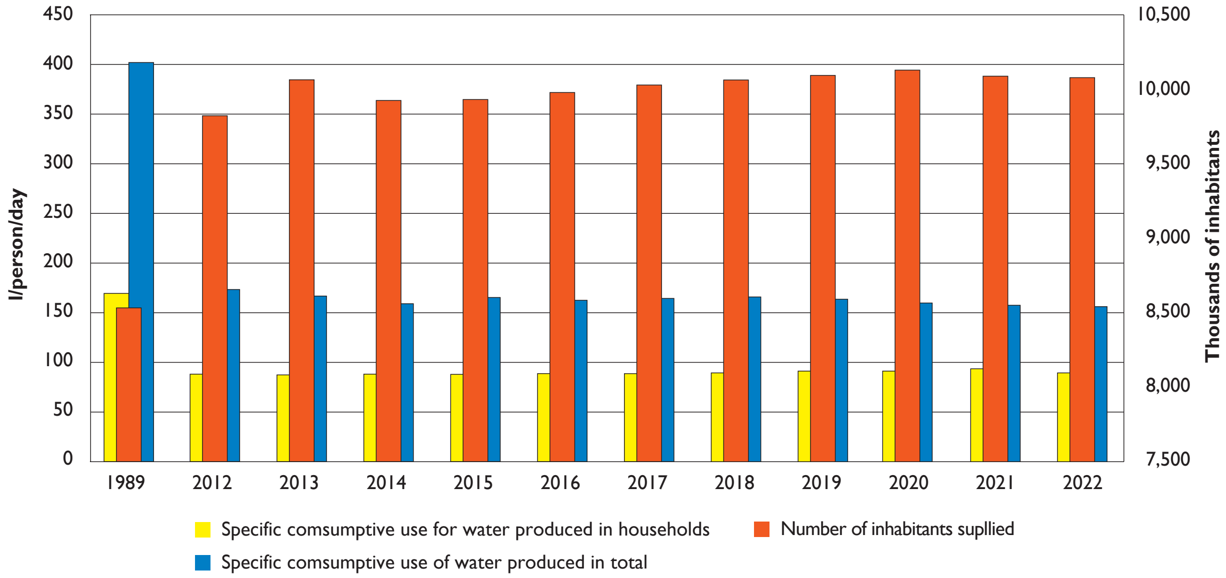
The specific quantity of total water invoiced is the proportion of total water invoiced (to households, industry and other customers) per supplied inhabitant per day and represents how many litres of total water consumption (invoiced water) is per a supplied inhabitant. In 2022, the consumption of specific quantity of water invoiced decreased slightly by 0.1 l/person/day to 130.1 l/person/day and consumption of water invoiced to households also decreased by 3.8 l/person/day to 89.4 l/person/day.

Table 9.1.1
Water supply from water supply systems in 1989 and 2017–2022

Indicator	Unit of measurement	1989	2017	2018	2019	2020	2021	2022
Inhabitants (mean)	thousands of inhabitants	10,362	10,584	10,626	10,669	10,700	10,501	10,530
Inhabitants actually supplied with water from water supply systems	thousands of inhabitants	8,537.0	10,027.4	10,064.1	10,090.1	10,126.3	10,075.9	10,069.0
	%	82.4	94.7	94.7	94.6	94.6	96.0	95.6
Water produced by water supply systems	million m³/year	1,251.0	603.8	609.7	602.4	589.4	587.2	584.3
	% as at 1989	100.0	48.3	48.7	48.2	47.2	46.3	46.0
Water invoiced in total	million m³/year	929.4	482.0	490.4	492.6	479.0	478.7	478.1
	% as at 1989	100.0	51.9	52.8	53.0	51.5	51.5	51.4
Specific consumptive use of water produced	l/person/day	401.0	164.9	165.9	163.5	159.5	157.5	156.7
	% as at 1989	100.0	41.1	41.4	40.8	39.8	39.3	39.1
Specific quantity of water invoiced in total	l/person/day	298.0	131.7	133.5	133.8	129.2	130.2	130.1
	% as at 1989	100.0	44.2	44.7	44.9	43.4	43.7	43.7
Specific quantity of water invoiced to household	l/person/day	171.0	88.7	89.2	90.6	91.1	93.2	89.4
	% as at 1989	100.0	51.8	52.2	52.3	52.6	54.5	52.3
Water losses per 1 km of water mains	l/km/day	16,842.0*)	3,409.4	3,303.5	2,993.5	3,042.3	2,955.1	2,855.6
Water losses per 1 inhabitant supplied	l/person/day	90.0*)	26.7	25.8	23.4	23.8	23.5	23.0

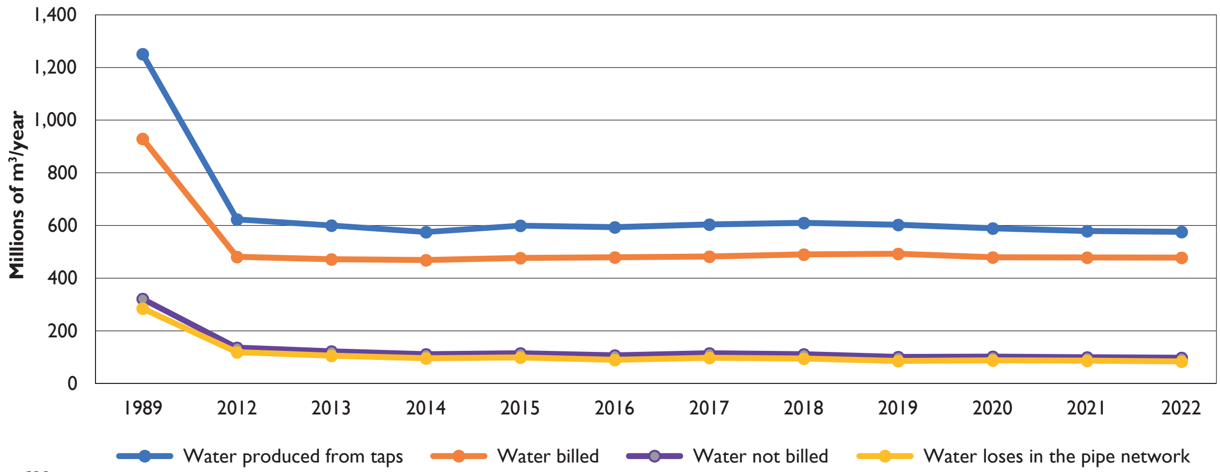
Source: CSO
*Note: *) Data for the water supply systems of the main operators.*

Graph 9.1.1
Development of the number of inhabitants supplied, specific needs for water produced and the specific amount of water invoiced to households in 1989 and 2012–2022



Source: CSO

Graph 9.1.2
Development of the quantity of water produced in water supply systems and total water invoiced in 1989 and 2012–2022



Source: CSO

Vodovody a kanalizace Hradce Králové (Author: Hubalová Petra)

The highest share of the population supplied with drinking water from water supply systems in 2022 was in the Karlovy Vary Region (100%), the Capital City of Prague (100%), the Moravia-Silesia Region (99.7%) and the Pardubice Region (99.0%), while the lowest share of the population supplied with drinking water was in the Central Bohemian Region (88.4%) and the Pilsen Region (87.5%).

The length of the water supply network was extended by 808 km to 81,005 km in 2022, which means that, taking into account the number of inhabitants supplied, the length of water supply network per inhabitant is 8.04 m.

The number of water supply connections increased by 25,944 to 2,267,268. The number of water meters installed increased by 26,068 to a total of 2,269,684. There are almost five inhabitants per water connection. These figures reflect the consequences of the relatively massive construction of family houses.

Table 9.1.2
Population supplied, production and supply of water from the water supply system in 2022

Region	Residents: supplied with water from water supply system	Residents: share of the population supplied with water	Water produced	Water invoiced: Total	Water invoiced: of which for households
	(number)	(%)	(thousands of m³)		
City of Prague	1,281,331	100.0	102,014	76,117	52,030
Central Bohemia	1,232,825	88.4	56,818	55,618	39,157
South Bohemia	582,263	91.3	34,014	26,470	17,035
Pilsen	507,396	87.5	29,959	24,968	16,070
Karlovy Vary	282,960	100.0	18,644	13,802	9,197
Ústí nad Labem	781,468	97.9	46,299	36,579	26,212
Liberec	407,249	93.1	25,368	19,020	13,034
Hradec Králové	526,359	97.1	30,312	23,399	15,856
Pardubice	509,773	99.0	26,514	22,248	14,667
Vysočina	487,047	96.6	23,962	21,209	14,410
South Moravia	1,147,941	96.7	63,117	55,483	38,580
Olomouc	594,339	95.5	28,538	25,870	18,155
Zlín	556,230	97.2	28,105	22,592	15,678
Moravia–Silesia	1,171,862	99.7	70,636	54,725	38,665
Czech Republic	**10,069,043**	**95.6**	**584,300**	**478,100**	**328,746**

Source: CSO

9.2 Discharge and treatment of municipal wastewatersd

In 2022, 9.191 million inhabitants of the Czech Republic lived in houses connected to the sewerage system, which is 87.3% of the total population. A total of 453 million m³ of wastewater was discharged into the sewerage system (excluding rainwater invoiced). Out of this quantity, 97.7% of the wastewaters were treated (excluding rainwater), which amounts to 442.4 million m³.

The number of inhabitants connected to the sewerage system increased by 16,835 year-on-year. The volume of wastewater discharged into the sewerage system excluding rainwater increased by 1.2 million m³ year-on-year. The quantity of treated water (including rainwater) decreased by 77.9 million m³ year-on-year.

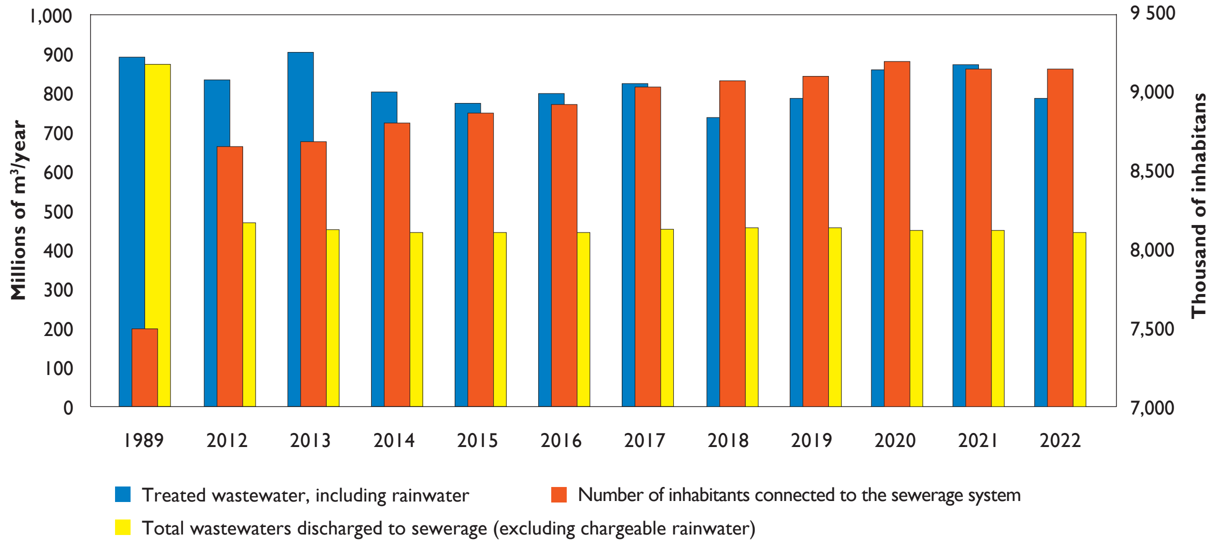
Table 9.2.1
Discharge and treatment of wastewaters from the sewerage system in 1989 and 2017–2022

Indicator	Unit of measurement	1989	2017	2018	2019	2020	2021	2022
Inhabitants (mean)	thousands of inhabitants	10,364	10,590	10,626	10,669	10,700	10,501	10,530
Residents in houses connected to sewerage systems	thousands of inhabitants	7,501	9,052	9,090	9,120	9,211	9,174	9,191
	%	72.4	85.5	85.5	85.5	86.1	87.4	87.3
Total wastewaters discharged to sewerage systems (excluding rainwater invoiced)	millions of m³	877.8	453.3	457.3	461.1	450.5	451.8	453.0
	% compared to 1989	100.0	51.6	52.1	52.5	51.3	51.5	51.6
Treated wastewaters including rainwater [1)]	millions of m³	897.4	826.2	743.6	792.6	863.0	877.6	799.7
Total treated wastewaters excluding rainwater	millions of m³	627.6	442.2	446.3	450.3	439.3	440.7	442.4
	% compared to 1989	100.0	70.5	71.1	71.7	69.9	70.2	70.5
Percentage of treated wastewaters excluding rainwater [2)]	%	71.5	97.5	97.6	97.7	97.5	97.5	97.7

Source: CSO
Note: [1)] In 1989, the figures relate to sewers run by the main operators.
[2)] It is the share of water discharged to sewers (excluding rainwater invoiced).

The highest share of population connected to the sewerage system in 2022 was in the Karlovy Vary Region (100.0%) and the Capital City of Prague (99.6%), the lowest share was in the Liberec Region (73.4%) and the Central Bohemia Region (77.9%).

Graph 9.2.1
The number of inhabitants living in houses connected to the sewerage system and the quantity of discharged and treated wastewaters in 1989 and 2012–2022



Source: CSO

Table 9.2.2
The number of inhabitants living in houses connected to the sewerage system and the amount of wastewater discharged and treated in each region in 2022

Region	Permanent residents in buildings connected to the sewerage system		Wastewater discharged to sewerage systems (excluding rainwater invoiced)	Treated wastewaters (excluding rainwater)	
	Total	Share of total population	Total	Total	Share
	(number)	(%)	(thousands of m³)	(thousands of m³)	(%)
City of Prague	1,275,586	99.6	76,272	76,272	100.0
Central Bohemia	1,086,774	77.9	53,167	53,093	99.9
South Bohemia	549,124	86.1	27,396	26,416	96.4
Pilsen	507,312	87.4	26,316	25,094	95.4
Karlovy Vary	282,960	100.0	13,401	13,394	99.9
Ústí	691,922	86.7	30,957	30,534	98.6
Liberec	320,942	73.4	14,632	14,401	98.4
Hradec Králové	440,055	81.1	20,756	19,886	95.8
Pardubice	404,644	78.6	18,359	18,147	98.8
Vysočina	442,390	87.7	18,936	17,454	92.2
South Moravia	1,091,347	92.0	53,273	52,727	99.0
Olomouc	543,284	87.3	28,055	27,468	97.9
Zlín	555,646	97.1	25,800	24,065	93.3
Moravia–Silesia	999,305	85.0	45,677	43,439	95.1
Czech Republic	**9,191,291**	**87.3**	**452,997**	**442,390**	**97.7**

Source: CSO

The length of the sewerage network was extended by 1,014 km to reach 51,568 km in 2022. According to the CSO, the total number of WWTPs increased by 54 compared to the previous year to a total of 2,915 WWTPs.

9.3 Development of water and sewerage prices

In 2022, according to a survey by the Czech Statistical Office, the average price of water excluding VAT was 46.10 CZK/m³ and the average price of sewerage was 41.00 CZK/m³.

Before the amendment to Act No. 76/2006 Coll. came into force in 2006, information about the average price of water and sewerage charges was determined on the basis of data that selected water supply and sewerage system operators sent upon request to the MoA. The amendment now requires owners (or operators authorized by owners) to send to the MoA annually by 30 April of the following calendar year detailed information about comparing all items in price calculation in accordance with price regulation for water and sewerage charges and actual numbers from the previous year pursuant to the provision of Section 36(5) of Act No. 274/2001 Coll., on water supply and sewerage systems for public use and on amendments to some related acts (act on water supply and sewerage systems), as amended (the 'WSS Act'). The MoA receives information about the prices including VAT through inquiry, while mean values are obtained through weighted average. With respect to the deadline for filing the comparisons it was impossible to include and assess the data in this publication. For this reason, we only present data ascertained by an inquiry of the CSO such as share in revenue from customers and the volume of drinkable water supplied and wastewaters discharged (including rainwater invoiced). The overall data obtained by the CSO concerning the Czech Republic are not a weighted average and they thus cannot be compared with data from MoA materials.

Based on a CSO survey, the highest average price of water was in the Ústí nad Labem Region (53.8 CZK/m³), which was 16.7% higher than the nationwide average. The highest average price of sewerage was in the Liberec Region, (48.4 CZK/m³), 18.0% higher than the nationwide average. By contrast, the lowest average price of water (38.9 CZK/m³) was in the Olomouc Region. The lowest average price of sewerage (32.6 CZK/m³) was in the Vysočina Region.

Table 9.3.1
Strike prices of water and sewerage charges in 2021 and 2022

Indicator	Measurement unit	2021	2022	Index 2022/2021
Total water charges	millions of CZK	20,988	22,058	1.05
Total water billed	millions of m³/year	478.7	478.1	1.00
Average price for water charges	CZK/m³ excl. VAT	43.80	46.1	1.05
Total sewerage	millions of CZK	20,225	21,507	1.06
Wastewater discharged into the sewerage system*)	millions of m³/year	524.8	524.0	1.00
Average price for sewerage	CZK/m³ excl. VAT	38.5	41.0	1.06

Source: CSO
*Note: *) Since 2013, including rainwater invoiced.*

Table 9.3.2
Water consumption, average prices without VAT for water and sewerage in 2022

Region	Specific quantity of water invoiced in total	Specific quantity of water invoiced to households	Average price of water	Average price of sewerage
	(l/person/day)		(CZK/m³ excl. VAT)	
City of Prague	162.8	111.2	51.0	47.4
Central Bohemia	123.6	87.0	50.0	41.7
South Bohemia	124.5	80.2	42.6	33.2
Pilsen	134.8	86.8	48.4	34.1
Karlovy Vary	133.6	89.0	46.0	41.6
Ústí	128.2	91.9	53.8	47.5
Liberec	128.0	87.7	51.3	48.4
Hradec Králové	121.8	82.5	41.0	40.2
Pardubice	119.6	78.8	41.9	42.2
Vysočina	119.3	81.1	43.2	32.6
South Moravia	132.4	92.1	42.9	41.3
Olomouc	119.3	83.7	38.9	39.6
Zlín	111.3	77.2	43.0	37.1
Moravia–Silesia	127.9	90.4	42.3	38.6
Czech Republic	**130.1**	**89.4**	**46.1**	**41.0**

Source: CSO

9.4 Regulation of the water supply and sewerage systems

In 2022, the Ministry of Agriculture carried out a total of 30 inspections of owners and operators of water supply and sewerage systems for public use.

The Ministry of Agriculture sees the main objectives of the regulation of water supply and sewerage for public use primarily in the following four key areas: monitoring the long-term sustainability of water supply and sewerage for public use, especially in relation to the financing plan for renewal and its implementation, increasing the transparency of price regulation for water and sewerage, continuously improving the protection of customers and obtaining the basis for proposals for amending legislation in the field of water supply and sewerage for public use, and increasing the protection of customers. In 2022, the control activities of the Ministry of Agriculture, provided by the Office of the Chief Regulator and Supreme Supervision of the Water Supply and Sewerage Sector (the 'WS&S'), will continue to focus on controlling the fulfilment of the obligations of owners and operators of water supply and sewerage systems arising from Act No. 274/2001 Coll., on water supply and sewerage systems for public use and on amendments to some related acts (the WSS Act) and from Decree 428/2001 Coll. The Ministry of Agriculture carried out a total of 30 inspections of owners and operators of public water supply systems in 2022. At the same time, the Ministry of Agriculture continued other activities aimed at improving the situation in the WS&S sector.

The audits focused mainly on the fulfilment of basic legal obligations of owners and operators of water management infrastructure. Their content was the operating permits and the compliance of Selected data from Public Water Supply and Sewerage Systems Assets Registry (the 'VÚPE') and Selected data from Public Water Supply and Sewerage Systems Operational Registry ('VÚME') of the operated WS&S assets with issued permits for operation of water systems for public use, operating contracts concluded between owners and operators of WS&S, written agreements between owners of operationally related WS&S, compulsory contractual relationship between operators and their professional representatives, compulsory details of customer contracts, and compliance of accounting documents issued for water and sewerage charges with the published price, including control of compliance with the procedures for determining the quantity of water supplied and wastewater discharged. Other aspects audited were the processing of sewerage codes, evidence of their approval by the water authority and processing of the complaints procedure. Particular attention was paid to the compulsory preparation of renovation financing plans and creating reserve funds for renovation of the WS&S together with providing confirmation of their use for such purposes.

In the case of the identified deficiencies, the Ministry of Agriculture required remedial action to be taken. Recurring major deficiencies included, for example, absence or incorrect preparation of the renovation financing plan, failure to comply with the compulsory requirements of the WSS Act for customer contracts, non-compliance of the VÚME and VÚPE with the issued permits for operation of the respective WS&S for public use, incorrectly determined quantity of delivered drinking water or discharged wastewater for invoicing water and sewerage charges to customers, absence of agreements between owners of operationally related water supply or sewerage systems, etc.

Table 9.4.1
Number of audits of owners and operators of water supply and sewerage systems in 2022

Entities inspected	Number of audits
Supply and sewerage system owners	**3**
– of which cities and municipalities	1
Water supply and sewerage system owners that are also operators	**8**
– of which cities and municipalities in the mode of independent operation	5
Water supply and sewerage system operators	**19**
– of which operators in the owner-operator mode	2
Total audits carried out	**30**

Source: MoA (Report on the performance of activities of owners and operators of water supply and sewerage systems for public use in the Czech Republic in 2022)

The Ministry of Agriculture finds significant differences between the audited entities. It is continuously confirmed that some municipalities, in their position as owners of WS&S for public use, underestimate the complexity of the sector, regardless of whether they lease the infrastructure or operate it on their own behalf and under their own responsibility. In some cases, this is reflected, for example, in their price policy, inadequate particularly in view of financing plans for renovation of the water and wastewater systems. Typically, small and medium-sized municipalities tend to prefer prices that are significantly below the actual sum of all the total costs linked with the operation and renovation of the water supply system, which often leads to incomplete or distorted values in the price calculation. And, subsequently, in the comparison of all the items of the price calculation with the actual value. Furthermore, the Ministry of Agriculture often finds that these entities (operators of water supply or sewerage systems) do not receive services from a professional representative and in some cases such experts are not even in a contractual relationship with the municipality. The institute of a professional representative is intended to ensure that the WS&S is operated in accordance with the applicable legislation and the technical and operational requirements of the infrastructure in question. The Ministry of Agriculture has repeatedly found that some expert representatives perform their functions rather formally, either because of lower financial remuneration or because of their reduced availability in some regions. The Ministry of Agriculture also provides the audited entities with methodological assistance in the framework of the audit, if they are interested. On the basis of the aforementioned experience, the Ministry of Agriculture gathers and assesses background materials aimed at refining the legislation in force.

In addition to the aforementioned control activities, the Ministry of Agriculture also carried out an assessment of the amount of financial resources generated for the renovation of water supply and sewerage systems for public use, which the owners of these water supply and sewerage systems reported in accordance with Section 36(5) and (7) of the WSS Act in a comparison of all items in the calculation of prices for water and sewerage for the calendar year 2021 and the actual amount generated in the same year. Entities that reported zero or significantly low amounts of such funds were invited by the Ministry of Agriculture to send a copy of the table of the currently valid and approved financing plan for renovation of water supply and sewerage systems in their ownership and a completed table of the actual generation of funds for renovation in 2018–2021. A total of 1187 owners of water supply and sewerage systems were asked to submit the tables. Due to the timing of sending mail and communicating with the entities, the Ministry of Agriculture will continue to address this campaign in the following year.

The Ministry of Agriculture also continued the campaign it had launched in 2020, aimed at identifying potential owners of water supply or sewerage systems for public use who, in breach with Section 5(1) to (3) of the WSS Act, have not kept property and operational records of water supply and sewerage systems for a long time and have failed to send the VÚME and VÚPE to the locally competent water authority, and where it can therefore be reasonably be assumed that they are in breach of other obligations under the WSS Act. The Ministry of Agriculture inspected whether the owners who were proven to be owners of public water supply systems within the meaning of Section 1 of the WSS Act in the previous phases of the campaign, or voluntary associations of municipalities which took over the ownership of water supply systems in the municipalities, had started to fulfil their obligations under Section 5(3) of the WSS Act after being requested to do so. Of such 104 entities where ownership of the water supply system for public use was proven, a total of 52 of them remedied the situation and started to fulfil their obligations. The Ministry of Agriculture will send a repeated call to the entities that were not recorded in the selected property and operational data records for 2021 by the beginning of the following year, with a warning that in the event of failure to remedy the situation, the Ministry of Agriculture will proceed by submitting complaints to the locally competent water authorities and initiate proceedings for the imposition of a fine for the proven offence.

Another activity of the Office of the Chief Regulator and Supreme Supervisor of the WS&S is the performance of analytical activities aimed at providing relevant information concerning the situation in the sector, necessary for designing and adopting adequate regulatory measures. Since 2016, two separate projects, Benchmarking of Owners and Benchmarking of Operators, have been running at the MoA at regular annual intervals. By publishing the Benchmarking Report and presenting the analysed data on the MoA website in the Water – Water supply and sewerage - WS&S Benchmarking section, the Ministry ensures transparency in the WS&S sector.

In 2022, the projects included data representing a 99% share of the drinking water market and a 97% share of the wastewater market.

The Benchmarking of Owners project emphasizes in particular monitoring of the fulfilment of the objective, which is to achieve self-financing of the water infrastructure. From this point of view, the lack of generation of funds for renovation of water infrastructure assets from water and sewerage charges appears to be the most significant problem. From 2016 to 2021, according to the methodology in force, the theoretical deficit in the creation of funds for the renovation of WS&S infrastructure assets was calculated at a total of CZK 10.5 billion, see the table below. The Ministry of Agriculture does not have sufficient information on the extent to which the deficit is compensated by subsidies from public or private sources.

The subject of the analyses of the Benchmarking of Operators project is the quality of services provided, pricing and environmental impacts. The focus is mainly on the quality of drinking water supplied, monitoring of drinking water losses, and the development of the share of non-compliant samples of drinking water and wastewater.

The average losses of water intended for sale has seen a slightly decreasing trend in the past three years, reaching 13.85% in 2021, which indicates a stable level of care for water supply assets and working with the loss indicator while improving operational performance. The quality of the drinking water supplied showed a consistently high level in the years observed.

The main problem in addressing the shortcomings in both benchmarking projects is the large number of owners and operators of water supply and sewerage systems. This fragmentation of the WS&S sector is negatively reflected in various processes, including the provision of services to the public. The most serious shortcomings were repeatedly identified in municipal operators invoicing less than 0.4 million m³ of water. The shortcomings include insufficient financial support for infrastructure renovation, unsystematic maintenance of assets, a lower degree of expertise and insufficient compliance with the obligations under the WSS Act and its implementing Decree No 428/2001 Coll.

More detailed information on the activities of the Ministry of Agriculture in the field of water supply and sewerage regulation can be found on the MoA website in the section dedicated to WS&S.

Table 9.4.2
Missing funds for renovation in 2016–2021

Missing funds for renovation	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Total**
	millions of CZK/year						
Drinking water	456.46	460.21	532.36	507.84	817.07	862.38	**3,636.32**
Wastewaters	758.85	808.21	1,045.56	1,033.58	1,534.21	1,681.71	**6,862.12**
Total	**1,215.31**	**1,268.42**	**1,577.92**	**1,541.42**	**2,351.28**	**2,544.09**	**10,498.44**

Source: MoA

V. Jelínek – World under water, Primary School Otevřená, Brno

10. FISHERIES AND FISH FARMING

There are currently approximately 24,000 fishponds and reservoirs with a total surface area of around 52,000 ha in the Czech Republic. In 2022, 19 thousand tonnes of marketable fish were caught in the Czech Republic.

Fisheries in the Czech Republic is divided in fish farming and recreational fishing, both regulated by Act No. 99/2004 Coll., on fish farming, exercise of fishing rights, fisheries guards, protection of marine fishing resources and on amendment to some acts (the Fisheries Act) and its implementing Decree No. 197/2004 Coll. Production fishing is a traditional part of agricultural production.

Fish is farmed at more than 41 hectares of fishponds and water reservoirs in the Czech Republic with more than 180 significant fish producers (i.e., companies producing more than 5 tonnes of fish per year) and several hundreds of small-scale breeders. Big producers of fish and waterfowl, fish processors, fish research and education institutions and fish associations are associated under the Czech Fish Farmers Association of the Czech Republic, seated in České Budějovice.

There are more than 2,000 official fishery districts in the Czech Republic with a total area of approximately 42,000 hectares and around 350,000 recreational fishermen registered. Fishery districts are classified as non-trout-fishing waters and trout-fishing waters. The largest users of fishery districts in the Czech Republic are the Czech Anglers Union, interest association, and Moravian Anglers Union, interest association. Recreation fishermen catch around 3–4 thousand tonnes of fish every year in fishery districts, the most caught fish is common carp.

Czech fishery has been facing many negative factors on a long-term basis. One of the main problems that interferes with production and recreation fishing is an increased pressure from fish-eating predators such as heron, otter and cormorant. Damage caused by such predators amounts to hundreds of millions CZK every year. Fishery is also affected by the ongoing climate change which is reflected in fish production as well as in fish population in fishing districts. Another adverse factor that complicates fish production is restriction on economic activity due to requirements concerning nature preservation and a compromise between interests of nature preservation and fish production should be found.

The total production in 2022 included 18.4 thousand tonnes of fish from ponds, 820 tonnes from special facilities (mostly from flow-through systems with salmonids and from recirculatory aquaculture systems) and 29 tonnes from dams.

Table 10.1
Market production of farmed fish in the Czech Republic in 2013–2022

Type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	tonnes									
Carp	16,809	17,833	17,860	18,354	18,460	18,430	17,945	17,370	17,616	16,437
Total	**19,358**	**20,135**	**20,200**	**20,952**	**21,685**	**21,751**	**20,986**	**20,401**	**20,991**	**19,259**

Source: MoA and Czech Fish Farmers Association

Reconstruction of the Hranice Weir – Fish ladder (Source: Morava River Board, s.e.)

6,397 tonnes of live fish were supplied to the Czech market, which means a year-on-year decrease of 1,235 tonnes. Export of live fish amounted to 9,401 tonnes, a decrease of 315 tonnes. In 2022, 2.4 thousand tonnes of fish were processed in live weight, which accounts for 12.5% of the total marketable fish caught.

The species composition of marketable fish is relatively stable and did not change significantly, compared to 2021. Of the total volume of harvested fish, carp accounted for 78.3% of the total catch, salmonids accounted for 3.3%, herbivorous fish 3.6%, tench 0.7% and predatory fish 1.3% of the total harvested quantity.

The domestic market continued to prefer supplies in the form of live fish, which in the past three years accounted for 33–37% of the production obtained by fish farming. Export of live fish in the past three years was 45–49% of the total harvest and displayed stable interest in fish produced mainly by member organizations of the professional association. Fish processing plants processed into products 12.5% of the freshwater marketable fish produced.

The consumption of freshwater fish obtained from fish farming in 2022 reached the value of 0.8 kg/person/year. To calculate the total consumption of freshwater fish per person in 2022, population of 10,516,707 as of 31 December 2022 was considered.

Peek-a-boo (Source: MoA)

Confluence of the Morava River and the Thaya River (Author: Man Miroslav)

Table 10.2
Consumption of marketable fish produced by farming in the Czech Republic in 2013–2022

Year	Total production	of which *)		
		sale of live fish in the Czech market	processed fish (live weight)	export of live fish
	thousands of tonnes			
2013	19.4	9.0	2.4	8.4
2014	20.1	8.5	2.1	8.4
2015	20.2	9.2	1.9	9.9
2016	21.0	8.3	2.5	11.0
2017	21.7	8.2	2.4	11.1
2018	21.8	8.4	2.2	10.3
2019	21.0	8.5	2.4	10.3
2020	20.4	7.6	2.4	9.2
2021	21.0	7.6	2.4	9.7
2022	19.3	6.4	2.4	9.4

Source: MoA and Czech Fish Farmers Association
*Note: *) Includes beginning and end of year stocks, losses and imports of live freshwater fish.*

Table 10.3
Fish consumption in the Czech Republic in 2013–2022

Type	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	kg/person/year									
Total fish	**5.3**	**5.4**	**5.5**	**5.1**	**5.4**	**5.6**	**6.0**	**5.7**	**5.6**	**5.1**
of which freshwater fish produced and caught in the Czech Republic	1.4	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.2	1.1

Source: MoA and Czech Fish Farmers Association

A. Šulíková – Secret underwater beauty, Primary School Hnojník

11. FINANCIAL SUPPORT FOR WATER MANAGEMENT

11.1 Financial support from national and transnational programmes

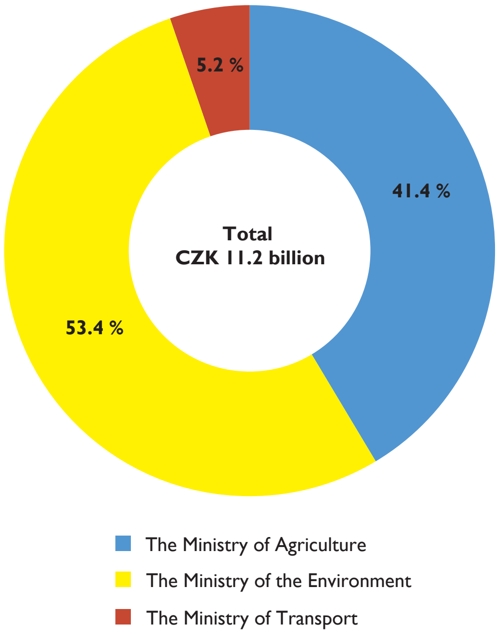
Financial support for water management includes selected national and transnational grant programmes related to water management. In 2022, the support was 11,168 million. The Ministry of Agriculture contributed to the sum with 42% of this amount (subsidies amounting to CZK 4,628 million), the Ministry of the Environment with 53% (CZK 5,963 million funded) and the Ministry of Transport with 5% (CZK 577 million).

Table 11.1.1
Key state financial support in water management in 2022

Resort	Total funds spent in millions of CZK
Ministry of Agriculture	4,628,
Ministry of the Environment	5,963
Ministry of Transport	577
Total	**11,168**

Source: MoA using data of MoE and the Ministry of Transport

Graph 11.1.1
Financial support for water management by ministries in 2022



Source: MoA using data of MoE and the Ministry of Transport

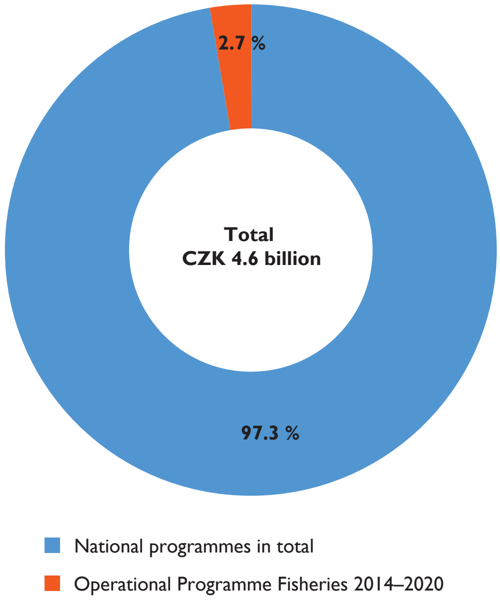
Revitalization of the Vltava River, Vraňany-Hořín (Source: Vltava River Board, s.e.)

11.1.1 Financial support provided by the Ministry of Agriculture

In 2022, the Ministry of Agriculture administered 18 grant programmes focused on water management, of which 16 were national and one was funded by national or supranational sources. In total, funds amounting to CZK 4,628 million were disbursed.

Drinking water reservoir Hamry (Source: Elbe River Board, s.e.)

Graph 11.1.1.1
Allocation of funds under the Ministry of Agriculture in 2022



Source: MoA using data of MoE and the Ministry of Transport

Table 11.1.1.1
Funds provided for water management by the Ministry of Agriculture in 2022

Programme registration number	Programme name	Programme expenditures in millions of CZK
129 300	Support for Construction and Technical Improvement of Water Supply and Sewerage System Infrastructure II	553.97
129 400	Support for Measures Aimed at Mitigating Negative Impacts of Drought and Lack of Water	704.54
129 410	Support for Construction and Technical Improvement of Water Supply and Sewerage System Infrastructure III	739.43
129 420	Support for Purchase and Integration of Water Supply and Sewerage Infrastructure	0.00
	Subsidy of part of interests on commercial loans under programmes 229 310 and 129 180	0.12
129 260	Support for Flood Prevention III	63.1
129 360	Support for Flood Prevention IV	841.00
129 280	Support for Water Retention in the Landscape – Ponds and Reservoirs	244.73
129 290	Support for Measures at Minor Watercourses and Small Water Reservoirs	120.01
129 310	Support for Competitiveness of Agriculture and Food Processing – Irrigations – Stage II	163.06
129 370	Remediation of Flood Damage to State Water Management Assets III	697.84
129 390	Support for Measures at Minor Watercourses and Small Water Reservoirs – Stage II	23.01
Skalička HS	Purchase of Land for Construction of the Skalička HS	50.73
129 330	Vlachovice – Settling rights to immovable property affected by the planned construction of a hydraulic structure	200.00
129 340	Settling rights to immovable property affected by the planned implementation of comprehensive drought measures in the Rakovník District	79.38
17	Support for Non-productive Functions of Fishing Grounds	22.98
National programmes in total		4,503,90
	Operational Programme Fisheries 2014–2020	124.30
Total		**4,628.20**

Source: MoA

Ensuring quality of surface water sources

As part of measures aimed at reducing the impact of agricultural primary production in the protection zone of the Švihov Water Reservoir on the Želivka River, an amount of CZK 51 million was paid in 2022.

The subsidy was intended to mitigate erosion and restrict application of plant protection agents on agricultural land and in the protection zones of the Švihov Water Reservoir, where intensive farming results in an increased occurrence of pesticides and their metabolites in the Švihov Water Reservoir. Currently, it is discussed that this support shall be transferred under the Rural Development Programme, including the extension of this measure to the protection zones of the water reservoirs of Římov, Vrchlice and Opatovice.

Water supply and sewerage systems

In 2022, investors received support in the form of subsidies and 'soft loans'. Under programme 129 300 'Support for Construction and Technical Improvement of Water Supply and Sewerage System Infrastructure II' that was terminated and the follow-up programme 129 410 'Support for Construction and Technical Improvement of Water Supply and Sewerage System Infrastructure III' of the Ministry of Agriculture, support was provided to 139 projects in the total amount of approx. CZK 1,294 million.

Programme 129 300 was approved for 2017–2022, and the follow-up programme 129 410 for 2021–2025. Both programmes are aimed at implementing measures to comply with European Union directives in the field of water supply and sewerage and at the development of the water supply and sewerage sector.

In 2022, a total of 56 projects were supported by the state budget in the form of subsidies totalling approximately CZK 370 million under sub-programmes 129 302 and 129 412 (measures focused on water supply systems) and a total of 79 projects under sub-programmes 129 303 and 129 413 (sewerage measures) amounted to CZK 914 million. Under sub-programme 129 304 (measures aimed at addressing the impact of the planned expansion of the Polish brown coal mine Turów on the Czech Republic), the state budget supported four projects in 2022, amounting to approx. CZK 10 million.

'Soft loans' were provided for projects under programmes 129 180 and 229 310 that have been terminated. The loans were provided in the form of reimbursement of part of the interest on commercial loans inf 102 projects from 2008–2013, demanding in terms of investment, loan agreements totalling approx. to CZK 1,578 million and maturity of 10 years at the most.

Table 11.1.1.2
State budget funds provided under programmes 129 300, 129 400, 129 410 and 129 420 of the Ministry of Agriculture, including subsidies for part of the interests on commercial loans in 2022

Form of support	Water supply systems and water treatment plants	Sewerage systems and wastewater treatment plants	Renovation of water supply and sewerage systems after floods	Total
	in millions of CZK			
Subsidies for development and renovation of the water supply infrastructure	1,084.151	913.795	0	1,997.946
Subsidies for purchase and consolidation of the WS&S infrastructure	0	0	0	0.000
Subsidies for part of the interest on commercial loans	0.001	0.118	0	0.119
Total subsidies	**1,084.151**	**913.913**	**0**	**1,998.065**
Repayable financial support	0	0	0	0
Total	**1,084.151**	**913.913**	**0**	**1,998.065**

Source: MoA

Table 11.1.1.3
Development of state support for the construction of water supply systems, water treatment plants, sewage systems and wastewater treatment plants under the Ministry of Agriculture in 2018–2022

Financial source	2018	2019	2020	2021	2022
	in millions of CZK				
Repayable financial support	0	0	0	0	0
State budget subsidies	597	974	1,087	1,895	1,998
Support from state budget	**597**	**974**	**1,087**	**1,895**	**1,998**
Soft loan (EIB and CEB)	0	0	0	0	0
Total support	**597**	**974**	**1,087**	**1,895**	**1,998**

Source: MoA

In 2022, a part of the interest on the remaining 11 outstanding loans was paid in 2022 for a total amount of approximately CZK 0.12 million. These are non-investment funds, kept outside the programme financing.

The implementation of two other subsidy programmes 129 400 'Support for Measures Aimed at Mitigate Negative Impacts of Drought and Lack of Water' and 129 420 'Support for Purchase and Unification of the WS&S Infrastructure', which are approved to last until the end of 2025, continued. Under programme 129 420, support was provided to 35 projects totalling to approx. CZK 705 million in 2022. No new applications were submitted under programme 129 420 and the programme was extended until the end of 2025 with the aim of achieving assets consolidation and transferring ownership rights under the control of Czech cities and municipalities.

No funds were expended from Chapter 397 of the State Financial Assets Operations for the aforementioned programs.

Flood control

In 2022, the implementation of programme 129 260 'Support for Flood Prevention III' continued. The programme is a follow-up to the previous stage, with greater emphasis on the implementation of measures with retention effects. In 2022, only one project was funded from the state budged under sub-programme 129 265 in the amount of CZK 63.1 million. The implementation of the programme was completed by 31 December 2022.

The programme was divided into four sub-programmes thematically focused on support for preparatory design works for significant constructions, support for flood control measures with retention and support for flood control measures along watercourses.

In 2022, the last project under the programme was financed, which was the 'Morava, Olomouc – Increasing the Channel Capacity, Stage II', which was the most important project of the entire programme. Its implementation completed the comprehensive flood protection of the Olomouc city built-up area, which also included construction of 2 capacitated bridges.

As in previous years, the implementation of the measures of programme 129 260 was carried out by watercourse administrators (i.e., River Boards, s.e. and Forests of the Czech Republic, s.e. and administrators of minor watercourses appointed by the MoA pursuant to Section 48(2) of the Water Act). Municipalities participated actively in the programme as applicants for subsidies for construction of local measures aimed at reducing flood risk of torrential rain on minor watercourses.

Programme 129 260 allowed municipalities and associations of municipalities, towns and regions to participate in the process of designing flood control measures through the institute of the so-called proposer; the measures proposed by proposers were subsequently implemented by watercourse administrators.

Table 11.1.1.4
Allocation of funds for major projects under programme 129 260 of the Ministry of Agriculture in 2022

Watercourse administrator	Project	Implementation date	Total cost	Subsidies in 2022
			in millions of CZK	
Morava River Board	Morava, Olomouc – Increasing the Channel Capacity, State II	11/2017–12/2022	739.496	63.055

Source: MoA

Table 11.1.1.5
Allocation of funds from the state budget under programme 129 260 of the Ministry of Agriculture by watercourse administrators in 2022

Owners and administrators	Investments	Non-investment
	in millions of CZK	
Elbe River Board	0	0
Vltava River Board	0	0
Ohře River Board	0	0
Oder River Board	0	0
Morava River Board	63.055	0
Forests of the Czech Republic	0	0
Municipalities	0	0
Total	**63.055**	**0**

Source: MoA

In 2022, the Ministry of Agriculture funded projects under programme 129 360 'Support for Remedying Flood Damage IV'. The programme is a follow-up to the previous stages, its emphasis continues to be on the implementation of measures with retention effects. The immediate start of implementation of major projects after the launching of the programme was possible thanks to previously processed design preparation provided conducted during Stage III. 26 projects totalling to CZK 841 million were funded under the programme in 2022.

The programme is divided into four sub-programmes thematically focused on preparation of design works for major constructions, support for flood control measures with retention, support for flood measures along watercourses and also on preparation and implementation of selected constructions related to the construction of the Nové Heřminovy HS.

Sub-programme 129 363 'Support for Project Documentation' is intended to support preparation of project documentations for major constructions of flood control measures that shall subsequently be implemented under further sub-programmes and also pre-project preparation of projects prepared on the basis of Government Resolution No. 243 of 18 April 2018 on preparations of water reservoir constructions in drought-affected regions as an effective measure to reduce water scarcity and proposal of their funding and funding of other significant hydraulic structures.

Sub-programme 129 364 'Support for Flood Control Measures with Retention' is intended to support construction of new retention areas, adjustments at existing water reservoirs with retention effect in order to increase flood protection, measures against flood spilling and building and renovating polders including other related measures.

Sub-programme 129 365 'Support for Flood Control Measures Along Watercourses' is primarily aimed at building flood control measures along watercourses such as construction of protective dykes and increasing the capacity and stabilisation of watercourse channels (especially in built-up areas).

In 2019, the programme was extended by new sub-programme 129 366 'Support for Preparation and Implementation of Investments and Constructions Resulting from the Construction of the Nové Heřminovy Water Structures' aimed at adjusting the site for the planned construction of the new hydraulic structure by conducting preparatory works and technical measures. The sub-programme implements Government Resolution No. 386 of 3 June 2020 concerning the Report on the state of preparation and implementation of measures aimed at reducing flood risks at the Upper Opava River Basin including a proposal of securing funds for the preparation and implementation of the investments and constructions resulting from the 'Measures on the Upper Opava River' project.

As in previous years, the measures of programme 129 360 are implemented by watercourse administrators (i.e., River Boards, s.e., and Forests of the Czech Republic, s.e., and minor watercourse administrators appointed by the MoA pursuant to Section 48(2) of the Water Act. Municipalities actively participate in the programme as applicants for subsidies for implementation of local measures aimed at reducing flood risk of torrential rainfall on minor watercourses.

Table 11.1.1.6
Allocation of funds for selected major projects under MoA programme 129 360 in 2022

Watercourse administrators	Name of event	Implementation date	Total costs	Subsidies in 2022
			in millions of CZK	
Ohře River Board	Nechranice HS	05/21–06/26	121.650	40.00
Vltava River Board	Orlík HS – protection of the HS against floods	09/21–06/27	2,007.171	342.639
Elbe River Board	Pastviny HS, reconstruction of the dam crest	03/21–12/23	64.495	18.975
Oder River Board	Morávka HS, transfer of extreme floods	03/21–02/24	152.837	34.790
Morava River Board	Bečva, Přerov - flood protection above the dam – Stage I	01/22–08/23	70.614	50.000
Forests of the Czech Republic	Muslov IV	08/21–03/23	12.455	9.490

Source: MoA

Table 11.1.1.7
Allocation of state budget funds by watercourse administrators under MoA programme 129 360 in 2022

Owners and administrators	Investments	Non-investment
	in millions of CZK	
Elbe River Board	56.176	0
Vltava River Board	421.786	0
Ohře River Board	47.843	0
Oder River Board	48.901	0
Morava River Board	178.535	68.000
Forests of the Czech Republic	18.233	1.504
Municipalities	0	0
Total	**771.474**	**69.504**

Source: MoA

This programme also allows municipalities and associations of municipalities, towns and regions to participate in the procedure of designing flood measures through the institute of so-called 'proposer'; measures designed by proposers are subsequently implemented by watercourse administrators.

The Water reservoir Gabrielka in the Ore Mountains (Source: Forests of the Czech Republic, s.e.)

Remedying flood damage

The Department of Agriculture's 129 370 'Flood Damage Remediation on State Water Assets III' program continued in 2022. A total of 26 projects were supported with a total amount of more than CZK 163 million.

Programme 129 370 provides for remedying flood damage to watercourse channels including constructions, hydraulic structures and riparian vegetation owned by the state, damaged by extreme stresses during floods and the implementation of purposeful stabilization structures and modifications to structures, ensuring continued functionality of watercourse channels and related structures and facilities where failures occur. The implementation of the programme is approved for the period 1 March 2021 – 31 December 2026.

Elbe River in Špindlerův Mlýn (Source: Elbe River Board, s.e.)

Table 11.1.1.8
Allocation of state budget funds and number of projects funded under MoA programme 129 370 in 2022

Owners and administrators	Use of funds – Investments (in millions of CZK)	Use of funds – Non-investment (in millions of CZK)	Use of funds – Total (in millions of CZK)	Number of funded projects
Forests of the Czech Republic	1.843	1.557	**3.4**	3
Morava River Board	0	159.661	**159.661**	23
Total 129 370	**1.843**	**161.218**	**163.061**	**26**

Source: MoA

Minor watercourses and small water reservoirs

In 2022, the Ministry of Agriculture continued programme 129 390 'Support for Measures on Minor Watercourses and Small Water Reservoirs – Stage II', which is divided into two sub-programmes: 129 392 and 129 393. A total of 385 projects were supported with a total amount of CZK 698 million.

Sub-programme 129 392 'Support for Measures on Minor Watercourses, Fishponds and Small Water Reservoirs – Stage II' is intended for River Boards, s.e. and Forests of the Czech Republic, s.e. In 2022, it provided financial support to 112 projects with a total amount of CZK 286 million.

Sub-programme 129 393 'Support for Measures at Fishponds and Small Water Reservoirs Owned by Municipalities – Stage II' is intended for municipalities and associations of municipalities. Under this sub-programme, financial support was allocated to 273 projects in the amount of CZK 412 million in 2022.

Table 11.1.1.9
Allocation of state budget funds and number of projects funded under MoA programme 129 390 in 2022

Owners and administrators	Use of funds – Investments (in millions of CZK)	Use of funds – Non-investment (in millions of CZK)	Use of funds – Total (in millions of CZK)	Number of funded projects
Ohře River Board	48.620	12.281	**60.901**	7
Forests of the Czech Republic	60.012	24.501	**84.513**	66
Morava River Board	46.821	29.083	**75.904**	14
Vltava River Board	12.744	14.921	**27.665**	16
Oder River Board	3.944	0.500	**4.444**	3
Elbe River Board	30.864	1.761	**32.625**	6
Total 129 392	**203.005**	**83.047**	**286.052**	**112**
Total 129 393 – Municipalities	**379.630**	**32.154**	**411.784**	**273**
Total 129 390	**582.635**	**115.201**	**697.836**	**385**

Source: MoA

Water in the landscape

In 2022, the Ministry of Agriculture continued to administer programme 129 280 'Support for Water Retention in the Landscape – Fishponds and Water Reservoirs' funded between 2016 and 2024. The funds expended in 2022 supported 27 projects totalling to CZK 244.73 million.

Programme 129 280 is divided in three sub-programmes: sub-programme 129 282 'Support for Construction, Rehabilitation, Renovation and De-mudding of Fishponds and Water Reservoirs', sub-programme 129 283 'Remediation of Emergency Situations at Fishponds and Water Reservoirs' and Sub-programme 129 284 'Remediation of Flood Damage at Fishponds and Water Reservoirs'.

In 2022, financial support under sub-programme 129 282 was provided to 25 projects with a total amount of CZK 236.33 million; two projects were supported under sub-programme 129 283 with CZK 8.4 million.

Table 11.1.1.10
Allocation of state budget funds under programme 129 280 in 2022

Sub-programme	Number of projects	Funds
		in millions of CZK
129 282	25	236.33
129 283	2	8,4
129 284	0	0
Total	**27**	**244.73**

Source: MoA

Fortificaton of the Rakovský Stream in Rokycany (Source: Forests of the Czech Republic, s.e.)

Table 11.1.1.11
Allocation of state budget funds for selected projects under programme 129 280 in 2022

Applicant	Project	Implementation date	Total costs	Funds in 2022
			in millions of CZK	
Fishery Kardašova Řečice, s.r.o.	Restoration of the Blatec Pond	11/21–¨03/23	50.380	40.304
Moravian Fishing Association i.a.	De-mudding of the Budeč Pond	08/21–12/22	56.506	14.793
Věra Krejsková	Interaction element – Háje	11/21–09/22	9.744	7.539

Source: MoA

In 2022, the notification process for the follow-up programme 129 380 'Support for Water Retention in the Landscape – Fishponds and Water Reservoirs – Stage 2' started.

In 2022, the Ministry of Agriculture continued programme 129 310 'Support for the Competitiveness of the Agri-food Complex – Irrigation – Stage II'. Under programme 129 310, financial support was provided to 54 projects in the amount of CZK 120.01 million.

The objective of programme 129 310 is to reduce the need for irrigation water, energy and personnel demandingness of operating irrigation systems, greater flexibility of irrigation systems in meeting different requirements concerning irrigation systems, reduction in total water consumption per irrigation dose and use of positive environmental and non-economic effects of irrigations as a measure of adopting to climate change and thus increasing competitiveness of agricultural businesses and stabilising agricultural production. Programme 129 310 is divided into two sub-programmes: sub-programme 129 312 'Support for Renewal and Construction of Irrigation Detail and Optimisation of Irrigation Systems – Stage II' is intended to support renovation and construction of an irrigation detail and to support renovation, construction and optimisation of irrigation networks. Sub-programme 129 313 'Support for Optimization of Irrigation Networks Administered by the State Land Office' is aimed at supporting renovation, construction and optimisation of irrigation networks.

Table 11.1.1.12
Allocation of state budget funds under MoA programme 129 310 in 2022

Sub-programme	Number of funded projects	Financial support in millions of CZK
129 312	49	116,42
129 313	5	3,59
Total	**54**	**120,01**

Source: MoA

The Úpa Stream (Source: Elbe River Board, s.e.)

Table 11.1.1.13
Allocation of state budget funds for selected projects under MoA programme 129 310 in 2022

Applicant	Name of event	Implementation date	Total cost	Subsidies in 2022
			in millions of CZK	
AGÁTA s.r.o.	Purchase of irrigation	04/22–12/22	13.964	9.775
Pěstitel Stratov a.s.	Irrigation tank and feeder Milovice	04/22–11/22	13.137	6.475
Karel Dryák	Purchase of irrigation belts	04/22–11/22	2.546	1.272

Source: MoA

Preparation for the implementation of water works

In 2022, the Ministry of Agriculture administered three grant programmes aimed at purchasing real estate affected by the preparation for construction of major hydraulic structures: the Skalička and the Vlachovice and the comprehensive measure aimed at drought in the Rakovník District (Kryry, Senomaty, Šanov Water Reservoirs and water feeders).

Under programme 129 330 'Vlachovice – Settlement of Rights to Real Property Affected by the Planned Construction of a Water Structure', funds totalling to CZK 200 million were used in 2022.

The aim of programme 129 330 is to implement the task arising from Government Resolution No. 257 of 15 April 2019, which approved the Principles for settlement of rights to real estate affected by the planned construction of the Vlachovice HS. The main purpose of the programme is to settle the property rights of all owners affected by the future construction of the Vlachovice HS in accordance with the approved incentive compensations by 2023. The programme includes one sub-programme 129 332 'Vlachovice – Settlement of Rights to Real Property Affected by the Planned Construction of the Vlachovice Hydraulic Structure', through which the actual property rights will be settled. The beneficiary of the subsidy is the Morava River Board, s.e.

The Vlachovice Hydraulic Structure is a key source of drinking water for the Zlín District and will be able to supply water to the adjacent parts of the South Moravian and Olomouc Regions through joint water supply systems. It is one of the most important measures aimed at mitigating the effects of climate change in the Czech Republic.

Under programme 129 340 'Settlement of Rights to Real Property Affected by the Planned Comprehensive Drought Solution in Rakovník', funds amounting to CZK 79.384 million were allocated to the project in 2022.

Government Resolution No. 971 of 5 October 2020 approved the Principles for settlement of rights to real estate affected by the planned implementation of the comprehensive drought solution in Rakovník – Stage I and approved funding totalling to CZK 485 million for 2020–2025. In the first stage, the real estate affected by the implementation of the Kryry, Senomaty and Šanov hydraulic structures is settled. Programme 129 340 is divided into two sub-programmes, namely sub-programme 129 342 'Kryry HS – Settlement of rights to real estate affected by the planned construction of the hydraulic structure', where the Ohře River Board is the beneficiary of the subsidy, and sub-programme 129 343 'Senomaty and Šanov – Settlement of rights to real estate affected by the planned construction of hydraulic structures', where the Vltava River Board is the beneficiary of the subsidy. At the beginning of 2022, documentation was approved to extend programme 129 340 with a new sub-programme 129 344 'Water feeder of the Kryry HS – Vidhostice Reservoir; the Kolešovický and Rakovnický Stream – Settlement of rights to real estate affected by the planned implementation of the feeders', where both the Ohře and Vltava River Boards are beneficiaries; applications to this programme were accepted in 2023.

The Kryry Hydraulic Structure is a crucial element in the planned system of measures aimed at addressing drought in the Rakovník District. Together with the small water reservoirs of Senomaty and Šanov in the Rakovnický Stream Basin and its feeders, it is an effective solution to enhancing water resources and mitigating water deficit in the area.

Within the framework of the Principles for the settlement of rights to real estate affected by the planned construction of the Skalička Hydraulic Structure', funds in the amount of CZK 23.01 million were disbursed in 2022.

The Bečva River Basin is one of the most exposed areas in the Czech Republic in terms of flood risks, which is why the Principles for the settlement of rights to real estate affected by the planned construction of the Skalička HS were approved in 2017 on the basis of Government Resolution No. 274 of 10 April 2017.

The preparation and implementation of flood protection measures in the Bečva River Basin is divided into two stages. The total amount of funds intended for the purchase of real estate affected by the construction of the Skalička HS is CZK 1.24 billion. So far, property worth CZK 752.6 million has been bought in Stage I, the beneficiary of the subsidy is the Morava River Board. The Skalička HS will be built in Stage II. Land purchases for the Skalička HS were to be completed in 2023. Based on the preferences of the Ministry of Environment and the Ministry of Health and in accordance with the Programme Declaration of the Government, the second best option V3 – Lateral dry reservoir with a manipulable object was recommended for implementation.

In September 2022, the documentation of new programme 129 430 'Support for drought mitigation measures – project preparation and implementation of necessary investments' was approved and the Ministry of Agriculture started its administration.

The programme is aimed at the implementation of pre-project preparation, project preparation and implementation of investments related to the planned construction of the Vlachovice HS, Kryry HS, Senomaty HS and Šanov HS, which are prepared with a view of mitigating the impact of drought. The measures need to be implemented before the actual construction of the reservoirs. They encompass a set of induced and accompanying investments, changes in infrastructure, changes in land use and implementation of measures to ensure the long-term use of the newly created water sources and stabilisation of the changed conditions in the landscape.

No projects were funded in 2022 under programme 129 430.

Fisheries

In order to support non-productive functions of fishing grounds, the Ministry of Agriculture established national subsidy programme 17 'Support of Non-productive Functions of Fisheries' on the basis of the provisions of Section 1, 2, and 2(d) of Act No. 252/1997 Coll., on agriculture, as amended. In 2021, it was divided into 17.A 'Support for Non-productive Functions of Fisheries' and 17.B 'Support for Fish Community Recovery After a Water Clarity Incident'. In 2022, funds totalling to CZK 22.532 million were allocated, with a total of 57 applications funded. From 17B, one application was founded with an amount of CZK 0.446 million in 2022.

Grant Programme 17 was launched by the Ministry of Agriculture in 2015. Grant programme 17.A was established with the view of promoting the biodiversity of fish stocks in surface waters intended for users of fishing grounds. The subsidy rate is per hectare of fishing grounds. Funds may only be used for costs covering the introduction of those fish species that have been introduced in accordance with the established stocking levels. Grant programme 17.B was established with the view of restoring fish populations in surface waters after a water clarity incident that resulted in minimal survival of the fish community intended for users of fishing grounds. The subsidy rate is per hectare of fishing ground. The funds may be used only for the costs covering restocking of the fish species which have been planted in accordance with the established stocking levels.

Table 11.1.1.14
Allocation of state budget funds under subsidy programme 17 'Support of Non-productive Functions of Fisheries' of the Ministry of Agriculture in 2022

Programme	Number of applications received	Number of funded projects	Financial support
			in millions of CZK
17.A	66	57	22.532
17.B	1	1	0.446
Celkem	**67**	**58**	**22,978**

Source: MoA

Operational Programme Fisheries 2014–2020

In 2022, the Ministry of Agriculture paid subsidies to 132 projects from the Operational Programme Fisheries 2014–2020 in the total amount of approximately CZK 124.3 million.

The Operational Programme Fisheries 2014–2020 is a programme through which fishermen can use funds from the European Maritime and Fishing Fund under Priority Axis 2 – Support for environmentally sustainable, resource efficient, innovative, competitive and knowledge-based aquaculture, support for new breeders and introduction of European eel (Anguilla anguilla) in selected fishing districts in the Elbe and Oder River Basins. Under EU Priority Axis 3 – Support for implementation of common fishing policy, the grant promotes data gathering and monitoring of fishing and aquaculture products. Under EU Priority Axis 5 – Support for marketing and processing, the grant supports promotion and investment in fish processing and strengthening the competitiveness of aquaculture enterprises and fish processors.

Table 11.1.1.15
Operational Programme Fisheries 2014–2020 – Allocation of funds in 2022

EU priority axis	Measure number	Project	Number of projects	Funds reimbursed in millions of CZK
2 – Support for environmentally sustainable, resource efficient, innovative, competitive and knowledge-based aquaculture	2.1	Innovation	2	2.64
	2.2	Productive investments in aquaculture	84	86.99
	2.3	Support for new farmers	0	0
	2.4	Recirculation equipment and flow systems with additional purification	0	0
	2.5	Aquaculture providing environmental services	4	3.53
	2.6	Increasing competitiveness of aquaculture enterprises	0	0
Total EU Priority 2			**90**	**93.16**
3 – Support for implementation of common fishing policy	3.1	Data collection	0	0
	3.2	Product traceability	11	11.16
Total EU Priority 3			**11**	**11.16**
5 – Support for marketing and processing	5.1	Production plans	-	-
	5.2	Marketing of products	16	7.85
	5.3	Investment in product processing	15	12.13
Total EU Priority 5			**31**	**19.98**
Total			**132**	**124.30**

Source: MoA

Operational Programme Fisheries 2021–2027

The Ministry of Agriculture registered 101 projects under the Operational Programme Fisheries 2021–2027 with the total requested amount of subsidy of approx. CZK 91.8 million.

The Operational Programme Fisheries 2021–2027 is a programme from which fishermen can use funds from the European Maritime, Fishing and Aquaculture Fund under Priority Axis 1 – Support for sustainable fisheries and restoration and conservation of aquatic biological resources for eel planting. Under Priority Axis 2 – Support for sustainable aquaculture activities, processing and marketing of fish and aquaculture products contributes to food safety in the EU and promotes innovation, investments in aquaculture and processing, compensation and promotion campaigns are supported.

Rural Development Programme

The Rural Development Programme of the Czech Republic for 2014–2020 is based on the Joint Strategic Plan, Partnership Agreement and other strategic documents and it was designed in accordance with Regulation No. 1305/2013 of the European Parliament and of the Council. Water management is partially concerned by the Land Consolidation section of the Programme.

Grants from RDP are co-funded from the European Agricultural Fund for Rural Development (the 'EAFRD') and from the state budget of the Czech Republic. The support from the EAFRD for 2014–2020 amounts to EUR 2.3 billion (CZK 63 billion), the state budget of the Czech Republic will additionally provide EUR 1.2 billion (approx. CZK 32 billion). Financing of the RDP 2014–2020 is prefunded from the state budget, meaning all payments to recipients are first covered from national funds.

The RDP 2014–2022 supports Land Consolidation, with a single beneficiary of the subsidy is defined: the SLO, through its regional branches. The programme is a follow-up to the previous RDP 2007–2013.

100% of eligible costs are funded. Funds from the EAFRD cover 49.5% of public costs, funds from the state budged of the Czech Republic cover 50.5% of public costs. EUR 130 million (approximately CZK 3.4 billion), was allocated for 2014–2022, continuous reception of applications started on 22 February 2016.

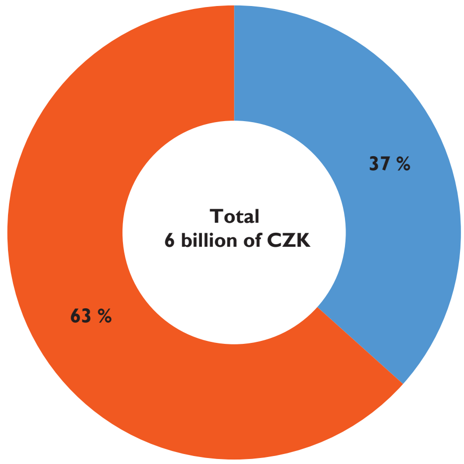
In the programming period 2014–2022, a total of 346 applications for subsidies in the total amount of CZK 3.5 billion were registered under Operation 4.3.1 Land Consolidation by 31 December 2022, while 334 applications in the amount of CZK 3.3 billion were approved and 329 projects worth CZK 3.3 billion were actually subsidised, of which CZK 373.7 million was intended for water management. No project was registered, approved or disbursed in 2022.

The subsidy title 4.3.1 Land Consolidation will be followed by intervention 46.73 Land Consolidation under the Joint Agricultural Policy for 2023–2027. Same as in the Rural Development Programme 2014–2022, the rate of support will be 100% of eligible costs and the beneficiaries will be regional branches of the State Land Office. The reception of applications for subsidies will be continuous and will start in 2024. The total allocation for the period is EUR 105.4 million (approx. CZK 2.5 billion).

11.1.2 Financial support from the Ministry of the Environment

In 2022, the Ministry of the Environment provided financial support under transnational and national grants. Financial support from the state budget under the Operational Programme Environment amounted to CZK 2,177 million. Financial support under programmes administered by the State Environmental Fund of the Czech Republic amounted to CZK 3,786 million. Thus, the total funds provided under the Ministry of the Environment for water management amounted to CZK 5,963 million.

Graph 11.1.2.1
Allocation of funds under the Ministry of the Environment in 2022



Source: MoE, SEF

Table 11.1.2.1
Funds provided for water management by the Ministry of the Environment in 2022

Programme name	Programme costs in millions of CZK
Operational Programme Environment 2014–2020	2,177.1
Ministry of the Environment – total	**2,177.1**
National Programme Environment	3,606*)
Call No. 2/2016/Call No. 1/2019 PU according to Directive No. 8/2017 of the MoE – loans from the State Environmental Fund	42.8
Norwegian funds	13.2
NRP	123.7
State Environmental Fund of the Czech Republic – total support provided	**3,785.7**
Total support provided by the Ministry of the Environment	**5,962.8**

Source: MoE, SEF
*Note: *) Call No.4/2019 was partially reimbursed from the Slovak Republic.*

Operational Programme Environment 2014–2020

The Ministry of the Environment provides financial support under programmes co-funded from the EU grants through the Operational Programme Environment. In 2022, funds were drawn under the OPE from the Cohesion Fund and European Regional Development Fund 2014–2020 for Priority Axes 1 and 4 for water management and for protection and care of nature and landscape, totalling to CZK 2,177.1 million.

Under Priority Axis 1 – improving water quality and reducing flood risk – 19 projects were approved for funding in 2022 with a total EU contribution of EUR 251.5 million. Legal act confirming subsidy provision from the EU totalling to CZK 545.1 million was issued for 159 projects. In 2022, funds were drawn from the Cohesion Fund in the total amount of CZK 888.5 million.

Under Priority Axis 4 – Protection and care of nature and landscape (specific objective 4.3 – Strengthening natural functions of the landscape and specific objective 4.4 – Improving quality of the environment in residential areas) including measures against drought, 38 projects were approved for funding with contribution from the EU of CZK 44.6 million and legal act confirming subsidy provision of CZK 48.8 million was issued for 37 projects in 2022. Funds drawn from the ERDF amounted to CZK 1,288.6 million in 2022.

Reception of applications for support under the OPE 2014–2020 in water management and protection and care of nature and landscape was launched under one call under specific objective 4.4 in 2022. There was a total of four calls for applications in 2022.

Table 11.1.2.2
Projects approved for funding from the Operational Programme Environment 2014–2020 in water management in 2022

Priority Axis	Area of support	Number of projects	Total costs	Total eligible expenditures	European Union contribution
			in millions of CZK		
1	1.3	19	323.61	278.86	251,52
Priority Axis 1 Total		**19**	**323,61**	**278.86**	**251.52**
4	4.3	8	31.58	29.02	17,41
	4.4	30	76.97	45.24	27,15
Priority Axis 4 Total		**38**	**108,55**	**74.26**	**44.56**
Total		**57**	**432,16**	**353.12**	**296.08**

Source: Monitoring system of European Structural and Investment Funds for 2014–2020
Note: Project approved for funding is a project approved by the Selection Committee of the Managing Body of the Operational Programme Environment.

Table 11.1.2.3
Projects with legal act on granting support from the Operational Programme Environment 2014–2020 in water management in 2022

Priority Axis	Area of support	Number of projects	Total costs	Total eligible expenditures	European Union contribution
			in millions of CZK		
1	1.3	18	297.34	251.16	226.51
	1.4	141	461.08	454.61	318.61
Priority Axis 1 Total		**159**	**758.42**	**705.77**	**545.12**
4	4.3	8	39.00	36.59	21.96
	4.4	29	76.05	44.74	26.84
Priority Axis 4 Total		**37**	**115,05**	**81.33**	**48.80**
Total		**196**	**873.47**	**787.10**	**593.92**

Source: Monitoring System of European Structural and Investment Funds for 2014–2020
Note: Project with a legal act issued is a project with issued Project Registration and Grant Decision.

Table 11.1.2.4
Drawing of funds under the Operational Programme Environment 2014–2020 in 2022

Area of support	European Union contribution in millions of CZK
1.1 – Reducing the amount of pollution discharged to surface waters and groundwaters from municipal sources and the input of pollutants to surface waters and groundwaters	324.26
1.2 – Ensuring the supply of drinking water of adequate quality and quantity	90.74
1.3 – Ensuring flood protection in the inner city	266.88
1.4 – Supporting preventive flood control measures	206.61
Priority Axis 1 Total	**888.49**
4.3 – Strengthening the natural functions of the landscape	1,151.40
4.4 – Improving the quality of the environment in settlements	137.19
Priority Axis 4 total (4.3, 4.4)	**1,288.58**
Total	**2,177.07**

Source: Monitoring System of European Structural and Investment Funds for 2014–2020

Table 11.1.2.5
Calls for the Operational Programme Environment 2014–2020 in water management in 2022

Call number	Number and name of the specific objective	Allocation of European Union funds	Start of receipt of applications	End of receipt of applications
		in millions of CZK		
156	4.3 Strengthening natural landscape functions	40	16/08 2021	03/01 2022
157	4.4 Improving quality of the environment in residential areas	60	16/08 2021	03/01 2022
159	1.3 Ensuring flood protection of built-up areas	500	25/10 2021	31/01 2022
161	4.4 Improving quality of the environment in residential areas	30	11/03 2022	30/06 2022

Source: Monitoring System of European Structural and Investment Funds for 2014–2020

Operational Programme Environment 2021–2027

Under the OPE 2021–2027, support for water management and climate change adaptation projects, and support for significant aquatic habitats and species is aimed at the following specific objectives and measures:

1.3 Supporting climate change adaptation, disaster risk prevention and resilience against disaster, taking into account ecosystem approaches
- 1.3.1 Supporting nature-friendly measures in the landscape and settlements
- 1.3.3 Implementation of flood protection measures
- 1.3.4 Implementation of measures aimed at slowing down runoff, improving collection, retention and cumulation of rainwater, including its further use; implementation of green roofs; measures for the use of grey water; measures for controlled groundwater recharge
- 1.3.5 Supporting preventive measures against floods and drought, in particular building, extension, improvement and renovation of monitoring, forecasting, reporting, warning and alert systems; preparation of digital flood plans, elaboration of runoff analysis
- 1.3.6 Supporting flood preparedness, raising awareness of flood risk, increasing resilience of vulnerable structures against floods
- 1.3.7 Monitoring and rebalancing of long-term usable groundwater resources for municipalities in the Bohemian Massif

1.4 Supporting access to water and sustainable water management
- 1.4.1 Construction of wastewater treatment plants; completion and construction of sewerage systems
- 1.4.2 Intensification of wastewater treatment plants in order to increase removal of specific pollution
- 1.4.3 Measures aimed at limiting discharge of wastewaters from overflow structures in the sewerage system (storage reservoirs, retention reservoirs, chemical pre-treatment, etc.)
- 1.4.4 Construction and modernisation of water supply pipelines and water supply lines; construction of water treatment plants; construction, intensification and revitalisation of existing water sources
- 1.4.5 Intensification of drinking water treatment plants.

In 2022, 5 calls for support for water infrastructure (including 1 call under the project scheme), 1 call for support for rainwater management and 2 calls for support for flood and drought prevention and groundwater monitoring and rebalancing were launched under this programme.

Table 11.1.2.6
Calls under the Operational Programme Environment 2014–2020 in the field of support for water infrastructure in 2022

Call number	Number and name of the specific objective	Allocation of European Union funds	Start of receipt of applications	End of receipt of applications
		in millions of CZK		
05_22_002	MoE_2nd call, SC 1.4, measure 1.4.1, continuous	4,000	15/08 2022	28/02 2023
05_22_003	MoE_3rd call, SC 1.4, measure 1.4.4 continuous	900	15/08 2022	5/010 2022
05_22_006	MoE_6th call, SC 1.3, measure 1.3.7, continuous	65	31/08 2022	30/09 2022
05_22_019	MoE_19th call, SC 1.3, measures 1.3.3 and 1.3.4, continuous	2,500	14/09 2022	31/10 2023
05_22_021	MoE_21st call, SC 1.4, measures 1.4.1, 1.4.2, 1.4.3, round	1,500	15/08 2022	20/10 2022
05_22_022	MoE_22nd call, SC 1.3, measure 1.3.5, continuous	150	16/11 2022	28/04 2023
05-22-025	Ministry of the Environment_25th call, SC 1.4, measures 1.4.1, 1.4.4 (project scheme for SFE)	750	09/011 2022	28/06 2024
05_22_026	MoE_26th call, SC 1.4, measures, 1.4.4, 1.4.5 round	1,000	15/08 2022	20/10 2022

Source: SEF
Note: Part of the programme funds under SC 1.3 is under the competence of the Nature Conservation Agency of the Czech Republic.

The Újezd Reservoir (Source: Ohře River Board, s.e.)

State Environmental Fund of the Czech Republic

The State Environmental Fund of the Czech Republic, established by Act No. 388/1991 Coll., is a specifically oriented institution that is an important financial resource supporting the implementation of measures aimed at protecting and improving the state of the environment in its components.

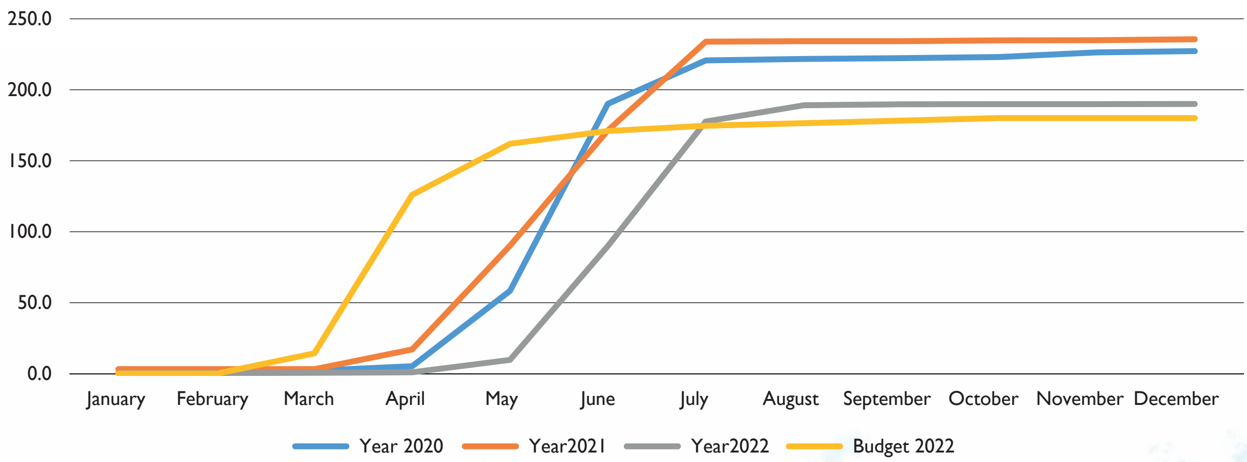
The total revenue of the State Environmental Fund of the Czech Republic (the 'SEF') included revenues from environmental pollution charges in the amount of CZK 2,121.9 million. Revenues from fines and financial penalties amounted to CZK 55.6 million. In the sphere of water protection, this includes a charge for wastewater discharges into surface waters and a charge for groundwater abstraction, as shown in Table 11.1.2.7.

Table 11.1.2.7
State Environmental Fund – Structure of revenues to the budget (water only) – 2022

Environmental component (water protection)	Budget for 2022	Revenue as of 31/12 2022	Payments	Difference
	in millions of CZK		in %	in millions of CZK
Wastewater	180.0	190.0	106	10
Groundwater	312.4	359.7	115	47.3

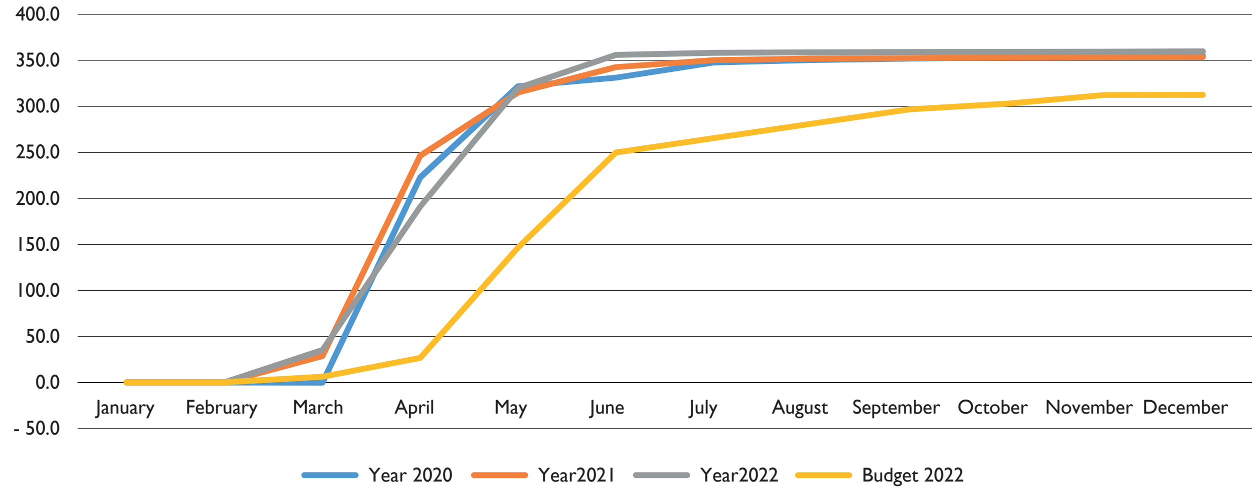
Source: SEF

Graph 11.1.2.2
State Environmental Fund – Revenues from charges for wastewater in 2019–2022



Source: SEF

Graph 11.1.2.3
State Environmental Fund – Revenues from charges for groundwater in 2019–2022

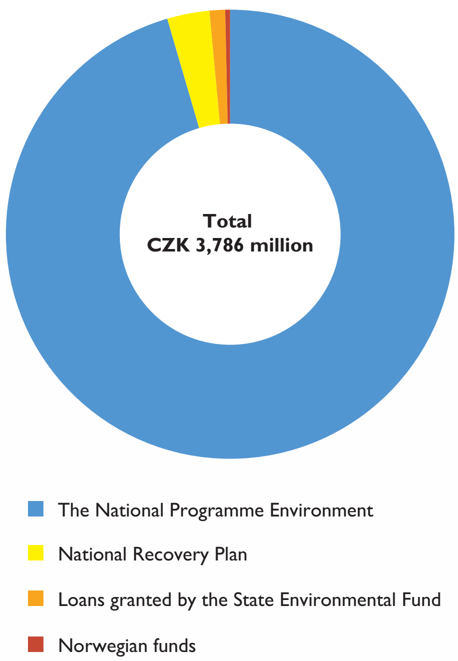


Source: SEF

National programmes administered by the State Environmental Fund of the Czech Republic

The State Environmental Fund of the Czech Republic ensures the drawing of financial resources from national programmes and the European Union Structural Funds for the environmental sector. From its own resources, the State Environmental Fund of the Czech Republic provides financial support to national programmes. In 2022, the State Environmental Fund of the Czech Republic administered four programmes outside the Operational Programme Environment, under which approximately CZK 3,786 million was disbursed.

Graph 11.1.2.4
State Environmental Fund of the Czech Republic – administered programmes (water management) – use of funds in 2022 in millions of CZK



Source: SEF

National Programme Environment

The National Programme Environment supports projects aimed at protecting and improving the environment in the Czech Republic using national funds. It is intended particularly for towns and smaller municipalities. It is financed from the funds of the State Environmental Fund obtained from environmental charges and it complements other grants, particularly the OPE and the New Green Savings Programme.

In 2022, the SEF administered a total of 14 calls and one non-call application under this programme – for details see Table 11.1.2.8. A total of 1,859 of applications received funds amounting to CZK 3,606.3 under the calls.

Quarry at the spring 2, Růžena's quarry (Author: Husák Vladimír)

Table 11.1.2.8
Calls administered under the National Environment Programme in 2021

Call number	Call title	Applications received		Approved applications		Paid applications	
		number	Subsidies in millions of CZK	number	Subsidies in millions of CZK	number	Subsidies in millions of CZK
11/2016	Domestic wastewater treatment plants	0	0	0	0	1	2,5
6/2017	Rainwater	0	0	1	0.04	1	0,0
12/2017	Rainwater II	0	0	1,159	48.8	1,163	48.6
17/2017	Domestic wastewater treatment plants	0	0	0	0	9	40.9
18/2017	Greenery for towns and municipalities	0	0	0	0	15	2.0
2/2018	Drinking water resources	0	0	2	5.7	199	249.8
3/2018 - selection of applications	Eco-innovation – selection of applications	0	0	0	0	2	10.6
8/2018	WWTP and sewerage systems	0	0	0	0	24	120.0
4/2019	Water supply and sewerage systems	0	0	5	200.8	211	3,023.8
12/2019	Domestic wastewater treatment plants	0	0	0	0	4	12.5
4/2021	Tree planting – individual projects	844	188.3	1,027	227.9	202	43.3
6/2021 - selection of applications	Support for municipalities in national parks – selection of applications	11	29.3	71	161.8	25	48.5
7/2021	Domestic wastewater treatment plants	41	284.7	24	164	0	0
9/2021	Drinking water resources	27	38.1	20	29.2	3	3.8
Total		**923**	**540**	**2,309**	**838**	**1,859**	**3,606**

Source: SEF

Call No. 2/2016 PU, No. 1/2019 PU, No. 1/2022 PU according to Directive No. 8/2017 of the Ministry of the Environment – loans from the State Environmental Fund

The first call was announced in 2016 with the objective of strengthening own resources for implementation of projects supported under the OPE 2014–2020, Priority Axis I, specific objectives 1.1 and 1.2, which intent of improving the quality of supply of quality drinking water for the population. Applications were received from 17 October 2016 until 31 December 2018, or until all the funds of CZK 690 million were allocated. In 2021, CZK 309.1 million was disbursed. In 2019, Call No. 1/2019 was announced with a total allocation of CZK 500 million, Priority Axis I, with applications received from 2 January 2020. In 2022, CZK 42.8 million was disbursed.

In 2022, call No. 1/2022 PU was announced for submission of applications for the provision of support in the form of a loan and possible additional subsidy according to the directives of the Ministry of the Environment No. 8/2017 on the provision of financial support from the Ministry of the Environment and Directive of the Ministry of the Environment No. 4/2015 on the provision of funds from the Ministry of the Environment through the National Environmental Programme. The loan and subsidies are provided to municipalities with less than 2,000 inhabitants with the view of strengthening their own resources, and to

Table 11.1.2.9
Overview of terminated Call No. 2/2016 PU, Call No. 1/2019 PU and Call No. 2/2022 PU for loans for implementors of water management projects under the Operational Programme Environment as of 31 December 2022 (period 2016–2022)

Call	Maturity in years	Allocation	Applications submitted	Applications administered	Applications with issued Decision of the Minister	Contracts concluded with recipients	Paid to recipients
		in millions of CZK					
2/2016	max. 10	690	728.1	0	0	674.4	664.6
1/2019	max. 10	500	342.5	0	0	334.9	317.7
1/2022	max 10	794.5	819.6	0	117.0	0	0

Source: SEF

beneficiaries under the OPE 2021–2027 under the specific objective 1.4 Supporting access to water and sustainable water management. Subsidies will be granted in cases where the acquisition of appropriate wastewater treatment technology is necessary in the interest of nature conservation.

Norwegian funds – the Environment, Ecosystems and Climate Change Programmes

The programme is funded from the Norwegian Financial Mechanism 2014–2021, with the SEF co-funding 15% of the programme. The programme focuses on improving the condition of ecosystems, reducing air and water pollution, including monitoring and on adaptation and mitigation measures related to climate change.

In the field of water, the programme focuses on enhancing substance monitoring according to the Water Framework Directive (list of priority substances, the 'watchlist') and on implementing projects aimed at reducing pharmaceutical pollution in surface waters.

In the first half of 2022, the evaluation of the following calls was concluded:

- Call-3B Trondheim: pilot projects aimed at reducing the content of pharmaceuticals and hormones residues (including their metabolites) in wastewaters
  - 6 projects supported with a total allocation of CZK 77.1 million.
- Call-1 Rago: Innovative projects aimed at implementing measures aimed at improving ecosystems and protecting biodiversity
  - 14 projects supported with a total allocation of CZK 164.2 million.

The Call-3A Alesund was launched in July with an allocation of EUR 78 million. The call offered support for the acquisition of instruments for micropollutant analysis and the introduction or optimisation of analytical methods for surface water monitoring according to Directive 2000/60/EC. In 2022, a total of CZK 13.2 million was reimbursed.

At the end of the year, two remaining calls were also announced, focusing on support for adaptation and mitigation measures in municipalities and regions and green air protection projects (Call-4B Stavanger with a total allocation of CZK 190.4 million) and air quality monitoring with a focus on household heating (SGS-2 Svalbard with a total allocation of CZK 25 million). The evaluation of these calls will be completed in the first half of 2023.

National Recovery Plan

The NRP is the Czech Republic's blueprint for reform and investment aimed at mitigating the economic and social damage caused by the Covid-19 pandemic, strengthening the green transition, and facilitating digital transformation and economic relaunch. For these purposes, the Czech Republic draws funds from the Recovery and Resilience Facility in the form of grants of approximately CZK 172 billion between 2021 and 2026. The Czech Republic also negotiates with the European Commission ('EC') a loan from the Recovery and Resilience Facility of up to CZK 350 billion.

The role of the AWD in the implementation of selected activities is based on the MoE Directive No. 5/2022 on implementation of NRPs in the framework of activities where the MoE acts as the owner of the component and binding methodological guidelines for NRP. It consists mainly in the process of administrating the projects of the final beneficiaries. Costs of NRP administration are not reimbursed from the NRP.

In 2022, a call for water management in municipalities was announced with a total allocation of CZK 1,754 million (Call 10/2021, activities 2.9.1 and 2.9.2).

Table 11.1.2.10
National Recovery Plan projects and funds disbursed in 2022

NRP projects managed by the SEF	Allocation of millions of CZK	Paid in 2022 in millions of CZK
2.9.1 Ensuring drought protection and nature-based flood protection of the Brno built-up area	762	124
2.9.2 Ensuring rainwater management	992	0
Total	**1,754**	**124**

Source: SEF

11.1.3 Financial support of the Ministry of Transport

In 2022, the State Fund for Transport Infrastructure expended a total of CZK 571 million on development, modernisation and maintenance of waterways of transport importance through the Waterways Directorate of the Czech Republic, of which investment expenditures amounting to approx. CZK 499 million and non-investment expenditures of approximately CZK 72 million. The financial participation was allocated to the RIS COMEX project from the Connecting Europe Facility amounting to a total of almost CZK 6 million.

State Fund for Transport Infrastructure

The State Fund for Transport Infrastructure ('SFTI') was established by Act No. 104/2000 Coll., on the State Fund for Transport Infrastructure, as amended. Representatives of the Ministry of Transport are members of the SFTI Committee. The SFTI is a legal entity under the Ministry of Transport. The purpose of the SFTI is to fund construction, modernisation, repairs and maintenance of roads and motorways, national and regional railways and transport-significant inland waterways to the extent provided for in the Act.

Waterways Directorate of the Czech Republic

The Waterways Directorate of the Czech Republic was established by the Ministry of Transport and Communications of the Czech Republic on 1 April 1998 pursuant to Section 51(1) of Act No. 219/2000 Coll., on the property of the Czech Republic and its representation in legal relations, as amended, as an organisational unit of the state. The main activity of this entity is to ensure the development of the waterway infrastructure of the Czech Republic from the funds of the SFTI. It is thus an investing organisation of the Ministry of Transport.

In 2022, the SFTI funds in the total amount of approx. CZK 571.05 million were expended on the aforementioned development, modernisation and maintenance of significant waterways through a daughter-organisation of the Ministry of Transport, i.e., the Waterways Directorate, of which investment expenditures amounting to approx. CZK 498.71 and non-investment expenditures in the amount of approx. CZK 72.34 million. The financial participation from the Connecting Europe Facility (the 'CEF') was in the total amount of approx. CZK 5.52 million for the international project RIS COMEX.

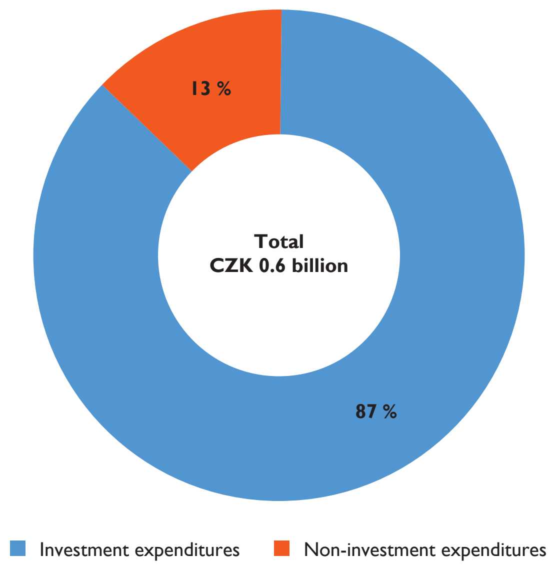
In 2022, the SFTI funds were allocated primarily to a set of investment projects for the overall increase of the parameters of the Vltava Waterway between Mělník and the Radotín Wharf (at the mouth of the Berounka River), i.e., the ongoing implementation of the project 'Underpass Clearance Increase on the Vltava Waterway' amounting to approx. CZK 105.18 million, approx. CZK 1.78 million was allocated to 'Increasing Draught on the Vltava Waterway' and approx. CZK 28.46 million from non-investment funds was disbursed for the repair of dredges after the passage of flood flows. In December 2022, the underpass heights on the Troja-Podbaba navigation channel were partially (2 out of 3 bridges completed) increased to 7.0 m under the draught on the Vltava Waterway – river part was increased to a depth of 2.5 m.

Furthermore, investment projects aimed at development of recreational navigation were successfully implemented, in particular the 'Passenger water transport mooring on the Lower Elbe' in the amount of approx. CZK 29.95 million, the 'Recreational Port of Kolín' in the amount of approx. CZK 15.27 million. The 'Poděbrady Wharf' in the amount of approx. CZK 24.05 million, the 'Service Centre Roudnice nad Labem' in the amount of approx. CZK 13.14 million. The 'Veselí nad Moravou Recreational Port' on the Bat'a Canal was also completed, receiving approx. CZK 3.73 million.

Under the item Investment Actions with budget costs below CZK 30 million, a total amount of approx. CZK 196.36 million was drawn in 2022. The largest number of projects were small vessel wharfs and harbour bridges for boats, such as the 'Děčín – Smetanovo nábřeží Wharf' drawing approx. CZK 7.62 million, 'Čelákovice Wharf' drawing approx. CZK 23.09 million, 'Davle Wharf' drawing approx. CZK 10.13 million, 'Roudnice nad Labem Wharf' drawing approx. CZK 27.73 million, 'Štětí Wharf' drawing approx. CZK 24.92 million and 'Brná Wharf' drawing approx. CZK 20.43 million. We can also mention other projects such as the 'Renovation and modernisation of vessel berths in the Peutehafen Port' drawing approx. CZK 35.86 million, 'Modernisation of protective berths of service vessels in Prague and Nymburk' drawing approx. CZK 23.01 million and 'Inspection Vessel of the Waterways Directorate of the Czech Republic (innovative technology with alternative propulsion)' drawing approx. CZK 16.28 million.

Significant funds amounting to approx. CZK 48.84 million were also spent on intensive preparation of other investment projects aimed at overall development of the entire network of transport-significant waterways. The main obstacle to the continued preparation of the Děčín Weir is the condition of determining compensatory measures identified in the SEA of the Water Transport Concept and the necessity to amend the land-use plan of the Přelouč Weir II project. Furthermore, the EIA assessment of the plans for the mooring area on the Vltava Waterway in Kamýk nad Vltavou and Týn nad Vltavou, the Veselí nad Moravou – Vnorovy Navigation Circle project, the building permit for the Roudnice nad Labem Service Centre, combined permit for the waiting area for small vessels in Vrané and the extension of the wharf in Strážnice were completed in the process of preparation of other investment projects.

Graph 11.1.3.1
Waterways Directorate – Use of funds in 2022



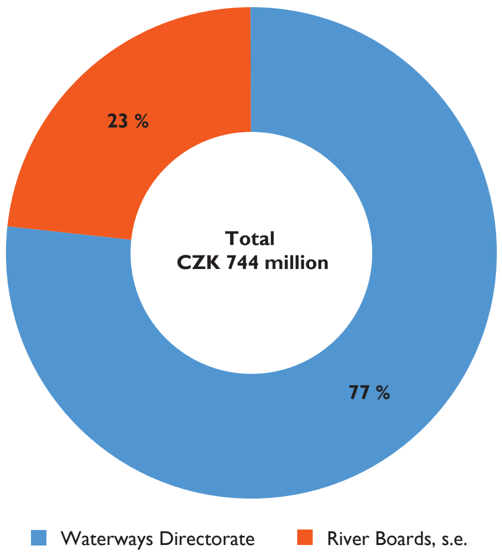
Source: Ministry of Transport

In 2022, the implementation of national RIS technologies and services continued intensively, with an emphasis on their integration into the common European EuRIS interface, including addressing detailed data compatibility and resolution of functional faults. Another set of production of upgraded electronic nautical charts continued. CEF funding for the project was formally closed on 30 June 2022, when the eligibility of expenditures expired. The EuRIS platform was implemented by the joint work of the 13 participating States, and went live for users with all operational data, including data for the Czech Republic, on 29 September 2022. The common 8-State platform for electronic voyage reporting CEERIS was also implemented, and was launched in early 2023. The data sources of the national RIS services were incorporated into the platforms.

In 2022, River Boards, s.e., expended on operation and maintenance of waterways funds amounting to CZK 270 million, of which more than CZK 96 million was from their own sources and more than CZK 173 million from grants. The grants were allocated from the State Transport Infrastructure Fund.

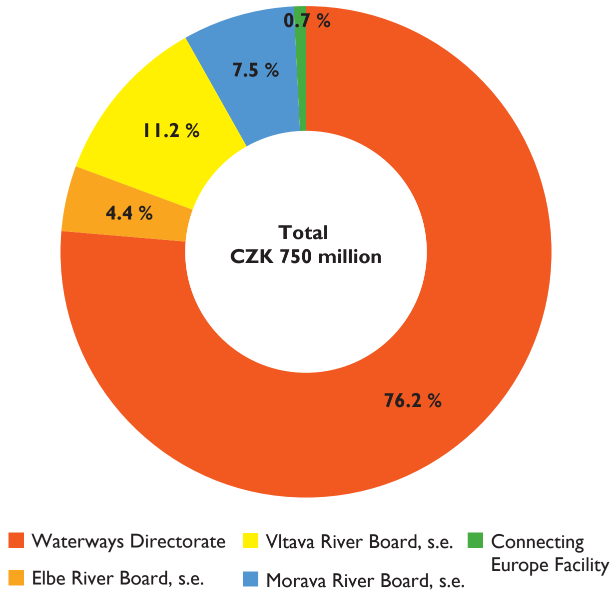
The Vltava, Elbe and Morava River Boards, s.e., used funds for renovation, operation and maintenance of waterways in their competence. They used funds from the STIF in a total amount of CZK 173.1 million, of which non-investment funds amounted to CZK 94.5 million and special-purpose investment funds to CZK 78.5 million.

Graph 11.1.3.2
Use of funds from the State Transport Infrastructure Fund in 2022



Source: MoA using data provided by the Ministry of Transport and River Boards, s.e.

Graph 11.1.3.3
Funds spent on transport-significant waterways through the Ministry for Transport in 2022



Source: MoA using data provided by the Ministry of Transport and River Boards, s.e.

Table 11.1.3.1
Waterways – selected projects of River Boards, s.e. in 2022

River Board, s.e.	Name of event	Total cost in millions of CZK	Source of funding
Elbe	Střekov HS, repair of the upper gate of the lock chamber	14.1	STIF
	Hradištko HS, repair of corrosion protection of the lock chamber gate	3.2	STIF
	Elbe Waterway, renewal of the paint on the guard rails	2.6	STIF
Vltava	Orlík, Malá Radava – modernisation of the water exit	4.3	STIF
	Orlík HS – modernisation of the ship lift	124.7	STIF
	Štěchovice HS – GO of the middle and lower head gates	11.6	STIF
Morava	Bata Canal, Valcha – Sudoměřice Dam, repair of fortifications	25.4	STIF
	Bata Canal, restoration of paint of the PK operator's houses	0.246	own resources
	Bridge inspections via lock chamber	0.235	own resources

Source: River Boards, s.e.

Table 11.1.3.2
Funds spent by River Boards, s.e. on repair, maintenance, construction, reconstruction and modernisation of waterways under their management in 2022

River Board, s.e.	Own resources	Special purpose non-investment grants *)	Investment subsidies *)	Total subsidies	Total own resources and subsidies
	thousands of CZK				
Elbe	80,800	31,737	1,395	**33,131**	**113,931**
Vltava	9,291	23,800	59,741	**83,541**	**92,832**
Morava	6,685	22,999	33,389	**56,388**	**63,073**
Total	**96,776**	**78,535**	**94,525**	**173,060**	**269,836**

Source: River Boards, s.e.
*Note: *) Grant provider – STIF.*

11.2 Financial support from international cooperation and the EU

Projects focused on water management in 2014–2020

All the projects of the 2014–2020 programme period have been successfully implemented. The period consisted of the following seven independent programmes:

Cross-border cooperation
- Interreg IVC Czech Republic – Poland
- Interreg IVC Slovak Republic – Czech Republic
- Interreg IVC Austria – Czech Republic
- Programme of cooperation Free State of Saxony – Czech Republic 2014–2020

Transnational and interregional cooperation
- Interreg CENTRAL EUROPE
- Interreg DANUBE
- Interreg EUROPE

Under these seven programmes, projects contributing to environmental improvement, risk prevention (natural and technological risks, including climate change and impact on the water sector, etc.) were submitted, approved and subsequently supported. 2022 was the year of full implementation for all of the above programmes, with new projects approved to a lesser extent, including projects focused on the above themes.

- **Cross-border cooperation programme Czech Republic – Bavaria Free State (under the Objective of European Territorial Cooperation 2014–2020)**

1. *Joint research of natural substances from blue algae as a mode of cross-border scientific partnership / Gemeinsame Erforschung von Naturstoffen aus Blaualgen als Entwicklungsmodell der grenzüberschreitenden wissenschaftlichen Partnerschaft*

No. of partner(s) on the Czech side: 1
Partner's budget:
- Institute of Microbiology of the CAS, p.r.i.: EUR 897,107.40

The objective of the project is interconnecting two significant workplaces and innovations from the given region, i.e., the ALGATECH Centre of the Institute of Microbiology of the CAS in Třeboň and Wissenschaftszentrum Straubing in Bavaria. The project is focused on joint research of cyanobacteria seen as a source of precious substances (high value products) while using other parts of the biomass grown. The Czech party shall bring in the joint project know-how in the sphere of mass cultivation of suitable organisms, methods of increasing production and methods of extraction of precious substances, whereas the Bavarian part endows the project with their experience of substance testing, technologies linked with further processing and testing the application potential. The target groups are research institutions of the partners, researchers and students.

2. *Silva Gabreta Monitoring – Implementation of cross-border monitoring of biodiversity and water regime, Silva Gabreta Monitoring – Realisierung eines grenzübergreifenden Monitorings von Biodiversität und Wasserhaushalt*

No. of partner(s) on the Czech side: 3
Partners' budget:
- Šumava National Park Administration: EUR 513,674.10
- Czech University of Life Sciences in Prague: 79,215.00
- Masaryk University: EUR 53,955,00

The objective of the project is to create functional infrastructure for a cross-border monitoring network and conduct, for the first time in history, monitoring of forest, moor and water

Drinking water reservoir Křižanovice (Source: Elbe River Board, s.e.)

biodiversity in both national parks using standardized modern methods. Additionally, the project will allow for sharing and assessing data from a joint biodiversity databank. The results will become an important basis for further steps aimed at building closer relations in conservational management in the shared area of Czech–Bavarian Šumava. Cross-border application of standard methodical processes will allow for compiling a unified dataset that will be a valuable basis for improving conservationist and scientific collaboration between the two neighbouring national parks.

3. *Measures on the Kössein and Reslava Rivers aimed at mitigating the problem with mercury at the Skalka Water Reservoir, project No. 214*

No. of partner(s) on the Czech side: 1
Partner's budget:
– Ohře River Board, s.e.: EUR 37,725.29

Water, sediments and fish in the Kössein, Röslau and Ohře Rivers are contaminated with mercury of anthropogenic origin. Sediments contained with mercury are deposited in the Skalka Water Reservoir. It has not been conclusively ascertained to what degree such sediments have on food chain in the water reservoir and on human use of the reservoir. Outcomes of an inquiry aimed at answering such questions will be risk analysis that will be conducted by the Czech partner. The risk analysis will serve the Bavarian partner as a background material for discussing remedial measures and will allow for defining priority of selected measures. Under the project, the Bavarian partner shall examine all possible measures in a feasibility study. The measures shall be assessed in terms of their efficiency, sustainability, costs and feasibility (with respect to technical and legal aspects including compliance with the Water Framework Directive). In case of long-term measures consisting in reinforcing long riverbank belts and bedrock and measures in valley meadows we can expect restrictions as some of the sites are considered European Significant Locations (ESL – Natura 2000). That is the reason why four or five measures shall be first implemented during common watercourse maintenance, while it will be tested in close cooperation with nature conservation authorities whether such measures can be considered environment-friendly.

4. *Green infrastructure measures from multipurpose use of waste sludge (green IKK) through cross-border interregional cooperation, project No. 70*

No. of partner(s) on the Czech side: 2
Partners' budget:
– CHEVAK Cheb a. s.: EUR 47,584
– Forestry and Gamekeeping Research Institute, p.r.i.: EUR 124,854.50

The aim is to create guidelines for multiple use, develop green infrastructure/ecosystem services specifically for organisations and businesses in the target regions (e.g., development of fertilisers from sludge nutrients, elimination of hazardous substances contained in waste sludge/ash), development of options for utilisation of nutrients contained in sludge/ash, utilisation of trace elements through nutrient management etc. including compliance with water protection, environmental and legislative requirements, application guidelines for the target region etc. Environmental protection – promoting the use of sustainable energy – through sustainable, efficient, regional, decentralised, energy recovery of waste sludge. Ensuring/restoring water quality through nutrient retention/recovery and retention/elimination of organic and inorganic pollutants such as heavy metals, polymers, etc. from sewage sludge and wastewater as well as from harnessing environmental risk management through targeted nutrient recovery such as mainly phosphorus and pollutant retention with the purpose of protecting water, soil and air.

5. *Water – Wasser 2020, Project No. 287*

No. of partner(s) on the Czech side: 1
Partner's budget:
– Zelený poklad ('Green Treasure') Foundation: EUR 125,409.40

Project description: The project 'Water – Wasser 2020' wants to contribute to the positive motivation and education of educators, municipal representatives, public administration and local government staff to address the future threat of water shortage. The aim is to positively motivate the target group to change the situation concerning issues related to inefficient rainwater management, while at the same time it is necessary to develop and put into operation as soon as possible strategies for groundwater protection, as it is threatened by climate change (extreme droughts with severe impacts on humans, nature and the environment).

6. *Granite and Water, Project No. 307*

No. of partner(s) on the Czech side: 2
Partners' budget:
– Town of Planá: EUR 6,974.33
– Sokolov Museum, c.o. of the Karlovy Vary Region: EUR 91,949.27

Project description: The project creates sustainable transboundary value by preserving, making accessible, enhancing and connecting several of the most valuable geological and mountain-historical monuments of the Czech–Bavarian borderland. Sustainability of the monuments is ensured on two levels through awareness-raising and research activities leading to information preservation and raising awareness of the value of geological monuments and through promotion of sustainable tourism. The monuments in question are located on the granite bedrock of the Moldanubik, which runs from Bohemia to Bavaria, and they represent different aspects of how the granite bedrock visibly influences the life and economy in the area: Flossenbürg (granite mining / building material), the Jeroným Mine (granite, ore resource / establishment of mining settlements) and Planá (granite and groundwaters). The sites form an imaginary diagonal through the transboundary geopark area and thus connect the hitherto unappreciated peripheral areas of the geopark. The project will preserve both tangible industrial and cultural heritage and intangible heritage through studies of stonework and mines for water extraction.

7. *Promotion of biodiversity and development of a concept for protection of forest ecosystems in Šumava, Project No. 316*

No. of partner(s) on the Czech side: 1
Partner's budget:
– Šumava National Park Administration: EUR 178,507.55

Implementation of a set of measures aimed at habitat improvement to maintain diversity of species (insects, fungi, lichens and bryophytes) associated with trees and rotting timber. It encompasses activities enhancing the quantity and quality of rotting timber and planting of rare trees. In addition, experimental measures will be implemented with the view of supporting populations of extremely rare species. An important component is the accompanying scientific monitoring with the view of evaluating the activities carried out and improving knowledge of the ecology of such species groups in order to optimise transboundary protection of forest ecosystems.

8. *Sustainability and environmental protection at school, work and in society, Project No. 320*

No. of partner(s) on the Czech side: 1
Partner's budget:
– Secondary School and Vocational School, Sušice: EUR 148,083.20

Deepening cooperation in the field of professional competences with a special emphasis on environmental protection and sustainability at work, school and in society. It includes a new format for Czech pupils' work experience in Bavaria, preparatory training and courses to familiarise them with the language content, development of new teaching materials for vocational language teaching and creation of supplementary working materials, language lessons, study stays of school groups at partner schools, working meetings of pupils, teachers and practice lecturers, workshops with experts, excursions and updating of the common website.

9. *Fast and accurate determination of carbon, nitrogen and risk elements in soil using NIRS technology, Project No. 322*

No. of partner(s) on the Czech side: 1
Partner's budget:
– T. G. Masaryk Water Research Institute: EUR 149,350

Development and validation of a calibration equation for the measurement of carbon, nitrogen and risk elements in soil in the Czech-Bavarian border area in the basins of the Odrava, Ohře, Otava and Mže Rivers using near-infrared spectroscopy (NIRS). It includes data inventory and soil samples, using samples from previous surveys and studies, measurements of archived soil samples using near-infrared spectroscopy, development of calibration equations for prediction of soil quality parameters and collection of approximately 100 new soil samples for subsequent validation of the developed calibration equations and overall assessment of the obtained data including scientific publications.

10. *Presentation of mining and modern research on the rock environment in the area of the Bohemian Forest and the Bavarian Forest, Project No. 326*

No. of partner(s) on the Czech side: 1
Partner's budget:
– Institute of Geophysics of the CAS, p.r.i.: EUR 415,564.37

Introducing the rock environment, history and nature of Šumava and the Bavarian Forest to the public in a popular educational form. A former seismic station will be reconstructed in the Kristina Drift Visitor Centre. The centre will be expanded with 2 exhibitions and 3 educational visitor programmes. On the Bavarian side, the Granitzentrum will be expanded by 1 exhibition and 2 programmes and the Arberland by 1 exhibition. An educational publication on the history of Šumava and the Bavarian Forest in terms of geophysics, geology and geomorphology, a geological map and a video on geological history have also been published.

– Interreg V-A Austria – Czech Republic

1. *Project No. ATCZ28 – SEDECO*

Partners on the Czech side: 2
Partners' budget:
– Brno University of Technology: EUR 267,577.45
– Morava River Board, s.e.: EUR 388,303.63

Project completed by 31 December 2022.

2. *Project No. ATCZ163 – Schwarzenberg Navigation Canal/ Bavorská Niva*

Partners on the Czech side: 3
Partners' budget:
– Military Forests and assets of the Czech Republic, s.e.: EUR 1,732,613.92
– Forests of the Czech Republic: EUR 728,566.87
– Šumava National Park Administration – strategic partner

Project completed by 31 December 2022.

3. *Project No. ATCZ86 – Innovative technologies for monitoring water and microbiological parameters in aquatic ecosystem*

Partners on the Czech side: 2
Partners' budget:
– Brno University of Technology: EUR 227,293.32
– Regional Hygienic Station of the South Moravian Region in Brno – strategic partner

Project completed by 31 December 2022.

4. *Project No. ATCZ236 – Impacts of climate change on the Thaya River Basin*

Partners on the Czech side: 4
Partners' budget:
– Czech Hydrometeorological Institute: EUR 33,365.48
– Institute of Global Change Research of the CAS, p.r.i.: EUR 44,943.75
– T. G. Masaryk Water Research Institute: EUR 43,616.05
– Morava River Board, s.e.: EUR 26,359.24

Project completed by 31 December 2022.

5. *Project No. ATCZ266 – Thaya, equilibrium dynamics of runoff conditions*

New project.
Partner on the Czech side: 1
Partner's budget, Morava River Board, s.e.: EUR 563,720.00

Project completed by 31 December 2022

The Jaroměř u Kaplice Reservoir (Source: Forests of the Czech Republic, s.e.)

– **Interreg V-A Programme Czech Republic – Poland**

1. *EN.11.2.45/0.0/0.0/15_003/0000266 – AQUA MINERALIS GLACENSIS*

Partners on the Czech side: 2
Partners' budget:
– Town of Náchod: EUR 622,917.00 from ERDF
– Town of Hronov: EUR 534 803.97 from the ERDF

The project addresses harnessing the potential of mineral waters through renovation of spa parks and relevant buildings in order to attract tourists and consequently boost economic growth and employment growth in the Kłodzko District that has the highest occurrence of mineral and curative springs. The main objective of the project is to create a Czech-Polish spa circuit trail using the potential of unique mineral waters.

2. *CZ.11.4.120/0.0/0.0/17_028/0001633 – SUWAT: Cross-border cooperation in monitoring of chemical and radiation contamination of surface waters by mine waters*

Project partner: 1
Partner's budget:
– Technical University of Ostrava: EUR 137,149.42 from ERDF

Aim: The project proposal is based on the synergistic potential of an existing and proven inter-institutional cooperation between Technical University of Ostrava and GIG. In the framework of the project, this cooperation will be further intensified by jointly addressing a new and topical issue such as possible contamination of surface waters by highly saline and otherwise contaminated mine waters. The joint research will be carried out in locations burdened by intensive mining activities in the border regions.

– **Interreg V-A Programme Slovakia – Czech Republic**

1. *D168 – Živé břehy (Live Riverbanks) – joint protection of river ecosystems*

Project partner: 1
Partner's budget:
– Krok Kyjov, i.o.: EUR 211,034.41

2. *S251 – Fighting together water erosion and wetland drying*

Project partner: 1
Partner's budget:
– Czech Union for Nature Conservation, Valašské Meziříčí: EUR 160,519.88

The project focuses on measures aimed at wetland protection by building an international expert team and on practical measures at dozens of sites in the Czech and Slovak Republics. Such measures are aimed at monitoring of the erosion process and compiling a joint plan of measures with the view of supporting and protecting wetlands.

Both of the above projects have been successfully completed.

– **Interreg EUROPE programme**

1. *Water Technology Innovation Roadmaps (PGI05062 – iWATERMAP)*

Partner on the Czech side: 1
Partner's budget:
– CREA Hydro&Energy, i.o.: EUR 122,650.00

The project is focused on support for innovative policies in water management sectors and thus contributes to an increase in the critical number of innovative ecosystems in partner regions. The general objective of the project is to improve innovative policies with the view of boosting critical mass development of innovative ecosystems in the water technology sector. The project was to be completed in 05/2023 by certifying the expenditures for 9th and 10th semesters, as per Project Application; as per information from the project partner (the manager), request for completion of certification by 31/03/2023 was sent, with the managing partner sending documents for review by 28/2/2023.

2. *Water reuse policies advancement for resource efficient European regions (PGI05592 – AQUARES)*

Partner on the Czech side: 1
Partner's budget
– Regional Development Agency of the Pardubice Region: EUR 143,860.00

Water reuse is a key way to boost resource efficiency in Europe's scarce areas, as well as to take advantage of opportunities in the expanding water market, thereby easing pressure on Europe's wetlands and coastal areas. The Strategic Implementation Plan of the European Innovation Partnership on Water was launched to promote water efficiency in Europe, where water scarcity affects 11% of the population. In this context, AQUARES will support the identification of viable strategies for harnessing water reuse, tackling inefficient water use and more.

The project partner was expected to submit a final report for the 9th and 10th monitoring period.

– Interreg DANUBE programme

1. *Reducing the flood risk through floodplain restoration along the Danube River and tributaries (DTP2-003-2.1Danube Floodplain)*

Partner on the Czech side: 1
Partner's budget:
– Morava River Board, s.e.: EUR 151,407.50

The main output of the project will be improvement and sustainability of transnational flood risk management in the Danube River Basin. The project will contribute to a harmonized approach to the protection and restoration of riparian meadows, to consensus of local stakeholders on priority measures and to broader public support for integrating of flood management with floodplain protection and restoration.

Administration of the project has been completed.

2. *Drought Risk in the Danube Region (DTP1-182-2.4 DriDanube);*

Partner on the Czech side: 1
Partner's budget:
– Global Change Research Institute of the CAS, p.r.i.: EUR 179,000.00

Objectives: Water scarcity and drought have often affected the Danube Region and have had a major impact on the economy and people's well-being. Despite the damage in recent decades, drought is still not considered a high priority issue. The main objective of the project is to increase the capacity of the Danube Region and to address drought-related risks. The objective has been identified as a response to issues related to shortcomings in both the drought monitoring process and in the drought management systems.

Administration of the project has been completed.

– Interreg CENTRAL EUROPE programme

1. *Integrated Approach to Management of Groundwater Quality in Functional Urban Areas (Amiiga – CE32)*

Partners on the Czech side: 2
Partners' budget:
– Town of Nový Bydžov: EUR 159,681.50
– Technical University of Liberec: EUR 235,219.60

The project addresses especially groundwater contamination from brownfields, an issue that is common in Central Europe. AMIIGA provides a balanced combination of technical, research, management and professional expertise that is shared and transferred in order to address groundwater contamination in an all-embracing manner.

Administration of the project has been completed.

2. *Integrated Heavy Rain Risk Management (Rainman – CE968)*

Partners on the Czech side: 2
Partners' budget:
– T. G. Masaryk Water Research Institute: EUR 201,170.00
– South Bohemia Region: EUR 72,380.99

The main objective of the project is to improve integrated management capacities of public authorities with the aim of mitigating risks of heavy rains and implementation of warning infrastructure in the participating regions. Partners from six countries jointly develop innovative methods focused on the actual situation and new tools for reducing casualties and damage caused by heavy/torrential rain.

Administration of the project has been completed.

3. *Increased renewable energy and energy efficiency by integrating, combining and empowering urban wastewater and organic waste management systems (CE946 – REEF 2W)*

Partners on the Czech side: 2
Partners' budget:
– University of Chemistry and Technology: EUR 172,533.25
– VEOLIA: EUR 207,634.25

The main purpose of the project is to increase energy efficiency and production of renewable energy in public infrastructures.

4. *Enhancing environmental management capacities for sustainable use of the natural heritage of Central European SPA towns and regions as the driver for local and regional development (CE1308 HealingPlaces)*

Partner on the Czech side: 1
Partner's budget:
– Mendel University in Brno: EUR 22,948.38

The project focuses on the sustainable development of the spa while protecting the unique groundwater resources that form its foundation. This will be achieved by expanding knowledge and awareness of the impact of various factors on groundwater deposits and building multi-level and multi-territorial management models for the management of valuable natural spa resources. A critical element of the project will be the development of a collaborative, innovative and web-based tool for assessing threats and pressures on mineral and hot water deposits. HealingPlaces will design, test and implement innovative solutions for sustainable mineral water management in spas through different participatory models.

Administration of the project has been completed.

5. Board for Detection and Assessment of Pharmaceutical Drug Residues in Drinking Water – Capacity Building for Water Management in CE (CE1412 boDEREC-CE)

Partner on the Czech side: 1
Partner's budget:
– University of Life Sciences Prague: EUR 33,290.24

Recent research has shown that the aquatic environment from which we produce drinking water in Europe contains anthropogenic substances that were unknown just a few years ago. The boDEREC-CE project defines an innovative approach by implementing pilot sites in Central European countries for monitoring emerging contaminants, mainly pharmaceuticals and personal care products (PPCPs). Thus, boDEREC-CE focuses not only on studying the behaviour of PPCPs, but special attention is paid to assessment of mitigation effectiveness of this specific type of pollution by different types of technological treatments of drinking water: the main output are innovative decisions based on a model that can be used as an early warning tool with respect to future legal limits. The tool will be tested in hydraulic structures under different conditions. Furthermore, activities will be launched to inform the public about measures to reduce the use and waste of PPCPs.

6. JoinT Efforts to increase water management Adaptation to climate Changes in central EuRope (CE1670 – TEACHER-CE)

Partner on the Czech side: 1
Partner's budget:
– Czech University of Life Sciences Prague: EUR 56,000.00

TEACHER-CE integrates and harmonises the results of previously funded projects recognising their links to climate change adaptation and risk prevention. The main territorial challenge to be addressed is the development of effective climate change adaptation and water risk prevention processes in Central Europe, where effects can be clearly observed and could have a strong impact at territorial level in the years to come. The main objective is to develop an integrated set of tools aimed at water resource management, including climate change adaptation, flood/heavy rain/drought risk prevention, small-scale water retention measures and water resource protection through sustainable land management, based on integration of tools from selected projects: RAINMAN, FRAMWAT, PROLINE-CE, SUSTREE, LUMAT (all chemicals and products); H2020 FAiRWAY; LifeLocalAdapt; DRIDANUBE and DAREFFORT (DTP), C3SDisaster sectoral information system for risk reduction and C3S soil erosion demo case. The project focuses on providing project outputs/tools at the municipal/regional level; the TEACHER-CE project will build on integrated water management tools, including climate change adaptation and risk prevention from previously funded projects. The experience gained at the local level under TEACHER-CE will be used to maximize the use of the toolbox for effective and robust climate change adaptation in sector plans. The TEACHER-CE innovation consists in a guided and documented process of integrating outputs and numerous tools of previously funded projects from different grant programmes in a single toolbox with testing and validation in nine pilot projects in eight countries.

Reconstruction of the Hranice Weir (Source: Morava River Board, s.e.)

N. Frysová – The Reef, Special and Practical Primary School Březinova, Jihlava

12. LEGISLATIVE MEASURES

12.1 Water Act and implementing regulations

In 2022, there were no direct or indirect amendments to the Water Act. At the same time, no changes were made to the implementing legislation of the Water Act, and no interpretations of the Water Act were adopted or amended.

The provisions of the so-called ‘dry’ amendment to the Water Act have been fulfilled. Specifically, all regional drought and water scarcity management plans were developed and discussed in 2022, so that they could become publicly available by the end of January 2023. Furthermore, warning of natural hydrological drought was ensured for each municipality with extended jurisdiction, within a weekly interval in the HAMR, a forecasting system presenting actual and expected development of the drought situation.

12.2 Water Supply and Sewerage Act

In 2022, there was no direct amendment to Act No. 274/2001 Coll., on water supply and sewerage systems for public use and on amendments to some related acts (the Water Supply and Sewerage Act), as amended.

Decree No. 428/2001 Coll., which implements the Water Supply and Sewerage Act, was amended in 2022 in connection with a direct amendment to Decree No. 244/2021 Coll. With effect as of 1 July 2022, the formula for calculating the amount of rainwater discharged into the sewerage system is extended in Annex 16 (Formula for calculating the amount of rainwater discharged into the sewerage system) and it newly includes areas that take into account possible existence of green roofs that allow for partial retention of rainwater. In Annex 19 (Calculation of water and sewerage charges for the calendar year) and Annex 19a (Breakdown of calculation and other items, their content, volume and quantity items in calculation of water and sewerage charges), the content of calculation items in calculation of rent and lease payments is specified.

12.3 Control of state administration in the field of water management

The Ministry of Agriculture and the Ministry of the Environment are entrusted with the exercise of supreme state supervision by Act No. 2/1969 Coll., on the establishment of ministries and other central bodies of state administration of the Czech Republic, as amended, through the provisions of Section 111 of Act No. 254/2001 Coll., on waters and amendments to some acts (Water Act), as amended.

Old Town Weir, concreting (Source: Vltava River Board, s.e.)

Audits of regional authorities are conducted in accordance with Government Resolution No. 689 of 11 September 2013 on Planning, Assessment and Coordination of Audits of the Exercise of Delegated and Independent Competence of Territorial Self-Government Units by Central Administrative Authorities, Regional Authorities, the Prague City Hall and the Municipalities of Territorial Statutory Cities. The Ministry of the Interior of the Czech Republic prepared a three-year audit plan for regions and the Capital City of Prague for 2020–2022.

Ministry of Agriculture

Auditing of the exercise of delegated competences in water management is carried out within the organizational structure of the Ministry of Agriculture by the Department for State Administration in Water Management and for River Basin Administration as the central water authority. In 2022, five audits were carried out at regional water authorities. In addition, 13 inspections were carried out at water administration offices of municipalities with extended powers.

Audits carried out by the MoA focus primarily on implementation of the Water Act in matters where the MoA exercises the competences of the central water authority, and regulations issued pursuant to the Act; the Water Supply and Sewerage Act, as amended, and regulations issued pursuant to the Act; Act No. 106/1999 Coll. on free access to information, as amended, Act No. 500/2004 Coll., the Code of Administrative Procedure, as amended; and Act No. 183/2006 Coll., on spatial planning and building rules (the Building Act), as amended, and its implementing legal regulations. Audits at regional offices focus on adherence to the provisions of Section 67(1)(a), (b), (c) and (e) of Act No. 129/2000 Coll., on regions (establishment of regions), as amended; and at municipal offices with extended powers on adherence to the provisions of Section 61 of Act No. 128/2000 Coll., on municipalities (establishment of municipalities), as amended.

Beyond the abovementioned legislative framework, audits also focused on the functioning of water authorities, including their personnel, material and organizational aspects, especially in terms of qualification and experience of their employees.

A random sample of files was examined during each audit. The MoA draws a report of each inspection, including description of any deficiencies found. Based on the audits, it can be concluded that the exercise of the delegated competences of regional authorities in water management has been consistently on a high level. Another positive aspect are efforts of regional water authorities to provide professional methodological guidance to authorities within their competence. None of the entities audited were required to adopt remedial actions, the shortcomings identified were mainly of a formal nature and did not result in invalidity of the decisions vetted.

The MoA uses findings from audits at water authorities as feedback which not only helps deepen mutual communication at all levels of the administrative hierarchy, but it is very useful beneficial for the Ministry of Agriculture as it learns about regional and local water management issues. Audit findings are subsequently applied in the methodological guidance for water authorities. Findings concerning the application of regulations within the competence of the MoA together with water management issues are presented annually at a working meeting of the MoA Water Management Department with water authorities (in 2022, the meeting was held at the Skalský Dvůr Hotel in Vysočina on 3–5 October 2022).

The Lipno I Reservoir (source: Vltava River Board, s.e.)

The Orlík Reservoir, realization of the test block of concreting (Source: Vltava River Board, s.e.)

Ministry of the Environment

Supervision of the execution of the delegated powers in water management is annually carried out, as part of supreme water management supervision, by the Ministry of the Environment as the central water authority through the Departments for Execution of State Administration (DESA). Supervision of the regional authorities was prepared in accordance with Government Resolution No. 689 of 11 September 2013, pursuant to Article 6(2) of the related material No. 978/13, and in accordance with the Ministry of the Interior's 'Inspection Plan for Regions and the Capital City of Prague for 2020–2022' and the Ministry of the Environment's Supervisory Activity Plan for 2022. At the Czech Environmental Inspectorate and at municipalities with extended powers (water authorities), supervisory activities were prepared in accordance with the 2022 plan of supervisory activities of the Ministry of the Environment, DESA I-IX.

Exercise of the supreme state supervision is imposed on the Ministry as the supreme water management supervisor by Act No. 2/1969 Coll., on the establishment of ministries and other central state administration bodies of the Czech Republic, as amended, and by the provisions of Section 111 of the Water Act.

Supervisory activity is an essential element of verifying the level of state administration execution, its purpose is to supervise how lower administrative authorities (regional authorities, water authorities and the CEI) carry out state administration in the entrusted area of water management, how they implement provisions of the Water Act and regulations issued under it. In particular, supervision focuses on correct application of legal regulations, relevant statutory provisions and compliance with Act No. 500/2004 Coll., the Code of Administrative Procedure. Audits also focus on the way in which the performance of water authorities is ensured, officials' qualification and experience, work organisation and equipment of organisational units.

The purpose of the supreme state supervision consists primarily in eliminating irregularities of a systemic nature. In individual cases, wrong decisions may be rectified by means of an extraordinary remedy (review of the decision in a review procedure, reopening of the proceedings).

Audits of water authorities constitute a minor part of the MoE's supervision activities. More frequent and extensive in scope are inspections at regional authorities and other entities.

No deficiencies requiring imposition of corrective measures were found, only minor administrative deficiencies and partial shortcomings consisting in procedural errors observed in the initiation of water administrative proceedings, where it was not initiated by notification as required by the Code of Administrative Procedure, lacking the indication of legal validity, which, however, did not affect the validity or legality of the issued administrative acts and were discussed with officials in the course of the actual exercise of the supreme water management as part of methodological assistance.

Based on the conclusions of the audits carried out within the competence of supreme water management supervision by DESA, partial deficiencies were found consisting in insufficient application of criteria that have an impact on the determination of the sanction, such as insufficiently specified quantities of pollutants handled by the defendants.

However, apart from the aforementioned partial deficiencies, it can be concluded that the exercise of delegated powers in the field of water protection performed by the water authorities audited in 2022 is still ensured at a very good level, the decisions issued contain the particulars required by the Code of Administrative Procedure and references to the relevant provisions of the Water Act. The methodologies and directives of the MoE are observed in the proceedings and decision-making.

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13. PRIORITY TASKS, PROGRAMMES AND KEY DOCUMENTS IN WATER MANAGEMENT

13.1 Water planning

In early 2022, the Government discussed and approved the update of the national river basin management plans and flood risk management plans for the period until 2027, thus officially commencing the third phase of water planning under the Water Framework Directive and the second phase of water planning under the Floods Directive. The SEA process of the updated river sub-basin plans was completed and subsequently the majority of the river sub-basin plans were approved by the regions. At the same time, implementation of the measures proposed in the river basin management plans and flood risk management plans started.

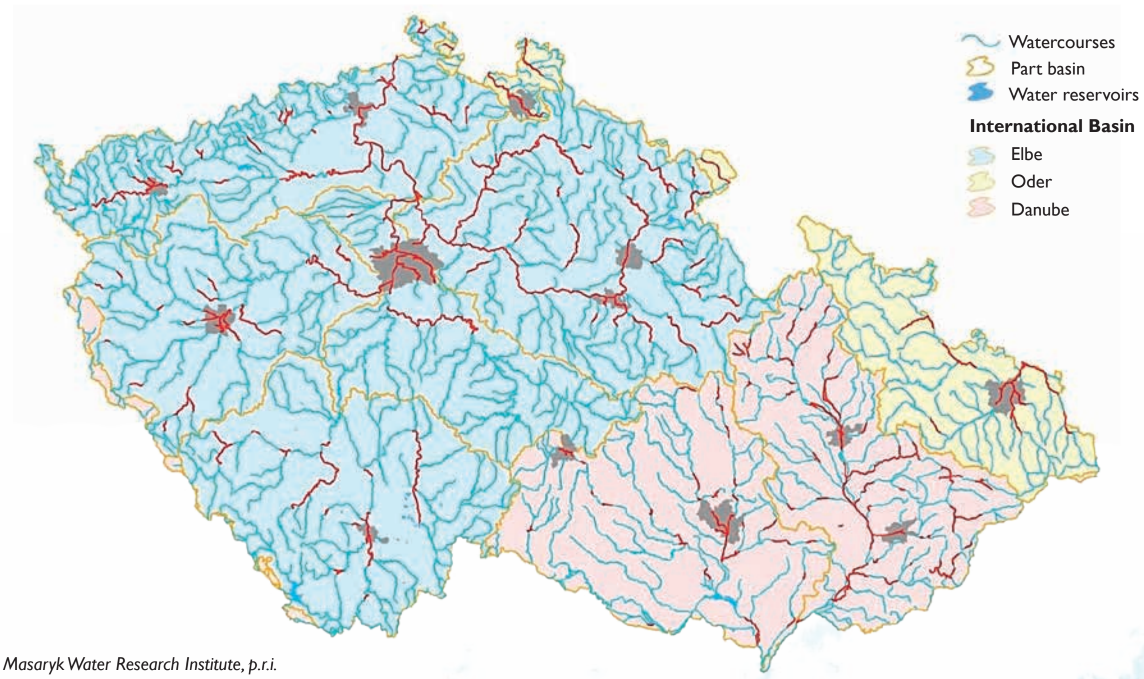
Update of the national river basin plans (the National Elbe River Basin Plan, the National Danube River Basin Plan and the National Oder River Basin Plan) for the period until 2027 was submitted to the Government for approval in December 2021. However, due to a change of government, the approval was not issued until 19 January 2022 by Resolution No. 31. Subsequently, the MoA, as the competent administrative authority within the meaning of Section 25(4) of the Water Act, issued all three national river basin plans by means of measures of a general nature dated 28 January 2022, which entered into force on 13 February 2022, pursuant to Section 173(1) of the Code of Administrative Procedure.

Update of flood risk management plans (the Elbe River Basin Flood Risk Management Plan, the Danube River Basin Flood Risk Management Plan and the Oder River Basin Flood Risk Management Plan) were approved by Government Resolution No. 30 of 19 January 2022. Subsequently, the MoE, as the competent administrative authority within the meaning of Section 25(5) of the Water Act, issued all three flood risk management plans by means of measures of a general nature dated 28 January 2022, which entered into force on 14 February 2022, pursuant to Section 173(1) of the Code of Administrative Procedure. Preparation of the third implementation stage of the Floods Directive started with preparations for the 2nd update of the preliminary flood risk assessment. At the same time, implementation of the proposed flood risk management measures started.

National river basin plans and flood risk management plans are complemented by ten sub-basin plans (Upper and Middle Elbe; Upper Vltava; Berounka; Lower Vltava; Ohře, Lower Elbe and other tributaries of the Elbe; Morava and tributaries of the Váh; Thaya; other tributaries of the Danube; Upper Oder; Lusatian Neisse and other tributaries of the Oder), which were assessed in terms of the SEA's impact on the environment. In September–December 2022, most of the sub-basin plans were approved by the regions in accordance with Section 24(13) of the Water Act.

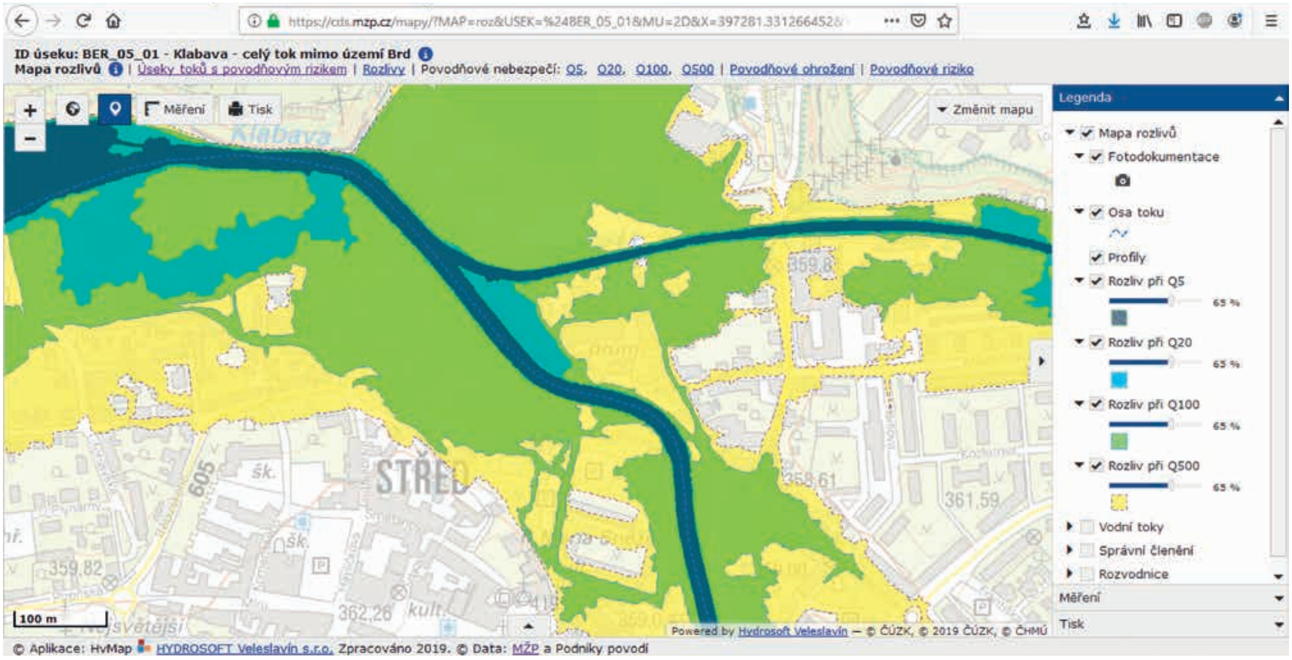
As in previous planning periods, the Water Planning Commission was established by the Ministry of Agriculture and the Ministry of the Environment and cooperation between its two working committees started, namely the Working Committee for Implementation of the Water Framework Directive and the Working Committee for Implementation of the Floods Directive.

Figure 13.1.1
Defining areas with significant flood risk for the 2nd planning cycle under the Floods Directive



Source: T. G. Masaryk Water Research Institute, p.r.i.

Figure 13.1.2
View of the flood risk map on the map portal



Source: MoE

Current and general information on the water planning process, including materials and minutes from the Water Planning Commission meetings, is available to the public on the MoA website under Water → Water Planning. For the purposes of implementation of the Floods Directive, the Flood Information System (www.povis.cz) is used as a communication platform, where information on the process of preparing flood risk management plans is published.

13.2 Water supply and sewerage development plans

The Water Supply and Sewerage System Development Plan in the Czech Republic, prepared pursuant to Section 29(1)(b) of Act No. 274/2001 Coll., on water supply and sewerage systems for public use and on amendments to some related acts, as amended, is available on the website of the Ministry of Agriculture.

Water supply and sewerage development plans in the Czech Republic (WSSDP, RWSSDP) including their updates represent a medium-term continuously updated concept of the water supply and sewerage sector.

The Regional Water Supply and Sewerage Development Plans in the Czech Republic (the 'RWSSDP') are the basis for the use of European Community funds and national financial resources for the construction and renewal of water supply and sewerage infrastructure. Therefore, the obligations of each applicant for the provision and use of state financial support include documenting the compliance of the technical and economic solution submitted with the valid WSSDP.

The Water Supply and Sewerage Development Plan in the Czech Republic (the 'WSSDP') is based on a synthesis of information from the RWSSDPs prepared, discussed and approved by the regional councils, including their updates. It builds on other strategic documents and departmental policy documents and also respects the requirements arising from the relevant European Community regulations. The WSSDP includes statements of the MoA issued on each of the updates of the RWSSDP.

In its general part, the WSSDP defines the framework objectives and main principles of government policy for ensuring long-term public interest in the field of water supply and sewerage in the Czech Republic, i.e., sustainable use of water resources and water management while adhering to requirements for water management services (drinking water supply, sewerage and wastewater treatment).

Pursuant to Section 29(1()c) of the Act, the Ministry of Agriculture continued to issue statements on the approved RWSSDPs concerning the proposed updates to the technical solutions for drinking water supply, sewerage and wastewater treatment.

In 2022, 956 opinions were issued. A total of 9,493 opinions of the MoA were issued for the period from 2006 to 2022, which accounts for approximately 55.30% of the 17,166 municipalities and local districts of the Czech Republic addressed in the WSSDP and RWSSDP.

The WSSDPs in the Czech Republic are used by the MoA, MoE, regions (regional authorities), municipalities with extended powers (water authorities), municipalities, owners and operators of water supply and sewerage systems and the professional and general public.

13.3 Programmes and measures aimed at reducing surface water pollution

Water quality protection constructions completed in 2022

Among the most significant projects for pollution sources above 2,000 EO, the following wastewater treatment plants (WWTPs) were completed in 2022: N = nitrification, DN = denitrification, BP = biological phosphorus removal, CHP = chemical phosphorus removal:

The Křímov Reservoir (Source: Ohře River Board, s.e.)

Table 13.3.1
New and renovated wastewater treatment plants with capacity over 2,000 equivalent population in 2022

Status	Wastewater treatment plants	Location	Capacity	Nitrification	Denitrification	Chemical phosphorus removal
			number of PE	YES/NO	YES/NO	YES/NO
New	Industrial		x	x	x	x
	Municipal	Bořetice (South Moravian Region) *)	2,300	YES	YES	YES
		Komárov and Suché Lazce *)	3,000	YES	YES	YES
reconstructed/expanded	Industrial	CTPark commercial zone Nová Hospoda	3,200	YES	YES	NO
	Municipal	Bílovec	8,800	YES	YES	YES
		Český Brod *)	13,300	YES	YES	YES
		Horoušany *)	2,000	YES	YES	YES
		Jaroměřice nad Rokytnou	8,800	YES	YES	YES
		Karlštejn	1,800	YES	YES	YES
		Mělník	23,900	YES	YES	YES
		Prušánky *)	6,399	YES	YES	YES
		Rychnov u Jablonce nad Nisou *)	4,400	YES	YES	YES
		Říčany (near Prague) *)	20,600	YES	YES	YES
		Stařič *)	2,500	YES	YES	YES
		Šestajovicee	6,000	YES	YES	YES
		Štěpánov u Olomouce	4,600	YES	YES	YES
		Štramberk-Bařiny	2,595	YES	YES	NO
		Tuchlovice	3,500	YES	YES	NO
		Votice	9,950	YES	YES	YES
		Všechlapy	3,350	YES	YES	YES
		Zdiby *)	6,000	YES	YES	YES

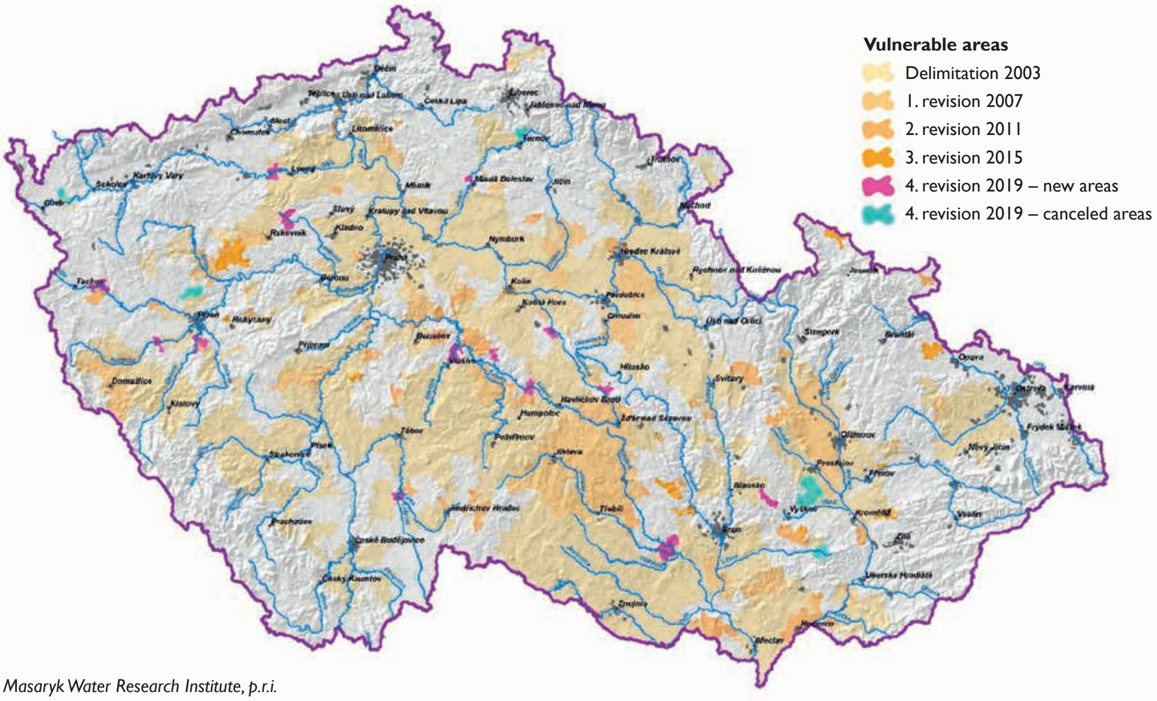
Source: SEF, River Boards, s.e.
*Note: *) WWTPs with support from the SEF.*

Action programme under Council Directive 91/676/EEC (Nitrates Directive)

In 1991, Council Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive) was adopted, which is transposed in the Czech Republic in the Act on Fertilisers, the Water Act and Government Regulation No. 262/2012 Coll., on the designation of vulnerable areas and the action programme, as amended. Vulnerable areas are locations where contamination of underground waters and surface waters with nitrates exceeded or could exceed the defined nitrate concentration limit of 50 mg/l. As required by the Nitrates Directive, such areas are subject to review at least every four years after their designation.

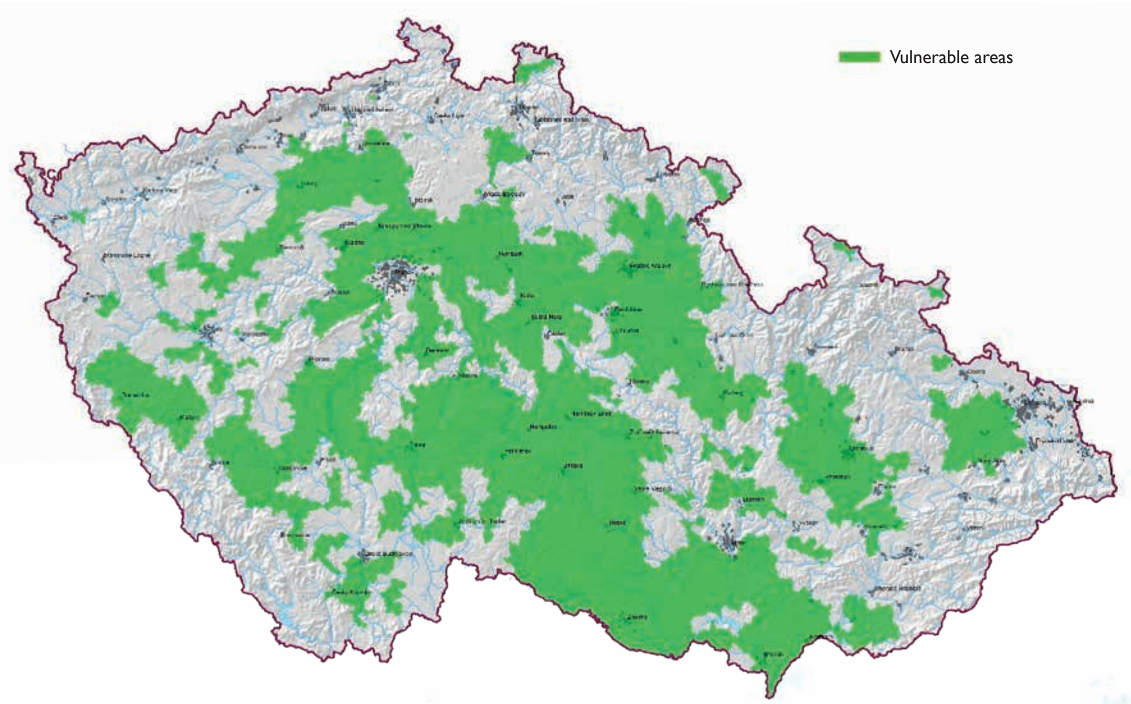
Among the main measures to reduce surface water pollution by nitrates from agricultural sources is Government Regulation No. 262/2012 Coll., on the designation of vulnerable areas and the action programme, as amended. Within the framework of this legislation, so-called Nitrate Vulnerable Areas (the 'NVAs') are defined (registered) and an action programme for the agricultural sector is announced. The above-mentioned measures are updated and announced at regular intervals not exceeding four years according to the current provisions of Council Directive 91/676/EEC concerning protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive). Significant amounts of nitrates, or nutrients in general, are washed into surface waters as part of water erosion, see more in Chapter 5.2.

Figure 13.3.1
Map of vulnerable areas and their designation in 2019



Source: T. G. Masaryk Water Research Institute, p.r.i.

Figure 13.3.2
Map of vulnerable areas as per Government Regulation No. 262/2012 Coll., on the designation of vulnerable areas and the action programme – Amendment No. 277/2020 Coll.



Source: T. G. Masaryk Water Research Institute, p.r.i.

Due to the fact that in July 2020 the above defined period was to end, the T. G. Masaryk Water Research Institute prepared a new update of the definition of nitrate vulnerable areas in 2019 and the MoA created a new action programme, which was announced by the amended Government Regulation No. 277/2020 Coll., with effect from 1 July 2020, for the period until 30 June 2024. Compared to the previous regulation, there are now changes to the definition of small-scale nitrate vulnerable areas and changes to the actual wording of the action programme. These changes concerning the nitrate vulnerable areas are based on data obtained from monitoring, and those concerning the action programme are based on the knowledge and experience gained over the previous four years.

In addition to the nitrate concentrations in the surface water and groundwater profiles, other aspects such as surface water eutrophication in a given locality are also taken into account when defining vulnerable areas, where sources of pollution other than surface pollution may be the source of such pollution. In the Czech Republic, the share of NVA is currently about 42% of its total area, NVAs cover about 50% of the total agricultural land area.

Vulnerable areas containing nitrate-polluted waters cover 1.8 million hectares, i.e., more than half of the agricultural land in the Czech Republic.

The main measures of the Action Programme include a period with a ban on fertilizing, fertilization limits according to crop yield levels, crop rotation – restriction of maize cultivation in 3rd application zone, storage of fertilizers, nitrogen balance, farming on slopes and in the vicinity of surface water bodies. The measures set out in the Action Programme have to guarantee that no farm using organic and/or organic-mineral fertilizers for farming in vulnerable areas exceeds the limit of 170 kg of nitrogen/ha/year.

In the calendar year 2022, the relevant programmes and measures for the protection of surface waters were finalised under the responsibility of the MoA, in cooperation with the MoE and other state and non-state institutions under the Common Agricultural Policy programme, which will come into force in the calendar year 2023. The measures (e.g., extension of buffer strips around surface water bodies) will be implemented through support programmes defined by relevant government regulations under the responsibility of the MoA.

13.4 Reporting activities of the Czech Republic to the European Union

Reporting under Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 on the management of bathing water quality and repealing Directive 76/160/EEC.

In terms of European legislation, the issue of bathing waters is governed by Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC.

The Seč Reservoir (Source: Elbe River Board, s.e.)

Every year before the bathing season, a list is compiled pursuant to Section 6g(1)(a) of Act No. 258/2000 Coll., on the protection of public health and on amendments to some related acts, as amended. The List is drawn up by the Ministry of Health in cooperation with the MoE and the MoA. In the Czech Republic, waters used for bathing in the open air are divided into natural bathing sites operated on surface waters used for bathing (i.e., surface waters where the operator offers bathing services) and surface waters where a large number of people can be expected to bathe and for which a permanent bathing ban or a permanent warning against bathing has not been issued by the competent public health authority (so-called other surface bathing waters). Prior to the start of the 2022 bathing season, a list of waters designated as bathing waters for the 2022 recreational season was submitted to the EC.

The MoE, in cooperation with the Ministry of Health, submitted to the EC a report on the results of the monitoring and assessment of the quality of the surface waters listed for the 2022 bathing season, which was prepared in accordance with the requirements of Directive 2006/7/EC. Bathing waters were classified as unsatisfactory, acceptable, good or excellent on the basis of their quality. The assessment was made on the basis of a set of quality data compiled for the 2022 bathing season and the four preceding bathing seasons. The reports from each European country are published annually on the EC portal http://ec.europa.eu/environment/water/water-bathing/index_en.html once the results are compiled.

The most frequent water quality problems in the Czech Republic are related to the mass development of cyanobacteria, which led to the announcement of a bathing ban at 13 locations in the 2022 bathing season. Out of a total of 156 reported bathing waters, no site was classified as non-compliant according to the requirements of Directive 2006/7/EC – 3 were classified as acceptable, 20 good and 120 of excellent quality. 13 locations were not assessed due to an insufficient number of samples (e.g., in the case of newly monitored sites), or because they were shut down for reconstruction.

Reporting under Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment

Directive 91/271/EEC on urban waste water treatment concerns the collection, treatment and discharge of urban wastewaters and treatment and discharge of wastewaters from selected industry sectors.

The status of implementation of the Directive is ascertained by reporting of the Member States to the EC every 2 years. In 2022, the MoE processed and sent to the EC via the Reportnet 3 network the reporting under Article 15 and Article 17 of the Directive for the reference year 2020. Data of asset and operation records provided by the MoA were used for the reporting.

The data collected for the reporting period show that the Czech Republic is not fulfilling the requirements under Art. 3 of the

The Bystřice Weir on the Úhlava Stream (Source: Vltava River Board, s.e.)

Directive in 186 agglomerations where sufficient sewerage systems are not provided, despite the fact that the number of agglomerations that now meet the obligations set out in the article has increased (by 12 agglomerations). In 41 agglomerations, there was an increase in the share of wastewaters discharged from the agglomerations through the sewerage system.

Furthermore, the Czech Republic does not meet the requirements of Art. 4 and 5 of the Directive, which is due to auxiliary WWTPs in large agglomerations that do not meet the requirements related to the size of agglomerations, and because there are still many open discharges of untreated wastewaters.

Reporting under Art. 15 of the Water Framework Directive 2000/60/EC

Reporting as required by Article 15 of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy – reporting on river basin management plans.

Following the completion of the preparation and approval of the river basin management plans for the 3rd planning period by the Government of the Czech Republic, it was necessary to ensure the obligation to report to the EC in accordance with Article 15 of the Framework Directive 2000/60/EC. This Article of the Framework Directive 2000/60/EC obliges EU Member States to send copies of river basin management plans and any subsequent updates to the EC and all other Member States concerned within three months of their publication.

In the case of the Czech Republic, it was therefore necessary to ensure the submission of the report by 22 March 2022. In addition to providing copies of the approved river basin management plans, the EC also requires other data related to the water planning process. The requirements for reporting on river basin management plans for the 3rd planning period were specified in detail by the relevant guideline documents of the Joint Implementation Strategy of the Framework Directive 2000/60/EC. The subject of reporting was a large set of data. In formal terms, the reporting can be divided into a data part, which was a structured geodatabase containing detailed data on individual water bodies (their status, anthropogenic impacts identified, etc.), protected areas, monitoring sites and proposed measures to achieve environmental objectives, and a text part, describing in particular the methodological procedures applied. The reporting also included sets of geographic data: boundaries of river basin districts, water bodies (including the structure of the river network for surface water bodies), protected areas with a link to water and monitoring sites.

The relevant EC guideline documents also set considerable requirements for the quality of the reported information, in particular accuracy and topological consistency of the geographic data and logical coherence and completeness of the descriptive data. The quality of the data was automatically checked when uploaded to the relevant data repository. Only sufficiently accurate, consistent and complete data were received. If a Member State did not have some of the required data, it had to justify this in advance.

In accordance with the requirements of the Framework Directive 2000/60/EC, the Czech Republic submitted copies of the river basin management plans to the EC on 22 March 2022. Subsequently, work on data validation for the EIONET reporting tool was underway in the parts of the data related to monitoring and methodologies. Data on monitoring sites, representative profiles for the assessment of the status of water bodies and protected areas with a link to water were made newly available. Due to the general complexity and data verification problems in the EIONET and longer response time from the 'helpdesk', the processing of electronic reporting has not yet been concluded and is still ongoing.

Reporting of the river basin management plans, prepared according to the requirements of the EC guideline documents, was to be fully completed by March 2023.

Reporting under Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks

The second planning cycle under the Floods Directive (2007/60/EC) was completed in 2021 with the preparation (update) of three flood risk management plans for the parts of the Elbe, Danube and Oder River Basins located in the Czech Republic. These plans were approved on 19 January 2022 by Resolution No. 30 of the Government of the Czech Republic.

The plans are drawn up for areas with significant flood risk identified pursuant to Article 5(1) of the Floods Directive on the basis of the maps referred to in Article 6 of the Directive.

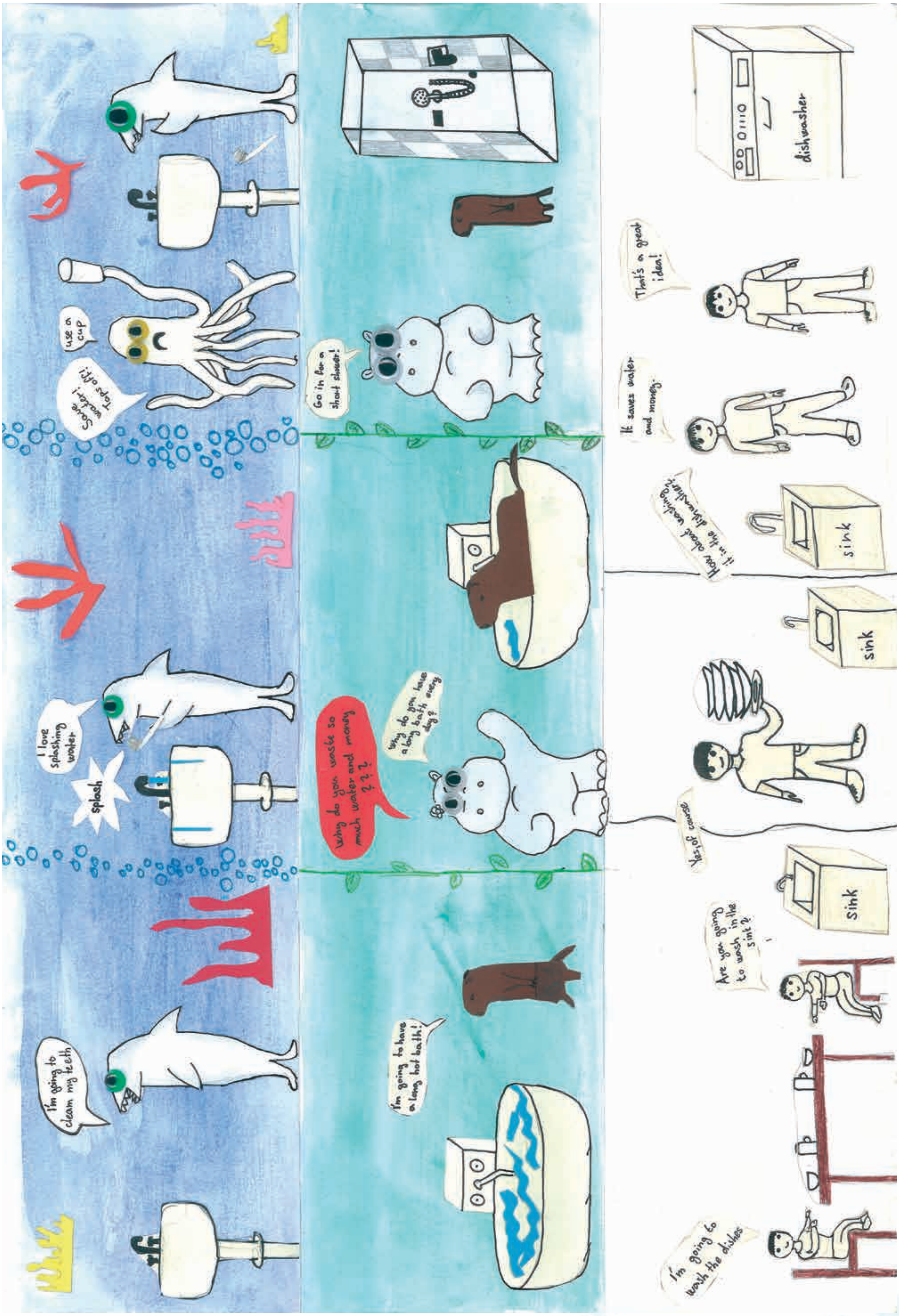
In 2022, the European Commission was informed of the progress of the review and update of the flood risk management plans through reporting under Article 15 of the Floods Directive.

Reporting is carried out according to documents agreed by representatives of the EU Member States in the Floods Directive Reporting Drafting Group, the Floods Working Group of the European Commission and approved by the Water Directors. Following the experience of the reporting in the first planning cycle, the data templates for data submission and the process of data checking in the Eionet were adapted by the European Commission.

The basic source of information for filling in the reporting templates was the texts of the flood risk management plans of individual river basins, which were prepared in accordance with the provisions of Section 25 of the Water Act for the period 2022–2027.

The reported data was compiled from the texts and tables annexed to the plans and from the sheets of proposed measures. The descriptive data both briefly characterise the principles by which the plans were drawn up and provide information on the proposed measures.

The reporting also included a report entitled Review and Update of Flood Risk Management Plans in the Czech Republic, which was compiled according to the requirements contained in the reporting templates.



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14. INTERNATIONAL RELATIONS

International cooperation of the Czech Republic in water protection is based on the principles of the 'UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes', to which the Czech Republic is a party.

Within the framework of international cooperation in water protection, the so-called Joint Technical Commission between the then Czechoslovak Republic and the Republic of Austria was established as early as 1928 to deal with technical and economic modifications of the border sections of the Danube, the Thaya and the Morava Rivers, as well as watercourses in the Malše and Lužnice River Basins. Currently, the Czech Republic is a contracting partner to nine international treaties in the field of water protection.

Revitalization of the Vltava River, Vraňany-Hořín (Source: Vltava River Board, s.e.)

14.1 Cooperation within the UNECE

UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes is intended to strengthen national measures for the protection and environmentally sound management of transboundary surface waters and groundwaters. The Convention encourages the contractual parties to prevent, control and reduce transboundary impacts and use water in a sustainable manner.

The basic principle is bilateral cooperation between neighbouring states on the basis of international agreements, treaties and conventions in the field of transboundary water management. Emphasis is placed on mutual exchange of information, joint research and development (e.g., through bilateral and multilateral projects, international commissions, etc.), improvement of warning and alarm systems, as well as public access to information.

UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes

This document entered into force on 6 October 1996 and the Czech Republic has been a party to it since 10 September 2000. Representatives of the Czech Republic participate in activities related to the areas of integrated management of water resources and aquatic ecosystems, protection of waters against accidental pollution from industrial sources, support for international cooperation on transboundary waters and in international river basin commissions. Cooperation under the Convention also focuses on the relationship between water quality and human health. In 2022, the Czech Republic participated in the meeting of the Working Group for Integrated Water Resources Management associated with the celebration of the 30th anniversary of the ratification of the Convention. At the celebratory meeting, representatives of the Convention and the Parties highlighted the progress made over the past three decades and discussed the main challenges for the future, such as the impact of climate change and the equitable allocation of scarce water resources.

Protocol on water and health

This document was produced in collaboration with the World Health Organization (WHO) and addresses the link between water and human health. The Protocol entered into force in 2005, but the Czech Republic has been a party to the Protocol since 2001 and the national targets of the Czech Republic are updated within the framework of the Protocol. The Ministry of Health is the promoter of the Protocol in the Czech Republic. The Council for Health and Environment entrusted a permanent working team consisting of representatives of the MoH, the MoE, the MoA and the State Institute of Health with the preparation of drafting national objectives and supervision of their implementation. The sixth meeting of the Parties to the Protocol was held in Geneva in 2022. The main topics discussed were the response to the Covid-19 pandemic and the prevention of further pandemics.

More information about the Convention and the Protocol can be found at www.unece.org/env/water.

14.2 International cooperation of the Czech Republic in the Elbe, Danube and Oder River Basins

Modern principles of water protection, based on the hydrological basins of large rivers crossing the borders of several countries, began to be applied in the Czech Republic in 1990 with the start of cooperation in protection of the Elbe River under the Agreement on the International Commission for the Protection of the Elbe River. At that time, the Agreement on the International Commission for the Protection of the Oder River against Pollution and later the Convention on Cooperation for Protection and Sustainable Use of the Danube River also began to be prepared.

Cooperation in the field of water protection at the level of the main river basins of the Czech Republic is conducted through international commissions for the protection of the Elbe, Danube and Oder Rivers and focuses primarily on:
– reducing pollution of the Elbe, Danube and Oder Rivers with hazardous substances,
– striving to achieve an ecosystem as close as possible to the natural condition with a healthy diversity of species,
– enabling the use of water, especially extraction of drinking water from bank infiltration and agricultural use of water and sediments,
– reducing pollution in the North Sea from the Elbe River Basin, in the Black Sea from the Danube River Basin and in the Baltic Sea from the Oder River Basin,
– flood control,
– coordinated implementation of the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy in integrated river basins) and the Floods Directive (Directive 2007/60/EC of the European Parliament and of the Council on the assessment and management of flood risks).

Agreement on the International Commission for the Protection of the Elbe River

On 8 October 1990, the Agreement on the International Commission for the Protection of the Elbe River (the 'ICPER') was signed in Magdeburg. The Agreement entered into force on 14 September 1992 and the Commission acquired legal subjectivity by the Protocol to the Agreement of 9 December 1991, which entered into force on 13 August 1993. The ICPER is the most important body of Czech-German cooperation in the field of water protection in the international Elbe River Basin.

The 35th meeting of the ICPER in October 2022 was held online. In 2022, an update of the International Elbe River Basin District Plan for the period 2022–2027 was completed and published on the ICPER website. At the same time, implementation of the updated plan was initiated and implementation of the Plan for Flood Risk Management in the International Elbe River Basin District, approved in 2021, continued. Information sheets on both the Water Framework Directive and the Floods Directive were produced and published.

Furthermore, the report 'Hydrological assessment of drought in the Elbe River Basin in 2018' and an analysis of the development of the runoff regime and seasonality of the high and low flow rates of the Elbe River between 1931 and 2010 were completed and published. The topic of the implementation of the 'ICPER Concept for Sediment Management' started to be discussed in expert consultations.

In 2022, the preparation of 20th Magdeburg Workshop on Water Protection, which was to take place in Carlsbad in October 2023. The main topic is extreme hydrological events and their impacts on the Elbe River Basin.

The working groups established under the ICPER continued in 2022 and were ready to continue their ongoing activities in 2023 (e.g., work on the extension of the Elbe Alert Model, continuation of joint projects, work on the International Elbe Measurement Programme, testing of the International Elbe Warning and Alert Plan and its possible updates, etc.).

Implementation of the Water Framework Directive, implementation of the Floods Directive, flood protection and emergency water pollution issues are still| the priorities of the ICPER.

Detailed information on the activities of the ICPER can be found at: www.ikse-mkol.org.

Convention on Cooperation for the Protection and Sustainable Use of the Danube River

This multilateral cooperation aimed at the Danube protection is one of the largest international activities in water protection. The Convention on Cooperation for the Protection and Sustainable Use of the Danube River was signed on 29 June 1994 and entered into force on 22 October 1998.

The International Commission for the Protection of the Danube River (ICPDR) consists of 15 contracting parties that have committed themselves to implementing Convention on the Danube protection. The ultimate objectives are cooperation on basic water management issues with the view of ensuring that surface waters and groundwaters in the Danube River Basin are managed and used in a sustainable and equitable manner, and adoption of all appropriate legal, administrative and technical measures aimed at preserving and improving the quality of the Danube and its environment.

In 2022, the 4th Ministerial Meeting of the ICPDR Member States took place, where a Ministerial Declaration was solemnly adopted expressing the commitment to implement the measures outlined in the Danube River Basin Plans as well as in the National Plans, and the Member States expressed their support for continued cooperation in the field of Danube River Basin protection.

Two meetings were held at the level of the heads of delegation of the parties. The 20th ICPDR Steering Group Meeting was held in June and the 25th ICPDR plenary meeting was held in December. The most important topics were the launch of implementation of the second update of the International Danube River Basin Management Plan and the first update of the International Danube River Basin Flood Risk Management Plan. The meetings discussed, among other things, current issues concerning preparation of the JDS5 Danube Survey, preparation of a joint information system for flood forecasting, and the We Pass 2 project aimed at improving the migratory permeability of the Danube. Sample analyses of the international scientific project Danube Hazard m3c focused on the occurrence and concentration levels of hazardous substances in the river basin, including the Czech Republic, have been completed.

Detailed information on the activities of the ICPDR can be found at: www.icpdr.org.

Agreement on the International Commission for the Protection of the Oder River against Pollution

The International Commission for the Protection of the Oder River against Pollution (ICPORaP) was established by the international Agreement on the International Commission for the Protection of the Oder River against Pollution, concluded by governments of the Czech Republic, Poland and Germany and by the European Community on 11 April 1996. The Agreement entered into force after ratification on 26 April 1999. Following the accession of the Czech Republic and Poland to the European Union on 1 May 2004, the membership of the European Community in the ICPORaP was terminated by the Agreement on the Amendment to the Agreement on the ICPORaP adopted in Brussels on 27 November 2008.

The activity of the International Commission for the Protection of the Oder River is focused especially on international coordination of meeting the requirements of the Water Framework Directive, flood protection and water pollution prevention. The work is carried out in working groups focused mainly on flood protection, accidental pollution, legal issues, monitoring and data management. A new ad hoc working sub-group 'Mining' was established (by resolution of the 24th Plenary Meeting of the ICPORaP on 2 December 2021) under a working group focused on implementation of the Water Framework Directive, as a new water management issue of trans-regional importance was identified, namely the need to address adverse environmental impacts of current and former lignite mining, particularly on groundwaters.

In early December 2022, the 25th Plenary Session of the ICPORaP was held in Wroclaw, at the seat of the Secretariat, where, among other things, the chairmanship was officially handed over from the Czech Republic to the Federal Republic of Germany which is to preside the Commission from 1 January 2023 to 31 December 2025. In 2022, the ICPORaP focused primarily on implementation of the Water Framework Directive, and the second update of the International Oder River Basin Management Plan (IORBMP) was published on the website on 22 March 2022, together with the responses to comments submitted during the public consultation on the draft. Also, Plan for Flood Risk Management was published. Furthermore, the 27th meeting of the heads of delegations of the ICPORaP approved the Strategy for Reduction of Nutrients in the Waters of the International Oder River Basin District, the development of which also concluded the work of the ad hoc working sub-group 'Nutrients'. Significant changes also took place as prevention of accidental pollution – in addition to the update of the annexes of the Oder Emergency Plan (April 2022), the International Oder Warning and Alert Plan (IOWAP) is also to be updated. The massive fish mortality in the Oder River in August 2022 triggered the need for an immediate response and the related need to draft a specific amendment.

Detailed information on the activities of the ICPORaP can be found at: http://mkoo.pl/index.php?lang=CZ.

14.3 International cooperation of the Czech Republic on transboundary waters

The total length of the state border of the Czech Republic with neighbouring countries is 2,290 km. Approximately one third of the state border is referred to as the 'wet' border, which means that about 740 km of the state border are constituted by watercourses and water bodies. Within the framework of international cooperation on transboundary waters, the Czech Republic has international agreements with all neighbouring countries and implements them through the respective transboundary water commissions.

Transboundary waters are watercourses and water bodies that are crossed by the state border as well as watercourses which cross the state border and surface waters and groundwaters where the measures implemented on the territory of one party would substantially affect water management conditions on the territory of the other party. In order to prevent any problems and disputes, the Czech Republic entered into international agreements with all its neighbouring countries.

The respective commissions for transboundary waters address issues such as regulation and maintenance of transboundary watercourses including construction and operation of structures on the watercourses, water supply and amelioration of border areas, protection of transboundary waters from pollution (including monitoring, joint measuring of the quality of transboundary waters, exchange of data and organising a warning service in case of emergency), hydrology and flood forecasting (including monitoring, joint measurements, exchange of data and organising a warning service in case of emergency), water management procedures regarding transboundary waters, protection of aquatic and littoral biotopes, the delimitation of national borders on transboundary watercourses, etc.

The results of the meetings of the commissions are always included in the Protocols, which are submitted to involved ministries for their opinion and they are subsequently approved by the Minister of the Environment.

Agreement between the Czech Republic and the Federal Republic of Germany on Cooperation on Transboundary Waters in the Field of Water Management

The Agreement was signed on 12 December 1995 and entered into force on 25 October 1997. Its implementation is carried out through the Czech-German Commission for Transboundary Waters (the Commission). With regard to the territorial division of the Federal Republic of Germany, the cooperation is conducted through the Standing Committee Bavaria and the Standing Committee Saxony under the umbrella of the Commission.

In 2022, the 24th meeting of the Bavaria Standing Committee was held in April, the 24th meeting of the Saxony Standing Committee was held in June and the 25th meeting of the Commission in October. In the framework of these meetings and the meetings of the working groups of the Standing Committees, the issue of elevated mercury concentrations in the wash loads and sediments of the Czech-Bavarian transboundary watercourse Reslava (Röslau), which are subsequently deposited in the Skalka Reservoir, continues to be intensively discussed. A joint transboundary project, which was completed in 2021, was used to address the issue. The German side implemented three water management measures on the Reslava River under the project, their technical implementation was coordinated directly with the Czech side. Further agreed measures will follow. Further long-term cooperation between the institutions involved was agreed within the newly established Reslava/Röslau working group. Following the initiative of the Czech side, a preparatory meeting of the working group took place on 10 August 2022.

The experts of the Saxony Standing Committee further refined their proposal for a new project from the Czech-Saxon Cooperation Programme 2021–2027 to identify opportunities for joint measures to further improve the water status of the shared water bodies and other important Czech and German water bodies.

Other topics discussed included specific intents on transboundary waters concerning modifications and repairs on transboundary waters, wastewater discharges, surface water and groundwater abstractions, small hydroelectric power plants, etc. Further joint transboundary projects aimed at improving the quality and quantity of surface waters, protection of the pearl mussel and thick shelled river mussel in transboundary waters and their river basins and implementation of the Water Framework Directive in transboundary waters were also discussed. Both parties exchanged information concerning the implementation of the Floods Directive at national levels.

Under the implementation of the Framework Directive on transboundary waters, it was noted that in addition to the six common transboundary surface water bodies, 13 surface water bodies were identified by the Saxony party and 17 water bodies by the Czech party as transboundary surface water bodies by the Saxony Standing Committee. In the Bavaria Standing Committee, in addition to the three shared transboundary surface water bodies, 13 and 18 surface water bodies were identified as transboundary surface water bodies by the Bavarian and Czech parties respectively.

Agreement between the Czechoslovak Socialist Republic and the Republic of Austria on Regulation of Water Management Issues on Border Waters

The Agreement was signed on 7 December 1967 and entered into force on 18 March 1970. The subject of the Agreement is performed through the Czech-Austrian Commission for Transboundary Waters that addresses current issues in transboundary waters of the two countries.

In 2022, all joint negotiations with the Austrian side were held in person. The usual issues concerning the maintenance of the transboundary watercourses and monitoring of their quality were discussed. One of the main topics was again the issue of the impact of the Austrian chemical plant in Pernhofen on the Thaya River and the prolonged drought affecting the conditions in the Vranov Reservoir. A proposal for an update of the Directive for the warning service on the Czech-Austrian transboundary waters was also drafted, which the Commission planned to approve at its meeting in 2023.

Agreement between the Government of the Czech Republic and the Government of the Republic of Poland on Cooperation on Water Management of Transboundary Waters

The Agreement was signed on 20 April 2015 and entered into force on 5 October 2015. The Agreement is implemented through the Czech-Polish Commission for Transboundary Waters. Within the Commission, five standing working groups were established, focusing on investment projects, hydrology, hydrogeology, flood protection, watercourse regulation, protection of waters from pollution and on the Water Framework Directive. Two expert groups were established: an expert group for hydrogeology of boundary waters in the area of the Inner Sudeten Basin and an expert group for addressing the impact of the Turów Coal Mine.

In 2022, the 6th regular meeting of the Commission took place on 2–4 November. The groundwater expert group in the sphere of influence of the Turów Coal Mine was reactivated. The expert group is responsible, among other things, for keeping up-to-date overview and descriptive documentation of the objects of the joint groundwater level monitoring network, providing information on the status of the objects on the Czech and Polish sides, providing each other with measured results and regularly evaluating the results of the joint measurements.

Furthermore, the results of cooperation in the field of water management planning on transboundary waters, cooperation in the field of hydrology, hydrogeology and flood protection and cooperation in the field of transboundary watercourse management and improvement of border areas were exchanged and discussed. Information on the implementation of the Transboundary Waters Framework Directive and the Floods Directive at national level was discussed.

Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation in Transboundary Waters

The Agreement was signed and entered into force on 16 December 1999 and is implemented through the Czech-Slovak Commission for Transboundary Waters. The Commission is divided into four working groups addressing technical issues, hydrology, water protection and the Water Framework Directive.

In May 2022, the 22nd session of the Commission was held in the Slovak Republic. The meeting discussed the implementation of the EU Directives (the Water Framework Directive and the Floods Directive) and the related continuation of work on the joint programme of measures on transboundary waters. The Commission discussed a proposal for a procedure for harmonisation of the status assessment (currently in place for two border surface water bodies, namely the Sudoměřice Stream and the Morava River from the Radějovka Stream to the state border) and a procedure for coordination of the application of exemptions from the environmental objectives, which appears to be very complicated. The meeting also dealt with current issues of regulation and maintenance of transboundary watercourses (e.g., the Baťa Canal, Sudoměřice Weir), evaluation of water quality monitoring of transboundary watercourses in 2021, hydrological aspects and water management issues. Furthermore, the intention to extend the port capacity at the Hodonín Weir and the technical study for the 'Completion and extension of the Skalica Port on the Baťa Canal' were discussed.

14.4 Czech Presidency of the Council of the European Union (CZ PRES)

The second Czech Presidency of the Council of the European Union, which took place in the second half of 2022, was rich in important water-related events. Crucial, in terms of legislation, was the publishing of two major EC legislative proposals, for which the Czech Presidency initiated discussions in the EU Council Working Group. These are the revision of the Urban Wastewater Treatment Directive and the amending Directive, which will lead to amendments to the Water Framework Directive, the Groundwater Protection Directive and the Directive on environmental quality standards in the field of water management. Both proposals were published on 26 October 2022.

Three important meetings of European water administrators involved in the structures of the joint implementation strategy for the Water Framework Directive with the EC were held in Prague during the Presidency. In addition to the meetings of the Groundwater and Floods Working Groups, these were mainly informal meetings of the water directors.

The meeting of the Groundwater Working Group took place in Prague on 11–12 October 2022. Representatives of 24 EU Member States discussed the revision of the EU Groundwater Directive, monitoring of monitored substances and artificial groundwater recharge. The representatives also discussed the possibilities of linking current European legislation with the Drinking Water Directive and groundwater indicators in the context of progress towards good status.

The meeting of the Floods Working Group took place in Prague on 19–21 October 2022. Experts on flood protection discussed current issues related to flood protection and implementation of the European Floods Directive. The main point of the Prague meeting of the working group was a discussion on the status of the development and adoption of flood risk management plans. Also, an interactive workshop was held, aimed at sharing experience from the first update of the flood risk management plans. During a field trip, the participants got acquainted with the mobile flood protection system in Prague, including practical demonstrations at a training polygon in Dubeč.

The water directors meet once during each Member State's six-month presidency of the Council of the EU, typically holding also a joint meeting with the marine directors, who head a similar working group structure for the Marine Strategy Framework Directive.

During the first Czech Presidency, an informal meeting of water directors took place in Brno on 28–29 May 2009. As part of the second Presidency, the water directors visited Prague for the first time, in 20–22 November 2022.

The main part of the programme focused on the legislative proposals mentioned above, which were first presented in detail by the EC. This was followed by a strategic discussion of the water directors, during which the first strategic positions of the Member States were presented, including many objections and questions. They concerned, in particular, the objectives set out in the proposal for the Urban Waste Water Treatment Directive (UWWTD) (e.g., extension of the obligation to build sewerage systems and wastewater treatment for agglomerations larger than 1,000 EP, tightening the possibility of using international accounting standards, removal of micropollutants by quaternary treatment, obligation to introduce an extended producer responsibility scheme, treatment of rainwater including monitoring of attenuation chambers, energy neutrality of WWTPs, etc.) and the deadlines and costs needed to achieve them. The vast majority of Member States came forward to speak in the debate. Objections were also expressed about the large number of delegated acts (implementing acts) sought by the EC in the proposal.

Just a week later, on 29 November 2022, the Czech Presidency organised an online meeting of the marine directors and a joint meeting of the water and marine directors. Taking into account the inland nature of the Czech Republic, the Czech Presidency took advantage of the offer of France, which co-chaired the maritime part of the programme together with the EC. The morning joint part of the meeting focused on EC initiatives and activities, namely the Nature Restoration Law and the status of implementation of the Zero Pollution Action Plan, and upcoming international events (the UN Water Conference to be held in March 2023 in New York). During the afternoon session dedicated to marine issues, limits on maximum acceptable levels for impulsive and continuous noise below sea level were approved. This was the first ever measure of its kind at the global level.

Sweden was scheduled to take over the Presidency of the Council of the EU from the Czech Republic in January 2023, ending the so-called Trio Presidency, in which the Czech Republic held the Presidency together with France and Sweden.

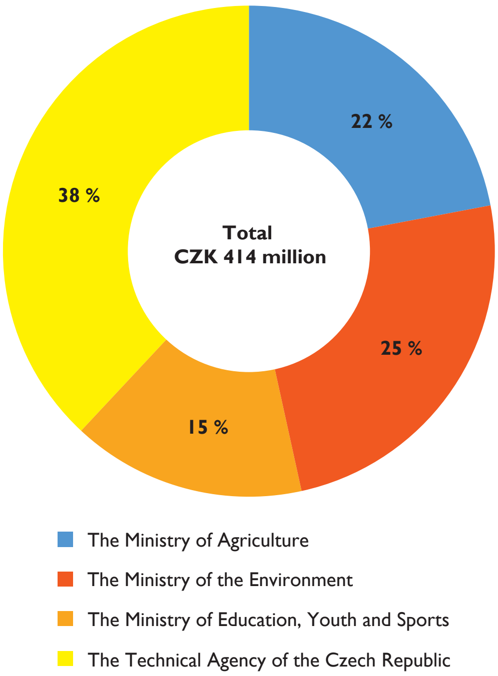
Ceremony of handing over the presidency in The International Commission on the Protection of the Oder against Pollution (ICPO) between the Czech republic and Germany (Source: ICPO)

M. Vacková, A. Kudová, S. Mc Sweeney – Pilgrimage of water, Primary School Otevřená, Brno

15. WATER RESEARCH AND DEVELOPMENT

A number of research projects are being carried out. This chapter is intended to present briefly research and development in the field of waters within the competence of the Ministry of Agriculture, the Ministry of the Environment and the Ministry of Education, Youth and Sports, which is funded by the central bodies either directly, in the form of institutional support or through the Technology Agency of the Czech Republic. Publicly accessible data on R&D projects and on institutional support provided for long-term conceptual development are available on the website of the Information System of Research, Experimental Development and Innovation at www.rvvi.cz (Central Registry of Projects or Central Registry of Activities). The results obtained from research activities are available on the same website in the Information Registry of R&D results. In 2022, funding totalling almost CZK 414 million was granted to research and development in the water sector. The Ministry of Agriculture contributed to the total amount with 22% (almost special-purpose and institutional funding CZK 91 million), the Ministry of the Environment with 25% (institutional funding CZK 102 million), the Ministry of Education, Youth and Sports with 15% (CZK 63 million) and Technical Agency of the Czech Republic 38 % (financial support provided CZK 158 million under the Environment for Life research programme under the Ministry of the Environment).

Grapf 15.1
Funds provided for water research and development in water management 2022



Source: MoA using data provided by the MoE and Ministry of Education, Youth and Sports

Spring of George and John, Rokytno, Nové Město na Moravě (Author: Nováková Marie)

15.1 Research and development within the competence of the Ministry of Agriculture

In 2022, the Ministry of Agriculture provided special-purpose and institutional funding aimed at implementing research and development projects and long-term conceptual development of research organisations in the field of water management in the amount of exceeding CZK 91 million.

In 2022, a total of CZK 76,856 thousand was spent on support of research and development projects. The R&D projects are mainly focused on soil and water conservation in sustainable development of the agricultural sector, creation, revitalisation and protection of cultural landscape, forests and water bodies, and rationalisation of water management, including addressing the impacts of climate change. An overview of current R&D projects is shown in Table 15.1.

The water research and development projects carried out in 2022 were the result of public tenders held under the departmental research programme entitled 'Applied Research Programme of the Ministry of Agriculture for the period 2017–2025, EARTH' (the 'EARTH').

Specific objectives of the EARTH programme are defined by three key areas and nine research lines. The key area Sustainable Management of Natural Resources continues to be fulfilled, among others, by the research line 'Water'. The aim of this research direction is to achieve a good ecological and chemical status of surface waters and a good chemical and quantitative status of groundwaters, to increase retention and accumulation of surface waters and groundwaters, to reduce pollution risk and to protect water resources from pollution from point and non-point sources, to reduce contamination by micropollutants (pesticides, pharmaceuticals and others including their metabolites), to apply new technologies in the field of water treatment and to recycle water in circulation. In addition, the Water research line is focused on optimising water management with the view of eliminating manifestations of hydrological extremes and to design a system of adaptation measures to mitigate them.

Within the framework of long-term development concepts of research organisations, some research organisations addressed also the issue of water management. These are mainly the Research Institute for Soil and Water Conservation, p.r.i. and to a lesser extent the Crop Research Institute, p.r.i., the Forestry and Game Management Research Institute, p.r.i., and the Research Institute of Agricultural Engineering, p.r.i. Institutions carrying out research in this sphere were supported with a total amount of CZK 14.283 million in 2022.

The thematic focus of the EARTH programme and the long-term development concepts of research organisations are fully in line with the Concept of Research, Development and Innovation of the Ministry of Agriculture for 2016–2022.

Publicly accessible data on R&D projects and on institutional support provided for long-term conceptual development are available on the website of the Research, Development and Innovation Information System https://www.isvavai.cz/ (CRP – Central Registry of Projects, CRA – Central Registry of Activities). Data on the results resulting from research activities are available in the Registry of Information on Results – RIV.

Table 15.1.1
Research and development projects in the field of water management financed by the Ministry of Agriculture in 2022

Project no.	Project name	from-to	Coordinator	financial resources (in thousands of CZK)
QK1810010	SMARTFIELD – Automatic system for collection and processing of temperature and humidity parameters of the microclimate and soil for conditions of precise agriculture in the Czech Republic based on the Internet of Things (IoT)	01/01 2018 31/12 2022	Crop Research Institute, p.r.i.	3,150
QK1810186	Improving soil structure stability and increasing infiltration via agrotechnical practices	01/01 2018 31/12 2022	Crop Research Institute, p.r.i.	2,775
QK1810415	Influence of woody plant composition and forest cover structure on the microclimate and hydrological situation in the landscape	01/01 2018 31/12 2022	Forestry and Game Management Research Institute, p.r.i.	3,095
QK1910029	Previous saturation and design rainfall intensities as factors of runoff response in small catchments	01/01 2019 31/12 2022	Czech Technical University in Prague	3,370
QK1910086	Reducing the burden in surface waters from areal sources of agricultural pollution when applying regulation of drainage runoff control at existing agricultural drainage structures	01/01 2019 31/12 2023	Research Institute for Soil and Water Conservation, p.r.i.	3,399
QK1910165	Modern methods in irrigation regime of fruit trees under water deficit	01/01 2019 31/12 2023	Research and Breeding Institute of Pomology Holovousy s.r.o.	3,648
QK1910282	Options for mitigating impacts of extreme rainfall-runoff events in small catchments with respect to requirements for sustainable agricultural farming and fish production	01/01 2019 31/12 2023	Masaryk University	4,042
QK1910299	Sustainable management of natural resources with emphasis on the non-productive and productive soil capacity	01/01 2019 31/12 2023	University of Life Sciences Prague	3,142
QK1910334	Innovation of environment-friendly system of maize growing using undersow crops for limiting soil degradation and improving water management in conditions of changing climate	01/01 2019 31/12 2023	Mendel University in Brno	4,147
QK1910382	Innovation in technologies of growing root crop and vegetables for more efficient use rainwater and irrigation, better stability and quality of the production	01/01 2019 31/12 2023	Crop Research Institute, p.r.i.	3,506
QK21010189	Implementation of ecosystem services with focus on water balance in viticulture practice	01/01 2021 31/12 2025	Crop Research Institute, p.r.i.	3,399

Project no.	Project name	from-to	Coordinator	financial resources (in thousands of CZK)
QK21010247	Optimisation of management on unbalanced land by using effective mapping of soil conditions and taking into account changes in moisture conditions in order to stabilise yield levels	01/01 2021 31/12 2024	Research Institute for Soil and Water Conservation, p.r.i.	3,025
QK21010300	Optimization of treatment technology of sludge from municipal wastewater treatment plants with regard to its chemical and microbial composition and water retention capacity with the aim of its safe use on agricultural and forest land	01/01 2021 31/12 2024	Technical University of Ostrava	3,392
QK21010310	Evaluation of the possibility of using planned linear structures to implement water transfers between basins and between water supply systems	01/01 2021 31/12 2024	Research Institute for Soil and Water Conservation, p.r.i.	3,106
QK21010328	Potential for the development of small water bodies in the landscape as adaptation measures to eliminate hydrometeorological extremes	01/01 2021 31/12 2024	Brno University of Technology	3,057
QK21010341	Optimisation of a set of measures for agricultural catchment areas in the framework of the land consolidation process	01/01 2021 31/12 2025	Research Institute for Soil and Water Conservation, p.r.i.	3,368
QK21020022	Comprehensive assessment of the application of treated sewage sludge in agriculture with respect to micropollutants	01/01 2021 31/12 2023	University of Life Sciences Prague	4,053
QK21020080	Fate of selected micropollutants present in treated water and sewage sludge in soil	01/01 2021 31/12 2023	University of Life Sciences Prague	4,230
QK21020386	Categorization and optimization of management of reclamation districts for increasing the retention function of forests	01/01 2021 31/12 2023	Research Institute of Forestry and Game Management, p.r.i.	1,187
QK22010142	Conservation of black poplar population and its use in water management and forestry	01/2022 12/2025	Silva Tarouca Research Institute for Landscape and Ornamental Gardening, p.r.i.	2,921
QK22010189	Impact of deforestation on the water regime of small catchments	01/2022 12/2025	Research Institute of Forestry and Game Management, p.r.i.	3,087
QK22020146	Technical recommendations for water management within the forest transport network	01/2022 12/2024	University of Life Sciences Prague	7,757
Total				**76,856**

Source: MoA

15.2 Research and development within the competence of the Ministry of the Environment

In 2022, the Ministry of the Environment provided institutional support in the total amount of CZK 102 million to its two research organisations in the field of water: the T. G. Masaryk Water Research Institute, p.r.i., and the Czech Hydrometeorological Institute with CZK 81 million and CZK 21 million, respectively.

Flood control measure on the Markovický Stream (Source: Morava River Basin, s.e.)

15.3 Research and development within the competence of the Ministry of Education, Youth and Sports

The Ministry of Education, Youth and Sports supports research and development in areas related to water management through the Joint Programming Initiative 'Water for a Changing World' and the large research infrastructure projects CzeCOS and CENAKVA and related international cooperation projects of the Czech Republic in research and development. In 2022, funds amounting to more than CZK 63 million were provided.

Water JPI

Since 2018, the Czech Republic as a member state, through the Ministry of Education, Youth and Sports (the 'MoEYS'), has been participating in activities of the 'Water for a Changing World' Joint Programming Initiative (the 'Water JPI'), focused on research in the field of water and hydrological sciences. In 2022, the MoEYS confirmed its interest in continuing the participation of the Czech Republic as a full member in the JPI by renewing the Collaboration Agreement. At the end of 2022, the MoEYS paid the membership fees for 2022–2023.

In the spring of 2022, the number of countries participating in the Water JPI was expanded when Malta joined as an observer. At the end of 2022, the Water JPI included 20 full members, 5 associate countries and 4 observer countries.

Large Research Infrastructure CzeCOS – Czech Carbon Observation Infrastructure

In 2022, 8 ecosystem stations and the atmospheric station of Křešín u Pacova were upgraded within the large research infrastructure CzeCOS (LRI CzeCOS) in order to standardize the accuracy of measurements according to the criteria of the European Research Infrastructure Consortium ICOS ERIC. In the same year, the representatives of the Global Change Research Institute CAS, p.r.i., which is the operator of the LRI CzeCOS, concluded a Memorandum of Understanding with the representatives of the CHMI, on the basis of which the staff of the LRI CzeCOS can use the capacities of the CHMI operated observatories free of charge. In 2022, a total of 82 professional user impact publications and 77 publications focused on the development of LRI CzeCOS were published.

Large research infrastructure CENAKVA – South Bohemian Research Centre for Aquaculture and Biodiversity of Hydrocenoses

In 2022, an important step for CENAKVA was joining the consortium within the adopted PARC project – Partnership for the Assessment of Risks from Chemicals providing the basis for the management of chemicals in the aquatic environment. Furthermore, the research centre was successful with a project application in the HORIZON EUROPE Framework Programme – JPI Water, and a project aimed at support of the implementation phase of the DANUBIUS IP consortium. In 2022, the LRI CENAKVA was used to carry out a total of 45 research projects. A total of 42 peer-reviewed user publications and 3 publications focused on the development of the LRI CENAKVA were published.

Czech participation in European research infrastructures

The Czech Republic, through the Ministry of Education, Youth and Sports, LRI CzeCOS and LRI CENAKVA, participates in several consortia of European research infrastructures such as ACTRIS ERIC, AnaEE ERIC and ICOS ERIC, and as a proposed founding member state is also involved in the preparation of consortia to manage the European research infrastructures DANUBIUS-RI and eLTER-RI.

(Source: Global Change Research Institute CAS)

Table 15.3.1
Research and development projects in water management funded by the Ministry of Education, Youth and Sports in 2022

Project No. / designation	Acronym	Solver, name	Funds (in thousands of CZK)
	Water JPI	Water challenges for a changing world Joint Programming Initiative	322
	AnaEE ERIC	AnaEE European Research Infrastructure Consortium	2,583
	ICOS ERIC	ICOS RI European Research Infrastructure Consortium	1,662
LM2018099	PRICING	South Bohemian Research Centre for Aquaculture and Biodiversity of Hydrocenoses – large research infrastructure CENAKVA.	16,857
LM2018123	CzeCOS	Czech Carbon Observation System – CzeCOS Large Research Infrastructure	42,054
Total			**63,478**

Source: Ministry of Education, Youth and Sports

15.4 Research and development within the competence of the Technology Agency of the Czech Republic

In addition to institutional support, the Ministry of the Environment has administered a research programme called 'Environment for Life' since 2019. The programme is aimed at supporting applied research, experimental development and innovation in the environment. The provider and implementor of the programme is the Technology Agency of the Czech Republic. The duration of the programme, with a total allocation of CZK 4.46 billion, is 7 years, i.e., until 2026. Half of the expenditures of the programme is intended for research related to climate change. In 2022 an amount has been granted to support projects in the amount of CZK 158 million.

The programme is divided into three sub-programmes:
– Support for projects in public interest ('SP1')
– New procedures, environmental technologies, eco-innovation ('SP2')
– Long-term research ('SP3')

In 2022 (on 29 June 2022), the sixth call for tenders was announced with the receipt of applications by 14 September 2022. A total sum of CZK 152 million was allocated to SP1 and CZK 200 million to SP2. A total of 60 Priority Research Objectives (PROs) were set for SP1, 30 PROs for SP2. A total of 298 project proposals were submitted to the call for tenders, of which 46 project proposals (23 in each sub-programme) were supported, which means a success rate of 15.4%. The supported water projects are listed in Table 15.2.1 and Table 15.2.2.

In the field of research, the MoE also uses the 'Public Procurement Programme in Applied Research and Innovation for the Needs of the State Administration BETA2 (2017–2024)'. No new projects were supported in 2022 as this programme is coming to an end. Table 15.2.3 shows an overview of the currently running research projects commissioned on the basis of the needs of the MoE.

Table 15.4.1
Research and development projects in water management supported by the Ministry of the Environment in 2022 under the sixth call of tenders of the Environment for Life Programme in SP1

Project No.	Project name	Main implementor	Funds (in thousands of CZK)
SS06010290	Strip crop rotation as an adaptive measure to optimise water management in the landscape	Brno University of Technology	9,942
SS06010027	Most important components of organic detritus as food for the survival and development of juvenile freshwater pearl mussel	T. G. Masaryk Water Research Institute, p.r.i.	6,736
SS06010044	Defining and evaluating the areas critical for the subsidy of strategic groundwater resources with regard to their protection and stabilization	T. G. Masaryk Water Research Institute, p.r.i.	6,960
SS06010280	System for continuous monitoring of vadose zone and prediction of water level in deep aquifers	Technical University of Liberec	9,750
SS06010142	Biodiversity of overgrown pond edges in the Třeboň Protected Landscape Area: assessment of the situation and proposal of solutions	Charles University	9,781
SS06010059	Increasing preparedness of urbanized areas in the Czech Republic by linking the critical point method with the flash flood indicator	T. G. Masaryk Water Research Institute, p.r.i.	8,037
SS06010189	Biodiversity analysis and management proposal for newly built small water reservoirs and pools in the South Moravian Region	Masaryk University	5,619
SS06010386	Adaptation of urbanised areas to flash floods and droughts	T. G. Masaryk Water Research Institute, p.r.i.	8,707
SS06010258	Assessment of the ecological status of drying streams according to biological components	T. G. Masaryk Water Research Institute, p.r.i.	8,070
SS06010461	Creation of documents for the establishment of Protective Zones of HG phenomena in the Slavkov Forest Protected Landscape Area	Czech Geological Survey	8,456
SS06010268	Understanding, quantification and protection of strategic groundwater resources of the Czech Cretaceous Basin of deep circulation in hydrogeological districts 4410 and 4522	T. G. Masaryk Water Research Institute, p.r.i.	6,704
SS06010441	Greenhouse gas emissions from wastewater treatment plants and possibilities of their reduction	T. G. Masaryk Research Institute of Water Management, p.r.i.	8,384
Total			**97,146**

Source: Technology Agency of the Czech Republic

Table 15.4.2
Research and development projects in the field of water management supported by the Ministry of the Environment under the sixth public tender of the Environment for Life programme in 2022 in SP2

Project No.	Project name	Principal Investigator	Funds (in thousands of CZK)
SS06020124	Elimination of micropollutants in drinking water by adsorption followed by UV photocatalysis	University of Life Sciences Prague	11,462
SS06020167	Development of technology for transformation of sediments into secondary raw material and its multi-purpose use in measures for strengthening aquatic ecosystems	Biological Centre of the CAS, p.r.i.	11,389
SS06020091	Development of advanced technology for the removal of pharmaceuticals and other micropollutants from wastewater produced by healthcare facilities	Technical University of Liberec	7,074
SS06020447	Development of equipment for treatment and processing of expanded and low-density waste thermoplastics for production of seepage elements to modify runoff conditions in the built-up areas	VIA ALTA a.s.	11,902
SS06020006	Comprehensive assessment of pesticide contamination of soils and in-situ remediation measures to eliminate their input to groundwaters	ALS Czech Republic, s.r.o.	11,657
SS06020416	System for detection and quantification of precipitation using microwave link networks	Brno University of Technology	4,990
Total			**58,474**

Source: Technology Agency of the Czech Republic

Table 15.4.3
Research and development projects in the field of water management funded by the Technology Agency of the Czech Republic (BETA2) for the Ministry of the Environment in 2022

Project No.	Project name	from-to	Principal investigator	Financial resources (in thousands of CZK)
TITSMZP945	Analysis of changes in the water regime of land and watercourses in the Krkonoše National Park caused by the road network	09/12 2021 – 31/05 2024	T. G. Masaryk Water Research Institute	3,149
Total				**3,149**

Source: Technology Agency of the Czech Republic

The Nechranice Reservoir (Source: Ohře River Board, s.e.)

Selected interesting data for 2022

- Basic hydrological network – 99,156 km of watercourses
- Funds expended on watercourse management (Rier Boards, s.e., Forests of the Czech Republic, s.e.): 3 528 mil. CZK 2,528,000
- River Boards, s.e.:
  - Revenues: CZK 5,923 million (12.2% increase)
  - Costs: CZK 5,616 million (7.9% increase)
  - Investment: CZK 2,769 mil. (7% decrease) – of which 1,082 million from own sources (39%)
  - Grants: CZK 1,046
  - Number of small hydroelectric power plants: 106
- Average price per m³ of surface water – CZK 6.5 (year-on-year increase of 18%)
- Land consolidation – implementation in the amount of CZK 1,353 million, of which CZK 352 million for water management measures, CZK 54 million for anti-erosion measures
- Water supply and sewerage:
  - Population supplied with drinking water: 10.07 million (96%), connected to the sewerage system – 9.1 million (87.3%)
  - Water consumption (invoiced to households) – 89.4 l/person/day (year-on-year decrease of 3.8 l/person/day)
  - Total length of the water supply network: 81,005 km (extended by 808 km, compared to 2021)
  - Total length of the sewerage network: 51,568 km (extended by 1,014 km, compared to 2021)
  - Number of wastewater treatment plants: 2,915 (up by 54, compared to 2021)
  - Water charges, average price: CZK 46.10 per m³
  - Sewerage charge, average price: CZK 41.00 per m³
- State financial support in water management: CZK 11,168 million (year-on-year increase of 0.8%)
  - Programmes of the Ministry of Agriculture: CZK 4,628 million
    - 16 national programmes (CZK 4,504 million) + 1 transnational programme (CZK 124 million)
  - Programmes of the Ministry of the Environment: CZK 5,963 million
    - Operational Programme 'Environment 2014–2020', water management (CZK 2,177 million), State Environmental Fund (CZK 3,786 million)
  - Support from the Ministry of Transport: 577 mil. CZK
    - State Transport Infrastructure Fund (CZK 571 million), Connecting Europe Facility (CZK 6 million)
- Research and development in water management: CZK 414 million
  - MoA 91 million CZK
  - MoE 102 million CZK
  - Ministry of Education, Youth and Sports CZK 63 million
  - Technology Agency of the Czech Republic CZK 158 million

Acronyms

AMPA	aminomethylphosphonic acid
AOX	adsorbable organically bound halogenated compounds (halogens)
BOD_5	biochemical five-day oxygen demand
BP	biological phosphorus removal
Bq	Becquerel
CAS	Czech Academy of Sciences
CEB	Council of Europe Development Bank
CEF	Connecting Europe Facility
CENAKVA	South Bohemian Research Centre for Aquaculture and Biodiversity of Hydrocenoses
CHP	chemical phosphorus removal
CEI	Czech Environmental Inspection
CHMI	Czech Hydrometeorological Institute
COD	chemical oxygen demand
CRA	Central Registry of Activities
CRF	Compulsory Requirements for Farming
CRP	Central Registry of Projects
CRW	Central Registry of Watercourses
CSO	Czech Statistical Office
CZ-NACE	Classification of economic activities according to the CSO (in accordance with Eurostat standard)
CzeCOS	Czech Carbon Observation System
ČSN	Czech State Standard
DDT	Dichlorodiphenyltrichloroethane
DEHP	di(2-ethylhexyl)phthalate
DESA	Departments for Execution of State Administration
DIS	dissolved inorganic salts
DN	denitrification
EAFRD	European Agricultural Fund for Rural Development
eAgri	website of the Ministry of Agriculture
EC	European Commission
EC_m	monthly exceedance curve
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EP	equivalent population
EQS	Environmental Quality Standard
ERDF	European Regional Development Fund
ESA	ethane sulfonic acid
ESL	European Significant Location
EU	European Union
FAD	flood activity degree
FAO	Food and Agriculture Organization of the United Nations
FCSN	Fund for Cultural and Social Needs
GAEC	Good Agricultural and Environmental Condition
HGR	hydrogeological region
HS	hydraulic structure
ICPDR	International Commission for the Protection of the Danube River
ICPER	International Commission for the Protection of the Elbe River
ICPORaP	International Commission for the Protection of the Oder River against Pollution
i.o.	interest organization
ISVS	public administration information systems
JPI	Joint Programming Initiative
LRI	large research infrastructure
MoA	Ministry of Agriculture
MoE	Ministry of the Environment
MoEYS	Ministry of Education, Youth and Sports
MoH	Ministry of Health
N	nitrification
N_{inorg}	inorganic nitrogen
NM	non-dissolved matters
$N\text{-}NH_4$	ammoniacal nitrogen
$N\text{-}NO_3$	nitrate nitrogen
NRP	National Recovery Plan
NRBP	National River Basin Plans
NVA	Nitrate vulnerable areas
OA	oxamic acid
OPE	Operational Programme Environment
PAH	polyaromatic hydrocarbons
PBDE	polybrominated diphenyl ethers
PCB	polychlorinated biphenyls
PFOS	perfluorooctane sulfonate
p.r.i.	public research institution
P_{total}	total phosphorus
Q_m	average monthly flow rate

Q_{355d}	flow that was reached or exceeded on average 355 days per year in a given profile and whose exceedance is indicative of hydrological drought
Q_{364d}	flow that has been reached or exceeded in the profile throughout the year
RDP	Rural Development Programme
RSBP	River Sub-Basin Plans
RWSSDP	Regional Water Supply and Sewerage Development Plans
RIV	Registry of Information on Results
s.e.	state enterprise
s.r.o.	limited company established under Czech law
SEA	Strategic environmental assessment
SEF	State Environmental Fund of the Czech Republic
SF	Solidarity Fund
SLO	State Land Office
SP1	Support for projects in public interest
SP2	New procedures, eco-innovation
SP3	Long-term research
STIF	State Transport Infrastructure Fund
TOC	total organic carbon
TOL	toluene and 1,2-cis-dichloroethene
UNECE	United Nations Economic Commission for Europe
UWWTD	Urban Waste Water Treatment Directive
VAT	value added tax
VÚME	Selected data from Public Water Supply and Sewerage Systems Assets Registry
VÚPE	Selected data from Public Water Supply and Sewerage Systems Operational Registry
WS&S	Water supply and sewerage
WSS Act	Act No. 274/2001 Coll., on water supply and sewerage systems for public use and on amendments to some related acts, as amended
WSSDP	Water Supply and Sewerage Development Plans
WWTP	wastewater treatment plant

The Morávka Reservoir (Source: Oder River Board, s.e.)

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Ohře River Board, state enterprise
Bezručova 4219, Chomutov, 430 03, www.poh.cz
Oder River Board, state enterprise
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Dřevařská 932/11, Brno, 602 00, www.pmo.cz
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Zonal water sampling at the Nýrsko HS (Source: Vltava River Board, s.e.)

The Kadaň HS (Source: Ohře River Board, s.e.)

Notes

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