



MINISTRY OF AGRICULTURE
OF THE CZECH REPUBLIC

Ministry of the Environment
of the Czech Republic



REPORT ON WATER MANAGEMENT IN THE CZECH REPUBLIC IN 2019



Report on Water Management in the Czech Republic in 2019

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

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Dear Readers,

You're holding the 24th issue of the water management yearbook referred to as the Blue Report. Like every year, it provides an overview of water management in the Czech Republic in the previous year.

History of the Blue Report dates back to 1997 when the Ministry of Agriculture first published it in cooperation with the Ministry of the Environment. Its main mission is to acquaint the readers with important facts related to water management in the given year and compare it with previous years and to show development trends and changes achieved. Water management pervades many industries and affects all aspects of life. That is why you can find in the Blue Report information about hydrology, water quality and its pollution and learn details about management performed by significant watercourse administrators, about water supply and sewerage water systems, water management funding and planning, about research and development and international relation in the sphere of water management.



The current issue of the Blue Report provides information on the situation in 2019 when the period of severe drought, which started in 2014, continued for the sixth consecutive year.

It is worth noticing that the annual precipitation in the Czech Republic was average, not differing from long-term values and thus confirming scenarios of climate change development. Mean air temperatures keep rising, resulting into increased evaporation. However, distribution of precipitation does not change significantly, neither in terms of territory nor in terms of time. Prolonged periods without precipitation take turns with intense torrential rainfalls of local nature, which leads to fluctuation of watercourse flow rates. When flow rates are low, levels of shallow groundwaters are not refilled and groundwater levels correspond with "exceptional drought", as the case was in many regions in 2019.

Almost 95% of the total length of all watercourses is administered by state enterprises of River Boards and Forests of the Czech Republic that conduct many important water management activities. The Blue Report also informs about their economic activities and projects in 2019 including comparisons with previous years.

As you will learn in the chapter on water supply and sewerage systems, water consumption by Czech households grew by 1.4 litre per person and day and was 90.6 litre per person and day in 2019. In comparison with developed parts of the world, our water consumption is low and it may be difficult to keep lowering it in the future with economic measures, partly with respect to the quality of drinkable water supplied and reliable drainage and treatment of wastewaters. We saw a positive trend of decreasing water losses from water supply systems that were 86.3 million cubic metres in 2019, which accounts for 14.5 % of water intended for supply. The average price of water excluding VAT charged per a cubic metre was CZK 39.30, the sewerage rate was CZK 34.70 per cubic metre. The prices of water and sewerage rates are significantly affected by responsible approach of water supply and sewerage system owners to renovation and maintenance of the infrastructure. Thanks to further extension of the water supply system, the total length of all water supply piping in the Czech Republic was 78,983 kilometres in 2019, which is more than double of the circumference of the Earth.

The Blue Report also contains information about the funds expended by the Ministry of Agriculture on numerous projects in the sphere of water supply and sewerage systems, flood measures, drought prevention, management of minor watercourses and small water reservoirs and land adjustment with a total of CZK 2.7 billion in 2019.

The yearbook is complemented with information about research and development within the scope of the Ministry of Education, Youth and Sports that provides financial support to projects by large research infrastructures such as CENAKVA, CzeCOS and SoWa. The report is accompanied with illustrative photographs showing water management as seen by the eyes of administrators and other water-related authorities. As usual, all chapters are revived by pictures drawn by children that succeeded in a contest held by the Ministry of Agriculture on World Water Day that focused on water and climate change in 2020.

I believe that this yearbook raises awareness of water and natural resources and helps you understand the work of water administrators who are to thank for "water abundance" that we have despite the fact that our water resources are limited and dependent exclusively on precipitation. Water is essential for life and it is our duty to protect it, retain it in our landscape and ensure its quality and sufficiency for future generations so that the current water abundance does not become a thing of past. That is why it is necessary to learn how to manage water, appreciate it, care for it and use it responsibly.

Miroslav Toman
Minister of Agriculture

Dear Readers,

You have just opened the Report on Water Management in the Czech Republic in 2019 commonly referred to as the Blue Report that provides a comprehensive overview of water management in the Czech Republic for the given period, informs about the state and quality of surface waters and groundwaters, water quality monitoring and about other activities.

Although 2019 was average in terms of precipitation in the Czech Republic, it was sixth consecutive year since 2014 that was below average in terms of runoff in all main monitored river basins, which was given by the time and territory distribution of precipitation. Seen from the perspective of underground waters, 2019 was the second driest year in terms of shallow wells and springs since 1971. The driest year so far has been 2018. At the same time, 2019 was the second warmest year since 1961 (2018 being the warmest) with mean annual air temperature of 9.5 °C. That suggests that the period of drought that started in the Czech Republic in 2014 continued.



From this point of view, I consider it necessary to appreciate the cooperation between representatives of the Ministry of Agriculture and Ministry of the Environment, as we successfully initiated fight with signs of climatic change and current problems linked with drought and we have completed tasks arising from the Concept of Protection Against Drought Impacts in the Czech Republic.

I am really glad that we were able to inform the general public about the development of various signs of drought through the Information System HAMR (Hydrology, Agronomy, Meteorology, Retention) in 2019. Everyone can now see at the hamr.chmi.cz website current information, past development (since 1981) and development forecast for up to eight weeks. That means that the development of a similar situation in a given region in the past can be checked together with future predictions.

I would like to emphasise that the Government discussed and acknowledged in October 2019 the Study of Rainwater Management in Urbanized Areas that was produced by the Ministry of the Environment. It is a first comprehensive strategic document in the Czech Republic that deals with rainwater in such an extent and creates a platform for improving water regime in urbanized areas with the purpose of their adaptation to climate change and increasing water quality in such areas.

In conclusion, I would like to mention our financial support: in 2019, the Ministry of the Environment funded water management projects aimed at improving water quality, decreasing flood risks and protection and care for the landscape amounting to CZK 6.18 billion.

I believe that this publication becomes a useful resource of information for you whether while performing your job duties or if you simply want to gain a deeper understanding of what is happening in water management. Last but not least, I hope that the Blue Report contributes to raising awareness of the current situation concerning water resources and their use for everyday needs in the Czech Republic.



Richard Brabec
Minister of the Environment



L. Duchek – Even We Are Hope for the Earth – Olomouc Region

I. HYDROLOGICAL BALANCE

I.1 Temperature and precipitation

In terms of temperature, 2019 was exceptionally above the average in the Czech Republic, with the mean air temperature of 9.5°C exceeding the long-term average of 1981–2010 by 1.6°C. That means that 2019 was the second warmest year in the period since 1961, the only year with higher air temperature being the previous year (2018) with 9.6°C.

Deviation from the average air temperature in 2019 from the long-term average of 1981–2010 was positive for all the months in 2019 with the exception of May. The following months were average in terms of air temperature: January, July and September. February (deviation +2.6°C), April (deviation +1.5°C), October (deviation +1.4°C) and December (deviation +2.8°C) were above average in terms of air temperature, whereas March (deviation +2.7°C), August (deviation +1.6°C) and November (deviation +2.7°C) were highly above average and June (deviation +4.9°C) exceptionally above average. By contrast, May was strongly below average with deviation of -2.3°C from the long-term average.



The Chomutovka Stream (Source: Ohře River Board)

Interval limits for assessing normality (or abnormality) are defined for every single month, which means that the limits may vary month by month. The table below shows what the intervals mean and how they are defined. Abnormality of a phenomenon is, generally speaking, defined using Q_p quantile values, for which the following is true $P(X \leq Q_p) = p$ (meaning that the likelihood that a phenomenon achieves the value of a Q_p quantile is lower or equals p). Temperature and precipitation are assessed in accordance with the classification in Table I.1.1.

Table I.1.1
Interval limits for assessing normality (abnormality)

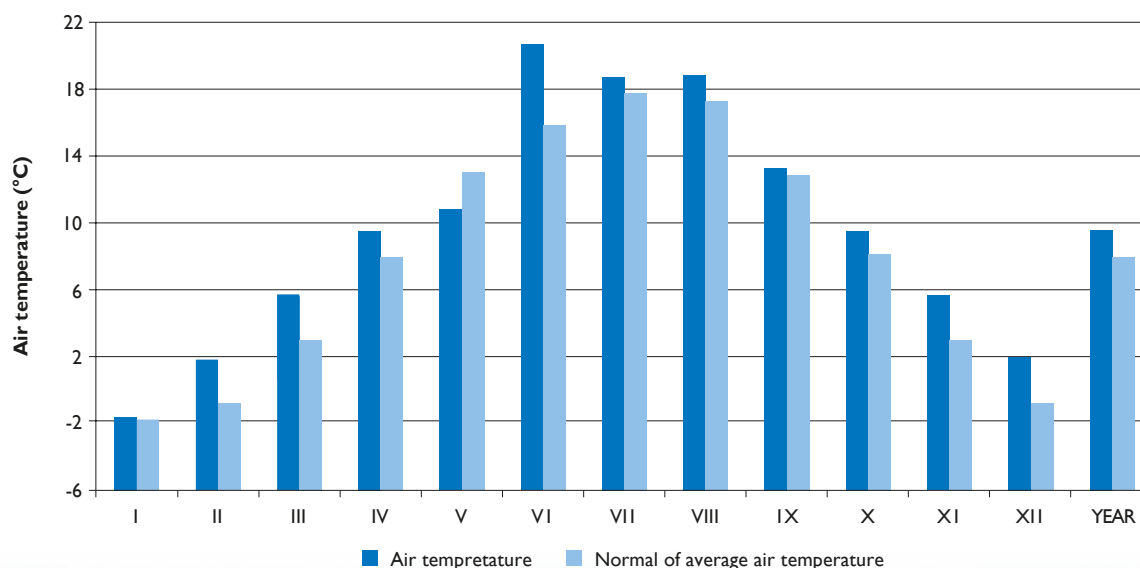
Degree	Interval limits by quantiles	Exceedance probability (in %)
Exceptionally below average	$< Q_{0.02}$	> 98
Strongly below average	$< Q_{0.02}, Q_{0.10}$	$(90, 98>$
Below average	$< Q_{0.10}, Q_{0.25}$	$(75, 90>$
Average	$< Q_{0.25}, Q_{0.75}$	$< 25, 75>$
Above average	$(Q_{0.75}, Q_{0.90})$	$< 10, 25)$
Strongly above average	$(Q_{0.90}, Q_{0.98})$	$< 2, 10)$
Exceptionally above average	$> Q_{0.98}$	< 2

Source: CHMI

Winter 2018/2019 seen as a whole was quite warm in the Czech Republic. The mean air temperature in winter season (0.4°C) was 1.7°C above the long-term average of 1981–2010. The particularly warm months were December 2018 and February 2019 with the deviation of the average monthly air temperature of +2.1 and +2.6°C, January was average in terms of air temperature (with deviation of +0.3°C). The spring seasons with the average air temperature in the Czech

Chart I.1.1

Average monthly air temperature in the Czech Republic in 2019 in comparison with the long-term average of 1981–2010

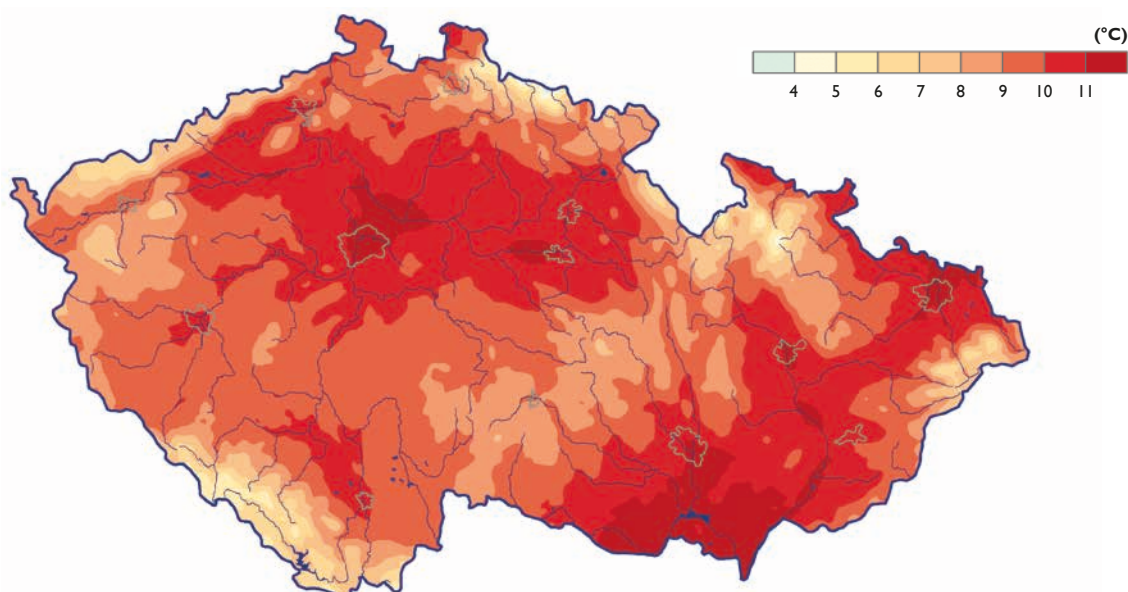


Source: CHMI

Republic of 8.6°C was warmer by 0.7°C than the long-term average of 1981–2010. After warm March and April (with deviations from the long-term average of +2.7 and +1.5°C) followed very cold May (deviation -2.3°C). The first summer day (exceeding 25.0°C) was recorded on 24 April 2019 at the Pilsen-Mikulka and Pilsen-Bolevec station. The summer was very warm. The average temperature of summer months in the Czech Republic was 19.5°C, which is 2.5°C above the long-term average of 1981–2010. Summer 2019 was thus the warmest period since 1961, exceeding the previous maximum temperature (19.3°C) of summers 2003 and 2018. This was particularly due to the exceptionally warm June with the average month temperature of 20.7°C (deviation +4.9°C from the average). The average month temperature in July and August (18.8 and 18.9°C) exceeded the average by 1.0 and

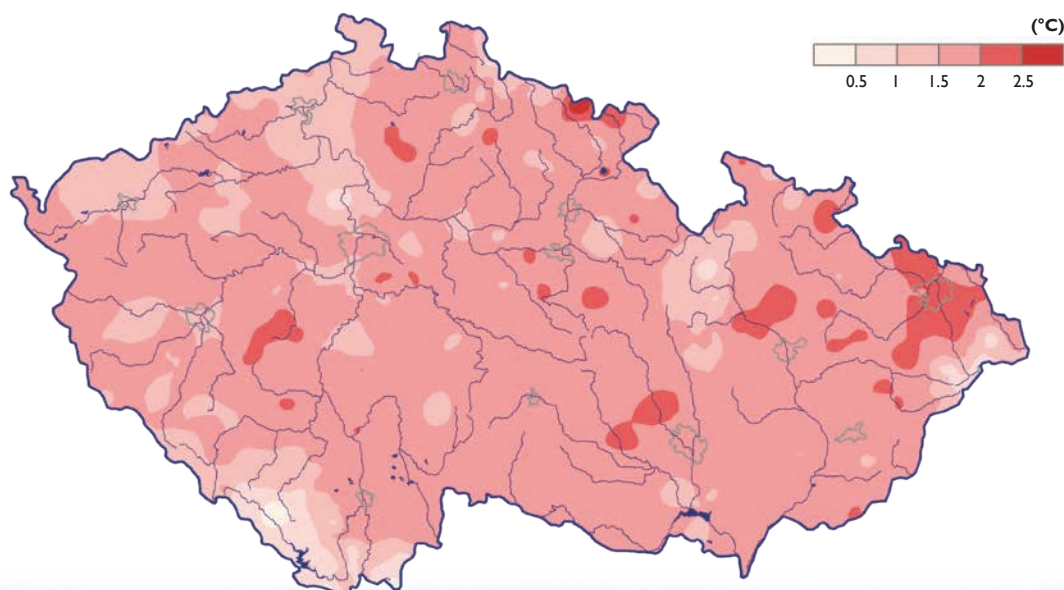
1.6°C. Several hot periods were recorded during the summer when daily highest temperature in the Czech Republic exceeded 30°C. The highest day temperature of 38.9°C in June and in the entire summer 2019 was recorded at the Doksan station on 26 June. This is the highest temperature ever recorded in June in the Czech Republic. Autumn 2019 with average temperature of 9.5°C in the Czech Republic was by 1.6°C warmer than the long-term average of 1981–2010. September was average with the deviation from the long-term month average temperature of +0.5°C, October was above-normal with the deviation of +1.4°C and November (deviation + 2.7°C) was highly above-normal. The last month of the year, December, was above-average in the Czech Republic in terms of air temperature with 1.9°C, which exceeded the long-term average by 2.8°C.

Figure 1.1.1
Average air temperature in the Czech Republic in 2019



Source: CHMI

Figure 1.1.2
Deviation from the average air temperature in 2019 from the long-term average of 1981–2010



Source: CHMI

In terms of precipitation, 2019 in the Czech Republic was an average year, the mean precipitation amount of 634 mm corresponds with 92% of the long-term precipitation average of 1981–2010.

In 2019, 7 months were considered average in terms of precipitation with the following months being below average: April (60% of the long-term average), June (67% of the long-term average) and July (66% of the long-term average). January (148% of the long-term average) and May (132% of the long-term average) were above average in terms of precipitation.

Territorial distribution of total annual precipitation was uneven. The mean precipitation in Bohemia was 601 mm (88% of the long-term average), whereas in Moravia and Silesia it was 701 mm (102% of the long-term average). The lowest amount of rainfall in comparison with the long-term average was recorded in the Liberec region (80% of the long-term average), and the highest amount in the Zlín Region (106% of the long-term average) and South-Bohemia region (105% of the long-term average).

January was above-average in the Czech Republic in terms of precipitation with the mean total of rainfall (65 mm) being 148% of the long-term average. Precipitation was mostly in the form of snow. February was average in terms of precipitation with the mean monthly total of 31 mm being 82% of the long-term average. Most of the total monthly precipitation fell in the first decade of the month. Precipitation occurred in the form of rainfall and snow.

March was average in terms of precipitation with the total monthly precipitation in the Czech Republic being 98% of the long-term average. Precipitation occurred in the form of rainfall and snow. Precipitation in April was below average with 25 mm being 60% of the long-term average. Most of the month total was recorded in the last three days of the month. By contrast May was above average: 91 mm represents 132% of the long-term average. Significantly higher amount of precipitation was in the east of the Czech Republic. While monthly total in Bohemia was 81 mm (121% of the long-term average), in Moravia it was 114 mm (154% of the long-term average), the last decade being rich in terms of

Table 1.1.2
Renewable water resources in 2013–2019

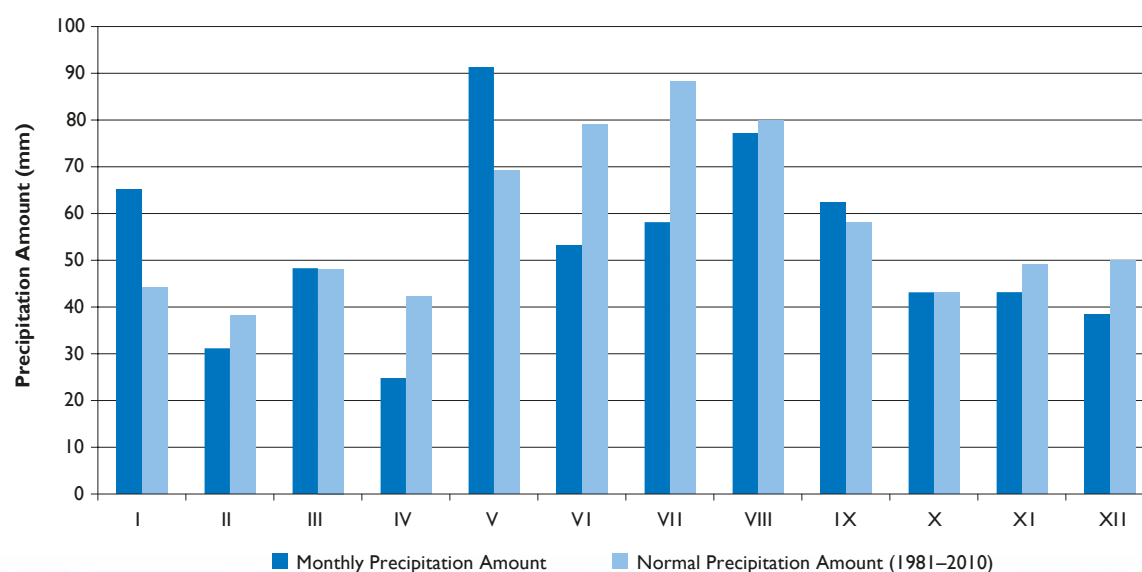
Item	Annual values (in millions of m ³)						
	2013	2014	2015	2016	2017	2018	2019
Precipitation	57,336	51,815	41,957	50,240	53,868	41,170	50,004
Evapotranspiration	38,296	41,542	32,165	40,223	43,424	33,305	40,369
Annual inflow to the Czech Republic from neighbouring countries	845	388	398	402	339	320	405
Annual outflow from the Czech Republic	19,885	10,661	10,190	10,419	10,783	8,185	10,040
Sources of surface waters ¹⁾	6,626	5,273	3,591	4,421	4,258	3,355	3,732
Usable sources of groundwaters ²⁾	1,657	1,077	939	925	911	765	789

Source: CHMI

Note: ¹⁾ Determined as the flow in the main catchment areas with 95% exceedance probability.

²⁾ A qualified estimate, more detailed specifications are published by the CHMI in the second half of 2020.

Chart 1.1.2
Average monthly precipitation in the Czech Republic in 2019 in comparison with the average of 1981–2010



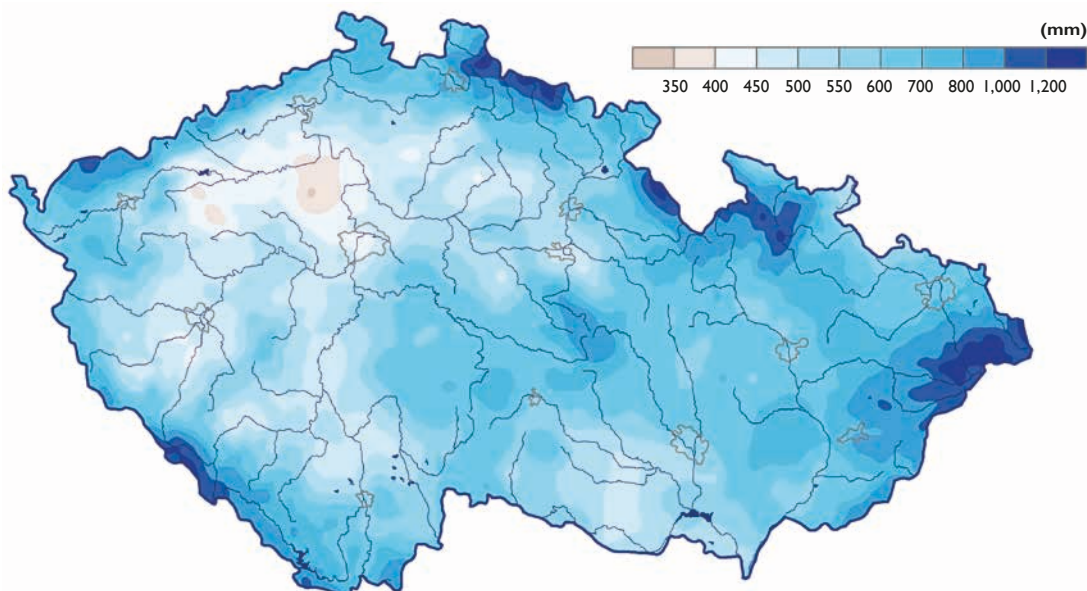
Source: CHMI

precipitation in particular. Total precipitation at some places exceeded 100 mm, which was partly due to the low-pressure area Axel.

The summer months of June and July were below average in terms of precipitation with 67% and 66% respectively of the monthly long-term average in the Czech Republic. The precipitation was frequently linked with stormy weather. August was an average month in terms of precipitation with 77 mm in the Czech Republic (96% of the long-term average). Precipitation amounts in Moravia and Silesia (84 mm, i.e. 111% of the long-term average) were higher than in Bohemia (74 mm, i.e. 90% of the long-term average). The highest mean daily precipitation total in August and the entire summer was linked with a cold waving crossing when a total average of 15 mm of rain fell in the Czech Republic.

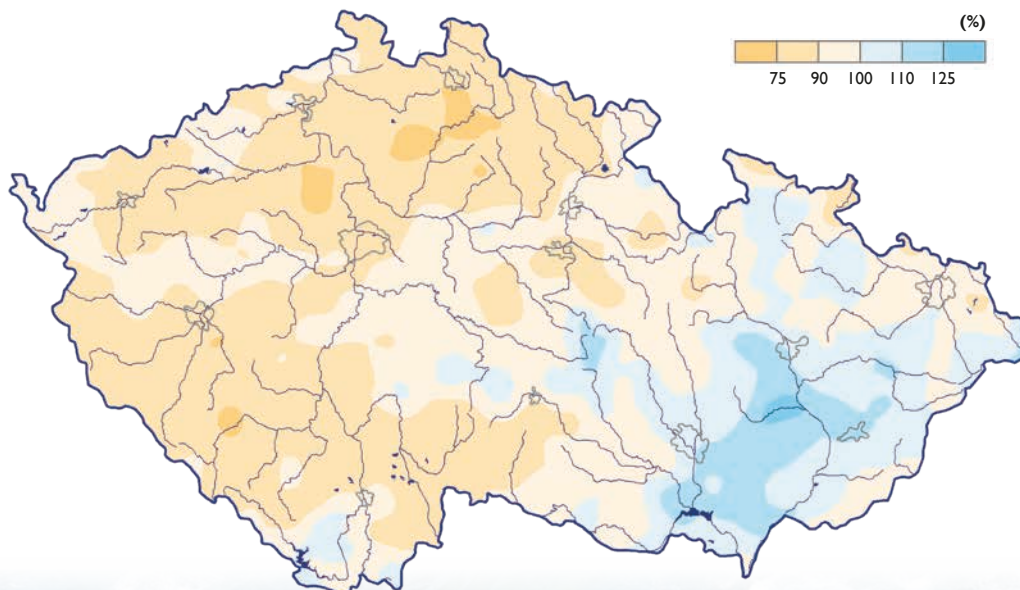
All the three autumn months were average in terms of precipitation in the Czech Republic. The mean monthly total in September (62 mm) was 107% of the long-term average. Higher precipitation totals in September were recorded in the east of the country: 76 mm (123% of the long-term average) of rainwater fell in Moravia and Silesia, whereas it was 55 mm (100% of the long-term average) in Bohemia. Most of the monthly precipitation in the Czech Republic was recorded in the first decade of the month. The mean precipitation total in the Czech Republic in October (43 mm) equalled 100% of the long-term average. Most of the precipitation in October fell in the first decade of the month, the rest of August was very poor in terms of precipitation. The monthly mean of precipitation in November (43 mm) was 88% of the long-term average. The lowest amount of precipitation (less than 70% of the long-term average) fell in the west of the country.

Figure 1.1.3
Distribution of precipitation in 2019



Source: CHMI

Figure 1.1.4
Total precipitation compared with the average of 1981–2010 (in %) in 2019



Source: CHMI

December was also an average month in terms of precipitation, even though the monthly total in the Czech Republic (38 mm) scored only 76% of the long-term average. Again, more precipitation fell in the east of the country, the total precipitation amount in Moravia and Silesia being 52 mm (108% of the long-term average), whereas it was 32 mm (63% of the long-term average) in Bohemia. Precipitation occurred in the lowlands, mostly in the form of rainfall, in mountains in the form of snow and rain.

1.2 Runoff

In terms of runoff, 2019 was another consecutive below average year since 2014 in all river basins monitored. The lowest total runoffs were recorded, in particular, in the Dyje River Basin, Middle Elbe River Basin and tributaries to the Middle Vltava. By contrast, only slightly below average runoff was recorded in the Bečva River Basin and Olše River Basin, which was due to several significant runoff episodes that occurred in winter months, May and September.

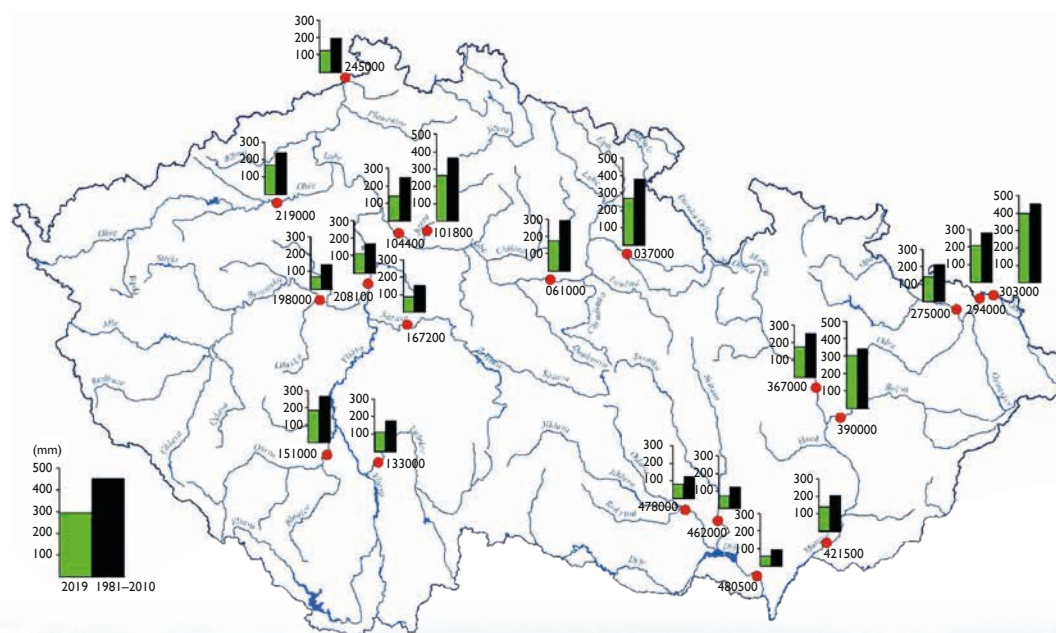
The beginning of 2019 was between slightly below average and average, seldom above average in most of the main river boards (in particular the Upper Vltava River Basin, Oder River Basin and Bečva River Basin). Higher amount of water in watercourses Higher water yield from January to March was the result of above-average supplies of snow from the mountains and abundant rainfalls. However, that period was followed by April that was above-average in terms of temperatures while below average in terms of precipitation and the hydrological situation started quickly deteriorating and above-average flows became strongly below average in all monitored river basins. Thanks to May that was above-average in terms of precipitation the situation improved temporarily, particularly in the Oder and Morava River Basins as well as in the Middle Elbe River Basin. Nevertheless, the flow in all main

river boards returned to average values. The lowest water yield in 2019 was recorded at the end of July when approximately 40% of the monitoring profiles reported water yield of or below Q_{355d} (a limit indicating hydrological drought on a watercourse). The river basins with least water were in particular the Oder and Morava River Basins. The hydrological situation improved in both river basins as a result of affluent rainfall in the first decade of September; the flow rate in the Oder River Basin and Bečva River Basin rose to average values in September. However, the Vltava River Basin and Elbe River Basin remained strongly below average. A temporary improvement in water yield was recorded in the Lower Vltava River and Lower Elbe River in October, which was due to discharging water from the Vltava Cascade. Other river basins were average in terms of runoff until the end of the year. A slight increase in runoff was recorded in the Oder and Morava River Basins after affluent precipitation in the last decade of December.

In 2019, no larger flood episode occurred, even though runoff events exceeding flood activity degrees (hereinafter referred to as the “FAD”) were recorded with the exception of April and November in all months of 2019. Runoff situation exceeding third FAD occurred in the Bečva, Oder, Olše and Lower Morava River Basins in May and in the Otava and Bečva River Basins in June 2019.

Winter months (January, February) ranged rather below average and slightly above average in terms of runoff. Water yield in unaffected watercourses ranged typically between 60% and 180% of Q_m . Water levels in watercourses were unstable with sporadic temporary increases of the water levels caused by snow melting and rainfall. More significant level increases occurred in mid-January in the Oder River Basin and in tributaries of the Lower Elbe River below the Ohře River. Peak flow rates of some watercourses reached first or second FAD. Many watercourses were temporarily affected by ice weather phenomena in the third decade of January.

Figure 1.2.1
Annual runoff in comparison with the long-term average of 1981–2010



Source: CHMI

Spring months (March, April, May) were between below average and average in terms of runoff. Flow rates typically ranged between 30% and 110% of Q_m . Water yield of the watercourses fluctuated in the spring depending on the rainfall and snow melting ranging on average between Q_{240d} and Q_{90d} . Watercourse levels fluctuated only slightly or were stable. A significant runoff episode occurred in mid-March when levels rose in particular in the upper part of the Vltava, Otava and Berounka River Basin due to abundant precipitation and snow melting, when peak flow rates exceeded second or third FAD. Other significant watercourse level increases were recorded in the second half of May when, in particular, levels of the Oder, Bečva and Middle Elbe Rivers rose. Most significant increases that exceeded third FADs were recorded in the Olše and Bečva River Basins.

The summer (June, July and August) was below average in terms of runoff, usually with flow rate ranging between 20% and 60% of Q_m . Above average flow rate was temporarily achieved by rivers in river basins affected by higher precipitation or local storms typically in June, resulting in fluctuation of watercourse levels, in some cases exceeding flood activity degrees. Watercourse flow rates fluctuated in summer depending on rainfall episodes. The highest values, typically between Q_{270d} and Q_{120d} , were achieved at the beginning of June and lowest values at the end of August, Q_{355d} and Q_{270d} . The decreasing trend in flow rates was interrupted by storms when some watercourses temporarily achieved flow rate of Q_{30d} .

The autumn months (September to November) as a whole were between below average and slightly above average in terms of runoff with flow rates ranging between 30% and 85% Q_m . Watercourse levels remained mostly stable or fluctuated slightly as a result of occasional rainfalls that increased transiently flow rates and interrupted the trend of watercourse level decrease. Temporary level increases, only seldom reaching first FAD occurred due to larger abundant rainfalls at the beginning of September and the at the end of the first / beginning of the second decade of the month. Mean monthly flow rates in watercourses ranged typically between Q_{330d} and Q_{240d} .

December was average in terms of runoff in the Vltava and Elbe River Basins with mean monthly flow rates ranging between 25% and 60% Q_{xII} . A similar situation was at first recorded also in the Oder and Morava River Basins, however, due to more abundant rainfalls at the beginning of the third decade of the month the hydrological situation improved and the mean monthly flow rates ranged between 55% and 100% Q_{xII} . Watercourse levels remained mostly stable or fluctuated slightly until the third decade of December. Mean watercourse flow rates in all monitored river basins were lower than at the beginning of December (between Q_{330d} and Q_{240d}). From mid-December, temporarily higher values (from Q_{270d} to Q_{120d}) occurred due to warming and snow melting in mountain and submontane watercourses in the Elbe River Basin and as result of rainfalls in the third decade of the month in the Morava and Oder River Basins.

Table 1.2.1
Runoff in 2019 in percentage of long-term average monthly runoff

River	Profile	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		(%)											
Orlice	Týniště nad Orlicí	73	96	121	43	82	74	27	37	41	72	51	57
Elbe	Přelouč	56	73	81	44	79	70	32	36	35	58	57	53
Jizera	Tuřice-Předměřice	86	80	108	76	95	65	35	38	36	57	48	54
Elbe	Kostelec nad Labem	57	68	79	48	78	64	29	34	32	54	49	45
Lužnice	Bechyně	115	137	116	30	53	47	14	14	38	65	43	28
Otava	Písek	97	115	124	67	58	76	40	29	36	55	41	42
Sázava	Nespeky	77	101	69	32	72	66	35	25	37	52	49	33
Berounka	Beroun	66	80	67	34	52	36	27	35	48	51	31	26
Vltava	Praha-Chuchle	82	89	91	46	57	52	48	43	62	100	46	38
Ohře	Louny	88	75	117	55	64	53	42	41	43	78	49	62
Elbe	Hřensko	78	81	89	48	65	57	39	41	48	81	49	46
Opava	Děhylov	56	98	67	43	101	74	28	50	94	55	57	75
Oder	Bohumín	77	117	70	34	162	60	21	45	94	65	62	83
Olše	Věřňovice	132	145	84	40	235	52	22	42	85	66	66	89
Morava	Olomouc-Nové Sady	55	100	95	49	73	80	29	41	56	65	62	82
Bečva	Dluhonice	68	179	83	23	205	66	20	56	118	64	63	107
Morava	Strážnice	52	115	73	34	104	70	23	44	81	65	60	85
Svratka	Židlochovice	43	63	51	32	55	80	47	61	87	68	84	73
Jihlava	Ivančice	65	84	82	41	74	88	42	42	64	59	52	48
Dyje	Ladná	52	74	77	30	67	84	47	47	58	59	61	61

Source: CHMI



Brno Water Structure, January 2020 (Author: Vladimír Husák)

1.3 Groundwater regime

In terms of groundwater, 2019 can be described as the second driest year with respect to shallow wells and springs (since 1971), the driest year being 2018.

Regions that were most affected by drought in shallow wells were the Upper and Middle Elbe River Basin and the Dyje River Basin, whereas the least affected regions were the Oder and Morava River Basins (Table 1.3.1). In terms of spring yield, the most severe drought was in the Upper, Lower and Middle Elbe River Basin, the least serious in the Oder River Basin and in the Lower Vltava River Basin (Table 1.3.2). As to deep wells, 2019 was the driest year (since 1991). The most affected area was North Bohemian Cretaceous (region between the Jizera River and Lower Elbe River) where the groundwater levels were exceptionally below average throughout the entire year. By contrast, the Moravian Tertiary was in a better condition where the groundwater level was standard for almost the entire year. Also, in the Cenomanian of the North Bohemian Cretaceous that has substantially longer, i.e. multi-year, regime the groundwater level was still slightly above the average.

Groundwater levels in shallow wells oscillated around slightly and strongly below average values in 2019 with the exception of average values in February (Chart 1.3.1). Similar can be said about springs where the average yield only occurred in March and February, while spring values were strongly below average for the rest of the year (Chart 1.3.2). As concerns deep aquifers, groundwater levels were strongly and exceptionally below average in many groups of hydrogeological regions throughout the entire year.

Shallow wells

Looking at the groundwater levels in shallow wells, it is apparent that almost the entire year was below average in the Czech Republic with the exception of average February (68% of the monthly exceedance probability curve – hereinafter also referred to as the “mEP”). At the beginning of 2019, peak values of groundwater levels were reached in February and March, whereas in the long-term they have typically peaked in March and April (Chart 1.3.1). With the onset of the growing season, we noticed an increase in the deficit of shallow aquifers. By the beginning of April, groundwater levels of more than half of shallow wells (59%) were strongly or exceptionally below average. The following month did not see any improvement and groundwater levels of shallow wells oscillated around slightly and strongly below average values for the rest of the year.

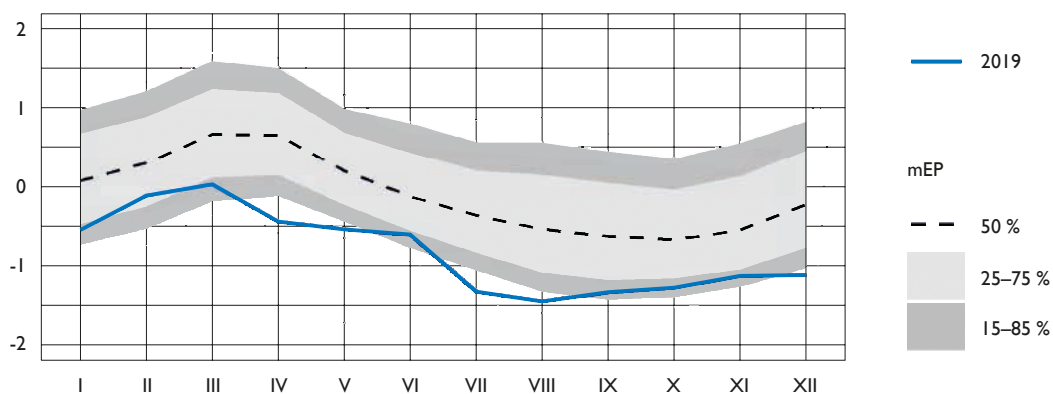
Groundwater levels in shallow wells were standard in most of Bohemia with the exception of North Bohemia (Upper and Middle Elbe River Basin) where the groundwater level was strongly below standard in January and later improved to slightly below standard in February and March. The situation in Moravia was different where groundwater levels in shallow wells were between slightly and strongly below average at the beginning of the year, the exception being North Moravia (the Oder River Basin where groundwater levels were average in January and February. With the onset of the growing season we saw a significant drop in groundwater levels of shallow wells in the whole of the Czech Republic, so by the end of April 82% of shallow wells corresponded with strong and/or exceptional drought. The situation concerning

groundwaters slightly improved in May and June in almost the entire territory of the country. The most distinct increase was recorded in North Moravia (the Oder River Basin) where groundwater levels rose to the levels of the long-term average. By contrast, in South Moravia with the prevalence of Flysch rock with worse water permeability, the deficit in shallow aquifers kept growing until it reached a level of exceptional drought (in May in the Dyje River Basin). In July we saw another drop in groundwater levels of shallow wells and it became the driest month of 2019 in the Czech Republic (92% mEP). Wells with such low levels were almost in the whole of the Czech Republic (Figure 1.3.1). The situation kept deteriorating throughout the entire month, so the lowest values of groundwater levels were recorded by the end of July when groundwater levels in 70% of shallow wells dropped to strongly or exceptionally below average values.

Drought had most serious impacts in North and North-East Bohemia where 78% of structures in the Upper and Middle Elbe River Basin showed values of strong or exceptional drought. Severe drought remained in the Czech Republic also in August. During the autumn, the situation started improving slightly, especially in Moravia where shallow aquifers in the Oder and Morava River Basins filled up to the average level. Nevertheless, in the northeast of Bohemia (the Upper and Middle Elbe River Basin and the Lusatian Neisse River Basin), in South Bohemia (the Upper Vltava River Basin) and in South Moravia (the Dyje River Basin) strong drought prevailed until the end of the year. In December we noticed another substantial drop in groundwater levels in the whole of the Czech Republic with the exception of Morava where the values remained around average. Groundwater levels of shallow wells in other river basins was strongly below average (Table 1.3.1).

Chart 1.3.1

Average standardised water level of groundwaters in shallow wells in the monitoring network of the Czech Republic in 2019 (blue) in comparison with the long-term average values of 1981–2010

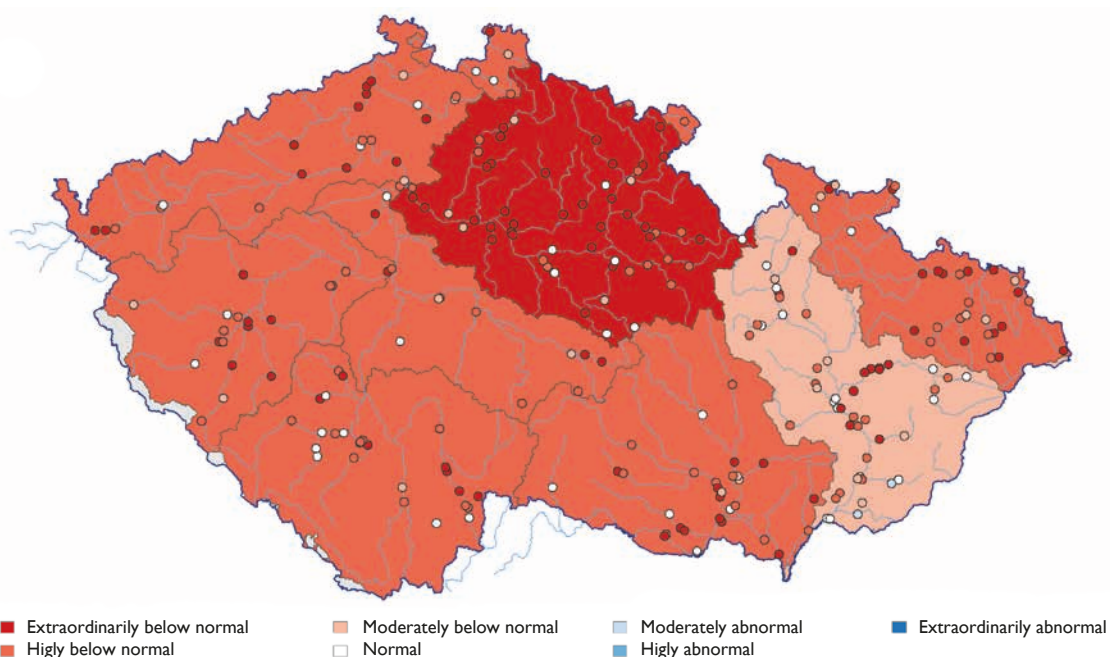


Source: CHMI

Note: The Chart also shows quantiles of monthly exceedance probability curves (mEP).
The vertical line marks the standard deviation.

Figure 1.3.1

Groundwater levels in shallow wells in July 2019



Source: CHMI

Table 1.3.1

Probability of exceeding average groundwater levels in 2019 expressed in % of the monthly exceedance probability curve (for 1981–2010) for the river basins

River Basin	Water level with respect to the monthly exceedance probability curve in %											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Upper and Middle Elbe	90	77	79	93	91	81	95	95	92	89	86	91
Upper Vltava	42	31	48	85	82	70	89	91	90	91	91	93
Berounka	69	63	77	89	84	87	94	87	80	77	83	87
Lower Vltava	56	43	57	87	78	72	90	88	85	80	77	87
Lower Elbe	60	67	68	87	84	79	93	93	90	81	82	87
Oder	59	57	78	95	58	59	94	79	58	64	66	86
Morava	87	77	83	91	89	66	83	79	65	63	59	73
Dyje	91	88	89	94	97	91	93	87	83	85	85	87
Lusatian Neisse	36	55	53	83	78	44	86	90	90	87	87	91
Czech Republic	78	68	78	91	87	78	92	88	81	80	79	87

Source: CHMI

Note: The scale of colours corresponds with categories of slightly (75–85%), strongly (85–95%) and exceptionally (95–100%) below average levels.

Springs

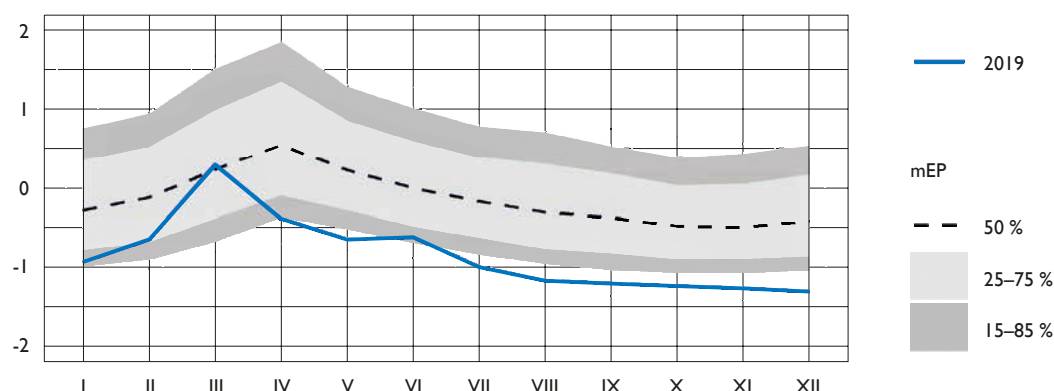
Yield of the springs from the monitoring network in the Czech Republic decreased dramatically from quite favourable values in February and March with the onset of the growing season. As the case was with shallow waters, even with springs we noticed the shift in annual peaks to an earlier period (February) when compared with long-term averages (Chart 1.3.2). At the time of the usual spring highest values (April) spring yield was strongly below average and more than a half of springs in the Czech Republic (59%) had water yield corresponding with strong or exceptional drought. Spring yield kept decreasing and the lowest values were achieved in the first half of May when yield of 69% springs in the Czech Republic was between strong and exceptionally below average.

After slight improvement in June to overall below average values the yield kept worsening and, with the exception of the Berounka River Basin (where spring yield remained stable), reached strongly below average values in August in most of the

country when yield of 62% of springs was strongly or exceptionally below average (Figure 1.3.2). Drought peaked again at the end of the year in November and December when 62% and 67%, respectively, of springs showed values of strong or exceptional drought. The regions most affected by drought since April were Northeast and North Bohemia (the Upper and Middle as well as Low Elbe River Basin), Central Bohemia (the Lower Vltava River Basin) and South Moravia (the Dyje River Basin). Strong or exceptional drought in these regions lasted from April to December with the exception of slight improvement in June (Table 1.3.2). Exceptional drought affected most severely the Upper, Middle and Lower Elbe River Basin where the situation was comparable (actually worse in the case of the Lower Elbe River Basin) with 2018, the driest year so far (since the start of measuring in 1981). The situation was more favourable in the second half of the year in Bohemia only in the Berounka River Basin (slightly below average) and in Moravia in the Oder and Morava River Basin (from September to November) although even there the spring yield was slightly below average.

Chart 1.3.2

Average standardized spring yield in the monitoring network of the Czech Republic in 2019 (blue) in comparison with the long-term average of 1981–2010

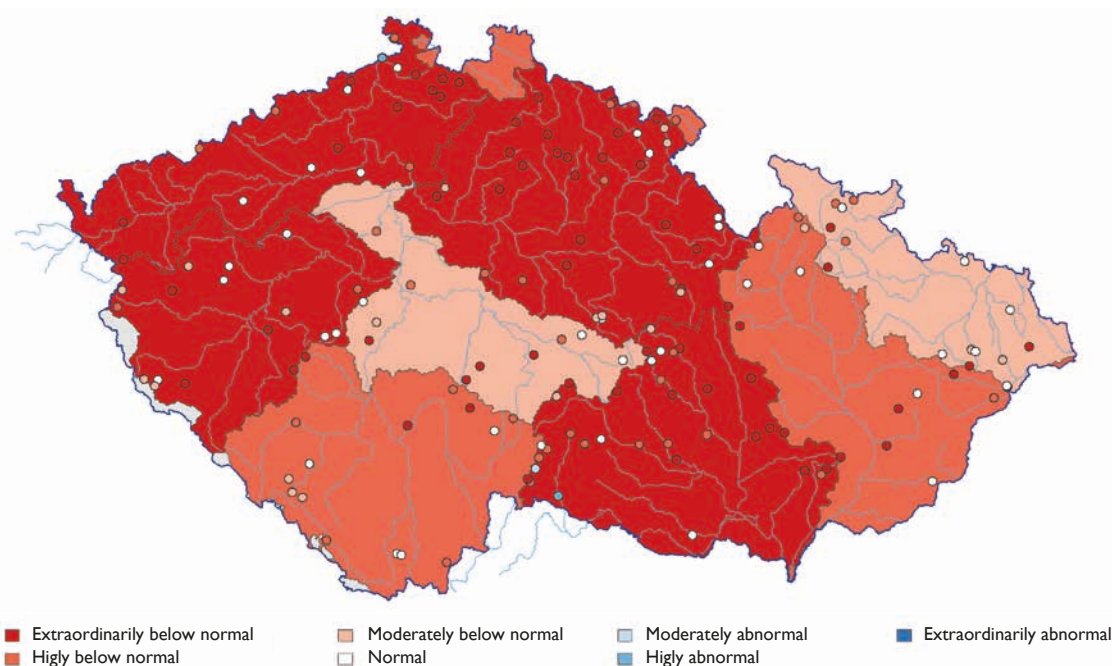


Source: CHMI

Note: The Chart also shows quantiles of monthly exceedance curves (mEP = monthly EP curve).

The vertical line marks the standard deviation.

Figure 1.3.2
Spring yield in August 2019



Source: CHMI

Table 1.3.2
Probability of exceeding spring yield in 2019 in river basins in % with respect to the monthly exceedance probability curve of 1981–2010

River Basin	Classification of yield values on mEP in %											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Upper and Middle Elbe	87	80	63	91	94	90	94	96	96	96	94	96
Upper Vltava	57	59	17	52	72	62	72	89	92	93	94	94
Berounka	59	66	46	71	76	79	81	79	79	80	84	85
Lower Vltava	93	76	55	91	93	89	94	95	95	96	94	97
Lower Elbe	84	90	65	92	95	95	97	97	97	96	97	97
Oder	59	41	38	77	50	45	81	81	68	73	81	88
Morava	92	54	44	80	85	59	89	87	77	78	82	88
Dyje	90	79	47	88	93	81	90	92	92	92	91	91
Lusatian Neisse	85	64	63	71	82	84	80	88	90	83	74	83
Czech Republic	82	74	48	85	88	82	90	92	91	91	92	94

Source: CHMI

Note: The scale of colours corresponds with categories of slightly (75–85%), strongly (85–95%) and exceptionally (95–100%) below average levels.

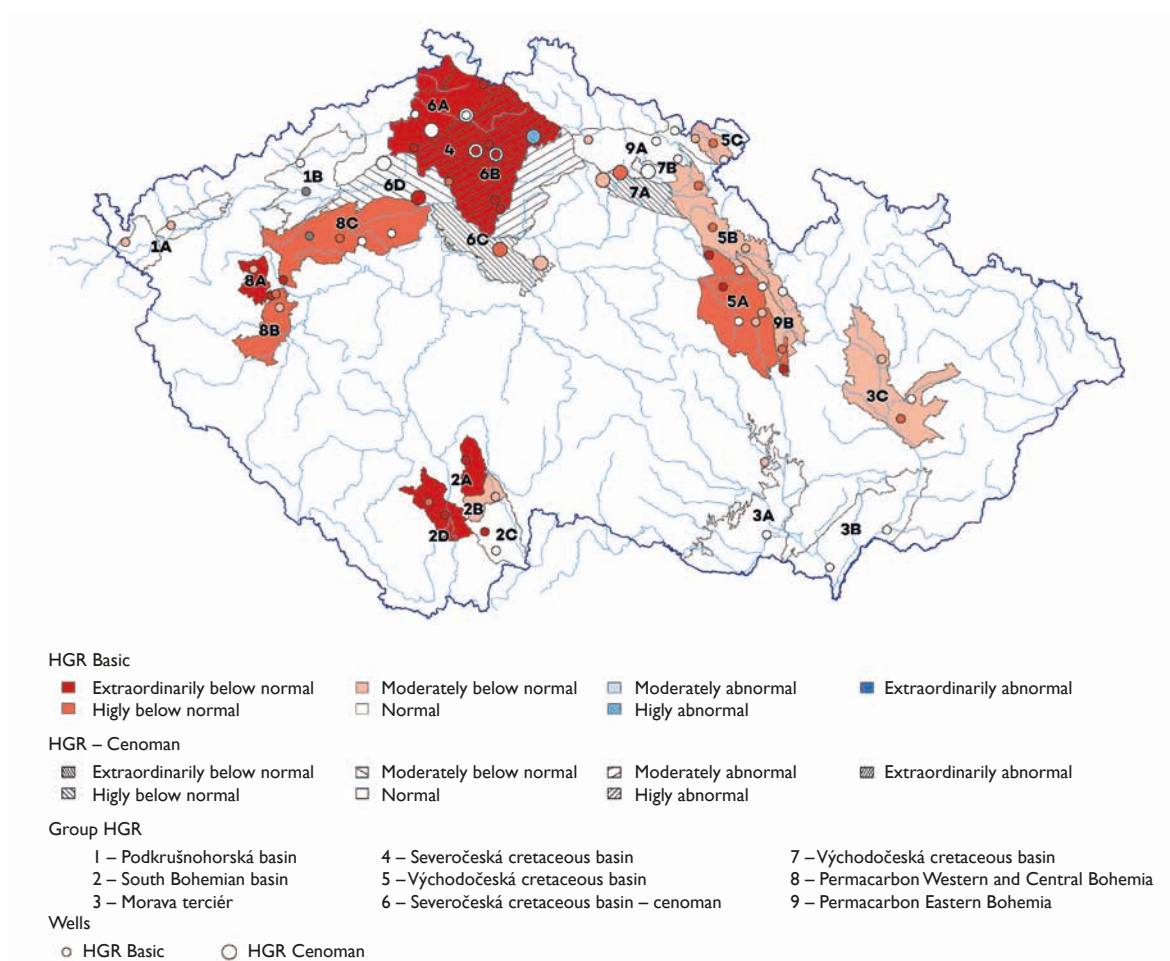
Deep wells

Groundwater levels in deep wells classified under groups of hydrogeological regions (hereinafter referred to as the “HGR”) was strongly or exceptionally below average throughout 2019. The region most severely affected by drought was North Bohemian Cretaceous (group HGR 4) where groundwater levels were exceptionally below average for the entire year. In groups of hydrogeological permo-carbon regions in Central and West Bohemia, South Bohemian Basins and East Bohemian Cretaceous the levels were also between slightly and exceptionally below average the entire year. By contrast, the situation was better in the southern part of the Moravian Tertiary

where groundwater levels showed average values for almost the entire year. Also, in a part of the Cenomanian of North Bohemian Cretaceous that has a distinctively multi-year regime where groundwater levels were still slightly above average.

With respect to the usual annual regime of groundwater levels the situation concerning deep aquifers was most serious in May when the level was strongly or exceptionally below average in 42% of deep wells and also from July to September when the same values were recorded between 38% and 41% deep wells (Figure 1.3.3). 40% of deep wells had groundwater levels around the long-term average in those months, while there were almost no deep wells with above average levels of groundwater.

Figure 1.3.3
Groundwater levels in deep wells in August 2019



Source: CHMI



Janov Water Reservoir, May 2020 (Source: Ohře River Board)



2. HYDROLOGICAL EXTREMES

2.1 Flood situations

The first half of 2019 was quite rich in floods. Water reserves in snow were larger than in 2018 and several flood episodes caused by snow melting occurred in the period from January to March. The vastest floods in terms of affected area were in May. In the summer months we noticed occasional fast torrential floods caused by local rainfall. In the second half of the year there were almost no flood episodes while a flood activity degree was reached only exceptionally.

In January, rises of watercourse levels were recorded in the Czech part of the Oder River Basin and in the Lower Elbe tributaries on 13–15 January. Second flood activity degree was recorded in the Kamenice River at Hřensko achieving Q_2 and in the Lusatian Neisse River Basin and Smědá River Second FAD was exceeded at Řasnice in Frýdlant on 14 January by achieving $Q_{<2}$. At the beginning of February, watercourse level rises were recorded after abundant rainfall on 2–3 February (daily totals of 10–30 mm of rainwater fell on 3 February). In the Oder and Morava River Basins, first FAD was exceeded at several profiles with water yield $Q_{<2}$. In mid-March, watercourse levels repeatedly rose as a result of abundant rainfall and snow melting. In the Upper Otava River Basin, second FAD was exceeded at Křemelná in Stodůlky, in the Otava River in Rejštejín in Sušice and in the Sázava River in Sázava on 16 March. On smaller watercourses in the Upper Vltava and Otava River Basins, in the Czech part of the Oder River Basin, Orlice, Ohře, Svatka and Moravice River Basins first FAD was exceeded by reaching $Q_{<2}$, only in the Cold Vltava (Studená Vltava) at the Černý Kříž profile the water yield was Q_5 . First FAD was also exceeded in the Elbe River in Děčín for a short time.

Abundant rainfall at the beginning of the third decade in May that exceeded in some regions, especially in the Beskydy Mountains, values of 100 mm in 72-hour totals, increased – together with previous saturation – levels at many profiles in the Oder, Bečva and Middle Elbe River Basins. In the Olše and Bečva River Basins, third FAD was exceeded in the Jičínka Stream in Nový Jičín, Olše in Český Těšín and in Dětmárovice, in the Hutiský Stream in Solanec, Rožnovská Bečva in Rožnov pod Radhoštěm and Valašské Meziříčí, in the Senice Stream in Ústí, in the Bystrčická Stream above the reservoir, in the Vsetínská Bečva River in Jarcová, in the Bečva River in Teplice, in the Lutoninka Stream in Vizovice, in the Velička River in Velké nad Veličkou and in Strážnice on 22–23 May. The water yield values of swollen watercourses typically ranged from Q_2 to Q_5 , whereas in the Olše River in Český Těšín, in the Rožnovská Bečva River in Rožnov, in the Senice Stream in Ústí and in the Velička River in Strážnice values of Q_{10} were reached. The highest water yield of Q_{20} was recorded in the Velička in Velké nad Veličkou. In the Dřevnice, Ondřejnice, Velká Stanovnice, Zděchovka, Bečva, Bystrčická, Novohradka, Olše, Ropičanka and Stonávka Watercourses, second FAD was reached and at some smaller watercourses even first FAD was reached. Abundant showers and storms reappeared in Moravia on 28 May. At some places, total precipitation exceeded 50 mm and in the Jičínka River in Nový Jičín and the precipitation and strong saturation of the river basin resulted in second FAD being exceeded the night from 28 to 29 May. In the first decade of June, from 5 to 7 June, when maximum torrential rain with totals between 40 and 70 mm were recorded on 6 June particularly in South, Central and East Bohemia, at Vysočina and in South Moravia, watercourse levels rose especially in the Bečva, Velička, Upper Vltava River Basins and in some Middle Vltava tributaries. The largest increases



Janov Water Reservoir – runoff, May 2020 (Source: Ohře River Board)



Drought at the Radbuza River, Pilsen (Source: Vltava River Board)

were recorded in the Bystřička Stream in Bystřička above the reservoir where third FAD was exceeded with water yield of Q_3 , in the Blanice in Podedvory second FAD was reached with Q_2 and third FAD with Q_3 was reached in the Volyňka in Sudslavice. Second FAD was also exceeded in the Botič Stream in Prague-Nusle and first FAD was reached by the Kocába in Štěchovice and in the Teplá Vltava in Lenora (with Q_2 on both watercourses). Other increases in levels of particularly minor watercourses occurred due to local storms between 12 and 16 June. On 15 June, the Upper Sázava overflowed and reached second FAD in Sázava at the Sázava profile (Q_2). Second FAD was exceeded in the Třebůvka River in Mezihoří with water yield of Q_3 also on 16 June. At the turn of the second and third decade from 19 to 22 June, showers and sporadic strong local storms occurred in the east and south of the Czech Republic, which caused local increases in watercourse levels. In the Loučka Stream at the Dolní Loučky profile and in the Sázava River in Žďár nad Sázavou, second FAD was exceeded with Q_2 and third FAD was exceeded for a short time in the Blanice at the Podedvory profile on 22 June with water yield of Q_3 . On 30 July, a total of 30 mm of rain fell in Prague and precipitation activity continued also on 31 July. Due to the precipitation, levels of particularly Prague watercourses rose significantly: first FAD was reached in the Botič Stream in Prague-Nusle and in the Rokytka Stream in Prague – Vysočany with water yield of Q_2 .

In August, watercourse levels fluctuated, which was given by abundant rainfalls in 12–14 August and 26–29 August. With respect to the very low levels of soil saturation, reactions of watercourses were insignificant and only reached levels approaching an FAD. The level of the Botič Stream in Prague reached second FAD on 12 August with Q_2 . Last increase of watercourse levels occurred on 29 August in the Loučná River in Litomyšl by reaching second FAD with Q_2 . At the beginning of the first decade of September, abundant rainfalls occurred in the whole of the Czech Republic and second FAD was exceeded for a short time by reaching Q_2 in the Vsetínská Bečva and Bystřička.

2.2 Remediating flood damage

For the case of flood damage, the Ministry of Agriculture administrates grant programmes 129 284 “Remediating Damage at Fishponds and Water Reservoirs”, 129 270 “Remediating Flood Damage to State-owned Water Management Property II and 129 320 “Support for Remediating Flood Damage to the Infrastructure of Water Supply and Sewerage Systems II”. With regards to the fact that there were no significant floods in 2019, the programmes were not activated and no support from the abovementioned grants was provided.

The Ministry of the Environment continued administering the grant programme 115 270 “MoE Clean-up after natural disasters” in 2019. The programme was initiated by repeated natural disasters, in particular by floods that affected various regions of the Czech Republic in the past years and caused considerable damage. The main objective of the programme is to ensure remedying damage with the purpose of restoring the property under the scope of the Ministry of the Environment and serving the purpose of ensuring the basic functions in the region. The programme is offered for municipalities, legal entities and physical persons with maximum drawing of 80% of the eligible costs of the project as per programme documentation. Departmental organization of the Ministry of the Environment can apply for subsidy amounting to 100%. The programme is divided in sub-programmes by the nature of the natural disaster and time when the disaster occurred.

In 2019, the Ministry of the Environment continued administering the sub-programme 115 273 “Remediating Damage Caused by Natural Disasters in 2014” that was conceived in response to the landslides in South Moravia in 2014. Applicants that complied with the sub-programme requirements subsequently received project documentation.

For more detailed information including funding see Chapter 9 Financial Support for Water Management.

2.3 Drought situation

The Czech Republic has been beset by drought since 2014, the driest years being 2015 and 2018. 2019 with the average temperature of 9.5°C was the second warmest year since 1961 (i.e. since the nation-wide characteristics started to be systematically assessed), only slightly colder than the warmest year of 2018.

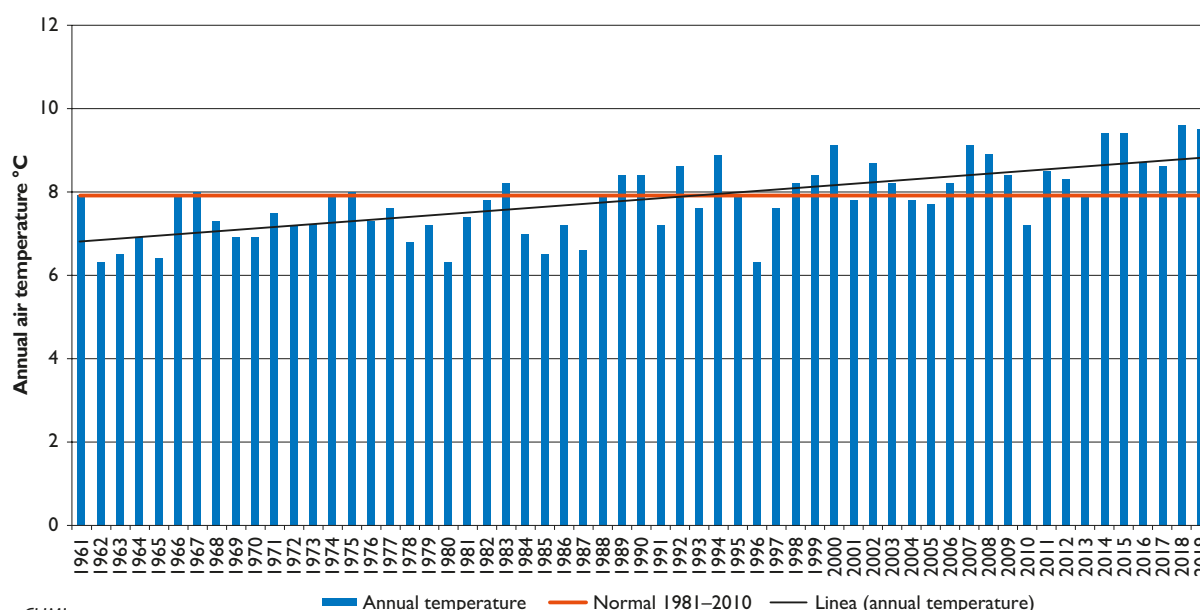
Drought is caused by the lack of atmospheric precipitation: since 2014, the nation-wide annual rainfall average only reached values of the long-term average of 1981–2010, other years were below average in terms of precipitation. Another negative factor is above-average air temperature that manifests, especially in the growing season, with larger water losses by evaporation

and transpiration. The average deviation from the long-term average of 1981–2010 in 2019 was +1.6°C. The only below average month in terms of temperature was May (deviation -2.3°C), the warmest month was June with the deviation of +4.9°C. Air temperature did not differ significantly by regions. From the long-term perspective, air temperature in the Czech Republic keeps slowly increasing.

The amount of precipitation in Bohemia and Moravia in 2019 differed greatly by regions. On average, 634 mm of precipitation fell in the country (92% of the long-term average of 1981–2010). The annual precipitation in Bohemia was only 601 mm, whereas it was 701 mm in Moravia. In Moravia, all the months following April were rainier, in particular May, September and December.

Chart 2.3.1

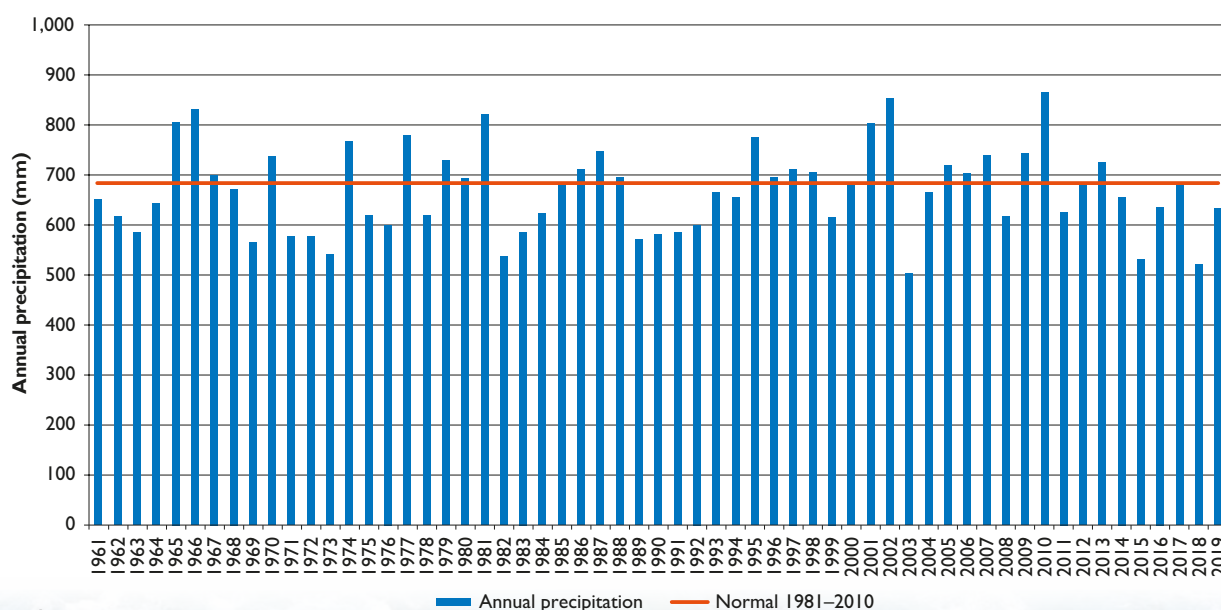
Average annual air temperature in the Czech Republic in 1961–2019



Source: CHMI

Chart 2.3.2

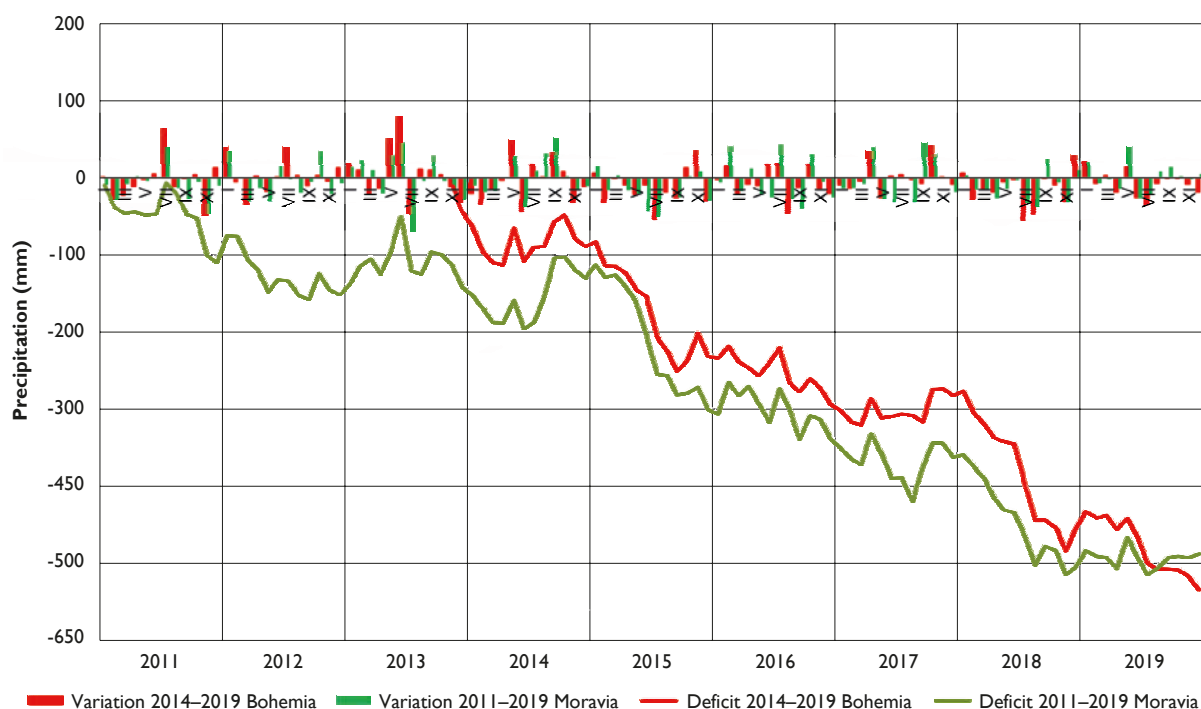
Annual precipitation in the Czech Republic in 1961–2019



Source: CHMI

Chart 2.3.3

Course of precipitation deficit in Bohemia and Moravia in 2011–2019



Source: CHMI

From the long-term perspective, no trend can be detected in the series of annual precipitation in the Czech Republic since 1961. Nevertheless, there were several consecutive years with below average precipitation, of which the 6-year period of 1989–1994 is the longest. The current dry period started in 2014 (in Moravia in 2011) since when the cumulated precipitation deficit has been growing. In 2019, the precipitation deficit compared with the long-term average grew in Bohemia by another 84 mm, whereas it decreased by 14 mm in Moravia. In total, the precipitation deficit in the Czech Republic was 485 mm by the end of 2019, which is approximately 70% of the long-term average of annual precipitation (1981–2010).

Surface water levels in 2019 were affected by the drought in previous year, particularly by prolonged periods with no precipitation when runoff uses groundwater resources. Generally speaking, while watercourse discharge was higher than in the dry year of 2018, average annual discharge in the monitored profiles was below long-term average values and the total discharge from the Czech Republic was around 65% of the long-term average of 1981–2010.

In Bohemia, after a relatively favourable beginning of the year, drought affected watercourses since strongly below average precipitation in April and kept deteriorating throughout the summer. Exceptionally low levels were especially in the Upper and Middle Elbe River Basin, for instance annual discharges in the Cidlina River were below 10% of long-term averages of the given months.

Furthermore, Moravia profited from strongly above average precipitation in May, which reflects in above average water yield of watercourses, particularly those discharging water from the Beskydy Mountains. However, even these watercourses showed marked drops in the summer months. In total, water yield of

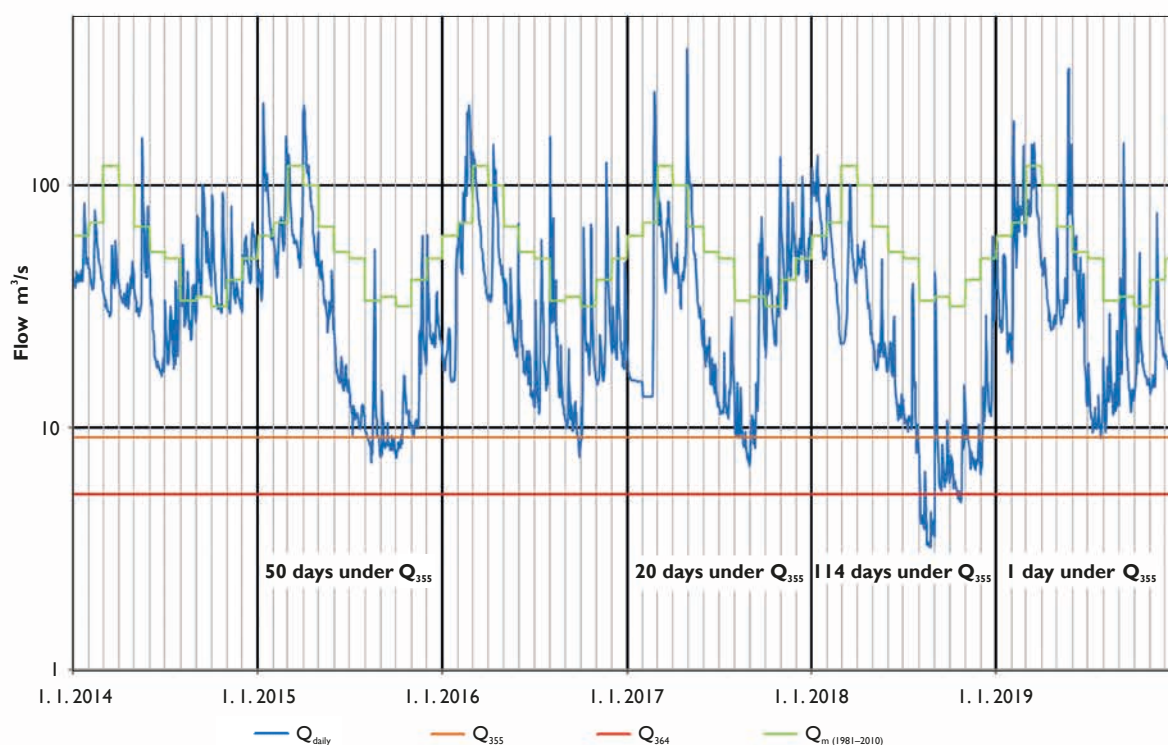
watercourses in Moravia was significantly higher than in Bohemia.

Minimum flow rates in Czech watercourses dropped for a prolonged period of time under the level of 355 flow rates, in some watercourses even below the 364 daily flow rate levels. For instance, in the Jizera River in Železný Brod, values below Q_{355} lasted for 97 days, in the Elbe River in Kostelec nad Labem for 99 days, in the Berounka River in Beroun for 78 days. By contrast, the situation in Moravia was significantly better: values below Q_{355} lasted in the Morava River in Olomouc for 43 days, in the Oder River in Svinov for 31 days and in the Morava River in Strážnice for only 1 day. Nevertheless, the drops in all monitored watercourses were not as distinct as in the “dry years” of 2015 and 2018. The fact that the situation in 2019 was more favourable can be demonstrated on the development of minimum flow rate values in the Morava River in Strážnice. A logarithmic scale is used on the vertical line of the chart 2.3.4 for the sake of better illustration of the course of minimum values.

The development of shallow well levels displays clearly the negative influence of the dry year of 201. At the beginning of 2018, the initial situation was relatively normal, which was due to the fact that 2017 was an above-average year in terms of precipitation. From then on, however, levels dropped to below average and even strongly below average values (with respect to the average values of 1981–2010 for the given season). Both years were negatively affected by low precipitation in winter and spring and little water from snow melting, which reflected in low groundwater levels at the very beginning of the growing season and the situation kept deteriorating throughout the season. The second half of 2019 was positively affected by higher precipitation totals in Moravia.

Chart 2.3.4

Daily water rate values in the Morava River in Strážnice in 2014–2019



Source: CHMI

2.4 Interdepartmental commission WATER-DROUGHT

Members of the Interdepartmental commission **WATER-DROUGHT** monitored situation concerning the implementation of measures and relevant activities throughout 2019, in particularly work of the Senate commission **DROUGHT** together with preliminary conclusions of the inspection performed by the Supreme Audit Office.

At its meeting of 15 October 2019, the commission approved deadlines for processing materials for the Position Report, i.e. performing tasks arising from the Concept of Protection Against Drought Impacts in the Czech Republic, approved by the Czech Government on 24 July 2017 with its Resolution No. 528. At the same time, it was agreed that the scope of performance should include managerial summary specifying successes and shortcomings in the given year together with what has not been initiated yet and why. By the end of the year the commission members ensured filling a uniform mock-up for the tasks and the output was used for drawing up a proposal of the 2019 Position Report.

The Interdepartmental commission **WATER-DROUGHT** shall continue in monitoring implementation of the measures resulting from the Concept in the years to come. The commission proved to be a very suitable and effective communication platform. By the end of every year it shall issue position reports about the progress made and the resulting Report on the concept implementation that shall be submitted to Government members by 31 December 2022.



Drought at the Ohrázenický Stream, Brdy (Source: Vltava River Board)

Website www.suchovkrajine.cz is dedicated to the Interdepartmental commission **WATER-DROUGHT**, Concept of Protection Against Drought Impacts in the Czech Republic and the 2019 Position Report.



D. Poláčková – Water of Life – Hradec Králové Region

3. QUALITY OF SURFACE WATERS AND GROUNDWATERS

3.1 Surface water quality

Current surface water quality under ČSN 75 7221 in comparison with the 1991–1992 period

The map of the quality of waters in selected watercourses of the Czech Republic was first produced for the 1991–1992 period under ČSN 75 7221 standard **Water Quality – Classification of Surface Water Quality**. Since this biennium, the Report on Water Management in the Czech Republic has annually included analogical maps so that they can be compared with the current water quality. With regard to the scope of 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 (ČSN 75 7221 **Water Quality – Classification of Surface Water Quality**) a standard that was in force for the previous 19 years.

The subject of the standard was to take into consideration requirements concerning the current state in surface water protection in terms of pollution indicators as well as the degree of acceptable pollution. Monitored indicators and limit values of quality classes were reviewed. That is why

a new map of the quality of surface waters was produced for 1991–1992 under the amended ČSN 75 7221 for the sake of objective comparison.

COD_{Cr} , BOD_5 , $N-NH_4$, $N-NO_3$ and P_{total} were used as indicators for assessment of surface waters. and As Figure 3.1.2 shows, water quality has improved over the past 25 years, however, there are still watercourse sections with surface water quality of Class V. Most watercourses are classified in Class III – polluted water. The number of watercourse sections in Classes I and II keeps growing.

To produce the above presented map of quality of surface water of the Czech Republic for the period 2018–2019 in accordance with ČSN 75 7221, the resulting evaluation from selected profiles of the water quality monitoring network provided by the Czech Hydrometeorological Institute (from primary data sent by the individual River Boards, s. e.). The respective monitored hydrometric profiles are classified in the following water contamination quality classes under the amended ČSN 75 7221 standard:

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,



Pastviny Dam (Source: Elbe River Board)

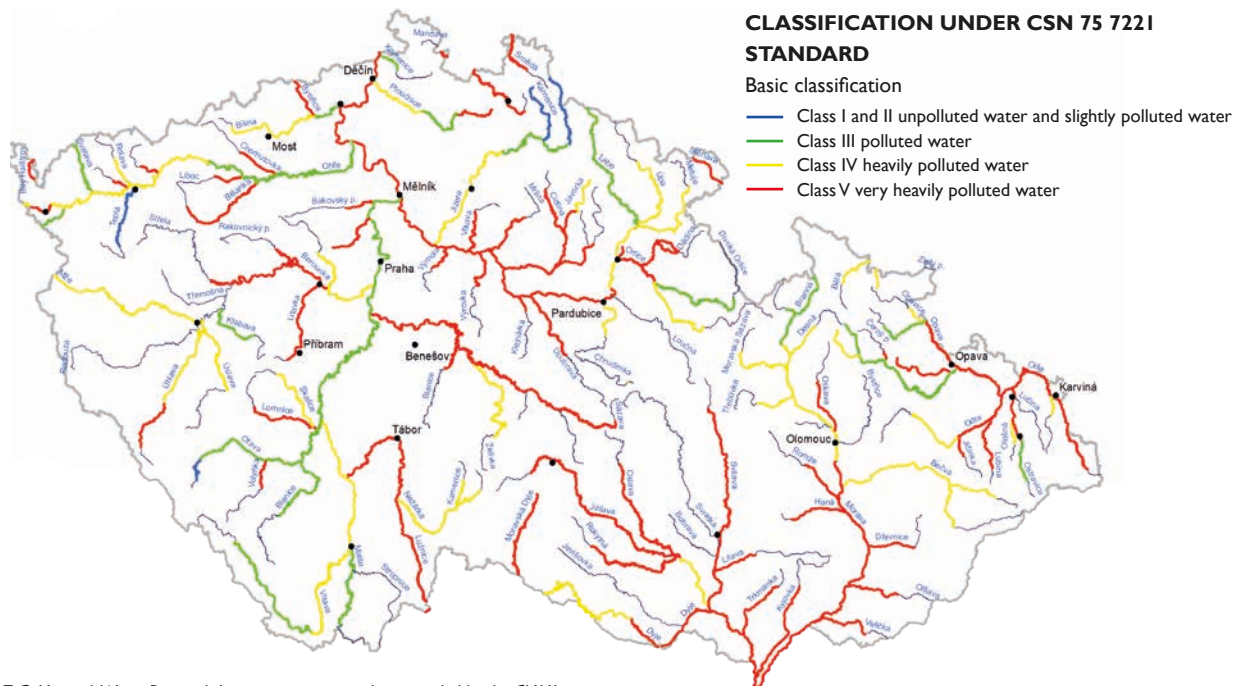
Class II slightly polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values allowing for the existence of a rich, balanced and sustainable ecosystem,

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 conducive to conditions allowing for the existence of only an unbalanced ecosystem,

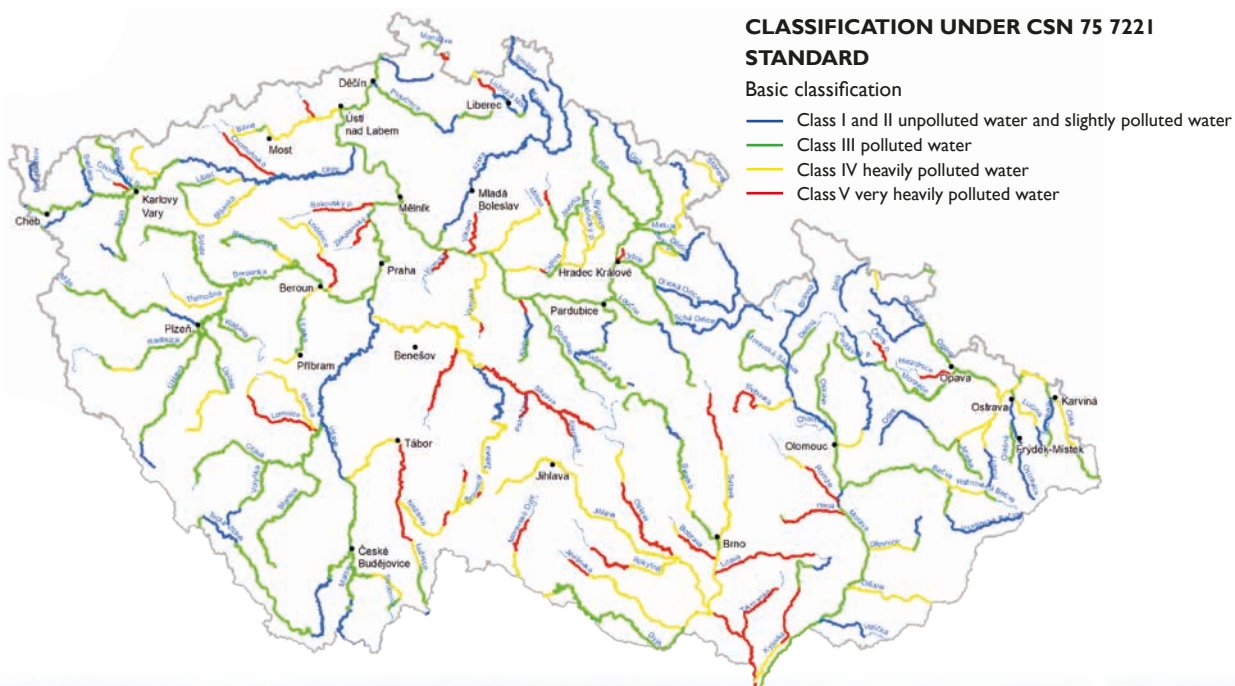
Class V very heavily polluted water – surface water status that was affected by human activity to an extent that water quality indicators attain values that are conducive to conditions allowing for the existence of only a heavily unbalanced ecosystem.

Figure 3.1.1
Quality of surface waters in the Czech Republic in 1991–1992



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

Figure 3.1.2
Quality of surface waters in the Czech Republic in 2018–2019



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

Radioactivity

In surface waters, radiological indicators are monitored on a long-term basis in selected hydrometric profiles of the monitoring network. These profiles are situated at locations of nuclear facilities currently in operation and in watercourse stretches affected by the discharge of mine waters and by the seepage from refuse dumps at locations where uranium ores were formerly mined or treated.

In surface water of the Vltava River (significant watercourse) at the Vltava Solenice profile (river km 144) below the Temelín Nuclear Power Station wastewater outfall, the annual mean volume activity of tritium in 2019 was 19.4 Bq/l with highest values of 29.9 Bq/l, the annual mean value at the Vltava Praha Podolí profile (river km 56.2) was 12.7 Bq/l, with peak of 22.9 Bq/l and before the outfall to the Elbe River at the Vltava Zelčín profile (river km 4.5) the annual mean value was 11.7 Bq/l with peak value of 20.4 Bq/l. The tritium values comply with acceptable pollution in surface waters as per Government Resolution No. 401/2015 Coll. The total alpha and beta volume activity was also detected in values that completely comply with the acceptable pollution. No other activation and fission by-products from operation of nuclear power plants were detected. Low-volume activities of Strontium-90 and Cesium-137 were detected: such activities are comparable to residual contamination after atmospheric nuclear weapon tests and the Chernobyl nuclear reactor explosion in the past century.

In the vicinity of uranium ore deposits, elevated values of radiologic indicators are detected every year in surface waters of the upper Kocába Stream at the Višňová profile (river km 38.5) and Štěchovice (river km 0.7) and in the Drásovský Stream at the Drásov profile (river km 0.2). All the cases fall under Class V – very heavily polluted water. The acceptable pollution values as per Government Resolution No. 401/2015 Coll. are exceeded in the indicators “total alpha volume activity” at all the three profiles monitored and the total beta volume activity is exceeded at the Kocába Višňová profile.

The mean volume activity of tritium below the Dukovany Nuclear Power Station in 2018–2019 at the Jihlava – Mohelno profile was 167.0 Bq/l and at the Jihlava – Ivančice profile below 82.5 Bq/l. The concentrations of tritium comply with values of acceptable pollution in surface waters expressed by annual average or maximum values as per Government Resolution No. 401/2015 Coll. Total volume activity beta was also detected in concentrations that comply completely with values of acceptable pollution. Under assessment per ČSN 75 7221, the characteristic values of tritium were classified in Class III in both profiles, values of total volume beta after correction to 40 K in Class I and total volume activity beta ranked the watercourse at the Jihlava – Mohelno profile in Class I and at the Jihlava – Ivančice profile in Class II of water quality. There was no marked change when compared with previous years.

From the perspective of the total alpha volume activity and total beta volume activity, NEK values defined by the Government Resolution No. 401/2015 Coll., as amended, were not exceeded at the Stráž pod Ralskem site, even though there was a slight increase in radioactivity at the monitored profile

compared with 2018. The statistic values of the parameters monitored at the Ploučnice Česká Lípa profile were classified under ČSN 75 7221 in Class I and II.

The highest activity of Radium-226 isotope amounting to 162 mBq/l was measured at the Loket profile in the Stoke surface watercourse. In the West Bohemian region of the country with uranium ores, i.e. at the locations where radioactive material was once mined and processed, pollution with radioactive substances persists at the Jáchymov region in the Bystřice Stream in Ostrov nad Ohří as well as in its tributary: the Jáchymovský Stream. The surface water quality as per the volume alpha activity corresponds with Class V – very heavily polluted water. In the Hamerský Stream in the Tachov region, the quality of surface waters is markedly better; judging on the basis of lower activities of the radium-226 isotope not exceeding 17 mBq/l, is classified under ČSN 75 7221 in Class II – slightly polluted water.

Surface water pollution by uranium and the increased volume alpha activity that exceeds limit indicators for annual mean and maximum NEK values under Government Resolution No. 401/2015 Coll. was identified at profiles in the Jindřichův Hradec region where uranium was once mined and at the Nekrasín profile in the Račí Stream and at Licoměřice at the Kurvický Stream. The total alpha volume activity in surface waters near the Okrouhlá Radouň site in the Jindřichův Hradec region achieves values up to 1,300 mBq/l, the measured activity of Radium-226 isotope was below 72 mBq/l and uranium contents did not exceed 70 µg/l.

Once in three months, samples of raw water are analysed and its radioactivity is assessed on the basis of the total volume beta activity. The total volume beta activity of raw water from the Vrchlice Stream and raw water for water treatment plant in Hulice from Želivka achieves at most the activity of 150 mBq/l. Activity of raw water from the Kamenice Stream for the Josefův Důl Water Reservoir and activity of raw water from the Černá Desná Stream for the Souš Water Reservoir in the Jizera Mountains achieves 53 mBq/l at most. Total volume beta activity in waters used for water supply purposes did not exceed acceptable pollution values. Total volume alpha activity in raw water intended for the water treatment plant in Hulice was below detection limit. Total volume alpha activity meets the condition of annual NEK average as required by Government Resolution No. 401/2015 Coll. regulating use of surface water for treatment for drinkable water.

Water quality in water supply reservoirs and other reservoirs

In connection with the ongoing climatic change there is a risk of more pronounced eutrophication (an increased content of mineral nutrients, particularly phosphorus compounds), especially in the sphere of oxygen regime, recycling of nutrients deposited in sediments and an increase in the intensity of late summer cyanobacterial water bloom. Such impacts can be prevented in a single way: continual limitation of phosphorus supply from the catchment area. This consists primarily of minimising phosphorus emissions and of support for self-cleaning procedures and phosphorus retention in the river basins (proper pond management, watercourse rehabilitation, support for water retention in the landscape in general).



Kamenička Water Reservoir (Source: Ohře River Board)

In spring 2019, due to snow melting and with respect to sufficient reserves of snow in the mountains, flow rates in reservoirs administered by the Elbe River Board, s.e., were stabilized. After colder early spring and the beginning of spring temperatures rose sharply. As a result, surface temperatures at most reservoirs were among the highest since 1979. Alongside with high temperatures, 2019 also distinguished by below average inflows to reservoirs and thus with related phenomenon of very low water exchange. At most reservoirs the values of water inflow were ones of the lowest since 1979. The Křižanovice, Vrchlice and Hamry Water Reservoirs suffered again intensely from the impacts of eutrophication. Biomanipulation was conducted again at the Hamry Reservoir with the aim of increasing the quality of raw water by influencing the composition of fish stock. At the Vrchlice Water Structure, distinct and regularly recurring oxygen stratification was detected; it is linked with a decrease and even total vanishing of oxygen in greater depths and near the bottom. Due to a change in oxygen reduction oxy reduction oxidation-reduction ratios in deeper oxygen-free layers of the reservoir we saw development of higher concentrations of manganese, nitrates and ammonia. Water supply abstraction at the Vrchlice Reservoir was linked with two other attributes that distinguish 2019 from previous year cycles. Minute pico-cyanobacteria (*Snowella*, *Aphanothece*, *Aphanocapsa*, *Chroococcus* genus etc.) had total prevalence in the reservoir in the summer. Their distribution in the water column differed from large species of planktonic cyanobacteria from previous years that concentrated primarily near the surface. These small photosynthesizing organisms were dispersed from the surface down to considerable depths with maximums around the middle abstraction slot. Even though large amount of chlorophyll-a did not reach critical values, the numbers of these picocyanobacteria exceeded several times bigger types of cyanobacteria that were once common. Such a situation required transition from the upper abstraction layer. Abstraction from top-most layers (epilimnia) meant that water with different physical-chemical features when compared with water abstracted from depths. This led to a formation of another specific attribute of water abstractions in 2019. At the Josefův Důl and Souš Water Reservoirs the quality is stabilized. New technologies at water treatment plants can cope with the

occurrence of picocyanobacteria of the *Merismopedia* genus, meaning the quality of water supply abstractions is not affected by such development. Water quality at the Labská reservoir was deteriorated. Transparency dropped from 410 cm in May to 110 cm in September. Development in water quality may have been partly affected by a decrease in the accumulation volume due to ongoing construction works. Negative consequences of eutrophication during the entire growing season had impact on the Seč Reservoir. Water quality at reservoirs with recreational use was quite favourable in 2019. Relocation of the bathing point from the northern part of the Rozkoš reservoir to the southern bank near the town of Jesenice increased the total score of the reservoir. At the Pastviny Reservoirs the situation was ideal, transparency achieved values of up to 400 cm. At the Mšeno and Harcov Reservoirs, a sonar device was experimentally installed with the view of improving the situation. Development of water quality at this type of reservoirs was similar to previous years. Water at the Bedřichov Reservoir was traditionally of excellent quality. The surface water temperature reached an exceptional value of 24°C, offering thus perfect conditions for bathing. Water quality at the Fojtka Reservoir was deteriorated for the most of the summer (with transparency during most of the growing season below 200 cm). The worst water quality was traditionally at reservoirs with frequent water exchange such as Les Království and Pařížov.

In water reservoirs in the Vltava River Basin, 2019 was another quite dry year. While the situation in some river basins was normal in terms of precipitation, rainwater was mostly absorbed by the landscape, so it was another dry year for watercourses and water reservoirs. It meant that the influence schemes applied were similar to those of previous year: 1) Low phosphorus supply in reservoirs with longer water retention and particularly in deep reservoirs and reservoirs with elongated shape resulted in increased eutrophication (including development of cyanobacterial water bloom) in the upper levels and, by contrast, in better quality in the lower parts (improved transparency and lower volume of phytoplankton) – Hracholusky, Orlík, Klíčava, Švihov. 2) Low flood flows meant a low supply of humic substances and thus better water quality in reservoirs used for

water supply (lower UV values of absorption and COD_{Mn}) – Lučina, Římov, Karhov. 3) Strongly eutrophic and shallow water reservoirs with higher flow rate displayed lower quality due to the development of cyanobacteria water bloom as internal burden with nutrients was more intense than in previous years (interaction between sediments and water) – České údolí (Czech Valley). 4) Due to strongly decreased flow rate in some water reservoirs, temperature stratification was more stable with marked oxygen deficits at the bottom of the lower part of the Nýrsko and Lučina Water Reservoirs that were accompanied with increased iron and manganese concentrations to the degree that even the quality of raw water in water supply reservoirs slightly deteriorated. Slightly worse was the negative impact on lower water bodies (lack of oxygen and high concentrations of iron, manganese, ammonia nitrogen, sometimes also COD_{Mn} and total phosphorus). Generally, water quality is still threatened, almost “affected”, by eutrophication that is caused by excessive supply of phosphorus from river catchment areas, especially from point sources of pollution. In terms of water quality threatened and affected by pesticides, the situation has been long adverse at the Švihov Water Reservoir. Furthermore, it is burdened by decaying pesticide products. Another persisting factor is the inflow of erosional material from farmland. However, it is not linked with eutrophication, but with debris deposits at the upper parts of reservoirs. The quality of vast majority of standing water does not deteriorate, but does not improve either, as phosphorus concentrations have not declined (in some river basins) in tributaries over the past 5–10 years. This stagnation is caused (1) by application of the currently valid Government Resolution No. 401/2015 Coll. that codifies, *inter alia*, the impossibility of exceeding best available technologies (BAT), (2) lack of restrictive limitation of phosphorus content in detergents used in washing machines and dish washers for “professional use” and (3) significant negative influence of relieving integrated sewer systems during flood episodes. It is particularly episodic pollution from relieving of the integrated sewer system that has been very underestimated until now, even though it means intake of a wide range of substances including microbial agents to waters for water supply and recreational use. Such pollution subsequently prevents achieving good environmental condition or potential and should be systematically monitored everywhere. The situation cannot be significantly improved without implementation of measures addressing the aforementioned causes. Water quality in water reservoirs is currently stabilized partly thanks to sediments rich in phosphorus, especially in the upper layers. This “old environmental burden” will vanish very slowly. Unless the three points mentioned above are implemented, no improvement can be expected. Agriculture in the Czech Republic is not currently a significant source of phosphorus, which is the only active nutrient in the Czech Republic that is significant in terms of eutrophication. Exceptions may consist in application of digestate on unsuitable land (e.g. on Třeboň meadows above the Rožmberk Pond). Water treatability is constantly deteriorated at the Lučina and Žlutice Water Reservoirs, not so seriously at Římov and Karhov, the Švihov Water Reservoir is also seriously jeopardized, however, we expect gradual improvement there after the WWTP Pelhřimov reconstruction. Eutrophication deteriorates the use for recreational purposes at the following reservoirs: Orlík, Lipno, Hracholusky, České údolí.

Water quality was monitored on a regular basis and results show that the quality raw water supplied in the Ohře River Basin was not compromised despite strong drought in 2019.

Detailed information about any issues with water treatability needs to be requested directly from water treatment plant operators (Severočeské vodovody a kanalizace, a. s., Vodárny and kanalizace Karlovy Vary, a. s., Vodohospodářská společnost Sokolov, s. r. o., CHEVAK, a. s.).

2019 was another of extremely warm and dry year for the Morava River Basin. A peculiar situation was very cold and humid May, followed by warm and dry June. In comparison with 2018, in the spring there was a temporary slowdown of the vegetation season and the development of phytoplankton. Lower mass development of cyanobacteria, especially of the *Microcystis* sp. A marked improvement and suppression of the mass water bloom occurred, e.g., in the Brno Reservoir. The worst hypertrophied water reservoirs in 2019 were Jevišovice, Výrovce, Upper and Lower Nové Mlýny Reservoirs, Moravská Třebová, Podhradský Pond, Luhačovice, Farářka profile near the Vranov Reservoir and Mostiště and Fryšták. Strongly eutrophic, almost at the border of hypertrophy were the reservoirs at Výrovce, Znojmo, Bítov profile, Vranov and Ludkovice. Eutrophic reservoirs were the most frequent, especially the following ones: Brno, Vír, Hubenov, Bystřička, Horní Bečva, Vranov near the dam and Letovice. As in previous years, those included Landštejn and Koryčany because of their later summer and autumn values, although the latter one increased significantly after a marked deterioration in 2018 linked with water level decrease. Water reservoirs that were mesotrophic, or more precisely eutrophic in 2019 were Opatovice, Nová Říše, Bojkovice and Boskovice that improved significantly in comparison with 2018. Karolinka and Slušovice can be considered oligotrophic. Although the number of reservoirs affected by mass water bloom did not rise, it actually decreased, some reservoirs displayed unprecedented amounts of cyanobacterial biomass (e.g. the Upper Nové Mlýny and Mostiště, a significant water supply reservoir), others exhibited almost extreme development of non-cyanobacterial biomass (Luhačovice, Výrovce). A pleasant situation was that the quality of the Brno Reservoir improved, especially in its lake section jezerní části, most exposed to recreation (the values in the inflow section corresponded with strong eutrophication and almost hypertrophy with cyanobacteria forming a thick biomass).

Šance and Kružberk was very good in 2019 and did not require complex treatment to become drinkable water. The total biomass was low and the number of phytoplankton types detected ranged between dozens and exceptionally hundreds of organisms per millilitre. An oxygen deficit at the bottom was detected at the Morávka Reservoir in August 2019, which was due to lower water exchange and it subsequently resulted in temporary problems with water treatability. Thanks to apposite interventions at the water reservoir and particularly thanks to more abundant inflow from tributaries, the situation was solved rather fast. In 2019, water quality from reservoirs not intended for water supply was only compromised at the Těrlicko Reservoir and at the end of the growing season also at the Baška Reservoir that was marked as unsuitable for bathing according to the regional hygiene stations methodology. A specific situation was detected at the Olešná Water Reservoir where the total biomass of phytoplankton did achieve high values, but cyanobacteria were not prevalent. So, while the water quality at the water structure manifest visually marks of compromised quality, it was classified in second class under the regional hygiene stations methodology, i.e. water suitable for bathing with deteriorated properties perceptible by human senses.

Quality of water used for bathing during the 2019 bathing season

In the 2019 recreational season a large part of bathing sites encountered problems particularly with excessive growth of phytoplankton – cyanobacteria, which was the main reason for issuing a ban on bathing. Cyanobacteria occur due to surface water pollution mainly due to the phosphorus content which – under increased temperature and duration of sunshine – contributes to their excessive development. Elimination of the developed cyanobacterial bloom is very expensive and it does not have a long-term effect. The priority should be to restrict nutrient (especially phosphorus) dotation in surface waters, which can only be ensured by thorough completion of the third level of wastewater purification in all current wastewater treatment plants and by building new wastewater treatment plants in all cities and municipalities that do not treat wastewaters at the moment.

Act No. 258/2000 Coll., on the protection of public health and on amendments to certain relevant acts, as amended, regulates the rights and obligations of natural and legal persons, which must be met in the area of protection and promotion of public health; the Act further establishes a system of public health protection bodies, their scope of activity and authority. One of the areas that is protected by this Act, is outdoor bathing, operation of outdoor bathing pools, artificial bathing pools, swimming pools and saunas. Decree No. 238/2011 Coll. regulates the equipment of outdoor bathing pools and the requirements for the sampling method and frequency of inspection and also bathing water quality requirements.

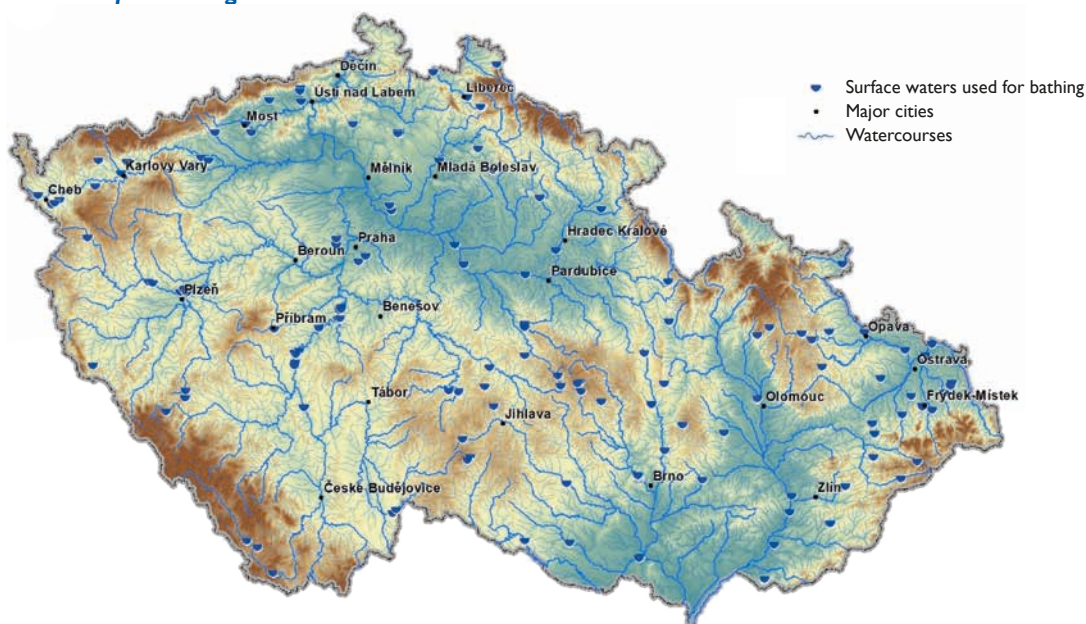
Before the beginning of the recreational season the Ministry of Health proposes annually a list of locations where water quality shall be monitored with respect to bathing. The proposal of the list is published before the beginning of the recreational

season on the website of all regional hygiene stations and of the Ministry of Health for the general public to submit any observations. Once the observations are taken into account, the list is adjusted and published.

In the 2019 bathing season, public health protection bodies monitored 275 sites for bathing, of which 158 open air bathing facilities and 117 bathing locations. Public health protection bodies took 933 control samples and conducted laboratory tests, whereas operators took 982 samples. On the basis of the laboratory tests, public health protection bodies issued bans on bathing at 10 locations in the 2019 recreational season in the Czech Republic. Water quality that was assessed as unsuitable for bathing, was detected at 28 locations. Summer 2019 was above-average in terms of temperatures as well as precipitation, which affected water quality of the bathing sites – unsatisfactory water quality was detected at 38 locations in the 2019 recreational season, i.e. 13.8%, whereas 22.2% of locations were unsuitable in 2018, in 2015 the number was 15.5%.

The number of bathing facilities and water surfaces intended for bathing monitored by regional hygienic stations open to public did not change much in comparison with previous years. More and more bathing sites with a system of natural water purification (so-called biotopes) are built and put into operation. Water quality at such locations is typically very good throughout the entire recreational season: 24 biotopes were in operation in the Czech Republic in 2019. Summer weather conditions were above-average in terms of temperature and they were also above-average in terms of precipitation, which was in contrast with 2015 and 2018, which were years above-average in terms of temperature while very dry. The average temperature in summer 2019 was increased particularly by June, which was an extremely warm month, but water did not reach high temperatures yet. This was probably the reason why the number of locations with unsuitable quality of water for bathing in the 2019 bathing season was lower than the other two years of 2015 and 2018.

Figure 3.1.3
Surface waters used for bathing



Source: T. G. Masaryk Water Research Institute, p. r. i., using data provided by the River Boards, s.e., Ministry of Health of the Czech Republic and ©ZABAGED



Landštejn Water Reservoir (Source: Morava River Board)

Quality of suspended matters and sediments

Monitoring of the chemical state of solid components of the water ecosystem, i.e. suspended matter (insoluble substances transported by the flow in suspended matters) and river sediments, has long been part of the all-embracing monitoring of water quality je. Many chemical pollutants cumulate primarily in river suspended matters and sediments and their analyses thus provide us with valuable information about the presence of a certain substance in the water ecosystem. EU regulations require that long-term trends are monitored in a set of 20 selected priority hazardous substances. Contents of such priority substances in sediments shall not increase for the sake of achieving good chemical conditions.

Monitoring of the chemical state of solid components and sediments was performed at 48 profiles of significant watercourses with special attention on contents of heavy metals, metalloids and specific organic substances with the emphasis on priority dangerous substances in the sphere of water policy under European directives 2000/60/EC (hereinafter referred to as the “Water Framework Directive”), 2008/105/EC and 2013/39/EU, totalling 130 chemical substances. The monitoring results were assessed in accordance with Government Resolution No. 401/2015 Coll. on the basis of an analysis of long-term trends in concentrations of selected priority matters that may cumulate in sediments and suspended matters. The degree of contamination was assessed using foreign quality limits.

Suspended matters and sediments are consistently contaminated – to a various degree – by many priority substances and other chemical potentially dangerous substances. The number of priority substances detected in sediments and suspended matters at the locations monitored in 2019 is shown in Fig. 3.1.4. The following priority substances scored highest values in nation-wide measurements: polyaromatic hydrocarbons and phthalates. Other priority organic substances such as hexachlorobenzene, hexachlorobutadien, tributyltin, chloroalkanes C10-13, perfluorinated substances, dicofol and hexabromocyclododecane were detected locally depending on the source of contamination and anthropogenic burden, in significantly lower concentrations (see Chart 3.1.1). Their

highest contents were found in the Bílina River in Ústí n. L. and in the Lusatian Neisse in Hrádek n. N. The highest total concentration of priority organic substances was found in the Ohře River above the Nechranice Reservoir and in the Ploučnice River in Březiny with extreme contents of substance group of PAH – fluoranthene.

Generally speaking, the watercourses permanently burdened by chemical substances are those that flow in regions with high concentration of industry, long-term anthropogenic burden and affected by old burdens as the case is with the Bílina, Lower Ohře and Lower Elbe Rivers with the contamination of sediments and suspended matters by heavy metals, hexachlorobenzene, hexachlorobutadien, perfluorinated substances, polybrominated diphenyl ethers, dioxins and furans and the Middle Elbe contaminated by chlorobenzenes, mercury, cadmium, tributyltin and PAH. Varied contamination with higher concentrations of heavy metals, chloroalkanes C10-13, tributyltin and many other potentially harmful substances (bisphenol A, triclosan, methyl triclosan, galaxolide, tonalide) is displayed by suspended matters and sediments in watercourses with less water in sections near big urban agglomerations (Lusatian Neisse in Hrádek n. Nisou, Svratka in Židlochovice near Brno) where the effect of wastewater discharge is apparent. Speaking of polyaromatic hydrocarbons, they still have high contents of particularly benzo(a)pyrene with carcinogeneous effects, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene in partial regions of the Morava, Dyje and Upper Oder River Basins. The most serious pollution by dioxins, furanes and PCBs with dioxin effect was ascertained (by the number of cases above limit of quantification and total concentrations of toxic equivalents) in the Bílina River in Ústí n. L. and in the Ohře River in Terezín. Total higher concentrations of dioxins were also found in the Elbe River in Litoměřice, in the Elbe River near Děčín, in the Svratka pod Brno and in the Berounka River near Pilsen. Qualitative limit for dioxins was exceeded in all the abovementioned locations.

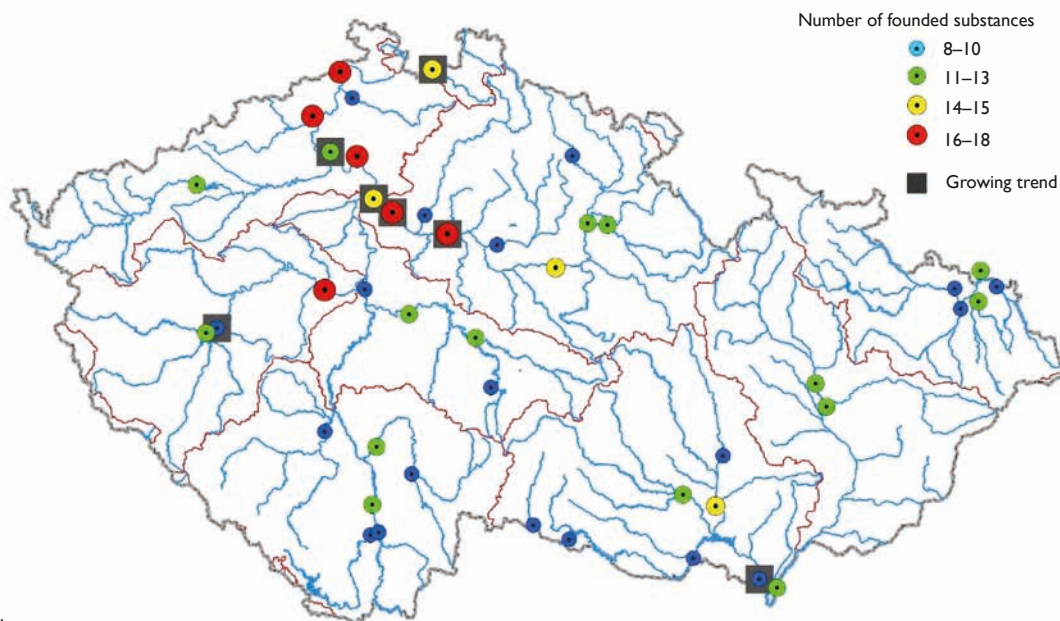
Other harmful substances that were repeatedly detected were, e.g., exceptionally high concentrations of organochlorinated pesticides DDT in the Bílina River in Ústí nad Labem and in the Elbe River near Děčín. The currently used and often discussed pesticide glyphosphate was detected in most samples of suspended matters and in 50% of sediment samples.

The range of substances exceeding quality limits has been stable over a long period. The most frequent ones are concentrations of anthracene, fluoranthene, sums of 5 PAHs, tributyltin and exceptionally also hexachlorobenzene. Heavy metals that most often exceeded limit concentrations were lead and cadmium, sporadically nickel and mercury. Localisation of above-limit values has remained unchanged for a long period of time. The most significant contamination by the number of substances in above-limit concentrations was detected in the

partial Lusatian Neisse River Basin in Hrádek nad Nisou in concentrations of cadmium, lead, mercury, nickel, anthracene, fluoranthene, sum of 5 PAHs, hexachlorobenzene and tributyltin. In addition to heavy metals, the partial Ohře River Basin and Lower Elbe in Bílina in Ústí n. L. and in the Elbe near Děčín above-limit contents of particularly hexachlorobenzene and tributyltin were detected, whereas above-limit contents of cadmium, mercury, anthracene and tributyltin were found in the Middle Elbe in Lysá n. L. In the partial Morava River Basin, Dyje

Figure 3.1.4

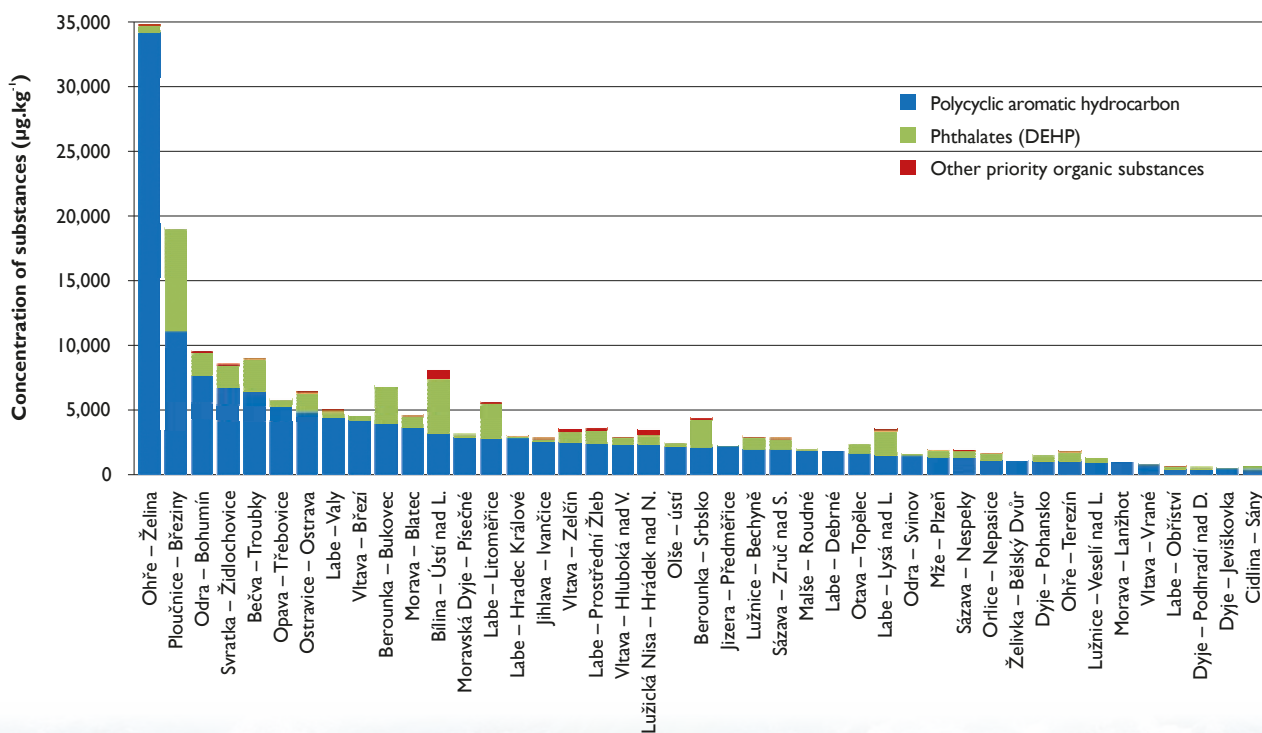
Number of detected priority substances in sediments and suspended matters in locations in 2019



Source: CHMI

Chart 3.1.1

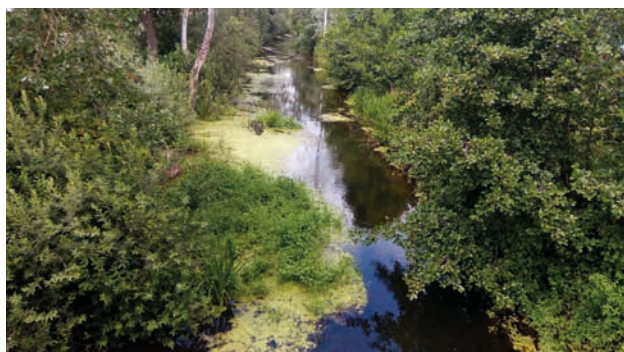
Summary concentrations of priority organic substances in sediments with a share of polyaromatic hydrocarbons in 2019



Source: CHMI

River Basin and Upper Oder River Basin were found above-limit concentrations of polyaromatic hydrocarbons (anthracene, fluoranthene and other substances from PAH group assessed together as a sum of 5 PAHs).

According to the analysis of long-term trends, sediments were found to show a statistically growing trend at seven locations, the most often in the contents of substances from the group of polyaromatic hydrocarbons (anthracene, fluoranthene, sum of 5 PAHs, cadmium and locally in chloroalkanes C10-13).



A river full of life (Author: Lenka Procházková)

Microcontaminants in surface waters

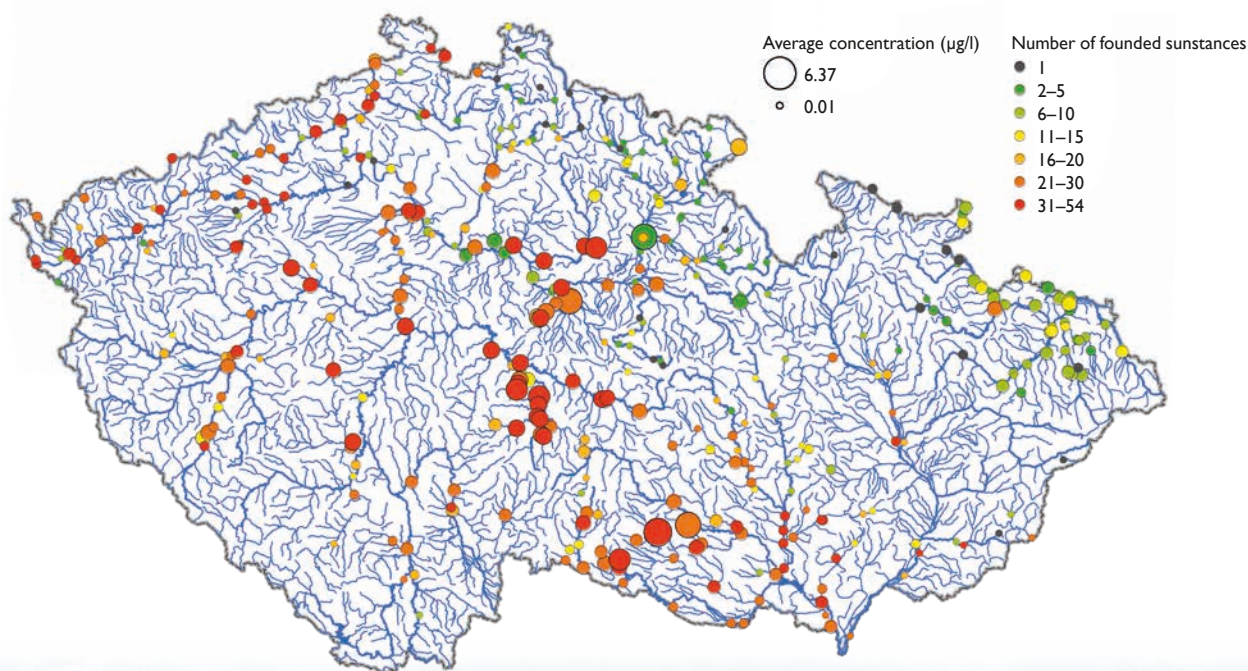
The presence of microcontaminants in surface waters has recently been a frequently and worldwide discussed issue, the Czech Republic being no exception. Monitoring is focused primarily on residues of pesticides, pharmaceuticals, roentgendiagnostic substances, anti-corrosives and other specific substances linked with wastewater discharge. Occurrence of the two most significant groups of such substances, pesticides and pharmaceuticals in surface waters in 2019 was assessed.

Pesticides

Water management laboratories of river Boards, s.e., monitor utmost scrupulously pesticide substances and their metabolites that get to surface waters particularly from agricultural activity. In 2019, results from 540 profiles (a total of 5 210 samples) for 263 analytes were processed. Pesticides were found at 500 profiles (92.6% of the monitored profiles), in 4,457 samples (i.e. in 85.5% of the samples). In 2019, a total of 161 pesticides and their metabolites were found in surface water; out of which 38 substances were found in more than 5% of the samples.

The most frequently found metabolites of herbicides used for treating rape (at present allowed substances: metazachlor, dimethachlor, pethoxamide and banned ones: alachlor, acetochlor), corn (allowed: metolachlor, terbuthylazine, pethoxamide and banned: atrazine, acetochlor), beetroot (chloridazon), and glyphosate (total herbicide) and its metabolite AMPA. Most substances were found at the following profiles: Kryry – Podvinecký Stream (54 substances), Havlíčkův Brod – Žabinec, Zruč nad Sázavou – Sázava and Varnsdorf – Mandava (50 substances), Senožaty – Martinický Stream (49 substances), Postoloprty – Chmutovka (48 substances), Kozlíky – Teplický Stream and Dvory – Chodovský Stream (47 substances), Samšín – Kejtovský Stream (46 substances), Sány – Cidlina, Olešnice – Lučický Stream and Ústí nad Labem – Klášský Stream (45 substances). The highest total concentrations of pesticides were found at the following profiles: Nový Bydžov – Králický Stream (maximum 19.3 µg/l, average concentration 6.9 µg/l), Jaroměřice nad Rokytnou – Štěpánovický Stream (maximum 51.2 µg/l, average concentration 6.4 µg/l), Hradec Králové – Piletický Stream (maximum 23.1 µg/l, average concentration 6.3 µg/l), Dalešice – Rouchovanka (maximum 16.4 µg/l, average concentration 5.9 µg/l), Rohozec – Brslenska (maximum 11.5 µg/l, average concentration 5.8 µg/l) and Frahelž – Ponědražský Stream (maximum 9.7 µg/l, average concentration 5.3 µg/l).

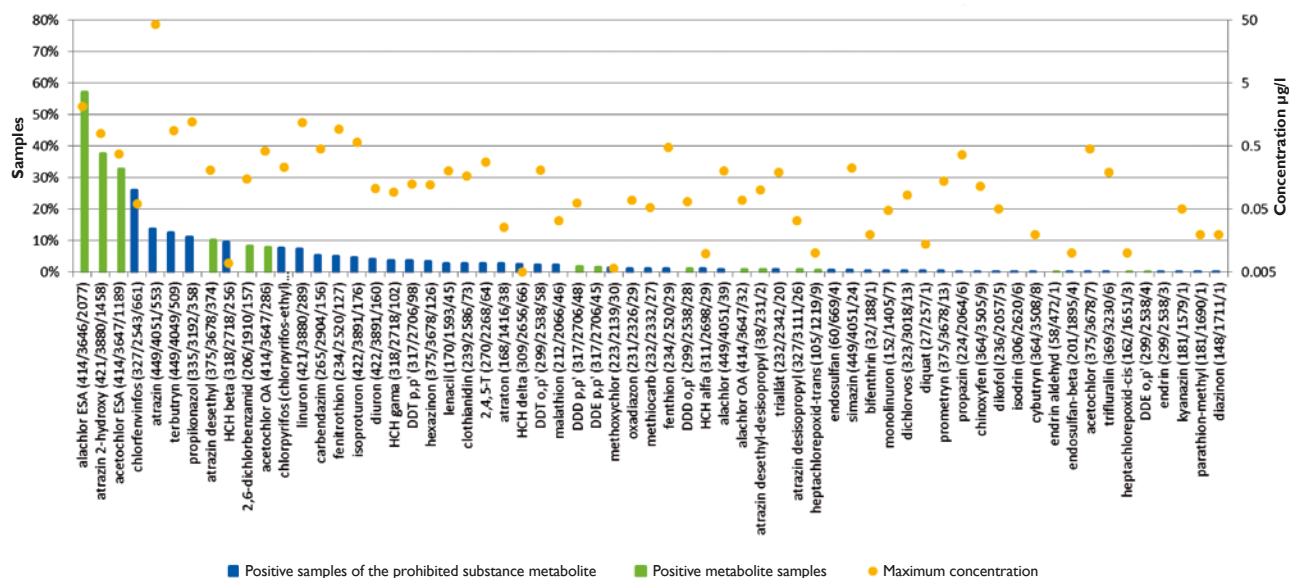
Figure 3.1.5
Pesticides in the Czech Republic by number and concentration in 2019



Source: CHMI

Chart 3.1.2

Monitoring banned pesticide substances in the Czech Republic in 2019

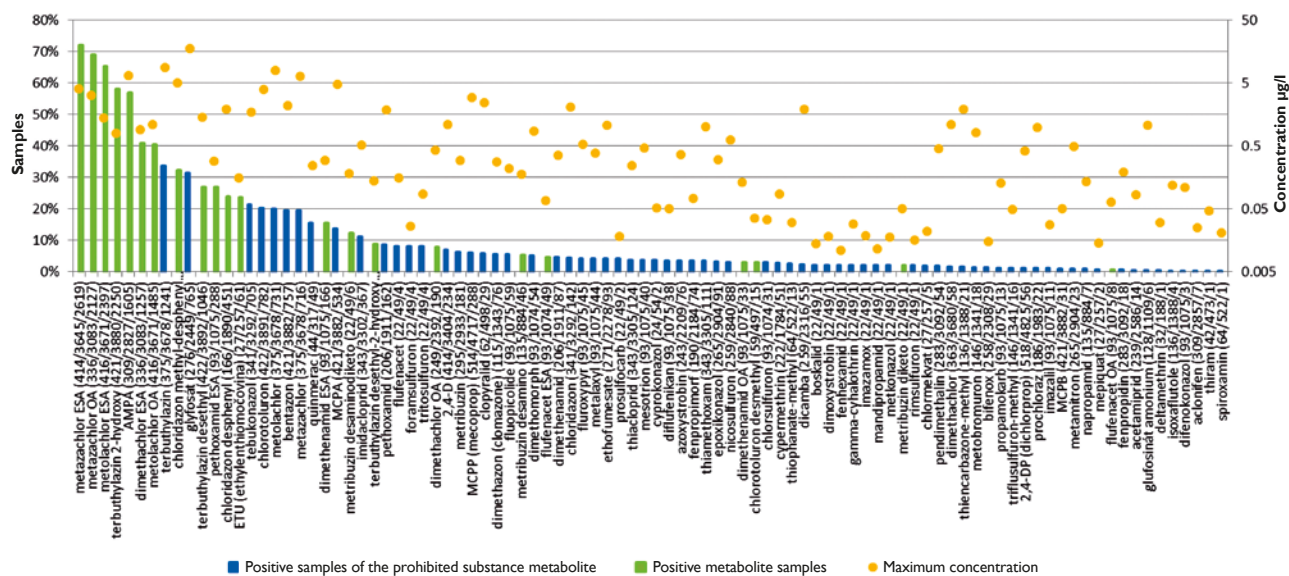


Source: CHMI

Note: In brackets: number of profiles / number of samples / number of positive samples.

Chart 3.1.3

Monitoring of allowed pesticide substances in the Czech Republic in 2019



Source: CHMI

Note: In brackets: number of profiles / number of samples / number of positive samples.



A family outing, Lednice-Valtice Cultural Landscape (Author: Petr Soukup)



A snack, the Oslava River (Author: Petr Soukup)



Nechranice (Source: Morava River Board)

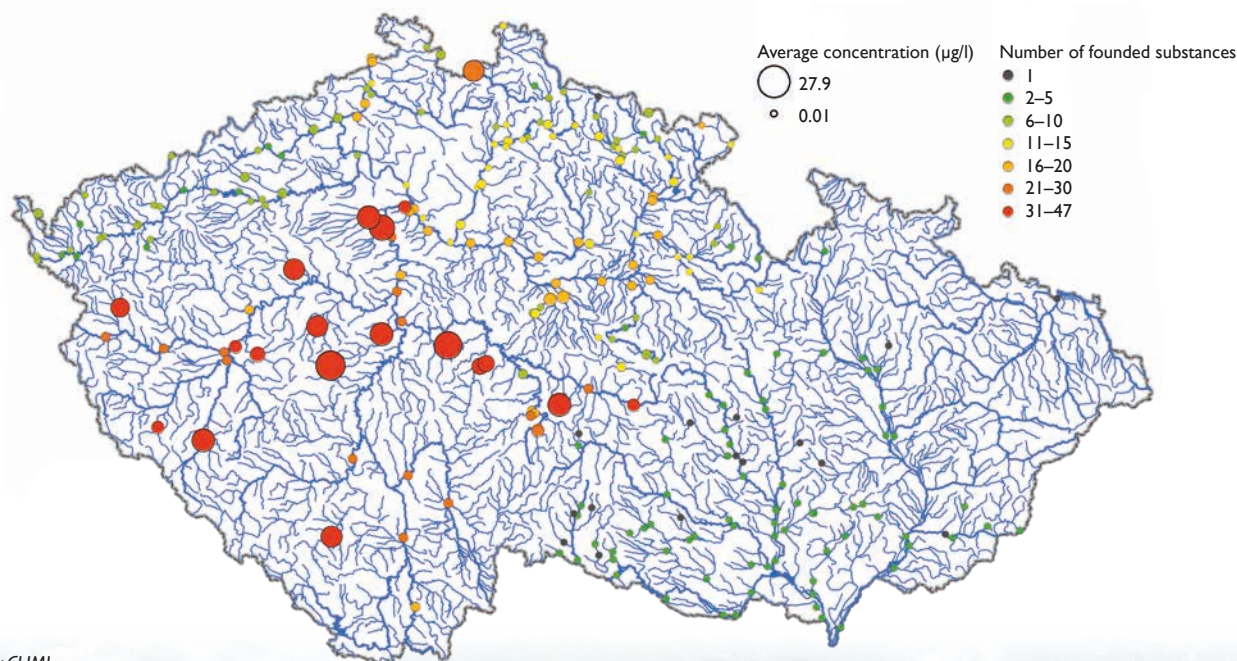
Pharmaceuticals

Considerable amounts of pharmaceuticals and their metabolites get to surface waters from municipal sources, results from 303 profiles (totalling to 2,836 samples) were processed for 67 analytes in 2019. Occurrence of pharmaceuticals in some locations is extensive, particularly in smaller watercourses to which big agglomerations are drained. Pharmaceuticals were found in 302 profiles (99.7% of the profiles monitored) in 2,688 samples (94.8% of the samples). The most frequently found substances are telmisartan (antihypertensive), metformin (diabetes drug), oxipurinol (gout drug), carbamazepine (anticonvulsant), indomethacin (analgesic, antiphlogistic, antirheumatic), iomeprol (contrast agent), irbesartan (antihypertensive), tramadol (analgesic), diclofenac (antirheumatic), 2-hydroxy metabolite of ibuprofen (analgesic, antipyretic, antiphlogistic), valsartan (antihypertensive) and metoprolol (antihypertensive). Most pharmaceutical substances

were found in the following profiles: Trhové Dušníky – Příbramský Stream (47 substances), Klatovy – Drnový Stream (45 substances), Benešov – Benešovský Stream (44 substances), Senešnice – Novoveský Stream (44 substances), Humpolec – Pstružný Stream (43 substances), Kralupy nad Vltavou – Zákolanský Stream (42 substances), Dolní Chlum – Rakovnický Stream (42 substances) and Vlašim – Blanice (42 substances). The highest total concentrations of pharmaceuticals were detected in the following profiles: Trhové Dušníky – Příbramský Stream (maximum 55.8 µg/l, average concentration 27.9 µg/l), Benešov – Benešovský Stream (maximum 53.5 µg/l, average concentration 23.2 µg/l), Kralupy nad Vltavou – Zákolanský Stream (maximum 36.3 µg/l, average concentration 20.9 µg/l), Senešnice – Novoveský Stream (maximum 43.9 µg/l, average concentration 15.1 µg/l), Velvary – Červený Stream (maximum 30.8 µg/l, average concentration 16.1 µg/l) and Humpolec – Pstružný Stream (maximum 32.9 µg/l, average concentration 14.6 µg/l).

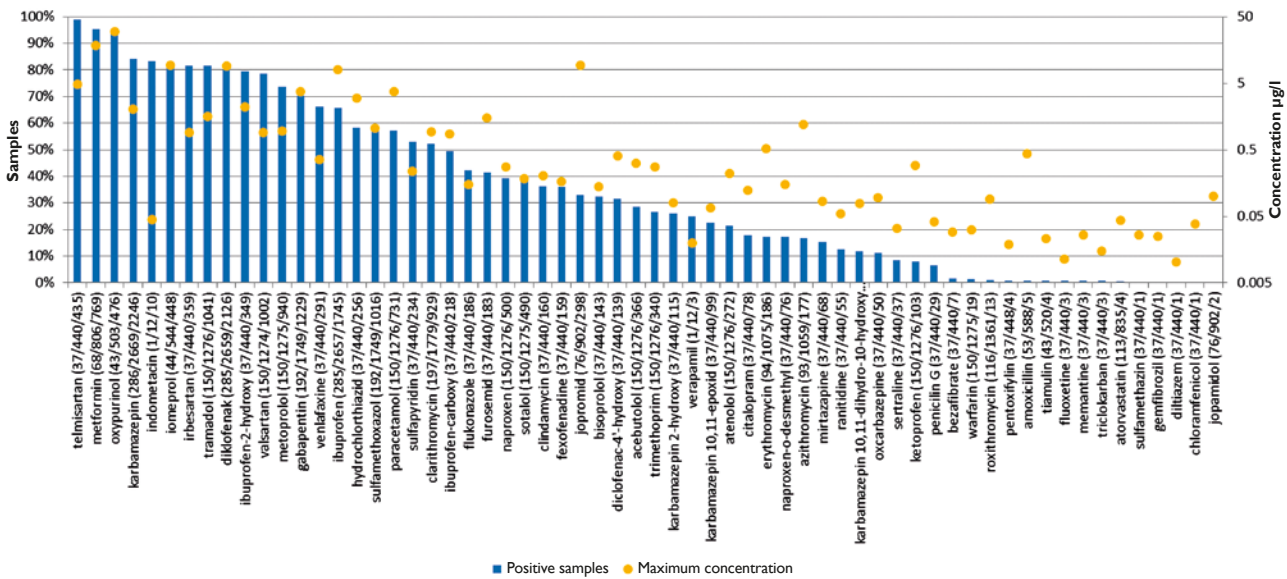
Figure 3.1.6

Pharmaceuticals detected in the Czech Republic by number and concentration in 2019



Source: CHMI

Chart 3.1.4
Monitoring effective substances in pharmaceuticals in the Czech Republic in 2019



Source: CHMI

Note: In brackets: number of profiles / number of samples / number of positive samples.



Opatovice Water Reservoir after reconstruction (Source: Morava River Board)

Accumulation biomonitoring of surface waters

The programme of bio-accumulation monitoring allows to comprehensively determine the status of the sites in question and it significantly contributes to an increase in knowledge of the state of contamination by biota. Monitoring uses not only fish and fry, but also other suitable matrices accumulating poisonous pollutants in connection with the manner of feeding and type of habitat. In 2019, aquatic organism contamination by dangerous substances was monitored at 22 river profiles of significant Czech and Moravian rivers covered by surface water situational monitoring.

The programme monitors occurrence of dangerous substances whose content in water samples is usually below detection limits and which cumulate well in biotas. Monitoring focused on fish (*Squalius cephalus*), fish fry, benthic organisms (in most cases *Hydropsyche* sp., *Erpobdella* sp., *Gammarus* sp.) and in growth.

Seven dangerous organic substances that were analysed in fish fry were selected for monitoring, namely polychlorinated biphenyls (sum of PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153, PCB-180), chlorinated pesticides (sum of o,p and p,p-disomeres DDT), polybrominated diphenyl ethers (sum of PBDE 28, 47, 99, 100, 153, 154), bis(2-ethylhexyl) phthalate (DEHP), perfluorooctanesulfonic acid (PFOS), from polyaromatic hydrocarbons (PAH) fluoranthene and benzo(a) pyrene. Indicators with NEK values defined in Government Resolution No. 401 from 2015 were compared.

The highest total concentration of monitored organic substances was detected at the Morava Blatec profile with significant prevalence of polyaromatic hydrocarbons. Values of fluoranthene exceeded almost 5-times the NEK value ($30 \mu\text{g.kg}^{-1}$), values of b(a)pyrene were significantly higher

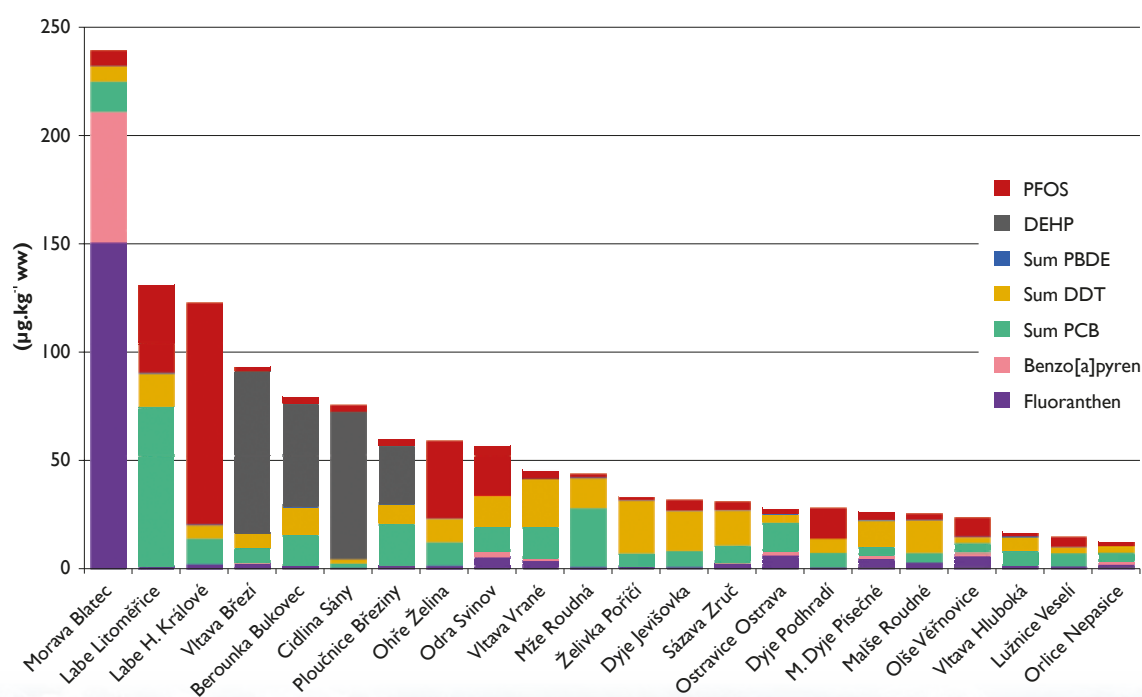
(NEK= $5 \mu\text{g.kg}^{-1}$). Concentration of PFOS were higher than the NEK value ($9.1 \mu\text{g.kg}^{-1}$) at 23% of the profiles with highest concentration in the Elbe River in Hradec Králové. PBDE values (with NEK of $0.0085 \mu\text{g.kg}^{-1}$) exceeded the environmental quality standard at all monitored profiles by hundreds of percent ($0.05\text{--}0.56 \mu\text{g.kg}^{-1}$).

Monitoring aquatic organism provides us with information that is impossible to find out by the means of water sample analysis and results from several matrices confirm general pollution of the water ecosystem.



Renovation of the Zádolský Stream (Source: Forests of the Czech Republic)

Figure 3.1.7
Finds of hazardous organic substances in fish fry in 2019



Source: CHMI

3.2 Groundwater quality

A total of 698 sites were monitored in the national groundwater quality monitoring network in 2019. They comprised 201 sources, 225 shallow wells and 272 deep wells. A total of 365 quality indicators were analysed. Indicators from three major groups (basic indicators, metals, polar pesticides and pharmaceuticals) were monitored at most of the sites. Other groups of indicators were analysed at a selected lower number of locations. The number of groundwater bodies exceeding limit values of monitored substances in 2019 was similar to 2018 values.

Monitoring of springs documents natural drainage of groundwaters, in particular from the basement and local drainage of chalk structures. Shallow wells are concentrated mostly in the alluviums of the Elbe, Orlice, Jizera, Ohře, Dyje, 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 wells 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 2019 were assessed by comparing values of groundwater quality indicators with liminal values for groundwater in accordance with Decree No. 5/2011 Coll., as amended, and in accordance with Regulation of the European Parliament and of the Council 2006/118/EC – Annex I. The assessment was performed in the form of tables and maps, especially for indicators that occurred in concentrations exceeding the given criteria in groundwaters at least in one monitored location in 2019.

The most distinct indicators of groundwater pollution when compared with limit values are pesticides (metabolites of herbicides used particularly for treating crops such as rape, corn and beetroot), inorganic substances (ammonia ions, nitrates and phosphates), defining totals of organic substances (COD_{Mn} and DOC), metals (barium, manganese, arsenic and cobalt), VOC (toluen and 1,2-cis-dichlorethen) and PAH (phenanthrene and chrysene).

Table 3.2.1

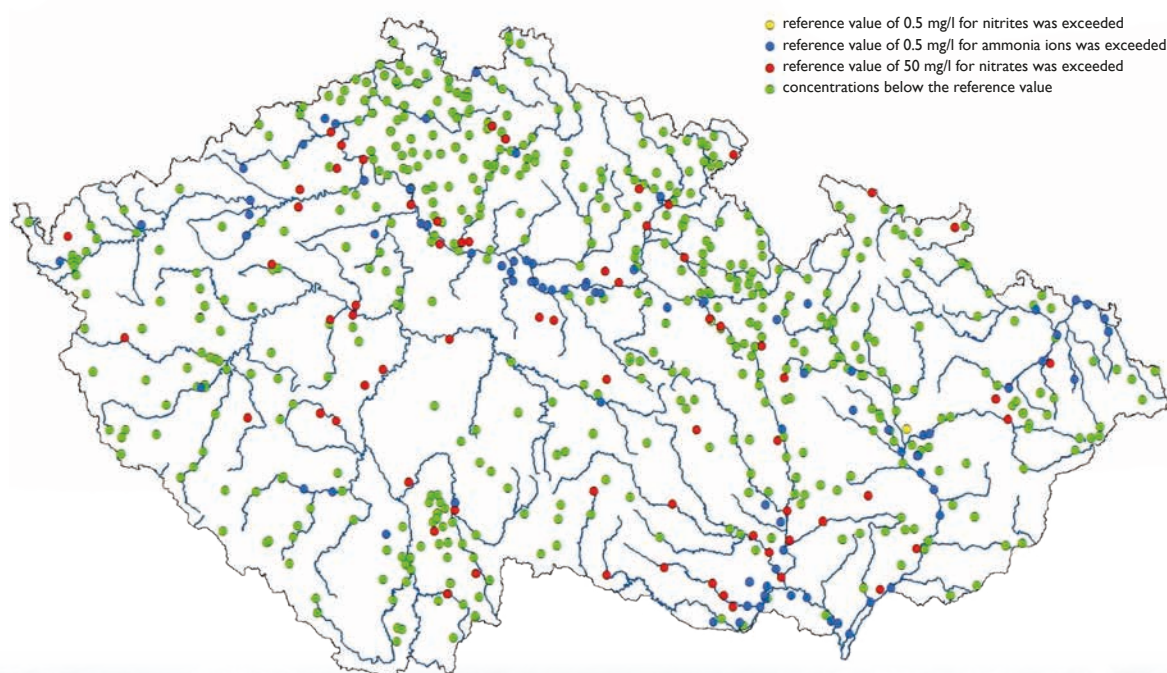
Number of sites exceeding limits for groundwater in at least one indicator in 2019, compared with 2018 and 2017

Sites	No. of sites	No. of sites exceeding limits for groundwater	% of sites exceeding limits for groundwater		
			2019	2018	2017
Shallow wells	225	216	96.0	95.5	96.0
Deep wells and springs	473	371	78.4	77.8	76.2
All sites	698	587	84.1	83.5	82.6

Source: CHMI

Figure 3.2.1

Concentrations of nitrogenous substances in groundwaters in 2019, exceeding limits set forth by Decree No. 5/2011 Coll., as amended

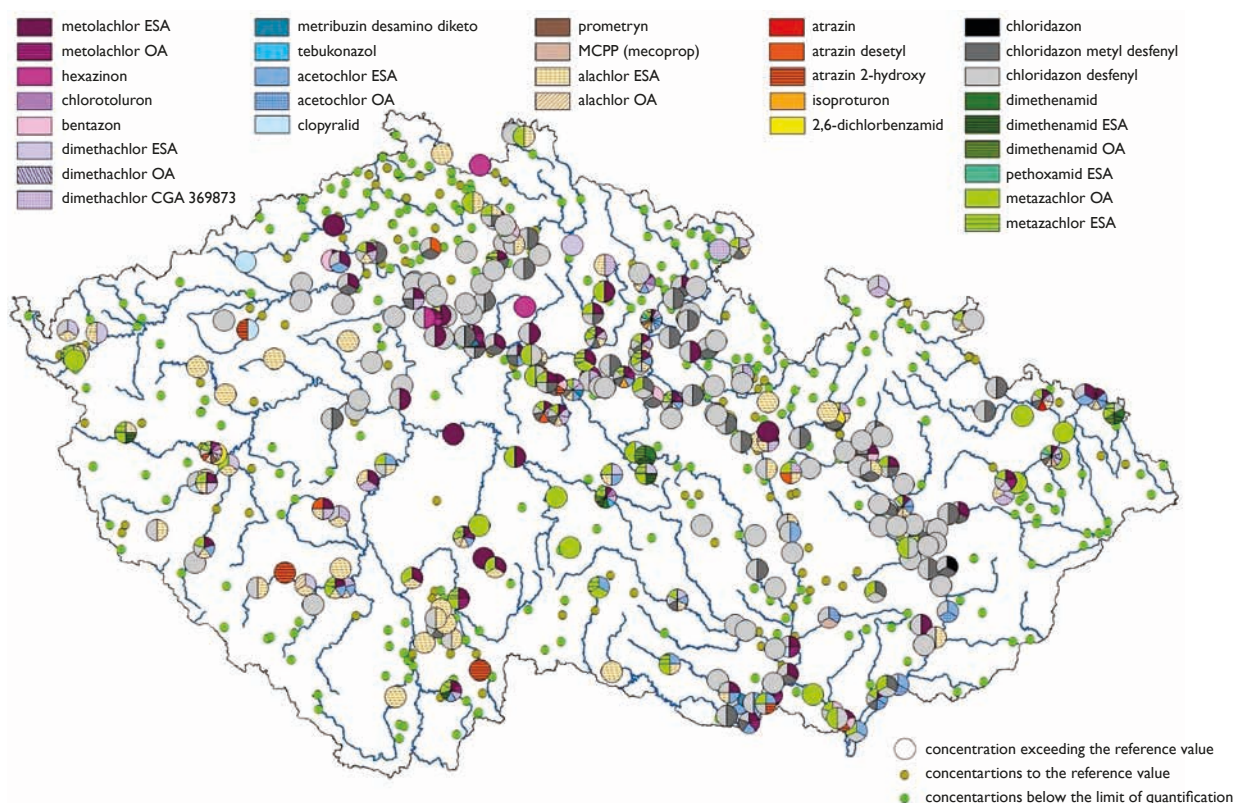


Source: CHMI

Assessment of groundwater quality in 2019, with respect to the most frequently occurring monitored substances of each group only confirm results from the past years. The percentage of exceeding limits for the substances is affected by the extent of groundwater quality monitoring. Operational monitoring in 2019 is a follow-up to the wider situational monitoring from 2017 and 2018: it only monitors groups of indicators with scarcer occurrence at structures where values above the

detection limit were measured in the past. Nevertheless, the change in the manner of monitoring did not affect significantly total assessment of groundwater quality. Quite by the contrary, similar values confirming the slightly deteriorating trend in groundwater quality in terms of foreign substances were measured in 2019. In general, indicator values exceeding limits occur more often in shallow well groundwaters oriented to river alluviums that are most affected by anthropogenic activity.

Figure 3.2.2
Concentrations of pesticides in groundwaters (substances exceeding limit values at two and more sites) in 2019



Source: CHMI

Note: Exceeded limit values under Decree No. 5/2011 Coll. as amended by Regulation of the European Parliament and of the Council 2006/118/EC.



Mlýnská Weir (Source: Ohře River Board)



L. Havelková – Water and Climate Change – Vysočina Region

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. 2019 saw a decrease in the amount of surface water and groundwater abstraction as well as in the volume of discharged water.

Pursuant to the provision in Section 10 of this Decree, the scope of reported data changed after 2001, so that now the registered abstractions (as well as waste water and mine water discharges) only include abstractions exceeding 6,000 m³ per year or 500 m³ per month. The source documents for retrieving the data are the reports submitted to the Czech Statistical Office by the respective river basin administrators before the deadline of 31 March of the following year. The data for 2019 were classified based on the CZ-NACE according to Eurostat. The comparison of data for 2018 and 2019 was based 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: Czech Statistical Office



Renovation of a peatbog at the Zhůřský Stream (Source: MoE)

4.1 Surface water abstractions

The annual volume of surface water abstractions has decreased every year since 2016. In 2019, the total volume of surface water abstracted dropped year-on-year from 1,220.7 million m³ to an all-time low of 1,147 million m³.

A very slight year-on-year increase in abstractions was in abstractions for public water supply networks (by 0.1%) in 2019. By contrast, the Other (incl. construction industry) category rose by 10.7%. Other groups saw a decrease in the abstracted volumes, the highest in Agriculture (incl. irrigation) (by 15.7%), Industry (by 2.3%) and Energy sector (by 10.3%).

In 2019, surface water abstractions dropped in the Elbe River Board (by 12.5%), Ohře River Board (by 3.1%) and Oder River Board (by 8%). By contrary, an increase was reported for the Vltava River Board (by 0.6%) and Morava River Board (by 4.1%).

Exploitation of water sources dropped significantly at all levels after 1990 when valuation of water management services was rectified and the structure of industrial and agricultural production changed. This trend can be seen in Chart 4.1.1.



Fláje Water Reservoir (Source: Ohře River Board)

Surface water abstractions for public water supply networks dropped from 744.9 million m³ in 1990 to 326.2 million m³ in 2019, which means in 2019 was consumed only 43.8% of the abstraction in 1990. Abstractions in agriculture decreased from 97.2 million m³ in 1990 to 27.3 million m³ in 2019, i.e. only 28.1% of the abstraction in 1990. The most significant drop was in industry from 830.1 million m³ in 1990 to 219 million m³, i.e. only 26.4% of the abstraction in 1990. In comparison with 1990, abstractions fell also in the energy sector: from 1,060.9 million m³ in 1990 to all-time low 562.1 million m³, i.e. 53%.

Nevertheless, the abovementioned facts do not imply lower anthropogenic influence of water sources. For instance, so-called “irrecoverable consumption” (difference between abstracted and discharged volumes caused by evaporation in cooling towers of thermal and nuclear plants) in the energy sector grew (with respect to increasing production of electricity in the Czech Republic).



Zlích Weir (Source: Elbe River Board)

Table 4.1.1

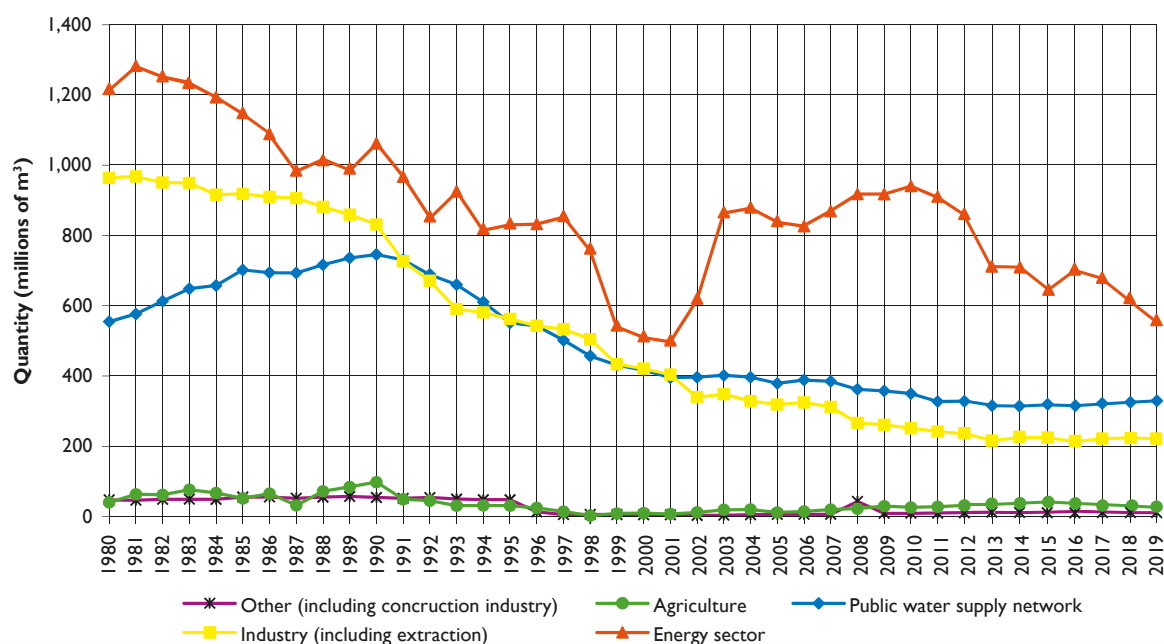
Surface water abstractions by clients exceeding 6,000 m³/year or 500 m³/month in millions of m³ in 2019

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	39.3	25	10.7	62	331.6	12	91.3	65	2.0	94	474.9	258
Vltava	140.7	39	2.3	18	53.1	12	29.8	59	8.2	68	234.1	196
Ohře	42.4	21	2.8	41	41.9	9	38.3	50	0.6	29	126.0	150
Oder	63.3	25	0	0	7.8	16	48.9	34	0.6	33	120.6	108
Morava	40.5	36	11.5	43	127.7	9	10.7	55	1.0	58	191.4	201
Total	326.2	146	27.3	164	562.1	58	219.0	263	12.4	282	1,147.0	913

Source: River Boards, s.e.

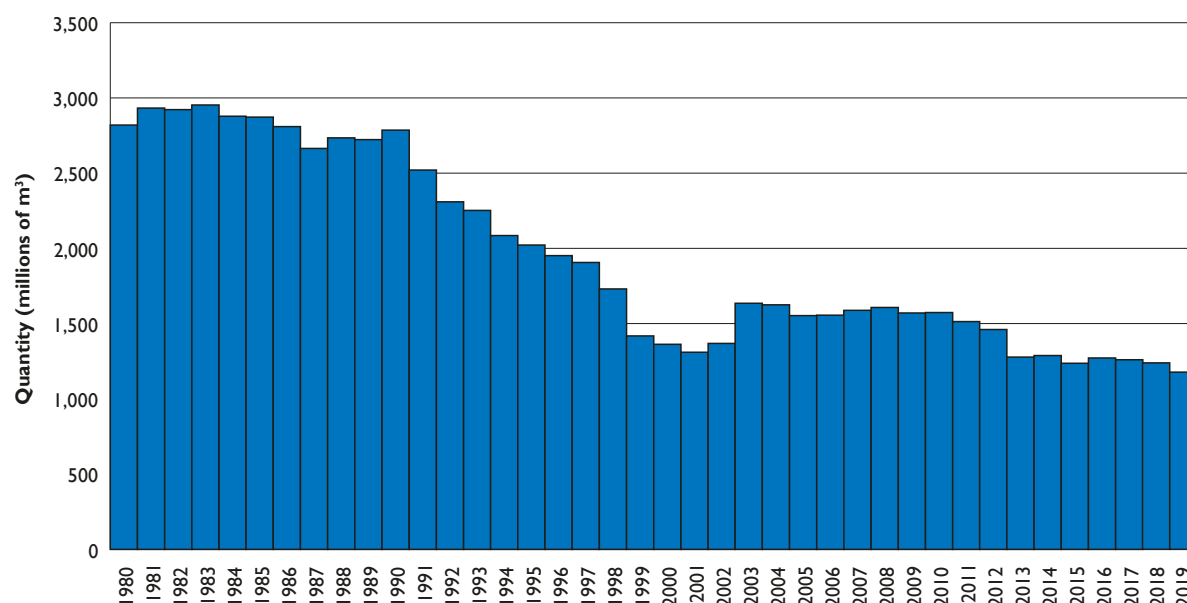
Chart 4.1.1

Surface water abstractions in the Czech Republic by industry in 1980–2019



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

Chart 4.1.2
Surface water abstractions in the Czech Republic in 1980–2019



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

Annual assessment of water source influencing is conducted as part of water balance compiled under Decree No. 431/2001 Coll.: its principle is overall assessment of requirements for maintaining the minimum balance flow rate with flow rates at monitoring profiles that include all activities linked with water management.

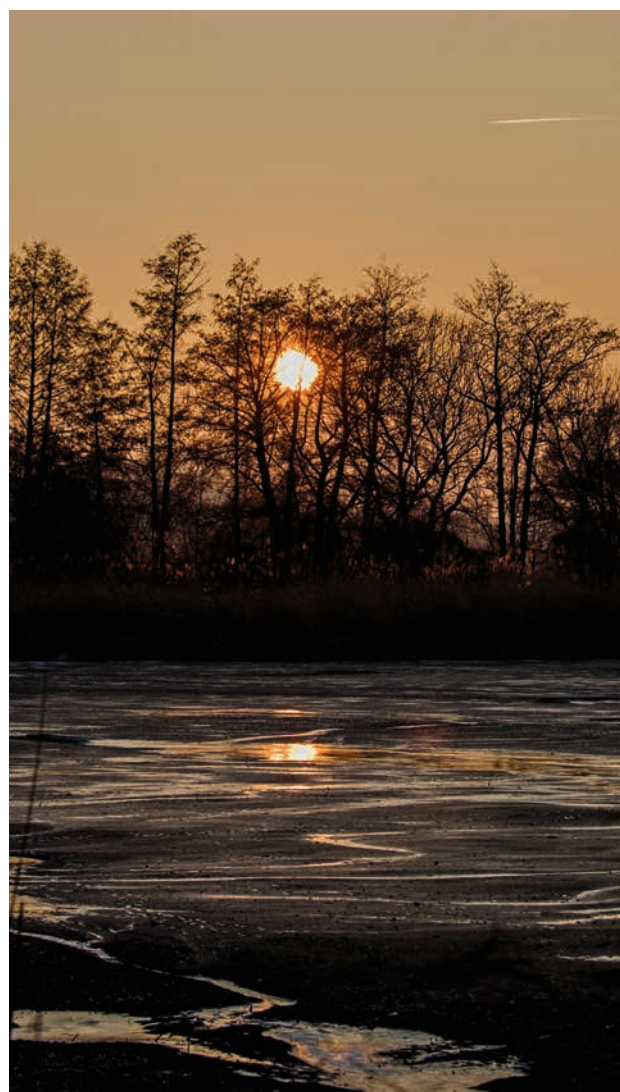
Table 4.1.2 shows water abstractions for technical snowing with more than 6,000 m³/year or 500 m³/month by River Boards, state enterprises.

Table 4.1.2
Surface water abstractions by clients exceeding 6,000 m³/year or 500 m³/month for snowmaking in 2019

River Board, s.e.	Snowmaking ^{*)}	
	Volume in thousands of m³	Number
Elbe	1,722.1	68
Vltava	391.4	14
Ohře	246.1	12
Oder	256.4	17
Morava	703.7	39
Total	3,319.7	150

Source: T. G. Masaryk Water Research Institute using data provided by the River Boards

Note: ^{*)} Ascertained using internal code VHB „260410 – snowmaking of technical snow“ used by the River Boards, s.e., or by the name of the abstraction.



Waterless – Nohavica, Pohořelice District (Author: Veronika Šimečková)

4.2 Groundwater abstractions

Groundwater abstractions decreased in 2019 when compared with 2016–2018 when they were on a slight rise. The volume of groundwater abstracted in 2019 was lowest in history, only 359.3 million m³. In 2018 370.4 million m³ of groundwater was abstracted.

Groundwater volumes fell year-on-year almost in all categories in 2019: abstractions for public water supply networks by 3%, for the energy sector by 14.3%, for industry by 4.1% and for others including construction industry by 1.7%. Agriculture abstracted the same volume as in 2018.

The highest share of total groundwater abstractions was in the Morava River Board (32.9%), the lowest in the Oder River Board (5.1%).



Blue is the colour – courtship of the moor frogs (*Rana arvalis*), the Šatava River, Nosislav (Author: Jana Vampolová)

Table 4.2.1

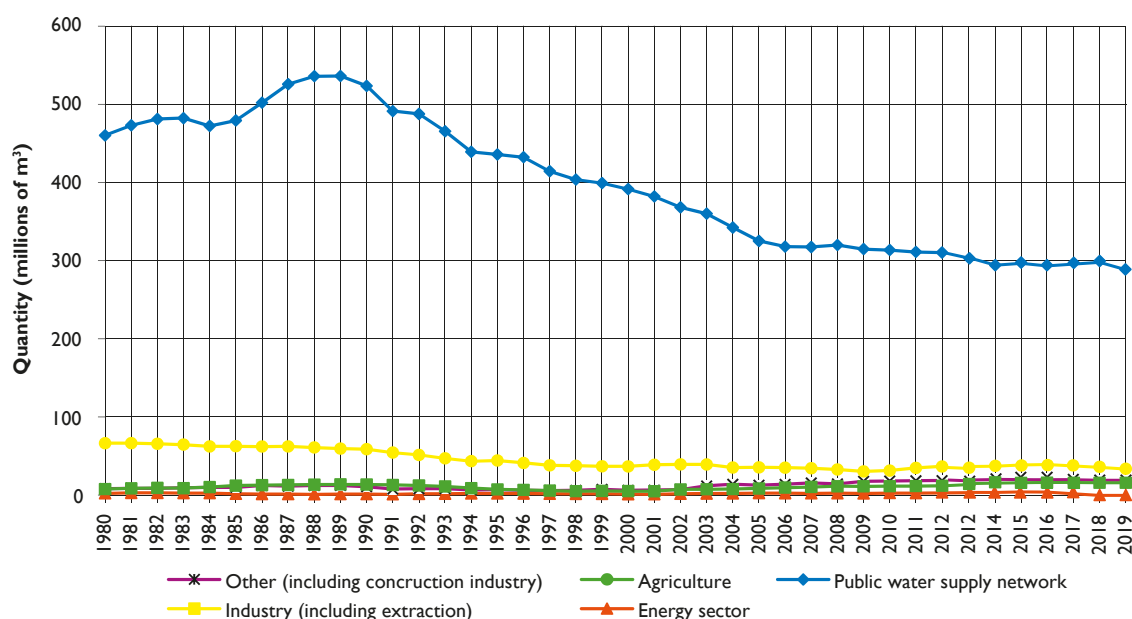
Groundwater abstractions (million m³) by users exceeding 6,000 m³/year or 500 m³/month in 2019

River Board, s.e.	Public water supply networks		Agriculture incl. irrigation		Energy sector		Industry incl. extraction		Others incl. construction industry and sewerage systems		Total	
	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number
Elbe	93.5	690	3.1	215	0.6	8	8.2	132	2.4	92	107.8	1,137
Vltava	32.0	583	5.5	358	0.3	9	10	116	10.0	441	57.8	1,507
Ohře	45.8	309	0.7	28	0.8	6	8.1	110	1.8	34	57.2	487
Oder	16.5	148	0.5	24	0.0	0	1.0	29	0.3	19	18.3	220
Morava	102.3	705	5.5	332	0.1	7	7.7	159	2.6	84	118.2	1,287
Total	290.1	2,435	15.3	957	1.8	30	35.0	546	17.1	670	359.3	4,638

Source: River Boards, s.e.

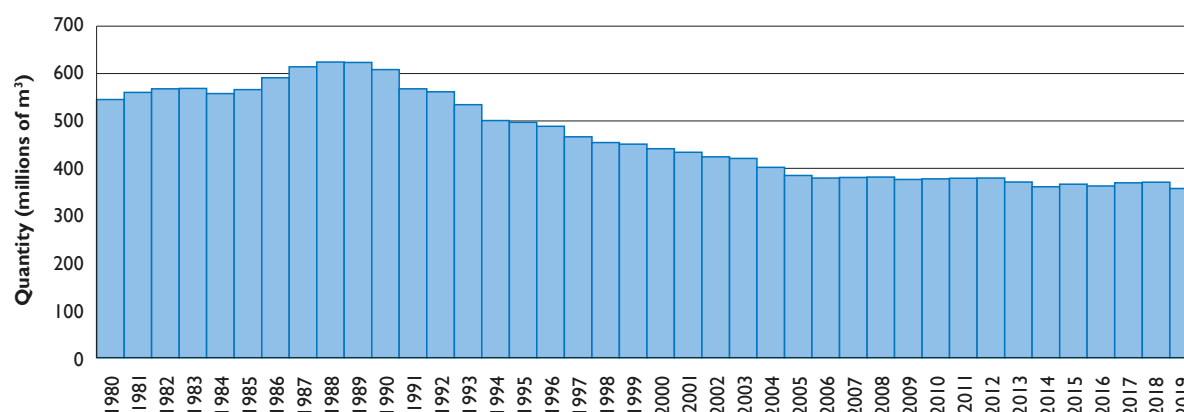
Chart 4.2.1

Groundwater abstractions in the Czech Republic by industry in 1980–2019



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

Chart 4.2.2
Groundwater abstractions in the Czech Republic in 1980–2019



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

From the perspective of the volumes of groundwater abstractions a slight increase was only recorded in the Oder River Board (by 1.7%). Other River Boards, s.e., saw a year-on-year decrease: the Ohře River Board by 6.7%, Morava River Board by 4.7%, Vltava River Board by 1.2% and Elbe River Board by 0.7%.

Comparison from the long-term perspective shows that the highest volumes of groundwater were abstracted in 1988 and 1989, since then the volumes have been decreasing. The volumes of groundwaters have been rather stable since 2006. 2019 saw a drop, the years to come will show whether this was a beginning of a new trend.

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

Table 4.2.2
Groundwater abstractions (in millions of m³) exceeding 6,000 m³/year or 500 m³/month in 2019

River Board, s.e.	Snowmaking ^{*)}	
	Volume (thousands of m³)	Number
Elbe	22.4	2
Vltava	3.7	1
Total	26.1	3

Source: T. G. Masaryk Water Research Institute using data provided by River Boards

Note: ^{*)} Ascertained using internal code VHB „260410 – snowmaking of technical snow“ used by the River Boards, or by the name of the abstraction.

4.3 Wastewater discharges

In 2019, a total of 1,522.3 million m³ of wastewaters and mine waters were discharged into surface waters, which means a year-on-year decrease by approximately 1.2%. The volume of reported discharged waters is the lowest in history.

For the sake of uniformity, the total volume did not include water discharged from fishpond systems as the case was in the previous years.



Dam at the Labská Water Reservoir (Source: Elbe River Board)

The most significant decrease in the volume of discharged waters in 2019 was in agriculture (by 33.3%) and energy sector (by 12.1%). A lower volume of discharged wastewaters, as compared with 2018, was also noticed in industry (by 1.8%). By contrast, there was an increase in public sewerage system (by 6.2%) and in the “others including construction” category (by 2.8%).

From the perspective of discharged wastewater volumes, the highest increase was in the area administered by Morava River Board (by 7.6%), by the Vltava River Board (by 5.7%) and by the Oder River Board (by 1.7%). Other River Boards, s.e., showed a decrease in discharged wastewaters: Elbe River Board by 9.4% and Ohře River Board by 2.7%.

Seen from the long-term perspective, discharge of wastewaters and mine waters has displayed a slight decrease in the volume of discharged water. This is due particularly to the system of discharge reporting with prevalence of discharges free of charge in the past when water was discharged directly into surface waters, not through a wastewater treatment plant and volumes of discharged water was typically estimated on the basis of the invoiced water consumption. By extending sewerage systems, building new wastewater treatment plants with exact measuring of discharged wastewaters and by adopting the new Water Act in 2001, reports on discharged waters became more accurate.

Table 4.3.1

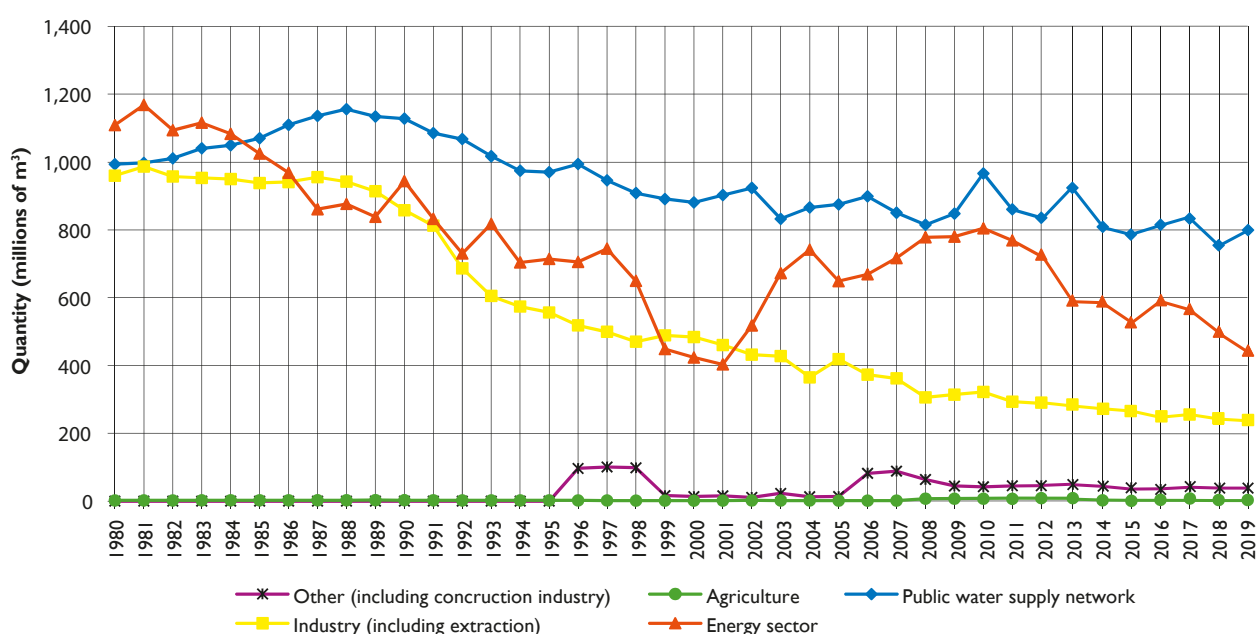
Discharges of wastewaters and mine waters (in millions of m³) into surface waters from sources exceeding 6,000 m³/year or 500 m³/month in 2019

River Board, s.e.	Public water supply networks		Agriculture incl. irrigation		Energy sector		Industry incl. extraction		Others incl. construction industry and public sewerage systems		Total	
	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number	Volume	Number
Elbe	167.4	737	0.04	4	300.5	22	78.0	157	2.5	62	548.44	982
Vltava	259.0	776	0.80	4	17.5	23	33.5	143	28.8	692	339.6	1,638
Ohře	75.1	287	1.90	2	19.0	22	65.8	143	2.0	28	163.8	482
Oder	94.9	305	0.02	2	7.4	15	47.7	75	3.8	72	153.82	469
Morava	202.3	1,156	0.30	6	94.1	16	17.3	140	2.7	79	316.7	1,397
Total	798.7	3,261	3.06	18	438.5	98	242.3	658	39.8	933	1,522.36	4,968

Source: River Boards, s.e.

Chart 4.3.1

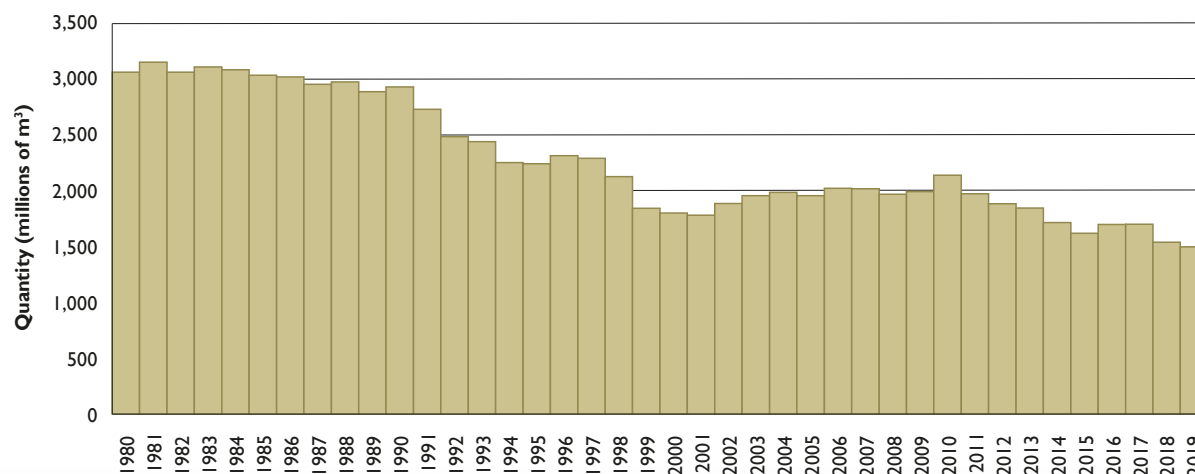
Discharge of wastewaters in the Czech Republic by industry in 1980–2019



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

Chart 4.3.2

Discharge of wastewaters in the Czech Republic in 1980–2019



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

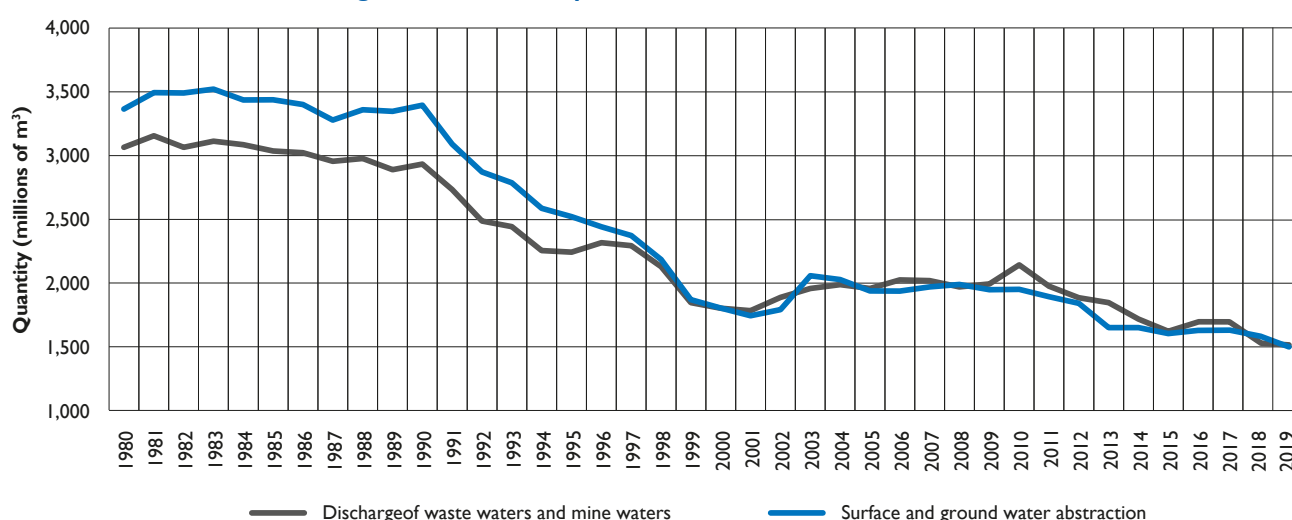
4.4 Overall comparison of water management

In 1980–2018 there was a very significant decrease in water abstractions and discharging after 1990, whereas since 2001 there was a slight growth, however, after 2010 we saw another decrease in the volume of abstractions and discharging. The volumes of abstracted and discharged water in 2019 reached all-time lowest values. In comparison with the previous year, the volume of discharged water was again slightly higher than the volume of the abstracted water, even though the difference was rather insignificant.

After 1990, there was a significant drop in the volumes of abstracted and discharged water. The difference between the abstracted and discharged volumes of water before 1995 can be attributed to the different method of reporting discharge, higher leakage from water supply systems and non-uniform sewerage network in many smaller towns (agglomerations with more than 2,000 equivalent citizens were only furnished with sewerage systems after the Czech Republic joining the EU in 2004).

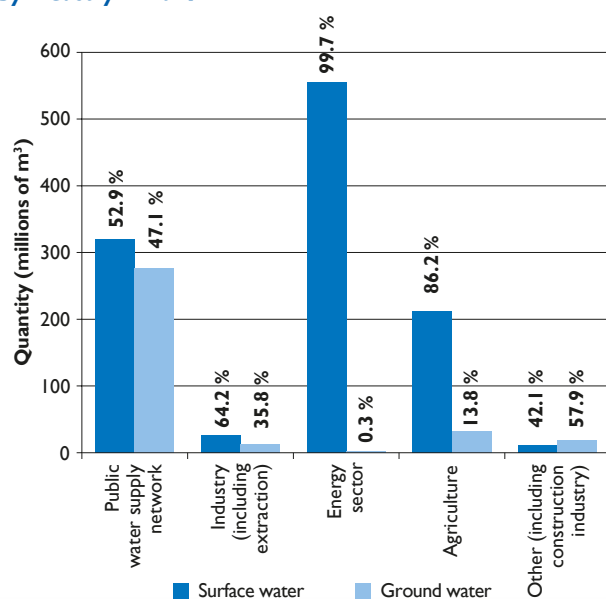
In dry years, the values of abstracted and discharged volumes of water are similar; in more abundant years we notice higher volumes of discharged water than water abstracted which is linked with streaming a part of rainwater into the sewerage system above the volume of measured consumption in the water supply system.

Chart 4.4.1
Water abstractions and discharges in the Czech Republic in 1980–2019



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

Chart 4.4.2
Comparison of surface water and groundwater abstractions by industry in 2019



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

In connection with the drop in surface water abstractions in 2019 (especially in energy sector, see Chart 4.1.1) there was also a drop in the discharged volume. A total of 1.52 billion m³ of waters were discharged, whereas, the volume of surface water abstractions amounted to 1.51 billion m³.

When comparing groundwater and surface water abstractions by industries, we can conclude that abstractions for water supply are almost identical, whereas majority of other industries uses prevalently surface water.

In 2019, public water supply systems abstracted (as the case was in 2018) more water from surface sources, which was given by the prolonged period of drought and decreasing level of groundwaters. The water used by the energy sector is almost 100% surface water, which is also the case in other industries. Agriculture covers its needs with two thirds of surface water. The only industry – others incl. construction – abstracts larger volumes of groundwaters than surface waters. This is probably given also by the price of groundwater that is significantly lower than the price of the surface water.



K. Brusová – Life in Danger – Vysočina Region

5. SOURCES OF POLLUTION

5.1 Point sources of pollution

Surface water quality is affected primarily by point sources of pollution such as municipalities, industrial plants and farms with intensive agricultural animal production. The level of water protection against pollution is most often assessed based on the development of the produced and discharged pollution.

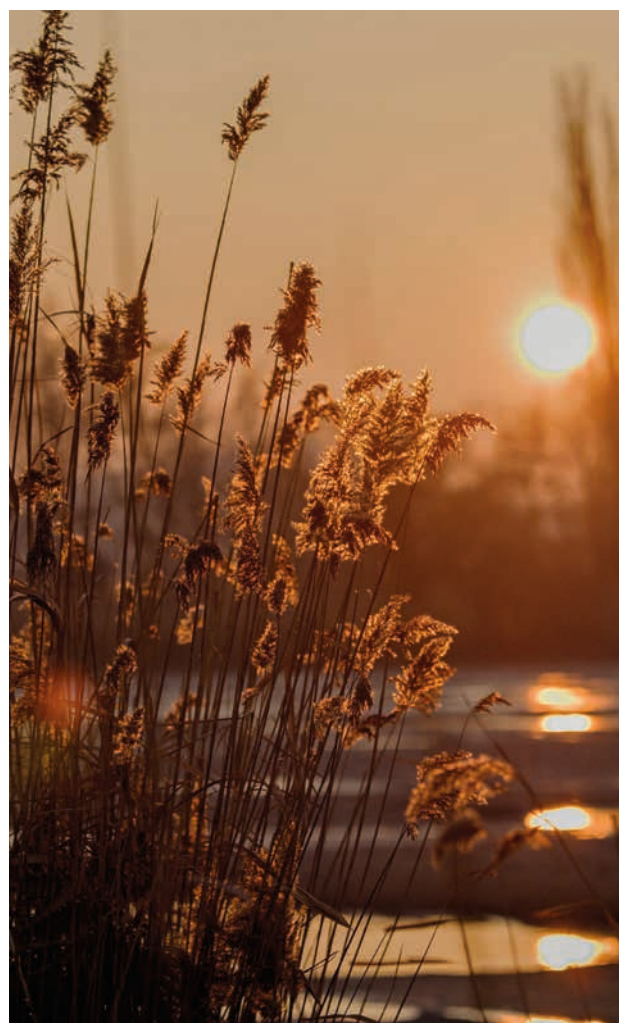
The term “produced pollution” refers to the volume of pollution contained in produced (untreated) wastewaters. In line with EU requirements, the Czech Republic pays increased attention to data collection and analysis of the situation concerning pollution. In particular, data are collected from a larger number of reporting entities under so-called water balance in line with requirements of Decree No. 431/2001 Coll., on Content of Water Balance, Kind of its Compilation and on Data for Water Balance.

In comparison with 2018, the produced pollution increased in all indicators: BOD₅ (by 4.7%), COD_{Cr} (by 4.9%), DIS (by 3.4%), N_{inorg} (by 3.7%), NM (non-dissolved matters dried at 105°C) – by 3.5% and P_{total} (total phosphorus) – by 6.1%.

The pollution discharged in surface waters decreased in 2019 in only one indicator (out of six): N_{inorg} (by 3.4%), whereas all the other indicators increased: BOD₅ (by 0.8%), COD_{Cr} (by 5%), NM (by 3.1%), DIS (by 0.7%), P_{total} (by 3.6%). Values of the indicators in the discharged (and charged for) pollution since 1990 is shown in Chart 5.1.1.

Between 1990 and 2019 there was a drop in the amount of discharged pollution as shown by the following indicators: BOD₅ by 96.5%, COD_{Cr} by 90.8% and NL by 95.2%. At the same time there was a decrease in the amount of discharged dangerous and extraordinarily harmful substances. There was also a significant drop in macronutrients (nitrogen, phosphorus) that was 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 WWTP.

Table 5.1.1 shows that monitored values DIS of discharged pollution under the territorial scope of the Vltava River Board



January sunset – Nohavica, Pohořelicko (Author: Veronika Šimečková)

and the Oder River Board are higher than produced pollution. The 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 sample, or the data about produced pollution might not be complete.

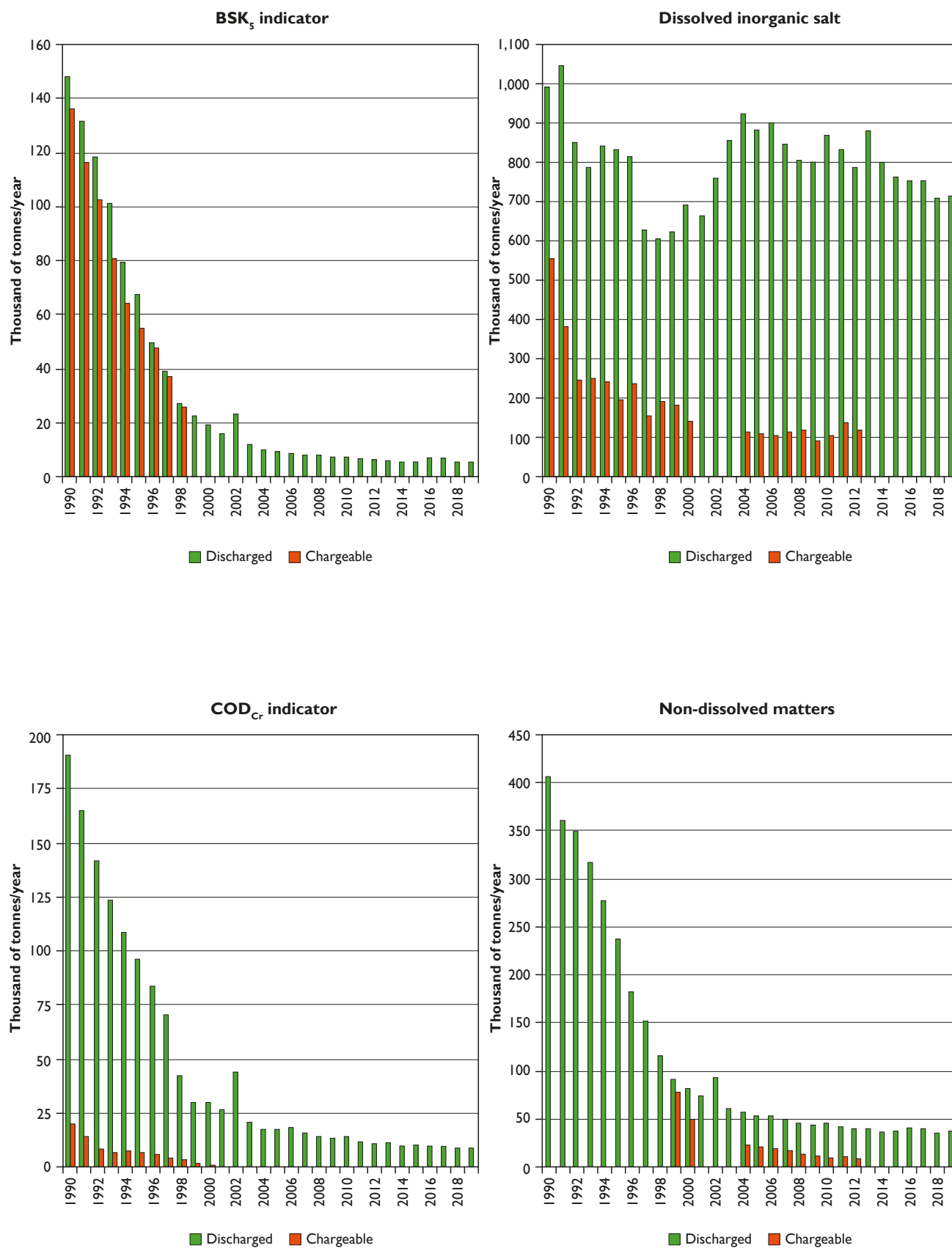
Table 5.1.1
Produced and discharged pollution in 2019

River Board	Produced pollution (tonnes/year)						Discharged pollution (tonnes/year)					
	BOD ₅	COD	NM	DIS	N _{inorg}	P _{total}	BOD ₅	COD	NM	DIS	N _{inorg}	P _{total}
Elbe	56,325	135,404	51,585	199,645	7,494	1,204	1,443	11,749	2,738	195,340	2,113	205
Vltava	92,676	222,097	99,350	108,725	9,531	2,509	1,348	9,549	2,182	113,498	2,473	253
Ohře	19,807	42,679	20,114	86,417	2,476	808	444	3,432	1,244	83,423	1,376	269
Oder	31,348	63,812	24,957	171,134	3,704	611	613	5,051	1,352	185,888	1,136	129
Morava	69,748	169,929	81,859	142,212	8,074	1,821	1,266	7,749	1,523	134,488	2,200	191

Source: T. G. Masaryk Water Research Institute using data provided by the Czech Statistical Office and River Boards, s.e.

Chart 5.1.1

Discharged pollution and pollution on which charges were imposed in 1990–2019



Source: T. G. Masaryk Water Research Institute using data provided by the Czech Statistical Office and River Boards, s.e.

5.2 Area sources of pollution

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 and also by phosphorous, though not so much.

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 by Government Regulation No. 448/2012 Coll., Government Regulation No. 400/2013 Coll. and Government Regulation No. 117/2014 Coll. This legal regulation defines (registers) so-called vulnerable areas and initiates an action programme.

Direct funding and some subsidies from the Rural Development Programme (hereinafter referred to as 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” (hereinafter referred to as the “GAEC”) and adhering to “Compulsory Requirements for Farming” (hereinafter referred to as the “CRF”) in the sphere of Environment, Climate Change and Good Agricultural and Environmental Condition of Soil, Public Health, Health of Animals and Plants and Good Life Conditions for Animals.

In case a support applicant fails to meet with the requirements at any time of the calendar year in which they file the application for payment, the subsidy may be decreased or refused.

Conditions related to water pollution are CRF I – and GAEC I standards – unfertilized belts alongside watercourses, protection distances for application of plant protection preparations with the aim of protecting aquatic organisms and GAEC 3 – handling with harmful substances.

Water erosion of land

The Czech Republic, as the case is with other countries, is more and more often exposed to hydrological extremes, which is due to the climate change. It can be expected that regions affected by such extremes will expand significantly in the future. One of the key tools that can mitigate the impact of the climate change is suitable farming on agricultural land. In 2019, monitoring of water erosion recorded damage to 24% of water bodies.

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 clogging of watercourse and reservoir beds. During prolonged periods of drought, sediments in watercourses may be subject to accelerated

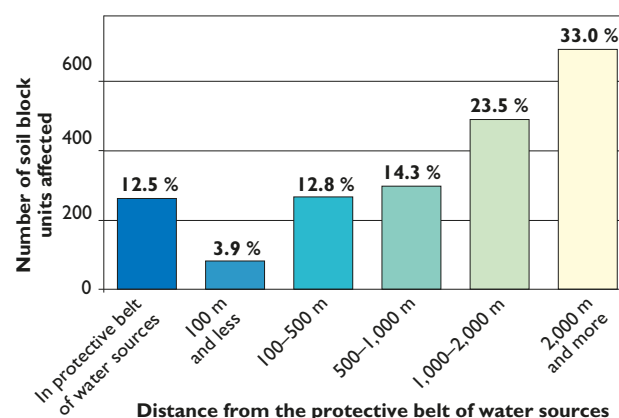
mineralization and once the water levels increase, water quality is deteriorated. This means that water erosion deteriorates water quality, contributes to eutrophication and complicates the use of water. Together with some extensive single-functional drainage systems, water erosion decreases water retention and accumulation in the land.

The basic tool for limiting water erosion in the authority of the Ministry of Agriculture (hereinafter referred to as the “MoA”), is so-called “good agricultural and environmental condition of the soil standard No. 5 (GAEC 5) that conditions payment of agricultural grants in full amounts by restricting certain crops in areas threatened by water erosion. In particular, it defines crops that are dangerous in terms of erosion that are completely banned to be grown or allowed only as long as certain soil protection technologies are used such as protective belt, undersow, strip cropping, sowing into uncultivated soil etc. The extent of duties under GAEC 5 applies to approximately 25% of the arable land and in case of failing to meet the given conditions, farmers’ total subsidies paid from the EU funds are reduced by percentage sanctions.

The unfavourable condition of extremely large blocks of soil is addressed by GAEC 7 starting from 2020, focusing on landscape biodiversity. At the same time, it complements anti erosion procedures divided in GAEC 5, as it primarily related to land threatened by erosion. The principle of GAEC 7 (namely GAEC 7d) monocultural areas are limited up to 30 hectares and have to be interrupted with a protective belt or different crops have to be grown there. The new condition that is to concern almost 600,000 hectares of arable land is expected to result in a more favourable landscape structure, to retain water in farmland and to contribute to other anti-erosion measures. As of 2021, conditions defined in GAEC 7d shall apply to all land classified as “common arable land”.

GAEC standards are defined in Government Resolution No. 48/2017 Coll., on Defining Requirements in Accordance with Acts and Standards of Good Agricultural and Environmental Condition for the sphere of rules concerning conditions (and consequences of their breach) for receiving some agricultural support, as amended.

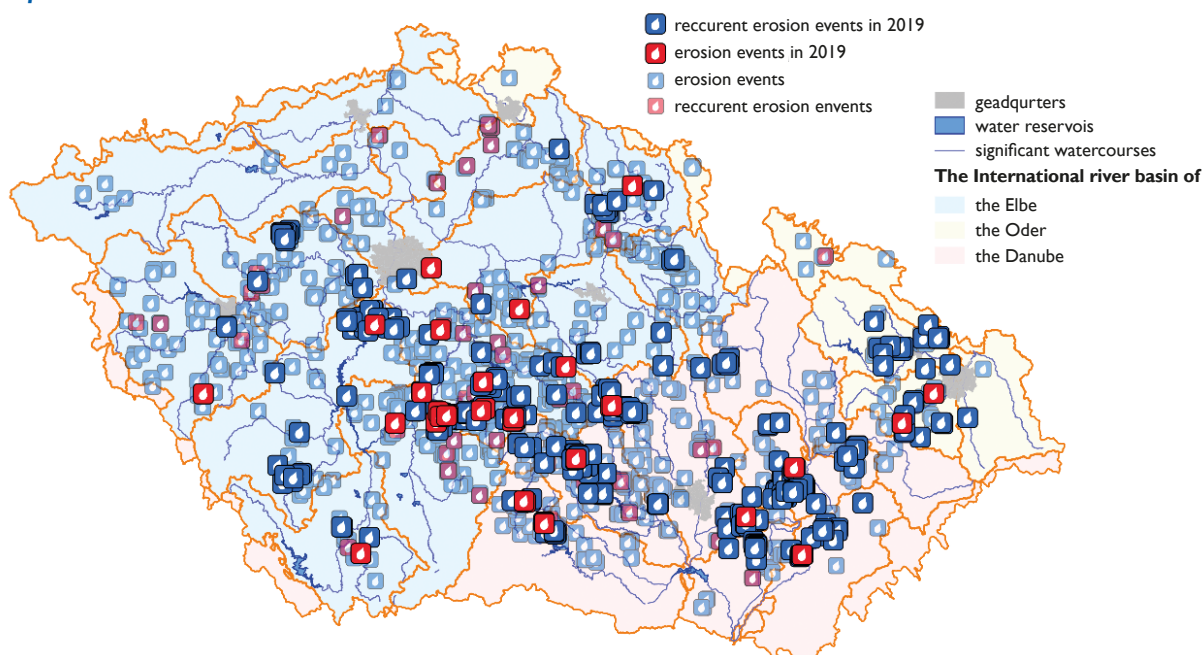
Chart 5.2.1
Recorded erosion events by distance from the protective belt of water sources in 2019



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 2019



Source: Research Institute for Soil and Water Conservation

Since 2012, Research Institute for Soil and Water Conservation, p.r.i. (hereinafter referred to as the “Research Institute for Soil and Water Conservation”) 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.

Monitored events in 2019 showed damage to water bodies in 24% of the cases, which means a year-on-year growth by more than 4%. Monitoring identified especially visible damage such as sediments. Runoff of erosion sediments carry other substances (pesticides, fertilizers, nutrients, etc.) that may get through the hydrographic network to water sources, meaning the negative impact of erosion events on water source quality has several levels.

As Graph 5.2.1 shows, almost 30% affected soil are within 500 m from water source protection belts and 12.5% of the blocks is inside the belts. This long-term assessment displays year-on-year decrease in single-digit percent.

Due to runoff of erosion sediments (according to the analyses, about 1.4 million m³ of sediments from the agricultural land fund gets to watercourses) and intake of other substances (pesticides, nutrients) that get to water sources through hydrographic network and drainage systems affects adversely the water source quality. Major part of erosion events has negative impact on the water source quality, the same applies to pollution through drainage: the amount of N-NO₃ offtake from arable drained land in the long-term average is approximately 30 kg/ha¹/year¹ (Zajiček et al. 2019).

In order to mitigate impacts and effects of hydrological extremes in the landscape, it is necessary to adapt farming methods and use of agricultural landscape. Such measures can be proposed,

e.g., using the tools published at: <https://geoportal.vumop.cz>, in particular consumptive water use calculator <https://vlaha.vumop.cz> that allows for determining water balance for given sowing methods and locations (with accuracy to single blocks of soil), define enclaves threatened by various degree of drought, determine water need values and amount of irrigation. This tool helped ascertain that water deficit of the water balance, i.e. the difference between crop consumptive water use (according to FAO-56) and water sources available (rainfall, amount of rising water, water reserve in soil at the beginning of the growing season) grew sharply in 2009–2018 in comparison with the current climate average (1981–2010). The highest growth of areas with medium and strong stress was detected in maize (from 9,746 to 11,383 km²) and semi-early potatoes (from 10,077 to 12,125 km²). Crop water stress is a deficiency in water supply available for plants, defined by the “point of reduced water availability” that is markedly different for different types of soil and crops in different stages of growth (Duffková et al. 2020).

An analysis of biotechnical measures including modernization and/or elimination of drainage systems with the aim of addressing hydrological extremes, increasing water retention and improving its quality has been conducted in the Vltava River Basin (28,000 km²) split into sub-basins (50–300 ha) (<https://atlaspl.vumop.cz/>).

At present, more than 50% of the total 4.15 million ha of farming land in the Czech Republic is threatened by water erosion. The maximum loss of soil in the Czech Republic is calculated to be approximately 21 tonnes of topsoil a year, which accounts for damage amounting to CZK 10 billion per year.

A suitable indicator of farmland threat by water erosion is the $C_p \cdot P_p$ value expressing the degree of vulnerability of an area to water erosion using the maximum acceptable value of the factor of the protective influence of vegetation and anti-erosion

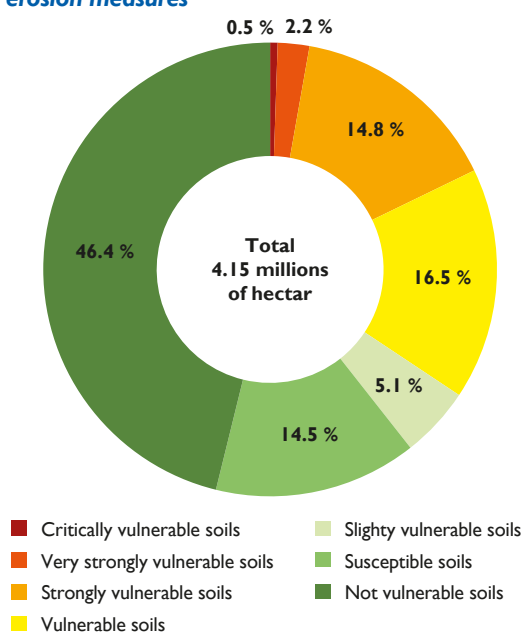
Table 5.2.1
Exposure of agricultural land to water erosion as of 31. 12. 2019

Category $C_p \cdot P_p$	Degree of threat	Recommended general management	Agricultural land fund	
			Share (%)	Surface (ha)
0.005 and less	Critically threatened land	protective grassing	0.50	20,743
0.006 – 0.020	Very strongly threatened land	perennial crops or protective grassing	2.17	90,316
0.021 – 0.100	Strongly threatened land	exclusion of crops dangerous in terms of erosion and higher share of perennial crops	14.84	616,502
0.101 – 0.200	Threatened land	exclusion of crops dangerous in terms of erosion and use of land protecting technology	16.55	687,324
0.201 – 0.240	Slightly threatened land	changing crops in belts or excluding crops dangerous in terms of erosion	5.06	210,266
0.241 – 0.400	Land prone to erosion	crops dangerous in terms of erosion grown with land protecting technology	14.52	603,069
0.401 and more	No threat	no limitation	46.36	1,925,922
Total			100.00	4,154,142

Source: Research Institute for Soil and Water Conservation

Note: Degree of exposure to water erosion is expressed using the maximum acceptable value of the factor of protective influence of vegetation and anti-erosion measures ($C_p \cdot P_p$) with regionalised factor of erosion effect of rain (R).

Chart 5.2.2
Erosion exposure expressed by the maximum acceptable value of the factor of protective influence of the vegetation and erosion measures



Source: Research Institute for Soil and Water Conservation

measures (the required protective influence of vegetation and anti-erosion measures with respect to the acceptable mean annual loss of soil). Since 2015, the values are classified in seven categories, each of them defining generally the sowing procedures or sowing procedures using soil conservation technologies that meet required values of the $C_p \cdot P_p$ factor.

5.3 Accidental pollution

Surface water and groundwater quality is also affected by the adverse impacts of accidental pollution. In 2019, the Czech Environmental Inspection registered a total

of 96 accidental releases of harmful substances into surface waters and 4 accidental releases into groundwaters and imposed 518 fines totalling 21 million CZK in the sphere of water management.

Pursuant to the Water Act, the Czech Environmental Inspection (hereinafter referred to as the "CEI") has kept central records of accidents since 2002. In 2019, the CEI registered a total of 165 accidents that met the definition of accidents under Section 40 of Act No. 254/2001 Coll., the Water Act. Additional accidents were reported to the CEI in 2019 that were not included in the central records of accidents because of their negligible impact on water quality.

The most common accidents continue to be those caused by transport. In 2019, 55 such accidents were registered, which accounts for 33.3% of the total number of accidents.

23 accidents were accompanied by fish kill in 2019, which accounts (same as in the previous year) for 14% of the total number of accidents. Six accidents were caused by farming activity. The accidents resulted in groundwater pollution in three cases. The inflictors of pollution were known in 83 cases.

Out of the total number of 165 recorded cases, the most numerous group of pollutants were oil products: 96 of the total number of registered cases, which accounts for 58.2%, followed by waste waters (10.9%) and chemical substances excluding heavy metals (9.1%). The character of the pollutants was not identified in 15 accidents (9.1%).

Classified by the cause (inflictor) of the accident (CZ-NACE), the most numerous were accidents falling under group H – transport and storage (33.3%), followed by accidents in section C – processing industry (7.3%) and accidents in section E – water supply (4.9%). The industry of inflictors could not be identified in 41.8% of the cases.

In 2019, the CEI imposed 518 penalties, of which 505 penalties became fully effective as of 31 December 2019.



B. Černá – A Dam – Ústí nad Labem Region

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 Boards, s.e., Morava River Boards, s.e., Oder River Boards, s.e., Vltava River Boards, s.e., and Forests of the Czech Republic, s.e. (hereinafter referred to as the "Forests of the Czech Republic"). These administrators administer 94.5% of total watercourse length in the Czech Republic. The remaining 5.5% of watercourse lengths are administered 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)	
		2018	2019
Significant watercourses	Elbe River Board, s. e.	3,589	3,589
	Vltava River Board, s. e.	5,533	5,539
	Ohře River Board, s. e.	2,377	2,377
	Oder River Board, s. e.	1,111	1,111
	Morava River Board, s. e.	3,759	3,761
	River Boards in total	16,369	16,377
Minor watercourses	Forests of the Czech Republic, s. e.	38,538	38,416
	River Boards, s. e., in total	38,839	38,866
	Other administrators ¹⁾	5,453	5,449
	Total	82,830	82,731
Watercourses in total		99,198	99,199

Source: MoA

Note: Digital lengths of watercourses from the Central Register 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. I to Decree No. 178/2012 Coll. that defines a list of significant watercourses and methods for conducting activities linked with watercourse administration. It is an overview of 819 watercourses including their identifiers (watercourse ID); the overview also includes small watercourses that are so-called "border" watercourses. Significant watercourses with total length of 16,377 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 Dyje 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 administration 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(4) 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 Register of Watercourses (hereinafter referred to as the "CRW"), the total length of minor watercourses is 82,731 km. The process of reassessment, refining and reclassification of the mapping of the designated minor watercourses continues to be underway.

Public administration bodies and the general public can find detailed information on the administration of watercourse in a CRW online application which is available at the website of the Ministry of Agriculture (www.eagri.cz) and on the Water Management Information Portal (www.voda.gov.cz).



Completed chute at the Opatovice Water Reservoir (Source: Morava River Board)

Watercourse administrators under the Ministry of Agriculture expended on significant and minor watercourse administration funds totalling to CZK 3.2 billion, the similar amount as in the previous year.

Table 6.1.2
Money spent on watercourse management in 2019

Watercourse administrator	Significant watercourses	Minor watercourses	Total
	in millions of CZK		
Elbe River Board	449.9	95.6	545.4
Vltava River Board	408.0	148.2	556.2
Ohře River Board	432.6	57.3	489.9
Oder River Board	299.9	90.4	390.3
Morava River Board	413.0	137.0	550.0
River Boards in total	2,003.3	528.4	2,531.8
Forests of the Czech Republic ^{*)}	-	623.5	623.5
Total	2,003.3	1,151.9	3,155.3

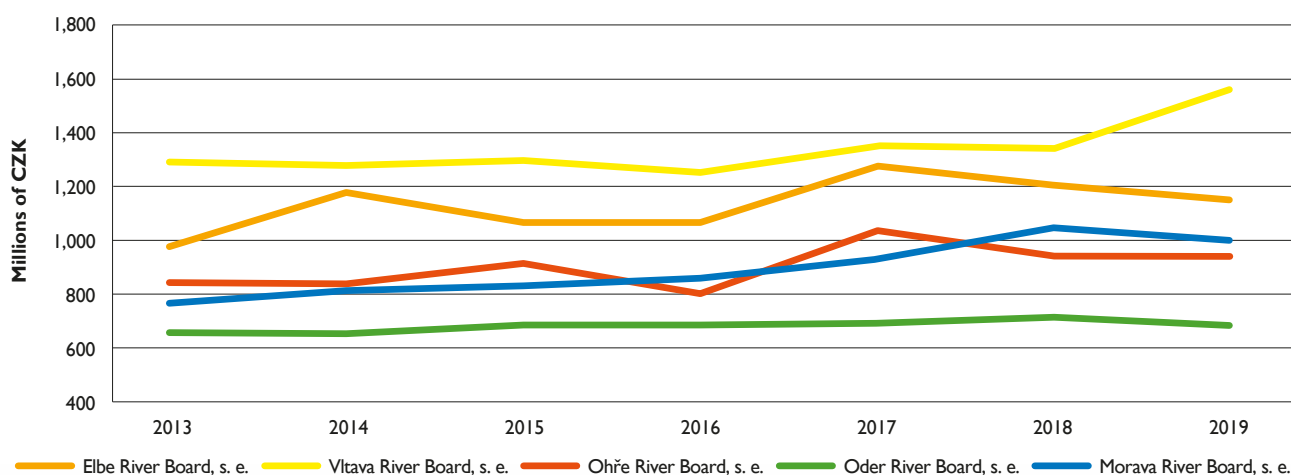
Source: MoA

Note: ^{*)} The item includes funds intended for watercourse and reservoir management.

The acquisition value of fixed assets linked with watercourses rose year-on-year by CZK 0.85 billion in 2019 to CZK 53.75 billion.

The year-on-year growth is mainly caused by the increase in the non-current tangible assets generated by the renewal and planned development of entrusted property in the form of routine investment construction and by entries of the assets taken over and the completed hydraulic structures in the accounting records. In 2019, none of the administrators of watercourses completed, approved or took over a hydraulic structure that would significantly influence the indicators expressing the acquisition value of the non-current tangible assets.

Chart 6.2.1
Revenues of River Boards, s.e., in 2013–2019



Source: MoA

Table 6.1.3
Purchase value of fixed assets related to watercourse management

Watercourse administrator	2018	2019
	in billions of CZK	
Elbe River Board	10.64	10.70
Vltava River Board	11.16	11.38
Ohře River Board	10.25	10.40
Oder River Board	6.25	6.39
Morava River Board	8.60	8.78
River Boards in total	46.90	47.65
Forests of the Czech Republic ^{*)}	6.00	6.10
Total	52.90	53.75

Source: MoA

6.2 River Boards, state enterprises

In 2019, the total revenues generated by the River Boards, state enterprises, amounted to CZK 5.35 billion, which means a year-on-year increase of almost CZK 95 million, i.e. by 1.8%. The biggest increase by 54.7% was in revenue from special-purpose non-investment grants from the state budget. By contrast, the biggest drop of 22.4% was in other revenues.

The year-on-year increase in revenues of River Boards, s.e., was given by a significant increase in special-purpose non-investment grants (an increase by more than CZK 117 million) and also by an increase in revenues from electric power generation (an increase by CZK 102 million). Revenues from the use of weirs also rose by almost 10%. Revenue in two items dropped, whereas other revenues decreased year-on-year by almost CZK 114 million. Payments for surface water abstractions decreased by 0.6%, i.e. by CZK 22 million.

Chart 6.2.1 shows the development of revenues generated by the respective River Boards, s.e., over a longer period of time. While the revenues in the Vltava, Morava and Oder River Boards have quite a gradual development, the revenues of the Ohře River Board are rather volatile.

Table 6.2.1
Structure of the revenues of River Boards, state enterprises, in 2019

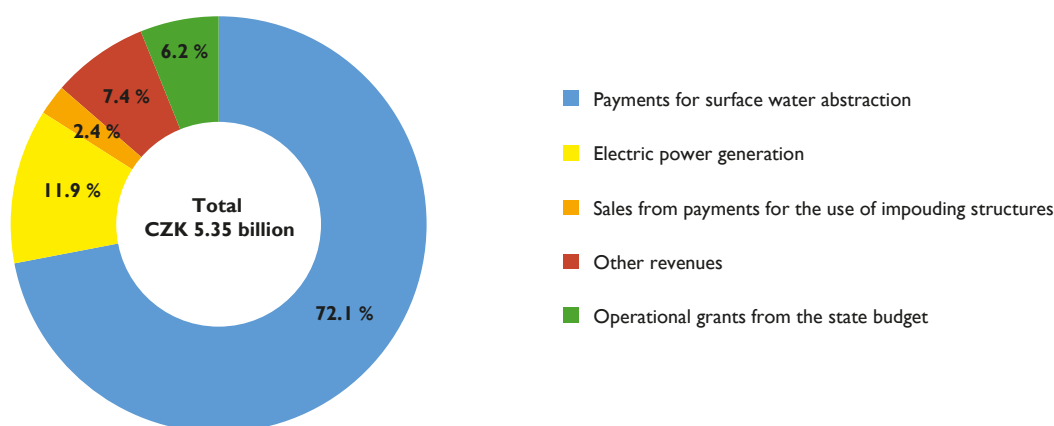
Indicator	River Boards, state enterprises					Total
	Elbe	Vltava	Ohře	Oder	Morava	
	thousands of CZK					
Payments for surface water abstractions	993,443	861,178	621,725	553,025	827,038	3,856,409
Electric power generation	48,758	271,244	213,417 ^{a)}	79,630	22,215	635,264
Revenues from the use of weirs	6,900	112,390	2,706	0	4,956	126,952
Other revenues	86,446	108,072	96,623	45,375	61,124	397,640
Special-purpose non-investments grants ¹⁾	17,044	210,184	7,329	6,573	90,358	331,488
River Boards in total	1,152,591	1,563,068	941,800	684,603	1,005,691	5,347,753

Source: River Boards, s.e.

Note: ^{a)} 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.

Chart 6.2.2
Structure of the revenues of River Boards, state enterprises, in 2019



Source: MoA

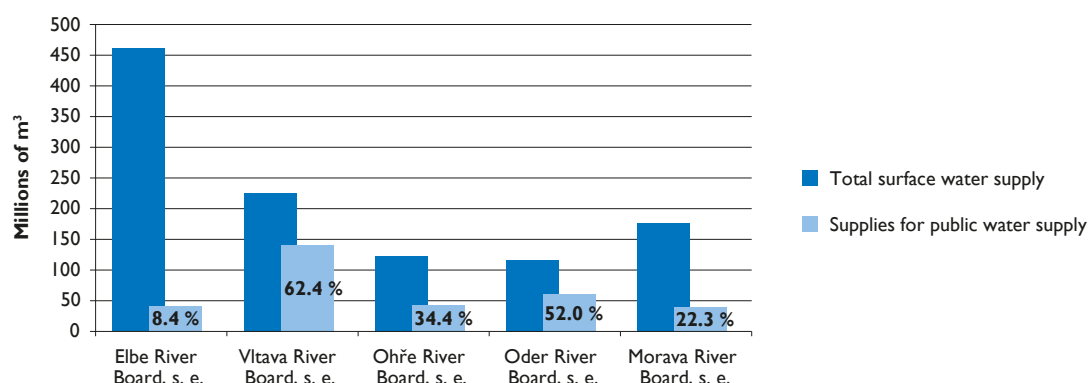
Table 6.2.2
Surface water supplies charged for administered by River Boards, state enterprises, in 2013–2019

River Board, s.e.		2013	2014	2015	2016	2017	2018	2019
		thousands of m ³						
Elbe	a)	600,131	609,118	547,658	614,377	583,838	526,598	460,970
	b)	35,782	36,022	37,271	37,707	38,873	39,017	38,861
Vltava	a)	214,195	211,473	213,944	204,885	219,138	224,819	224,871
	b)	134,750	130,214	134,544	134,333	139,485	142,813	140,292
Ohře	a)	121,167	118,390	120,352	119,384	122,837	124,054	122,628
	b)	42,212	40,583	40,777	40,305	40,953	40,919	42,243
Oder	a)	136,614	135,223	136,832	127,995	124,144	125,379	115,696
	b)	65,105	64,920	65,045	62,306	60,592	60,901	60,204
Morava	a)	155,848	162,058	160,288	151,857	156,666	168,582	176,873
	b)	30,951	32,262	32,975	32,816	35,763	37,715	39,478
Total	a)	1,227,955	1,236,262	1,179,074	1,218,498	1,206,623	1,169,432	1,101,038
	b)	308,800	304,001	310,612	307,467	315,666	321,365	321,078

Source: River Boards, s.e.

Note: a) charged for in total,

b) of which for public water supply systems.

Chart 6.2.3**Surface water supplies charged for administered by River Boards, state enterprises, by purpose in 2019**

Source: River Boards, s.e.

Average price for other surface water abstractions per m³ in 2019 was CZK 4.97, which means a year-on-year increase of 2.5%. It is a “factually regulated price” that may only include justified costs, reasonable profit and tax pursuant to the relevant tax regulations.

In addition to flow cooling and other abstractions, abstraction levels and prices of surface water intended for charged agricultural irrigation and flooding of artificial depressions in the landscape have been monitored since 2003. Same as in the previous years, water for agricultural irrigation was abstracted in 2019 in areas administered by the Elbe River Board, s.e., and Vltava River Board, s.e., and for the first time in areas administered by the Ohře River Board, s.e. These abstractions amounted to a total of 187 thousand m³, which

means a year-on-year decrease by 32.7%. Surface water abstractions intended for flooding artificial depressions in the landscape were not reported by any River Board, s.e., in 2019. In the current approach the current prices reflect the costs of the River Boards linked with administering the river basins, not the value of surface water. The current prices are subject to regulation pursuant to Act No. 526/1990 Coll., on prices, and the rules stipulated by the decisions of the Ministry of Finance on price regulation, i.e. by the relevant notifications issuing the list of goods with regulated prices which are published in the Price Bulletin.

Revenues from surface water abstraction fell year-on-year in 2019 by 0.6%, i.e. by CZK 23 million, amounting to CZK 3.86 billion.

Table 6.2.3**Price for abstractions used for flow cooling in 2013–2019**

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	CZK/m³						
Elbe	0.65	0.68	0.70	0.72	0.74	0.77	0.79
Vltava	1.22	1.25	1.25	1.27	1.32	1.32	1.34
Morava	0.89	1.15	1.19	1.21	1.22	1.23	1.25

Source: River Boards

Note: The unit price per m³ does not include value added tax.

Table 6.2.4**Price for other surface water abstractions in 2013–2019**

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	CZK/m³						
Elbe	4.09	4.29	4.39	4.49	4.58	4.72	4.82
Vltava	3.45	3.55	3.62	3.69	3.84	3.84	3.90
Ohře	4.14	4.34	4.51	4.69	4.92	4.97	5.07
Oder	3.99	4.09	4.21	4.33	4.46	4.62	4.78
Morava	6.16	6.39	6.52	6.65	6.68	6.69	6.79
Average price ^{a)}	4.08	4.25	4.34	4.64	4.77	4.88	4.97

Source: River Boards

Note: The unit price per m³ does not include value added tax.

^{a)} Calculated using weighted average.

Table 6.2.5
Payments for surface water abstractions in 2013–2019

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	in millions of CZK						
Elbe	832	882	860	996	1 001	1 027	993
Vltava	725	739	759	745	832	852	861
Ohře	502	514	543	560	604	617	622
Oder	545	553	576	554	554	579	553
Morava	589	639	637	672	715	804	827
Total	3,193	3,327	3,375	3,527	3,706	3,879	3,856

Source: River Boards, s.e.

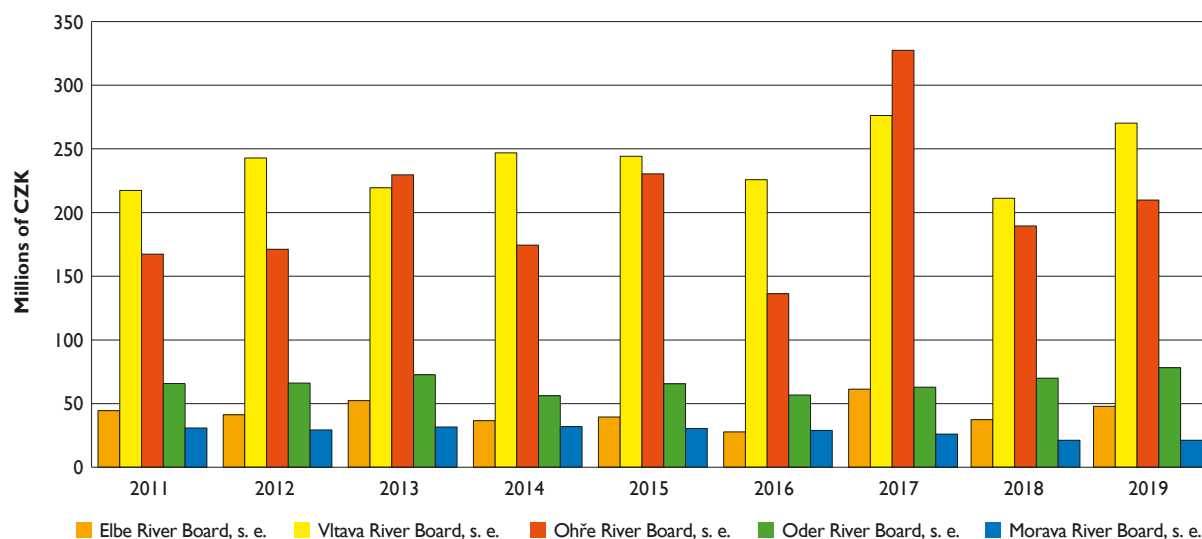
The second highest source of revenues of the River Boards, s.e., is electric power generation: it accounts for more than 10% of the total income. The number of small hydroelectric plants in operation decreased year-on-year by one to a total of 102. Despite this fact, the total revenues from electric power generation rose by more than 19% and exceeded CZK 630 million.

The highest revenues for electric power generation have been repeatedly achieved by the Vltava River Board, s.e., and Ohře River Board, s.e. Details about small hydroelectric plants owned by the respective River Boards, s.e., are shown in Table 6.2.6 and Chart 6.2.4.

Table 6.2.6
Number of small hydroelectric power plants owned by River Boards, state enterprises, in 2013–2019

River Board, s.e.	Indicator	2013	2014	2015	2016	2017	2018	2019
Elbe	Number of small hydroelectric plants	20	20	20	20	20	20	20
	Installed capacity in kW	6,438	6,438	6,438	6,795	6,819	6,819	6,989
	Electric power generation in MWh	23,509	16,349	15,880	12,288	22,440	13,835	16,327
	Sales in thousands of CZK	52,257	36,532	39,390	27,754	61,268	38,012	48,758
Vltava	Number of small hydroelectric plants	19	19	19	19	19	20	20
	Installed capacity in kW	21,816	22,016	22,016	22,128	22,128	22,328	22,328
	Electric power generation in MWh	86,749	92,102	88,474	99,497	77,475	77,922	91,123
	Sales in thousands of CZK	219,464	246,837	244,146	225,704	276,114	211,048	271,244
Ohře	Number of small hydroelectric plants	21	21	21	21	22	22	22
	Installed capacity in kW	16,930	16,966	16,966	16,966	17,091	17,091	17,091
	Electric power generation in MWh	102,642	67,371	84,954	84,910	84,244	72,908	76,484
	Sales in thousands of CZK	229,545	174,342	230,236	136,223	327,221	189,511	211,005
Oder	Number of small hydroelectric plants	16	16	16	23	23	26	25
	Installed capacity in kW	5,809	5,809	5,809	6,236	6,236	6,352	6,262
	Electric power generation in MWh	27,201	20,656	24,535	21,569	23,181	25,073	27,612
	Sales in thousands of CZK	72,506	56,006	65,509	56,669	62,942	69,487	79,630
Morava	Number of small hydroelectric plants	15	15	15	15	15	15	15
	Installed capacity in kW	3,497	3,497	3,497	3,497	3,497	3,497	3,551
	Electric power generation in MWh	12,228	12,343	11,535	11,008	9,609	8,239	7,566
	Sales in thousands of CZK	31,592	32,014	30,432	28,812	26,039	22,279	22,215
Total	Number of small hydroelectric plants	91	91	91	98	99	103	102
	Installed capacity in kW	54,490	54,726	54,726	55,622	55,771	56,087	56,221
	Electric power generation in MWh	252,329	208,821	225,378	229,272	216,949	197,977	219,112
	Sales in thousands of CZK	605,364	545,731	609,713	475,162	753,455	530,337	632,852

Source: River Boards, s.e.

Chart 6.2.4**Development of revenues of small hydroelectric power plants owned by River Boards in 2011–2019**

Source: River Boards, s.e.



Nihošovický Stream, Nihošovice – regulation before repair (Source: Vltava River Board)



Nihošovický Stream, Nihošovice – regulation after repair (Source: Vltava River Board)

Other revenues of the River Boards, s.e., dropped in 2019 year-on-year by almost CZK 114 billion, totalling to almost CZK 398 million.

The “other revenues” item is a sum of less significant items such as leas of land, non-residential premises and water areas and other business activities. The most significant items is revenue from the performance of machines and road haulage,

performance of laboratories and for designing and engineering work. Other revenues are often significantly affected by a number of unplanned items such as insurance payments, increased interest rates received and the amount of transfers of certain specified sales from previous periods but were only effectuated in the monitored year. As such unplanned items cannot be always anticipated, they may show considerable year-on-year variations.

Table 6.2.7**Other revenues of River Boards, state enterprises, in 2013–2019**

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	thousands of CZK						
Elbe	83,184	147,863	86,346	73,388	149,163*)	91,122	86,446
Vltava	144,774	92,183	93,132	71,409	78,738	120,231	108,072
Ohře	90,474	107,668	79,965	75,702	85,264	108,496	96,623
Oder	39,639	43,802	43,221	41,191	49,013	61,595	45,375
Morava	74,491	53,933	57,799	56,462	48,295	130,084	61,124
Total	432,562	445,449	360,463	318,152	410,473	511,528	397,640

Source: River Boards, s.e.



Dam crest after reconstruction at the Boskovice Water Reservoir (Source: Morava River Board)

In order to ensure crucial activities of the River Boards, various purpose non-investment and investment grants are used every year. The total amount of grants provided in 2019 rose by 4% to CZK 1.42 billion.

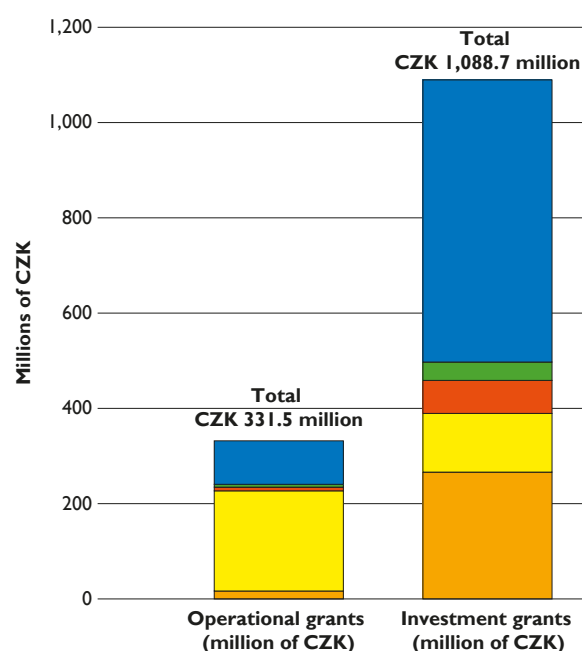
State subsidies are necessary for systematic activities allowing for implementation of flood control measures, defining inundation areas, producing conceptual studies, remedying consequences of floods etc. In 2019, the specific-purpose non-investment subsidies increased sharply with year-on-year growth of 55% (i.e. an increase of CZK 117 million). By contrast, investment subsidies decreased by 5%.

Grants were allocated for programmes focusing both on prevention and remedying of flood damage from previous years. The grants were provided from the budget of the MoA, the Operational Programme Environment, the Cohesion Fund, European Regional Development (hereinafter referred to as the "ERDF"), flood control measures were also co-funded by some regional offices and municipalities.

Total costs of River Boards rose by 3.3% to CZK 5.2 billion in 2019. The greatest increase was in repairs and financial costs (more than 18%), by contrast, other costs dropped dramatically (by 52%).

Costs increased in five items: repair (by CZK 203.4 million, i.e. by 18.8%), personnel costs (by CZK 136.2 million, i.e. by 6.7%), financial costs (by CZK 0.4 million, i.e. by 18.4%), energy and fuel (by CZK 5.7 million, i.e. by 5.1%) and in services (by CZK 1.7 million, i.e. by 0.7%). A significant drop in other costs was caused by entering into the accounts the reserve for feeder adjustment in the Oder River Board, s.e.

Chart 6.2.5
Grants used by River Boards, state enterprises, in 2019



	Operational grants (million of CZK)	Investment grants (million of CZK)
Elbe River Board, s. e.	90.36	591.74
Vltava River Board, s. e.	6.57	38.35
Ohře River Board, s. e.	7.33	70.17
Oder River Board, s. e.	210.18	121.51
Morava River Board, s. e.	17.04	266.97

Source: MoA, River Boards, s.e.

Table 6.2.8
Costs of River Boards, state enterprises, in 2018 and 2019

Type of costs	Year	River Boards, state enterprises					Total
		Elbe	Vltava	Ohře	Oder	Morava	
		in millions of CZK					
Depreciation	2018	202.7	346.1	183.6	156.8	168.7	1,058.1
	2019	199.1	337.9	192.5	150.5	164.2	1,044.1
Repair	2018	210.4	271.5	170.7	118.0	312.8	1,083.5
	2019	185.3	433.1	161.3	214.1	292.9	1,286.8
Material	2018	37.9	29.5	18.1	34.0	45.2	164.8
	2019	34.7	28.0	18.7	30.6	47.8	159.8
Energy and fuel	2018	35.1	34.9	24.4	5.0	12.1	111.5
	2019	36.3	37.0	24.0	6.0	13.9	117.2
Personnel costs	2018	525.2	470.4	387.1	272.8	390.6	2,046.0
	2019	549.9	506.9	412.4	288.2	424.8	2,182.2
Services	2018	76.2	83.8	32.9	32.4	31.8	257.3
	2019	71.5	79.9	46.4	30.4	30.9	259.0
Financial costs	2018	0.4	0.3	0.2	0.2	0.3	2.1
	2019	0.4	1.1	0.4	0.2	0.3	2.5
Other costs	2018	92.2	55.2	50.8	45.8	70.2	314.2
	2019	59.7	72.1	44.8	-44.9 ^{*)}	18.6	150.2
Total costs	2018	1,180.1	1,291.7	867.9	665.1	1,031.8	5,036.6
	2019	1,137.0	1,495.9	900.4	675.1	993.4	5,201.8

Source: River Boards, s.e.

Note: *) The negative value is due to accounting for the reserve for the repair of the Morávka-Žermanice Feeder, completed in 2019.

In 2019, River Boards spent on investment implementation CZK 2.3 billion with equal share from its own and external sources, same as in the previous year.

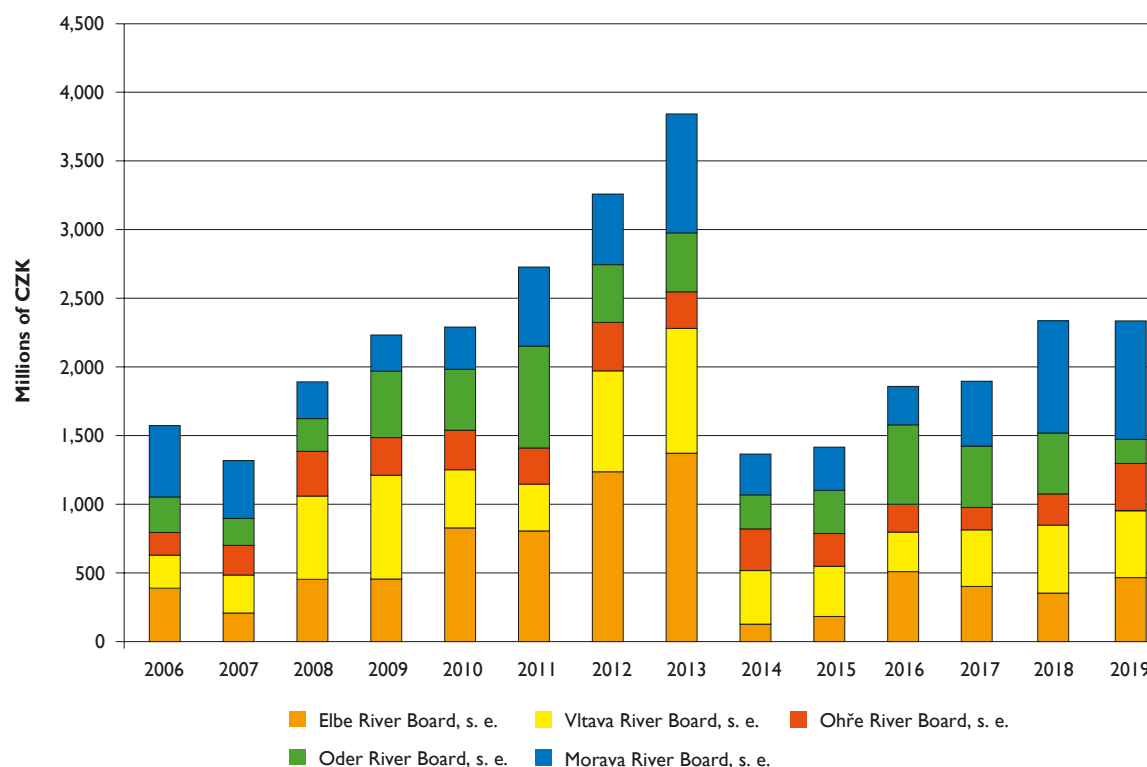
In comparison with 2018 there was a decrease by 0.5% in total revenues generated by all the River Boards, s.e. (by CZK 12.5 million). External funds for investment construction were CZK 1.11 billion, of which 90.5% from the state budget, 9.5% other sources and 0.005% from the EIB. "Other sources" mean funds from the Operational Programme Environment, Cohesion Fund, ERDF, regions, municipalities and free transfers.

The largest volume of investment costs in 2019 was reported, same as the previous year, the Morava River Board, with year-on-year increase by 3.4%, with investments of CZK 850 million exceeding other River Boards. A significant increase in investment was also in the Ohře River Board (56%) and Elbe River Board (28%). In comparison with the previous year, investment decreased significantly in the Oder River Board, by more than 60%. From the perspective of investment funded by external funds, the largest amount was used by the Morava River Board (CZK 592 million), Elbe River Board (CZK 267 million) and Vltava River Board (CZK 122 million).

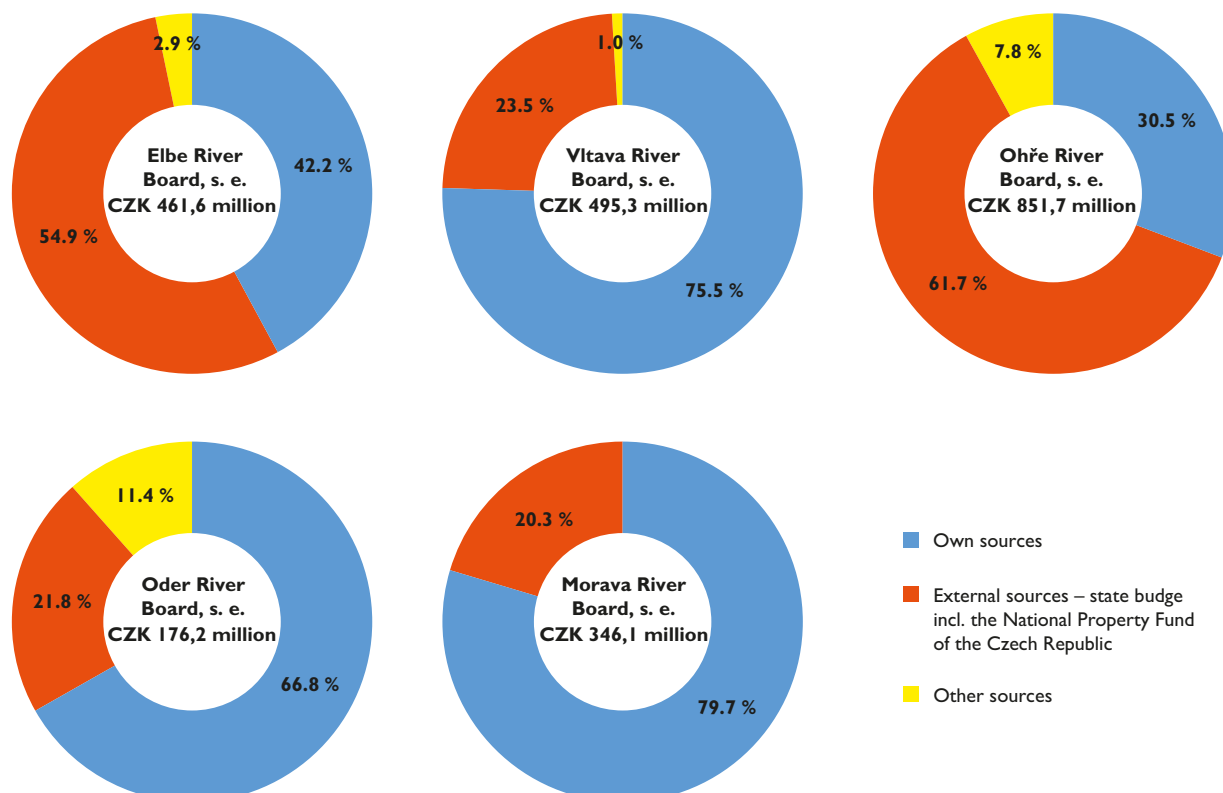
Table 6.2.9
Investments made by River Boards, state enterprises, in 2013–2019

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	in millions of CZK						
Elbe	1,378.3	132.6	189.9	514.6	401.2	360.0	461.6
Vltava	905.2	386.7	361.5	286.0	410.9	493.0	495.3
Ohře	262.5	306.7	242.5	210.7	161.6	221.2	346.1
Oder	435.4	248.4	313.7	568.2	453.4	445.5	176.2
Morava	856.0	290.4	314.5	283.7	468.0	823.7	851.7
Total	3,837.4	1,364.8	1,422.1	1,863.2	1,895.1	2,343.4	2,330.9

Source: River Boards, s.e.

Chart 6.2.6**Development of investment construction in River Boards, state enterprises, in 2005–2019**

Source: MoA, River Boards, s.e.

Chart 6.2.7**Structure of the use of investment funds by resource types in River Boards, state enterprises, in 2019**

Source: MoA, River Boards, s.e.

The financial results reached by all River Boards, state enterprises, showed only a profit, totalling a little less than CZK 146 million in 2019, which means another year-on-year drop by 32.5% to CZK 70 million.

High profits in 2016–2018 by River Boards, s.e., were caused by extraordinary circumstances that will not repeat: final payments for green bonuses, settlement under Section 59(a) of the Water Act, sale of water structures from the Agricultural Water Management Administration, financial gifts, revenue from sale of securities, cancellation of a high reserve for a court dispute and minor repairs funded by own sources.

Only revenues of the Vltava River Board grew year-on-year in 2019 by almost CZK 18 million (growth by 36.4%). All other River Boards, s.e., saw a decrease in their profits, the steepest drop (82%) was reported by the Oder River Boards, which was given mainly by a significant decrease in revenues from surface water by CZK 26 million.

In comparison with 2018 the number of employees decreased by two, meaning a total of 3,569 employees worked for River Boards, state enterprises, in 2019.

Table 6.2.10

Economic results of River Boards, state enterprises, (profit, loss) in 2013–2019

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	in thousands of CZK						
Elbe	770	12,100	16,471	22,026	60,276	22,880	15,631
Vltava	14,495	16,022	16,038	13,711	73,880	49,221	67,123
Ohře	12,624	13,008	20,300	27,422	169,652	73,346	41,380
Oder	16,603	13,718	12,495	20,845	22,291	53,053	9,503
Morava	6,200	7,786	18,830	112,916	11,721	17,875	12,300
Total	50,692	62,634	84,134	196,920	337,820	216,375	145,937

Source: River Boards, s.e.

Table 6.2.11

Allocation of profit of River Boards, state enterprises, for 2019

River Board, s.e.	Profit	Allocation of profit or loss					
		Reserve Fund	Social Welfare Fund	Investment Fund	Social Fund	Remuneration Fund	Accumulated losses from previous years
		in thousands of CZK					
Elbe	15,631	0	15,631	0	0	0	0
Vltava	67,123	17,123	25,000	0	0	25,000	0
Ohře	41,380 ^{*)}	0	9,259	0	0	0	0
Oder	9,503	0	3,879	0	250	5,374	0
Morava	12,300	1,230	9,196	0	0	1,874	0

Source: River Boards, s.e.

Note: ^{*)} Increase of owner's capital by CZK 32,121 thousand.

Table 6.2.12

Number of employees of River Boards, state enterprises, in 2013–2019

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
Elbe	921	925	919	904	894	884	878
Vltava	842	853	852	855	861	867	873
Ohře	618	618	619	614	605	617	614
Oder	467	464	462	465	463	464	458
Morava	683	693	713	737	742	739	746
Total	3,531	3,552	3,564	3,575	3,565	3,571	3,569

Source: River Boards, s.e.

Note: Average recalculated numbers, rounded up to whole numbers.

The average monthly salary in the River Boards, state enterprises, grew on average by 6.3% to CZK 36,383 in 2019.

The year-on-year growth of the average monthly salary in the River Boards, state enterprises, was CZK 2 162, whereas in four River Boards, s.e., (Elbe, Vltava, Oder and Morava) the increase exceeded CZK 2 thousand, in Ohře River Board the rise lower by CZK 1.3 thousand. Despite that fact the salary in Ohře River Board has been the highest over the past many years.

Activity of the River Boards, s.e., is regularly inspected by relevant inspection bodies. In 2019, a total of 130 inspections were conducted.

Other inspection bodies include those that performed one or two inspections in the given year such as the nature Conservation Agency of the Czech Republic, the State Office for Nuclear Safety, the Trade Union of Workers of Wood Processing Industries in Forest and Water Management of the Czech Republic, Police of the Czech Republic, Central institute for Supervising and Texting in Agriculture. No serious shortcomings were found by the inspections. An overview of inspections is given in Graph 6.2.8.

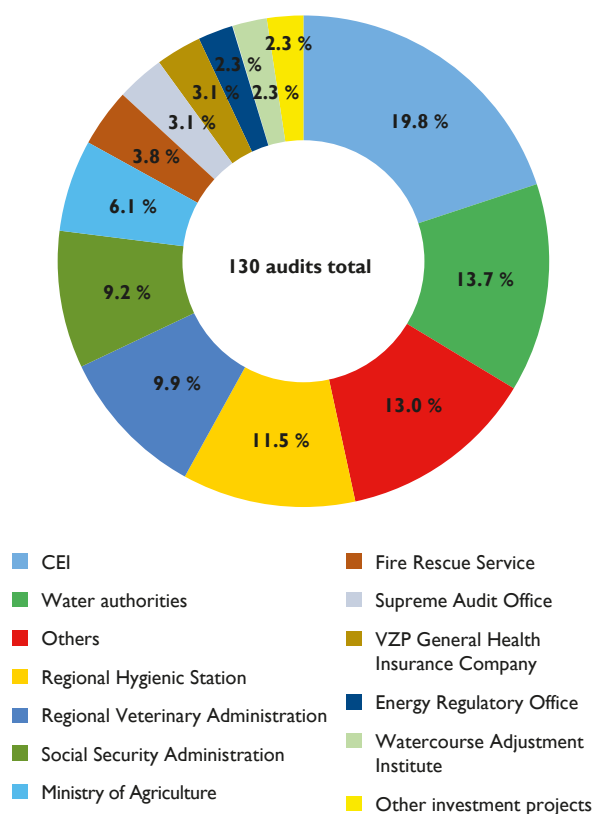
Table 6.2.13
Average salaries in River Boards, state enterprises, in 2013–2019

River Board, s.e.	2013	2014	2015	2016	2017	2018	2019
	CZK/month						
Elbe	30,293	30,823	31,596	32,538	33,653	35,050	37,472
Vltava	29,808	29,809	30,398	31,087	31,550	32,740	35,017
Ohře	31,698	32,312	33,242	33,505	34,541	37,079	38,365
Oder	29,458	30,083	31,133	31,787	32,629	34,409	36,695
Morava	26,479	26,668	27,167	28,392	29,782	32,464	34,981
Average monthly salary in River Boards^{*)}	29,574	29,932	30,650	31,497	32,357	34,221	36,383

Source: River Boards, s.e.

Note: *) Calculated using weighted average.

Chart 6.2.8
Auditing bodies performing audits at the River Boards, state enterprises, in 2019



Source: River Boards, s.e.



Hučivá Desná River (Source: Forests of the Czech Republic)

6.3 Forests of the Czech Republic, state enterprise

Forests of the Czech Republic, state enterprise, carries out the management of specified minor watercourses and torrents as one of non-production forest functions. In 2019, Forests of the Czech Republic administered more than 38.4 thousand km of watercourses and 977 of small water reservoirs.

Watercourse management carried out by Forests of the Czech Republic, s. e. includes the management of assets relating to watercourses, with acquisition value of CZK 6.1 billion (especially watercourse regulation, torrent and ravine control, flood control measures and water reservoirs). Watercourse management was performed by seven watercourse administrators with territorial responsibility according to the respective river basin districts.

In 2015, 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 flood control measures, erosion control measures and also the public interest projects pursuant to Section 35 of the Forest Act,
- restoration and repairs of water reservoirs, pools and marshland 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,
- preparation and implementation of projects under the MoA subsidy programmes Flood Prevention and Measures in minor watercourses and minor water reservoirs,
- other activities aimed at riparian stand management, revitalization of watercourses which were improperly adjusted in the past, non-productive forest functions, support for endangered species, elimination of non-indigenous invasive plant species, etc.,
- administering the Central Register of Watercourses and Water Reservoirs and inventory of assets.

Watercourse management and preparation and implementation of measures (repairs, rehabilitation and new investments) were mainly financed from the organization's own resources and from grants and 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 financial resources from the state budget allocated for programmes of the Ministry of Agriculture pursuant to Section 102 of the Water Act, namely "Support for Prevention Against Floods" and "Support for Measures in Minor Watercourses and Minor Water Reservoirs" and from the EU Funds (the "Operational Programme Environment" and the "Rural Development Programme"). 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., disbursed in 2019 a total of CZK 623.5 million, including expenditures of capital investment nature amounting to CZK 289.0 million; the amount includes investments in construction as well as in machines and intangible assets and purchase of land necessary for ensuring care of watercourses. Its own funds used for these investments amounted to CZK 101.7 million. In total CZK 334.5 million, of which CZK 302.2 million of own funds, was used to perform management of defined minor watercourses and repairs and maintenance of the relevant fixed assets. In total CZK 23.4 million, of which CZK 22.0 million of own funds, were expended on remedying flood damage. The abovementioned amounts include all costs relating to watercourse management. Funding structure is shown in Table 6.3.1.



Rašelín Damming (Source: Forests of the Czech Republic)

Table 6.3.1
Forests of the Czech Republic, s. e. – Funding structure – water management in 2019 (total costs)

Projects	Total	Own sources	Grants	Of which flood damage	
				Grants	Own sources
	in millions of CZK				
Investment	289.0	101.7	187.3	0.4	1.5
Non-investment	334.5	302.2	32.3	1.0	20.5
Total	623.5	403.9	219.6	1.4	22.0

Source: Forests of the Czech Republic

Revenues from surface water abstractions intended for covering costs of watercourse management amounted to CZK 15.6 million

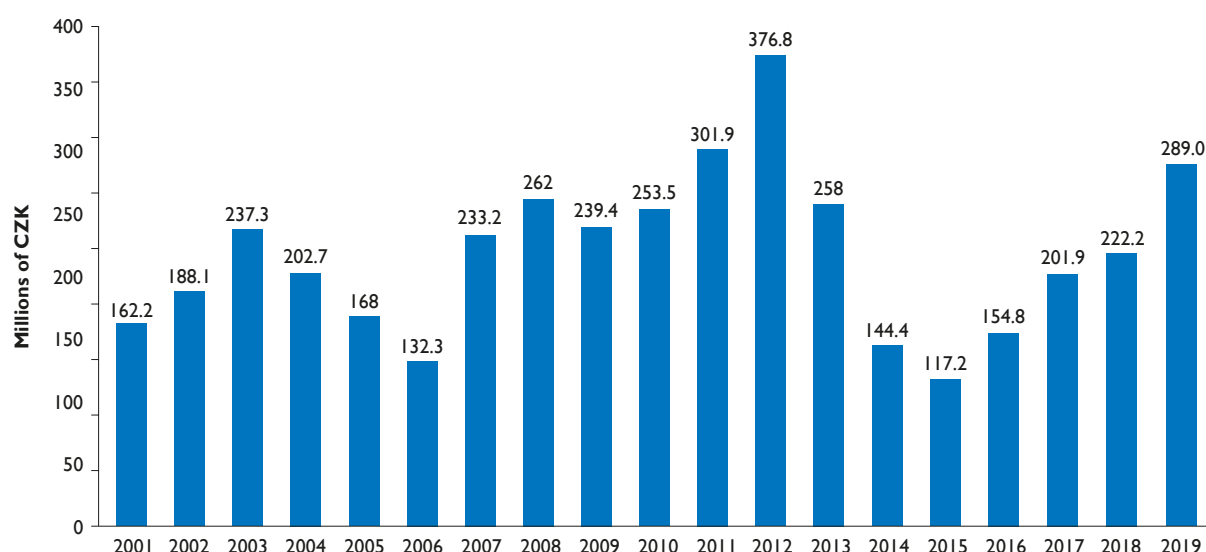
in 2019. The development of revenues from surface water abstractions and unit prices are shown in Table 6.3.2.

Table 6.3.2
Forests of the Czech Republic, s. e. – Revenues from surface water in 2009–2019

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	thousands of CZK										
Revenues	10,542	11,239	12,969	13,679	12,211	11,544	10,682	13,192	15,106	15,481	15,610
Price per m ³ *)	1.55	1.6	1.9	1.96	2.00	2.05	2.06	2.26	2.52	2.65	3.06

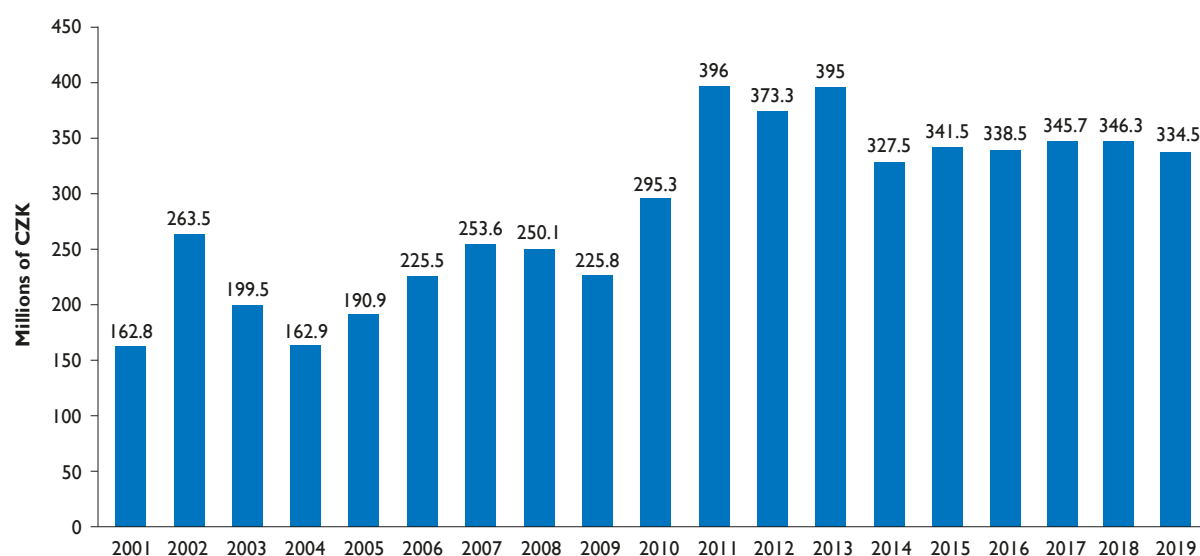
Source: Forests of the Czech Republic
Note: *) Unit price per m³ excluding VAT.

Chart 6.3.1
Forests of the Czech Republic, s. p. – Investment costs in –2019 – water management



Source: Forests of the Czech Republic

Chart 6.3.2
Forests of the Czech Republic, s. p. – Expenses in 2001–2019 – repairing and maintenance of watercourses and water reservoirs (total costs)



Source: Forests of the Czech Republic

2019 was below average in terms of precipitation, no significant flood episodes were detected. In connection with the ongoing climate change the programme “Returning Water to the Forest” was initiated contributing to water retention in the landscape. The objective of the programme is implementation of measures aimed at mitigating negative impacts of drought and lack of water. The aims are focused primarily on decelerating surface runoff (renovation of forest technological ameliorations) and creation and restoration of water elements in the landscape (e.g. ponds, wetlands and small water reservoirs). In total, 70 constructions were built under the project and 30 constructions were started. Preparatory and design works of more than 80 projects were initiated.

Measures in river basins

Watercourse administration for the Oder River Basin district completed in 2019 flood measures in Staré Heřminovy in the Bruntál District and in Malenovice in the Frýdek-Místek District. Implementation of flood measures continued in the Mušlov Watercourse in Pitárné in the Osoblažsko microregion.

An important project concerning the reconstruction of the outfall device in the Sedlinka Water Reservoir near Opava. This means that together with previous maintenance, a measure aimed at increasing the retention capability of the reservoir and improving flood protection of settlement bodies sídelních útvarů situated further downstream in the river basin. Furthermore, restoration of the Čertův Pond Reservoir (Čerták) near Nový Jičín was completed. Thanks to voluminous rainfall at the end of 2019, the water levels in both reservoirs reached reserve levels.

Reconstruction and repair works were conducted in other minor water reservoirs in the Morava-Silesia Region: Kojetín in the Nový Jičín District, U Kostela Water Reservoir and Bílčická Water Reservoir in the Opava District, estoration of Artmanov reservoir – the upper reservoir in the Bruntál District and 5 Kajlovec Water Reservoirs in the Opava District and the Malý Tovaryš Water Reservoir in the Jeseník District in the Olomouc Region. Renovation of the Kobylí Stream in Bruntál aimed at improving the ecological function of the watercourse in the urbanized landscape was initiated.

Watercourse administration for the Dyje River Basin district took place in 2019 especially construction and reconstruction of minor water reservoirs and watercourse modification of watercourses or reconstruction of current reinforcements.

As regards flood measure, the Hodonínka project in the cadastral unit of Křténov was successfully completed: it was a follow-up to a previous flood measure in Olešnice in the Blansko District. The flood control measure programme continued by increasing the capacity of the Hybrálec Stream in Hybrálec near Jihlava.

The projects completed in forests included construction of the Kančí obora (Boar Enclosure) Water Reservoir near Moravský Krumlov and stabilization of the Maliňák Ravine on the right-sided feeder to the Rokytá Stream. Near the municipality of Jestřábí (near Brtnice), construction of a new retention reservoir called U Malovaného mostku was completed. Construction of two water reservoirs in the Kralická obora near Náměšť nad Oslavou and U Sila Water Reservoir near Moravský Krumlov was started. Furthermore,



Kaliště Pool at Bezděkov u Třemešného (Source: Forests of the Czech Republic)



U Kamenného mostu Water Reservoir (Source: Forests of the Czech Republic)

the following water reservoirs were subject to reconstruction: Kožichovice near Třebíč, Šumné in the Znojemo District, Šilhán Roštýn Pond and Pařezitý Roštýn Pond near Telč and Ježkovce Pond near Krasnice in the Jihlava District.

In the urban area of Petrůvka in the Blanensko District, longitudinal and transverse reinforcement in the Petrůvka Watercourse and in Radonínský Stream in Radonín in the Třebíč District was reconstructed.

Watercourse administration for the Elbe River Basin district: Repairs at the Dobroučka Watercourse in Dolní Dobrouč and in the Lhotský Stream in Lhoty u Trutnova were completed. A structure funded from the Flood Measure Programme was built in the Markoušovický Stream in Velké Svatoňovice; construction of a dry reservoir and modification of watercourse bed in the Počátecký Stream near Počátky in the Chrudim District in the Iron Mountains Protected Landscape Area were initiated.

Three Babický Ponds near Babice were reconstructed, while other three ponds were reconstructed in the Žehrov Game Enclosure in the Mladá Boleslav District. Renovation of the Lovětínský Stream near Podhradí was completed and the Městecký Stream in Vojnův Městec was modified in the Pardubice District. Watercourse bed reinforcement was reconstructed in the Kocbeřský Stream in Choustníkovo Hradiště including maintenance works and in the Chuchelenský Stream in Semily.

Anti-erosion measures in public interest of the Pardubice Region under Section 35 of the Forest Act were constructed in the left-sided tributary to the Knapovecký Stream.

Small water reservoir in Všesoky in the Kutná Hora Region and renovation of the Švabínov site were completed from the EU

funds. In the Králova Zahrada Nature Reserve, renovation of the Zádolský Stream was successfully completed. Renovation of the Vlčinec Stream Olešnice and a piped watercourse above the Souvlastní settlement were completed in the Orlické Mountains. At the same time, renovation of the Kunštát Stream in Orlické Záhoří was commenced. A part of the Debrný Stream near Nasavrky in the Iron Mountains was renovated.

Watercourse administration for the Vltava River Basin district: Focused was primarily on preparation and implementation of constructions funded by grants. In 2019, construction projects adjusting the Kalhoty and Odlehčovač Streams near Třeboň and the Hazard Water Reservoir near Kaplice in the Český Krumlov District were completed. Investment works were performed at the Maršovský Stream in the Tábor District and at the Debrnický Stream near Soběslav. In the Květoňov Water Structure in the Kamenice River Basin a foot drain was renovated.

In the Kutná Hora District, the Úžice Pool project was implemented, whereas in the Třeboň District peat mining in Hrdlořezy was renovated. Small water reservoirs of Horní Čtvrtník near Vlašim and Nepraš in forests near Jindřichův Hradec were renovated. In the Český Krumlov District, the Chrástalí Stream was renovated using funds from the EU.

Under Interreg V–A Austria – the Czech Republic “Cultural and Natural Heritage: Schwarzenberg Navigational Canal / Bavarian Water Meadow”, construction works were initiated at a forest path to Opona and at restoration of the historic channel in the Schwarzenberg Stream, Otovský Stream and Světlá Stream in 2019.

Watercourse administration for the Berounka River Basin district: Completion of projects focused on water retention in the landscape. These projects concerned

reconstructions of historic water reservoirs that – because of their state given by their year of construction – no longer fulfilled the function of retaining water in the landscape: Jordán I. and Jordán II. Water Reservoirs near Přeštice, the Lomany Water Reservoir in the Lomanský Stream in the Pilsen-North District and the Zvonička Reservoir in the Hutský Stream in the landscape park of Upper Palatine Forest. In Stará obora near Podrážnice the U chaty Reservoir was renovated and the surface of the Sedmihoří Water Body was renovated in the Sedmihoří Nature Park.

The Lichovský Stream was renovated and a project called “Dlouhý Újezd – RVT U Křížku” was commenced; the project is aimed at opening the piped watercourse bed and renovating its valley meadow.

Many water management assets were subjected to maintenance, e.g. in the Žihlický Stream in Žihle in the Pilsen Region, in the Lašovický Stream in the Rakovník District, in the Kudibál Stream in the urban area of Dobruška in the Pilsen Region and in the Skořický Stream in the urban area of Mirošov in the Rokycany District the watercourse bed reinforcement, its stone cunettes and transverse steps, some of them in serious disrepair, were repaired. Maintenance works at accompanying riverbank growth were completed at the Úněšovský Stream in the North Pilsen District and at the tributary to the Chumava Stream near Hostomice under Brdy.

Watercourse administration for the Ohře River Basin district: Implementation of measures was aimed at water retention in the landscape. The most significant measure in the sphere of water management works was the completion of reconstruction and de-mudding of the Býčkovice Water Reservoir in Býčkovice in the Litoměřice District. Reconstruction of two Bečovský Ponds in Bečov nad Teplou in the Karlovy Vary District and the Vlčí Water Reservoir near Šluknov was commenced.

Watercourse administration focused also on maintenance of watercourse bed reinforcement. The most important projects completed were: repair of the reinforcement in the Březinský Stream in the Děčín District and repair of the reinforcement in the Zdislavský Stream in the Liberec District. Reconstruction of damming in the Miřetický Stream in the Chomutov District was completed and repair of damming in the Zvonický Stream in Sobětkovice was commenced.

Watercourse administration for the Morava River Basin district: Several projects in the Zlín Region were completed in 2019: construction of the bed in the Nedašovka Stream in Brumov and Návojná Stream and left-side tributary to the Nedašovka Stream in Nedašov, maintenance and reconstruction of steps in the Losinka Stream in the Šumperk District were made. Completely reconstructed damming in the Třiramenný Stream now protects again the built-up area of Loučná nad Desnou from alluvia. Watercourse beds in the Babská Stream and Malá Bystřička Streams in the Vsetín District were adjusted so that increased flow rates do not jeopardize the property in the vicinity. Sediments from two retention structures called “Kameňák” in the Zlín District were removed. Flood damage from previous years was remedied in the Brusénka Stream in the Kroměříž District and the Semetínská Stream in the Vsetín District.

In May and September 2019, local floods affected mainly the Vsetín, Zlín, Olomouc and Šumperk Districts with costs of safety ensuring works achieved millions of CZK.

6.4 Land consolidation and structures used for amelioration

Land consolidation

Long-term retention of water in the landscape and anti-erosion protection (building ponds, small water reservoirs, marshes and elements ensuring anti-erosion protection) is currently the main priority of land consolidation. Since 1991, land consolidation encompassed implementation of water management measures on an area of almost 650 ha and anti-erosion measures on an area of approximately 822 ha. Water management measures for approximately CZK 203 million and anti-erosion measures for more than CZK 57 million were implemented as part of land consolidation in 2019.

Transport and green infrastructure were developed, meaning measures ensuring access to plots together with environmental measures. Such measures (referred to as “joint structures”) are typically designed as polyfunctional: unpaved roads have draining and retaining ditches, newly designed plots of land are divided by balks, swales and anti-erosion dikes 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. More than CZK 1.398 million was expended on joint structures in 2019.

In order to allow for building such measures in the landscape, it is first necessary to design and approve new arrangement of plots; this ensures that such plots are ready for the measures. The most effective instrument for their suitable arrangement 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 conducting 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 by implementing Decree No. 13/2014 Coll., is the State Land Office.

Land consolidation is carried out either comprehensive or simple consolidation. Currently, simple and comprehensive land consolidation has been completed for more than 35.3% of total agricultural land resources, while land consolidation is underway in 12.6% of land. Over CZK 534 million was spent on designing land consolidation including non-investment activities in 2019.

One of the main results of comprehensive land consolidation, in addition to the new digital cadastral map, is the plan of joint

structures that is closely linked with the land-use plan. It is subject to approval by municipal councils and land designated for placement of joint structures is typically transferred to the ownership of a given municipality.

Thanks to land consolidation and clearly defined ownership, the State Land Office may subsequently implement the proposed measures. The State Land Office ensures proposals of land

consolidation and implementation of joint structures through funds from the General Treasures Management, State Land Office budget, relevant EU funds (RDP, Operational Programme Environment) and others (Road and Motorway Directorate, budgets of municipalities and towns, private entities). For the current programme period 2014–2020, the State Land Office defined use of funds from the RDP so that projects contributing to mitigating negative effects of climate change have priority.

Table 6.4.1
Use of funds for land consolidation measures in 2019

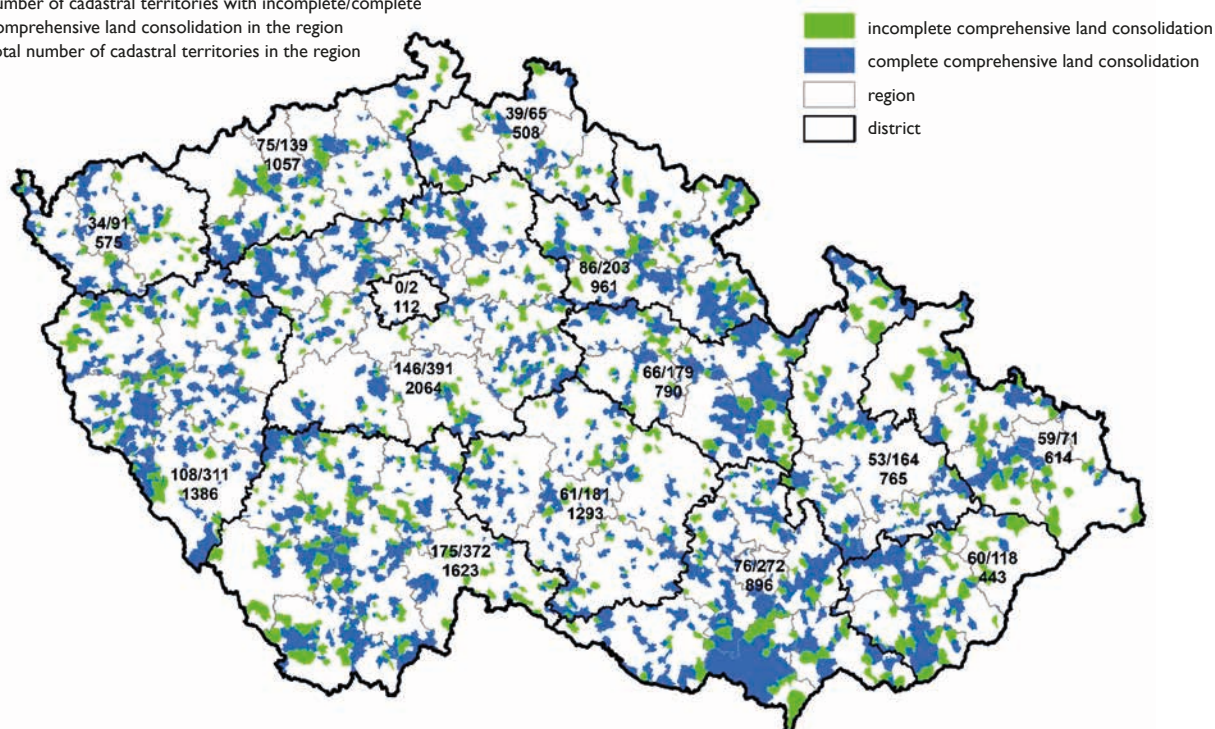
Non-investment activities		Implementation						Non-investment activities and implementation in total
Total	of which land consolidation proposals	Total	of which					
			roads	erosion control measures	water management measures	environmental measures	other ^{*)}	
thousands of CZK								
534,353	480,098	1,398,417	1,047,621	56,808	202,906	42,613	48,469	1,932,770

Source: State Land Office

Note: ^{*)} Operational and technical activities.

Figure 6.4.1
Overview of comprehensive land consolidation measures by region by 31/12/2019

34/91 number of cadastral territories with incomplete/complete comprehensive land consolidation in the region
575 total number of cadastral territories in the region

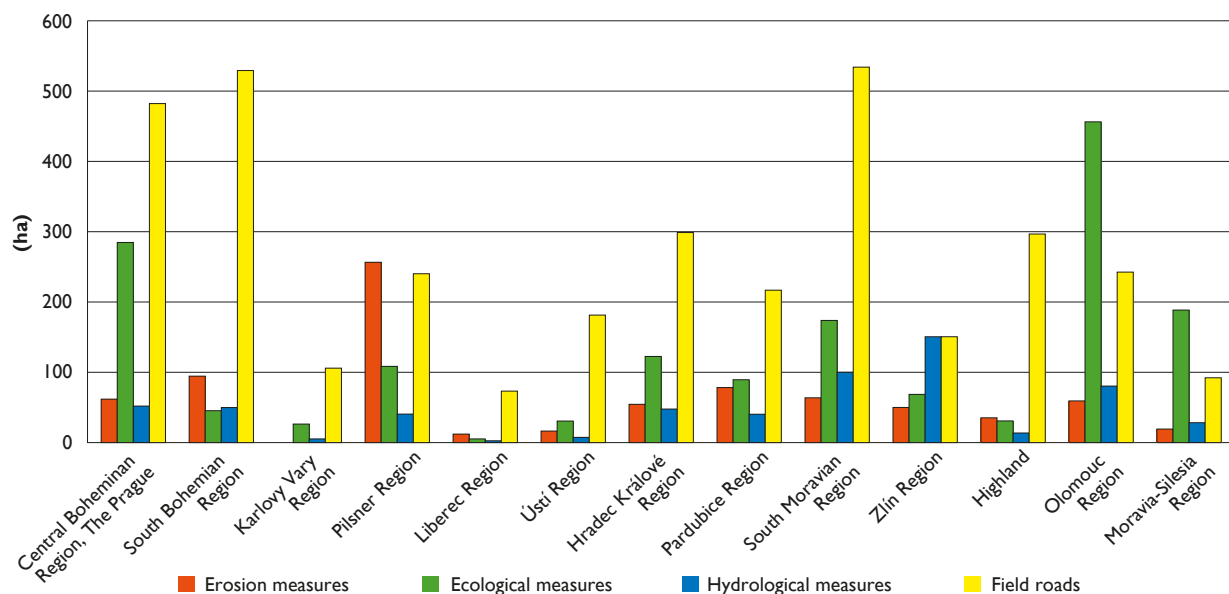


Source: State Land Office

Table 6.4.2
Implemented joint measures in total – in the Czech Republic by 31/12/2019

Measure	Erosion control measures	Environmental measures	Water management measures	Roads
	ha			km
Total	822.10	1,654.69	649.35	3,463.73

Source: State Land Office

Chart 6.4.1**Implemented joint measures in land adjustment by regions by 31/12 2019**

Source: State Land Office

Structures used for amelioration

In 2019, the State Land Office expended CZK 40.6 million from the MoA state budget section on management, maintenance and operation of amelioration structures on state-owned land and the authority to carry out the management. Maintenance and repair costs reached a total of CZK 15.5 million, costs for ensuring the operation and repair of pumping (drainage and irrigation) stations including the consumption of electric power were CZK 25.1 million.

The State Land Office is authorized to administer structures used for amelioration of land and related hydraulic structures pursuant to Section 56 (6) of Act No. 254/2001 Coll., the Water Act, as amended, and Section 4 (2) of Act

No. 503/2012 Coll., on State Land Office and on the amendment to some relevant acts, as amended. The State Land Office thus ensures the management, maintenance, repairs and operation of major drainage facilities, major irrigation facilities and erosion control measures. On 31 December 2019, the total acquisition value of the property administered by the State Land Office amounted to CZK 2,572 billion, consisting of 18,975 items, of which 8,935.982 km of channels (5,171.294 km of open channels and 3,764.688 of piped channels), 22 water reservoirs and 130 pumping stations.

Agendas linked with 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



Jeseník, General land consolidation at Javorník-ves, Multifunctional Reservoir of the Střední díly Biocentre (Source: State Land Office)



Střekov lock chambers (Source: Elbe River Board)

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 – Irrigate – 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 were used 842,983 in 2019.

From the perspective of building new irrigation systems, the State Land Office focused on preparing the pilot project of new irrigation system in selected cadastral units in the Břeclav District and Brno-Country District with demonstrable interest of end users in irrigation. At present, “Feasibility Study of an Irrigation System in the Hustopeče District – Stage I” is being implemented.

6.5 Waterways

Pursuant to Act No. 114/1995 Coll., on Inland Navigation, as amended, the management of the development and modernization of waterways of importance to shipping is in the competence of the Ministry of Transport. This activity concerns, in particular, the management of the development of the Elbe-Vltava waterway, which is the most important waterway system in the Czech Republic and is the only navigable connection between the Czech Republic and the West European waterway system.

Under the “European Agreement on Main Inland Waterways of International Importance (AGN)” the E 20 main European waterway on the Elbe and its branch E 20-06 on the Vltava River, is a waterway of international importance. As defined in Regulation No. 1315/2013 the European Parliament and of the Council of 11 December 2013 on the main trends of the European Union for the development of 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 system TEN-T. In Annex I, Part I of this Regulation, this waterway is included in the “Eastern and Eastern-Mediterranean” corridor and into predetermined projects “Hamburg – Dresden – Prague – Pardubice” – “work on better navigability and modernization”. From this perspective, it is a project of highest importance. The necessity to increase parameters is also documented by the Corridor Study of December 2014 prepared for the European Commission and by the work schedule pracovní plán of the European coordinator for this corridor that identifies as critical for the Elbe and the Vltava Waterways the fact that their parameters fail to meet the requirements for class IV of waterways.

From the Ústí nad Labem hydraulic structure in Střekov to Přelouč in the Elbe River and to Třebenice in the Vltava River, navigability is ensured by a system of hydraulic structures constituting a fully operational transport system, independent of external natural conditions. Navigation traffic in the regulated stretch from Střekov down the stream to the Czech Republic/Germany state border depends, however, on water levels based on the current flows and on the overall water situation in the entire Elbe and the 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 stretch between Ústí nad Labem and the state border.

Strategic material of the Ministry of Transport called “Waterway Transport Concept for 2016–2023” has been discussed on a long-term basis.

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 9.1 herein.



L. Komárková + L. Šumová + T. Šorfová – Heavy Head – Liberec Region

7. PUBLIC WATER SUPPLY AND SEWERAGE SYSTEMS

7.1 Drinking water supply

In 2019, water supply systems supplied water to 10.09 million inhabitants in the Czech Republic, i. e. 94.6% of the total population.

All water supply systems produced a total 602.4 million m³ of drinking water. 492.6 million m³ of drinking water was supplied and charged for (invoiced), including 338.8 million m³ of drinking water for households. Drinking water losses amounted to 86.3 million m³, i.e. 14.5% of water intended for consumption.

The data provided by the Czech Statistical Office were collected on the basis of information provided by 1,560 reporting units, i.e. 306 professional water supply and sewerage system operators and a selected set of 1,254 municipalities operating the water management infrastructure on their own. The figures published for regions and for the Czech Republic have been calculated.

In 2019, water consumption increased. Specific quantity of water invoiced in total increased by 0.3 l/person/day to 133.8 l/person/day, whereas water invoiced to households increased by 1.4 l/person/day to 90.6 l/person/day.



WWTP Bitouchov – Semily (Author: Petra Hubalová)

Table 7.1.1
Water supply from water supply systems in 1989 and 2014–2019

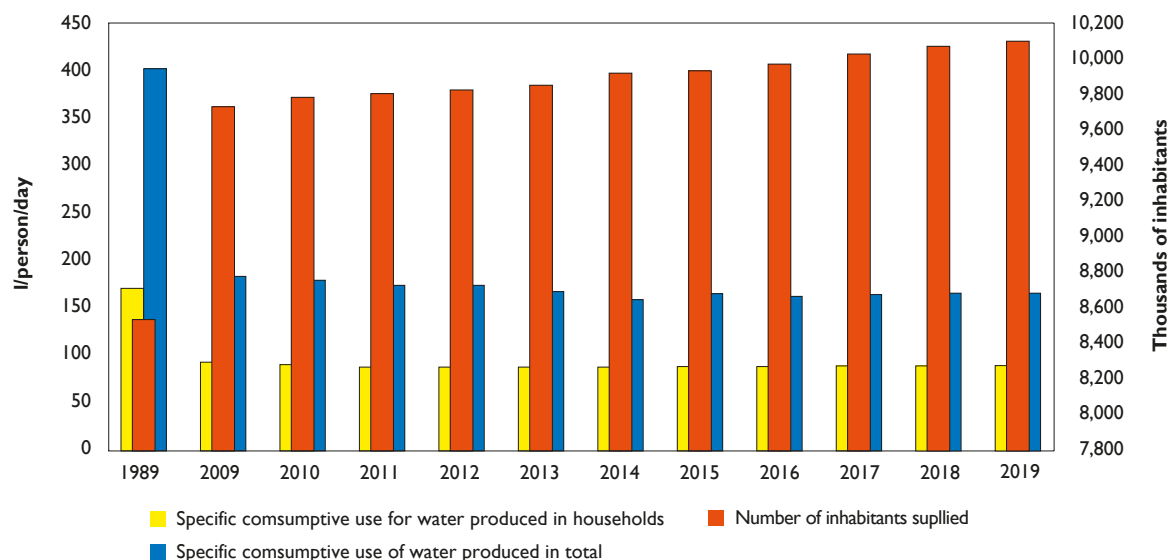
Indicator	Measurement unit	1989	2014	2015	2016	2017	2018	2019
Inhabitants (mean)	thousand inhabitants	10,364	10,525	10,543	10,565	10,584	10,626	10,669
Inhabitants actually supplied with water from water supply systems	thousand inhabitants	8,537.0	9,917.2	9,929.7	9,972.5	10,027.4	10,064.1	10,090.1
	%	82.4	94.2	94.2	94.4	94.7	94.7	94.6
Water produced by water supply systems	million m ³ /year	1,251.0	575.4	599.6	593.3	603.8	609.7	602.4
	% as of 1989	100.0	46.0	47.9	47.4	48.3	48.7	48.2
Water invoiced in total	million m ³ /year	929.4	468.7	476.8	478.9	482.0	490.4	492.6
	% as of 1989	100.0	50.4	51.3	51.5	51.9	52.8	53.0
Specific consumptive use of water produced	l/person/day	401.0	158.9	165.4	162.5	164.9	165.9	163.5
	% as of 1989	100.0	39.6	41.2	40.5	41.1	41.4	40.8
Specific quantity of water invoiced in total	l/person/day	298.0	129.4	131.5	131.2	131.7	133.5	133.8
	% as of 1989	100.0	43.4	44.1	44.0	44.2	44.7	44.9
Specific quantity of water invoiced for households	l/person/day	171.0	87.3	87.9	88.3	88.7	89.2	90.6
	% as of 1989	100.0	51.0	51.4	51.6	51.8	52.2	52.3
Water losses per 1 km of water mains	l/km/day	16,842.0 ^{a)}	3,417.2	3,519.3	3,167.9	3,409.4	3,303.5	2,993.5
Water losses per 1 inhabitant supplied	l/person/day	90.0 ^{a)}	26.5	27.3	24.7	26.7	25.8	23.4

Source: Czech Statistical Office

Note: ^{a)} Data for water supply systems run by the main operators.

Chart 7.1.1

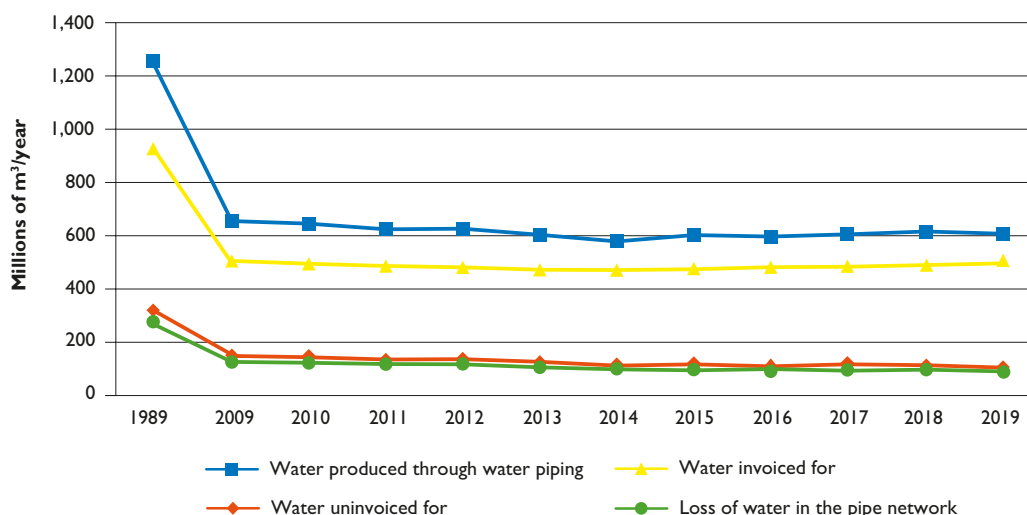
Development in the number of population supplied with water, specific needs for water produced and specific amount of water invoiced to households in 1989 and 2009–2019



Source: Czech Statistical Office

Chart 7.1.2

Development in the quantity of water produced in water supply systems and water invoiced in total in 1989 and 2009–2019



Source: Czech Statistical Office

The highest percentage of population supplied with drinking water from water supply systems in 2019 was recorded in the Karlovy Vary Region (100%), in the Capital City of Prague (100%) and in the Moravian-Silesian Region (99.9%), the lowest percentage of inhabitants supplied with drinking water was recorded in the Pilsen Region (85.9%) and in the Central Bohemian Region (86.5%).

In 2019, the length of water supply network was extended by 233 km and reached the total length of 78,983 km. Construction of new water supply systems and completion of the existing ones thus resulted in an increase in the number of inhabitants supplied by water by 26,059. The length of water supply network per one inhabitant supplied was 7.83 m.

The number of water supply connections increased by 29,095 and amounted to 2,181,793. The number of water meters installed increased by 29,322 and amounted to 2,180,676.

The number of connected inhabitants per one water supply connection is almost five. Markedly shown in these figures are the results of rather intense building of family houses.



WWTP Prosiměřice reconstruction and intensification (Source: MoE)

Table 7.1.2**Population supplied, production and supply of water from the water supply system in 2019**

Region	Population		Water from water supply system	Water invoiced for	
	supplied with water from water supply system	share of population supplied with water		total	supplied with water from water supply system
	number	%		thousands of m ³	
City of Prague	1,315,311	100.0	104,575	82,975	54,290
Central Bohemia	1,192,132	86.5	60,483	55,227	39,041
South Bohemia	574,936	89.4	33,720	26,363	17,281
Pilsen	504,911	85.9	30,870	25,202	16,009
Karlovy Vary	294,807	100.0	19,289	14,543	9,312
Ústí	804,040	98.0	49,013	38,154	27,294
Liberec	412,044	93.0	26,125	19,219	13,413
Hradec Králové	521,614	94.6	31,437	23,978	16,115
Pardubice	505,694	97.0	27,176	22,742	14,797
Vysočina	482,944	94.8	24,149	21,471	14,352
South Moravia	1,131,535	95.1	62,875	56,047	38,386
Olomouc	590,298	93.4	28,662	26,221	18,161
Zlín	559,510	96.0	29,188	23,834	16,080
Moravia-Silesia	1,200,414	99.9	74,879	56,615	39,260
Czech Republic	10,090,190	94.6	602,440	492,591	333,791

Source: Czech Statistical Office

7.2 Discharge and treatment of municipal wastewaters

In 2019, a total of 9.12 million people in the Czech Republic lived in buildings connected to sewerage systems, i.e. 85.5 % of the total population. In total, 461.1 million m³ of wastewaters (excluding rainwater charged for) were discharged into sewerage systems. Out of this quantity, 97.7% of wastewaters were treated (excluding rainwater), which amounts to 450.3 million m³.

The number of inhabitants connected to the sewerage system rose year-on-year by 30,063. The volume of wastewater discharged in the sewerage system excluding rainwater grew year-on-year by 3.8 million m³. The share of wastewater treated excluding rainwater grew by 0.1% in 2019.

The highest share of inhabitants connected to the sewerage system in 2019 was in the Karlovy Vary Region (100.0%) and in the City of Prague (99.1%), the lowest share was in the Liberec Region (69.5%) and in the Central Bohemia Region (74.4%).

Table 7.2.1**Discharge and treatment of wastewaters from sewerage systems in 1989 and 2014–2019**

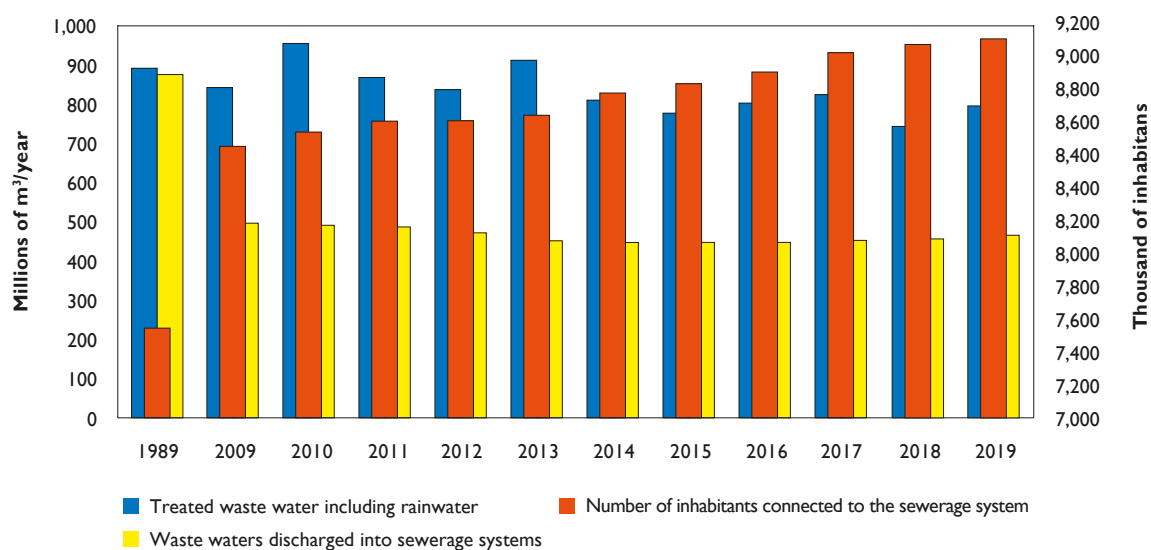
Indicator	Measurement unit	1989	2014	2015	2016	2017	2018	2019
Inhabitants (mean)	thousands of inhabitants	10,364	10,525	10,543	10,565	10,584	10,626	10,669
Inhabitants living in buildings connected to sewerage systems	thousands of inhabitants	7,501	8,828	8,882	8,944	9,052	9,090	9,120
	%	72.4	83.9	84.2	84.7	85.5	85.5	85.5
Wastewaters discharged to sewerage systems (excluding rainwater charged for) in total	million m ³	877.8	446.1	445.5	446.9	453.3	457.3	461.1
	% as of 1989	100.0	50.8	50.8	50.9	51.6	52.1	52.5
Treated wastewaters including rainwater ¹⁾	million m ³	897.4	812.2	779.0	803.4	826.2	743.6	792.6
Treated wastewaters in total excluding rainwater	million m ³	627.6	432.3	432.0	434.9	442.2	446.3	450.3
	% as of 1989	100.0	68.9	68.8	69.3	70.5	71.1	71.7
Percentage of treated wastewaters excluding rainwater ²⁾	%	71.5	96.9	97.0	97.3	97.5	97.6	97.7

Source: Czech Statistical Office

Note: ¹⁾ In 1989, the data related to sewerage systems run by the main operators.²⁾ This percentage relates to waters discharged to sewerage systems (excluding rainwater charged for).

Chart 7.2.1

Development in the number of inhabitants living in buildings connected to sewerage systems and the quantity of discharged and treated wastewaters in 1989 and 2009–2019



Source: Czech Statistical Office

Table 7.2.2

Number of inhabitants living in buildings connected to sewerage systems and the quantity of discharged and treated wastewaters in 2019

Region	Inhabitants living permanently in buildings connected to the sewerage system		Water discharged to sewerage systes (exluding rainfall charged for)	Treated wastewaters (exluding rainwater)	
	Total	Share of total population in the region	Total	Total	Share
	count	%	thousands of m³	thousands m³	%
City of Prague	1,303,156	99.1	81,837	81,837	100.0
Central Bohemia	1,025,303	74.4	51,489	51,323	99.7
South Bohemia	555,008	86.3	27,440	26,472	96.5
Pilsen	504,873	85.9	28,659	27,371	95.5
Karlovy Vary	294,807	100.0	13,432	13,429	100.0
Ústí	685,121	83.5	30,293	30,253	99.9
Liberec	307,752	69.5	14,679	14,323	97.6
Hradec Králové	434,912	78.9	20,801	19,959	96.0
Pardubice	389,904	74.8	17,934	17,755	99.0
Vysočina	448,287	88.0	19,410	17,505	90.2
South Moravia	1,073,942	90.3	52,863	52,244	98.8
Olomouc	541,054	85.6	27,767	27,241	98.1
Zlín	559,072	95.9	26,703	24,931	93.4
Moravia-Silesia	996,871	83.0	47,751	45,610	95.5
Czech Republic	9,120,062	85,5	461,058	450,253	97.7

Source: Czech Statistical Office

The length of sewerage network was extended by 393 km in 2019 and now is 49,149 km. According to the Czech Statistical

Office, the total number of WWTPs increased by 54 plants to 2,731 WWTPs in the Czech Republic.

7.3 Development of water and sewerage charges

Based on the survey carried out by the Czech Statistical Office, the average price of water charge excluding VAT amounted to 39.30 CZK/m³ and the average price of sewerage charge amounted to 34.70 CZK/m³ in 2019.

Before the amendment to Act No. 76/2006 Coll. entered into force in 2006, information about the average price of water and sewerage charges were defined 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 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 public water supply and

sewerage system and on amendments to certain acts (act on water supply and sewerage systems). The MoA receives information about the prices including VAT through inquiry, mean values are obtained through weighted average. With respect to the deadline for filing the comparisons it was impossible to include and assess the date in this publication. For this reason, we only present data ascertained by an inquiry of the Czech Statistical Office such as share in revenue from customers and the amount of drinkable volume supplied and wastewaters discharged (since 2013 including rainwater charged for). The overall data obtained by the Czech Statistical Office concerning the Czech Republic are not a weighted average and they thus cannot be compared with data from MoA materials.

Based on the survey carried out by the Czech Statistical Office, the highest average price (44.80 CZK/m³) of water charge was in the Liberec Region, exceeding the nationwide average by 14.0%. The highest average price of sewerage charge was also in the Liberec Region: 42.90 CZK/m³ exceeded the national average by 23.6%. By contrast, the

Table 7.3.1
Strike prices of water and sewerage charges in 2018 and 2019

Indicator	Measurement unit	2018	2019	Index 2019/2018
Water rates in total	millions of CZK	18,692	19,367	1.04
Water invoiced in total	millions of m ³ /year	490.4	492.6	1.00
Average price of water rate	CZK/m ³ excl. VAT	38.1	39.3	1.03
Sewerage charges in total	millions of CZK	17,676	18,353	1.04
Wastewaters discharged to sewerage systems ^{*)}	millions of m ³ /year	529.1	529.6	1.00
Average price of sewerage rate	CZK/m ³ excl. VAT	33.4	34.7	1.04

Source: Czech Statistical Office

Note: ^{*)} Since 2013 including rainwater charged for.

Table 7.3.2
Water consumption, average prices of water and sewerage charges excluding VAT in 2019

Region	Specific quantity of water invoiced in total	Specific quantity of water invoiced to households	Average price of water rate	Average price of sewerage charge
	l/person/day		CZK/m ³ excl. VAT	
City of Prague	172.8	113.1	42.7	35.3
Central Bohemia	126.9	89.7	41.9	34.2
South Bohemia	125.6	82.3	37.6	29.9
Pilsen	136.7	86.9	40.8	30.5
Karlovy Vary	135.2	86.5	40.1	36.8
Ústí	130.0	93.0	44.2	41.8
Liberec	127.8	89.2	44.8	42.9
Hradec Králové	125.9	84.6	36.1	35.6
Pardubice	123.2	80.2	35.9	37.3
Vysočina	121.8	81.4	38.5	28.8
South Moravia	135.7	92.9	36.1	36.2
Olomouc	121.7	84.3	34.1	33.9
Zlín	116.7	78.7	37.2	32.0
Moravia-Silesia	129.2	89.6	36.2	32.9
Czech Republic	133.8	90.6	39.3	34.7

Source: Czech Statistical Office

lowest average price of water charge (34.10 CZK/m³) was in the Olomouc Region. The lowest average price of sewerage charge (28.80 CZK/m³) was in the Vysočina Region.

7.4 Regulation in water supply and sewerage systems

The Ministry of Agriculture sees the main objectives of regulation in public water supply and sewerage systems particularly in the following four spheres: supervision over long-term sustainability of the W&S for public use, especially with respect to renovation funding planning and its implementation; increasing transparency of price regulation of water and sewerage rates; continual increase of customer protection and gathering background materials for proposals of legislation adjustment in the sphere of public water supply and sewerage systems and customer protection. Auditing activity of the Ministry of Agriculture performed by the department of the main regulator and supreme supervision of the W&S sector focused in 2019, similarly to previous years, on performance of W&S owners and operators resulting from Act No. 274/2001 Coll., on Water supply and sewerage systems for public use and on amendments to certain relevant acts, as amended, and from Decree No. 428/2001 Coll. A total of 43 audits were performed in 2019.

The audits focused primarily on water system infrastructure owners' and operators' performance of basic duties such as permit to operate a facility and whether selected information from operational records are in line selected details from asset records of the managed property with relevant permits, operation agreements concluded with owners and operators of the water supply and sewerage systems, written agreements of the owners concerning water supply and sewerage systems related in terms of operation, contractual agreement between operators and expert representatives, template customer agreements, calculation of the water supply and sewerage rates, comparison of all items in price calculation for water supply and sewerage rates and actual state (hereinafter referred to as the "comparison") including the duty to report and submit to the MoA, tax documents issued for water supply and sewerage rates and whether they are in line with the published price, cost compensation concerning material for detour and closure of a water supply connection, sewerage lines and documents confirming their approval by a relevant water authority, complaint procedures defined, renovation funding plans and plans for making financial reserves for water supply and sewerage system renovations and documents how such funds were expended on such purposes.

In case of finding any shortcomings, the MoA required remedial actions. The most serious and repeated shortcomings include, e.g., complete lack of wrong keeping of renovation funding plan, lack of calculation of water supply and sewerage rates and incompliance with rules for calculation defined by Decree No. 428/2001 Coll., lack of comparison or non-compliance with rules defined by Decree No. 428/2001 Coll. for its preparation, customer agreements non-compliant with requirements of the Act on water supply and sewerage systems, non-compliance of VÚME (Selected data from Public Water Supply and Sewerage

Systems Registry) and VÚPE (Selected data from Public Water Supply and Sewerage Systems Operational Registry) with issued operation permits, wrongly defined volumes of drinkable water supplied or wastewater discharged for invoicing water supply and sewerage rates, lack of agreements between owners of water supply and sewerage systems linked in terms of operation, etc.

The MoA finds great differences between the entities audited. Some municipalities being public water supply and sewerage system owners consider the sphere and relevant issue as marginal (regardless of the fact whether they leased the infrastructure or they operate at their own expense ve vlastní režii). This concerns particularly setting of the water supply and sewerage rate and in maintaining and managing assets, e.g. in terms of water losses. Especially in small and medium-sized municipalities often prefer lower water supply and sewerage rate (below the level of actual total costs) that typically results in incomplete or distorted values in calculation items and subsequent comparison. Additionally, such entities (i.e. water supply and sewerage system operators), the MoA found in many cases absence of an expert representative and/or lack of existing contractual relation with an expert representative. The institute of expert representative is meant to safeguard that water supply and sewerage systems are operated in accordance with the valid legislation and technical and operational requirements concerning the given infrastructure. The MoA repeatedly found that expert representatives often perform their job rather formally, either because of low remuneration or because of insufficient number of competent experts in some regions of the Czech Republic. The MoA provides such entities, as part of their audit, certain educational aid. On the basis of the abovementioned experience, the MoA gathers and assesses background materials aimed at particularizing valid legislation.

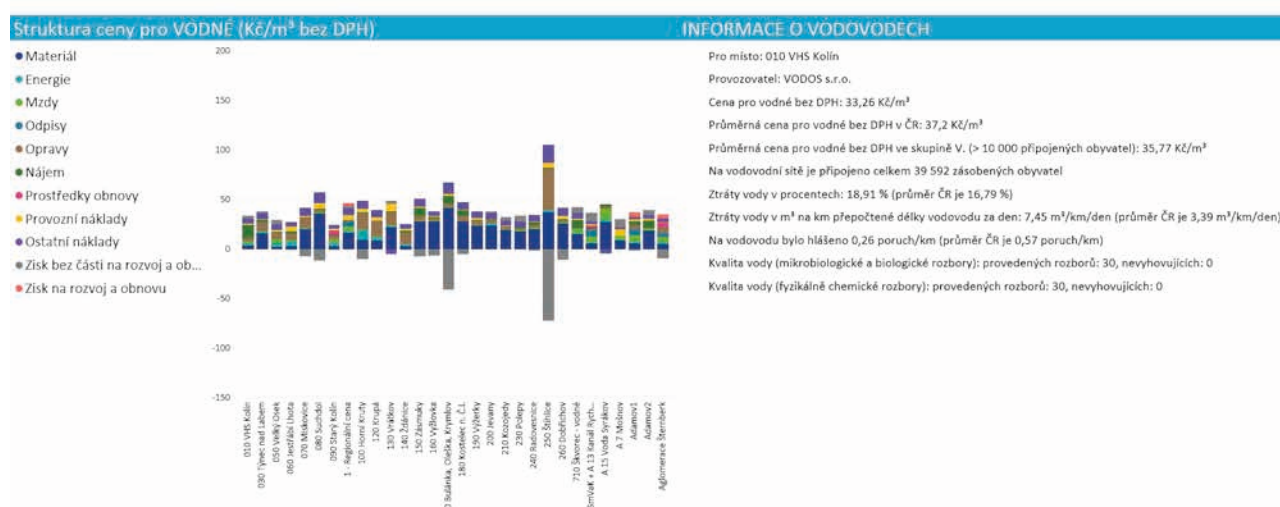
Table 7.4.1
Number of audits carried out at W&S owners and operators in 2019

Entities audited	No. of audits
Water supply and sewerage system owners	8
– of which towns and municipalities	5
Water supply and sewerage system owners the are also operators	20
– of which towns and municipalities in the mode of independent operation	16
Water supply and sewerage system operators	15
– of which towns and municipalities in the mode of independent operation	9
Total	43

Source: MoA

At the beginning of 2019, on the basis of comparing data from VÚME and VÚPE records with data in received comparisons from previous years, the MoA asked 934 infrastructure owners to complement data (i.e. identification number of operational records of relevant infrastructural assets, so-called IČPE codes) in the comparison and in some cases to send missing

Figure 7.4.1
Sample output of website presentation of W&S data, cost structure of water supply rates



Source: MoA

comparisons. Therefore, the MoA received approximately 900 more comparisons for 2018 (by 391 pieces for drinkable water and 546 pieces for wastewater) than for 2017.

This approach resulted in increased transparency of water supply and sewerage rates in terms of their cost structure and in increased general awareness of such pricing. This is one of the reasons why the MoA publishes at its website some data from the sphere of water supply and sewerage rates received from the relevant entities in connection with annual comparisons.

2019 was the fourth consecutive year when two independent projects were underway: Benchmarking for the owners – 2018 and Benchmarking for the operators – 2018. The analysis included and linked data for almost 98% of the market in 2019. Results of the two projects are summed up in the Benchmarking report 2018 that presents a summary of found anomalies linked with the regulation intentions adopted and presents recommendations how to tackle them. The report and results of the two projects are published at the MoA website in the section Water – Water supply and sewerage systems – W&S benchmarking.

The analyses repeatedly confirmed that one of the main shortcomings in arrangement of the public water supply and sewerage market that manifests in all processes related to the water supply and sewerage sector and when providing services to the inhabitants, is the high degree of market atomization. This, in combination with different level of care of water management

infrastructural assets and diversity of the existing business models can be considered, from the perspective of the regulator – the greatest weakness of the industry. It can be presumed that this situation may combine in near future with the growing risk of climate change, which may bring about the necessity to alter behaviour of all stakeholders including the need to coordinate interdepartmental measures in the interest of positive synergic effort and fight with climate change and its impacts.

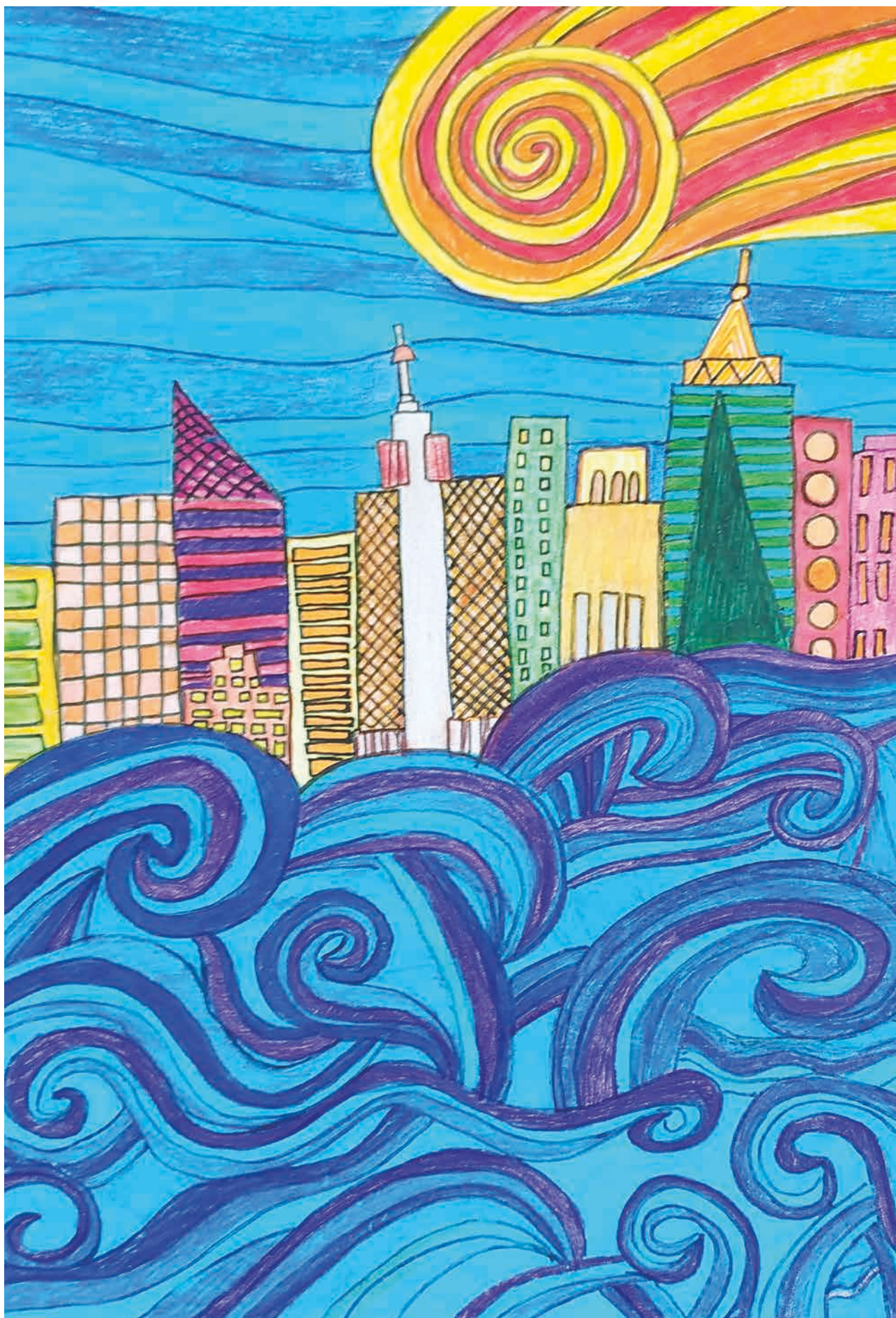
Seen from the time perspective, the influence of market atomization including relevant impacts of climate change may first become evident in less inhabited regions, i.e. in smaller infrastructure owners who are more sensitive to such changes, especially in places where local resources of surface waters and groundwaters may be insufficient. The reason is not merely the fact that the number of inhabitants connected to public water supply and sewerage systems is smaller in such locations or constant sub-capitalization of the water management infrastructural assets, but also lower degree of operation and non-systematic care of water management infrastructural assets and also the need for vision of desired development.

The detected insufficient theoretic creation of funds for renovation testifies of sub-capitalization of the infrastructural assets. Creation of such funds was assessed in all “Benchmarking for the owners” projects. It was found out that owners of infrastructural assets did not create reserves for renovation from income from water supply and sewerage rates in 2016–2018 totalling to CZK 4 billion.

Table 7.4.2
Missing funds for restoration in 2016–2018

Missing funds for restoration	2016	2017	2018
	in millions of CZK/year		
Drinkable water	456.46	460,21	532,36
Wastewater	758.85	808,21	1,045,56
Total per year	1,215.31	1,268,42	1,577,92
Total		4,061.65	

Source: MoA



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8. FISHERIES AND FISHPOND MANAGEMENT

At present, there are approximately 24 thousand fishponds and water reservoirs with total surface area of approximately 52 thousand ha in the Czech Republic. 20,986 tonnes of marketable fish were caught in the Czech Republic in 2019.

Czech fisheries include fish farming and recreation fishing, both regulated by Act No. 99/2004 Coll., on fish farming, performance of fishing right, fishing inspection, protection of marine fishing resources and on amendments to some acts (the Act on Fishing), and its implementing Decree No. 197/2004 Coll. Fish farming for production 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 minor breeders. Big producers of fish and waterfowl, fish processors, fish research and education institutes 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 total area of approximately 42,000 hectares and around 350,000 recreation fishermen registered. Fishery

districts are classified as either extra-trout-fishing waters or trout-fishing waters. The greatest users of fishery districts in the Czech Republic are the Czech Fishing Union, interest association, and Moravian Fishing Union, interest association. Recreation fishermen catch every year in fishery districts around 3–4 thousand tonnes of fish, 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 is hundreds of millions CZK every year. Fishery is also affected by the ongoing climate change which manifests in fish production as well as in fish population in fishing districts. Another adverse factor that complicates fish production is restriction of farming with respect to requirements concerning nature preservation and it is desirable to find a compromise between interests of nature preservation and fish production.

The total fish production in 2019 included 19,894 tonnes of fish from fishponds, 1,048 tonnes from special facilities (mainly from flow systems with salmonoid fish and from recirculatory aquacultural systems) and 44 tonnes from dams.



Boats, Vrkoč Pond (Author: Kateřina Behunková)

Table 8.1.1
Market production of fish from the Czech Republic in 2011–2019

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019
	tonnes								
Carp	18,198	17,972	16,809	17,833	17,860	18,354	18,460	18,430	17,945
Total	21,010	20,763	19,358	20,135	20,200	20,952	21,685	21,751	20,986

Source: MoA and Czech Fish Farmers Association

In 2019, 8,464 tonnes of live fish were delivered to the Czech market, which means a year-on-year increase by 62 tonnes. Export of live fish was 10,297 tonnes, which means a decrease by 24 tonnes. 2,428 tonnes of fish were processed in live weight, which accounts for 12% of the total of fish caught.

The species composition of marketable fish is relatively stable and has not changed significantly, compared to the previous years. Of the total volume of harvested fish, carp accounted for 85.5%, salmonids 4.5%, herbivorous fish 5.2%, tench 0.7% and predatory fish accounted for 1.2% 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 38–40% of the production obtained by fish farming. Exports of live fish corresponded during the three previous years with 48–51% of the total catch and displayed stable interest in fish produced mainly by member organizations of the professional association. Fish processing plants processed into products 10–12% of the freshwater marketable fish produced.

The consumption of freshwater fish produced by fish farming in 2019 reached the value of 0.972 kg/person/year. To calculate the total consumption of freshwater fish per capita in 2019, population number of 10,693,939 as of 31 December 2019 was considered.



Rozkoš Water Reservoir (Source: Elbe River Board)



Přisečnice Fish Hatchery below the water reservoir (Source: Ohře River Board)

Table 8.1.2
Use of marketable fish produced by fish farming in the Czech Republic in 2011–2019

Year	Total productions	of which ^{*)}		
		sale of live fish in the Czech market	processed fish (live weight)	export of live fish
		thousand tons		
2011	21.0	9.7	2.1	8.8
2012	20.8	9.5	2.3	8.6
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

Source: MoA and Czech Fish Farmers Association

Note: ^{*)} Including inventory at the beginning and at the end of the year, losses and import of live freshwater fish.

Table 8.1.3
Fish consumption in the Czech Republic in 2010–2019

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019
	kg/person/year								
Fish in total	5.4	5.7	5.3	5.4	5.5	5.1	5.4	5.6	^{*)}
of which freshwater fish produced and caught in the Czech Republic	1.5	1.5	1.4	1.3	1.4	1.3	1.3	1.3	1.3

Source: Czech Statistical Office and Czech Fish Farmers Association

Note: ^{*)} Data for 2019 not available.



V. Zemanová – No One Can Live Without Water – Moravian-Silesian Region

9. FINANCIAL SUPPORT FOR WATER MANAGEMENT

9.1 Financial support provided by individual ministries

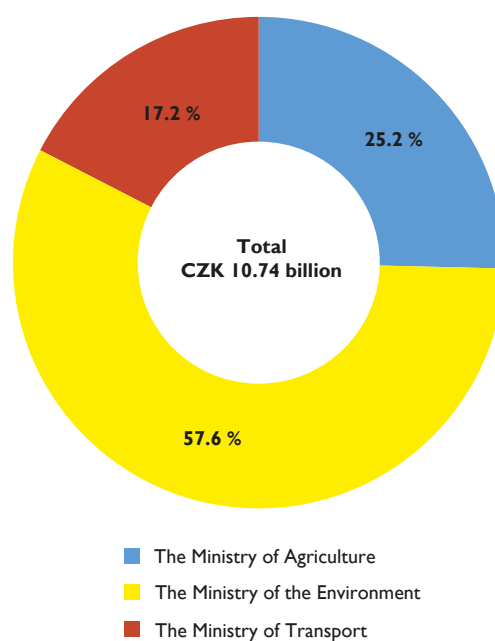
State financial support for water management includes selected national and transnational grant programmes linked with water management. In 2019, this support exceeded CZK 10.7 billion with the Ministry of Agriculture contributing to the sum with almost 25% (subsidies amounting almost to CZK 2.7 billion), the Ministry of the Environment with 58% (i.e. almost CZK 6.2 billion) and the Ministry of Transport with 17% (CZK 1.8 billion).

Table 9.1.1
Crucial support in water management in 2019

Ministry	Total funds in millions of CZK
Ministry of Agriculture	2,713.0
Ministry of the Environment	6,182.3
Ministry of Transport	1,844.1
Total	10,739.4

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

Chart 9.1.1
Financial support for water management by ministries in 2019



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

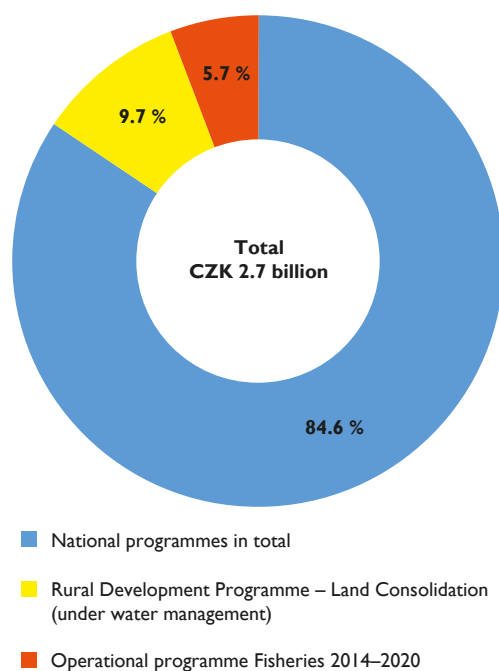


Reconstruction of the Koryčany Water Reservoir (Source: Morava River Board)

9.1.1 Financial support provided by the Ministry of Agriculture

The Ministry of Agriculture administered nine grant programmes focused on water management in 2019. Seven programmes were national and two were funded from national and transnational funds. The funds used amounted to a total of CZK 2.7 billion.

Chart 9.1.1.1
Use of funds under the Ministry of Agriculture in 2019



Source: MoA



Příchovický Stream, Horšice, reinforcement before repair (Source: Vltava River Board)



Příchovický Stream, Horšice, reinforcement after repair (Source: Vltava River Board)

Table 9.1.1.1
Funds provided for water management by the Ministry of Agriculture in 2019

Programme No.	Name of the programme	Programme expenditures (millions of CZK)
I29 300	Support for Construction and Technical Betterment of Water Supply and Sewerage System Infrastructure II	974.0
I29 260	Flood Prevention III	401.3
I29 360	Flood Prevention IV	140.7
I29 290	Support for Measures at Minor Watercourses and Small Water Reservoirs	461.9
I29 280	Support for Water Retention in the Landscape – Fishponds and Water Reservoirs	180.1
I29 310	Support for Competitiveness of Agriculture and Food Processing – Irrigations – Stage II	65.8
I7	Support for Extra-production Functions of Fishing Grounds	22.0
Švihov Water Reservoir Protective Belt	Measures Aimed at Decreasing the Impact of Primary Agricultural Production in the Protective Belt of the Švihov Water Reservoir at Želivka	50.0
	National programmes in total	2,295.8
	Rural Development Programme – Land Consolidation (under water management)	263.0
	Operational programme Fisheries 2014–2020	154.2
Total		2,713.0

Source: MoA

Ensuring quality of surface water sources

As part of decreasing the impacts of primary agricultural production in the protective belt of the Švihov Water Reservoir in the Želivka River the sum of CZK 50,049.3 thousand was paid in 2019.

The sum was intended for mitigating erosion and restricting application of plant protection agents on agricultural land and in protective belts of the Švihov Water Reservoir as intense farming results in an increased occurrence of pesticides and their metabolites in the Švihov Water Reservoir.

Water supply and sewerage systems

In 2019, investors received support in the form of grants as well as “subsidised loans”. Under programmes of the Ministry of Agriculture 129 300 “Support for Construction and Technical Betterment of Water Supply and Sewerage System Infrastructure II” aimed at implementation of measures to meet the directives of the EU in the field of water supply and sewerage systems and at the development of this sector, the Ministry of Agriculture provided grants amounting to CZK 1 billion. Grant programme 129 300 is approved for 2017–2022.

In 2019, funds from the state budget supported a total of 49 projects amounting to approximately CZK 404 million

under sub-programme 129 302 (measures aimed at water supply systems) and 73 projects amounting to CZK 564 million under sub-programme 129 303 (measures aimed at sewerage systems). No funds were expended from Chapter 397 of the Operations with State Financial Assets.

In 2018, the Ministry of Finance approved new sub-programme 129 304 “Support for Project and Engineering Preparation of the Measures Aimed at Tackling Consequences of the Intended Mining Extension of the Brown Coal Mine Turów in the Czech Republic”. 9 projects with total costs exceeding CZK 40 million were approved under the programme in 2019, but no support have been provided so far. The funds shall be paid upon reception of relevant documents (zoning permit, construction permit, statutory agreements).

“Discounted loans” were provided for projects under programmes 129 180 and 229 310 that were terminated. The loans were provided in the form of payments against parts of interests on commercial loans in 102 projects from 2008–2013 that were demanding in terms of investments with loan agreements totalling approximately CZK 1,578 million with less than ten-year maturity. In 2019, a part of unsettled interests in 68 outstanding loans was paid off totalling approximately to CZK 6 million. These were non-investment funds that are not considered as funding under the programme.

Table 9.1.1.2

State budget funds provided under programme 129 300 of the Ministry of Agriculture including subsidy for a part of interest on commercial loans in 2019

Form of support	Water supply systems and water treatment plants	Sewerage systems and wastewater treatment plants	Renovation of water supply systems and sewerage systems after floods	Total
	in millions of CZK			
Subsidies under MoA programmes	404.019	564.018	0	968.037
Subsidies for a part of interest on commercial loans	1.250	4.720	0	5.970
Subsidies in total	405.269	568.738		974.007
Refundable financial support	0	0	0	0
Total	405.269	568.738		974.007

Source: MoA

Table 9.1.1.3

Development of the state support for construction of water supply systems, water treatment plants, sewerage systems and wastewater treatment plants in 2015–2019 provided by the Ministry of Agriculture

Financial source	2015	2016	2017	2018	2019
	in millions of CZK				
Refundable financial support	0	0	0	0	0
State budget subsidies	1,170	1,883	1,683	597	974
Support from the state budget	1,170	1,883	1,683	597	974
Subsidised loan (EIB and CEB)	0	0	0	0	0
Total support	1,170	1,883	1,683	597	974

Source: MoA

Flood control

In 2019, programme 129 260 “Support for Flood Prevention III” continued to be implemented. The programme is a follow-up to the previous stage, while its emphasis is on the implementation of measures with retentive effects. In 2019, 19 projects were funded under this programme with total funds expended amounting to CZK 401.3 million.

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

Sub-programmes 129 262 “Support for Design documentation for Zoning Proceedings” and 129 263 “Support for Design Documentation for Construction Proceedings” are aimed at support for design documentations for significant constructions of flood measures that shall subsequently be implemented under further sub-programmes and for pre-project preparation of projects prepared on the basis of Government Resolution of 29 February 2016 No. 171 on initiating preparations of water reservoir constructions in regions affected by drought and jeopardized by water insufficiency.

Sub-programme 129 264 “Support for Flood Prevention with Retention” is aimed at constructing new retention areas, adjustments at existing water reservoirs with retention effect in order to increase protection against floods, measures against flood spilling and support for water retention in dry reservoirs in minor watercourses.

Sub-programme 129 265 “Support for Flood Measures Along Watercourses” is primarily aimed at construction of protective dykes and stabilization and increasing capacity of watercourse beds (especially in built-up areas).

Same as in previous year, programme 129 260 is implemented by watercourse administrators (i.e. River Boards, s.e., and Forests of the Czech Republic and minor watercourse administrators appointed by the MoA pursuant to Section 48(2) of the Water Act. Municipalities participate actively in the programme as applicants for subsidies for construction of local measures aimed at reducing flood risk of torrential rain and in minor watercourses.

The programme 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.

Table 9.1.1.4

Use of funds for selected projects under programme 129 260 in 2019

Watercourse administrator	Project	Date	Total costs	Funds in 2019
			in millions of CZK	
Elbe River Board	Divoká Orlice, Žamberk – flood protection	03/17–12/20	129.930	73.654
Ohře River Board	Nechranice Water Reservoir – renovation of lateral plots at the safety spill	9/17–02/21	96.099	16.336
Morava River Board	Boskovice Water Reservoir – renovation of the structure – increasing safety during floods	07/17–06/20	161.323	35.606
Forests of the Czech Republic	Stará Voda at 4,000–6,000 km	06/18–10/19	8.025	4.893
Oder River Board	Jelení Dry Reservoir, Measures at the Upper Opava	06/18–12/19	152.989	11.643

Source: MoA

Table 9.1.1.5

Use of funds of the state budget in 2019 under programme 129 260 by watercourse administrators

Owners and administrators	Investments	Non-investments
	in millions of CZK	
Elbe River Board	118.107	0
Vltava River Board	0	0
Ohře River Board	16.336	0
Oder River Board	22.526	0
Morava River Board	229.776	0
Forests of the Czech Republic	14.511	0
Municipalities	0	0
Total	401.256	0

Source: MoA

In 2019, the Ministry of Agriculture initiated funding projects under 129 360 programme “Support for Remedying Flood Damage IV”. The programme is a follow-up to previous stages and it emphasises implementation of measures with retention effects. Immediate implementation of significant projects after the launching of the programme was possible thanks to previously processed design preparation conducted during Stage III.

The programme is divided in four sub-programmes focused on preparation of design works for significant constructions, support for flood measures with retention, support for flood measures along watercourses and newly on preparation and implementation of selected construction related to the construction of the Nové Heřminovy Water Structure.

Sub-programme 129 363 “Support for Design Documentation” is aimed at support for design documentations for significant

constructions of flood measures that shall subsequently be implemented under further sub-programmes and for pre-project preparation of projects prepared on the basis of Government Resolution of 18 April 2018 No. 243 on preparations of water reservoir constructions in regions affected by drought as an effective measure of reducing water insufficiency and proposal of their funding and funding of other significant water structures.

Sub-programme 129 364 “Support for Flood Prevention with Retention” is aimed at constructing new retention areas, adjustments at existing water reservoirs with retention effect in order to increase protection against floods, measures against flood spilling and building and renovating polders including other related measures.

Sub-programme 129 365 “Support for Flood Measures Along Watercourses” is primarily aimed at construction of protective dykes and stabilization and increasing capacity of watercourse beds (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 location for the intended construction of a new water structure through conducting preparatory works and technical

measures. The new sub-programme is performance of Government Resolution of 3 June 2019 No. 386 concerning the Report on the state of preparation and implementation of measures aimed at reducing flood risks at the Upper Opava River including a proposal of funding the preparation and implementation of investment and constructions resulting from the “Measures at the Upper Opava” intent.

As in previous years, programme 129 360 shall be implemented by watercourse administrators

(i.e. River Boards, s.e., and Forests of the Czech Republic and minor watercourse administrators appointed by the MoA pursuant to Section 48(2) of the Water Act. Municipalities participate actively in the programme as applicants for subsidies for construction of local measures aimed at reducing flood risk of torrential rain and in minor watercourses.

The 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.

In 2019, 13 projects (out of 25 applications received) were funded under this programme with a total amount of CZK 140.7 million.

Table 9.1.1.6

Use of funds for selected significant projects under programme 129 360 in 2019

Watercourse administrator	Name of the project	Date	Total costs	Funds in 2019
			in millions of CZK	
Elbe River Board	Višňová, Víska, construction of a dry reservoir at the Krčelský Stream	01/19–12/21	77.431	29.260
Oder River Board	Measures in Holasovice, protection of PB area	08/19 – 02/22	108.514	6.100
Morava River Board	Olšava, Kunovice, flood protection of town	04/19 – 12/21	320.734	13.000
Forests of the Czech Republic	Flood measure at the Počátecký Stream, Počátky	03/19 – 01/21	22.899	12.000

Source: MoA

Table 9.1.1.7

Use of state budget funds under programme 129 360 by watercourse administrators in 2019

Owners and administrators	Investment	Non-investment
	in millions of CZK	
Elbe River Board	90.548	0
Vltava River Board	0	0
Ohře River Board	1.500	0
Oder River Board	6.100	0
Morava River Board	18.427	0
Forests of the Czech Republic	18.152	0
Municipalities	5.973	0
Total	140.700	0

Source: MoA



New retention damming in the Dunávka Stream ensure constant presence of water and favourable conditions for water organisms (Source: Morava River Board)

Remedying flood damage

In the sphere of remedying flood damage, the Ministry of Agriculture registers programme 129 270 “Remedying Flood Damage to State-owned Water Management Property II”, sub-programme 129 272 “Remedying the Impacts of Floods in 2013” that was implemented in 2013–2017 and assessed in 2017. Further use of this programme depends on occurrence of any flood damage to watercourse beds including relevant facilities, water structures and bank vegetation owned by the state. The grant applicants may be River Boards and Forests of the Czech Republic, s. e.

Minor watercourses and small water reservoirs

In 2019, programme 129 290 “Support for Measures at Minor Reservoirs and Small Water Reservoirs” continued to be implemented. It is divided in two sub-programmes: 129 292 and 129 293. A total of 256 projects were supported with funds amounting to a total of CZK 462 million.



Naděje Water Reservoir (Source: Ohře River Board)

Table 9.1.1.8

Use of state budget funds and number of projects funded under programme 129 290 in 2019

Owners and administrators	Use of funds			No. of funded projects
	Investment	Non-investment	Total	
	in millions of CZK			
Ohře River Board	10.971	5.538	16.509	6
Forests of the Czech Republic	85.391	27.839	113.230	53
Morava River Board	57.341	18.556	75.897	19
Vltava River Board	30.835	22.883	53.718	27
Oder River Board	4.202	6.573	10.775	7
Elbe River Board	21.915	12.726	34.641	23
Total 129 292	210.655	94.115	304.770	135
Total 129 293 – Municipalities	131.429	25.661	157.090	121
Total 129 290	342.084	119.776	461.860	256

Source: MoA

Sub-programme 129 292 “Support for Measures at Minor watercourses, Fishponds and Small Water Reservoirs” is intended for River Boards and Forests of the Czech Republic, s.e. In 2019, funds totalling to almost CZK 305 million were allocated to 135 projects.

Sub-programme 129 293 “Support for Measures at Fishponds and Small Water Reservoirs Owned by Municipalities” is intended for municipalities and associations of municipalities. Funds amounting to CZK 175 million were allocated to 121 projects under this Subprogramme in 2019.

Water in the landscape

In 2019, 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 2021. The funds expended in 2019 supported 25 projects totalling to CZK 180 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 “Remedying of Emergency Situations at Fishponds and Water reservoirs” and Sub-programme 129 284 “Remedying of Flood Damage at Fishponds and Water reservoirs”.

Table 9.1.1.9

Use of state budget funds under programme 129 280 in 2019

Sub-programme	No. of projects	Funds
		in millions of CZK
129 282	23	157.914
129 283	2	22.209
129 284	0	0
Total	25	180.123

Source: MoA

Table 9.1.1.10**Use of state budget funds for selected significant projects under programme 129 280 in 2019**

Applicant	Project	Data	Total costs	Funds in 2019
			in millions of CZK	
Štěpán Bečvář	Water areas in the cadastre of Pláně na Šumavě (construction of 2 reservoirs – Reservoir II = 1.70 ha; III = 1.69 ha)	9/18 – 12/19	5.404	4.332
Lesní družstvo v Polné	Kukle Fishpond – renovation (reconstruction and de-mudding)	12/18 – 12/19	25.940	20.752
Štičí líheň ESOX, s.r.o.	Mlýnský Pond, cadastre of Stádlec – reconstruction of the dam and buildings	3/19 – 8/19	3.606	2.836

Source: MoA

In 2019, funds under sub-programme 129 282 supported 23 projects with a total amount of CZK 157.91 million; two projects were supported under sub-programme 129 283 with CZK 22.209 million.

In 2019, programme 129 310 “Support for Competitiveness of Agrifood Industry – Irrigations – Stage II” continued at the Ministry of Agriculture. Financial support amounting to CZK 65.8 million was allocated to 45 projects under the programme.

The objective of programme 129 310 is to decrease the need for water and irrigation, energy demandingness of irrigation and use of positive environmental and extra-economic effects of irrigations as a measure of adopting to the climate change and thus increasing competitiveness of agricultural entities and stabilization of farming production. Programme 129 310 is divided in two sub-programmes: sub-programme 129 312 “Support for Renewal and Construction of Irrigation Detail and Optimization of Irrigation Systems – Stage II” is intended

as a support for restoration and building irrigation detail and support for restoration, building and optimization of irrigation networks. Sub-programme 129 313 “Support for Optimization of Irrigation Networks Administered by the State Land Office” is aimed at the support for restoration, building and optimization of irrigation networks.

Table 9.1.1.11**Use of state budget funds under programme 129 310 in 2019**

Sub-programme	Number of projects	Funds
		in millions of CZK
129 312	42	64.982
129 313	3	0.843
Total	45	65.825

Source: MoA

Table 9.1.1.12**Use of state budget funds for selected significant projects under programme 129 310 in 2019**

Applicant	Projects	Date	Total costs	Funds in 2019
			in millions of CZK	
Landmann s.r.o.	Mikulov irrigation reservoir	4/19 – 12/19	9.791	4.895
Galafruit s.r.o.	Intensification of Vlčí pole orchard	1/19 – 6/19	4.776	2.387
Josef Fabičovic	Extending Pasohlávky irrigation detail	5/19 – 12/19	1.044	0.730

Source: MoA



Flood protection of the town of Pohořelice: construction of 6,450 m of protective dams and walls (Source: Morava River Board)

Fisheries

In the sphere of fisheries, the Ministry of Agriculture administers national grant programme DT17 “Support for Extra-production functions of Fishing Districts”. In 2019, funds amounting to CZK 22 million supported 47 applicants.

The grant programme was launched by the MoA in 2015 with the view of supporting biological diversity in fish populations in surface waters intended for users of fishing districts. The subsidy is counted per one hectare of fishing districts. Funds from the grant may only be used to cover costs of introducing fish species in accordance with the predefined fish breeding of the relevant authority under state fishing administration.

In 2019, the programme was administered in accordance with principles that defined conditions for providing grants for 2019 pursuant to the provisions of Sections 1, 2 and 2d of Act No. 252/1997 Coll., on Agriculture, as amended.

Table 9.1.1.13

Use of state budget funds under programme DT17 in 2019

Programme	Number of applications	Number of projects funded	Funds in millions of CZK
DT17	47	47	22

Source: MoA

Operational programme Fisheries 2014–2020

The Ministry of Agriculture provided from the Operational programme 2014–2020 funds to 149 projects totalling to approximately CZK 154 million in 2019.

Table 9.1.1.14

Operational programme Fisheries 2014–2020 – use of funds in 2019

EU priority	No. of measure	Project	Number of projects	Funds provided in millions of CZK
2 – Support for knowledge-based environmentally sustainable, innovative and competitive aquaculture using resources efficiently	2.1	Innovation	0	0
	2.2	Productive investment in aquaculture	142	117.68
	2.3	Support for new fish farmers	3	0.87
	2.4	Recirculatory devices and flow systems with additional purification	3	12.33
	2.5	Aquaculture providing environmental services	7	9.70
Total EU Priority 2			155	140.58
3 – Support for implementation of common fishing policy	3.1	Data gathering	1	0.25
	3.2	Product traceability	-	0
Total EU Priority 3			1	0.25
5 – Support for introduction to the market and processing	5.1	Production plans	-	0
	5.2	Introducing products to the market	2	5.68
	5.3	Investments in product processing	8	2.94
Total EU Priority 5			10	8.62
Technical assistance			10	4.79
Total			176	154.24

Source: MoA



Loners, Nové Mlýny Water Reservoir (Author: Petr Soukup)

Fishers may use funds under the Operational programme Fisheries 2014–2020 from the European Marine and Fishing Fund under Priority Axis 2 – Support for knowledge-based environmentally sustainable, innovative and competitive 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 common fishing policy promotes data gathering and monitoring of fishing and aquaculture products. Under EU Priority Axis 5 – Support for new introductions to the market and processing, the grant concerns promotion and investment in fish processing.

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 of the European Parliament and of the Council No. 1305/2013. Water management is partially concerned by this programme by its Land consolidation. In 2019, funds amounting to CZK 263 million were expended under Operation 4.3.1 Land consolidation.

Grants from RDP are co-funded from the EAFRD and from the state budget. The support from the EAFRD for 2014–2020 is EUR 2.3 billion (CZK 63 billion). Furthermore, EUR 1.2 billion (approximately CZK 32 billion) will be paid from the state budget of the Czech Republic. RDP 2014–2020 funding is prefunded from the state budget, meaning all payments to recipients go first from national funds.

The RDP 2014–2020 supports Land consolidation with a single grant recipient defined: the State Land Office and its branches of regional land offices. The programme is a follow-up to previous RDP 2007–2013.

100% of eligible costs are funded. Funds from the European Agricultural Fund for Rural Development cover 49.5% of public costs, funds from the state budget of the Czech Republic cover 50.5% of public costs. EUR 130 million (approximately CZK 3.2 billion), was allocated for 2014–2020 applications were received on a continual basis from 22 February 2016.

Under the RDP 2014–2020, operation 4.3.1 Land Consolidation, 344 applications for grants amounting to CZK 3.4 billion were registered with 280 applications totalling CZK 2.7 billion approved and CZK 1.9 billion actually paid by 31 December 2019.

Table 9.1.1.15
Use of funds under Operation 4.3.1 Land Consolidation in 2019

Operation 4.3.1 Land consolidation	Unit	Intent a) Geodetic work	Intent b) Implementing plans of joint structures	Total	Of which allocated to water management
No. of projects registered	pcs	0	74	74	19
Amount for projects registered	millions of CZK	-	786	786	207
No. of approved projects	pcs	2	45	47	7
Amount for projects approved	millions of CZK	2.6	492	495	111
Funded projects	pcs	0	101	101	25
Funded	millions of CZK	-	1,018	1,018	263

Source: MoA

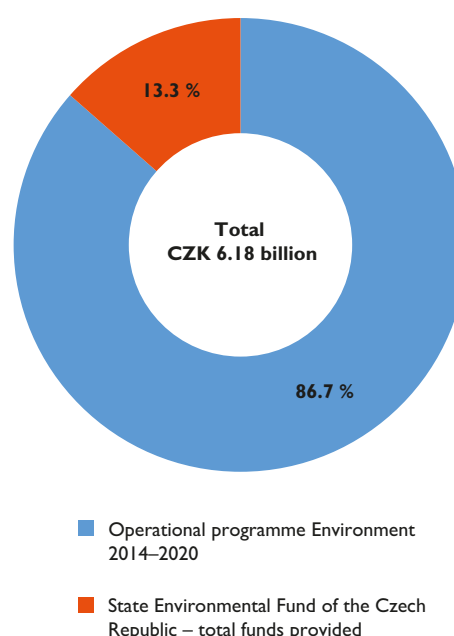
9.1.2 Financial support provided by the Ministry of the Environment

The Ministry of the Environment provided financial support under transnational and national grants in 2019. Financial support from the state budget amounted to CZK 5.36 billion, funds from the State Environmental Fund of the Czech Republic was CZK 0.82 billion. Funds provided under the Ministry of the Environment for water management totalled to CZK 6.18 billion.



Divoká Orlice River, Land Gate (Source: Elbe River Board)

Chart 9.1.2.1
Use of funds under the Ministry of the Environment in 2019



Source: MoE, SEF

Table 9.1.2.1**Funds provided for water management by the Ministry of the Environment in 2019**

Name of the programme	Programme expenditures (millions of CZK)
Operational programme Environment 2014–2020	5,358.6
Ministry of the Environment – total	5,358.6
National programme Environment	337.4
Call No. 2/2016 PU in accordance with Directive of the Ministry of the Environment No. 8/2017 – loans from the State Environmental Fund	486.3
State Environmental Fund of the Czech Republic – total funds provided	823.7
Total funds provided by the Ministry of the Environment	6,182.3

Source: MoE, SEF

Operational Programme Environment 2014–2020

The Ministry of the Environment provides financial support under programmes co-funded from the European Union grants through the Operational Programme Environment. In 2019, funds from the Cohesion Fund and European Regional Development Fund were provided for priority axes 1 and 4 for water management and for care and protection of nature and landscape, totalling to CZK 5.36 billion.

The programme document for Operational Programme Environment 2014–2020 was approved by the European Commission on 30 April 2015. The funds started to be used in December 2015. The Operational Programme Environment 2014–2020 is a follow-up to the Operational Programme Environment 2007–2013. In comparison with the previous programme, there is a decrease in the number of activities supported by so-called priority axes. In 2014–2020, support from the programme may be received in one of the following priority axes:

1. Improving water quality and decreasing the risk of floods,
2. Improving air quality in urban areas,
3. Waster and material flows, ecological burden and risks,
4. Protection and care of the nature and landscape,
5. Energy savings.

Under Priority Axis 1 – Improving water quality and decreasing the risk of floods – 143 projects were approved for funding with contribution from the EU of CZK 582.9 million, and legal act confirming future grant provision with contribution from the EU amounting to CZK 2,227.79 million was issued for 166 projects in 2019. Funds used from the Cohesion Fund amounted to CZK 4,526.0 million in 2019.

Under Priority Axis 4 – Protection and care of the nature and landscape (specific objective 4.3 – 4.3 To strengthen natural landscape functions and 4.4 – To improve quality of the environment in residential areas) including measures against drought, 278 projects were approved for funding with contribution from the EU of CZK 992.9 million and legal act confirming future provision was issued for 231 projects in 2019. Funds used from the ERDF amounted to CZK 832.7 million in 2019.

In 2019, applications for grants from the Operational Programme “Environment 2014–2020” for water management and protection and care of landscape were received under 7 calls (of which 5 under specific objectives 1.1 to 1.4 and two calls under specific objectives 4.3 and 4.4). A total of 18 calls were opened in 2019.



Sedlinka Water Reservoir (Source: Forests of the Czech Republic)

Table 9.1.2.2**Projects approved to receive funds under the Operational Programme Environment 2014–2020 in 2019**

Priority axis	Area of support	Number	Total costs	Total eligible costs	EU grant
			in millions of CZK		
I	I.1	2	254.69	206.09	131.38
	I.3	39	261.99	168.16	139.70
	I.4	102	471.14	441.26	311.76
Priority axis I in total		143	987.82	815.51	582.85
4	4.3	215	1,088.74	959.57	852.38
	4.4	63	269.31	208.30	140.49
Priority axis 4 in total		278	1,358.05	1,167.87	992.86
Total		421	2,345.87	1,983.38	1,575.71

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 9.1.2.3**Projects with an issued legal act on providing support from the Operational Programme Environment 2014–2020 in Water Management in 2019**

Priority axis	Area of support	Number	Total costs	Total eligible costs	EU grant
			in millions of CZK		
I	I.1	23	2,069.83	1,572.85	1,002.69
	I.2	2	1,490.63	1,185.79	755.94
	I.3	43	277.47	183.54	153.86
	I.4	98	469.22	437.66	315.30
Priority axis I in total		166	4,307.16	3,379.84	2,227.79
4	4.3	187	1,005.04	892.90	793.16
	4.4	44	172.64	125.57	75.32
Priority axis 4 in total		324	231	1,177.68	1,018.47
Total		397	5,484.84	4,398.30	3,096.28

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

Note: Project with an issued permit is a project with a Project registration and Decision on Grant Provision.

Table 9.1.2.4**Use of funds from the Operational Programme Environment 2014–2020 in 2019**

Area of support	EU grants in millions of CZK
I.1 To reduce the amount of pollution discharged into surface and ground water from municipal sources and the input of pollutants into surface and groundwater	3,152.09
I.2 To ensure the supply of drinking water of an adequate quality and quantity	766.49
I.3 To ensure flood protection of urban areas	383.63
I.4 Promote flood prevention measures	223.78
Priority axis I in total	4,525.98
4.3 To strengthen natural landscape functions	747.09
4.4 To improve quality of the environment in residential areas	85.58
Priority axis 4 in total (4.3, 4.4)	832.66
Total	5,358.64

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

Table 9.1.2.5**Calls of the Operational programme Environment 2014–2020 in the field of water management in 2019**

Call No.	Call and No. of specific objective	Allocation of EU funds	Applications received from	Deadline for filing applications
		in millions of CZK		
51	4.3 To strengthen natural landscape functions	500	09/01/2017	07/01/2019
52	4.3 To strengthen natural landscape functions	40	03/04/2017	30/06/2020
80	1.1 To reduce the amount of pollution discharged into surface and ground water from municipal sources and the input of pollutants into surface and groundwater	211	16/01/2017	28/02/2019
81	1.2 To ensure the supply of drinking water of an adequate quality and quantity	189	16/01/2017	31/10/2019
82	1.3 To ensure flood protection of urban areas	285	16/01/2017	31/10/2019
83	1.4 Promote flood prevention measures	35	16/01/2017	01/07/2019
88	4.3 To strengthen natural landscape functions	160	16/01/2017	02/01/2020
113	1.3 To ensure flood protection of urban areas	1,800	01/03/2018	07/01/2019
115	4.4 To improve quality of the environment in residential areas	119	01/08/2018	30/06/2020
116	1.1 To reduce the amount of pollution discharged into surface and ground water from municipal sources and the input of pollutants into surface and groundwater	1,250	07/01/2019	31/07/2019
119	1.3 To ensure flood protection of urban areas	1,000	04/02/2019	13/01/2020
123	1.4 Promote flood prevention measures	100	01/04/2019	30/09/2019
124	1.4 Promote flood prevention measures	150	01/04/2019	03/06/2019
125	1.4 Promote flood prevention measures	150	01/10/2019	19/12/2019
127	4.3 To strengthen natural landscape functions	310	01/10/2018	06/01/2020
128	4.4 To improve quality of the environment in residential areas	610	01/10/2018	06/01/2020
131	4.3 To strengthen natural landscape functions	300	01/02/2019	31/10/2019
132	4.4 To improve quality of the environment in residential areas	100	01/02/2019	31/10/2019

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

The State Environmental Fund of the Czech Republic

The State Environmental Fund (SEF) of the Czech Republic established by Act No. 388/1991 Coll., is a specifically oriented institution which is an important financial resource for support for implementation of measures to protect and improve the status of the environment in its respective compartments. On 31 December 2019 the revenue part of its budget amounted to CZK 1.07 billion.

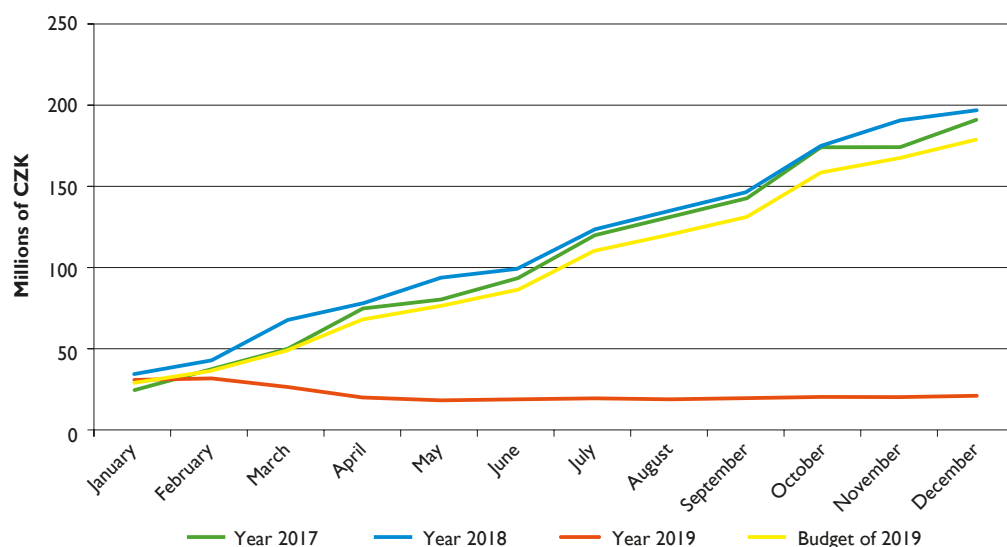
The revenues of the State Environmental Fund of the Czech Republic included collected charges for environmental pollution of CZK 572.2 million. Revenue from fines and financial penalties amounted to CZK 51.1 million. In the sphere of the protection of waters they comprise a charge for wastewater discharges into surface waters and a charge for abstracted groundwater as shown in Table 9.1.2.6.

Table 9.1.2.6**Structure of the revenue part of the budget (only water-related)**

Item (water protection)	Budget for 2019	Revenue as of 31/12 2019	Payments	Difference
	in millions of CZK		%	in millions of CZK
Wastewater	180.0	20.3	11.3	-159.7
Groundwater	300.0	-188.3	-62.8	-488.3

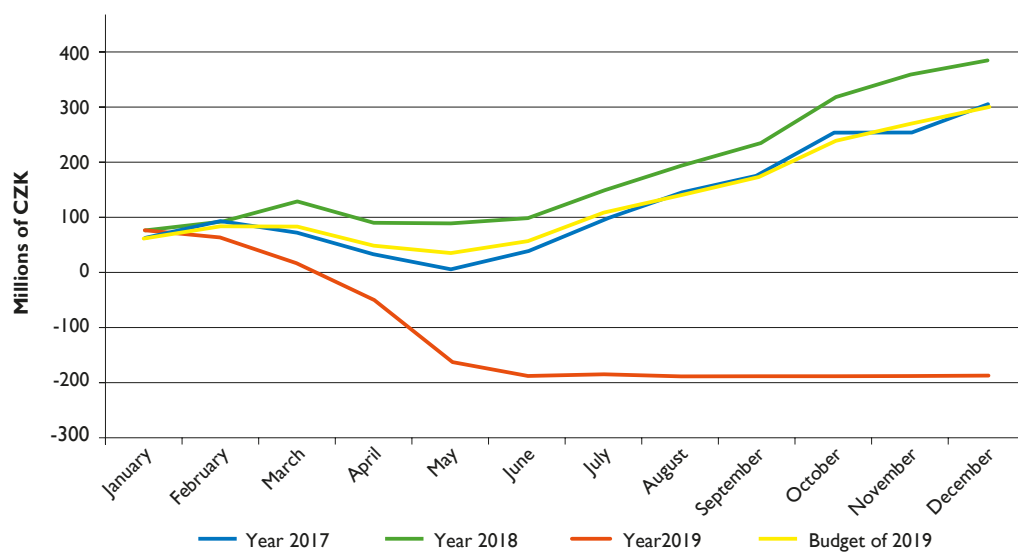
Source: State Environmental Fund

Chart 9.1.2.2
Development of revenues from charges for wastewater in 2017–2019



Source: SEF

Chart 9.1.2.3
Development of revenues from charges for groundwater in 2017–2019



Source: SEF



Renovation of the Baštýnský Stream near Novosedly with a new riparian forest, state of construction in May 2020 (Source: Morava River Board)



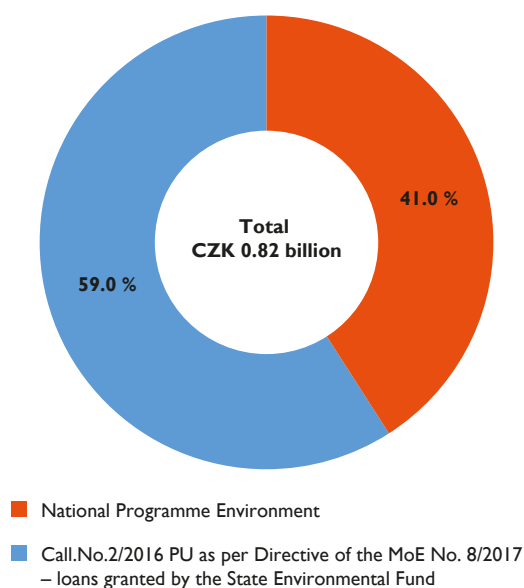
Flood protection of the municipality of Žiželice (Source: MoE)

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

The State Environmental Fund of the Czech Republic provided from its beginning funds from national sources supporting a wide range of measures to be taken in the environment of the Czech Republic. These funds were offered through so-called national programmes, their focus being grounded in priorities of the current State Environmental Policy and the Strategy of the State Environmental Fund of the Czech Republic. After European funds were made accessible in 2004, they obtained a complementary function to European union grants. The abovementioned programmes were substituted by the National Programme Environment in 2015. The State Environmental Fund of the Czech Republic administered in 2019 the following programmes under which approximately CZK 823.7 million was paid.

Chart 9.1.2.4

Use of funds under national programmes for water management administered by the State Environmental Fund of the Czech Republic in 2019



Source: SEF



Střekov Fishpass (Source: Elbe River Board)

Programme 115 270 “MoE Remedying Damage Caused by Natural Disasters” – funds from the state budget

Under programme 115 270, the State Environmental Fund administered two sub-programmes: 115 272 “MoE Floods 2013” and 115 273 “Remedying Damage Caused by Natural Disasters in 2014”. In sub-programme 115 272 were closed all applications administered and no funds were paid – the sub-programme can now be considered terminated. The sub-programme 115 273 administered three applications of which two were terminated in 2019, no funds were paid in 2019 under this sub-programme. In the case of the third application programme in 2020, it is expected that the sum shall not exceed CZK 5,7 million.

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 uses funds of the State Environmental Fund obtained from environmental fees and it complements other grants, particularly Operational Programme Environment and the New Green Savings programme.

The State Environmental Fund administered under this programme 16 applications in 2019 – see Table 9.1.2.7. 2,302 grants totalling to CZK 337.4 million were paid under the calls.



Renovation of the U křížku Stream, Dlouhý Újezd (Source: Forests of the Czech Republic)

Table 9.1.2.7
Calls administered under the National Programme Environment in 2019

Call No.	Name of the call	Applications received		Applications approved		Applications paid	
		No.	grants millions of CZK	No.	grants millions of CZK	No.	grants millions of CZK
10/2015	Renovations and maintenance of water areas and watercourses	0	0.0	0	0.0	5	1.9
8/2016	Research, intensification and construction of drinkable water resources	0	0.0	0	0.0	100	99.1
10/2016	Green vegetation for towns and municipalities	0	0.0	0	0.0	32	8.2
11/2016	Domestic wastewater treatment plants	0	0.0	0	0.0	11	46.7
12/2016	Liquidation of unnecessary drills	0	0.0	0	0.0	3	5.3
2/2017 – application selection	Ecoinnovation – application selection	0	0.0	0	0.0	1	1.3
6/2017	Rainwater	0	0.0	146	6.9	158	7.4
12/2017	Rainwater II	3,260	130.4	1,920	72.3	1,810	68.4
15/2017 – application selection	Support for municipalities in national parks – application selection	0	0.0	1	5.7	8	21.9
17/2017	Domestic wastewater treatment plants	18	71.4	22	98.1	1	2.0
18/2017	Green vegetation for towns and municipalities	0	0.0	0	0.0	44	22.0
20/2017	Liquidation of unnecessary drills	5	4.6	3	1.1	0	0.0
2/2018	Drinkable water resources	162	201.7	144	179.2	27	35.6
3/2018 – application selection	Ecoinnovation – application selection	2	30.6	1	15.0	0	0.0
8/2018	WWTPs and sewerage systems	0	0.0	0	0.0	2	12.0
4/2019	Water supply and sewerage systems	2	18.9	0	0	0	0
beyond the call	Czech geological service (Turów – Exploratory Stage II)	0	0.0	0	0.0	1	5.7
Total		3,449	457.6	2,237	378.2	2,203	337.4

Source: SEF

Call No. 2/2016 PU as per Directive of the Ministry of the Environment No. 8/2017 – loans granted by the State Environmental Fund

The call was made in 2016 with the objective of enhancing own sources expended on implementing projects supported under Operational Programme Environment 2014–2020, Priority Axis

I, specific objectives 1.1 and 1.2 with the intent of improving quality of drinkable water for the population. Applications were received from 17 October 2016 until 31 December 2018 or until the allocation of CZK 690 million was used up. In 2019, almost CZK 290.8 million was paid and Call No. 1/2019 was made with total allocation of funds of CZK 500 million in Priority Axis I with reception of applications from 2 January 2020.

Table 9.1.2.8
Overview of terminated call No. 2/2016 PU for loans for implementors of water management projects under the Operational Programme Environment on 31 December 2019

Interest rate in % p. a.	Maturity in years	Allocation	Applications filed	Applications being administered	Applications with issued Decision of the Minister	Contracts concluded with receivers	Paid to receivers
		in millions of CZK					
0.45	max. 10	690	728.103	0	674.487	647.552	486.270

Source: SEF

Norwegian funds – the Programme Environment, Ecosystems and Climate Change

The programme is funded from the Norwegian Financial Mechanism for 2014–2021, the State Environmental Fund co-funds the programme with 15%. The programme is focused on improving the state of ecosystems, decreasing air and water pollution including monitoring and on adoption and mitigation measures linked with the climate change.

In the field of waters, the programme focuses on enhancing substance monitoring in accordance with the Water Framework Directive (list of priority substances and list of monitored substances – “watchlist”) and on implementing projects aimed at reducing pharmaceutical pollution in surface waters. In 2018, the programme was in its preliminary stage and being signed on 20 February 2019 the Programme Agreement entered the implementation stage and calls for projects in the field of water protection are expected for the first half of 2020. Total allocation for water management amounts to approximately CZK 170 million.

9.1.3 Financial support of the Ministry of Transport

The State Transport Infrastructure Fund was established with Act No. 104/2000 Coll., on the State Transport Infrastructure Fund of 4 April 2000 with effect as of 1 July 2000. The purpose of the fund in water management is to fund construction, modernization, repairs and maintenance of significant national waterways.

Funds of the State Transport Infrastructure Fund were expended on development, modernization and maintenance of waterways significant in terms of transport in 2019 through the Waterways Directorate of the Czech Republic amounting to CZK 1,252.7 million, of which investment expenses accounted for CZK 1,224.0 million and non-investment expenses for CZK 28.7 million. Financial participation from funds from the programme Connecting Europe Facility amounted to CZK 293.8 million.

Waterways Directorate of the Czech Republic

Waterways Directorate of the Czech Republic was established by the Ministry of Transport and Communication 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 Relationships as amended, as a managing organization of the state. Its core activities consist in developing waterways infrastructure in the Czech Republic using funds from the State Transport Infrastructure Fund. It is an investing entity under the Ministry of Transport.

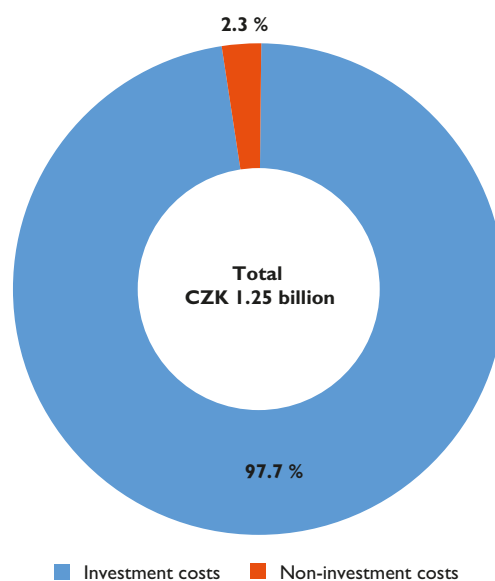
Funds expended on waterways significant in terms of transport amounting to CZK 1.25 billion were the highest sum invested in waterways infrastructure since 2010. Funds from STIF and from the Connecting Europe Facility programme (hereinafter referred to as the “CEF”) were primarily allocated to a set of works linked with overall improvement of

parameters in the Vltava Waterway between Mělník and Prague co-funded from the CEF, i.e. “Modernization of the Štvanice Lock Chamber” amounting to approximately CZK 141.39 million (with CZK 53.02 million from the STIF) and “Adjustment of the pound at the Hořín Lock Chamber” amounting to approximately CZK 300.00 million (with CZK 108.75 million from the STIF); these projects are closely linked with the “Draught increase in the Vltava Waterway” project implemented at the cost of CZK 229.88 million and “Underpass Clearance Increase in the Vltava Waterway” project at the cost of CZK 314.07 million.

New constructions using funds from the STIF included the “Road Bridge over the Elbe River between Valy and Mělnice” project of CZK 115.06 million, which is one of a series of constructions making the Elbe Waterway to Pardubice navigable and the “Veselí nad Moravou Recreational Marine” of CZK 14.10 million. Additionally, modernization of anchorage ground in Edvard Beneš Square in Prague was completed with investment costs of CZK 11.37 million. A total item called “Investment projects with budget below CZK 20 million” encompassing smaller projects used a total of CZK 34.99 in 2019.

Significant funds were also expended on intense preparation of other investments in general development of the network of waterways significant in terms of transport. The main obstacle in ongoing preparations of the projects was the fact that rights pertaining to the use of the relevant land necessary for construction by River Boards, s.e., have not been resolved and in the case of the Děčín Weir and it is first necessary that the SEA Concept of Water Transportation is completed for in the Přelouč II Weir and Louka u Přelouče becomes a “Site of Community Importance”.

Chart 9.1.3.1
Waterways Directorate – use of funds in 2019



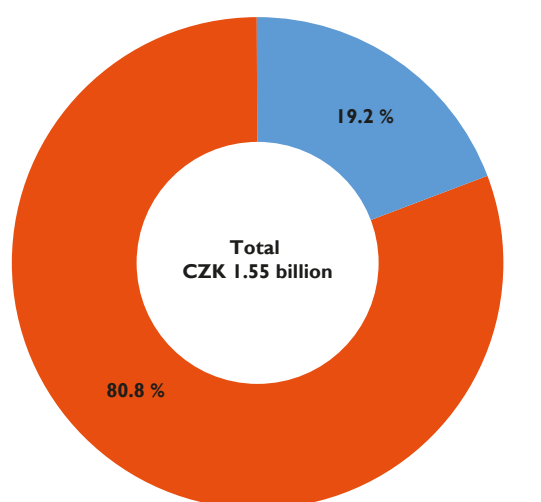
Source: Ministry of Transport

Furthermore, permits for other investment projects were obtained, e.g. for another bridged under “Ensuring Underpass Clearance in the Vltava Waterway”, for “Stabilization of the

Waterway in the Chvaletice Marina”, “Veselí nad Moravou Recreational Marina” and for four marinas for recreational navigation.

Crucial advancement was also made in implementation of the River Information Services (RIS), a portal concerning corridors made under a common project of 13 countries called “RIS COMEX”. The RIS portal was implemented to all European watercourses and it conveys information to waterways users. Data processing from national systems was initiated and the Czech Republic included in the Beta phase data from AIS and NTS with further data from electronic navigation maps and together with other services shall be included in the RIS in 2020. RIS COMEX invested in the national RIS infrastructure CZK 16.67 million in 2019, of which CZK 14.17 from the CEF.

Chart 9.1.3.2
Use of funds from the State Transport Infrastructure Fund in 2019



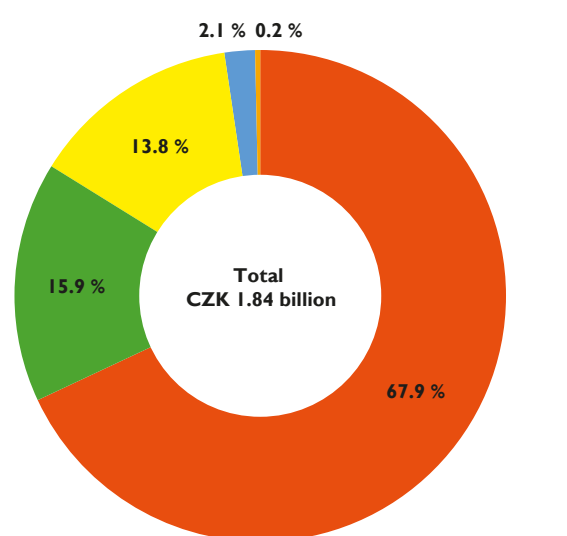
■ River Boards, s. e. ■ Waterways Directorate of Czech Republic

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

River Boards, s.e., expended on operation and maintenance of water ways funds amounting almost to CZK 400 million in 2019, of which CZK 102 million were from their own sources, the remaining CZK 298 million from grants. The grants were in their entirety allocated from the State Transport Infrastructure Fund.

The Vltava, Elbe and Morava River Boards, s.e., also used funds for renovation, operation and maintenance of waterways under their authority. The funds from the STIF were of investment as well as of special-purpose non-investment nature. Non-investment funds amounted to CZK 209.5 million and investment funds to CZK 88.1 million in 2019.

Chart 9.1.3.3
Funds spent on waterways significant in terms of transport through the Ministry of Transport in 2019



■ Waterways Directorate of Czech Republic
■ Connecting Europe Facilities
■ Vltava River Board, s. e.
■ Elbe River, s. e.
■ Morava River Board, s. e.

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

Table 9.1.3.1
Waterways – selected projects by River Boards, s.e., in 2019

River Boards, s.e.	Project	Total costs (millions of CZK)	Funded by
Elbe	WS Lobkovice, repair of anti-corrosive protection of the damming structure of the weir	7.7	own resources
	WS Lysá n. L., anticorrosive protection of LC gates	1.0	own resources
	Elbe, Děčín – Rozbělesy Marina, sediment removal	2.3	STIF
Vltava	Vltava, LC Smíchov – brickwork repair	6.8	STIF + own resources
	Vltava, river km 18,00 LC Miřejovice – brickwork repair	2.3	STIF
	WS Vrané – modernization of LC damming system	24.7	STIF + own resources
Morava	Bat'a Canal, Vnorovy – Veselí n. Mor, km 14,895 – 17,825, corridor reinforcement	11.0	STIF
	Bat'a Canal, Huštěnovice – Babice, km 39,150 – 40,778, bulwark repair	7.9	STIF
	Anchorage for service vessels – Vnorovy I., Vnorovy II., Veselí n.M.	8.8	STIF

Source: River Boards, s.e.

Table 9.1.3.2

Financial funds expended by River Boards, state enterprises, on repair, maintenance, building, reconstruction and modernization and waterways administered in 2019

River Board	Own sources	Purpose non-investment grants ^{*)}	Investment grants	Grants in total	Own sources and grants in total
millions of CZK					
Elbe	87,760	2,559	588	3,147	90,907
Vltava	12,731	186,895	67,998	254,893	267,624
Morava	1,667	19,995	19,546	39,541	41,208
Total	102,158	209,449	88,132	297,581	399,739

Source: River Boards, s.e.

Note: ^{*)} Grant provider – State Fund for Transport Infrastructure.

9.2 Financial support from international cooperation and the EU

Projects focused on the area of water management in 2014–2020

The programme period 2007–2013 ended and is successfully followed by new programmes for 2014–2020. It consists of the following nine independent programmes:

Cross-border cooperation:

- Interreg IVC Czech Republic – Poland
- Interreg IVC Slovak Republic – Czech Republic
- Interreg IVC Austria – Czech Republic
- Programme of transboundary cooperation Czech Republic – Free State of Bavaria (under the Objective of European Territorial Cooperation 2014–2020)
- Programme of cooperation Free State of Saxony – Czech Republic 2014–2020

National and inter-regional cooperation:

- Interreg CENTRAL EUROPE
- DANUBE
- Interreg EUROPE
- URBACT III

Under these nine programmes, projects that contribute to improving the environment (natural and technological risks including the climate change and influence on water management, etc.) were submitted, approved and subsequently funded. 2019 was a year of full implementation of all the projects, while still several new projects focusing on the abovementioned issues were approved.

1. Programme of transboundary cooperation Czech Republic – Free State of Bavaria (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

Objectives: 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

Partner's budget:

- Šumava National Park Administration: EUR 513,674.10
- Czech University of Life Sciences Prague: EUR 79,215.00
- Masaryk University: EUR 53,955.00

Objectives: 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 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) *Green infrastructure measures from multi-purpose use of waste sediments (green IKK) through cross-border interregional cooperation / Green Infrastructure Maßnahmen aus Klärschlamm-Kaskadennutzung (green IKK) mittels grenzüberschreitender interregionaler Zusammenarbeit*

No. of partner(s) on the Czech side: 2

Partner's budget:

- CHEVAK Cheb, a.s.: EUR 47,584.00
- Forestry and Game Management Research Institute, p. r. i.: EUR 124,854.50

Objectives: Creating instructions for multi-purpose use, development of measures concerning green infrastructure/ecosystem services intended particularly for organizations and companies in the target regions (e.g. fertilizer development from sediment nutrients, elimination of harmful substances contained in waste sediments/ashes), development of options how nutrients contained in sediments/ashes can be utilized, use of trace elements through nutrient management while adhering to principles of water protection, environmental and legal requirements, instructions of use for the given region, etc.

Environment protection – support for sustainable energies – thanks to sustainable, efficient, regional, decentralized, energetic use of waste sediments. Ensuring/restoring water quality thanks to retention/regaining nutrients and retention/elimination of organic and inorganic noxious substances such as heavy metals, polymers and others from waste sediments and wastewaters as well as from energetic use of the management of environmental risks through targeted reclamation of nutrients, in particular phosphorus, and retaining noxious substances with the aim of protecting waters, soil and air.

4) *Measures in the Kössein and Röslau 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

Objectives: 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 (EVL – 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.

5) *Green infrastructure measures from multi-purpose use of waste sediments (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 47,584.00
- Forestry and Game Management Research Institute, p. r. i. – EUR 124,854.50

Objectives: Establishing cross-border cooperation in the sphere of substance and energy use of municipal waste sediments (multi-purpose use). New processes and measures of green infrastructure shall be initiated in management of landscape care, in particular through nutrient reclamation and use of phosphorus. Furthermore, the project shall contribute to decreasing costs linked with disposal of waste sediments and thus minimize the burden to local economies by lowering sewerage charges

6) *Water – Wasser 2020, project No. 287*

Newly approved project

No. of partner(s) on the Czech side: 1

Partner's budget Zelený poklad (meaning "Green Treasure")

Foundation: EUR 125,409.40

Project implementation: 1 January 2020 – 31 May 2022

Objectives: To motivate positively the target group to change the situation concerning issues linked with inefficient rainwater management. At the same time, it is necessary to develop and put into operation as soon as possible strategies of groundwater protection as it is jeopardized by the climate change (extreme droughts with severe impacts on humans, environment and nature). The projects are aimed at contributing to positive motivation and promote education of teachers, municipality representatives, public administration and municipality employees to tackle the impending threat of insufficient water reserves in the future.

II. Interreg V-A Austria – Czech Republic

1) *Project No. ATCZ7 – Dyje 2020*

No. of partner(s) on the Czech side: 2

Partner's budget:

- Morava River Board, s.e.: EUR 1,877,494.45
- T. G. Masaryk Water Research Institute: EUR 55,250.00

Objectives: The main objective of the project is to create a scientific, methodological and personnel basis for coordinated development of the region and achieving the desired quality of environment and ecosystem services in the borderland region. Ten cross-border vehicles aimed at harmonizing monitoring and assessment of watercourse situation, support for fish population development and improvement of watercourse morphology shall be established.

2) *Project No. ATCZ37 – Support for natural environment and occurrence of freshwater pearl mussel in the Malše River Basin*

No. of partner(s) on the Czech side: 4

Partner's budget:

- Ministry of the Environment: EUR 220,150.00
- T. G. Masaryk Water Research Institute: EUR 458,437.30
- Nature Conservation Agency of the Czech Republic: EUR 138,268.70
- South Bohemia: EUR 42,494.45

Objectives: The objective of the project is to enhance population of critically threatened freshwater pearl mussel in the borderline part of the Malše River by introducing young freshwater pearl mussels to the river, describing the exact causes why the animal does not reproduce successfully in the location and create conditions for improving water cleanness and reducing erosion in the entire international river basin.

3) *Project No. ATCZ163 – Schwarzenberg Navigational Canal / Bavarian Water Meadow*

No. of partner(s) on the Czech side: 3

Partner's budget:

- Vojenské lesy a statky ČR, s. p.: EUR 2,038,369.32
- Forests of the Czech Republic: EUR 789,381.09
- Šumava National Park Administration – strategic partner

Objectives: The main outputs of the project will include assessment of a part of the Schwarzenberg Navigational Canal that is a heritage of international importance and improving its accessibility to the general public. Furthermore, the project will focus on improving accessibility to and potential of the Bavarian Water Meadow (a peat bog) and opening an educational wheelchair accessible trail to the Bavarian Water Meadow so that visitors have the chance to see the peat bog and the importance of environment conservation. Hydrological remediation of the peat bog will be necessary.

4) *Project No. ATCZ167 – Hydrothermal potential of the region*

No. of partner(s) on the Czech side: 2

Partner's budget:

- Masaryk University: EUR 738,662.00
- Ministry of the Environment – strategic partner

Project under implementation.

Objectives: To describe occurrence of thermal waters in a comprehensive geoscientific model and assess their possible use together with conflicts in use. On the basis of achieving the best knowledge possible of the occurrence of thermal waters in the region, strategies and specific measures and/or tools for future management of such resources should be developed in cooperation with decision-making authorities and regional stakeholders. This includes harmonization of administrative procedures, proposals of establishing a joint legal framework and institutional tools. The project deals with the issue of origin, capacities and possible use of cross-border water in the Laa – Pasohlávky region.

III. Programme of cooperation Free State of Saxony – Czech Republic (under the Objective of European Territorial Cooperation 2014–2020)

1) *Project No. 100266035 – Vita-Min*

No. of partner(s) on the Czech side: 1

Partner's budget: Ústí: EUR 493,241,40

Objective: Improving water quality and situation concerning groundwaters and surface waters in the Bohemian-Saxony borderland. For this purpose, it is necessary to take measures in the sphere of monitoring and reduction of harmful substances and remediation of water bodies and soils.

2) *Project No. 100272124 – Flood measures in the Vilémovský Stream River Basin – Sebnitz – feasibility study*

No. of partner(s) on the Czech side: 1

Partner's budget Ohře River Board, s. e.: EUR 124,196.90

Objective: Improving flood protection in the Vilémovský Stream River Basin near the town of Sebnitz. Such measures will protect population and material assets more effectively in case of floods. The study consists, in particular, in analysing and proposing measures aimed at protecting the town of Sebnitz and other areas near the watercourse in case of floods while taking nature conservation and economy into consideration.

3) *Projekt No. 100320948 – TraboRiMa – Cross-border integrated administration of the Mandava River*

No. of partner(s) on the Czech side: 2

Partner's budget:

- T. G. Masaryk Water Research Institute: EUR 545,380.64
- Czech Technical University: EUR 174,906.00

Objective: Coming up with a proposal of a sophisticated system for administrating the Mandava River (a borderline watercourse) and its tributaries with a view of improving and creating new environmental habitats together with sustainable flood risk management. The project focuses on systemic implementation of the EU Water Framework Directive (2000/60/EC) and the EU Floods Directive (2007/60/EC) in the Mandava River and its tributaries.

IV. Programme Interreg V-A Czech Republic – Poland

1) *CZ.1.1.2.45/0.0/0.0/15_003/0000266 – AQUA MINERALIS GLACENSIS*

No. of partner(s) on the Czech side: 2

Partner's budget:

- City of Náchod: EUR 622,917.00 from the ERDF
- City of Hronov: EUR 534,803.97 from the ERDF

Objective: Creating a Czech-Polish circuit trail capitalizing on the potential of unique mineral waters. The project addresses harnessing the potential of mineral waters through element renovation and relevant buildings in order to attract tourists and boosting economic growth and employment in the Kłodzko region that has very high occurrence of mineral and curative springs.

V. Program Interreg V-A Slovak Republic – Czech Republic

1) *D168 – Živé břehy “Live Riverbanks” – joint protection of river ecosystems*

No. of partner(s): 1

Partner's budget: Krok Kyjov, i.o.: EUR 211,034.41

Objectives: The project focuses on monitoring, research, protection and practical management of target animal species fixed to riverbanks and shores and to pollard willows. It concerns, in particular, the following protected species: sand martin, common kingfisher, common merganser and hermit beetle. These species are so-called “umbrella species”, meaning their protection ensures protection of varied communities of other

endangered species. The main objectives of the project lie primarily in detailed and profound understanding of the mentioned species and their biotopes. Appropriate biotope management will improve conditions for such species. The project strives for raising awareness of such species and their biotopes on the part of general public.

2) S251 – Fighting together water erosion and wetland drying up

Newly approved project

No. of partners: 1

Partner's budget: Czech Union for Nature Conservation, Valašské Meziříčí unit: EUR 160,519.88

Objectives: The project focuses on measures aimed at wetland protection by building an international expert team and on practical measures taken at dozens of locations in the Czech and Slovak Republic. Such measures are aimed at monitoring of the erosion process and compiling a joint plan of measures at the support and protection of wetlands.

VI. Programme Interreg EUROPE

1) Water Technology Innovation Roadmaps (PGI05062 – iWATERMAP)

No. of partner(s) on the Czech side: 1

Partner's budget CREA Hydro&Energy, i. o.: EUR 122,650.00

Objectives: The project is focused on support for innovative policies in water management sectors and thus contributed to an increase in the critical amount 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 field of water technologies.

2) Water reuse policies advancement for resource efficient European regions (PGI05592 – AQUARES)

No. of partner(s) on the Czech side: 1

Partner's budget: Regional Development Agency of the Pardubice Region: EUR 143,860.00

Objectives: Water reuse is a key method of supporting the efficiency of water in parts of Europe where resources are rare and capitalize on opportunities linked with the expanding water market and thus mitigating pressure on wetlands and coastal regions of Europe. The strategic plan for European innovative partnership for water was introduced for the purpose of efficient water management in Europe where lack of water affects 11% of the population. In this connection AQUARES will support: determining of viable strategies for water reuse, dealing with inefficient use of water and others.

VII. Programme Interreg DANUBE

1) Reducing the flood risk through floodplain restoration along the Danube River and tributaries (DTP2-003-2.1 Danube Floodplain)

No. of partner(s) on the Czech side: 1

Partner's budget: Morava River Board, s. e.: EUR 151,407.50

Objectives: The main output of the project will be improvement and sustainability of supranational flood risk management in the Danube River Basin. The project will enhance a harmonized

approach to the protection and restoration of riparian meadows, consensus of local stakeholders in the question of priority measures and broader public support for integrating flood management with protection and restoration of flood areas.

2) Drought Risk in the Danube Region (DTP1-182-2.4 DriDanube);

No. of partner(s) on the Czech side: 1

Partner's budget Global Change Research Institute CAS, p. r. i.: EUR 179,000.00

Objectives: Lack of water and drought often affected the Danube Region and economy and wellbeing of the local people. Despite damage caused by drought in the past decades, it is still not considered a high-priority issue. The main objective of the projects is to increase the capacity of the Danube Region and tackling drought-related risks. The objective was identified as an answer to problems linked with the process of drought monitoring as well as in the actual systems of drought management.

VIII. Program Interreg CENTRAL EUROPE

1) Integrated Approach to Management of Groundwater Quality in Functional Urban Areas (Amiga – CE32)

No. of partner(s) on the Czech side: 2

Partner's budget:

– City of Nový Bydžov: EUR 159,681.50

– Technical University of Liberec: EUR 235,219.60

Objectives: The project addresses especially groundwater contamination from brownfields, an issue that states of Central Europe have in common. AMIGA provides a well-balanced combination of technical, research, management and expert know-how that is shared and transferred in order to approach the issue of groundwater contamination in an all-embracing manner.

2) Integrated Heavy Rain Risk Management (Rainman – CE968)

No. of partner(s) on the Czech side: 2

Partner's budget:

– T. G. Masaryk Water Research Institute: EUR 201,170.00

– South Bohemia: EUR 72,380.99

Objectives: The main objective of the project is to improve integrated management capacities of public authorities with the aim of mitigating risks of heavy rains, implementation of warning infrastructure in the affected regions. Partners from six countries develop, in a joint effort, methods focused on actual situation and new tools of reducing casualties and damage caused by heavy/torrential rains.

3) Increased renewable energy and energy efficiency by integrating, combining and empowering urban wastewater and organic waste management systems (CE946 – REEF 2W)

No. of partner(s) on the Czech side: 2

Partner's budget:

– University of Chemistry and Technology: EUR 172,533.25

– VEOLIA: EUR 207,634.25

Objectives: The main purpose of the project is to increase energy efficiency and production of renewable energy in public infrastructures.



M. Majer + P. Jestřebský – Aquamobile – South Bohemian Region

10. LEGISLATIVE MEASURES

10.1 Water Act and implementing regulations

In 2019, the Water Act was amended by Act No. 312/2019, amending Act No. 183/2006 Coll., on Land-use planning and the building code (the Building Act), as amended, and Act No. 254/2001 Coll., on Waters and amendments to some acts (the Water Act), as amended.

In order to enhance water retention in the landscape, the permit procedure concerning a certain group of land adjustment and a defined group of water structures was simplified with effect as of 1 February 2020.

Notification to the relevant water authority is now sufficient for constructing a water structure with an area below 20,000 m² and dam height of 2.5 metres at most serving the purpose of water surging and accumulation and that is not subject to technical-safety supervision or does not meet classification criteria for Category IV of technical-safety supervision; notification is now sufficient also for terrain adjustment serving the purpose of retaining water in the landscape with depth of 1.5 metres at most and surface area between 300 m² and 20,000 m² in an unbuilt area that does not border with a road for public use.

The Water Act defines that zoning decision or a zoning approval is not necessary for the mentioned intents, however, it is always necessary to receive a binding statement of the relevant land-zoning authority pursuant to Section 96b of the Building Act. Formalities of the notification and content of design documentation are defined. As long as notifications do

not consist in an intent to be conducted in a protected area pursuant to Section 3 (areas of particular protections) or Section 4 (NATURA 2000) of the Act No. 114/1992 Coll., on the Conservation of Nature and Landscape, as amended, no binding statement of a nature conservation body is required.

A consent issued by the relevant water authority is also considered to be a consent with handling water; the minimum flow rate in the design documentation is considered defined and such a water structure is in Class IV of technical-safety supervision, providing it is subject to supervision. The owner of the water structure prepares and submits a “handling rules” to the relevant water authority for approval not later than on the day of filing an application for a final approval.

In 2019, Decree No. 197/2019 Coll. entered into force amending Decree No. 183/2018 Coll., on Formalities of Decisions and Other Measures Taken by Water Authorities and Documents Submitted to Water Authorities. The amendment entered into force on 23 August 2019.

The amendment to the Decree responds to an amendment to the Water Act (Act No. 113/2018 Coll.) that entered into force on 15 June 2018 and became effective on 1 January 2019. The Water Act amendment expanded, *inter alia*, the number of cases for which a consent by a water authority is required as of 1 January 2019 by incorporating in Section 17(1) of the Water Act new letter i) stipulating that a consent issued by the relevant water authority is essential for geological works linked with intervention to a plot of land with the purpose of subsequent use of a probe for construction consisting in collecting groundwater or for wells with the purpose of using energy potential of groundwaters.



Chřibská Water Reservoir, February 2020 (Source: Ohře River Board)

In order to obtain consents in accordance with Section 17(1) (a-h) of the Water Act, Decree No. 183/2018 Coll. defines a list of documents that an applicant needs to submit to the relevant water authority together with the application for consent. Decree No. 197/2019 Coll. amended the list of documents (in Annex No. 11 to the Decree) that the applicant shall submit to the relevant water authority in accordance with Section 17(1) (i) of the Water Act together with the application for consent.

In 2019, the Interpretation Committee for the Water Act updated Interpretations No. 13 and 74 and approved new Interpretation No. 97. All interpretations are published at the MoA website at its support Water → Legislation → Interpretations.

10.2 Act on Public Water Supply and Sewerage Systems

In 2019, there was no direct amendment to Act No. 274/2001 Coll., on public water supply and sewerage systems and on amendments to some relevant acts, as amended.

Decree No. 448/2017 Coll., amending Decree No. 428/2001 Coll., implementing the Act on Water Supply and Sewerage systems.

The decree entered into force on 15 December 2017 and became effective on 1 January 2018 with the exception of Annexes No. 1–8 and Annexes No. 18 and 20 that became effective on 1 January 2020.

A methodological instruction for preparing and reporting implementation of the Plan for Funding Water Supply and Sewerage System Renovation was discussed and prepared for the coordination committee for W&S regulation in 2019 and now it is published at the MoA website.

10.3 Audits of the execution of public administration in water management

Audits of regional authorities were carried out in 2019 pursuant to Government Resolution No. 689 of 11 September 2013. The plan of audits of regions and the Capital City of Prague within the defined three-year auditing period, i.e. for 2017–2019, was prepared by the Ministry of the Interior of the Czech Republic.

Ministry of Agriculture

Auditing of the execution of the delegated powers 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 2019, the MoA conducted 24 audits, of which four at regional water authorities and 20 at municipal water authorities.

In 2019, audits of Regional Authorities were carried out in accordance with Government Resolution No. 689/2013.

In 2019, in accordance with the plan of the Ministry of the Interior of the Czech Republic, audits of the execution of the delegated powers were carried out at four Regional Authorities performing the function of the water authority (see table 10.3.1).

Table 10.3.1
Audits of the execution of state administration carried out by the Ministry of Agriculture in 2019

Region	Date of audit
Capital City of Prague	16/01/2019
Karlovy Vary	11/03/2019
South Bohemia	28/05/2019
Zlín	25/09/2019

Source: MoA

Beyond the scheduled audits of regional water authorities that are performed outside the summer months, audits of the execution of the agenda of the water authorities of municipalities with extended powers were also carried out in the period from March – November. These audits inspected activities of 20 municipalities with extended powers performing the function of the water authority.

Audits carried out by the Ministry of Agriculture focus primarily on implementation of the Water Act in cases in which the powers of central water authority are exercised by the Ministry of Agriculture, and regulations issued pursuant to this Act; the Public Water Supply and Sewerage Act, as amended, and regulations issued pursuant to this Act; Act No. 106/1999 Coll. on Free Access to Information, as amended; Act No. 500/2004 Coll., Code of the Administrative Procedure, as amended; and Act No. 183/2006 Coll., on Land-Use Planning and Building Code (the Building Act), as amended, and its implementing legal regulations. Audits at regional offices focused 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 regional 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 scope, audits also focused on the way how water authorities operate, involving their personnel, material and organizational background, especially in terms of qualification and experience of their staff.

Based on audits carried out it can be concluded that the exercise of the delegated powers of regional authorities in the field of water management is consistently on a high level. Another positive aspect are the continuing efforts of regional water authorities to provide detailed methodological guidance for offices within their jurisdiction. None of the entities audited were required to adopt remedial actions, the shortcomings

identified were mainly of formal nature and did not result in invalidity of the decisions vetted.

The Ministry of Agriculture uses findings from audits at water authorities as feedback that not only helps deepen mutual communication at all levels of administrative hierarchy, but it is very useful for the Ministry of Agriculture to become acquainted with the regional and local water management issues.

The audit findings are subsequently applied in the methodological guidance for water authorities. Findings concerning the application of regulations within the competence of the Ministry of Agriculture together with water management issues are annually presented at a work meeting of the MoA Water Management Department with water authorities. Representatives of the MoA present their findings from audits also at meetings of regional offices with their subordinate water authorities.

Ministry of the Environment

Supervision of the execution of the delegated powers in water management sector is annually carried out within the supreme water management supervision by the Ministry of the Environment as the central water authority through the Departments for Execution of State Administration. This body carried out 13 audits in 2019, of which five audits at regional and water authorities and three at the Czech Environmental Inspection.

Execution of the supreme government supervision is delegated to the Ministry of the Environment by Act No. 2/1969 Coll., on the Establishment of Ministries and Other Central Bodies of State Administration of the Czech Republic, as amended, and provisions of Section III of the Water Act, as amended, specifying it as supreme supervision over water management. Supervision on the regional level was performed in accordance with Government Resolution No. 689/2013, specifically with Art. 6(2) of the related material No. 978/13 and in accordance with the “Plan of audits of regions and the Capital City of Prague for 2017–2019” of the Ministry of the Interior and supervision plan of the Ministry of the Environment for 2019. At the Czech Environmental Inspection and municipalities with extended powers (water authorities) supervision was conducted in accordance with supervision plan of the Ministry of the Environment, Department of Execution of State Administration I–IX for 2019.

Supervisory activities form an essential element of controlling the level of execution of state administration, the purpose of which is to supervise how the administration authorities at the lower level (regional authorities, water authorities and the Czech Environmental Inspection) execute state administration in the assigned area of water management. Of particular concern is the correct application of legal regulations, compliance with the relevant competence legal provisions and compliance with the provisions of the Act No. 500/2004 Coll., the Code of the Administrative Procedure, as amended. Audits also focus on the way the water authorities operate, qualifications and experience of staff members, organization of work and material background of departments.

The purpose of the exercise of the supreme state supervision is primarily to eliminate defects of systemic nature. In individual cases, the wrong decision may be changed by means of an extraordinary legal remedy (review of the decision in review proceedings, revision).

Table 10.3.3
Audits of the execution of state administration carried out by the Ministry of the Environment at regional authorities in 2019

Region	Date of audit
Pardubice	January
Vysočina	April
Karlovy Vary	May
City of Prague	June
Zlín	September

Source: MoE

When carrying out audits of the exercise of the delegated powers of regional authorities no major shortcomings were identified in the area of water management in 2019, only formal ones. For that reason, it was not necessary to take any measures of the fundamental (systemic) nature. Tasks resulting from special legal regulations are duly fulfilled and achieved. Opposition proceedings were not conducted and process penalties did not need to be imposed. Recommendations for administrative authorities were formulated in relevant protocols, other minor irregularities or administrative shortcomings were addressed and remedied during the audit.

Audits carried out at water authorities constitute a smaller part of supervisory activities of the Ministry of the Environment. In 2019, five municipalities with extended powers were audit and no shortcomings that would require remedial actions were identified. The minor administrative shortcomings were discussed and eliminated.

Three audits were carried out at the Czech Environmental Inspection under supreme water management supervision with only minor shortcomings identified, with no remedial actions needed to be imposed.

Based on the conclusions of the audits carried out within supreme water supervision by the departments for the execution of state administration it can be concluded that the exercise of the delegated powers in the field of water protection performed by regional authorities, water authorities and the Czech Environmental Inspection audited in 2019 is at a very good level, the decisions issued contain the particulars required by the Code of the Administrative Procedure and references to the relevant provisions of the Water Act. The methodologies and guidelines of the Ministry of the Environment are respected in the proceedings and decision-making. Positively assessed are also supervisory activities of the regional authorities and methodical guidance provided to lower-level water authorities, which in turn is positively reflected in the fact that none of the water authorities audited in 2019 were imposed remedial measures.



S. Marulevová – Save Water Every Day So There is Enough of it for Everyone – Moravian-Silesian Region

II. PRIORITY TASKS, PROGRAMMES AND KEY DOCUMENTS IN WATER MANAGEMENT

II.1 Planning concerning waters

In 2019, the third phase of river basin management planning for 2021–2027 was prepared, consisting in review and update of existing river basin plans. Update of flood risk maps was completed as part of the second planning cycle, in accordance with Directive 2007/60/EC on the Assessment and Management of Flood Risks.

Proposal of Preliminary overviews of significant problems of handling with waters identified in the river basin (for the Elbe, Oder and Danube River Basins) were published to observations of water users and general public during the preparation of the third phase concerning waters in accordance with requirements of the Water Act. The proposals are one of basic outputs of preparatory works in 2019 and were published on 20 December for six months (until 22 June 2020). These documents are compiled on the basis of an analysis of general and water management characteristics, assessment of impacts of human activity, maps of flood danger and maps of flood risks, economic analysis and programmes of gathering information and assessment of the quality of waters pursuant to Section 21(3) of the Water Act, taking into consideration the objectives set.

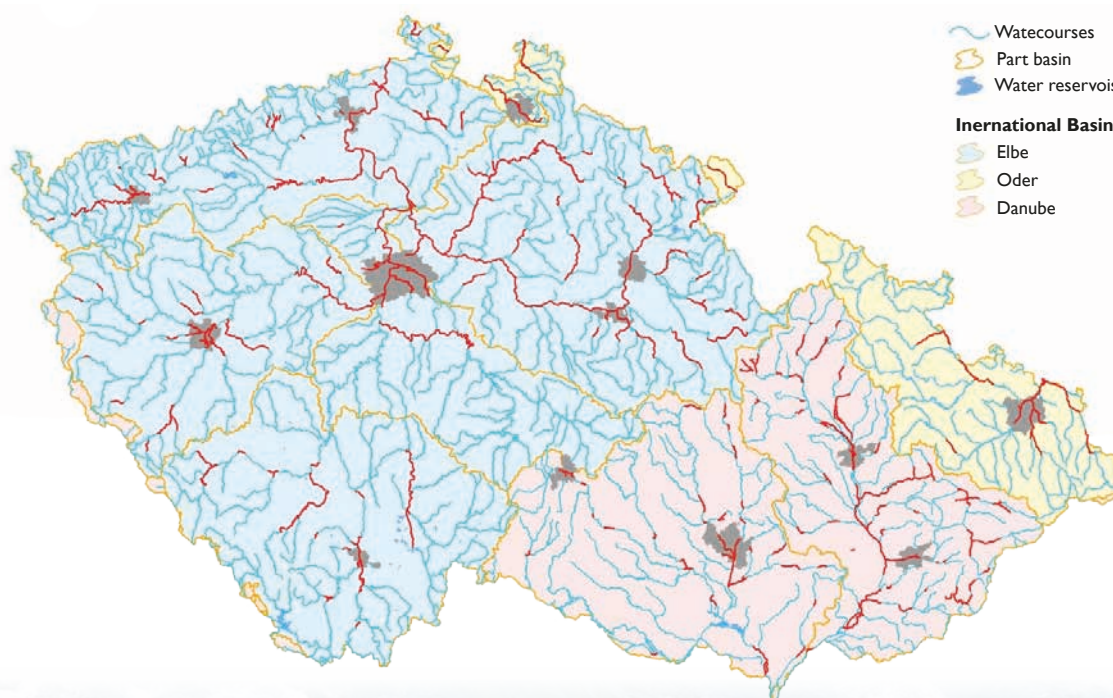
In 2019, update of maps of flood danger and flood risks was completed in accordance with deadlines defined in European and Czech legislation. The updated maps of flood danger and flood risks are available online at <https://cds.mzp.cz/>.

Review and update of locations with significant flood risk took place in 2018 and the results are comparable with the previous period. 718.6 km of watercourses were defined in the Danube River Basin as locations with significant flood risks, 1825.4 km of watercourse sections in the Elbe River Basin and 283.3 km of watercourse sections in the Oder River Basin. Maps of flood danger and flood risks were reviewed and updated with respect to the new background materials or newly defined sections for these watercourse sections. These updated maps are one of the basic background materials for preparation of the Plan of coping with flood risks for 2021–2027: the Ministry of the Environment prepared its proposals in cooperation with other entities throughout 2020.

Updated maps of flood danger and flood risks for the second planning stage were prepared by watercourse administrators for the relevant sections in locations with significant flood risk. Update and review of maps was funded mainly under long-term projects concerning background analyses for plans for coping with flood risks supported from the Operational Programme Environment, Priority Axis I, specific objective I.4 To promote preventive flood measures.

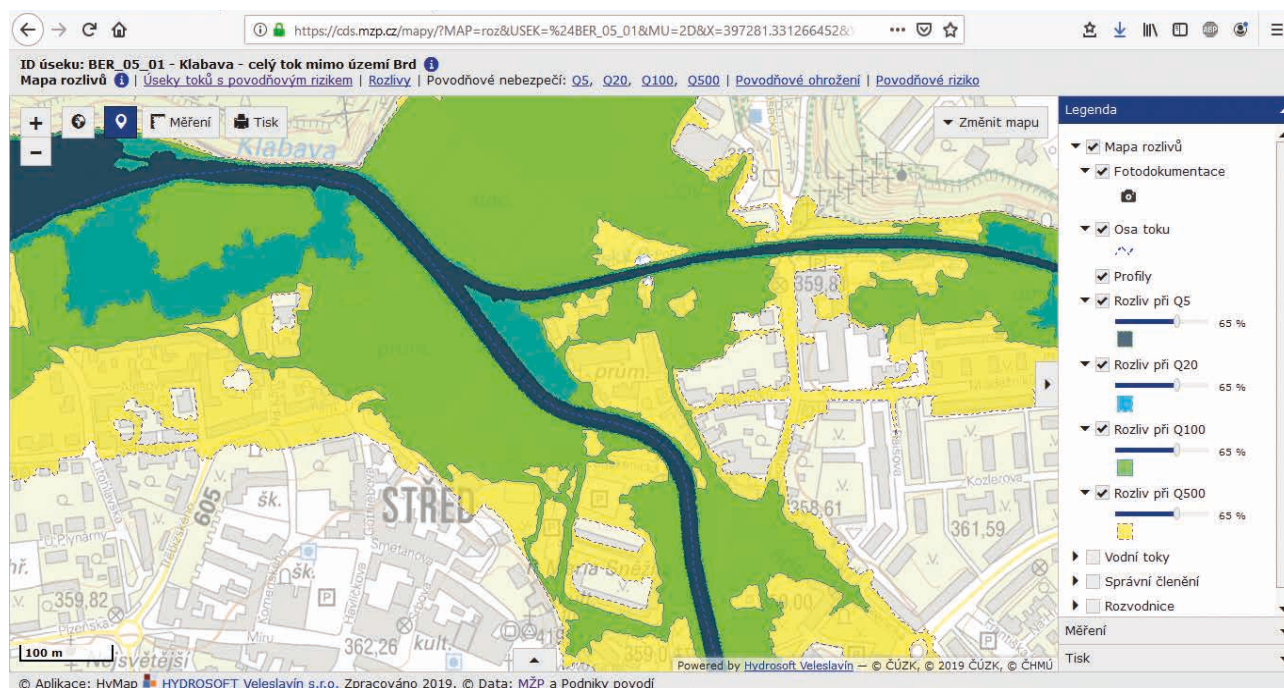
The current and general information about the process of planning in the field of waters, including materials and minutes from meetings of the Committee for Water Planning, is available to the general public on the website of the MoA (www.eagri.cz) with links to the MoE website and river basin administrators. For the purpose of implementing the Flood Guideline, the Flood Information System (www.povis.cz) is used as a communication platform.

Figure II.1.1
Defining areas with significant flood risk for the 2nd planning cycle under the Floods Directive



Source: T. G. Masaryk Water Research Institute

Figure 11.1.2
Look at a map application showing flood risk



Source: MoE

11.2 Development plans for water supply and sewerage systems

The National Development Plan for Water Supply and Sewerage Systems in the Czech Republic, prepared pursuant to Section 29(1)(b) of Act No. 274/2001 Coll., on public water supply and sewerage systems and on amendments to certain related laws, as amended, is placed on the website of the Ministry of Agriculture.

Development plans for water supply and sewerage systems in the Czech Republic (the National Development Plan for Water Supply and Sewerage Systems, the Regional Development Plans for Water Supply and Sewerage Systems) including their updates represent a medium-term, constantly updated concept in the sector of water supply and sewerage systems.

The Regional Development Plans for Water Supply and Sewerage Systems in the Czech Republic are the basis for the use of the European Community funds and national financial resources for the construction and renewal of water supply and sewerage system infrastructure. Therefore, one of the obligations of each applicant requesting the provision and use of the state financial support is to demonstrate the compliance of the submitted technical and economic solution with the valid Regional Development Plan for Water Supply and Sewerage Systems.

The National Development Plan for Water Supply and Sewerage Systems in the Czech Republic is based on a synthesis of information from the Regional Development Plans for Water Supply and Sewerage Systems, including their updates, which were prepared, discussed and approved by the

councils of regional authorities. It follows up with other strategic documents and departmental policy documents and also respects the requirements resulting from the relevant regulations of the European Communities. The National Development Plan for Water Supply and Sewerage Systems in the Czech Republic also includes standpoints of the Ministry of Agriculture issued to each of the updates of the Regional Development Plans for Water Supply and Sewerage Systems.

The National Development Plans for Water Supply and Sewerage Systems in the Czech Republic also defines general objectives and main principles of government policy for ensuring long-term public interest in the field of water supply and sewerage system in the Czech Republic, i.e. sustainable use of water resources and water management while adhering to requirements for water management service (drinkable water supply, sewerage and cleaning of waste waters).

Pursuant to Section 29(1)(c) of the aforementioned Act, the Ministry of Agriculture continued to issue statements for the approved and effective Development Plans for Water Supply and Sewerage Systems in the Regions of the Czech Republic, relating to the proposed updates of the technical solutions for drinking water supply and waste water sewerage and treatment.

In 2019, 1242 statements were issued. In total for the period 2006–2019, the Ministry of Agriculture issued 7,893 statements, which accounts for approximately 47% of municipalities and local districts of municipalities in the Czech Republic out of 17,166 processed in the National Development Plan for Water Supply and Sewerage Systems in the Czech Republic and in the Regional Development Plans for Water Supply and Sewerage Systems.

In 2019, the National Development Plans for Water Supply and Sewerage Systems in the Czech Republic and in the Regional Development Plans for Water Supply and Sewerage Systems continued to be updated, focusing particularly on drought and that will contain possible proposals of specific measures implemented in the existing water management systems (namely reviews of the current capacities, proposal of new or extension of existing facilities, connecting existing and/or new facilities, proposal of drinkable water optimization in periods of drought) including costs calculation linked with such measures.

Such updates of the National Development Plans for Water Supply and Sewerage Systems in the Czech Republic are implemented in accordance with Government Resolution No. 620 of 29 July 2015 as performance of C3 task "Review of functionality of interconnection and ensuring new possible interconnections of water supply systems during drought". In 2019, the second stage of works and activities focuses particularly on the SEA processed continued.

The National Development Plans for Water Supply and Sewerage Systems in the Czech Republic are used by the Ministry of Agriculture, the Ministry of the Environment, the regional authorities, municipalities with extended powers (water authorities), municipalities, owners and operators of water supply and sewerage systems as well as by special communities and the general public.

11.3 Programmes and measures aimed at reducing surface water pollution

Construction projects for water quality protection completed in 2019

The most significant measures aimed at improving surface water quality implemented in 2019 include completion of one new municipal wastewater treatment plant and renovation or expansion of other 17 ones. These are wastewater treatment plants for sources of pollution exceeding 2,000 PE. No new industrial wastewater treatment plants were constructed, renovated or expanded in 2019.

Action Programme under Directive of the Council 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. In the Czech Republic, this directive is implemented in the act on fertilizers, the water act and Government Resolution No. 262/2012 Coll., on defining vulnerable areas and the action programme.

Table 11.3.1

Municipal wastewater treatment plants with capacity over 2,000 PE (new, renovated or expanded in 2019)

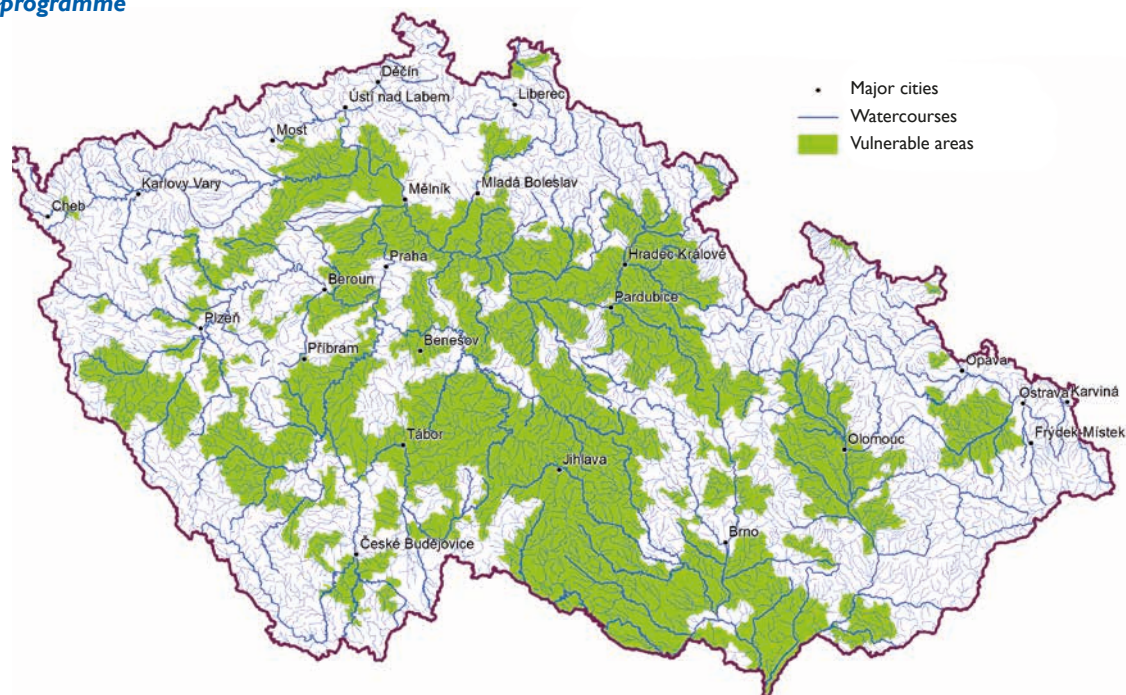
Wastewater treatment plants	Location	Capacity	Nitrification	Denitrification	Chemical removal of phosphorus
		Number of PE	YES/NO	YES/NO	YES/NO
New					
Municipal	Rostěnice	2,045	YES	YES	YES
Renovated/expanded					
Municipal	Kašperské Hory ^{*)}	2,000	YES	YES	YES
	Slaný – Blahotice ^{*)}	16,000	YES	YES	YES
	Měřín	3,565	YES	YES	YES
	Ruda nad Moravou	3,000	YES	YES	YES
	Jedovnice	6,800	YES	YES	YES
	Polička	28,550	YES	YES	YES
	Velké Bílovice	20,000	YES	YES	YES
	Soběslav	9,300	YES	YES	YES
	Horažďovice	22,400	YES	YES	YES
	Zdiby	6,000	YES	YES	YES
	Řitka	3,100	YES	YES	YES
	Horní Bříza	2,600	YES	YES	NO
	Jablunkov	9,950	YES	YES	YES
	Slavkov	2,000	YES	YES	YES
	Všetaty	3,050	YES	YES	YES
	Častolovice	2,500	YES	YES	YES
	Kounice	2,500	YES	YES	YES
	Libochovice	2,425	YES	YES	YES
	Semily	13,333	YES	YES	YES

Source: SEF, River Boards, s.e.

Note: ^{*)} WWTP with support from the SEF.

Figure 11.3.1

Map of vulnerable areas as per Government Resolution No. 262/2012 Coll., on defining vulnerable areas and the action programme



Source: T. G. Masaryk Water Research Institute

Vulnerable areas are locations where contamination of underground waters and surface waters with nitrates exceeded or could exceed the defined threshold of nitrate concentration of 50 mg/l: such locations, as specified in the Nitrates Directive, are subject to review at least each fourth year since they were declared vulnerable locations.

Arable farming is governed by the Action Programme that is subject to review and adjustment every fourth year. It introduces compulsory farming methods in defined vulnerable areas aimed at reducing risk of washing nitrates out and to surface waters and groundwaters: it is the most efficient system of measures for implementation of the Nitrates Directive. The main measures aimed at reducing pollution on a large scale include a period with a ban on fertilizing, fertilization limits according to crop yield levels, storage of farming fertilizers, farming on slopes and in the vicinity of surface water bodies.

The measures included in the Action Programme have to guarantee that no entity using organic and/or organic-mineral fertilizers for farming in vulnerable areas exceeds the limit of 170kg nitrogen per hectare per year when.

Government Resolution No. 262/2012 Coll., in accordance with Directive of the Council 91/676/EEC, is regularly reviewed and new amendment that entered into force as of 1 July 2020 with reviewed vulnerable areas exposed to nitrates and with new measures of the Action Programme. The adjustments are based on monitoring of groundwaters and surface waters while adjustments to the Action Programme are based on research results and observations from hands-on experience.

The share of vulnerable areas exposed to nitrates currently accounts for 42% of the total area of the Czech Republic, the vulnerable areas cover approximately 50% of its total farmland.

11.4 Accompanying strategic documents

Strategy of the Ministry of Agriculture of the Czech Republic with the outlook until 2030

It is a basic strategic document of the Ministry of Agriculture that was approved by Government Resolution No. 392 of 2 May 2016. In order to ensure transparent and effective management of this strategy, the Government approved the Implementation Plan of the Strategy of the Ministry of Agriculture for 2017–2020 in 2017.

The Implementation Plan contains a list of specified activities to be performed by the Ministry of Agriculture in order to implement the measures with the view of achieving objectives defined in the Strategy in 2017–2020. Seven indicators were defined and the Ministry of Agriculture assesses them annually in this yearbook in Chapters 7., 9.1 and 14.

Study of rainwater management in urbanized areas

On 30 October 2019, the Government discussed and became acquainted with the Study of rainwater management in urbanized areas that was conducted by the Ministry of the Environment. It is the first

comprehensive strategic document in the Czech Republic that deals with the issue of managing rainwater in such a broad extent and forms a platform for improving the water regime in urbanized areas with the view of their adaptation to the climate change and improving quality of life in such areas.

The study defines six strategic objectives. The proposal of a system for rainwater management in urbanized areas with the purpose of meeting strategic objectives includes a wide range of the rainfall regime variability that can occur: ranging from common rains to rains of high intensity and to extreme rains. Meeting the strategic goals results in reducing impacts of drought (in periods with rainfall deficits). Deficits (94 in total) that prevent the strategic objective from being met were defined. The deficits relate to different stages of implementation the process of rainwater management ranging from defining target values to motivation, planning, permit proceedings, technical design to administration, operation, supervision and maintenance. The result of the study is a proposal of 49 pages of changes aimed at eliminating the deficits identified and that are crucial for improving rainwater management in the Czech Republic. The changes are divided in four categories: legislation and economic principles; technical regulations and data; science and research; education and raising awareness.

11.5 Czech Republic's reporting to the EU

Reporting under Directive Council 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the Assessment and Management of Flood Risks.

In 2018, complete datasets concerning the first phase of the second planning cycle of updates of preliminary assessment of flood risks were submitted to the European Commission as part of reporting under Art. 15 of the Floods Directive. Reporting followed the new guidance documents (Floods Directive Reporting Guidance 2018, Floods Directive GIS Guidance, Reporting on the Floods Directive – a user manual) in new data schemes that were prepared between 2017 and 2019. With regards to technical issues with the new data schemes and the reporting environment, the deadline of reporting to the European Commission was prolonged until August 2019. A temporary solution consisted in uploading a pdf file in the EIONET system, summing up briefly the course of preliminary flood risk assessment in the second planning cycle together with links to essential documents and description of the actual implementation and results.

Under the actual reporting, information on significant river basins since 2011 were uploaded to the EIONET environment, in the case of the Elbe River Basin, newly submitted information reached back to the flood of June 2013.

Furthermore, reporting included overall information and spatial data on updated and newly defined areas with significant flood risk. Such information was stored for every single national part of an international river basin. For the sake of comparison of the defined areas with significant flood risk in the previous planning cycle, information on the relation between areas with significant flood risk defined in the first and second planning cycle was required. This information is stored under APSFRIdTracking.

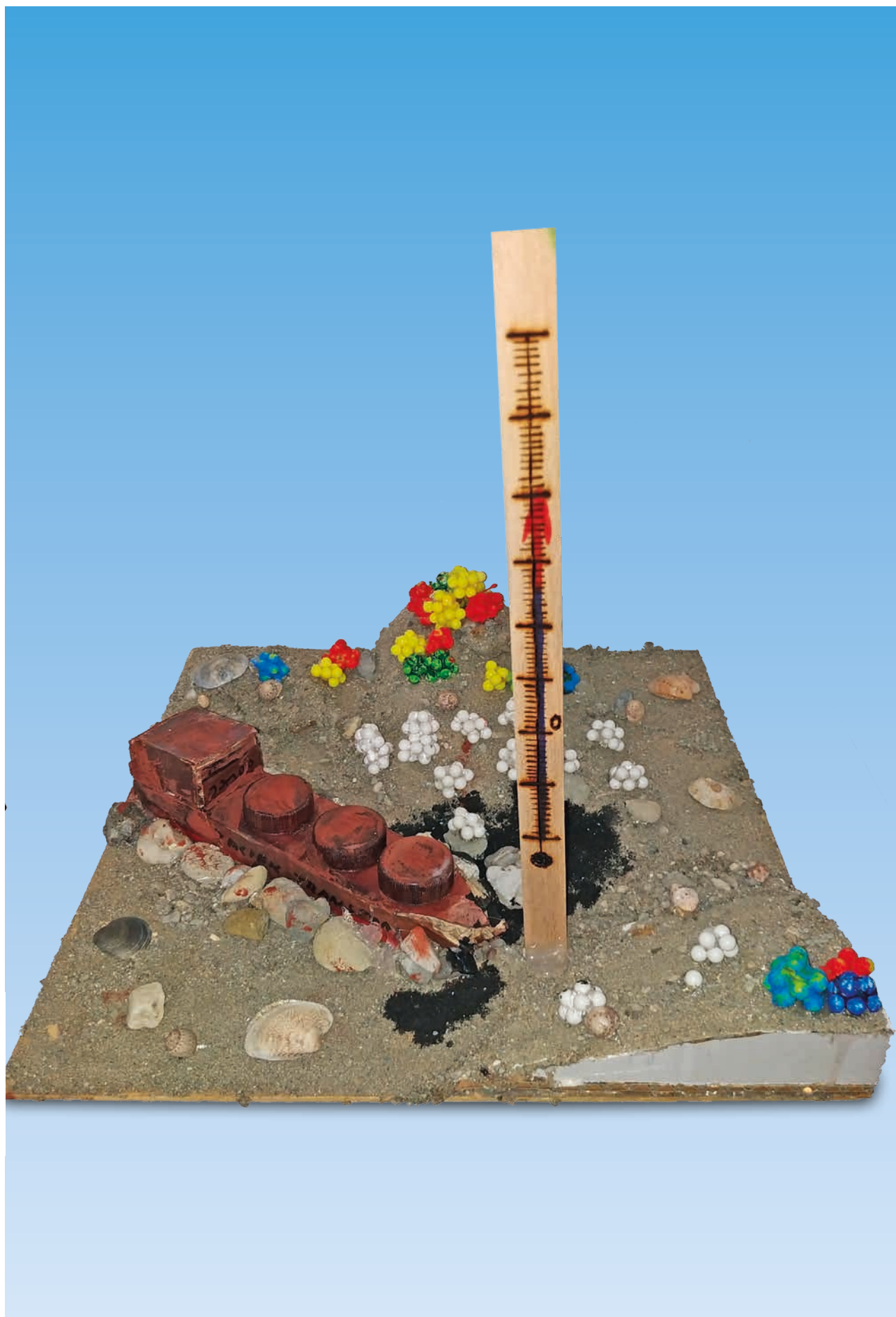
Reporting pursuant to Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006, on the Management of Bathing Water Quality and Repealing Directive 76/160/EEC.

From the perspective of European legislation, bathing waters are governed by 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.

Before every bathing season, a list pursuant to Section 6g(1)(a) of Act No. 258/2000 Coll., as amended by Act No. 151/2011 Coll. (hereinafter referred to as the "List") is compiled. This list is made by the Ministry of Health in cooperation with the MoE and the MoA. Waters used for bathing in the landscape in the Czech Republic are divided into natural swimming pools operated on surface waters used for bathing (i.e. surface water where the bathing service is offered by the operator) and surface waters where it can be expected that a large number of people will bathe in where no permanent ban on bathing or warning was issued by the relevant public health protection body (i.e. other surface waters for bathing). Before the beginning of the 2019 bathing season, a list of waters designated as waters for the 2019 bathing season was submitted to the European Commission.

The MoE in cooperation with the Ministry of Health presented to the EC a report on results of monitoring and assessing the quality of surface waters included in the List for bathing season 2019. This list was compiled in accordance with the requirements of Directive 2006/7/EC. Waters designated for bathing were classified on the basis of their quality as unsuitable, acceptable, good or excellent. The assessment was performed on the basis of the data set on quality for the 2019 bathing season and four preceding bathing seasons. Reports from all European countries are published annually after the results are processed on the European Commission website at: http://ec.europa.eu/environment/water/water-bathing/index_en.html.

The most frequent problems affecting water quality in the Czech Republic are connected with mass development of cyanobacteria which resulted in bathing season 2019 in imposing a ban on bathing at 8 sites. Out of total 148 reported waters for bathing, only three sites were classified as unsuitable under the requirements of Directive 2006/7/EC (Staňkovský Pond and Mělice Excavation Lake).



F. Gróf + M. Svoboda – Coral Reef Degradation Caused by Warming and Pollution of the Seas – Moravian-Silesian Region

12. INTERNATIONAL RELATIONS

International cooperation of the Czech Republic in the field of water protection is based on the principles arising from the “UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, which the Czech Republic is a party to.

The roots of the involvement of the Czech Republic in international cooperation in the protection of waters date back to 1928, when the Joint Technical Commission was established between the former Czechoslovak Republic and Austria and dealt with technical issues in transboundary stretches of the Danube River, the Dyje River and the Morava River and also watercourses in the Malše River and the Lužnice River Basins. At present, the Czech Republic is a contractual party to nine international agreements concerning water protection.

12.1 Cooperation within the UN/UCEN



UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) is intended to

strengthen national measures for the protection and ecologically sound management of transboundary surface waters and groundwaters. The Convention invites the contractual parties to prevention, monitoring and reduction of the transboundary influence and to using waters in a sustainable manner.

The basic principle is bilateral cooperation of neighbouring states in the field of water management, based on concluded international agreements, treaties and conventions. Emphasis is laid on mutual exchange of information, joint research and development (for example, through bilateral and multilateral projects, international commissions, etc.), improving warning and alarm systems, as well as access to information by the public.

The UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes

The UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (The Convention) entered into force on 6 October 1996. The Czech Republic has been a party to the Convention since 10 September 2000. Representatives of the Czech Republic participate in activities relating to the fields of integrated management of water resources and water ecosystems, protection of waters against accidental pollution from industrial sources, support for international cooperation on transboundary watercourses and in commissions for international river basins. Cooperation under the Convention also focuses on the relation between water quality and human health. The supreme body of the Convention is the

Meeting of the Parties, held once every three years, last meeting was held in 2018.

Protocol on Water and Health

The Protocol was produced in cooperation between the World Health Organization (WHO) and focuses on the relation between water and human health. Although the Protocol entered into force in 2005, the Czech Republic has been a party to the Protocol since 2001 and set national targets under the Protocol in 2008: the national targets are updated within the Protocol. The administrator of the Protocol in the Czech Republic is the Ministry of Health. The Commission for Health and the Environment authorised a permanent working team composed of representatives from the Ministry of Health, MoE, MoA and State Health Institute to compile a proposal of national objectives and to supervise their implementation. The Fifth Meeting of Contractual Parties was held in Belgrade, Serbia in 19–21 November 2019.

More detailed information on the UN/ECE Convention and the Protocol on Water and Health is available at www.unece.org/env/water.

12.2 International cooperation of the Czech Republic in the integrated Elbe, Danube and Oder River Basins

Modern principles of water protection, based on the hydrological basins of large transboundary rivers, started to be applied in the Czech Republic in 1990 through launching cooperation in protection of the Elbe River in accordance with the Agreement on the International Commission for Protection of the Elbe River. At that time, also the Agreement on the International Commission for Protection of the Oder River against Pollution started to be prepared, later followed by preparation of the Convention on Cooperation for Protection and Sustainable Use of the Danube River.

International cooperation in protection of the main river basins in the Czech Republic is conducted through international commissions for protection of the Elbe, Danube and Oder Rivers and focuses primarily on the following:

- reducing the pollution load in the Elbe, Danube and Oder River,
- striving to achieve an ecosystem that is as close as possible to natural condition with a healthy diversity of species,
- allowing the use of water, especially the provision of drinking water from bank infiltration and the 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 of the European Parliament and of the Council, establishing a framework for Community action in the field of water policy in integrated river basins.

Agreement on the International Commission for Protection of the Elbe

The Agreement on the International Commission for Protection of the Elbe River (ICPER) was signed in Magdeburg on 8 October 1990. This Agreement entered into force on 14 September 1992, the Protocol to the Agreement through which the Commission acquired legal subjectivity, came into effect on 13 August 1993. The ICPER is the most important board of the Czech-German cooperation in the sphere of water protection in the Elbe River Basin.



The 32nd ICPER meeting was held in Maisse in October 2019. The advancement in update of the International Plan for the Elbe River (Part A) for 2022–2027 was discussed together with the International Plan for Coping Flood Risks in the Elbe River Basin and preparation of the Magdeburg Seminar on Water Protection in 2020. A document intended for objections from the part of the general public under the Water Framework Directive to the preliminary overview of significant problems linked with water management identified in the international area of the Elbe River Basin to the update of the River Basin

Plan (Part A) for 2022–2027. The document was published on the ICPER website in December 2019. Furthermore, curriculum for the report “Hydrological Assessment of Drought in the Elbe River in 2018” was approved. In January and April 2019, the updated International Warning and Alarm System of the Elbe River was tested. The ICPER also supported activities of the Elbe River Board, s.e., linked with preparation of implementation of the pilot restoration of contaminated sediments in the Czech Lower Elbe River. The ICPER also recommended preparation of implementation of the study “Mapping of the sediment quality in pools in the Czech part of the Elbe River” under the grant project “Restoration of Pollutants in Elbe Sediments” (ELSA).

On 9 and 10 April 2019, the International Elbe Forum on the state of implementation of the Water Framework Directive and the Floods Directive for the International Elbe River Basin was held in Dresden with participation of more than 110 people from the Czech Republic, Germany and Austria.

It was agreed that the Czech Republic would preside the ICPER in 2020. The ICPER president will continue to be RNDr. Petr Kubala, Director General of the Vltava River Board.

The ICPER contributes significantly to organizing the Magdeburg Seminar on Water Protection that is held biannually in turns in the Czech Republic and in Germany. The 19th Seminar will be held in Dessau in October 2020 in Dessau. For detailed information about activities of the ICPER SEE: www.ikse-mkol.org.



Orlice River, meanders and weaned river shoulders (Source: Elbe River Board)

Convention on Cooperation for Protection and Sustainable Use of the Danube River



The Convention was established with the view of a coordinated approach to watercourse protection in the Danube River Basin.

It was signed on 29 June and entered into force on 22 October 1998. The Czech Republic joined the Convention on 10 March 1995. The sustainable and fair use of waters from the Danube River Basin is ensured by the International Commission for Protection of the Danube River (ICPDR), consisting of 15 contractual parties.

Two meetings at the level of heads of delegations of the Parties were held in 2019. The 17th meeting of the ICPDR Managing Commission was held in June. The main topic was a preliminary overview of significant water management issues, joint research of the Danube River and preparation of river basin plans for the third planning cycle and plans for coping with flood risks in the second planning cycle. In December, 22nd plenary session of the ICPDR was held. The heads of delegations approved the preliminary overview of significant water management issues that was subsequently published online at the ICPDR website for general public to submit observations. A project focusing on sediments (Danube Sediment) was evaluated. The project, terminated in November 2019, was focused on restoration of sediment balance in the Danube River. The main output of the project was a document for sediment management in the Danube River that provides crucial background materials for the preparation of river board plans for the third planning cycle and plans for coping with flood risks in the second planning cycle. One of the topics discussed at the meeting were issues concerning the EU Strategy for the Danube River (EUSDR) in close cooperation with national coordinators of the EUSDR.

More detailed information on the activities of the International Commission for Protection of the Danube River is available at www.icpdr.org.

Agreement on the International Commission for Protection of the Oder River against Pollution



The International Commission for Protection of the Oder River against Pollution was established by the international Agreement on the International Commission for Protection of the Oder River against Pollution, which was concluded by the Government of the Czech Republic, the Government of the Republic of Poland, the Government of the Federal Republic of Germany and the European Community on 11 April 1996. The Agreement entered into force after ratification on 26 April 1999.

The activity of the Commission for Protection of the Oder River against Pollution (ICPORaP) is focused especially on international coordination of meeting the requirements of the Water Framework Directive, flood protection and prevention of water pollution. The work of the Commission is carried out in working groups focused mainly on flood

protection, accidental pollution, legal issues, monitoring and data management.

In November 2019, the 22nd plenary meeting of the ICPORaP was held where activity in 2019 was assessed, work schedules of the Managing Work Teams and their sub-teams for 2020 were approved. A document for observations by the general public to the preliminary overview of significant issues in water management identified in the Oder River Basin for the third planning cycle under the Water Framework Directive was approved. At the same time, sequence of works on updating the International Plan for the Oder River Basin for 2022 – 2027 and the International Plan for Coping with Flood Risks in the Oder River Basin were discussed. By the end of 2019, the following documents were published: “Concept for introducing the floods directive in the International Oder River Basin” and “Review and update of maps of flood danger and maps of flood risk in the In the Oder International River Basin for the second planning cycle”.

In accordance with Art.(6)(1) of the Agreement on ICPORaP and Art. 2 of the ICPORaP rules of procedure, the Czech Republic takes over presidency in the ICPORaP. The current ICPORaP president, Ms. Joanna Kopczyńska passed on her duties to the new ICPORaP president, Ing. Daniel Pokorný, who was appointed to the office by Richard Brabec, the Minister of the Environment.

The “Flood” Team held a two-day workshop dedicated to the issue of Preliminary assessment of flood risks and update of maps of flood danger and maps of flood risks in the Oder International River Basin in April 2019. The programme was divided in four sections: update of preliminary flood risk assessment in the Oder International River Basin, international experience (projects/international events, use of satellite data), update of maps of flood danger and maps of flood risks, issues linked with the INSPIRE Directive and modelling, prognosis and water balance.

Detailed information on the activities of the International Commission for Protection of the Oder River against Pollution is available at www.mkoo.pl.

12.3 International cooperation of the Czech Republic on transboundary waters

The total length of the state border of the Czech Republic with neighbouring states is 2,290 km, of which approximately a third is known as the “wet borderline”, which means that approximately 740 km of the state border are constituted by watercourses and water surfaces. Under international cooperation on transboundary waters, the Czech Republic has international agreements with all neighbouring countries and it implements them through relevant commissions for transboundary waters.

Transboundary waters are watercourses and water bodies that are crossed by the state border as well as watercourses

which criss-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 avoid potential disputes with neighbouring states, the Czech Republic entered into international agreements with all neighbouring countries.

Through the relevant commissions for transboundary waters, the following issues are addressed at the level of bilateral cooperation: regulation and maintenance of transboundary watercourses including construction and operation of structures on these watercourses, water supply and amelioration of border reaching territories, the protection of transboundary waters against pollution (including the respective monitoring, joint monitoring of the quality of transboundary waters, exchange of data and organization of warning and alert service in case of emergency), hydrology and flood warning service (including monitoring, joint measurements, exchange of data and organization of warning and alert service in case of emergency), water management proceedings regarding transboundary waters, the protection of aquatic and littoral biotopes, the course of the state border on transboundary watercourses, etc.

Outcomes from sessions of the commissions are always included in the Protocols that are presented to involved ministries to issue a statement 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. The fulfilment of the Agreement takes place through the Czech-German Commission for Transboundary Waters. 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 Czech-German Commission for Transboundary Waters.

In 2019, the following issues, among others, were discussed at regular meetings of the Commission, Permanent Committees and their boards: increased concentrations of mercury in sediments and sediments in the Röslau River (a transboundary watercourse) that sediment in the Skalka Water Reservoir. Such issues are addressed by the cross-border project “Measures in the Kössein and Röslau Rivers aimed at mitigating the problem with mercury at the Skalka Water Reservoir” under the “Programme of transboundary cooperation Czech Republic – Free State of Bavaria (under the Objective of European Territorial Cooperation 2014–2020). On 16 October 2019, a meeting of experts discussing risk analysis prepared by the Czech party and feasibility study prepared by the German party was held in Marktreidwitz.

Other discussed issues included specific intents at transboundary waters concerning adjustments and repair, wastewater discharges, surface water and groundwater abstractions, small water power plants, etc. Other issues discussed included joint transboundary projects focused on

improving the quality and quantity of surface waters, protection of the pearl mussel and thick shelled river mussel in transboundary watercourses and their river basins and implementation of the Water Framework Directive in transboundary waters. Both parties exchanged information concerning implementation of the Floods Directive at national levels. Warning systems alarming of pollution in transboundary waters between the Czech Republic and Germany and their updates were also discussed and assessed.

Agreement between the Czechoslovak Socialist Republic and the Republic of Austria on Regulation of Water Management Issues on Transboundary 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 2019, 27th meeting of the Commission and their boards Subcommission I and Subcommission II was held together with a regular meeting of authorized government representatives with the purpose of exchanging information on current problems in water management. Besides traditional issues (transboundary watercourse maintenance, quality monitoring), the main focus was on the issue of the Dyje River being affected by an Austrian chemical plant in Pernhofen and the long period of drought affecting the Vranov Water Reservoir and runoff of water in the Dyje River to Austria.

Agreement between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation on Transboundary Waters

The Agreement was signed and entered into force on 16 December 1999. It is fulfilled through the Czech-Slovak Commission for transboundary waters (hereinafter referred to as the “Commission”). The Commission is divided in four work groups addressing technical aspects, hydrology, water protection and the Water Framework Directive.

In May 2019, the 19th meeting of the Committee was held. In addition to issues concerning transboundary watercourse maintenance, navigation related subjects (the intent of connecting South Moravia to the Danube River, construction of extending navigability on the Otrokovice-Rohatec Waterway and use of the Morava River and the Dyje River for recreational navigation) and joint cross-border projects focused on increasing flood protection (the intent of protective dykes in the section from the Dyje River mouth to the Radějovka Stream mouth) were also discussed at the meeting. At the same time, experts discussed information about the implementation of the Water Framework Directive in transboundary waters, the Floods Directive at national levels and about the new legislation concerning water management that had entered into force since last session of the Commission.

Convention between the Government of the Czech Republic and the Government of the Republic of Poland on Water Management on 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 cooperation in transboundary waters. Within the framework of the Czech-Polish cooperation five standing working groups were established, focusing on investment plans, hydrology, hydrogeology, flood protection, regulation of watercourses, the protection of waters against pollution and the Water Framework Directive.

In October 2019, the 4th meeting of the Commission was held and the following outputs of the cooperation in the field

of transboundary water management were discussed: cooperation in hydrology, hydrogeology and flood protection (flood protection at the transboundary sections of the Oder, Opava, Petrůvka and Stěnáva Rivers) and cooperation in the sphere of transboundary watercourse adjustment and amelioration of borderland. Furthermore, information about the implementation of the Water Framework Directive in transboundary waters were exchanged at the meeting together with the Floods Directive at national levels and information about the cooperation with the Standing Czech-Polish Commission for transboundary waters.



Cross-border project of reintegrating weaned shoulders of the Dyje River: a shoulder of the Dyje River reinforced with willow fences (Source: Morava River Board)



K. Valentíková + M. Mikešová – Polluted Water – Zlín Region

13. RESEARCH AND DEVELOPMENT CONCERNING WATERS

A series of researches are being carried out. This chapter is intended to present briefly research and development in the field of waters within the scope of the Ministry of Agriculture, the Ministry of the Environment and the Ministry of Education, Youth and Sports that fund the central bodies either directly, in the form of institutional support or through Technology Agency of the Czech Republic. Publicly accessible data on R&D projects and granted institutional support for long-term conceptual development are available on the website of the Information System of Research, Experimental Development and Innovations at www.rvvi.cz (Central Register of R&D projects, Central Register of Activities). The information on the results obtained from research activities is available on the same website in the Information Register of R&D results.

13.1 Research and development within the scope of the Ministry of Agriculture

In 2019, the Ministry of Agriculture provided special-purpose and institutional funding aimed at implementing research and development projects and long-term conceptual development of research organizations in the field of water management in the amount exceeding CZK 61 million.

A total of CZK 54,971 thousand was expended in support of research and development projects in 2019. Research and development projects are primarily focused on soil and water protection while maintaining sustainability of the agricultural industry, formation, renovation and protection of cultural landscape, forests and water bodies and rationalization of water management including dealing with the impacts of the climate change. The overview of projects is shown in Table 13.1.

Water management R&D projects implemented in 2019 resulted from public tenders under the research programme of the Ministry of Agriculture called the Programme of Applied Research of the Ministry of Agriculture for 2017–2025, ZEMĚ (meaning the “EARTH”).

Specific objectives of the ZEMĚ programme are defined by three key areas and nine research directions. The key area “Sustainable Management with Natural Resources” is fulfilled by, among others, the Water research directions. The objective of this research directions is to achieve good environmental and chemical condition of surface waters and good chemical and quantitative condition of groundwaters, increase of retention and accumulation of surface waters and groundwaters, decrease of the risk of their pollution and care of water resource quality before they are polluted from point and non-point sources, limitation of micropollutant contamination (pesticides, pharmaceuticals and others including their metabolites), use of new technologies in the sphere of water treatment and recycling of waters in circulations. Furthermore, the Water research direction is focused on optimization of water management with the objective of eliminating hydrologic extreme manifestations and designing a system of adaptation measures aimed at their mitigation.

Under long-term concepts of research organization development, some research organizations also addressed the issue of water management. An institutional support amounting to CZK 6,745 thousand was provided to research organizations in 2019. The funds were allocated primarily to: Research Institute for Amelioration and Soil Protection, p. r. i. (CZK 4,038 thousand), Crop Research Institute, p. r. i. (CZK 1,433 thousand), Research Institute of Agricultural Engineering, p. r. i. (CZK 939 thousand), Forestry and Game Management Research Institute, p. r. i. (CZK 184 thousand) and Agriresearch Rapotín s. r. o. (CZK 151 thousand).



CENAKVA experimental background (Author: Vladimír Žlábek)

Table 13.1**Research and development projects in water management funded from the budget section of the Ministry of Agriculture in 2019**

Project No.	Name	From-to	Coordinator	Funds (in thousands of CZK)
QK1710379	Safe use of mud from WWTPs on farmland via torefaction technology	1/2/2017 31/12/2021	Czech University of Life Sciences Prague	2,435
QK1720303	Soil retention ability and possibilities of its increasing in conditions of the climate change	1/2/2017 31/12/2019	Brno University of Technology	2,777
QK1720285	Methods of adjusting irrigation needs of crops taking into consideration different scenarios of the climate change in the Czech Republic for optimization of irrigation management	1/2/2017 31/12/2019	Research Institute for Soil and Water Conservation, p.r.i.	3,692
QK1810186	Improving soil structure stability and increasing infiltration via agrotechnological procedures	1/1/2018 31/12/2022	Crop Research Institute, p.r.i.	3,393
QK1810415	Influence of wood plant composition and forest cover structure on the microclimate and hydrological situation in the landscape	1/1/2018 31/12/2022	Forestry and Game Management Research Institute, p.r.i.	3,692
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 on the principle of the Internet of Things (IoT)	1/1/2018 31/12/2022	Crop Research Institute, p.r.i.	3,850
QK1810463	Development of a new form of probiotic superabsorbent bedding with subsequent use for rainwater retention in soil	1/1/2018 31/12/2021	Veterinary Research Institute, p.r.i.	2,802
QK1910029	Previous saturation and design rainfall intensity as factors of runoff response in small river basins	1/1/2019 31/12/2022	Czech Technical University in Prague	3,210
QK1910086	Decreasing the burden by areal sources of agricultural pollution in surface waters when applying regulation of drainage outfall at current agriculture drainage structures	1/1/2019 31/12/2023	Research Institute for Soil and Water Conservation, p.r.i.	3,330
QK1910165	Modern methods in irrigation regime of fruit trees in conditions of water deficit	1/1/2019 31/12/2023	RESEARCH AND BREEDING INSTITUTE OF POMOLOGY HOLOVOUSY s.r.o.	3,973
QK1910282	Options of mitigating impacts of extreme rainfall-runoff phenomena in small river basins with respect to requirements for sustainable agricultural farming and fish production	1/1/2019 31/12/2023	Masaryk University	3,850
QK1910299	Sustainable management of natural resources with emphasis on non-productive and productive soil capacity	1/1/2019 31/12/2023	Czech University of Life Sciences Prague	2,993
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	1/1/2019 31/12/2023	Mendel University in Brno	3,950
QK1910382	Innovation in technologies of growing root crop and vegetables for more efficient use rainwater and irrigation, better stability and quality of the production	1/1/2019 31/12/2023	Crop Research Institute, p.r.i.	3,340
QK1920011	Methodology of quantifying predatory fish species in water reservoirs for optimizing water ecosystem management	1/1/2019 31/12/2021	Biology Centre CAS, p.r.i.	3,445
QK1920214	Innovation in the system of potato growing in water resource protective belts with limited input of pesticides and fertilizers resulting in water pollution and maintaining potato farmers' competitiveness	1/1/2019 31/12/2021	Potato Research Institute Havlíčkův Brod, s.r.o.	4,239
Total				54,971

Source: MoA



Třeboň ecosystem station during the 2013 spring flood (Author: Jiří Dušek)

13.2 Research and development within the scope of the Ministry of the Environment

In 2019, a new research programme called **Environment for Life** was launched at the Ministry of the Environment. the programme focuses on support for applied research, experimental development and innovations in the environment. The provider and implementor of the programme is the Technology Agency of the Czech Republic. The duration of the programme with total allocation of CZK 4.46 billion is 7 years, i.e. until 2026. Half of the total funds is intended for research relating with the climate change.

The programme is divided in three sub-programmes:

- Support for projects in public interest (hereinafter referred to as the “SP1”)
- New procedures, environmental technologies, eco-innovation (hereinafter referred to as the “SP2”)
- Long-term research (hereinafter referred to as the “SP3”)

First public tender (for SP1 and SP2) was opened on 12 June 2019 with deadline for applications on 19 September 2019. The programme stirred great interest from the very beginning: 328 applications were filed for the project. 15 projects were selected under SP1 and 25 projects under SP2. The projects are expected to be initiated by the end of the 1st half 2020. The list of projects funded is published at the website of the Technology

Agency of the Czech Republic – www.tacr.cz. The expected amount of funds for these projects (at the moment, not all agreements have been signed) is CZK 393.8 million. Total costs of projects (including participations) are CZK 451.5 million.

The second public tender focused on support for SP3 projects and was opened on 27 November 2019 with deadline for applications on 19 February 2020. The tender was open for seven research topics, the most important two being 1. Drought and climate change in broader context with allocation of CZK 320 million and 2. Water systems and water management in the Czech Republic in the context of climate change with allocation of CZK 247.5 million. Thanks to a bride focus of the assigned main and partial objectives, it is presumed that investigation consortia consisting from several research organizations will be composed. At present, 8 project applications that have met formal conditions of the tender are under assessment.

The third public tender for support for projects under Sub-programme 1 is planned for 2020. It is expected to be open for applications in May with expected allocation under this sub-programme of CZK 152 million.

In 2019, the Ministry of the Environment provided an institutional support amounting to almost CZK 88 million to two research organization in the field of waters. The institutional support allocated to T.G. Masaryk Water Research Institute, p. r. i., was almost CZK 71.4 million and to the Czech Hydrometeorological Institute to CZK 16.5 million.

Table 13.2.1**Research and development projects in water management funded by the Ministry of the Environment in 2019**

Order No.	Project	Year of implementation	Ordering party
3701.05	Expert support for monitoring and assessment of the condition of surface waters and underground waters	2019	Work for the Ministry of the Environment
3701.06	Review of definition of vulnerable areas for the Nitrates Directive including support for reporting	2019	Work for the Ministry of the Environment
3701.07	Reporting under Art. 15 and Art. 17 of the Directive of the Council No. 91/271/EEC	2019	Work for the Ministry of the Environment
3701.08	Expert support for assessment and management of flood risks	2019	Work for the Ministry of the Environment
3701.16	Intercalibration for assessment of biological components	2019	Work for the Ministry of the Environment
3701.19	Balance, monitoring and assessment in water volume protection and water quality	2019	Work for the Ministry of the Environment
3701.22	Support for activities in the process of water planning	2019	Work for the Ministry of the Environment
3701.23	Background materials for assessment under Art. 15 of Directive 2000/60/EC	2019	Work for the Ministry of the Environment
3701.24	Preparing methods for minimum residual flows	2019	Work for the Ministry of the Environment
3701.27	Assessment of the chemical and quantitative condition of groundwaters	2019	Work for the Ministry of the Environment
3701.28	Assessment of the influence of navigating the Ploučnice River and proposal of conditions for regulation	2019	Work for the Ministry of the Environment
3701.29	Migration penetrability	2019	Work for the Ministry of the Environment
3703.00	DROUGHT 2019	2019	Work for the Ministry of the Environment
3710	Preparation of the LIFE Crayfish 2019 project	2019	Work for the Ministry of the Environment
3600.61	Research and assessment of the hydrological regime in present and future conditions	2019	Ministry of the Environment – Institutional support
3600.62	Research and development in hydraulics and hydrotechnology from the perspective of anthropogenic influence	2019	Ministry of the Environment – Institutional support
3600.63	Interaction of surface waters and groundwaters	2019	Ministry of the Environment – Institutional support
3600.64	Research and development of tools for identification and assessment of water conditions and research for the needs in water planning	2019	Ministry of the Environment – Institutional support
3600.65	Research of anthropogenic influences on the condition of water and water ecosystems	2019	Ministry of the Environment – Institutional support
3600.66	Research and protection of biodiversity in water ecosystems	2019	Ministry of the Environment – Institutional support
3600.67	Research in the sphere of processing information, databases and geographic information systems	2019	Ministry of the Environment – Institutional support
3600.68	Technological processes of water treatment and purification and water recycling	2019	Ministry of the Environment – Institutional support
3600.69	Waste and prevention of its creation	2019	Ministry of the Environment – Institutional support
3600.70	New trends in the sphere of wastewater treatment mud and bed sediments	2019	Ministry of the Environment – Institutional support
3600.71	Use and popularization of historic and current water management sources of information for the development of environment-friendly society	2019	Ministry of the Environment – Institutional support
3600.72	Research and assessment of lifecycle of products, services and institutions relating to water	2019	Ministry of the Environment – Institutional support

Source: T. G. Masaryk Water Research Institute

Table 13.2.2

Research and development projects in water management funded from the budget of the Technology Agency of the Czech Republic (BETA2) for the Ministry of the Environment in 2019

Project No.	Name	From-to	Coordinator	Funds (in thousands of CZK)
TITSMZP809	Influence of small water reservoirs on the groundwater level and total hydrological balance with emphasis on dry periods	1/6/2019 31/12/2021	Czech Technical University in Prague	9,731
TITSMZP720	Potential of dry reservoirs as part of water management in the landscape	1/5/2019 31/12/2021	T. G. Masaryk Water Research Institute	4,898
TITSMZP707	Influence of technical snowing on biological components of the natural environment in the Krkonoše National Park and its protective belt	1/5/2018 31/12/2021	Masaryk University in Brno	10,492
TITSMZP703	Watercourse drying up and biodiversity of flowing waters: influence of natural conditions and anthropogenic interventions	1/6/2018 30/11/2021	Masaryk University in Brno	9,999
Total				37,015

Source: MoE



Restoration of the Chrástálí Stream (Source: Forests of the Czech Republic)

13.3 Research and development within the scope of the Ministry of Education, Youth and Sports

The Ministry of Education, Youth and Sports provided funds totalling to CZK 70.3 million to projects of large research infrastructures in the sphere of water in 2019, the most important research infrastructures being CENAKVA, CzeCOS, SoWa and European projects DANUBIUS-RI and ICOS-ERIC.

Large research infrastructures are unique entities showing high knowledge and technologic level. In the regime of open access they provide their research capacities of the expert public from Czech and foreign research organizations, universities and companies (see Section 2(2)(d) of Act No. 130/2002 Coll.) whose project applications for allocation of research capacity are approved. They are listed in the Roadmap of the Czech Republic of large infrastructures for research, experimental development and innovations for 2016–2022. Their list in the environmental field can be seen online at <https://www.vyzkumne-infrastruktury.cz/environmentalni-vedy>. Research infrastructures at the European level are shown at the ESFRI (European Strategy Forum on Research Infrastructures) Roadmap and a list of research infrastructures with Czech participation at <https://www.vyzkumne-infrastruktury.cz/konsorcium-evropske-vyzkumne-infrastruktury-eric/>.

South Bohemian Research Centre for Aquaculture and Biodiversity of Hydrocenoses (hereinafter referred to as the “CENAKVA”) was established in 2010 with support from the Operational Programme Research and Development for Innovation and subsequently from the National Programme of Sustainability on the platform of the Faculty of Fisheries and Protection of Waters and the Biophysical Institute of the University of South Bohemia in České Budějovice. The main scientific objective of the centre is to fully understand the ongoing processes in freshwater ecosystems and their society-wide importance from the perspective of conserving biodiversity, water environment and water source protection for human lives and activities. CENAKVA is the only large

research infrastructure in the Czech Republic dealing globally with processes in freshwater ecosystems, substance cycle in water including monitoring new pollutants in the environment. CENAKVA boasts of unique background in terms of ponds, experiments and science together with close relations with the “fishing community” in the Czech Republic, Europe and the entire world that allows it to plan and verify proposals of adjustments of the fishery management of water sources in the context of climatic changes in the Czech Republic and in Europe. The main task for fishers in the future will not be fish production, as the case has been until now, but maintaining water quality in an environment-friendly landscape creating regional microclimate reducing drought and floods. The research focus of CENAKVA is on four principal scientific multidisciplinary research programmes that form an internationally-renowned basic, applied and targeted research with focus on water, biodiversity, water ecology and aquaculture.

CENAKVA is a member of DANUBIUS RI. This Pan-European research infrastructure focuses on development of the interdisciplinary study of water ecosystems ranging from river springs to coastal seas, funded by the ESFRI Project (European Strategic Forum on Research Infrastructures) with the aim of forming a European consortium. General society-wide challenges for DANUBIUS-RI concern water insufficiency in the landscape, management of sediments and healthy environment. Representatives of the Faculty of Fisheries and Protection of Waters of the University of South Bohemia in České Budějovice together with their CENAKVA and the Global Change Research Institute of the CAS, p.r.i. (CzechGlobe) signed the Memorandum of Understanding on National and International Cooperation under the DANUBIUS Research Infrastructure on 26 April 2019.

The CzeCOS research institute administered by CzechGlobe that is part of the European Research Infrastructure Consortium (ICOS ERIC) – integrated system for monitoring cycle of carbon, was used in cooperation with national and international users and relevant programmes from national and international sources (the Technology Agency of the Czech Republic, Grant Agency of the Czech Republic, programmes of Czech ministries, Interreg and others) for research encompassing almost the entire issue linked with the use a protection of waters and water ecosystems. The outputs employing the CzeCOS

Table 13.3.1

Research and development projects in water management funded from the budget of the Ministry of Education, Youth and Sports in 2019

Project No.	Acronym	Name of the project	Funds (in thousands of CZK)
LM2018099	CENAKVA	South Bohemian Research Centre for Aquaculture and Biodiversity of Hydrocenoses	17,201
LM2015061	CzeCOS	Carbon Observation System	35,629
LM2015075	SoWa	SoWa (Soil and Water) National Research Infrastructure for Comprehensive Monitoring of Soil and Water Ecosystems in the Context of Sustainable Use of Landscape	15,870
ESFRI LANDMARKS	ICOS ERIC	The Integrated Carbon Observation System	1,596
Total			70,296

Source: Ministry of Education, Youth and Sports

infrastructure are used for Intersucho (meaning “Interdrought”) (<https://www.intersucho.cz>) a widely-used and well-known online website providing monitoring and forecasts of drought intensity and soil saturation as well as other information important for a large group of users (particularly in agriculture, forestry, water management, energy sector, media). The CzeCOS infrastructure also serves the research of the impacts of drought and related climatic extremes on agricultural and forestry production and management, prediction of the occurrence of wildfires. One of important users of the CzeCOS has been since 2019 the SUWAC programme focused on sustainable water management in the Dyje River Basin, a region with tense climate and hydrologic water balance, a place with markedly changing climatic conditions. The SUWAC is a consortium project of research, water management, municipal and other stakeholders in the Dyje River Basin coordinated by the CzechGlobe and supported and shielded at all levels of public administration (municipalities, regions, relevant ministries).

The SoWa (Soil and Water) National Research Infrastructure for Comprehensive Monitoring of Soil and Water Ecosystems in the Context of Sustainable Use of Landscape increased significantly the capacity of the Czech and international research community when studying interactions between soil and water. SoWa primarily supports research focused on understanding crucial physical-chemical and biological processes responsible for the provision of ecosystem services such as water retention in landscape, runoff and processes of water self-cleaning, nutrient (especially nitrogen and phosphorus) cycle in the landscape with the emphasis on organic matter decomposition and nutrient release and processes affecting water quality in watercourses

and reservoirs. It studies processes that are essentially responsible for providing quality water that can be treated and become drinkable water. It researches relations in the food chain affecting water quality, in particular the restricted occurrence of algae and cyanobacteria and interaction of water and sediments and their role in the nutrient cycle affecting water quality, greenhouse gas emission from valley reservoirs and other key processes. Furthermore, it studies water movement in the landscape, particularly in its interaction with soil and other landscape components that retain larger amounts of water than valley reservoirs and define runoff to reservoirs and watercourses and thus contribute to solving the issue of drought and floods. Special attention is paid to ecosystems under strong anthropogenic pressure. This public research institution also focuses with its activities on transfer of results to entities participating in water management. An inseparable aspect of its work is expert cooperation with involved authorities in the process of planning in the sphere of water management (methodology creation, water body assessment, etc.).

A unique combination of using laboratory micro-universes, meso-universes and an unparalleled set of artificial manipulable river basins in connection with a set of long-term monitored valley reservoirs and other relevant sites provides the possibility to determine key watercourses and bio-geo-chemical processes at all relevant scales. High quality of the research is enhanced by the cutting-edge laboratory facilities allowing for the use of modern analytical methods including stable isotopes, modern methods of molecular biology, computer simulation and other sophisticated approaches that represent state-of-art of the current research of ecosystems.



Large Pond (Source: Elbe River Board)

Interesting numbers from 2019

- Basic hydrological network: 99.199 thousand km of watercourses
- Purchase value of fixed assets related to watercourses: CZK 53.75 billion (year-on-year increase by CZK 0.85 billion)
- Increase in the revenue of the River Boards, s.e., by CZK 95 million (1.8%)
- Average price for 1 m³ of surface water – CZK 4.97 (year-on-year increase by 2.5%)
- Investments of River Boards, s.e.: CZK 2.3 billion, of which CZK 1.2 billion (52%) of internal funds
- Land consolidation: CZK 1.9 billion, of which CZK 0.2 billion for water management measures and CZK 0.06 billion for anti-erosion measures
- Population supplied with drinkable water: 10.09 million (94.6%) – most in Prague and the Karlovy Vary Region (100%) and Moravia-Silesia Region (99.9%), least in the Pilsen Region (85.9%) and in the Central Bohemian Region (86.5%)
- Water consumption (invoiced to households): 90.6 l/person/day (year-on-year increase by 1.4 l/person/day)
- Population connected to sewerage system: 9.12 million (85.5%) – most in the Karlovy Vary Region (100%) and Prague (99.1%), least in the Central Bohemian Region (74.4%) and the Liberec Region (69.5%)
- Total length of the water supply system: 78,983 km (extended by 233 km, compared to 2018)
- Total length of the sewerage system: 49,149 km (extended by 393 km, compared to 2018)
- Number of wastewater treatment plants: 2,731 (increased by 54, compared to 2018)
- Water rate: average price: CZK 39.30 per m³, highest in the Liberec Region (CZK 44.80 per m³), lowest in the Olomouc Region (CZK 34.10 per m³)
- Sewerage charge: average price: CZK 33.70 per m³, highest in the Liberec Region (CZK 42.90 per m³), lowest in the Vysočina Region (CZK 28.80 per m³)
- Production of marketable fish: 20,986 tonnes (19,894 tonnes from ponds)
- State financial support in water management – CZK 10.7 billion
 - Programmes of the Ministry of Agriculture – CZK 2.7 billion:
 - o ensuring quality of surface water sources (Švihov Water Reservoir) – CZK 50 million
 - o public water supply and sewerage systems:
 - 49 projects focused on water supply systems (CZK 404 million),
 - 73 projects focused on sewerage systems (CZK 564 million),
 - subsidised loans: subsidies for interests (68 loans amounting to CZK 6 million)
 - o flood measures – 32 projects (CZK 542 million)
 - o administration of minor watercourses and small water reservoirs owned by the state – 256 projects (CZK 462 million)
 - o support for water retention in the landscape – 25 projects (CZK 180 million)
 - o irrigation – 45 projects (CZK 66 million)
 - o support for extra-production functions of fishing grounds – 47 projects (CZK 22 million)
 - o Operational Programme Fisheries 2014–2020: 182 projects (CZK 154 million)
 - o Rural Development Programme (land consolidation in water management) – CZK 263 million
 - Programmes of the Ministry of the Environment – CZK 6.2 billion:
 - o Support from the state budget (MoE):
 - Operational Programme “Environment 2014–2020” (water management) – CZK 5.359 million
 - o Support from the State Environmental Fund: national programmes – CZK 824 million
 - Programmes by the Ministry of Transport – CZK 1.8 billion:
 - o Support from the State Transport Infrastructure Fund: CZK 1,550 million
 - o Support from the Connecting Europe Facility Programme – CZK 294 million

List of acronyms in the text

BOD ₅	biochemical five-day oxygen demand
CAS	Czech Academy of Science
CEI	Czech Environmental Inspection
CF	Cohesion Fund
CHMI	Czech Hydrometeorological Institute
COD	chemical oxygen demand
CRF	Compulsory Requirements for Farming
CRV	Central Register of Watercourses
CZ-NACE	Classification of economic activities as per the Czech Statistical Office (in accordance with Eurostat)
ČSN	Czech National Standard
DEHP	bis(2-ethylhexyl)phthalate
DIS	dissolved inorganic salts
DOH	dissolved organic hydrocarbons
EAFRD	European Agricultural Fund for Rural Development
EC	European Community
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EP	equivalent population
ERDF	European Regional Development Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EUSDR	EU Strategy for the Danube Region
FAD	flood activity degree
GAEC	Good Agricultural and Environmental Condition
HGR	Hydrogeological Region
ICPDR	International Commission for Protection of the Danube River
ICPER	International Commission for Protection of the Elbe River
ICPORaP	International Commission for Protection of the Oder River against Pollution
i.o.	interest organization

LC	lock chamber
MoA	Ministry of Agriculture of the Czech Republic
MoE	Ministry of the Environment of the Czech Republic
N _{inorg}	inorganic nitrogen
NEK	environmental quality standards
NM	non-dissolved matters
P _{total}	total phosphorus
PAH	polyaromatic hydrocarbons
PBDE	polybrominated diphenyl ethers
PCB	polychlorinated biphenyls
PFOS	perfluorooctanesulfonic acid
p.r.i.	public research institute
Q _m	average monthly flow rate
RDP	Rural Development Programme
RIS	River Information Services
s. e.	state enterprise
SEA	Strategic Environmental Assessment
SEF	State Environmental Fund of the Czech Republic
SPI	Sub-programme Support for projects in public interest
SP2	Sub-programme New procedures, environmental technologies, eco-innovations
SP3	Sub-programme Long-term research
s. r. o.	limited company under Czech law
STIF	State Transport Infrastructure Fund of the Czech Republic
UN/ECE	United Nations Economic Commission for Europe
VAT	value added tax
VOC	Volatile Organic Compound
W&S	water supply and sewerage systems
WHO	World Health Organization
WS	water structure
WWTP	wastewater treatment plant

Important contacts in water management

Ministry of Agriculture of the Czech Republic
Těšnov 65/17, Prague 1, 110 00, www.eagri.cz
Ministry of the Environment of the Czech Republic
Vršovická 1442/65, Prague 10, 100 10, www.mzp.cz
Elbe River Board, state enterprise
Víta Nejedlého 951/8, Hradec Králové, 500 03, www.pla.cz
Vltava River Board, state enterprise
Holečkova 3178/8, Prague 5, 150 00, www.pvl.cz
Ohře River Board, state enterprise
Bezručova 4219, Chomutov, 430 03, www.poh.cz
Oder River Board, state enterprise
Varenská 3101/49, Ostrava, Moravská Ostrava, 701 26, www.pod.cz
Morava River Board, state enterprise
Dřevařská 932/11, Brno, 602 00, www.pmo.cz
Forest of the Czech Republic, s. e.
Přemyslova 1106/19, Hradec Králové, 500 08, www.lesy.cz
Czech Hydrometeorological Institute
Na Šabatce 2050/17, Prague 412 – Komořany, 143 06, www.chmi.cz
T. G. Masaryk Water Management Research Institute, public research institution
Podbabská 2582/30, Prague 6, 160 00, www.vuv.cz
State Land Office
Husinecká 1024/11a, Prague 3 – Žižkov, 130 00, www.spucr.cz
Research Institute for Amelioration and Soil Protection, public research institution
Žabovřeská 250, Prague 5 – Zbraslav, 156 27, www.vumop.cz



Němčany, new fauna (Source: State Land Office)



Water and history, Lednice-Valtice Cultural Landscape (Author: Lenka Procházková)

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A team of authors: Eva Fousová, Lenka Jiroudová, Jana Koubová

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