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Report on the Environment of the Czech Republic

2023

Drawn up by
Department of Environmental Policy and Sustainable Development, Ministry of the Environment of the Czech Republic

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The assessment is processed on the basis of data provided by the listed cooperating organizations. Rabble Collection of data sets for the 2023 Report took place via the Dataport system, the technical and graphic processing of the data as well as the majority of map outputs was carried out by CENIA.

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List of cooperating organisations

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Czech Astronomical Society
Czech Geological Survey
Czech Environmental Information Agency
Czech Ornithological Society
Czech Hydrometeorological Institute
Czech Statistical Office
Czech Office for Surveying, Mapping and Cadastre
Energy Regulatory Authority
Forest Stewardship Council Czech Republic
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Ministry of the Environment of the Czech Republic
National Reference Laboratory for Environmental Noise
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Road and Motorway Directorate of the Czech Republic
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Railway Administration, state enterprise
State Environmental Fund of the Czech Republic
National Institute of Public Health
Forest Management Institute
Institute of Agricultural Economics and Information
Central Institute for Supervising and Testing in Agriculture
Forestry and Game Management Research Institute, public research institution
Research Institute for Soil and Water Conservation, public research institution
Silva Tarouca Research Institute for Landscape and Ornamental Horticulture, public research institution
T. G. Masaryk Water Research Institute, public research institution
Institute of Public Health based in Ostrava

Table of Contents

Introduction

The Report on the Environment of the Czech Republic ("Report") is produced on an annual basis under Act No. 224/2023 amending Act No. 123/1998 Coll., on the Right to Information on the Environment, as amended, and Government Resolution No. 446 of 17 August 1994 and Government Resolution No. 934 of 12 November 2014 and is submitted to the Government of the Czech Republic for approval and subsequently to the Chamber of Deputies and the Senate of the Parliament of the Czech Republic for consideration.

The Report provides a comprehensive assessment of the condition and developments of the environment in the Czech Republic, covering all its aspects and based on the available data for the assessment year.

The Report on the Environment of the Czech Republic 2023 is drawn up by the Ministry of the Environment and builds on the Reports on the Environment of the Czech Republic from previous years, produced by CENIA for the Ministry of the Environment. The datasets for the 2023 Report were collected through the Dataport system, with technical and graphical data processing done by CENIA. Starting with the 2020 Report, the content design and framework of the Report has been changed, drawing on the National Environmental Policy of the Czech Republic 2030 with a view to 2050 ("NEP 2030"), in order to provide an interim assessment of its indicators and of the achievement of its objectives and priorities. The main thematic areas are based on the NEP 2030 (1. Environment and Health, 2. Climate Neutral and Circular Economy, 3. Nature and Landscape) and are framed by other topics that are central to the condition and development of the environment (Effects of Climate Change in the Czech Republic, Environmental Protection Funding, Public Opinion and Attitudes in the Czech Republic, Planetary Boundaries).

Legend for symbols related to the assessment of indicators and target achievement[1]

Graphical depiction of the indicator trend		
Positive upward trend	Stagnation	Negative upward trend
Positive downward trend	Variable trend	Negative downward trend
N/A The trend cannot be determined or is not worth assessing		

Graphical depiction of the indicator status assessment			
Good	Neutral	Bad	N/A Unable to assess

Graphical depiction of target achievement		
Is on track to meet the target	Meeting the target is uncertain	Meeting the target is unlikely

[1] *For more details, see chapter "Methodology for assessing status, trends and achieving the objectives".*

Key messages of the Report

The environmental quality in the Czech Republic has significantly improved over the past decades, mainly because of the major investments in its protection, nevertheless the condition of various environmental compartments is still far from being optimal. Intensive landscape use is undermining its functions and causing biodiversity loss. As a result of technological development and the implementation of environmental protection measures, the environmental pressures by the national economy per unit of economic output generated continue to decline.

Externalities, such as energy price volatility caused by unstable geopolitical situations, interfere with the quality of the environment and decarbonisation of the economy, affecting households and their environmental behaviour. Unsustainable forms of household consumption in terms of mobility and consumption of energy and natural resources remain a threat to further environmental improvement and the decarbonisation process.

The energy crisis has forced some households to stay with coal heating or even switch to coal heating because of the high prices of the other heating methods (natural gas, electricity and renewable energy). The combustion of solid fuels, including biomass (wood) in residential space heating systems is a significant source of emissions of, *inter alia*, persistent organic pollutants (POPs), which are bioaccumulative and highly hazardous to human health.

In the public energy sector, the evolution of primary energy source consumption for most fuels is moving towards the established target corridors for different fuels, with a gradual shift away from solid fossil fuels and an increasing share of renewables. However, the energy efficiency is not yet increasing and final energy consumption is not decreasing, as provided for under the updated Climate Protection Policy of the Czech Republic and the National Energy and Climate Plan.

Greenhouse gas emissions in the Czech Republic dropped by 37.1% relative to 1990. Based on the modelled scenarios, the Czech Republic is likely to meet the European target of a 55% reduction in emissions by 2030. The sector with the least advanced decarbonisation process is clearly transport, where energy consumption is increasing and more than 90% of the energy consumed in transport is fossil-based. Despite a clear decrease in particulate pollutant emissions due to modernisation of technologies, greenhouse gas emissions from transport are increasing. The uptake of alternative fuels and propulsion, particularly in private transport, is slow. The Czech Republic has the third lowest share of registrations of new battery electric passenger cars in the EU-27.

In the forests, a gradual wind down of the bark beetle calamity – that started in 2015 in northern Moravia in the Jeseníky region and gradually spread to other areas, culminating in 2020 – can be observed. In 2023, the extraction intensity has reached approximately the 2016 levels. Meanwhile, extensive reforestation is taking place in the affected areas. Despite the significant improvement in the carbon balance in the last inventory, due to the bark beetle calamity, emissions in the forestry sector are higher than the amount of carbon removed. Moreover, the health of the forests remains unfavourable, even in view of the inadequate species composition and simple structure. Spruce is still the most widely planted tree species.

Emissions of main air pollutants are falling and the Czech Republic is on track to meet its national emission reduction commitments by 2030, with the exception of ammonia emissions, where compliance is still uncertain. Air quality from a human health perspective is improving and the proportion of areas with exceeded limits of ambient air quality standards is already very low, supported by favourable weather conditions. As to the protection of ecosystems and vegetation, the ground-level ozone immission standard continues to be exceeded in national parks and protected areas, however, in 2023 the total area exceeding the immission limit has decreased compared to the previous year.

Surface water quality has improved significantly since 2000. The most effective reductions in ammonia nitrogen and total phosphorus content in watercourses have been achieved through the construction of new wastewater treatment plants and technologically improved treatment of wastewater discharged from point sources. Nevertheless, in the short term, the water quality has stagnated and a further reduction in pollution levels has been unsuccessful.

Bird populations, which are the main indicator of biodiversity in forest and agricultural landscapes, continue to decline. The area of agricultural (mainly arable) land continues to decrease and the area of built-up areas and forest land increases. Soil is prone to degradation as a result of intensive farming, low heterogeneity of the agricultural landscape and high degree of ploughing. In terms of nature conservation, partial successes can be observed for populations of endangered species, mainly due to protected areas management and active species conservation tools.

A positive point about the transition to circular economy is that the overall waste management is still predominated by recovery, notably material recovery, complying with the current waste management hierarchy. In the area of municipal waste management, the core objective is to significantly reduce landfilling with a view mainly to achieving material recovery, yet a substantial proportion of municipal waste is still landfilled.

Environmental protection, including addressing climate change, has long been financed from both national and European sources through operational programmes. These include in particular the Operational Programme Environment, the Rural Development Programme and, from 2021, the Modernisation Fund and the Recovery and Resilience Facility for the implementation of the national recovery plan. As a result of the energy crisis and in respect of the geopolitical situation, these resources are essential for ensuring the Czech Republic's energy independence. An example of successful environmental protection measures funding is the implementation of the "New Green Savings" Programme and "Rainwater" and "Boiler Subsidies" programmes. These programmes provide major support not only to industry and the energy sector, but in particular to households in shifting to renewable green energy, in saving energy and in managing water resources more efficiently.

Climate Change Effects in the Czech Republic

Key messages

- The annual average air temperature in the Czech Republic is rising in a statistically significant way, with 2023 being the warmest year since 1961.
- Annual precipitation levels do not show any identifiable trends, but the geographical and temporal distribution of rainfall varies increasingly.
- The climatic drought in 2023 was only mild, however, in low-lying areas, notably in the Polabí and Poohří basins and in southern Moravia, there was a distinctly negative moisture balance and low soil moisture values in the growing season, which was primarily related to high temperatures and high evaporation.
- In terms of runoff, 2023 was an average year with one more severe and spatially extensive flood episode in December caused by significant warming, rainfall and snowmelt.

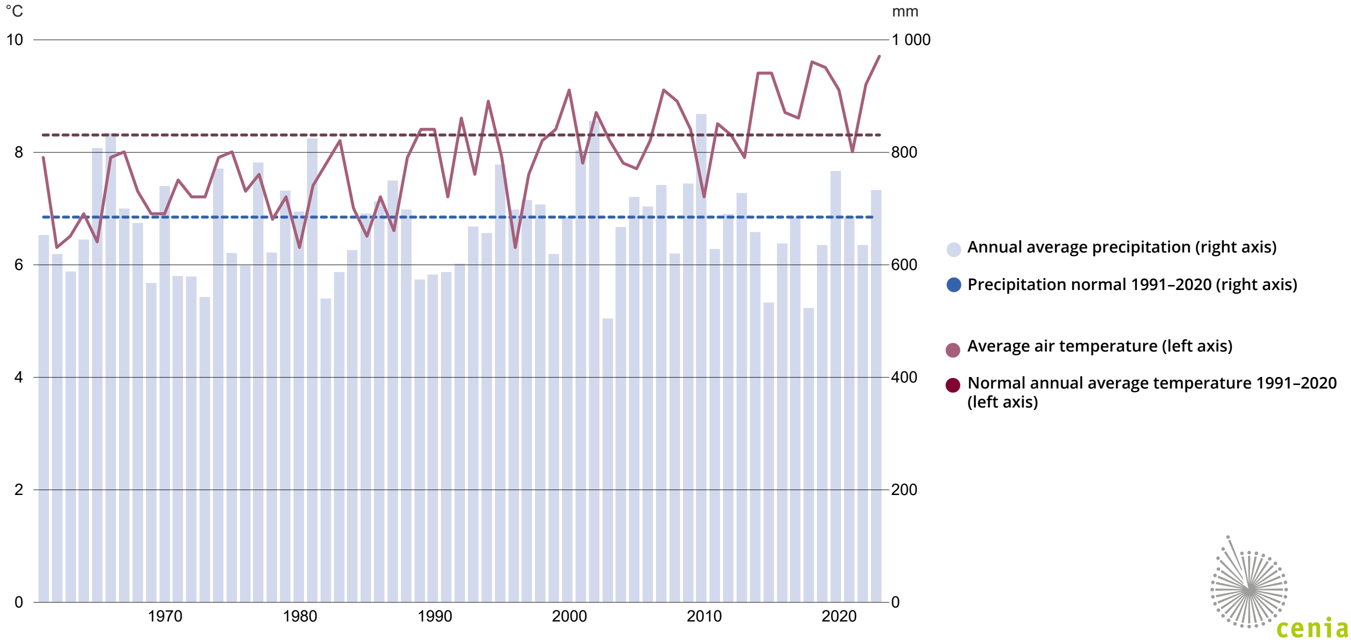
Climate Change Effects in the Czech Republic

Temperature and precipitation patterns

In terms of temperature, the year 2023 was rated as **highly above normal** in the Czech Republic, with the average annual air temperature (9.7 °C) 1.4 °C higher than the 1991–2020 normals (Chart 1). 2023 was the **warmest year** on record since 1961, followed by 2018 with an average annual temperature of 9.6 °C, 2019 (9.5 °C) and 2015 (9.4 °C). The annual average temperature in the **Czech Republic is rising at a rate of 0.35 °C per 10 years**, i.e. about twice the global average. Rising air temperature is a driving factor for other climate change impacts such as drought, fire hazards, torrential rainfall and the associated risk of flash floods, as well as the increasing extremity of dangerous hydrometeorological events (storms, high winds).

Chart 1

The annual average air temperature and annual precipitation in the Czech Republic relative to 1991–2020 normals [°C, mm], 1961–2023

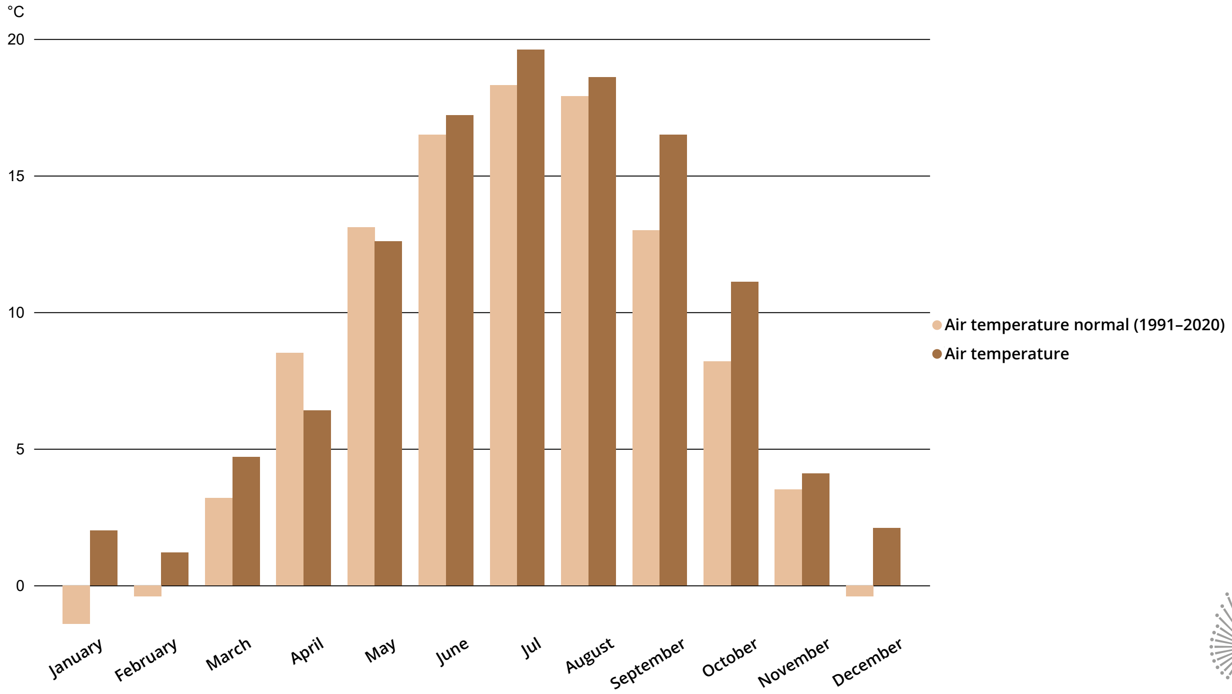


https://www.envirometr.cz/data/prumerna-rocni-teplota-vzduchu *Data source: CHMI*

In most months of 2023, with the exception of April and May, the **deviation of average monthly temperature from the** 1991–2020 **normals** was positive (Chart 2). The largest positive deviation from normals (+3.5 °C) was recorded in September, rated as an **exceptionally above-normal temperature**, the warmest September since 1961. The months of January (+3.4 °C) and October (+2.9 °C) were in terms of extreme temperatures rated as **highly above normals**, while December (+2.5 °C) and July (+1.3 °C) were above normal. April, on the other hand, was very cold. With a monthly average temperature deviation from normals of −2.1 °C, April temperature was highly below normal. The other months of the year were rated as temperature normal.

Chart 2

The monthly average air temperature in the Czech Republic relative to 1991–2020 normals [°C], 2023



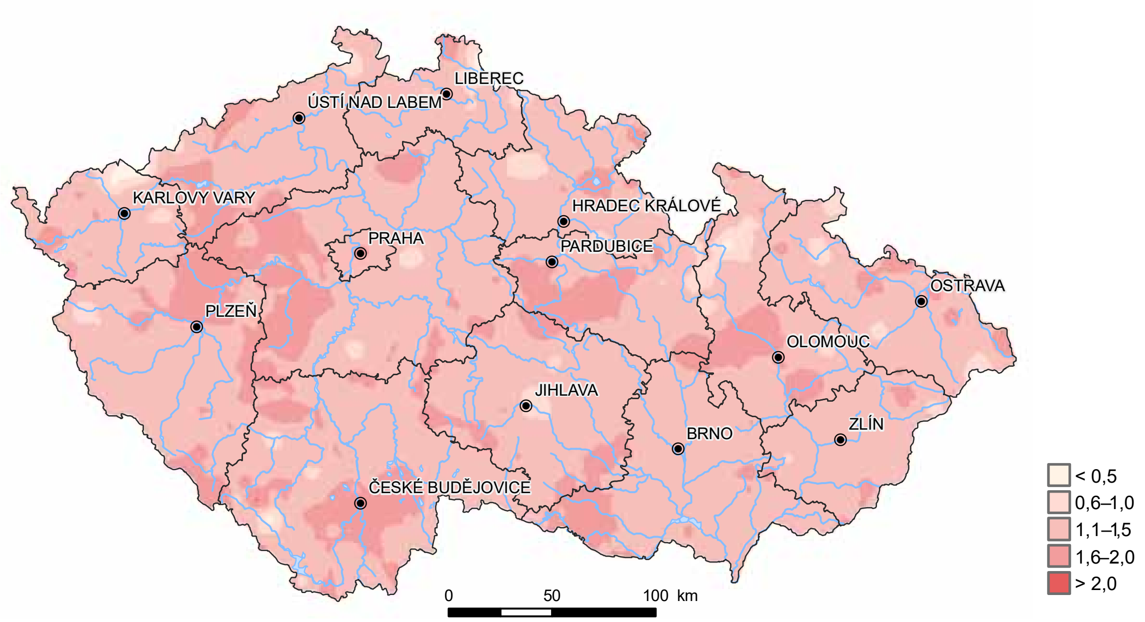
https://www.envirometr.cz/data/prumerna-mesicni-teplota-vzduchu

Data source: CHMI

In 2023, **the annual average temperature** exceeded the 1991–2020 normals in **all regions of the Czech Republic**, and positive deviation of the average annual temperature from normal was also recorded in all altitude categories, including mountains (Fig. 1). The highest deviations from normals were recorded in the **southern part of the territory**, with a total deviation of +1.4 °C in 5 regions of Bohemia (e.g. Pilsen and South Bohemia). It was somewhat colder than normals in western and northern Bohemia (Karlovy Vary, Ústí nad Labem Liberec Regions) and in northern Moravia (Moravian-Silesian Region), where the deviation of the annual average temperature from normals ranged between 1.2 and 1.3 °C. The South Moravian Region had the highest annual temperature in absolute terms (10.7 °C), followed by Prague and the Central Bohemian Region (10.4 °C).

Figure 1

Annual average air temperature deviation from 1991–2020 normals in the Czech Republic [°C], 2023



Data source: CHMI

The above-average temperatures in 2023 are also reflected in the assessment by climatological indices. There were 57 **summer days** with temperatures above 25 °C in 2023 (122.5% of the 1991–2020 normals). The average number of **tropical days**, when the temperature reaches or exceeds 30 °C, was 13 (124.5% of normals), the lower average number of tropical days is due to the inclusion of mountainous areas where tropical days almost never occur. **The annual number of summer and tropical days** is **rising** at a statistically significant rate, with the annual number of tropical days being more than doubled in the last 30 years. In the warmest regions of Bohemia and South Moravia, more than 30 tropical days were recorded in 2023, most of them at Doksany (39) and Plzeň-Bolevec (35). The highest ever maximum daily temperature in 2023 was recorded on 15 July 2023, when the temperature at the stations Plzeň-Doksany and Husinec-Řež rose to 38.6 °C, the absolute record for the maximum temperature from 2012 (40.4 °C) was not exceeded.

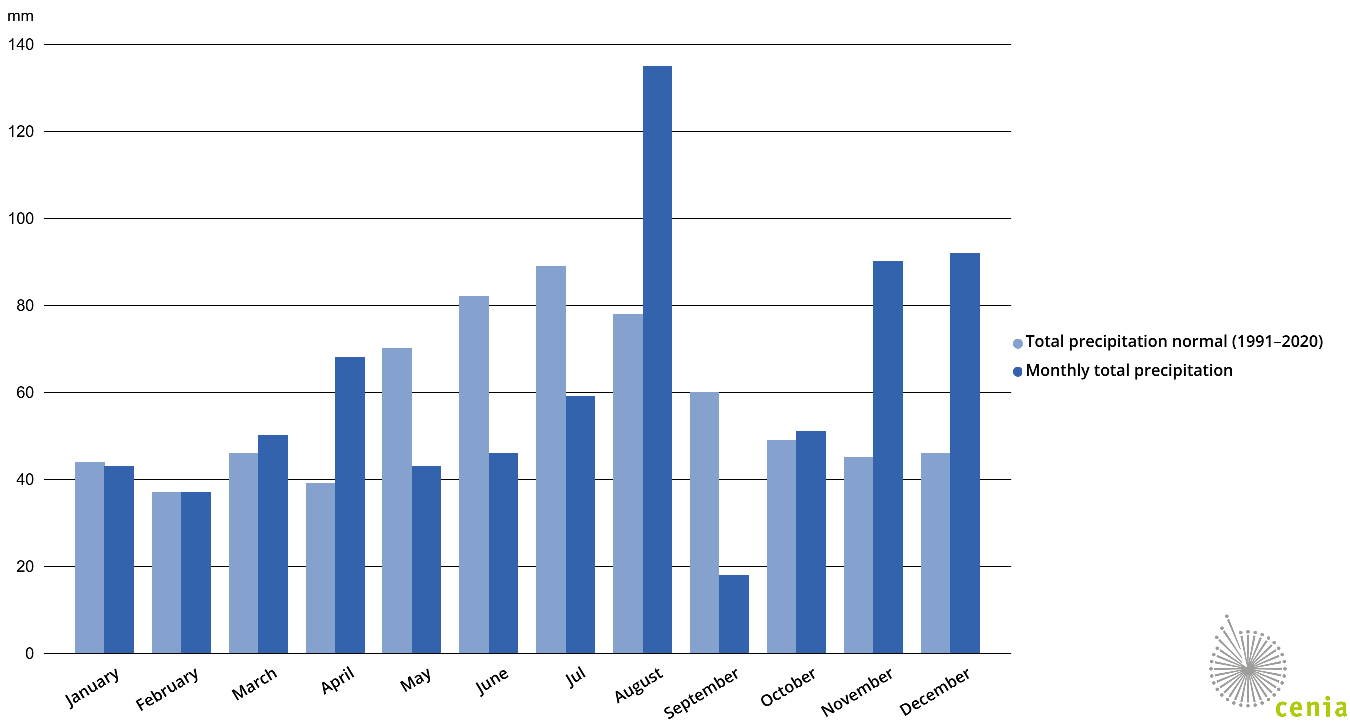
A **heat wave** – i.e. a continuous period of 3 or more days when the maximum air temperature rises above 30 °C while exceeding the 1991–2020 normals by more than 5 °C – was recorded at one of the stations in the Czech Republic on a total of **39 days** in 2023, most of them in the Ústí nad Labem Region (33 days) and the Pilsen Region (29 days). The occurrence of heat waves in 2023 was the **fourth highest since 2000**, and was higher only in 2003 (43 days), 2018 (42 days) and 2015 (41 days). Heat waves are an indicator of the **health risks of hot weather** and their high incidence is therefore alarming.

The warming climate is also reflected in the **decreasing incidence of "frost" and "ice days"**. In 2023, there were on average 91 (81.7% of the 1991–2020 normals) frost days, when the minimum temperature drops below 0 °C, and only 20 (61.7% of the normals) ice days with temperatures not rising above 0 °C throughout the day. Although the incidence of frost and ice days remains high in the mountains (the Luční bouda station in the Krkonoše Mountains recorded a total of 181 frost days and 88 ice days in 2023), the decrease in the number of these days in the middle and lower elevations leads to variations and overall **lower water reserves in the snow cover**, creating conditions for the development of drought in the coming spring and summer season.

In terms of **precipitation**, 2023 was a **normal** year in the Czech Republic, with an average annual precipitation of 732 mm, i.e. 107% of the 1991–2020 normals. The pattern of annual precipitation in the Czech Republic is variable and does not follow a statistically significant trend. However, the variability of geographical and temporal distribution of rainfall is increasing.

Chart 3

Monthly precipitation on the territory of the Czech Republic relative to 1991–2020 precipitation normals [mm], 2023



https://www.envirometr.cz/data/mesicni-srazkove-uhrny

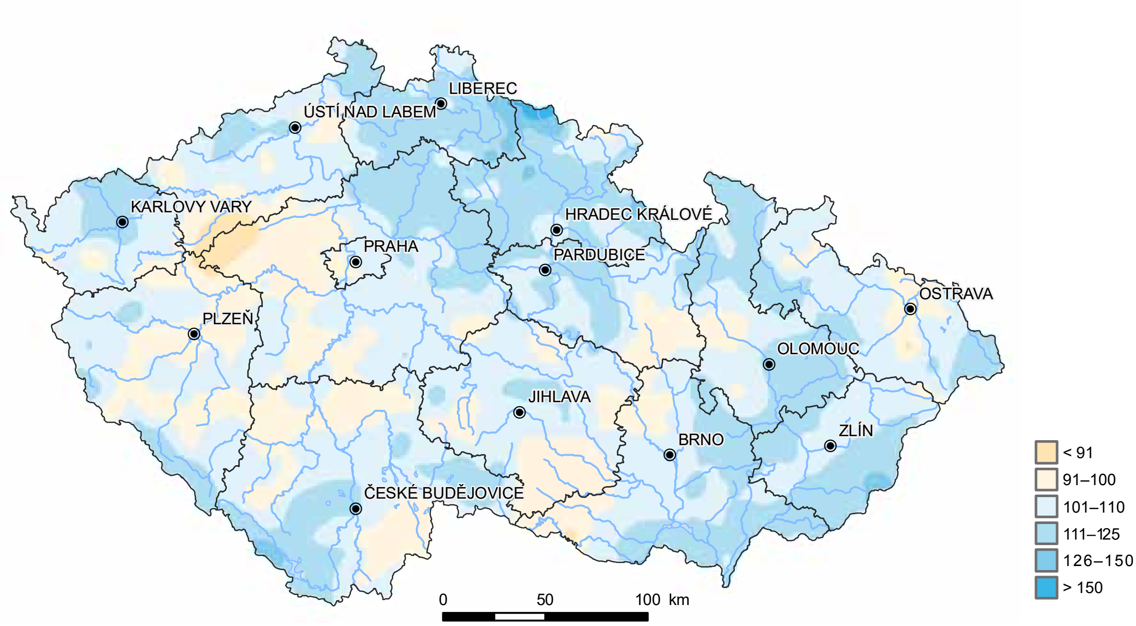
Data source: CHMI

During the year, **drier periods and periods richer in precipitation occurred alternately**. The months reaching **well above-normal** precipitation included April, with 174% of the 1991–2020 monthly precipitation normals, followed by August (173% of normals), November (200%) and December (200%; Fig. 3). On the other hand, September was **very dry** in the Czech Republic with only 18 mm of precipitation (30% of normals), and the months of May and June were also below normal with 61% resp. 56% of normal precipitation.

The average rainfall in **Bohemia** in 2023 was 726 mm (107% of normals), while in **Moravia and Silesia** it was 743 mm (107% of normals). In all regions as a whole, annual precipitation exceeded the 1990–2020 normals. The Liberec Region recorded the highest precipitation (989 mm, i.e. 116% of normals), the Hradec Králové Region had the highest proportion of precipitation relative to normals (117%). **The least precipitation** was recorded in the South Moravian Region (602 mm, i.e. 107% of normals), the driest region relative to normals was Vysočina with the annual precipitation of 693 mm, i.e.102% of normals, followed by part of the Central Bohemia Region (Rakovník) and Ústí nad Labem Region (Žatecko and Lounsko), where the annual precipitation was lower than the long-term normals (Fig. 2).

Figure 2

Annual precipitation in the Czech Republic as proportion to 1991–2020 normal [%], 2023



Data source: CHMI

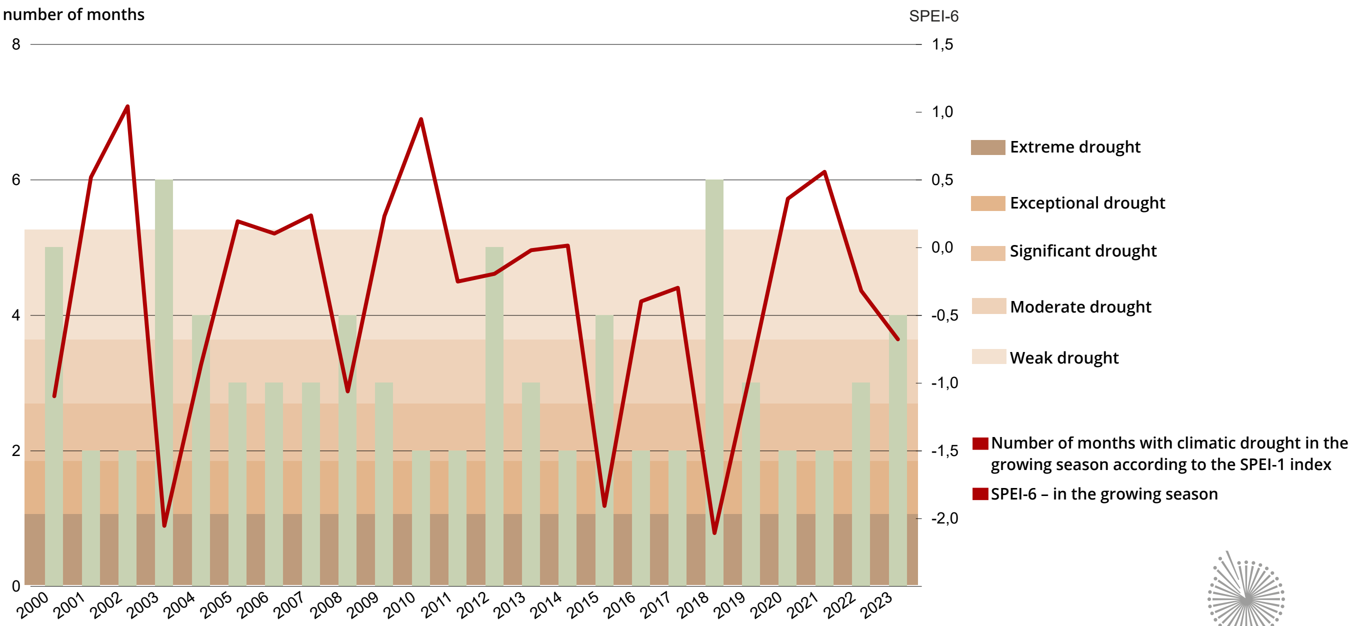
Droughts and floods, runoff conditions and groundwater levels

In the Czech Republic as an aggregate, **climatic drought** in the growing season (April-September) in 2023 was classified by the SPEI-6 index[2] only as **weak**, while in the previous two years (2022 and 2021) the index did not indicate any drought at all (Chart 4). The worst droughts in the post-2000 period were recorded in 2003, 2015 and 2018 with “exceptional” to “extreme” droughts. In each month of the 2023 growing season, droughts occurred in all months except April and August, with the most intense drought in **June**, when classified as moderate by the SPEI-1 index.

[2] *The Standardized Precipitation Evapotranspiration Index (SPEI) is a climate drought index that assesses drought as the difference between precipitation and potential evapotranspiration relative to normals. The index is most commonly calculated on a rolling basis with timescales of 1 to 6 months; here we present a variant with timescales of 1 (SPEI-1) and 6 months (SPEI-6).*

Chart 4

Precipitation evapotranspiration index SPEI-6 in the growing season (April-September) and number of months with drought by SPEI-1 index [SPEI], 2023



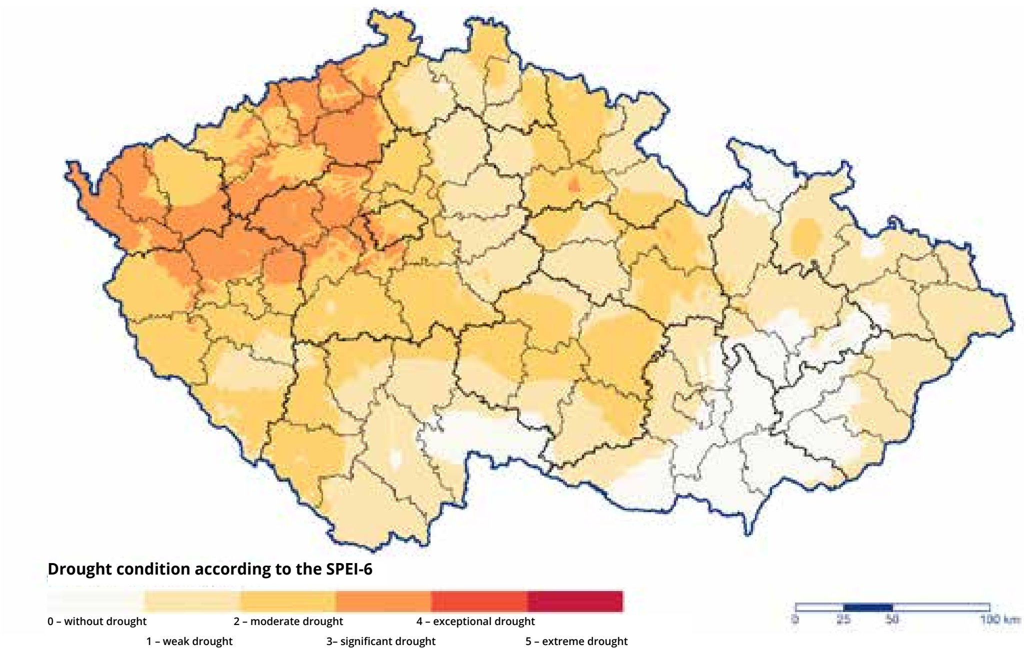
https://www.envirometr.cz/data/srazkovo-evapotranspiracni-index-spei

Data source: CHMI

On the regional level, the climatic drought affected mainly the **western part of Bohemia** with **moderate intensity** during the growing season (Fig. 3). By contrast, the traditionally dry **South Moravia** was, based on the SPEI-6 index, **almost free of drought** owing to the positive deviation of precipitation from normal and lower temperature extremes.

Figure 3

Precipitation evapotranspiration index SPEI-6 in the growing season (April–September) [SPEI-6], 2023



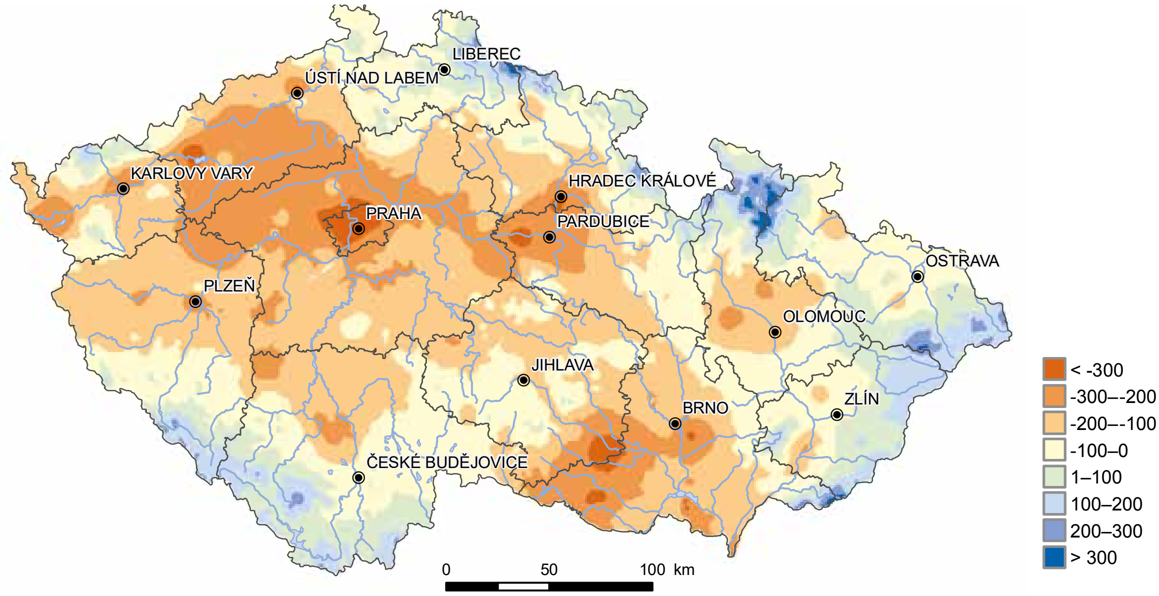
Data source: CHMI

The **moisture balance** patterns in 2023 were **more favourable** compared to the previous year. Until mid-April, positive balance values prevailed in most of the area, boosted by a significant precipitation episode in mid-April. Later, owing to higher temperatures, the balance values dropped, only to be interrupted again in mid-May by heavy rainfall. From the end of May onwards, the moisture balance values dropped dramatically, especially in the low-lying areas of the Czech Republic, and at the end of July the moisture balance values fell below −100 mm in more than 70% of the territory, and below −150 mm in southern Moravia, Polabí and Poohří. Positive moisture balance was present only in the high elevations of the peripheral mountain ranges. The largest deviations of the moisture balance from the long-term average for the period 1991–2020 were recorded in July in south-western, western and eastern Bohemia, as well as in the Beskydy and Jeseníky mountains. After a temporary improvement in the moisture balance caused by higher precipitation in August, the moisture balance values dropped again significantly from the beginning of September to the end of October in most of Bohemia and also in northern Moravia, where the moisture balance values were below average. The lowest values were recorded in South Moravia, around Pardubice, Pilsen, in Poohří, Prague and the western part of the Central Bohemian Region. From the beginning of November, the moisture balance values were raising throughout the Czech Republic, with the lowest balance values remaining mainly in the western part of southern Moravia (below −200 mm), around Pardubice, in western part of the Central Bohemia Region and lower elevations of western Bohemia and around Pilsen (below −100 mm). This situation lasted until the end of the year.

In aggregate over the **entire growing season** (April-September) of 2023 (Fig. 4), a negative moisture balance was observed in most of the Czech Republic, the most prominent negative moisture balance with a cumulative total of less than −200 mm was observed in the western part of the South Moravian Region, in the central Polabí, lower Povltaví and Poohří. Positive aggregate moisture balance was observed only in the border mountain areas. For the entire year 2023, the moisture balance for the Czech Republic as a whole reached 174.7 mm (94.2% of normals), which was well above the previous year's levels (78.7 mm).

Figure 4

Basic moisture balance of precipitation and potential evapotranspiration of grassland for the growing season 1 April – 30 September 2023 in the Czech Republic [mm]



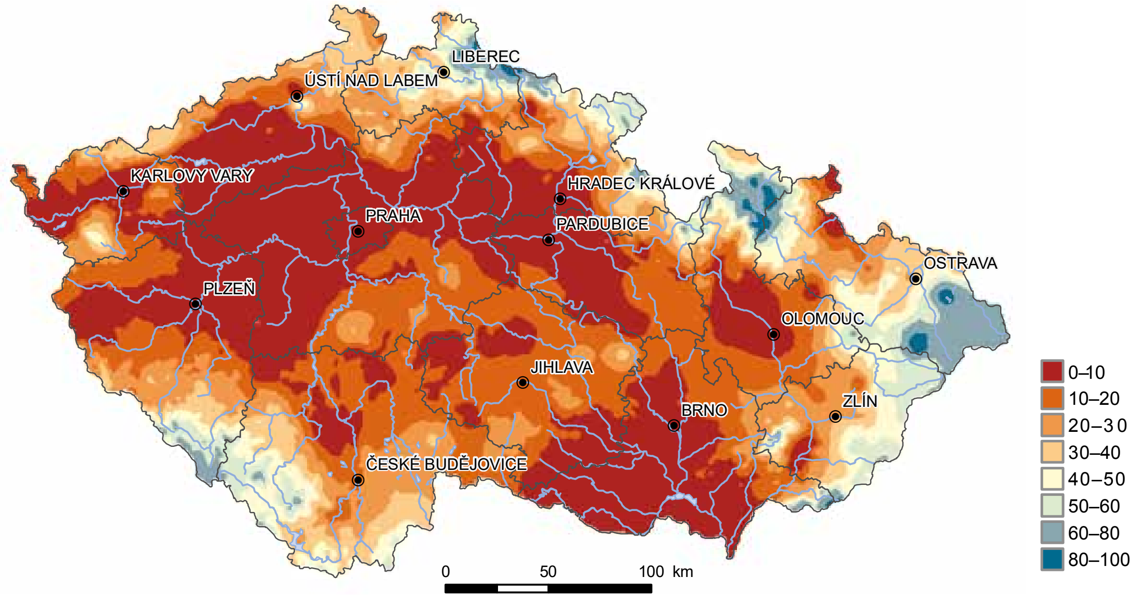
Data source: CHMI

The evolution of the moisture balance conditions was also reflected in the values of the **available water storage in the soil**. At the beginning of July, the lowest values were below 40% of the available water capacity ("AWC") in the area of South Moravia, Polabí and Poohří basins. This was followed by a decline in the rest of the Czech Republic, and by the end of July soil water storage levels dropped below 20% AWC in more than 50% of the Czech Republic (Fig. 5), and below 10% AWC in southern Moravia and in Polabí and Poohří basins, indicating a severe soil drought. Relative to normal, these values were below 25% of the long-term average, i.e. sub-normal soil moisture. Higher values were found only in the eastern and north-eastern part of Moravia and in the peripheral mountains.

During August, heavy rainfall episodes resulted in some improvement in soil water storage, though in southern Moravia and the western part of central Bohemia and Poohří basin, the values remained very low, below 10 to 20% of the AWC. In September, soil water reserves fell again and by mid-October the values were below 10% AWC in much of Bohemia and southern Moravia. Subsequently, from the end of October onwards, the **soil water storage** was **replenished** and by the end of the year the values were already above 70% AWC in most of the Czech Republic, with the exception of the areas of southern Moravia, Pardubice, Plzeň and western Central Bohemia and Poohří, where the values were around 40 to 50% AWC. These soil moisture values were at the level of the long-term average for this time of year, in southern Moravia and north-western Bohemia they reached up to 125–150% of normal and were therefore slightly above average.

Figure 5

Available water storage in the soil in the Czech Republic (AWC = 170 mm/m) – current state of modelled values as of 24 July 2023 [% AWC]



Data source: CHMI

From the hydrological point of view, the year 2023 in the Czech Republic can be generally regarded as an **average** one **in terms of runoff**, however, there were periods of below-average and significantly above-average runoffs. While the winter and most of the spring, except for March, saw **average** to slightly above average **runoffs** in all major basins, the summer months, except for August, were rated as **below average to significantly below average** in terms of runoff. Lower flow rates on the watercourses continued in September and October, but towards the end of the year, particularly in December, they reached well above average volumes when most of the main river basins saw more than 2.5 times the normal amount of water runoff, making it the most significant runoff event in recent years.

The runoff from the main river basins measured by the average annual flow at the end profiles for the whole year 2023 ranged from 87% of the average long-term flow rate for the period 1991–2020 in the Dyje basin (Ladná profile) to 102% in the Olše basin (Věřňovice profile). In terms of sub-basins, the highest annual runoff relative to normal was registered in the tributaries of the Upper Elbe (Labe), the highest in the Orlice basin (Týniště nad Orlicí profile), where it reached 120% of the long-term average, and in the Sázava basin (116% of the long-term average in the Nespeky profile).

Flood events reaching one of the flood activity levels ("FAL") occurred in almost all months **in 2023**. Floods happened mostly in the winter, caused by a combination of heavy precipitation and melting snow combined with strong winds. The major flood event took place **in late December** and was characterised by a large extent of affected area, with FALs being reached in all main basins. During the summer months, the floods were mainly **local**.

More serious flood situations occurred in **May**, when rainfall between 15 and 21 May led to rising water levels, especially in the basins of the Bečva, Lower Morava and Odra rivers. Most of the precipitation came down in heavy storms on 17 and 18 May with totals of 50–60 mm, causing the levels of the Velička River in Velká nad Veličkou and Strážnice to rise above FAL 3 to a flow rate with Q_{20} recurrence interval, making it – along with the values measured in December – the largest recorded flood extremity in 2023. Further significant precipitation and the resulting runoff events took place in August, when on 4–6 August the eastern part of the Czech Republic saw 30–65 mm of raining in 72 hours, mostly in the Orlické hory mountains with 70–110 mm in 72 hours, causing a runoff response not exceeding

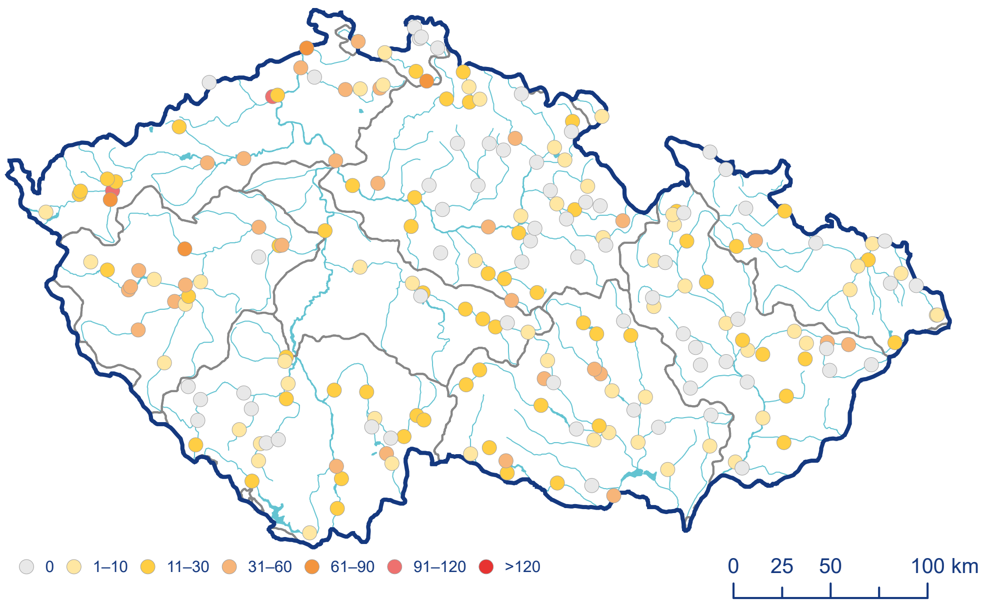
FAL 1. Further local precipitation took place in the south-eastern part of the country between 14 and 20 August and on 26 August, when 30–70 mm of rain fell in 24 hours, briefly exceeding FAL 3 on the Černovický potok brook in Tučapy (Lužnice basin).

The largest flood event of the year occurred as a result of significant rainfall combined with thawing of above average snowpack in the 3rd decade of December 2023. Water flows culminated on 24–27 December at flow rates exceeding both FAL 2 and 3 especially in the belt stretching across northern and north-eastern Bohemia through Vysočina to the eastern part of South Bohemia. The highest flood recurrence interval of Q_{20} (n-year) was recorded at only FAL 1 on the Svatava river in Sokolov district; the Sázava river (profile Chlístov) culminated with Q_{10} at FAL 3, the Nežárka river (Rodvínov) with Q_{10} at FAL 3 and the Elbe (Labe) river (Kostelec nad Labem) also with Q_{10} at FAL 3.

In terms of the occurrence of **hydrological drought in surface waters**, 2023 was more watery than 2022. Hydrological drought is measured by the occurrence of flows below 25% of the monthly average flow (below 25% of Q_m), by the 355-day flow reached or exceeded on a given profile on an average of 355 days per year (Q_{355d}) that is essential for retaining the basic water management and ecological functions of the stream, and by the 364-day flow (Q_{364d}) that indicates extreme hydrological drought (Fig. 6). The number of profiles with drought indication started to rise during June, with the drought peaking at the beginning of the 3rd decade of July, when flow rates below 25% Q_m were recorded at almost 40% of the profiles and flow rates below Q_{355d} at about a quarter of the profiles. The highest number of profiles with hydrological drought indication based on flow rates below Q_{355d} was observed in the Dolní Labe and Ohře river basins, which was the case in 79% of the profiles. After a temporary improvement in August, the hydrological droughts continued during the autumn months, with average flow rates below Q_{355d} recorded at about one tenth of the profiles monitored. The highest number of days with hydrological drought based on Q_{355d} for the entire year 2023 was registered on the Teplá river in the Březová profile (120 days) in the Karlovy Vary Region and on the Bílina river in the Trmice profile (104 days) in the Ústí nad Labem Region. Extreme hydrological drought with flow rates below Q_{364d} occurred only in July on about 3% of the profiles.

Figure 6

Flow rate under the long-term 355-day flow rate in the Czech Republic for the 1981–2010 period [number of days], 2023



Data source: CHMI

Groundwater tables at shallow depths and spring yields were generally normal in 2023, but the situation differed considerably on a regional scale. The worst situation was in the Ohře and Dolní Labe basins, where the water table was highly, and the yield extremely, subnormal. On the other hand, in the Vltava basin the yield was slightly above normal (Fig. 7, Fig. 8).

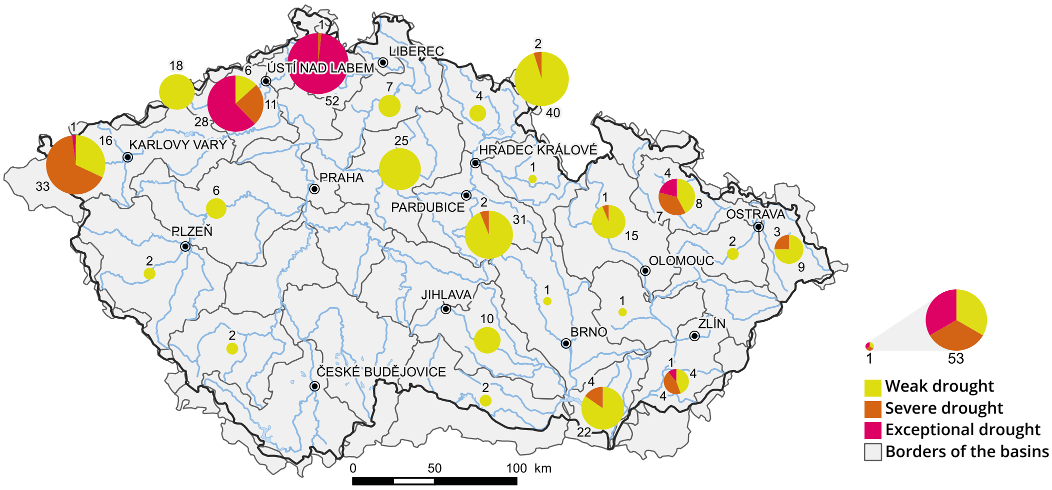
In the **first quarter**, normal levels prevailed for both the groundwater table at shallow depths and spring yields. The annual water tables and yields peaked in April, when the upper and lower Vltava basin and the Berounka basin showed even way above-normal levels in shallow boreholes. Later on, the water table in the **shallow boreholes** continued to decline until July, when it reached an overall **highly subnormal level**, below 90% of the quantile of the monthly exceedance curve (EC_m), and in part of the basins (Berounka, Ohře and Dolní Labe and Lužická Nisa) an annual highly to extremely subnormal minimum was recorded. After a temporary improvement in August and September, with the exception of the Ohře and Dolní Labe basins, the drought continued with a decline to an overall moderate to severely subnormal levels in October (at 80% EC_m). Thereafter, the water level in shallow boreholes continued to rise and in December reached a highly above-normal level (7% EC_m), while in part of the basin (Ohře and Dolní Labe, Morava and Lužická Nisa) a slightly to extremely above-normal annual maximum (3–17% EC_m) occurred. Overall, 55% of the shallow wells reached their annual maximum in December, with levels highly or extremely above normal in 52% of wells, the best result for December since 2010.

In the case of **springs**, the annual maximum was reached in April, at a normal level of 52% EC_m, in the Upper and Lower Vltava basins it was highly above normal (5–9% EC_m), while in the Ohře and Dolní Labe basins the yields were extremely below normal (95% EC_m). Thereafter, yields continued to decline to an overall severely subnormal level (91% EC_m) in July with 37% of the springs yields showing severely or extremely subnormal results, while at 3% of the springs above-normal yields were observed. After a temporary improvement, the level of the springs dropped to another highly subnormal minimum in October (90% EC_m), only in the Lower Vltava basin was the annual minimum of the yield in October normal (42% EC_m). By the end of the year, the yield had increased to overall highly above-normal levels (8% EC_m), but with considerable regional variation. In the Ohře and Dolní Labe river basins, a subnormal levels of yield persisted in December (81% EC_m), while in the Morava basin the spring yield was extremely above normal. The yield was highly or extremely above normal in 46% of the springs and overall it saw the best results for December since 2010.

The drought of previous years continued in the **deep aquifers** and their water tables were **highly subnormal** for most of the year in the whole country. From January, the level continued to rise to slightly below normal in May, then dropped to extremely below normal in July. After oscillations during the autumn months at subnormal levels, water tables in the deep wells improved to normal in December. In the **North Bohemian Cretaceous and Permo-Carboniferous systems** of Central and Western Bohemia, the water table was extremely subnormal throughout the year, in the basins of the Podkrušnohoří foothills the water table levels were extremely subnormal from January to April. **The best situation** was recorded in the Permo-Carboniferous system of eastern Bohemia, where the water table of deep aquifers was normal for most of the year, slightly above normal in May and highly above normal in December.

Figure 7

Duration of drought in springs in the Czech Republic [number of weeks], 2023

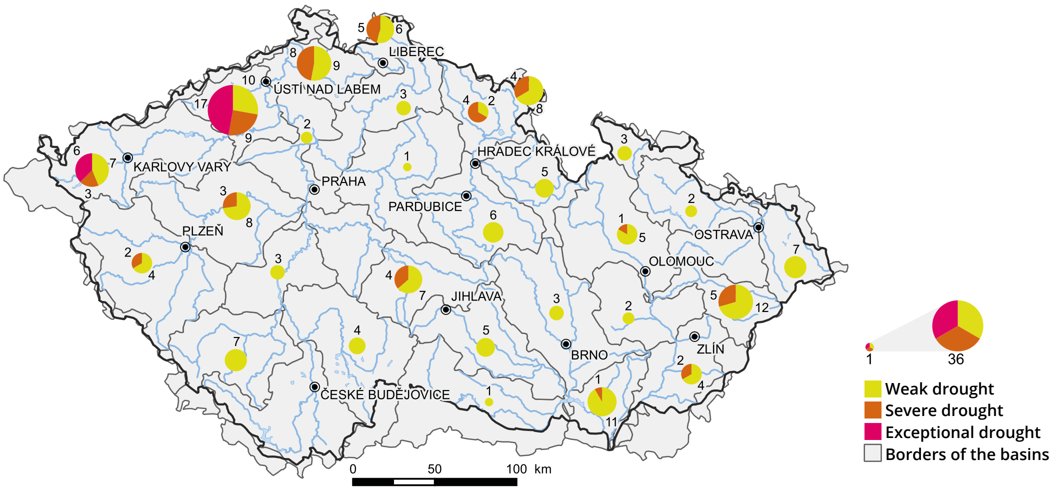


The data are aggregated by basins and processed based on the current drought index.

Data source: CHMI

Figure 8

Duration of drought in shallow wells in the Czech Republic [number of weeks], 2023



The data are aggregated by basins and processed based on the current drought index.

Data source: CHMI

Detailed visualisations and data

https://www.envirometr.cz/data

1 Environment and health

1.1 Water availability and quality

Key messages

- Water quality in watercourses has been stagnant in recent years and there has been no further significant reduction in pollution levels. The 2021–2023 water quality assessment, based on the Czech technical standard CSN 75 7221, showed a predominance of Quality Class III (Polluted Water) results (in 47.0% of profiles).
- The best results in reducing pollution in Czech watercourses over the period 2000–2023 were for ammoniacal nitrogen (N-NH_4^+; 72.5% decrease in average concentration) and total phosphorus (TP; 44.8% decrease).
- The problem with respect to ecosystems and human health is currently the long-term pollution of surface waters with organic micro-contaminants, which have long been found in water samples throughout the Czech Republic.
- Improved efficiency of freshwater use through infrastructure development has resulted in a reduction in the total amount of water abstracted as well as the total volume of wastewater and the amount of pollution discharged. 15.5% of the population have not been connected to the sewerage system with a WWTP. Over the period 2000–2023, the share of the population connected to the public water supply increased from 87.1% to 94.5%.

1.1 | Water availability and quality

Meeting the underlying targets

Target set	For year	Value in 2023	On track towards the target
96.7% of population connected to public water supply[3]	2030	94,5%	✓
89% of the population living in houses connected to the sewerage system[4]	2030	86,7%	✓

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.1.1 Surface water quality is improving	Water quality in watercourses	↗	→	~
	Bathing water quality	↗	↝	✓
1.1.2 Groundwater quality is improving	Groundwater quality	N/A	↝	~
1.1.3 The supply of drinking water of satisfactory quality to the population is improving	Residents supplied with water from the public water supply	↗	↝	✓
1.1.4 Wastewater treatment is improving	Wastewater treatment	↗	↗	✓
	Wastewater discharge	↘	→	~
1.1.5 Water use efficiency, including water recycling, is increasing	Groundwater and surface water abstractions by sector	↘	↝	~
	Water consumption from the public water supply	↘	↝	~
	Water losses in the water supply network	↘	↝	~

[3] *Target value of the indicator according to NEP.*

[4] *Target value of the indicator according to NEP.*

Current measures supporting achievement of the objective

- The amendment to the Water Act will help to reduce the impact of accidents on watercourses. It, *inter alia*, vprovides for the registration of wastewater discharges, online monitoring of water released from industrial plants into rivers at the outfalls of major polluters where there is a risk of large-scale accidents. In the event of an accident on a watercourse, it will improve the cooperation of the responding authorities.
- The Drought and Water Scarcity Management Plan for the territory of the Czech Republic was endorsed, which forms the basis for the decision-making of the Central Drought Commission on water scarcity measures.
- Financial support is provided for the construction of new drinking water sources, water supply systems, interconnection of water supply systems, rainwater harvesting and utilisation systems, drinking water treatment technologies, sewers and wastewater treatment systems.
- Newly adopted 2023–2027 Common Agricultural Policy Strategic Plan will contribute to reducing the use of pesticides in water protection zones.

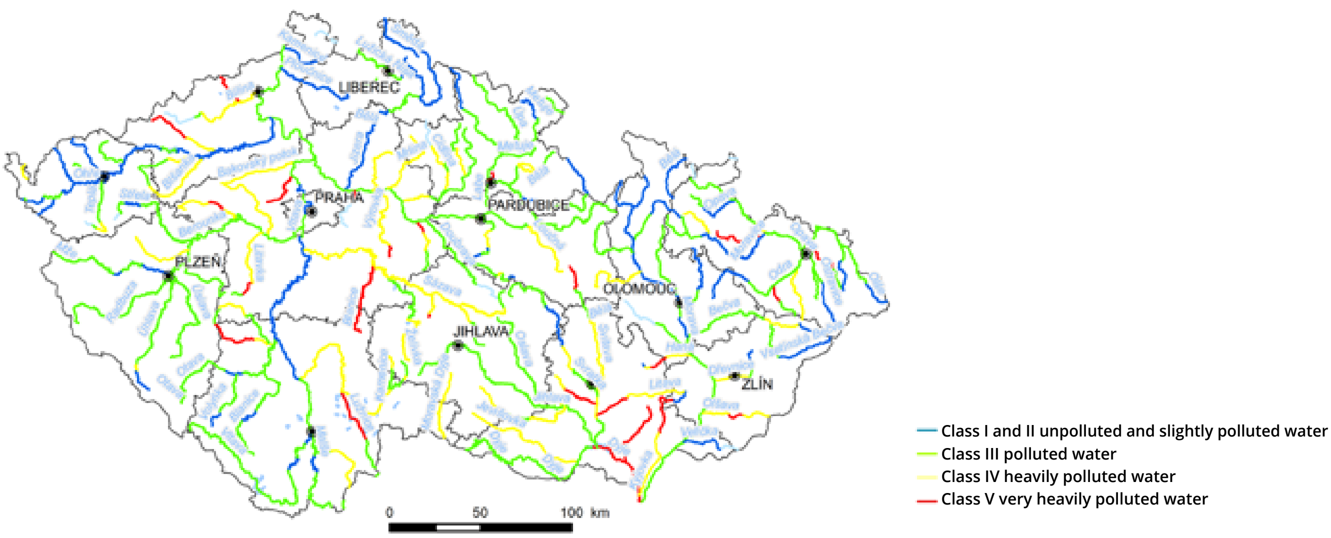
Surface water quality

According to the 2022–2023 **water quality** assessment of **watercourses** using basic indicators (COD_{Cr}, BOD_5, $N\text{-}NH_4^+$, $N\text{-}NO_3$ and TP) on selected profiles[5] 20% of waters are classified as class I and II = "unpolluted" or "slightly polluted water", 47% of profiles are classified as class III = "polluted water", 23% of profiles are classified as class IV = "heavily polluted water" and 10% of profiles are classified as class V = "very heavily polluted water" (Fig. 9).

Over the period 2000–2023, the most successfully reduced substance among the main indicators was **ammoniacal nitrogen** ($N\text{-}NH_4^+$; 75.2% decrease in average concentration, Chart 5), mainly because of more efficient wastewater treatment and a decrease in livestock farming. Concentrations of **total phosphorus** (TP) were reduced by 44.8%, mainly because of more thorough wastewater treatment and a reduction in the amount of phosphates in detergents.

Figure 9

Water quality in streams of the Czech Republic, 2022–2023

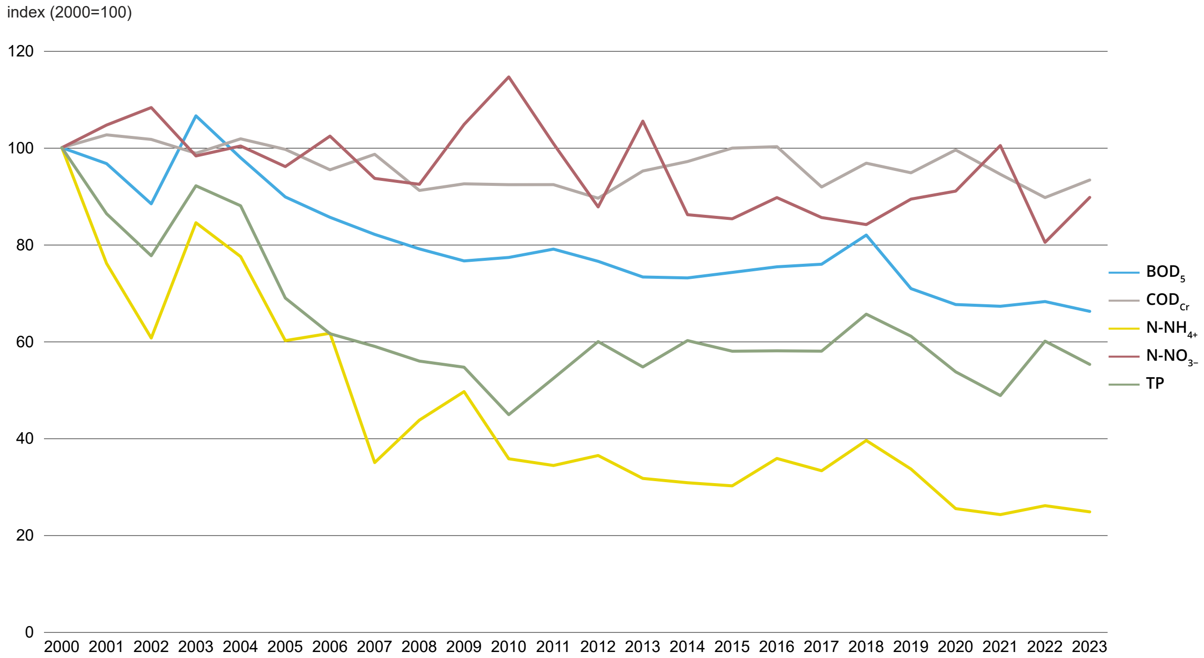


Data source: T.G.M. WRI

5 *In the Czech Republic, water quality in watercourses is monitored on 1,024 representative river profiles, for the 2021 assessment 124 profiles were used.*

Chart 5

Pattern of pollution indicators concentrations in watercourses of the Czech Republic [index, 2000 = 100], 2000–2023



https://www.envirometr.cz/data/koncentrace-ukazatelu-znecisteni-ve-vodnich-tocich

Data source: CHMI based on data from Povodí, state enterprises

The problem with respect to ecosystems and human health is currently the long-term pollution of surface waters with **organic micro-contaminants**, which have long been found in water samples throughout the Czech Republic.

Pesticides and their metabolites are the most frequently monitored substances by the water management laboratories of Povodí, state enterprises, and they were detected in 546 profiles (94.3% of the monitored profiles) in a total of 4,506 samples (81.5% of the samples) in 2023. Similar to 2022, the most frequently found metabolites were those of herbicides used for the treatment of canola, including both those currently in use (metazachlor, dimethochlor, pethoxamid, dimethenamid) and those already banned (alachlor, acetochlor), maize (permitted metolachlor, terbuthylazine, pethoxamid, dimethenamid and banned atrazine, acetochlor), beet (metabolites of chloridazon, banned since 2021), as well as the total herbicide glyphosate and AMPA, its metabolite. The most frequently detected fungicides included the permitted substance tebuconazole and a metabolite of the permitted azoxystrobin. In terms of the **sum of pesticides**, the ratio of profiles exceeding the EQS-AA (environmental quality standards – annual average) varied between 10.1 to 36.7% for the reporting period. In 2023, the ratio of profiles exceeding the EQS-AA was 15.0%.

Pharmaceutical drugs were found in 348 profiles (92.3% of profiles monitored) in a total of 2,713 samples (87.3% of samples). The most frequently found substances included Oxypurinol (pharmaceutical drug used to treat gout), Telmisartan (antihypertensive), Tramadol (analgesic), Gabapentin (antiepileptic, analgesic), Valsartan (antihypertensive), Iomeprol (contrast agent), Diclofenac (antirheumatic, analgesic), Ibuprofen and its metabolites 2-hydroxy and carboxy (analgesic, antipyretic, antiphlogistic).

Substances accumulating in biotic and abiotic compartments and food chains because of their high stability and lipophilicity are detected by means of **accumulation biomonitoring[6].** These substances are classified as human carcinogens and endocrine disruptors with serious adverse effects on the reproductive system and fetal development. For **polyaromatic hydrocarbons** (PAHs), formed during incomplete combustion, EQS for benzo[*α*]pyrene (5 μg.kg^{-1}) in the "fish fry" matrix were exceeded on 3 profiles. In the "benthic organisms" matrix, EQS were exceeded in 38% of the profiles for benzo[*α*]pyrene and in 14% for fluoranthene (30 μg.kg^{-1}). For **perfluorinated compounds** (PFAS), used for various surface treatments of materials, EQS (9.1 μg.kg^{-1}) in the "fish fry" matrix was exceeded in 57% of the profiles monitored, and in the case of benthic organisms in 24% of the profiles. As in previous years, the concentration of **mercury**, originating mainly from combustion processes, in the "fish" matrix exceeded the EQS values (20 μg.kg^{-1}) on all monitored profiles, in the "fish fry" matrix at 24% of sites and the "benthic organisms" matrix at 2 sites. The maximum values for **dissolved mercury** in 2023 did not exceed the limit of 0.07 μg.l^{-1}. The **polybrominated diphenyl ethers** indicator (sum of PBDEs) exceeded the EQS value (0.0085 μg.kg^{-1}) by several orders of magnitude on all profiles, as in previous years.

As part of the monitoring of **the quality of surface waters used for outdoor bathing**, a total of 287 sites were monitored in the 2023 recreational season, of which 70.6% were suitable for bathing (classified as quality category I or II). In the period 2006–2023, this value remained stable at around 60% to 70%. 47 monitored sites, i.e. 16.4%, had unsatisfactory bathing water quality. Bathing bans were issued at 19 locations. The main reason was the excessive occurrence of cyanobacteria, which grow in our waters as a result of pollution of surface waters, primarily in the "phosphorus" indicator, which contributes to their excessive growth at increased temperature and sunshine hours. In order to improve water quality, priority should be to prevent nutrient loading, especially of phosphorus, into surface waters, which can be achieved by completing the tertiary stage of wastewater treatment at all existing wastewater treatment plants and by building new wastewater treatment plants in municipalities that do not yet treat wastewater consistently. In the case of three bathing biotopes, poor microbiological water quality or the presence of cercarial dermatitis agents was recorded[7]. In the 2023 bathing season, 85.4% of inland **bathing water areas in EU countries** were classified as category I according to the assessment carried out under Directive 2006/7/EC of the European Parliament and of the Council. The Czech Republic scored slightly below average (79.1% sites had excellent water quality).

Groundwater quality[8]

In 2022, the dominant **inorganic** groundwater pollution **indicators**, relative to the threshold values of the Decree of the Ministry of the Environment and the Ministry of Agriculture 5/2011 Coll., as amended, were ammonium ions (11.4% samples exceeding the limit value) and nitrates (10.4% samples exceeding the limit value). For nitrite, the samples exceeding the limit value range between 0.1–0.4%. There have been no significant changes in nitrogen concentrations since 2010.

Among organic substances, **pesticides** are the main pollutants. In 2022, exceedance for the sum of pesticides was found at a total of 209 sites (for shallow boreholes, 126 sites exceeded the limit; 43 sites exceeded the limit for deep borehole and 40 sites exceeded the limit for springs, Chart 6). Excessive concentrations of different pesticide substances are also reflected in an increased number of 34.1% of samples exceeding the limit value in 2022 for the indicator sum of pesticides with a quality standard of 0.5 μg.l^{-1}. The substances from the group of pesticides that are most frequently found in groundwater are herbicides used for the treatment of canola, corn and beet (metabolites of chloridazon, metazachlor, metolachlor, dimethochlor) and, from the already banned herbicides, the metabolites of acetochlor, alachlor and atrazine.

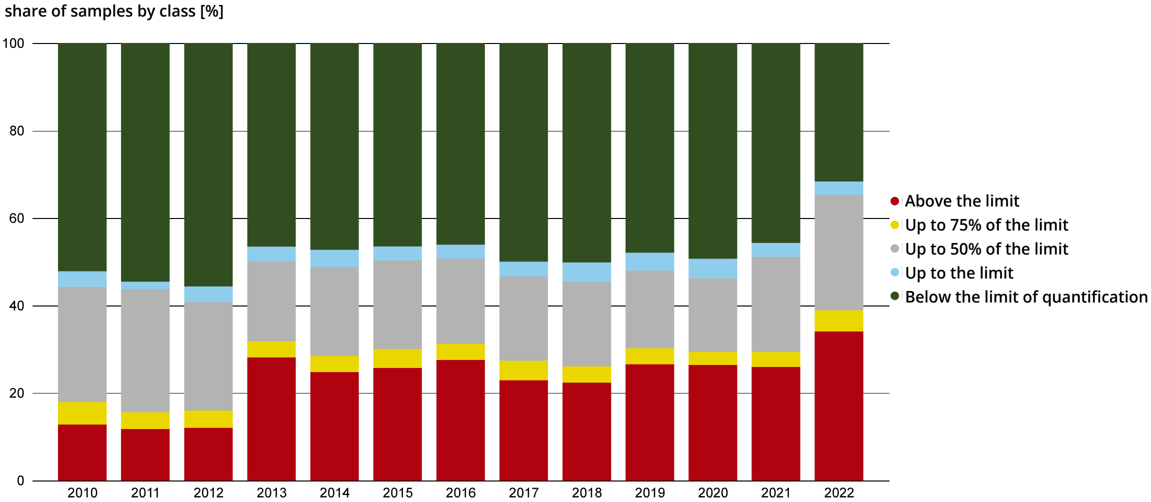
[6] *CHMI regularly monitors the content of almost 90 substances on the profiles of major Czech and Moravian rivers. Government Regulation No.401/2015 Coll. sets the value of the environmental quality standard (EQS) for some substances, against which the measured values are compared. Samples of adult fish (common chub), fish fry and benthic organisms (mainly larvae of caddisflies, leeches and Gammarus) are taken for chemical analysis.*

[7] *A parasitic disease that manifests itself in humans by the formation of spots, blisters or even skin reddening and is accompanied by intense itching.*

[8] *In 2023, the Czech Hydrometeorological Institute did not implement a groundwater quality monitoring programme according to the approved groundwater quality monitoring programme due to complications with the tender procedure for the supplier of sampling and laboratory work.*

Chart 6

Ratio of established values for the indicator sum of pesticides in groundwater in the Czech Republic [%], 2010–2022



Maximum number of substances monitored in the group of pesticides: in 2010 (85), in 2011 (85), in 2012 (85), in 2013 (156), in 2014 (162), in 2015 (140), in 2016 (135), in 2017 (138), in 2018 (150), in 2019 (195) and in 2020 (196), in 2021 (163), in 2022 (164). As to the closing date of this publication, data for 2023 were not available.

https://www.envirometr.cz/data/podily-stanovenych-hodnot-pro-pesticidy-v-podzemnich-vodach *Data source: CHMI*

The **status of groundwater bodies** assessment under Directive 2000/60/EC of the European Parliament and of the Council (Water Framework Directive) is part of the river basin management plans drawn up in six-year cycles. From a total of 174 groundwater bodies defined in the shallow, basal and deep zones, 46 bodies had a satisfactory chemical status in the period 2013–2018, 126 bodies had an unsatisfactory chemical status and the chemical status could not be assessed in 2 groundwater bodies due to lack of data. The quantitative status of groundwater bodies is based on a balance assessment, as the amount of water abstracted should not exceed the usable groundwater resources and at the same time should respect the requirements for the so-called ecological flows of the associated surface waters. 162 groundwater bodies had a satisfactory quantitative status, 11 groundwater bodies had an unsatisfactory quantitative status.

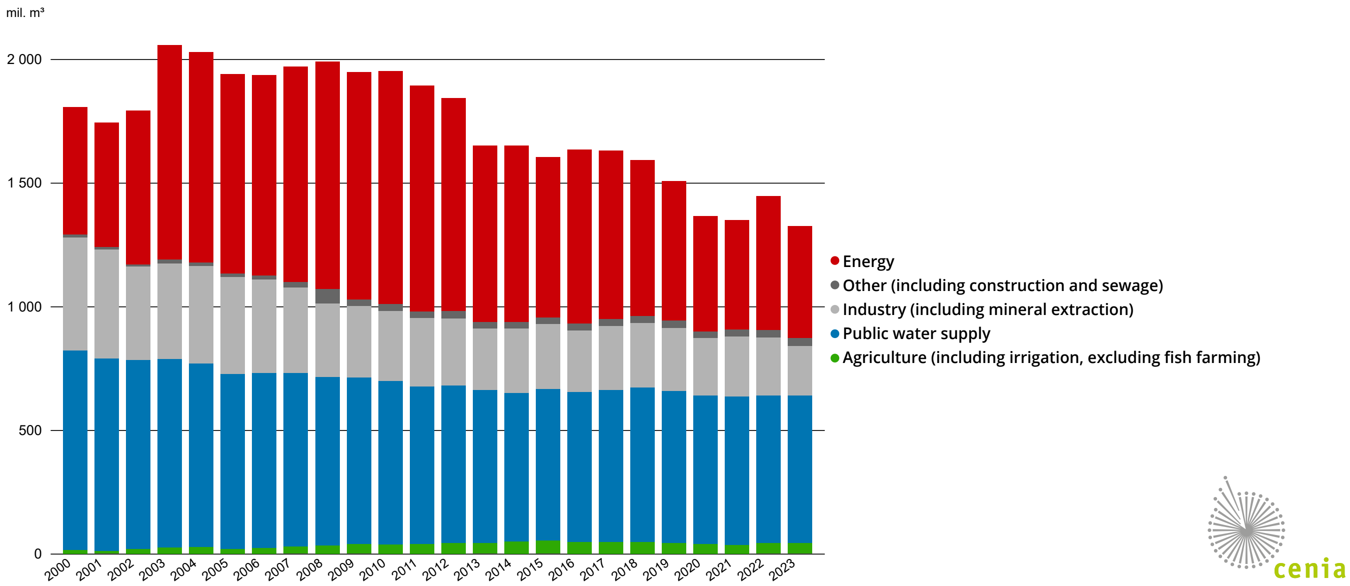
Use of water resources

Surface and groundwater abstractions reflect the development of the economy, the hydrometeorological conditions in given year and the behaviour of households. In the longer term, there has been a significant decline in the amount of surface water abstracted since 1990, due to economic and environmental factors, modernisation of production reducing the need for water and also by cutting losses in supply networks. The year 2023 saw the lowest ever abstraction from surface water, with 966.8 million m^3 abstracted. In 2023, the discharge was about 25.2 million m^3 less than in 2022. The amount discharged was again slightly higher than the amount of water abstracted.

The highest abstractions were for **public** water supply, accounting for 45.1% of total abstractions in 2023 (597.1 million m^3, Chart 7). In 2023, the **per capita water use** supplied from the public water network was 127.1 $l.inhabitant^{-1}.day^{-1}$. Households used 86.7 $l.inhabitant^{-1}.day^{-1}$. Another major user was the **energy sector**, accounting for 34.2% of total water used in 2023 (452.6 million m^3). The third most important water user was **industry**, accounting for 198.8 million m^3 of water abstractions in 2023, i.e. 15.0% of total abstractions. Water abstractions for **agriculture accounted for only 3.3% and abstractions for other sectors, including construction and wastewater-relat**ed activities, accounted for 2.4% of total water abstractions in 2023. The majority of abstractions were made from **surface water** (966.8 million m³, i.e. 73.0% of total abstractions in 2023), with a smaller share taken from **groundwater** (357.3 million m³, i.e. 27.0% in 2023).

Chart 7

Total water abstractions by sectors in the Czech Republic [million m³], 2000–2023



Until 2001, water abstractions exceeding 15,000 m³ per year or 1,250 m³ per month were recorded. Since 2002, water abstractions by customers above 6,000 m³ per year or 500 m³ per month have been recorded – in accordance with Section 10 of Ministry of Agriculture Decree No. 431/2001 Coll.

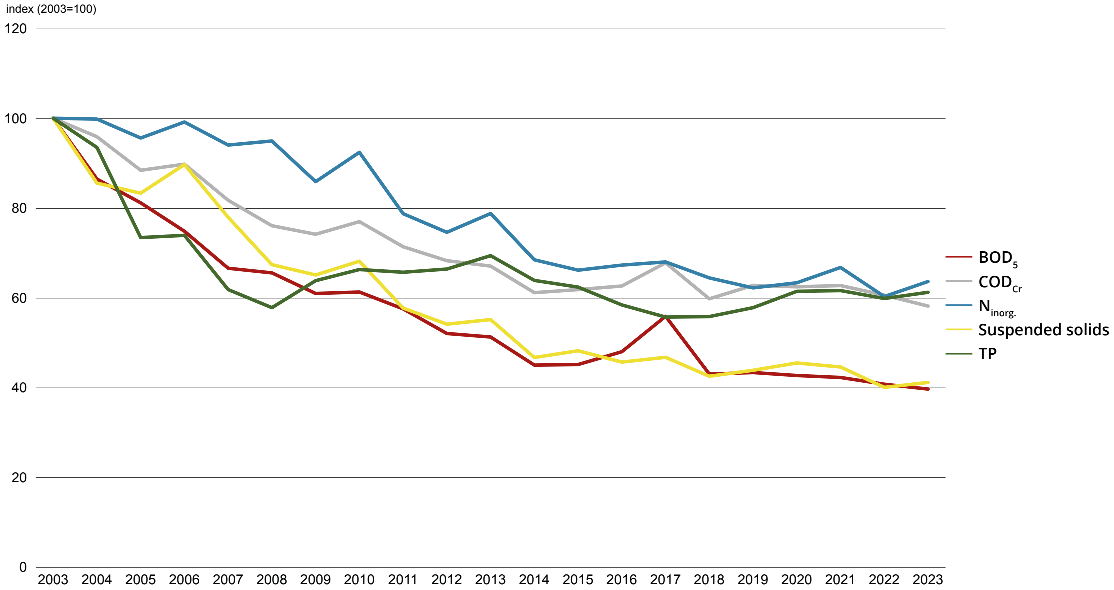
https://www.envirometr.cz/data/odbery-povrchove-vody *Data source: MoA, Povodí, state enterprises, T.G.M. WRI, CZSO*

Since 2000, the **total volume of wastewater discharged** has been reduced by 18.3% to 1,471.7 million m³. The structure of wastewater discharges reflects the structure of water users.

Over the period 1990–2023, there was a 96.8% reduction in **pollutant discharges** expressed in BOD_5, 95.5% in suspended solids and 91.4% in COD_{Cr} indicators. At the same time, the amount of hazardous and particularly hazardous pollutants discharged was also reduced. There was also a significant decrease in macronutrients (nitrogen, phosphorus). Since 2003, the amount of N_{inorg} and TP discharged has been reduced by 36.4% and 38.8%, respectively (Chart 8). The long-term decline is primarily a result of the targeted implementation of biological nitrogen removal and biological or chemical phosphorus removal techniques in new and upgraded wastewater treatment plants, and is also impacted by a reduction in the amount of phosphates used in detergents.

Chart 8

Pollution discharged from point sources expressed in N_{inorg}, TP, BOD_5, COD_{Cr} and suspended solids indicators in the Czech Republic [index, 2003 = 100], 2003–2023



https://www.envirometr.cz/data/znecisteni-vypoustene-z-bodovych-zdroju-do-povrchovych-vod

Data source: Povodí, state enterprises, T.G.M. WRI

Surface and groundwater quality is also heavily affected by **nonpoint source pollution**, particularly pollution from agricultural activities, atmospheric deposition and erosive surface runoff. The share of nonpoint source pollution seems to be increasing with the ongoing reduction of point source pollution. The most noticeable impacts on surface water and groundwater quality can be observed mainly for nitrate, pesticides and acidification, less so for phosphorus.

Access to water resources is largely dependent on the geography and physical and geographic conditions of each country. The annual average WEI+ scores in most EU-27 countries were below the limit value set for water stress (i.e. below 20%). In 2019[9], a total of 25 countries remained below this threshold, while the WEI+ value for the Czech Republic was set at 12.1%. Only Greece (13.3%), Malta (29.6%) and Cyprus (113.0%) were worse than the Czech Republic; in Cyprus this high value is attributed to the fact that some of the water is obtained by desalination of seawater. In the long-term trend, the average annual value for the EU-27 is constant and no significant year-on-year fluctuations were observed for any of the monitored countries. In recent years, pressure on water resources has gradually increased due to recurrent dry episodes. This trend could also be seen in the development of the WEI+ Index in the Czech Republic, particularly since 2014, when reservoirs and lakes were at low levels and flow rates were lower than normal.

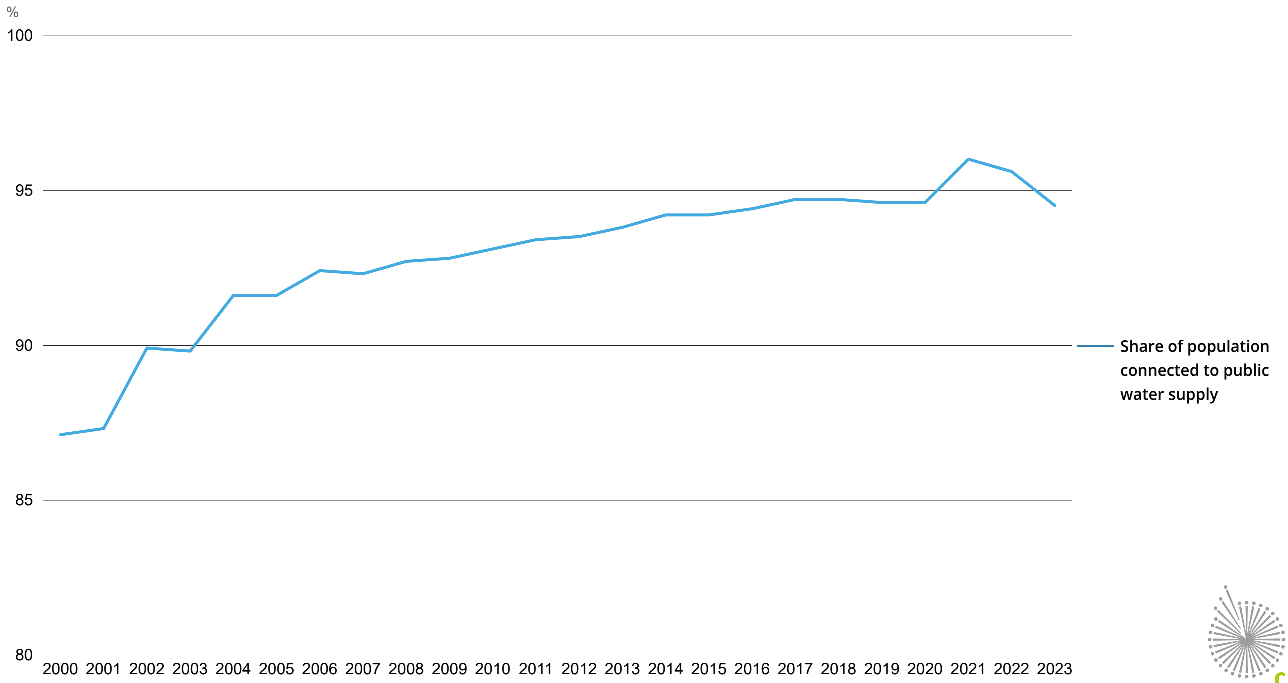
[9] *As to the closing date of this publication, data for 2020–2023 were not available.*

Water infrastructure

The water infrastructure has been developed in the long term, its revitalisation is taking place and the share of population connected to the public water supply system is also rising. **The share of population connected to public water supply** has increased significantly compared to 2000, from 87.1% to 94.5% in 2023 (Chart 9). The quality of the supplied drinking water has been consistently high in each year.

Chart 9

Share of population connected to public water supply in the Czech Republic [%], 2000–2023



https://www.envirometr.cz/data/obyvatele-zasobovani-vodou-z-verejneho-vodovodu

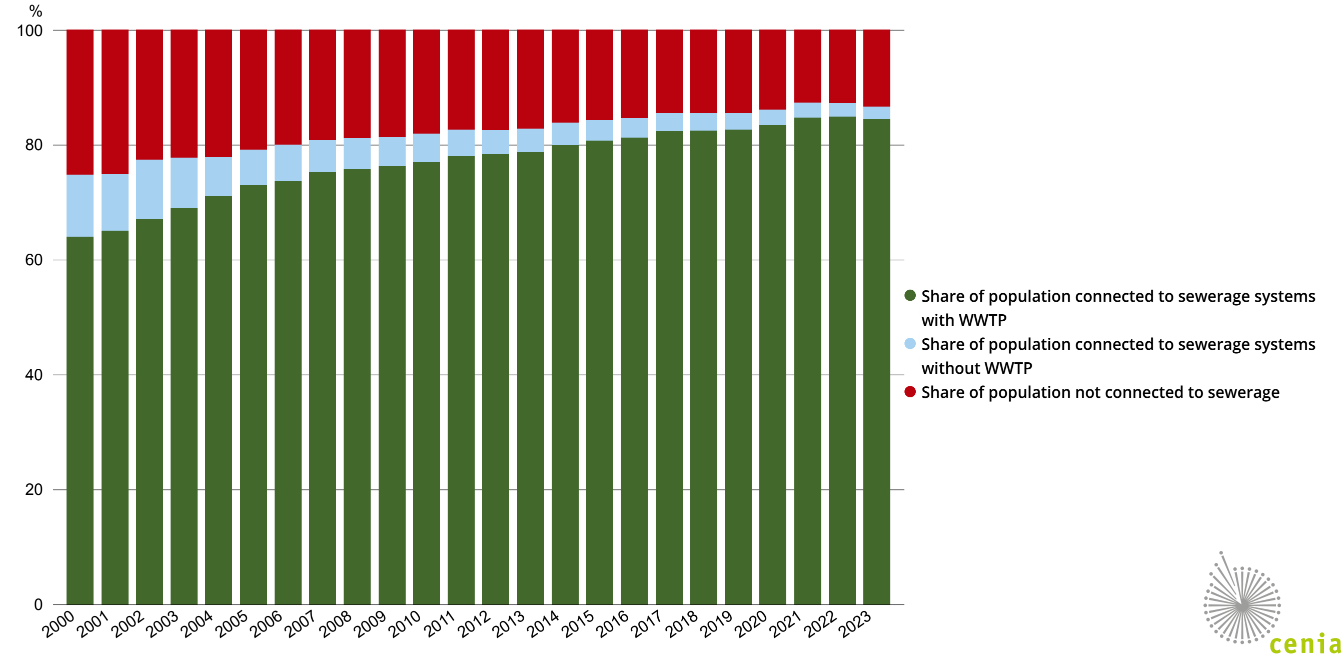
Data source: CZSO

The share of population connected to the sewerage system in 2023 was 86.7%, while the share of the population connected to a sewerage system with a wastewater treatment plant was 84.5% (Chart 10). Relative to 2000, the ratio of population connected to a sewerage system with a wastewater treatment plant increased by 20.7 p.p. 15.5% of the population have not been connected to the sewerage system with a WWTP. Wastewater generated in these cases should be treated e.g. in domestic WWTPs or collected in drainless cesspools and septic tanks and subsequently sent for professional treatment (by transport to WWTP).

The length of the **sewerage network** was extended by 799 km to reach 52,367 km in 2023. **The total number of wastewater treatment plants** increased by 44 compared to the previous year to a total of 2,959 WWTPs in the whole Czech Republic. Through construction and reconstruction of WWTPs, the total number of WWTPs with nitrogen and/or phosphorus removal (tertiary treatment) has increased to 1,745. The number of treatment plants with only mechanical treatment remains at 21.

Chart 10

Share of population connected to sewerage and sewerage systems with WWTP in the Czech Republic [%], 2000–2023



https://www.envirometr.cz/data/pripojeni-obyvatel-na-cistirny-odpadnich-vod

Data source: CZSO

The amount of **drinking water losses** in the water supply network has decreased significantly since 2000, when it was 25.2%. In 2023, the loss of water from the water intended for delivery reached 85.1 million m^3, i.e. 14.8%. Drinking water losses in the water supply network are mainly caused by accidents and leaks from public water supply systems.

Detailed visualisations and data

https://www.envirometr.cz/data

1 Environment and health

1.2 Air quality

Key messages

- Atmospheric emissions of main air pollutants are dropping. Current emissions trends are on track to meet the national emission reduction commitments for SO_2 and NO_x emissions by 2030. The present level and trends of VOC, $PM_{2.5}$ and NH_3 emissions do not suggest that the national commitments would be met, however, in the case of VOC and $PM_{2.5}$ emissions, the current emission projections indicate with sufficient certainty that the national commitments can be met if the expected significant changes in the local heating sector, the major source of emissions of these substances, are implemented. Meeting the national commitment for NH_3 emissions is thus subject to uncertainty.
- Air quality in the Czech Republic is continuing to improve and areas with exceeded health protection limits are being reduced. This positive development is the result not only of economic factors but also of weather conditions.
- The immission limits for ozone for the protection of ecosystems and vegetation continue to be exceeded, particularly in the context of warm weather in the summer months. Nevertheless, in 2023, in year-on-year comparison, the size of the area with exceeded immission limits decreased considerably.

1.2 | Air quality

Meeting the underlying targets

Target set	For year	Value in 2022[10]	On track towards the target
Reduction of NO_x emissions by 64% compared to 2005 [11]	2030	48.3% reduction	✓
50% reduction in VOC emissions relative to 2005	2030	24.6% reduction	~
66% reduction in SO_2 emissions relative to 2005	2030	69.0% reduction	✓
22% reduction in NH_3 emissions relative to 2005	2030	5.9% reduction	✗
60% reduction in $PM_{2.5}$ emissions relative to 2005	2030	25.4% reduction	~

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.2.1 Atmospheric emissions are reduced	Atmospheric emissions of selected air pollutants	↘	↘	~
	Emissions from household heating	~↗	↘	✗
	Atmospheric emissions of main air pollutants from transport	↘	↘	✓
	PAH emissions from transport	↗	~↗	✗
1.2.2 The ambient air quality limits for pollutants are complied with	Air quality from a human health perspective	N/A	↘	~
	Air quality in terms of vegetation and ecosystem protection	N/A	↘	~

[10] *As to the closing date of this publication, data for 2023 were not available.*

[11] *Directive (EU) 2016/2284 of the European Parliament and of the Council (all objectives listed).*

Current measures supporting achievement of the objective

- The planned amendment to the Air Protection Act will improve air quality in urban areas and municipalities and reduce dust and odour annoyance from new construction. Companies will now have to minimize dust on construction sites, during restoration or demolition and limit the spread of dust. It provides for the extension of continuous emissions measurement and introduces new measures, notably the ad hoc emission monitoring. The results will now only be reported digitally, reducing excessive paperwork.
- An update of the National Emission Reduction Programme of the Czech Republic was endorsed.
- Financial support for the replacement of non-ecological heating in households with emission-free and low-emission heat sources and for reducing the energy performance of buildings, with an emphasis on so-called low-income households, continues. These challenges primarily address the change in air protection legislation, where a ban on the use of coal or wood boilers that do not meet at least Emission Class 3 will come into force from September 2024.
- CO_2 reduction measures have a synergistic effect on improving air quality.

Pollutant emissions

Atmospheric emissions of selected air pollutants (= substances subject to national emission reduction commitments – NO_X, SO_2, NH_3, VOCs, $PM_{2.5}$) are decreasing in the short term and for most pollutants also in the long term (Chart 11). However, the long-term trend for $PM_{2.5}$ and NH_3 emissions is fluctuating and non-significant. The largest decline in pollutants was recorded over the period 1990–2000, in particular in its early part, as a result of structural changes in the economy. The decline in pollutant emissions in subsequent years was supported by innovative developments in all sectors, a reduction in the material and energy intensity of the economy, and the obligation to comply with the legislative requirements for atmospheric emissions from air pollution sources. These factors have contributed to an acceleration of the downward trend in emissions in the short term over the last 5 reporting years (i.e. from 2018 to 2022), including for those substances for which the reductions since 2005 have so far been inadequate. Early emission inventory data for 2023 suggest a continuation or further acceleration of the downward trend in emissions (year-on-year decreases ranged from 4.5% for NH_3, to 16.3% for $PM_{2.5}$).

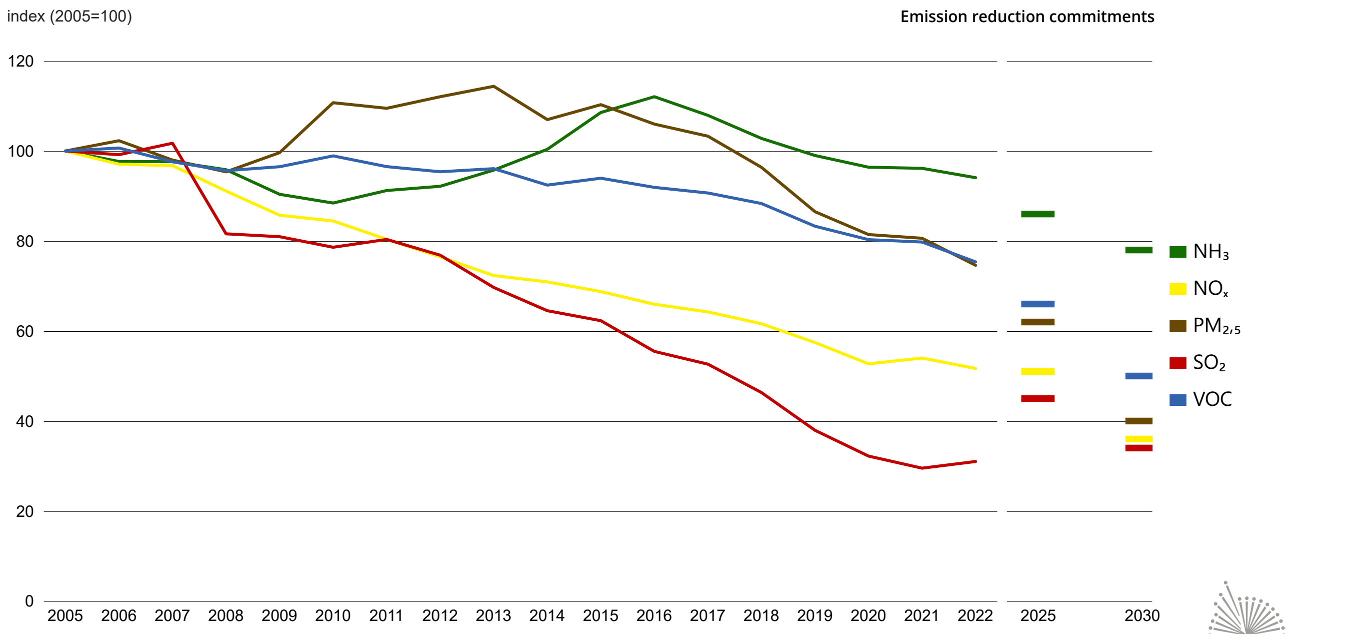
Meeting the commitments of Directive 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants, the so-called "national emission reduction commitments", implies a reduction in emissions compared to 2005 values. It is clear from the latest National Emission Balance[12] that while the national commitments for SO_2 and NO_X have already been, or will be met with confidence, unless the downward trend in $PM_{2.5}$, NH_3 and VOC emissions is further accelerated, achieving the required emission reductions by 2030 may be difficult. However, the 2023 CHMI projections[13] indicate that all national emission reduction commitments will be met without additional measures, with reasonable certainty for VOC and $PM_{2.5}$ pollutants.

[12] *Final emission balance data for 2023 are not yet available.*

[13] *2024 National Inventory Report (Informative Inventory Report, IIR), see https://cdr.eionet.europa.eu/cz/un/clrtap/iir/envzfysgg/CZ_IIR_2024_v2.0.pdf.*

Chart 11

Emissions of selected pollutants in the Czech Republic and national emission reduction commitments for 2025 and 2030 [index, 2005 = 100], 2005–2022



As to the closing date of this publication, final data for 2023 were not available.

https://www.envirometr.cz/data/vyvoj-emisi-vybranych-zakladnich-znecistujicich-latek-do-ovzdusi *Data source: CHMI*

SO_2 and NO_X emissions are decreasing in the long term (SO_2 by 69.0% and NO_X by 48.3% over the period 2005–2022[14]) following the adoption of technologies and production processes in line with the Best Available Techniques requirements, the use of new fuels and improvements in the energy efficiency of the economy. An important factor was the diversification of electricity generation, i.e. the reduction of electricity generated by solid fuels-firing steam power plants and its increased generation by nuclear power plants, as well as the use of renewable energy sources. In the short term, the downward trend in emissions of these substances is more pronounced. The long-term reduction in NO_X emissions is also related to the decrease in transport emissions, mainly due to the gradual upgrade and renewal of the car fleet.

The long-term pattern in **NH_3 emissions** is variable and shows no significant trend. Over the period 2005–2022, NH_3 emissions dropped by only 5.9%, and even increased between 2010 and 2016. In the short term, however, there is a more significant decline in emissions (by 8.5% in 2018–2022), which is mainly attributable to the Czech Republic's agricultural policy and the decline in livestock.

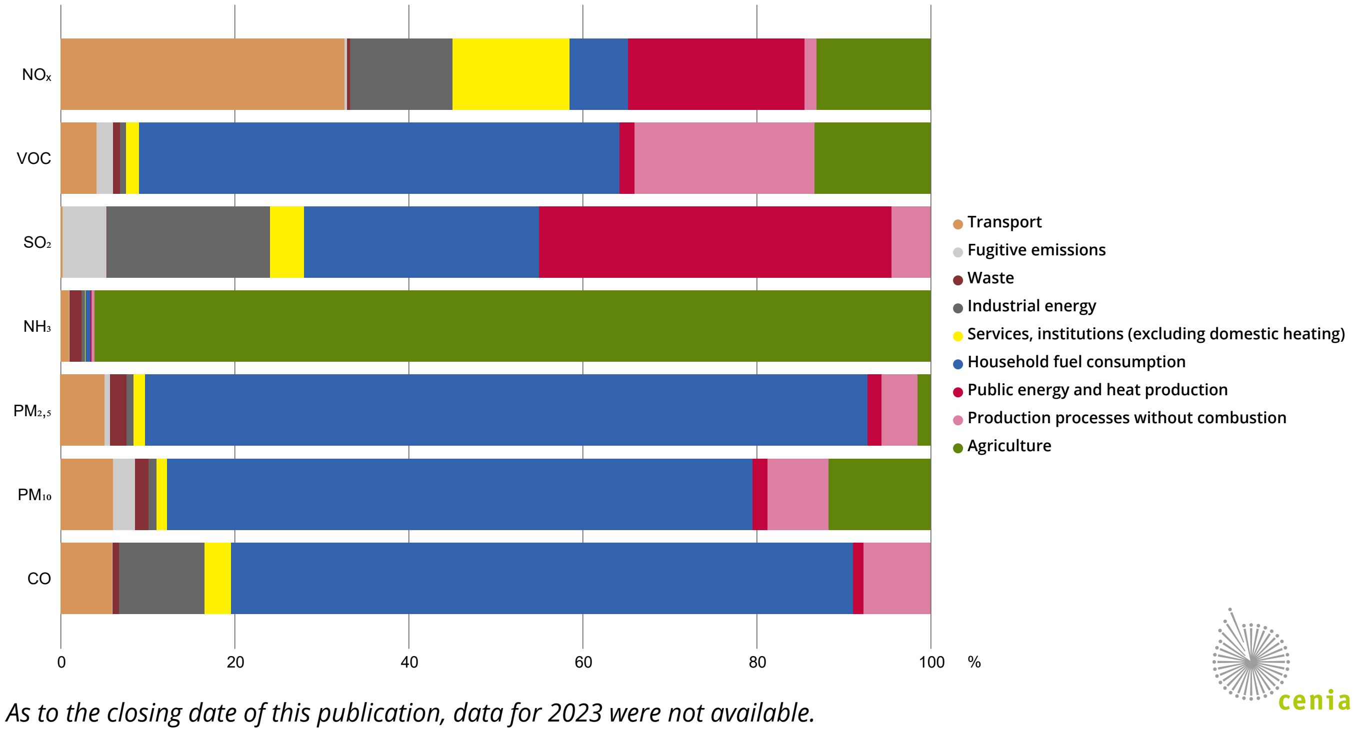
In the long term between 2005 and 2022, **$PM_{2.5}$, PM_{10}** and **VOC emissions** decreased by 25.4%, 25.6% and 24.6% respectively; nevertheless, the situation in each year is affected by the weather conditions in the respective season and is moreover highly impacted by the type of fuel used in residential space heating systems.

[14] *As to the closing date of this publication, data for 2023 were not available. They will not be published before February 2025. The emission balance of the whole time series was recalculated from the August 2023 CHMI data.*

The most important groups of emission sources vary according to pollutants (Chart 12). In 2022, the main sources of NO_X emissions included transport (32.7%) and the public power and heat sector (20.3%). VOC emissions came from both household fuel consumption (55.2%) and non-combustion production processes (20.7%). In the case of SO_2 emissions, the major source was the public energy and heat production sector (40.6%), but SO_2 emissions are also generated to a large extent by residential space heating (27.0%). NH_3 emissions were mainly emitted by the agricultural sector (96.1%). In 2022 the dominant source of emissions for suspended particulate matter of PM_{10} and $PM_{2.5}$ fractions was fuel consumption by households (particularly for residential space heating), accounting for 83.1% of total emissions for $PM_{2.5}$ and 67.3% of total emissions for PM_{10}. Residential heating remains an issue in terms of air pollution, as it is the predominant source of emissions of substances causing significant health risks. Household fuel consumption is also the largest source of carbon monoxide emissions (71.5% of total emissions).

Chart 12

Sources of emissions of selected pollutants in the Czech Republic [%], 2022



As to the closing date of this publication, data for 2023 were not available.

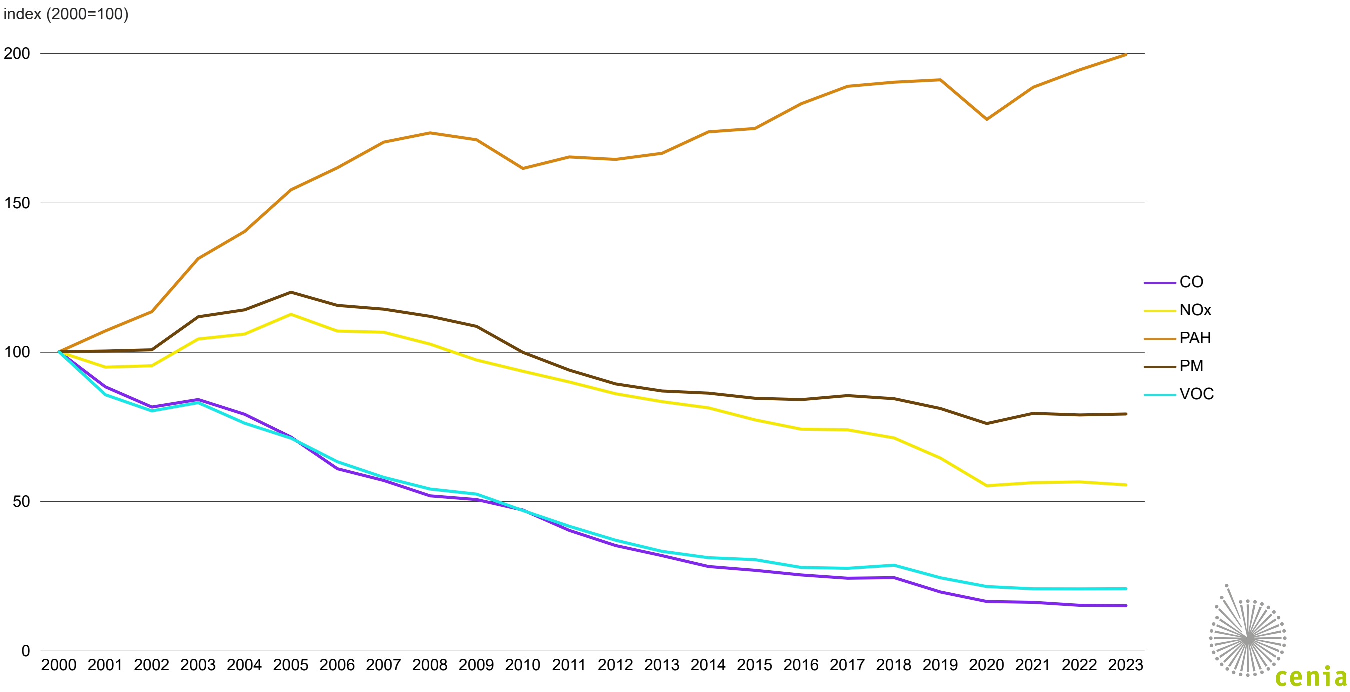
https://www.envirometr.cz/data/zdroje-emisi-vybranych-zakladnich-znecistujicich-latek-do-ovzdusi *Data source: CHMI*

Transport is an important and specific category of air pollutant sources affecting the ambient air quality particularly in conurbations. Emissions of the main pollutants from transport (NO_X, VOC, CO and PM) declined over the period 2000–2023 (Chart 13). The most marked long-term downward trend was observed for CO (3.7% a year) and VOC emissions (3.3% a year). This positive trend can be linked to the renewal and modernisation of the car fleet, with an increasing share of vehicles meeting higher EURO emission standards and, towards the end of the period, of vehicles using alternative fuels and propulsions. In total, NO_X emissions from transport decreased by 44.6%, VOC emissions by 79.3%, CO by 85.0% and PM by 20.8% over the period 2000–2023. Over the period 2000–2023, emissions of polycyclic aromatic hydrocarbons (PAHs), which pose serious health risks, grew as energy and fuel consumption in transport increased. In total, PAH emissions roughly doubled during the reporting period.

Emissions patterns during the reporting period were subject to fluctuations due to variations in the performance of the economy as reflected in the development of freight and road transport outputs, as well as in changes in the car fleet. At the beginning of the 21st century, during the period of economic growth, the share of more emission-intensive diesel engines in the passenger car fleet increased, mainly affecting the pattern of NO_x and PM emissions. In the case of **PM emissions**, the generally lower relative decrease is partly linked to the fact that PM emissions are also produced from non-combustion processes (road dust resuspension, mechanical abrasion of brakes and tires), which are only marginally affected by the technological upgrading of the car fleet.

Chart 13

Pollutant emissions from transport in the Czech Republic [index: 2000 = 100)], 2000–2023



https://www.envirometr.cz/data/emise-znecistujicich-latek-a-sklenikovych-plynu-z-dopravy *Data source: TRC, public research institution*

In 2023, the most significant category of transport emission sources across all monitored substances was **private car transport**, with the highest shares of VOC (76.6%) and CO (74.9%) emissions. This is due to the low transport and energy efficiency of private transport as opposed to public transport, as well as the high share of private car transport in total passenger transport (71.3% in 2023). In 2023, road freight transport contributed about one third of the total NO_x, PM and PAH emissions from transport. Among non-road transport modes, diesel traction rail transport accounted for 6.3% of NO_x emissions, and air transport produced 8.8% of NO_x emissions from transport.

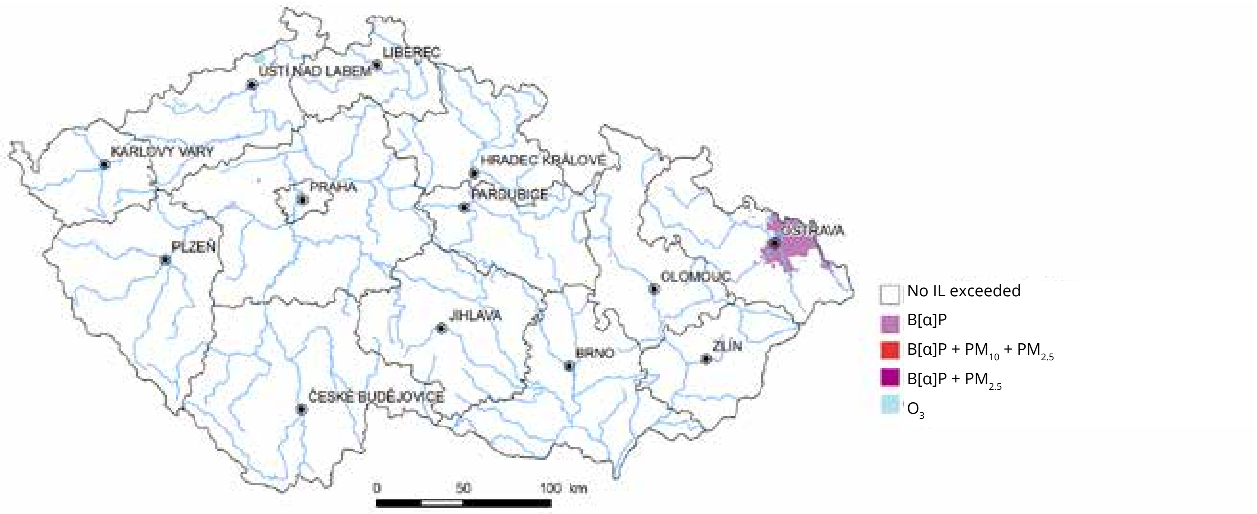
The ambient air quality status

Air quality has a major impact on human health and quality of life, as well as on ecosystems and vegetation, and it is therefore imperative to ensure compliance with the ambient air quality standards for pollutants and the long-term reduction of the overall immission load. Today, the most important air pollutants are suspended particulates, benzo[*a*]pyrene, nitrogen oxides and ground-level ozone, affecting both small settlements where households use solid fuels for heating and areas of industrial and traffic congestion.

In 2023, 0.9% of the Czech Republic was found to have **exceeded** at least one **immission limit**[15] excluding ground-level ozone, where 5.9% of the population lived (Fig. 10). In 2022, 1.7% of the territory and 11.7% of the population were affected, showing a further marked year-on-year decrease in the share of affected territory and population. The Moravian-Silesian Region remained the most affected area, where the immission limit was exceeded in 13.7% of the territory (in the Ostrava/Karviná/Frýdek-Místek conurbation in 33.4% of the territory, where 73.1% of the conurbation's population lived), while in the rest of the territory the exceedance of the immission limits was sporadic. The ground-level ozone emission limit was exceeded in 2023 only in a marginal area of territory (0.1%), as it was the year before.

Figure 10

Areas with exceeded human health immission limits in the Czech Republic [%], 2023



Data source: CHMI

The immission limits for **PM_{10} and $PM_{2.5}$ suspended particulate matter** have been exceeded in the long term, but in a very small area of the Czech Republic. The year-on-year fluctuations are mainly caused by the weather conditions during the winter, when exceedances of the immission limits are caused by the inversion character of the weather and by lower temperatures, significantly affecting the intensity of residential heating. In 2023, only 0.003 % of the territory exceeded the daily average concentration limit for PM_{10} (0.02% of the territory in 2021). Most exceedances of the daily average concentration of PM_{10} were detected at stations in the Ostrava/Karviná/Frýdek-Místek conurbation. In 2020, a stricter immission limit of 20 μg.m^{-3} for the annual average concentration of $PM_{2.5}$ came into force, which was exceeded in only 0.01% of the territory in 2023, with 0.01% of the Czech population exposed to above-limit concentrations in that assessment year. However, taking into account the limits set by the WHO, which are stricter compared to the legal immission limits, the risk of air quality exposures of the population is still significant.

Benzo[*α*]pyrene (B[*α*]P) is considered the most problematic atmospheric pollutant in the Czech Republic. It is generated by incomplete combustion and in the ambient air is mostly bound to the fine fraction of suspended particulate matter $PM_{2.5}$. High concentrations are reached in industrial areas, but above-limit concentrations are present in the long term especially in small residential communities where solid fuels are used for heating. In 2023, the emission limit for B[*α*]P was exceeded in 0.9% of the area where 5.9% of the population lived. Exceedance of the immission limit for the annual average concentration of B[*α*]P 1 ng/m^3 was observed at 8 stations out of 49, all in the Moravian-Silesian Region, apart

[15] *Act No. 201/2012 Coll., on Air Protection, as amended, Annex No. 1, Part 1–3. (immission limits for sulphur dioxide, nitrogen dioxide, carbon monoxide, suspended particulates, benzene, lead, benzo[a]pyrene, arsenic, cadmium, nickel).*

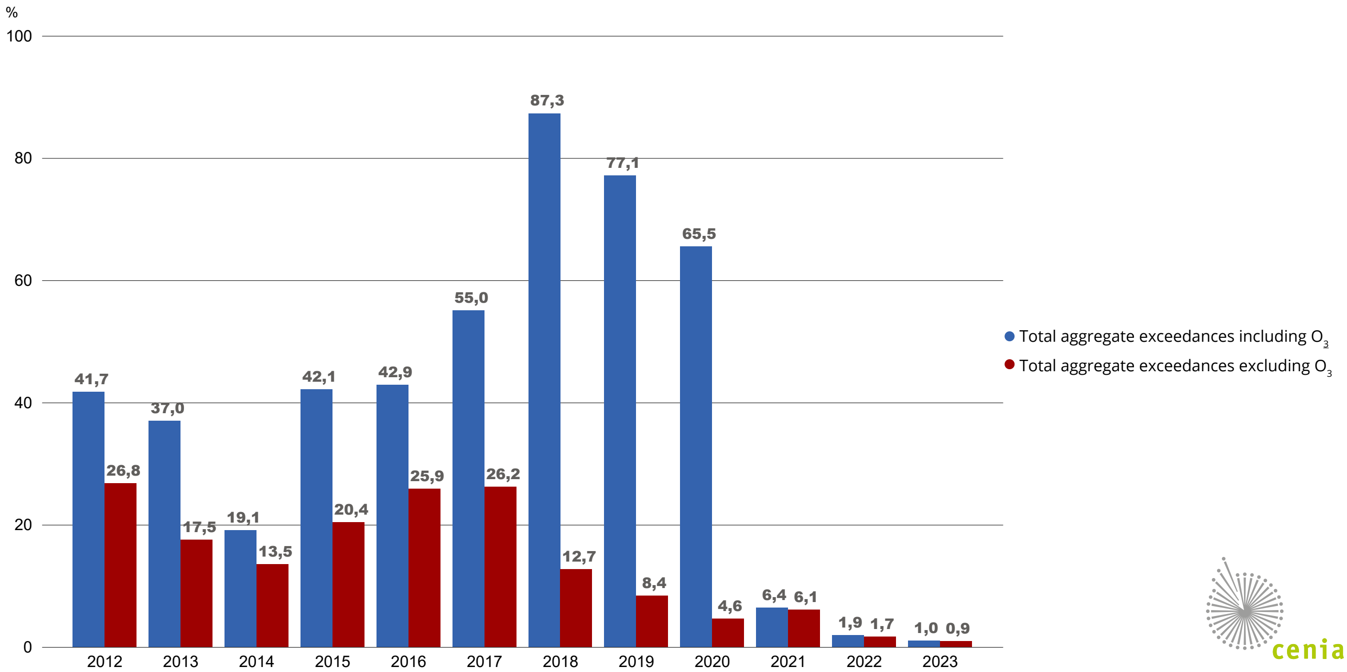
from the Kladno-Švermov station. B[α]P concentrations showed a significant annual variation with peaks in winter as a result of worsening dispersion conditions and pollution from residential local heating. B[α]P has been demonstrated to have mainly carcinogenic effects.

Ground-level ozone (O_3), generated by chemical reactions of the so-called ozone precursors (VOCs, NO_X, CO and CH_4), is a specific pollutant negatively affecting human health and ecosystems because of its highly oxidative properties. Its concentrations depend largely on the nature of weather conditions (intensity and length of hours of sunshine, air temperature and precipitation). The years 2018–2020 were especially conductive to ground-level ozone formation due to high temperatures in the summer months. In 2023, only 0.1% of the territory exceeded the immission limit for the protection of human health for ozone, and 0.1% of the population was exposed to its above-limit concentrations.

High concentrations of **nitrogen oxides**[16] (NO_X) cause respiratory problems, in particular in traffic congested areas. In 2023, again none of the applicable immission limits for nitrogen dioxide (NO_2) were exceeded. In 2023, neither the daily nor the hourly **sulphur dioxide** (SO_2) immission limits were exceeded at any site, as were the immission limits set for arsenic, cadmium, lead, nickel and carbon monoxide (CO).

Chart 14

Territory of the Czech Republic with exceeded human health immission limits [%], 2012–2023



For PM_{10} the values refer to daily concentrations, for $PM_{2.5}$ and B[a]P to annual concentrations.
In 2020, stricter ambient air quality standards of 20 μg.m^{-3} for the annual average concentration of $PM_{2.5}$ came into force.

https://www.envirometr.cz/data/podil-obyvatel-a-uzemi-s-prekrocenymi-imisnimi-limity *Data source: CHMI*

[16] *I.e. mixture of nitrogen dioxide (NO_2) and nitric oxide (NO) in varying proportions.*

The ambient air quality in the Czech Republic is improving in terms of the area of territory with exceedances of immission limits set for the protection of human health (Chart 14). In the last 5 years assessed (2019–2023), the dispersion conditions were very good compared to the long-term average, and at the same time, except for 2021, they were warmer than average. The improvement in air quality can therefore be attributed to weather (particularly dispersion) conditions, but also to the further take up of modern technologies in manufacturing, the upgrading of the mix of combustion equipment in households ("Boiler Subsidies" effect) and the gradual replacement of the car fleet with lower-emission vehicles.

Air pollution combined with atmospheric deposition has a detrimental effect not only on humans, but also on **ecosystems and vegetation**. Air pollutants reduce the resilience of vegetation to external pressures and thus also affect the water regime in the landscape and biodiversity.

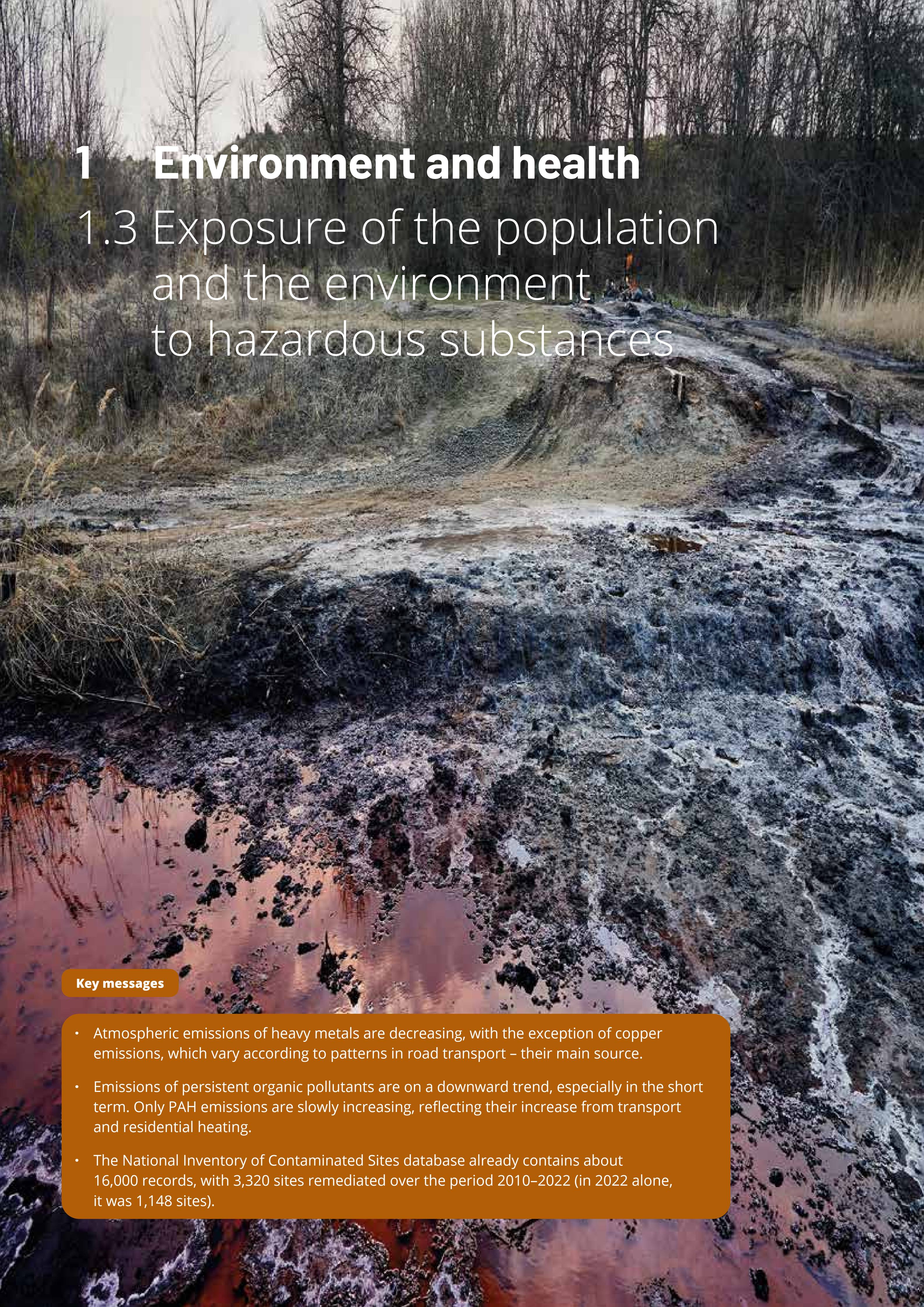
Ground-level ozone damages plant assimilation organs and therefore has a negative impact on forest, grassland and agricultural vegetation. This makes the vegetation less resilient to biotic and abiotic factors, which also affects different habitats and ecosystems. In 2023, the O_3 emission limit for the protection of ecosystems and vegetation (the so-called exposure index AOT40[17]) was exceeded at 18% of stations in the Czech Republic (at 7 out of 39 rural and suburban stations where the level of annual O_3 concentrations is assessed relative to the immission limit for the protection of ecosystems and vegetation under the applicable Czech legislation). The year-on-year changes in the AOT40 exposure index are driven not only by the cumulative emissions of ozone precursors, but primarily by the weather conditions between May and July. In 2023 **the other immission limits** for the protection of ecosystems and vegetation, i.e. the immission limits for SO_2 and NO_x, were not exceeded.

In 2023, the **immission limit for the protection of ecosystems and vegetation** was exceeded in 4.0% of the territory of national parks (NPs) and protected landscape areas (PLAs). This is a major improvement over the previous year, when the immission limit was exceeded in 28.7% of NP and PLA territories. The exceedances in both years were observed almost exclusively for the AOT40 exposure index for ground-level ozone. In 2023, among the national parks, the immission limit was exceeded only in the Krkonoše National Park (on 78% of the territory), and among the protected landscape areas, the largest area of the territory with an exceedance of the immission limit was recorded in the PLA Labské pískovce (32.2%) and the PLA České Středohoří (12.4%).

Detailed visualisations and data

https://www.envirometr.cz/data

[17] *Average AOT40 over 5 years, i.e. 2019–2023.*



1 Environment and health

1.3 Exposure of the population and the environment to hazardous substances

Key messages

- Atmospheric emissions of heavy metals are decreasing, with the exception of copper emissions, which vary according to patterns in road transport – their main source.
- Emissions of persistent organic pollutants are on a downward trend, especially in the short term. Only PAH emissions are slowly increasing, reflecting their increase from transport and residential heating.
- The National Inventory of Contaminated Sites database already contains about 16,000 records, with 3,320 sites remediated over the period 2010–2022 (in 2022 alone, it was 1,148 sites).

1.3 | Exposure of the population and the environment to hazardous substances

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.3.1 Emissions and releases of hazardous chemical substances to all environmental compartments are reduced	Atmospheric emissions of heavy metals and POPs	↘	↘	~
1.3.2 Contaminated areas, including old environmental burdens, are registered and subject to effective remediation	Contaminated sites (registration and remediation)	N/A	↗	~

Current measures supporting achievement of the objective

- The amendment to the Water Act will help to reduce the impact of accidents on watercourses. It, *inter alia*, provides for the registration of wastewater discharges, online monitoring of water released from industrial plants into rivers at the outfalls of major polluters where there is a risk of large-scale accidents. In the event of an accident on a watercourse, it will improve the cooperation of the responding authorities.
- A regular update of the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants in the Czech Republic for the period 2024–2029 was adopted.
- The amendment to the Government Regulation on the Integrated Pollution Register (No 137/2023 Coll.) entered into force on 1 July 2023. It expanded the list of pollutants to include per- and polyfluorocarbons (PFAS).
- Financial support for the regeneration of brownfield sites for both non-business and business use continued.

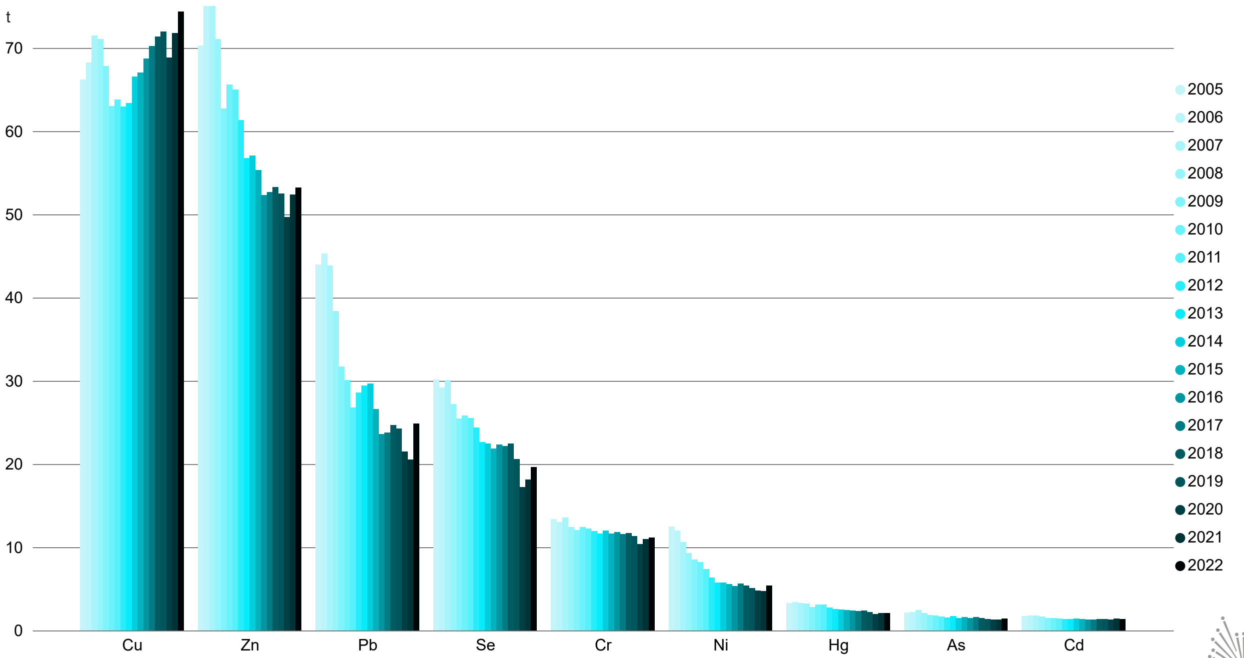
Emissions and releases of hazardous chemical substances

For the reporting period 2023, required data for releases to water, land and air were reported to the **Integrated Pollution Register (IPR)** from a total of 2,637 sites. By category of economic activity, most of the reports were submitted by enterprises in the categories of manufacture of fabricated metal products, apart from machinery and equipment (486) and livestock production (344). A total of 1,285 of accidental escapes to air, water and land were reported, of which 1,024 were above the reporting threshold for at least one substance. A total of 1,081 releases to air were reported (of which 827 were above the limit), with 33 substances above the limit reported. There were 214 releases to water reported (of which 197 were above the limit), 25 substances out of a total of 75 substances monitored in spillages to water, were reported as above the limit. In 2023, a total of 858.9 kg of arsenic and its compounds, 612.5 kg of chromium and its compounds and 2,783.5 kg of cyanide (as total CN) were reported to be released to water. A total of 1,175 reports (of which 1,041 were above limit) were made for transfers in waste, reporting transfers of a total of 22 substances above limit, e.g. fluorides (474.0 t), cadmium and its compounds (10.9 t) and copper and its compounds (21,827.5 t).

Atmospheric emissions of heavy metals, excluding copper, have been declining over the long term, despite significant year-on-year variations caused by the development of the economy, the characteristics of heating seasons and the variable heavy metal content of fuels and raw materials used (Chart 15). Over the period 2000–2022[18], lead emissions decreased most significantly (by 89.0%), mainly as a result of the phase-out of leaded petrol, with a substantial drop in emissions between 2000 and 2005 (by about 80%), and only a slight decrease in lead emissions after 2005. Arsenic emissions decreased by 64.4% and nickel emissions by 62.6% between 2000 and 2022. This improvement has been driven by a decrease in coal burning in the public power sector and in the production of heat and local residential heating. Over the period 2000–2022, copper emissions increased by 50.0% and in the year-on-year comparison to 2022 by 3.6% to 74.4 t/year; the adverse development in emissions was related to the growth in road transport – the main source of these emissions

Chart 15

Pattern of atmospheric heavy metal emissions in the Czech Republic [%], 2005–2022



As to the closing date of this publication, data for 2023 were not available. They will not be published before February 2025.

https://www.envirometr.cz/data/vyvoj-emisi-tezkych-kovu-do-ovzdusi

Data source: CHMI

Heavy metals are metals with a specific gravity greater than 4.5 g.cm^{-3}. They are bound in most fossil fuels, from which they are released during the combustion process. Heavy metals are carcinogenic and mutagenic and their hazard lies in their potential transfer from the air to other environmental compartments, in particular to soil, where they accumulate. The main **sources of heavy metal emissions** (Chart 16) in the Czech Republic in 2022[19] were the public power and heat sector, emitting 86.8% of total emissions of selenium, 49.7% of mercury, 33.4% of nickel and 31.4% of chromium. Local residential heating is the most significant source of cadmium (51.8%) and arsenic (33.4%) emissions. Road transport, specifically abrasion of brakes, accounted for 89.6% of copper emissions, 38.8% of zinc emissions and 27.2% of chromium emissions.

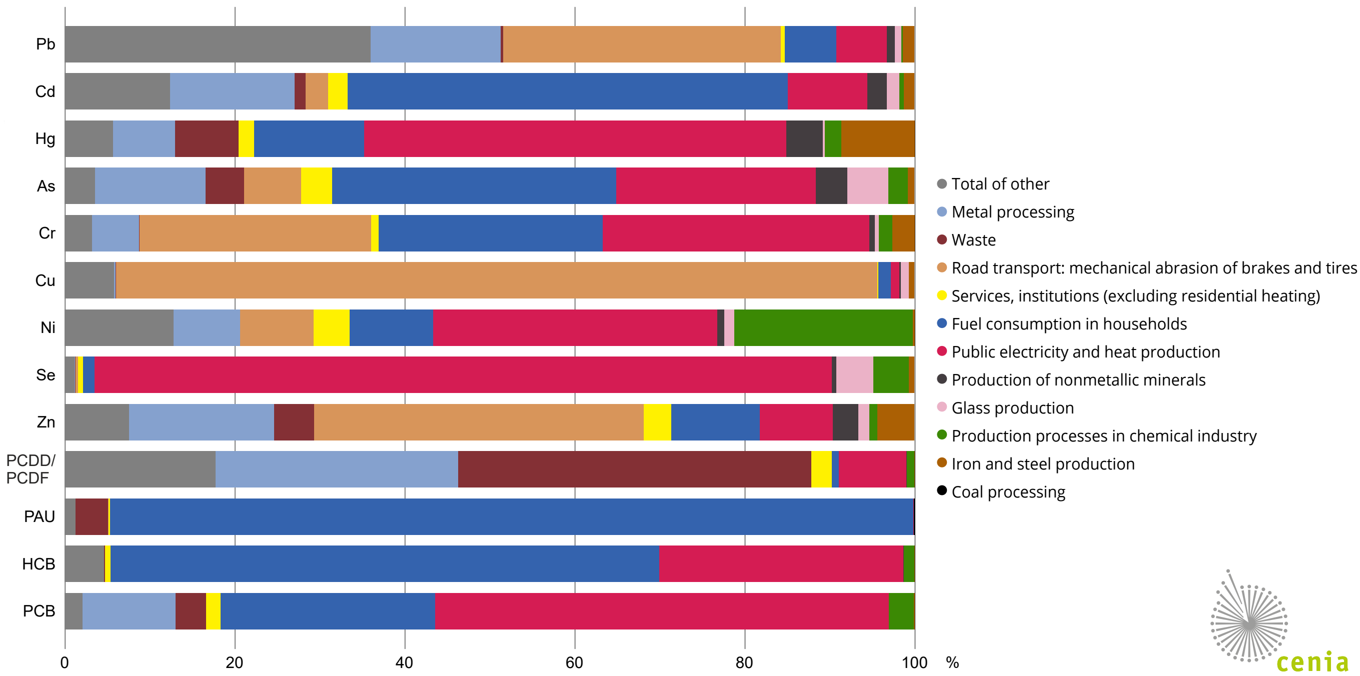
[18] *As to the time of submission of the Report to the internal comment procedure, emission inventory data for 2023 were not available; a new emission inventory will be published in February 2025.*

[19] *As to the closing date of this publication, data for 2023 were not available.*

Persistent organic pollutants (POPs) have bioaccumulative and toxic properties and pose risks to human health in the form of damage to internal organs, reduced immunity and increased risk of cancer. These substances remain in the environment for many years and are very difficult to degrade – this very persistence makes environmental contamination an ongoing problem. POPs enter the air from a number of industrial sources, but also from residential space heating systems, transport, agricultural pesticide use and landfill.

Chart 16

Sources of atmospheric emissions of selected heavy metals and POPs in the Czech Republic [%], 2022



As to the closing date of this publication, data for 2023 were not available. They will not be published before February 2025.

https://www.envirometr.cz/data/zdroje-emisi-tezkych-kovu-a-pops-do-ovzdusi *Data source: CHMI*

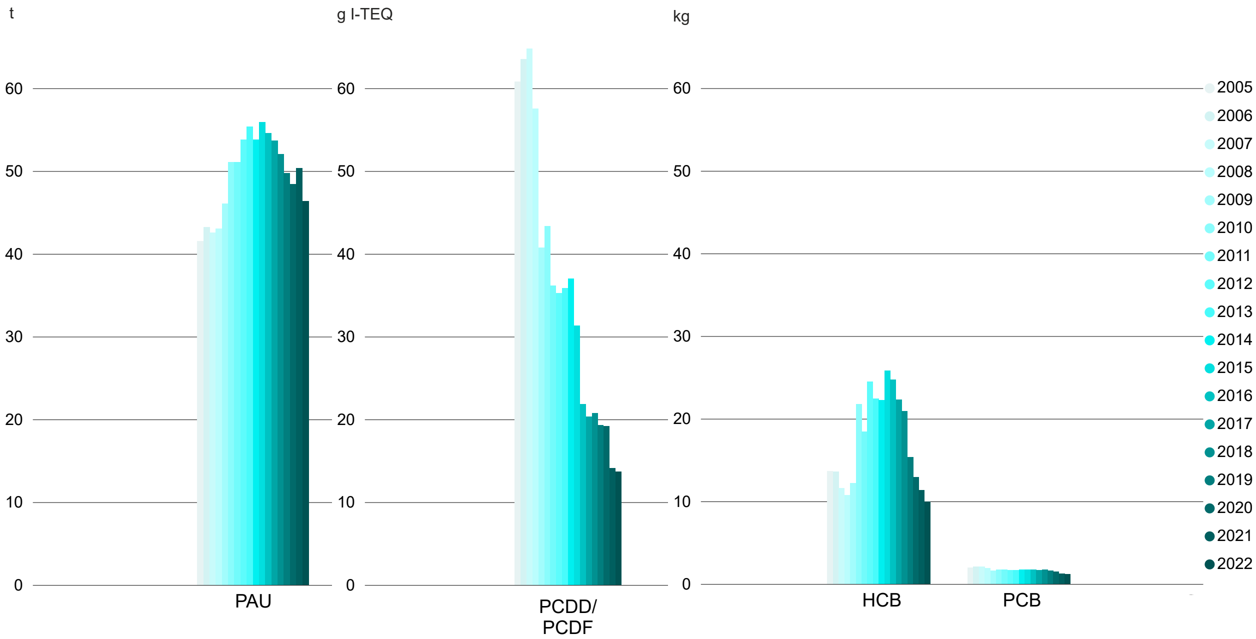
The pattern of emissions of different POPs **groups** is fluctuating, but overall emissions of all monitored substances have a downward trend, which is significant in the short term. The most significant long-term reduction in emissions since 2000 has been achieved for **hexachlorobenzene** (HCB), by 94.2%. A sharp decline in HCB emissions occurred over the years 2000–2003 to almost a tenth of the original value, when the use of HCB as a fungicide was reduced and emissions from the chemical industry also fell (Chart 17). Later on, HCB emission values were uneven, with a more pronounced decrease after 2015, the main source of HCB in this period being the biomass combustion in residential space heating systems (mainly wood), because of the content of chlorine compounds in biomass.

Emissions of **polychlorinated dioxins and furans** (PCDDs/PCDFs) decreased by 77.0% over the period 2000–2022, with a significant decrease especially towards the end of the period, and emissions of **polychlorinated biphenyls** (PCBs) decreased by 43.2%. The most important sources of dioxin and furan emissions are waste management sector (41.7% of emissions) and the metallurgical industry (28.7%), while for PCBs the most important source is public power and heat generation (53.3%).

Emissions of **polycyclic aromatic hydrocarbons** (PAHs), which come almost exclusively (94.5% in 2022) from residential heating, increased by 8.6% over the period 2000–2022, varying according to the characteristics of the heating seasons and the composition of residential heating fuels, and decreased by 7.9% year-on-year. Emission factors for benzo[*a*]pyrene for coal and biomass combustion in residential space heating systems do not differ significantly. Thus, a reduction in PAH emissions from residential heating can only be achieved by replacing technologies (boilers), reducing the energy intensity of buildings and switching to non-fossil fuel energy sources (e.g. photovoltaics, heat pumps).

Chart 17

Atmospheric emissions of POPs in the Czech Republic [t, g I-TEQ, kg], 2005–2022



As to the closing date of this publication, data for 2023 were not available.

https://www.envirometr.cz/data/vyvoj-emisi-pops-do-ovzdusi *Data source: CHMI*

Contaminated areas

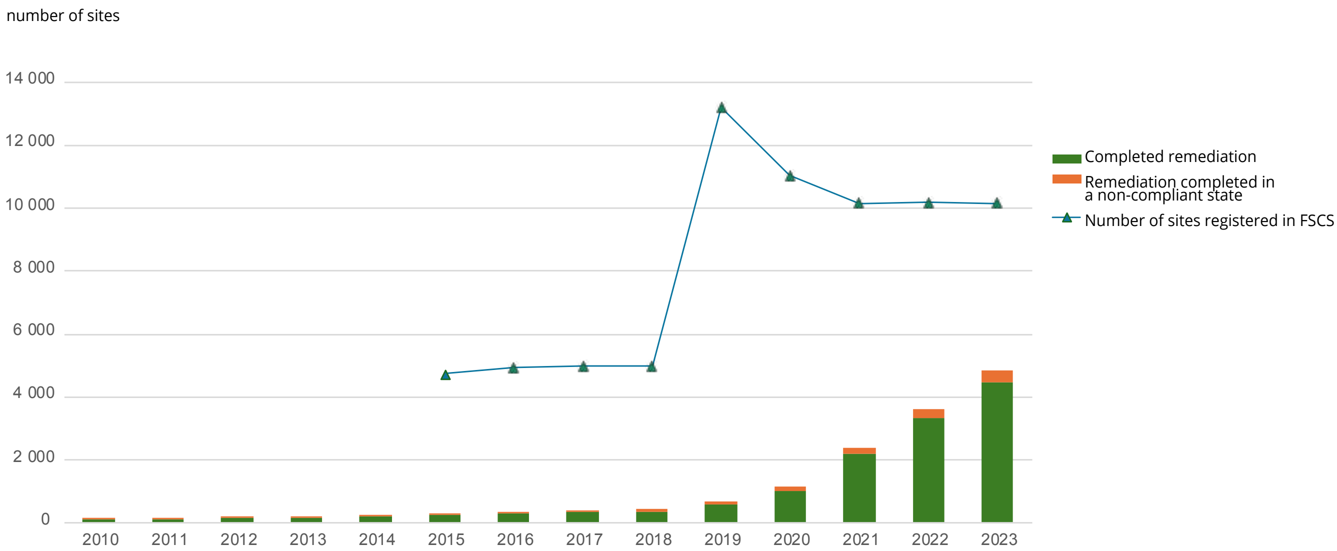
Contaminated sites, or old ecological burdens, are consequences of anthropogenic activities, during which occasional/accidental or chronic escaping of pollutants into the environment occurred or occurs. Although pollutants are already widespread in the environment, truly contaminated sites in urban areas and the countryside can be found where the concentration or volume of pollution is considerably higher than in the surrounding environment, posing risks to human health and ecosystems. Some of these sites have a very long and complex history and are therefore referred to as "old ecological burdens". A contaminated site is an area with severe contamination of the rock environment, groundwater or surface water caused by improper handling of hazardous substances such as oil, pesticides, PCBs, chlorinated and aromatic hydrocarbons, heavy metals, etc. Identified contamination is typically regarded an old environmental contamination if it occurred before privatisation or if the originator of the contamination does not exist or is unknown.

The Ministry of the Environment runs the **Filing System of Contaminated Sites (FSCS)** database, that as of 31 December 2023 contained 10,157 entries of contaminated and potentially contaminated sites. Over the period 2018–2022, in the context of the implementation of the National Inventory of Contaminated Sites (NICS) project, a one-off update of the formerly strictly incremental database was made with bulk data on already known sites. Despite the fact that the database contains more than 10,000 official entries, it should be noted that the absence of any given site/locality in FSCS does not mean that the relevant site/locality is not contaminated. The database records only sites for which the Ministry of the Environment holds relevant information on their possible contamination.

The number of sites listed in FSCS changes dynamically as the sites are remediated or new, previously unknown, sites are identified. Over the period 2010–2023, remediation of 4,486 contaminated sites was completed in compliance with the terms of the remedial action (Chart 18). Remediation of 369 contaminated sites over same period was completed in a non-compliant state.

Chart 18

Number of sites with old environmental burdens with completed remediation registered in FSCS in the Czech Republic, cumulatively over the period, and total number of sites registered in FSCS [number of sites] 2010–2023

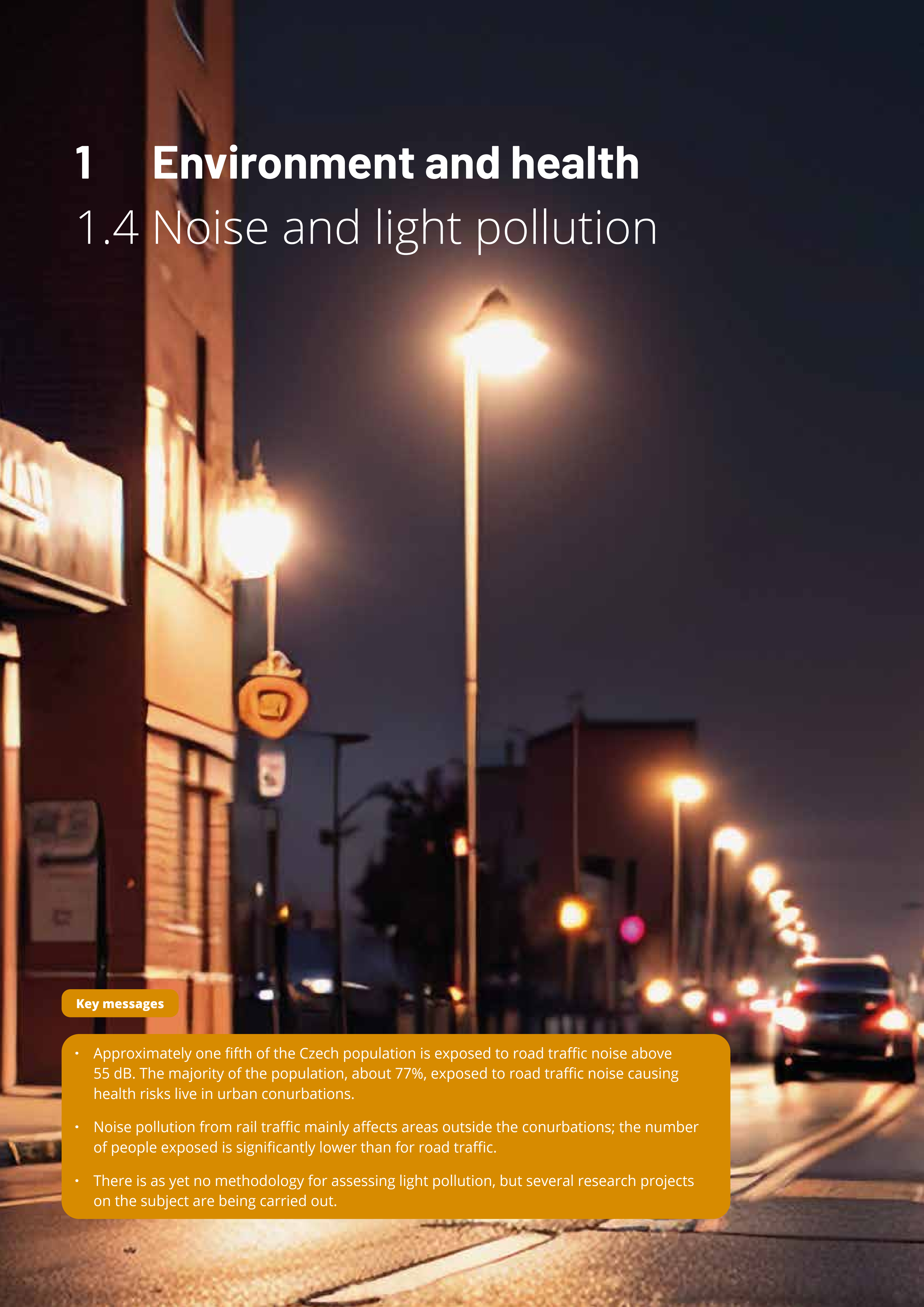


https://www.envirometr.cz/data/sanace-kontaminovanych-mist *Data source: MoE*

Funding for the remediation of old environmental burdens in the Czech Republic is provided by European funds under different operational programmes, especially the Operational Programme Environment, as well as by the Ministry of Finance (the so-called “Ecological Contracts”) and in some cases by the respective ministries.

Detailed visualisations and data

https://www.envirometr.cz/data



1 Environment and health

1.4 Noise and light pollution

Key messages

- Approximately one fifth of the Czech population is exposed to road traffic noise above 55 dB. The majority of the population, about 77%, exposed to road traffic noise causing health risks live in urban conurbations.
- Noise pollution from rail traffic mainly affects areas outside the conurbations; the number of people exposed is significantly lower than for road traffic.
- There is as yet no methodology for assessing light pollution, but several research projects on the subject are being carried out.

1.4 | Noise and light pollution

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.4.1 Exposure of population and ecosystems to noise pollution is decreasing	Population exposed to noise pollution	N/A	N/A	~
	Noise control measures in transport and development of transport infrastructure	N/A	↗	✓
1.4.2 Light pollution is decreasing	Night sky brightness	N/A	↝	~

Current measures supporting achievement of the objective

- Draft updates of Noise Control Plans to reduce noise pollution on main roads were prepared based on the results of the of the Strategic Noise Mapping (SNM) round 4. The Noise Control Plans have been drawn up for 13 regions, the plans for conurbations are part of the Noise Control Plans for their respective regions, the plans for the Capital City of Prague are part of the Central Bohemia Region Noise Control Plan.
- With effect from 1 March 2023, original Czech technical standard CSN 36 0459 on "Reducing the Undesirable Side Effects of Outdoor Lighting" was issued.
- In cooperation with the Ministry of Regional Development, light has been included as part of the health and environmental protection requirements under the new Construction Act No. 283/2021 Coll. It will also become part of its implementing Decree No. 146/2024 Coll. on Construction Requirements and Decree No. 131/2024 Coll. on Building Documentation.
- The Czech Republic also promotes the issue of light pollution internationally through a series of workshops and conferences (e.g. "Light Pollution 2023" webinar).
- The Ministry of the Environment has published a new Manual of Proper Lighting, explaining the parameters and application of the Czech technical standard CSN 36 0459.
- On 29 September 2023, the Ministry of the Environment issued an updated Methodological Guideline for the Prevention and Reduction of Light Pollution.

Exposure of population and ecosystems to noise pollution

Noise pollution affects the quality of the environment and is a source of health risks for the population. Excessive noise causes stress, which leads to a wide range of civilisation diseases. Noise annoyance, i.e. the subjective effects of acoustic discomfort, is considered to be the most common effect of noise on humans, as well as disturbance of sleep and activities. The most serious health effects of noise are those on the auditory organ and the cardiovascular system.

Environmental **noise pollution** in the Czech Republic and throughout the EU is mainly caused by **road traffic**. According to the results of the 2022 Strategic Noise Mapping (SNM) – Round 4[20], a total of about 2.2 million people in the Czech Republic are exposed to road traffic noise above 55 dB all day long, i.e. about one fifth of the Czech population. 1.7 million of these residents (i.e. 77%) live in **urban conurbations of more than 100 000 inhabitants**. 210.6 thousand inhabitants are exposed to road traffic noise levels exceeding the set limit value of 70 dB (for the L_{den} indicator = day-evening-night level), of which 149.1 thousand inhabitants (71%) live in conurbations, and action plans are being drawn up to reduce the noise burden in the affected areas. At night (10 pm–6 am, indicator L_n), when the lower limit of 60 dB applies, 272,100 inhabitants are exposed to noise exceeding the limit, 187,500 (69%) of them in conurbations.

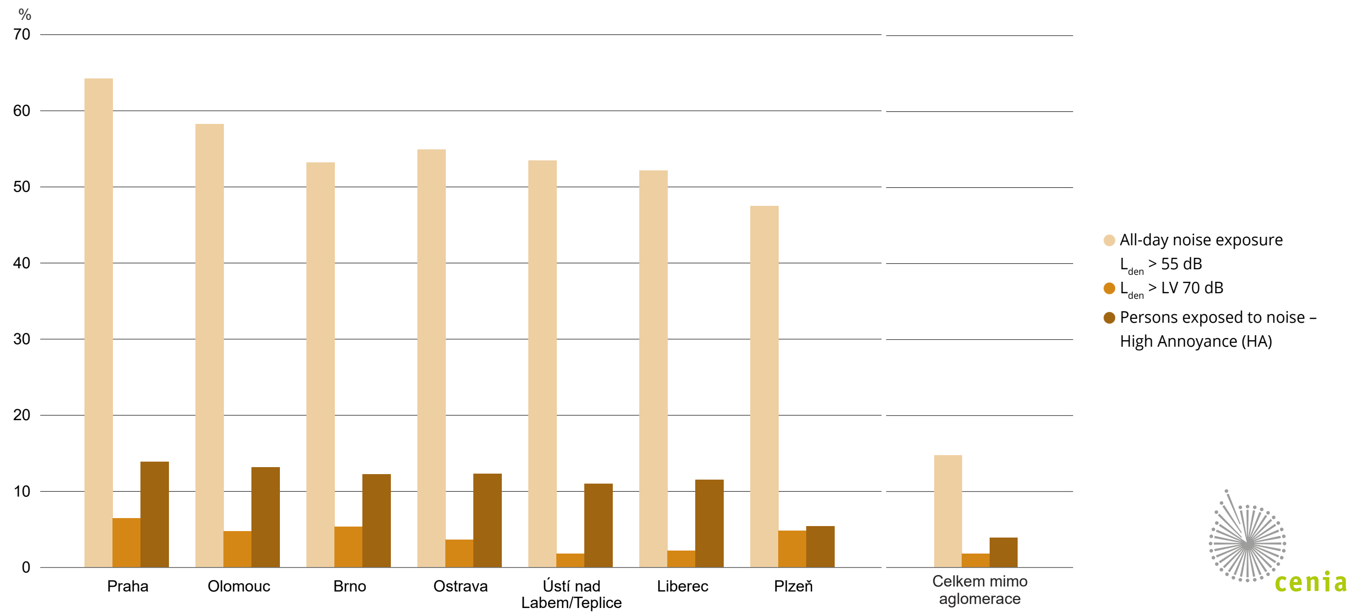
High Annoyance (HA) and High Sleep Disturbance (HSD) indicators are used to assess the **health risks of exposure to noise**. The methods for determining these indicators and consequently the exposure of the population take into account not only the intensity of the noise (i.e. sound pressure) but also the evolution of the noise over time and its other characteristics. According to the SNM results, 496.6 thousand people in the Czech Republic are exposed to noise meeting the criteria of high annoyance, of which 360.8 thousand people (73%) are exposed to noise in conurbations. Thus, a significant segment of the Czech population (about 4.5%) faces health risks from high noise exposure. From a health point of view, 162.2 thousand inhabitants are exposed to even more serious sleep disturbance, 70% of whom (113.2 thousand) live in conurbations.

The **conurbation of Prague** is the most affected area by road traffic noise, with 91.3 thousand residents, i.e. 6.4% of the population covered by the noise mapping, exposed to noise exceeding the limit value throughout the day, and 13.8% of the population highly annoyed by noise with a risk of health effects (Chart 19). Prague is also significantly affected by road traffic noise at night, with 4.2% of the population suffering from high levels of sleep disturbance (Chart 20). According to the monitored noise indicators, conurbation of Brno also has an above-average noise burden. On the other hand, the best noise situation in terms of day and night noise exposure of the population was found in the conurbations of Ústí n. L. and Liberec.

[20] *Strategic noise mapping is carried out following the requirements of Directive 2002/49/EC of the European Parliament and of the Council on the assessment and management of environmental noise in five-year periods. In 2020, an amendment to this legislation was adopted (Commission Directive (EU) 2020/367), which specifies the method for calculating noise indicators and health impact indicators in Annex III.*

Chart 19

All-day (24-hour) noise burden from road traffic in and outside conurbations according to L_{den} and HA indicators [% of exposed population covered by the noise mapping], 2022

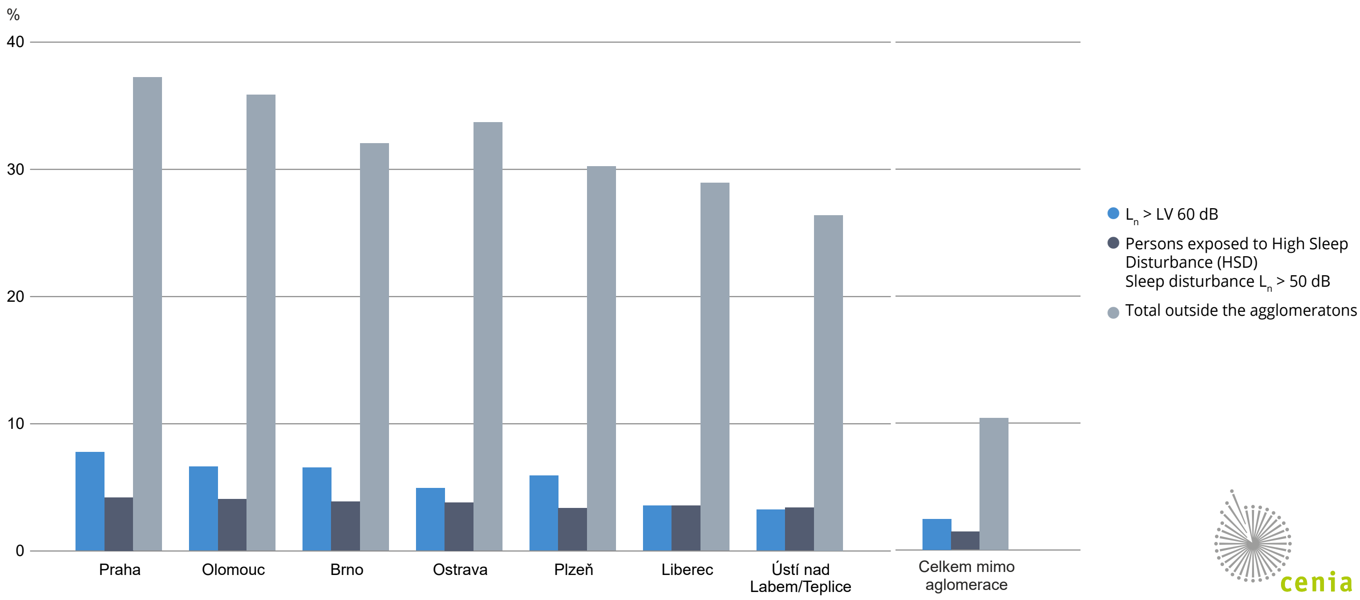


Data for roads outside conurbations are only available for roads with traffic volumes higher than 3 million vehicles per year. Data for 2023 are not available, noise mapping is carried out in 5-year cycles.

https://www.envirometr.cz/data/hlukova-zatez-obyvatelstva-v-aglomeracich *Data source: NRL*

Chart 20

Nighttime (10 pm–6 am) noise burden from road traffic in and outside conurbations according to L_n and HSD indicators [% of exposed population covered by the noise mapping], 2022



Data for roads outside conurbations are only available for roads with traffic volumes higher than 3 million vehicles per year. Data for 2023 are not available, noise mapping is carried out in 5-year cycles.

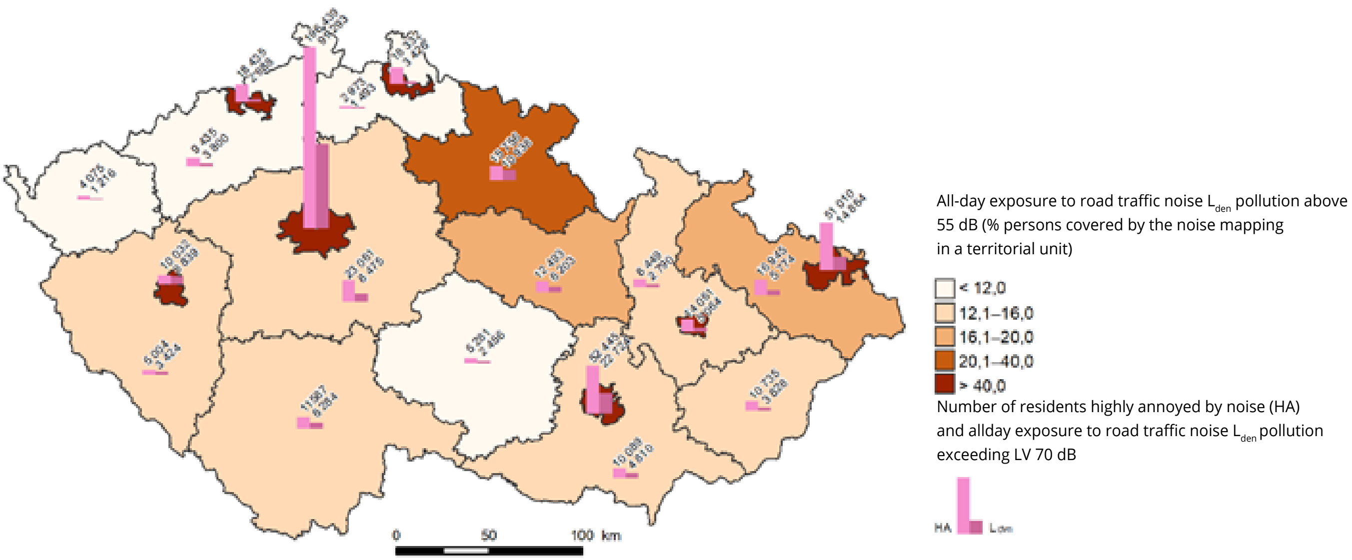
https://www.envirometr.cz/data/hlukova-zatez-obyvatelstva-v-aglomeracich *Data source: NRL*

Outside of the conurbations, noise mapping is carried out in line with the requirements of the legislation only in the vicinity of roads with a traffic intensity of more than 3 million vehicles per year. Among the regions of the Czech Republic, the highest number of people exposed to all-day noise pollution from road traffic exceeding the limit value was identified in the Hradec Králové (10.9 thousand) and Central Bohemia (8.5 thousand, Fig. 11) Regions. The Central Bohemian Region is also home to the highest number of people exposed to high annoyance from noise (23.1 thousand) and people exposed to high sleep disturbance (8.3 thousand); the situation in the region is affected by the high intensity of road traffic because of the central location of the region within the Czech Republic and the proximity of the Prague conurbation. Outside the Ostrava conurbation, the Moravian-Silesian Region also has a significant noise burden. The region with the lowest number of people exposed to high noise pollution outside conurbations is the Karlovy Vary Region, and also (except for the Liberec agglomeration) the Liberec Region. The lower noise burden is linked to the geographical location of these regions in relation to road transport transit routes and their lower population density.

The trends in noise pollution cannot be not objectively assessed due to changes in mapping methodology between SNM rounds. A simple comparison of values from the current SNM Round 4 (2022) and the previous SNM round (2017) shows a stagnation in the number of residents exposed to high noise levels exceeding the thresholds for the all-day and night noise indicators. However, for the HA and HSD health impact indicators, we observe a slight **increase in the number of exposed residents**.

Figure 11

Share of population of conurbations and regions affected by all-day road traffic noise pollution above 55 dB in the total population covered by the noise mapping, number of residents highly annoyed by noise (HA) and number of residents exposed to noise exceeding the limit value based on the L_{den} indicator [%, population], 2022



Data for roads outside conurbations are only available for roads with traffic volumes higher than 3 million vehicles per year. As to the closing date of this publication, data for 2023 were not available.

Data source: NRL

Based on the results of the current round of noise mapping, **traffic on the main railway lines**, used by at least 30 thousand trains a year, is a source of all-day noise pollution (indicator L_{den}) exceeding 55 dB for a total of 194.1 thousand inhabitants, of which 9.4 thousand are exposed to noise exceeding the limit value of 70 dB. Roughly two-thirds of the total population affected by railway noise live outside the conurbations; in urban areas, the lines are better equipped with noise abatement measures and trains run at lower speeds. In total, 5,100 inhabitants are exposed to night-time noise from railways exceeding the limit value of 65 dB, and 35,600 inhabitants are exposed to high levels of sleep disturbance from the main railways. The highest levels of noise pollution from railways in the Czech Republic were recorded in the Central Bohemia, Ústí nad Labem and Pardubice Regions, crossed by corridor railway lines with high traffic intensity.

Noise abatement measures are implemented in each region and conurbation in line with the round 3 of the Noise Control Action Plans for the main roads under the management of the Road and Motorway Directorate (ŘSD ČR), main railway lines and main airports. Based on the results of the SNM round 3, the action plans define critical locations of priority 1 and 2 according to the exceedance of limit values of noise indicators and population density in the given location. For critical locations, the action plans propose specific noise abatement measures. In June 2024, an update of the action plans for the main roads was completed reflecting the results of the SNM round 4. The draft updated action plans are now open for comment and a public consultation will take place in August 2024.

Noise pollution from road traffic is reduced by the **development of road infrastructure** by diverting through traffic away from settlements and the **implementation of noise abatement measures** on transport infrastructure such as noise barriers and quiet asphalt pavements. In 2023, CZK 968.0 million was spent on the implementation of noise abatement measures on road infrastructure under the management of the Road and Motorway Directorate (ŘSD). This meant more than doubling the investment over the previous year. Most of the investments were made in noise abatement measures in the Moravian-Silesian (CZK 330 million), Olomouc (CZK 186 million) and Central Bohemia (CZK 176 million) Regions, i.e. in the regions where the road and motorway network was developed the most; in the case of new road constructions, noise protection measures are part of the construction budget. At the end of 2023, the total length of noise barriers on roads and motorways amounted to 531.3 km and increased by 31.5 km year-on-year.

In 2023, 15.3 km of new motorways were opened, mainly the new sections of the D48 motorway in the Moravian-Silesian Region (the section of the Bělotín grade separation–Rybí – Stage 1a and Stage II of the Frýdek-Místek bypass). A total of 175.9 km of motorways are under construction, namely the D3 motorway in the South Bohemian Region (bypass of České Budějovice and continuation of the motorway to the state border), D4, D1 (section Říkovice–Přerov), D35, D49 and D55. In 2023, a total of 55 km of bypasses and relocations were opened on the Class I roads under the management of the Road and Motorway Directorate (ŘSD), e.g. the southeastern bypass of Havlíčkův Brod on the I/38 road, the bypass of Doudleby nad Orlicí in the Hradec Králové Region on the I/11 road or the bypass of Bludov on the I/44 road in the Olomouc Region.

In 2023, CZK 48.8 million was invested in the construction of **noise barriers on the railway**. The length of the lines newly equipped with noise barriers increased by 2.3 km. A further CZK 1.8 million was invested in the construction of new noise abatement measures (e.g. replacement of windows in buildings near the railway) and CZK 0.7 million in the construction of rail absorbers. A non-investment noise abatement measure on the railway was the grinding of the crown of the rail to reduce the noise pollution. In 2023, EUR 4 million was spent on rail grinding. The length of the sections with optimized rail surface belonging to the TEN-T network in the Capital City of Prague was 11.4 km, significantly less than in the previous year (57.4 km of lines).

Night sky brightness

Light pollution (popularly known as *light smog*), caused by artificial lighting at night, is a major civilisation problem with negative impacts on human health, the environment, the economy, safety and visibility of the night sky. It is typically caused by directing light into undesirable areas (e.g., sky, open landscape, or through windows into or out of interiors), lighting outside of necessary time periods (e.g., illuminating a shopping centre parking lot outside of business hours), or using sources with inappropriate spectral characteristics (especially in the blue part of the spectrum). Not only the often-discussed giant greenhouses in Poland near the Czech border, but also stadiums, ski slopes, roadside advertisements and inappropriately designed street lighting pose problems.

Although according to experts, light pollution is harmful to humans, animals and plants, neither the competence to control it nor the limit values for light pollution are currently comprehensively regulated in the Czech Republic. However, in 2023, the first significant steps were taken indicating a reversal of this trend. With effect from 1 March 2023, original Czech technical standard CSN 36 0459 on "Reducing the Undesirable Side Effects of Outdoor Lighting" was issued. This standard outlines the essential rules and sets maximum values for lighting parameters to be technologically accessible. It defines five types of zones, ranging from the darkest (undeveloped areas in protected areas) to the brightest (centres of statutory cities and the capital city), and specifies requirements such as façade brightness values, luminance classes, alternative colour temperatures, etc.

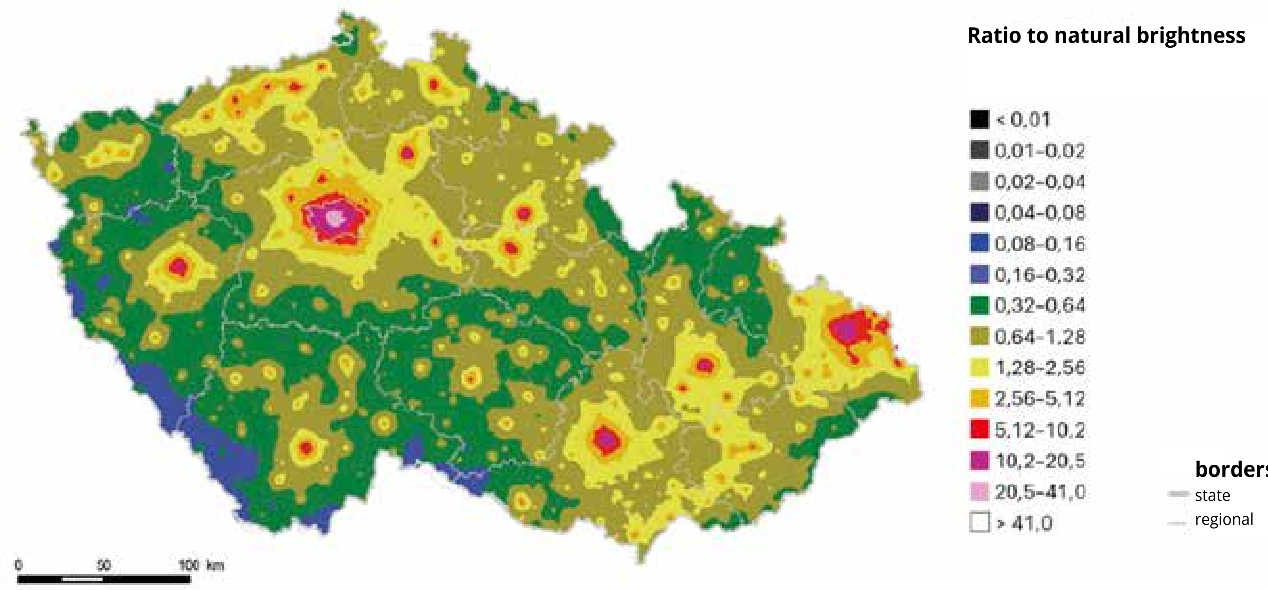
A major step towards the adoption of light pollution control is the new Construction Act and its implementing decrees with effect from 1 July 2024. The regulation includes light among the requirements to protect health and the environment. In the framework of Decree No. 146/2024 Coll., on Construction Requirements, a provision on limiting the undesirable effects of outdoor lighting was included in 2024. Even though this provision will not limit all lighting, such as construction sites, and will not be retrospectively enforceable, it is a significant step forward.

Currently, the most appropriate measure for assessing the level of light pollution is the **night sky brightness**[21]. The total brightness of the night sky is a combination of natural light sources and artificial light scattered in the Earth's atmosphere (Fig. 12). The brightness of the sky is influenced both by the light sources themselves (their quantity, location and parameters) and by the conditions in which the light propagates (the amount of greenery, snow cover, the amount and type of aerosols (smog, haze), the width of streets, the height of buildings, cloud cover, etc.). However, in the Czech Republic, there is no area left that would not be affected by artificial brightness, because the light spreads tens or even hundreds of kilometres away due to scattering in the atmosphere.

[21] *Brightness is a photometric quantity and can be defined as the luminous flux per unit solid angle per unit projected source area.*

Figure 12

Artificial night sky brightness over the Czech Republic, 2016



As to the closing date of this publication, data for 2017–2023 were not available.
Adapted from: Falchi et al. (2016): The New World Atlas of Artificial Night Sky Brightness, https://doi.org/10.5880/GFZ.1.4.2016.001

Data source: Czech Astronomical Society, 2017 (www.svetelneznecisteni.cz)

In order to obtain valid and sustainable data, light pollution is currently the subject of two research projects of the Technology Agency of the Czech Republic. These include TITSMZP012 project: "Impact of Light Pollution on Sensitive Species, Ecosystems and Landscape Character", results (including measurement methodology and resulting map of the Czech Republic) will be available by the end of 2024; and SS05010159 project "Research and Development on the Measurement and Assessment of Artificial Light in the Nocturnal Environment and its Effects on Living Organisms and the Environment as a Whole", aiming to develop a measuring device that will be particularly suitable for local measurements in areas with light-sensitive ecosystems at night.

The most recent publication on light pollution, the 2022 Review and Assessment of Available Information on Light Pollution in Europe[22], uses satellite data from the Visible Infrared Imaging Radiometer Suite (**VIIRS**) as two-year averages of the amount of light emitted from the Earth's surface into space (only externally corrected data) **to assess the brightness of the night sky**. Two limit values were chosen to assess the level of light pollution: 2 $nW.cm^{-2}.sr^{-1}$ (below this level only a low ecological impact can be expected) and 0.5 $nW.cm^{-2}.sr^{-1}$ (the lowest light emission measurable by VIIRS, where artificial light can no longer be distinguished from natural night light).

[22] *Widmer, K., Beloconi, A., Marnane, I., Vounatsou, P. (2022). Review and Assessment of Available Information on Light Pollution in Europe (Eionet Report – ETC HE 2022/8. ISBN 978-82-93970-08-8. ETC HE c/o NILU, Kjeller, Norway.*

Tab. 1

Change in night sky brightness between 2014–2015 and 2020–2021 two-year averages[23] in the Czech Republic [%]

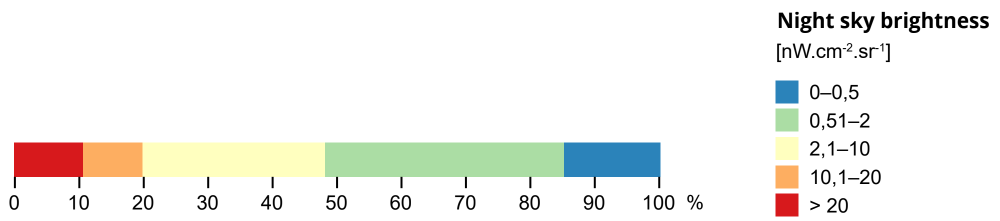
Limit value	Increase in the area with the exceeded limit value	Reduction of the area with exceeded limit value
0,5 $nW.cm^{-2}.sr^{-1}$	9,5%	2,2%
2 $nW.cm^{-2}.sr^{-1}$	2,3%	0,5%

Data source: Widmer, K., Beloconi, A., Marnane, I., Vounatsou, P. (2022). Review and Assessment of Available Information on Light Pollution in Europe (Eionet Report – ETC HE 2022/8). ISBN 978-82-93970-08-8. ETC HE c/o NILU, Kjeller, Norway.

Current levels of light pollution continue to worsen as a result of increasing numbers of light sources or illuminated areas (Tab. 1). Over the period 2014–2021, the area of the Czech Republic exceeding the minimum limit value of 0.5 $nW.cm^{-2}.sr^{-1}$ increased by 7.3% (i.e. the situation worsened in 9.5% of the Czech Republic and improved in 2.2% of the country). Most of the night sky artificial brightness is found in large cities, in particular in the centre of Prague. In 2021, brightness above 20 $nW.cm^{-2}.sr^{-1}$ was recorded in approximately 12% of the Czech Republic's territory (Chart 21). The wider area around Prague, Brno, Plzeň, Ostrava, Olomouc, České Budějovice and many other cities also produce significant brightness. About 53% of the Czech Republic's territory is rated as having a low environmental impact of light pollution, equivalent to the typical level of light emission in rural or sparsely populated areas (with values below 2 $nW.cm^{-2}.sr^{-1}$, Chart 21). In terms of light pollution, the best situation is in the northern part of the Šumava, then in the mountain areas and rural areas of the south-western part of the Czech Republic and the Bohemian-Moravian Highlands, i.e. approximately 15% of the area with values below 0.5 $nW.cm^{-2}.sr^{-1}$. Such areas also include so-called dark-sky parks, intended to preserve the night-time environment. Three such parks have been declared in the Czech Republic so far – in 2009, the Czech-Polish Jizera Dark-Sky Park was declared and it became the first such area in Europe as well as the first transboundary park of this sort in the world. In 2013, the Beskydy park was added (on both the Czech and Slovak sides of the Beskydy Mountains), and in 2014 the Manětín Dark-Sky Park (between Plzeň and Karlovy Vary). The preparation of a dark-sky park in the Podyjí National Park has been underway since 2016.

Chart 21

Night sky brightness in the two-year average 2020–2021[24] in the Czech Republic [% of area]



Data source: Widmer, K., Beloconi, A., Marnane, I., Vounatsou, P. (2022). Review and Assessment of Available Information on Light Pollution in Europe (Eionet Report – ETC HE 2022/8). ISBN 978-82-93970-08-8. ETC HE c/o NILU, Kjeller, Norway.

23 *As to the closing date of this publication, data for 2023 were not available.*

24 *As to the closing date of this publication, data for 2023 were not available.*

Inappropriate types of artificial lighting, and in particular the lack of difference between day and night light intensity, result in disruption of **circadian rhythms** (natural cycles of hormonal processes dependent on the alternation of light and dark parts of the day), leading to changes in the behaviour of organisms. If animals are exposed to environments where artificial light reaches intensities disrupting these natural processes, the effects can be observed on whole populations and they can affect the ecosystems dependent on them (ultimately leading to a biodiversity loss). Nocturnal exposures to light result in insufficient regeneration of human body during sleep a suppressed production of melatonin (a hormone regulating circadian rhythms), even at very low light intensities. Recurrent disruption of the dark phase of the night by light (especially light containing a blue spectral component) significantly increases the risk of so-called civilisation diseases, such as immune deficiencies, psychiatric diseases including depression, sleep and memory disorders, cardiovascular diseases, insulin resistance or obesity, and above all several forms of cancer.

In addition to the spread of illuminated areas, the **level of light pollution** is affected by the type of light source used. In particular, LED-based sources producing cool white light (Correlated colour temperature (CCT) > 3,000 K) are more energy efficient than warm white sources (CCT < 3,000 K) and may thus be cheaper to use. However, their spectral composition contains a high proportion of blue light component, a strong biological activator. There is therefore a need to find ways to ensure that the lighting used is not only cost-effective but also minimises disruption to the health of people, animals and entire ecosystems, including the night-time landscape visual aspect. To address this issue, projects for the retrofitting/adaptations of public lighting systems containing a requirement for a maximum CCT are eligible for financial support. Municipalities outside NPs can obtainin funding for this purpose through the EFEKT Programme of the MIT National Recovery Plan. For municipalities within National Parks, a call for proposals under the Modernization Fund is being prepared by the State Environmental Fund, combining energy savings with compliance with Czech technical standard CSN 36 0459 parameters on “Reducing the Undesirable Side Effects of Outdoor Lighting”.

Detailed visualisations and data

https://www.envirometr.cz/data

1 Environment and health

1.5 Society preparedness and resilience to emergencies

Key messages

- Support for preparedness for weather extremes or the impacts of climate change is provided by a number of programmes from both national and European sources. The main sources of funding for adaptation measures to the climate change impacts in the Ministry of the Environment were the OP ENV, NP ENV, NRP and the Modernisation Fund. The main sources of funding in the Ministry of Agriculture were the RDP and national programmes for flood prevention and water retention in the landscape. Other ministries addressing the issue of climate change adaptation include the Ministry of Agriculture and Ministry of Regional Development (mainly through IROP funding) and the Ministry of Industry and Trade (e.g. through OP TAC).
- In 2023, a total of 277 warning alerts were issued by the Integrated Warning Service System. 220 warning alerts concerned weather event, 43 warning alerts were issued for dangerous hydrological event. 85% of the weather warning alerts were successful or partially successful. In 2023, weekly hydrological drought warning alerts were newly provided by the HAMR assessment system for each municipality with extended jurisdiction.
- In 2023, there were 44 thousand insured events caused by natural events totalling CZK 2.5 billion. The major contributors to both the number of insured events and total damage are windstorms and hailstorms.
- During 2023, there were five major accidents in the Czech Republic involving explosions, fires, hazardous substance leaks and personal injuries.

1.5 | Society preparedness and resilience to emergencies

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.5.1 Preparedness, resilience and adaptation to weather extremes increase	Issuing Integrated Warning Service System (IWSS) warning alerts*	N/A	N/A	✓
1.5.2 Negative impacts of emergencies and crisis situations of anthropogenic and natural origin are minimised	Events and interventions due to natural disasters	N/A	~↗	~
	Amount of damage caused by natural disasters	~↗	~↗	~
	Preventive and educational activities in the field of population protection and crisis management	N/A	~↗	~
1.5.3 The occurrence of emergencies and crisis situations of anthropogenic origin is minimised	Number of major accidents reported	↗	↘	~

* *There is no way, and no point, in establishing a trend for the warning system operation. The criterion for its success is not the number of warning alerts issued, but their quality, accuracy and timeliness.*

Current measures supporting achievement of the objective

- The drought control policy concept for the Czech Republic was evaluated and updated in 2023.
- Financial support is provided in particular for smaller and medium-scale measures to improve the retention capacity of the landscape, e.g. restoring wetlands, pools, small water reservoirs, revitalising watercourses and floodplains, etc. Other funding programmes are aimed at preventing and remedying flood damage, linking water supply networks or rainwater harvesting.
- 2014–2020 OP ENV provided support for flood control measures under both Priority Axis 1 ("Improving Water Quality and Reducing Flood Risk") and Priority Axis 4 ("Protection and Care of Nature and Landscape"). Over this programming period, more than CZK 5 billion TEE (total eligible expenditure) was spent on flood control under the OP ENV. Under the successor OP ENV for the programming period 2021–2027, over CZK 12.6 billion TEE was allocated to support climate change adaptation, including flood control measures.

Preparedness for weather extremes

Effective financial support for measures in view of the risks of climate change or natural hazards is essential for enhancing the adaptation of the population and economic sectors to these risks. The aim of the measures is mainly to lower the level of risk (e.g. reducing flood risks in the floodplains of watercourses) and to effectively combat the extreme effects of climate change and their impacts not only on the landscape but also on the socio-economic system.

In the **2014–2020 OP ENV**, this issue was addressed primarily under Priority Axis 1 ("Improving Water Quality and Reducing Flood Risk") in Supported Area 1.3 ("Ensuring the Intramural Flood Control and Rainwater Management") and 1.4 ("Supporting Preventive Flood Control Measures"). Projects in these areas also tackle water retention in landscapes and settlements, including better water management, in the context of growing urgency of tackling **drought**. This was the focus of OP ENV support for the development of water supply infrastructure to ensure sufficient drinking water for the population, specifically under Supported Area 1.2 ("Ensuring Supplies of Drinking Water of Adequate Quality and Quantity"). In addition, drought was also addressed in Priority Axis 4 ("Protection and Care of Nature and Landscape") under Supported Area 4.3 ("Strengthening the Natural Landscape Functions"). By the end of 2023, in total more than 1,600 projects worth CZK 10.9 billion TEE (total eligible expenditure, of which more than CZK 5 billion was spent specifically on flood control measures) were approved for the above areas in the 2014–2020 OP ENV.

In 2022, the European Commission approved the **OP ENV for the 2021–2027 programming period** with a total allocation of EUR 3.0 billion (CZK 75.7 billion TEE) by the end of 2023. The main supported areas include support for climate change adaptation (such as flood control measures) with an allocation of over CZK 12.6 billion TEE and support for water access and sustainable water management with an allocation of CZK 17.5 billion TEE. By the end of 2023, approximately 290 projects covering these areas were approved for a total of CZK 3.2 billion TEE.

Since 2017, the issue of drought has also been addressed through the national subsidy programme **Rainwater (Dešťovka)** envisaged under the National Programme for the Environment (NP ENV). The aim of the programme is to incentivise efficient water management and thereby reduce the amount of drinking water abstracted from surface and groundwater sources. A total of CZK 540 million has been allocated in two calls for proposals so far. By the end of 2023, 10,195 projects were approved with a total support amount of about CZK 400 million (for more information on the "Rainwater" programme, see chapter 1.6 Adapted settlements).

Adaptation measures to mitigate the climate change impacts are also addressed by the national subsidy programme of the Ministry of the Environment, Landscape Management Programme, in particular its Sub-programme B for the enhancement of the preserved natural and landscape environment, where over the period 2014–2023, almost 7,000 projects were supported worth CZK 368.0 million. Another programme called **Support for the Restoration of Natural Landscape Functions** provides opportunities to mitigate the impacts of climate change on aquatic, forest and non-forest ecosystems. Over the period 2014–2023, CZK 122.8 million was spent on the implementation of 975 actions under this programme. Since 2022, funding for this programme has been provided by the National Recovery Plan and between 2022 and 2023, over 700 projects worth CZK 100 million were supported under climate change adaptation measures.

The **Ministry of Agriculture** has implemented measures to mitigate the negative impacts of climate change (i.e. in particular flood control measures and water retention in the landscape in connection with drought) through more than 10 national programmes and in particular through **RDP** as a transnational source. The total amount of funds paid from the national programmes under the MoA administration in the years 2014–2023 amounted to approximately CZK 18.9 billion (of which approximately CZK 5.8 billion were disbursed under the Flood Prevention Programme III and IV). Land consolidation financed mainly from the RDP or CAP CP (complex or simple), contributing to the recovery from the negative climate change impacts, especially in the area of reducing the adverse effects of floods and droughts and addressing runoff conditions in the landscape, needs to be mentioned. By the end of 2023, 40.8% of the area of the agricultural property stock (more than 1.7 million ha) had undergone comprehensive and simple land consolidation. Between 2014 and 2023, CZK 3.2 billion was spent on the implementation of anti-erosion, hydrological and ecological measures within the framework of land consolidation. The RDP or CAP SP also provide funding for agri-environmental and climate measures (AECM); over the period 2014–2023 specifically in the area of landscape management these measures were implemented on about 25 thousand ha of agricultural land for about CZK 2.6 billion. During the same period, CZK 2.3 billion was spent from the RDP on forest protection, i.e. in support of investments in forest development, forest vitality improvement and forest-environmental and climatic measures.

In addition to the Ministry of the Environment and the Ministry of Agriculture, the issue of adaptation to climate change is also addressed by the **Ministry of Regional Development and the Ministry of Industry and Trade**. The Ministry of Regional Development is responsible for the **IROP** administration, which sets specific objective 2.1: "Promoting climate change adaptation and disaster risk prevention and resilience", taking into account ecosystem-based approaches. Specifically, this objective supports increased preparedness of the Integrated Rescue System units to deal with emergencies related to climate change and accidents involving hazardous substance. For the 2021–2027 programming period, 35 projects with a total allocation of CZK 9.2 billion were approved in 5 IROP calls with a total volume of CZK 1.8 billion TEE. In the previous programming period 2014–2020, almost 300 projects were supported for the same purpose for a total of CZK 5.3 billion TEE.

The MIT supports the implementation of measures aimed at saving water in the corporate sector, for example under the **OP EIC** and **OP TAC** operational programmes, in order to prevent the negative impacts of drought on industrial enterprises. With the contribution of the Property Programme under OP EIC, small and medium-sized enterprises were able to implement water saving measures (i.e. rainwater harvesting and use, water recycling, greywater use, etc.) as part of comprehensive projects for the revitalisation of buildings used for commercial activities and their adjacent infrastructure. The total allocation of the respective calls was CZK 2 billion. Similar support under the Sustainable Water Management activity, intended for all types of enterprise sizes, is also offered by the OP TAC through the relevant call with an allocation of CZK 1.2 billion. Another support could be obtained from the National Recovery Plan (NRP, Component 2.7 "Circular economy, recycling and industrial water"), specifically through the call Water Savings in Industry with a total allocation of CZK 1 billion. The MIT has also developed a methodology aimed at preparing assessments of water management in industrial enterprises (so-called **"water audit"**). The benefits of the water audit should be particularly a more careful water and water resources management by business.

Preparedness for extreme weather is also ensured by the **Integrated Warning Service System ('IWSS')**, jointly provided by the Czech Meteorological Office and the Meteorological Service of the Czech Army in the fields of operational meteorology and hydrology. Warning alerts of dangerous weather and hydrological events are issued in line with the World Meteorological Organization (WMO) recommendations and are handed on to the European warning system Meteoalarm[25]. The purpose of issuing warning alerts is to warn the public, the state administration and economic entities of the risk of hazardous event in a timely manner to mitigate their effects or to support the recovery from the consequences that have already occurred. Alerts are divided into Warning Information (PVI), predicting and warning of hazardous events, and Information on the Occurrence of a Dangerous Event (IVNJ), warning about selected particularly hazardous events that have already occurred.

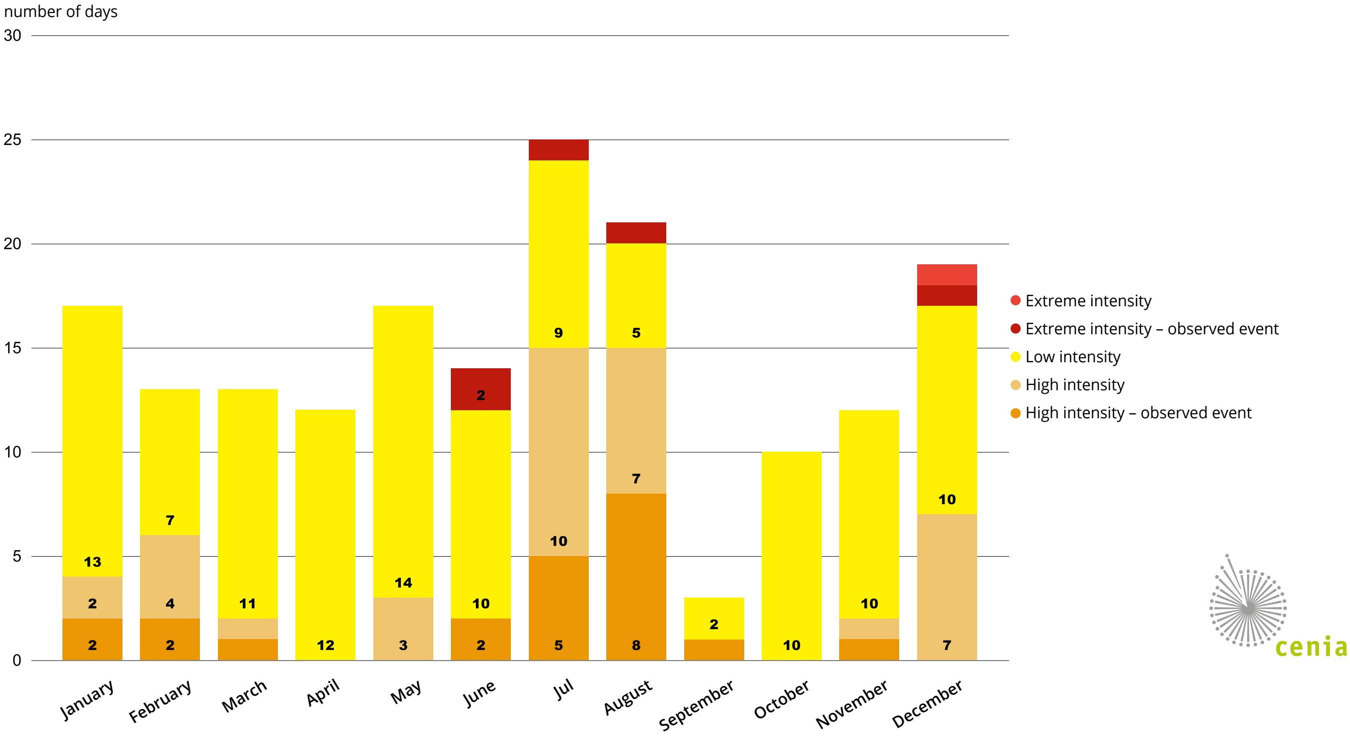
In 2023, a total of **277 warning alerts** were issued by the IWSS, of which 170 were predictive warning alerts and 107 warned of the imminent occurrence of a hazardous events. A total of 220 warning alerts, of which 156 predictive, were issued to warn of a meteorological event. A total of 57 warning alerts were issued by the **Flood Reporting and Forecasting Service**, of which 14 were predictive and 43 warned of the occurrence of flood conditions. In 2023, weekly hydrological drought warning alerts were newly provided by the HAMR assessment system for each municipality with extended jurisdiction.

[25] *www.meteoalarm.org*

Weather warnings applied on a total of **176 days**, i.e. 48% of the days in the year. Warnings alerting of **low-intensity** events prevailed (113 days, Chart 22). Warning of **high intensity** events applied on 57 days, with **extreme intensity** only on 6 days. Warnings for high and extreme intensity events were prevalent in July and August (thunderstorms, fires, maximum temperatures, rain) and were also frequent in December, when warnings were issued for snowfall and the presence of new snow cover. Throughout the year, the shortest warning lasted in September (3 days), and the highest number of days with a warning was in July, 25 days, of which 1 day was a warning of the highest danger level of extremely high temperatures (above 37 °C).

Chart 22

Number of days with IWSS warning alerts for expected and observed hazardous events [number of days], 2023

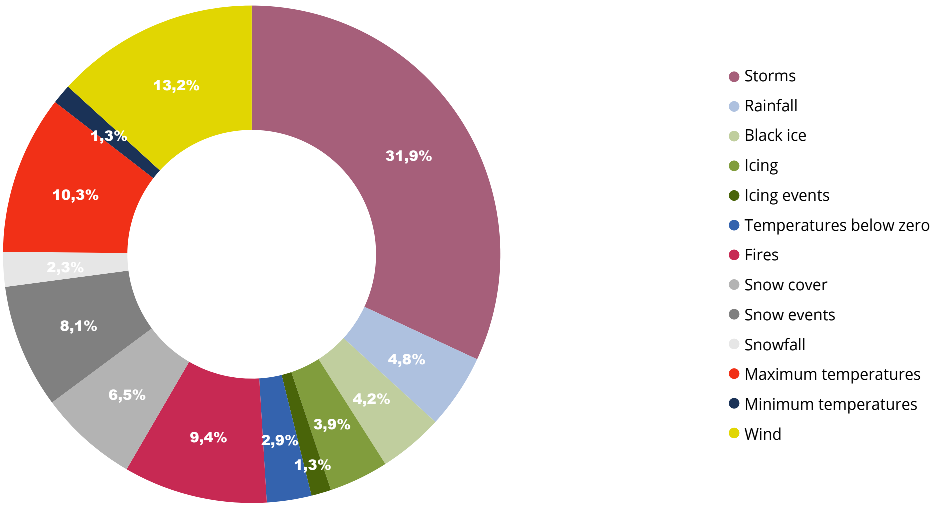


https://www.envirometr.cz/data/prehled-vystrah-sivs-jevy-dle-intenzity *Data source: CHMI*

Of the total number of warning alerts issued, the most frequent ones were the warnings of **storms**, making 45% of the total number of alerts and 31.9% of the total number of events in the alerts (one alert can warn of multiple events, Chart 23). A significant amount of storm warnings were short-term warnings for the imminent occurrence of storms of high and extreme intensity. A significant number of alerts were also issued for wind, high temperatures and fires, with 22 of the 29 fire alerts issued in July.

Chart 23

Distribution of groups of events in IWSS warning alerts [%], 2023



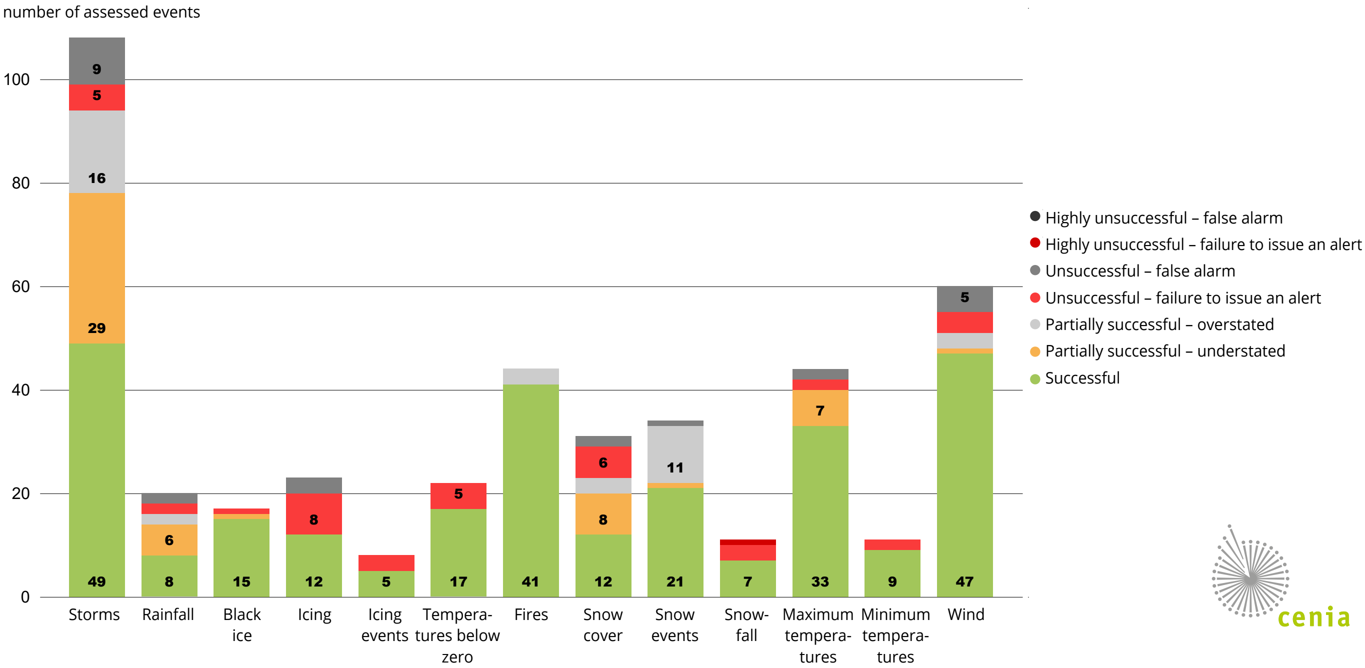
https://www.envirometr.cz/data/prehled-vystrah-sivs-kategorie-jevu

Data source: CHMI

Performance assessment of weather warning alerts is carried out with reference to actual measured or observed events on the respective calendar days. It is not the entire warning that is being assessed, but the separate events with respect to their intensity within the area covered by the warning alert for the event in question. The assessment of warning alerts issued by IWSS for the year 2023 was carried out for a total of 433 events, i.e. issued warning alerts and observed hazardous events. 276 events were assessed as successful, i.e. 63.7% of the total number of assessed events. Warnings assessed as partially successful (21.0%) were more often understated (12.2%), i.e. the warnings were issued for a lower intensity event than actually occurred. In the case of events assessed as unsuccessful, the events not addressed by the alert (failure to issue an alert), which occurred in 15.0% of the evaluated events, were more prevalent than warning alerts for events that failed to occur (false alarm – 5.5%). In 2023, the only event rated as very unsuccessful was a failure to issue a warning alert of extreme snowfall in December; however, snow events were not left uncovered, and warnings were issued for high and extreme new snow cover.

Chart 24

Performance assessment of issued warning alerts for each category of hazardous events [number of events assessed], 2023



https://www.envirometr.cz/data/prehled-vystrah-sivs-uspesnost-vystrah *Data source: CHMI*

When broken down by event category, the highest number of assessed events concerned storms (Chart 24), with a higher proportion of poorer warning performance categories. These include mainly under-rated intensity of storms for which a warning alert was issued and, on the contrary, warning alerts issued for storms that failed to occur in the region (false alarms), owing to the difficulty of predicting the exact location of storms. Warning alerts of fire danger (91.2% of successful alerts), ice (88.2%), high winds (78.3%) and high temperatures (75% of events rated as successful) were above average.

Impact of emergencies and crisis situations

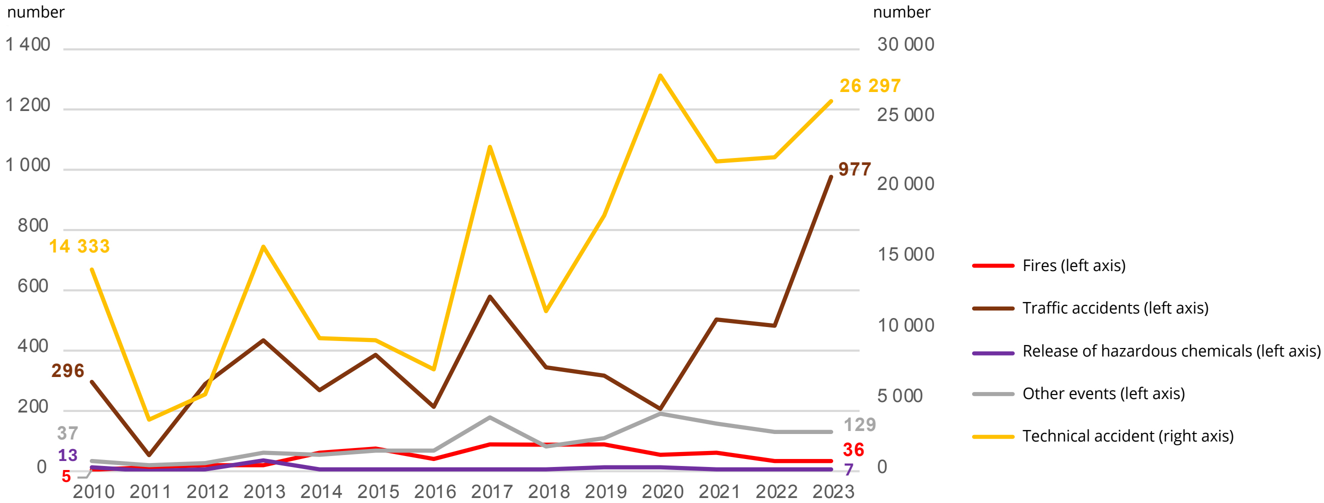
In the context of intensifying impacts of climate change, an increased incidence of extreme events requiring the activation of the Integrated Rescue System can be expected. The main coordinator of the Integrated Rescue System is the Fire and Rescue Service of the Czech Republic (Fire Brigade), which, in addition to fires, is responsible for dealing with other **emergencies caused by climate change**, such as prolonged droughts, hurricanes and windstorms, floods, excessive snowfalls or massive icing, as well as incidents caused by human activity, such as accidents associated with the release of hazardous substances.

In 2023, a total of 27,446 emergencies related to natural disasters occurred, requiring 35,241 associated responses involving 32,968 fire brigade units. Compared to 2022, there was an increase in all instances, by an average of 20%. In 2023, natural disasters resulted in 5 deaths, 381 injuries and 1,700 evacuations. Damage caused by fires as a result of natural disasters amounted to CZK 25.5 million. At the same time, a total of 454 people were saved and the value preserved in the case of fires amounted to CZK 41.1 million.

Looking at the trends since 2010 (see Chart 25), with the exception of the release of hazardous substances, the number of incidents has been increasing, notably in the case of road accidents and technical accidents. The latter category dominates with over 95% of the total number of emergencies. These include mostly damage or destruction of buildings, removal of fallen trees and electrical wires, and rescue of persons and animals.

Chart 25

Number of natural disaster events in the Czech Republic, 2010–2023



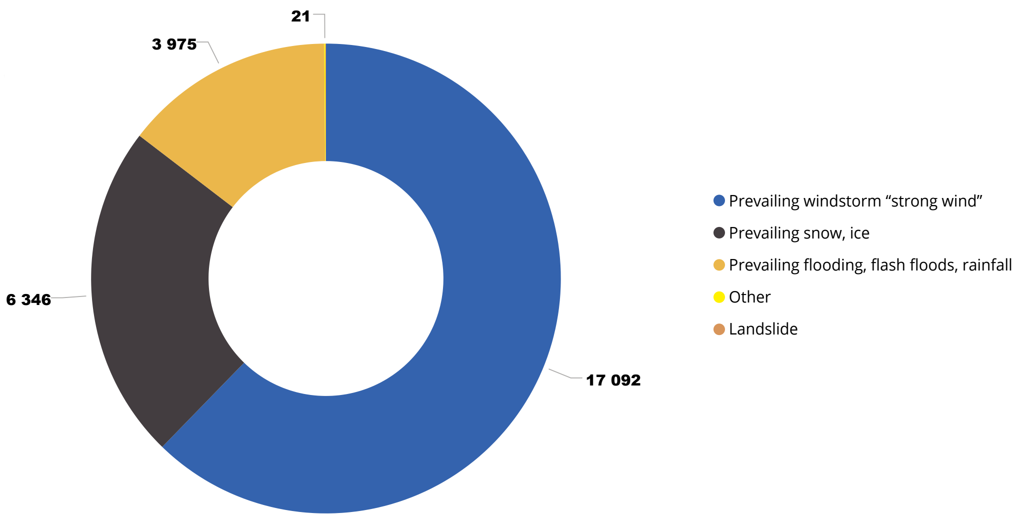
https://www.envirometr.cz/data/pocet-udalosti-a-zasahu-v-dusledku-zivelnich-pohrom

Data source: MoI – General Directorate of the Fire and Rescue Service of the Czech Republic

The leading cause of accidents in the long term is mainly strong winds, with the exception of traffic accidents, mainly caused by snow and ice. Flooding, flash floods or rain are also a significant cause in the long term, but in 2023 they were ranked third in terms of the frequency of incidents, after the above listed causes, i.e. high winds and snow with ice (Chart 26).

Chart 26

Distribution of various natural disasters in the total number of events in the Czech Republic [number], 2023



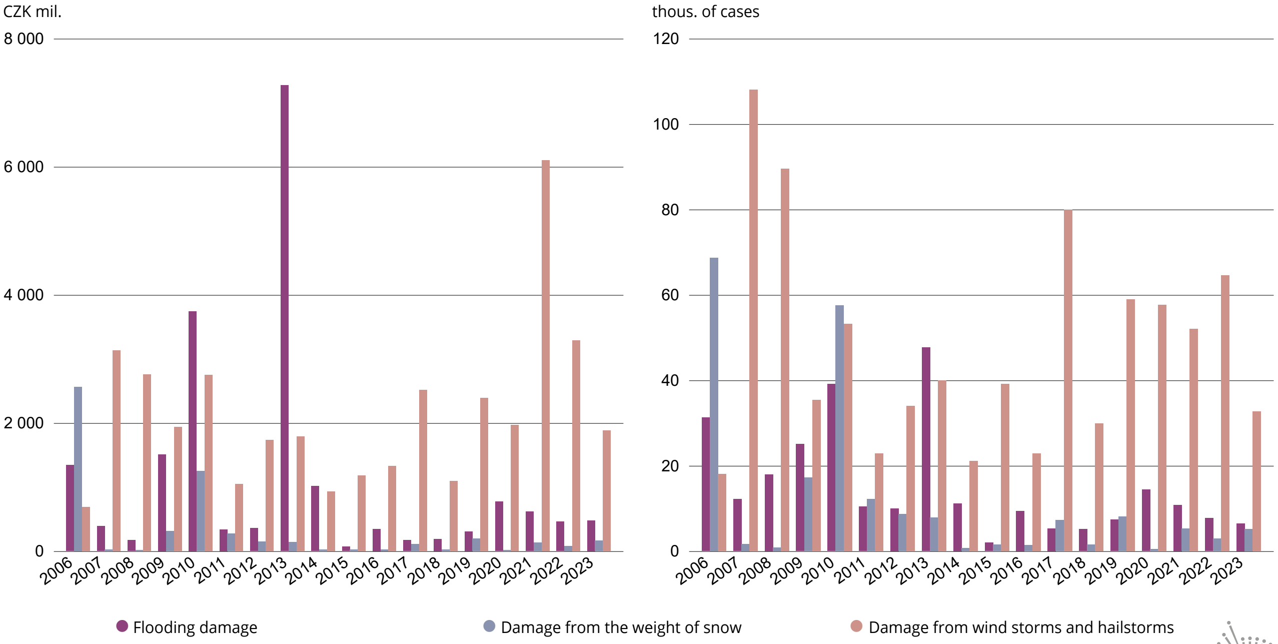
https://www.envirometr.cz/data/pocet-udalosti-a-zasahu-v-dusledku-zivelnich-pohrom

Data source: MoI – General Directorate of the Fire and Rescue Service of the Czech Republic

A comprehensive view of the issue of **monitoring and settlement of claims after natural disasters** is shown by the statistics of the Czech Association of Insurance Companies, which, among other reported property losses, also monitors damage caused by floods, windstorms, hail and snow (see Chart 27). These statistics reveal fluctuations in both the volumes and numbers of losses related to extreme natural events. Since 2006, insurers have recorded more than 1.3 million claims caused by the above-mentioned natural events, with a total loss of CZK 63.5 billion, including 44 thousand claims with a loss of CZK 2.5 billion in 2023. The major contributors to both the number of insured events and total damage are windstorms and hailstorms.

Chart 27

Claims lodged under insurance against natural hazards in the Czech Republic [million CZK, thousands of cases], 2006–2023



https://www.envirometr.cz/data/pocet-a-vyse-skodnich-udalosti-zpusobenych-zivly

Data source: Czech Association of Insurance Companies

However, another effect of climate change, **long-term drought**, has not yet featured in insurance companies' statistics. In our country, long-term drought is emerging as the most serious climate change effect having major potential impacts not only on biodiversity, but also on the population and the economy. Although drought has not been the same problem in the past 5 years as in the extremely dry year of 2018, its economic consequences may be long-term. This is particularly apparent in the case of forests, where extensive logging and subsequent reforestation continues to take place after the bark beetle calamity, caused primarily by excessive drought. In this context, more than CZK 4.5 billion worth of compensation was provided to farmers from national sources during 2015–2023, and more than CZK 12.9 billion worth of contributions were provided to the forestry sector to mitigate the impact of the forest bark beetle calamity.

Recurring natural disasters caused by natural factors require a comprehensive approach to addressing the settlement of claims and asset recovery following these disasters. That is why the Ministry of Regional Development in cooperation with other ministries is developing **strategies for the territory recovery and reconstruction**. These strategies constitute a document establishing the framework conditions for the provision of state aid primarily through programme financing within the competence of appointed ministries (e.g. through the programmes of the Ministry of the Environment "Settlement of Claims after Natural Disasters", the Ministry of Agriculture "Remedying the effects of Flooding on State Water Management Property", the Ministry of Regional Development "Restoring Municipal and Regional Property after Natural Disasters" or the "Živel" ("Natural Calamity") programme, or the applicable operational programmes under the EU funds).

In 2005–2023, recovery and restoration strategies were developed mainly with regard to devastating floods or storms or hurricanes. The total amount of damage (as reflected by the total restoration costs) caused by these floodings or flash floods amounted to some EUR 44 billion over the period 2005–2023. Between 2014 and 2023, no major floodings or flash floods occurred. With regard to windstorms and hurricanes, the recovery and restoration strategy was developed in the wake of Hurricane Kyrill in 2007, when the total cost of property restoration amounted to almost CZK 7.5 billion. In connection with the 2021 tornado in Moravia, the losses to private and public property were estimated at CZK 6.9 billion.

The issue of the human protection under common risks and emergencies is covered by **preventive and educational activities related to the civil protection and crisis management**. The guarantor of the civil protection, fire prevention and of the Integrated Rescue System is the Fire and Rescue Service of the Czech Republic, which in order to inform the public through preventive education activities addresses children in kindergartens, pupils and students in primary and secondary schools, universities, adult population, seniors and disabled citizens. The preventive and educational activities are based primarily on personal contact between members of the Fire and Rescue Service of the Czech Republic with the general public. This includes in particular training the population through various educational projects, programmes, talks, presentations or excursions, training of primary and secondary school teachers or fitness/knowledge contests, etc. The years 2020 and 2021 were quite exceptional due to the measures related to the spread of **Covid-19** and therefore cannot be assessed in comparison with the previous period. The year 2022 can be seen as the beginning of a gradual return to the pre-Covidian regime, which was confirmed in 2023. Social media and regional media outlets are particularly effective tools for communicating preventive information to citizens. Thanks to the aforementioned availability of information with preventive content, not only the number of media outlets picking up this content has increased significantly, but also the number of citizens receiving the necessary information in connection with emergencies or other current risks in a timely manner.

Occurrence of emergencies

The **Major-Accident Prevention System**[26] requires operators of establishments where selected hazardous chemical substances or mixtures are present to put in place all measures to prevent a major accident from occurring, as well as to establish procedures to deal with it in the event that an accident occurs despite the precautions taken.

In the Czech Republic, a total of 214 establishments were included in the major accident prevention system in 2023, of which 100 establishments fell into Group A (lower risk) and 114 establishments into Group B (higher risk). These include mostly chemical plants or production plants handling hazardous substances, but also, for example, fuel or chemical warehouses.

During 2023, there were five major accidents in the Czech Republic involving explosions, fires, hazardous substance leaks and personal injuries. One reported incident was assessed by the operator as a technical equipment failure, in some cases the Czech Environmental Inspectorate (CEI) found breaches of statutory duties set out in the Act on the Prevention of Major Accidents and a report was submitted to the relevant regional authority. In other cases, administrative proceedings will be conducted by the CEI. Minor deficiencies were corrected during the inspections.

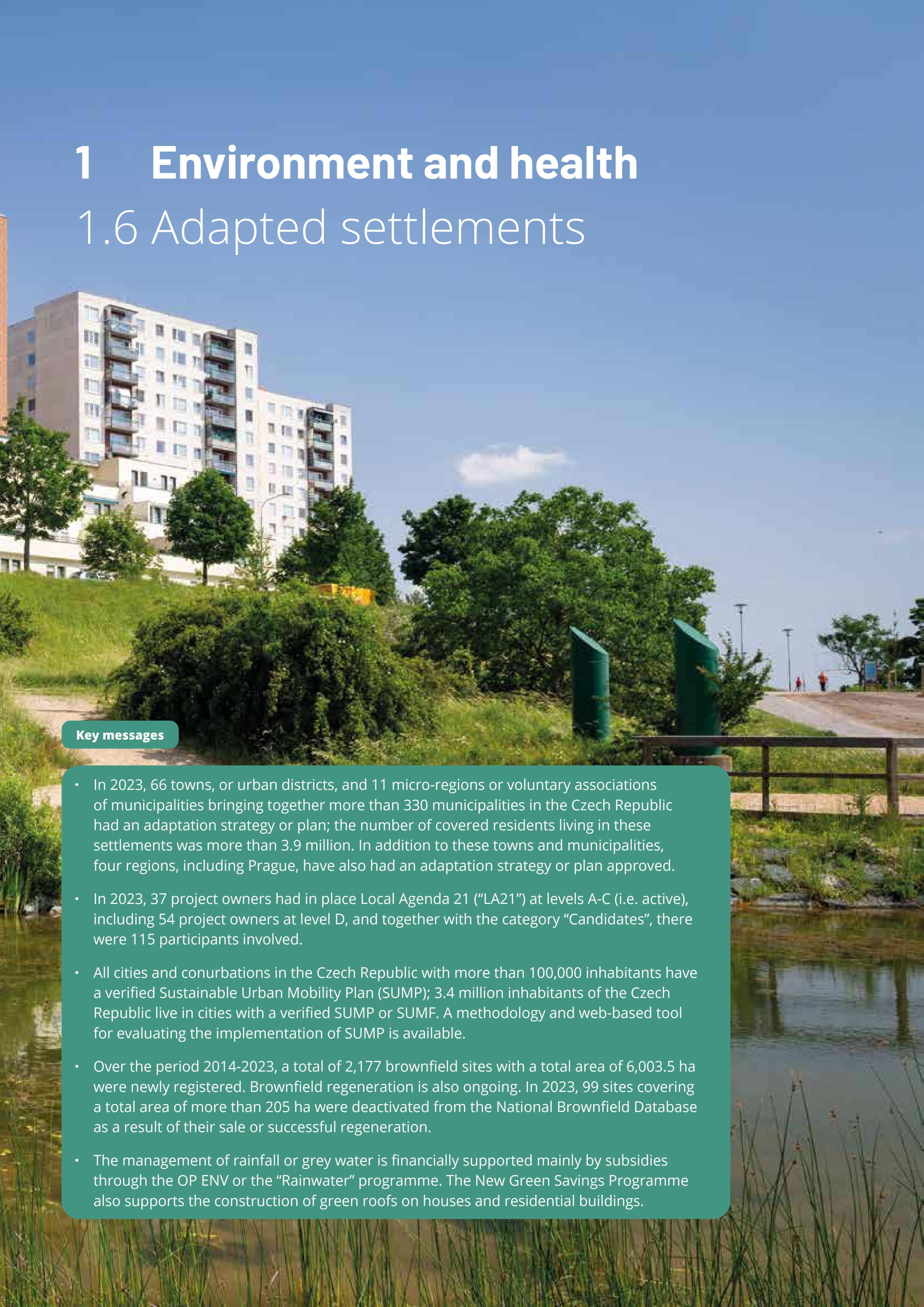
Detailed visualisations and data

https://www.envirometr.cz/data

[26] *Act No. 224/2015 Coll., on the prevention of major accidents, implements the relevant European Union regulation (Directive 2012/18/EU of the European Parliament and of the Council, the so-called Seveso III) and establishes a prevention system.*

1 Environment and health

1.6 Adapted settlements



Key messages

- In 2023, 66 towns, or urban districts, and 11 micro-regions or voluntary associations of municipalities bringing together more than 330 municipalities in the Czech Republic had an adaptation strategy or plan; the number of covered residents living in these settlements was more than 3.9 million. In addition to these towns and municipalities, four regions, including Prague, have also had an adaptation strategy or plan approved.
- In 2023, 37 project owners had in place Local Agenda 21 ("LA21") at levels A-C (i.e. active), including 54 project owners at level D, and together with the category "Candidates", there were 115 participants involved.
- All cities and conurbations in the Czech Republic with more than 100,000 inhabitants have a verified Sustainable Urban Mobility Plan (SUMP); 3.4 million inhabitants of the Czech Republic live in cities with a verified SUMP or SUMF. A methodology and web-based tool for evaluating the implementation of SUMP is available.
- Over the period 2014-2023, a total of 2,177 brownfield sites with a total area of 6,003.5 ha were newly registered. Brownfield regeneration is also ongoing. In 2023, 99 sites covering a total area of more than 205 ha were deactivated from the National Brownfield Database as a result of their sale or successful regeneration.
- The management of rainfall or grey water is financially supported mainly by subsidies through the OP ENV or the "Rainwater" programme. The New Green Savings Programme also supports the construction of green roofs on houses and residential buildings.

1.6 | Adapted settlements

Meeting the underlying targets

Target set	For year	Value in 2023	On track towards the target
Increase the total number of registered entities in LA21 to 500 (NEP 2030 target)	2030	115	✗

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
1.6.1 Settlements adapt effectively to climate change risks	Number of municipalities with adaptation plans	N/A	↗	✗
1.6.2 The development of settlements is conceptual, priority is given to the use of brownfield sites and already used areas	Brownfield sites	N/A	N/A	~
	Local Agenda 21	↗	↘	✗
	Sustainable Urban Mobility Plans	N/A	↗	✓
1.6.3 The settlements have an established water management system, including rainwater	Supported projects for the use of rainwater and grey water	N/A	↗	✓
1.6.4 The quality of green infrastructure contributing to an improved microclimate in settlements is increasing	Urban green spaces	N/A	→	~

Current measures supporting achievement of the objective

- The drought control policy concept for the Czech Republic was updated in 2023.
- The Ministry of the Environment supports municipalities, LAGs and DSOs through the calls of the NP ENV to promote the development of Sustainable Energy and Climate Action Plans (SECAP) within the framework of the Covenant of Mayors European Initiative for Energy and Climate.
- The Ministry of the Environment has prepared a methodological tool for municipalities for the preparation of adaptation strategies.
- Financial support for the regeneration of brownfield sites for both non-business and business use continued.
- Support for blue-green infrastructure, e.g. support for rainwater management, construction of green roofs or replacement of impermeable surfaces, continues under the NP ENV, NGS or relevant operational programmes.

- The NGO Support Programme supports projects aimed at awareness raising and education in the field of climate change adaptation in settlements. Topics include green roofs, greening of courtyards, planting of greenery in settlements and training of municipal staff.
- A clear methodology for rainwater management in relation to green infrastructure has been completed and published. It is intended primarily for mayors and elected representatives of Czech cities and municipal staff to provide a concise but comprehensive introduction to the subject.

Adaptation of settlements to climate change

The impacts of climate change on settlements/urban areas constitute a complex cross-sectoral environmental issue that has been at the fore of strategic documents at national and local level in recent years. At the national level, various strategic and policy documents have highlighted climate change as a priority environmental issue for the Czech Republic, and an increasing number of cities and municipalities are also beginning to realise that the ability to adapt to climate change through appropriate adaptation measures will be a key factor in improving the quality of life of their inhabitants. This corresponds to the relatively high growth rate of cities and municipalities in recent years that have developed and approved their own adaptation strategy or plan enabling the **integration of specific adaptation actions into their planning processes**.

The adoption of adaptation strategies is essential not only at EU, international and national level, but also and, in particular, at local level, to prepare for the negative impacts of climate change and to prevent and minimise potential damage. These strategies often have an urban dimension, as local public administrations are best placed to respond to climate change and to gradually adapt to it. Climate change impacts in a particular city may occur in the near future with high economic, environmental and social consequences. Actions taken now are much more effective and less costly than future solutions to problems such as damage caused by flash floods, buildings and public transport overheating, or lack of water resources.

The first adaptation strategies of cities began to emerge after 2015 (Praha, Brno, Plzeň), followed by other cities, funding their adaptation strategies mainly with the support of the EEA and Norway Grants (e.g. under the UrbanAdapt project), and also through the NP ENV, designed among other things, to promote the involvement of municipalities in the Covenant of Mayors ("Covenant"). The Covenant is a joint initiative of cities, municipalities and the European Commission and is the main source of EU support for municipalities in their climate change adaptation activities. By signing the Covenant, the municipality commits to prepare a Sustainable Energy and Climate Action Plan ("SECAP") within two years. Although SECAP is not a standard adaptation strategy, it could be, in view of its scope, considered a document addressing the issue of adaptation of settlements to climate change.

In 2023, 66 towns, or urban districts, and 11 micro-regions or voluntary associations of municipalities bringing together more than 330 municipalities in the Czech Republic had an **adaptation strategy or plan** (or a non-binding adaptation "road map"); the number of covered residents living in these settlements was more than 3.9 million. In addition to these towns and municipalities, four regions, including Prague and Mendel University in Brno, have also had an adaptation strategy or plan approved. However, the issue of adaptation to climate change is at least partially addressed by the "Smart City" concept, which has been developed by 14 cities, either independently on or in addition to an existing adaptation strategy or plan. Transport, greenery and energy are central themes of the adaptation strategies or plans of cities and municipalities. The implementation of sustainable urban mobility plans contributes to the adaptation of transport systems, while in the case of greenery, the focus is usually on urban greenery and its aesthetic/recreational functions, but without a comprehensive solution to its functionality in terms of adaptation to climate change. The management of rainfall or grey water is also a widely addressed topic in most cities.

It needs to be acknowledged that the preparation and implementation of an adaptation strategy at local level is a highly challenging process, with many obstacles to be taken into account. In the context of the adaptation of settlements to climate change, or in the context of efforts to achieve climate neutrality, settlements in the preparatory phase are particularly confronted with obstacles related to the lack of powers and staff capacity of the authorities. In the planning phase, settlements face problems mainly related to property rights and coordination between urban districts, authorities or institutions. In the implementation phase, the main obstacle is funding or the readiness of legislation, which can significantly limit or even prevent the implementation of some adaptation actions. The aforementioned obstacles could be addressed by systematic support to settlements provided from the national level or by supporting platforms for climate-neutral cities – the set-up of which, however, is still not optimal.

Conceptual development of settlements and use of brownfield sites

Conceptual development of settlements is not feasible without continuous updates of spatial and strategic plans. This requires, among other things, the use of incentives for the reuse of **brownfield sites**, which are often located in the centres of towns and villages and pose a major problem for the sustainable development of settlements. The brownfield sites are abandoned properties (land, buildings, premises) that have been vacant, are neglected and possibly contaminated, cannot be used effectively without an overall rehabilitation process, and are left over from industrial, agricultural, military or other uses. In most cases, the costs of revitalising these areas are so high that they exceed the real financial capacity of the landowners and therefore continue to deteriorate and become a burden on their surroundings.

The issue of brownfield sites has long been dealt with by CzechInvest, an agency promoting business and investment development, which runs the publicly accessible **National Brownfield Database**. Over the period 2014–2023, a total of 2,177 brownfield sites with a total area of 6,003.5 ha were **registered** in that database. In 2023, a total of 67 brownfield sites with a total area of 387.8 ha were newly registered in the Czech Republic. The average size of a brownfield site was 3.2 ha.

At the end of 2023, a total of **4,458 sites with a total area of 14,094 ha** were registered in the National Brownfield Database, with the largest number of brownfields registered in 2023 in the Moravian-Silesian (683 sites) and Ústí nad Labem regions (504 sites). In the aggregate, the most extensive areas were the vacant sites in the Ústí nad Labem Region (2,783 ha), the Moravian-Silesian Region (2,062 ha) and the Central Bohemian Region (1,687 ha).

Compared to the results of 2022, when an extensive database update and more detailed mapping of brownfield sites took place, the year-on-year increase in the number of registered brownfield sites between 2022 and 2023 was essentially insignificant.

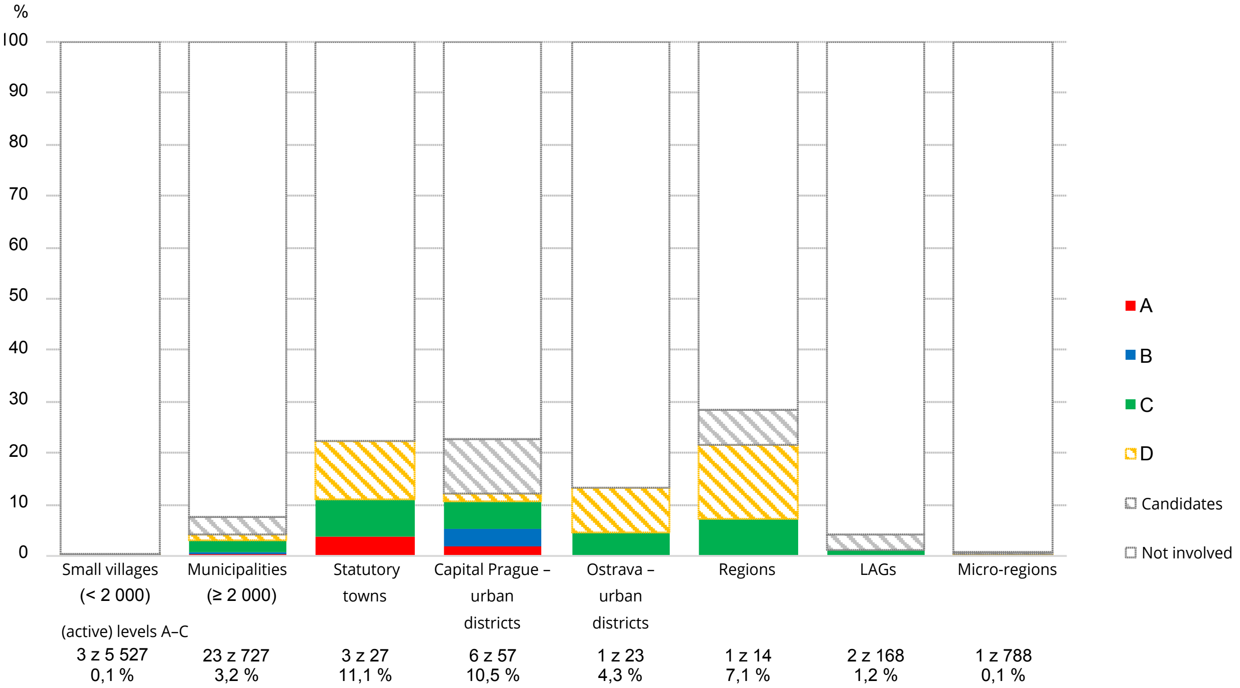
Brownfield sites in the Czech Republic are being **regenerated**. In 2023, 99 sites covering a total area of more than 205 ha were deactivated from the National Brownfield Database as a result of their sale or successful regeneration, including through subsidy programmes. Because of the potential of their further use, brownfield regeneration will have to be promoted.

Conceptual or sustainable development of settlements is supported by the voluntary instrument **Local Agenda 21 ("LA21")**, which is coordinated by the Ministry of the Environment. It is a state-sponsored programme to support the sustainable development of municipalities and regions. This instrument is based on close cooperation between the relevant authorities and not only commercial entities and associations operating locally, but also and foremost with the public, i.e. the residents of a given settlement or region.

In 2023, 37 project owners had in place LA21 at levels A–C (i.e. active), including 54 project owners at level D, and together with the category "Candidates", there were 115 participants involved. In terms of figures, the largest group of so-called active project owners (i.e. levels A–C) consisted of municipalities with at least 2 thousand inhabitants (23 municipalities out of 727, i.e. 3.2%), followed by Prague city districts (6 out of 57, i.e. 10.5%), while in the case of other groups of project owners, i.e. municipalities with a population under 2 thousand, regions, local action groups ("LAGs") and micro-regions, the interest was lower (see Chart 28 for details). In the short term, i.e. over the last 5 years, the number of LA21 project owners has been declining. Thus, if the current trends persist, the targets for the number of project owners set in the NEP 2030 (500 registered entities) will not be met. The reasons for this may range from a change in political leadership in the municipalities or cities concerned, the need to meet more demanding criteria and tasks in the transition to the next phases of the LA21 implementation, a simple loss of interest, insufficient funding or unforeseen contingencies such as the Covid-19 pandemic. The lack of awareness of this instrument and its poor attractiveness, also with regard to the need for its administration, play a significant role here as well. The stagnation or downward trend of LA21 implementation continues despite the fact that in order to promote greater involvement of all groups in LA21, a new methodology for assessing LA21 implementation has been gradually developed and approved for each group since 2019, more adapted to the reality and situation of each group of project owners. For these reasons, the MoE is working on a significant revision of the LA21 implementation rules.

Chart 28

Local Agenda 21 participants [in %], 2023



The proportion of neighbourhoods and urban districts not listed in the chart not involved in LA21 was 100%.

https://www.envirometr.cz/data/pocet-registrovanych-subjektu-ma21

Data source: MoE[27]

[27] *The National Network of Local Action Groups of the Czech Republic, special interest association, which represented the majority of LAGs in the Czech Republic, provided data on 168 LAGs in its membership database as of 12 August 2024. August 2024 (available from: http://databaze.nsmascr.cz/index.php).*
The figure of 788 micro-regions is given in the update (as of 31 December 2018) of an overview of functional micro-regions and euroregions in the Czech Republic, see ŠIMKOVÁ, Hana. Microregions and Euroregions in the Czech Republic: 2018 update. Online. Urban planning and territorial development. 2019, vol. XXII, No. 1, p. 54. ISSN 1212-0855.
Available from: https://www.uur.cz/media/fxqjvxhf/08-mikroregiony.pdf. [quot. 2024-08-12].

The range of areas covered by LA21 is wide – from the environment, to health, territorial development, social issues, education and transport. In particular, sustainable urban mobility is one of the key issues addressed through **Sustainable Urban Development Plans ("SUMPs")**. This is an EU-wide policy to change the approach to urban mobility in order to ensure that urban areas develop in a more sustainable way and to meet the EU's objectives for a competitive and resource-efficient European transport system. The purpose of the SUMP is to ensure the accessibility of transport in cities while minimising its negative impacts on health and the environment (noise and pollution) and thus improving the quality of life of the population.

The development and implementation of the SUMP in the Czech Republic takes place within the framework of the **2021–2030 Urban and Active Mobility Policy Concept**, as approved by the Government in January 2021, for 6 size categories of towns A–F. The development of SUMPs has so far been carried out following the **Methodology for the Preparation of Sustainable Urban Mobility Plans of the Czech Republic** (TRC, public research institution, 2015). One of the conditions for funding urban projects under the OP T and IROP in the 2014–2020 programming period was to have either a full-fledged SUMP or a simplified version of the SUMF (Sustainable Urban Mobility Framework) focusing on public transport. In September 2021, the new **Methodology for Sustainable Urban Mobility Plan SUMP 2.0**[28], developed as an output of the Technology Agency of the Czech Republic's MOBILMAN project "Human Dimension of Sustainable Urban and Regional Mobility Plans", was submitted for final comments and certification. A communication plan for the preparation and implementation of the SUMP is an annex to the methodology.

Director and coordinator of the SUMP and SUMF approval processes of is the Ministry of Transport of the Czech Republic, in cooperation with the Ministry for Regional Development and relevant partners, including professionals and academic experts. The SUMP and SUMF approval processes are carried out by the Committee for the Assessment of Urban Mobility Documents (CAUMD), appointed by the 1st Deputy Minister of Transport. Evaluation of the SUMP performance is carried out **based on the Methodology for Evaluation of Sustainable Urban Mobility** (UJEP Ústí n. L., May 2022)[29].

By the end of 2023, a total of **29 sustainable urban mobility dossiers** had been submitted to CAUMD for consideration. Applications from 6 towns and conurbations, including Hradec Králové, Ústí n. L. and Pardubice, were submitted for the first time as SUMFs, while the others were full-fledged SUMPs. In the municipalities of Hradec Králové, Opava and Přerov the final verification was achieved only at the SUMF level, whereby the latter two towns initially submitted their applications as a SUMP, but failed to meet all the SUMP requirements and were verified as SUMFs. The dossiers of the towns of Chomutov, Mladá Boleslav and Otrokovice are being prepared for submission to CAUMD.

By the end of 2023, all cities/towns and conurbations above 100 thousand inhabitants had their SUMPs verified. The municipalities with verified SUMPs account for 3.4 million inhabitants, less than one third of the population of the Czech Republic.

28 *https://md.gov.cz/Dokumenty/Veda-a-vyzkum/Certifikovane-metodiky/Ostatni-metodiky/Metodika-planu-udrzitelne-mestske-mobility-SUMP-2?returl=/Dokumenty/Veda-a-vyzkum/Certifikovane-metodiky/Ostatni-metodiky*

29 *The methodology includes a web-based tool PLUMM (Sustainable Urban Mobility planner).*

Water management system in settlements

Rainfall water management system can be defined as a method of precipitation water (mainly rainwater) management that seeks to **maintain the natural water balance in the area after its urbanisation**. The basic approach to rainwater management is decentralised drainage. It is a rainfall water management approach that targets the full spectrum of rainfall variability from normal rainfall to extreme rainfall events, seeking to mimic as much as possible the natural runoff characteristics of the site prior to urbanisation, to protect the urbanised area from flooding and pollution entering surface and groundwater, as well as to reduce the impacts of drought. It is one of the **key tools for adaptation of urbanised areas to climate change**.

Currently, **subsidies for rainwater harvesting are offered to citizens, municipalities, regions, public institutions**, etc. For example, municipalities can use the subsidy to capture rainwater in underground tanks and use it to irrigate municipal greenery, to cool streets or for toilet flushing in public buildings. In addition to reducing water consumption from the public water supply, the idea is to ensure **meaningful use of rainwater as close as possible to the point where it falls, with the priority being to irrigate vegetation on site, leading to an improvement in its microclimatic function** and to increase the groundwater tables. It should also reduce pressure on the capacity of the drainage system for rainwater, which is overwhelmed during heavy rainfalls. Subsidies for municipalities and regions can be used, for example, for underground water storage tanks and seepage facilities, as well as for the construction of green roofs and the replacement of impermeable surfaces in car parks or other public areas for permeable ones. Subsidies for citizens can be used for the storage of rainwater for garden watering and toilet flushing, and for the use of treated wastewater (grey water).

The above-mentioned financial support can be drawn primarily from the **grant title "Dešťovka" (Rainwater)** intended for the segment of family and apartment buildings. This title was launched in 2017 and until 2021 it was funded from the national resources of the SEFCR under the National Environment Programme (NP ENV). A total of CZK 540 million has been allocated in two calls for proposals so far. By the end of 2023, 10,195 projects were approved with a total support amount of about CZK 400 million. In the vast majority of cases, projects or applications concerning the storage of rainwater for garden watering or for simultaneous toilet flushing and garden watering prevailed (over 10,000 applications), the remaining projects or applications were for the use of treated wastewater (grey water) with the possible use of rainwater. The total volume of storage tanks acquired with the support of the Rainwater Programme amounts to more than 50,000 m^3.

The Rainwater Programme for owners and builders of family and recreational houses and residential buildings has been included under the New Green Savings subsidy programme from October 2021, initially funded from the National Recovery Plan under the calls for proposals for family houses and residential buildings, and since mid-2023 the source of funding has been the Modernisation Fund. By the end of 2023, over 3,900 projects worth CZK 195.5 million have been approved to support rainwater management systems. In November 2021, a call for proposals (covered under the NRP) was launched through the NP ENV, aimed at supporting efficient management of rainwater in the built-up area of municipalities and intended for listed public entities and other legal entities. The call's allocation for this type of measure was CZK 992 million. The funds were primarily used to cover projects submitted to the 2014–2020 OP ENV (see below) for which there were no available EU funds left. By the end of 2023, 193 projects of this type had been approved under this call for a total of CZK 821.8 million.

The New Green Savings Programme also supports the **construction of green roofs** on houses and residential buildings. From mid-2023 onwards, since the programme gets funding under the Modernisation Fund, the building of green roofs must be combined with another measure (insulation of the building, construction of a new house, or change of energy source). By the end of 2023, 575 applications for support worth CZK 34.0 million had been approved.

Rainwater management measures are also supported **under the OP ENV**. In the 2014–2020 programming period, support was provided under Priority Axis 1 "Improving Water Quality and Reducing Flood Risk", supported area 1.3 "Ensuring the Intramural Flood Control and Rainwater Management", specifically in activity 1.3.2 "Rainwater

Management in the Intramural Area" (so-called **"Rainwater for Municipalities"**). The total allocation for the supported area 1.3 was approximately CZK 2.8 billion TEE (total eligible expenditure) and the respective calls were regularly announced for activities related to the management of rainwater in the intramural area. In 2020, the 144th call was launched, the so-called "Big Rainwater" with a total allocation of CZK 1.0 billion from EU funds, followed by the 159th call in 2021 with an allocation of CZK 0.5 billion from EU funds. By the end of 2023, almost 200 projects with a total amount of CZK 0.8 billion TEE were approved for activity 1.3.2, which should retain approximately 24 thousand m^3 of rainwater in the intramural area. The issue is also addressed in the successor 2021–2027 OP ENV, where CZK 1.8 billion is available under measure 1.3.4, intended, among other things, to slow down runoff, for rainwater harvesting, retention and accumulation, as well as for the use of rainwater and grey water and the implementation of green roofs. For most of the activities under this measure, a rolling call was launched from September 2022 to October 2023, with 184 applications for support with a total budget of approximately CZK 1.4 billion. In 2023, a special call No. 36 was also announced, targeting only the activity "Construction of technology for the accumulation, treatment, and distribution of grey and rainwater in buildings for flushing and other relevant uses" with a total allocation of CZK 200 million from EU funds.

Similar support, but focused on comprehensive blue and green infrastructure projects in settlements, is also provided by the Ministry of Regional Development under the **IROP**, in particular under Specific Objective 2.2 Green Infrastructure. The Ministry of the Environment is the substantive coordinator and guarantor of the criteria relating to rainwater management and blue-green infrastructure systems. This is fully based on the criteria used for sub-projects of rainwater management and blue-green infrastructure, which have been supported by the OP ENV for a long time and thus give a guarantee of a quality project.

Support for the implementation of water saving measures is also aimed at the corporate sector, for example within the operational programmes administered by the MIT, namely **OP EIC** and **OP TAC**. With the contribution of the Property Programme under OP EIC, small and medium-sized enterprises were able to implement water saving measures (i.e. rainwater harvesting and use, water recycling, greywater use, etc.) as part of comprehensive projects for the revitalisation of buildings used for commercial activities and their adjacent infrastructure. The total allocation of the respective calls was CZK 2 billion. Similar support under the Sustainable Water Management activity, intended for all types of enterprise sizes, is also offered by the OP TAC through the relevant call with an allocation of CZK 1.2 billion. Another support could be obtained from the NRP (Component 2.7 "Circular economy, recycling and industrial water"), specifically through the call Water Savings in Industry with a total allocation of CZK 1 billion.

Within the framework of the Technology Agency of the Czech Republic research project "More Economical Use of Water in the Czech Industry and Energy Sector", a certified methodology for the so-called **water audit** (analogy to the energy audit) was developed in 2021, in order to help beneficiaries to technically and economically establish where water is used, what is its consumption with respect to the topography of the site, where to save water, how to behave economically, etc. Submission of a completed "water audit" is a prerequisite for applying for support for the implementation of drought control measures under the NRP and OP TAC. The sustainability of the grant support for the "water audit" can be demonstrated i.a. by obtaining the "Responsible Water Management" (RWM) label awarded by the Ministry of the Environment. Holders of the label can claim that their water management is sustainable and environmentally friendly. Since September 2022, when the programme was launched, three companies have been awarded the RWM label[30].

[30] *For more information on the RWM programme, see https://www.mzp.cz/cz/odpovedne_hospodareni_voda.*

Quality of urban green spaces

Urban environment, population and biodiversity are significantly affected by climate change. **Green spaces** (especially tall vegetation) and urban water bodies and their quality (the degree of ecosystem services provided) are one of the factors that can affect the immediate impact of the climate change. Vegetation in settlements and water bodies significantly enhance the level of adaptation of the urban system and population, especially to extreme temperatures. Green spaces in settlements and water bodies provide important resting zones with natural shading, improve the microclimate of the area, increase evapotranspiration, enhance biodiversity of a given site, reduce surface runoff, noise and dust, and thus improve the health of the population and the quality of life in urban areas in general. The spatial accumulation of green spaces and water bodies in settlements, or the evenness of their spatial distribution and their interconnectedness, play an important role in the adaptation of the settlement environment. In doing so, the factors of the size, spatial distribution and quality of green spaces and water bodies significantly counteract urban overheating (the so-called "heat islands") and reduce the adverse effects of the built urban environment.

The quality assessment of green spaces in cities is based on information on the **proportion of green spaces in settlements and water bodies in the urban area** of all 61 cities and towns in the Czech Republic with a population of over 20,000 (i.e. including regional cities), based on the classification of remote sensing data. In 2020[31] the proportion of green spaces and water bodies (forest land, protected areas (large-scale specially protected areas, small-scale specially protected areas), floodplains – polders, waterlogged areas, permanent grasslands – meadows and pastures, urban parks with vegetation, roofs covered with lawns and plantings (so called green roofs), ecoducts, watercourses and their riparian vegetation and water bodies) ranged from 45.7% (Havířov) to 91.9% (Trutnov) of the total urban area (Chart 29), with an average share of 76.0%. Relative to the last measurement in 2017, there have been more significant developments, mainly in the category of 76–80% proportion of green spaces and water bodies to the total urban area, where the share of those towns has decreased, mainly for the benefit of the "higher" category of 86–90%.

Despite the generally high proportion of total green spaces in the urban areas, it needs to be stated that a significant part of it is represented by **low vegetation** (e.g. low mown lawns, thickets, etc.), with low potential for providing ecosystem functions and increasing adaptive capacity compared to high vegetation. Low vegetation represents on average 59.1% of the urban area, i.e. 78.0% of the total green spaces in settlements. The lowest ratio of low green spaces to the total area was identified in Karlovy Vary (25.7%), while the highest in Přerov (75.6%). In contrast, **tall vegetation (trees)** takes on average only 13.3% of the urban area, i.e. 19.8% of the total area of green space in settlements, which corresponds to the numerical representation, where more than 60% (i.e. 37) of the monitored towns had a share of tall vegetation only between 1–20% of the total urban area.

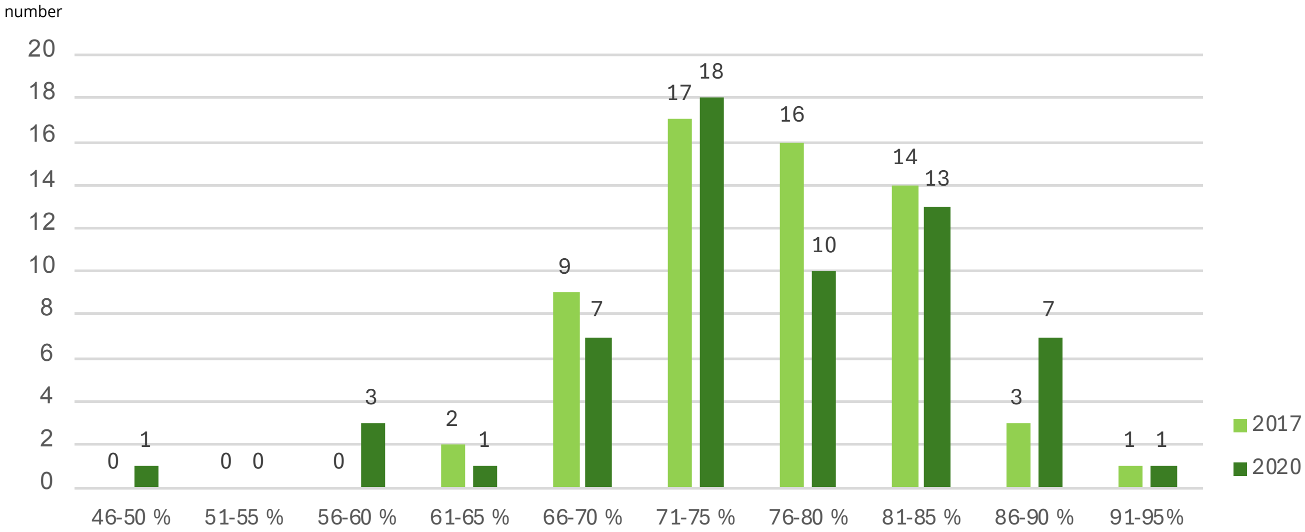
Water bodies are also an important element in the urban microclimate that deserves more attention. In 2020, the highest share of water bodies and wetlands in the urban area of the monitored towns was identified in Hodonín (7.4%), due to the local wetlands and ponds and the (Stará) Morava River. The second highest share of water bodies in 2020[32] was in Cheb (6.7%) due to the presence of reservoirs and of the Ohře River. The lowest share of water bodies was in Kladno (0.01%) or Vsetín (0.02%).

[31] *As to the closing date of this publication, data for 2021–2023 were not available. The data will be updated in 2025.*

[32] *As to the closing date of this publication, data for 2021–2023 were not available. The data will be updated in 2025.*

Chart 29

Number of towns in the Czech Republic with population over 20 thousand by the ratio of green spaces and water bodies to their total area of urban territory [number], 2017, 2020



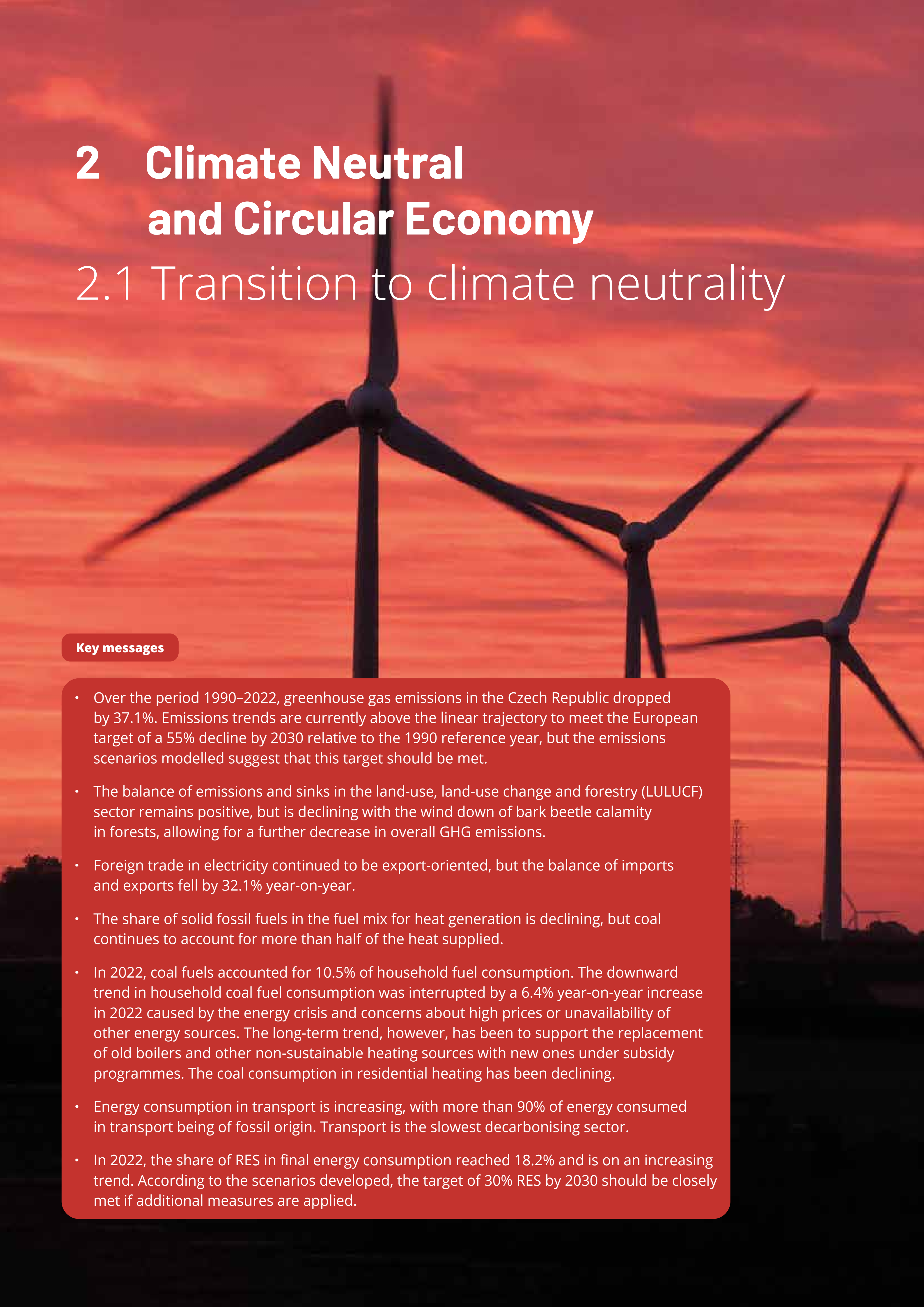
As to the closing date of this publication, data for 2021–2023 were not available. The data will be updated in 2025.

Data source: CENIA, Sentinel-2, CZSO

Financial support is continually provided for the establishment, development and sustainable care of the system of settlement vegetation in the urbanised environment (e.g. application of nature-based approaches and restoration of small water features in settlements, implementation of vegetation roofs or rainwater management), especially within the framework of grant calls of the NP ENV (Priority Area 5: Environment in Towns and Municipalities), IROP (Green Infrastructure of Towns and Municipalities), OP ENV (Specific Objective 1. 3 Climate Change Adaptation (e.g. Support for Nature-Based Measures in Landscapes and Settlements, Establishment and Restoration of Public Settlement Vegetation) and NRP (Component 2.9 Support for Biodiversity and Combating Drought).

Detailed visualisations and data

https://www.envirometr.cz/data



2 Climate Neutral and Circular Economy

2.1 Transition to climate neutrality

Key messages

- Over the period 1990–2022, greenhouse gas emissions in the Czech Republic dropped by 37.1%. Emissions trends are currently above the linear trajectory to meet the European target of a 55% decline by 2030 relative to the 1990 reference year, but the emissions scenarios modelled suggest that this target should be met.
- The balance of emissions and sinks in the land-use, land-use change and forestry (LULUCF) sector remains positive, but is declining with the wind down of bark beetle calamity in forests, allowing for a further decrease in overall GHG emissions.
- Foreign trade in electricity continued to be export-oriented, but the balance of imports and exports fell by 32.1% year-on-year.
- The share of solid fossil fuels in the fuel mix for heat generation is declining, but coal continues to account for more than half of the heat supplied.
- In 2022, coal fuels accounted for 10.5% of household fuel consumption. The downward trend in household coal fuel consumption was interrupted by a 6.4% year-on-year increase in 2022 caused by the energy crisis and concerns about high prices or unavailability of other energy sources. The long-term trend, however, has been to support the replacement of old boilers and other non-sustainable heating sources with new ones under subsidy programmes. The coal consumption in residential heating has been declining.
- Energy consumption in transport is increasing, with more than 90% of energy consumed in transport being of fossil origin. Transport is the slowest decarbonising sector.
- In 2022, the share of RES in final energy consumption reached 18.2% and is on an increasing trend. According to the scenarios developed, the target of 30% RES by 2030 should be closely met if additional measures are applied.

2.1 | Transition to climate neutrality

Meeting the underlying targets

Target set	For year	Value in 2022[33]	Moving towards the objectives
Reduction greenhouse gas emissions (including LULUCF) by at least 55% compared to 1990 levels[34]	2030	decrease by 37.1%	✓
Achieving net carbon sequestration in biomass and soil in the LULUCF sector –1,228 kt CO_2 eq.[35]	2030	3,378,1 kt	~
Non-ETS emissions decrease by 26% compared to 2005 levels[36]	2030	decrease by 6.6%	~
EU-ETS emissions decrease by 62% compared to 2005 levels[37]	2030	decrease by 43.4%	✓
Increase energy efficiency, i.e. reduce final energy consumption to 846 PJ[38]	2030	1 019 PJ	✗
Share of RES in final energy consumption 30%	2030	18,2%	~
Share of RES in final energy consumption in transport 14%[39]	2030	7,2%	~

[33] *As to the closing date of this publication, data for 2023 (except for ETS emissions) were not available.*

[34] *European target – European Climate Law Regulation (Regulation (EU) 2021/1119).*

[35] *Regulation 2023/839 of the European Parliament and of the Council.*

[36] *Regulation (EU) 2023/857.*

[37] *Common target under Directive (EU) 2023/959 of the European Parliament and of the Council.*

[38] *National Energy and Climate Plan of the Czech Republic, draft update June 2024.*

[39] *Directive 2018/2001/EC (RED II).*

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
2.1.1 Greenhouse gas emissions are falling	Greenhouse gas emissions	↘ (green)	↘ (green)	~ (yellow)
	Electricity and heat production by fuel (share of non-fossil energy sources)	↗ (green)	↗ (green)	~ (yellow)
	Residential heating by fuel (share of solid fossil fuels)	↘ (green)	~↗ (yellow)	✓ (green)
	Energy and fuel consumption in transport	↗ (red)	↗ (red)	✗ (red)
2.1.2 Energy efficiency increases	Energy intensity of the economy	↘ (green)	↘ (green)	✓ (green)
	Energy efficiency	→ (yellow)	~↗ (yellow)	~ (yellow)
	Energy import dependency	↗ (red)	↗ (red)	~ (yellow)
2.1.3 The use of RES is increasing	Use of RES	↗ (green)	↗ (green)	~ (yellow)
	RES consumption in transport	↗ (green)	~↗ (yellow)	~ (yellow)

Current measures supporting achievement of the objective

- Possible impacts of the adopted European legislation (in particular Fit for 55) on the Czech Republic were identified. The specific circumstances of the Czech Republic and the impacts related to the green transformation, including social ones, are reflected, for example, in the drafting of the Social Climate Fund and Plan and in the formulation of appropriate measures. They were also taken into account in the redesign of the Modernisation Fund, one of the main sources of decarbonisation funding, with an estimated allocation of CZK 500 billion by 2030 (for more information on the expenditure from the Modernisation Fund, NRP or OP ENV, see chapter Funding).
- A draft amendment to the Greenhouse Gas Emissions Trading Act has been drawn up to ensure that 100% of the proceeds from emission allowance auctions are used for climate change-related purposes or measures.
- The development of renewable energy sources is accelerated. Comprehensive amendments to the Energy and Construction Acts have been approved, simplifying the RES permitting procedure (the so-called Lex RES 1) and an amendment to the Energy Act (the so-called Lex RES 2), establishing the basic principles of community energy systems (electricity sharing, energy community, active customer).
- In line with the requirements of EU legislation and in order to support the achievement of the decarbonisation targets in terms of energy and climate, updates of strategic documents have been drawn up: National Energy and Climate Plan, Climate Protection Policy of the Czech Republic and National Energy Concept.
- The updated National Action Plan for Clean Mobility meeting the requirements of the Alternative Fuels Infrastructure Regulation (AFIR) was approved by the Government of the Czech Republic on 28 August 2024. It includes new targets for alternative fuels vehicles and public recharging/refuelling infrastructure.

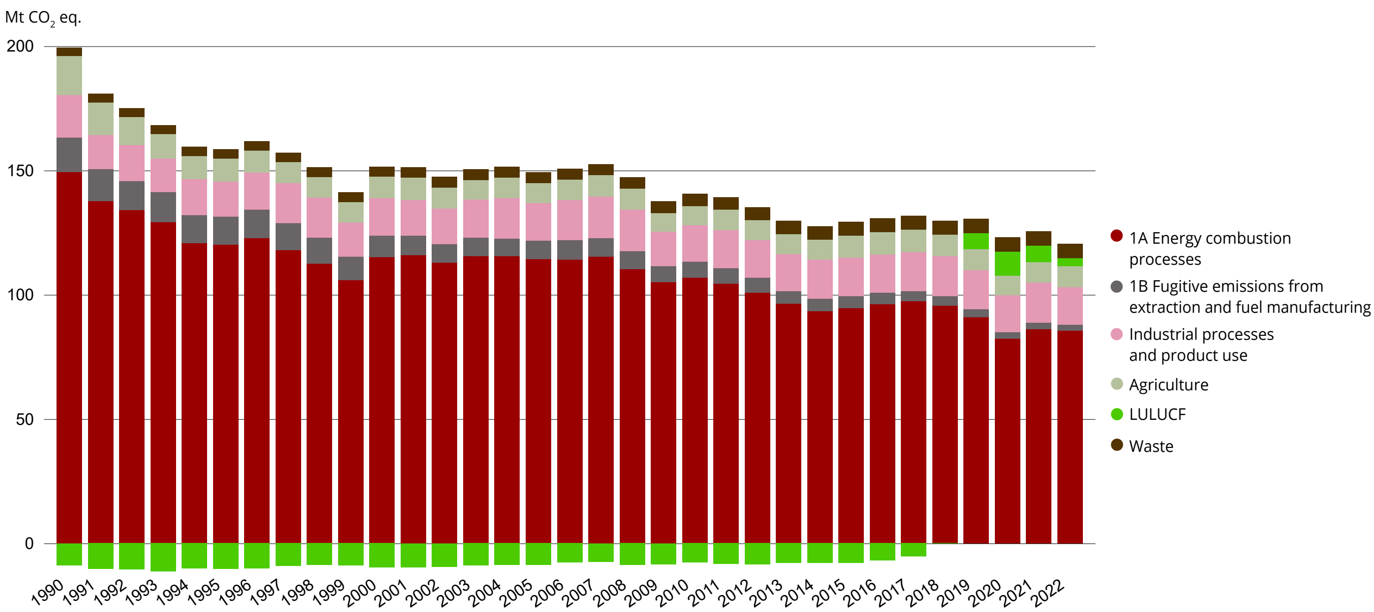
Greenhouse gas emissions

Over the period 1990–2022[40], **total aggregate GHG emissions** in the Czech Republic (including the LULUCF sector and indirect CO_2 emissions) decreased by 37.1% to 121.1 Mt CO_2 eq. (Chart 30), with a year-on-year decrease of 3.9%. In the long term, emissions were characterised by a significant decline in the early 1990s as a result of economic restructuring, with emissions fluctuating in correlation with economic performance fluctuations and declining only slowly thereafter – over the period 1990–2022, on average, emissions declined by 0.9% per year. The decline accelerated towards the end of the reporting period, and in addition to the implementation of decarbonisation measures, two major factors played a role in their decline: these included the Covid-19 pandemic, resulting in a temporary significant drop in emissions; and the bark beetle calamity in forests, peaking in 2020, causing the balance of emissions and sinks in the LULUCF sector to surge into significant positive figures. Over the period 2018–2022, i.e. the implementation period of the current NEP, emissions fell by 7.2%, with the significant year-on-year decline in 2022 largely driven by the gradual wind down of the bark beetle calamity.

In 2022, the balance of emissions and sinks in the LULUCF sector was +3.4 Mt CO_2 eq. and decreased by 47.8% year-on-year. Although the current value of the LULUCF emission balance is well above the target of −1.23 Mt CO_2 eq. by 2030 set by European legislation, meeting the target is realistic given the decreasing trend in emissions and the model scenarios developed.

Chart 30

Aggregate greenhouse gas emissions in the Czech Republic by sectors [Mt CO_2 eq.], 1990–2022



Data for 2023 are not available due to the timing of the emission inventory.

https://www.envirometr.cz/data/emise-sklenikovych-plynu-v-sektorovem-cleneni *Data source: CHMI*

[40] *As to the closing date of this publication, data for 2023 were not available. The emission inventory for the UNFCCC is always available in April for the previous twenty-four months, i.e. the last reporting year in 2024 is 2022.*

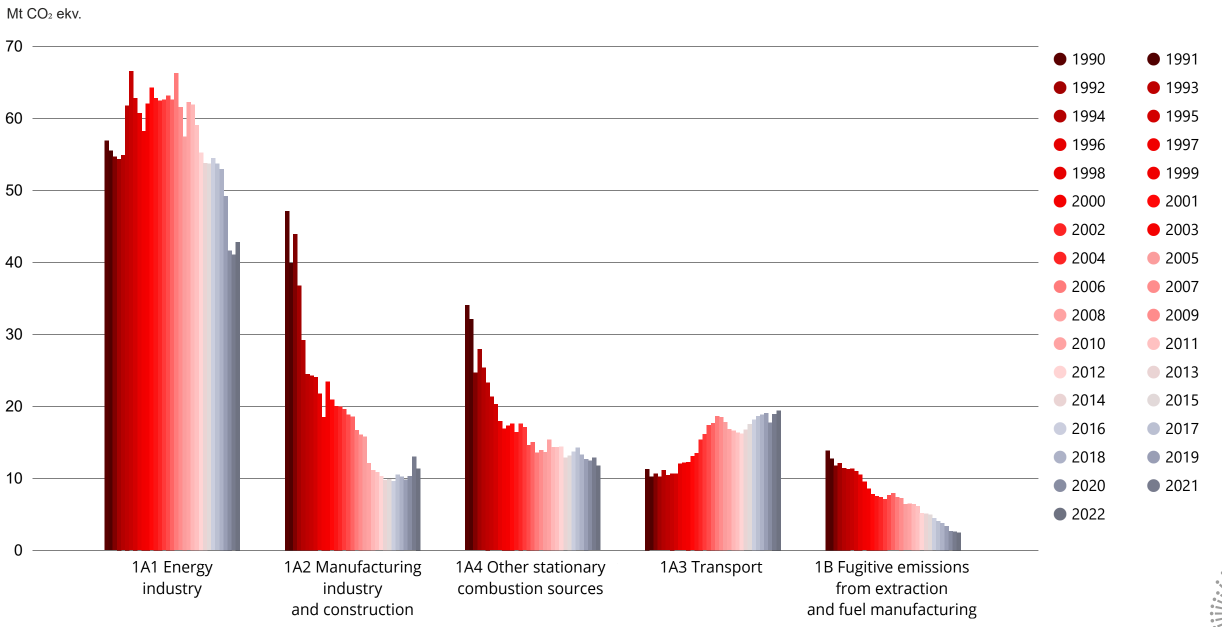
The current pattern in total GHG emissions in the Czech Republic has been so far **above the linear trajectory** (by 6.9 p.p. in 2022) to meet the European target laid down in the Green Deal for Europe and related European legislation, as reflected in the updated national strategy documents, requiring emissions to fall by 55% by 2030 compared to the 1990 baseline level. In order to meet the aggregate emissions target of about 87 Mt CO_2 eq. by 2030, the downward trend in emissions will need to accelerate (roughly threefold) over the next eight years. The modelled emission scenarios developed by the SEEPIA[41] project team for the update of the NCEP and the CPCR indicate that the target will be met with a good margin. According to WEM scenario ("with existing measures"), emissions are projected to decrease to 67.4 Mt by 2030, in line with a 65% decrease relative to the baseline year 1990. The WAM scenario ("with additional measures") projects a decrease to 61.0 Mt, i.e. 68.3%.

Over the period 1990–2022, **total GHG emissions excluding the LULUCF sector** (i.e. including only emission sources) decreased by 41.5%. In 2022, combustion processes accounted for 73.0% of total emissions (excluding indirect emissions), with the most significant categories within combustion processes being the power industry (36.5% of total emissions) and transport (16.6%). In 2022, CO_2 emissions accounted for 81.2%, CH_4 emissions 11.2%, N_2O 4.4% and F-gases 3.2% of the total aggregated emissions (excluding LULUCF).

Since 1990, in terms of **emission trends** in the sectoral decomposition, emissions from combustion (sector 1A) have dropped more than the total emissions, i.e. by 42.8%. Over the last reporting 5 years (2018–2022), following the gradual change in the energy mix and decarbonisation, emissions from the energy industry have significantly decreased (Chart 31), i.e. by 19.2%, as well as emissions from local space heating in residential and commercial buildings (by 11.4%). The adverse development remains in transport emissions, where alternative propulsions and non-fossil energy sources are only slowly gaining ground. Since 1990, transport emissions have increased by 72.4%, and by 3.0% over the last 5 years. Emissions from **agriculture and waste** have stagnated over the last reporting 5 years and have barely affected the trend in total emissions.

Chart 31

Trends in greenhouse gas emissions by sectors of Category 1 – Energy [Mt CO_2 eq.], 1990–2022



Data for 2023 are not available due to the timing of the emission inventory.

https://www.envirometr.cz/data/emise-sklenikovych-plynu-v-sektorovem-cleneni

Data source: CHMI

[41] *Centre for Socio-Economic Research on Environmental Policy Impact Assessment, see https://seepia.cz/.*

Over the period 2005–2023 GHG emissions from installations covered by the **European Emissions Trading Scheme (EU-ETS)** fell by 43.4% to 46.7 Mt CO_2 eq. Towards the end of that period, the decline in emissions accelerated, with a significant 18.2% year-on-year decline in 2023 to levels below the "Covid year" 2020. The current trend of emissions in the ETS is on track to meet the EU-wide target, set as a 62% decrease in ETS emissions relative to the baseline year 2005 in line with the current legislation. The modelling of emissions based on the SEEPIA project results also indicates that the target would be met, with emissions falling to 23.7 Mt by 2030, i.e. by 71.3%, under WEM scenario. In the long term, installations in the combustion category have the highest share of emissions from EU-ETS installations (79.9% in 2023). Other major activity categories within the EU-ETS are iron and steel production (8.4%) and cement and lime production (6.4%).

Over the period 2005–2022, the **non-EU-ETS emissions**, regulated by the Effort Sharing Regulation (ESR), decreased by 6.6% in the Czech Republic to 60.7 Mt CO_2 eq. The main sources of emissions in this category are households, transport and other small nonpoint sources of pollution (agriculture, waste, etc.), which are mostly difficult to control. According to the latest amendment to Regulation (EU) 2023/857, all EU countries are to contribute to a 40% reduction in EU emissions in the ESR by 2030 compared to 2005 levels, with the target for the Czech Republic increased to 26%. If the current linear trend in emissions in the ESR were to continue with a decrease by about 0.6% per year, the target would not be met (the extrapolated value represents a reduction by about 15% in 2030 compared to 2005). However, the SEEPIA project modelling results, taking into account planned future measures, expect the target to be closely met, based on the WEM scenario, with emissions in ESR reaching 47.5 Mt CO_2 eq. in 2030, a decrease of 26.9% compared to the baseline year.

Electricity and heat production, residential space heating

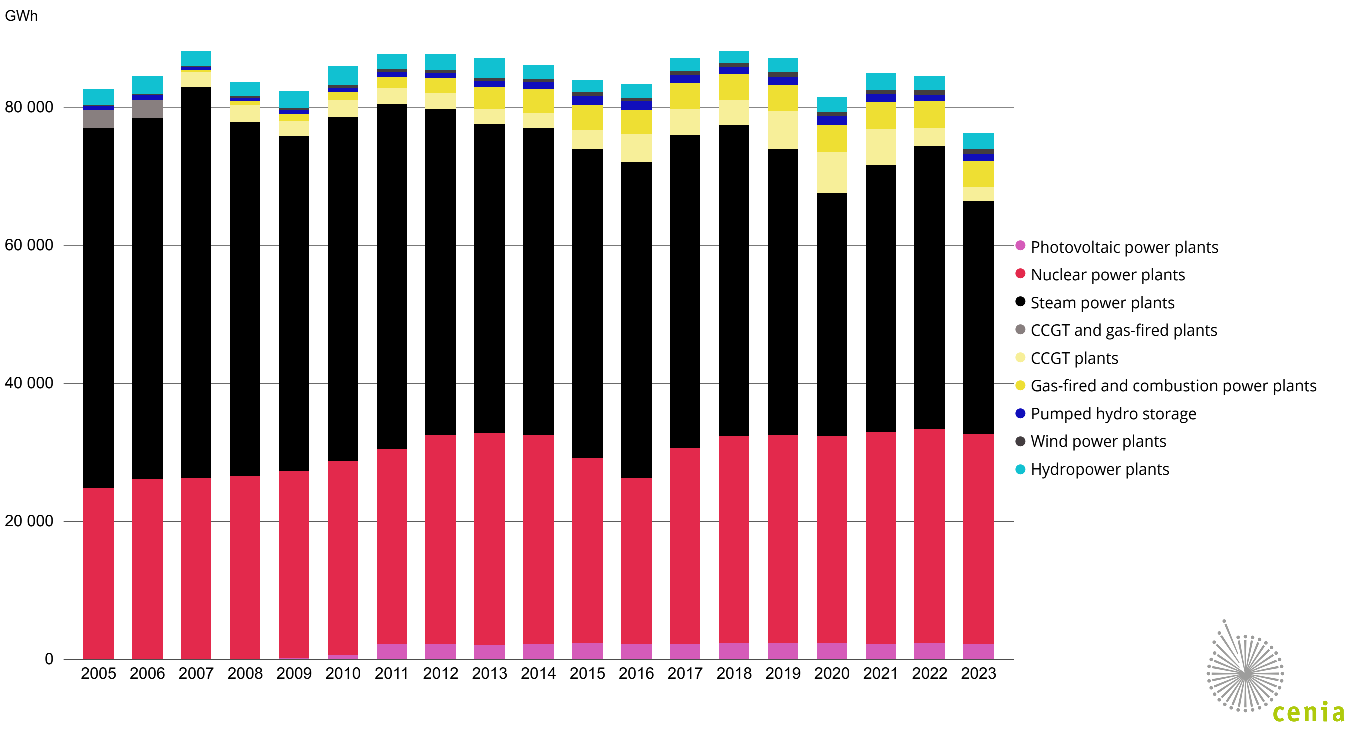
The fuel mix used in electricity and heat production is affected by the stock of available domestic energy sources, the situation in foreign trade in fuels and also the current energy policy, regulating their use conditions. The amount of electricity and heat production is then determined by current demand and consumption on the domestic and foreign markets.

In 2023, **gross electricity production** will reach 76,232 GWh, in year-on-year comparison a decrease by 9.8% (Chart 32). The most significant year-on-year decrease in electricity production was caused by a drop in production in steam power plants (by 17.8%, i.e. by 7,306 GWh) and in combined cycle gas turbine (CCGT) plants (by 17.6%). By type of power plant (Chart 31), in 2023, despite a decline in production, the largest share of electricity was generated by solid-fuelled steam power plants[42] (44.2%). The second most important category were the nuclear power plants, with 39.9% of the electricity generated. The other sources produce electricity on a smaller scale, namely gas-fired and combustion power plants (4.9%), hydroelectric (3.1%), photovoltaic (2.9%), CCGT (2.7%), pumped hydro storage (1.4%) and wind (0.9%).

42 *Steam power plants are generally those that employ steam to drive an electricity generator, where the steam is obtained by heating water using fuel combustion or a nuclear reaction. In this document, however, the category of steam power plant is taken from the ERA statistics and includes thermal power plants that in the Czech Republic burn mainly lignite. Nuclear power plants are listed under a separate category.*

Chart 32

Electricity production by type of power plants in the Czech Republic [GWh], 2005–2023



https://www.envirometr.cz/data/vyroba-elektriny-podle-druhu-elektraren

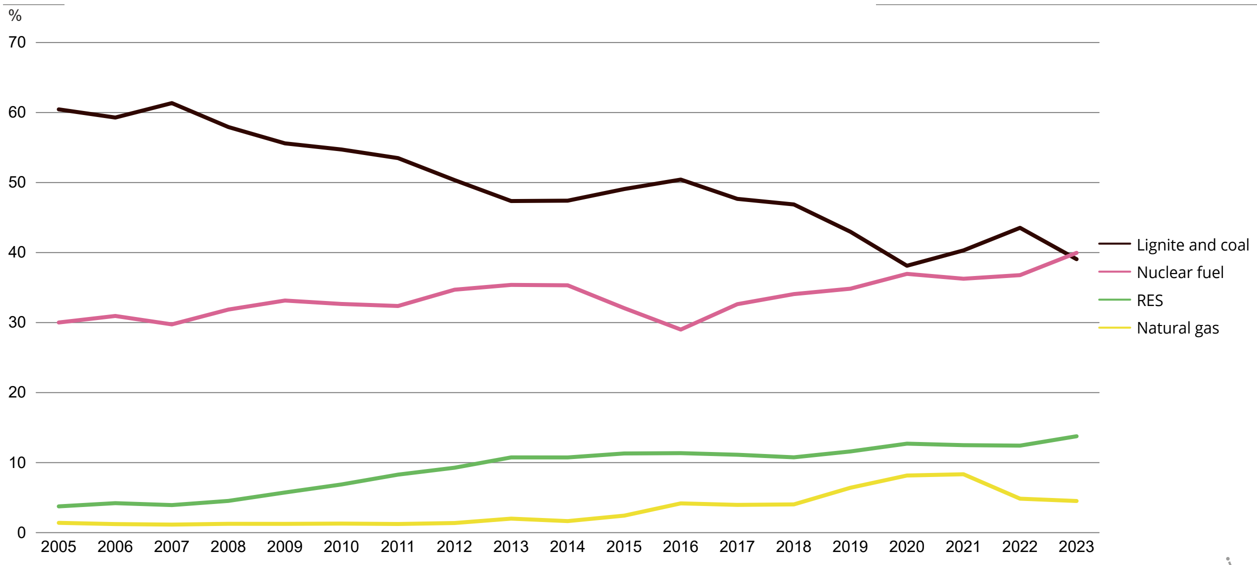
Data source: ERA

By fuel, in 2023 the Czech Republic generated most of its electricity from nuclear fuel (39.9%, Chart 33). It was the first year since 2005 that electricity generation from nuclear power plants exceeded that from lignite and coal (39.0%), due to a decline in production from steam power plants. Renewable energy sources accounted for 13.7% of electricity generation (1.3 p.p. year-on-year growth). In 2023, natural gas accounted for 4.5%, continuing the decline in natural gas-fired electricity generation.

The target structure of electricity generation by fuels is established by the existing strategic documents; the NEC sets target corridors to 2040. In 2023, the nuclear power generation share is approximating the target corridor (46–58%) and the target is likely to be met with a margin. Electricity production from nuclear plants has been stable over the long term (in terms of installed capacity), but the decline in fossil fuel generation is leading to an increase in the share of nuclear fuel. The share of coal is gradually decreasing (from 60.4% in 2000 to 39% in 2023). Currently, the share of coal-fired power generation is above the target corridor (11–21%), but given the existing trend and the gradual decarbonisation of the economy, reaching even this target corridor by 2040 is likely. The share of electricity generation from renewable sources is increasing (by 10 p.p. over the period 2005–2023) and the target corridor is thus also likely to be achieved.

Chart 33

Share of electricity production by fuel type in the Czech Republic [%], 2005–2023



Target corridors for single sources (nuclear 46–58%, renewables and secondary sources 18–25%, natural gas 5–15%, lignite and coal 11–21%.

cenia

https://www.envirometr.cz/data/podil-vyroby-elektriny-podle-druhu-paliv

Data source: ERA

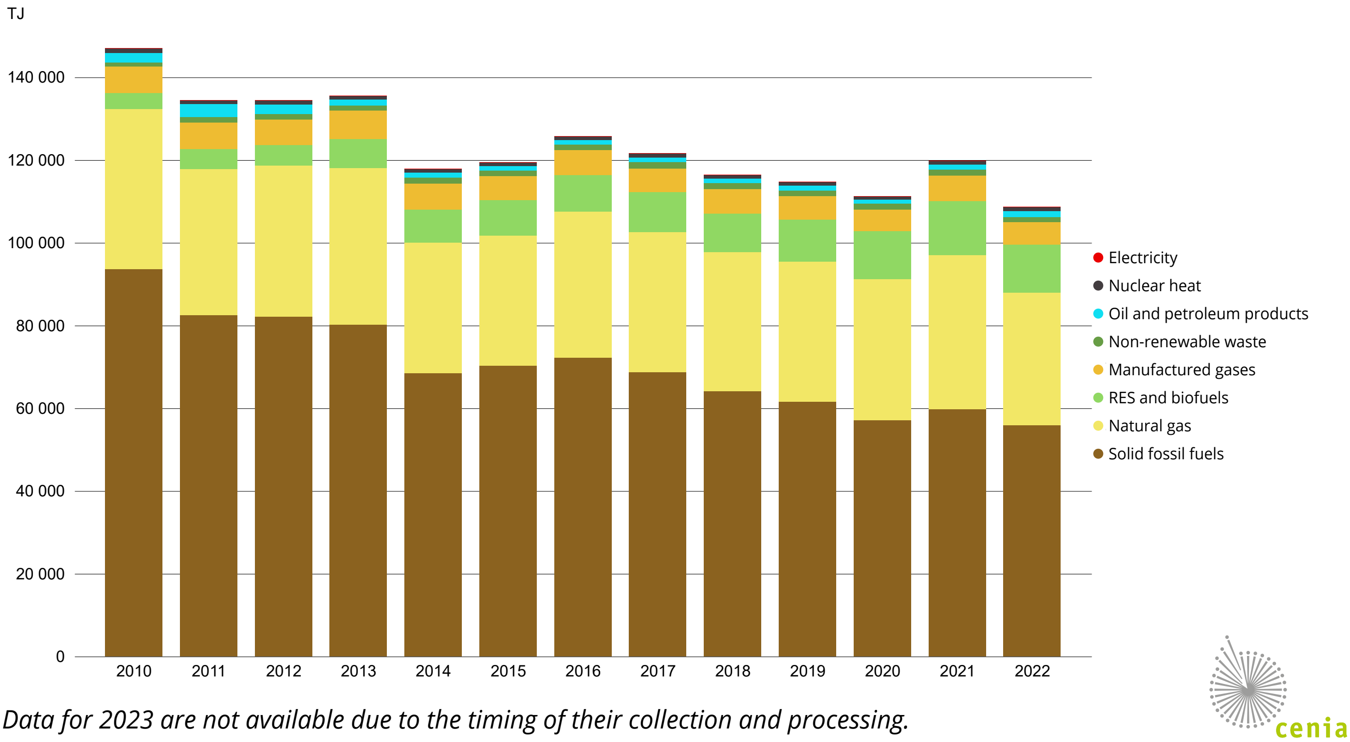
Exports still prevail over imports **in foreign trade in electricity**. In 2023, 22,648 GWh of electricity was exported, while imports amounted to 13,365 GWh. The foreign trade balance was thus negative at 9,184 GWh, i.e. by 32.1% less than in the previous year. In 2023, with total electricity production of 76,232 GWh, exports accounted for 29.7% of production. One of the actions of the current strategy of the National Energy Concept of the Czech Republic is a gradual decline in electricity exports and maintaining the balance in the range of +/−10% of domestic consumption until 2040. In 2023, the domestic electricity consumption amounted to 67,412 GWh, thus the share of the balance in consumption reached 13.6%.

The **total amount of heat produced** has been gradually decreasing, falling by 9.3% year-on-year to 108.6 PJ in 2022[43] (Chart 34); since 2010, heat production has dropped by 26.1%, driven both by the declining energy performance of buildings and warmer heating seasons in most years during this period. **Heat production** includes heat production for sale, i.e. for district heating, as well as heat production in residential boilers and housing cooperatives. In 2022, heat was predominantly produced from solid fossil fuels (51.4%). The second major source was natural gas accounting for 29.5%. Heat production from solid fossil fuels is gradually decreasing, with its share falling from 63.7% in 2010 to 51.4% in 2022. By contrast, the share of renewable resource and biofuels in heat production is growing significantly, increasing from 2.6% to 10.8% between 2010 and 2022.

[43] *As to the closing date of this publication, data for 2023 were not available.*

Chart 34

Gross heat production by fuel type in the Czech Republic [PJ], 2010–2022



Data for 2023 are not available due to the timing of their collection and processing.

https://www.envirometr.cz/data/hruba-vyroba-tepla-podle-druhu-paliva

Data source: MIT

Throughout the Czech Republic, the **structure of residential heating** also differs considerably between different regions or municipalities. In areas with larger conurbations and in towns close to industrial facilities, from which residual heat can be used, the heat energy supply system (district heating) is usually used, whereas in smaller and less accessible municipalities individual heating of single houses or housing units is more often employed.

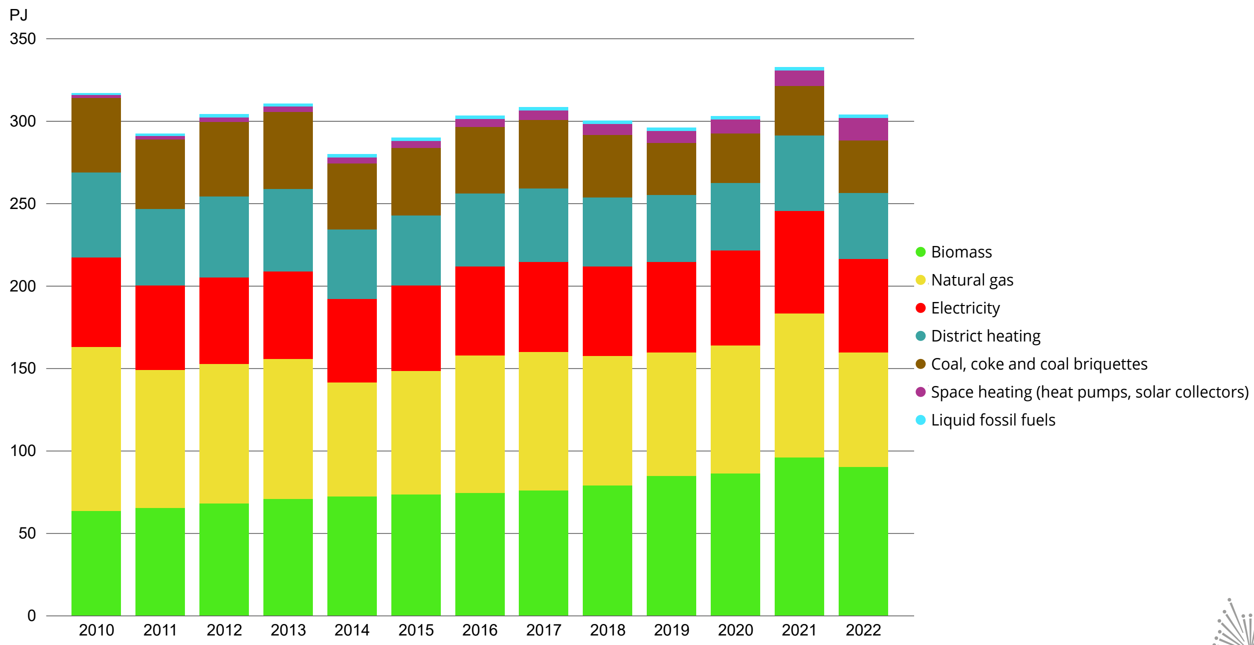
In 2022[44], **households** consumed a total of 303.6 PJ of energy (mainly for heating), which was 8.7% less than in the previous year, due to the warmer heating season. In the longer term, heat production for residential heating fluctuates according to the temperature conditions of the heating seasons and follows no trend. In terms of **fuel consumption** for heating (Chart 35), most heat in residential houses in 2022 was produced from biomass, including mainly firewood, wood briquettes or pellets (29.7%), and natural gas (22.9%, Chart 35). While biomass consumption is increasing with year-to-year variations, natural gas consumption, on the other hand, is declining, in 2022 dropping significantly by 20.2%, which can be attributed to high natural gas prices in that year. Household natural gas consumption includes consumption for cooking and water heating. The situation is similar for electricity (18.6%, a 9.0% year-on-year decrease in consumption), including not only heating but also consumption for the operation of domestic electrical appliances, even in those households that heat their homes using other means.

[44] *As to the closing date of this publication, data for 2023 were not available.*

The **district heating systems** supply only 13.2% of the energy to households, although 35.3% of households (about 1.5 million households) are heated using district heating. This is because district heating is more often used in residential buildings on housing estates, where less heat is needed to provide heating for one household than for a household in a family house. The **consumption of solid fossil fuels** in households is slowly declining in the long term and the impact of technology change on residential heating supported by subsidy programmes is being felt. In 2022, households consumed 31.9 PJ of energy from burning coal fuels (6.4% year-on-year growth), representing 10.5% of total energy consumed in households. The transient year-on-year increase in household consumption of coal fuels can be linked to rising prices of other energy (electricity and natural gas) and their substitution by coal fuels. According to the Solid Fuels Supply and Quality Database, in 2023, the supply of coal fuels to the residential sector fell significantly by 33.8% year-on-year to 909.4 kt, indicating a continued downward trend in residential consumption of coal fuels despite the very warm winter of 2023/2024.

Chart 35

Fuel consumption in households in the Czech Republic [PJ], 2000–2022



As to the closing date of this publication, data for 2023 were not available.

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https://www.envirometr.cz/data/spotreba-paliv-v-domacnostech

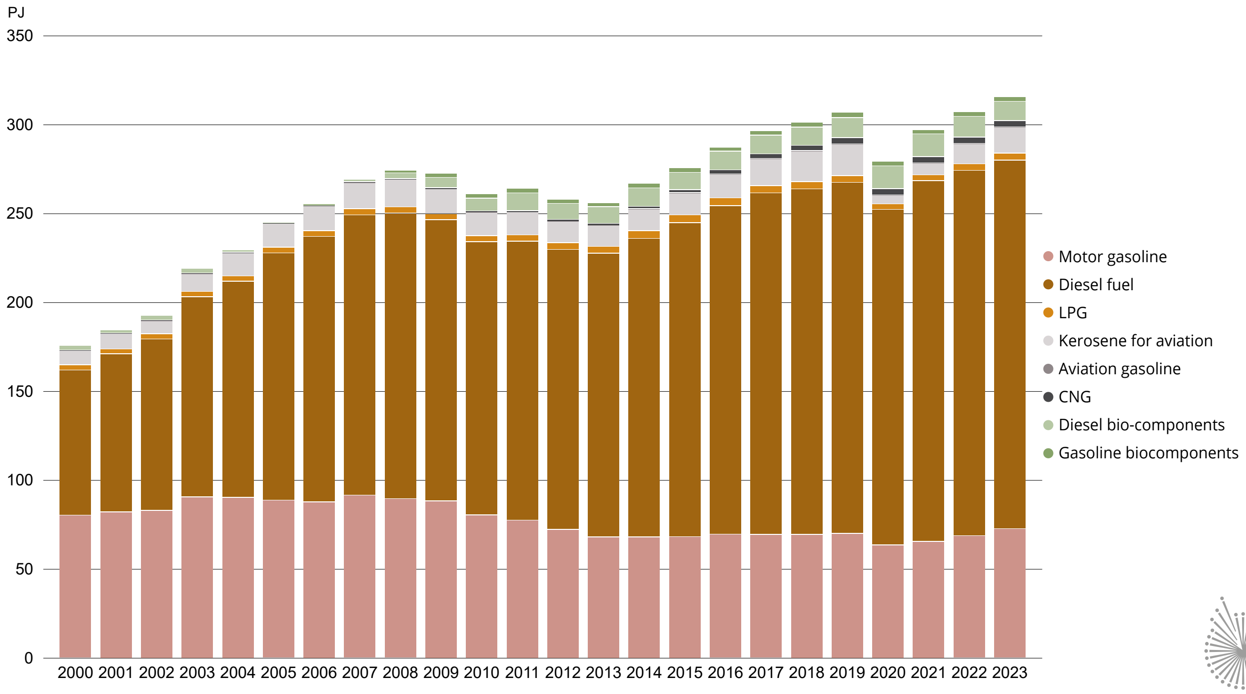
Data source: MIT

Energy consumption in transport

Over the period 2000–2023, **energy consumption in transport** increased by 81.4% (Chart 36), with a year-on-year increase of 3.6% to 313.2 PJ, the highest value of energy consumption in transport since 2000. Energy consumption in transport in the Czech Republic is almost steadily rising with variations caused by fluctuating economic performance and the Covid-19 pandemic around 2020. Energy in transport comes largely from **fossil, non-renewable sources**. In 2023, 95.9% of total transport energy consumption came from fuel combustion (excluding electricity consumption by electric modes). In terms of different fuels, **diesel consumption** had the highest share in total transport energy consumption (66.2% in 2023), while the share of petrol consumption was 22.5%. Consumption of alternative fuels of fossil origin (LPG and CNG) is stagnating, their share in total transport energy consumption was 1.3% and 1.0% respectively.

Chart 36

Energy consumption in transport by fuel in the Czech Republic [PJ], 2000–2023



https://www.envirometr.cz/data/spotreba-paliv-v-doprave

Data source: TRC, public research institution

Both the single largest energy consumer and the least energy efficient mode of transport is **private car transport**, accounting for 56.6% of total transport energy consumption from fuel combustion in 2023. Road freight transport accounted for about a third of total energy consumption (33.0%), and road transport in general accounted for 93.6% of transport energy consumption.

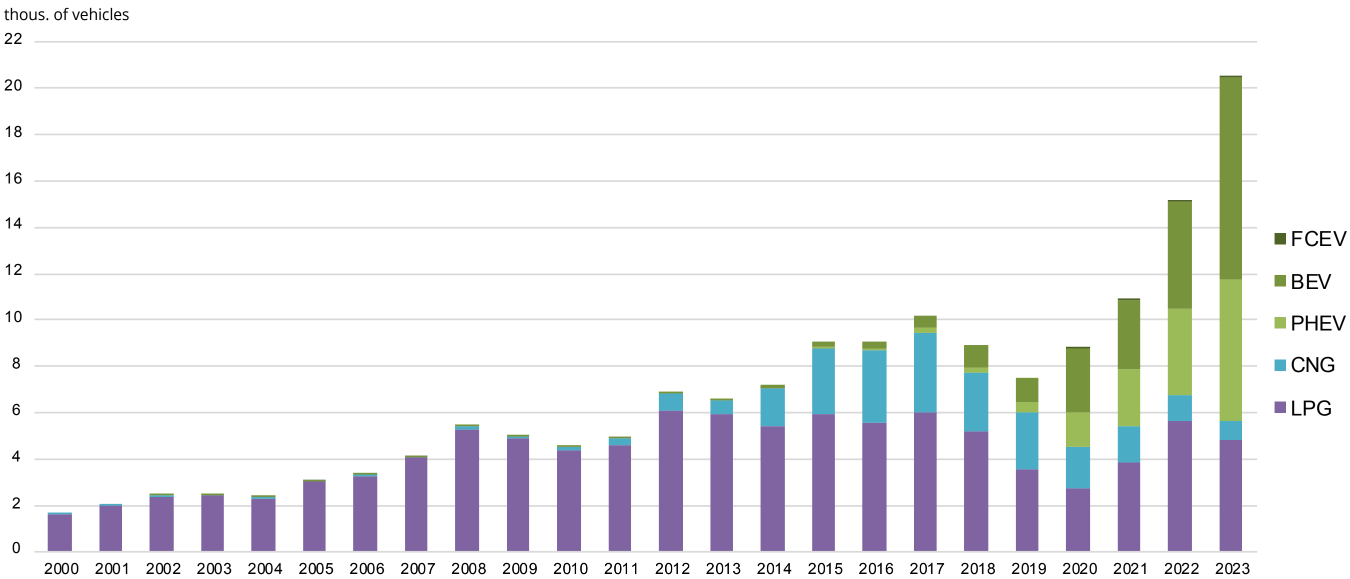
Increasing use of zero- and low-emission vehicles should reduce the environmental impact of transport and gradually decarbonise transport as part of the transition to climate neutrality. In 2023, a total of 182.4 thousand zero- and low-emission vehicles of all categories were registered, 2.1% of the existing fleet. Year-on-year, the number of vehicles in the register increased by 14.8%. The trend in annual registrations of zero- and low-emission passenger cars (M1 vehicles) is increasing (Chart 37), mainly due to the emergence of electromobility in recent years. In 2023, 20.5 thousand zero- and low-emission passenger cars were registered, a 35.5% annual growth in registrations (Chart 37). In 2023, 8,670 **battery electric vehicles** (BEVs) of the M1 category and 6,167 **plug-in hybrid vehicles** were registered; year-on-year registrations of both these clean propulsion categories almost doubled. The use of hydrogen and fuel cells is still quite marginal, with only 16 M1 fuel cell vehicles (FCEVs) registered in 2023.

By the end of 2023, **battery electric vehicles (BEVs)** of all categories totalled 33,401, 0.4% of the total number of registered vehicles. Year-on-year, BEV registrations increased by 60.3% to 10.9 thousand vehicles in 2023. About two thirds of the registered BEVs (22,029 vehicles) were passenger cars (M1 category vehicles). There were registered about 9.8 thousand electric motorcycles of all categories (29.4% of BEVs), mainly small motorcycles of L1 category. A total of 1,358 small commercial BEVs up to 3.5 t were registered, only 19 large trucks (category N3) and 153 electric buses. Year-on-year comparisons to 2023 show the largest increases in annual registrations of electric passenger cars (88.2%) and small commercial vehicles (86.0%) among the vehicle categories. The number of electric buses registered fluctuates significantly from year to year, with 10 vehicles registered in 2023, a 73.4% decrease in registrations compared to the previous year with 39 electric buses registered.

In the Czech Republic, the pace of development of clean mobility, as measured by the development of registrations of zero- and low-emission vehicles, is significantly below the European average. In 2023, the Czech Republic had the third lowest share of new battery electric passenger car registrations (3.0%) of all EU-27 countries, after Slovakia and Croatia.

Chart 37

Registration of low- and zero-emission passenger cars (M1 vehicles) by fuel and propulsion categories and year of last registration in the Czech Republic [thousands vehicles], 2000–2023



BEV – Battery Electric Vehicles, PHEV – plug-in hybrid electric vehicle, HEV – other hybrid electric vehicles (excluding plug-in), FCEV – fuel cell electric vehicle (hydrogen), CNG – compressed natural gas, LPG – liquefied petroleum gas

Data source: TRC, public research institution

Energy efficiency

The **energy efficiency** indicator tracks the energy consumption and savings. The energy efficiency targets set for a non-exceedable level of primary energy sources (PES) of 1,855 PJ by 2020 and 1,206 PJ by 2030. Further targets were set for the maximum level of final energy consumption, which should not exceed 1,060 PJ in 2020 and, as set by the updated NCEP, 852 PJ in 2030.

The consumption of **primary energy sources** is one of the basic indicators of the national energy balance. It is the sum of domestic and imported energy sources, expressed in energy units. The objective of the current National Energy Concept of the Czech Republic (NEC) is to achieve a diversified mix of PES by 2040 with a target structure in the following corridors: nuclear fuel 25–33%, solid fuels 11–17%, gaseous fuels 18–25%, liquid fuels 14–17%, renewable and secondary sources 17–22%.

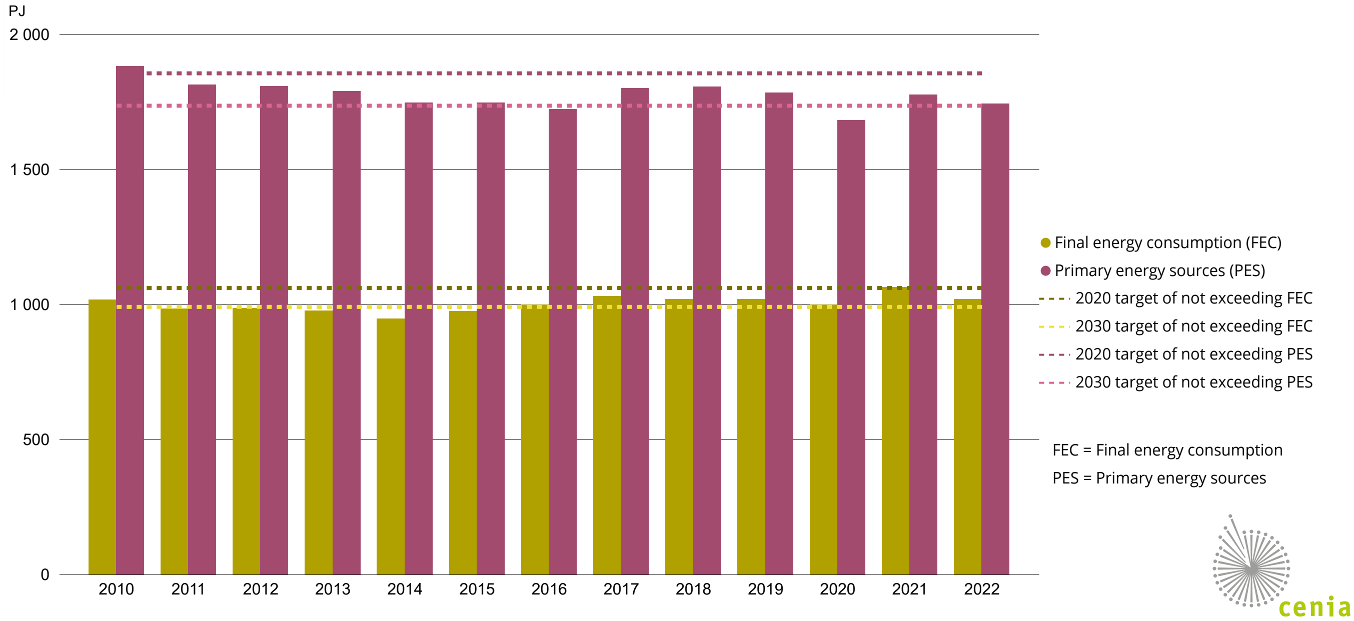
Consumption of primary energy sources is fluctuating with a slightly decreasing trend. In 2022, the value of PES was 1,742.6 PJ, i.e. 1.9% lower than in the previous year 2021. In 2022, the largest share of the energy mix (32.3%) in the Czech Republic consisted of **solid fossil fuels** (lignite and coal), the extraction of which has a long tradition in the Czech Republic due to its rich reserves. In line with efforts to decarbonise the energy sector, this figure is declining over the long term and solid fossil fuels are gradually being replaced by more environmentally friendly sources. After 2020, however, the share of solid fossil fuels is stagnating to slightly increasing, which can be attributed to the still high consumption of coal for electricity and heat generation and the energy crisis, where coal-fired electricity generation temporarily increased in 2021 and 2022 due to natural gas shortages and high gas prices, while natural gas-fired electricity generation decreased. Achieving the NEC target corridor is thus distant but likely by 2040.

Oil and petroleum products accounted for 22.7% of total PES consumption in 2022. The NEC aims to reduce their share to values in the range of 14–17%, but the trend of the share of liquid fuels is going in the opposite direction, their share in the energy mix is slightly increasing, mostly as a result of the development of the consumption of petroleum fuels in transport. **Natural gas** consumption fluctuated, with its share in the PES mix reaching the target corridor (18–25%) in 2020 and 15.2% in 2022. The decrease in natural gas consumption was caused by a decrease in its use for electricity and heat production on account of its high prices. **Nuclear energy** accounted for 18.5% of the energy mix in 2022. The current NEC envisages an increase in the share of nuclear power in the PES to 25–33%. Based on NEC, the National Action Plan for the Development of Nuclear Energy in the Czech Republic was developed, detailing the further development of these sources in the Czech Republic, including the construction of new nuclear units to increase the existing capacity. In 2022, the **contribution of renewable energy sources (RES) and biofuels** in the structure of the PES was 13.1%. This category has a significantly increasing trend and it can be assumed that the set targets for the contribution of RES can be achieved by 2030.

Final energy consumption in 2022 declined by 4.2% year-on-year to 1,019.0 PJ (Chart 38). The year-on-year decline in final energy consumption was driven by a decrease in energy consumption in industry (by 5.9%) and in households (by 8.7%), while energy consumption in transport increased year-on-year. In contrast to the consumption of PES, final energy consumption follows a slightly increasing trend and thus the trend is not yet on a track to reach the energy efficiency target of 846 PJ in 2030 set in the draft update of the NCEP and the CPCR. Based on the results of the modelling carried out under the SEEPIA project using the TIMES model, the final energy consumption in 2030 should be 1,026.9 PJ under the WEM scenario and 1,001.8 PJ under the WAM scenario.

Chart 38

PES consumption and final energy consumption compared to 2020 and 2030 targets in the Czech Republic [PJ], 2010–2022



As to the closing date of this publication, data for 2023 were not available.
The chart does not yet take into account the updated targets in the draft update of the NCEP and CPCR, the chart will be adjusted once these documents are approved.

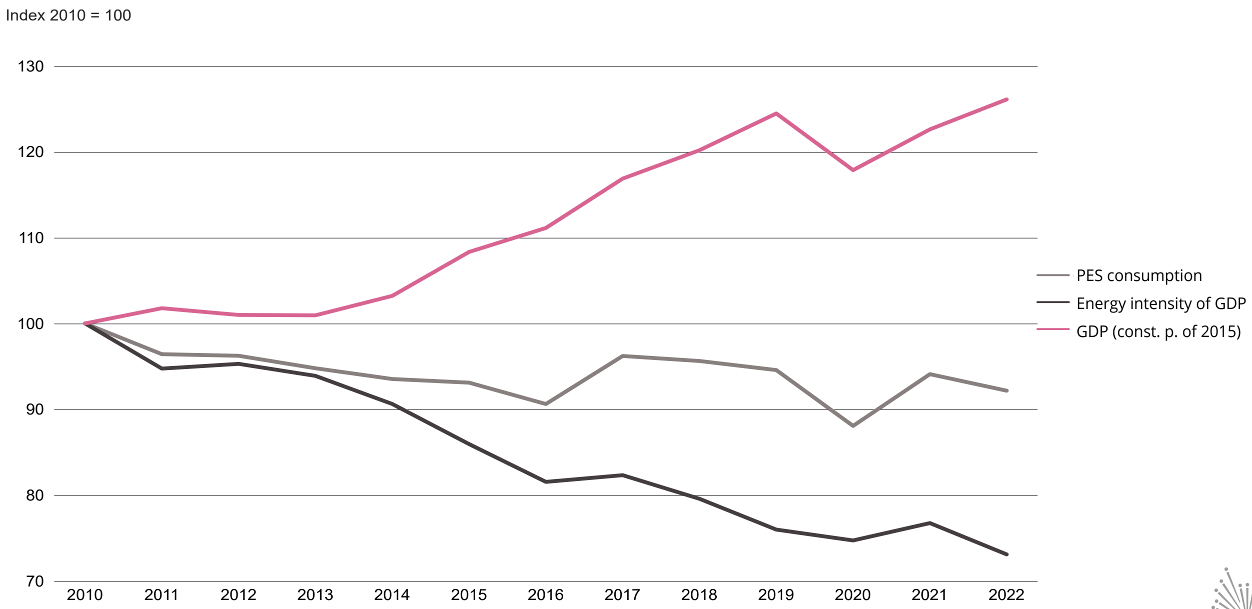
https://www.envirometr.cz/data/spotreba-pez-a-konecna-spotreba-energie *Data source: MIT*

The energy intensity of an economy tracks the amount of energy that an economy needs to produce per unit of economic output. We express it as consumption of PES per unit of gross domestic product. Unlike the energy efficiency indicator, it does not track the absolute amount of energy consumed, but the efficiency of energy use in the economy. As energy consumption (and production) is associated with a number of environmental pressures, the long-term goal is to reduce energy intensity in all areas of human activity by increasing the efficiency of appliances, introducing energy-saving technologies and reducing waste. These steps are aimed at increasing energy security, independence and self-sufficiency.

The energy intensity of the Czech economy has been **steadily decreasing**, between 2010 and 2022 the energy intensity dropped by 26.9% to 279.5 MJ.thousand CZK^{-1} (Chart 39). When comparing the **energy intensity of the different sectors** of the national economy, transport has the highest values, followed by agriculture and forestry and industry. However, the high energy intensity of transport is distorted by the inclusion of private car transport, which makes no contribution to economic performance.

Chart 39

Energy intensity of GDP in the Czech Republic [index, 2010 = 100], 2010–2022



As to the closing date of this publication, data for 2023 were not available.

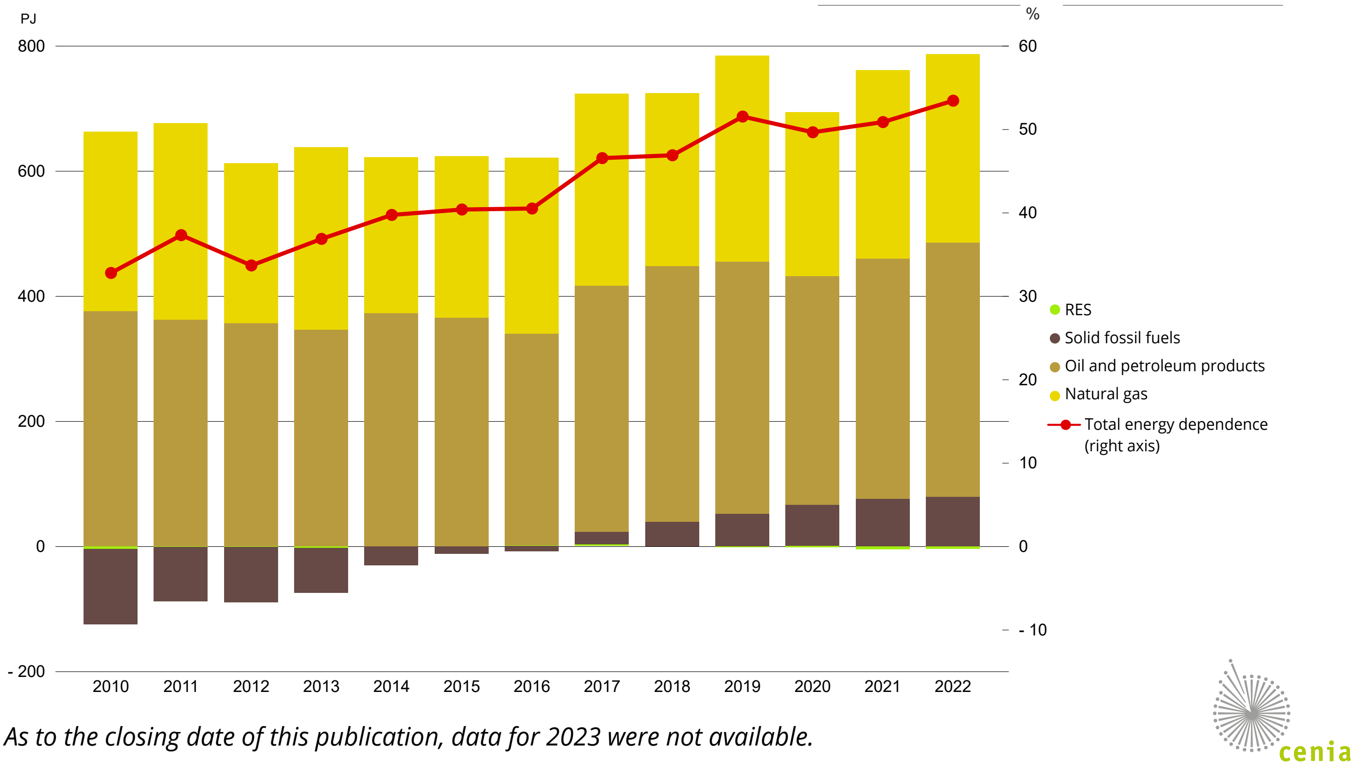
https://www.envirometr.cz/data/energeticka-narocnost-hdp

Data source: CZSO, MIT

A country's energy security is also defined by its **energy import dependency**, indicating the extent to which the economy is forced to import energy resources to meet its energy needs. The Czech Republic has a target of not exceeding 65% import energy dependency by 2030 and 70% by 2040. Over the last decade, the Czech Republic's energy import dependency has been on an increasing trend, rising from 32.7% in 2010 to 53.4% in 2022 (Chart 40). The Czech Republic is almost entirely import-dependent on oil and natural gas imports, and after 2017 we also observe a positive import/export balance for solid fossil fuels due to the domestic coal production phase-out.

Chart 40

Balance of exports and imports of different fuels, import energy dependency of the Czech Republic [PJ, %], 2010–2022



As to the closing date of this publication, data for 2023 were not available.

https://www.envirometr.cz/data/energeticka-zavislost

Data source: MIT

Renewable energy sources

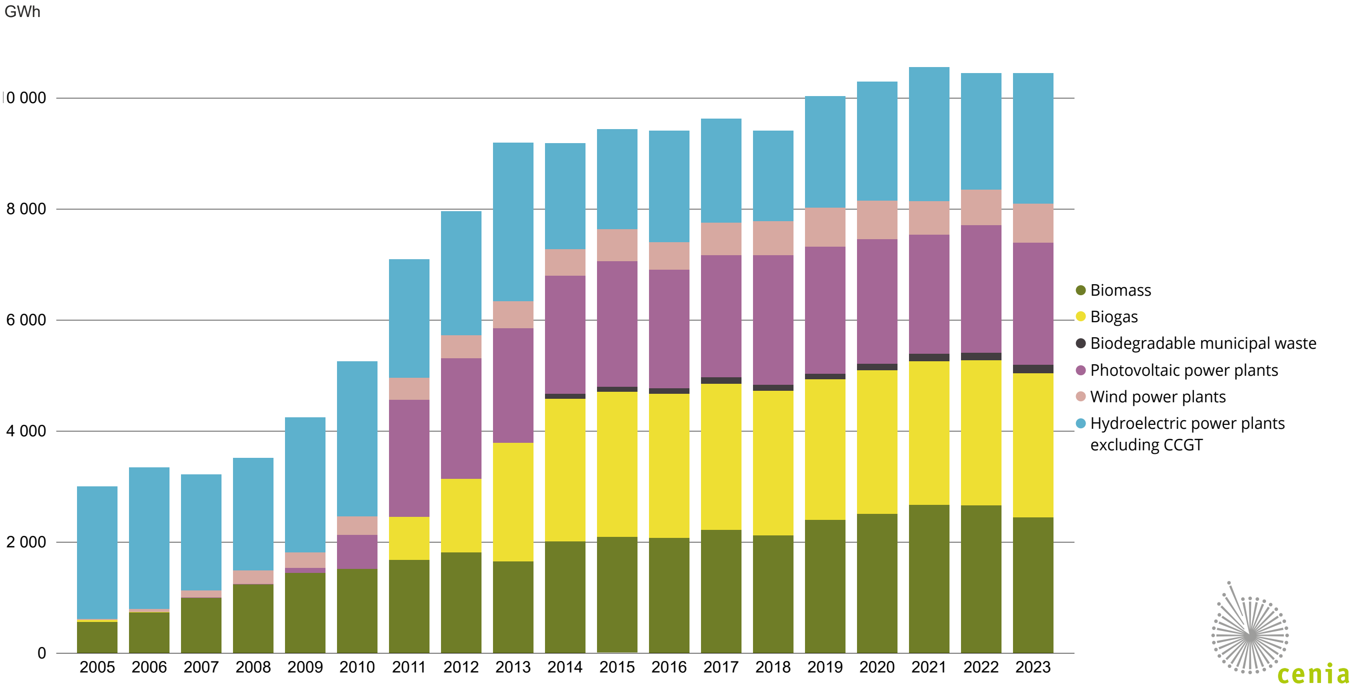
The use of renewable energy sources is beneficial in terms of energy security and climate neutrality. However, it is limited by local natural conditions (relief, climate) and its economic viability.

During the period 2008–2013, **electricity generation from renewable sources** soared, as these sources were strongly promoted through the implementation of policy decisions. Since 2014, however, the growth rate of electricity generation from RES has slowed down (Chart 41). In 2023, 10,440 GWh of electricity was generated from renewable sources, indicating a year-on-year stagnation of RES generation. Renewable sources accounted for 13.7% of total gross electricity generation.

In terms of sources, electricity production from RES is rather diverse and their contribution is relatively balanced (Chart 41). In 2023, most of the electricity generated by renewable sources came from biomass (23.3%), biogas (24.9%), photovoltaic plants (21.0%) and hydropower (22.5%, excluding pumped storage). In aggregate, wind and waste-to-energy generation represent only about 7% of the total electricity generated from RES.

Chart 41

Electricity production from RES in the Czech Republic [GWh], 2003–2023



https://www.envirometr.cz/data/vyroba-elektriny-z-oze

Data source: ERA

There are two **binding targets** for electricity from renewable sources in the Czech Republic. The first stems from the National Energy and Climate Plan of the Czech Republic (NECP) and sets a target of a 30% contribution of RES to gross final energy consumption by 2030, compared to 18.2% in 2022. Another target, laid down by the National Energy Concept (NEC), is to achieve a contribution of RES to electricity generation in the range of 18–25% by 2040. In 2023, this contribution was 13.7%. If the rate of growth of RES electricity generation and final electricity consumption from RES is sustained, it can be assumed that both targets will be met within the given deadlines. The modelling carried out within the SEEPIA project predicts a contribution of RES to final energy consumption of 24.0% in 2030 under the WEM scenario, and 30.1% under the WAM scenario.

Over the period 2010–2022[45], the **heat production from renewable sources** followed an increasing trend, but in 2022 it decreased by 10.3% year-on-year to 11,687 TJ, which was however caused by overall lower heat production because of the warmer heating season. The contribution of RES to heat production in 2022 reached 10.8%. Biomass took the largest share of heat production from RES, accounting for 79.6% in 2022. Other heat sources include waste (heat from waste incinerators, 12.9%), biogas (6.7%) and heat pumps (0.8%).

The growing use of **RES in transport** is essential for reducing the transport dependency on fossil energy sources, for decarbonising transport and thereby reducing greenhouse gases from transport. Binding targets for the contribution of RES to final energy consumption in transport were set by Directive 2009/28/EC for 2020. This Directive was replaced by Directive 2018/2001/EC (RED II), under which the share of RES in transport was to be increased to 14% by 2030. In October 2023, the amended Directive 2023/2413/EC (RED III) entered into force, increasing the RES target to 29% and introducing an alternative target of 14.5% reduction in fuel intensity relative to the baseline set under the Directive's methodology, i.e. when using fossil fuels.

[45] *As to the closing date of this publication, data for 2023 were not available.*

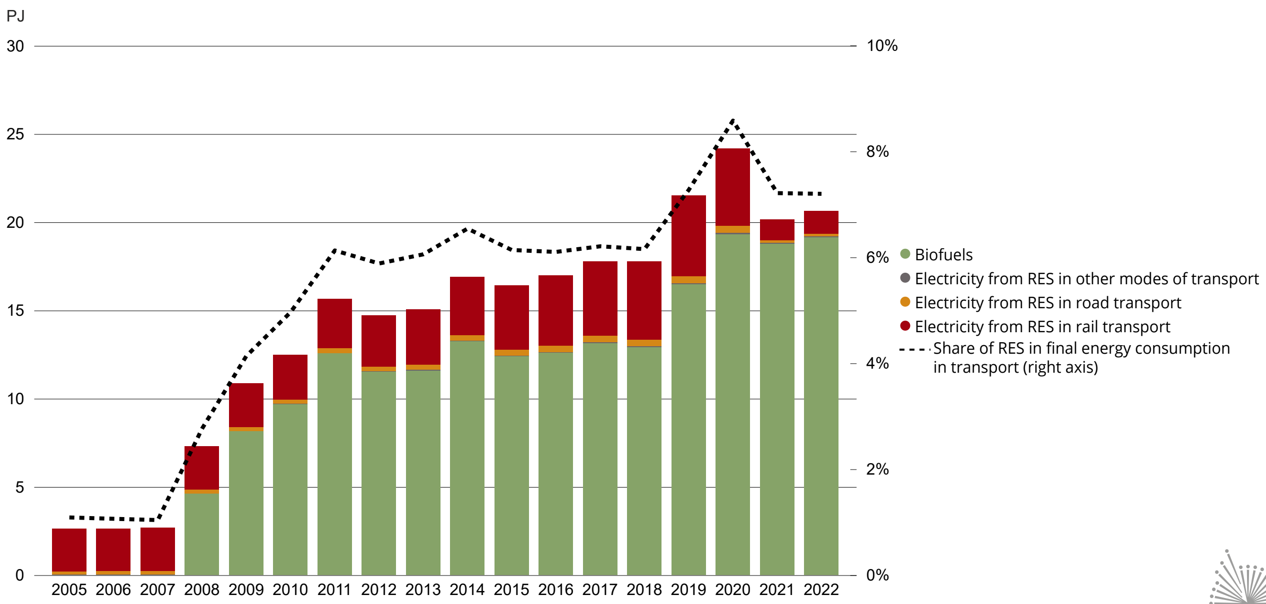
According to SHARES data[46], over the period 2010–2022 **RES energy consumption** in transport increased by 65.3% to 20.7 PJ, while year-on-year RES energy consumption in transport stagnated (Chart 42). Biofuels accounted for the highest share of RES energy consumption (92.8%), while electricity consumption in rail transport accounted for 6.3% and only 0.7% in road transport. In 2022, the share of RES in final energy consumption in transport was 7.2%.

RES consumption and RES shares are calculated using the methodology set out in the European legislation in force for the year in question, laying down rules for biofuels counting (e.g. limiting the counting of 1st generation biofuels produced from crops grown on agricultural land and, on the contrary, favouring biofuels produced from waste and non-food biomass) and for calculating the shares of RES in electricity consumption. In 2021, the RED II Directive came into force, providing a different way of calculating the consumption of electricity produced from RES in transport (taking into account the national energy mix instead of the European one and using lower multipliers for road and rail transport); data for the following years were calculated according to this Directive. The reported decrease in RES consumption in transport between 2020 and 2021 is therefore merely methodological.

The Czech Republic is not yet on track to meet the **target** of 14% for the **share of RES in final energy consumption in transport** set by the REDII Directive (and 29% by the amended REDIII Directive). However, the model calculations conducted as part of the SEEPIA project for the update of the NCEP predict a significant increase in the share of RES in transport in the future. Under the WEM scenario, the share should reach 13.7% of final energy consumption in transport in 2030, while the WAM scenario predicts a more significant growth of RES use in transport to 18.1% of final energy consumption in 2030.

Chart 42

Energy consumption from RES in transport in the Czech Republic and share of RES in final energy consumption in transport [PJ, %], 2005–2022



As to the closing date of this publication, data for 2023 were not available.

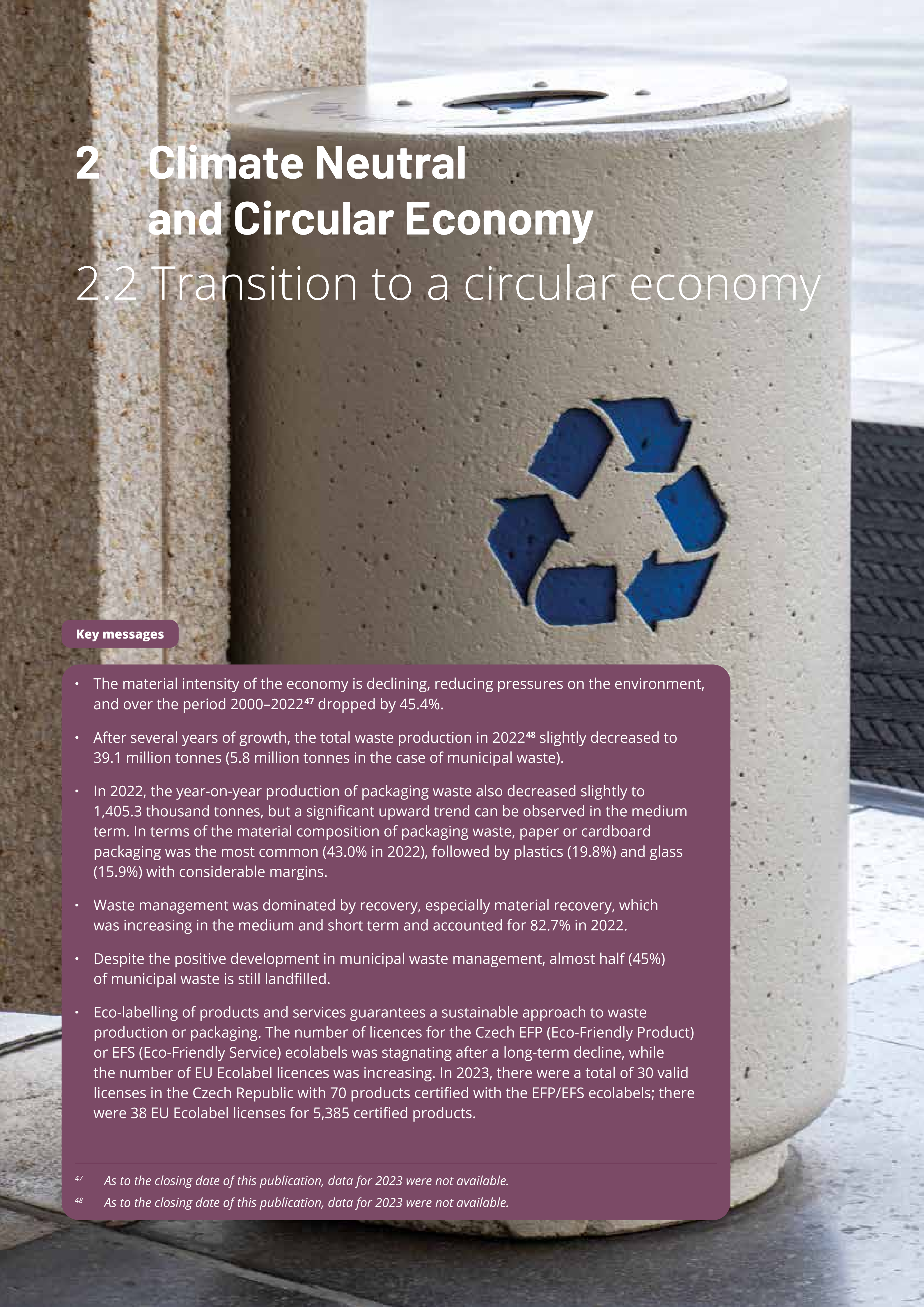
https://www.envirometr.cz/data/vyroba-elektriny-z-oze

Data source: MIT

Detailed visualisations and data

https://www.envirometr.cz/data

46 *SHARES (Short Assessment of Renewable Energy Sources) methodology, see under Directive 2009/28/EC and Directive (EU)2018/2001 (RED II). 2023 SHARES data are not available.*



2 Climate Neutral and Circular Economy

2.2 Transition to a circular economy

Key messages

- The material intensity of the economy is declining, reducing pressures on the environment, and over the period 2000–2022[47] dropped by 45.4%.
- After several years of growth, the total waste production in 2022[48] slightly decreased to 39.1 million tonnes (5.8 million tonnes in the case of municipal waste).
- In 2022, the year-on-year production of packaging waste also decreased slightly to 1,405.3 thousand tonnes, but a significant upward trend can be observed in the medium term. In terms of the material composition of packaging waste, paper or cardboard packaging was the most common (43.0% in 2022), followed by plastics (19.8%) and glass (15.9%) with considerable margins.
- Waste management was dominated by recovery, especially material recovery, which was increasing in the medium and short term and accounted for 82.7% in 2022.
- Despite the positive development in municipal waste management, almost half (45%) of municipal waste is still landfilled.
- Eco-labelling of products and services guarantees a sustainable approach to waste production or packaging. The number of licences for the Czech EFP (Eco-Friendly Product) or EFS (Eco-Friendly Service) ecolabels was stagnating after a long-term decline, while the number of EU Ecolabel licences was increasing. In 2023, there were a total of 30 valid licenses in the Czech Republic with 70 products certified with the EFP/EFS ecolabels; there were 38 EU Ecolabel licenses for 5,385 certified products.

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[47] *As to the closing date of this publication, data for 2023 were not available.*

[48] *As to the closing date of this publication, data for 2023 were not available.*

2.2 | Transition to a circular economy

Meeting the underlying targets

Target set	For year	Value in 2023	On track towards the target
Total number of 100 valid Eco-Friendly Product or Eco-Friendly Service Ecolabel licences (NEP 2030 target)	2030	30	✗
Total number of 25 valid EU Ecolabel licences (NEP 2030 target)	2030	38	✓
Increasing the recycling rate of municipal waste to at least 55% (target of the WMPCR)	2025	40,7*	✗
Increasing the recycling rate of municipal waste to at least 60% (target of the WMPCR)	2030	40,7*	✗
Increasing the recycling rate of municipal waste to at least 65% (target of the WMPCR)	2035	40,7*	✗
Reduction of landfilling rate of municipal waste to maximum 10% (target of the WMPCR)	2035	45,4*	✗

** Value in 2022. As to the closing date of this publication, data for 2023 were not available.*

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
2.2.1 The material intensity of the economy is decreasing	Material intensity of the economy	↘	↘	✓
	Share of secondary raw material production volume in direct material input	N/A	↗	~
2.2.2 Maximum waste prevention	Waste production	N/A	→	✗
	Ecolabel*			
	Total number of valid Eco-Friendly Product or Eco-Friendly Service Ecolabel licences	↘	↘	✗
	Total number of valid EU Ecolabel licences	↗	↗	✓
2.2.3 Waste hierarchy is respected	Waste management structure	N/A	~↗	✓
	Municipal waste management	N/A	~↗	~

** Due to the different timeline trends underlying the design of the indicator, an assessment of the sub (elementary) indicators is given.*

Current measures supporting achievement of the objective

- As a follow-up to the Strategic Framework for the Circular Economy of the Czech Republic 2040, the Action Plan for the Circular Economy 2022–2027 was approved.
- The adopted Act No. 243/2022 Coll. (on Limiting the Environmental Impact of Selected Plastic Products) bans the marketing of a number of single-use plastic products.
- An amendment to the Packaging Act is being prepared to introduce a Deposit Return Scheme for PET and aluminium containers.
- The 2025–2035 Waste Management Plan of the Czech Republic (WMPCR) is under preparation.

Material intensity of the economy

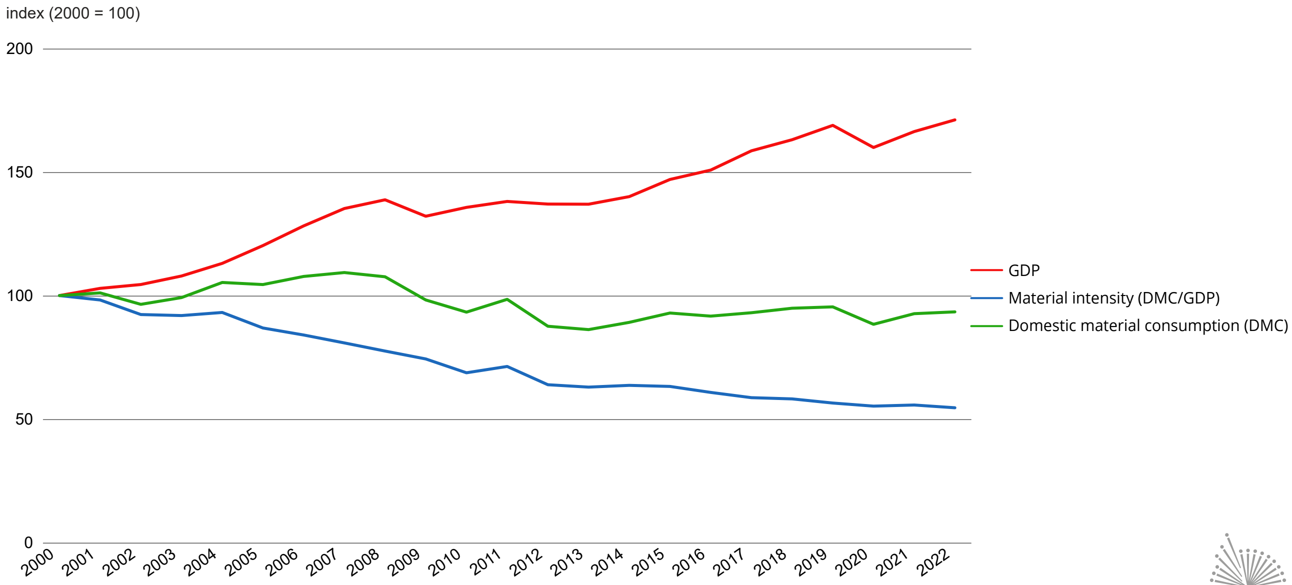
Over the period 2000–2022[49], the **material intensity of the economy** decreased by 45.4%, i.e. by 2.0% year-on-year to 26.9 kg.1000 CZK^{-1} (Chart 43). The declining material intensity reflects a reduction in the natural resource intensity of the economy due to the increased efficiency of converting material inputs into economic output. The situation in 2022 represented a relative decoupling, with the economy's output rising by 2.8% year-on-year, whilst domestic material consumption increasing as well, but only by 0.8% to 168.0 million t.

For most years in the period 2000–2022, the pattern of material intensity was one of **relative decoupling**, whereby the environmental burden expressed as material consumption (DMC) per unit of GDP declines, but in absolute terms DMC follows the same pattern as the economy (i.e. it rises as the economy grows and falls as the economy declines). This is a consequence of the structure of GDP generation in the Czech Republic with a high share of industry and also of the fact that the growth of the economy during the reporting period was significantly impacted by manufacturing industry and its more material-intensive sectors. **Absolute decoupling**, whereby the environmental burden decreases in absolute terms despite economic growth, which is the optimal path from the environmental perspective, was rare during the reporting period. It occurred in a total of five years during the reporting period, most recently in 2016.

[49] *As to the closing date of this publication, data for 2023 were not available.*

Chart 43

Development of material intensity of the economy, domestic material consumption and GDP in the Czech Republic [index, 2000 = 100], 2000–2022



GDP in constant 2020 prices. As to the closing date of this publication, data for 2023 were not available.

https://www.envirometr.cz/data/materialova-narocnost-hospodarstvi

Data source: CZSO

Factors causing the decline in material intensity after 2000 included a reduction in the share of solid fuels in the energy mix for electricity and heat production, the growth in the use of renewable and other non-fossil energy sources, and a reduction in the energy and material intensity of industry. Declining material intensity allows to reduce the negative impacts on the landscape resulting from the extraction of mineral resources and to cut the waste flows of the economy generated by the use of materials and raw materials, including air emissions and waste production. Increasing efficiency in the cultivation and use of biomass reduces the pressures of agriculture on water quality and ecosystems.

The **intensive indicators of material flows**, and hence the specific environmental burdens per capita and per unit of GDP associated with the extraction and consumption of materials, are slightly above average in the Czech Republic relative to other EU-27 countries, reflecting the nature of the economy. **Domestic material consumption per capita** in the Czech Republic reached 15.8 t.capita^{-1} in 2021[50], i.e. 11.8% above the EU-27 average. The material intensity of the Czech economy in 2021 was 0.5 t.(1,000 PPS)$^{-1}$, i.e. 22.4% above the EU-27 average material intensity. The highest material intensity is recorded in economically weaker countries with high extraction and consumption of raw materials (e.g. Romania, Bulgaria), while the Czech Republic's position in terms of material intensity is one of the best among Central European countries with comparable economies.

[50] *As to the closing date of this publication, data for 2023 were not available.*

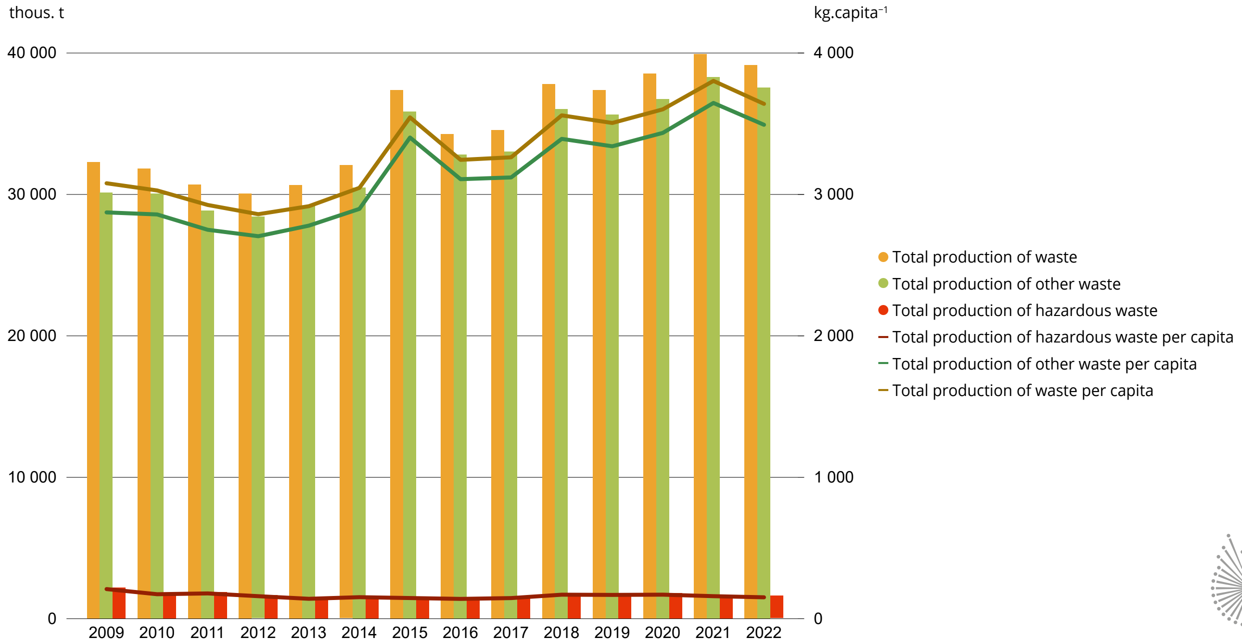
Waste prevention

Currently, a key effort in waste management is to move towards a **circular economy**, where material flows are closed in long cycles and the emphasis is on waste prevention, product reuse, recycling and conversion to energy rather than mineral extraction and landfilling.

Total waste production (sum of total production of other and hazardous waste) increased by 21.3% from 2009 to 2022[51], but decreased by 1.9% year-on-year between 2021 and 2022 to 39,140.1 thousand tonnes (Chart 44). However, despite the decline in 2022, a medium-term upward trend can be observed. Waste production can be reduced by preventing its generation, in consistency with the circular economy principles. Another important indicator is the total waste production per capita: in 2022, it amounted to 3,716.9 kg.capita^{-1} and decreased by 2.2% year-on-year. The total production of other waste contributes significantly (95.9% in 2022) to the **total waste production**. This is mainly affected by the production of construction and demolition waste. Over the period 2009–2022, the total production of other waste increased by 24.7%, but decreased by 1.9% year-on-year between 2021 and 2022 to 37,547.2 thousand tonnes. **Hazardous waste** accounted for 4.1% of total waste generation in 2022. The value of this share has dropped from 6.7% since 2009. Over the period 2009–2022, the total production of hazardous waste decreased by 26.3% and by 2.7% year-on-year between 2021 and 2022 to a total of 1,592.8 thousand tonnes. The total production of hazardous waste per capita in 2022 was 151.3 kg.capita^{-1}. This waste can be prevented by reducing the hazardous substances in products.

Chart 44

Total production of waste, other and hazardous waste in the Czech Republic [thousand tonnes], total production of waste, other and hazardous waste per capita in the Czech Republic [kg.capita^{-1}], 2009–2022



As to the closing date of this publication, data for 2023 were not available.
The data were derived using the methodology of the Waste Management Indicator System applicable for the given year.
The CZSO is the source of data on the population of the Czech Republic (mean).

https://www.envirometr.cz/data/celkova-produkce-odpadu

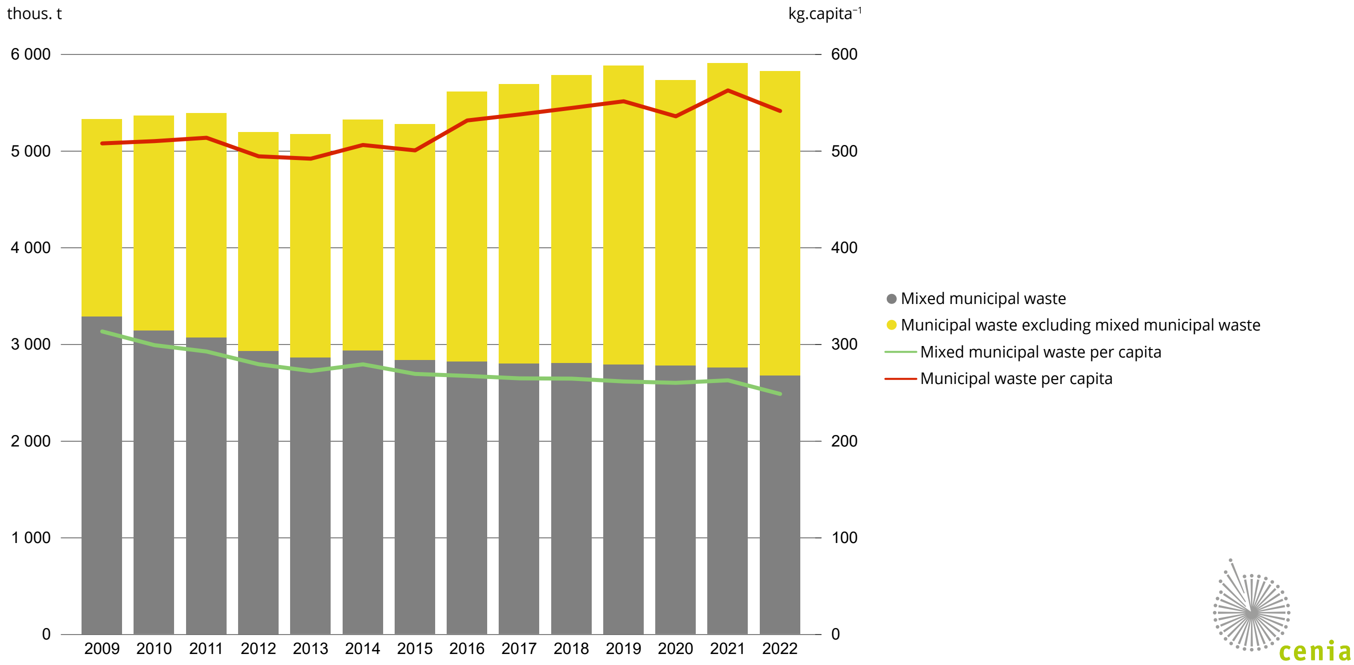
Data source: WMIS, CZSO

[51] *As to the closing date of this publication, data for 2023 were not available.*

The total production of municipal waste[52] over the period 2021–2022 decreased by 1.4% year-on-year to 5,821.1 thousand tonnes (Chart 45). However, despite the latest year-on-year decline, there was a 9.3% increase since 2009. The total per capita production of municipal waste in 2022 was 552.8 kg.capita^{-1}. On the plus side, there is a slight reduction in the production of mixed municipal waste in the medium term. Over the period 2009–2022, the **production of mixed municipal waste** decreased by 18.6% and by 3% year-on-year between 2021 and 2022 to a total of 2,672.1 thousand tonnes. The total production of mixed municipal waste per capita in 2022 was 253.8 kg.capita^{-1}.

Chart 45

Total production of municipal waste in the Czech Republic [thousands tonnes], per capita production of municipal and mixed municipal waste in the Czech Republic [kg.capita^{-1}], 2009–2022



As to the closing date of this publication, data for 2023 were not available.
The data were derived using the methodology of the Waste Management Indicator System applicable for the given year.
The CZSO is the source of data on the population of the Czech Republic (mean).

https://www.envirometr.cz/data/produkce-komunalnich-odpadu *Data source: WMIS, CZSO*

52 *Due to the change in methodology, as of 2020 waste catalogue numbers 20 02 02 (soil and rocks) and 20 03 06 (sewage treatment waste) are not counted in the total municipal waste production.*

One of the most characteristic features of the consumer society is the increase in the **production of packaging waste**. Over the period 2009–2022, the production of packaging waste increased by 57.1%. In 2022, 1,405.3 thousand tonnes of packaging waste was produced in the Czech Republic, with a slight decrease of 2.2% compared to 2021. However, a significant upward trend can be observed in the medium and short term. In terms of the material composition of packaging waste, paper or cardboard packaging was the most common (43.0% in 2022), followed by plastics (19.8%) and glass (15.9%) with considerable margins.

Eco-labelling of products and services is one of the principles that guarantees a **sustainable approach to waste production or packaging. Eco-labelling** refers to the labelling of products and services that are proven to be more environmentally friendly throughout their life cycle, as well as being better for the health of the consumer. Their quality must remain at a very high level, and their properties are tested by accredited laboratories. Eco-labels are awarded after a comprehensive verification of the entire life cycle of the product, certified products or services can be identified by a simple and easy to remember symbol, the eco-label logo.

The **EU Ecolabel** is the European Union's official label for environmental excellence. In this respect, the only purely Czech, specific labels are the **Eco-Friendly Product (EFP)** and the **Eco-Friendly Service (EFS)**, guaranteed by the Ministry of the Environment. It is up to the applicant whether they want to have certified their product with the national label, the EU label or both.

In 2023, there were a total of **30 valid licenses** in the Czech Republic with 70 products certified with the EFP/EFS ecolabels; there were **38** EU Ecolabel **licenses** for 5,385 certified products. Compared to 2022, there is an increasing trend in the number of EU Ecolabel licences, while the number of EFP/EFS licences was rather stagnant (Chart 46). It is clear that, if current trends continue, the EFP/EFS eco-label will fail to reach its target set for 2030 (100 valid licences), unlike the EU Ecolabel where the target of 25 valid licences has already been reached. The eco-label **certification criteria** are continuously updated according to the most recent knowledge and available technologies so that the eco-label remains a token of environmental excellence. Thus, only 10–20% of environmentally friendly products are awarded the eco-label. Currently, the most valid EFP/EFS eco-labels and EU Flower licences are in the categories of furniture, paper, cosmetics and pharmaceuticals.

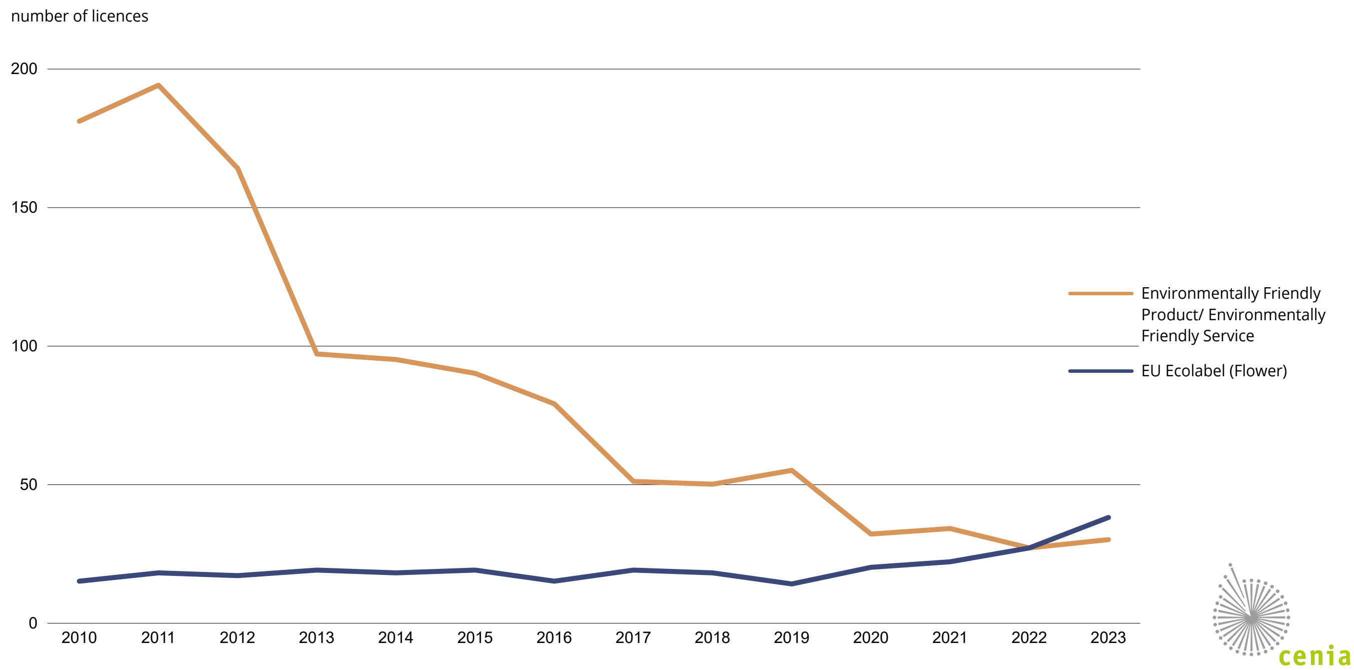
Since May 2022, a **communication campaign** on eco-labels has been implemented with the aim of raising consumer awareness of eco-labels, or the benefits of products certified with official eco-labels, and to attract new licensees among producers. The media campaign focused mainly on online media, e.g. visuals with "Ekolífek" as a so-called "branding" (frame of the entire website) or banner on news portals, as well as accompanying PR articles (advertorials) about eco-labels, also on social media (Facebook).

In 2023, in addition to social media, the campaign continued mainly in the form of direct marketing (direct mails and calls), targeting directly the producers, i.e. potential eco-label candidates. The call centre reached out to over 2,000 companies. To a lesser extent, the media campaign was also carried out in the press (print advertisements in magazines and newspapers), on television ("Interview+" on CNN Prima News) and on Czech Radio (interviews with experts from the Ministry of the Environment and CENIA about eco-labels).

Internationally, a comparison of the number of licences or products and services certified with the EU Ecolabel in individual European countries can be made. In EU-27, there were a total of 2,584 licences valid for 88,921 certified products and services as of September 2023. The Czech Republic ranked 7th in the number of certified products and services across all EU-27 countries.

Chart 46

Valid EFP/EFS Eco-label and EU Flower licences in the Czech Republic [number], 2006–2023



https://www.envirometr.cz/data/celkovy-pocet-platnych-licenci-ekoznacek

Data source: MoE

Waste hierarchy compliance

Waste management was dominated by recovery, especially material recovery, which was increasing in the medium and short term (Chart 47). In 2009–2022, the share of **material recovered from waste** increased from 72.5% to 82.7% (i.e. to 29,034.8 thousand tonnes). Only a small proportion of the total waste production is used for **waste-to-energy recovery**. Over the period 2009–2022, the share of waste-to-energy recovery increased from 2.2% to 3.1% (i.e. 1,343.7 thousand tonnes).

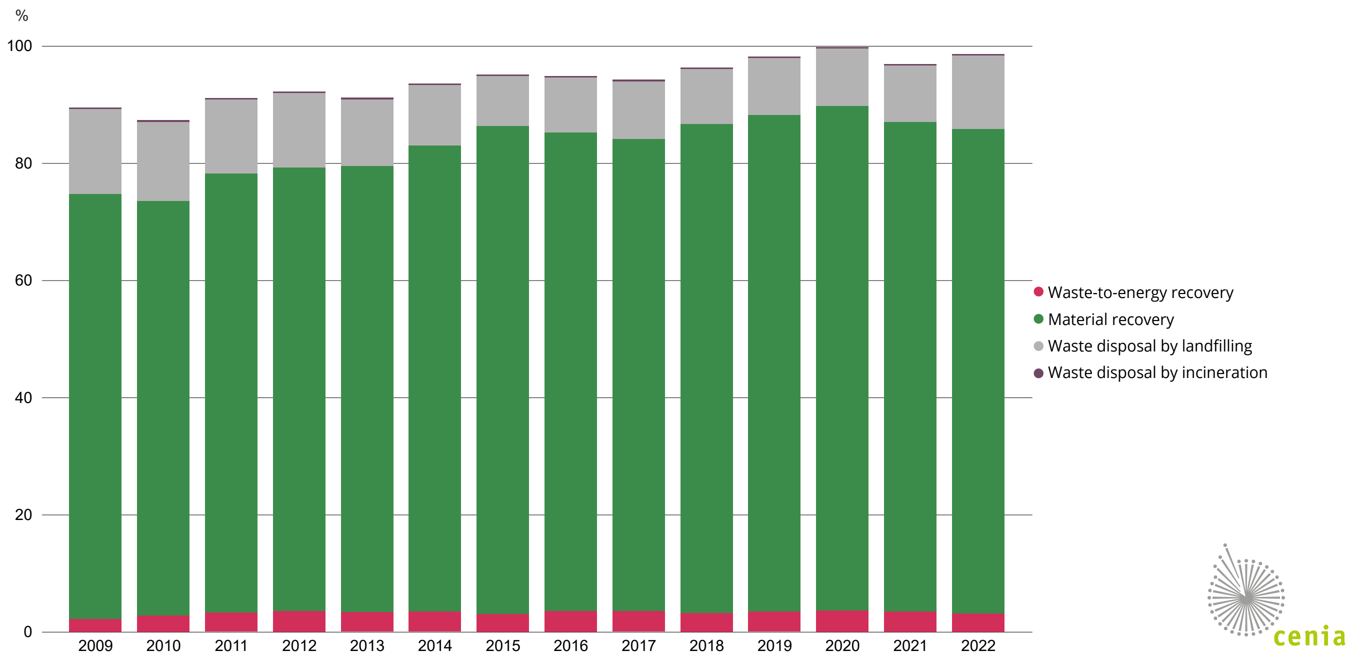
The most common method of waste disposal is landfilling, i.e. disposal at or below ground level. This remains a significant problem in the Czech Republic. Since 2009, the share of landfilling has dropped from 14.6% to 12.6% in 2022; i.e. the not significant decrease. In 2022, the amount of waste disposed of by landfilling was 4,519.0 thousand tonnes. Another method of waste disposal is **incineration**. Approximately 0.2% (i.e. 78.0 thousand tonnes) of waste generated each year is disposed of by incineration, i.e. a negligible proportion.

The aim is to further reduce the share of landfilling in total waste production in favour of material and energy recovery, i.e. in line with the current waste management hierarchy. It is essential to use the right (mainly legislative[53]) instruments for this gradual change, which can significantly facilitate the transition to a circular economy.

[53] *In the context of the transition to a circular economy, active legislative support for material recycling is necessary, as the preparation and transition to systems that foster the circular economy are very time consuming and challenging without such support (as shown by examples from other countries).*

Chart 47

Share of selected waste management methods in waste generation in the Czech Republic [%], 2009–2022



As to the closing date of this publication, data for 2023 were not available.
The data were derived using the methodology of the Waste Management Indicator System applicable for the given year.

https://www.envirometr.cz/data/podil-jednotlivych-kategorii-nakladani-s-odpady *Data source: WMIS*

Municipal waste[54] is a specific group of waste, and this is reflected in the way it is **managed**. Unlike the other waste groups, **landfilling** is the predominant method of disposal in this case. However, since 2009, the share of landfilled municipal waste in municipal waste generation has decreased from 64.0% to 45.4% in 2022. Compared to 2021, the decline was 2.2 p.p. (Chart 48).

Diversion from landfill is increasing the share of **material recovery** of municipal waste, which rose from 22.7% in 2009 to 40.7% in 2022, with an increase of 3.2 p.p. relative to 2021. In the medium term, this share has an increasing trend. At the same time, the importance of **waste-to-energy recovery** from municipal waste also increased from 6.0% in 2009 to 12.2% in 2022, with a 0.1 p.p. year-to-year increase in 2021–2022.

The situation is different for **incineration** (unlike the waste-to-energy recovery of municipal waste, municipal waste is only disposed of by incineration, so it is not used in any way), which is used to dispose of an almost negligible amount of municipal waste (0.1% in 2022).

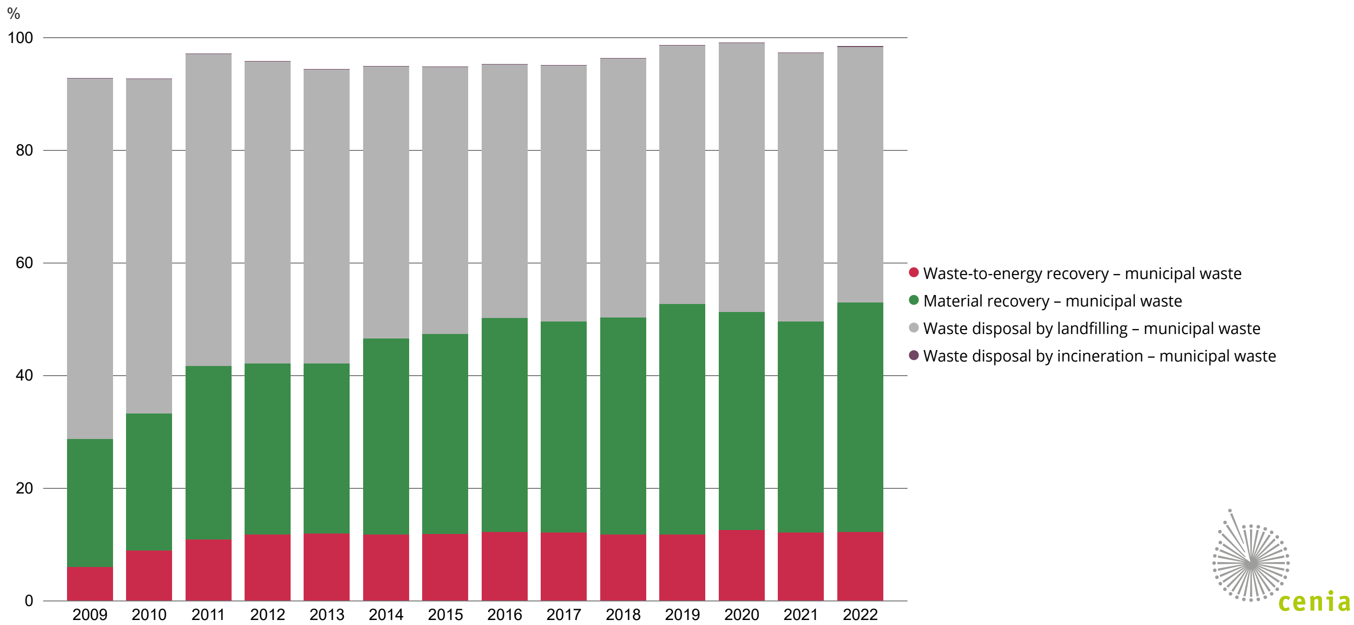
Nevertheless, the municipal waste management situation in the Czech Republic – where municipal waste landfilling is above the EU-28 average and recycling below average – is not satisfactory. The aim is to reduce the share of landfilling in the total production of municipal waste more substantially and at the same time to increase its material and energy recovery, in line with the current hierarchy of waste management methods and the principles of circular economy

[54] *Due to the change in methodology, as of 2020 waste catalogue numbers 20 02 02 (soil and rocks) and 20 03 06 (sewage treatment waste) are not counted in municipal waste management and total municipal waste production.*

along with the need to meet the European targets[55] of circular economy. If the current pattern continues, it will be challenging to achieve the 2025, 2030 and 2035 targets for recycling of municipal waste, the 2035 target for landfilling of municipal waste and the 2035 target for waste-to-energy recovery of municipal waste.

Chart 48

Share of selected municipal waste management methods in the production of municipal waste in the Czech Republic [%], 2009–2022



As to the closing date of this publication, data for 2023 were not available.
The data were derived using the methodology of the Waste Management Indicator System applicable for the given year.

https://www.envirometr.cz/data/podil-jednotlivych-kategorii-nakladani-s-komunalnimi-odpady *Data source: WMIS*

Detailed visualisations and data

https://www.envirometr.cz/data

[55] *The targets for municipal waste are set in Act No. 541/2020 Coll., on Waste.*

3 Nature and landscape

3.1 Ecological stability of the landscape and sustainable landscape management

Key messages

- There has been a long-term trend of land development, which prevents its future use for agriculture or forestry. Over the period 2000–2023, the area of built-up land increased by a total of 4.8 thousand hectares (3.7%), while the loss of agricultural land amounted to 85.7 thousand hectares (2.0%).
- The area affected by mining has been declining in the long term since 2001, but has increased slightly in the last two years as a result of the increase in extraction of construction raw materials in 2021 and then energy raw materials in 2022. In 2023, there were a total of 540.0 km^2 of unreclaimed land.
- Every year there is extensive soil loss through erosion. Potentially 48.1% of agricultural land is prone to water erosion, of which 13.4% is prone to extreme erosion. 33.3% of agricultural land is prone to wind erosion.
- The use of active substances in plant protection products gradually decreased by 13.0% over the period 2000–2023. Nevertheless, the preventive levels of organic pollutants on agricultural land are still being exceeded.
- In 2023, there is a sharp year-on-year reduction in nutrient consumption in mineral fertilisers by 24.2% to 81.01 $kg.ha^{-1}$ of agricultural land. The decrease in consumption was observed mainly for nitrogen fertilisers as a result of economic factors and limited domestic production and imports. Over the period 2000–2022, mineral fertilisers consumption increased by 37.3%.
- In the long term, the health of forest stands has not improved. Logging intensity is decreasing as the bark beetle calamity winds down and extensive reforestation is taking place in the affected areas. Coniferous trees, including fir, dominate forest regeneration, accounting for 52,7 % of the total. Spruce has long been the most frequently planted tree species. Nevertheless, in the long term, a gradual approach to a more natural species composition of forest stands can be observed.

3.1 Ecological stability of the landscape and sustainable landscape management

Meeting the underlying targets

Target set	For year	Value in 2023	On track towards the target
Slowing down the APS loss rates to 0.25% APS over the period 2020–2030[56]	2030	0,71%[57]	✗
Recommended representation of deciduous trees in forests 35.6%[58]	2030	30,1%	~
50% reduction in the use and risk of chemical pesticides[59]	2030	22,5%[60]	✗
Achieve 22% share of organic areas in the total agricultural land in the Czech Republic[61]	2027	16,8%	✗

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
3.1.1 Water retention in the landscape is increased through ecosystem solutionsand sustainable management	Infiltration capacity of soils	N/A	N/A	N/A
	Area of impermeable surfaces	↗	↗	✗
3.1.2 Degradation, including accelerated erosion, and the area loss of agricultural land is decreasing	Soil quality	N/A	N/A	✗
	Erosion and compaction of agricultural soils	N/A	~↗	✗
	Consumption of fertilisers and plant protection products	~↗	↘	~
	Loss of agricultural land	↗	↗	✗
	Mineral extraction	↘	↘	N/A
	Reclamation after mineral extraction	↗	↗	N/A

[56] *Target value of the indicator according to NEP.*

[57] *For the period 2013–2023.*

[58] *Target value of the indicator according to NEP.*

[59] *EU benchmark: 'Farm to Fork' Strategy.*

[60] *Relative to a three-year benchmark calculated as a mean value of 2015, 2016 and 2017.*

[61] *2021–2027 Action Plan of the Czech Republic for the Development of Organic Agriculture*

3.1.3 Non-productive and ecosystem services of the landscape, especially agricultural areas, ponds and forests, are enhanced	Organic farming	↗	↗	✗
	Average size of soil blocks	N/A	↘	✗
	Forest health	↘	↘	✗
	Sustainable forest management	~↗	~↗	~
	Forest species composition	↗	↗	✗

Current measures supporting achievement of the objective

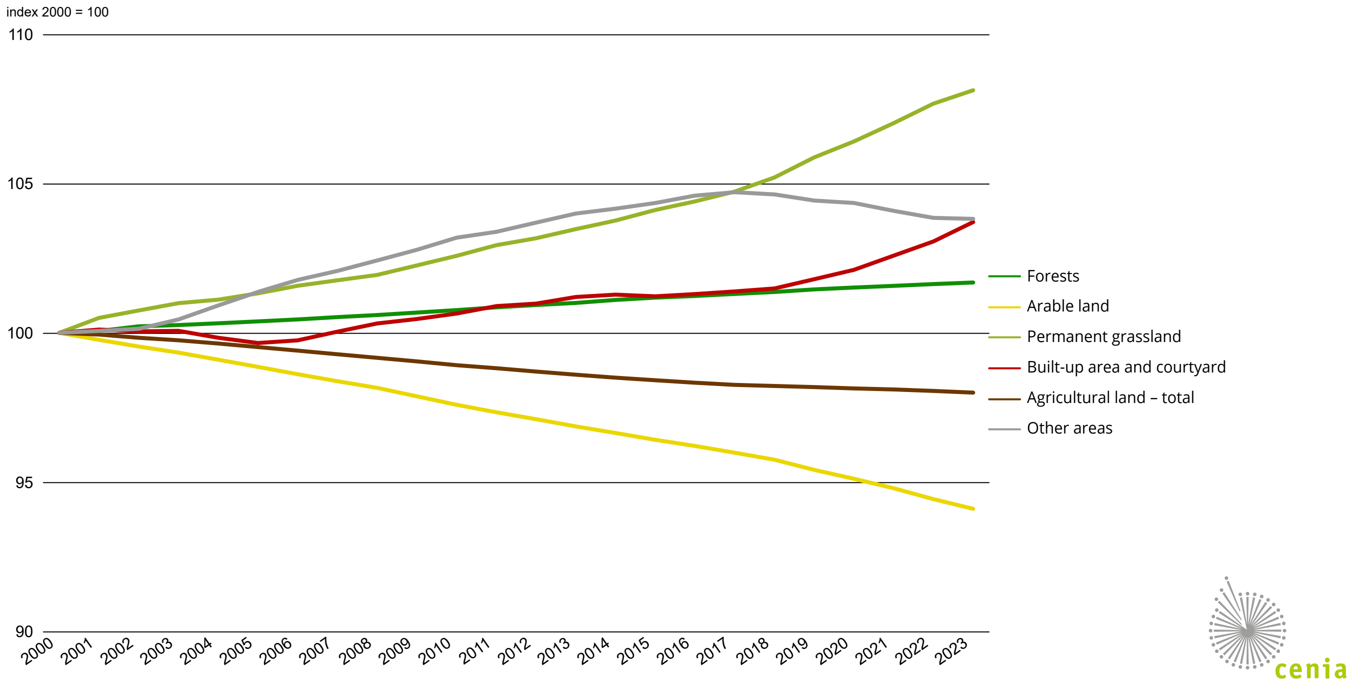
- Financial support is provided for projects to restore wetlands, pools, small water reservoirs and floodplains, care for valuable habitats, planting of greenery, improving the spatial and species composition of woodlands or revitalising watercourses and making them more accessible for fish migration.
- Amendments to the Act on the Protection of the Agricultural Property Stock (APS) have enabled the implementation of landscape features on the APS without the need to remove them from the APS, regulated corrective measures in the event of erosion, and strengthened the role of landowners so that the consent of the landowner is now a prerequisite for the permission to extract land from the APS.
- Financial support is provided for the establishment and restoration of landscape elements, including tree planting, care of significant landscape elements and elements of the Territorial System of Ecological Stability (TSES).
- Adaptation of forest ecosystems to climate change is supported through a financial contribution to environmentally friendly and nature-friendly technologies (specifically, the concentration of timber by cable cars, horses, forest horses or lighter forwarders).
- The MoE regularly sponsors volunteer and awareness-raising activities, e.g. Earth Day, World Cleanup Day, etc.
- During the adoption of the Strategic Plan of the Common Agricultural Policy, the obligation to adjust the definition of erosion-prone land according to the parameters set out in Decree No. 240/2021 Coll., on the Protection of Agricultural Land Against Erosion, was included in the conditions of the Good Agricultural and Environmental Conditions of land (GAEC 5). Since 2023, the area of a single crop has been limited to 30 ha and up to 10 ha on severely erosion-prone land.
- Since 1991, State Property Authority has implemented 859 hectares of water management, 940 hectares of erosion control and 1,985 hectares of environmental measures in the landscape.
- The amendment to the Game Management Act changes hunting planning so that the mandatory minimum hunting of herbivorous game is based on the level of damage to the forest.

Land use

Clear **long-term patterns** of land use in the Czech Republic show a decline in the area of agricultural land and an increase in built-up areas (Chart 49). Over the period 2000–2023, the area of built-up land increased by a total of 4.8 thousand hectares (3.7%), while the loss of agricultural land amounted to 85.7 thousand hectares (2.0%). In 2022[62], a total of 600.1 ha of land was permanently taken from the Agricultural Property Stock (APS) for the housing construction, production and storage and transport construction; 225.3 ha (37.5%) of that stock was the best quality agricultural land of protection classes I and II. Land underlying buildings and structures loses its productive function, preventing its future use for agriculture or forestry. In addition, impermeable surfaces prevent the infiltration of rainwater into the soil and lose their ability to regulate the microclimate. New housing and transport infrastructure also has an adverse effect on species diversity, as it increases landscape fragmentation and generates additional traffic, causing noise and pollution. Intensive land use leads to homogenisation of the landscape and loss and degradation of habitats and species' habitats (see Chapter 3.2).

Chart 49

Land use [index 2000 = 100], 2000–2023



https://www.envirometr.cz/data/podil-zastavenych-a-ostatnich-ploch

Data source: COSMC

Increasing **water retention in the landscape** is supported by water regime revitalisations, which include the removal of drainage systems especially in forest communities of selected wetland areas. The revitalisation measures result in the creation of a dyke system using small and large embankments, mainly to slow down or eliminate water runoff from the wetland, supplemented by a method of covering. Silting and overgrowing of the drainage channels gradually eliminates the entire drainage system and results in the restoration of the wetland habitat.

[62] *As to the closing date of this publication, data for 2023 were not available.*

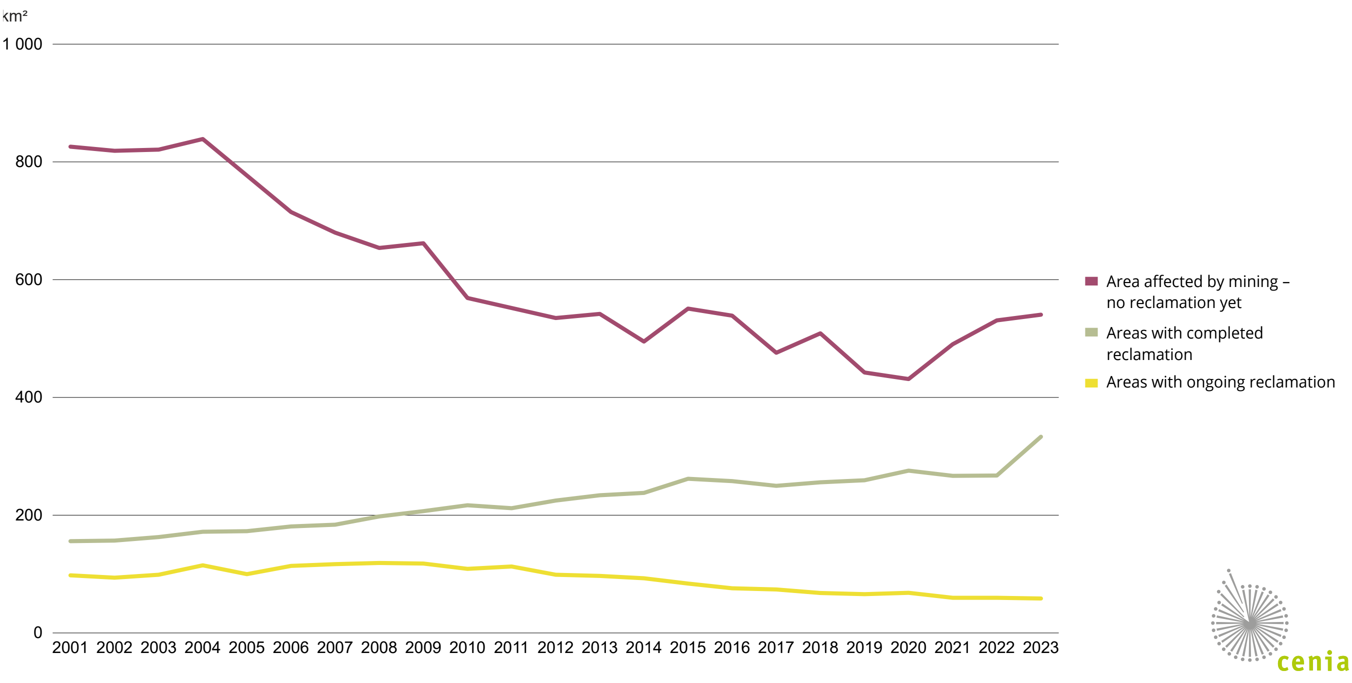
Mineral extraction

Mineral extraction can cause large-scale soil degradation of an area, as the extracted deposits move significant volumes of rock. The largest volumes of mined material in the Czech Republic are construction materials, with building stone and gravel being the most important commodities. As to the energy sources, lignite and stone coal mining play important role. Lignite is mined at the surface in the North Bohemian and Sokolov basins. Stone coal is currently mined in the Upper Silesian Basin by underground mining. However, its production has been declining significantly in recent years due to the mining phase-out.

Act No. 44/1988 Coll., on the Protection and Utilisation of Mineral Resources (Mining Act), requires mining companies **to reclaim areas affected by mining** and to create financial reserves for such reclamation. The area affected by mining (Chart 50) has been declining in the long term since 2001, but has increased slightly in the last two years as a result of the increase in extraction of construction raw materials in 2021 and then energy raw materials in 2022. In 2023, there were a total of 540.0 km^2 of unreclaimed land. Areas reclaimed by natural succession show high natural value within a short period of time. Water reclamation of the area affected by mining also positively affects the environment by retaining water in the landscape, providing drinking water sources or creating desirable landscape features with wetland biotopes dependent on them.

Chart 50

Reclamation after mineral extraction [km^2], 2001–2023



https://www.envirometr.cz/data/rekultivace

Data source: CGS

Condition of soils

The most serious form of **degradation** in the country is **soil erosion**, to which the Czech Republic is vulnerable due to intensive farming relying on mineral fertilisers. Currently, the maximum soil loss in the Czech Republic is estimated at approximately 21 million tonnes of topsoil per year, which can be expressed as a loss of at least CZK 4.3 billion a year and a loss of soil productivity of 0.1% per year[63]. In addition to the loss of soil, soil particles also cause pollution to surface water and siltation of water reservoirs. Furthermore, climate change is increasing the risk of erosion events due to localised, high-intensity rainfall following periods of drought. Long-term erosion events[64] occur in the Vysočina Region, most frequently on areas with maize (45.0% of recorded erosion events). However, the deployment of effective soil conservation technologies should be implemented regardless of the type of crop. The majority of erosion events occur on field soil blocks without soil conservation technologies in place, and especially on uncovered soils with no crop cover. Measures to increase soil coarseness and cover, to increase rooting and the stability of soil aggregates at the time of sowing the main crop are therefore key.

Water erosion, expressed by a long-term potential soil loss rates (G)[65] higher than 2.1 $t.ha^{-1}.year^{-1}$ (i.e. above the lower limit of soil exposed to moderate risk), affects 48.1 % of the Agricultural Property Stock (APS), of which 16.1 % is exposed to extreme risk (G higher than 10.1 $t.ha^{-1}.year^{-1}$). In the long term, regions most exposed to risk are those bordering the Moravian valleys and the hills and uplands of the Czech Republic. 33.0% of agricultural land is potentially at risk from **wind erosion**[66], of which 4.0% are the most vulnerable soils, located mainly in southern Moravia and Polabí.

In the EU-28, 90.3% of the area was at risk of water erosion according to the latest available model data[67]. Soils particularly exposed to the risk are those in southern Europe (Italy, Slovenia, Greece). The sandy soils characteristic of glacial deposits in the northern countries (Denmark, Germany, the Netherlands, Scandinavia and the Baltic Sea area) are most at risk from wind erosion, which is estimated to affect around 9.6% of the EU-28. **Losses related to degradation in the EU** are estimated at more than EUR 50 billion a year. Moreover, in the future, climate change is expected to increase the susceptibility of soils to water erosion due to increasing extremes of precipitation and changes in land use. Soil loss rate due to water erosion is projected to increase by 13–22.5% in the EU and UK by 2050 relative to 2016 baseline[68]. In 2015[69], the proportion of land that is degraded over total land area of the Czech Republic was 6%[70], below average relative to other European countries.

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63 *Panagos P., Standardi G., Borrelli P., Lugato E., Montanarella L., Bosello F. Cost of agricultural productivity loss due to soil erosion in the European Union: From direct cost evaluation approaches to the use of macroeconomic models. LandDegrad Dev. 2018; 29: 471–484. https://doi.org/10.1002/ldr.2879.*

64 *An overview of recorded erosion events is available on the web portal for monitoring agricultural soil erosion: https://me.vumop.cz/app/.*

65 *The calculation of the average long-term soil loss rates G is based on the Universal Soil Loss Equation (USLE): $G = R \times K \times L \times S \times C \times P$ [$t.ha^{-1}.year^{-1}$]. The following factors are included as inputs to the equation: the climate-regionalized erosion efficiency factor of torrential rainfall on cropland according to LPIS (R), the soil erodibility factor (K), the slope length factor (L), the slope steepness factor (S), factor of the protective effect of vegetation based on climatic regions (C), and the efficiency of erosion control factor (P). Potential vulnerability expressed in terms of long-term average soil loss is calculated on the basis of long-term regionalised factors and therefore does not change much over the years.*

66 *The methodology of establishing the potential soil vulnerability to wind erosion was used. From the BPEJ data, data on climatic regions (sum of daily temperatures above 10 °C, average moisture security over the growing season, probability of dry growing seasons, average annual temperatures, annual precipitation) and data on the main soil units (genetic soil type, soil substrate, granularity, skeletonization, degree of hydromorphism) were used. The resulting rating is expressed as the product of the climate region factor and the main soil unit factor.*

67 *Panagos, P., Borrelli, P., Poesen, J., Ballabio, C., Lugato, E., Meusburger, K., Montanarella, L., Alewell, C. The new assessment of soil loss by water erosion in Europe. Environmental science & policy, 2015; 54: 438–447. https://doi.org/10.1016/j.envsci.2015.08.012.*

68 *Panos Panagos, Cristiano Ballabio, Mihaly Himics, Simone Scarpa, Francis Matthews, Mariia Bogonos, Jean Poesen, Pasquale Borrelli: Projections of Soil Loss by Water Erosion in Europe by 2050, Environmental Science & Policy, 124 (2021), 380–92. Available from: https://doi.org/10.1016/j.envsci.2021.07.012.*

69 *As to the closing date of this publication, data for 2016–2023 were not available.*

70 *This is a calculation under the international SDG indicator 15.3.1, for which data on trends in land cover, land productivity and carbon stocks were used. Available from: https://landportal.org/node/52267.*

Factors causing degradation of soils include **soil compaction**, which adversely affects both the productive and non-productive properties of the soil. As a result of compaction, rainfall infiltration is reduced, surface runoff is accelerated and the risk of erosion increases, natural soil processes are suppressed as the water, air and thermal regime of the soil is disturbed and therefore the organic matter content of the soil is reduced. The potential susceptibility of the lower soil layers to compaction is partly based on the type of soil – so-called genetic compaction, which is typical of soils with a higher clay content. Of the total area of soils prone to compaction, genetic compaction accounts for only 30%, while compaction caused by intensive farming accounts for 70%. For agricultural soils, a high potential susceptibility of the lower layers to compaction was assessed for 16.1% of the agricultural land area. Soils with lower medium to low **infiltration capacity**[71] together account for 38.7%. Dual soil groups (medium/low infiltration capacity and lower medium/low infiltration capacity) account for a total of 1.5% of agricultural soils.

A fundamental characteristic of soil ecosystems defining their ability to fulfil production functions and resilience is the soil **organic matter content**. In the Czech Republic, 55.8% of agricultural land has an organic matter content[72] in the low to lower medium category. The low humus content in the soil is driven by intensive agricultural management with a predominance of mineral fertiliser application and low use of manure and compost. Erosion also contributes significantly to dehumidification.

The quality of agricultural soils is negatively affected by the content of **hazardous substances in the soil**[73], entering the soil and sediments through anthropogenic activities. The presence of hazardous elements and substances in soil is not necessarily related to agricultural activities, and if so, it is mostly the result of the use of plant protection products, sewage sludge or sediments from reservoirs and streams.

Based on the results of the soil element of concern assay using nitrohydrochloric acid extraction method, for the period 1998–2022, **cadmium** was the most problematic element of concern with 11.3% above limit samples for all soils (i.e., for both light and other soil types, which include sandy loam, clay loam, and clay loam soils), followed by **arsenic** (9.5%) and **zinc** (8.1%).

For **organic pollutants**[74], the highest proportion of samples exceeding the precautionary thresholds in recent years was measured for the sum of 12 PAHs. PAHs are also produced by natural processes, but are currently present in the environment at higher levels, including as a result of human activities, particularly the incomplete combustion of carbon fuels. They have a high bioaccumulation capacity and, depending on their structure, some of them have carcinogenic effects. In 2023, exceedances occurred in two selected arable land monitoring areas (Fig. 13). DDT levels were exceeded in arable land at three sites. The limit for PCB content in arable land was exceeded in one monitoring area.

71 *For the evaluation of the potential infiltration capacity of soils, a soil categorization (HPJ) is used, which is based on the saturated hydraulic conductivity, the depth of the impermeable layer and the ground-water table in combination with the hydrogeological characteristics of the soil-forming substrates.*

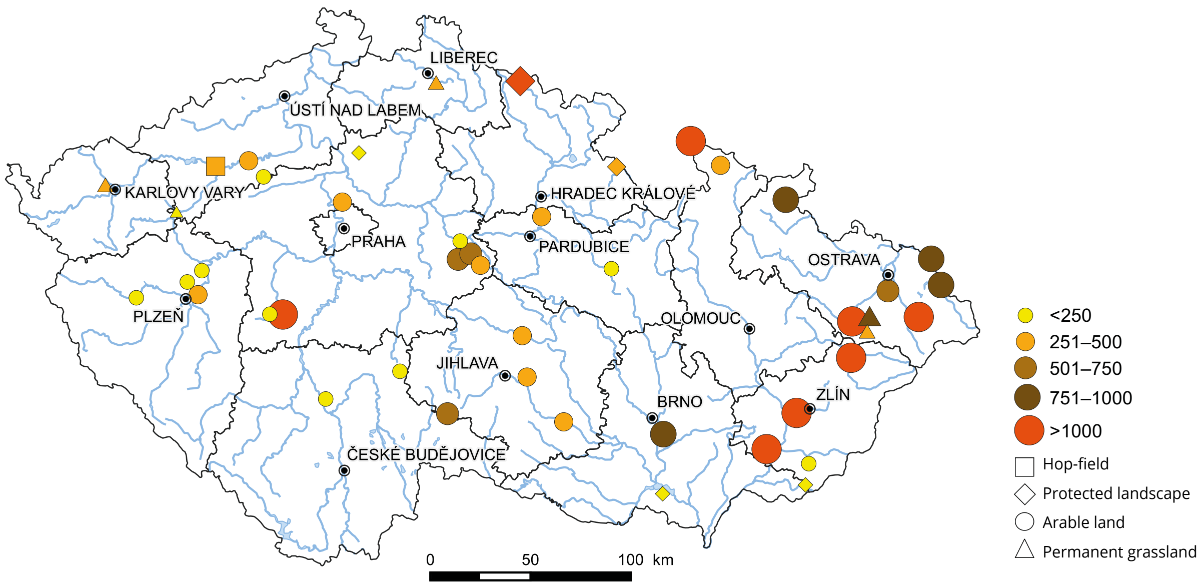
72 *For the evaluation, the system of farmland classification units (BPEJ) was used and soil probe data concerning the organic matter content (oxidisable carbon content – Cox and humus content) were grouped under the taxonomically corresponding main soil units (HPJ) of the system, i.e. the 2nd and 3rd digits of the BPEJ code.*

73 *Both inorganic pollutants or risk elements (e.g. As, Cd, Ni, Pb, Zn, etc.) and persistent organic pollutants (POPs) are monitored as part of the monitoring of the content of risk elements and substances in soil (basal soil monitoring – BSM). These include in particular 12 polycyclic aromatic hydrocarbons (12 PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (HCH, HCB, DDT group substances). The core network of BSM points was established in 1992. The system currently contains 214 monitoring areas.*

74 *Organic pollutants are determined annually at the same 40 selected BSM monitoring plots and 5 plots in protected areas (KRNAP, Kokořínsko, Pálava, Bílé Karpaty, Orlické Mountains) from the ploughing horizon.*

Figure 13

Sum of 12 PAHs in agricultural topsoils (under BSMs) in the Czech Republic [µg.kg⁻¹ dry weight], 2023



Based on samples from 40 selected monitoring plots and 5 plots in protected areas. The preventive threshold for the sum of 12 PAHs according to Decree No. 153/2016 Coll. is 1,000 µg.kg⁻¹ dry matter.

Data source: Central Institute for Supervising and Testing in Agriculture

Sustainable farming

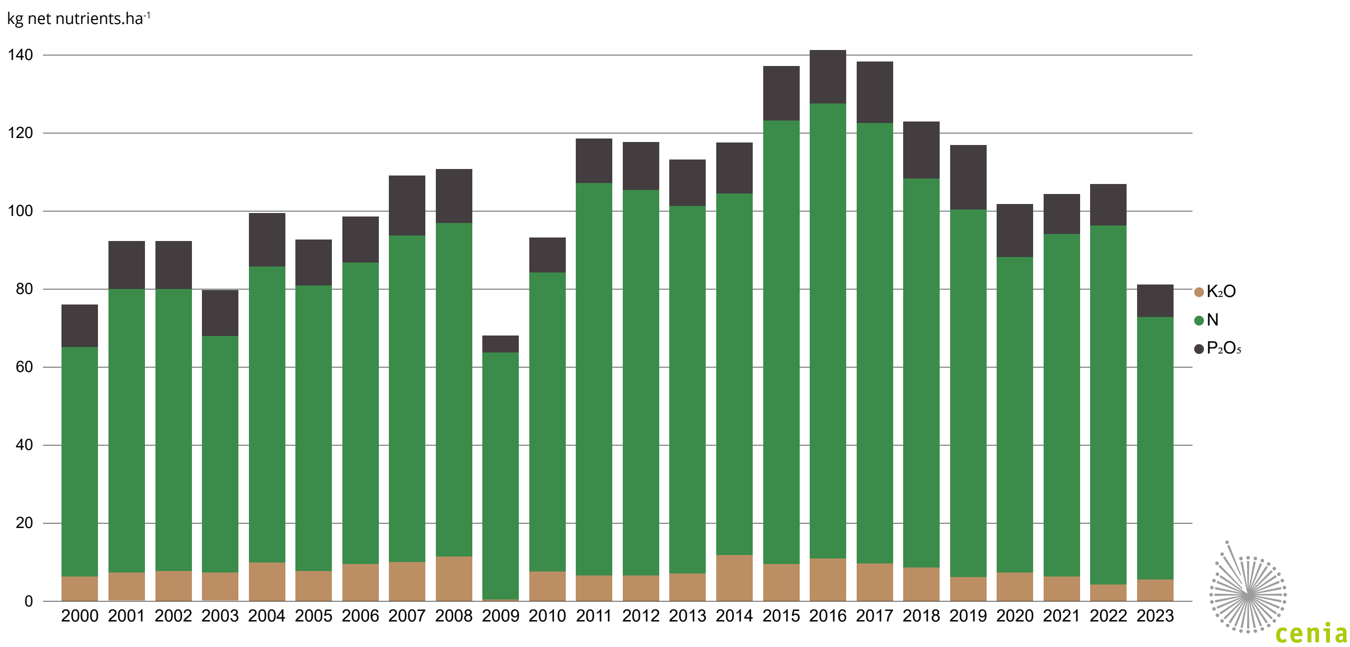
Conventional intensive farming causes a number of environmental effects and is partly responsible for the biodiversity loss. To ensure crop yields and maintain food security, modern agriculture relies on large amounts of chemical pesticides and fertilisers, which contributes to degradation, causes a decline in the biodiversity of soil micro-organisms and negatively affects the quality of surface and groundwater.

Over the period 2000–2022, **mineral fertiliser consumption** increased gradually by a total of 37.3%. In 2023, however, relative to 2022, the consumption of nutrients in mineral fertilizers has decreased sharply by 24.2% to 81.01 kg.ha⁻¹ of agricultural land, with the decrease in consumption mainly due to economic reasons and limited domestic production and imports of nitrogen fertilizers (Chart 51). In terms of mineral fertiliser and plant protection product consumption, the Czech Republic compares favourably with other EU-27 countries, i.e. below the European average.

Fertiliser consumption has remained relatively flat since 2014. In 2023, the total net nutrient input from **farmyard manure** (dung, slurry etc.) and **organic fertilisers** (mainly digestate from biogas plants) was 65.2 kg.ha⁻¹. The high consumption of fertilisers in recent years has been linked, among other things, to efforts to offset the negative effects of drought on crops.

Chart 51

Mineral fertiliser consumption in the Czech Republic [kg net nutrients.ha⁻¹],2000–2023



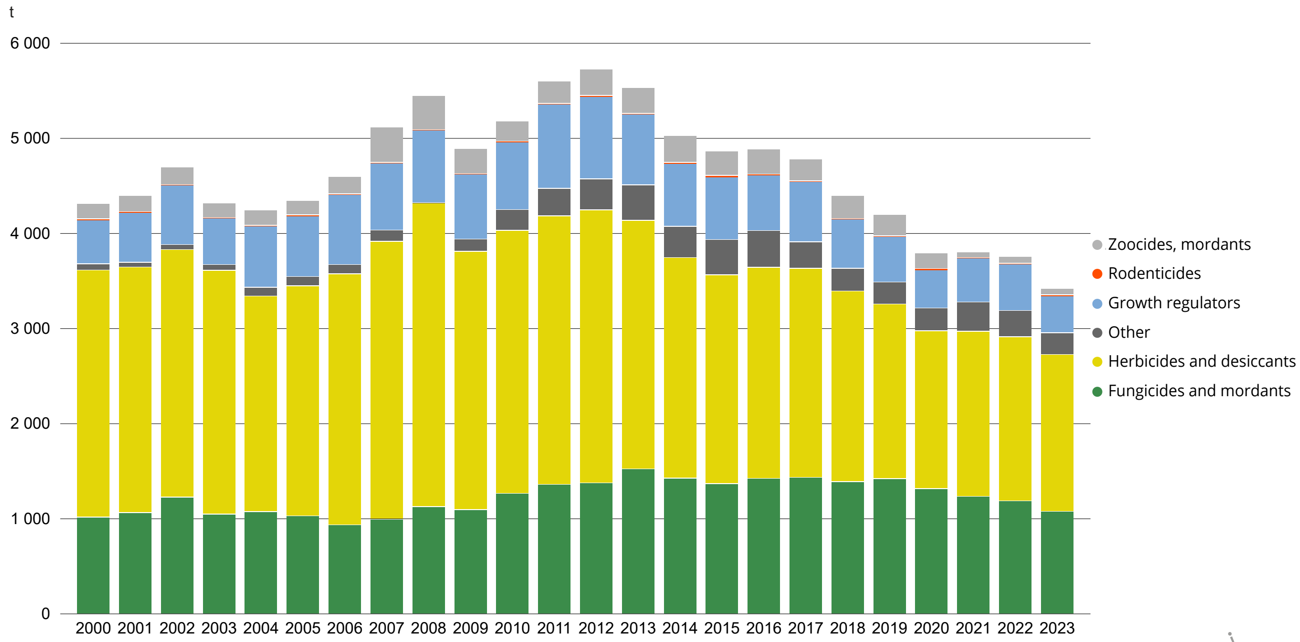
https://www.envirometr.cz/data/spotreba-mineralnich-hnojiv *Data source: MoA*

In 2020, the European Commission has presented two targets for reducing pesticide use in its Farm to Fork Strategy: a 50% reduction in the use and risk of chemical pesticides and a 50% reduction in the use of hazardous pesticides. In the Czech Republic, the consumption of active substances contained in **plant protection products** (PPPs) has decreased by 13.0% over the period 2000–2023 and will amount to 3,745.2 t of active substances in 2023 (Chart 52), however, the current reduction trend is not sufficiently ambitious to meet these targets.

In 2023, herbicides and desiccants accounted for the largest share of total consumption (40.0%), followed by fungicides and mordants (31.5%) and growth regulators (13.3%). The decline in their consumption is attributed to weather patterns, bans on some active ingredients, as well as changes in herbicide application strategies in winter crops, often in response to actual progress of the season. The consumption of insecticides (under zoocides) decreased significantly, mainly due to the ban of the active substances chlorpyrifos and thiacloprid, as the groups of the most used active substances in the control of insect pests of oilseed rape and against viral carriers in cereal crops, the overall consumption of active substances in the group Zoocides, mordants decreased by 62.1%. By the end of 2022, the onset of the field vole gradation started to become evident, which was reflected in 2023 by an extreme annual increase (468%) in the consumption of the rodenticide category.

Chart 52

Consumption of active substances contained in plant protection products and other products by intended use in the Czech Republic [t of active substance], 2000–2023



Other – soil improvers, repellents, mineral oils, etc.

https://www.envirometr.cz/data/spotreba-pripravku-na-ochranu-rostlin

Data source: Central Institute for Supervising and Testing in Agriculture

Organic farming (OF) is an approach to improving and maintaining soil fertility and ecological functions. Its aim is to close the nutrient cycle as much as possible and to manage the cropland in harmony with nature. Organic farming avoids mineral fertilisers and synthetic pesticides, its diversified inter cropping practices preserve and support soil organisms and soil fertility, and its species-appropriate animal husbandry contributes to animal welfare and ensures acceptance by the general public.

Since 1990, organic farming in the Czech Republic has been driven primarily by farmer support and consumer demand. Significant increase came between 2005 and 2011, boosted by subsidies following EU accession. Between 2011 and 2014, the number of organic farms stagnated due to restrictions on new program entries, with a revival since 2015. In 2023 the share of organically farmed land in the Agricultural Property Stock (APS) recorded in the public Land Parcel Identification System (LPIS) was 16.8% and the development is thus not on track to meet the target of 22% in 2027[75] (Chart 53).

In the Czech Republic, organic farming is developed especially in cattle breeding. The structure of organically managed cropland is thus skewed in favour of **permanent grassland**, which in 2023 represented 78.7% of the organically managed property stock. Although the share of arable land in organic farming is gradually increasing, maintaining the current pattern will not lead to achievement of the national target of at least 30% of **arable land** in organic farming by 2027[76]. Although the permanent grasslands perform an important function in the landscape and are utilized for

[75] *2021–2027 Action Plan of the Czech Republic for the Development of Organic Agriculture*

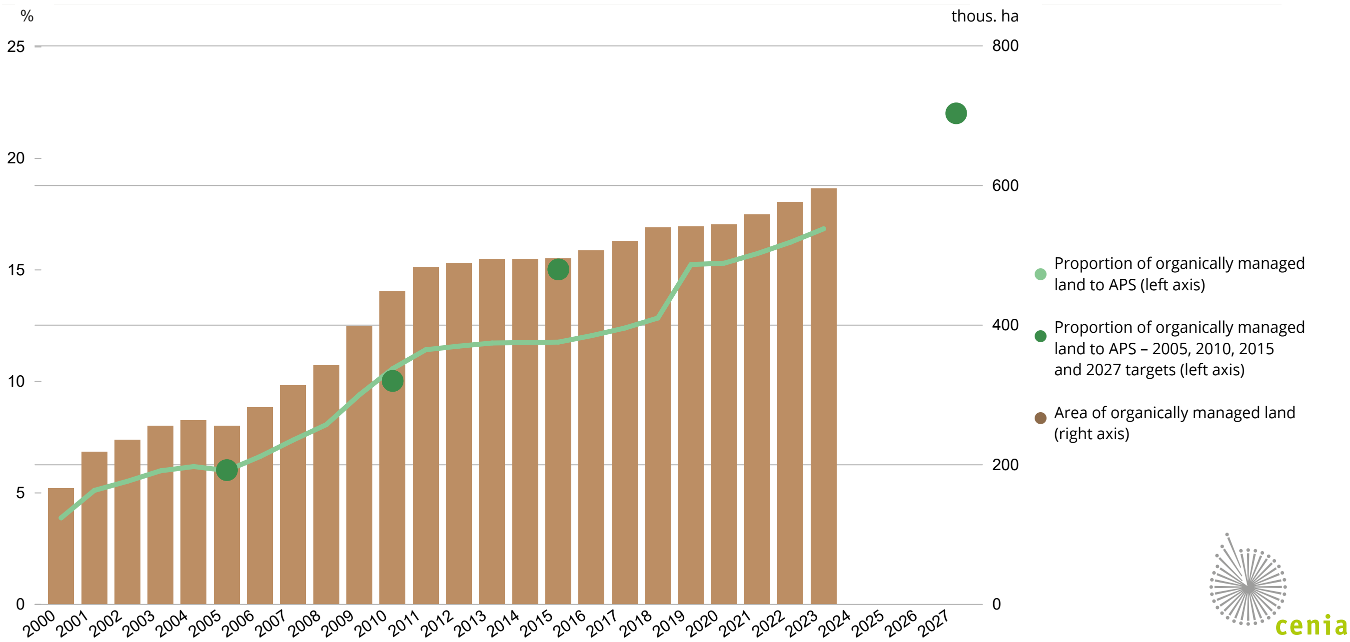
[76] *2021–2027 Action Plan of the Czech Republic for the Development of Organic Agriculture*

organic livestock farming, the share of other categories, particularly arable land and orchards, needs to be increased in the future, above all in order to increase the production of organic food and for the sustainable management and use of agricultural cropland.

Despite the growing trend, the **market for organic food** remains small, accounting for just 1.6% of total consumption in 2022[77]. As a result of the lack of processing capacity, part of Czech bio-production is still processed as conventional or exported as raw material abroad. The development of domestic processing and distribution networks is hampered in particular by low consumer demand for organic food, negatively affected by the increased cost of living and the declining purchasing power of the population.

Chart 53

Area and proportion of organically managed land relative to the total agricultural area [thousand ha, %], 2000–2023



Before 2019, calculations were made for the proportion of organically managed land in the total APS utilised agricultural area, starting from 2019 it reflects the proportion of organically managed land relative to the total APS land registered in the LPIS. The objectives stem from the applicable Action Plan of the Czech Republic for the Development of Organic Agriculture.

https://www.envirometr.cz/data/podil-ekologicky-obhospodarovane-pudy

Data source: Institute of Agricultural Economics and Information, MoA

[77] *As to the closing date of this publication, data for 2023 were not available.*

The structure of Czech agriculture is characterised by its large-scale "industrial" character with a predominance of hired labour and land and low diversification of production and a high degree of ploughing (71.2% of agricultural land in LPIS in 2023). It has some of the largest fields in Europe[78], a result of the collectivisation and intensification of agriculture that took place from the late 1940s and especially in the 1950s[79]. While these characteristics have increased productivity and efficiency in recent years, large-scale farming has significantly affected habitat, soil and water quality. While in 1948 the average size of soil blocks was 0.23 ha, in 2023 the average size of field soil block (FSB)[80] was 5.3 ha. There are 3,559 of the largest FSBs of the size of 60 ha or more, covering an area of 301.0 thousand ha (8.5%). However, the average size of the FSB is decreasing. The representation of FSBs depends on the type of agricultural and settlement structure in each region. The largest FSBs are located in the Karlovy Vary Region (average 7.6 ha) and the smallest in the Liberec Region (average 3.6 ha).

Structural changes in Czech agriculture are partly implemented through the eligibility criteria for financial support to farmers. One of the preconditions for granting the full amount of direct aid is that the land is managed in accordance with the Good Agricultural and Environmental Condition (GAEC 5) standards, which will concern 65% of arable land from 2025. From 2023 onwards, there is a related precondition requiring measures to increase biodiversity by limiting the size of a single crop (up to 10 hectares on erosion-prone land) and ensuring minimum soil cover during the most sensitive periods (winter; post-harvest).

Landscape elements are also an important part of the agricultural landscape, contributing to the preservation of biodiversity, having an important anti-erosion function and co-creating its character. In 2023, the LPIS recorded environmentally valuable features (EVF) occurring within agricultural land with a total area of 13.7 thousand ha (0.4% of agricultural land), and their expansion is gradually taking place. New financial support for landscape features also encourages farmers to reduce the size of their fields. A powerful tool for the implementation of landscape features is land consolidation[81], with comprehensive improvements having been made on 40.8% of agricultural land.

There is also a continuous effort to convert arable land in areas with natural constraints[82] to grassland and to promote extensive livestock farming, with more than half of the suckler cows being reared organically. **Converting arable land to permanent grassland** is supported by the state subsidy policy and the application of the principles of the Common Agricultural Policy and is aimed at areas more prone to soil water erosion, in areas of frequent washouts and in catchment areas with high soil permeability (infiltration areas), where it supports the reduction of amount of nitrate entering groundwater and surface water.

[78] *Lesiv, Myroslava, et al. Estimating the global distribution of field size using crowdsourcing. Global change biology. 2019. 174–186. https://doi.org/10.1111/gcb.14492.*

[79] *Lerman, Zvi. Agriculture in transition economies: from common heritage to divergence. Agricultural economics. 2001. 95–114. https://doi.org/10.1111/j.1574-0862.2001.tb00057.x.*

[80] *A FSB is a continuous area of agriculturally managed land with a minimum area of 0.01 ha, with boundaries that are identifiable in the field and on which a natural or legal person performs agricultural activities on its own behalf and under its own responsibility and on which one type of agricultural crop is cultivated, as determined in accordance with Government Regulation No. 307/2014 Coll. on Establishing Details of Land Use Records According to User Relationships, or where an ecologically significant element is located.*

[81] *For more information see: https://www.spucr.cz/pozemkove-upravy.*

[82] *For more information see: https://agriculture.ec.europa.eu/common-agricultural-policy/income-support/additional-schemes/anc-payment_en.*

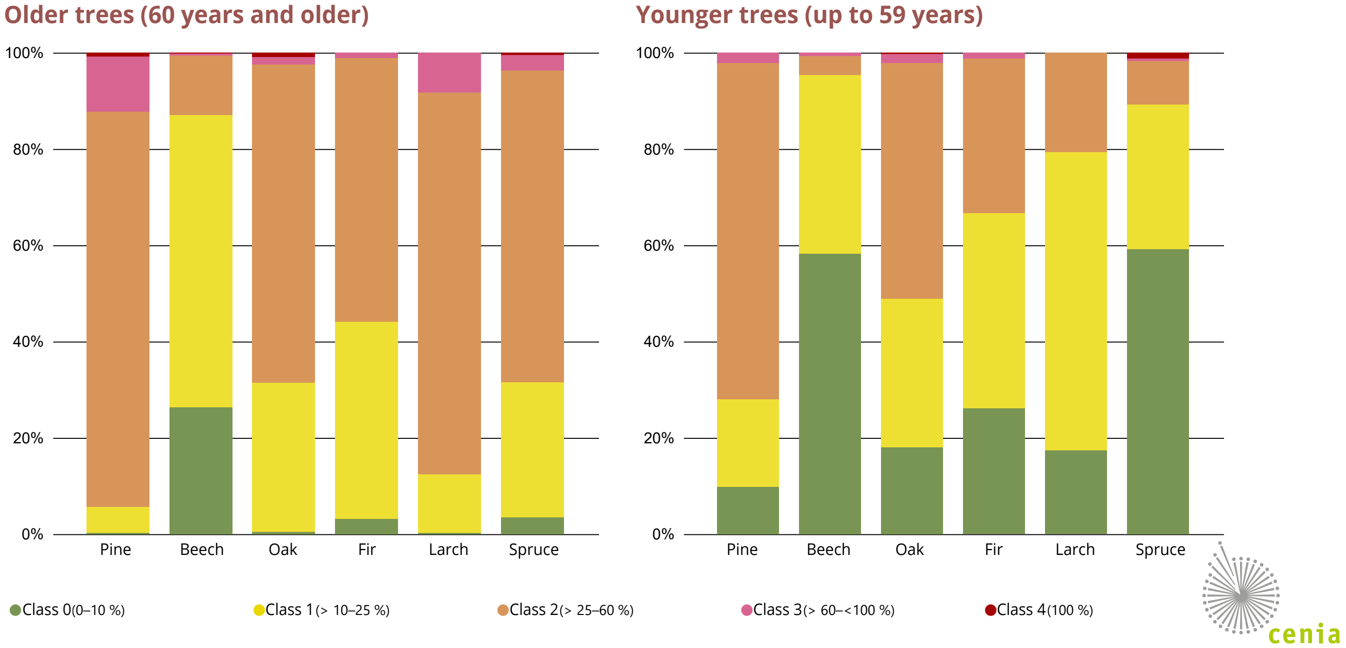
Condition of Forests

In the long term, woodland covers about a third of the Czech territory and is still slightly expanding. **Forest ecosystems** are therefore an important element of the entire landscape and forestry is an important economic sector. Stable forest ecosystems support biodiversity, regulate the water regime of the landscape, protect soil from erosion, improve air quality and provide recreational and aesthetic functions. Moreover, as a renewable material source, timber holds significant potential for the transition to sustainable production and consumption systems.

The ability of forests to perform their functions can be measured by their **health** as expressed by the degree of **defoliation**[83]. In 2023, 80.5% of conifers and 40.6% of broadleaves were classified in defoliation classes 2–4 for older stands (60 years and older) and 28.0% of conifers and 28.8% of broadleaves for younger stands (up to 59 years). In terms of tree species, pine has the highest level of defoliation in both older and younger stands (Chart 54). Furthermore, older stands of larch, spruce and older and younger stands of oak are in poor health (more than 50% of individuals in defoliation classes 2–4). In 2022[84], 28.7% of coniferous and 33.0% of deciduous trees in Europe were in defoliation classes 2–4[85]. The aforementioned factors causing defoliation are the reasons why the Czech Republic is among the countries with the highest defoliation rates in Europe.

Chart 54

Defoliation of basic tree species by class [%], 2023



The health assessment of coniferous and deciduous stands by defoliation level is divided by age into two categories – older (60 years and older) and younger (up to 59 years). The defoliation values are divided into five basic classes (0–4), where classes 2–4 describe significant tree damage.

https://www.envirometr.cz/data/defoliace-zakladnich-druhu-drevin *Data source: FGMRI, public research institution*

83 *Relative loss of assimilatory apparatus in the crown of a tree compared to a healthy tree growing in the same stand and habitat conditions.*

84 *As to the closing date of this publication, data for 2023 were not available.*

85 *Michel A, Kirchner T, Prescher A-K, Schwärzel K, editors (2023) Forest Condition in Europe: The 2023 Assessment. ICP Forests Technical Report under the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention). Eberswalde: Thünen Institute. https://doi.org/10.3220/ICPTR1656330928000.*

The lower level of defoliation in younger stands is caused by the fact that younger stands have greater vigour and ability to withstand adverse environmental conditions. Furthermore, the older stands were exposed to sulphur (SO_2) and nitrogen (NO_X) immissions during the 1970s and 1980s. In addition to their direct effect on the assimilating organs of trees (leaves), these affected the **forest soils acidification** and the availability of nutrients (especially the base cations Ca, Mg, Na, K) in their sorption complex, that are relatively scarce in most forest soils in the Czech Republic because of its natural conditions. The available data show an acidification and a decrease in the content of base elements of forest soils, mainly in the upper mineral horizons, in various parts of the Czech Republic[86]. According to the data obtained by means of spatial models[87], 97.2% of forest soils in the upper mineral layer (0–30 cm) and 89.1% in the lower mineral layer (30–80 cm) fall into the categories of highly and extremely susceptible to acidification.

Since 1989, **the immission situation** has improved significantly due to the installation of equipment, changes in the fuel base and the application of emission limits at air pollution sources. However, forest stands respond to changes with a considerable delay and, moreover, although the intensity of immission load is demonstrably lower, particularly the nitrogen deposition fails to decrease in the long term. In addition to the habitat conditions and the amount of acid deposition, the **management practices**, including tree species composition and harvesting intensity, also impact the acidification and overall nutrient balance of forest ecosystems. Coniferous stands are more susceptible to acidification because of the slow decomposition of their needles, which is associated with the production of low-molecular-weight organic acids, and also because of the higher concentration of immissions in the sub-crown precipitation due to dry deposition on the needles. For the long-term sustainability of forest management, it is a prerequisite that nutrient losses from biomass extraction (logging) do not exceed nutrient replacement by natural processes (weathering, atmospheric deposition).

High defoliation rates and a fluctuating trend in the representation of defoliation classes mean that, **in the long term**, the forest health remains unfavourable. Currently, forest health is being negatively affected mainly by **climate change** impacts such as drought, high winds and the lengthening of the growing season. Moreover, in recent years, spruce forests have been affected by a declining gradation of the spruce leaf beetle, which was caused simultaneously by climatic conditions and low ecological stability of forest stands, largely consisting of spruce monocultures.

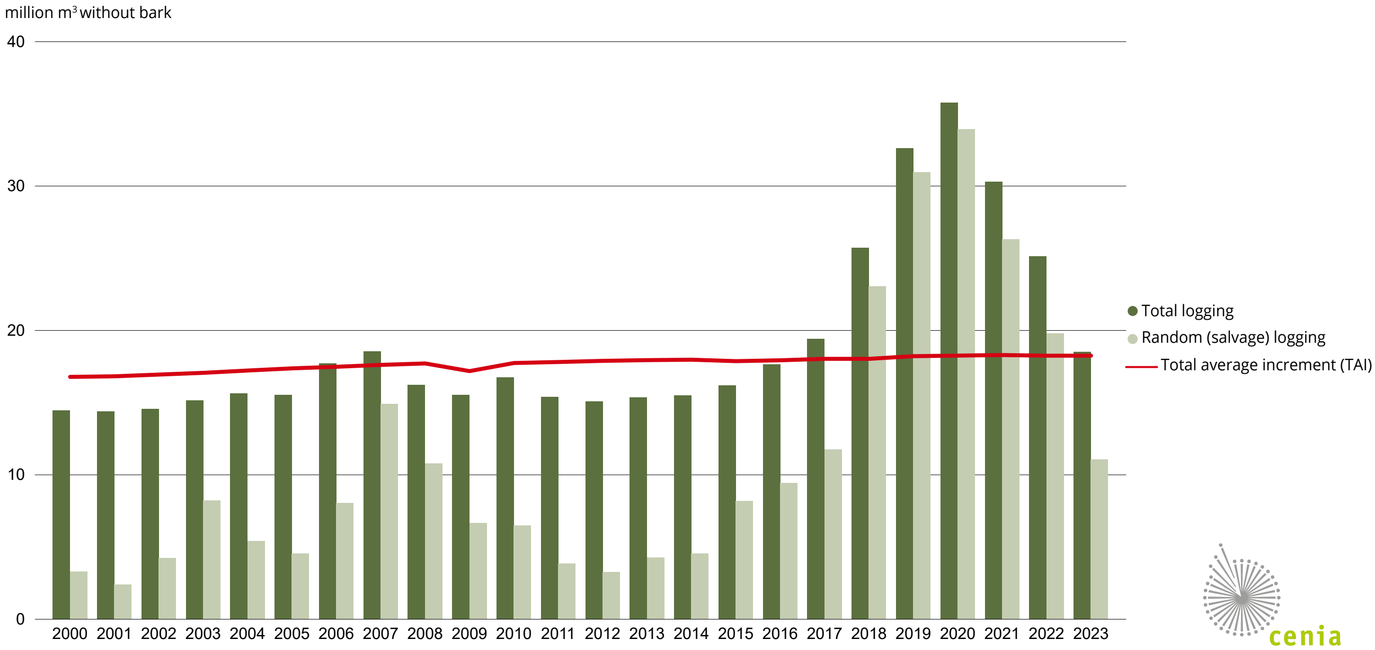
The largest **bark beetle calamity** in the Czech Republic to date, which started in 2015 in northern Moravia in the Jeseníky region and gradually spread to other areas, culminated in 2020, when the volume of timber harvesting reached a historic high of 35.8 million m^3 of wood without bark. Since then, production has declined annually, reaching approximately 2016 levels in 2023. The total volume of recorded **logging** reached 18.5 million m^3 of wood without bark and the total share of **random** (salvage) logging decreased to 59.7% (Chart 55).

86 *Šrámek V., Jurkovská L., Fadrhonsová V., Hellebrandová-Neudertová K., 2013: Chemismus lesních půd ČR podle typologických kategorií – výsledky monitoringu lesních půd v rámci projektu „BIOSOIL". [Forest Soil Chemistry in Relation to the Forest Site Classification Categories Used tn The Czech Republic – Results Of The EU "Biosoil" Forest Soil Monitoring Project] Zprávy lesnického výzkumu [Forest Research Reports], 58: 314. Available from: https://www.vulhm.cz/files/uploads/2019/01/324.pdf.*

87 *Komprdová K. et al., 2021: Chemické vlastnosti svrchních minerálních vrstev lesních půd a ohrožení lesních půd acidifikací a nutriční degradací [Chemical properties of top mineral layers of forest soils and threats to forest soils from acidification and nutrient degradation], a set of maps. Forestry and Game Management Research Institute, public research institution Available from: https://www.vulhm.cz/.*

Chart 55

Comparison of realised timber harvests with total average increment (TAI) in the Czech Republic [million m³ without bark], 2000–2023



Total average increment (TAI) is a measure of the productive capacity of woodland habitats and is a crucial indicator in assessing the principle of balance and sustainability of harvesting potential.

https://www.envirometr.cz/data/celkova-a-nahodila-tezba-dreva *Data source: CZSO, FMI*

In addition to impact on ecosystems and economic losses, massive logging also affects the overall **forest carbon balance**. While in the past the Czech forests sequestered carbon, since 2018 the carbon storage in biomass has temporarily decreased due to the decline in tree cover and – drawing on the methodology used to calculate the greenhouse gas balance –forests have been considered a source of greenhouse gas emissions (see chap. 2.1). Restoring the carbon sequestration capacity of forest ecosystems is therefore a priority for the coming period. However, long-term soil CO_2 sequestration occurs primarily in natural forest ecosystems. In the long term, it is therefore important to support this function by introducing nature-based farming methods.

Sustainable forest management

Most (74.0%) of the forest ecosystems in the Czech Republic are **commercial forests**. Their main mission is sustainable management ensuring the fulfilment of all ecosystem services, including the production of wood as a sustainable renewable raw material. Increasing the resilience of these forests to the climate change impacts and improving their productive and non-productive functions can be achieved by using nature- based management practices and maintaining a diverse forest structure.

These nature-based management methods are those that make maximum use of the creative forces of nature to achieve the objective of forest management, respect the habitat conditions and their management measures are carried out in harmony with natural processes and the condition of the stands. Based on the data from the forest management plans (FMPs)[88], they almost exclusively employ **passive management methods** (shelterwood, partial, clear-cutting systems).

Long-term implementation of predominantly uniform shelterwood system has resulted in a significant predominance of **simple-structured** forest stands (81.1% of forests)[89] at the level of the lowest units of the spatial distribution of the forest (stand groups). At the same time, however, the size of deliberate regeneration fellings is gradually decreasing to the current average of about 0.35 ha, which leads to a group differentiation in area and age of these forest stands. In terms of forest formations, **high forests** clearly predominate (about 97.2% of the stands), characterised by a long rotation period. However, there are efforts to increase the proportion of medium and low forests with a very short rotation period and forests with a richer structure, positively affecting the resilience of forest stands and promoting biodiversity.

Many species of forest organisms are threatened by the lack of **dead wood** left in forests to natural decomposition. The amount of dead wood in the Czech Republic is less than under natural conditions but is slightly increasing.

One of the principles of nature-based management is the use of **natural regeneration** in genetically suitable stands. The total area of regeneration is well above average due to record-high logging in recent years in response to the bark beetle calamity. Most of this regeneration involves artificial afforestation. The long-term trend in the proportion of natural regeneration to the total regeneration area has been fluctuating, but the area of natural regeneration has been growing in the long term. In 2023, its proportion of the total forest regeneration area increased by 1.2 p.p. year-on-year to 21.4%. Greater use of natural regeneration and appropriate management practices could significantly reduce the cost and need for planting material and human resources, which are in short supply at the time of a calamity, while achieving higher value forest production.

A range of both forestry and game management measures are necessary to promote natural and artificial forest regeneration. For game management measures, it is particularly important to comply with the **cloven-hoofed game keeping and hunting** plan, especially in view of the persistent extensive damage caused by game browsing on newly planted forest crops and natural regeneration, as well as on agricultural crops and land. As to the long-term trend, the abundance of all monitored game species is increasing, especially for fallow deer, whose population more than doubled over the period 2000–2023. The most abundant game species in the long term is roe deer. Based on data from the National Forest Inventory (NFI), the minimum demonstrable amount of **damage caused by** game can be estimated at CZK 1,163 million. year^{-1} [90]. The reason for the high game populations is the intensive use of the landscape by humans, especially agricultural farming, which creates suitable cover and feeding conditions, and reduced or complete absence of natural game regulation. Damage caused by game can also be reduced by establishing game food plots and browsing areas. As regards forestry measures, it is worth mentioning consistent protection of the forest and early stand tending in line with the tree species. The costs of forest protection against game currently amount to approximately CZK 1,451 million.year^{-1}.

In recent decades, a targeted shift in species composition towards a more natural (and more stable) woodland structure is evident, resulting in more frequent **planting** of deciduous trees rather than conifers. In 2023, 18.6 thousand ha of conifers and 16.7 thousand ha of deciduous trees were planted and seeded (i.e. artificially), with spruce being the most commonly used species (11.2 thousand ha), followed by beech (6.4 thousand ha) and oak (5.5 thousand ha).

88 *Data from the draft part of the FMPs depend on the owner's management objectives and may not correspond to the actual representation of different management methods.*

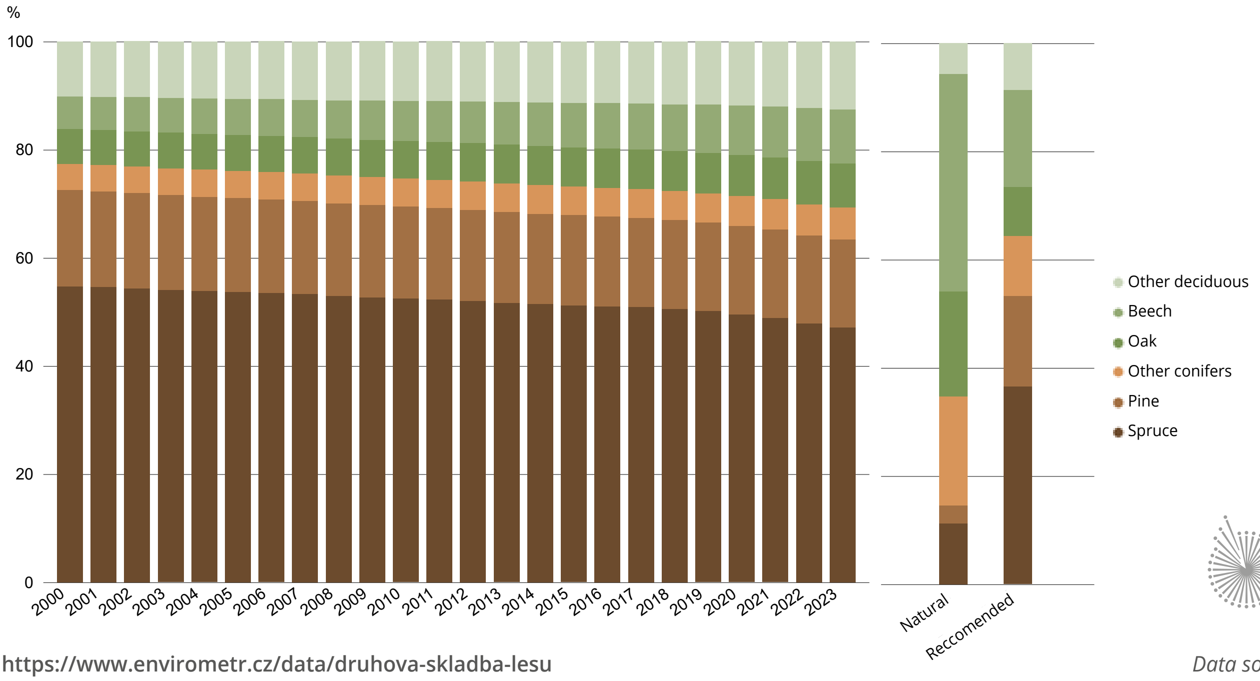
89 *Kučera M., Adolt R., editors: National Forest Inventory of the Czech Republic – results of the second cycle (2011–2015) [online]. First edition. Brandýs nad Labem: Forest Management Institute, Brandýs nad Labem, 2019 [quot. 29. June 2021]. ISBN 978-80-88184-24-9. Available from: https://nil.uhul.cz/downloads/2019_kniha_nil2_web.pdf.*

90 *FGMRI, public research institution Establishing the minimum demonstrable amount of damage caused by game to forest stands in the Czech Republic. Available online: https://www.vulhm.cz/files/uploads/2024/07/Skody_na_lese_VULHM.pdf.*

The current **forest species composition** is significantly different from the reconstructed natural and recommended composition[91], mainly due to the large-scale planting of spruce and pine monocultures in the past. The same old conifer monocultures, often of an unsuitable ecotype, decrease biodiversity and are significantly more susceptible to damage from both biotic and abiotic factors. The overall **share of deciduous stands** in the forest area has been increasing slowly since 2000, rising from 22.3% to 30.1% in 2023, with the share of deciduous projected to increase to 35.6% as part of the recommended composition (Chart 56). In terms of different tree species, spruce is the most represented tree species in the long term with a share of 46.0%, followed by pine (16.0%), beech (9.8%) and oak (7.9%).

Chart 56

Species composition of forests in the Czech Republic, restored natural and recommended composition [%], 2000–2023



https://www.envirometr.cz/data/druhova-skladba-lesu

Data source: FMI

A tool for promoting responsible forest management as well as for informing consumers about the origin and environmental impact of logging is the **forest certification** according to the standards of international certification organisations, practice adopted in the Czech Republic especially after 2000. Currently, PEFC (Programme for the Endorsement of Forest Certification Schemes) and FSC (Forest Stewardship Council) certificates are available. In 2023, 66.5% of forest land had PEFC certification and 5.0% had FSC certification, the latter setting higher standards in some aspects of sustainability. All forest land with FSC certification had also PEFC certification. In 2023, a total of 66.5% of forest land was certified, which is a relatively high proportion in comparison with European countries, where the certified forest land accounts on average for about 50% of the total forest area. The proportion of certified forests in the Czech Republic has been stable over the long term.

Detailed visualisations and data

https://www.envirometr.cz/data

[91] *The restored natural composition is close to the climax composition before human activity started affecting the forest. The recommended forest species composition is a compromise between the current and natural tree species composition, taking into account economic interests, non-productive forest functions and knowledge related to climate change adaptation.*

3 Nature and landscape

3.2 Biodiversity

Key messages

- Since 1982, the abundance of all common bird species in the Czech Republic has declined by a total of about 12%, with the decline being most pronounced in the last five to ten years. The greatest decline was recorded in farmland bird species, whose populations declined by 46.8% between 1982 and 2023 due to high agricultural intensity. Bird populations are also affected by climate change.
- The majority of the Czech Republic's species (59.8%), plants (75.4%) and habitats (79.6%) of European importance are in a poor or unfavourable condition.
- The increasing breakup of the landscape by transportation infrastructure and the continuing failure to effectively improve the river network.
- Partial successes can be observed in populations of endangered species through the protected areas management.
- Active Species Conservation Tools are implemented for 16 animal species and 13 plant species.
- The number of exported animals of species protected by the CITES is increasing. Birds (mainly parrots) are the most exported group of animals, followed by reptiles and amphibians.

3.2 | Biodiversity

Meeting the underlying targets

Target set	For year	Value in 2023	On track towards the target
Legally protect at least 28.33% of the territory[92]	2030	21,9%	✗

Trend and Indicator Status Assessments

NEP specific objective	Indicator	Long-term trend (15 years and more)	Short-term trend (5 years)	Indicator status
3.2.1 Habitats health is improving and species protection is ensured	Landscape fragmentation	↗	↗	✗
	Conservation status of species and habitats of European importance	→	N/A	✗
	Status of bird species	↘	N/A	✗
	Common bird species	↘	↘	✗
	Status of plant, animal and fungi species according to Red Lists	↘	N/A	✗
3.2.2 Protection and care of the most valuable parts of nature and landscape is ensured	Specially protected areas and Natura 2000 sites	↗	→	~
	Proportion of the area of natural habitats and species in Natura 2000 sites	N/A	N/A	N/A
	Active Species Conservation Tools	↗	↗	~
3.2.3 The negative impact of invasive non-native species is limited	Non-native species in the Czech Republic	↗	↗	✗
3.2.4 Protection of wildlife in human care is ensured	International trade in endangered species protected by CITES	~↗	~↗	N/A

[92] *Contribution of the Czech Republic to the delivery of the EU Biodiversity Strategy.*

Current measures supporting achievement of the objective

- Invasive non-native species control guidelines have been issued for the ailanthus wood and the giant hogweed. Work is continuing on the development of principles of control for other invasive non-native species.
- A central database of invasive species, INVAHUB, was launched in pilot mode, and its interconnection with other public administration systems will allow for more timely detection of quarantine pests and their more effective eradication.
- Financial support is provided for the modernisation and development of CITES rescue stations and rescue centres for endangered species.
- Individual rescue and care programmes are gradually being developed – e.g. for the stone crayfish or Eurasian lynx. The amendments to the Nature Protection Act will improve the status of active species conservation tools also through their clearer enshrining in legislation.
- The forthcoming amendment to the Act on Nature and Landscape Protection in the area of species protection regulates rights and obligations in relation to wildlife, including in the case of the need to provide care.
- The intention to declare the NP Křivoklátsko has been announced and an amendment to the Act on Nature and Landscape Protection is being prepared.
- Expert documents on the intention to declare the Protected Landscape Area Krušné hory were obtained and the possibility of declaring this Protected Landscape Area in the region was discussed.
- The Ministry of the Environment has prepared the 2023–2032 Concept of Active Species Conservation Tools in the Czech Republic, including new lists of candidate species.

Condition of habitats, species and landscapes

All biodiversity indicators suggest a global **decline in biodiversity**, and pressures causing this decline are growing. However, conserving biodiversity and the benefits that nature provides to people is essential to achieving the goals of sustainable development and human well-being. For example, food production depends on biodiversity and the range of ecosystem services that support agricultural productivity. Nature is also key to meeting climate protection targets. Roughly one-third of the net GHG reductions needed to meet the Paris Agreement targets could come from nature-based solutions[93]. The main reasons for biodiversity loss are changes in land and water use (e.g. deforestation), overexploitation of organisms (e.g. marine fisheries), climate change, pollution of ecosystems and the spread of invasive species.

Changes in land use and overall changes in ecosystems reflect trends in bird populations[94]. Since 1982, the abundance of all **common bird species**[95] in the Czech Republic has declined by a total of about 12%, with the decline being most pronounced in the last five to ten years (Chart 57).

[93] *IPBES. (2019). Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Zenodo. Available online: https://doi.org/10.5281/zenodo.6417333.*

[94] *Vermouzek, Z., Jechumtál Skálová A. (2024): 2023 Common Bird Species Indicator. Study for the Ministry of the Environment of the Czech Republic. Unpublished. 16. p.*

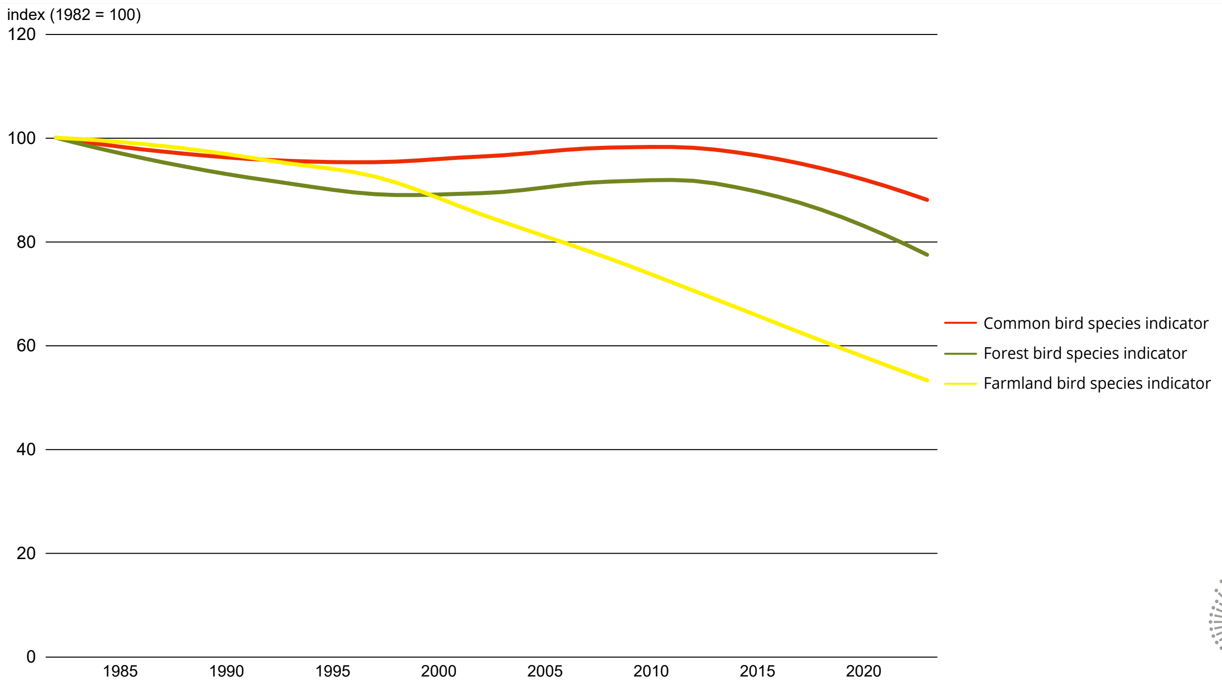
[95] *The indicator is based on data from the Unified Bird Census Programme (JPSP) in the Czech Republic, a long-term monitoring programme of breeding bird populations in the Czech Republic which provides data on changes in the abundance of bird species and their occurrence and abundance in different types of environments. JPSP is organized by the Czech Ornithological Society. For the purpose of calculating the indicator of common bird species, 42 species were selected, whose populations [together with the population of Feral Pigeon (Columba livia f. fera) though excluded from the analysis] together represent 95% of all birds breeding in the Czech Republic.*

The abundance of **farmland birds** has almost halved (by 46.8%), with massive declines in field birds already beginning before the commencement of monitoring in 1982. The main reasons for the dramatic decline in farmland bird numbers are mainly due to the high intensity of agriculture[96] with lack of adequate measures to promote biodiversity[97]. For example, grey partridge, northern lapwing, meadow pipit, and western yellow wagtail have reduced their abundance to a fraction of the baseline level during the monitoring period and have remained at this significantly reduced level.

The abundance of **forest bird species** declined slightly until about 2000, followed by a period of stability and then a decline again in recent years, with a value in 2023 that was by 22.6% lower than in 1982. At the same time, forest habitat specialists are mostly reducing their numbers (e.g. red-breasted flycatcher, wood warbler, goldcrest) and they are replaced with widely distributed species with a wide ecological valence, such as common blackbird, song thrush, European robin, Eurasian blackcap, great tit and Eurasian blue tit. As a result, biodiversity is generally declining at the local and regional level.

Chart 57

Indicators of all common bird species, forest birds and farmland birds [index, 1982 = 100], 1982–2023



https://www.envirometr.cz/data/index-beznych-druhu-ptaku

Data source: COS

[96] *Reif J. & Vermouzek Z. (2018): Collapse of farmland bird populations in an Eastern European country following its EU accession. Conservation Letters 2018, doi: 10.1111/conl.12585.*

[97] *Vermouzek Z. & Zámečník V., 2018: 2018 Farmland Bird Indicator; Study for the Ministry of Agriculture of the Czech Republic. COS, unpublished, 64 p.*

Trends in bird populations reflect changes in the landscape and its use, as well as overall changes in ecosystems. To a lesser but increasing extent, the effects of **climate change** have been evident since about the mid-1990s. As a result of these effects, northern species are disappearing from Central Europe (whinchat, common grasshopper warbler, Icterine warbler) and thermophilic species (Eurasian collared dove, common nightingale, Eurasian golden oriole) whose habitat has so far been southern Europe, are slightly increasing in number. In this context, a further decline in bird populations in the Czech Republic can be expected, since according to models of the future distribution of individual species in response to changing climate, the area with the greatest species diversity, of which the Czech Republic has been a part so far, will move towards the north-east[98].

The EU protects more than 460 species of wild birds in all their life stages under the **EU Birds Directive**. In the Czech Republic, according to the most recent assessment (2013–2018)[99], 49.8% of wild bird populations in terms of long-term abundance change (i.e. 1980–2018) and 44.3% of populations in terms of short-term abundance change (2007–2018) have an increasing or stable abundance status. The other part of the bird populations show a long-term declining (23.5%), uncertain (1.8%) and unknown (24.4%) status. The status of populations of bird species depends to a large extent on the **state of their ranges**. In the long term, 74% and 72% of the populations of wild bird species have stable or increasing breeding ranges.

The overall health of Czech nature is also reflected in the status of the **species of European importance**. Based on the 2013–2018 results[100], 59.8% (131) of animal species and 75.4% (46) of plant species were in poor or unfavourable condition. At the same time, despite the gradual improvement in **the status of habitat types of European importance**, 79.6% of habitats were still assessed as being in poor or unfavourable condition. When it comes to the comparison among the EU-28[101], the Czech Republic has an average rating. 30.3% of species of European importance were in favourable status in the Czech Republic, compared to 31.4% in the EU as a whole[102]. At the EU level, 33.4% of the monitored sites were in unfavourable condition – 30.1% in the Czech Republic.

A number of factors contribute to the unfavourable status of habitats and species, the changing attitude of society towards landscape care and use being one of the most important one. This is manifested, on one hand, in the intensification of landscape use, leading to the homogenisation of the landscape and loss and degradation of natural habitats and species habitats (as evidenced, *inter alia*, by the unfavourable status of forest habitats and associated species, farmland birds, amphibians, etc.), on the other hand, in the abandonment of farming and posing threat to natural habitats and biotopes of species by succession (especially threatened are formerly extensively managed non-forest natural habitats and species associated with them). Other factors include landscape fragmentation (especially by transport infrastructure and stream crossings) and the loss of naturally valuable areas (especially by development), as well as the impact of nutrient loading on the landscape, climate change and the spread of non-native invasive species.

The ecological stability of the landscape can be assessed by the amount of natural biotopes. **The share of natural habitats** in the cadastral area averaged 15.6% in 2023. Areas with maximum disturbance of natural structures are located in the most agriculturally exploited areas and in metropolitan areas, while natural and close to nature landscapes are found mainly in border areas and are related to the designated SPAs.

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98 *Huntley B., Green R. E., Collingham Y. C. & Willis S. G. (2007): A Climatic Atlas of European Breeding Birds. Lynx Edicions, Barcelona.*

99 *As to the closing date of this publication, data for 2019–2023 were not available as the indicator is published in six-year cycles.*

100 *As to the closing date of this publication, data for 2019–2023 were not available as the indicator is published in six-year cycles.*

101 *2013–2018 assessments included the UK.*

102 *This is the average of the countries listed. The expert assessment at European level indicates an even lower proportion of 28% of species in good condition. For more information see: https://www.eea.europa.eu/ims/conservation-status-of-species-under.*

The breakup of the landscape by traffic leads to the loss of the original quality of habitats and their connectivity essential for animal migration. The results of the average effective mesh size[103] analysis for the period 2016–2022[104] show that there is an overall increase in fragmentation, mainly due to the gradual construction of the motorway and road network or the expansion of built-up areas. Nevertheless, fragmentation rates have declined in a number of places. This was mainly caused by the transfer of some public roads to the category of non-public roads. The most fragmented areas include the surroundings of large settlements (Central and Eastern Bohemia, Liberec, Plzeň, Ostrava, Brno, Olomouc and Ústí nad Labem) and areas along major transport routes. On the other hand, the least fragmented areas are the peripheral areas of the border mountain ranges, areas of current and former military settlements, larger forest complexes, or areas with sparser settlement and transport infrastructure.

For many species of animals, traffic roads represent a significant and often insurmountable barrier. The barrier effect of the new roads is largely mitigated by compensatory measures (ecoducts, underpasses, etc.) for **animal migration**.

Watercourses and their floodplains represent a specific migration route upon which various species of animals and plants, especially fish, depend. **Watercourse fragmentation** and the associated restriction or prevention of free migration, often in combination with other anthropogenic pressures (hunting, inappropriate fisheries management, pollution, climate change, modification or loss of original habitats as a result of regulation and modification of stream channels), have led to a significant numerical decline in the populations of most rheophilic[105] fish species and the partial or complete disappearance of specialised diadromous[106] fish species.

A total of 34 “concept” streams (19 of international and 15 of national importance) were assessed in the last update of the **Concept for the Improvement of the River Network** in 2020, some of which were planned to be implemented by 2021 (subject of the assessment). A total of 798 transverse barriers (584 barriers in streams of international and 214 barriers in streams of national importance) were located on these streams. Here, the construction of 161 fish ladders (152 on international and 9 on nationally important streams) has been planned, of which 22 measures have been implemented so far (12 fish ladders and 10 other measures to restore the migratory permeability of the stream).

The planned measures to **systemically** and hierarchically **improve the river network** in the Czech Republic are still not being implemented. In practice, fish ladders are still mostly built “alternatively” on different sections of watercourses than the most effective ones, and especially in watercourses where the restoration of migratory passage is of regional or local importance, which cannot be assessed as optimal. The launch of other measures, such as the removal of transverse barriers, which are comprehensive measures, can be seen as very positive. Other factors causing fragmentation of watercourses are run-off and accumulation of water, inappropriate watercourse alterations (flood control measures), water abstraction and pollution.

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103 *Effective Mesh Size (EMS) expresses the imaginary probability of connection between two randomly chosen points in the landscape. The higher the EMS values, the lower the level of landscape fragmentation (and vice versa). For units of the regular mesh that are located within larger unfragmented areas, this is practically the size of the unfragmented areas.*

104 *As to the closing date of this publication, data for 2023 were not available.*

105 *Fish species that prefer to live in fast-moving water.*

106 *Species of fish that migrate between salt and fresh water.*

Protection and care of the most valuable parts of nature and landscape

Specially protected species are set out by Decree No. 395/1992 Coll. as amended[107], a decree of the Ministry of the Environment of the Czech Republic implementing certain provisions of the Czech National Council Act No. 114/1992 Coll., on Nature and Landscape Protection. However, there are many more species that deserve attention and they are listed in the so-called Red Lists, which are continuously updated (the last edition of the Czech Red Lists was published in 2017, but there is also an updated digital database of Red Lists[108]).

According to the **Red Lists**, 908 species of vascular plants and over 1,000 species of fungi, lichens and mosses, 163 species of vertebrates (16 species of amphibians, 7 species of reptiles, 25 species of lampreys and fish, 100 species of birds and 15 species of mammals) and over 3,300 species of invertebrates are listed as critically endangered, endangered or vulnerable in the Czech Republic. A large number of endangered plant and animal species are found in the border areas of the Czech Republic, where many protected areas are located, as well as in the Pannonian region (southern Moravia).

A large proportion of the Red Lists **endangered species** can be found among reptiles, amphibians, fish and lampreys, birds, butterflies and *Euoniticellus fulvus* beetle, which points to the main problems in the Czech landscape: the large number of inadequately managed watercourses, the poor, although still improving, water quality in many places, and the overall uniformity of many parts of the Czech landscape. Predation by piscivorous predators also has an impact on fish populations.

Italian crested newt is the only amphibian species that has been reclassified in the new Red List to a lower category than in the previous assessment. Thanks to appropriate management, its population has begun to thrive again. Since 2012, targeted management and management of suitable sites has been carried out in the territory of the National Park Podyjí – change of management of ponds, targeted reduction of fish stocking and creation and restoration of pools and small wetlands, which strengthens the populations of the Italian crested newt. From the available monitoring data, we can currently observe an increase in the abundance of populations, as well as the successful spread of the species to new or restored sites.

Populations of native plant and animal species and individual valuable communities in the Czech Republic are threatened by the spread of geographically **non-native species**, in particular **invasive** species. The highest numbers of invasive species occur along watercourses and roads, which facilitate their spread. Increased numbers of invasive species are also recorded in human settlements and their surroundings. From a geographical point of view, a high number of invasive species occurs in the North-Pannonian sub-province (the territory of southern Moravia), where a higher number of endangered plant and animal species are also found.

The occurrence and spread of invasive species in the Czech Republic is reviewed and assessed once every ten years. Data on the occurrence of non-native species are collected at the national level in the NCACR Finding Database. The data are used, *inter alia*, for planning interventions against invasive species in selected sensitive areas, including important projects aimed at the eradication of the giant hogweed in the Karlovy Vary Region (since 2013) or the northern raccoon in the Doupovské hory Mountains (2019–2024).

107 *For more information see: https://portal.nature.cz/web/cz/zvlaste-chranene-druhy#/.*

108 *For more information see: https://portal.nature.cz/cervene-seznamy#/.*

Of the 1,576 **non-native plant species** that occur or have been recorded in the Czech Republic in 2022[109], 75 are considered **invasive**[110]. Widely spread invasive plant taxa include e.g. the reynoutria, impatiens glandulifera, large-leaved lupine, giant hogweed or black locust.

One of the areas where efforts are being made to stop the spread of **black locust** is the National Park Podyjí. So far, about 50 hectares (the size of approximately 17 football fields) of the originally planned area of approx. 180 hectares of black locust have been treated. Eradication of both individuals and stands is carried out by manual stem injection. The herbicide is applied following a strategy of prioritising the treatment of small isolated outbreaks and stands of black locust growing on sites with well-preserved vegetation.

As of 2022[111], 113 of the 595 **non-native animal species** were considered **invasive**. Widespread invasive species include, *inter alia*, American mink, northern raccoon, Northern spotted deer, stone moroko, Prussian carp, spinycheek crayfish, as well as signal crayfish or Iberian slug. In 2023, the Asian hornet was first spotted in the Czech Republic which is on the EU list of invasive non-native species.

The EU Biodiversity Strategy for 2030 includes a target of ensuring area-based **protection for at least 30% of the EU territory** (and 10% of the EU territory under strict protection). At the national level, a contribution to the protection of 28.3% of the Czech territory by 2030 is proposed, of which 6.02% is under strict protection. The Czech Republic has a limited number of valuable large areas suitable for potential nature conservation, which has led to the creation of many small protected areas (median size < 9 hectares) that suffer from isolation (Fig. 14). The contribution is therefore based, in addition to the proposal for establishing new protected areas, primarily on securing the protection of other areas of natural value in order to improve the connectivity of the protected area network (i.e. "other effective area-based conservation measures").

The **Natura 2000** network in the Czech Republic has almost reached its final form, thus its contribution to the achievement of the objectives of ensuring area-based and strict protection will be minimal. The creation of new specially protected areas of national importance is still planned. In 2023, the intention to declare the NP Křivoklátsko was announced, and the Ministry of the Environment announced the intention to declare the PLA Soutok, and the pre-negotiation and acquisition of expert documents for the forthcoming intention to declare the PLA Krušné hory was underway.

Overall, **the area of protected areas** (21.9% in 2023) should be increased by 1.1% of previously unprotected areas by 2030. Further efforts will focus on improving the interconnectivity of the protected areas network by strengthening the protection of natural areas that are currently protected by other means (e.g. significant landscape features, territorial system of ecological stability, temporarily protected areas, natural parks, water protection zones). These areas, which can be listed as **other effective area-based conservation measures** in the Protected Areas World Database will account for an additional 5.3% of the commitment. Overall, 28.3% of the state's land area is proposed to be protected by 2030. The increased share of strictly protected areas should be secured by declaring new specially protected areas and strengthening the protection of natural values of the PLA's second zone.

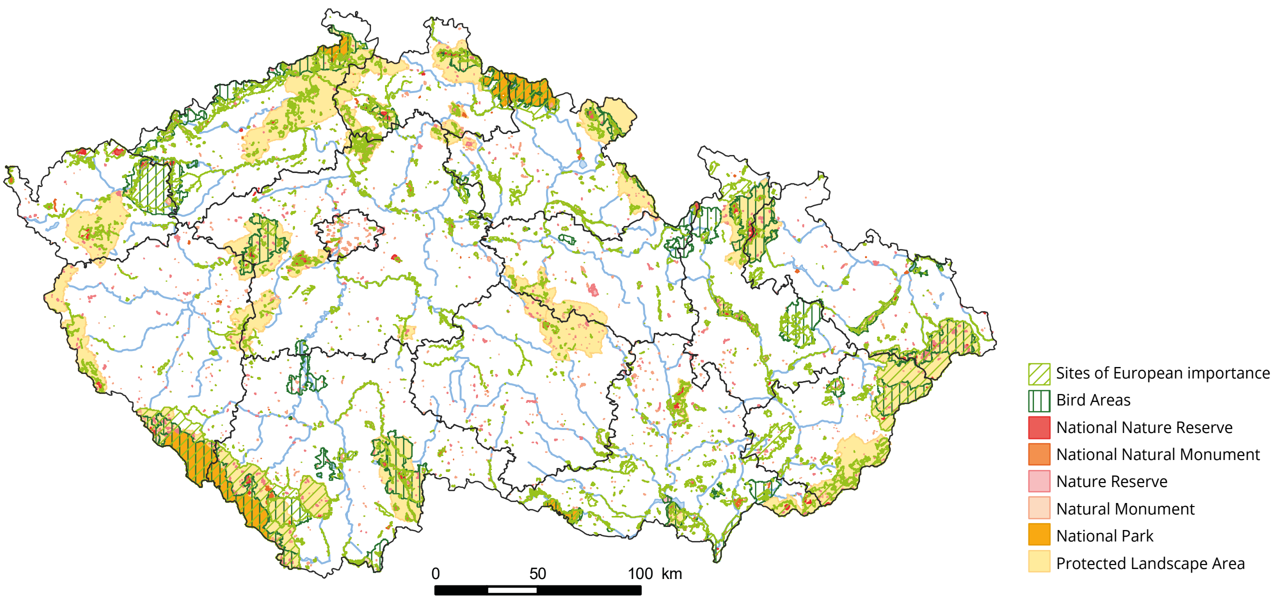
[109] *As to the closing date of this publication, data for 2023 were not available.*

[110] *Pyšek, P.; Sádlo, J.; Chrtek, J. Jr. et al. (2022). Catalogue of alien plants of the Czech Republic (3rd edition): species richness, status, distributions, habitats, regional invasion levels, introduction pathways and impacts. Preslia. 94, p. 447–577.*

[111] *As to the closing date of this publication, data for 2023 were not available.*

Figure 14

Specially Protected Areas and Natura 2000 sites in the Czech Republic, 2023



Data source: NCACR

The NCACR project "TSES Plan in PLA" contributes to greater **connectivity** of valuable **natural biotopes** and the delineation of areas for their development. It gradually revises the delineation of the plans of the Territorial System of Ecological Stability (TSES) in 20 PLAs, adding new ones and expanding the selected TSES components delineated using the biotope-based approach in a targeted manner.

Maintaining **no-interference zones** in national parks and other protected areas is also highly valuable to biodiversity. In the Šumava National Park, for example, the no-interference zones allow the survival of two rare forest beetle species – *Peltis grossa* and *Tragosoma depsarium*.

An increase in numbers was recorded, for example, in the Šumava population of **western capercaillie**, which responded positively to the no-interference regime in Zone 1 of the National Park after the wind calamity caused by Hurricane Kyrill.

A species with significantly positive range and population trends is the **peregrine falcon**, whose European population collapsed in the 1950s due to the use of various types of pesticides in agriculture, especially DDT. The falcons returned to the Czech nature 30 years later and nowadays there are more than 100 pairs nesting in the Czech Republic, thanks to the protection of natural nesting sites and placing boxes on high-rise buildings. Also, the unpopular step of **restricting access and activities** in selected areas of NP České Švýcarsko, which is one of the most important nesting sites of the peregrine falcon, enabled successful nesting and raising of chicks and significantly contributed to the protection of this species.

Active species conservation tools are an important tool for the protection of the most endangered species[112]. In 2023, the 2023–2032 Concept of Active Species Conservation Tools in the Czech Republic was approved setting down the categories of active species conservation tools (rescue programmes, care programmes and regional action plans) and defining the criteria for selecting plant and animal species for their preparation. Currently, active species conservation tools are implemented for 17 animal species and 13 plant species.

[112] *Information on active species conservation tools is available at: https://www.zachranneprogramy.cz/.*

This rescue programme has, for example, helped to save the **Bohemian sand pink (*Dianthus arenarius subsp. bohemicus*)**, whose remaining population (about 200 individuals in the 1990s) has increased more than fortyfold and the species population continues to expand.

Another success was the regional action plan for the **hermit (*Chazara briseis*)** in the České středohoří Highlands, approved at a time of critically low numbers of this species at the last site (Raná) in the České středohoří region. To date, the numbers of the hermits at Raná have been significantly increased and through a combination of measures their abundance has been restored at other sites too.

Conservation of wildlife in human care

Exploitation of wildlife for international trade is the second most serious cause of species decline after habitat destruction[113]. Imports, exports and the number of seizures of specimens in **international trade in endangered species protected by CITES** have shown a steady upward trend. The main export areas are mostly developing countries, for which wildlife exports often represent a significant economic resource.

Reptiles are the most frequently **imported** group of **live animals** into the Czech Republic, followed by another important group – Anthozoa (Chart 58). Mammals, birds, amphibians, etc. are imported in numbers of a few tens or lower hundreds of individuals per year at most. Imported specimens are mostly from the wild (mainly corals and some reptiles), and less so from captive breeding. The **non-living animal-based items** imported to the Czech Republic include mostly watch bracelets made of crocodile skin (hundreds to thousands per year).

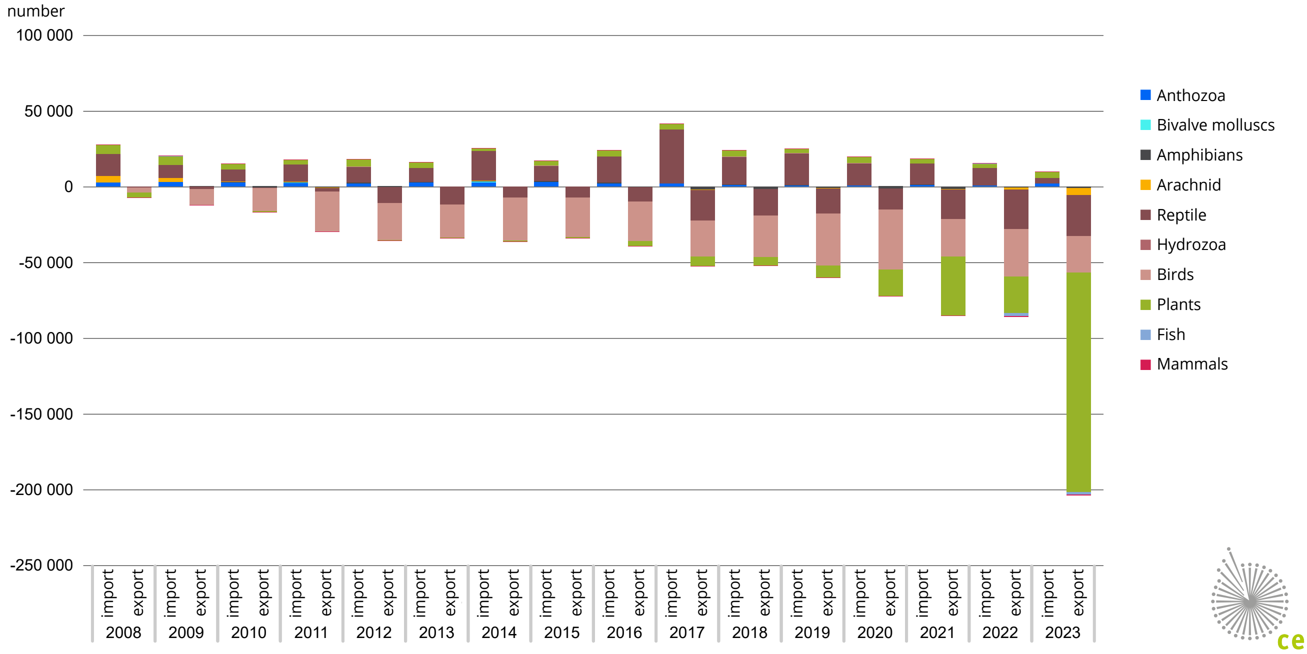
Imported live plant specimens include cultivated orchids as well as members of the spurge and dogbane families. Regarding **non-living plant specimens**, we mainly import the extract of the *Dolomiaea costus* for the use in traditional Chinese medicine.

Birds (mainly parrots, but also raptors for falconry purposes) are the most frequently **exported group of animals**, followed by reptiles and amphibians. Mammals, fish and invertebrates are exported in tens or lower hundreds of individuals per year at most. The vast majority of exported animals come from captive breeding.

[113] *For more information see: www.mzp.cz/cites and https://sysnet.shinyapps.io/CITES_public/.*

Chart 58

International trade in endangered species protected by CITES in the Czech Republic [number of specimens cleared], 2008–2023



https://www.envirometr.cz/data/mezinarodni-obchod-s-ohrozenymi-druhy-chranenymi-umluvou-cites *Data source: NCACR*

The living specimens **seized** in **illicit trafficking** are most frequently plants (mainly cacti) in their hundreds. Seizures of traditional Asian medicine items containing specimens of endangered species, mainly plants (886 items in 2023) and animals – mostly reptiles (e.g. extracts from python or cobra fat) or mammals (e.g. bear bile, musk from the Siberian musk deer), have been on the rise in recent years.

Detailed visualisations and data

https://www.envirometr.cz/data

Environmental protection funding

Key messages

- In 2023, the volume of expenditure from central sources (i.e. mainly from the state budget and state funds) increased significantly by 76.9% year-on-year to CZK 162.6 billion (i.e. by 0.83 p.p. to 2.13% of GDP). The principal reason for such considerable year-on-year growth is increased support under the insulation and energy efficiency programmes primarily funded under the Modernisation Fund and the national recovery plan.
- In 2023, priority areas of support continued to include air and climate protection, with programmes aimed at promoting insulation, energy efficiency and changes in space heating technologies (e.g. the “New Green Savings” Programme or “Boiler Subsidies” programme). Other supported areas included water conservation, biodiversity and landscape protection as well as the transition to circular economy.
- Under the OP ENV 2021–2027, with a total allocation of CZK 75.7 billion TEE (total eligible expenditure), 60 calls were launched from the beginning of the programming period by the end of 2023 and support amounting to a total of CZK 27.2 billion TEE was approved.
- Compared to other EU-27 countries, investment in environmental protection in the Czech Republic is above average in the long term.

Environmental protection funding

Public spending on environmental protection

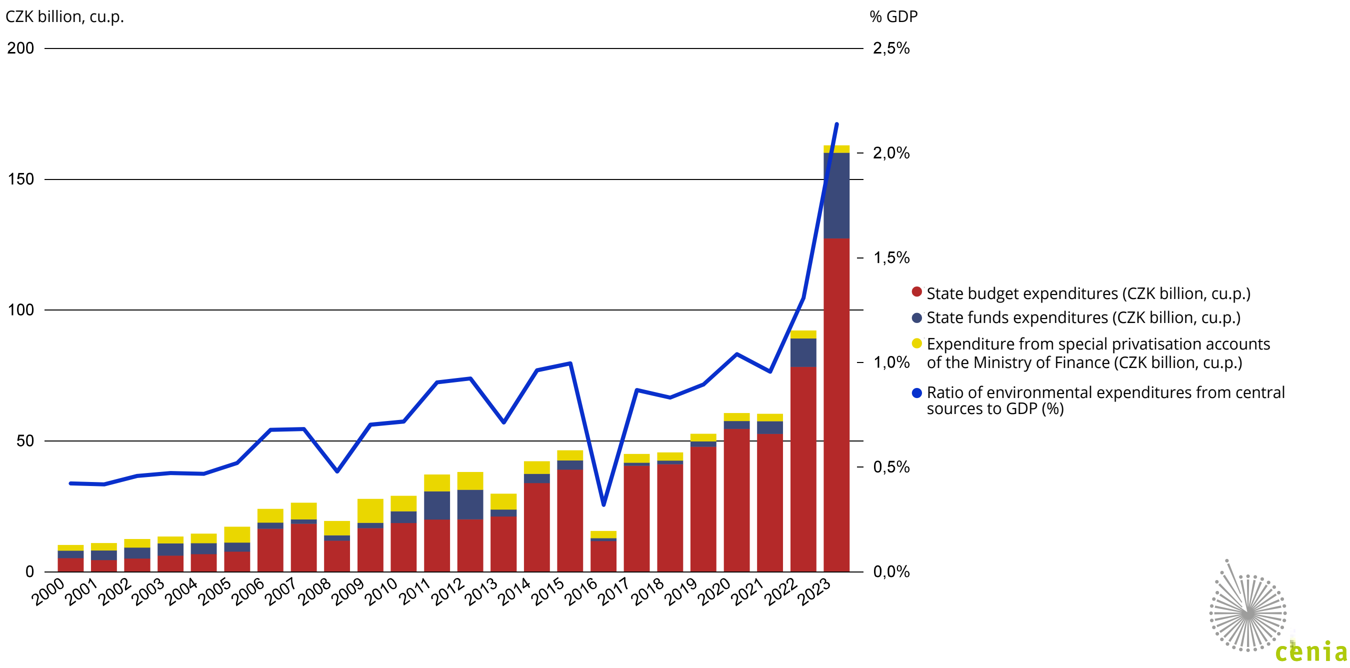
Environmental funding is a key prerequisite for improving the health of individual environmental components and is also an articulation of the public need for environmental protection at central and regional level. This need can be quantified not only in terms of the amount of funds spent from the own resources of economic operators, but also in terms of the amount of financial support from public sources, i.e. budgets. The environmental protection public expenditures are covered form both national sources – i.e. the state budget and state funds (central sources) as well as regional and municipal budgets – and European and international funding[114].

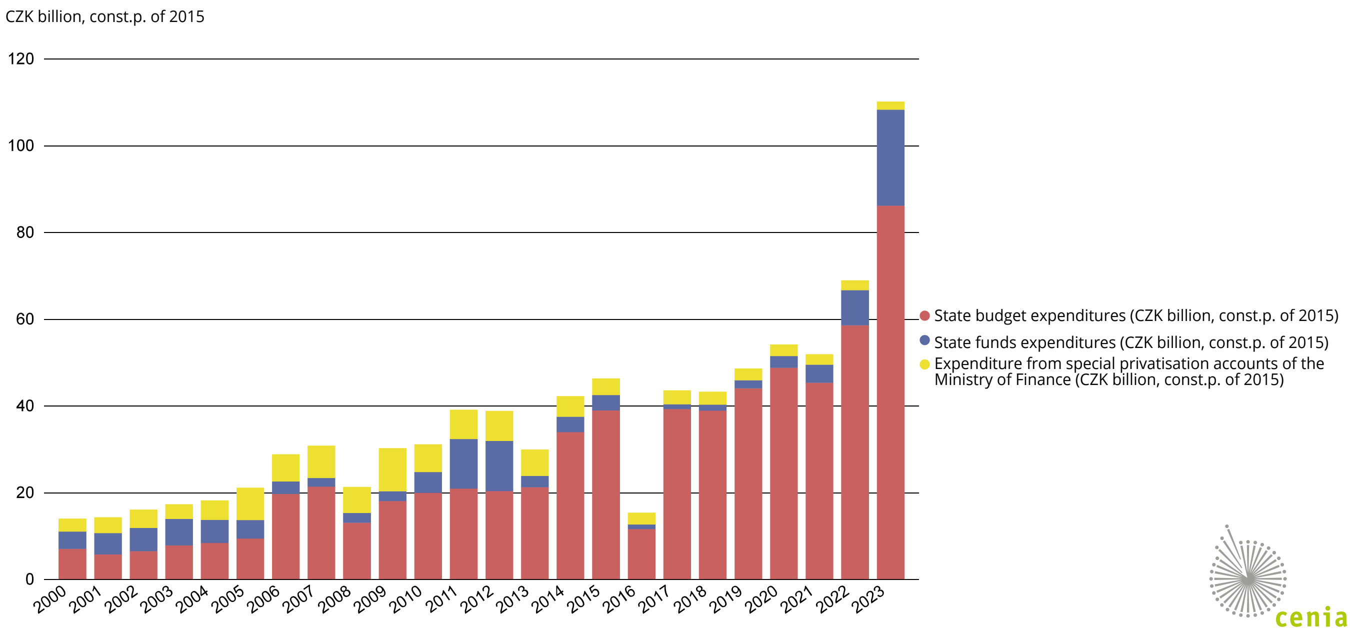
In 2023, the volume of **environmental protection expenditure from central sources** increased significantly by 76.9% year-on-year to CZK 162.6 billion (i.e. by 0.83 p.p. to 2.13% of GDP). The amount of funds provided by the **state budget**, as the main central source of expenditure, increased by 62.8% year-on-year to CZK 127.1 billion in 2023 (Chart 59). **Expenditures from state funds**, including the SEFCR playing a crucial role, also increased by 201.6% to CZK 32.7 billion. The principal reason for such considerable year-on-year growth is increased support under the insulation and energy efficiency programmes primarily funded under the Modernisation Fund and the national recovery plan. Apart from the state budget and state funds, a specific category of central sources of environmental protection funding are the assets of the defunct National Property Fund, administered by the MoF under **special privatisation accounts**, from which CZK 2.8 billion was disbursed in 2023. These expenditures are aimed at remedying old environmental burdens caused by the existing activities of enterprises prior to privatisation, or at remedying environmental damage caused by mineral extraction and revitalising the areas concerned.

[114] *The information on public spending is based on the MoF's budgetary structure, which over the long term also monitors funds provided primarily for the purpose of creating and protecting the environment. As the sources of expenditure of municipal and regional budgets can include financial transfers (e.g. from the state budget, state funds, etc.), some of this expenditure is overlapping with expenditure from central sources or European funds. For this reason, the central, regional/municipal and European or international expenditure is assessed separately and cannot be aggregated.*

Chart 59

Public spending on environmental protection from central sources in the Czech Republic [CZK billion, cu.p., c.p. of 2015, % of GDP], 2000–2023



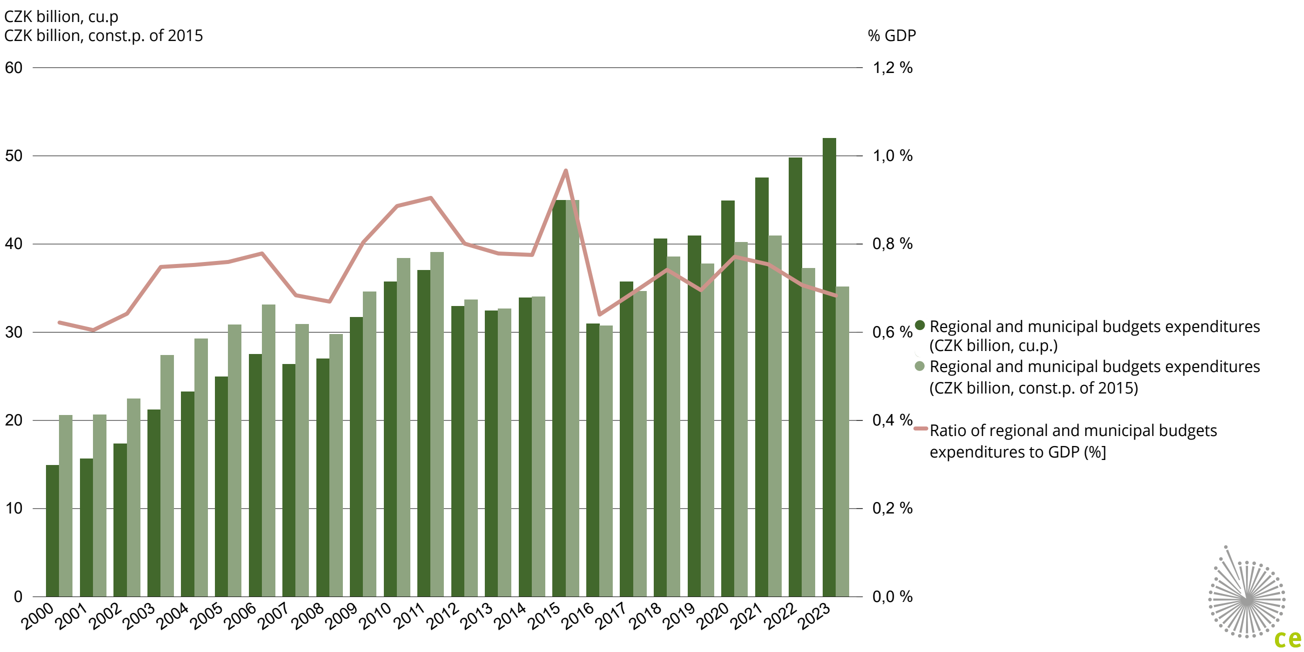


https://www.envirometr.cz/data/verejne-vydaje-na-ochranu-zivotniho-prostredi-z-centralnich-zdroju *Data source: MoF, CZSO*

Municipal and regional budget expenditures on environmental protection, intended to finance actions implemented on an ongoing basis under the authority of municipalities or regions increased by 4.4% year-on-year to a total of CZK 52.0 billion in 2023. However, the slight increase in these expenditures led to a stagnation in their share in GDP, or a slight decrease of 0.03 p.p. to 0.68% of GDP (Chart 60).

Chart 60

Environmental public spending from municipal and regional budgets in the Czech Republic [CZK billion, cu.p., c.p. of 2015, % of GDP], 2000–2023



https://www.envirometr.cz/data/verejne-vydaje-na-ochranu-zivotniho-prostredi-z-uzemnich-rozpoctu *Data source: MoF, CZSO*

In 2023, **in terms of programme focus**, most public financial support continued to be channelled into the area of air and climate protection, with programmes aimed at supporting insulation, energy savings and changes in space heating technologies in view of reducing air pollution from local solid fuel space heating systems and reducing greenhouse gas production. This area includes, for example, the so-called "Boiler Subsidies" provided to support the replacement of older boilers (see below for more details) and the **New Green Savings Programme (NGS)**[115], which in 2023 provided funding for more than 101,000 applications totalling CZK 21.7 billion. In January 2023, **"NGS Light"** was launched for elderly and lower-income householders, under which over 54,000 applications have received support totalling CZK 5.8 billion by the end of 2023.

Other priority areas of support included water conservation and biodiversity and landscape protection. In this area, most of the funds were spent in particular on the support of protected natural areas and the protection of species and habitats (e.g. through the Landscape Management Programme or the Support for the Restoration of Natural Landscape Functions programme). In the context of municipal and regional budgets, the main emphasis in this area was on the maintenance of the public spaces appearance and public green spaces. Last but not least, the priority areas of public support included also waste management and circular economy. Priority was given to the promotion of waste prevention, collection and transport to waste treatment facilities, and high-quality sorting, re-sorting and material recycling of wastes.

In addition to the national environmental protection subsidy programmes, which are mainly administered by the SEFCR, public spending on environmental protection has also been boosted since 2004 by **direct EU support and the**

[115] *From 2021 onwards, the NGS funding is provided from the resources of the National Recovery Plan and, once its allocation is used up, from the HOUSEnerg programme under the Modernisation Fund.*

possibility of co-financing projects from other international sources. Currently, these include in particular the EEA and Norway financial mechanisms, LIFE Programmes, Interreg and the Swiss-Czech Cooperation Programme. In terms of European funds, the most important in terms of subsidies are the OP ENV, the main source of EU environmental protection funding, and the RDP (or CAP SP), aimed, *inter alia*, at preserving and improving natural ecosystems dependent on agriculture.

The total allocation of the **OP ENV 2014–2020** (including reallocations) is EUR 2.8 billion (CZK 70.7 billion) of EU funds, or EUR 3.3 billion (CZK 83.5 billion) of total eligible expenditure (TEE). From the beginning of the programming period to 31 December 2023, the OP ENV Managing Authority of the launched 172 calls (including 1 call for financial instruments), including 10 new calls launched in 2023 with an allocation of approximately EUR 256.4 million (CZK 6.2 billion) TEE. As of 31 December 2023, 15,611 applications for support amounting to approximately EUR 7.4 billion (CZK 180.1 billion) TEE were registered in OP ENV from the beginning of the programming period. On the basis of the subsequent recommendation of the selection committee, 9,771 legal acts were issued from the beginning of the programming period for the implementation of projects amounting to EUR 3.9 billion (CZK 98.4 billion) TEE. From this, about EUR 3.5 billion (CZK 88.2 billion) TEE was granted to the beneficiaries since the beginning of the programming period.

OP ENV also finances the so-called **Boiler Subsidies**, in which 3 calls for different regions were launched with a total allocation of approximately EUR 428.6 million (CZK 10.43 billion) TEE or EU funds. This allocation from the ENV OP was further increased by CZK 1.5 billion from the NGS programme. By the end of 2023, 107.6 thousand replacements of solid fuel boilers were approved in all 3 calls with a total volume of EUR 489 million (CZK 11.9 billion). The Boiler Subsidies continue in OP ENV 2021–2027, focusing on support for low-income households. In 2022–2023, two calls were launched with a total allocation of CZK 6.7 billion, under which 16.7 thousand replacements of solid fuel boilers were accepted by the end of 2023 for a total amount of EUR 104.4 million (CZK 2.5 billion).

On 18 July 2022, the EC approved the **ENV OP 2021–2027** with a total allocation of EUR 2.5 billion (CZK 63.1 billion) of EU funds by the end of 2023, or EUR 3.0 billion (CZK 75.7 billion) TEE. From the beginning of the programming period to 31 December 2023, the Managing Authority of the ENV OP has launched 60 calls with an allocation corresponding to 89% of the programme allocation and 3,220 applications for support amounting to approximately EUR 3.9 billion (CZK 94.6 billion) TEE were registered. From the beginning of the programming period, 821 legal acts amounting to EUR 1.1 billion (CZK 27.2 billion) TEE were issued and funds cleared in payment claims amounted to about EUR 232.2 million (CZK 5.6 billion) TEE.

The implementation of the **Modernisation Fund**, an investment instrument of the European Investment Bank and the European Commission, started in 2021. The fund is designed to support green projects that will significantly reduce the Czech Republic's dependence on coal combustion and accelerate the transition to clean energy sources. The investments are intended to contribute to the reduction of greenhouse gas emissions through energy savings and the development of renewable energy sources. The Fund's allocations depend on the price of emission allowances and are expected to reach CZK 500 billion by 2030. Subsidies are distributed in 8 programmes for a wide range of energy-saving actions – from technology upgrades in industry and energy sector, construction of photovoltaic/wind power plants or energy savings in buildings to modernisation of public lighting or purchase of electric buses. In total, calls for CZK 107.0 billion have already been launched in the Modernisation Fund, including seven calls for CZK 18.3 billion in 2021, eight calls with a total allocation of CZK 40.5 billion in 2022 and 16 calls for CZK 48.2 billion in 2023. In 2023, 79,722 applications were submitted under all launched calls (including NGS and NGS Light) with a total funding sought of CZK 141.3 billion, and a total of 61,482 projects with a total subsidy of CZK 47.2 billion were approved.

Other major international funding is provided through the **National Recovery Plan (NRP)**, the Czech Republic's plan for reforms and investments to mitigate the impact of the Covid-19 pandemic and bring the economy back on track using funds from the Recovery and Resilience Facility under the EU recovery plan – Next Generation EU. The Ministry of the Environment is the owner or co-owner of eight sub-components bringing together environmental activities with a total volume of funds of CZK 33.5 billion. The first two calls for NRP activities were launched by the Ministry of Environment through the SEFCR under the NGS programme already in 2021. In addition to these calls, other NRP calls are being implemented under the ENV NP, e.g. on energy savings in public buildings, on water management in municipalities, on support for the purchase of vehicles (electric, H2) and non-public charging infrastructure, on support for building recycling infrastructure in the field of biodegradable waste, on environmental education programmes on climate change or on adaptation of aquatic, non-forest and forest ecosystems to climate change. A total of CZK 9.8 billion has been allocated for the NRP calls under the NP ENV. From the beginning of the application process to the end of 2023, a total of 1,913 applications were submitted under the NP ENV with a total request for subsidies of CZK 7.7 billion. In 2023, a total of 1,047 positive decisions of the Minister on granting subsidies were issued on the calls of the NRP NP ENV and a total of EUR 685.8 million was paid to projects.

In addition to the SEFCR, part of the components of the NRPs under the MoE are implemented directly by the Ministry and the NCACR through the National Recovery Plan – Support for Restoration of Natural Functions of the Landscape (NRP-SRNLF) programme. The total amount of funds in the programme is CZK 1.2 billion. By 31 December 2023, 8 calls for proposals with an allocation of CZK 644 million had been launched under the programme. Under these calls, 1,371 applications were submitted by the end of 2023, with a total volume of CZK 386.7 million.

In 2023, the implementation of the **Operational Programme Just Transformation** continued. It is a targeted support for the most affected regions (coal regions) to mitigate the socio-economic (coal mining decline, economic transformation, etc.) and environmental impacts of the transition. In the Czech Republic, the Karlovy Vary, Ústí nad Labem and Moravian-Silesian Regions, as those most affected by the phase-out of coal, will benefit from the programme with a total allocation of over CZK 40 billion. By the end of 2023, 45 calls had already been launched with an allocation of CZK 30.6 billion, three quarters of the total programme allocation, and 196 applications with an EU contribution of CZK 10.8 billion had been approved.

The **Ministry of Agriculture** has also implemented support that contributes to environmental improvement, particularly through the **Rural Development Programme (RDP)** and the **Common Agricultural Policy Strategic Plan (CAP SP)**. The activities supported under the current RDP include mainly agri-environment and climate measures, organic farming measures, forestry-environmental and climate services and forest protection, Natura 2000 payments and payments for less favoured areas. Under these actions, approximately CZK 6.4 billion was paid from the RDP in 2023. Rural development support, including the above-mentioned measures, continues under the 2023–2027 CAP SP, where the first payment of about CZK 1.6 billion has been made, in particular for the Areas with Natural or Other Constraints intervention.

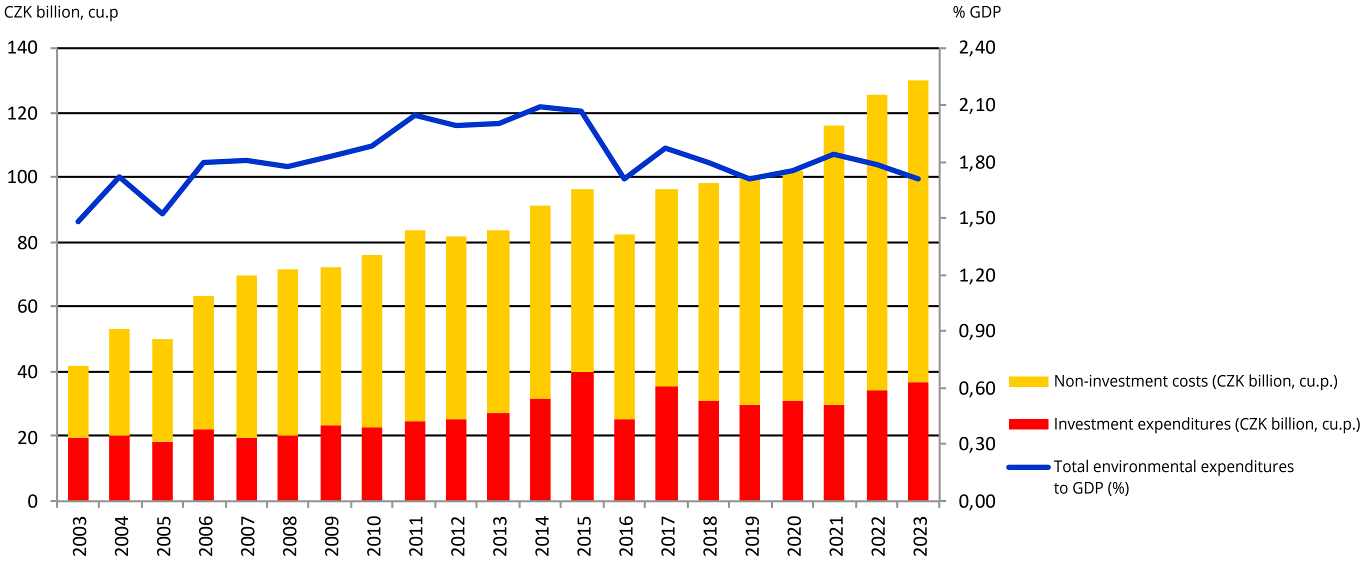
As to the **Ministry of Industry and Trade**, it is worth mentioning the operational programmes that focus, *inter alia*, on promoting energy savings and reducing emissions and the circular economy, in particular the 2021–2027 OP TAC, which includes priorities such as “Moving towards a low-carbon economy” and “More efficient resource management”, under which 770 projects worth CZK 9.4 billion have been supported. As to the **Ministry of Regional Development**, it is important to mention the **IROP**, especially the specific objective “Enhancing protection and preservation of nature, biodiversity, and green infrastructure, including in urban areas, and reducing all forms of pollution”, under which over 60 projects worth CZK 2.4 billion have been supported in the current programming period.

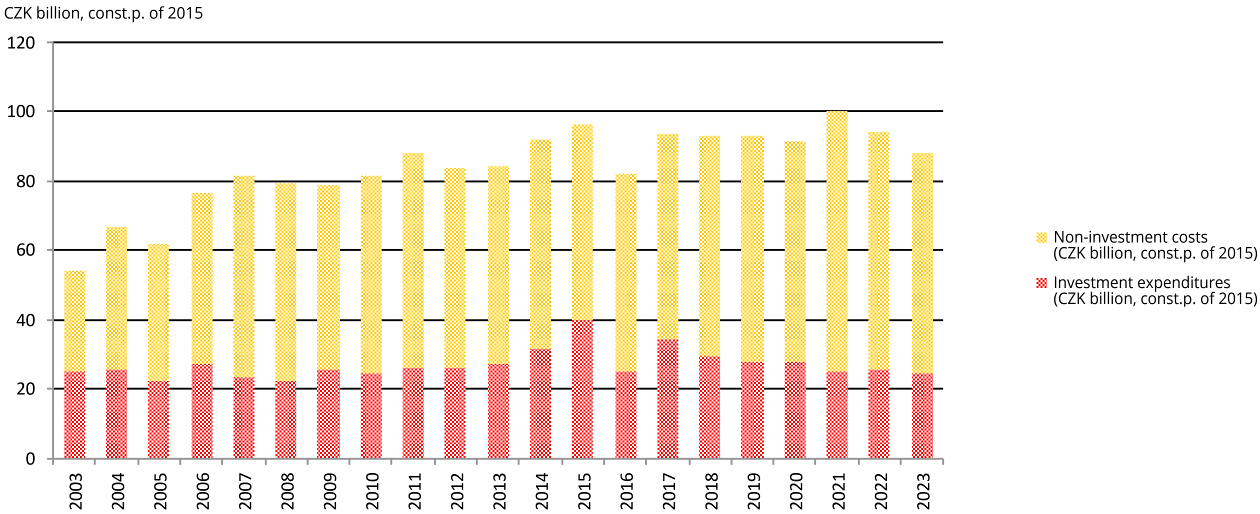
Environmental investments and non-investment costs

An alternative view of the environmental protection funding is provided by a statistical survey conducted by the CZSO, focusing on the issue of environmental investments and non-investment costs made by both the public and corporate (private) sectors. In 2023, environmental investments and non-investment costs rose by CZK 4.7 billion year-on-year, i.e. by 3.7% to CZK 130.2 billion in cu.p. (Chart 61). However, the **ratio of investments and non-investment costs to GDP** fell slightly by 0.07 p.p. year-on-year to 1.71% of GDP, reflecting the relatively stronger performance of the economy.

Chart 61

Total environmental expenditures in the Czech Republic [CZK billion, cu.p., c.p. of 2015, % of GDP], 2003–2023





https://www.envirometr.cz/data/investice-a-neinvesticni-naklady-na-ochranu-zivotniho-prostredi *Data source: CZSO*

In 2023, **investments** increased by CZK 2.6 billion, i.e. by 7.5%, to CZK 36.6 billion, and as was the case in the past, expenditures for integrated facilities (i.e. for pollution prevention) of CZK 22.6 billion exceeded expenditures for end facilities (i.e. for pollution removal) amounting to CZK 14.0 billion. This allows for a high level of long-term investment with an integrated approach to environmental protection based on the principle of introducing and applying BATs and other innovations. The aim of this approach is the gradual upgrading of the polluters' production facilities, resulting in particular in the elimination of the adverse effects caused by their operations.

In terms of **programme focus of the investments**, most investment expenditures in 2023 were made in waste water management (CZK 11.4 billion, e.g. in the reconstruction and construction of sewers and WWTPs), in air and climate protection (CZK 9.1 billion, e.g. to reduce industrial emissions) and in the area of waste and circular management (CZK 6.2 billion, e.g. in waste prevention, collection and transport to waste treatment facilities, and high-quality sorting, re-sorting and material recycling of wastes). **According to the statistical classification of economic activities of the investing entity (CZ-NACE)**, in 2023, the largest share of total investment came from the public administration and defence, compulsory social security sectors (32.4% of total investment) and from the energy sector, i.e. production and distribution of electricity, gas, heat and air conditioning (23.7% of total investment), followed by water supply, including activities related to wastewater, waste and remediation (21.9% of total investment) as well as manufacturing industry (14.5% of total investment).

Regarding **non-investment costs/current costs**, there is a long-term upward trend. This was confirmed in 2023, when these costs increased by CZK 2.1 billion, i.e. by 2.3% to CZK 93.6 billion, and thus continued to account for a substantial part of environmental protection expenditure monitored by the CZSO along with investments. As in previous years, in 2023, in terms of programme focus, most current costs was implemented in the area of waste management and circular economy (CZK 60.0 billion) as well as in the area of wastewater management (CZK 19.5 billion). Other cost-intensive areas are long-term air and climate protection (CZK 6.7 billion in 2023), as well as soil protection and remediation, including groundwater and surface water protection (CZK 3.7 billion).

In international comparison of environmental protection funding, we can compare in particular the investments that are above average in the Czech Republic relative to the EU-27 as a whole, i.e. within the public and corporate (industrial) sectors in the long term. While in some of the new Member States (e.g. Slovenia, Czechia or Croatia) investments in 2021[116] amounted to over 0.6% of GDP in cu.p., many of the older Member States did not even reach the level of 0.2% of GDP in cu.p. (Greece, Ireland). The reason for the increased investment in the Czech Republic and other new Member States is mainly the need to comply with the stricter conditions and requirements of the relevant European legislation. The level of investment is also supported by the availability of EU funds or other international subsidy programmes.

Detailed visualisations and data

https://www.envirometr.cz/data

[116] *As to the closing date of this publication, data for 2022 and 2023 were not available.*

Views and attitudes of the Czech public

Key messages

- Awareness of the Czech public in the areas of climate change, greenhouse gas emissions, energy and related policies and actions is problematic. Nevertheless, in 2023, climate change was seen as a serious problem by the majority (77%) of the Czech public.
- The majority of the Czech public also agrees on the basic policy objectives in terms of climate protection. For example, 75% of respondents agree that we should reduce greenhouse gas emissions to a minimum and offset the remaining emissions, for example by increasing forest cover, to make the EU climate neutral by 2050.

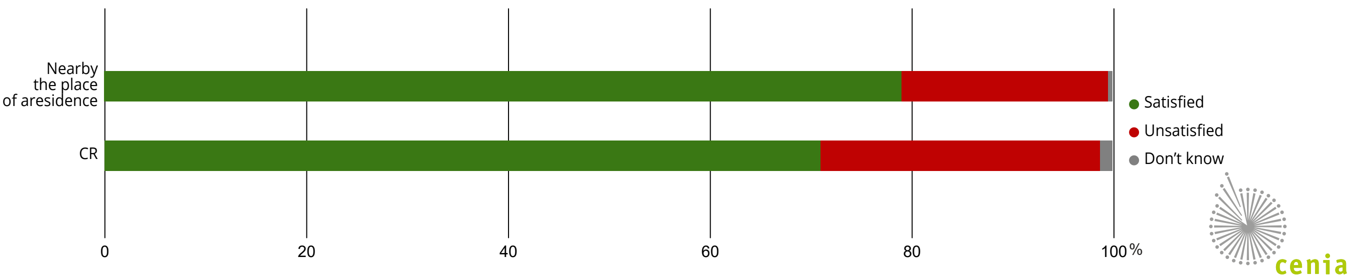
Views and attitudes of the Czech public

Regular representative public opinion polls on Czech society's attitude towards the environment

The long-term pattern shows that the public rates the environment in their place of residence higher than the overall environment in the Czech Republic. At least 70% of respondents express satisfaction with the **environment in their place of residence** (except in 2004 and 2010; Chart 62). Nevertheless, satisfaction with the **overall state** of the environment in the Czech Republic has been gradually increasing since 2002 when the survey was initially conducted with slight variations.

Chart 62

Satisfaction with the environment in the Czech Republic and in the place of residence [%], 2023



Question asked: How satisfied are you with the environment in our country in general and nearby your home?

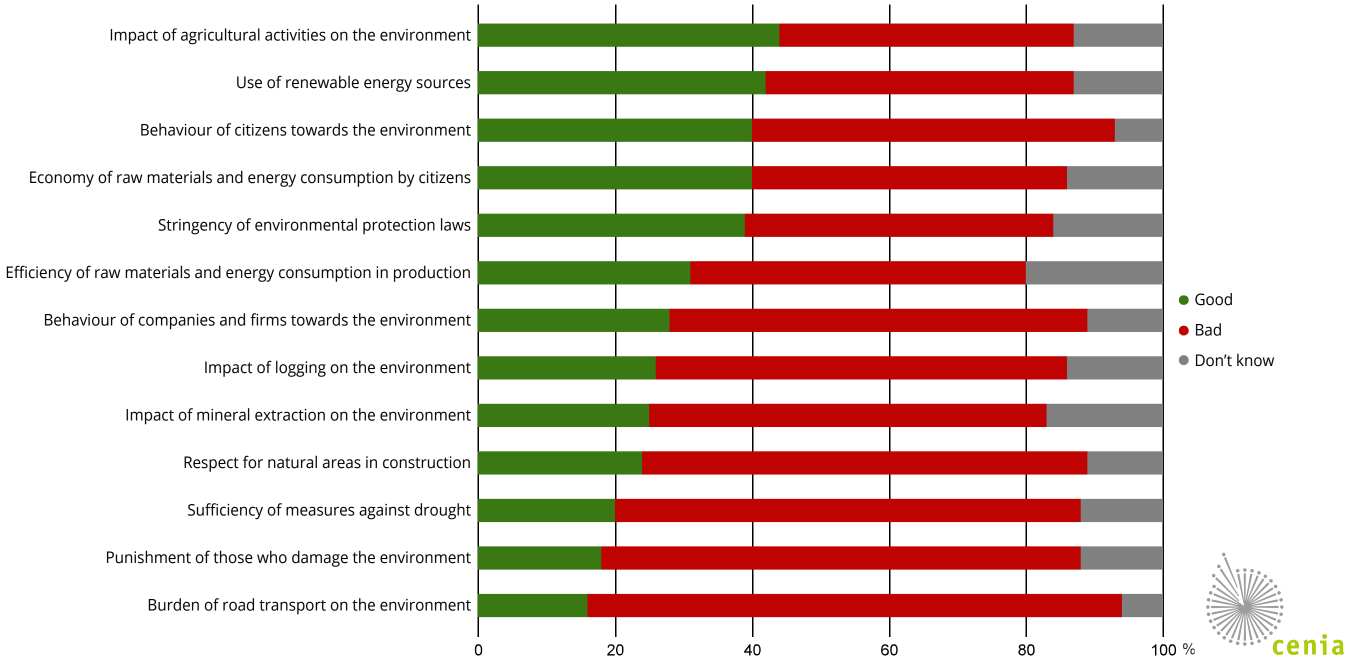
https://www.envirometr.cz/data/spokojenost-s-zp-v-cr-a-v-miste-bydliste *Data source: CVVM SOÚ AV ČR, public research institution*

The results of the 2022[117] survey show that when it comes to the environment, society is most **critical of the burden of the environment from road traffic** (78% of respondents stated that the situation was bad) and the insufficient sanctions against those who cause damage to the environment (70% of respondents stated that the situation was bad). Roughly two thirds of respondents rated the drought control measures as inadequate (68% of respondents) and the measures to protect natural areas during construction as poor (64% of respondents said the situation was bad; Chart 63).

[117] *The survey was not conducted in 2023.*

Chart 63

Rating of activities affecting the environment [%], 2022



Question asked: In your opinion, what is the situation in the Czech Republic in terms of: (a) punishment of those who cause damage to the environment, (b) environmental behaviour of companies and businesses, (c) environmental behaviour of citizens, (d) environmental impact of mineral extraction, (e) environmental impact of timber extraction, (f) efficiency of raw material consumption and energy consumption by the Czech production sector, (g) efficiency of raw material consumption and energy consumption by citizens, (h) respect for natural areas during construction, (i) strictness of environmental protection legislation, (j) environmental burden of road traffic, (k) environmental impact of agricultural activities, (l) use of renewable energy sources, (m) sufficiency of drought control measures? The survey was not conducted in 2023.

https://www.envirometr.cz/data/hodnoceni-aktivit-ovlivnujicich-zivotni-prostredi

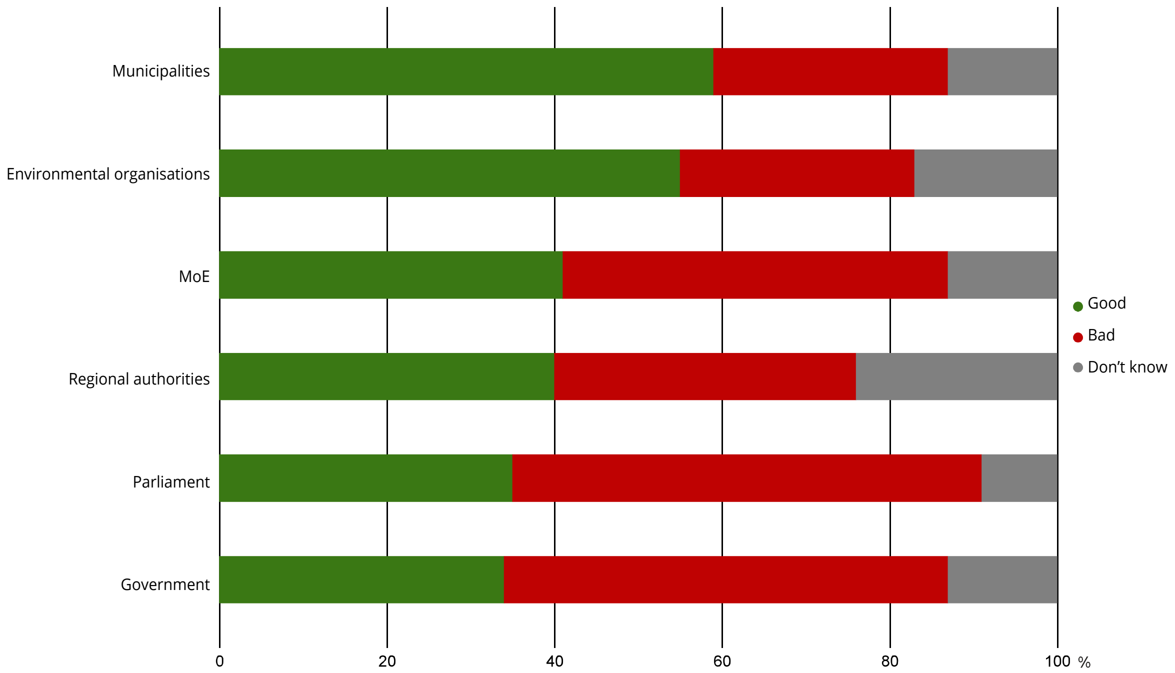
Data source: CVVM SOÚ AV ČR, public research institution

In the rating of activities aimed at protecting the environment, the activities of **municipal authorities** (59% of responses) and **environmental organisations** (55% of responses) were the most highly valued in 2022[118]. On the other hand, a negative evaluation was voiced for the environmental **performance of the parliament** (59% of responses) as well as the **government** (53% of responses; Chart 64). Compared to 2020, when the same survey was carried out, an improved rating was recorded especially in the case of the **regional** (7 p.p. increase in positive evaluation) and **municipal authorities** (3 p.p. increase in positive evaluation) actions.

[118] *The survey was not conducted in 2023.*

Chart 64

Rating of the environmental performance of institutions [%], 2022



Question asked: As far as environmental protection is concerned, how do you rate the activities of the government, the Ministry of the Environment, parliament, regional authorities, municipal authorities, environmental organisations? The survey was not conducted in 2023.

https://www.envirometr.cz/data/hodnoceni-cinnosti-instituci-v-ochrane-zivotniho-prostredi

Data source: CVVM SOÚ AV ČR, public research institution

Perception of climate change among the Czech public

Awareness of the Czech public in the areas of climate change, greenhouse gas emissions and energy in the Czech Republic is problematic[119]. For instance, only 7% of respondents know that the Czech Republic produces more greenhouse gas emissions per capita than India, China or the UK.

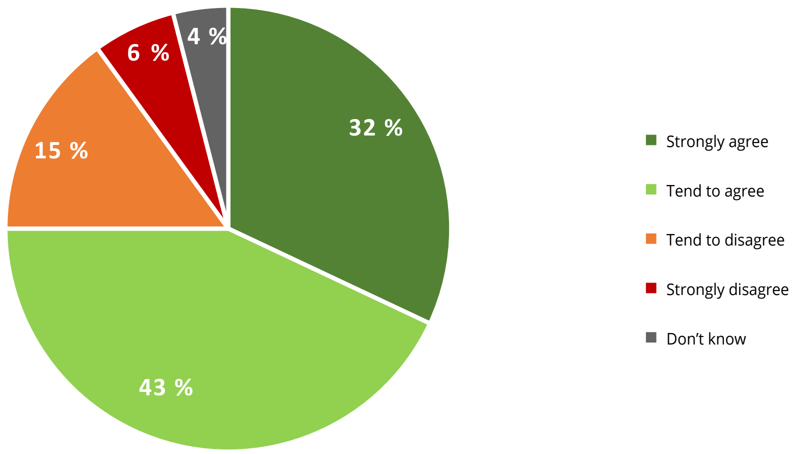
Despite relatively low awareness, according to the Eurobarometer survey[120], the majority (77%) of the Czech public considered climate change to be **a serious problem** in 2023. Compared to the 2021 survey, however, the share of people considering climate change a **very serious problem** has dropped significantly (by 16 p.p.). This is significantly lower than the EU-wide figure, as more than three quarters (77%) of all respondents in EU-27 think climate change is a very serious problem. At the same time, it is important that the majority of the Czech population **agrees on** the basic political objectives concerning the climate protection. For example, 75% of the Czech public agrees that we should **reduce greenhouse gas emissions to a minimum** and offset the remaining emissions, for example by increasing forest cover, to make the EU climate neutral by 2050 (Chart 65). However, here too there has been a significant drop in number of people in the "strongly agree" category since 2021 (by 17 p.p.).

[119] *Krajhanzl, J. et al. (2021): Czech Climate 2021. Map of Czech public opinion on climate change. Department of Environmental Studies FSS MU, in cooperation with Green Dock, z.s.*

[120] *For more information see: https://europa.eu/eurobarometer/surveys/detail/2954.*

Chart 65

Perception of decarbonisation of the economy [%], 2023



Question asked: To what extent do you agree with the following statement? We should reduce greenhouse gas emissions to a minimum and offset the remaining emissions, for example by increasing forest cover, to make the EU climate neutral by 2050.

Data source: Eurobarometer 538

There is much less public support for some specific initiatives or **measures** to meet climate change targets. One of these, for example, is the **Green Deal for Europe**, which is considered too ambitious by 36% of the population[121]. About the same proportion of the population (34%) have no or little knowledge of the Green Deal, and half know only a little. Awareness remains almost unchanged compared to 2022[122]. The vast majority know little or nothing (87%) or only a little (11%) about the "Fit for 55" legislative package.

In terms of **actions**, there is strong **support** for water efficiency (e.g. 86% support the construction of small reservoirs and ponds) and the implementation of a circular economy. The majority of respondents are also **highly supportive** of subsidies, e.g. for insulation[123].

A majority of the Czech public would increase the share of **hydro, solar and wind energy** in the national energy mix (71% to 67%). Around half of the respondents are in favour of increasing the share of **nuclear energy** (54%). A large proportion of respondents could not decide on the future of natural gas, whether to reduce or increase its share in the energy mix (38% undecided). On the contrary, the share of **coal and oil** should decrease (57%) in their opinion. Although **renewable energy sources** are generally highly supported, the construction of wind power plants faces resistance from municipalities. 40% of the respondents would tend to agree or strongly agree with the construction of a new wind farm within 500 metres of the last house in the village. However, this proportion increases or decreases depending on how the financial compensation is used. The largest proportion of people would agree if it was used to reduce the energy bills of village residents (61%). The least popular option is to grant the money to the municipality without identifying its purpose (25%).

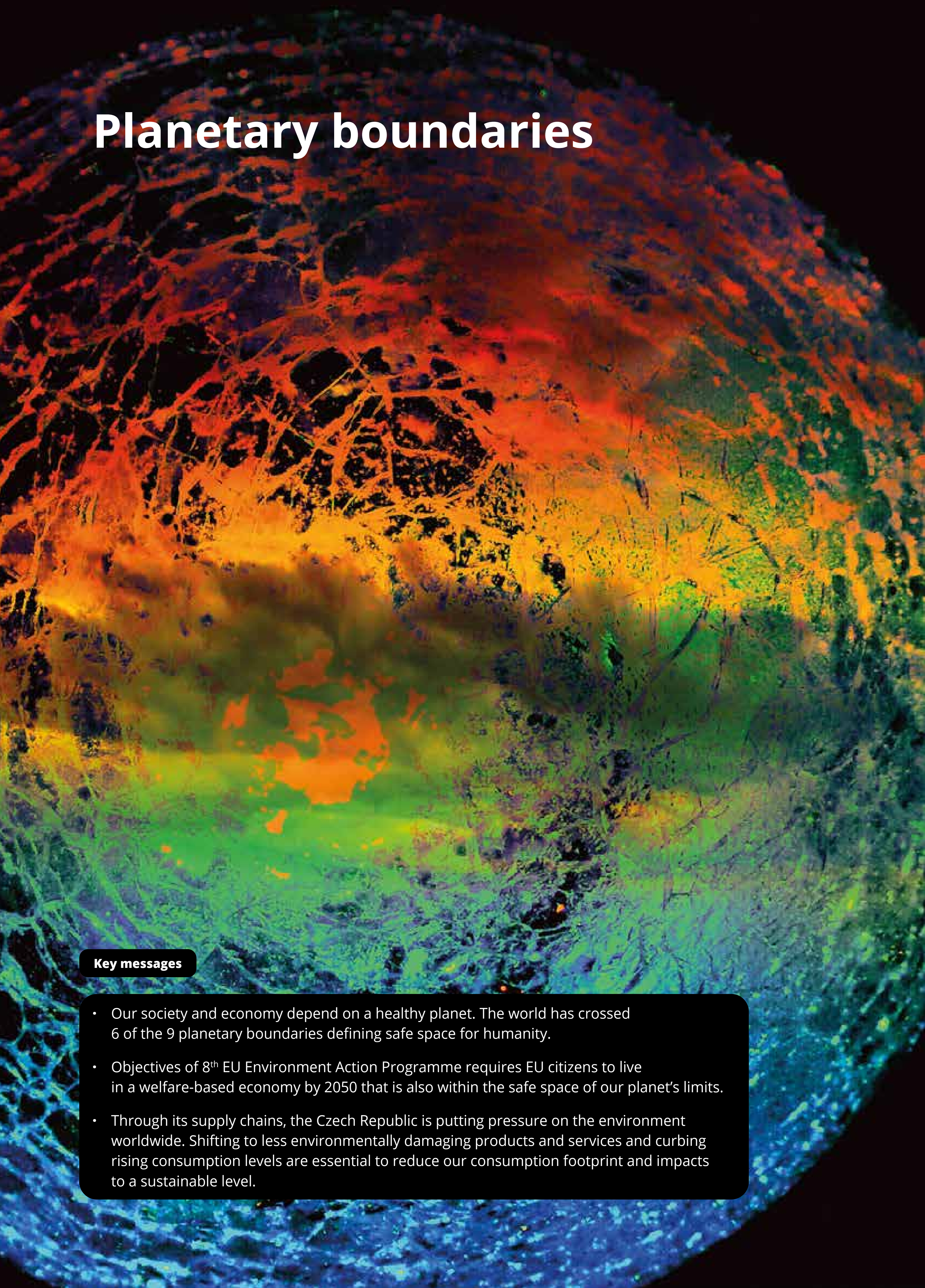
Detailed visualisations and data

https://www.envirometr.cz/data

[121] *Results of the SEEPIA Environmental Policy Acceptability Survey, 2024, unpublished.*

[122] *STEM & Institut 2050. Česká (ne)transformace 2022. Available online: https://institut2050.cz/wp-content/uploads/2022/09/CZtransformace220920.pdf.*

[123] *Results of the SEEPIA Environmental Policy Acceptability Survey, 2024, unpublished.*



Planetary boundaries

Key messages

- Our society and economy depend on a healthy planet. The world has crossed 6 of the 9 planetary boundaries defining safe space for humanity.
- Objectives of 8th EU Environment Action Programme requires EU citizens to live in a welfare-based economy by 2050 that is also within the safe space of our planet's limits.
- Through its supply chains, the Czech Republic is putting pressure on the environment worldwide. Shifting to less environmentally damaging products and services and curbing rising consumption levels are essential to reduce our consumption footprint and impacts to a sustainable level.

Planetary boundaries

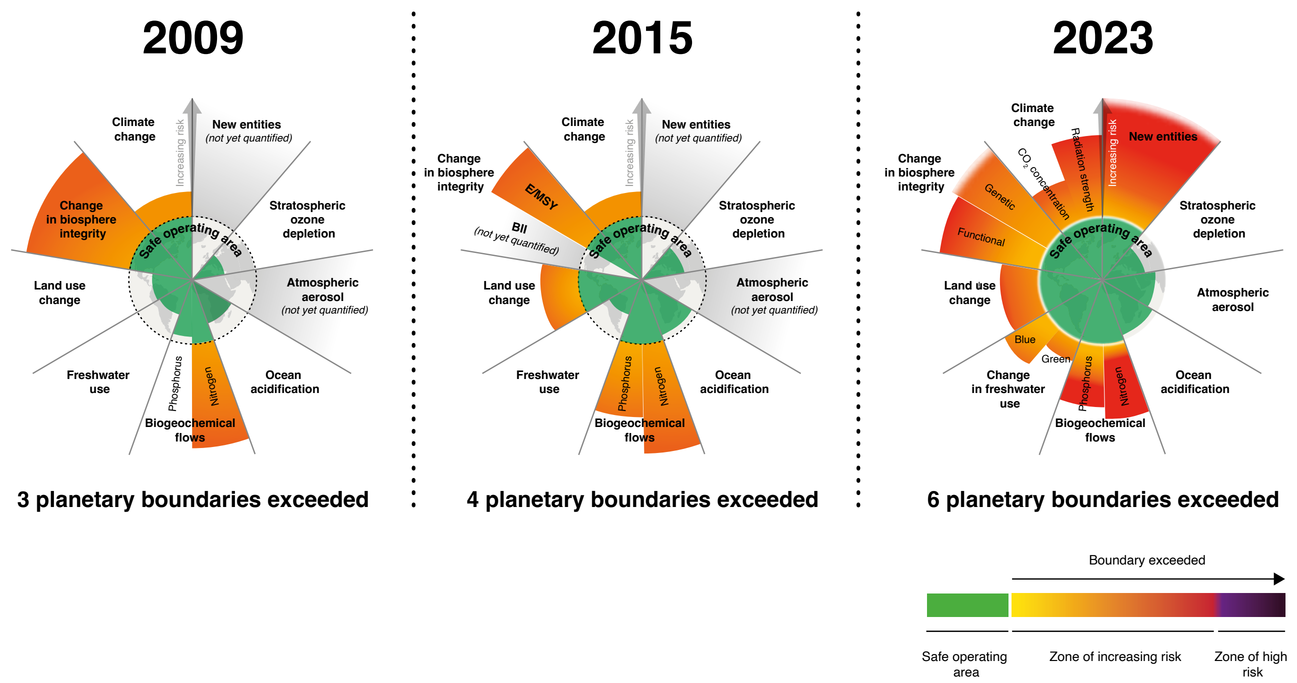
The concept of planetary boundaries

The concept of planetary boundaries[124] aims to define a **"safe operating space for humanity"** based on the development of nine complex, interconnected phenomena: climate change, rate of biodiversity loss, biogeochemical fluxes (phosphorus and nitrogen cycles), land-system change, freshwater use, ocean acidification, stratospheric ozone depletion, atmospheric aerosol loading and the introduction of new entities into the biosphere (Fig. 15).

Currently, it is estimated that humanity has already crossed 6 of the 9 planetary boundaries, namely biosphere integrity change; climate change; land use change and biogeochemical fluxes, in addition to new entities whose boundaries have been newly quantified, and freshwater use change. In addition, for all planetary boundaries already identified as being crossed in the past (change in biosphere integrity; climate change; land use change and biogeochemical fluxes), the level of exceedance has increased. Ocean acidification is also approaching its planetary limit. On the other hand, stratospheric ozone has improved, with its decline halted and the ozone layer recovering. It is the result of actions taken under the ratified Montreal Protocol of 1987.

Figure 15

Visualisation of the planetary boundary concept



Data source: adapted from Steffen, W. et al., 2015; Richardson, K. et al., 2023

[124] *Richardson, K. et al., 2023: Earth beyond six of nine planetary boundaries. Science Advances, Vol. 9, Issue 37, doi: 10.1126/sciadv.adh2458.*

Living well, within the limits of our planet

The Planetary Boundaries Framework has been profoundly affecting the international debate on global sustainability since it was first proposed, and considerable efforts have been made to translate it at the national level in order to enhance its **policy** relevance. The EU's 8th Environmental Action Programme (8th EAP) has enhanced the planetary boundaries perspective and its goals require that by 2050 EU citizens live in a welfare-based economy that is also within the safe space limits of our planet. To achieve this, the EU must accelerate its transition to a regenerative growth model "to give back to the planet more than it takes", as set out in the EU's 2020 Circular Economy Action Plan.

Translating global limits into national policy objectives requires addressing the biophysical, socio-economic and ethical dimensions of each process and involves a series of decisions to quantify them. As **EU countries** are heavily dependent on resources such as water, land use, biomass or other materials extracted or used outside their territory to meet their relatively high consumption levels, their impact can be assessed using **aggregated consumption footprint indicators**. The consumption footprint reflects the environmental and climate impacts of the consumption of goods and services by EU citizens, regardless of where these goods and services are produced. The consumption footprint can be reduced by reducing the total amount of goods and services consumed or by consuming goods with a lower environmental impact.

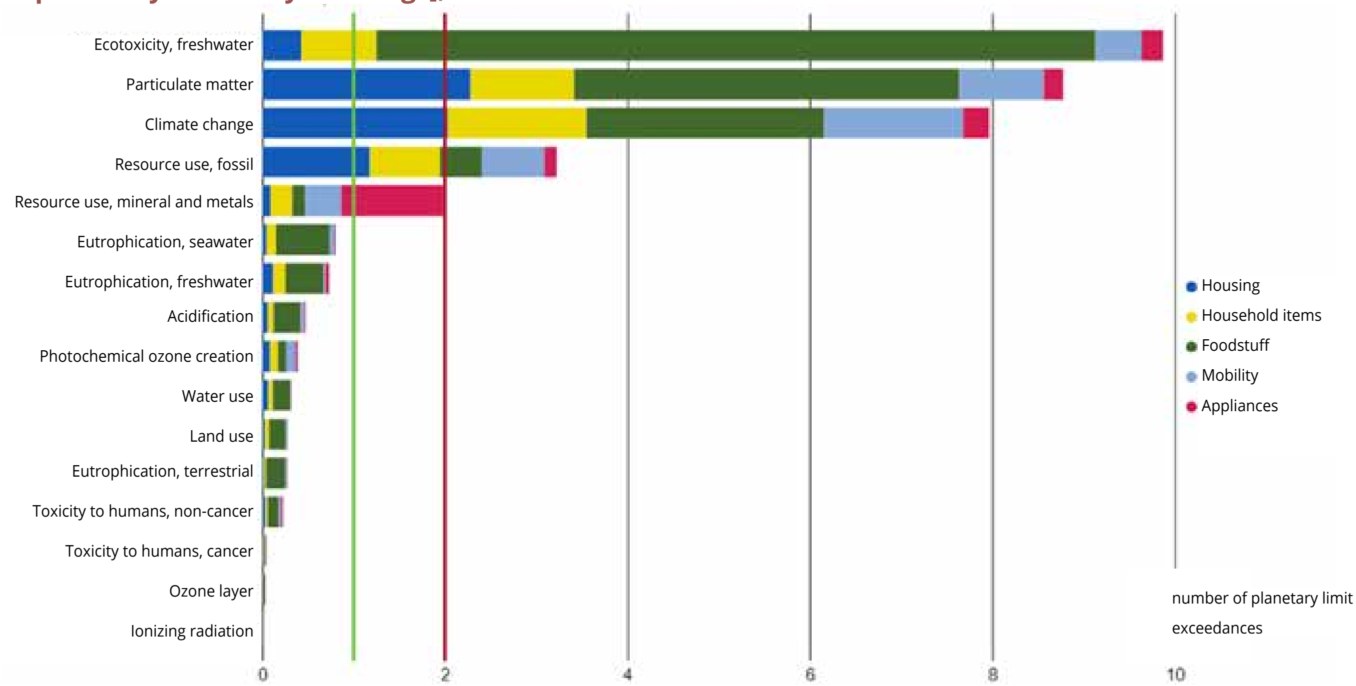
Overall, the environmental impacts of EU consumption are considered high, with the **per capita consumption footprint** in the **Czech Republic** being average across the EU-27[125]. Over the period 2010–2022[126] it increased by almost 13% in the Czech Republic. The biggest environmental impacts are caused by our consumption of food (42.5%), housing (19.9%), household goods (16.1%) and mobility (14.0%). In terms of planetary boundaries, our consumption has the most global impacts on freshwater resources, particulate emissions and climate change (Chart 66).

125 *European Commission, 2023: Consumption Footprint Platform – EPLCA', European Commission. Available online: https://eplca.jrc.ec.europa.eu/ConsumptionFootprintPlatform.html.*

126 *As to the closing date of this publication, data for 2023 were not available.*

Chart 66

Assessment of planetary boundary crossings using the Czech consumption footprint indicator [number of planetary boundary crossings], 2022



The footprint indicator assesses environmental impacts across 16 different categories, including climate change and resource depletion, which can be aggregated into a single index score based on a standardisation and weighting system. These categories are assigned to the nine ecological processes identified within the planetary boundaries for assessing planetary boundary crossings. As to the closing date of this publication, data for 2023 were not available.

Data source: European Platform on Life Cycle Assessment (EPLCA)

Detailed visualisations and data

https://www.envirometr.cz/data

Methodology for assessing status, trends and achieving the objectives

Each chapter at the level of the NEP strategic objectives includes an assessment of the status and trend of the relevant indicators of the Report on the Environment of the Czech Republic. The trend assessment methodology is based on statistical analysis using the linear regression method.

Time horizon of the trend

Trend	Time period
Short-term	last 5 years
Long-term	last 15 years and more[127]

The evaluation is carried out on three levels:

1) Trend at the level of individual variables

The evaluation of the trend of individual variables of the indicator (e.g. NO_X emissions) is based on the parameters of the linear regression (linear regression equation $Y = ax + c$, $R^2 = \{0,1\}$).

The time series is converted to an index (percentage) series, where the evaluated start of the trend is 100 (e.g. the long-term trend of NO_X emissions in 1990 = 100). The values of *a* and R^2 are calculated for each variable.

The *a value* is a linear trend that expresses the way in which the quantity has decreased or increased since the start of the measurement. It is a dimensionless number comparable across all other variables as it is independent of absolute values (the index series removes the effect of units and the eigenvalues of the numbers), and describes the trend curve based on the parameters of the linear regression. The *a value* indicates the % change per year.

R^2 is the reliability value (determination, $R^2 = \{0,1\}$). R^2 expresses the extent to which the regression line represents the actual data.

[127] *A minimum of 15 years is required for a time series with a long-term trend, but no earlier than 1990.*

The resulting values are converted in a verbal evaluation table and used in the text of the individual variable evaluation, i.e. the calculation results in a numerical value used as a basis for the verbal evaluation in the text.

The index a value (linear trend)	Verbal evaluation in text
0 to +/− 0.5% per year	stagnant trend
+/− 0.5 to +/− 1% per year	slightly increasing/decreasing trend, gradual trend
+/− 1 to +/− 3% per year	increasing/decreasing trend
+/− 3 to +/− 10% per year	significantly increasing/decreasing trend
more than +/−10% per year	very significantly increasing/decreasing trend

2) Trend Indicators

The trend of different indicators is assessed by determining the trend of the individual variables from which the indicator is constructed. The aggregate trend is assessed by aggregating the indicator scores composed of time series of individual variables. For individual indicators, the variables entering into the aggregate trend assessment, the chosen aggregation method, or other parameters for trend assessment are listed in specific indicator sheets available on the portal https://www.envirometr.cz, which are based on the CENIA methodology used and tested in the Environmental Reports 2020–2022. A fluctuating trend is established for an aggregate trend when a majority of the number of individual variables has a coefficient of determination less than 0.5. A trend cannot be evaluated if there is no time series over a given time period.

Graphical representation of the trend					
↗	Positive upward trend	→	Stagnation	↗	Negative upward trend
↘	Positive downward trend	~	Variable trend	↘	Negative downward trend
N/A	The trend cannot be determined or is not worth assessing				

3) Status assessment

The status of the indicators is assessed according to the criteria listed in the indicator sheets available on the Envirometr portal. Since 2020, the criteria have been based on the achievement of the NEP 2030 targets, values set by experts or on the development of the indicator in the short-term trend.

Graphical depiction of the indicator status assessment							
✓	Good	~	Neutral	✗	Bad	N/A	Unable to assess

Evaluation of progress towards achieving the targets

The achievement of the targets is assessed based on linear trend analysis and the method used by the EEA in the SOER 2025 Gap to Target.

Progress towards the target is evaluated according to whether the linear trend identified from past data is on track to meet the target in the future, or whether additional measures are needed to change the trend dynamics (e.g. accelerate the decline in emissions). The proportion between the ideal trajectory towards achievement of the target (from the baseline to the target year) and the calculated linear trend (both calculated as the change in the quantity per year) indicates the deviation from achievement of the target (Transition Gap). This is a dimensionless number, where values of 1 and below indicate achievement of the target while continuing the current trend, and values above 1 indicate how many times the current linear trend would need to accelerate in the years remaining to the target year in order to achieve the target. If the trend is reversed and moves away from meeting the target, the number is negative.

This method is only a trend analysis, not a policy analysis; it is not about setting indicator scenarios according to variant measures. The calculation indicates the efficiency gap between the existing measures in order to meet the target. Non-linearities in the future development of the indicator due to the application of new measures may ensure that the target is met despite the unfavourable current trend assessment.

Progress towards the target is assessed as follows:

(green)	**Trend acceleration by less than 1.2 times**
(orange)	**Trend acceleration by 1.21–3.0 times, R^2<0.5**
(red)	**Trend acceleration by more than 3.01 times, or the opposite trend**

If the calculation of target attainment cannot be determined due to a short time series or a low R^2 value of the time series or a major change in data methodology, the trend is graphed as N/A.

Graphical depiction of target achievement		
✓ Is on track to meet the target	~ Meeting the target is uncertain	✗ Meeting the target is unlikely

To assess progress towards the targets in Chapter 2.1 (Transition to Climate Neutrality), the Report uses the results of modelling prepared by the SEEPIA project[128] for the update of the Czech National Energy and Climate Plan. The scenarios are developed for the variant with Existing Measures (WEM) and with Additional Measures (WAM).

[128] *see https://seepia.cz/*

List of abbreviations

AECM agri-environment-climate measure
AFIR Alternative Fuels Infrastructure Regulation
AMPA α-Amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid
AOT40 accumulated ozone exposure over a threshold of 40 ppb
APS agricultural property stock
AWC available water capacity
B[α]P benzo[*α*]pyrene
BAT best available techniques
BEV battery electric vehicle
BOD_5 biochemical oxygen demand over five days
BPEJ farmland classification units
BSM basal soil monitoring
c.p. constant prices
CAP SP Common Agricultural Policy Strategic Plan
CAS Czech Astronomical Society
CAUMD Committee for the Assessment of Urban Mobility Documents
CCT correlated colour temperature
CEI Czech Environmental Inspectorate
CENIA Czech Environmental Information Agency
CGS Czech Geological Survey
CHMI Czech Hydrometeorological Institute
CNG compressed natural gas
COD_{Cr} chemical oxygen demand by potassium dichromate
COD_{Mn} chemical oxygen demand by potassium permanganate
COS Czech Ornithological Society
COSMC Czech Office for Surveying, Mapping and Cadastre
CPCR Climate policy of the Czech Republic
CR Czech Republic
cu.p. current prices
CZ-NACE CZSO Czech Statistical Office
DDT dichloro-diphenyl-trichloroethane
DH district heating
DMC domestic material consumption
DNA deoxyribonucleic acid
EAP EU Environment Action Programme
EEA European Environment Agency
EFP eco-friendly product
EFS eco-friendly service
EGD European Green Deal
EPLCA European Platform on Life Cycle Assessment
EQS-AA Environmental quality standard – annual average
EQS-MPC Environmental quality standard – maximum permissible concentration
ERA Energy Regulatory Authority
ESD „Effort Sharing Decision“ in force until 2020, when replaced by the ESR
ESR “Effort Sharing Regulation” for reducing greenhouse gas emissions outside the EU-ETS, e.g. from transport
ETBE ethyl tert-butyl ether
EU European Union
EU-27 European Union Member States (excluding the United Kingdom)

EU-28 European Union member states (including the United Kingdom)
EU-ETS European Union Emission Trading Scheme
Eurostat Statistical Office of the European Union
EVF environmentally valuable feature
FAL flood activity level
FAME fatty acid methyl ester
FCEV fuel cell electric vehicle
FGMRI Forestry and Game Management Research Institute, public research institution
FMI Forest Management Institute
FMP forest management plans
FRS Fire and Rescue Service
FSB field soil-block
FSC Forest Stewardship Council certification system
FSCS Filing System of Contaminated Sites
GAEC good agricultural and environmental condition of soil
GDP gross domestic product
GS grade separation
HA high annoyance
HCB hexachlorobenzene
HCH hexachlorocyclohexane
HPJ main soil unit
HSD high sleep disturbance
IL immission limit
IPR Integrated Pollution Register
IROP Integrated Regional Operational Programme
IVNJ Information on the Occurrence of a Dangerous Event
IWSS Integrated Warning Service System
KP_m monthly exceedance curve
KRNAP Krkonoše National Park
LA21 Local Agenda 21
LAG local action group
LPG liquified petroleum gas
LPIS Land Parcel Identification System
LSSPA large-scale specially protected area
LULUCF land-use, land-use change and forestry
LV limit value
MEYS Ministry of Education, Youth and Sports
MIT Ministry of Industry and Trade
MoA Ministry of Agriculture
MoE Ministry of the Environment
MoF Ministry of Finance
MoI Ministry of the Interior
MoLSA Ministry of Labour and Social Affairs
MoT Ministry of Transport
NCACR Nature Conservation Agency of the Czech Republic
NCEP National Energy and Climate Plan of the Czech Republic
NEC National Energy Concept
NECP National Climate and Energy Plan
NEP National Environmental Policy
NFI National Forest Inventory
NGS New Green Savings Programme
NICS National Inventory of Contaminated Sites
NIPH National Institute of Public Health

NP ENV National Programme Environment
NP national park
NRL National Reference Laboratory for Municipal Noise
NRP National Recovery Plan
OF organic farming
OP EIC Operational Programme Enterprise and Innovation for Competitiveness
OP ENV Operational Programme Environment
OP T Operational Programme Transport
OP TAC Operational Programme Technologies and Application for Competitiveness
p.p. percentage point
PAH polycyclic aromatic hydrocarbons
PCB polychlorinated biphenyls
PCDDs/PCDFs Polychlorinated dioxins and furans
PEFC Programme for the Endorsement of Forest Certification Schemes
PES primary energy sources
PFAS per- and polyfluorinated chemicals
PG permanent grassland
PHEV plug-in hybrid electric vehicle
PLA protected landscape area
PM suspended particulate matter
POPs persistent organic pollutants
PPP plant protection product
PPS purchasing power standard
PT public transport
PVI warning information
RDP Rural Development Programme
RES renewable energy sources
RISMP Research Institute of Soil Monitoring and Protection, public research institution
ŘSD Road and Motorway Directorate of the Czech Republic
RWM responsible water management
s.p. state enterprise
SDA Car Importers Association
SECAP Sustainable Energy and Climate Action Plan
SEFCR State Environmental Fund of the Czech Republic
SHARES short assessment of renewable energy sources
SNM strategic noise mapping
SPA specially protected area
SPEI Standardized Precipitation Evapotranspiration Index
SRNLF Support for the Restoration of Natural Landscape Functions
SSSPA small-scale specially protected area statistical classification of economic activities
(Nomenclature génerale des Activitiés economiques dans les Communautés Européennes)
SUMF Sustainable Urban Mobility Framework
SUMP Sustainable Urban Mobility Plan
T.G.M. WRI T. G. Masaryk Water Management Research Institute, public research institution
TACR Technology Agency of the Czech Republic
TAI total average increment
TEE total eligible expenditure
TOC total organic carbon
TRC Transport Research Centre, public research institution
TSES Territorial System of Ecological Stability
UJEP Jan Evangelista Purkyně University in Ústí nad Labem
USLE Universal Soil Loss Equation
VIIRS Visible Infrared Imaging Radiometer Suite

VOC volatile organic compound
WAM “with additional measures” scenario
WEI Water Exploitation Index
WEM “with existing measures” scenario
WM waste management
WMIS Waste Management Information System
WMO World Meteorological Organization
WMPCR Waste Management Plan of the Czech Republic
WWTP waste water treatment plant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