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# Report on the Environment of the Czech Republic

cenia

Ministry of the Environment of the Czech Republic

**Drawn up by**
CENIA, Czech Environmental Information Agency

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# Introduction

The Report on the Environment of the Czech Republic (the "Report") is drawn up every year on the basis of Act No. 123/1998 Coll., on the right to information on the environment, as amended, Government Resolution No. 446 of 17 August 1994, and Government Resolution No. 934 of 12 November 2014. It 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 debate.

The Report is a comprehensive document assessing the state of the environment in the Czech Republic from all aspects on the basis of data available for the year under assessment.

CENIA, the Czech Environmental Information Agency, has been responsible for drawing up the Report on the Environment of the Czech Republic since the 2005 Report. In 2018, the Report concept was revised. As a result, a detailed version of the Report is now prepared every two years, and in the intervening period the most important information on the state and development of the environment is published in concise form. The 2019 Report is one of those interim summaries.

The 2019 Report was discussed and approved by the Government on 12 February 2021 and then submitted to both parliamentary chambers for debate. The timetable for the preparation of the 2019 Report was affected by the COVID-19 pandemic, after the spring environmental reporting obligations were postponed by three months. Because of the reporting and processing methodology used, at the time the Report was being drawn up some data sets for 2019 were not available or the data was only provisional. Information on data sets (the reasons for their unavailability and future updates) for which 2019 data was unavailable at the time of publication is provided in the relevant chapters.

The 2019 Report is also published electronically (http://www.cenia.cz, http://www.mzp.cz) together with the Statistical Environmental Yearbook of the Czech Republic 2019 and Reports on the Environment in the Regions of the Czech Republic 2019.

# Key messages of the Report

The quality of the air and surface water in the Czech Republic is gradually improving. The effects of climate change are weighing heavily on the state of the environment and ecosystems, contributing to the decline in biodiversity and the deterioration of forest stands. The year 2019 was the second warmest ever to be recorded in the Czech Republic. Although the total annual precipitation was in the normal range, much of the country experienced soil and hydrological drought as a result of the high temperatures.

The trend of separating economic development from the pressures on the environment continues, and the material and energy intensity of the economy is decreasing. Aside from emissions of suspended $PM_{2.5}$ particulate matter, the Czech Republic is already meeting the emission ceilings set for 2020. From the perspective of climate and air protection, transport remains problematic, as it continues to be almost entirely dependent on fossil-based energy sources. Although limit values for air pollutants are exceeded regionally, in 2019 the proportion of the country's territory and the share of the population affected by above-limit concentrations went down. Air quality in the last two years has benefited from weather (and especially dispersion) conditions. The introduction of modern technologies in manufacturing and the heating technology renewal in households, supported by boiler subsidisation, have also clearly contributed to air quality improvements.

The quality of watercourses is improved thanks to better wastewater treatment from point sources. However, both surface water and groundwater continue to be contaminated by pesticides, which enter the water from intensively farmed agricultural land. The ongoing increase in the share of the population connected to the public water supply and to sewerage systems terminated with a wastewater treatment plants is helping to reduce water pollution from the municipal sphere and contribute to climate change adaptation.

In the structure of land use, the share of agricultural land has long been declining as it gives way to developed land. This not only results in the permanent loss of fertile soil, but also increases surface impermeability, which intensifies water runoff from the land. Climate change effects and shrinking natural habitats are causing a decline in bird populations, which are a key indicator of agricultural and forest land biodiversity. The worsening bark beetle outbreak and drought have made the condition of forest stands unsatisfactory. This is one of this year's Report's main negative findings impacting human society and ecosystems. The volume of registered spruce wood infested with bark beetles almost doubled in the last year and the volume of registered logging in 2019 again broke the previous record from 2018.

There has been a long-term uptrend in waste generation in response to economic growth and the associated rise in industrial production and construction. A positive finding for the transition to a circular economy is that waste treatment is very much dominated by material recovery, and that this share is continuing to increase at the expense of landfilling. Nevertheless, almost half of municipal waste is still landfilled.

One factor in the successful implementation of environmental protection measures has been the amount of spending directed into this area. Public expenditure on environmental protection from central sources, i.e. mainly from the state budget and state funds, is increasing. The take-up of European funding under operational programmes, especially the Operational Programme Environment, continues. Environmental protection investments relative to GDP have long been above average internationally.

# Main findings of the Report

## Climate system

- The mean annual temperature in the Czech Republic was exceptionally above normal in 2019. The average annual temperature of 9.5 °C was 1.6 °C higher than the 1981–2010 long-term average. Precipitation was normal in 2019, with rainfall equal to 92% of the 1981–2010 long-term annual average precipitation. Total annual precipitation higher than the long-term average was recorded in Moravia and Silesia rather than in Bohemia.

- Temperature and precipitation trends resulted in the continuation of the drought recorded in previous years. In the driest areas of the Czech Republic, on balance evaporation was more than 300 mm higher than precipitation in the growing season (April to September).

- Hydrological drought, expressed by a flow rate of less than $Q_{355}$, was recorded for more than 100 days at more than 30 profiles (of the 217 monitored).

- The yield of springs was at its lowest in October (when the yield was found to be deeply to extremely below normal at 65% of springs). Groundwater levels in shallow wells were at their lowest in April (75% were deeply or extremely below their normal levels).

- Greenhouse gas emissions decreased by 35.6% in the 1990–2018[1] period and by 1.3% year-on-year. The Czech Republic contributes to the fulfilment of the common European target stemming from the EU climate and energy package for emissions under the EU-ETS. The Czech Republic is also meeting its target for non-EU-ETS emissions. On the other hand, the reduction target under the Climate Protection Policy has not yet been met in the Czech Republic.

## Air quality

- Year-on-year emissions of all basic pollutants decreased in 2019[2], with $SO_2$ emissions falling the most (by 17.2%). In line with commitments under Directive (EU) 2016/2284, in 2018 the reductions achieved in $NO_x$, VOC, $SO_2$ and $NH_3$ emissions[3] were those required for 2020. $PM_{2.5}$ emissions in 2018 were 11% higher than the target set for 2020.

- While some air pollution limits continue to be exceeded, there was a year-on-year fall in the percentage of the population and the percentage of areas where the daily limit value for suspended $PM_{10}$ particulate matter and the annual limit values for benzo(a)pyrene and $PM_{2.5}$ were exceeded. The limit for the annual average concentration of $PM_{10}$ was not exceeded at all.

- In 2019, the human health protection limit values set for arsenic, cadmium, lead, nickel, sulphur dioxide, carbon monoxide and benzene were not exceeded.

## Water management and water quality

- Between 2000 and 2019, the best reductions in the Czech Republic's watercourses were recorded for contamination with ammonia nitrogen (a 66.7% decrease in the average concentration) and phosphorus (a 38.9% fall).

- The public water mains supplied water to 94.6% of the Czech population.

- The number of WWTPs with a tertiary treatment stage has increased significantly to stand at 1,538, i.e. 1,038 more such WWTPs than in 2002.

*[1] Data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in April 2021.*

*[2] The data for the year 2019 are only provisional.*

*[3] Final data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

## Nature and landscape

- The total area of agricultural land has long been shrinking. It decreased by 1.8% between 2000 and 2019. The proportion of agricultural land given over to permanent grassland, however, has increased by 5.9%. There has been a 1.8% increase in developed land since 2000, with other types of areas growing by 4.4%.

- Bird populations in the Czech Republic have been steadily declining since 1982. While the populations of common bird species hovered around the same levels between 1982 and 2019 and reported little change, the populations of woodland birds fell by 13.4% and the populations of farmland birds by as much as 42.3%.

## Forests

- Forest health has deteriorated in recent years, mainly because trees have been damaged by drought and insect pests. The volume of registered logging this year came to 32.6 mil. $m^3$ (excluding bark), breaking the previous record from 2018. Salvage logging accounted for 95.0% of total logging.

- More deciduous trees (14.7 thous. ha) than conifers (14.0 thous. ha) were planted in the forests for the first time ever in 2019. However, spruce remained the most frequently planted tree species (8.7 thous. ha).

- In the last year, the FSC-certified area doubled. FSC certification places higher demands than PEFC certification on sustainable management. At the end of 2019, 4.0% of forest land in the Czech Republic was FSC-certified.

## Soil and agriculture

- Mineral fertiliser consumption decreased by 4.9% year-on-year to 116.8 kg of pure nutrients per hectare. This interrupted the long-term growth trend.

- Rodenticide consumption increased year-on-year in response to the overpopulation of the common vole.

- Compared to 2018, the total consumption of lime materials increased by 18.2% to 402.0 thous. t, the highest level since 2000.

## Industry and energy

- Total gross electricity production in 2019 decreased by 1.1% year-on-year to 87.0 TWh.

- As in previous years, the country was a net exporter of electricity. The balance of electricity exports and imports in 2019 was 13.1 TWh, corresponding to 15.1% of the total amount of electricity produced.

- Electricity production from renewable sources was at its highest ever level. In 2019, 10.1 TWh was produced from RES. After five years of relative stagnation, this translated into a more distinctive 6.9% year-on-year increase. The share of electricity produced from renewable sources in total electricity production was 11.6% in 2019.

- Between 2010 and 2019, the remediation of 590 contaminated sites was completed when the conditions imposed by remedial actions were met. In 2019, the remediation of 221 sites was completed.

## Transport

- Passenger transport performance increased by 31.1% between 2000 and 2019 and by 2.3% year-on-year. The share of public transport in passenger transport performance has stalled (at 33.0% in 2019), but is above average for Europe. Of the types of public transport service provided, environmentally friendly rail transport in particular is growing.

- In freight transport performance, road transport accounts for about two thirds. This has a major impact on air quality and the noise pollution faced by inhabitants.

- Energy consumption in transport rose by 75.6% between 2000 and 2019 and by 1.4% year-on-year. The share of RES in transport-related energy consumption was 6.5% in 2018.[4] This means that the target of using RES for 10% of energy needs in transport by 2020 was not met.

- Emissions of the pollutants $NO_x$, VOC, CO and PM from transport are declining. However, with fuel consumption in transport rising, there has been an upward trend in PAH and $CO_2$ emissions.

## Material flows

- Post-2000 domestic material consumption (DMC) in the Czech Republic has fluctuated with no distinct trend. In 2019, DMC increased by a modest 0.4% year-on-year. The share of fossil fuels in the DMC structure is declining. Fossil fuel consumption has an adverse effect on the environment and climate.

- The Czech economy's material intensity has long been in decline. Between 2000 and 2019, it decreased by 44.2%. The downtrend in material intensity is driving a reduction in the environmental burden caused by the consumption of materials per unit of GDP generated.

## Waste

- Total waste generation has increased since 2009,[5] especially in connection with expanding construction, to 37,362.3 thous. t in 2019.

- Waste treatment is very much dominated by material recovery (84.8% in 2019). This share is increasing at the expense of landfilling (9.7% in 2019).

- The rate of landfilling of municipal waste remains high (45.9% in 2019), even though this is declining in favour of material recovery (41.0% in 2019) and energy recovery (11.7% in 2019).

- The rate of recycled packaging waste is growing and targets for packaging waste are being met.

- For the most part, the strategic targets for selected products are being met on an ongoing basis, and their take-back is increasing.

## Financing

- While public expenditure on environmental protection from central sources (i.e. mainly from the state budget and state funds) increased 15.8% year-on-year to CZK 52.6 bil. in 2019, expenditure from the local budgets of municipalities and regions rose only slightly to CZK 40.9 bil.

- Under the Operational Programme Environment for the 2014–2020 programming period, 20 new calls worth EUR 674.0 mil. (i.e. CZK 17.2 bil.) in total eligible expenditure were announced in 2019. From the beginning of the programming period to the end of 2019, 6,602 projects worth EUR 3.0 bil. (CZK 77.3 bil.) in total eligible expenditure had been approved. The Operational Programme Environment also covers the funding of "boiler subsidies". In 2019, a third call for individual regions was announced with an allocation worth approximately EUR 147 mil. (CZK 3.8 bil.) in total eligible expenditure. In the previous two calls, 60,000 boilers fired by solid fuel had been replaced at a cost of CZK 6.5 bil.

- The Czech Republic's environmental protection investments relative to GDP have long been above the EU28 average.

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*[4] Data for the year 2019 were not available at the time of publication because of the methodology used to process them.*

*[5] An overall assessment of the trend has been postponed because of changes in the calculation method.*

# Environmental assessment by theme

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| **Climate system** | | | |
| Temperature and precipitation conditions | ☹ | ☹ | 😐 |
| Runoff conditions and groundwater status | ☹ | ☹ | 😐 |
| Greenhouse gas emissions | 😐 | 😐 | 😐 |
| **Air quality** | | | |
| Emissions of basic air pollutants | 🙂 | 🙂 | 🙂 |
| Emissions of heavy metals[6] | 🙂 | 🙂 | 😐 |
| Air quality in terms of human health protection | 😐 | 😐 | 🙂 |
| Air quality in terms of ecosystem and vegetation protection | 😐 | 😐 | 😐 |
| **Water management and water quality** | | | |
| Water abstraction | 🙂 | 🙂 | 🙂 |
| Wastewater discharge | 🙂 | 🙂 | 😐 |
| Wastewater treatment | 🙂 | 🙂 | 🙂 |
| Water quality | 🙂 | 😐 | 😐 |
| **Nature and landscape** | | | |
| Land use | 😐 | 😐 | 😐 |
| Landscape fragmentation | ☹ | ☹ | ☹ |
| Nature protection | 🙂 | 🙂 | 😐 |
| Status of animal and plant species of Community importance in 2000–2006, 2007–2012, 2013–2018[7] | N/A | 😐 | N/A |
| Status of natural habitat types of Community importance in 2000–2006, 2007–2012, 2013–2018 | N/A | 😐 | N/A |
| Indicator of common bird species | ☹ | ☹ | ☹ |
| **Forests** | | | |
| Defoliation of forest stands | ☹ | ☹ | ☹ |
| Logging | ☹ | ☹ | ☹ |
| Species composition and age structure of forests | 🙂 | 🙂 | 🙂 |
| Responsible forest management | 🙂 | ☹ | 🙂 |

*[6] Assessment of the trend up to 2018. Data for the year 2019 were not available at the time of publication.*

*[7] Species and, similarly, habitats of European importance are established by European Community legislation. Specifically, this is Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, according to which evaluation reports are submitted every 6 years. These evaluations started in 2000. Bird species are not included here as they have their own evaluation system under Directive 2009/147/EC of the European Parliament and of the Council.*

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| **Soil and agriculture** | | | |
| Risk of soil erosion and slope instabilities | ☹️ | ☹️ | ☹️ |
| Consumption of fertilisers and plant protection products | ☹️ | 😐 | 🙂 |
| Quality of agricultural land | 😐 | 😐 | 😐 |
| Organic farming | 🙂 | 🙂 | 🙂 |
| **Industry and energy** | | | |
| Extraction of raw materials | 🙂 | 🙂 | 🙂 |
| Industrial production | 🙂 | 🙂 | 😐 |
| Final energy consumption | 😐 | 😐 | 🙂 |
| Energy intensity of the economy | 🙂 | 🙂 | 🙂 |
| Electricity and heat generation | 🙂 | 😐 | 🙂 |
| Renewable energy sources | 🙂 | 🙂 | 🙂 |
| Contaminated sites | 🙂 | 🙂 | 🙂 |
| **Transport** | | | |
| Transport performance and infrastructure | 😐 | 😐 | 😐 |
| Energy and fuel consumption in transport | ☹️ | ☹️ | 😐 |
| Emissions from transport | 😐 | 😐 | 😐 |
| Noise pollution burden of the population[8] | N/A | 🙂 | N/A |
| **Material flows** | | | |
| Domestic material consumption | 😐 | 😐 | 😐 |
| Material intensity of the economy | 🙂 | 🙂 | 😐 |
| **Waste[9]** | | | |
| Total waste generation | ☹️ | ☹️ | 😐 |
| Municipal waste generation and treatment | 😐 | 😐 | 😐 |
| Waste treatment structure | 🙂 | 🙂 | 🙂 |
| Packaging waste generation and recycling | 😐 | 😐 | 😐 |
| Generation and recycling of waste from selected products | 🙂 | 🙂 | 🙂 |
| **Financing** | | | |
| Environmental protection investments and non-investment costs | 🙂 | 🙂 | 🙂 |
| Public expenditure on environmental protection | 🙂 | 🙂 | 🙂 |

[8] *In accordance with the requirements of Directive 2002/49/EC, strategic noise mapping data is acquired at five-year intervals (in "rounds"). The data obtained in the third round of strategic noise mapping are for 2017. They are compared to the second round of mapping (i.e. data for 2012) in order to determine the trend.*

[9] *The long-term trend is assessed as the change since 2009. Overall assessment of the trend has been postponed because of changes in the calculation method.*


1
Climate system

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Temperature and precipitation conditions | | | |
| Runoff conditions and groundwater status | | | |
| Greenhouse gas emissions[10] | | | |

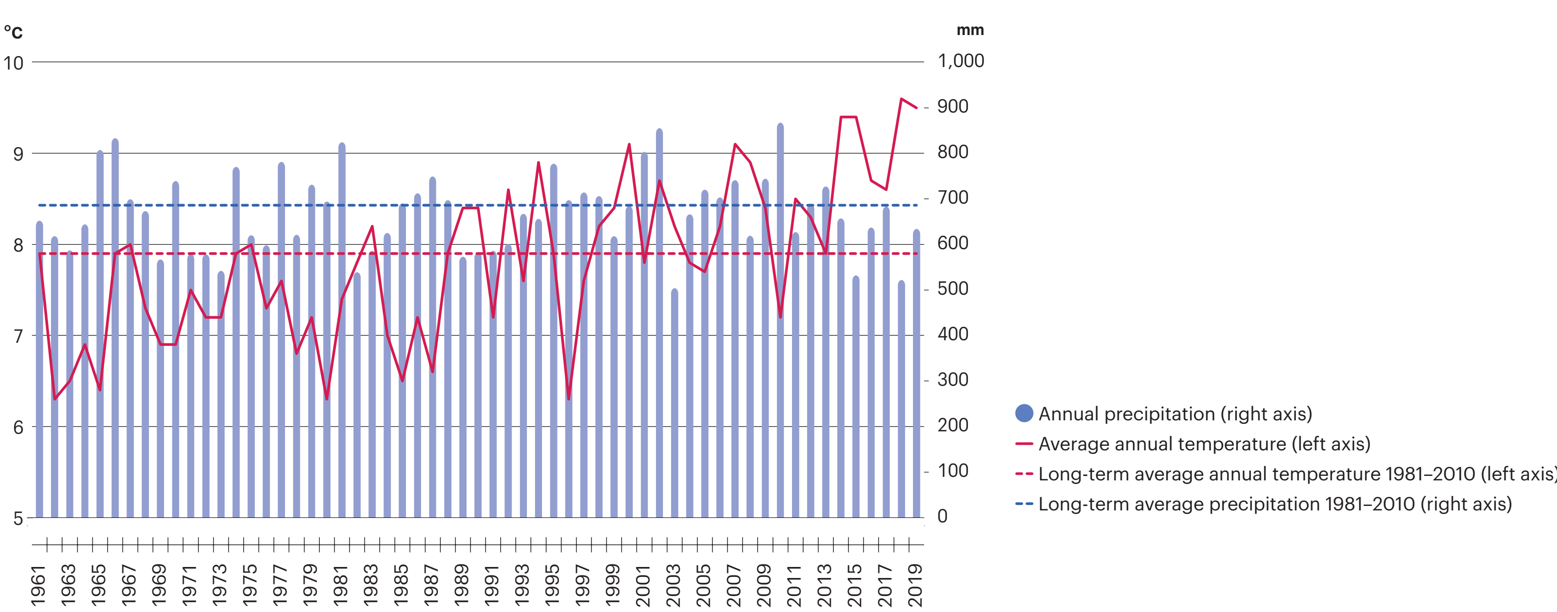
Meteorological conditions, altering in response to climate change, are one of the fundamental natural factors influencing the environment. They affect the dispersion of pollutants in the air and hence their atmospheric concentrations. They have an effect on domestic heating and the associated air pollution, the quantity and quality of surface water and groundwater, and the water balance. They may increase risks to human health due to high temperatures.

In terms of temperature, the year 2019 was exceptionally above normal on the territory of the Czech Republic. The **average annual temperature** of 9.5 °C was 1.6 °C higher than the 1981–2010 long-term average. As a result, 2019 was the second warmest year recorded since 1961. Only 2018 was warmer (Chart 1). The last five years assessed (2015–2019) with an average temperature of 9.2 °C, are the warmest five-year period since 1961. Nine of the ten warmest years since 1961 occurred after 2000. From a global perspective, too, 2019 was the second warmest year in the history of instrumental observation (the warmest year on record was 2016).

The average monthly temperature deviation from the 1981–2010 long-term average was positive for every month in 2019 except May. June 2019 (+4.9 °C) went extremely beyond the normal and was the warmest June ever in the Czech Republic. The **average summer temperature** in 2019 (June, July and August) was 19.5 °C (a deviation from the long-term average of +2.5 °C). This surpassed the previous highest average summer temperature (19.3 °C) recorded in 2003 and 2018. There were 16 **tropical days** with temperatures above 30 °C. This is 190% of the 1981–2010 long-term average. There were 57 (137% of the long-term average) **summer days** with a temperature above 25 °C. The highest numbers of summer and tropical days were recorded in southern Moravia, in the Bohemian Elbeland, and in the Lower Vltava Valley. The Strážnice station registered 40 tropical days.

**Chart 1**

**Long-term trend in the average annual air temperature and annual precipitation in the Czech Republic in 1961–2019 compared to the 1981–2010 long-term average [°C, mm]**




*Data source: Czech Hydrometeorological Institute*

[10] *Because the Report was publicated in January 2021, the assessment relates to 2018. The greenhouse gas emission inventory data prepared under the NIS for reporting according to the UNFCCC are always available 15 months after the end of the given year, i.e. the data for 2019 will be published in April 2021. The reporting schedule is internationally harmonised and is based on processes for data acquisition and processing and for ensuring data quality.*

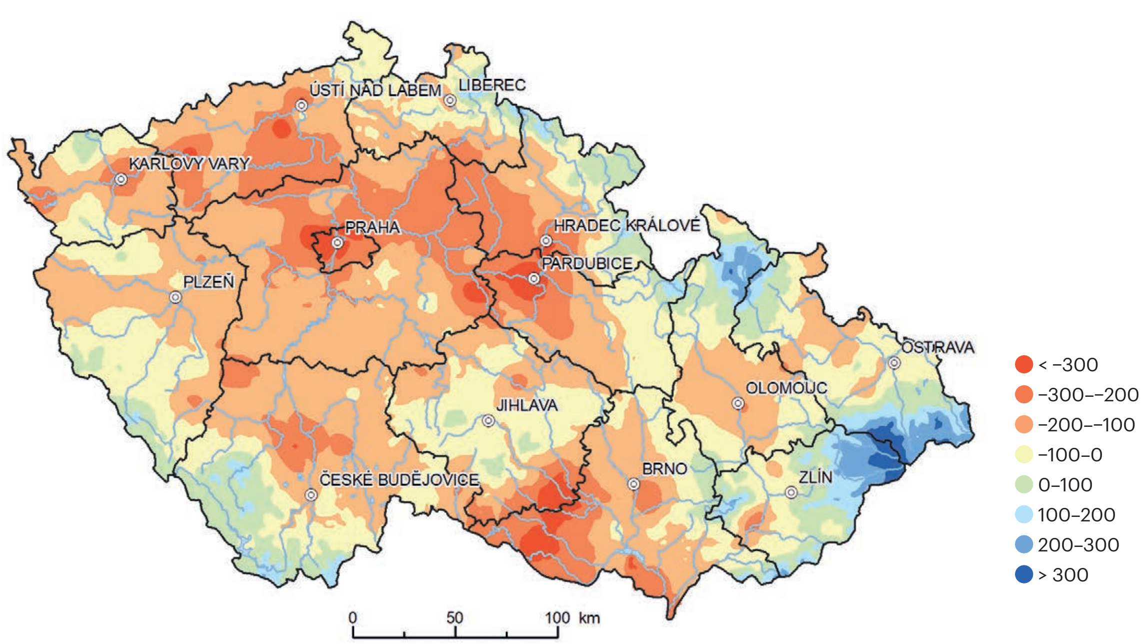
**Precipitation** was normal in 2019. The total annual precipitation of 634 mm was equal to 92% of the 1981–2010 long-term average. Seven months of the year were within the normal precipitation range. Precipitation was below normal in April (60% of the long-term average), June (67%), and July (66%). Precipitation was above normal in January (148% of the long-term average) and May (132%).

The **spatial distribution of the total annual precipitation** was uneven. Precipitation averaged 601 mm in Bohemia (88% of the long-term average) and 701 mm in Moravia and Silesia (102%). Compared to the long-term average, precipitation was lowest in the Liberec Region (80% of the long-term average) and highest in the Zlín Region (106%) and the South Moravian Region (105%).

**Drought** conditions in 2019 reflected the levels of moisture prevailing in recent years, including 2018, which was very bad from a drought perspective. As early as April 2019, the lack of precipitation and the above-average temperatures led to the development of the negative **moisture balance**, i.e. the difference between precipitation and potential evapotranspiration. After a temporary improvement following rainfall in May, the decline in the moisture balance continued. At the end of the summer, the moisture balance was below −150 mm in more than a third of the Czech Republic, mainly in southern Moravia, southern Bohemia, the Bohemian Elbeland, Pardubice, and the Ohře Valley. This negative situation persisted in the affected areas until the end of the year, with the western half of the Czech Republic being affected more. The cumulative total moisture balance in the growing season (April to September) fell below −300 mm in the driest areas (Figure 1). Compared to the long-term average, the largest negative deviation from the long-term moisture balance was recorded in southern, northern and north-eastern Bohemia, and in northern Moravia. At the end of 2019, the water balance deficit was more than 200 mm compared to the long-term average in these most affected areas.

**Figure 1**

**Basic moisture balance between precipitation and the potential evapotranspiration of grassland in the Czech Republic [mm], in the growing season from 1 April to 30 September 2019**

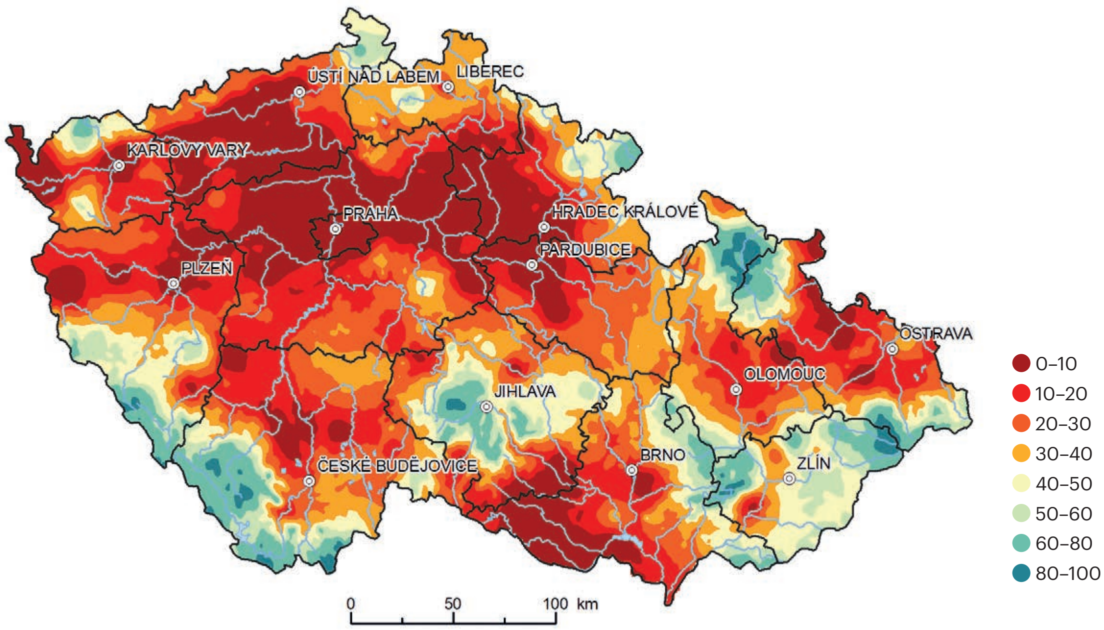



*Data source: Czech Hydrometeorological Institute*

The trend in moisture conditions in 2019 was reflected in the decline in the **soil water reserves**. As early as the spring, there was a steep reduction in soil moisture, especially in the lowland areas of the Czech Republic. After water resources were partially replenished in May, soil moisture continued to decrease. By the end of July the soil moisture over an extensive area (excluding mountain locations) fell below 30% of available water capacity (AWC), signalling severe water stress for flora, and even went below 10% AWC in the driest areas, especially in the Bohemian Elbeland and south Moravia (Figure 2). There was subsequently an improvement in eastern Moravia, but low levels of soil water reserves persisted in south Moravia and then mainly in the Bohemian Elbeland, south Bohemia and the Ohře Valley, where available soil water reserves were still below 20% in most parts of these areas in October. Comparison with the long-term average showed that, in mid-summer 2019, the available soil water reserves in a large part of the Czech Republic were below 25% of the 1961–2010 long-term average, i.e. the situation was significantly below normal.

**Figure 2**

**Available water capacity in soil (AWC = 170 mm.m$^{-1}$) in the Czech Republic, current state of the value modelled as at 28 July 2019 [% AWC]**



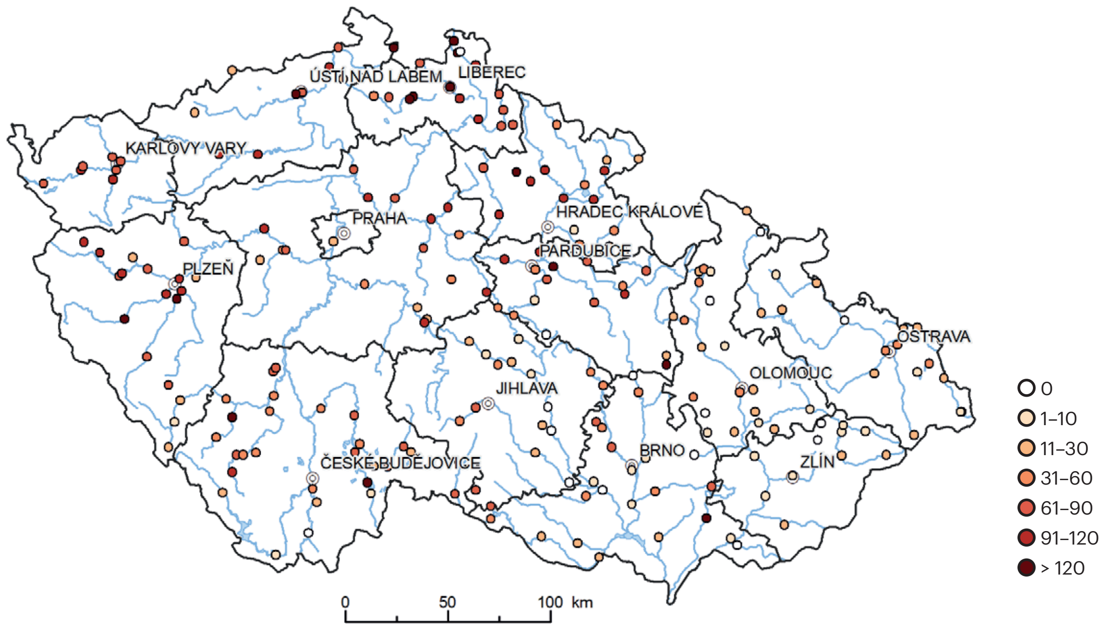

*28 July was chosen because this is when the drought peaked.*

*Data source: Czech Hydrometeorological Institute*

The temperature and precipitation conditions resulted in the continuation of the **hydrological drought** into 2019. The **average annual flow rate** in 2019 failed to reach 100% of the 1981–2010 long-term average in any of the main profiles monitored. The lowest flow rates compared to the long-term average were recorded in the profiles Beroun-Berounka (50% of the long-term average), Nespeky-Sázava and Kostelec nad Labem-Labe (57%), Židlochovice-Svratka (58%), and Ladná-Dyje (60%). **Hydrological drought** was recorded on a number of streams. Hydrological drought occurs when the flow rate falls below **$Q_{355}$**. This is the flow rate which is reached or exceeded 355 days a year on average. It is important for maintaining the basic water management and ecological functions of the watercourse (Figure 3). Hydrological drought lasting for longer than 100 days was recorded at more than 30 profiles (of the 217 monitored). The worst situations were on the Kyjovka, with the hydrological drought in the Kyjov profile lasting for 257 days, and on Bulovský potok, where the $Q_{355}$ deficit in the Předlánce profile lasted for 216 days.

**Figure 3**

**Flow rate lower than the long-term 355-day flow rate for the 1981–2010 period [number of days], 2019**

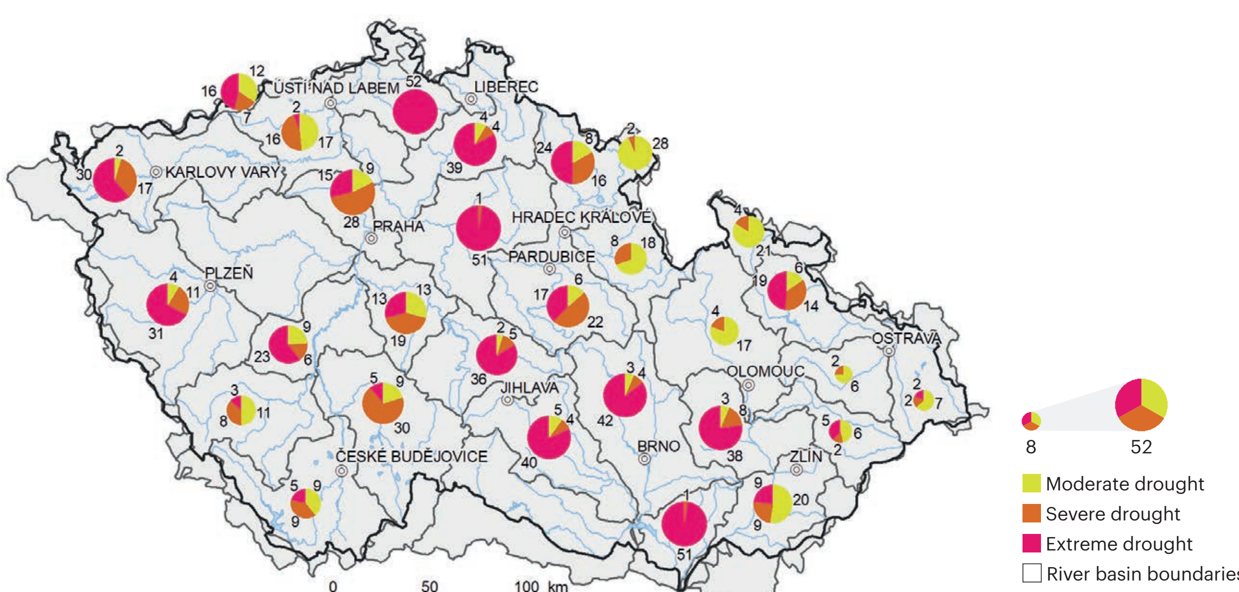



*Data source: Czech Hydrometeorological Institute*

The drought situation was also reflected in the **yield of springs and in the groundwater levels** (Figure 4, Figure 5). The most critical situation was in the Dyje river basin (at the confluence of the Dyje and Morava rivers) and in the Elbe river basin (from the Doubrava to the Jizera), where the drought was manifested at springs and shallow wells to varying degrees throughout the year. Year-round drought was also identified at springs in the Ploučnice river basin (from the Vltava to the Ohře) and at shallow wells in the Jihlava and Lower Ohře river basins.

**Figure 4**

**Duration of drought at springs in the Czech Republic [number of weeks], 2019**

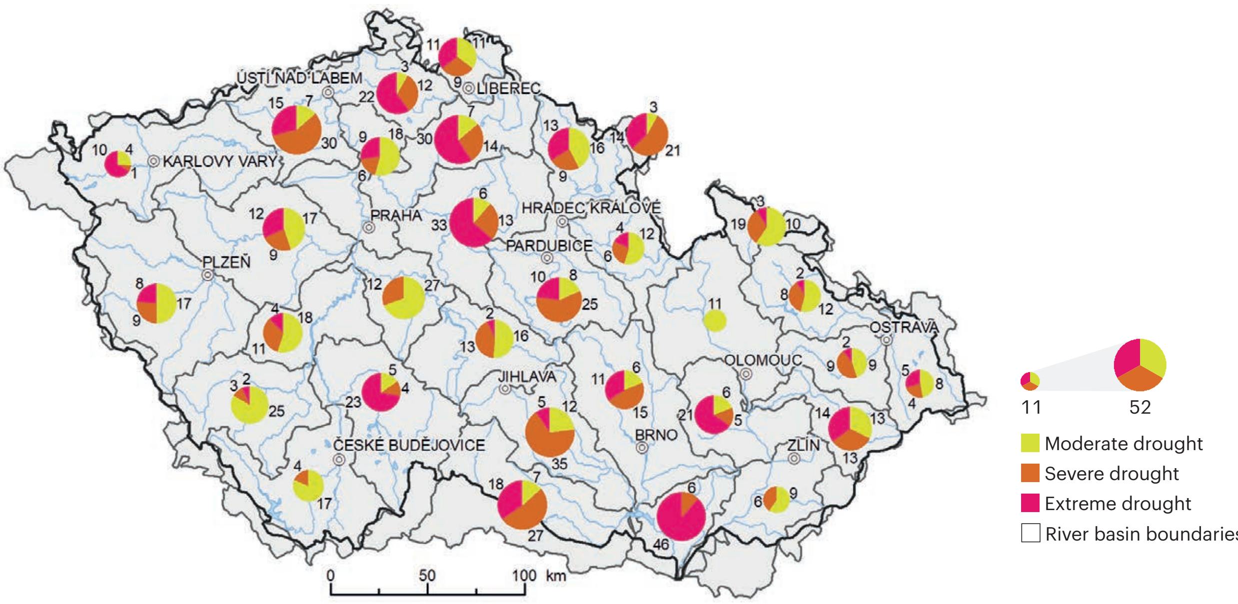



*The data have been aggregated for the river basins and processed on the basis of the current drought index.*

*Data source: Czech Hydrometeorological Institute*

**Figure 5**

**Duration of drought at shallow wells in the Czech Republic [number of weeks], 2019**




*The data have been aggregated for the river basins and processed on the basis of the current drought index.*

*Data source: Czech Hydrometeorological Institute*

With the onset of the growing season, the yield of **springs** in the Czech reporting network began to decrease significantly. At the time of the usual spring peaks (April), the yield was already well below normal, with more than half of the springs in the Czech Republic (57%) reporting a yield at the level of severe to extreme drought. The yield of springs remained low in the following months, reaching its lowest point in October, when 65% of springs were found to have a yield that was severely to extremely below normal. The situation was also below normal at **shallow wells**. Groundwater levels were at their lowest in shallow wells in April (75% had levels severely or extremely below the norm). In the following months (except June), levels severely to extremely below normal were found in 50% to 70% of shallow wells. In line with the usual development of the water table over the course of the year, the level at deep aquifers was worst in August. In this month, the level was severely or extremely below normal at 44% of deep wells. In the other months of the year, levels severely to extremely below normal were found at 35% to 41% of deep wells.

One of the main approaches to reducing the anthropogenic impact on the climate system and **mitigating climate change** is to reduce greenhouse gas emissions. The Czech Republic contributes to global efforts to reduce greenhouse gas emissions as a signatory party to the United Nations Framework Convention on Climate Change (UNFCCC) and, as an EU Member State, in its pursuit of the European Community's objectives.

**Greenhouse gas emissions**[11] in the Czech Republic (excluding LULUCF, but including indirect $CO_2$ emissions) decreased by 35.6% between 1990 and 2018 and by 1.3% year-on-year in 2017/2018 to 128.1 Mt $CO_2$ eq. (Chart 2). However, the reduction target under the Climate Protection Policy in the Czech Republic (a decrease of 32 Mt compared to 2005, i.e. to 117.0 Mt $CO_2$ eq. by 2020) has not yet been met. Greenhouse gas emissions (excluding LULUCF) decreased by 14.0% (by 20.8 Mt $CO_2$ eq.) between 2005 and 2018.

Emissions from **large stationary combustion sources** are decreasing. Emissions from the energy industry, which has long accounted for the largest share of total emissions (40.1% in 2018), fell by a sharp 17.8% between 2010 and 2018. This drop reflects favourable changes in the energy mix towards higher use of RES and other low-emission sources. Emissions from combustion processes in manufacturing and construction are also following a downward trend, falling by 57.5% between 2000 and 2018.

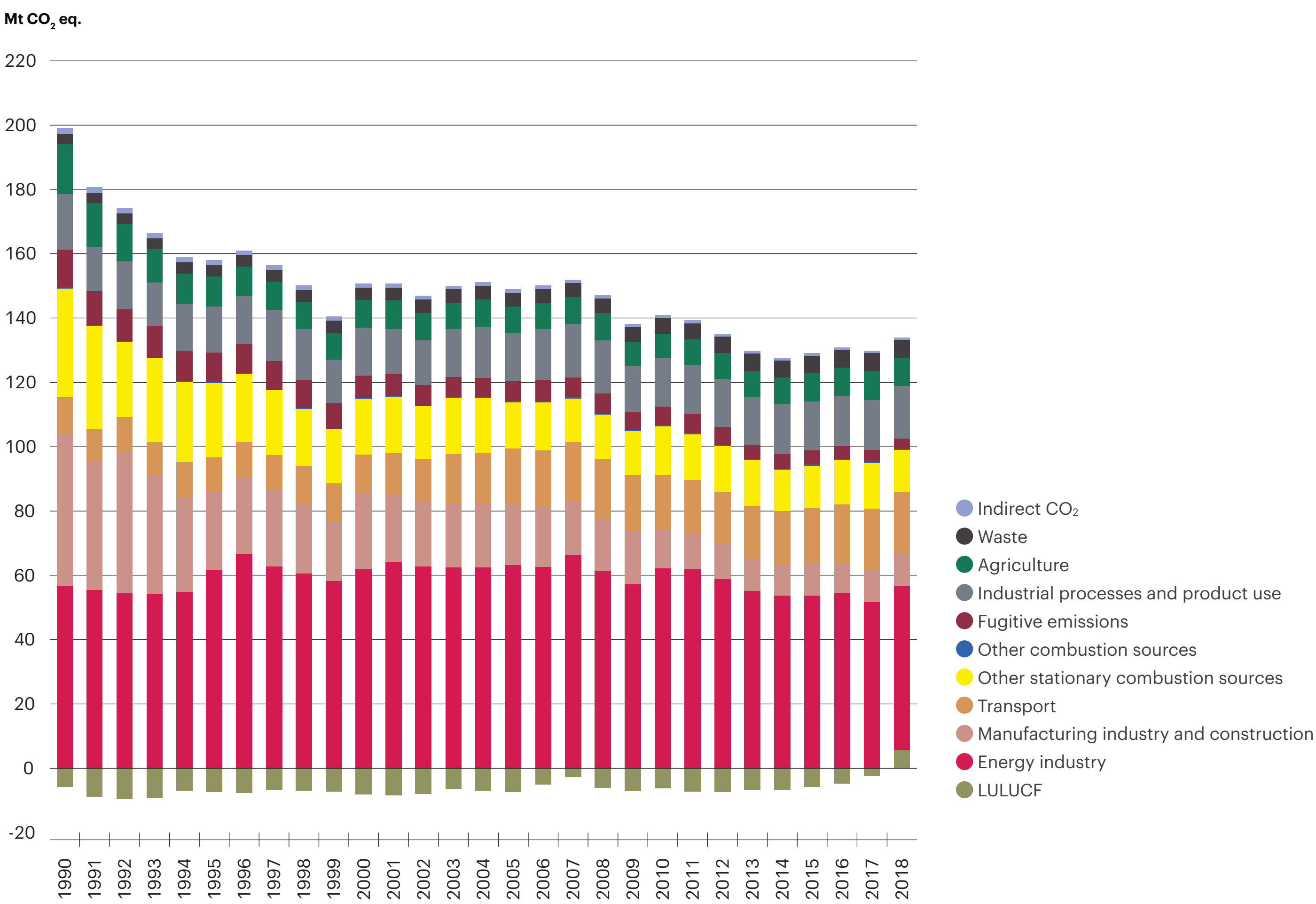
[11] *Data for the year 2019 were not available at the time of publication.*

By contrast, **transport** is experiencing an increase in emissions due to increasing energy consumption in transport and the continuing dependence of transport on petroleum products. Between 2000 and 2018, emissions from transport increased by 57.2%. In 2018, transport was the second largest source of greenhouse gas emissions, with a share of 15.0% of total emissions (excluding LULUCF). Emissions from **waste management** are also growing slowly. They increased by 48.0% between 2000 and 2018. Emissions of **F-gases**, a substitute for the freons that are no longer used, are growing significantly. They increased almost nine-fold between 2000 and 2018. In 2018, they accounted for 3% of aggregate emissions (excluding LULUCF).

Emissions in the **land use, land use change and forestry** sector (LULUCF) are also developing adversely. The balance of emissions and removals in the LULUCF sector was positive in 2018 for the first time since 1990, amounting to 5.8 Mt $CO_2$ eq. The significant year-on-year increase in LULUCF emissions, mainly caused by bark beetle outbreaks and the logging these have necessitated, led to a year-on-year increase in total net greenhouse gas emissions (including LULUCF) by 5.1% in 2018.

**Chart 2**

**Aggregated greenhouse gas emissions in the Czech Republic by sector [Mt $CO_2$ eq.], 1990–2018**




*Data for the year 2019 were not available at the time of publication.*

*Data source: Czech Hydrometeorological Institute*

Verified greenhouse gas emissions from installations falling under the **EU ETS (the European emissions trading scheme)** decreased by 24.2% between 2005 and 2019 to 62.5 Mt $CO_2$ eq. In the 2018/2019 year-on-year comparison, emissions in the EU ETS fell by 6.6% (4.4 Mt $CO_2$ eq.). The objective of the 2012–2020 National Environmental Policy, which is based on the common EU target set under the EU climate and energy package (a 21% reduction in EU ETS emissions by 2020), has already been met. Non-EU ETS emissions fell by 8.0% up to 2018, and the target set for the Czech Republic (maximum growth of 9% by 2020 compared to 2005) was also met.

**Greenhouse gas emissions** per capita in the Czech Republic (12.1 t $CO_2$ eq. per capita) were the fourth highest in the EU in 2018 and 46.3% above the EU28 average. Although the Czech economy's **emission intensity** (i.e. the amount of emissions per unit of GDP generated) decreased by 48.5% between 2000 and 2018, it still exceeded the EU28 average by 61.8% in 2018. The high intensity indicators of greenhouse gas emissions in the Czech Republic can be attributed to the structure of GDP creation, with a high share of industry, an export-led economy, and a persistently high share of solid fossil fuels in the energy mix for electricity and heat generation.

## Detailed data sources

https://issar.cenia.cz

# 2 Air quality

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| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Emissions of basic air pollutants | 🙂 | 🙂 | 🙂 |
| Emissions of heavy metals[12] | 🙂 | 🙂 | 😐 |
| Air quality in terms of human health protection | 😐 | 😐 | 🙂 |
| Air quality in terms of ecosystem and vegetation protection | 😐 | 😐 | 😐 |

Because **air quality** has a major impact on human health, quality of life, ecosystems and vegetation, compliance with air pollution limits for pollutants and long-term reductions in the overall air pollution load need to be ensured. This plan has been successfully implemented in the last two years in particular. Emissions of pollutants are decreasing and air quality in the Czech Republic has been gradually improving over an extended period. Concentrations of air pollutants in the Czech Republic are mainly influenced by local heating of households, transport, and industrial and energy production. They also depend on weather conditions and cross-border transport. In 2019 and 2018, the dispersion conditions were very good compared to the long-term average, and at the same time the temperatures in these years were well above the normal. Improvements in air quality can therefore be attributed both to weather (especially dispersion) conditions, but also to the further introduction of modern technologies in the production and heating technology renewal in households (the effect of boiler subsidies).

The decrease in **pollutant emissions** reflects developments in the national economy, the impact of the introduction of more efficient technological and production processes, reductions in material and energy intensity, and the obligation to meet legislative requirements for emissions from air polluting sources. In order to meet commitments under Directive 2016/2284 of the European Parliament and of the Council on the reduction of national emissions of certain atmospheric pollutants, which spell out emission reductions relative to 2005, it is clear from the latest emissions balance report that $NO_x$, VOC,[13] $SO_2$ and $NH_3$ emissions in 2018[14] reached the reduction required for 2020. $PM_{2.5}$ emissions in 2018[15] were 11% higher than the 2020 target (Chart 3). A similar drop in emissions is evident throughout Europe.

*[12] Because the Report was publicated in January 2021, the assessment relates to 2018. Because of the way they are processed, final data for the year 2019 will not be available until February 2021 at the earliest.*

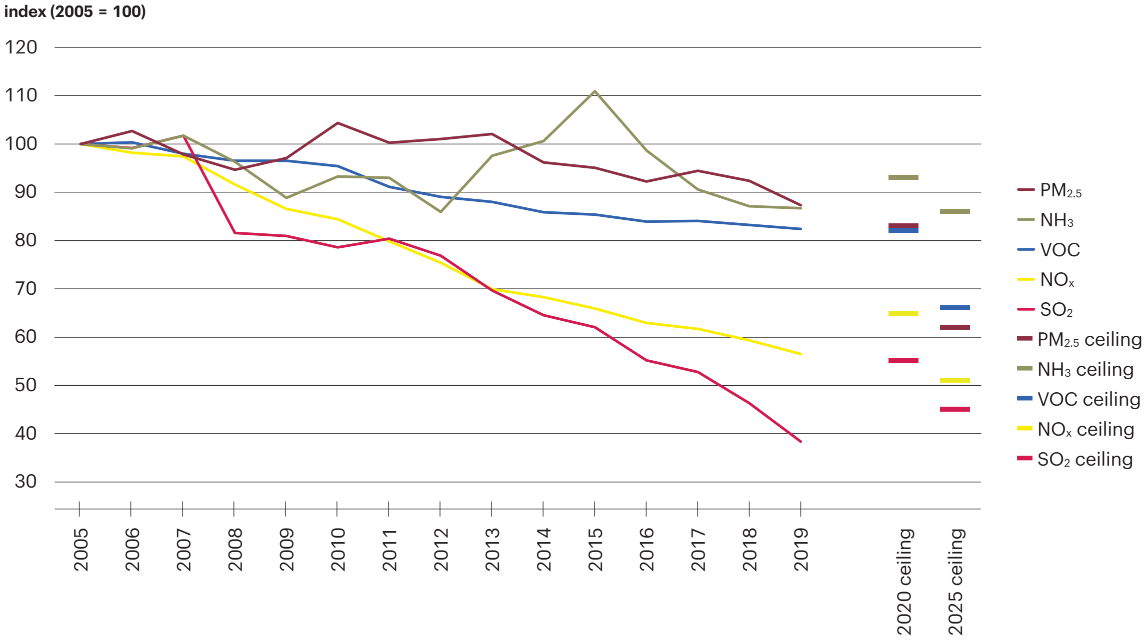
*[13] $NO_x$ and VOC emissions from the agricultural sector are not included in the assessment of compliance with the emission ceiling.*

*[14] Final data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

*[15] Final data for the year 2019 were not available at the time of publication.*

**Chart 3**

**Emissions of selected pollutants in the Czech Republic and national emission ceilings for the years 2020 and 2025 [index, 2005 = 100], 2005–2019[16]**




*Data for the year 2019 are only provisional.*

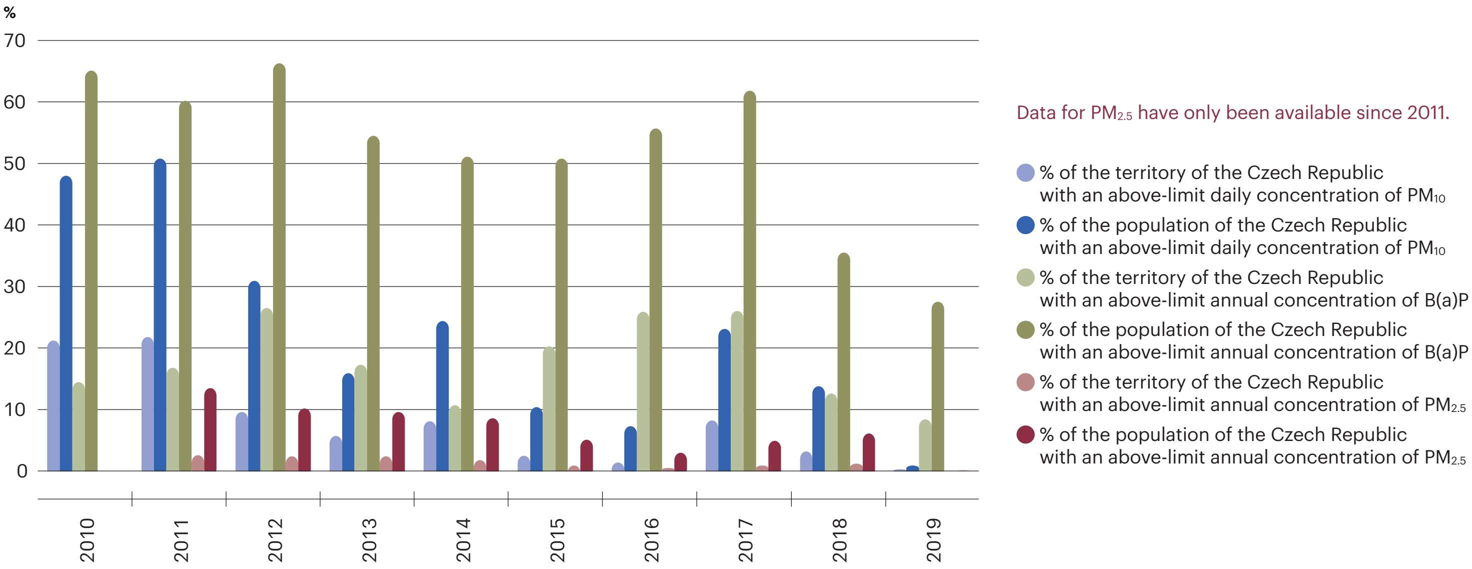
*Data source: Czech Hydrometeorological Institute*

The **limit values for suspended $PM_{10}$ and $PM_{2.5}$ particles** have long been exceeded in the Czech Republic. However, in 2019 the limit for the annual average concentration of $PM_{10}$ in the Czech Republic was not exceeded. Year-on-year fluctuations can mainly be attributed to weather conditions and, in the winter, they are associated with the inverse nature of the weather and temperature, which significantly affects the intensity of household heating. The limit value for the 24-hour average concentration of $PM_{10}$ (Chart 4) was exceeded only on 0.3% of the territory in 2019 (compared to 3.2% of the territory in 2018), with 0.9% of the population of the Czech Republic being exposed to above-limit concentrations in that reporting year (compared to 13.8% of the population in 2018). The highest number of exceedances of the 24-hour average concentration of $PM_{10}$ could be found at stations covering the densely populated area of Ostrava/Karviná/Frýdek-Místek. The limit value for the 24-hour average concentration of $PM_{2.5}$ (Chart 4) was exceeded only on 0.04% of the territory in 2019 (compared to 1.2% of the territory in 2018), with 0.1% of the population of the Czech Republic being exposed to above-limit concentrations in that reporting year (compared to 6.1% of the population in 2018).

[16] *The data for the year 2019 are only provisional. The chart shows the relative values of emissions, where 2005 = 100%.*

**Chart 4**

**Percentage of the Czech Republic's area and population exposed to above-limit average 24-hour concentrations of suspended $PM_{10}$ particles and above-limit annual average concentrations of suspended $PM_{2.5}$ and B(a)P [%], 2010–2019**




*Data source: Czech Hydrometeorological Institute*

Only five **smog situations**, lasting for a total of 385 hours, and two regulations due to high concentrations of suspended $PM_{10}$ particles were declared in 2019. This improvement of the situation compared to the previous year can be attributed mainly to very good dispersion conditions prevailing even in the winter. In 2019, 88% of days had good dispersion conditions (the 2007–2018 average is 77%). Another important factor was the above-average temperature. This meant there fewer heating days and therefore the heating intensity was lower. Suspended particulate matter is a problem not only in the Czech Republic, but also in other European countries. Roughly 15% of the urban population of the EU28 countries was exposed to above-limit 24-hour concentrations of $PM_{10}$ in 2018,[17] and 4% of the urban population was exposed to above-limit annual concentrations of $PM_{2.5}$.

Long-term exposure to suspended particles increases **mortality**, with vulnerable people (the chronically ill and the elderly) always affected most. In 2019, this translated into approximately 4.7 thous. persons nationwide, of whom about 3.1 thous. in a normal urban environment.[18] The year-on-year decrease in the concentration of $PM_{10}$ pushed down mortality by 1.9 thous. persons compared to 2018.

Suspended particles of size fractions $PM_{10}$ and $PM_{2.5}$ are emitted into the air by various **sources** (Chart 5). In 2018,[19] in both cases the dominant source was household heating, accounting for 73.9% of total $PM_{2.5}$ emissions and 58.7% of total $PM_{10}$ emissions. The second most significant source of emissions was transport, especially because of resuspension and tyre and brake wear. Besides the emission of primary suspended particulate matter by these sources, secondary suspended particles are also formed by chemical reaction from precursors ($NO_x$, $SO_2$, $NH_3$, and VOC).

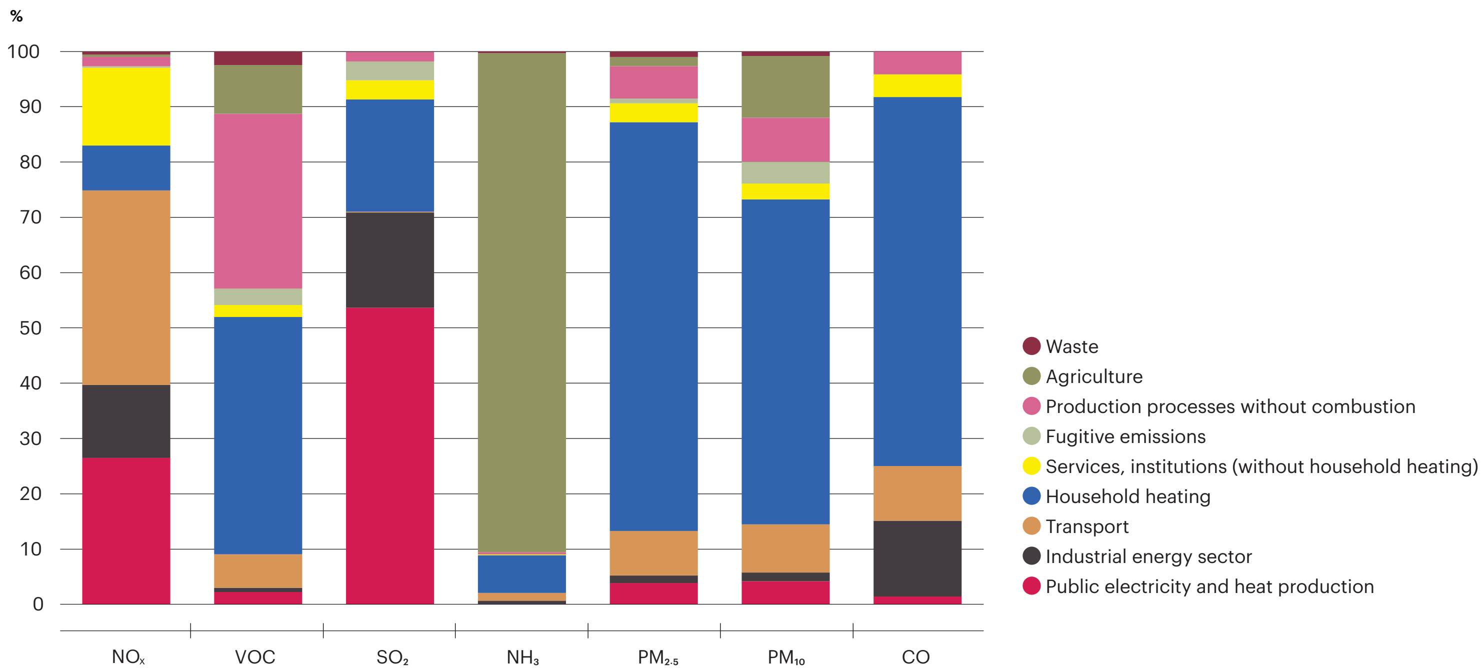
*[17] Data for the year 2019 were not available at the time of publication.*

*[18] According to the methodology used by the National Institute of Public Health, a normal urban environment encompasses data from urban stations, where stations with a very high traffic load (i.e. over 10,000 vehicles per day) and stations significantly affected by industrial production are excluded from the assessment.*

*[19] Data for the year 2019 were not available at the time of publication.*

Chart 5

## Sources of selected emissions of pollutants in the Czech Republic [%], 2018




*Data for the year 2019 were not available at the time of publication.*

*Data source: Czech Hydrometeorological Institute*

**Benzo(a)pyrene** poses a very serious air quality problem in the Czech Republic, as it increases the individual lifetime risk of cancer. While the highest concentrations can be found in industrial localities, above-limit concentrations have also long been present at urban stations. The overwhelmingly predominant source of benzo(a)pyrene emissions is household heating (98.8% in 2018[20]). In 2019, the limit value for benzo(a)pyrene was exceeded on 8.4% of the territory, an area in which 27.5% of the population was living (Chart 4). In 2018, it was exceeded on 12.6% of the territory, accounting for 35.5% of the population. Benzo(a)pyrene concentrations follow a well-established annual pattern, with peaks in the winter (due to the worsening dispersion conditions and pollution caused by local household heating). Other European populations are also exposed to above-limit annual concentrations of benzo(a)pyrene – accounting for 15% of the EU28 urban population in 2018.[21]

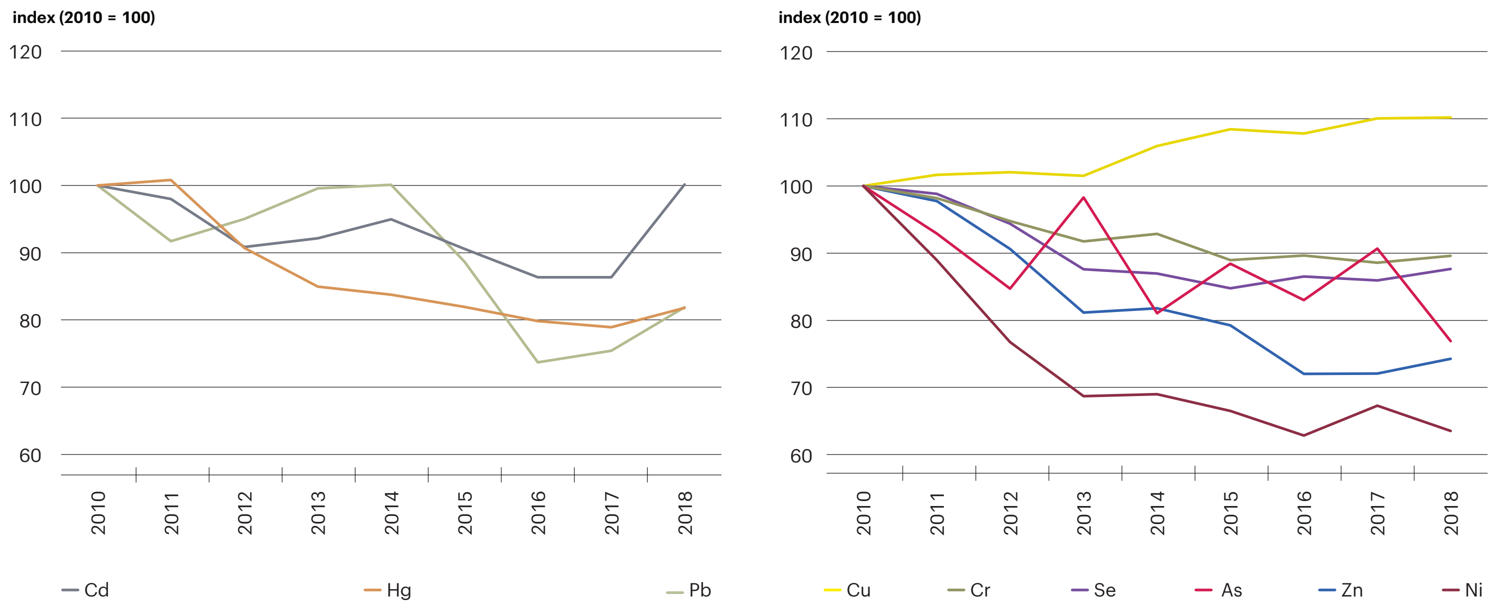
High concentrations of **nitrogen oxides** ($NO_x$) mainly cause respiratory problems, particularly at congested location, where the main source is road transport (Chart 5). $NO_x$ emissions in the Czech Republic have long been declining. They went down by 43.5% between 2005 and 2019, and by 4.8% year-on-year in 2019. In 2019, when the weather and dispersion conditions were favourable, the annual limit value for $NO_2$ was exceeded at just one traffic-heavy location (three locations in 2018). The daily and hourly air pollution limits for **sulphur dioxide** were not exceeded anywhere in 2019. $SO_2$ emissions have long been reporting the most significant decline. They went down by 61.7% between 2005 and 2019, and by 17.2% year-on-year in 2019 (Chart 3).

**Heavy metals** have carcinogenic and mutagenic properties. They accumulate in living organisms and the environment. Air pollution limits for heavy metals were not exceeded in 2019. Heavy metal emissions (Chart 6) have been declining since 2010, despite highly volatility between individual years due to economic developments, the specific characteristics of each heating season, and the variable content of heavy metals in the fuels and raw materials used. The one exception is copper emissions, which are constantly growing as transport intensifies (by 10.1% since 2010). Between 2010 and 2018,[22] emissions of nickel, zinc, lead and mercury decreased the most. In 2018, year-on-year cadmium emissions increased by 16.0% and lead emissions by 8.6%. The main sources of heavy metal emissions in the Czech Republic in 2018 included the public energy and heat production sector (producing 87.6% of the selenium emitted and 42.9% of mercury emissions), tyre and brake wear (74.9% of copper emissions), iron and steel production (58.4% of lead emissions), and local household heating (44.5% of cadmium emissions).

[20, 21, 22] *Data for the year 2019 were not available at the time of publication.*

**Chart 6**

## Heavy metal emissions in the Czech Republic [index, 2010 = 100], 2010–2018




*Data for the year 2019 were not available at the time of publication.*

*Data source: Czech Hydrometeorological Institute*

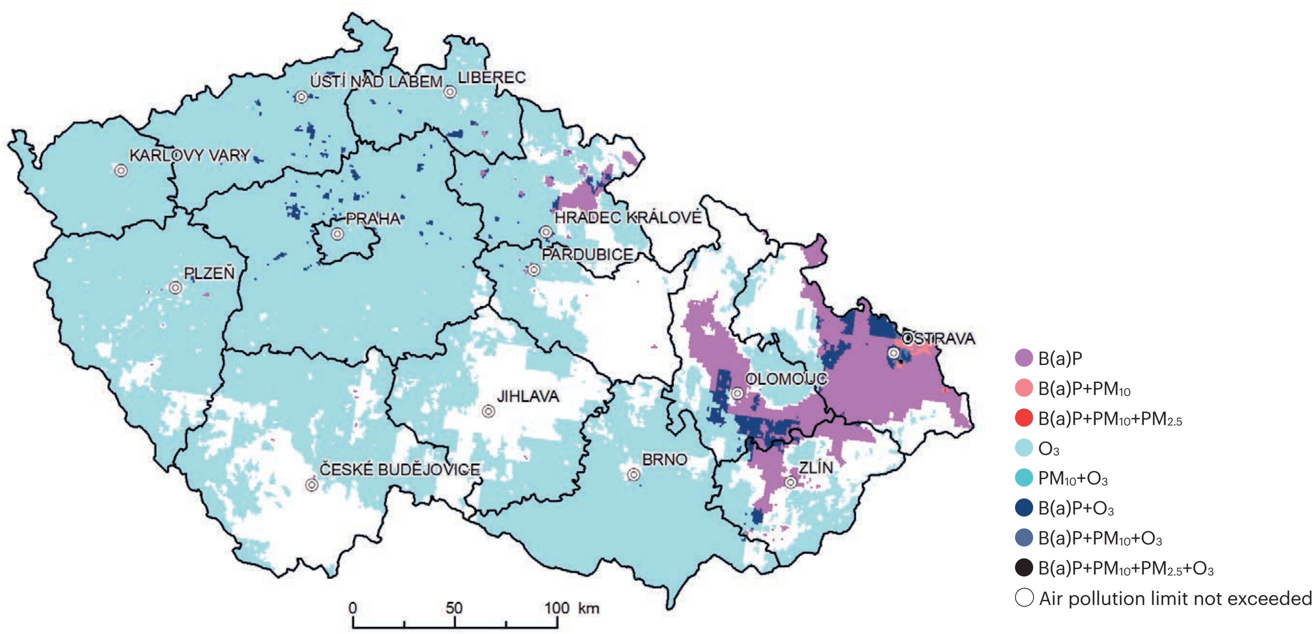
Another substance that significantly affects human health and ecosystems is **ground-level ozone**, which damages the respiratory system in particular. Its concentrations are mainly influenced by meteorological conditions (the intensity and duration of sunshine, temperature and precipitation). The highest concentrations are usually measured in the period from April to September. The years 2018 and 2019 were very favourable for the formation of ground-level ozone due to the high temperatures in the summer months. In 2019, the limit value applicable to ozone in order to protect human health was exceeded on 70.5% of the territory, with 56.9% of the population exposed to above-limit concentrations. In 2019, six smog situations were announced because of ground-level ozone (in June and July), lasting for a total of 90 hours. In 2019 (calculated as the average for the years 2015–2019), the limit value for ozone (AOT40) for the protection of ecosystems and vegetation was exceeded at 64.1% of stations in the Czech Republic.

In 2019, at least one air pollution limit was exceeded (excluding ground-level ozone) on 8.4% of the territory of the Czech Republic.[23] 27.5% of the population was living in that area. After including ground-level ozone, in 2019 the limit value of at least one pollutant was exceeded in 77.1% of the area of the Czech Republic, where 75.6% of the population was living. The concentration of pollutants is exceeded in at numerous sites, with the Moravian-Silesian and Zlín Regions remaining the most polluted areas (Figure 6).

[23] *Act No. 201/2012 on air protection, Annex 1, points 1+2+3: exceedance of the limit value (excluding ground-level ozone) for at least one of the listed pollutants ($SO_2$, CO, $PM_{10}$, $PM_{2.5}$, $NO_2$, benzene, Pb, As, Cd, Ni, benzo(a)pyrene)*

**Figure 6**

**Areas where human health protection limit values for air quality were exceeded in the Czech Republic [%], 2019**




*Data source: Czech Hydrometeorological Institute*

## Detailed data sources

https://issar.cenia.cz

# 3 Water management and water quality

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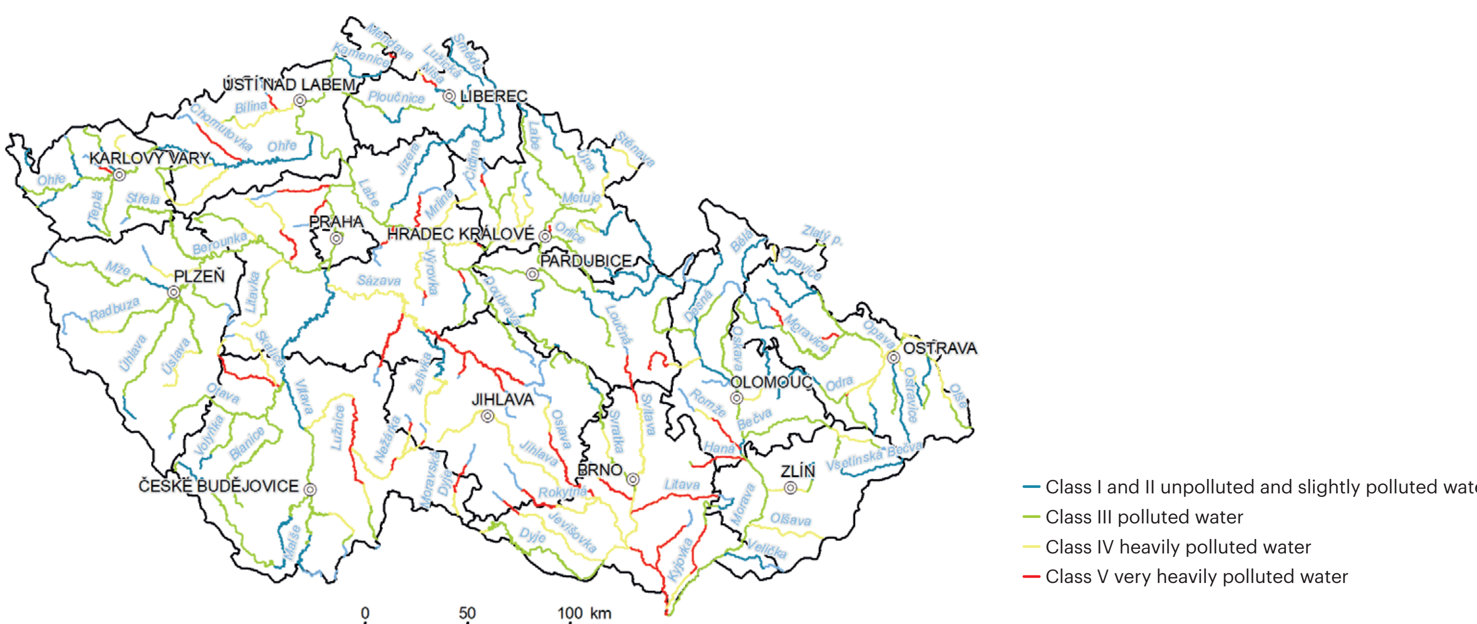
| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Water abstraction | 🙂 | 🙂 | 🙂 |
| Wastewater discharge | 🙂 | 🙂 | 😐 |
| Wastewater treatment | 🙂 | 🙂 | 🙂 |
| Water quality | 🙂 | 😐 | 😐 |

Water is the basis of life on Earth. It is essential for the functioning of ecosystems and for the existence of living organisms. It is also an important input for many economic sectors. In this light, it is important to protect natural sources of surface and groundwater and to monitor their quality.

The **quality of surface water** is evaluated on the basis of $COD_{Cr}$, $BOD_5$, N-$NH_4^+$, N-$NO_3^-$ and $P_{total}$. These indicators are monitored according to the standard ČSN 75 7221. On the basis of the indicators assessed, the quality of surface water is divided into five classes. A comparison of the situation in 2018–2019 (Figure 7) shows an improvement in water quality in most sections of watercourses compared to the 1991–1992 period. Most watercourses belong to Class III, i.e. "polluted water". Gradually, however, increasing numbers of sections of watercourses are being classified under Classes I and II. However, some sections are still of a quality condemning them to Classes IV and V. Although water quality has improved significantly since 1991, eutrophication is a persistent problem in both running and, in particular, stagnant waters. It is caused by an increased amount of nutrients entering the water after being flushed from the soil or as a result of discharges of wastewater.

**Figure 7**

**Water quality in watercourses in the Czech Republic, 2018–2019**




*Data source: T. G. Masaryk Water Research Institute, public research institution*

Water quality in the Czech Republic is monitored at 1,024 representative river profiles; 124 profiles were used for assessment purposes. Between 2000 and 2019, the best reductions in the Czech Republic's watercourses were recorded for contamination with N-$NH_4^+$ (a 66.7% decrease in the average concentration) and $P_{total}$ (a 38.9% decrease). The average concentration of ammoniacal nitrogen in 2019 was 0.167 mg.$l^{-1}$. The decline is mainly attributable to more efficient wastewater treatment and a decline in livestock production. The concentration of total phosphorus in 2019 averaged 0.175 mg.$l^{-1}$. The positive long-term trend can be attributed to the fact that some phosphorus pollution comes from point pollution, which is subject to more thorough treatment.

Problematic substances observed in surface waters include pesticides and their metabolites. These tend to enter surface water from agricultural activities. For 2019, the results from 540 profiles (a total of 5,210 samples) for 263 individual analytes were processed. Pesticides were found in 500 profiles (92.6% of the profiles monitored), in a total of 4,457 samples (85.5% of samples). In 2019, 161 pesticides and their metabolites were found in surface waters. The most commonly occurring were the metabolites of herbicides that are used to treat rapeseed – these comprised both currently used herbicides (metazachlor, dimethachlor, pethoxamide) and banned ones (alachlor, acetochlor) – as well as herbicides used to treat corn (in current use: metolachlor, terbuthylazine, pethoxamide; banned: atrazine, acetochlor), and beets (chloridazon), and the broad-spectrum herbicide glyphosate and its metabolite AMPA.

Medicinal products and their metabolites are problematic in surface water. They enter surface water from municipal sources when there are no technologies to treat them at municipal wastewater treatment plants. For 2019, the results from 303 profiles (a total of 2,836 samples) for 67 individual analytes were processed. Medicinal products were found in 302 profiles (99.7% of the profiles monitored), in a total of 2,688 samples (94.8% of samples). There are no emission limits on medicinal products discharged in wastewater from WWTPs. Within the Czech Republic, it is difficult to compare results from the monitoring of medicinal products due to the inconsistency of the substances monitored. Povodí Vltavy in particular has engaged in the long-term monitoring of these substances.

In the monitoring of the **bathing water quality in open countryside**, a total of 271 sites were monitored in the 2019 recreational season (of which 148 sites are subject to EC reporting). Of these, 50.2% were classified under the Quality Category I, i.e. water suitable for bathing (up on the 48.5% recorded in 2018). A bathing ban was issued at 10 sites (3.7% of the total) due to the excessive occurrence of cyanobacteria, and 30 sites (11.1% of the total) were classified as unsuitable for bathing. In the 2019 bathing season, 6,949 inland bathing areas in EU countries were assessed in accordance with Directive 2006/7/EC[24] of the European Parliament and of the Council. Of these, 79.1% had excellent water quality. The Czech Republic achieved a slightly above-average rating (81.0% of sites had excellent water quality).

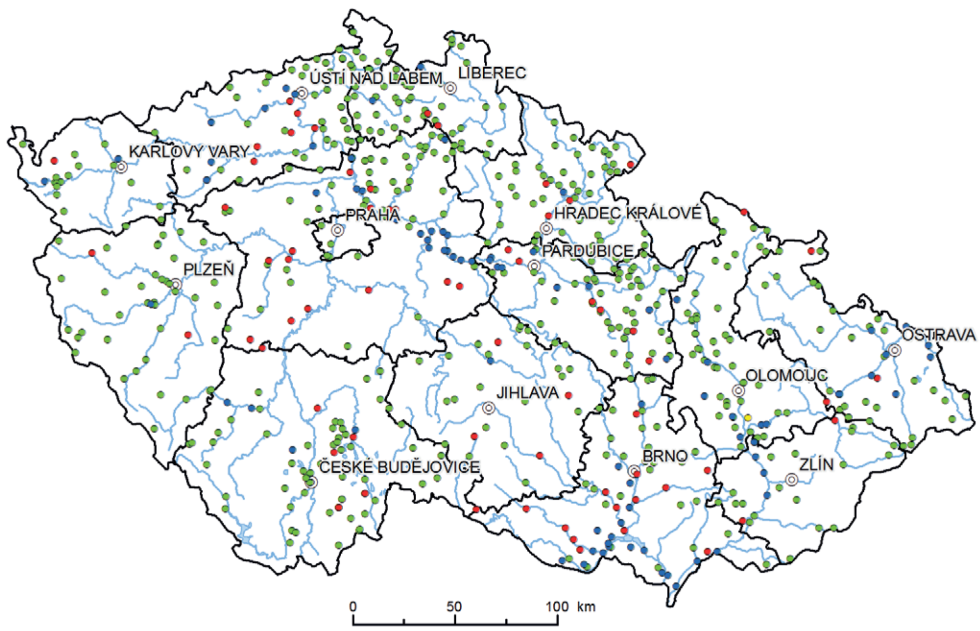
The quality of **groundwater** is also monitored and evaluated annually on the basis of Implementing Decree of the Ministry of the Environment and the Ministry of Agriculture No. 5/2011 Coll. In 2019, 698 objects were observed in the state groundwater quality monitoring network, of which 225 were shallow wells, 201 were springs and 272 were deep wells. Groundwater quality is evaluated on the basis of 365 indicators. The limits for groundwater were exceeded in at least one indicator at 182 shallow wells, 132 deep wells and 89 springs in 2019.[25] Heavy pollution from pesticides was found at a total of 202 objects (the limit was exceeded at 122 shallow wells, 40 deep wells, and 40 springs). This was a slight deterioration compared to 2018. In 2018, the limits for groundwater were exceeded in at least one indicator at 177 shallow wells, 120 deep wells and 79 springs (out of a total of 691 objects monitored).

In 2019, the indicators of groundwater pollution for which a high proportion of thresholds set by Implementing Decree of the Ministry of the Environment and the Ministry of Agriculture No. 5/2011 Coll. were exceeded were ammonium ions (12.7% of samples were above the limit) and nitrates (9.8%), Figure 8. Of organic substances, pesticides accounted for the highest proportion. For the indicator of the sum of pesticides with a quality standard of 0.5 $\mu g.l^{-1}$, 26.6% of samples were above the limit. The problem with pesticides is that they remain in the ecosystem for a long time. As a result, the values of the relevant substances do not change much from one year to the next.

*[24] Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 on the management of bathing water quality*

*[25] Evaluation based on selected indicators ($NH_4^+$, $NO_2^-$, $NO_3^-$, $Cl^-$, $SO_4^{2-}$, As, Cd, Co, Ni, Pb, Hg, $COD_{Mn}$, DOC and pesticides).*

Figure 8
**Concentrations of nitrogenous substances in groundwater [mg.l$^{-1}$], 2019**




*Data source: Czech Hydrometeorological Institute*

**Surface and groundwater abstractions** mainly reflect the state of the economy and the hydrometeorological conditions in the given year. The total amount of water abstracted from surface and groundwater has decreased by 16.5% since 2000. In 2019, total water abstraction amounted to 1,506.3 mil. m$^3$, a year-on-year decrease by 5.3% (Chart 7). The majority of abstractions are made from surface waters (76.1% of the total abstractions in 2019), with a smaller proportion coming from groundwater (23.9%). The highest abstraction was made for public water mains (40.9% of total consumption) and for the energy sector (37.4%). When total abstractions are broken down into surface and groundwater abstractions, there are clear differences in the representation of individual economic sectors in the source of abstracted water. The most significant consumers of groundwater are public water mains, which account for 80.7% of total groundwater abstractions.

In 2019, 594.0 mil. m$^3$ of water was produced and intended for drinking water. The drinking water actually billed to households and other customers amounted to 492.6 mil. m$^3$. Of the drinking water produced, 67.7% was used by households. 94.6% of the Czech population was supplied with water from public water mains. This was a significant increase compared to 2000, when the share of the population connected to the public water mains was 87.1%. Out of the total amount of water produced, per-capita specific water consumption for the population supplied with water from the public water supply system was 163.6 litres per capita per day, a 1.4% decrease compared to 2018. Water consumption by households (the amount of water billed to households per capita per day) in 2019 was 90.6 litres per capita per day.

The proportion of **drinking water losses** in the water supply network has decreased significantly since 2000, when it amounted to 25.2%. By 2019, it was 14.5% (86.3 mil. m$^3$). Drinking water losses in the water supply network are caused by accidents and leaks from the public water mains. They have been reduced thanks to the gradual reconstruction of water management networks.

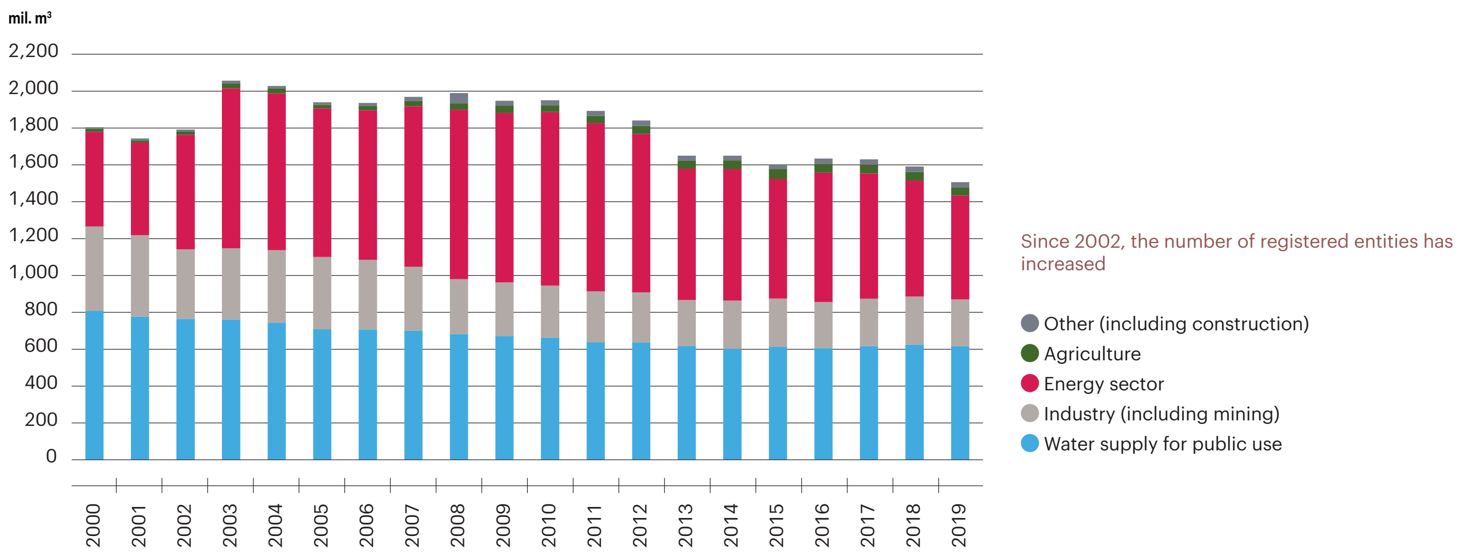
Access to water resources very much depends on the geographical location and the physical geography of individual countries. The countries in Europe that are most at risk, i.e. the countries with the highest WEI index,[26] were mainly Spain, Portugal, Italy, Belgium, and the Netherlands in July 2015.[27] Water shortages in these areas occur because of unfavourable natural conditions (the climate, the nature of the river network, geological conditions, etc.) and anthropogenic interventions in the water regime and the nature of the given country's economy.

*[26] The WEI index is used to express water scarcity. It describes the pressure exerted by total water abstractions on water resources (calculated as the share of total water abstractions in the volume of renewable water supplies). In this way, it identifies countries that have high consumption relative to their resources and are therefore prone to water shortages (water stress). The WEI alert threshold that separates water-sufficient and water-scarce regions is about 20. Severe water shortages may occur when the WEI exceeds 40.*

*[27] Data for the years 2016–2019 were not available at the time of publication.*

**Chart 7**

## Total water abstraction by individual sectors in the Czech Republic [mil. $m^3$], 2000–2019




*Until 2001, water abstraction exceeding 15,000 $m^3$ per year or 1,250 $m^3$ per month was registered. Since 2002, abstraction by users at over 6,000 $m^3$ per year or 500 $m^3$ per month has been registered – pursuant to Section 10 of Decree of the Ministry of Agriculture No. 431/2001 Coll.*

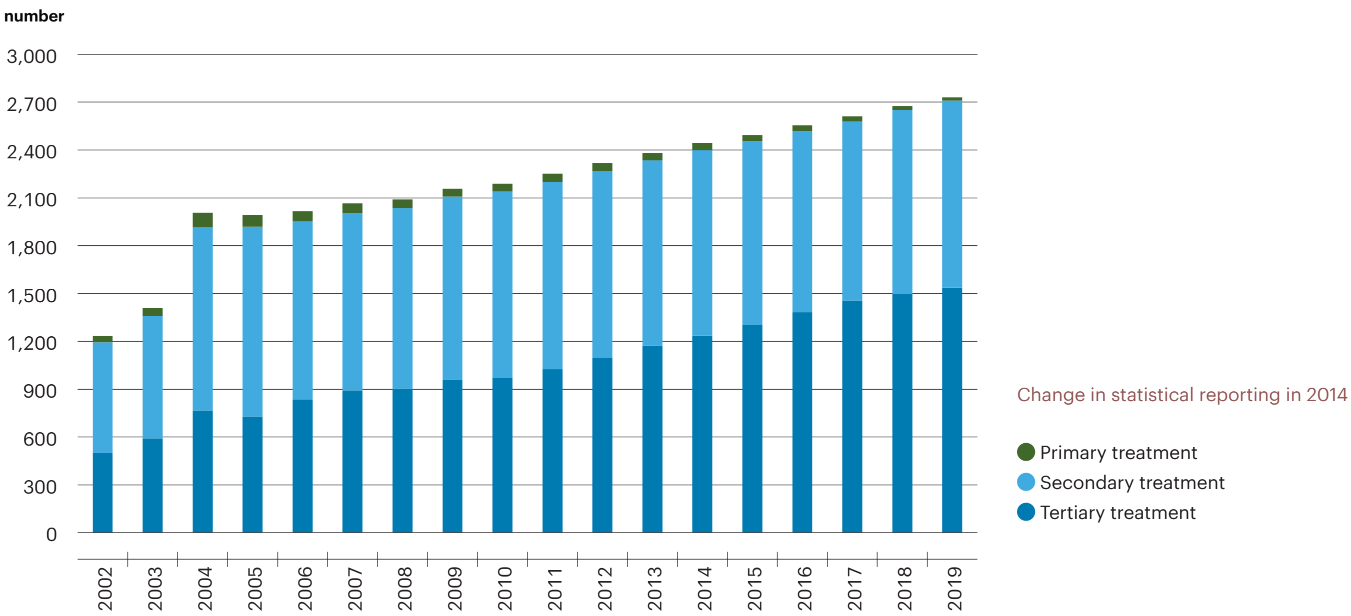
*Data source: Ministry of Agriculture, Povodí state enterprises, T. G. Masaryk Water Research Institute, public research institution, Czech Statistical Office*

Water quality is affected by the amount and degree of pollution of discharged wastewater. The total amount of **wastewater discharged** into surface water in 2019 was 1,522.3 mil. $m^3$, a decrease of 15.6% compared to 2000. The largest share of discharged wastewater is wastewater from public sewers (52.5%). The share of the population connected to the sewer network has remained the same since 2017 (85.5%). The share of the population connected to a sewerage system with a WWTP increased from 82.4% to 82.6% year-on-year in 2019.

The total number of **WWTPs** is constantly growing (Chart 8). In 2019, there were 2,731 of them, i.e. 1,497 more than in 2002. The number of WWTPs with a tertiary treatment stage has increased significantly to stand at 1,538 (1,038 more than in 2002). In 2019, there were only 22 treatment plants with just a mechanical stage of treatment. Although the number of wastewater treatment plants is constantly rising, the incomplete sewerage system in smaller municipalities (with a population equivalent below 2,000) remains a persistent problem.

**Chart 8**

**Treatment plants by wastewater treatment stage in the Czech Republic [number], 2002–2019**




*Data source: Czech Statistical Office*

Article 3 of Council Directive 91/271/EEC concerning urban wastewater treatment requires EU Member States to ensure that all agglomerations with a population equivalent of more than 2,000 are provided with collecting systems for urban wastewater. In EU countries, the average rate of connection to the sewerage system in accordance with Article 3 was 94.7% in 2016.[28] The Czech Republic had a 100% compliance rate. The Directive lays down individual criteria for specific types of treatment, with Article 4 establishing that Member States are ensure that urban wastewater entering collecting systems is subject to secondary treatment or an equivalent treatment before discharge. In EU countries, the level of compliance with this stage of treatment was 88.7% of wastewater (93.0% in the Czech Republic). The level of compliance with treatment requirements according to the stricter demands placed on agglomerations with a population equivalent of more than 10,000 in sensitive areas (Article 5) was 84.5% in EU countries in 2016 (65.0% in the Czech Republic).

## Detailed data sources

https://issar.cenia.cz

[28] *Data for the years 2017–2019 were not available at the time of publication.*

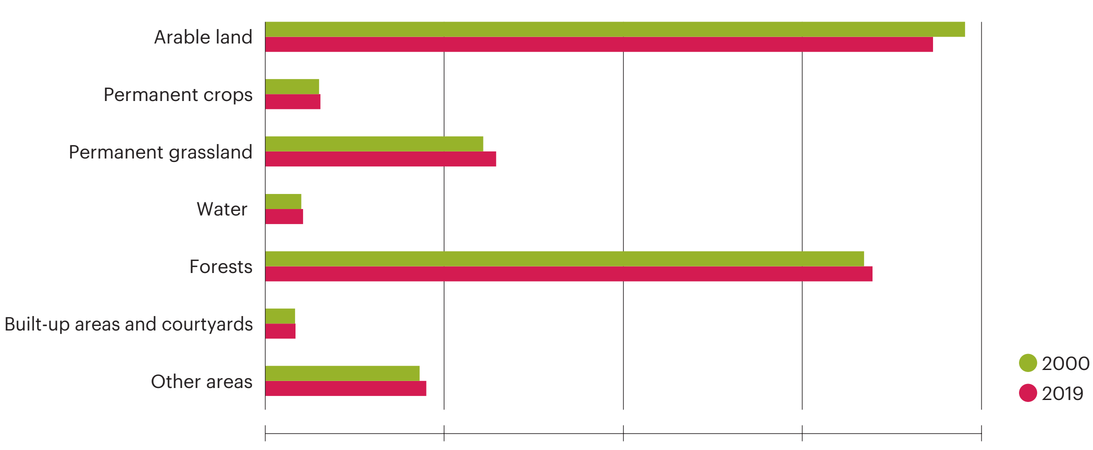

4
Nature and landscape

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Land use | 😐 | 😐 | 😐 |
| Landscape fragmentation | ☹️ | ☹️ | ☹️ |
| Nature protection | 🙂 | 🙂 | 😐 |
| Status of animal and plant species of Community importance in 2000–2006, 2007–2012, 2013–2018[29] | N/A | 😐 | N/A |
| Status of natural habitat types of Community importance in 2000–2006, 2007–2012, 2013–2018 | N/A | 😐 | N/A |
| Indicator of common bird species | ☹️ | ☹️ | ☹️ |

From the perspective of **land use** (Chart 9), the Czech landscape consists mainly of agricultural land (53.3%), which is 70% ploughed. The second most extensive category is forest land (33.9%). Within the framework of agricultural land, the proportion of permanent grassland has long been expanding. It has increased by 56.5 thous. ha, or 5.9%, since 2000. Grassing, especially in less favourable areas for agriculture, is supported by a government subsidy policy and by the application of the principles of the Common Agricultural Policy, primarily with the aim of reducing erosion and protecting biodiversity. However, agricultural land is steadily shrinking. Between 2000 and 2019, it decreased by 77.8 thous. ha (i.e. 1.8%). Areas in the category of built-up areas and courtyards are constantly increasing (reporting an increase by 2.3 thous. ha, i.e. 1.8%, since 2000). This category increased by 0.4 thous. ha (0.3%) year-on-year to 132.9 thous. ha in 2019. Conversely, the acreage of the category "other areas" decreased by 1.4 thous. ha (0.1%) year-on-year. However, since 2000 "other areas" have increased by a total of 4.4% to 709.6 thous. ha. On aggregate, the area has increased by 32.5 thous. ha since 2000.

**Chart 9**

**Land use in the Czech Republic [%], 2000 and 2019**




*The values of the categories reported by the Czech Office for Surveying, Mapping and Cadastre may differ from CORINE Land Cover data. For example, the Office's "forests" category also includes clearings or forest roads, while the CORINE Land Cover "forests" category assesses the landscape cover.*

*Data source: Czech Office for Surveying, Mapping and Cadastre*

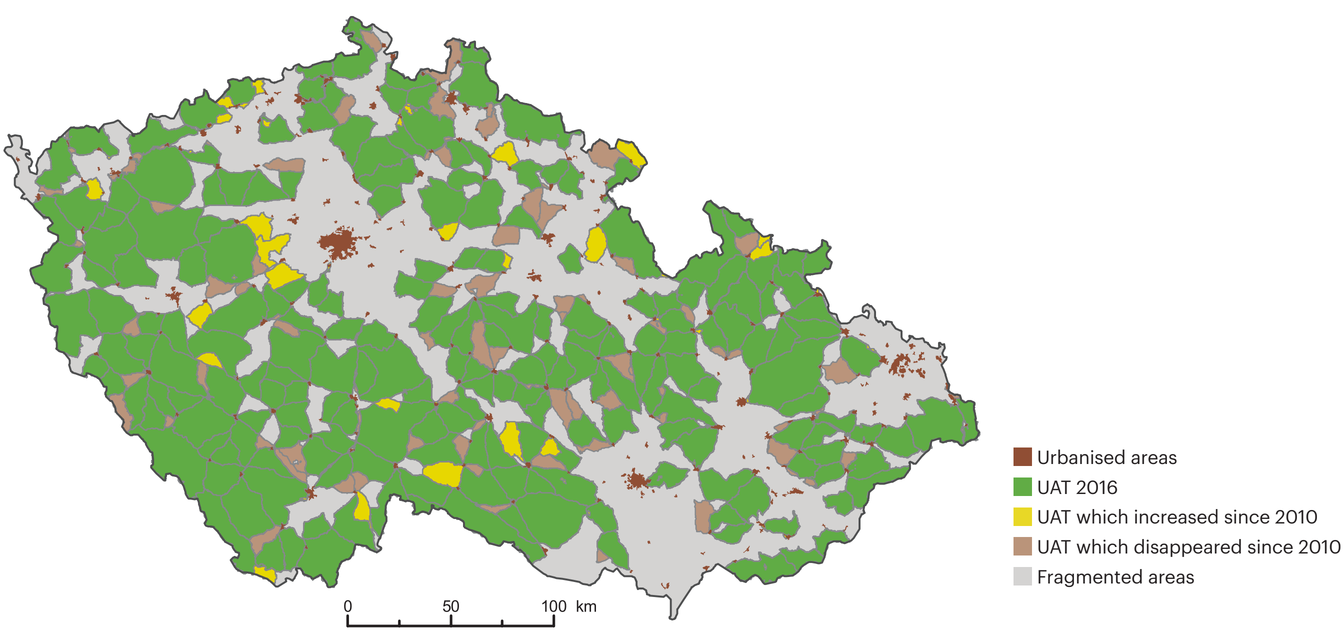
*[29] Species and, similarly, habitats of Community importance are established by European Community legislation. Specifically, this is Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, according to which evaluation reports are submitted every 6 years. These evaluations started in 2000. Bird species are not included here as they have their own evaluation system under Directive 2009/147/EC of the European Parliament and of the Council. The last year-on-year change cannot be assessed for this indicator because the changes are mapped at six-year intervals and there are no data for the last year monitored.*

According to data from **CORINE Land Cover** remote sensing, the majority (72.1%) of changes between 2012 and 2018 concerned forest stands. In this period, 48.2 thous. ha of forest were lost and 20.5 thous. ha were gained. The loss of forests was caused by logging and conversion to transitional woodland/shrub. There was a decrease in coniferous forests (41.6 thous. ha), although there was no shrinkage in forest land registered by the Czech Office for Surveying, Mapping and Cadastre. According to CORINE Land Cover data, arable land was converted mainly into meadows (6.5 thous. ha) and, conversely, 8.2 thous. ha of meadow was converted into arable land, i.e., there was a net gain of 1.7 thous. ha of arable land at the expense of meadows. 1.6 thous. ha of arable land were converted into construction sites and 1.2 thous. ha were converted into incoherent urban development. In relative terms, land use in the Czech Republic is 139.6 $m^2.km^{-2}$, which is an average value for European countries (EEA39 countries). The highest land use between 2000 and 2018 was recorded in Malta (485.8 $m^2.km^{-2}$), the United Kingdom (421.9 $m^2.km^{-2}$) and Luxembourg (384.0 $m^2.km^{-2}$). Conversely, the lowest land use was in Finland (33.2 $m^2.km^{-2}$), Sweden (28.9 $m^2.km^{-2}$) and Iceland (5.0 $m^2.km^{-2}$).[30]

The construction of transport corridors and the constant growth of urban agglomerations affect permeability and cause the **fragmentation of the landscape**. This results in the loss of the original qualities of habitats and their interconnection important for animal migration. Between 2000 and 2016, the area of unfragmented landscape decreased by 11.7%, from 54.1 thous. $km^2$ in 2000 to 50.0 thous. $km^2$ (63.5% of the total area of the Czech Republic) in 2010 and then to 47.8 thous. $km^2$ (60.6% of the territory of the Czech Republic) in 2016 (Figure 9). According to forecasts, the landscape will continue to be fragmented by transport to the extent that, by 2040, the share of unfragmented landscape will be just 53%. The Czech Republic, with 39.4% fragmentation, is one of the most fragmented countries in Europe. In 2015, an average of 28% of the territory of Europe was fragmented, with Luxembourg being the most fragmented (91% in 2015).[31]

**Figure 9**

**Landscape fragmentation due to transport in the Czech Republic, 2010–2016**




*Assessed using UAT (Unfragmented Areas by Traffic) polygons. UAT is a method of determining areas unfragmented by traffic, i.e. areas that are bounded by roads with a traffic intensity higher than 1,000 vehicles per 24 hours, or by multi-track railways, and that are larger than 100 $km^2$. Data for the 2017–2019 period were not available at the time of publication because of the methodology used to report them.*

*Data source: Evernia*

The total area of **specially protected areas** (SPAs) in the Czech Republic, including both small-scale and large-scale SPAs, amounted to 1,322.0 thous. ha, i.e. 16.8% of the country's territory, in 2019 (1,320.2 thous. ha in 2018), Figure 10. Large specially protected areas, which include national parks (NPs) and protected landscape areas (PLAs), covered an area of 1,257.1 thous. ha (15.9% of the territory of the Czech Republic). The area of the Moravian Karst PLA has expanded by 555 ha. Small specially

[30] *EEA (2020): https://www.eea.europa.eu/data-and-maps/indicators/land-take-3/assessment*

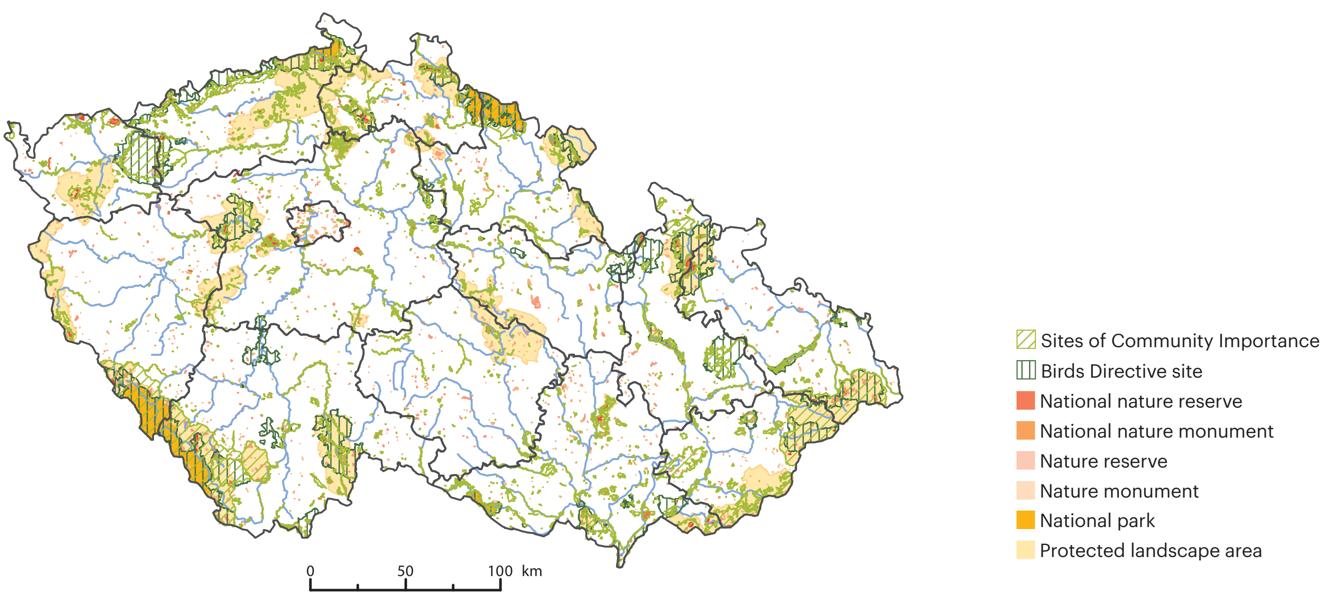
[31] *EEA (2020): https://www.eea.europa.eu/data-and-maps/indicators/mobility-and-urbanisation-pressure-on-ecosystems-2/assessment*

protected areas accounted for 113.3 thous. ha, or 1.4% of the territory of the Czech Republic, in 2019. In 2019, 24 new small-scale SPAs were established outside of other SPAs, and their total area increased by 1.4 thous. ha (1.3%). However, almost a third of small-scale SPAs are located in a PLA or NP.

In 2019, there were 1,153 **Natura 2000** sites. Of these, 41 Birds Directive sites covered a total of 703.4 thous. ha, while 1,112 sites of Community importance occupied a total of 795.1 thous. ha. The area of all Natura 2000 sites totalled 1,114.8 thous. ha, i.e. 14.1% of the entire territory of the Czech Republic. 36.1% of the Natura 2000 site was located outside other protected areas. The total area of specially protected areas and the Natura 2000 system, taking into account their mutual overlaps, amounted to 1,725.9 thous. ha, i.e. 21.9% of the area of the Czech Republic, in 2019 (Figure 10). On a European scale, the Natura 2000 system covers over 18% of the territory of the EU Member States.

**Figure 10**

**Specially protected areas and Natura 2000 sites in the Czech Republic, 2019**




*Data source: Nature Conservation Agency of the Czech Republic*

On the **red lists** (as of 2017), of the 2,256 native species of vascular plants, 908 are listed as endangered and 86 as extinct. Of the 886 bryophytes, 224 are endangered and 27 are extinct. Of the 1,526 species of lichens, 569 are endangered and 138 are extinct. Of the 4,000 species of fungi, 531 are endangered and 84 are extinct. Of the 91 mammal species known in our country, there are 17 endangered and 3 extinct on the red lists. Of the 210 native bird species, 110 are endangered and 10 are extinct. Similarly, 8 out of 13 species of reptiles, 13 out of 22 species of amphibians, 27 out of 59 species of fish and cyclostomata (9 extinct) and 5,245 out of 32,000 native invertebrates (627 extinct)[32] are endangered in the Czech Republic. Active conservation measures are being taken in the form of rescue programmes[33] for the most endangered species. In 2019, 4 rescue programmes for plant species and 4 for animal species continued. The spread of non-native plant and animal species is also significant. As of 2019, 1,454 non-native plant species were registered in the Czech Republic, of which 61 were invasive, and there were 278 were non-native species of animals, of which 113 were invasive. The decline in biodiversity and the occurrence of invasive species is a Europe-wide problem.

60.3% of **animal species of Community importance** and 75.4% of **plant species of Community importance** have an inadequate or unfavourable status. Despite the long-term positive trend, 79.6% of **habitats of Community importance** continue to have an inadequate or unfavourable status. In the EU, the status of 60% of species and 77% of habitats is unfavourable. Peatlands, bogs and wetlands remain the most endangered habitats in the EU.[34]

[32] *Complete red lists of Czech endangered species can be found at https://portal.nature.cz/.*

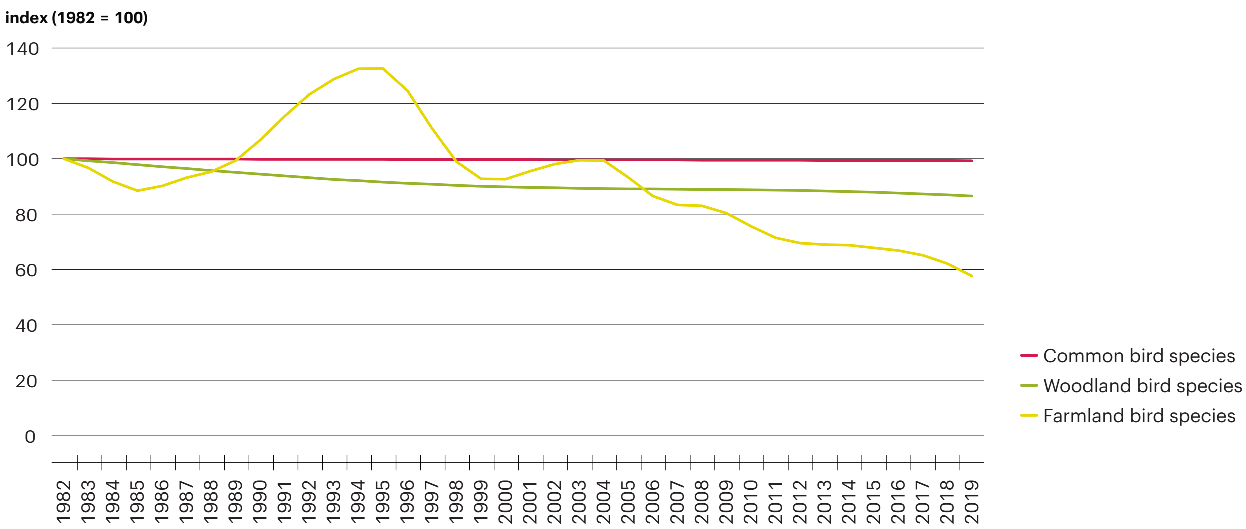
[33] *For more information, see www.zachranneprogramy.cz.*

[34] *EEA (2020): The European environment – state and outlook 2020. Available at: https://www.eea.europa.eu/publications/soer-2020*

The **bird species population indicator**[35] also reflects the overall state of biodiversity. Its value has long been declining since the beginning of monitoring in 1982. The only exception was the period after 1989. The number of farmland bird species had decreased by 42.3% up to 2019. The pace of decline is slowing, but this is more due to the depletion of populations than any real improvement in the situation. A comparable decline, albeit slower in the last five years, has been recorded for woodland birds, which were down by 13.4% in total (Chart 10). These are species associated with scarce habitats (i.e. hedgerows, borders, grassy strips, etc.). Rare species are being replaced by more common species that are able to live in more variable conditions.[36] The populations of common bird species have remained steady for a long time. The main reasons for this are the ever-increasing intensification of agriculture and the simultaneous abandonment of less fertile land, especially land in the foothills and mountain areas. Similar trends can be observed elsewhere in Europe.

**Chart 10**

**Indicator of all common bird species, woodland bird species and farmland bird species in the Czech Republic [index, 1982 = 100], 1982–2019**




*Data source: Czech Society for Ornithology*

## Detailed data sources

https://issar.cenia.cz

[35] *For the purposes of calculating the indicator of common bird species, 42 species were selected, whose population (together with the population of the feral pigeon (Columba livia f. Fera), which was excluded from the analysis) together represent 95% of all birds nesting in the Czech Republic. 17 species were included in the calculation of the woodland bird species indicator. The farmland bird indicator contains data from 20 species of field and meadow birds. The input data comes from the Single Bird Census Programme (JPSP). Since 2014, the selection of species has been different from previous years in order to improve the classification of individual species. In addition, in contrast to previous calculations, the indicator is smoothed by the Trend Spotter algorithm, which limits seasonal fluctuations. As a result, the entire time series is recalculated every year after the addition of new data. This refines the trend estimate. This smoothing process retroactively affects the numerical value of the index in the individual years.*

[36] *REIF J., ŠKORPILOVÁ J., VERMOUZEK Z. & ŠŤASTNÝ K., 2014:. Změny početnosti hnízdních populací běžných druhů ptáků v České republice za období 1982–2013: analýza pomocí mnohodruhových indikátorů. (Population changes of common breeding birds in the Czech Republic from 1982 to 2013: an analysis using multispecies indicators) Sylvia 50: 41–65 (In Czech). 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.*


5
Forests

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Defoliation of forest stands | ☹ | ☹ | ☹ |
| Logging | ☹ | ☹ | ☹ |
| Species composition and age structure of forests | ☺ | ☺ | ☺ |
| Responsible forest management | ☺ | ☹ | ☺ |

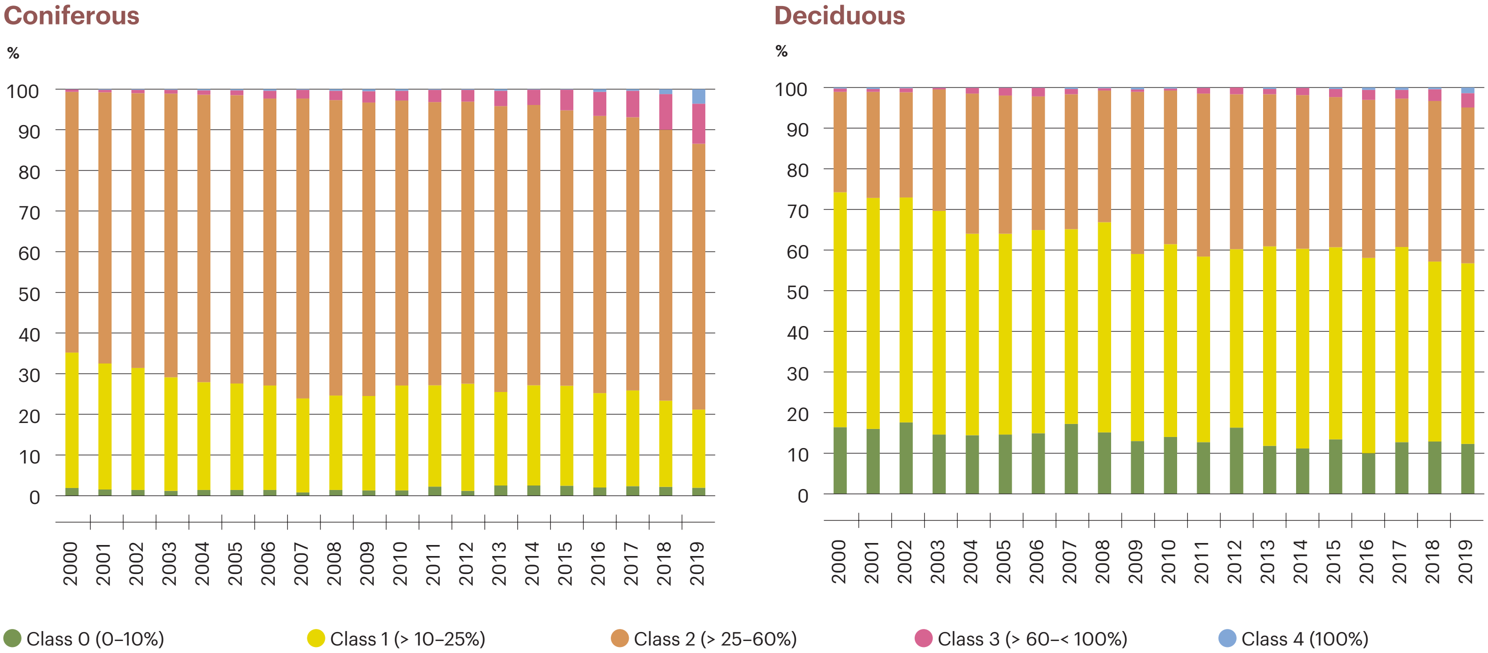
Forest land has long covered about a third of the territory of the Czech Republic. This area is slightly expanding; in 2019, it accounted for 33.9% of all land. Forest ecosystems are therefore an important element of the entire landscape and forestry is an important economic sector. As a renewable source of material, timber has significant potential in the transition to sustainable production and consumption systems. In addition, stable forest ecosystems support biodiversity, regulate the water regime of the landscape, protect soil from erosion, improve air quality, and play a recreational and aesthetic role. The current state of forests is very far from natural conditions, making them vulnerable to the current threats posed by climate change. Ultimately, the non-productive functions of forests are at risk and the usability and value of their main product – timber – is reduced.

The ability of forests to perform some of their functions can be assessed by their **state of health**. This is expressed by the degree of defoliation, defined as the relative loss of the assimilation apparatus in the tree crown compared to a healthy tree growing in the same vegetation and habitat conditions. In 2019, 78.8% of conifers and 43.3% of deciduous trees in stands more than 60 years old were classified under defoliation classes 2–4, which indicate significant damage to trees. In stands younger than 60 years, 31.4% of conifers and 33.4% of deciduous trees were in those classes (Chart 11). Forest health has deteriorated in recent years, mainly because trees have been damaged by insect pests and drought. In the past, the health of older stands has been also affected by intensive air pollution. Although the air pollution situation has much improved since 1989 due to a reduction in the volume of substances emitted into the air, the air pollution load persists. As a result, the health of forests is also affected by the way they are managed. A species composition that is not suited to habitats, combined with the impacts of climate change, does not create conditions for a reduction in the level of defoliation. In 2019, on average 28.4% of trees in Europe were in defoliation classes 2–4. The above-mentioned factors causing defoliation are thus the reason for the Czech Republic's inclusion among countries with the highest rate of defoliation in Europe.

**Chart 11**

**Defoliation of older coniferous and deciduous stands (60 years or older) in the Czech Republic, by class [%], 2000–2019**

**Coniferous** **Deciduous**

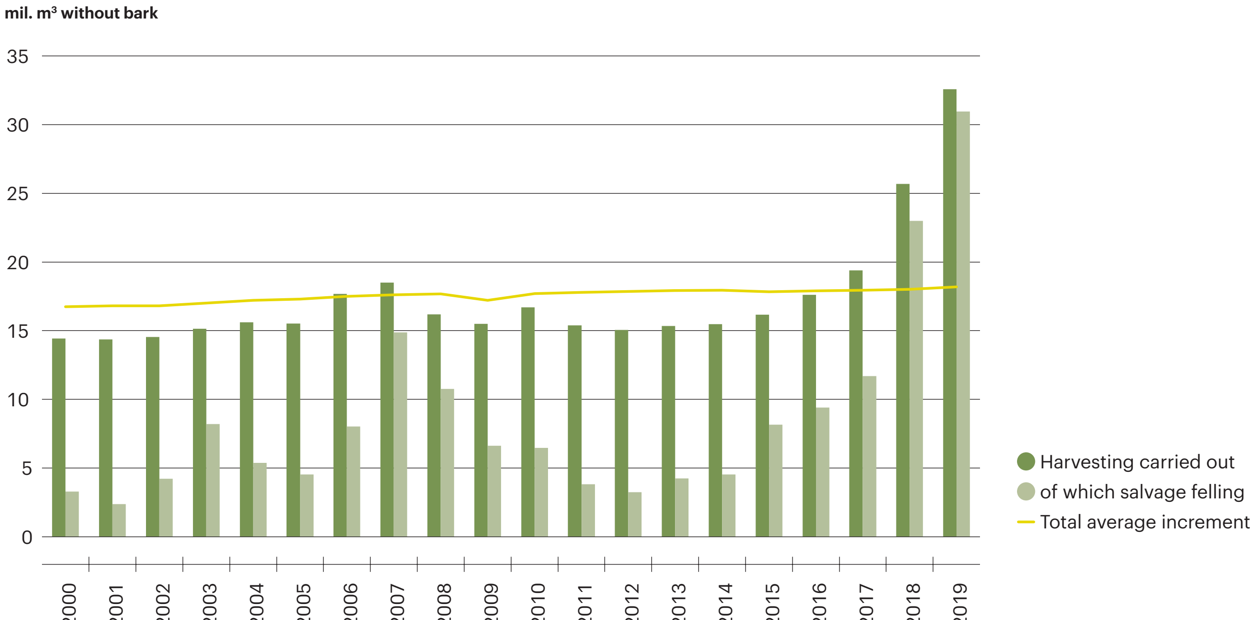



*Data source: Forestry and Game Management Research Institute*

In 2019, forest ecosystems were affected by extensive logging in the wake of bark beetle outbreaks. The volume of registered spruce wood infested with bark beetles almost doubled in the last year and the volume of registered **logging** this year, at 32.6 mil. $m^3$ (excluding bark), broke the previous record from 2018 (Chart 12). As such, the volume of logging significantly outperformed the total average increment, which in 2019 came to 18.2 mil. $m^3$ (excluding bark). Compared to 2018, the share of salvage logging in total logging in 2019 increased from 89.5% to 95.0%. This is a significant increase compared to the reporting in previous years post-2000, except for 2007, when salvage logging after Hurricane Kyrill accounted for 80.4% of total logging. The main causes of this change are the effects of drought, especially on timber species planted outside their ecological optimum (predominantly Norway spruce in lower vegetation belts), and their subsequent infestation by insect pests.

**Chart 12**

**Comparison of logging with total average increment in the Czech Republic [mil. $m^3$, without bark], 2000–2019**




*Data source: Czech Statistical Office*

The current **species composition** of forests is very different from the reconstructed natural and recommended composition.[37] In 2019, conifers accounted for 71.0% of the forest area, but according to the recommended composition their share should only be 64.4%. The dominant tree species is spruce, with a share of 49.5%, followed by pine (16.1%), beech (8.8%) and oak (7.4%). In recent decades, there has been clear targeted change in the species composition towards the natural composition of forest stands. The share of deciduous stands in the total forest area increased from 22.3% to 27.7% between 2000 and 2019. More deciduous trees (14.7 thous. ha) than conifers (14.0 thous. ha) were planted in the forests for the first time ever in 2019. However, spruce remained the most frequently planted tree species (8.7 thous. ha). In addition, the current bark beetle outbreaks will prompt a further reduction in the proportion of conifers in the coming years. The **age structure** of forests in the Czech Republic is uneven. The share of the area of older to overaged stands is constantly increasing. This trend, while constituting a risk of economic loss, is a positive factor in terms of supporting biodiversity. Older stands provide a favourable environment for species associated with ecosystems with a high proportion of deadwood.

The majority (74.4%) of forest ecosystems in the Czech Republic are commercial forests, whose main function is to produce timber. The economic use of forests results in diversions from natural conditions, which in many places has reduced their resilience. Forest resilience can be increased, and the productive and non-productive functions of forests can be improved by using nature-friendly **forestry methods** and maintaining a diverse forest structure. Forestry methods can be considered nature-friendly if, to achieve forestry goals, they make maximum use of the creative forces of nature, they respect habitat conditions, and management measures chime with natural processes and the condition of the stands. According to the information from forest management plans,[38] the most common management method is border strip cutting, followed by

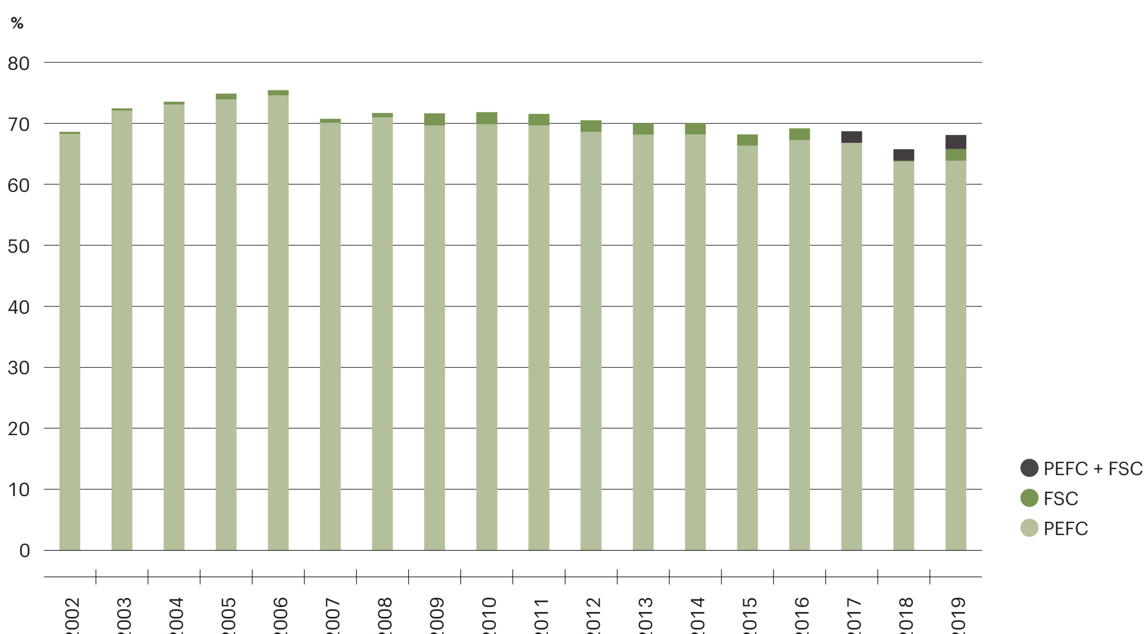
*[37] The reconstructed natural species composition is close to the climax composition before forests were influenced by humans. The recommended forest composition is a comprehensively optimised compromise between the natural composition and the most economically beneficial composition.*

*[38] The information from the propositional part of the forest management plans is influenced by the owner's management plans and may not reflect the actual shares of individual management methods in use.*

shelterwood cutting. The third most common method is clearcutting. Forests managed by selective cutting account for the lowest share. In terms of forest shapes, high forests clearly predominate (approximately 96% of stands[39]), but there are efforts to increase the share of medium and low forests, which is beneficial for biodiversity. Another of the principles of nature-friendly forestry methods is the use of **natural regeneration** in stands with a suitable species composition. The share of natural regeneration in the total regeneration area decreased from 23.5% in 2013 to 16.1% in 2018. In 2019, the area of natural regeneration grew, but its share in total afforestation fell to 15.4% because of an increase in artificial regeneration following intensive salvage logging. The currently large local populations of ungulates affect natural forest regeneration because they harm the young trees and growths emerging from natural regeneration by nibbling them. Game populations are high because of intensive use of the landscape by humans, especially for farming. This creates conditions in which the game has shelter and food. Another factor is that the natural regulation of the game by predators is reduced or non-existent. The **standards of the international certification organisations** FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification Schemes) are tools suitable for the introduction of responsible forest management.[40] The FSC certificate places higher demands on sustainable management. In 2019, 66.2% of forest land was PEFC-certified. The area FSC-certified has doubled in the last year. At the end of 2019, 4.0% of forest land in the Czech Republic had this certification. About half of the FSC-certified forest land was also PEFC-certified. Consequently, a total of 67.8% of forest land was certified in 2019 (Chart 13). In European countries, on average about half of forest land is certified.

**Chart 13**

**Share of PEFC- and FSC-certified forest land in the total area of forest land in the Czech Republic [%], 2002–2019**




*Since 2017, the PEFC and FSC have been working together to survey forest areas that have been certified according to both (PEFC + FSC) certificates.*

*Data source: FSC, PEFC*

## Detailed data sources

https://issar.cenia.cz

*[39] KUČERA M., ADOLT R., eds., 2019: Národní inventarizace lesů v České republice – výsledky druhého cyklu 2011–2015 [online]. First edition. Brandýs nad Labem: Brandýs nad Labem Forest Management Institute, 2019 [cited 10. 9. 2020]. ISBN 978-80-88184-24-9. Available at: http://nil.uhul.cz/downloads/kniha_nil2_web.pdf.*

*[40] The PEFC and FSC certification of forests is one of the forest management processes aimed at achieving sustainable forest management in the Czech Republic. At the same time, it is an attempt to improve all forest functions to the benefit of the environment inhabited by humans. Certification is a vehicle for forest owners to declare their commitment to manage forest land according to predetermined criteria.*

# 6 Soil and agriculture

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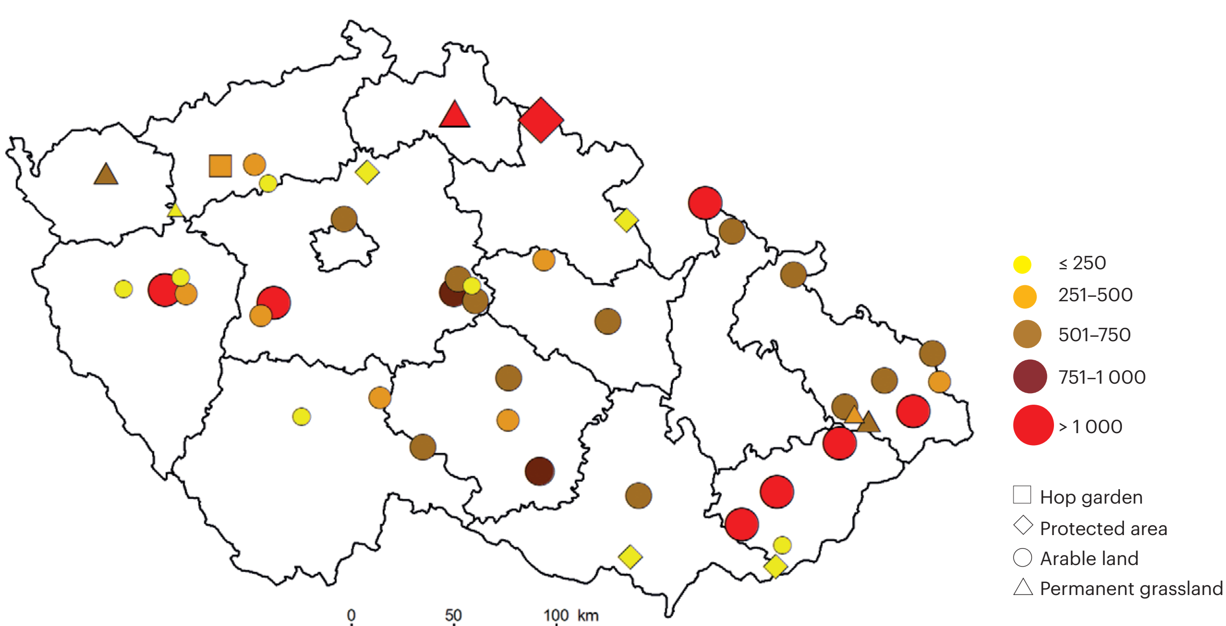
| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Risk of soil erosion and slope instabilities | ☹ | ☹ | ☹ |
| Consumption of fertilisers and plant protection products | ☹ | 😐 | ☺ |
| Quality of agricultural land | 😐 | 😐 | 😐 |
| Organic farming | ☺ | ☺ | ☺ |

The **quality of agricultural land** is influenced primarily by the farming methods in place. Ill-suited farming degrades the soil, resulting in soil compaction, erosion, nutrient loss, loss of organic matter and the accumulation of harmful substances (from agricultural and industrial activities). The quality of agricultural land is determined by reference to numerous properties (e.g. soil structure, soil reaction (pH), sorption capacity, organic matter content, the presence of soil organisms and microorganisms, etc.). Hazardous substances entering the soil and sediments as a result of anthropogenic activities have an adverse effect on the quality of agricultural land. The **monitoring of the content of hazardous elements and substances in the soil** (basal soil monitoring) encompasses inorganic hazardous elements (such as As, Cd, Ni, Pb, and Zn) and persistent organic pollutants (PAHs, PCBs, HCH, HCB, and DDT substances). The results aqua regia extraction to determine the content of hazardous elements in the soil show that the content of cadmium (9.4% of samples exceeded the limit) and arsenic (8.9% exceedance) was the most problematic between 1998 and 2019. In checks on persistent organic pollutants in 2019, the most problematic were PAHs (20.0% of samples were above the limit, Figure 11). Cadmium is also the most problematic in pond and river sediments. In the period from 1995 to 2019, 16.7% of the samples exceeded the limit values for cadmium, 8.1% for zinc and 5.1% for arsenic in pond and river profiles. Limit values for PAHs were exceeded in 19.4% of samples. Limit values for DDT were exceeded in 7.5% of samples from pond and river profiles. The conditions under which sediment can be spread on agricultural land are set out in Implementing Decree No. 257/2009 on the use of sediments on agricultural land.

**Figure 11**

**Content (sum) of 12 PAHs in the topsoil on agricultural land (from basal soil monitoring) in the Czech Republic [μg.kg$^{-1}$], 2019**




*Determined on the basis of samples from 40 selected monitoring areas and 5 sites in protected areas. The preventive value for the sum of 12 PAHs pursuant to Implementing Decree No. 153/2016 is 1,000 μg.kg$^{-1}$.*

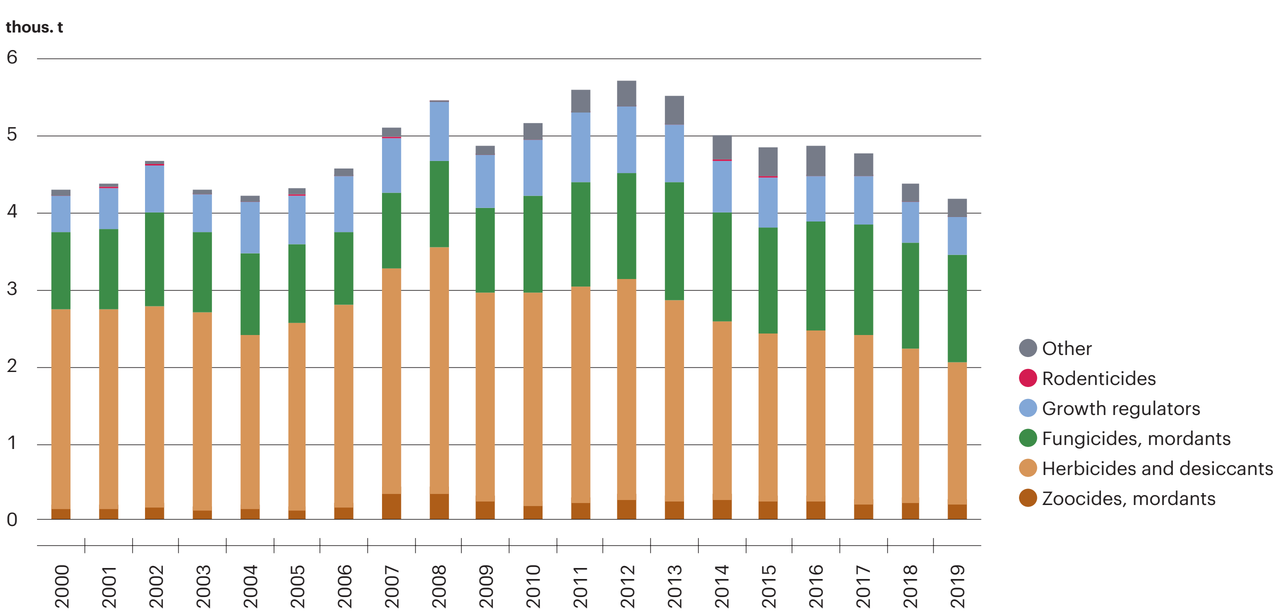
*Data source: Central Institute for Supervising and Testing in Agriculture*

**Mineral fertiliser consumption** has increased by 53.9% since 2000. In 2019, mineral fertiliser consumption amounted to 116.8 $kg.ha^{-1}$ of pure nutrients, a 4.9% decrease compared to 2018. Compared to 2018, there was a drop in the consumption of nitrogenous fertilisers by 5.6% to 94.2 $kg.ha^{-1}$ of pure nutrients and in the consumption of potassium fertilisers by 27.8% to 6.1 $kg.ha^{-1}$ of pure nutrients. In the overall structure of mineral fertiliser consumption, nitrogenous fertilisers predominate with a share of 80.7% of total consumption. Although the consumption of mineral industrial fertilisers has been declining in recent years, their consumption still significantly outweighs the **consumption of farmyard manure**, which is beneficial for the soil because it improves its sorption properties and structure and increases the occurrence of soil organisms. Consumption of farmyard manure decreased by a slight 0.7% year-on-year to 69.8 $kg.ha^{-1}$. Compared to 2018, the **total consumption of lime materials increased** by 18.2% to 402.0 thous. t, the highest level since 2000. Lime materials are used to modify the soil reaction. This helps to improve the fertility and production capacity of soils by preserving and enhancing their physical, chemical and biological properties. Greater use of liming increases the proportion of soils with an alkaline reaction. The average value of the soil reaction of agricultural land in the Czech Republic for the 2014–2019 period was 6.0 pH[41] (slightly acidic).

The **consumption of plant protection products** is influenced by the current occurrence of any crop diseases and pests in the given year. This varies because of factors such as the course of the weather over the year. The consumption of plant protection products has followed a downward trajectory since 2013. In 2019, there was a 4.5% year-on-year decrease in the consumption of active substances to 4,189.6 thous. kg. Herbicides and desiccants have long accounted for the largest share in the total consumption of active substances (43.8% in 2019), followed by fungicides and mordants (33.7%) and growth regulators (11.5%), Chart 14. In 2019, common vole overpopulation resulted in a year-on-year increase in the consumption of active substances contained in rodenticides (by 41.8%). In 2019, the consumption of active substances in the zoocide and mordant group decreased by 7.7% following a ban on the use of neonicotinoid-based insecticidal mordants on cereals in 2018. There was also a significant drop in the active substances of the herbicide and desiccant group (by 8.5%). This was mainly due to a decrease in the consumption of products containing the active substance glyphosate, which was banned for use in accelerating the ripening and drying of plants (cereals and rapeseed). Despite their positive impact on overall yields in agriculture, the use of plant protection products must be controlled because of adverse effects on the environment and human health. Overuse of plant protection products also affects non-target species (especially insects and birds). Measures and objectives to mitigate the adverse impact of plant protection products are defined in the 2018–2022 National Action Plan for the Safe Use of Pesticides in the Czech Republic. In 2018,[42] the Czech Republic was below the European average (in comparison with other EU28 countries) in terms of its consumption of plant protection products.

**Chart 14**

**Consumption of active substances contained in plant protection and other products, by purpose of use, in the Czech Republic [thous. t of active substance], 2000–2019**




*Other – processing aids, repellents, mineral oils, etc.*

*Data source: Central Institute for Supervising and Testing in Agriculture*

[41] *There is a six-year monitoring cycle, with 1/6 of the territory of the Czech Republic evaluated every year.*

[42] *Data for the year 2019 were not available at the time of publication.*

Soil quality is also diminished by **erosion**. The Czech Republic is vulnerable to erosion on account of its intensive farming that relies heavily on mineral fertilisers. In addition, climate change heightens the risk of erosion due to high-intensity local precipitation after periods of drought. 51.7% of agricultural land is at risk of water erosion, expressed as long-term potential erosive wash (G);[43] 15.7% is at extreme risk of water erosion. In the Czech Republic, the areas bordering the Moravian ravines and the uplands and highlands in the Czech Republic have long been most at risk of water erosion (here, the potential loss of soil particles is 10.1 t per ha per year or higher). 22.9% of agricultural land is potentially endangered by wind erosion;[44] 2.8% of agricultural land classified as soil most at risk. Areas in South Moravia and the Bohemian Elbeland are most at risk of wind erosion. In 2019, 426 erosion events were registered in the Czech Republic (276 in 2018). Most erosion events occur in single crop fields that have no anti-erosion protection according to GAEC standards, and especially on soil without cover or with uncultivated crops. The latest available model data shows that 90.3% of the territory in the EU28 is at risk of water erosion. The most endangered soil is mainly in southern Europe (Italy, Slovenia, and Greece). Wind erosion is also a serious problem, especially in many areas of Denmark, the east of England, north-west France, northern Germany, and the east of the Netherlands. It is estimated to affect around 9.6% of the EU28 territory. The highest annual loss of soil productivity due to erosion is recorded in Slovenia (3.3%) and Greece (2.6%). The lowest is in Denmark and Finland (0.0003%). The figure for the Czech Republic is 0.1%.[45]

**Organic farming** is one way to maintain and improve the fertility and ecological functions of the soil. Support from subsidy schemes has significantly increased the acreage of organically farmed land since 2000. It expanded from 165.7 thous. ha in 2000 to 541.0 thous. ha in 2019 (Chart 15). There was a slight year-on-year increase by 2.1 thous. ha. The share of organically farmed land in the total land registered in the LPIS system in 2019 was 15.2%,[46] thus achieving the goal set in the action plan for the development of organic farming in 2016–2020. Permanent grasslands have long had the largest share in the structure of organically farmed land, accounting for 82.1% of the total structure of organically farmed land use in 2019. The second largest share, by area, of organic land is held by arable land, accounting for 16.7% in 2019. The remainder of the area of organic land, i.e. 1.2%, comprises permanent crops (vineyards, orchards, hop gardens) and the "other" category. Although permanent grassland plays an important role in the landscape and is used for organic livestock farming, the share of other categories (especially arable land) needs to be increased in the future, mainly in order to increase organic food production and on account of sustainable farmland management and use.

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[43] *The calculation of the average long-term soil loss (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 equation inputs (regionalised by climate): rainfall erosivity factor (R), soil erodibility factor (K), slope length factor (L), slope gradient factor (S), cover and management factor determined by climatic regions (C), and the erosion control practice factor (P).*

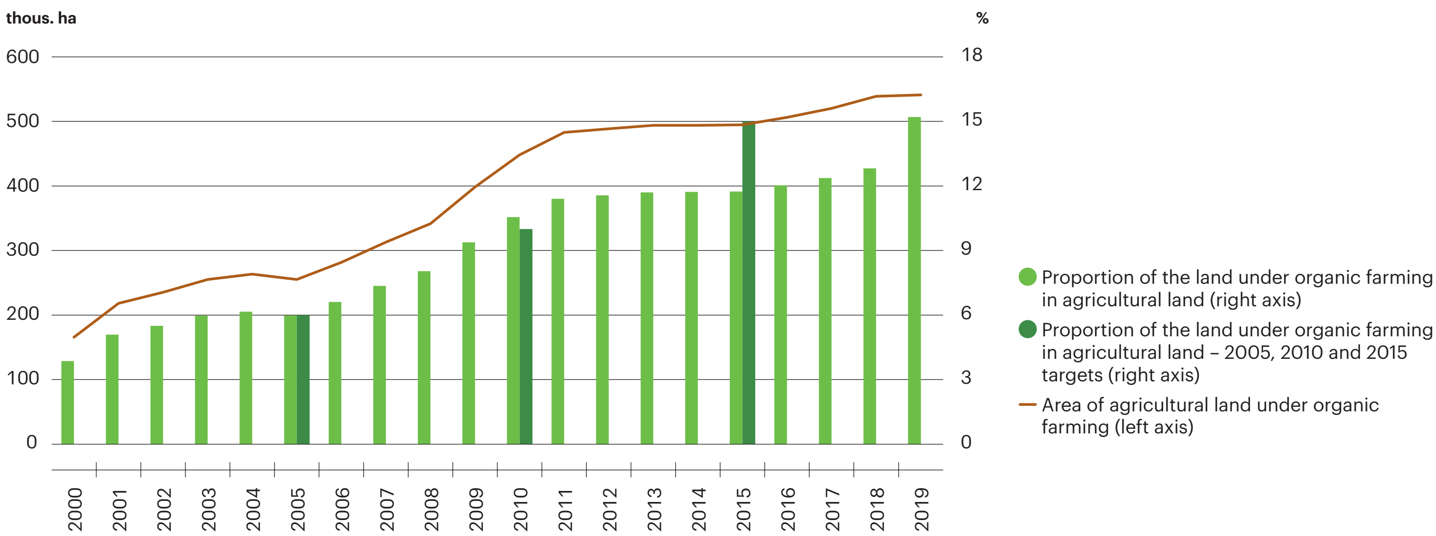
[44] *The methodology for determining the potential threat posed to soil by wind erosion is used. Data on climatic regions (the sum of daily temperatures above 10 °C, average moisture security in the growing season, probability of the occurrence of dry growing seasons, average annual temperatures, total annual precipitation) and data on the main soil units (genetic soil type, pedogenic substrate, granularity, skeletality, degree of hydromorphism), taken from farmland classification records, were used. The result is expressed as the climatic region factor multiplied by the main soil unit factor.*

[45] *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.*

[46] *In 2019, the methodology was changed. Since 2019, the share of organically farmed land relative to the total land registered in the LPIS system has been assessed. Previously, the share relative to the total acreage of agricultural land was assessed.*

**Chart 15**

**Area and share of organically farmed land in agricultural land in the Czech Republic [thous. ha, %], 2000–2019**




*Until 2018 (inclusive), the share of organically farmed land was calculated relative to total agricultural land. Since 2019, the share of organically farmed land relative to the total land registered in the LPIS system is calculated.*

*Data source: Ministry of Agriculture*

As organic farming has developed, the number of organic farms has increased. The number of organic farms has risen from 563 in 2000 to 4,690 in 2019. In 2019, there were 94 more registered farms than in 2018. There were 427.3 thous. organically farmed animals in 2019. Cattle farming was by far the most common, with a share of 61.5%. The number of organic food producers is constantly increasing. There were 75 organic food producers in 2001, rising to as many as 826 in 2019. Despite this long-running increase in the number of producers, the share of organic food in the total consumption of food and beverages was still only 1.5% in 2018.[47] Although organic farming has been developing in the EU for a long time, in 2018[48] the share of organically farmed land accounted for just 7.5% of all land farmed in the EU28.

## Detailed data sources

https://issar.cenia.cz

[47, 48] *Data for the year 2019 were not available at the time of publication because of the methodology used to process them.*


# 7 Industry and energy

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Extraction of raw materials |  |  |  |
| Industrial production |  |  |  |
| Final energy consumption |  |  |  |
| Energy intensity of the economy |  |  |  |
| Electricity and heat generation |  |  |  |
| Renewable energy sources |  |  |  |
| Contaminated sites |  |  |  |

The extractive, industry and energy sectors have a significant impact on the environment in the Czech Republic. Mining scars the landscape and changes the natural habitats of animals and plants. Industrial production emits pollutants into the air and surface waters. This all affects the health of living organisms, including humans.

The Czech Republic's rich deposits mean that the **extraction of raw materials** has a long-standing tradition here and steers the industrial focus of the country. In the reporting period since 2000, the extraction of raw materials in the Czech Republic gradually decreased by 38.6 mil. t to 122.7 mil. t in 2019. This also reduced its impact on the environment. Raw building materials are extracted most in the Czech Republic (64.0 mil. t in 2019). The most important commodities in this respect are building stone and gravel. Developments in the extraction of building materials mirror developments in construction output. In the extraction of energy feedstocks (40.7 mil. t in 2019), lignite and hard coal play a strategic role in the Czech Republic. This mining covers domestic consumption and is partly intended for export. The largest volumes of non-metallic minerals (18.0 mil. t in 2019) extracted in the Czech Republic are limestone and raw cement materials.

After extraction operations have been brought to a close, the deposits are gradually **reclaimed** to reduce the area impacted by extraction. In 2019, the Czech Republic had 441 $km^2$ of land registered for extraction, 65 $km^2$ was being reclaimed, and the reclamation of 4.6 $km^2$ was completed in that year.

**Industrial production** is also linked to the extraction of mineral resources. After five years' growth, industrial production dipped by 0.2% in 2019.

The **emission burden from industry** is gradually decreasing. In the long-term 2000–2018 time frame,[49] there is a clear downtrend in emissions of all pollutants from industry, with the exception of CO. This can be ascribed to the pressure exerted on industrial plant operators to constantly improve their technology and operate plants with minimal emissions and with minimal material and energy intensity. CO emissions fluctuating, depending on the volume of iron and steel production, which accounts for the vast majority of emissions of CO.

Energy consumption is closely linked to industrial production. **Final energy consumption** in the Czech Republic has fluctuated around 1,000 PJ since 2010. The updated State Energy Concept's target not to exceed 1,060 PJ by 2020 is being met. In 2018,[50] final energy consumption in the Czech Republic was 1,017.2 PJ, a 1.2% year-on-year decrease. In 2010, this value was 1,016.7 PJ, so it remains stagnant (a 0.1% difference).

Breaking final energy consumption down by sector, the highest (and a very similar) level of consumption is in three sectors: households (29.5% of total energy consumption in 2018), transport (27.4%) and industry (26.7%). Household energy

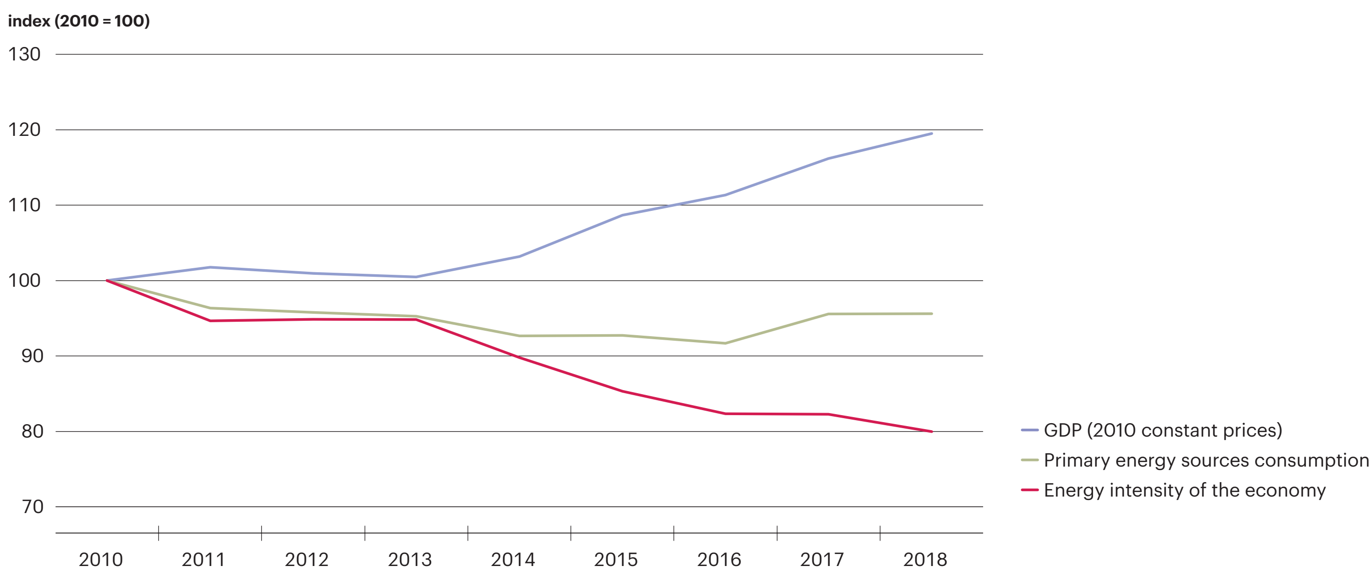
[49, 50] *Final data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

consumption depends very much on temperatures in the heating seasons, as households use most energy for heating. Energy consumption in transport is the only sector to reporting a rising trend. This is partly due to rising fuel consumption and expanding passenger and air transport. The high levels of energy consumed by Czech industry are a historical throwback, as the country's abundant mineral resources mean that industrial production is oriented towards energy-intensive heavy industry and engineering. In other sectors (agriculture, construction, other) energy consumption is stagnant or gradually declining.

The consumption of primary energy sources stagnated year-on-year in 2018,[51] even though gross domestic product increased in this period (by 2.8%). The **energy intensity of the economy** thus came to 380.4 MJ.(1,000 CZK)$^{-1}$ (in 2010 constant prices), a 2.8% year-on-year fall. Since 2010, energy intensity has decreased by 20.0% overall (Chart 16).

**Chart 16**

**Energy intensity of GDP in the Czech Republic [index, 2010 = 100], 2010–2018**




*Data for the year 2019 were not available at the time of publication.*

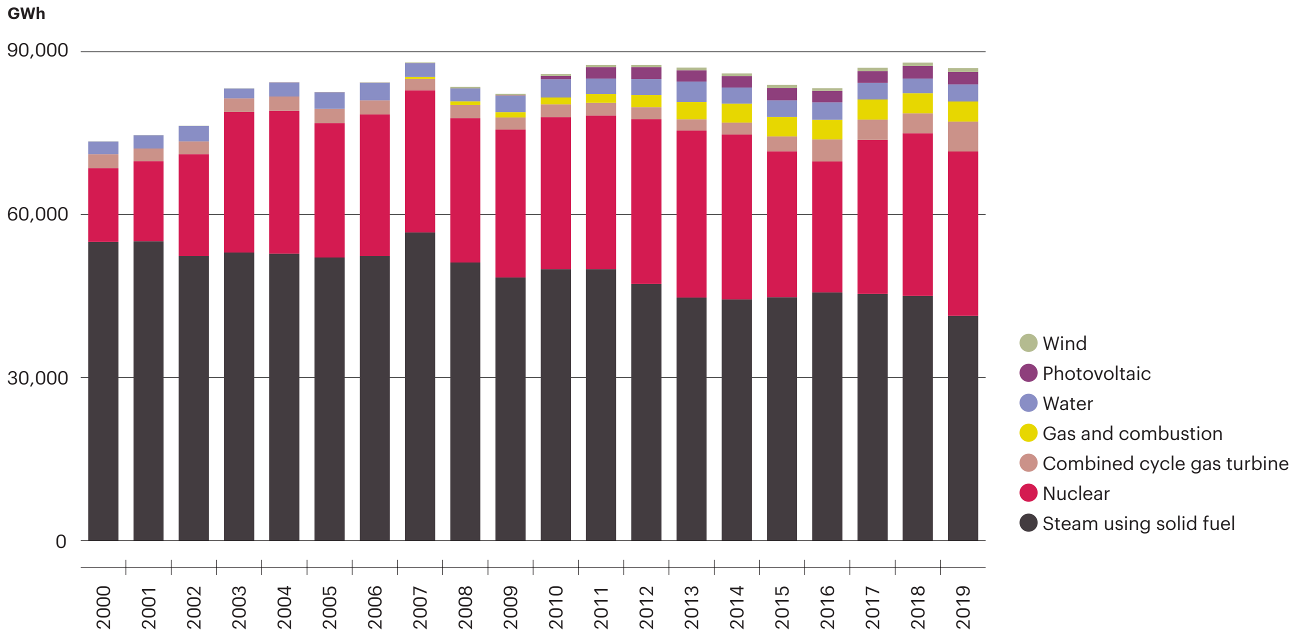
*Data source: Czech Statistical Office, Ministry of Industry and Trade*

**Electricity and heat production** depends on what demand there is for it; it is also closely aligned to consumption. Total gross electricity production has fluctuated without any clear trend since 2011. In 2019, it fell by 1.1% year-on-year to 86,988.7 GWh (Chart 17). In 2019, 18.4% more electricity was produced than in 2000. The structure of energy sources in the Czech Republic is gradually evolving. The share of coal, historically the country's mainstay because of the abundant deposits here, in the energy mix is shrinking (in 2019, lignite accounted for 40.4% of electricity production, hard coal for 2.5%). Coal is gradually being displaced by nuclear energy (34.8%) and renewable sources (11.5%).

[51] *Data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

Chart 17

**Electricity production by type of power plant in the Czech Republic [GWh], 2000–2019**




*Data source: Energy Regulatory Office*

Last year, **electricity produced from renewable sources** broke through 10 TWh for the first time. In 2019, 10,051.3 GWh was produced from RES. After five years of relative stagnation, this translated into a more distinctive 6.9% year-on-year increase. The amount of RES electricity is relatively evenly distributed between four main sources, which each have a share of more than 20%, and two smaller sources. Biogas (25.2%) accounted for the largest share of RES electricity production in 2019, followed by biomass (23.9%), photovoltaics (23.0%) and hydropower plants (20.0%). Electricity was generated on a smaller scale by wind turbines (7.0%) and from waste (1.0%). Electricity production from biogas decreased year-on-year (by 3.1%). Electricity production from photovoltaic power plants was also down (by 1.2%). Electricity produced from other renewable sources, however, rose on 2018, with hydropower plants leading the way (rising by 23.4%) thanks to more favourable hydrometeorological conditions (precipitation in the Czech Republic was 76% of the long-term average in 2018, but increased to 92% in 2019). Wind turbines' electricity production rose by 14.9% on the strength of an increase in installed capacity.

The Czech Republic is edging towards its indicative targets for RES. The Czech Republic's state environmental policy has adopted a target from an EU directive,[52] i.e. a 13% share of RES in gross final energy consumption by 2020. In 2018,[53] the Czech Republic reported a figure of 15.2%, the indicative target having been met back in 2013. A second target, stemming from the updated State Energy Concept, is to achieve an 18–25% share of RES in electricity production by 2040. In 2019, this share was 11.6%.

As in previous years, the Czech Republic exported more than imported in its **foreign trade** in electricity in 2019. 24.1 TWh of electricity was exported, while imports amounted to 11.0 TWh. The balance of electricity exports and imports for the full year was therefore 13.1 TWh, corresponding to 15.1% of the total amount of electricity produced (86,988.7 GWh). The value of the balance is 5.8% lower than in 2018.

**Heat production** in 2018[54] mainly came from the burning of solid fossil fuels, i.e. in particular lignite and black steam coal (55.1%) and natural gas (28.9%). This encompassed both the production of heat for sale, i.e. for district heating systems, and production in buildings' own boiler rooms, at housing cooperatives, etc. The total amount of heat produced decreased by 4.3% year-on-year to 116.4 PJ because the heating season was warmer than in the previous year. Heat produced from solid

[52] *Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources*

[53, 54] *Data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in February 2021 at the earliest.*

fossil fuels went down by 6.6% year-on-year. Heat produced from natural gas fell by 0.8% year-on-year. Heat production from solid fossil fuels and natural gas has long been following a gentle downward trajectory, whereas the share of renewable sources and biofuels has been slowly rising.

Contaminated sites and brownfields manifest the negative consequences of economic activity in industry, energy, and elsewhere. The fallout from activities in these sectors therefore needs to be addressed by reclaiming and remediating the affected sites. It is not known exactly how many **contaminated sites** there are in the Czech Republic, but estimates place the figure at more than 13,000 contaminated sites.[55] There are ongoing efforts to get them mapped and inventoried, mainly so that they can then be **remediated**. This will reduce their number and mitigate the potential risks to ecosystems and human health. Between 2010 and 2019, 590 contaminated sites (of which 221 in 2019) were remediated in the implementation of remedial actions. A further 89 remedial actions were brought to an end without achieving full compliance (of which 27 sites in 2019).

The remediation of contaminated sites in the Czech Republic is mainly **financed** from the funds of the Ministry of Finance (under “Environmental Agreements”), from financial resources of individual ministries, and from European funds drawn via operational programmes, especially the **Operational Programme Environment**. The total costs under the 6$^{th}$ call for specific objective 3.4, and more precisely the 99$^{th}$ call under the Operational Programme Environment (August–October 2019), were CZK 687 mil.

**Internationally**, despite a significant long-term decline in the energy intensity of the Czech economy, which came to 6.1 TJ.(mil. EUR)$^{-1}$ in 2018,[56] this figure is above average compared to other EU28 countries. The EU28 average was 4.2 TJ.(mil. EUR)$^{-1}$. This can mainly be attributed to the higher share of industry in GDP in the Czech Republic.

Because of the availability of its energy sources, the Czech Republic is a major exporter of electricity in Europe; only France, Germany and Sweden had a higher balance in 2018.[57]

## Detailed data sources

https://issar.cenia.cz

[55] *In 2019, the original Evidence System of Contaminated Sites database was merged with the Spatial Analysis Data Register and other databases kept by other ministries to record contaminated sites within their remit. Indications about the potential presence of contaminated sites, identified by CENIA after studying remote sensing maps, were also added to the database. This expansion has increased the number of records on sites (this also applies to remediation). The inventory process itself has also seen the number of sites rise.*

[56, 57] *Data for the year 2019 were not available at the time of publication because of the methodology used to process them. They will be published in June 2021 at the earliest.*

# 8

# Transport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| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Transport performance and infrastructure | 😐 | 😐 | 😐 |
| Energy and fuel consumption in transport | ☹ | ☹ | 😐 |
| Emissions from transport | 😐 | 😐 | 😐 |
| Noise pollution burden of the population[58] | N/A | 🙂 | N/A |

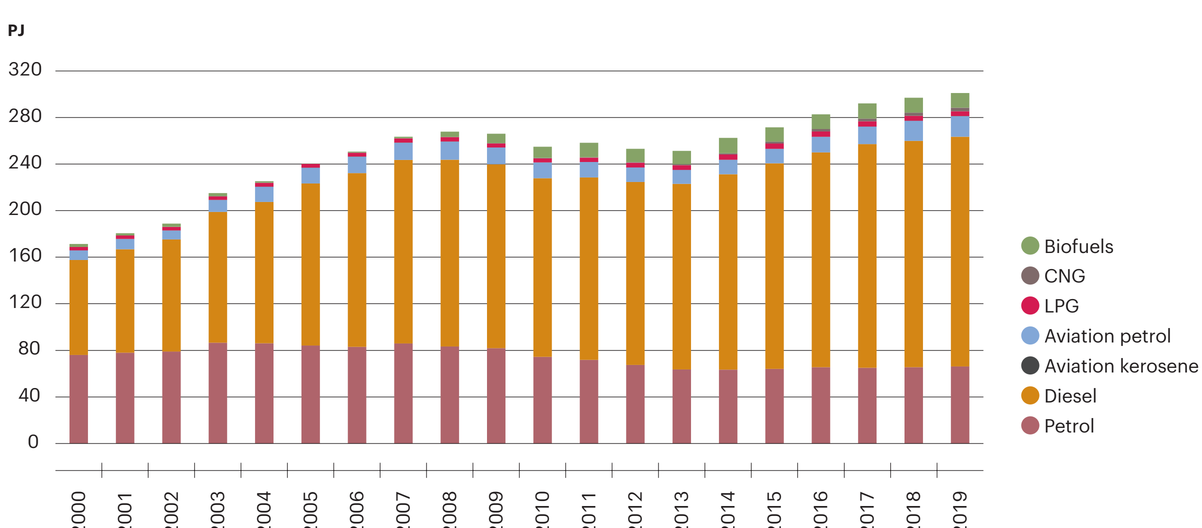
The dynamics of environmental burden from transport depends particularly on developments in the transport performance of passenger and freight transport and the share of environmentally friendly modes of transport in the structure of transport performance. **Passenger transport performance** reported a growing trend between 2000 and 2019, when it increased by 31.1%. In 2019, it rose by 2.3% year-on-year. Developments in passenger transport were supported by economic growth, especially at the beginning and end of this period. The share of public transport in the total transport performance of inland passenger transport modes was relatively stable in the period under review (33.0% in 2019). This was well above average for a European country. Railways, among the most environmentally friendly modes of transport, recorded significant growth in transport performance and the number of passengers transported after 2010.

**Freight transport performance** in the Czech Republic between 2000 and 2019 decreased by 4.8%. The share of road transport in total freight transport performance in 2019 was 67.5%. Although international road transport decreased (in national statistics, including performance abroad) at the end of the reporting period, the performance of domestic road transport continued to grow (by 11.1% in 2012–2019), as did the performance of foreign carriers in the Czech Republic (transit). The performance of environmentally friendly modes of freight transport (rail and water transport) is stagnating. The share of these modes in the structure of freight transport performance is not increasing.

**Energy consumption in transport** increased by 75.6% between 2000 and 2019 (Chart 18). In 2019, it rose by 1.4% year-on-year to a total of 301.2 PJ (excluding electricity consumed by electric modes of transport). Fossil energy sources accounted for 95.8% of total energy consumption in 2019. As such, the carbon intensity of transport remains very high. Diesel consumption went up by 150.2% to 4.5 mil. t between 2000 and 2019. Petrol consumption kept to a slightly declining trajectory in the reporting period (it dropped by 15.4%), but towards the end of the period there was an increase in demand for petrol as the share of petrol propulsion among cars expanded. Among alternative fuels of fossil origin, the consumption of CNG is growing sharply. In 2019, it increased by 19.3% year-on-year to 90.4 mil. $m^3$.

**Chart 18**

**Energy consumption in transport, by fuel, in the Czech Republic [PJ], 2000–2019**




*Data source: Transport Research Centre*

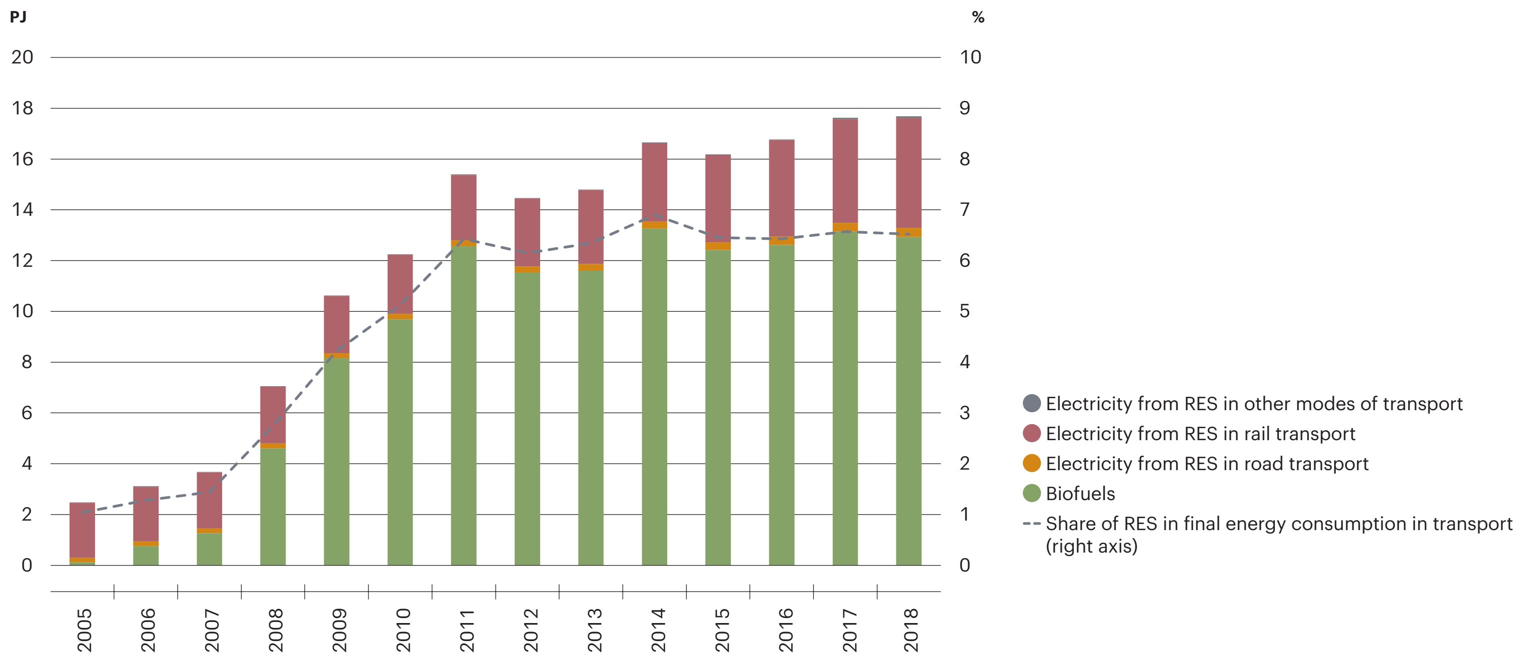
[58] *In accordance with the requirements of Directive 2002/49/EC, strategic noise mapping data is acquired at five-year intervals (in "rounds"). The data obtained in the third round of strategic noise mapping are for 2017. They are compared to the second round of mapping (i.e. data for the year 2012) in order to determine the trend.*

The **most energy-intensive mode of transport** is road transport, accounting for 92.8% of total energy consumption in transport in 2019, excluding the consumption of electricity by the electric traction of railways and public transport. Passenger cars, a mode of transport with very little energy efficiency, accounted for 59.0% of total energy consumption in transport in 2019.

The **consumption of renewable energy sources** (RES) in transport in the Czech Republic in 2018[59] came to 17.7 PJ, or 6.5% of final energy consumption in transport (Chart 19). The National Renewable Energy Action Plan's target, aiming for 10% of energy from renewable sources in transport by 2020, was not met in 2018. In 2018, biofuels took up the largest share in the consumption of RES energy in transport, i.e. 73.1%. The share of RES electricity consumed in rail transport was 24.5%. RES electricity in road transport accounted for just 2.0%.

**Chart 19**

**Consumption of energy from RES in transport, share of RES in energy consumption by the transport sector in the Czech Republic [PJ, %], 2005–2018**




*Data for the year 2019 were not available at the time of publication.*

*Data source: Ministry of Industry and Trade, Eurostat*

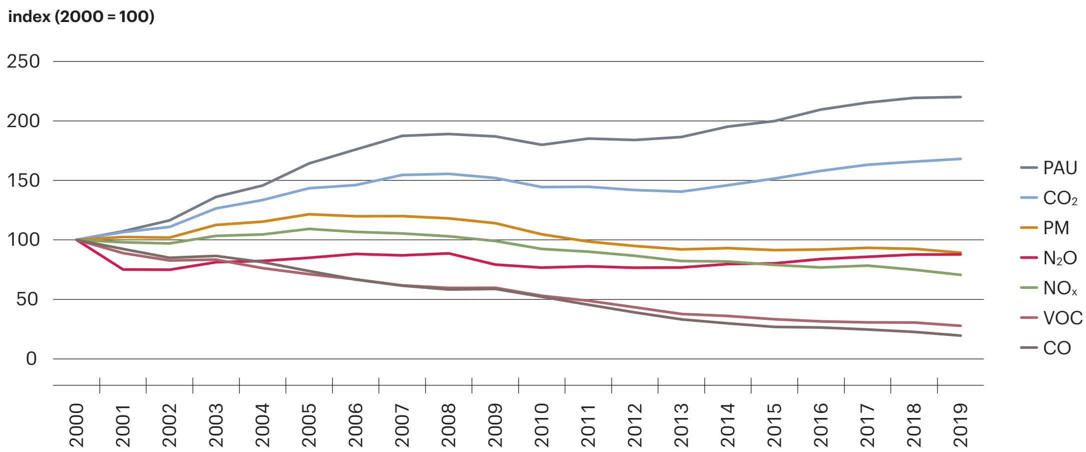
The use of **alternative fuels and propulsion** in transport in the Czech Republic remains marginal. Only public transport has recorded growth of any significance. In 2019, there were 636 newly registered electric vehicles (a 2.9% year-on-year increase), which is only 0.3% of the total number of registrations of new passenger cars. The number of registrations of new passenger hybrid cars almost doubled year-on-year, rising to approximately 8.4 thous. Their market share increased to 3.3%. The use of CNG propulsion is becoming more widespread. In 2019, the number of CNG passenger cars increased by 20.4% to 20.7 thous. The number of CNG buses rose by 10.2% to 1.2 thous. In urban public transport, 21.2% of buses in operation were powered by CNG or LPG in 2019. There were also 46 electric buses, the numbers of which are growing rapidly.

**Pollutant emissions** from transport, except for PAHs, are declining. Technological innovations and the introduction of increasingly stringent emission standards for newly registered vehicles have been reflected in these developments. Between 2000 and 2019, $NO_x$ emissions from transport decreased by 29.4%, VOC emissions by 72.2%, CO by 80.4% and particulate matter (PM) emissions by 10.7% (Chart 20). In 2019, emissions of these pollutants continued to decrease, with the most significant year-on-year decrease being reported for CO emissions, which were down by 13.4%. However, growth in fuel consumption saw PAH emissions more than double between 2000 and 2019 (by 120.1%) and rise by 0.3% year-on-year. **Greenhouse gas emissions** from transport are also growing, with $CO_2$ emissions rising by 68.0% between 2000 and 2009 and by 1.3% in 2019.

[59] *The data are processed according to the SHARES methodology so that the requirements under Directive 2009/28/EC can be assessed. The processes entailed in data preparation and reporting to Eurostat have delayed the publication of data.*

**Chart 20**

**Emissions of pollutants and greenhouse gases from transport in the Czech Republic [index, 2000 = 100], 2000–2019**




*Data source: Transport Research Centre*

The **biggest source** of pollutants and greenhouse gases in transport is individual car transport. In 2019, this accounted for 82.9% of total transport CO emissions, 48.5% of $NO_x$ emissions and 57.9% of $CO_2$ emissions. About a third of the total transport emissions of PM, $NO_x$ and PAHs came from road freight transport.

According to the results of the 3rd round of the **Strategic Noise Mapping** from 2017, approximately 2.5 mil. people in the Czech Republic are exposed to road traffic noise above 55 dB, measured according to the all-day noise level indicator $L_{dvn}$. Of these, 213.6 thous. persons were exposed above the limit value, which defines the areas for which noise abatement action plans have been created. Noise at night (the $L_n$ indicator) above 50 dB affected about 1.5 mil. inhabitants. Of these, 279.6 thous. were exposed to levels above the limit value of 60 dB. The largest noise level was identified in urban agglomerations with populations of more than 100 thous. Compared to the results of the last noise mapping (in 2012), the total number of inhabitants exposed to a high level of noise decreased, in the case of the $L_{dvn}$ indicator above 70 dB by 19.3%. Although this conclusion needs to be interpreted in the context of methodological changes in noise mapping, it can be assumed that a decrease in high noise exposure and the associated health risks has been proven.

The **development of road infrastructure** reduces the population's emission and noise exposure by diverting transit traffic away from settled areas, but this comes at the cost of land expropriation and landscape fragmentation. In 2019, three sections of the D1 and D3 motorways, running for a total length of 33.1 km, were opened (at an investment cost of CZK 7.9 bil.), increasing the total length of the motorway network to 1,276 km. In addition, 5 bypasses with a total length of 18.8 km were put into operation on Class 1 roads. In 2019, noise barriers in the road infrastructure were extended by 23.8 km to a total of 436.2 km. In 2019, 247.7 ha of agricultural land and 7.0 ha of forest land were expropriated for road infrastructure. Since 2000, 6.1 thous. ha of agricultural land and 569.7 ha of forest land have been expropriated.

From an **international point of view**, the burden placed on the environment and the climate system by transport in the Czech Republic is in line with the European average. In 2018,[60] specific greenhouse gas emissions from transport per capita amounted to 1.8 t $CO_2$ eq.capita$^{-1}$; the EU28 average was 1.9 t.capita$^{-1}$. The Czech Republic has the second lowest share of transport in total greenhouse gas emissions (15% in 2018) after Estonia, but this indicator is influenced by high emissions from stationary sources in the Czech Republic compared to other European countries.

The use of RES in transport in the Czech Republic (6.5% of energy from RES) is below the EU28 average (8.0% of energy from RES). The target of 10% of energy from RES in transport by 2020 had been met only by the two Nordic EU28 countries (Sweden and Finland), as well as by Norway and Iceland, as at 2018.

## Detailed data sources

https://issar.cenia.cz

[60] *Data for the year 2019 were not available at the time of publication.*


9
Material flows
AUTOSERVIS KADI

| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Domestic material consumption | 😐 | 😐 | 😐 |
| Material intensity of the economy | 🙂 | 🙂 | 😐 |

The evaluation of material flows[61] quantifies the flows of materials through the economic system. It allows for a comprehensive assessment of the economy's demand for natural resources and the degree of environmental burden associated with the acquisition, consumption and processing of raw and other materials.

In 2019, **domestic material consumption** (DMC[62]) in the Czech Republic increased by a modest 0.4% (0.7 mil. t) year-on-year to 170.3 mil. t. After 2000, DMC fluctuates, devoid of any significant trend, depending on economic developments and the share of materially intensive sectors in GDP. Between 2013 and 2019, there was a correlation between DMC and economic growth and the associated growth of industrial and construction production. In this period, DMC increased by 9.8%. At the beginning of the 1990s, DMC fell sharply as the economy was restructured. DMC in 2019 stood at 57.2% the level of 1990, which is a positive long-term development from an environmental point of view.

**Domestic extraction used** (DEU), which is a direct measure of the environmental burden from the extraction and consumption of raw materials, mirrored DMC in the period under review. The DEU of fossil fuels is constantly falling (there was a 40.3% decrease between 2000 and 2019) and reflects the decline of coal mining in the Czech Republic. In contrast, at the end of the reporting period there was a significant increase in the DEU of biomass from forestry. In the last five years monitored (2014–2019) the extraction of biomass from forestry almost doubled (it increased by 91.2%, and was up year-on-year by 17.7%). This can be attributed to efforts to combat bark beetle outbreaks in forests.

The volume of **foreign trade** in raw materials, materials and products is increasing. Between 2000 and 2019, **physical imports** went up by 82.2%, and physical exports by 86.6%. Growing imports and their share in DMC (47.7% in 2019) indicate an increase in the **Czech Republic's import dependence**, especially on liquid and gaseous fossil fuels (influenced by developments in the transport sector) and metal ores. The rising volume of imports (raw materials and products) and exports (especially finished products, e.g. cars) is indicative of positive economic developments in the manufacturing industry in this period (especially the automotive and related industries), but also suggests the growing environmental burden of metal processing. Compared to 2000, imports of metallic minerals had increased by 82.6% by 2019, while exports were up by 106.8%.

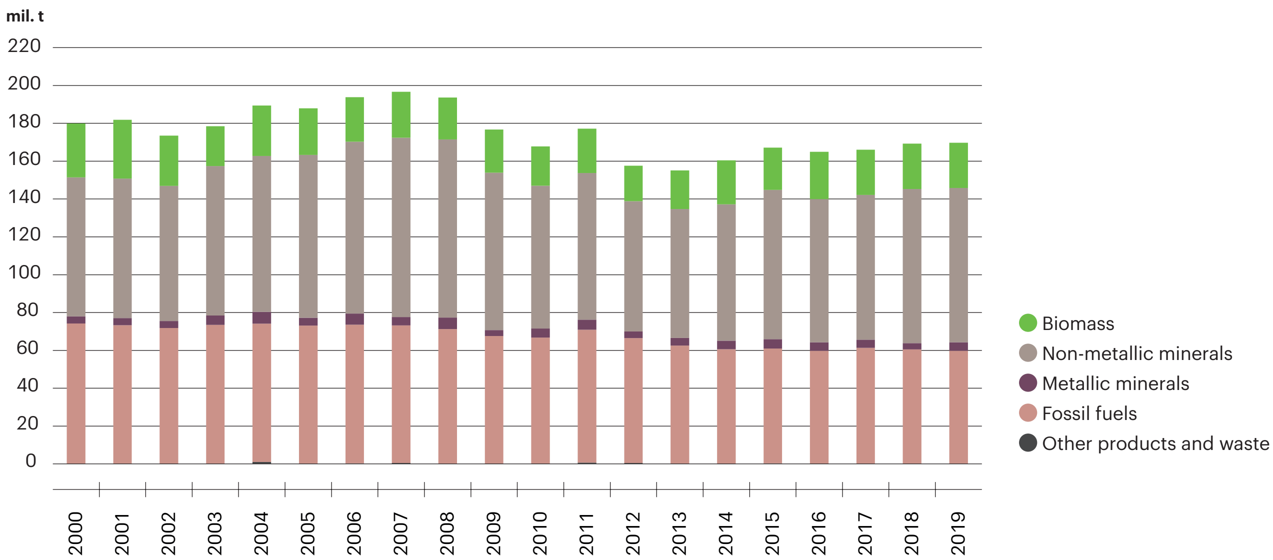
In 2019, measured by **material group**, non-metallic minerals (47.9%) and fossil fuels (35.1%), had the largest share in the DMC structure (Chart 21). Between 2000 and 2019, the DMC of fossil fuels decreased by 19.4%. In the same period, the share of fossil fuels in total DMC went down by about 6 percentage points. From an environmental perspective, this is a positive development as it allows the economy's carbon intensity to be reduced and lessens other environmental burdens associated with the extraction and combustion of fossil fuels. After 2000, the DMC of non-metallic minerals fluctuated. In the last five years monitored (2014–2019), the DMC of non-metallic minerals increased by 13.2% in connection with a rise in construction production. The share of biomass (i.e. renewables) in DMC, the consumption of which creates less of an environmental burden than the consumption of non-renewable resources, was 14.1% in 2019. This is among the lowest in the EU28.

*[61] The evaluation in this section is based on data from the Czech Statistical Office's publication Material Flow Accounts (selected indicators). See https://www.czso.cz/csu/czso/ucty-materialovych-toku-vybrane-indikatory-2014-2019. That publication describes the methodology used for material flow accounts. This methodology is internationally harmonised and the data are reported to Eurostat.*

*[62] DMC is calculated as domestic extraction used minus exports plus imports. This indicates the amount of materials (raw materials, semi-finished products and products) used by the economy for purposes of production and consumption (including the accumulation of materials in construction activities).*

**Chart 21**

## Structure of domestic material consumption in the Czech Republic, by material group [mil. t], 2000–2019

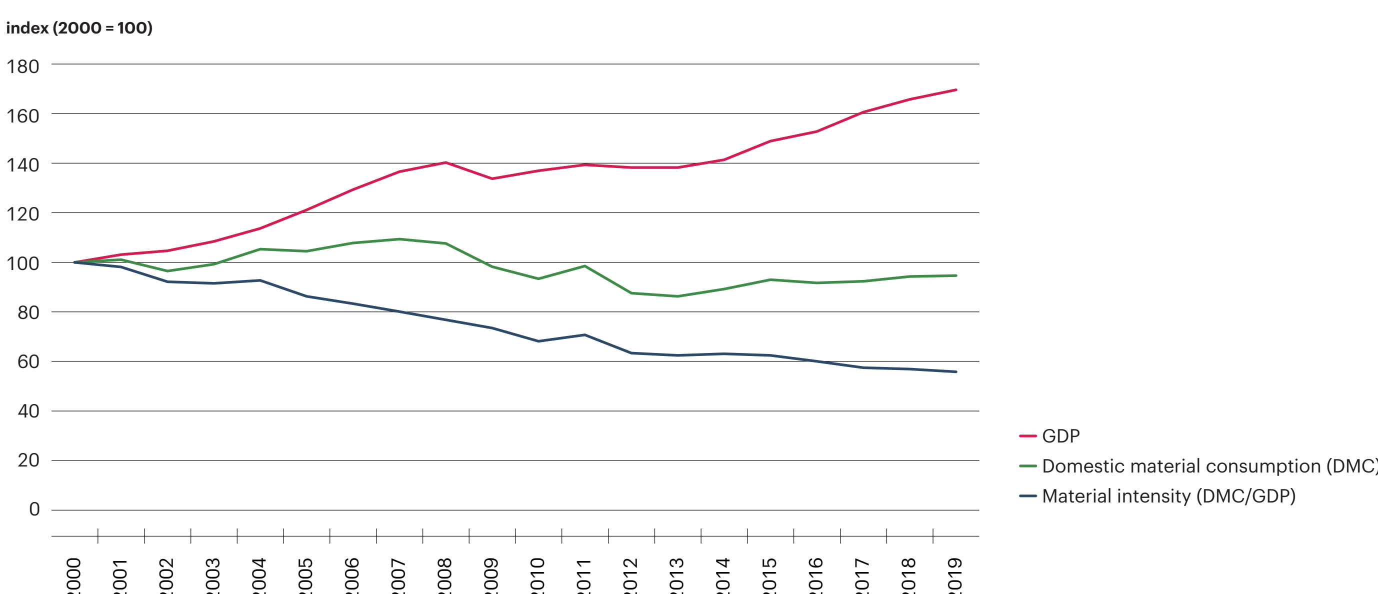



*Data source: Czech Statistical Office*

The **material intensity of the Czech economy** is declining. This indicates that the conversion of material inputs into economic output is becoming more efficient, and that the environmental burden caused by the extraction of raw materials and the consumption of materials per unit of GDP generated is falling. Between 2000 and 2019, material intensity decreased by 44.2% (Chart 22). In 2019, it fell by 1.9% year-on-year to 32.3 kg.(CZK 1,000 of GDP)$^{-1}$, less than a third of the level in the early 1990s. Factors causing a decrease in material intensity after 2000 include a reduction in the share of solid fuels in the energy mix for electricity and heat production, an increase in the use of renewable energy sources and other non-fossil energy sources, and a fall in the energy and material intensity of industry.

**Chart 22**

## Material intensity, domestic material consumption and GDP in the Czech Republic [index, 2000 = 100], 2000–2019



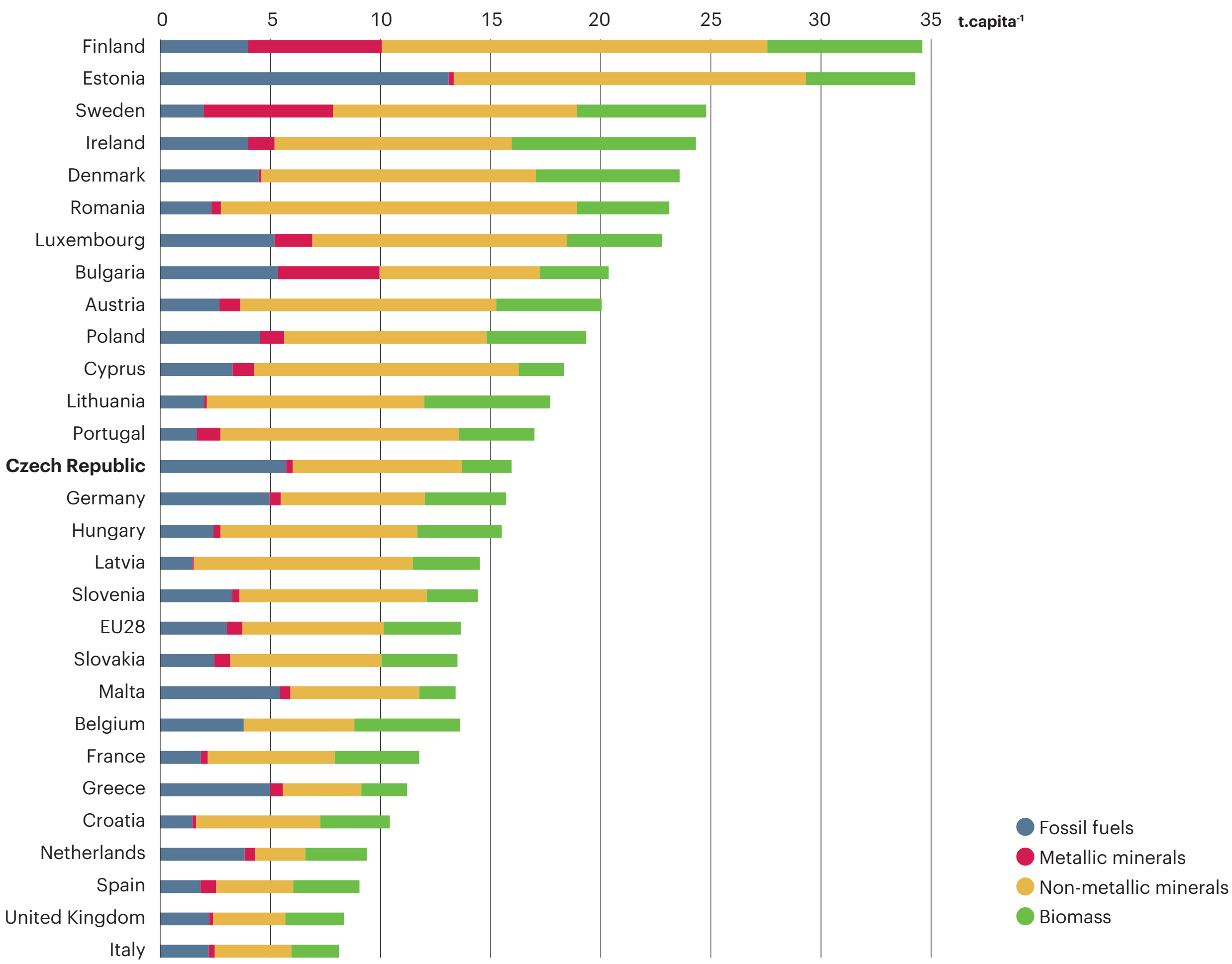

*GDP at 2015 constant prices.*

*Data source: Czech Statistical Office*

In most of the 2000–2019 period, material intensity can be described as **relative decoupling**, i.e. the environmental burden represented by material consumption per unit of GDP decreases, but in absolute terms DMC follows the same trend as the economy (i.e. it increases when the economy grows and decreases when the economy declines). This is connected to the high share of industry in GDP creation in the Czech Republic and to economic developments, which were significantly influenced in this period by manufacturing, especially its more material-intensive industries. **Absolute decoupling**, where the environment burden, expressed as material consumption in absolute terms, decreases despite economic growth (this is the optimal development from an environmental point of view), was rare during the period under review (since 2000). It occurred five times, most recently in 2016.

**Chart 23**

**Domestic material consumption per capita, international comparison [t.capita⁻¹], 2018**




*Data for the year 2019 were not available at the time of publication.*

*Data source: Eurostat*

**Intensity indicators of material flows**, and thus of the specific environmental burden per capita and unit of GDP associated with the acquisition and consumption of materials, is above average in the Czech Republic **compared to other EU28 countries**. In 2018,[63] domestic material consumption per capita in the Czech Republic came to 16.0 t.capita$^{-1}$, which is 16.9% above the EU28 average (Chart 23). In 2018, the Czech economy's material intensity was 0.57 t.(1,000 PPS)$^{-1}$, 29.3% higher than the average material intensity of the EU28 as a whole.

## Detailed data sources

https://issar.cenia.cz

[63] *Data for the year 2019 were not available at the time of publication.*

# 10 Waste

| Overall assessment of the trend | Change since 2009 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Total waste generation | ☹ | ☹ | 😐 |
| Municipal waste generation and treatment | 😐 | 😐 | 😐 |
| Waste treatment structure | 🙂 | 🙂 | 🙂 |
| Packaging waste generation and recycling | 😐 | 😐 | 😐 |
| Generation and recycling of waste from selected products | 🙂 | 🙂 | 🙂 |

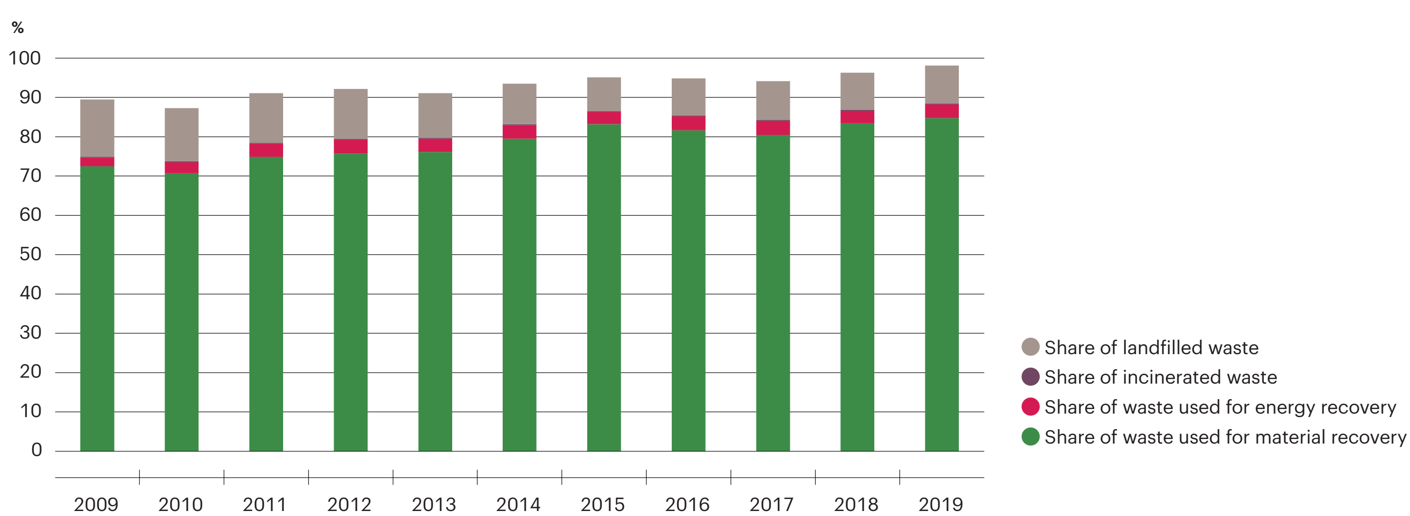
The key trend in waste management is currently to strive to make the transition to a **circular economy**, resulting in the closure of material flows in long cycles. An emphasis is placed on waste prevention, product reuse, recycling and energy conversion instead of mineral extraction and landfilling.

**Total waste generation**, in which the generation of non-hazardous waste plays a significant role (95.3% in 2019), has increased since 2009, rising to 37,362.3 thous. t in 2019. Municipal waste generation also increased in the reporting period, up by 10.4% to 5,879.2 thous. t in 2019. The generation of packaging waste has increased every year since 2009, rising to 1,334.4 thous. t in 2019. Between 2009 and 2019, the generation of hazardous waste decreased to 1,758.5 thous. t.

**Total waste treatment** is dominated by recovery, especially material recovery, the share of which has been increasing for a long time (Chart 24). Between 2009 and 2019, the share of waste used for material recovery increased from 72.5% to 84.8% and the share of waste used for energy recovery rose from 2.2% to 3.5%. The share of landfilled waste is declining in favour of waste used for material and energy recovery (it stood at 9.7% in 2019).

**Chart 24**

**Share of selected methods of waste treatment in total waste generation in the Czech Republic [%], 2009–2019**



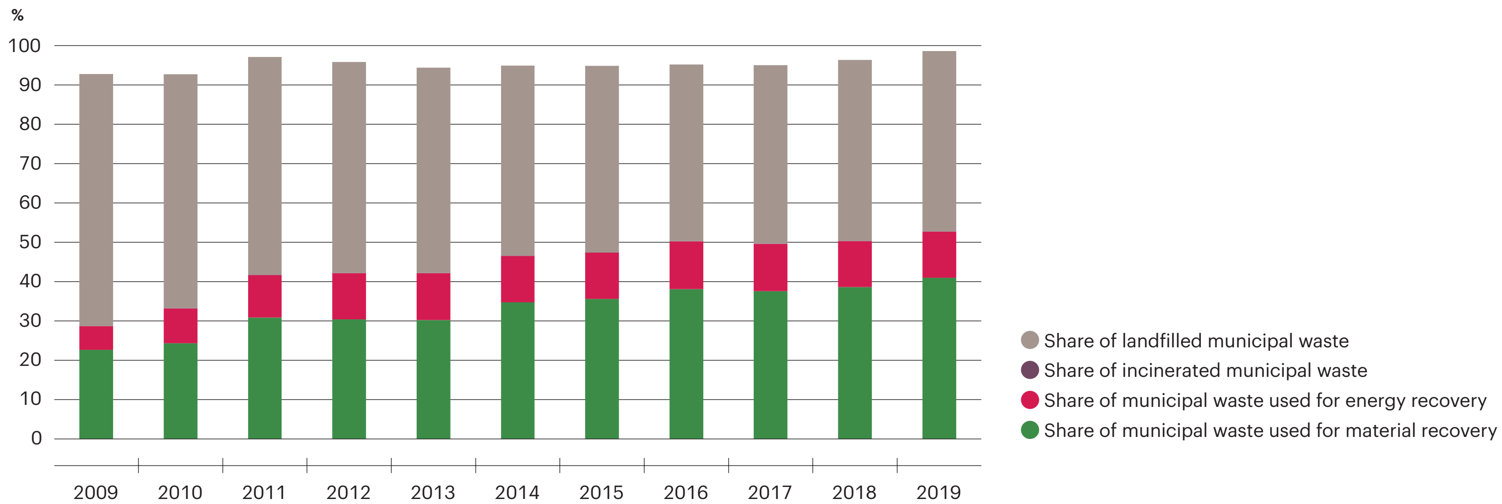

*The data was determined according to the methodology Mathematical presentation of the calculation of the "Waste Management Indicator Set" applicable to the given year.*

*Data source: CENIA*

Landfilling continues to predominate in **municipal waste treatment**. However, since 2009 the proportion of landfilled municipal waste has fallen from 64.0%, decreasing to 45.9% in 2019 (Chart 25). Because of the move away from landfilling, the share of municipal waste used for material recovery is growing, increasing to 41.0% in 2019. At the same time, the importance of municipal waste used for energy recovery has increased compared to 2009 (11.7% in 2019). Nevertheless, the municipal waste treatment situation in the Czech Republic has been unsatisfactory for a long time (landfilling of municipal waste is above the EU28 average, while recycling is below average). The aim is to significantly reduce the share of landfilling in total municipal waste generation and to increase the share of such waste used for material and energy recovery in accordance with circular economy principles and the need to meet European circular economy targets.[64]

**Chart 25**

**Share of selected methods of municipal waste treatment in total municipal waste generation in the Czech Republic [%], 2009–2019**




*The data was determined according to the methodology Mathematical presentation of the calculation of the "Waste Management Indicator Set" applicable to the given year.*

*Data source: CENIA*

**Packaging waste treatment**[65] is developing along positive lines. Material recovery predominates here. The rate of packaging waste recycling has increased since 2009, rising to 71.2% in 2019, and thus met the target[66] for that year with room to spare (65%). The total recovery rate for packaging waste in 2019 was 75.5%. The target for that year (70%) was therefore also met. The share of packaging waste registered in the EKO-KOM system in the total amount of packaging waste generated in 2019 was 92.8% (Chart 26).

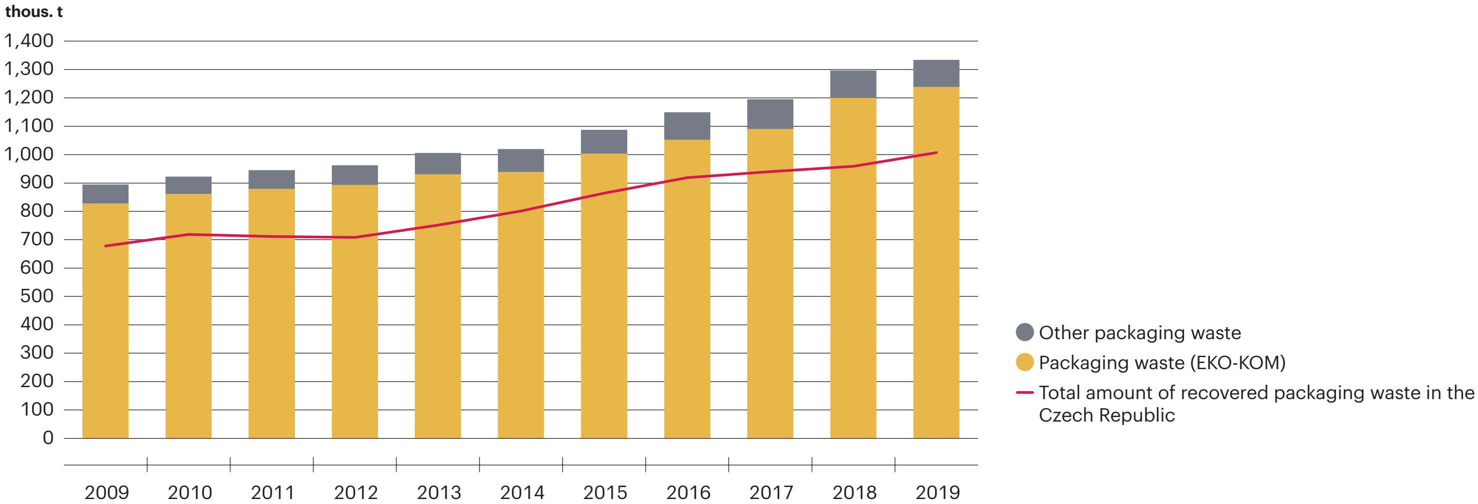
*[64] Municipal waste targets are set out in Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain directives, and in Council Directive 1999/31/EC on the landfill of waste.*

*[65] The treatment of packaging and packaging waste is regulated by Act No. 477/2001 Coll., on packaging and amending certain acts, as amended.*

*[66] Packaging waste targets are set out in Government Regulation No. 352/2014 Coll., on the Waste Management Plan of the Czech Republic for the period 2015–2024, and in Annex 3 to Act No. 477/2001 Coll., on packaging and amending certain acts, as amended.*

Chart 26

**Packaging waste generated (under the EKO-KOM system and others) and the recovery thereof in the Czech Republic [thous. t], 2009–2019**




*Data source: Ministry of the Environment*

Correct waste treatment and operating conditions at facilities intended for waste treatment are regularly **inspected** in the Czech Republic by the Czech Environmental Inspectorate. In 2019, inspectors from the waste management department conducted 3,495 inspections of waste management, packaging and chemicals. Breaking down this number, 1,323 inspections were planned and 2,172 were unplanned. Of these unplanned inspections, 826 inspections were conducted further to a complaint. In 2019, fines totalling CZK 47,549.0 thous. were imposed. This was CZK 3,952.5 thous. more than in the previous year.

The **treatment of selected end-of-life products** (electrical and electronic equipment, batteries and accumulators, end-of-life vehicles, tyres) is making positive progress in the Czech Republic. The rate of their material recovery is increasing. For the most part, the strategic targets[67] for selected products are being met on an ongoing basis.

In 2019, the **take-back level** of electrical and electronic equipment and the separate collection of waste electrical and electronic equipment was 54.2%, short of the 2019 target (at least 55%). The take-back level of tyres in 2019 was 74.1%, meeting the target for that year (35%). However, a further increase in the collection level will be needed to reach the 2020 target (80%). The required 45% take-back level of portable batteries and accumulators in 2019 was also achieved (49.4%).

In relation to selected products, considerable attention is also paid to the **recycling efficiency** targets that need to be achieved by waste batteries and accumulators recycling processes. These targets were met for all groups of batteries and accumulators. In 2019, the recycling efficiency for lead-acid batteries and accumulators was 84.2%. It was 94.1% for nickel-cadmium batteries and accumulators and 62.7% for other waste batteries and accumulators.

Other targets focus on end-of-life vehicles, namely targets for the **recycling, reuse and recovery** of selected end-of-life vehicles. In 2019, the Czech Republic met targets for reuse and recovery to 97.3% and for reuse and recycling to 93.3%.

## Detailed data sources

https://issar.cenia.cz

[67] *Targets for selected products are set out in Government Regulation No. 352/2014 Coll., on the Waste Management Plan of the Czech Republic for the period 2015–2024.*

# 11 Financing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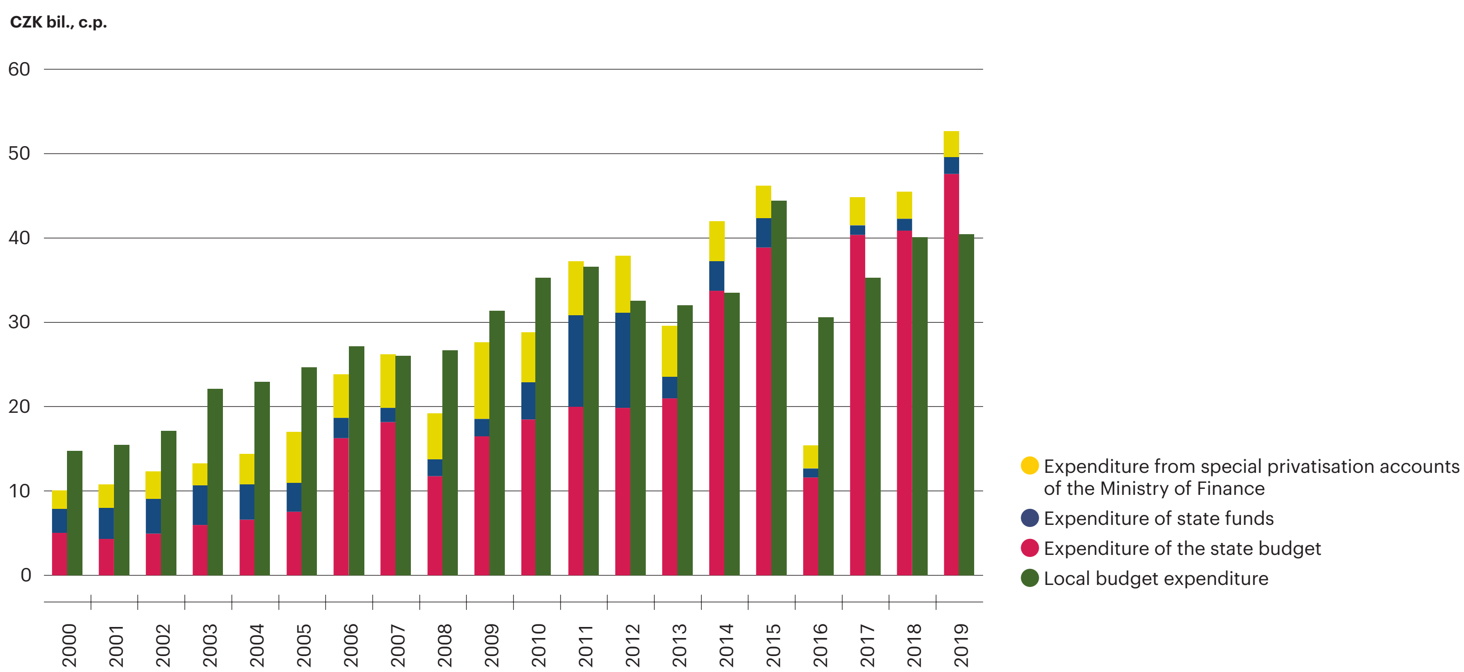
| Overall assessment of the trend | Change since 2000 | Change since 2010 | Last year-on-year change |
|---|---|---|---|
| Environmental protection investments and non-investment costs | ☺ | ☺ | ☺ |
| Public expenditure on environmental protection | ☺ | ☺ | ☺ |

The financing of environmental protection is a basic precondition if the state of individual components of the environment is to be improved. It also articulates the public need for environmental protection at central and regional level. This need can be quantified not only by the volume of funds spent by economic entities from their own resources, but also by the amount of financial support from public sources, e.g. budgets. Public sources of expenditure on environmental protection include national sources, i.e. the **state budget and state funds** (central sources) and the **local budgets of regions and municipalities**, as well as related funds from **European and international sources** earmarked for this purpose.[68]

**Chart 27**

**Public expenditure on environmental protection in the Czech Republic, by type of source [CZK bil., current prices], 2000–2019**




*Part of the public expenditure on the environment from local budgets may be duplications of expenditure from central sources, so it is listed in a separate column.*

*Data source: Ministry of Finance*

In 2019, **expenditure on environmental protection from central sources** increased by 15.8% year-on-year to CZK 52.6 bil. In particular, the volume of funds provided from the state budget increased (by 16.4% to CZK 47.6 bil.). This was partly linked to the implementation of the Operational Programme Environment 2014–2020 (Chart 27). Resources from operational programmes financed by EU funds are interconnected with funds from national public sources in the form of the co-financing or pre-financing of supported projects. Expenditure from state funds, where the State Environmental Fund of the Czech Republic plays a key role, increased by 43.6% to CZK 2.0 bil. In addition to the state budget and state funds, a specific category of central sources of environmental protection financing is the resources of the defunct National Property Fund of

[68] *Information concerning public expenditures is based on the Ministry of Finance budget structure, which has long monitored the funds provided primarily for creating and protecting the environment. As local budget expenditure may also be sources from financial transfers (e.g. from the state budget, state funds, etc.), some of this expenditure is duplicated with expenditure from central sources or European funds. For this reason, expenditure from central sources, local budgets and European or international sources is assessed separately. Therefore, it cannot be summarised.*

the Czech Republic, which are managed by the Ministry of Finance in special privatisation accounts and from which funds of CZK 3.0 bil. were drawn in 2019.[69]

In 2019, **environmental protection expenditure from the local budgets of municipalities and regions**, intended to finance actions that are implemented on an ongoing basis and that fall within the competence of municipalities or regions, increased slightly year-on-year to CZK 40.9 bil. (Chart 27).

**From the perspective of programming focus**, in 2019 the largest proportion of financial support from national sources was channelled into air and climate protection. Here, programmes aimed at promoting thermal insulation, energy savings and changes in heating technologies (e.g. the New Green Savings Programme[70]) continued. Other priority areas of support included water protection and the protection and care of nature and the landscape. Here, most funds were spent on supporting protected parts of nature (e.g. via the Landscape Management Programme and Landscape Natural Function Restoration Programme) and on safeguarding the universal functions of forests. Under local budgets, attention was paid in this area to caring for the appearance of municipalities and public greenery. Finally, priority areas of public support also included waste management, especially the recovery and disposal of municipal waste and waste prevention.

In addition to national subsidy schemes for environmental protection, which are mainly managed by the State Environmental Fund of the Czech Republic, since 2004 public expenditure on environmental protection has also benefited from **direct EU support and the possibility of co-financing projects from other foreign sources**. In particular, these are currently the Financial Mechanisms of the European Economic Area and Norway, the LIFE programmes, Interreg, and the Swiss-Czech Cooperation Programme. The European funds include the Operational Programme Environment, which is the vehicle for most subsidisation. It is the main source for financing environmental protection from EU resources. Another is the Rural Development Programme, which aims, among other things, to restore, preserve and improve natural agriculture-dependent ecosystems.

The total allocation of the **2014–2020 Operational Programme Environment** comprises total eligible expenditure of almost EUR 3.2 bil. (CZK 86.2 bil.). From the beginning of the programming period until 31 December 2019, the Operational Programme Environment's managing authority (the Ministry of the Environment) announced 136 calls. Of these, 20 new calls were announced in 2019 with an allocation of total eligible expenditure amounting to EUR 674.0 mil. (CZK 17.2 bil.). From the beginning of the programming period to the end of 2019, 11,309 project applications had registered in closed calls. Further to a subsequent recommendation by the selection committee, subsidies were approved for 6,602 projects with total eligible expenditure amounting to EUR 3.0 bil. (CZK 77.3 bil.), and 6,284 legal acts entailing total eligible expenditure of EUR 2.8 bil. (CZK 71.6 bil.) were issued. Of this, approximately EUR 1.4 bil. (CZK 36.0 bil.) of total eligible expenditure was financed by the subsidy beneficiaries from the beginning of the programming period. The Operational Programme Environment is also used to finance "boiler subsidies". In 2019, a third call for individual regions was announced with an allocation of total eligible expenditure amounting to approximately EUR 147 mil. (CZK 3.8 bil.). In the two previous calls, the replacement of 60,000 boilers fired by solid fuel had been approved at a total amount of CZK 6.5 bil.

The **2014–2020 Rural Development Programme** also provided support that contributes to the improvement of the environment and includes, in particular, agrienvironment-climate measures, organic farming measures, forestry-environmental and climate services and forest protection, Natura 2000 payments and payments for less-favoured areas. Under these measures, CZK 9.3 bil. was paid out from the 2014–2020 Rural Development Programme in 2019.

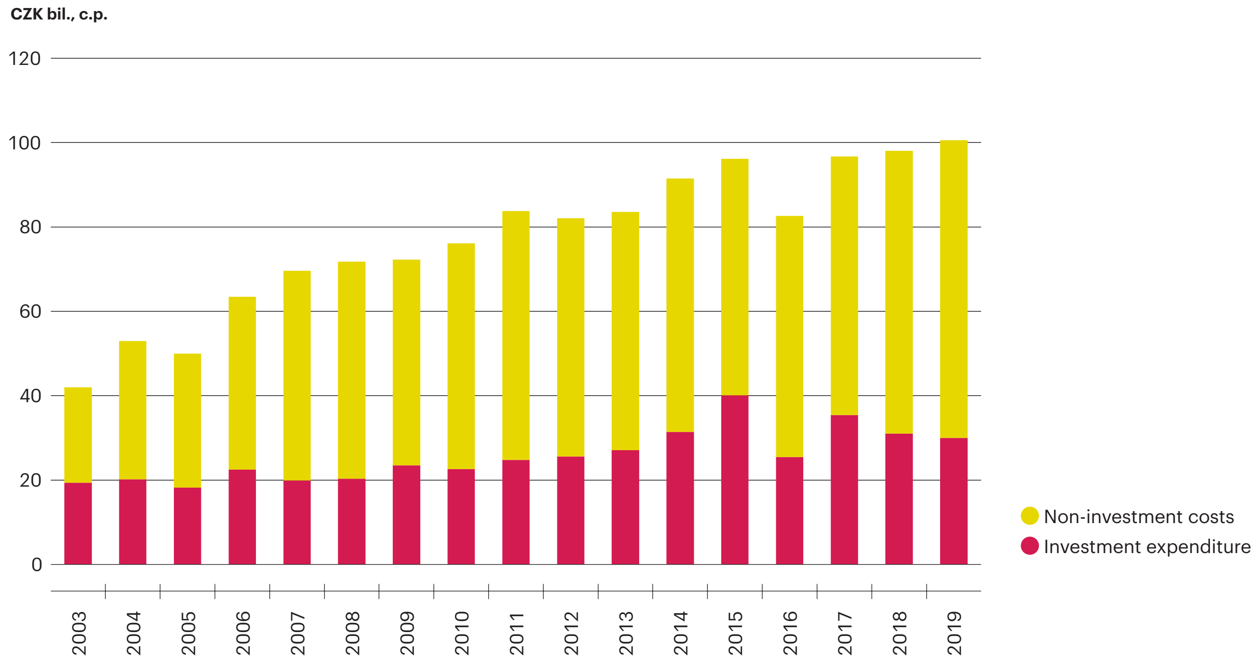
An alternative view of the financing of environmental protection is offered by a Czech Statistical Office statistical survey focusing on **environmental protection investments and non-investment** costs incurred by both the public and corporate (or private) sectors. In 2019, environmental protection investments and non-investment costs increased by 2.5% year-on-year to CZK 100.6 bil. (Chart 28). The steadily rising non-investment costs are the main growth driver. Investments, on the other hand, recorded a slight 3.3% decrease to CZK 30.0 bil. This was mainly related to lower investment activity in waste management. In 2019, investing entities increased the volume of investments financed primarily in the form of credit and loans by CZK 0.7 bil. Financing from their own resources and budgets decreased by CZK 1.4 bil.

*[69] Examples of this expenditure include funds intended to clean up the after-effects of chemical uranium mining in Stráž pod Ralskem, and funds for the Moravian-Silesian, South Moravian, Ústí nad Labem and Karlovy Vary Regions intended to clean up environmental damage caused before mining companies were privatised in connection with the restructuring of the metals industry and the rehabilitation of the land in question.*

*[70] The New Green Savings Programme's administrator and payment unit is the Ministry of the Environment. The State Environmental Fund of the Czech Republic is delegated to carry out certain administrative tasks, especially the selection and evaluation of applications. By the end of 2019, 52,269 applications for support had been submitted under the programme's individual calls, and 33,654 payment requests for approximately CZK 6.8 bil. had been paid.*

Chart 28

**Environmental protection investments and non-investment costs in the Czech Republic [CZK bil., current prices], 2003–2019**




*Data source: Czech Statistical Office*

In terms of **investments**, expenditure on integrated facilities (i.e. pollution prevention) outweighed expenditure on terminal equipment (i.e. pollution removal). With the exception of the protection of biodiversity and the landscape, the programming focus of investments is analogous to the priority areas of public resources described above. In 2019, most investment expenditure was on wastewater management (investments in the renovation and construction of sewers and WWTPs), air and climate protection, and waste management (investments in the collection, transport, recovery, and disposal of municipal waste). By reference to the classification of investing entities' economic activities (CZ-NACE), the sectors of public administration and defence, compulsory social security (32.5% of total investments) and manufacturing (21.7% of total investments) contributed the most to total investments in 2019. They were followed by the energy sector, i.e. the production and distribution of electricity, gas, heat and air conditioning supply (19.3% of total investments) and water supply, including activities related to wastewater, waste and remediation (19.1% of total investments).

**Non-investment costs**, or current expenditure, are keeping to a long-term growth trend. This was confirmed again in 2019, when these costs increased year-on-year by CZK 3.5 bil. (5.2%) to CZK 70.6 bil. Therefore, standing alongside investments, they continued to be a significant part of environmental protection expenditure monitored by the Czech Statistical Office. The largest volume of non-investment costs was spent on the consumption of materials and energy and on wages.

**International comparisons** of environmental protection financing can be used to examine investments in particular. Investments in the Czech Republic have long been above the EU28 average, both within the public and, especially, the industrial sector. While investment in the industrial sector was around 0.25–0.3% of GDP, measured in current prices, in some new Member States (e.g. the Czech Republic and Croatia) in 2017,[71] in many old Member States (Cyprus, Greece, the UK) it fell short of 0.05% of GDP in current prices. Investments in the Czech Republic and in other new Member States were higher mainly because of the need to meet stricter conditions and requirements set by relevant European legislation. The level of investment is also boosted by opportunities to draw on EU funds or other foreign subsidy schemes.

## Detailed data sources

https://issar.cenia.cz

[71] *Data for the years 2018 and 2019 were not available at the time of publication.*

# 12

# Czech national parks

One of the important tools for the territorial protection of nature and the landscape in the Czech Republic is the declaration and subsequent care of specially protected areas. Specially protected areas are divided into large and small areas and are scientifically and aesthetically unique or important places. In 2019, there were 2,663 specially protected areas in the Czech Republic. Their total area, factoring in any overlaps, was 1,322.0 thous. ha, i.e. 16.8% of the territory of the Czech Republic. Areas with natural or little-altered nature, where natural phenomena have been preserved, and with high potential for self-regulatory processes are protected and developed through **four national parks (NPs)**. The total area of national parks in 2019 was 119.1 thous. ha (1.5% of the territory of the Czech Republic). Šumava is the largest national park, with a total area of 68.6 thous. ha, followed by Krkonoše Mountains NP (36.3 thous. ha), Bohemian Switzerland NP (7.9 thous. ha) and Podyjí NP (6.3 thous. ha).

The long-term goals behind the protection of national parks are the preservation or gradual restoration of natural ecosystems, including ensuring that natural processes can take their course at their own natural pace without interruption over the predominant area of national parks, the preservation or gradual improvement of ecosystems whose existence is conditioned by human activity and that are important for biodiversity, and the preservation or gradual improvement of ecosystems in the remaining territory of national parks.

The **Krkonoše Mountains National Park** is a unique area within Central Europe where a number of ecosystems and species that are typical for Northern Europe and the mountainous areas of the Alps meet and are complemented by certain species unique to Krkonoše (the Giant Mountains). The NP's natural non-forest ecosystems of the arcto-alpine tundra can be regarded as the best preserved and scientifically most valuable ecosystems here. They include alpine grasslands, alpine and subalpine shrub vegetation, mountain pine stands, subalpine tall vegetation, uplands and transitional peat bogs. The forest ecosystems are mainly mountain read and peat spruce forests, acidophilic and subalpine beech woods and mountain pine stands, representing the natural transition between forest and bare alpine forest. The long-term goal behind the protection of all of these ecosystems is to achieve their natural state and then leave them to develop spontaneously. Among ecosystems important for the preservation of biological diversity conditioned by permanent human care, the most valuable are Nardus grasslands and alpine and subalpine mowed meadows, to which a number of important Krkonoše species are linked. The specific care provided by nature conservation authorities focuses on these non-forest communities.

Of the Krkonoše Mountains National Park's important and rare species, it is worth highlighting those for which the Krkonoše Mountains are the only place where they occur in the Czech Republic or for which these mountains are at the core of their occurrence. In this respect, particularly important bird species are Luscinia svecica svecica, the alpine accentor and the water pipit. The occurrence of the black grouse is very significant as the isolated Krkonoše-Jizera Mountains population makes up about 30% of the population of the whole Czech Republic (70% is in the Krkonoše Mountains). The Krkonoše Mountains National Park is one of the last relatively promising areas for this species' long-term existence, and hence for its survival in the Czech Republic. However, there has been a long-running decline in its population, so now pay particular attention is paid to it.

Significant plant species include endemic species such as the Krkonoše bellflower, *Galium sudeticum*, the Krkonoše crane and rare glacial relics such as the cloudberry, which is typical of the Scandinavian region and has survived in the Krkonoše Mountains since the last ice age.

Together with the adjoining Bavarian Forest National Park, the **Šumava National Park** is a unique large complex of preserved mountain forests in Central Europe. Alpine reed spruce woodland typically occurs here, followed by waterlogged and peat spruce woodland in a mosaic with bare wetlands and upland and transitional peat bogs. Ecosystems for which the goal is to facilitate their natural processes also include glacial cirques, with lakes at their bottom.

For post-war historical reasons, the Šumava region is characterised by a complex of successive and gradually overgrown stages, including areas where municipalities in the former border zone were abolished and regularly managed meadow types of ecosystems (Nardus grasslands, Calthion palustris, followed by mesophilic tall oat-grass and *Polygono bistortae-Trisetion* flavescentis).

An important and rare Šumava species that should be highlighted is the Eurasian lynx, which currently occurs permanently throughout the Šumava National Park. This area is part of the core territory of the Bohemian-Bavarian-Austrian population. Since 2015, the grey wolf has reoccurred in the area of the Šumava National Park. In 2017 and 2019, successful reproduction was recorded, with the emerging pack originating in the alpine German-Polish population. The occurrence of the western capercaillie is significant from a conservation perspective, as the isolated Bohemian-Bavarian-Austrian population numbers approximately 600 individuals and currently appears to be stable. Of the invertebrates, the occurrence of the freshwater pearl mussel is significant. This is an ageing population in the river Teplá Vltava. Its survival depends on conservation work.

An important activity carried out by the Šumava National Park Administration is the restoration of wetlands in the Šumava region. Under the Life for Mires Project, more than 2,000 ha of peatlands is to be revitalised, historical land development canals are to be removed, and certain watercourses are to be rehabilitated.

The **Podyjí National Park** lies on the border between the Bohemian Massif and the Carpathians, resulting in a relatively diverse geological structure. The nature of the relief stems from the diverse mosaic of ecosystems, which was also affected by the long-term minimisation of economic activities due to the existence of the Iron Curtain. Of the ecosystems intended to support natural processes, the most extensive are Hercynian oak-hornbeams, followed by rubble forests and acidophilic and thermophilic oak groves, and valley ash-alder meadows in the floodplain of the river Dyje. Of the non-forest ecosystems, rocks and boulder screes, rocky vegetation with blue fescue or broad-leaved dry grasslands and low xerophilic shrubs, occurring on steep, often rocky slopes in a mosaic with forest habitats, occupy the largest area. Of the ecosystems delineated for biodiversity protection, which requires ongoing management, dry grasslands and mountain heaths occur the most. Some forest stands are also intended for the protection of species diversity linked to permanent human activities. Here, their thinning and the restoration of historical management methods (coppicing, silvopasture) will take place on a permanent basis. An important achievement from the perspective of active biodiversity protection has been the grazing of Exmoor horses, introduced in 2018 in the area of Havranické vřesoviště and Mašovická střelnice.

Important species in the Podyjí National Park include a number of invertebrates (violet click beetle, great capricorn beetle, Jersey tiger), which are linked to thinned forests or forest edges, as well as the Italian crested newt, whose only site in the Czech Republic is in Podyjí, the Aesculapian snake and endemic species of cranes.

The **Bohemian Switzerland National Park**, together with the adjoining Saxon Switzerland National Park, is an extensive sandstone area with extensive forest stands and low levels of settlement. This whole area is a representative example of the sandstone phenomenon known as the Czech Cretaceous Basin, i.e. the typical relief of blocky sandstones and the specific natural conditions associated with it, which condition the local biodiversity. Ecosystems intended to support and protect natural processes mainly include lichen Scots pine forests, acidophilic oak forests, rubble forests and flowery and acidophilic beech forests, as well as acidophilic spruces in extreme inverse positions. There are fewer ecosystems intended for permanent care in the Bohemian Switzerland National Park than in other national parks. They mainly comprise *Arrhenatherion elatioris*.

Important species in the Bohemian Switzerland National Park include a nesting population of the peregrine falcon, the Eurasian eagle-owl and a population of the Eurasian otter. Within the Bohemian Switzerland National Park, Atlantic salmon has been introduced into the Kamenice river basin, including selected tributaries, every year since 1998. Since then, the occurrence of around 20 adults has been recorded every year.

## Forests in national parks

Most of the territory of national parks is covered by forests (Chart 29). This is particularly the case in the Podyjí National Park and the Bohemian Switzerland National Park, where they completely dominate the area. In terms of fulfilling the long-term goals of NP protection, forest stands can be divided into:

**(a) forests intended to enable natural processes to take place**

At sites where natural forest ecosystems predominate, these stands are left to develop spontaneously, and only specific interventions allowed by law are carried out (e.g., path maintenance, safety measures, or the extinguishing of fires). At sites where partially or significantly altered forest ecosystems predominate, management interventions are carried out that bring the stands closer to their natural state (e.g., adjustments to the age and spatial structure of the stand or the removal of non-native tree species). On completion of these interventions, the stands will be left to develop spontaneously. Alpine spruce or beech woods are examples of such forests. The largest area of forests left to develop spontaneously can be found in the Šumava National Park (17,564.9 ha, i.e., 35.9% of the forested land area), and the highest share of forests left to develop spontaneously is in the Podyjí National Park (2,800 ha, i.e., 52.6% of the forested land area).

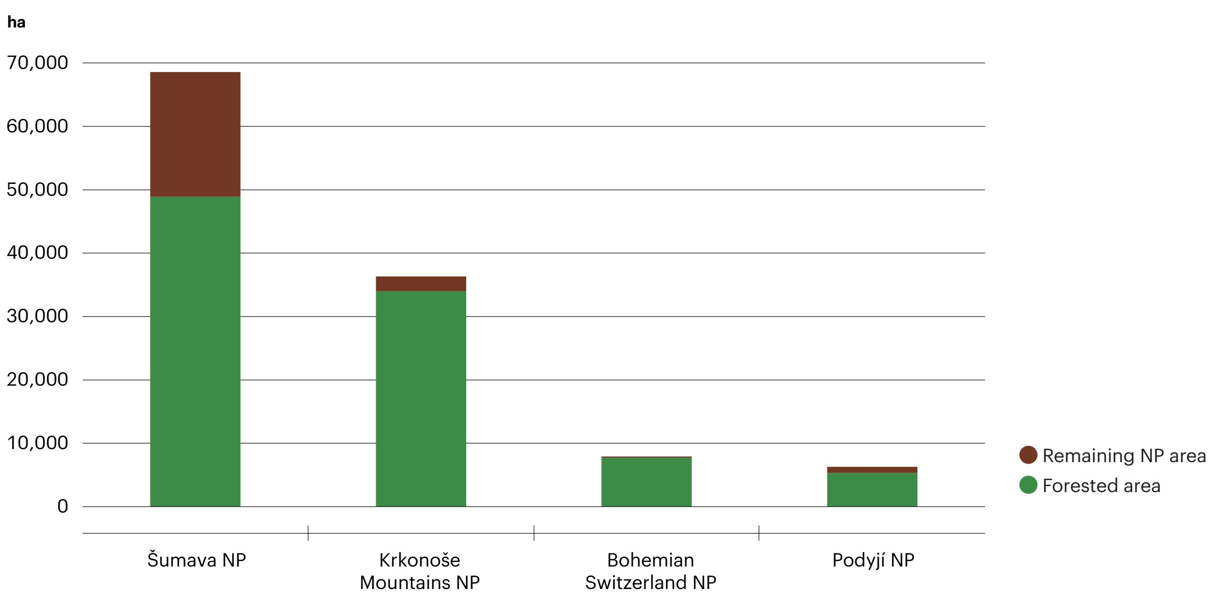
**(b) forests intended for the protection of biodiversity linked to permanent human care**

These forest stands are usually linked to some form of specific management, such as a traditional forestry method. If these methods are abandoned, biodiversity will be gradually reduced. These stands should therefore be cared for on a permanent basis. In general, permanent care for the protection of biodiversity linked to human activity is provided more often in non-forest areas. Light oak groves in the Podyjí National Park, which have historically been managed as low forests (sprout forestry), are a typical example of such forest ecosystems.

Important means of contributing to the fulfilment of long-term nature conservation goals in national parks include **logging** and the subsequent **restoration of forest stands**, primarily to transform geographically non-indigenous or habitat-unsuitable stands and introduce missing – mostly deciduous – trees. It is also important to remove geographically non-indigenous tree species (Pinus strobus in the Bohemian Switzerland National Park, and the false acacia or larch in the Podyjí National Park). In recent years, the volume of wood harvested in all national parks (except Podyjí, which has a high proportion of deciduous trees) has been affected by the ongoing bark beetle outbreaks, a phenomenon across the Czech Republic. In 2019, wood was harvested most (264.6 thous. $m^3$) in the Šumava National Park and least (9.9 thous. $m^3$) in the Podyjí National Park. Individual national park administrations are trying to avoid creating new clearings by logging. Instead, the aim is only to free up space primarily for natural rejuvenation. In the long run, the extent of artificial regeneration, consisting mainly of fir and deciduous trees, is being reduced. The species composition of forest stands in national parks is gradually aproaching the target (natural) composition.

**Chart 29**

**Area of forests in national parks in the Czech Republic [ha], 2019**




*Data source: National Park Administrations*

## National park economics

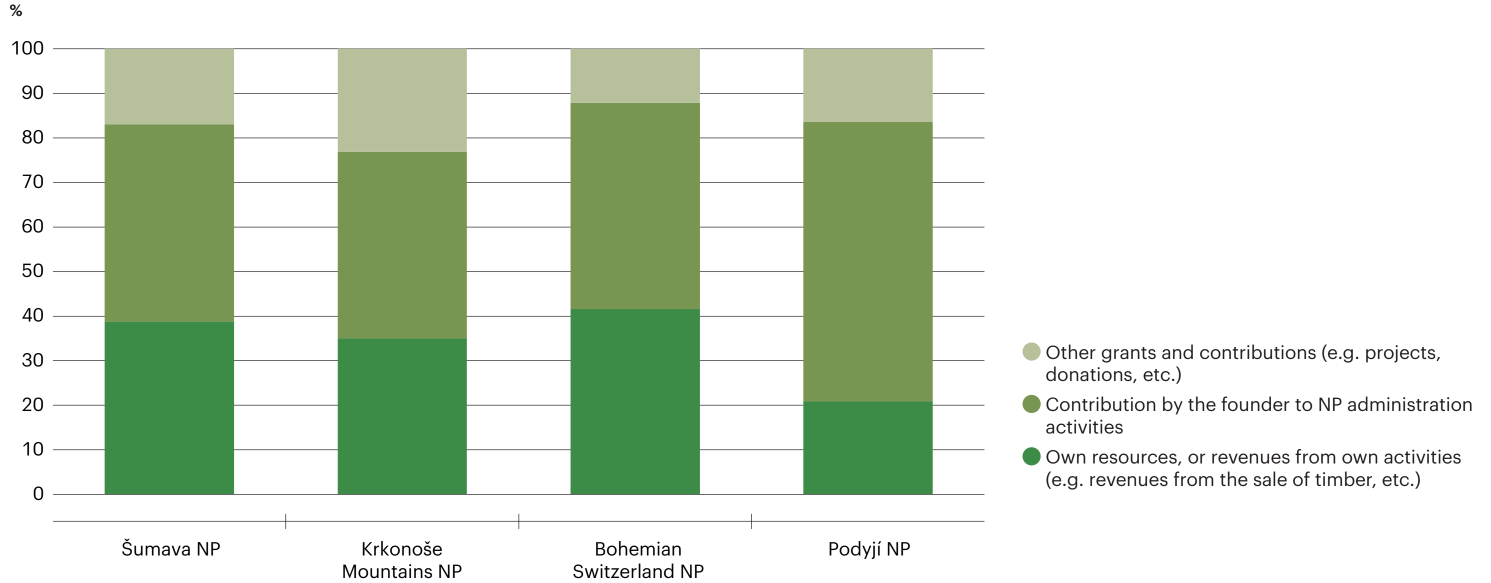
The **total annual budget of NP administrations** in 2019 ranged from approximately CZK 50 mil. (Podyjí National Park) to more than CZK 500 mil. (Šumava National Park). The budget mainly comprises both a contribution from the founder, i.e. the Ministry of the Environment, and internally generated resources (especially revenues from the sale of timber), Chart 30. The rest of the budget consists mainly of funds for projects financed from national or European (or international) sources. The financing of projects is secured mainly through the Operational Programme Environment (European Regional Development Fund), LIFE, Norwegian Funds, the Landscape Management Programme or the Landscape Natural Function Restoration Programme, or in the form of cross-border cooperation. This financing averages up to 20% of total budget coverage.

Under **current (operating) expenditure**, the most important items are purchases of materials and services, wages, and repairs and maintenance. **Investment expenditure** fluctuates over the years depending on whether major investment projects are implemented. Construction investments have long taken up a significant share.

National park economics is heavily dependent on **income from the sale of timber**, which makes up a significant portion of each administration's internally generated resources. At present, this source has been adversely affected by ongoing bark beetle outbreaks in the Czech Republic, have prompted a sharp increase in salvage logging throughout the country. Because there are large surpluses of wood on the market, the average price per $m^3$ and, consequently, the revenue from the sale of timber has slumped, while production costs are increasing (Chart 31).

Chart 30

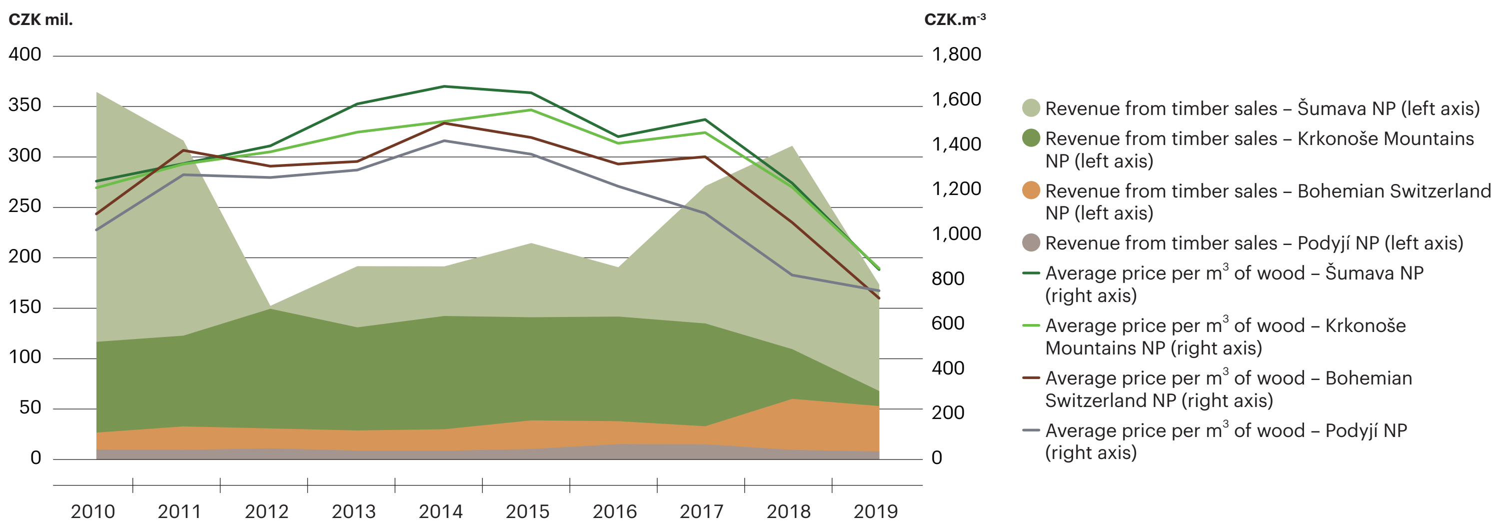
## Sources of financing for the expenditure of individual NP administrations [%], 2019




*Data source: National Park Administrations*

Chart 31

## Revenues from the sale of timber and the average price per m³ of timber, by NP administration [CZK mil., CZK.m⁻³], 2010–2019




*Data source: National Park Administrations*

# 13 Public and the environment

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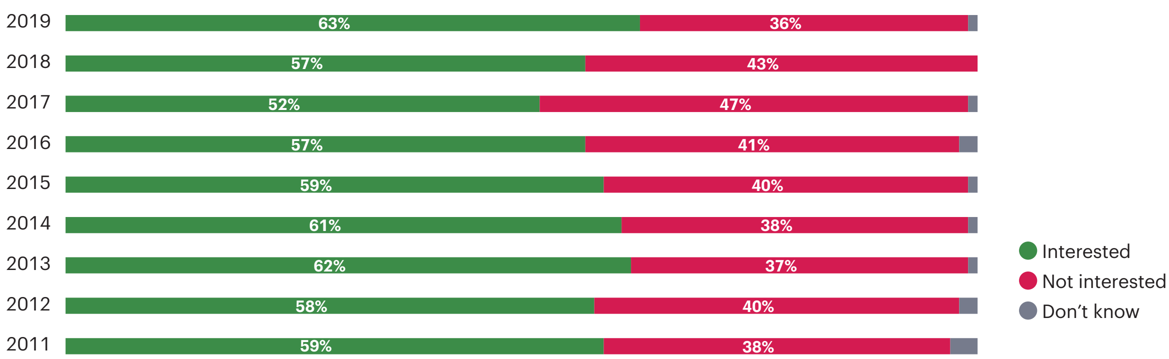
Representative public opinion polls paint an interesting picture of the relationship that Czech society has to conservation and the environment. They show that Czechs are interested in the environment and are sympathetic to its protection. However, their willingness to charge for entry to areas with the highest protection, to national parks, is much lower.

A closer look at Czech society's interest in the environment, gleaned from periodic sociological surveys conducted by Public Opinion Research Centre, shows that more than half of the population is interested in information about the environment in the Czech Republic. The latest survey from 2019 shows that 63% of the public is interested in this information. By contrast, 36% of respondents said they were not interested in that information (Chart 32). This level of interest has been relatively stable over an extended period. The public reported the least interest in 2017 (52% of the population) and the greatest in 2013 and 2019.

**Chart 32**

**Interest in information about the environment in the Czech Republic [%], 2011–2019**




*Question asked: Are you interested in information about the environment in the Czech Republic?*

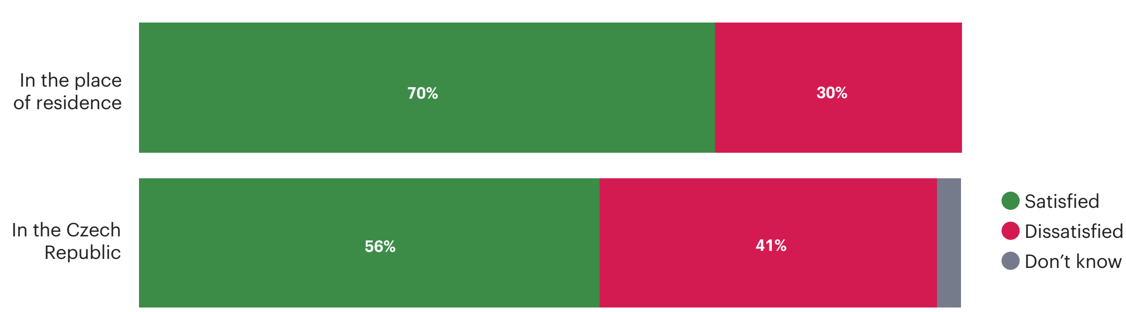
*Data source: Institute of Sociology of the Czech Academy of Sciences, Public Opinion Research Centre*

The majority of the Czech public, besides being interested in information about the environment, are also aware of the influence that the environment has on the quality of their own life. An international Eurobarometer survey shows that, according to 66% of Czechs, the state of the environment affects their quality of life and health.[72]

Most of the Czech population are satisfied with the state of the environment. They believe that the situation where they live is better than the overall situation in the Czech Republic (Chart 33). 70% of respondents say they are satisfied with the state of the environment in the place where they live, with 56% saying they are satisfied with the situation in the country as a whole.

**Chart 33**

**Satisfaction with the environment in the Czech Republic and in the place of residence [%], 2019**




*Question asked: How satisfied are you with the environment in our country as a whole and in the place where you live?*

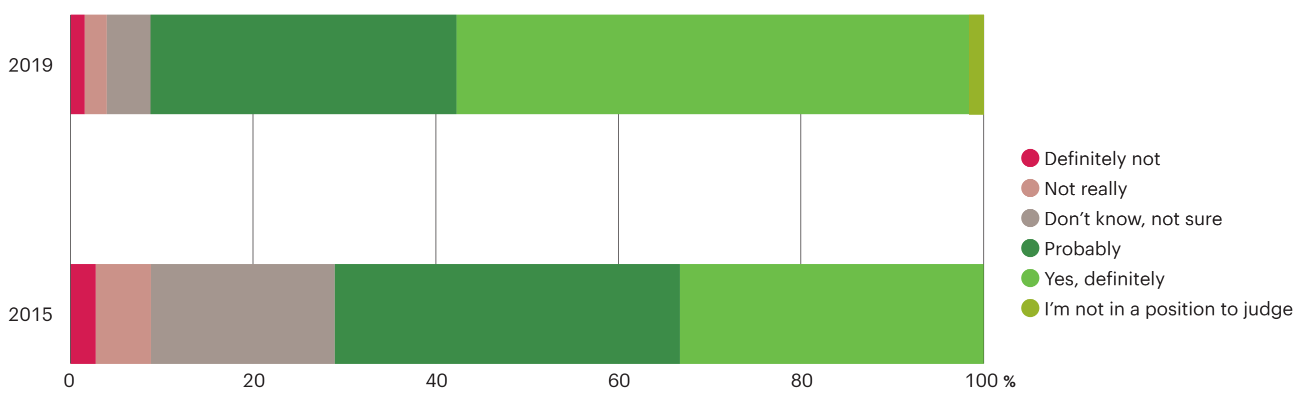
*Data source: Institute of Sociology of the Czech Academy of Sciences, Public Opinion Research Centre*

[72] *European Union. (2020). Special Eurobarometer 501: Attitudes of European Citizens towards the Environment. Report (Wave EB92.4.). Available at: https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/survey/getSurveydetail/instruments/special/surveyky/2257.*

The Czech public also likes the idea of protecting nature and the environment, with 80.8% of respondents saying this was true in 2019. The Czech public's need to protect wildlife and the landscape is also growing significantly (Chart 34). Whereas only 71.0% agreed with such protection in 2015, by 2019 the figure was 90.1%.

**Chart 34**

### The need to protect wildlife in the Czech Republic [%], 2015, 2019



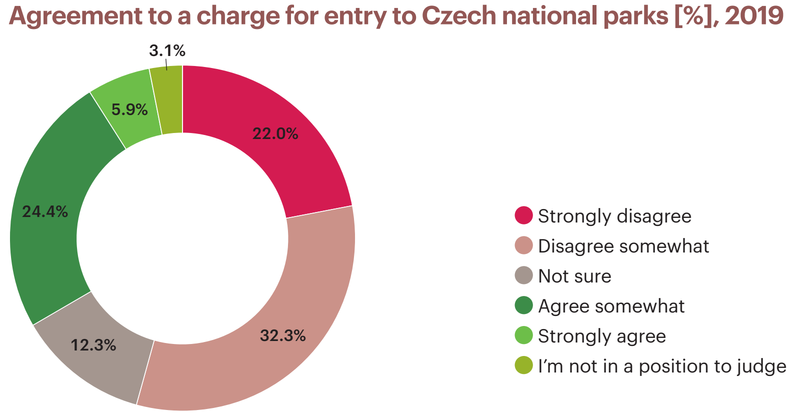

*Question asked: Do you think it is necessary to protect wildlife in the Czech Republic?*
*"Wildlife" means areas that are left to develop naturally and undisturbed, without human intervention, i.e. without buildings, and without forestry or farming (although humans can still enter these areas).*

*Data source: Masaryk University, Faculty of Social Studies: Krajhanzl, J., Chabada, T.*

Although the majority of the Czech population (more than 60%) visited Czech national parks between 2017 and 2019, mainly motivated to visit by the beauty of nature (46.0%) and for peace and relaxation (40.6%), and despite the fact that some of the population (32.8% of respondents) thought the number of visitors was the most intrusive factor, more than half of the Czech public refuse the prospect of paying a charge to enter Czech national parks (Chart 35). 22.0% would strongly disagree with a charge and 32.3% would disagree somewhat.

**Chart 35**

### Agreement to a charge for entry to Czech national parks [%], 2019



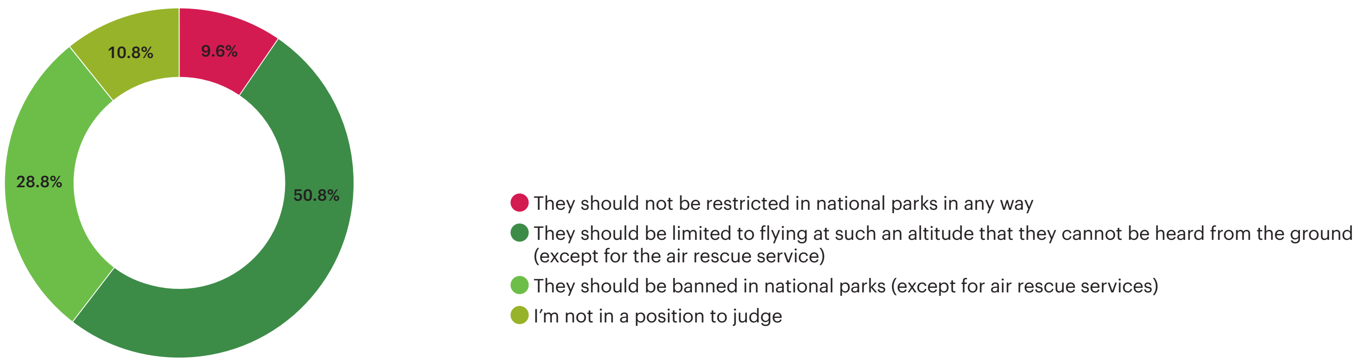

*Question asked: Would you agree or disagree to a charge for entry to Czech national parks?*

*Data source: Masaryk University, Faculty of Social Studies: Krajhanzl, J., Chabada, T.*

In 2019, for the first time, the Faculty of Social Studies of Masaryk University sought the public's opinion on the regulation of aviation activities in national parks. More than three quarters of Czechs support restrictions on aviation activities at lower flight levels over Czech national parks (Chart 36), with bans being preferred especially by those who have personally experienced an aircraft flying overhead and perceived it negatively.

**Chart 36**

**Perception of aircraft flying over national parks [%], 2019**




*Question asked: What do you think about smaller planes and helicopters that fly low (at an altitude of hundreds of metres) and can often be heard from the ground?*

*Data source: Masaryk University, Faculty of Social Studies: Krajhanzl, J., Chabada, T.*

# 14 Global context

The Czech Republic is connected to the world by a number of systems that allow for the flow of resources, goods, services, people, information and ideas. Although the Czech Republic has little influence on some of these systems, the state and development of the environment and the socio-economic situation in the Czech Republic is affected by processes in these systems. Within these systems, the Czech Republic's consumption also places significant pressure on the environment in other parts of the world.

Many global megatrends, weak signals, emerging trends, and wild cards have been identified that are, or may be, of environmental significance. They present both opportunities and threats to the environment.

Global megatrends (Box 1) are interconnected long-term trends that are likely to affect the future in all areas, including the environment and the global climate, over the next 10–15 years. Many of the global megatrends identified are already making their way into factors that affect the environment in the Czech Republic, and they are already taken into account in environmental management (in terms of measures and tools).

**Box 1**

### Global megatrends

- World population growth
- Global population ageing
- Migration
- Urbanisation
- Climate change caused by the increasing concentration of greenhouse gases in the atmosphere
- Degradation of ecosystems
- Biodiversity loss
- Environmental pollution and chemical pressure on the environment
- Dominance of fossil fuels in world energy supply
- Increasing resource consumption (including water consumption)
- Increasing demand for land
- Middle-class growth
- China's technological power
- Concentration of technological development in several countries
- Accelerating technological change and digitalisation
- Growing debt and systemic financial risks
- Uneven poverty reduction
- Growing inequality from country to country
- Structural change in the global economy
- Intensifying globalisation (shift to the south and east) and multilateralism

*Source: SOER 2020 – The European environment – state and outlook 2020, Drivers of change of relevance for Europe's environment and sustainability*

Weak signals and emerging trends (Box 2) are phenomena moving forward at a rapid pace, have not yet been fully implemented in the medium to long term, and therefore their potential consequences are not yet clear.

Box 2

### Examples of weak signals and emerging trends

**Blockchain** is a decentralised database that records transactions with an ever-expanding number of records. It illustrates new digitalisation opportunities. Environmental protection could benefit, for example, from increased traceability and responsibility in supply chain management in terms of waste, emissions or the origin of agricultural products. However, its use may have adversely impact climate change mitigation due to its high energy intensity.

**Drones** are increasingly used to move goods around in transport and industry. This can help to reduce greenhouse gas emissions from transport. However, uncertain factors in the use of drones are their life cycle (including the use of batteries) and potential threats to wildlife, including birds and game, increased noise, and the visual impacts in the urban environments.

**Artificial meat**, grown in vitro from live animal stem cells, may offer an alternative and new solution to the growing global demand for meat consumption (especially in Asia). Its introduction could help to reduce greenhouse gas emissions from livestock farming. Although the cost making would be reduced, its spread will remain largely dependent on social acceptance and food safety protocols.

**Synthetic biology**, which involves the assembly of completely new DNA sequences and genomes, is already used in the pharmaceutical, chemical, agricultural and energy sectors. In environmental protection, it can be used for the bioremediation of polluted industrial sites, pollution detection, the protection of endangered species, etc. However, synthetic biology may unexpectedly disrupt ecosystems and lead to biodiversity loss, for example by application to control disease vectors (e.g. by genetically engineering mosquitoes to reduce the spread of malaria).

*Source: SOER 2020 – The European environment – state and outlook 2020*

Considering the growing economic and geopolitical polarisation of the world today, a multilateral approach and cooperation between the various actors – politicians, businesses and world leaders – will be needed to stop threats, not least in the field of climate and the environment, in order to harmonise environmental goals and goals to support economies. This approach is also illustrated by the main message of The Global Risks Report 2020.[73] For the first time in its ten-year survey, it identified only environmental risks (extreme weather events with impacts on property, infrastructure and human lives; failure of climate-change mitigation and adaptation; human-made environmental damage, including environmental crime; biodiversity loss and ecosystem collapse with irreversible consequences for the environment; major natural disasters, such as earthquakes, tsunamis, volcanic eruptions, and geomagnetic storms) as the top five risks in terms of likelihood.

[73] *WEF, 2020, The Global Risks Report 2020, Insight Report No 15, World Economic Forum, Geneva, Switzerland.*

# List of abbreviations

**AOT40** Accumulated Ozone exposure over a Threshold of 40 ppb
**AWC** available water capacity
**B(a)P** benzo(a)pyrene
**$BOD_5$** biochemical oxygen demand over five days
**BSM** basal soil monitoring
**c.p.** current prices
**CENIA** CENIA, Czech Environmental Information Agency
**CNG** compressed natural gas
**$COD_{Cr}$** chemical oxygen demand by potassium dichromate
**$COD_{Mn}$** chemical oxygen demand by potassium permanganate
**CORINE** Coordination of Information on the Environment
**CZK** Czech crowns
**CZ-NACE** Statistical Classification of Economic Activities in the European Community (Nomenclature statistique des activités économiques dans la Communauté européenne)
**DDT** dichlorodiphenyltrichloroethane
**DEU** domestic extraction used
**DMC** domestic material consumption
**DNA** deoxyribonucleic acid
**DOC** dissolved organic carbon
**EEA** European Environment Agency
**EEA39** the 28 Member States of the European Union (EU) and 5 other member countries and 6 cooperating countries of the European Environment Agency (EEA)
**EU** European Union
**EU28** EU28 Member States
**EU-ETS** European Union Emissions Trading Scheme
**Eurostat** Statistical Office of the European Union
**FSC** Forest Stewardship Council certification system
**GAEC** Good Agricultural and Environmental Condition
**GDP** gross domestic product
**HA** high annoyance
**HCB** hexachlorobenzene
**HCH** hexachlorocyclohexane
**HSD** high sleeping disturbance
**LPIS** Land Parcel Identification System
**LULUCF** land use, land-use change and forestry
**NP** national park
**PAH** polycyclic aromatic hydrocarbon
**PCB** polychlorinated biphenyl
**PEFC** Programme for the Endorsement of Forest Certification schemes (certification system)
**PES** primary energy sources
**PLA** protected landscape area
**PM** particulate matter
**RES** renewable energy sources
**SHARES** Short Assessment of Renewable Energy Sources
**SPA** specially protected area
**UNFCCC** United Nations Framework Convention on Climate Change
**USLE** Universal Soil Loss Equation
**VOC** volatile organic compound
**WEI** water exploitation index
**WWTP** wastewater treatment plant

2019