Report
on the Environment of the Czech Republic

cenia

Ministry of the Environment
of the Czech Republic

Drawn up by
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Overall editing
T. Kochová and L. Hejná

Authors
E. Čermáková, T. Kochová, J. Mertl, T. Myšková, J. Pokorný, M. Rollerová, V. Vlčková

List of cooperating organisations
Central Institute for Supervising and Testing in Agriculture
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Vršovická 1442/65, 100 10 Prague 10, e-mail: info@cenia.cz, http://www.cenia.cz

Typesetting
Jakub Smolka

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Introduction

The Report on the Environment of the Czech Republic (hereinafter 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, and submitted for approval to the Government of the Czech Republic and subsequently submitted to the Chamber of Deputies and the Senate of the Parliament of the Czech Republic for discussion.

It is a comprehensive document, which assesses the state of the environment in the Czech Republic, including the entire context, on the basis of the data available for the given year of assessment.

CENIA, Czech Environmental Information Agency has been responsible for drawing up the Report on the Environment of the Czech Republic since the 2005 Report.

The 2017 Report was discussed and approved by the Government on 20 November 2018 and then submitted for consideration by both chambers of the Czech Parliament.

The Report is also published in electronic form (http://www.cenia.cz and http://www.mzp.cz) and it is distributed at the same time on USB flash drives, along with the Environmental Statistical Yearbook of the Czech Republic 2017 and Reports on the Environment in the Regions of the Czech Republic 2017. Data used in the Report are published and updated on the web portal of the Information System of Statistics and Reporting (https://issar.cenia.cz/en/).

Key messages of the Report

Thanks to technological development and implementation of environmental measures, the environmental burden in the Czech Republic fell in 2017, even though the Czech economy grew.

The state of the environment in the Czech Republic in 2017 did not change significantly compared to previous years. In recent years, however, it is strongly influenced by the deepening manifestations of climate change, in particular the more frequent occurrence of droughts and other dangerous hydrometeorological phenomena such as floods, torrential rainfall or strong winds. Droughts are affecting economic sectors, especially agriculture, water management, industry and energy. Drought also affects the stability and function of ecosystems, which leads to changes of ecosystem services (e.g. reduced ability of landscape to retain water etc.). In 2017, as a result of a combination of climatic factors and biotic agents (e.g. the bark beetle) and previous methods of forest management, the largest amount of wood was harvested since 2000. Climate change also reflects in the state of individual plant and animal species, which manifests itself, for example, in population declines of various species of birds. In combination with a change in the landuse, particularly long-term decline in the area of agricultural land and the simultaneous increase in built-up and other areas, populations are decreasing especially among farmland birds, whose numbers have fallen by one third since 1982. Due to significant financial assistance and other support instruments, emissions of air pollutants declined in 2017, but the air quality remains unsatisfactory even in 2017. In settlements, it is affected especially by road transport, and by local heating of households, particularly in areas where the effect of the so-called boiler subsidies could not yet fully manifest itself. Low air quality occurs also in industrial regions. Economic growth is also reflected in waste management. Waste generation, due to the consumerist social behaviour, has not been declining in the long term. Thanks to support for various types of instruments, however, there is a gradual change in the structure of waste treatment, especially in packaging waste, where the rate of material recovery is growing. The rate of municipal waste landfilling, however, reached 45.4% even in 2017.

The volume of funds spent on environmental protection is above average, also thanks to the support from European funds, which were mainly distributed through Operational Programme Environment also in 2017.

Main findings of the Report

Climate system

- In terms of temperature, the year 2017 was above-normal on the territory of the Czech Republic, the average annual temperature 8.6°C was higher by 0.7°C than the long-term average in 1981–2010. In 2017, on average for the entire country, there were 12 tropical days with temperature above 30°C, which was 5 tropical days more than in 2016.

- The developments of temperature and precipitation conditions in 2017 led to the development of hydrological and soil drought.

Air quality

- Year-on-year, selected pollutant emissions decreased in 2017, the greatest decrease was in TSP emissions by 3.8%, NO_x emissions by 2.9% and emissions of SO_2 by 2.5%.

- In 2017, at 50 burdened locations of the Czech Republic, the limit value for 24-hour concentration of suspended particles PM_{10} was exceeded, the annual limit value for PM_{10} was exceeded at 2 stations, the annual limit value for $PM_{2.5}$ was exceeded at 10 stations, and at the same time, the limit value for annual average concentration of benzo(a)pyrene was exceeded at 25 stations in 2017.

Water management and water quality

- Year-on-year, the total water abstraction declined by 4.5 mil. m^3 to 1,630.4 mil. m^3.

- The specific amount of water invoiced to households increased year-on-year slightly by 0.4 $l.inhabitant^{-1}.day^{-1}$ to 88.7 $l.inhabitant^{-1}.day^{-1}$.

- In 2017, 94.7% of the population was supplied with water from the public water supply systems, 85.5% of the population was connected to public sewerage. Year-on-year, the share of the population connected to public water supply systems rose by 0.3% and the share of population connected to public sewerage grew by 0.8%.

- According to summary assessment of the basic indicators monitored pursuant to CSN 75 7221, the quality of water in watercourses of the Czech Republic is satisfactory, but still a large part of watercourses is assessed as class III (polluted water) and worse.

Nature and landscape

- The total area of the agricultural land fund of the Czech Republic decreased by 1.7% in the period 2000–2017. In 2017, within the agricultural land fund, the acreage of permanent grassland grew to 12.8% of the territory and the area of arable land declined to 37.5% of the territory. Between 2016–2017, the area of permanent grassland grew by 0.3%, the area of arable land decreased by 0.2%.

- Since 1982, bird population levels have been steadily declining in the Czech Republic. Between 1982 and 2017, the population levels of common bird species in the Czech Republic dropped by 1.3%, the population levels of woodland bird species by 10.4% and the population levels of farmland bird species dropped by 33.5%.

Forests

- Defoliation of forests in the Czech Republic remains very high, in the category of older stands (60 years and over) the sum of the defoliation classes 2–4 for conifers was 74.1% and for deciduous trees it was 39.3%. In the younger stands (up to 59 years), the situation is more favourable. In the case of conifers, 26.0% of stands belonged to class 2 to 4, in deciduous trees it was 24.7%.

- The proportion of deciduous trees in the total forest area of the Czech Republic gradually increases, in 2017 it accounted for 27.0% of the total forest area against 26.7% in 2016.

- The area of forest stands, which are certified according to the principles of sustainable management of forests (PEFC and FSC), increased to 70.6%.

Soil and agriculture

- In the Czech Republic's territory, 56.7% of agricultural land is potentially threatened with water erosion and 18.4% with wind erosion.
- In 2017, the consumption of mineral fertilizers decreased by 2.1% to 138.2 $kg.ha^{-1}$ of pure nutrients. Consumption of livestock manure slightly increased by 1.2% to 70.0 $kg.ha^{-1}$. The consumption of lime products improving the production capacity of soils increased by 4.3% to 269 thous. t.
- The total area of organically cultivated land increases, in 2017, such farming was used on 520,1 thous. ha, i.e. 12.4% of the total area of the agricultural land fund, compared with 506,1 thous. ha and 12.0% of the total agricultural land fund area in 2016.

Industry and energy

- Industrial production in 2017 increased year-on-year by 6.5%.
- The energy intensity of the Czech economy is on a downward trend, since 2000 it has declined in total by 33.6%.
- Electricity production increased in 2017 year-on-year by 4.5%.
- In 2017, 9,618 GWh of electricity was produced from renewable energy sources, which means a year-on-year increase by 2.4%. The proportion of renewable energy sources in the total electricity generation was 11.1% in 2017.

Transport

- The share of public transport in the overall transport performance of passenger transport in 2017 amounted to 33.9%.
- Emissions of NO_x, VOC, CO and suspended particles from transport decreased in the period 2000–2017.
- CNG consumption increases, over the past 10 evaluated years (2008–2017), it increased ten times.

Waste

- Total waste generation in the period 2016–2017 increased by 0.8% to 34,512.6 thous. t. Since 2009[1], it grew by 7.0%.
- The waste treatment is dominated by material recovery (80.5% in 2017) and its share is increasing at the expense of landfilling (9.8% in 2017).
- Landfilling of municipal waste (45.4% in 2017) reduces in favour of its material recovery (37.5% in 2017) and energy recovery (12.0% in 2017).
- The rate of recycled packaging waste is growing, and hence its total recovery, the targets of waste management are met.
- Strategic objectives for selected products are continuously being met, their take-back is increasing.

Financing

- The volume of expenditure from both central sources (i.e. mainly from the state budget and state funds), as well as from local budgets in 2017 increased significantly year-on-year, mainly due to the intensification of financial support under the new Operational Programme Environment 2014–2020 which is the main source of EU funding for environmental protection with a total allocation of almost CZK 82 bil. of total eligible expenditure.
- The priority areas for financial support from public sources continue to include air protection (e.g. through the New Green Savings Programme or boiler subsidies), as well as water protection, biodiversity and landscape protection or waste management.

[1] *Overall assessment of the trend postponed because of changes in the calculation methodology.*

Evaluation of the environment by thematic units

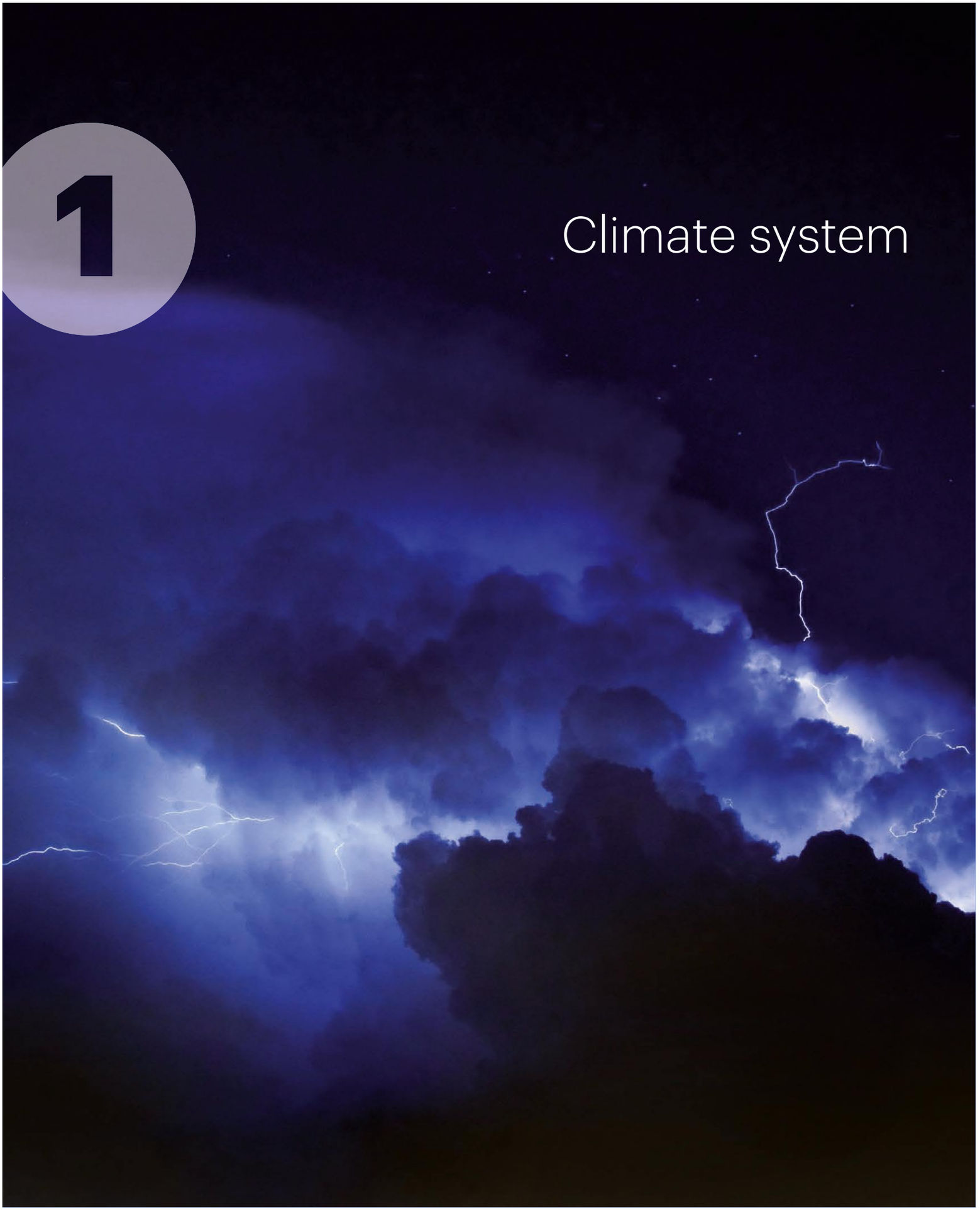
Thematic unit / Indicator	Page	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
1 **Climate system**	10				
Temperature and precipitation conditions		N/A	N/A	N/A	N/A
Runoff conditions and the state of groundwater in the context of climate change		N/A	N/A	N/A	N/A
Greenhouse gas emissions		☺	😐	😐	☹
2 **Air quality**	16				
Emissions of pollutants		☺	☺	☺	☺
Emissions of heavy metals		N/A	☺	☺	☺
Air quality in terms of human health protection		☺	😐	😐	☹
Air quality in terms of the protection of ecosystems and vegetation		N/A	😐	😐	😐
3 **Water management and water quality**	22				
Water abstraction		☺	☺	☺	😐
Waste water discharge		☺	☺	☺	😐
Waste water treatment		☺	☺	☺	☺
Water quality		☺	😐	😐	😐
4 **Nature and landscape**	28				
Land use		😐	😐	😐	😐
Landscape fragmentation		☹	☹	☹	☹
Nature protection		N/A	N/A	N/A	N/A
State of animal and plant species of Community importance in 2006 and 2012		N/A	N/A	N/A	N/A
State of natural habitats of Community importance in 2006 and 2012		N/A	N/A	N/A	N/A
Indicator of common bird species		☹	☹	☹	☹
5 **Forests**	32				
Health condition of forests		😐	☹	☹	😐
Species composition and age structure of forests		☺	😐	😐	😐
Responsible forest management		☺	😐	😐	😐
6 **Soil and agriculture**	36				
Risk of soil erosion and slope instabilities		☹	☹	☹	😐
Consumption of fertilisers and plant protection products		☺	☹	😐	😐
Quality of agricultural land		☺	😐	😐	😐
Organic farming		☺	☺	☺	😐

Thematic unit / Indicator	Page	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
7 Industry and energy	40				
Extraction of raw materials		☺	☺	☺	☺
Industrial production		☺	☺	☺	☺
Final energy consumption		😐	😐	😐	😐
Energy intensity of the economy		☺	☺	☺	☺
Electricity and heat generation		☺	☺	😐	😐
Renewable energy sources		☺	☺	☺	😐
Contaminated sites		N/A	☺	☺	☺
Domestic material consumption		☺	☺	😐	☺
Material intensity of GDP		☺	☺	☺	☺
8 Transport	46				
Transport performance and infrastructure		☹	😐	😐	😐
Energy and fuel consumption in transport		☹	☹	☹	☹
Emissions from transport		😐	😐	😐	☹
Noise pollution burden of the population		N/A	N/A	N/A	N/A
9 Waste	50				
Total waste generation		N/A	☹*	☹	☹
Municipal waste generation and treatment		N/A	😐*	😐	😐
Waste treatment structure		N/A	☺*	☺	☹
Packaging waste generation and recycling		N/A	😐*	😐	😐
Generation and recycling of waste from selected products		N/A	☺*	☺	☺
10 Financing	54				
Investments and non-investment costs in environmental protection		☺	☺	☺	☺
Public environmental protection expenditure		☺	☺	☺	☺

* Change since 2009.

☺ The trend is developing positively, in accordance with the set objectives.
😐 The trend is developing neither positively nor negatively and can be referred to as stagnating.
☹ The trend is developing negatively, not in accordance with the set objectives.
N/A It is not possible to evaluate the state and trend.

Change since 1990 – a change for the period from 1990 to the last available year of evaluation
Change since 2000 – a change for the period from 2000 to the last available year of evaluation
Change since 2010 – a change for the period from 2010 to the last available year of evaluation
The last year-on-year change – change for the period between the last two available years evaluation



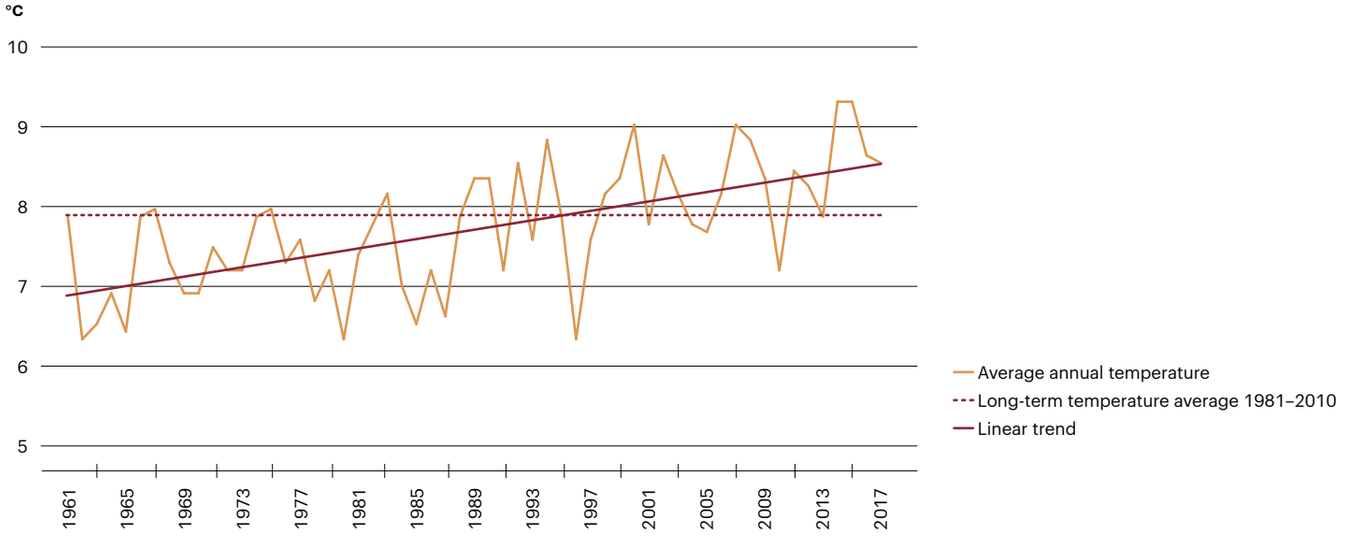
1 Climate system

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Temperature and precipitation conditions	N/A	N/A	N/A	N/A
Runoff conditions and the state of groundwater in the context of climate change	N/A	N/A	N/A	N/A
Greenhouse gas emissions	☺	😐	😐	☹

In terms of temperature, the year 2017 was above-normal on the territory of the Czech Republic, the average annual temperature 8.6°C was higher by 0.7°C than the long-term average in 1981–2010 (Chart 1). The average annual air temperature rises in the Czech Republic at a rate of about 0.3°C per decade, out of the ten warmest years since 1961, eight occurred after 2000. Most months of 2017 had a **positive deviation** of the average monthly temperature from normal, the warmest compared to normal was March, which had a deviation from normal at +3.1°C and its temperature was evaluated as strongly above normal.

Chart 1

Long-term development of annual average air temperature on the territory of the Czech Republic in the period 1961–2017 compared with the long-term average in 1981–2010 [°C]



Source: Czech Hydrometeorological Institute

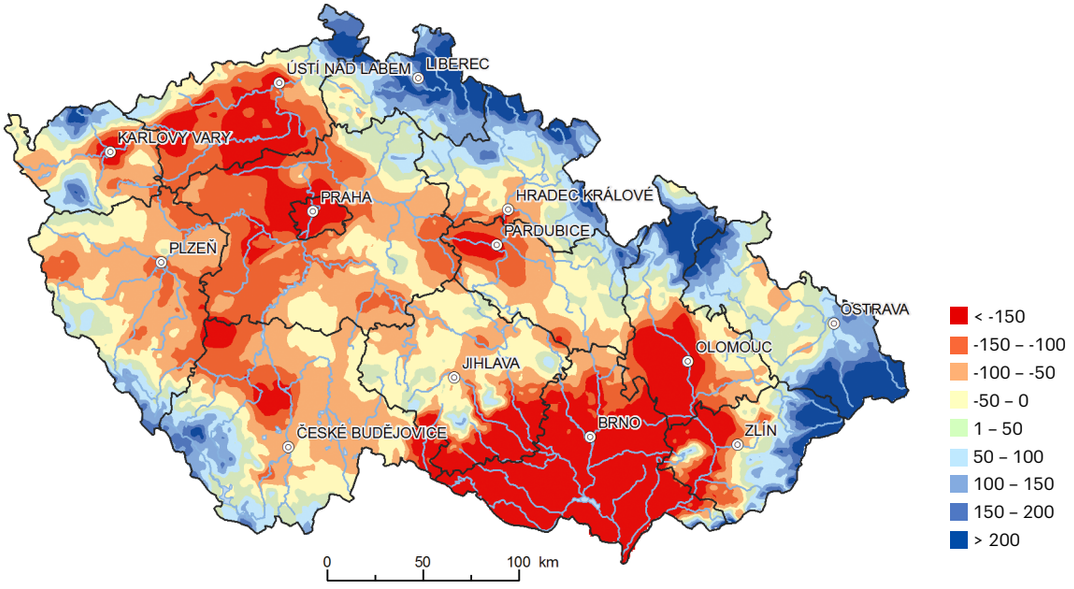
The average air temperature for the **summer season** of 2017 reached 18.5°C and was 1.5°C above normal of 1981–2010, it was the fourth warmest summer in the Czech Republic since 1961. Tropical days with the temperature above 30°C, showing the temperature extremity of a summer season, amounted to 12 on average for the whole country (normal for the period 1981 to 2010 is 8 tropical days per year). The highest number of tropical days was recorded at stations Strážnice (37) and Brno-Žabovřesky (36) in the South-Moravian Region.

In terms of **precipitation**, 2017 was normal in the Czech Republic, rainfall reached 100% of the 1981–2010 normal. National monthly rainfall for most of the months of 2017 was evaluated as normal. Rainfall was strongly above normal in April (183% of normal) and October (188% of normal). Below normal precipitation was in May, when the monthly rainfall reached 64% of normal. Precipitation was distributed unevenly in the Czech Republic, the lowest annual rainfall compared with 1981–2010 normal was recorded in the South-Moravian Region where 85% of annual normal precipitation fell. The dry season lasted there from January to August, when only 72% of normal rainfall fell and it is the second lowest rainfall total in this period since 1961.

From mid-May, the water balance values (difference between precipitation and potential evapotranspiration) significantly declined in most regions of the Czech Republic and that negative development of the balance continued till the end of June, in southern and central Moravia also in July and August. In total for the whole growing season (April to September), the water balance reached strongly negative values in the driest areas of the Czech Republic (Figure 1). Developments in the water regime had a negative impact on values of **water reserves in the soil**. By the end of June, the water reserves in the soil fell in most regions of the Czech Republic (except for mountainous areas) below 50% of available water capacity. In agricultural areas, mainly in southern and central Moravia, and the Ohře River basin, available water capacity was below 30%, which indicates already significant water stress for plants. The lowest values of soil moisture reserves (less than 25% of the long-term average from 1981 to 2010) occurred intermittently in southern Moravia from mid-June to mid-September.

Figure 1

Basic moisture balance of rainfall and potential evapotranspiration of grassland [mm] in the growing season 01.04.–30.09.2017



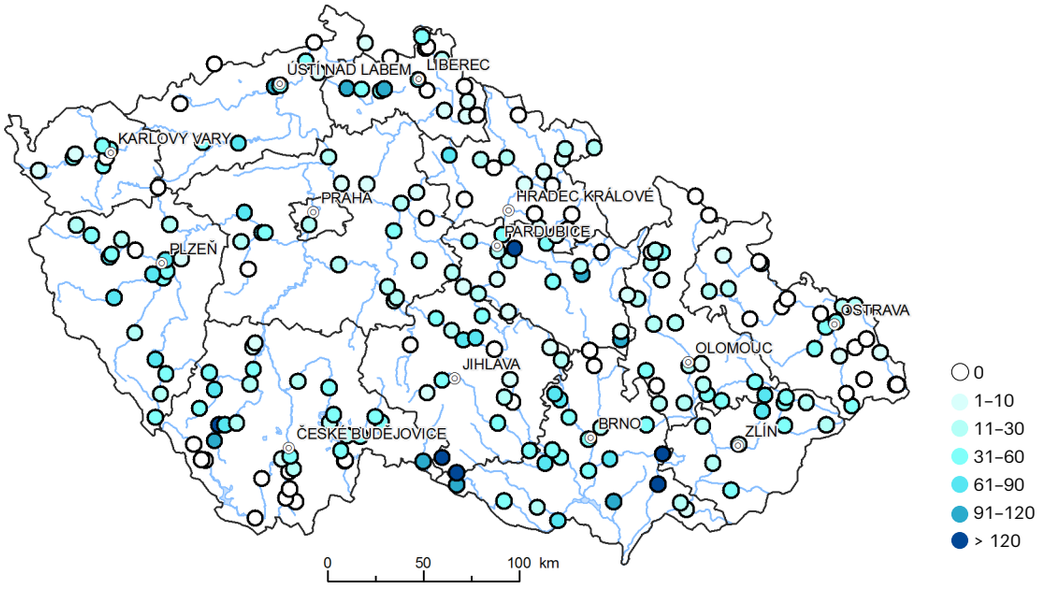
Source: Czech Hydrometeorological Institute

Due to the temperature and precipitation conditions, 2017 was characterized by the occurrence of **below-average flow rates**. The average annual flow rate reached around 100% of the average for the years 1981–2010 only in two main monitored profiles: on the Jizera river between Tuřice and Předměřice where it reached 91% of the long-term average, and on the Olše river in Věřňovice where it reached 106% of the long-term average. In the other profiles it reached less than 90% of the average values. The most critical situation was on the Jihlava river in Ivančice where the average annual flow rate was only 36% of the long-term flow rate, then on the Dyje river in Břeclav, where the average annual flow rate was only 43% of the long-term flow rate.

The worst situation when comparing the monthly flow rates was in January, when on most of the profiles the average flow rate did not reach even 50% of the long-term average for the period 1981–2010. The situation was also critical in the summer months. Conversely, in the autumn the situation improved and on some profiles, the flow rate was higher than the long-term average.

Figure 2

Flow lower than the long-term 355day flow for the period 1981–2010 [number of days], 2017



Source: Czech Hydrometeorological Institute

In 2017, the **hydrological drought** continued[1] (Figure 2)[2]. Hydrological drought lasting more than one hundred days was recorded on 12 profiles, the most critical situation occurred on the watercourse Kyjovka on the Kyjov profile, which had a lower flow rate than Q_{355} for more than 200 days in 2017 (in 2016 it was 80 days). A critical situation also appeared on the Loučná river in Dašice, on the Želetavka river in Jemnice and on the Litava river in Brankovice.

The **global annual average Earth surface temperature** (land surface and ocean) in 2017 was 0.46°C higher compared with the period 1981–2010. 2017 was, according to that data, the second warmest in the history of instrumental observations behind the record warm year of 2016.

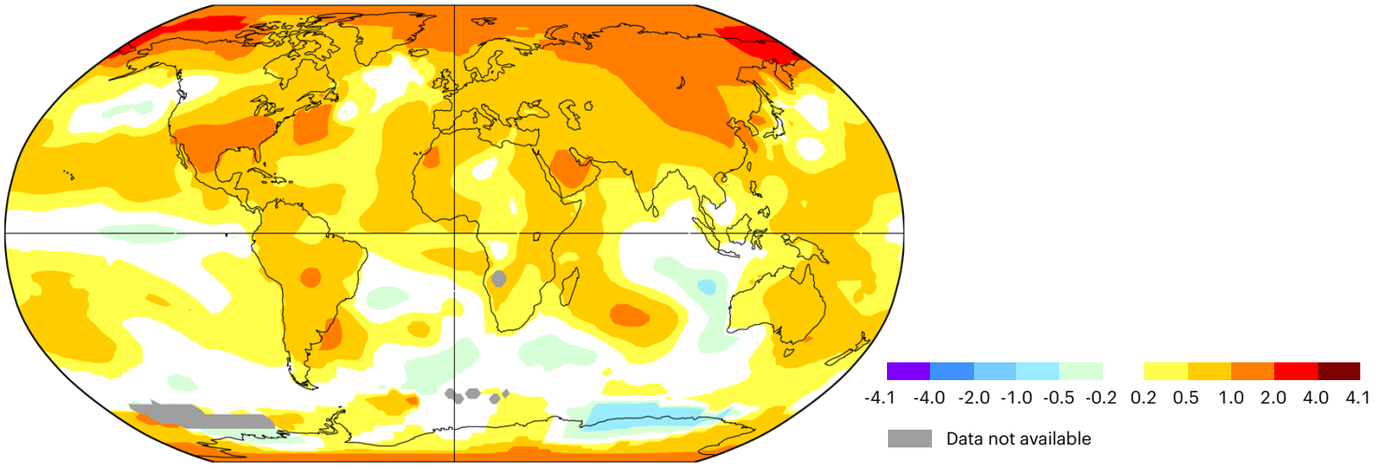
Year 2017 was exceptionally warm almost on the entire surface of the continents (Figure 3). The warmest compared with the normal of 1981–2010 were the high latitudes of the northern hemisphere, particularly eastern Russia and the northwest of North America, where the positive deviation of the average annual temperature from normal exceeded 2°C, in coastal areas (Svalbard) even more than 4°C.

[1] *Hydrological drought occurs when the flow gets below Q_{355}, i.e. a flow rate which is reached or exceeded on average on 355 days in a year. This flow is important for maintaining fundamental water-management and ecological functions of the stream.*

[2] *The map displays reported profiles of category A or B, provided that the monitoring on the profile has been carried out for at least 29 years (for the purpose of comparison with the long-term average).*

Figure 3

Average annual air temperature at the surface of land and ocean in 2017, expressed as deviation from the normal period of 1981–2010 [°C]



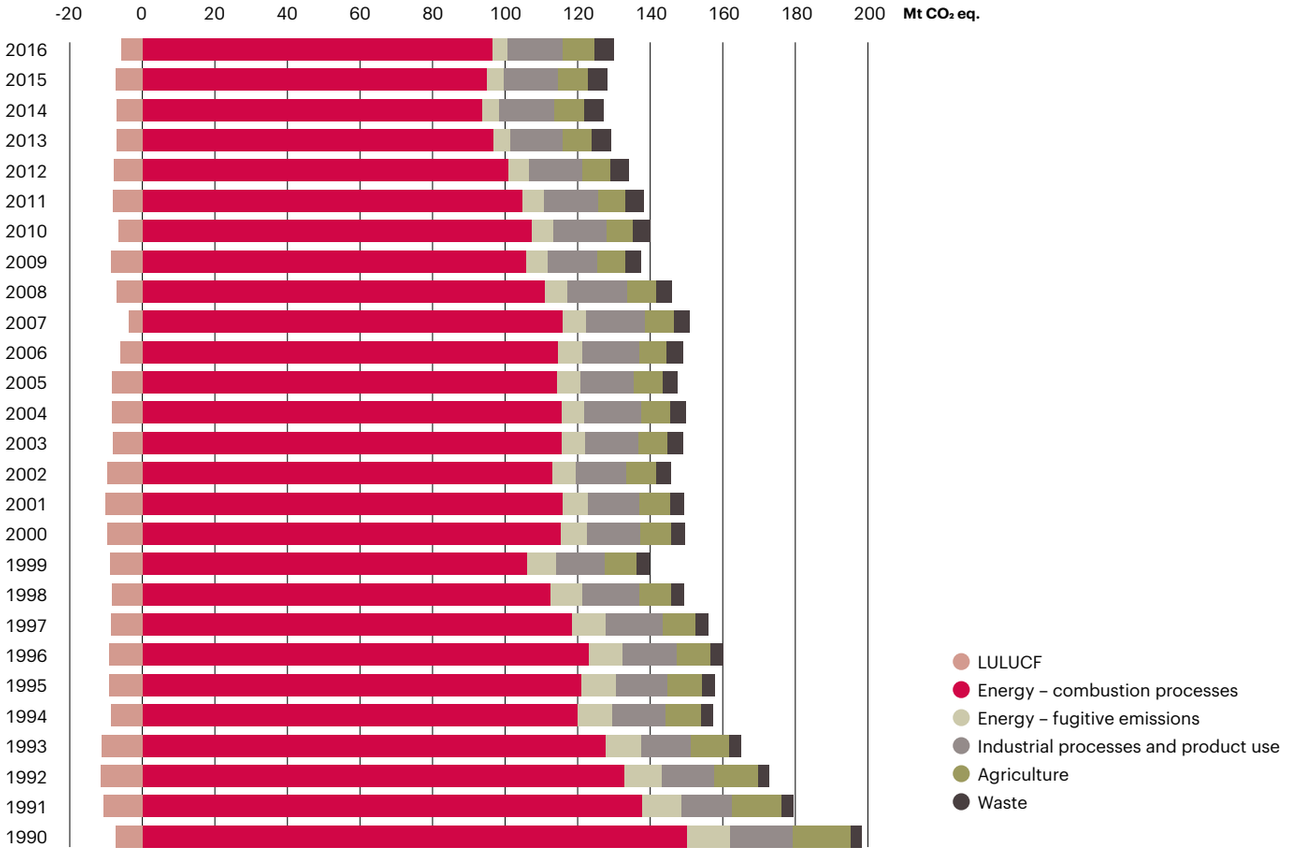
Source: NASA

Aggregate greenhouse gas emissions in the Czech Republic decreased in the period 1990–2016[3] by 34.4% to 129.6 Mt CO_2 eq. (without LULUCF, Chart 2). In the period 2005–2016, emissions decreased by 11.8% (17.4 Mt CO_2 eq.) and the objective of the Climate Protection Policy the Czech Republic (a decrease by 32 Mt CO_2 eq. by 2020 against 2005) is not met yet. In the year-on-year comparison of 2015–2016, aggregated emissions increased by 1.5%. The largest year-on-year emission increases were registered in the sectors of energy industry (by 0.8 Mt) and transport (by 0.7 Mt), these sectors together are the source of more than half of the total aggregate emissions of the Czech Republic.

[3] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

Chart 2

Development of aggregated greenhouse gas emissions in the Czech Republic by sectors [Mt CO_2 eq.], 1990–2016



Source: Czech Hydrometeorological Institute

The trend in greenhouse gas emissions from transport is upward, in the period 2000–2016 the increase was 54.6%. Since 2010, emissions from agriculture have been rising (by 14.9% in the period 2010–2016) and emissions from waste are steadily growing (by 44.3% in the period 2000–2016). Continued rapid growth is also recorded in emissions of F-gases from the use of products replacing CFCs, which have roughly tripled since 2005. Conversely, a downward trend, driven by the decline of coal mining, is recorded in fugitive emissions from fuels (since 2000, a decrease by 43.4%) and emissions from the sector of combustion processes in the manufacturing industry and construction (i.e. industrial energy), in connection with the reducing energy intensity of industry.

In the context of other EU28 countries, the Czech Republic has above average **GHG emissions per capita** (12.3 t CO_2 eq.capita.$^{-1}$ in 2016, i.e. 46.0% above the EU28 average) and a high emission intensity of the economy, which was higher in 2016 by 66.5% than the average for the EU28. It is mainly due to the structure of GDP generation with a high proportion of industry and export-focused economy.

Detailed data sources

https://issar.cenia.cz/

Air quality

2

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Emissions of pollutants	☺	☺	☺	☺
Emissions of heavy metals	N/A	☺	☺	☺
Air quality in terms of human health protection	☺	😐	😐	☹
Air quality in terms of the protection of ecosystems and vegetation	N/A	😐	😐	😐

In terms of air quality in the Czech Republic, it is necessary to ensure that the limit values for pollutants are not exceeded. Air quality in the Czech Republic is not improving despite the long-term reduction in emissions of pollutants. The reduction in emissions of pollutants reflects both the development of the national economy in each year, and the impact of introducing more efficient technology and production processes, reducing material and energy intensity and the obligation to meet specific legislative requirements. In 2016, the **emission ceilings set for 2010** were met. To achieve the **impassable values of emissions** set out in the National Emission Reduction Programme as of 2020, it is, however, needed to reduce emissions of SO_2 by 21.9%, emissions of NO_x by 14.4%, emissions of VOC and $PM_{2.5}$ roughly by half, and emissions of NH_3 by 10.8% as of 2017.

The limit values for **suspended particles PM_{10} and $PM_{2.5}$** are exceeded in the Czech Republic in the long term. Currently, the year-on-year fluctuations are driven mainly by weather conditions and in the winter part of the year are associated especially with inversions. The **limit value for the 24-hour concentration of PM_{10}** (Chart 3) was exceeded in 2017 on 8.3% of the territory (in 2016 on 1.4% of the territory). In the evaluated year, 23.1% of the population in the Czech Republic was exposed to above-limit concentrations (in 2016 it was 7.3% of the population). The annual limit value for the average concentration of PM_{10} was exceeded in 2017 on 0.02% of the territory of the Czech Republic. There was a total of 39 smog situations declared in 2017 due to high PM_{10} suspended particulate concentrations, with a total duration of 3,757 hours. Suspended particulates are a problem not only in the Czech Republic but also in the other European countries, about 16% of the urban population of EU28 countries was exposed to above-limit 24-hour concentrations of PM_{10} in 2014.

Exposure to suspended particulates in the Czech Republic in the long term leads to increased mortality, always affecting the most the vulnerable people such as the elderly or the chronically ill. In 2017, it was approximately 5.7 thous. people nationally, or roughly 5.2 thous. people in the ordinary (non-burdened) urban environment[4]. An increase in mortality compared to 2016 was caused in 2017 by the January and February smog situation.

Suspended particles of size fractions PM_{10} and $PM_{2.5}$ are emitted into the atmosphere by different sources (Chart 4), in both cases in 2016[5] the dominant source was household heating, which in the case of $PM_{2.5}$ accounted for 74.2% of all sources, for PM_{10} it was 57.2%. Another source of emissions was also transport, especially resuspension and tire wear, etc. Apart from those sources emitting particles, suspended particles are also produced by chemical reaction from the secondary particle precursors (NO_x, SO_2, NH_3 and VOC).

Another serious problem of air quality in the Czech Republic are exceedances of the limit value for **benzo(a)pyrene**. The highest concentrations are reached in industrial localities, above-limit concentrations, however, occur also at urban stations, while the entirely dominant source of benzo(a)pyrene emissions is the household heating (98.4% in 2016). The limit value for benzo(a)pyrene was exceeded in 2017 on around 26.0% of the territory, where 61.8% of the population lived (Chart 3). In 2016, it was 25.9% of the territory where 55.7% of the population lived. Concentrations of benzo(a)pyrene show strong annual variation, with maxima in winter due to, among other things, deteriorated dispersion conditions. Above-limit annual concentrations of benzo(a)pyrene (1 $ng.m^{-3}$) affect also other European population, in 2014, roughly 17 to 24% of the urban population of EU28 was exposed to it.

Benzo(a)pyrene generally increases the individual lifetime risk of developing cancer, the risk is the highest in industrial locations, in locations with traffic burden and also in urban areas. In 2017, this risk ranged from 4.5 to 10.2 cases of the disease per 100 thous. inhabitants.

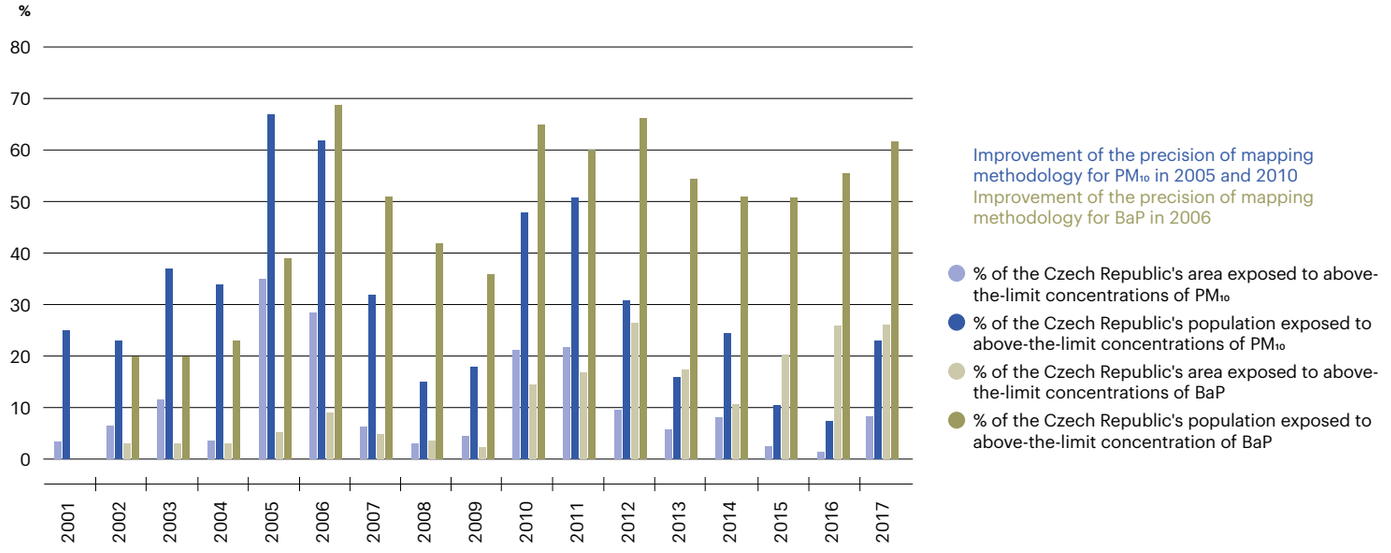
[4] *Data was provided by the National Institute of Public Health.*

[5] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

A long-term problem of air quality are high concentrations of nitrogen oxides **NO_x**, in particular causing breathing difficulties in heavy traffic areas, especially in large cities where their main source is the road transport (Chart 4). Although the total emissions of NO_x have been declining in the long-term in the Czech Republic, (between 2008 and 2017 by 33.5%, and year-on-year the decrease in 2017 was 2.9%), in 2017, as in previous years, the annual limit value for NO_2 was exceeded at 4 heavy traffic locations (two locations in Prague and two in Brno).

Chart 3

Percentage of the Czech Republic's area and population exposed to above-the-limit 24-hour average concentrations of PM_{10} and above-the-limit annual average concentrations of BaP [%], 2001–2017

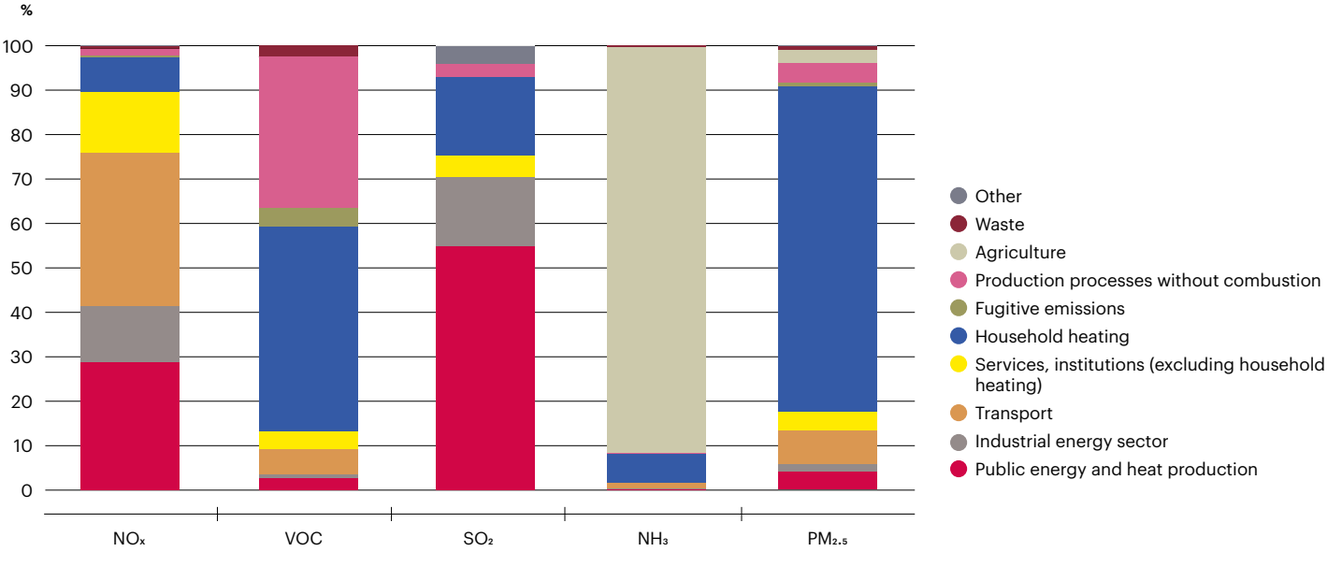


In 2005 and 2009, the methodology for mapping the concentrations of PM_{10} was specified.
In 2002–2007, the methodology of mapping benzo(a)pyrene was refined.

Source: Czech Hydrometeorological Institute

Chart 4

Sources of emissions of selected pollutants in the Czech Republic [%], 2016



Data for 2017 are not, due to the methodology of their processing, available at the time of publication.

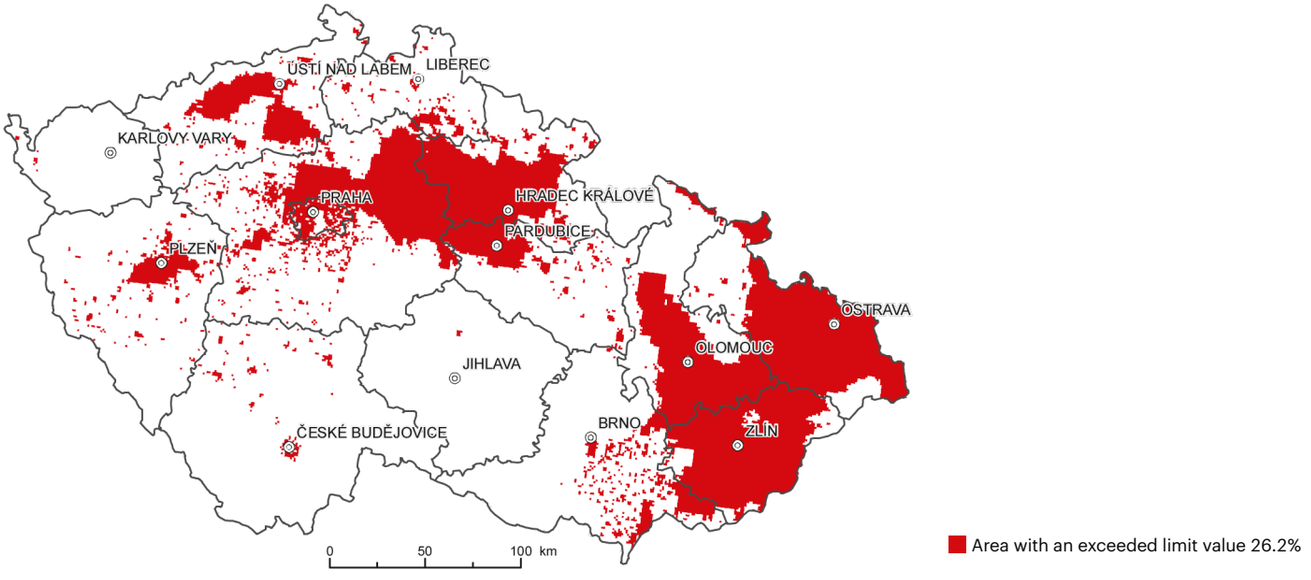
Source: Czech Hydrometeorological Institute

Another substance significantly affecting human health and the state of ecosystems is **ground-level ozone**. Its concentrations are influenced mainly by the meteorological conditions (the intensity of sunlight, temperature, and the occurrence of rainfall), the highest concentrations are usually measured in the period from April to September. In 2017, the limit value for the protection of human health expressed in daily 8-hour running average concentrations (120 $\mu g.m^{-3}$) was exceeded on 31.2% of the territory, 8.6% of the population was exposed to above-limit concentrations. In 2017, two smog situations were reported for ground-level ozone, in the Plzeň and Ústí nad Labem Regions, with a total duration of 54 hours. In 2017, the ozone (AOT40) limit value for the protection of ecosystems and vegetation was not exceeded in most of the territory of the Czech Republic. Limits set for ground-level ozone, both for the protection of human health and protection of ecosystems and vegetation, are exceeded in other European countries too, in the neighbouring countries, the exceedances of the limit value for the protection of human health are comparable, in the case of exceedances of the ozone limit value for the protection of ecosystems and vegetation, the situation is the worst, due to weather conditions, in southern and southeastern Europe.

In 2017, at least one limit value excluding ground-level ozone was exceeded on 26.2% of the Czech Republic territory[6] (Figure 4). That area was inhabited by 62.4% of the population. After the inclusion of ground-level ozone, the limit value of at least 1 pollutant was exceeded in 2017 on 55.0% of the area of the Czech Republic (Figure 5), where around 67.7% of the population lived.

Figure 4

Areas within the Czech Republic where limit values for human health protection were exceeded (excluding ground-level ozone), 2017

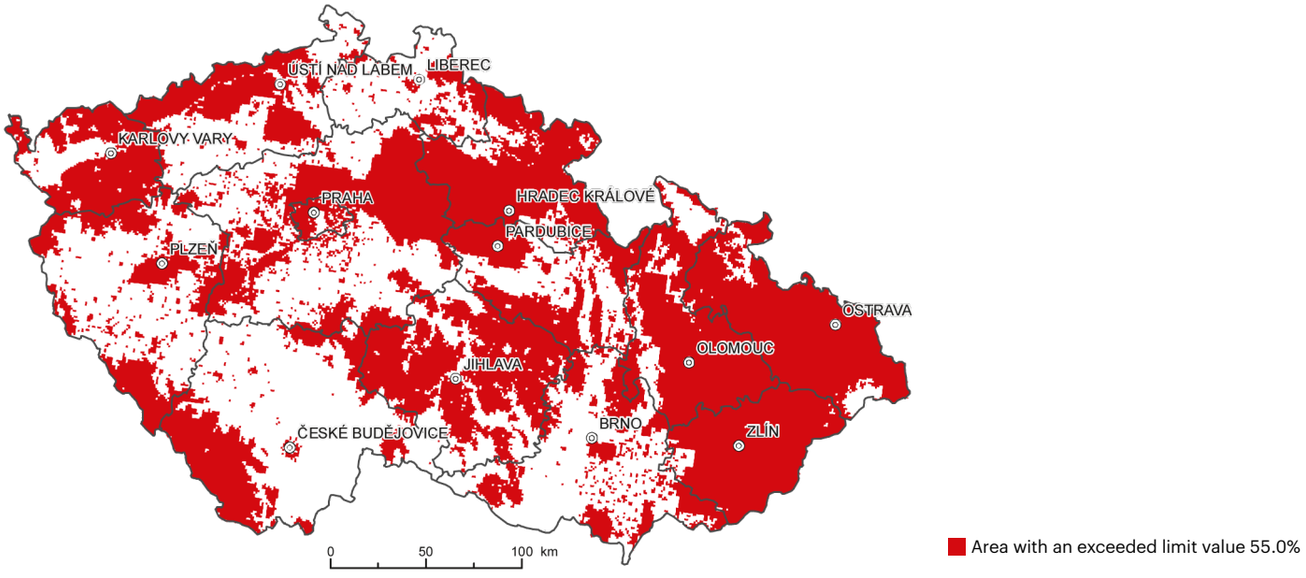


Source: Czech Hydrometeorological Institute

[6] *Act No. 201/2012 Coll., on air protection, Annex 1, point 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 5

Areas within the Czech Republic where limit values for human health protection were exceeded (including ground-level ozone), 2017



Source: Czech Hydrometeorological Institute

Detailed data sources

https://issar.cenia.cz/

3

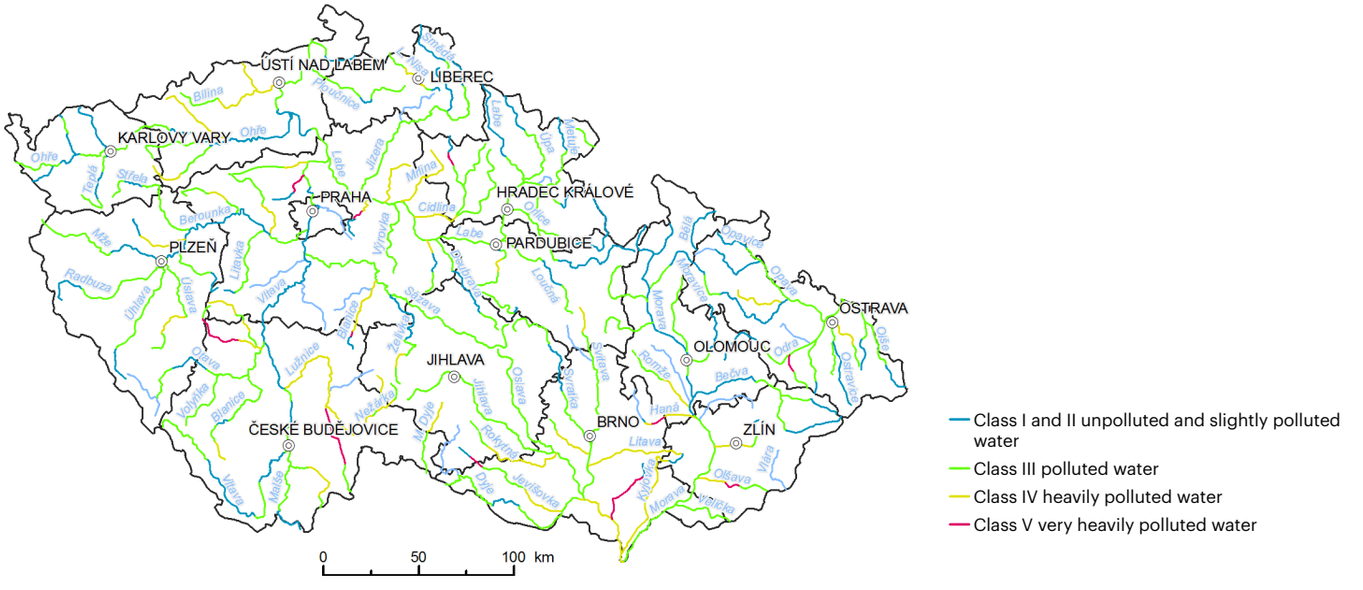
Water management and water quality

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Water abstraction	☺	☺	☺	😐
Waste water discharge	☺	☺	☺	😐
Waste water treatment	☺	☺	☺	☺
Water quality	☺	😐	😐	😐

Water is the basis of all ecosystems, it is therefore important to monitor its quality, but also to regulate its abstraction. Water quality is monitored regularly[7], a comparison of the status in the period 2016–2017 (Figure 6) shows an improvement of the condition of watercourses in most sections compared to the period 1991–1992. Most of the watercourses belong to class III according to the classification, i.e. polluted water. But gradually, the sections of streams falling in classes I and II are increasing. Some sections, however, remain classified in quality class V. Although water quality improved significantly since 1991, the persistent problem is eutrophication, which is caused by the increased amount of nutrients that reach the water due to runoff from soils and wastewater discharges.

Figure 6

Water quality in watercourses in the Czech Republic, 2016–2017



Source: T. G. Masaryk Water Research Institute, public research institution

The monitoring of **quality of surface water used for bathing in the wild** covered in 2017 a total of 251 locations. In the summer holiday season, bathing was banned at 14 sites and 23 sites were marked as unsuitable for bathing. The number of selected locations in the wild reported to the EU under Directive 2006/7/EC was 154 in 2017[8]. According to EU reporting for 2016, 81.8% of the localities in the Czech Republic had excellent water quality according to European standards, while across the EU the highest category was met by 85% of sites.

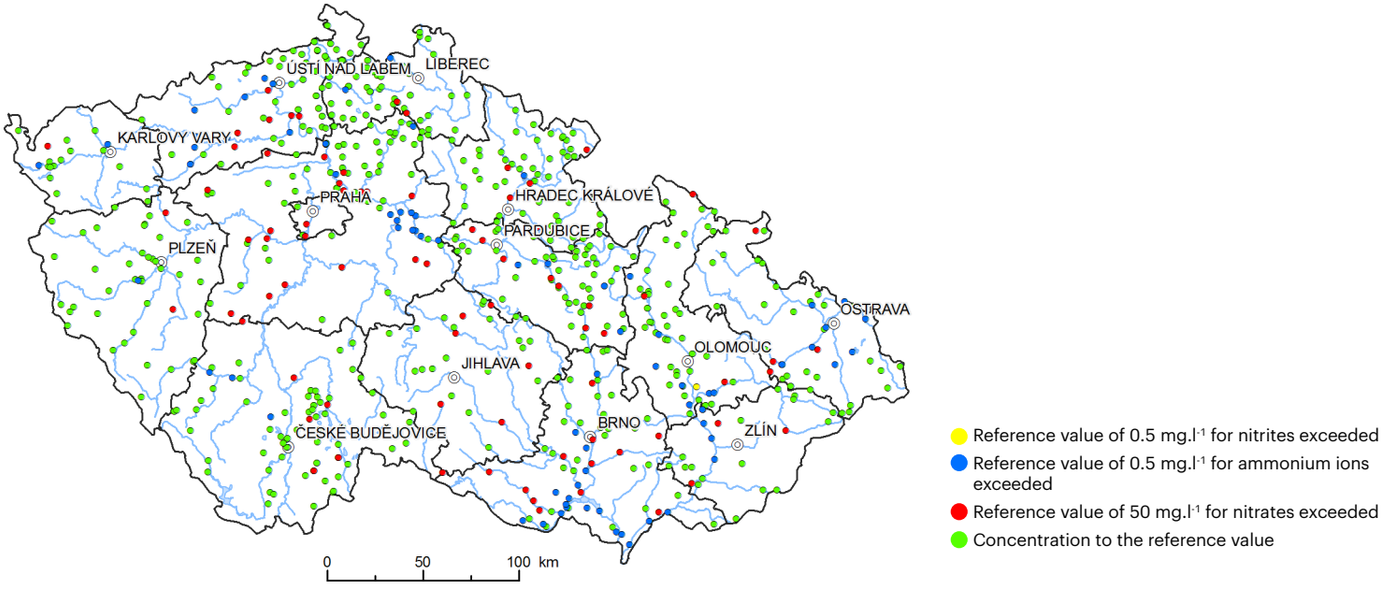
[7] *Maps of the quality of flowing waters are compiled according to the general evaluation of basic indicators (CODcr, BOD_5, $N\text{-}NH_4^+$, $N\text{-}NO_3^-$ and P_{total}) monitored pursuant to the national standard CSN 75 7221. The quality of streams is divided into 5 classes.*

[8] *Data was provided by the National Institute of Public Health.*

Water quality is also monitored for groundwater that is contaminated with nitrates and pesticides and mainly their metabolites due to intensive farming focused on crop production (Figure 7). The growing of certain crops (rape, beet, maize) represents a significant risk of contamination of ground and surface water in terms of the pesticides used. These are herbicides that are commonly used or were used in the past, and some are already banned (metazachlor, alachlor, metolachlor, acetochlor and atrazine). These herbicides, unlike herbicides used for the treatment of cereals (chlorotoluron, isoproturon, MCPP), contaminate groundwater to a greater extent. The problem with these materials is that they remain in the ecosystem in the long term, and therefore the values of those substances do not change much year-on-year. The most often exceeded limit for groundwater was recorded in chloridazon-desphenyl (herbicide treating sugar beet and fodder beet), the value exceeded the limit in 24.7% of the samples. The unsatisfactory state of most groundwater bodies is strongly influenced by the rule that if one indicator is unsatisfactory, then the whole water body is unsatisfactory (see the Water Framework Directive).

Figure 7

Concentration of nitrogen compounds in groundwater [mg.l^{-1}], 2017

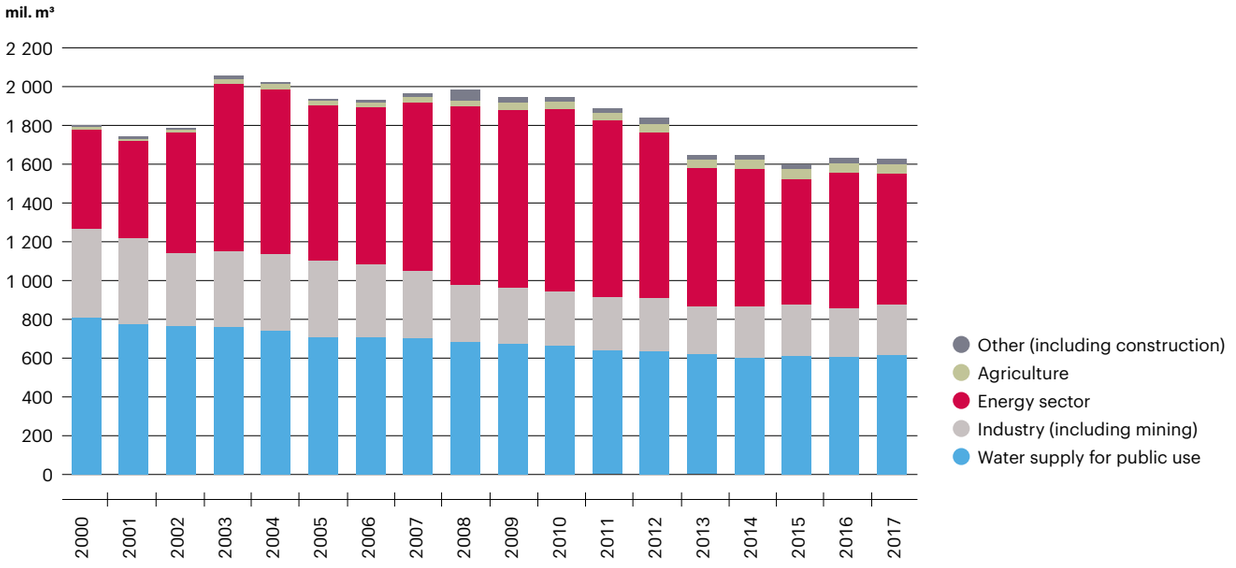


Source: Czech Hydrometeorological Institute

Abstractions of surface and groundwater are determined by the state of the economy, hydrometeorological conditions of the year and behaviour of households. In 2017, the total abstraction was 1,630.4 mil. m³, and it fell year-on-year by 0.3% (Chart 5). Most water is abstracted from surface waters (77.3% of total abstraction in 2017), a smaller part from the groundwater (22.7%). In the long term, the highest abstraction is carried out for the energy sector (41.6% in 2017). When dividing the total abstraction to surface water and groundwater, differences are noticeable in the representation of the economic sectors in the source of abstracted water, the most important consumer of groundwater is the public water supply, constituting 80.2% of the total abstraction of groundwater.

Chart 5

Total abstraction of water by individual sectors in the Czech Republic [mil. m³], 2000–2017



Source: Ministry of Agriculture, Povodí state enterprises, Water Research Institute T.G.M., Czech Statistical Office

For the **production of drinking water** in 2017, 596.5 mil. m³ was produced and intended for implementation, while the drinking water invoiced to households and other customers formed 482.0 mil. m³. Year-on-year, the invoiced water insignificantly increased by 0.7%. Out of the drinking water produced, 67.3% was used in households. In 2017, 94.7 % of the Czech population were supplied by water from public water supply systems. Specific water consumption per inhabitant supplied with water from the public water supply system, out of the total quantity of produced water, was 165.0 l.inhabitant^{-1}.day^{-1}, which is by 1.5% more than in 2016. The specific amount of water invoiced to households increased year-on-year slightly by 0.4 l.inhabitant^{-1}.day^{-1} to 88.7 l.inhabitant^{-1}.day^{-1}. The Czech Republic ranks among countries with the lowest water consumption per capita in the EU.

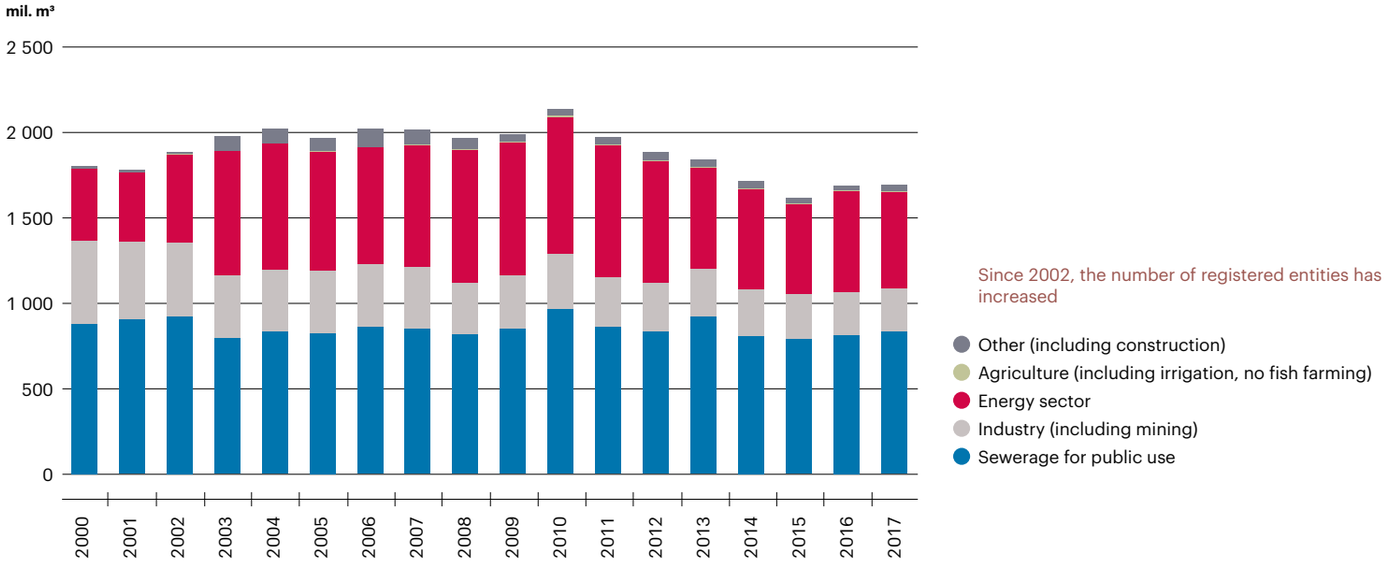
Losses of drinking water in the water supply network increased year-on-year. In relation to the total volume of water produced and intended for implementation, they increased from 15.4% in 2016 to 16.4% in 2017, but they are still low compared to 2000, when they accounted for 25.2%. Drinking water losses in the water mains are caused by accidents and leaks from public water supply systems.

Water quality is affected by the **quality of discharged wastewater**. The total amount of discharged wastewater and mine water in 2017 amounted to 1,702.1 mil. m³, year-on-year it negligibly increased by 0.1%. The **structure of the wastewater discharge** reflects the structure of customers (Chart 6). The largest share is held by public sewerage systems (48.9%) and energy (33.2%). The discharge of municipal wastewater increased year-on-year by 2.4%. An increase was also recorded for wastewater discharges from agriculture (by 18.3%), followed by the category other (by 13.5%), while the energy sector saw a year-on-year decline (by 4.3%). Year-on-year, the **share of Czech population connected to the sewerage network** rose from 84.7% in 2016 to 85.5% in 2017. The share of the population connected to a sewerage system with a wastewater treatment plant (WWTP) in the same period increased from 81.3% to 82.3%. The population connected to sewerage with a WWTP rose in comparison with 2000 by 18.4%. EU Member States are obligated to ensure (pursuant to Article 3 of Council Directive 91/271/EEC on municipal waste water treatment) that all agglomerations above 2000 population equivalent are equipped with sewerage systems for urban waste water. In the EU countries, the average rate of compliance with Article 3 reached 94.7% in 2014, the Czech Republic achieved 100% compliance rate. The Directive lays down criteria for specific types of treatment, and Article 4 requires that municipal waste waters drained by sewerage systems undergo secondary treatment or other equivalent treatment before discharge. Within the EU, that degree of treatment was applied to 88.7% water, in the Czech Republic, the rate of compliance was 90.5%. The rate of compliance with the requirements for tertiary treatment and more stringent treatment (Article 5) reaches 84.5% in the EU, while 62.7% in the Czech Republic. Nevertheless, due to ongoing new construction and reconstruction of WWTPs it can be expected that the rate of compliance with Article 5 in the

Czech Republic will grow significantly in the coming years, also in connection with the new Central Wastewater Treatment Plant being put into service in Prague.

Chart 6

Quantity of wastewater discharged into surface water in the Czech Republic [mil. m³], 2000–2017

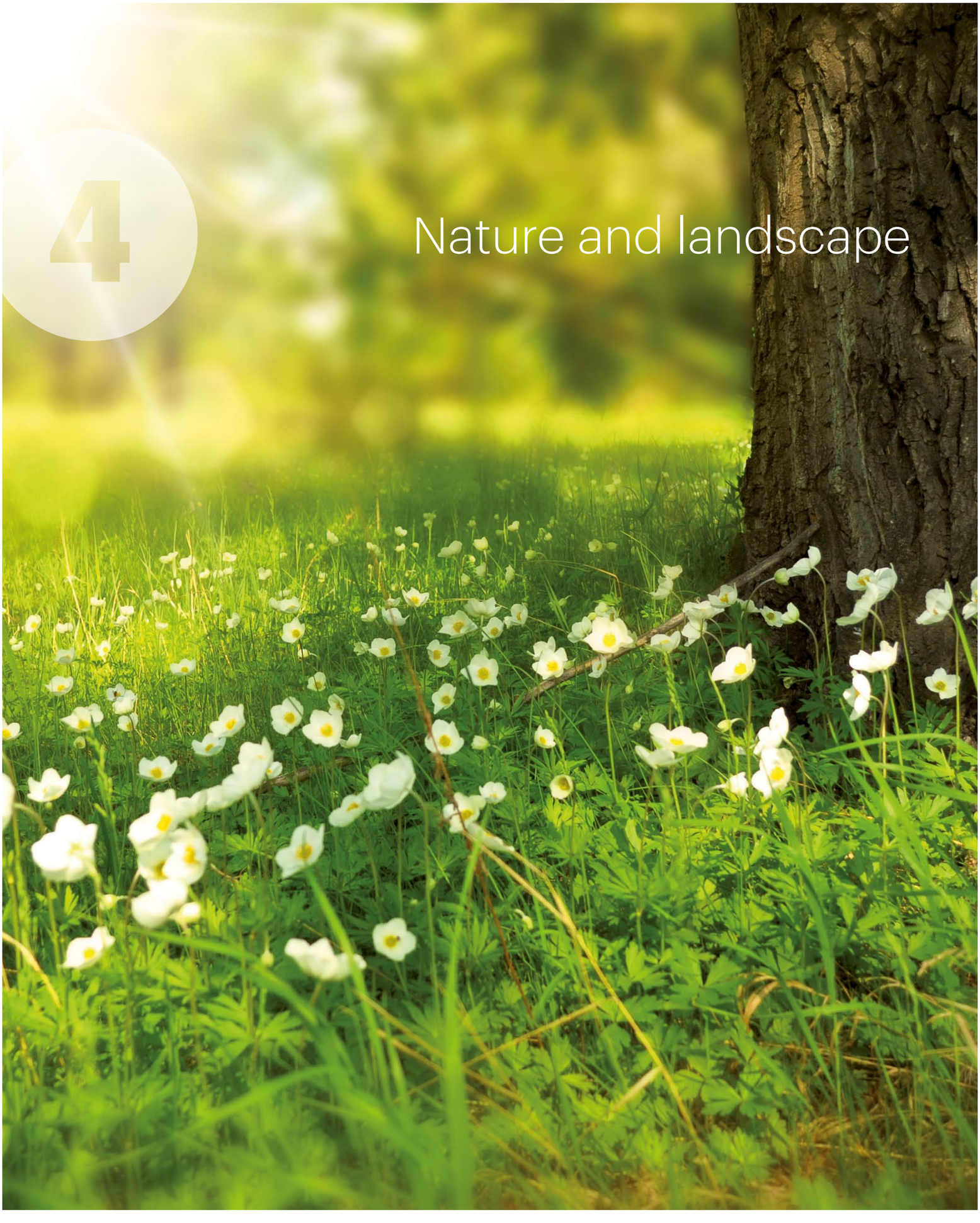


Source: Ministry of Agriculture, Povodí state enterprises, Water Research Institute T.G.M., Czech Statistical Office

The total volume of water discharged into the public sewer systems (including charged rainwater) increased compared to 2016 by 1.2%, from 517.97 mil. m³ in 2016 to 524.2 mil. m³ in 2017. The share of treated wastewater in water discharged into the sewer systems (without rainwater) was 97.5% in 2017, which translates into a year-on-year increase of 0.2%. The total number of WWTPs continues to grow, in 2017 there were 2,612 of them. A positive growth was recorded in WWTPs with tertiary treatment, where their number reached 1,456 (an increase compared to 2016 by 74 WWTPs). There were only 33 plants which apply only mechanical treatment in 2017. Although the number of wastewater treatment plants is growing, a persistent problem is the still unfinished sewer drainage of smaller communities (with less than 2,000 population equivalents).

Detailed data sources

https://issar.cenia.cz/



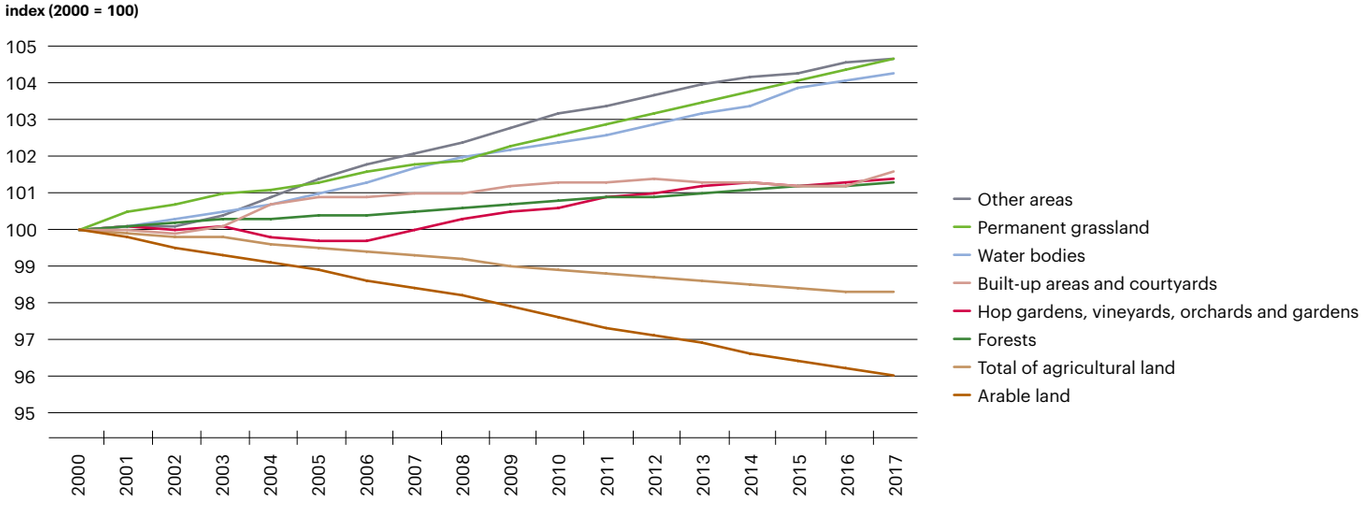
4 Nature and landscape

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Land use	😐	😐	😐	😐
Landscape fragmentation	☹	☹	☹	☹
Nature protection[9]	N/A	N/A	N/A	N/A
State of animal and plant species of Community importance in 2006 and 2012[10]	N/A	N/A	N/A	N/A
State of natural habitats of Community importance in 2006 and 2012[11]	N/A	N/A	N/A	N/A
Indicator of common bird species	☹	☹	☹	☹

Land use in the Czech Republic is characterized by higher forest coverage (33.9% of the territory) and a high rate of arable land (70.4% of agricultural land). Agricultural land covers 53.3% of the total land fund, but its area is declining in the long term, in the period from 2000 to 2017, it was reduced by 74,588.0 ha (by 1.7%). Land use shows several long-term trends (Chart 7). One of them is the increasing **area of grassland** (an increase by 45,482.0 ha, i.e. 4.7% since 2000), mainly at the expense of arable land. This trend, supported by state subsidy policy and the application of principles of the Common Agricultural Policy, helps to reduce soil erosion and enhances biodiversity. Another trend is the increase in **built-up areas**, **courtyards and other areas** (an increase by 33,816.0 ha, i.e. 1.4% since 2000). The increase in those surfaces causes a permanent loss of agricultural land, reduces water infiltration into the soil and raises the negative landscape fragmentation.

Chart 7

Land use development in the Czech Republic [index, 2000 = 100], 2000–2017



Source: Czech Office for Surveying, Mapping and Cadastre

[9] *For indicator Nature protection, the trend and the last year-on-year change cannot be evaluated because changes in the nature and landscape are gradual and long-term, they can not be assessed purely mathematically, but in the context of their inner characteristics.*

[10] *For indicator State of animal and plant species of Community importance in 2006 and 2012, it was not possible to assess the trend due to changes in methodology between evaluations in 2006 and in 2012. The last year-on-year change could not be evaluated due to the unavailability of data.*

[11] *For indicator State of natural habitats of Community importance in 2006 and 2012, it was not possible to assess the trend due to changes in methodology between evaluations in 2006 and in 2012. The last year-on-year change could not be evaluated due to the unavailability of data.*

The land use in the Czech Republic also affects the permeability and **fragmentation of landscape**. In the years 2000–2010, the area of unfragmented landscape decreased to 50 thous. km² (63.4% of the territory of the Czech Republic). It can be expected that the proportion of unfragmented landscape will reach in 2040 only 53%. The breakup of the landscape to ever smaller areas leads to the loss of ecosystem linkages and of the original quality of the divided biotopes. The cause of the landscape fragmentation is mainly the construction of transport corridors and urban sprawl.

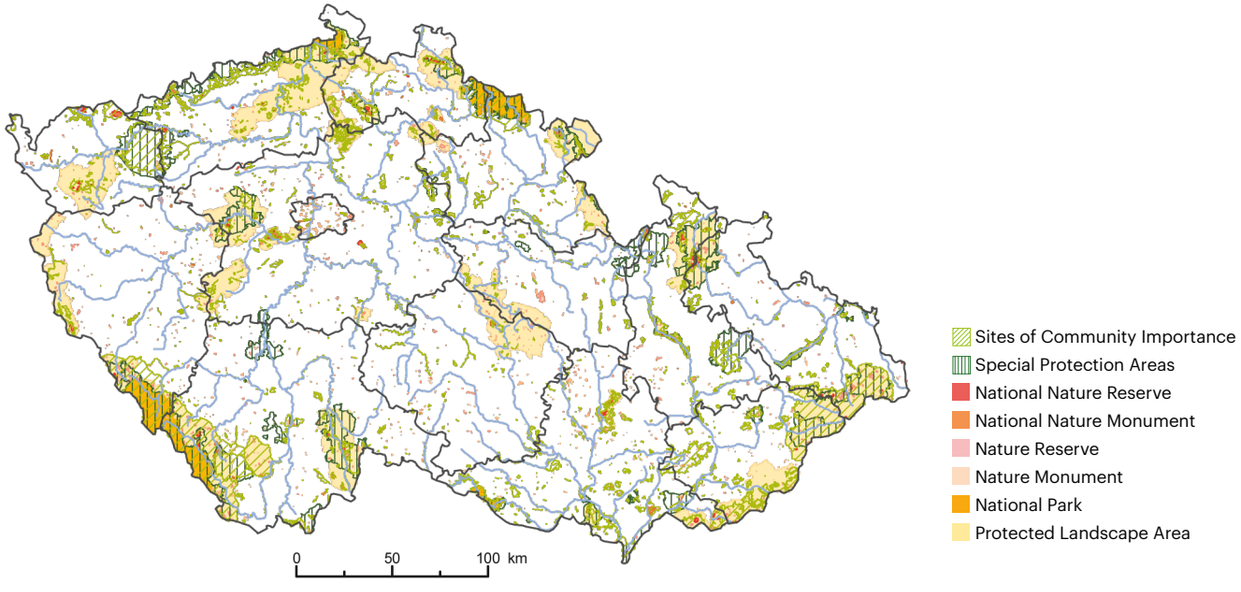
In 2017, **specially protected areas** covered 16.7% (1,320.1 thous. ha) of the Czech Republic, taking into account the overlap of large and small-size protected areas. The area of large specially protected areas that include national parks and protected landscape areas was 1,256.6 thous. ha (15.9% of the territory of the Czech Republic). Small-size specially protected areas accounted for 111.0 thous. ha, i.e. 1.4% of the Czech Republic's territory in 2017. However, nearly a third of the small-size specially protected areas are located inside National Parks or Landscape Protection Areas.

Bird areas within **Natura 2000** covered in 2017 a total of 703,437 ha, sites of Community importance as the second type of Natura 2000 sites occupied in 2017 a total area of 795,107 ha. Due to their overlaps, the area of all Natura 2000 sites in 2017 totalled 1,114.8 thous. ha, i.e. 14.1% of the territory of the Czech Republic. Natura 2000 sites occupied 18.1% of the European territory. The number of the sites increased in 2016, when the national list was enlarged with 50 new European sites and the 70 existing sites have been expanded to include new subjects of protection.

The territory protected through specially protected areas and areas and the territory protected by Natura 2000 overlap significantly, and thus the total area of protected areas in the Czech Republic accounted in 2017 for 22.0% of the territory (Figure 8).

Figure 8

Specially protected areas and Natura 2000, 2017



Source: Nature Conservation Agency of the Czech Republic

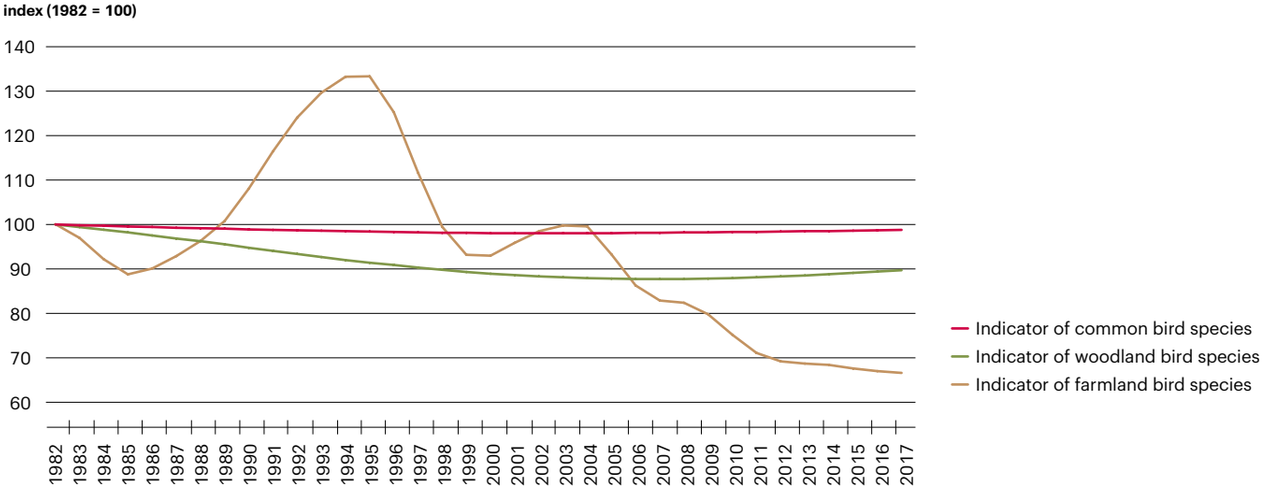
The Czech Republic registers 487 endangered species of higher vascular plants, 108 species of mushrooms, 15 species of mammals, 123 species of birds, 11 species of reptiles, 19 species of amphibians, 20 species of fish and Cyclostomata and 116 species of invertebrates. The **red lists** include critically endangered 248 species of vascular plants and about 200 animal species. For **the most endangered species** (determined according to the Ministry of the Environment Decree No. 395/1992 Coll.), active protective measures are implemented in the form **rescue programmes**[12]. In 2017, 4 rescue programmes continued for plant species and 4 rescue programmes for animal species.

[12] *See www.zachranneprogramy.cz for more details.*

The state of nature and landscape in the context of climate change reflects trends in the development of various bird populations and their individual monitored categories. Since 1982, the abundance of common species of birds has declined in the Czech Republic by 1.3% (Chart 8). The long-term decline continues at about the same speed, but it slowed down in the last five years. In the case of forest bird species whose abundance decreased by 10.4%, there are signs of a possible trend reversal. The cause of the long-term decline in the abundance of **all common and forest bird species** is the lack of suitable biotopes e.g. for nesting (i.e. in-field strips and patches, grassed belts etc.), shortage of food and overall environmental pollution. The **abundance of farmland birds** continues to fall at a slower pace due to exhaustion of the populations rather than to a real improvement in the situation. Since 1982, the abundance of farmland birds has fallen by 33.5%. Principal causes of the dramatic decline of the abundance of **farmland bird species** include continuously increasing intensification and concurrent abandoning of less fertile land, mainly in mountain and foothill areas. Similar trends as in the Czech Republic can also be seen on a European scale. The decline in the population of farmland birds in Europe is on the same level as in the Czech Republic.

Chart 8

Development of the common farmland bird species indicator, the common woodland bird species indicator and the overall indicator of all common bird species in the Czech Republic [index, 1982 = 100], 1982–2017



Source: Czech Society for Ornithology/ORNIS (Unified Bird Census Programme)

Detailed data sources

https://issar.cenia.cz/

5 Forests

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Health condition of forests				
Species composition and age structure of forests				
Responsible forest management				

Forests have long covered about a third of the Czech Republic, in 2017 it was 33.9%. Their quality should be judged according to their **health condition**, expressed as a percentage of defoliation[13].

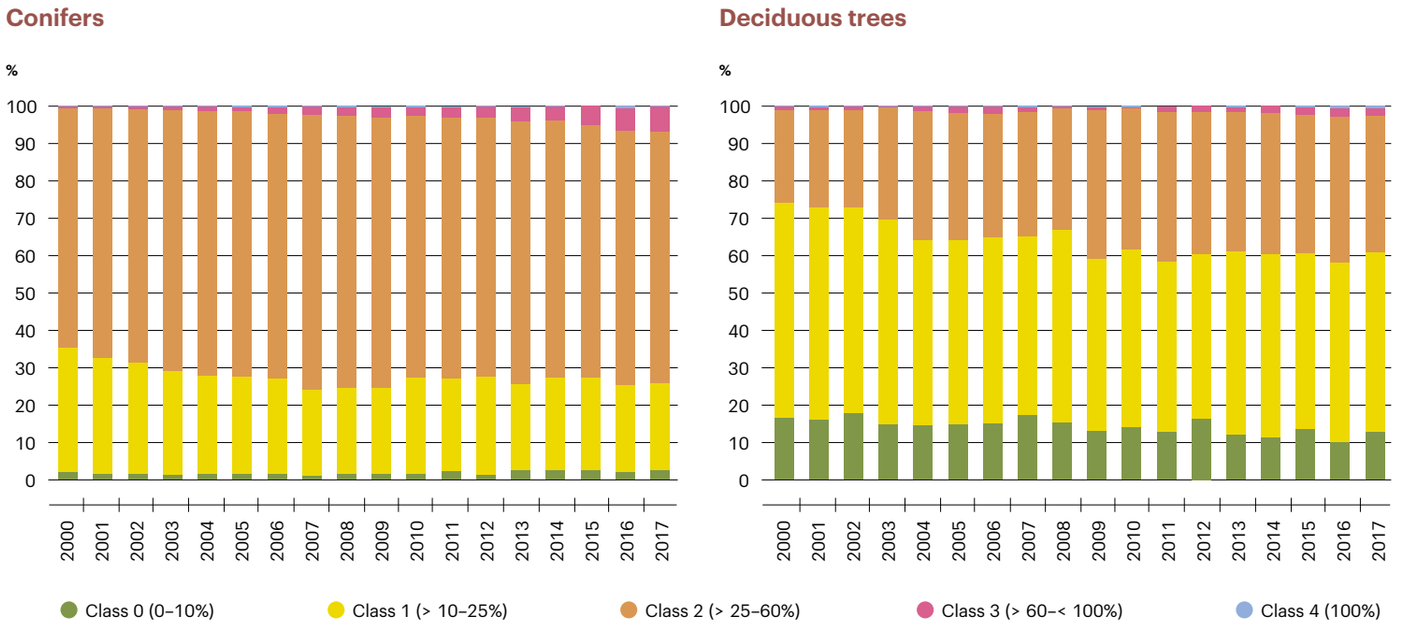
In 2017, defoliation class 2–4 covered 74.1% of **older stands** of conifers and 39.3% of older deciduous trees (Chart 9). The poor health of the older forests is the result of the intense ambient air pollution stress on the forest ecosystems in recent decades. Although since 1989 the pollution situation has greatly improved thanks to reducing the amount of emitted substances, the pollution burden persists, but its intensity is demonstrably lower. The older forests have been significantly affected by poor air quality since the early stages of growth. Many of these forests are also characterised by inappropriate species composition, therefore their health status remains unsatisfactory. The younger individuals in classes 2–4 represented 26.0% of conifers and 24.7% of deciduous trees. In **younger stands** (up to 59 years), the level of defoliation is lower, because younger stands have greater vitality and ability to withstand adverse environmental conditions, deciduous forests are generally, due to the annual complete renewal of the assimilatory apparatus, more resilient to defoliation. Another reason, which reflects in the health of the younger and older stands, is drought. However, the current massive dieback of forests can not be attributed merely expressions of drought, it is a consequence of the concurrent drought, recurring prolonged heat waves, biotic factors successfully attacking the stands weakened by wasting, unsuitable species composition, extensive areas of equal-age forests, pollution load, etc. Moreover, the individual forest species often respond to extreme manifestations of environmental conditions not only differently, but also often with a considerable delay, and so their health problems can manifest in later years.

The aforementioned factors causing defoliation are the reason why the Czech Republic ranks among the countries with the highest levels of defoliation in Europe.

[13] *Health condition assessment of coniferous and deciduous trees is expressed as % of defoliation, defined as a relative loss of the assimilatory apparatus in the treetop compared with a healthy tree growing in identical vegetation and habitat conditions, and which is divided by age into two categories – the older (60 years and older) and younger (under 59 years). The defoliation values are divided into five basic classes (0–4), of which classes 2–4 characterise significantly damaged trees.*

Chart 9

Defoliation of older conifers and deciduous trees (stands over 60 years of age) in the Czech Republic by classes [%], 2000–2017



Source: Forestry and Game Management Research Institute, public research institution

The current **species composition of forests** differs significantly from the reconstructed natural and recommended composition[14], mainly due to the planting of spruce and pine monocultures in the past. In 2017, conifers accounted for 71.9% of the forest area, even though according to the recommended composition, their share should be only 64.4%. The dominant species were spruce with a proportion of 50.3%, followed by pine (16.3%), and larch (3.8%). The **share of fir**, which ranks among tree species consolidating and draining the soil, in the total area of forests is stably around 1% (in 2017 it was 1.1%). The deciduous trees are dominated by beech stands (8.4%) and oaks (7.2%).

In the last decades, there is a clear **targeted change of the species composition** towards a more natural (and stable) structure of forest stands by applying deciduous tree species at the expense of conifers. The share of deciduous trees in the total area of forests in the period 2000–2017 increased from 22.3% to 27.0%, but according to the recommended composition of forests, the share of deciduous trees should make up 35.6%. The largest increase in this period was recorded in beech (2.4 p.p.). The acreage of conifers fell in the same period from 76.5% to 71.9%. The highest decrease was observed in spruce (3.7 p.p.).

The higher ecological stability of the forest is also enhanced by the **age structure of forest ecosystems**, where the area of stands younger than 60 years should reach 18%. In 2017, the area of stands in the categories under 60 years ranged from 14.8% to 16.6% and was thus sub-normal. The reason for the described unfavourable situation is the increase in forest areas in the late 19th and the first half of the 20th century, when mostly monocultures were planted. Still, the age structure is slowly approaching the so-called normality.

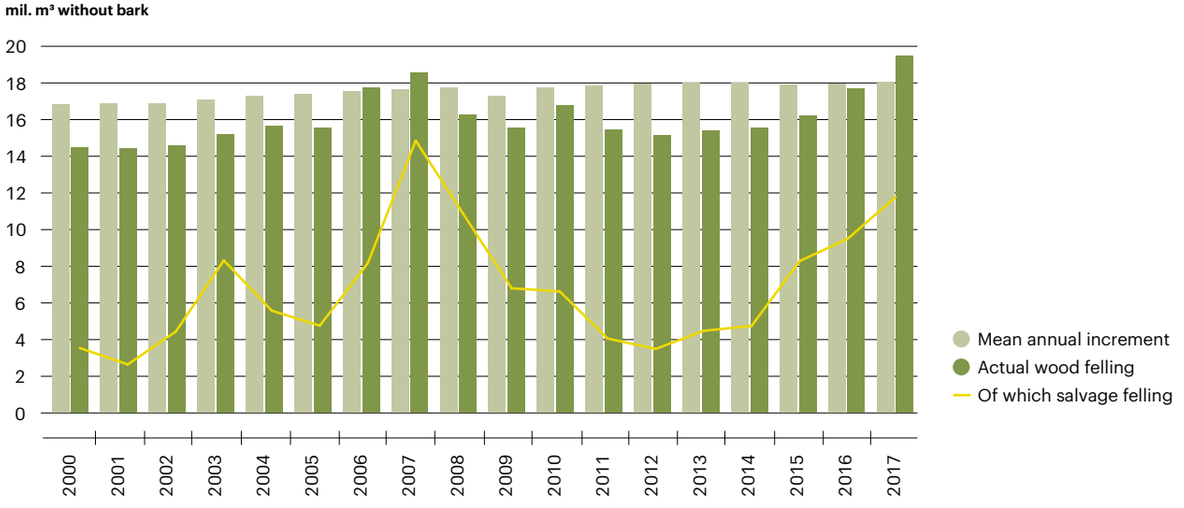
The state of forests in the Czech Republic, including the age structure and species composition, is strongly influenced by the method and the extent of restoration and harvesting. In 2017, the area of 24,446 ha was afforested, while **natural regeneration** accounted for less than a fifth of the afforested areas. In **artificial regeneration**, deciduous trees formed 42.3% and coniferous trees 57.7% of the afforested areas. Total mean annual increment in 2017 reached 18.0 mil. m³ without bark (Chart 10). Therefore, it was lower than the total harvest (19.4 mil. m³ without bark). That situation has occurred three times since 2000 (2006 and 2007 Kyrill hurricane and the subsequent bark beetle calamity (in 2007, salvage logging accounted for 80.4% of total harvesting). In 2017, it was timber-processing after the bark beetle calamity. Logging due to bark beetles has

[14] *The reconstructed natural composition is close to the climax composition at the time before forests were influenced by humans. The recommended composition of the forest is a universally optimised compromise between the natural composition and composition optimal from the contemporary economic perspective.*

risen since 2015, in 2017 it was the highest since 2000. The total standing stock has been growing steadily since 2000, while in 2000 it amounted to 630.5 mil. m³, in 2017 it was 699.0 mil. m³.

Chart 10

Comparison of wood felling and total average growth increment in the Czech Republic [mil. m³ without bark], 2000–2017



Source: Czech Statistical Office

The aim of forest management is to manage forests in a way that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to perform important ecosystem functions not only at local but also at the global level, without any negative impact on other ecosystems. One of the methods of such management is applying the principles of PEFC (Programme for the Endorsement of Forest Certification Schemes) and of FSC (Forest Stewardship Council).[15] In 2017, 68.6% of forests were certified according to PEFC and 2.0% according to FSC.

Detailed data sources

https://issar.cenia.cz/

[15] *Forest certification under the PEFC and FSC systems is one of the forest management processes which aim at sustainable forest management in the Czech Republic and strive to improve all forest functions in favour of the human environment. Through the certificate, the forest owner declares a commitment to manage the forest pursuant to the given criteria. In terms of international recognition, both systems are considered equal.*


6
FENDT
Soil and agriculture

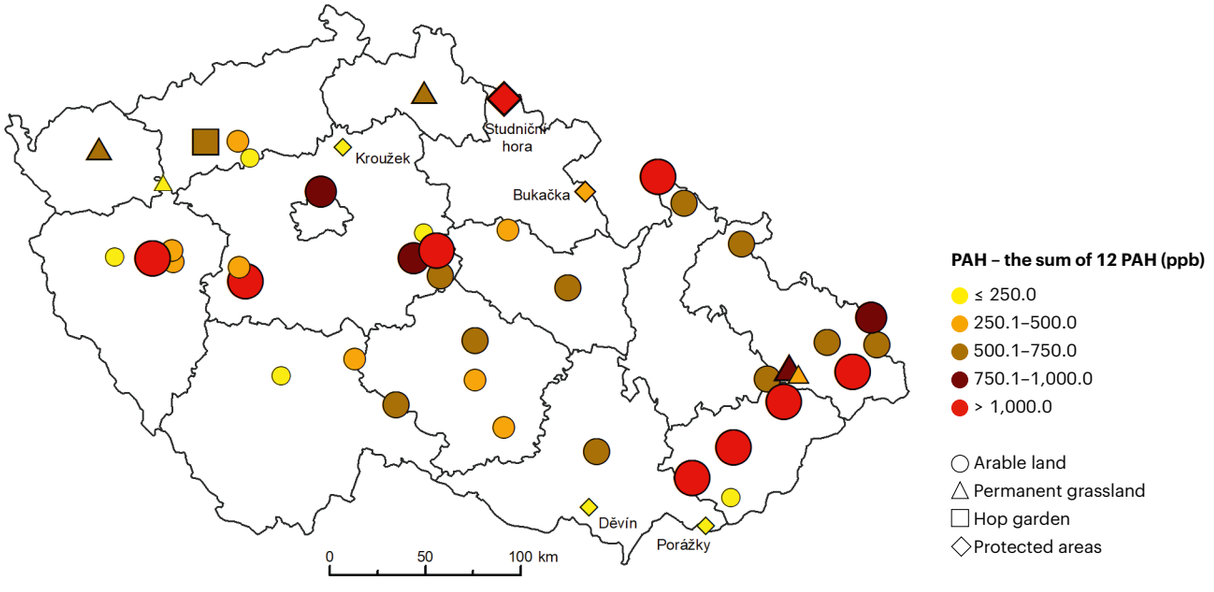
	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Risk of soil erosion and slope instabilities	☹	☹	☹	😐
Consumption of fertilisers and plant protection products	☺	☹	😐	😐
Quality of agricultural land	☺	😐	😐	😐
Organic farming	☺	☺	☺	😐

A long-term problem of agricultural landscape are large land blocks which were created in the 2nd half of the 20th century as a result of intensification of agriculture and the growth of a single crop over wide areas. Inappropriate farming leads to soil degradation such as compaction, erosion, loss of nutrients, loss of organic matter and accumulation of harmful substances (from agricultural and industrial activities).

The **quality of farmland** is determined by a number of properties (e.g. soil structure, soil reaction (pH), sorption capacity, humus content etc.). The quality farmland is adversely affected by the content of hazardous substances in the soil, which get into the soil and sediments through anthropogenic activities. The **monitoring of the content of hazardous elements and substances in soil (Basal Soil Monitoring – BSM)** covers both risk inorganic elements (e.g. As, Cd, Ni, Pb, Zn etc.) and persistent organic pollutants (PAH, PCB, HCH, HCB and substances of the DDT group). Based on the results of determining the content of hazardous elements in the soil by extraction with aqua regia, the most problematic in the period 1998–2017 were the contents of cadmium (9.5% samples exceeded the limit) and arsenic (8.9% above-limit samples), when checking the persistent organic pollutants, the most problematic were PAH (20.0% of the samples were above the limit, Figure 9). Cadmium is most problematic in the pond and river sediments. In the samples for the 1995–2017 period, the limit values were exceeded in 16.3% of samples for cadmium, in 7.9% for zinc and in 5.2% samples of pond and river profiles for arsenic. Limit values for PAH were exceeded in 23.1% of samples. Limit values for DDT were exceeded in 7.0% of samples of river and pond profiles and in 10.0% of samples of arable land.

Figure 9

Content of the sum of 12 EPA PAHs in topsoil of agricultural land (under BSM) in the Czech Republic [µg.kg^{-1}], 2017



Identified from samples taken from 40 selected monitoring areas and 5 sites in protected areas. The preventive value for the sum of 12 PAH EPA pursuant to Decree No. 153/2016 Coll. is 1,000 ppb (1.0 mg.kg^{-1} of dry mass).

Source: Central Institute for Supervising and Testing in Agriculture

Since 2000, an upward trend has been noticeable in consumption **industrial fertilizers** with fluctuations in the individual years. While in the years 2011–2014 their development stagnated, in 2015 there was again a significant increase in consumption, mainly due to prolonged drought and lack of nutrients in the soil. When comparing the years 2016 and 2017, there was a slight decline by 2.1% to 138.2 kg.ha^{-1} of pure nutrients. A decline was recorded, in comparison with 2016, in the consumption of nitrogen fertilizers (by 3.3%), and in the consumption of potash fertilizers by 11.1%. Although the consumption of nitrogen fertilizers decreased, regarding the composition of the mineral fertilisers used, nitrogen fertilisers still clearly dominate and represent 81.7% of total consumption. The **consumption livestock manure** saw a long-term decline (between 2005–2013), in 2014, its consumption increased slightly and then stagnated. Total input of pure nutrients from manure and organic fertilisers was 70.0 kg ha^{-1}. Year-on-year, the **consumption increased of lime substances** which reduce soil acidity, stabilize soil structure and enhance the biological properties of the soil, by 4.3% to 269.0 thous. t.

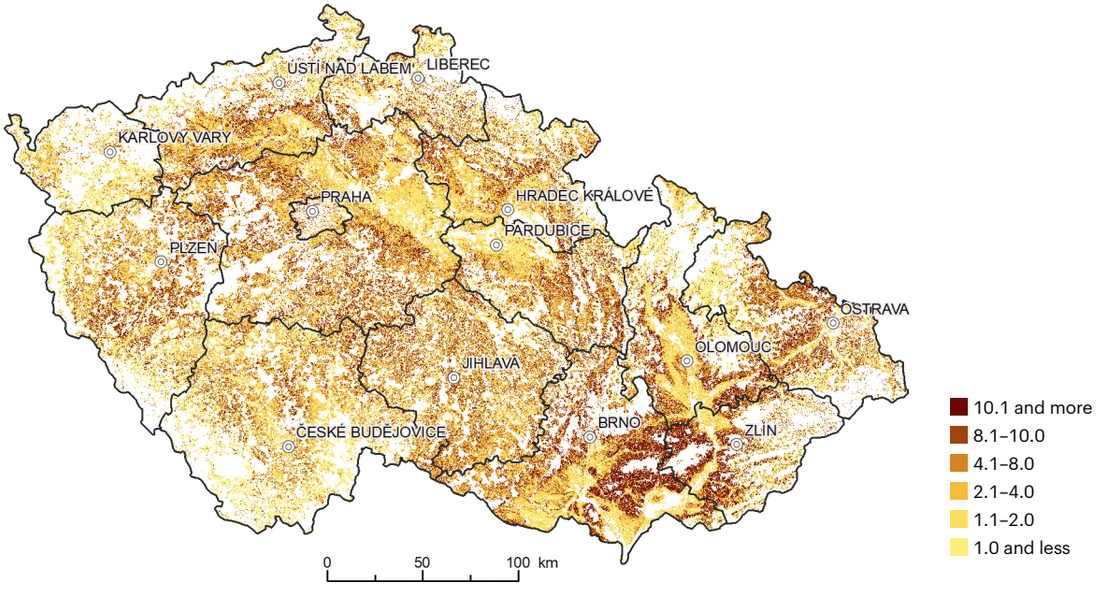
The **consumption of plant protection products** had a downward trend since 2012, in 2017 it slightly grew year-on-year compared to 2016 by 0.2% to 12,841.2 thous. kg. But the consumption of active substances contained in the plant protection products decreased by 2.2% to 4,769.2 thous. kg. The largest proportion in the total consumption of active substances was held by herbicides and desiccants (46.1%), followed by fungicides and dressings (29.9%) and growth regulators (13.4%). Although plant protection products have a positive impact on overall yields in agriculture, it is necessary to control their use due to negative impacts on the environment, and thus on the quality of the soil.

The **quality of the soil is also negatively affected by erosion.** On heavily eroded soils, the yields drop by up to 75% and land prices are reduced by up to 50%. Soil in the climatic conditions of the Czech Republic is threatened primarily by water and wind erosion.

Water erosion is a threat to soil as it removes soil particles from the upper (most fertile) parts of soil (topsoil) and deposits them in other locations, i.e. causes soil loss. The reduced thickness of the soil profile and disturbed soil structure significantly reduce the soil's ability to retain water. Water erosion in the Czech Republic threatens in the long term the areas with the most valuable, high-quality soil (the Labe basin and the Morava valleys, Figure 10), where the largest share of soil at an extreme risk (potential loss of soil particles at 10.1 t.ha^{-1}.year^{-1} and more) is located. In 2017, a long-term potential soil loss (G)[16] threatened 56.7% of the agricultural land fund, in 17.8% it was an extreme threat (Chart 11). Within the EU, the states most affected by water erosion are Italy, Slovenia and Austria (potential loss of soil parts at more than 7.0 t.ha^{-1}.year^{-1}). The cause of the high vulnerability of soil in those countries are the strong erosive effects of rainfall and a relief with steep and long slopes.

Figure 10

Potential vulnerability of agricultural land to water erosion expressed as a long-term average soil loss G in the Czech Republic [t.ha^{-1}.year^{-1}], 2017

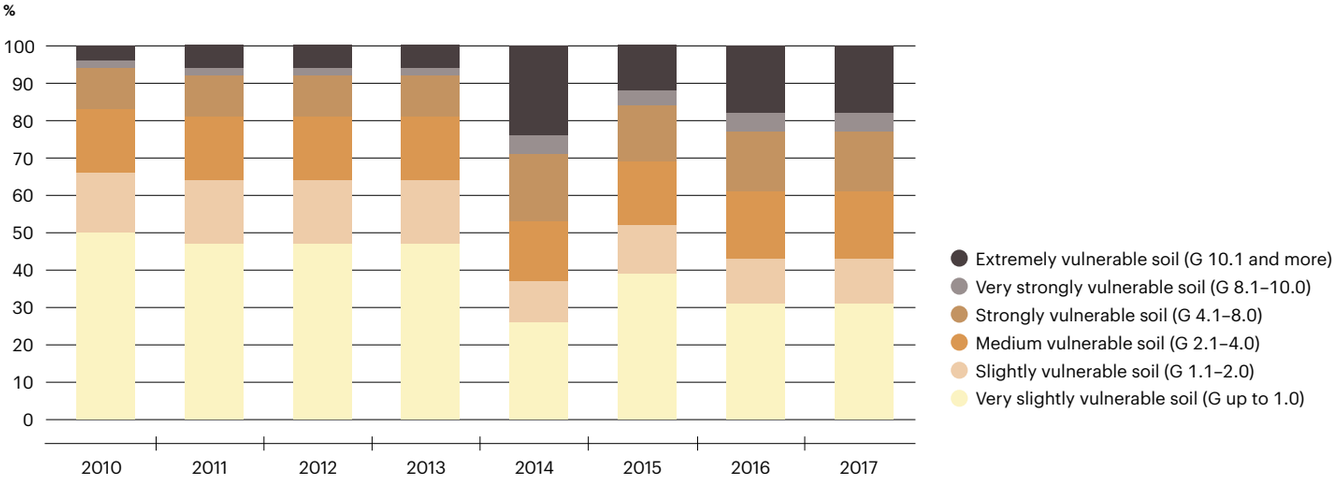


Source: Research Institute for Soil and Water Conservation

[16] *The calculation of the average long-term soil loss (G) is based on the universal soil loss equation (USLE): G = R × K × L × S × C × P [t.ha^{-1}.year^{-1}]. Inputs into the equation include the following factors: rainfall and runoff erosivity factor adjusted for regional climate according to public land register database (R), soil erodibility factor (K), slope length factor (L), slope steepness factor (S), cover-management factor adjusted for regional climate (C) and the support practices factor (P).*

Chart 11

Development of potential vulnerability of farmland to water erosion in the Czech Republic, expressed as a long-term soil loss [%], 2010–2017[17]



Source: Research Institute for Soil and Water Conservation

Wind erosion has a very similar effect on farmland to water erosion. Wind erosion[18] in 2017 potentially threatened 18.3% of agricultural land, 3.2% were included in the category of the most vulnerable land. The categories of soils not at risk covered 74.6% of the area. In the European context, wind erosion threatens the most some areas of Denmark, the eastern part of the UK, northwestern France, the northern part of Germany and the eastern Netherlands.

In order to maintain and improve soil fertility and ecological functions of soil, organic farming is applied. The **area of organically farmed land** more than tripled since 2000 – from 165.7 thous. ha to 520.1 thous. ha in 2017. Since 2012, the growth has stagnated, year-on-year the area of organically farmed land increased by 14.0 thous. ha. Due to the slow increase in the acreage of organically farmed land in recent years, the target set by the Action Plan of the Czech Republic for the development of organic agriculture in the years 2011–2015, i.e. reaching 15% of the agricultural land fund, was not achieved. In 2017, 12.4% of the total area of the agricultural land fund was organically farmed. While in 2005 and 2010 the objectives of the relevant Action Plan for the development of organic farming were achieved, the goal for 2015[19] (a 15% share) was not achieved, because in that year the share in the agricultural land fund was only 11.8%. The 15% target for the share in the agricultural land fund has been extended until 2020[20]. The largest share in the organically farmed land is held by permanent grassland, which in 2017 accounted for 82.2% of the total structure of the use of organically farmed land. The second largest share in the area of organically used land is held by arable land with 13.8%. The rest of the organically farmed land area, i.e. 4.0%, consists of permanent crops (vineyards, orchards, hop gardens) and other areas. In connection with the development of organic farming, the number of **organically farming entities (eco-farms)** is increasing. Since 2000, a sharp increase has been recorded from 563 entities to 4,399 entities in 2017. Year-on-year, 156 more eco-farms were registered in 2017. The number of organic food producers keeps growing, while in 2001 organic food was made by 75 producers, in 2017 it was already 672 producers. Despite the growing trend, the Czech organic food market is still underdeveloped, the share of organic food in the total consumption of food and beverages was only 0.9%. In the EU, organic farming has long been developing, while in 2015, the area of organically farmed land in the EU had 11.2 mil. ha, in 2016 the figure was 11.9 mil. ha. The share of organically farmed land in total cultivated land amounted to 6.7%. The Czech Republic thus ranks among the leading countries across the EU.

Detailed data sources

https://issar.cenia.cz/

[17] *The jump in the area of extremely vulnerable land in 2014 is due to a change in the methodology of calculating the potential vulnerability of farmland to water erosion in the Czech Republic.*

[18] *The methodology for establishing the potential vulnerability of agricultural land to wind erosion was used. From the data on soil environmental quality units, the data on climatic regions (the sum of daily temperatures above 10°C, average rainfall certainty for the growing period, probability of dry vegetation periods, average annual temperature, annual precipitation), and information on the main soil units (genetic soil type, soil-forming substrate, grain size, skeletal characteristics, rate of hydromorfism). The final evaluation is expressed by the product of the climate region factor and the main soil unit factor.*

[19] *Action Plan of the Czech Republic for the Development of Organic Farming in the years 2011–2015.*

[20] *Action Plan of the Czech Republic for the Development of Organic Farming in the years 2016–2020.*

7

Industry and energy

	Change since 1990	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				
Domestic material consumption				
Material intensity of GDP				

Industry and raw-material mining are among the pillars of the Czech economy, together they provide about a third of the gross domestic product. However, they have a significant impact on the environment as they disrupt the landscape character, change the natural habitats of plants and animals and deteriorate the quality of air, surface water and groundwater.

Extraction of raw materials has a long tradition in the Czech Republic and determines the industrial focus of the country. Mining activities in the Czech Republic are gradually declining, and so their environmental impact is reducing. In 2000, the total raw materials extracted by mining and quarrying weighed 161.3 mil. t, in 2017 it was only 121.3 mil. t. The materials mined in the largest volume in the Czech Republic are construction materials (59.8 mil. t in 2017) and the development of their mining is closely linked to the development of the construction industry. Out of the energy raw materials, the mining of brown and black coal (44.2 mil. t together in 2017) is strategically important in the Czech Republic. Brown coal mining covers domestic consumption and is also partly intended for export. Out of non-metallic minerals (17.2 mil. t in 2017), limestone and raw materials for cement production are mined in the largest volumes in the Czech Republic.

After terminating the extraction, the mining deposits are gradually **reclaimed** and the extent of areas affected by mining decreases. In 2017, the Czech Republic registered 475 km² of mining areas (in 2001, it was 825 km²), 73 km² of unfinished reclamation and 5.8 km² of areas that were terminated in the given year.

The extraction of raw materials is linked to **industrial production**. In 2017, industrial production continued for the fourth year in positive numbers, its year-on-year increase was 6.5%.

Although industrial production is growing, the emission burden produced by industry is gradually declining. In the long-term horizon 2000–2016[21], the decreasing trend in emissions of all pollutants from industry excluding CO is apparent. This trend is influenced by technological development leading to the reduction of material and energy intensity of industry, by changes in the sectoral structure of industry and by an increasing use of terminal equipment for removing emissions. CO emissions are fluctuating, their amount corresponds to the volume of iron and steel production, where the vast majority of the emission of this substance originates.

Industrial production, as well as other sectors of the national economy, are related to energy consumption. **Final energy consumption** in the Czech Republic is steadily decreasing, with occasional fluctuations. In 2016[22], the value of the final energy

[21] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

[22] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

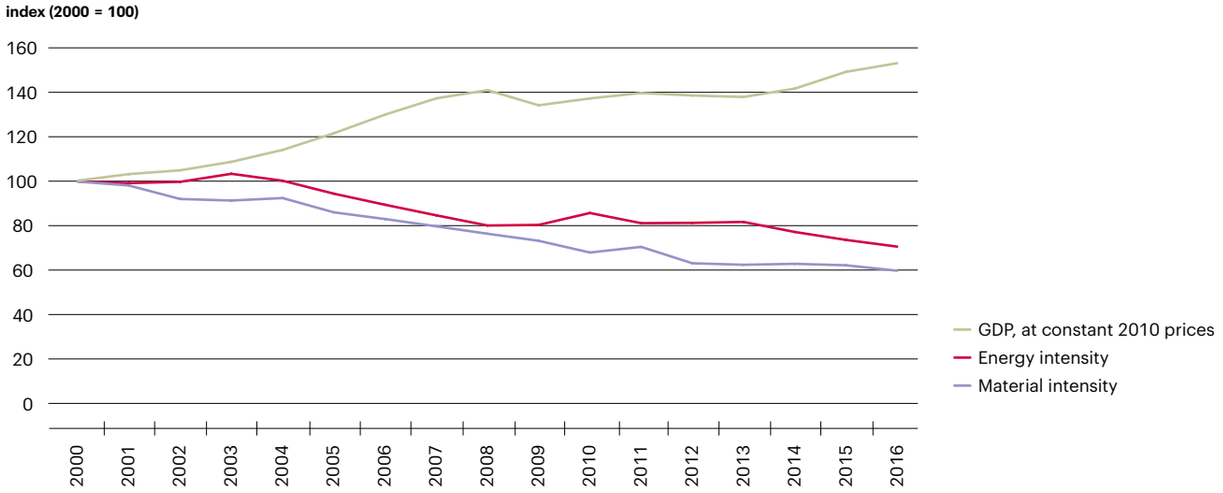
consumption in the Czech Republic was 1,041.7 PJ, which represents a year-on-year increase by 2.6%, but in the longer period 2010 to 2016, it decreased by 2.1%. The objective of the updated State Energy Concept is not to exceed the level of 1,060 PJ by 2020. This goal is being met, since 2010, the final energy consumption in the Czech Republic is below that threshold.

If **broken down by sector**, the highest and very similar consumption is seen in three sectors: industry (29.8% of total energy consumption in 2016), households (28.1%) and transportation (27.1%). The high energy consumption of Czech industry is given by historical focus on heavy industry and mechanical engineering. The development of energy consumption in households is significantly affected by the temperature conditions of heating seasons, because heating consumes most of the overall energy consumed in households. Energy consumption in transport has, as the only sector in the period 2010–2016[23], a growing trend by 8.1%, among other things due to the growing fuel consumption and increasing passenger and air transport. In the other sectors, the development of energy consumption is stagnant or slowly decreasing.

In connection with the consumption of energy, the consumption of **primary energy sources** (PES) is also decreasing. In 2016[24], the consumption of PES decreased year-on-year (by 1.2%), and at the same time the gross domestic product grew by 2.5%. The **energy intensity of the economy** reached 396.7 MJ.thous. CZK^{-1} (at constant prices of 2010) and it decreased by 3.6% year-on-year. In the period since 2000, there was an overall decrease in energy intensity by 33.6% (Chart 12).

Chart 12

Material and energy intensity of the economy and GDP in the Czech Republic [index, 2000 = 100], 2000–2016



Source: Czech Statistical Office

In parallel with the energy intensity, the **material intensity of the Czech economy** is also decreasing, in 2016 it fell year-on-year by 3.9% to 37.3 kg.(1,000 CZK of GDP)$^{-1}$, which is about one third compared to the early 1990s, in the period from 2000 to 2016, material intensity decreased by 39.8%. The decline in material and energy intensity indicates the increasing efficiency of energy and material transformation to economic performance, which results in a reducing environmental burden that is caused by the consumption of materials and energy production per unit of GDP produced, so-called **decoupling**[25]. In 2016, an absolute decoupling was achieved, in which the environmental burden decreases despite economic growth.

The specific indicators of energy and material consumption are, however, above average in the Czech Republic compared with the other EU28 countries, which is mainly due to the higher share of industry in GDP generation and energy based on fossil fuels. **Domestic material consumption per capita** in the Czech Republic in 2016 was 15.6 t.capita^{-1}, which is 17.7% above the average EU28 countries. **Material intensity of the economy** of the Czech Republic in 2016 amounted to 0.61 t.(1,000 PPS)$^{-1}$, which was higher by 34.2% than the average material intensity of the whole EU28. Energy intensity in 2016 was 10.0 TJ.(mil. EUR)$^{-1}$, which is 1.4 times more than the EU28 average.

[23] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

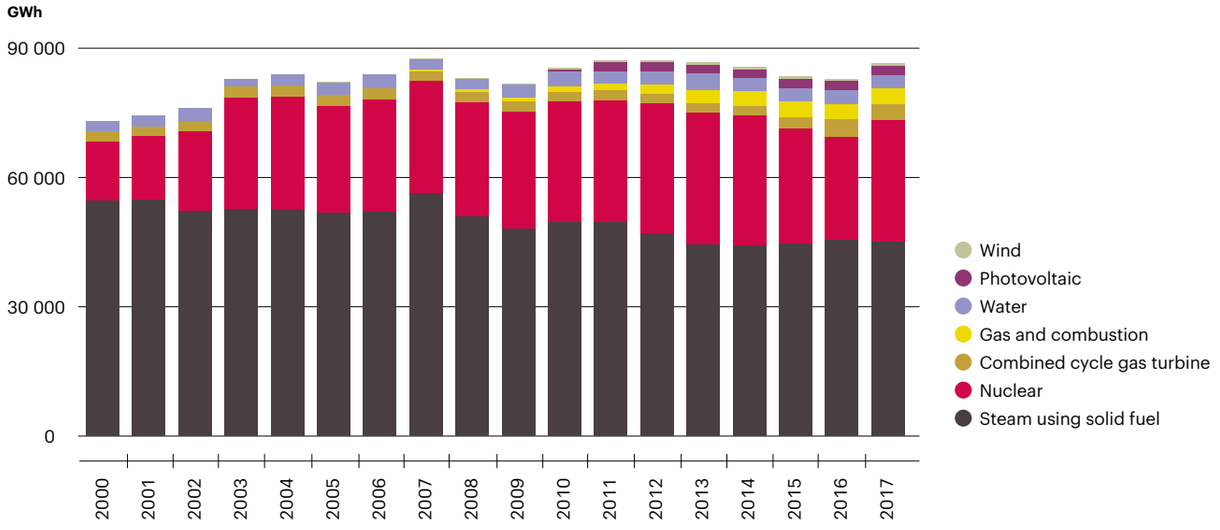
[24] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

[25] *Decoupling means the separation of economic development from the environmental burden.*

Production of electricity and heat is determined by the demand, therefore, it is closely related to consumption. Total gross electricity production in 2017 increased by 4.5% year-on-year after a four-year decline and reached 87,037.6 GWh (Chart 13). Compared to 2000, 18.5% more electricity was produced in 2017. **The Czech energy mix** is gradually changing. Production of electricity from coal, which has been historically determined in the Czech Republic by the available deposits of that energy mineral, decreases (in 2017, the share of lignite in power generation was 42.5% and black coal had 5.1%). Gradually, coal is replaced with nuclear energy (32.6%) and renewable sources (11.1%).

Chart 13

Electricity generation by the type of power plants in the Czech Republic [GWh], 2000–2017



Source: Energy Regulatory Office

Production of electricity from renewable sources developed dynamically in the Czech Republic since 2003. The reason for this is the establishment of international and national strategies and targets, which led to the promotion of renewable energy sources (RES), especially thanks to the law on the promotion of electricity from renewable energy sources. After 2013, however, the steep increase in electricity production from RES stopped in connection with the restricted support for photovoltaics. In 2017, 9,618 GWh of electricity was produced from renewable sources, which means more than five times the level of 2003 and a year-on-year increase by 2.4%. In 2017, the largest **proportion of electricity from RES** was produced from biogas (27.4%), followed by biomass (23.0%), and photovoltaics (22.8%). The next important source are hydroelectric power plants (19.4%) and wind turbines (6.1%), the potential of which is significantly limited by natural conditions in the Czech Republic. The lowest share is taken up by the biodegradable fraction of municipal solid waste (1.2%). In all types of RES, the electricity production grew in 2017 year-on-year, except for hydro power plants where production fell due to drought and the associated low water level in streams.

Currently, the Czech Republic is on its way to meeting the **indicative targets concerning RES**. The State Environmental Policy of the Czech Republic took over the target from the European directive[26], i.e. the share of RES in gross final energy consumption to be 13% by 2020. In 2016[27], the value for the Czech Republic was 14.9%, and the indicative target was reached already in 2013. The second target, arising from the updated State Energy Concept, is to achieve the proportion of RES in electricity production in the range of 18%–25% by 2040. In 2017, that share amounted to 11.1%.

Foreign trade in electricity in 2017 had, same as in the previous years, an export character. 28.1 TWh of electricity was exported, but imports amounted to 15.1 TWh. The balance of exports and imports for the whole year thus amounted to 13.0 TWh, which corresponds to 15.0% of the overall amount of electrical energy produced in the Czech Republic (87,037.6 GWh). The balance value is higher by 18.8% compared to 2016. In Europe, the Czech Republic is, due to the availability of energy sources, a major exporter of electricity, only Germany, France and Sweden had higher exports in 2016.

[26] *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.*

[27] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

Heat in the Czech Republic is produced mainly by the combustion of brown coal (43.3%) or natural gas (30.1%), which is the predominant fuel for domestic boilers and small heat generation systems. The heat produced is used for industrial purposes and for thermal energy supply for households (heat supply systems). In 2016[28], 104.9 PJ of thermal energy was produced for sale, which represents a year-on-year increase by 5.7%, which is consistent with the colder heating season compared to the previous year, and with growing industrial production. The consumption of heat decreases in the long term, which is due to savings of thermal energy and the effort to reduce heat consumption in the industrial and public sectors and in households.

The manifestation of the negative effects of economic activities, not only in industry and energy, are contaminated sites and brownfields. It is therefore necessary to deal with the consequences of the activities of those sectors, i.e. with reclamation and remediation of the affected sites. The total **number of contaminated sites** in the Czech Republic is not known but is estimated approximately at 10,000 contaminated sites. These are mapped and inventoried continuously, mainly for the purpose of their subsequent **remediation**, which can reduce their numbers and potential risks to ecosystems and human health. In the period 2010–2017, remediation was completed in 343 contaminated sites (of which 48 sites in 2017), and further 55 remedial actions were completed in an unsatisfactory condition (of that 10 sites in 2017).

The remediation of contaminated sites in the Czech Republic is predominantly **financed** by the Ministry of Finance of the Czech Republic (so-called "Environmental Contracts"), by the individual ministries, state enterprises, etc., and also from European funds spent through operational programmes, particularly the **Operational Programme Environment**. Total costs under call 3rd for support area 3.4, and call 44th of the Operational Programme Environment (October 2016 – January 2017) reached CZK 241.9 mil., and under call 4th for support area 3.4, and call 65th of the Operational Programme Environment (April–June 2017) it was CZK 746.6 mil.

Detailed data sources

https://issar.cenia.cz/

[28] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

8

Transport

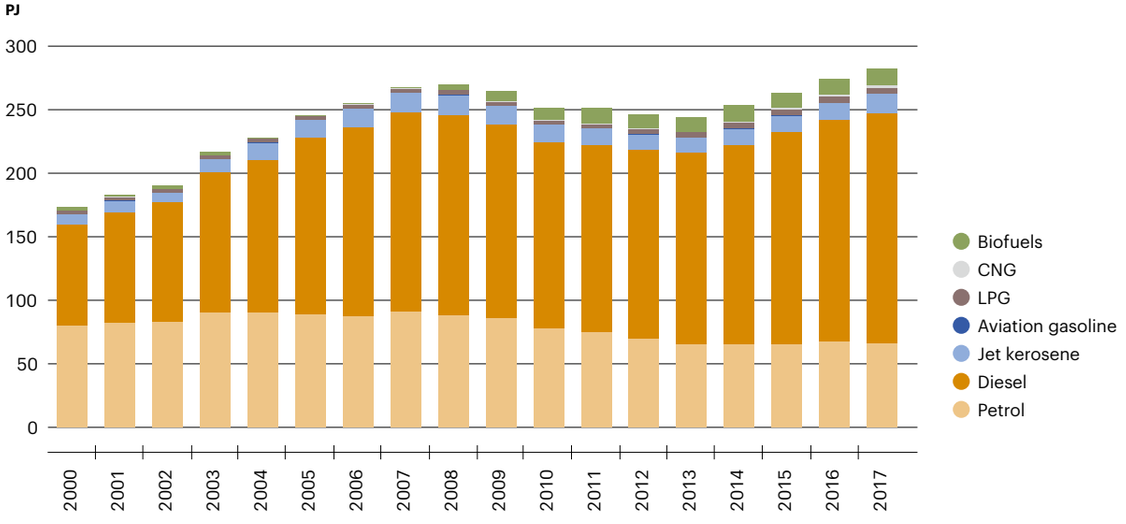
	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Transport performance and infrastructure	☹	😐	😐	😐
Energy and fuel consumption in transport	☹	☹	☹	☹
Emissions from transport	😐	😐	😐	☹
Noise pollution burden of the population[29]	N/A	N/A	N/A	N/A

The impact of transport on the environment in the Czech Republic is rising. The growth in transport in connection with the global trend of mobility development and the growth of the Czech economy prevails over the favourable impact of innovative development, leading to the use of modern, energy-efficient and more environmentally friendly technologies.

Energy consumption in transport increased in the period 2000–2017 by 63.3% to 282.0 PJ, year-on-year by 3.0% in 2017 (Chart 14). The energy from the combustion of fuels in transport came in 95.3% from fossil sources. The main consumer of energy in transport was road transport with a share of 93.3% in the total energy consumption, while the share of passenger car transport in 2017 was 56.2% and road freight transport 27.1%.

Chart 14

Energy consumption in transport by fuels in the Czech Republic [PJ], 2000–2017



Source: Transport Research Centre

The dependence of transport on fossil fuels (95.3%) persists due to the growth of **diesel consumption**. In the period 2000–2017, diesel consumption in the transport sector increased by 134.3%, in 2017 by 3.7% year-on-year, and was more than 2.5 times higher than the consumption of petrol. On the contrary, petrol consumption in the period 2000–2017 decreased by 13.9% and petrol covered 23.5% of total energy consumption in transport in 2017.

Out of the alternative fuels of fossil origin, **CNG consumption** is increasing sharply, in 2017 it increased by 13.9% year-on-year to 67.6 mil. m^3. The **consumption of biofuels** in 2017 grew by 4.2% year-on-year to 13.1 PJ, representing 4.7% of the energy

[29] *Data of the Strategic Noise Mapping as required by Directive 2002/49/EC are acquired at five-year intervals (so-called rounds), data of the 3rd round of Strategic Noise Mapping are for 2017. Due to changes in the mapping criteria (population in agglomerations, traffic intensity, etc.) and the mapping methodology, the individual rounds are not quite mutually comparable, and therefore it is not possible to evaluate the trends in noise pollution.*

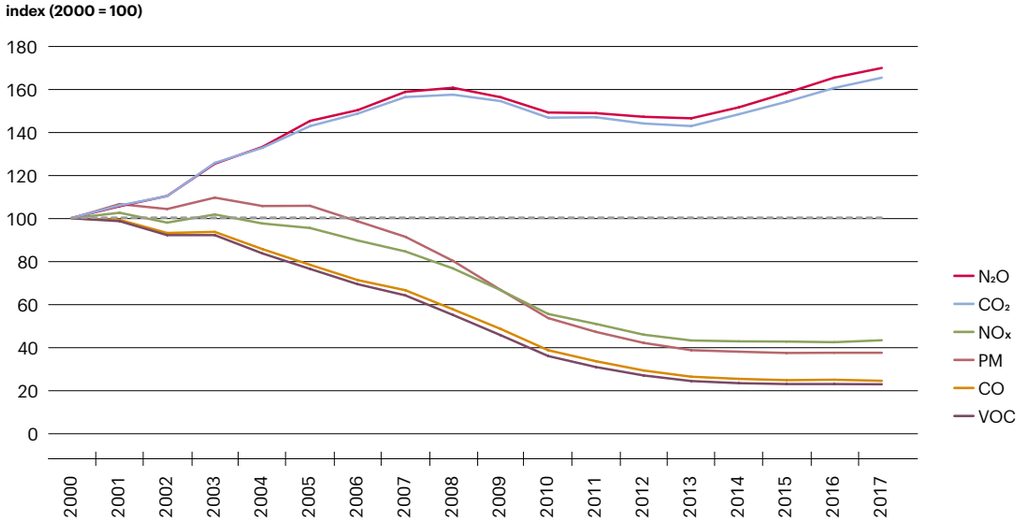
consumption in transport. The majority of the consumption of biofuels (FAME, bioethanol and bio-ETBE) is represented by the mandatory blending of bio-components in petrol and diesel.

The **share of renewable energy** sources in energy consumption in transport[30] in 2016[31] reached 6.4%, which represents a year-on-year stagnation. The RES consumption in transport in 2016 consisted in 75.1% of biofuels and in 24.9% of electricity from RES. The aim of the National Action Plan for Renewable Energy at 10% of energy from RES in transport by 2020 is not currently being achieved.

A fundamental aspect of the impact of transport on public health is the production of **emissions of pollutants**, which declined in the period 2000–2017 despite the growing transport performance in both passenger and freight transport (Chart 15). Emissions of NO_x decreased in that period by 56.7%, VOC by 77.1%, CO by 75.5% and emissions of suspended particles by 62.5%. The reduction in emissions was ensured by technological innovation, including the use of additional systems to reduce emissions, including particulate filters or the selective catalytic reduction. At the end of the reporting period, however, the decrease in emissions stopped, emissions of NO_x from transport went up in 2017 by 2.1% year-on-year.

Chart 15

Development of emissions of air pollutants and greenhouse gases from transport in the Czech Republic [index, 2000 = 100], 2000–2017



Source: Transport Research Centre

The technological possibilities for further reduction of pollutant emissions are limited for conventional drives, the development of emissions is, in addition, adversely affected by the structure of transport performance in passenger and freight transport where the most emission-intensive road transport dominates, and by the still marginal use of alternative fuels and drives.

Greenhouse gas emissions from transport grow steadily. In the period 2000–2017, CO_2 emissions from transport increased by 65.2% and emissions of N_2O by 69.7%. Significant growth is also seen in emissions of **polyaromatic hydrocarbons** (PAH), which increased in the period 2000–2017 by 188.7%, year-on-year by 3.5%. The largest source of GHG emissions in transport is passenger car transport, with a more than half of total emissions of CO_2 and N_2O, for PAH emissions, the share of passenger car transport is more than 90%.

Development of emissions from transport is influenced by the **composition and renewal of the car fleet**. Although the economic recovery encourages the growth of demand for new, lower-emission vehicles (in 2017, 271.6 thous. new cars were registered), the fleet remains very old, in 2017, the average age of passenger cars reached 14.6 years and slowly rises. The use of alternative fuels and drives remains marginal. The number of new registered passenger **electric vehicles** in 2017

[30] *According to the internationally used methodology SHARES, see https://ec.europa.eu/eurostat/web/energy/data/shares.*

[31] *Data for 2017 are not, due to the methodology of their processing, available at the time of publication.*

reached 307, which is only 0.1% of the total number of new passenger car registrations. A more significant growth is seen in the registration of new **hybrids**, which almost tripled since 2015 to 2,826 cars in 2017 (year-on-year increase by 83.4%), representing 1.0% of new passenger cars registered in that year.

Road transport in 2017 contributed to the total transportation performance of passenger transport in the Czech Republic with 73.4%, among the land modes (excluding aviation) the share was 80.8%. Public modes of transport in that year provided about a third of the passenger transportation performance (34.1% excluding aviation). A positive trend from an environmental point of view is the growing performance of rail passenger transport, which increased in the period 2010–2017 by 44.1%, in 2017 year-on-year by 7.4% to 9.5 bil. pkm, the number of passengers grew year-on-year by about 4 mil. to 183.0 mil. persons. A significant increase is seen in air transport, the airports in the Czech Republic in 2017 checked in 16.3 mil. passengers, which is 18.3% more passengers than in the previous year. The total **passenger transport performance** in 2017 grew year-on-year by 4.4% to 124.2 bil. pkm, which is the highest performance in passenger transport since 1990.

The performance of **freight transport** in the Czech Republic in 2017 declined by 7.7% year-on-year to 62.9 bil. tkm, mainly due to the decline in the international road transport performance. The performance of rail freight and water freight transport stagnated in 2017 and the **share of road freight transport** in the total transportation performance of freight transport amounted to 70.3% (in 2016 it was 73.8%). So far, freight transport is not shifting from road to the other more environmentally friendly modes of freight transport (rail and waterways).

Road transport causes considerable **noise pollution for the population**. According to the results of the third round of the Strategic Noise Mapping of 2017, the noise pollution from road traffic above 55 dB affects about a quarter of the Czech population, 2.0% of the population and about 6% of the population in urban agglomerations are exposed to noise levels above the limit all day. Out of agglomerations with over 100 thous. inhabitants, the highest noise pollution is in the Prague agglomeration (8.4% of the population are exposed all day above the limit), the lowest is in the Olomouc agglomeration (2.5%). Outside agglomerations, the highest exposure of the population to noise from main roads was found in the Central Bohemian and Moravian-Silesian Regions, on the contrary, the best situation is in the Liberec Region.

Development of road infrastructure reduces emissions and noise pollution by diverting transit traffic out of the settlements, the negative aspects are, however, the land take of agricultural land and landscape fragmentation. Construction of transport infrastructure in the Czech Republic took in 2017 a total of 453 ha of agricultural land and 25 ha of forest land. In 2017, 20.2 km of motorways were put in operation (investment costs of CZK 8 bil.) and the motorway network reached a length of 1,232 km. On class 1 roads, a total of 29 km of bypasses and realignments were put into operation in 2017, with total investment cost of CZK 6.4 bil., that included a bypass of Třinec on road I/11 and a bypass of Dubá on road I/9.

Detailed data sources

https://issar.cenia.cz/

9

Waste

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	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Total waste generation	N/A	*		
Municipal waste generation and treatment	N/A	*		
Waste treatment structure	N/A	*		
Packaging waste generation and recycling	N/A	*		
Generation and recycling of waste from selected products	N/A	*		

** Change since 2009. Overall assessment of the trend is postponed because of changes in the calculation methodology.*

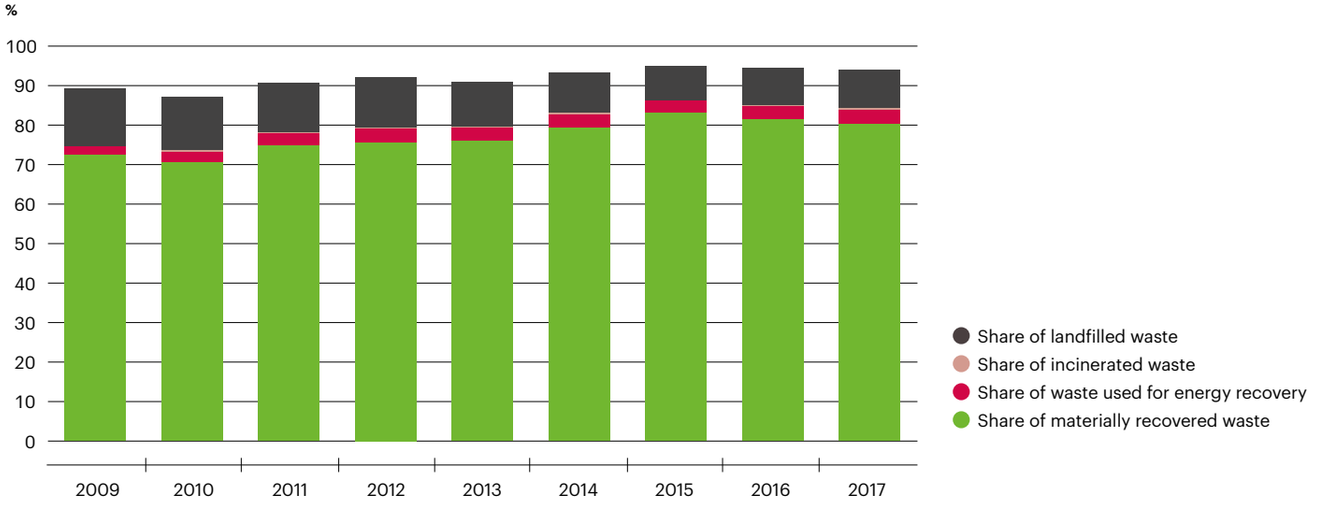
At present, the crucial trend in waste management is the effort to move towards a circular economy where material flows are closed in long time cycles and the emphasis is put on waste prevention, reuse of products, recycling and conversion to energy instead of extraction of raw materials and increasing landfills.

Total waste generation, in which the largest share (95.6% in 2017) is held by the generation of non-hazardous waste, rose since 2009 to 34,512.6 thous. t in 2017. Municipal waste generation also increased in the reporting period to 5,690.6 thous. t. Every year since 2009, the generation of packaging waste has risen to 1,195.4 thous. t in 2017. A declining trend has long been observed in the generation of hazardous waste (in the period 2009–2017 it dropped to a total of 1,507.7 thous. t).

The **total waste treatment** is dominated by waste recovery, particularly material, the proportion of which has long been increasing (Chart 16). Between 2009–2017, the share of waste used for material recovery grew to 80.5% and the share of waste used for energy recovery to 3.6%. The share of waste disposed of by landfilling is reducing (to 9.8% in 2017) in favour of material and energy recovery.

Chart 16

Proportion of selected waste treatment methods in the total waste generation in the Czech Republic [%], 2009–2017



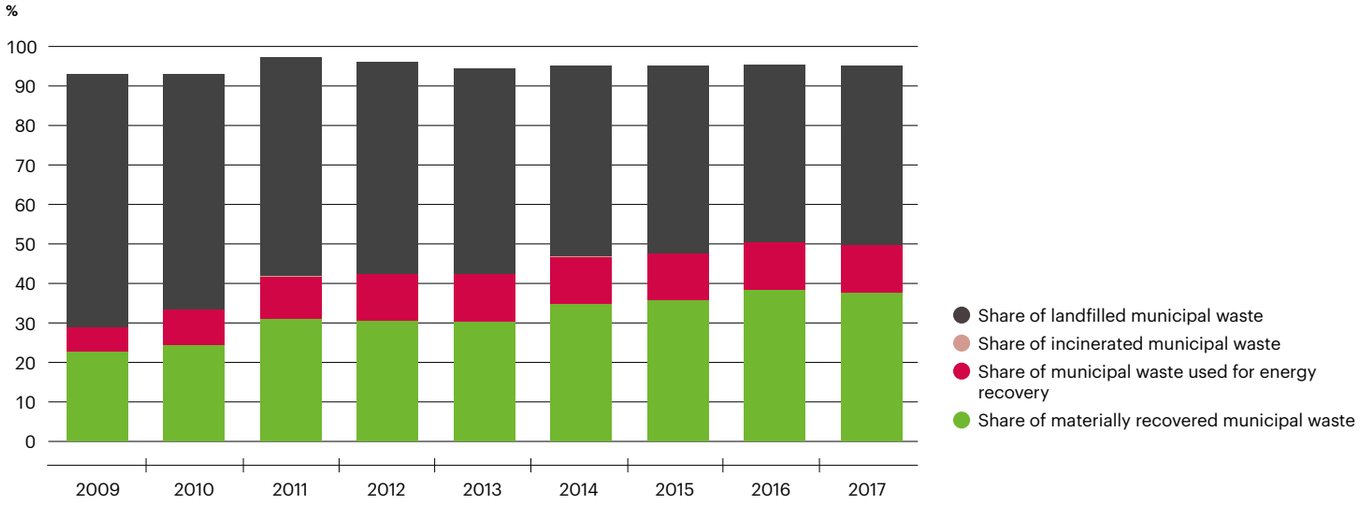
The data was determined according to the methodology Mathematical Expression of Calculating the "Waste Management Indicator Set" applicable for a given year.

Source: CENIA

Municipal waste treatment is still dominated by landfilling. However, landfilling is gradually decreasing, in 2017 its share was 45.4% (Chart 17). Thanks to moving away from landfilling, the proportion of municipal waste used for material recovery is growing, since 2009 it rose to 37.5%, and the importance of **energy recovery** of municipal waste is growing too (12.0% in 2017). The current situation in municipal waste treatment in the Czech Republic is not satisfactory (landfilling of municipal waste is above the EU28 average, and recycling is below average). The goal is a more intensive reduction in the proportion of landfilling in the total municipal waste generation and at the same time a growing material and energy recovery of that waste, in accordance with the principles of a circular economy and with the need to meet the European targets of circular economy. That will be boosted, among other things, by increasing the fee for landfilling and by strengthening the separation of municipal waste.

Chart 17

Proportion of selected waste treatment methods in the total municipal waste generation in the Czech Republic [%], 2009–2017



The data was determined according to the methodology Mathematical Expression of Calculating the "Waste Management Indicator Set" applicable for a given year.

Source: CENIA

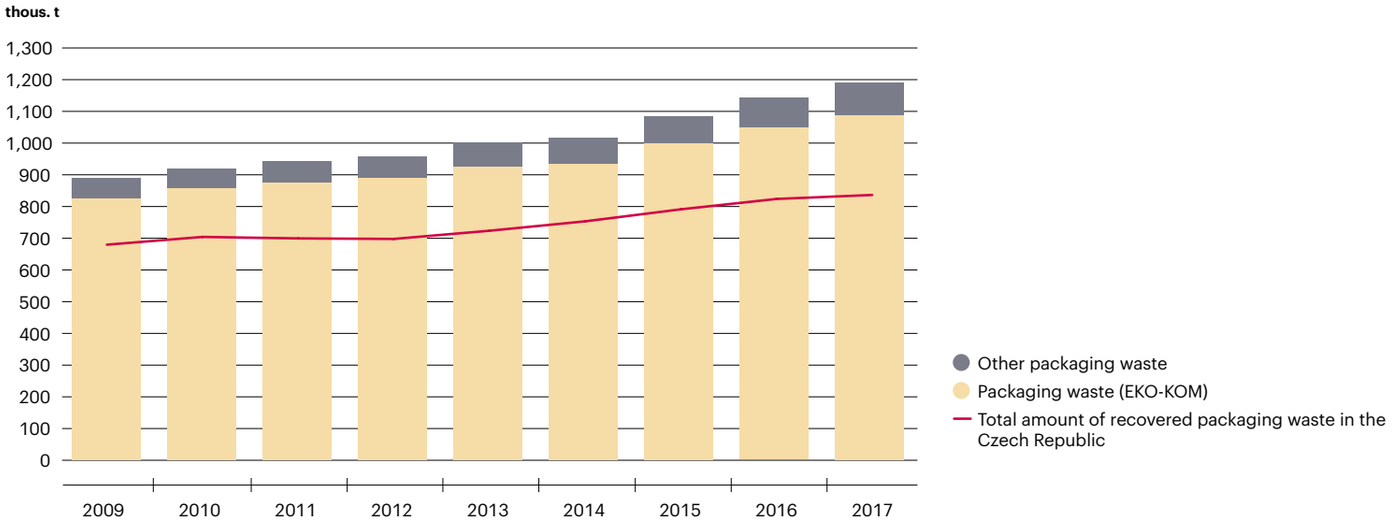
The **treatment of packaging waste**[32] is developing positively. It is dominated by material recovery. The rate of recycled packaging waste is increasing, in 2017 it reached 73.7%, and thus already meets the target[33] for 2020. The rate of the total recovery of packaging waste, which in 2017 amounted to 78.6%, is also growing and the target for 2020 was therefore achieved in advance. The rate of recycling and of total recovery of packaging waste in the Czech Republic is above the European average. In 2017, the proportion of packaging waste registered in the EKO-KOM system accounted for 91.3% of the total generation of packaging waste (Chart 18).

[32] *Treatment of packaging and packaging waste is regulated by Act No. 477/2001 Coll., on packaging and amending some laws, as amended.*

[33] *The targets for packaging waste are given in Government Regulation No. 352/2014 Coll., on 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 some laws, as amended.*

Chart 18

Generation of packaging waste (within the EKO-KOM system and other) and its recovery in the Czech Republic [thous. t], 2009–2017



Source: Ministry of the Environment

Proper waste treatment and compliance with rules of operation applying to waste treatment facilities are regularly checked by the Czech Environmental Inspectorate. In 2017, inspectors from the department of waste management in the area of waste management, packaging and chemicals, carried out 3,359 inspections. Out of those inspections, 1,317 were planned and 2,042 unplanned, of which 608 inspections were carried out on the basis of a complaint received. The total amount of penalties imposed in 2017 was CZK 43,115.5 thous., i.e. CZK 16,248.5 thous. less than in the previous year.

In terms of treating **selected end of life products**, a positive development can be observed in the Czech Republic. The rate of material recovery of them is increasing and the strategic objectives[34] for selected products are continuously being met.

The **take-back level** of electrical and electronic equipment and separate collection of waste electrical and electronic equipment in 2017 amounted to 48.1%, and the target for 2017 was met with a wide margin. The take-back level of tires in 2017 was 63.6%, and the target for that year was met also in this case. To achieve the target for 2020, however, the level of their collection will have to grow notably. The required 45% take-back level of portable batteries and accumulators in 2017 was achieved with the value of 47.0%.

For selected products, considerable attention is paid to goals of **recycling efficiency**, that must be achieved by processes of recycling waste batteries and accumulators. Those goals were met for all groups of batteries and accumulators. In 2017, the recycling efficiency of lead-acid batteries and accumulators was 82.6%, of nickel-cadmium batteries and accumulators 94.6% and other waste batteries and accumulators 52.8%.

Other targets focus on car wrecks, namely these are targets of **recycling**, **reuse and recovery** of selected car wrecks, where the Czech Republic meets the objectives of reuse and recovery at 95.4% and a reuse and recycling at 90.3%.

Detailed data sources

https://issar.cenia.cz/

[34] *Objectives 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.*

10

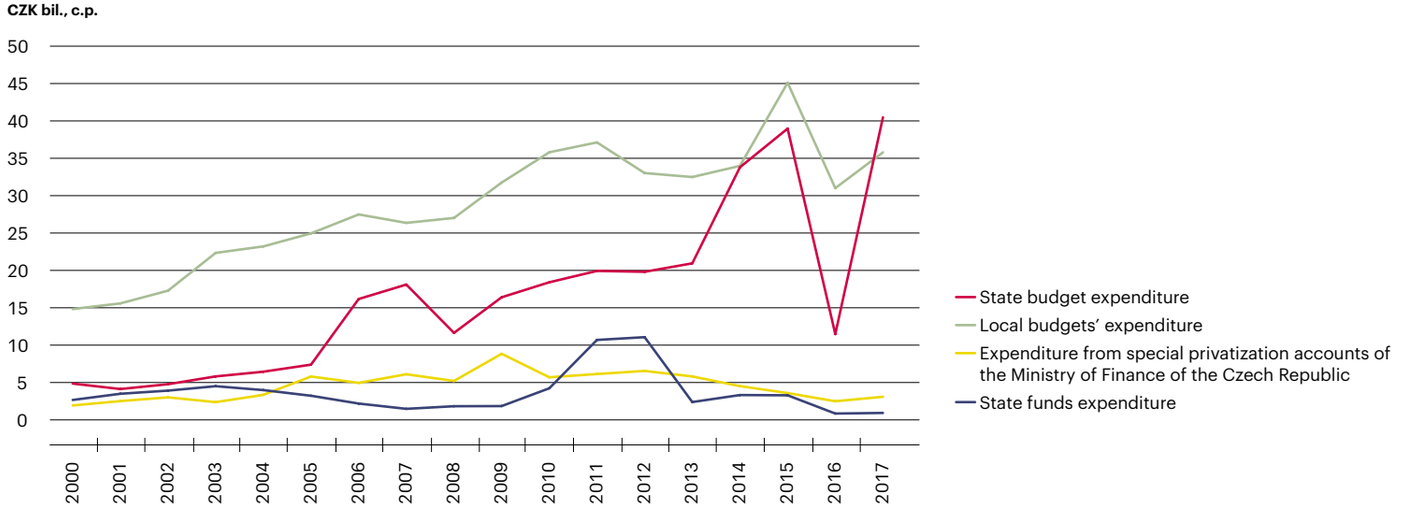
Financing

	Change since 1990	Change since 2000	Change since 2010	Last year-on-year change
Investments and non-investment costs in environmental protection	☺	☺	☺	☺
Public environmental protection expenditure	☺	☺	☺	☺

The financing of environmental protection is a prerequisite for improving the state of the individual components of the environment and is also an expression of the public environmental protection need at central and regional level. That need can be quantified not only as the amount of funds expended from own resources of economic entities, but also as the amount of financial support from public sources, or budgets. The public sources of expenditure on environmental protection include national resources, i.e. **state budget and state funds** (central sources) and **local budgets of regions and municipalities**, as well as **European or international sources** linked to them[35].

Chart 19

Public environmental protection expenditure in the Czech Republic by source type [CZK bil., current prices], 2000–2017



A part of public environmental expenditure of local budgets may be a duplication of expenditure from central sources.

Source: Ministry of Finance of the Czech Republic

Expenditure on environmental protection from central sources in 2017 rose nearly 3 times year-on-year to CZK 44.8 bil. (Chart 19). This growth, however, meant a return to the level attained before 2016 when there was a significant decline mainly due to the closure of the original Operational Programme Environment 2007–2013 and the gradual start of the follow-up Operational Programme Environment 2014–2020. The funding from operational programmes financed from EU funds is in fact interlinked with funding from national public sources in the form of co-financing or pre-financing of supported projects. Another reason for the steep year-on-year increase in 2017 was also the transfer of state budget funds allocated in the budget chapter of Ministry of Industry and Trade to the paragraph 2115: Programmes of thermal insulation and energy savings. A specific category of the central sources of financing for environmental protection is, in addition to the state budget and state funds, the funding of the defunct National Property Fund, which is managed **by the Ministry of Finance of the Czech Republic under special privatization accounts** and from which CZK 3.3 bil. was spent in 2017[36].

[35] *Information regarding public spending is based on the budget structure of the Ministry of Finance of the Czech Republic, which has long monitored the funds provided primarily for the purpose of environmental management and protection. As the source of expenditure of local budgets can include financial transfers (e.g. from the state budget, state funds, etc.), some of that expenditure is duplicate with expenditure from central sources or European funds. For that reason, the expenditure from central sources, local budgets, and European or international sources are evaluated separately and can not therefore be summarized.*

[36] *Examples of such expenditure include funding intended to eliminate the consequences of chemical mining of uranium in Stráž pod Ralskem, as well as funding for the Moravian-Silesian, South Moravian, Ústí nad Labem and Karlovy Vary Regions intended for the removal of environmental damage incurred before privatization of mining companies in connection with the restructuring of the steel industry and revitalization of the affected areas.*

Spending on environmental protection from local municipal and regional budgets, which are intended to finance actions that are implemented on an ongoing basis based on the competence of municipalities or regions, grew in 2017 by 15.3% to a total of CZK 35.7 bil. (Chart 19).

In terms of thematic focus of programmes, also in 2017 the largest financial support from national resources was directed to the protection of air and climate where implementation continued of programmes supporting thermal insulation, energy savings and changes in heating technology (e.g. the New Green Savings Programme[37]). Other priority areas of intervention included water protection and protection and care for nature and landscape. Within this area, the most resources were spent to support protected parts of nature (e.g. through the Programme of Landscape Management or the Landscape Natural Function Restoration Programme) and on erosion control. The local budgets paid attention in this area also to improving the appearance of municipalities and public greenery. The priority areas of public support included the area of waste management, especially the collection and transport of municipal waste, including its recovery and disposal.

In addition to national subsidy programmes in environmental protection, managed primarily by the State Environmental Fund of the Czech Republic, public expenditure on environmental protection has been strengthened since 2004 thanks to the **direct support from the EU and a possibility to co-finance projects from other foreign sources**. At present, these include mainly the Financial Mechanisms of the European Economic Area and Norway, the LIFE Programme and the Swiss-Czech Cooperation Programme. From among the EU funds, the highest amount of grant is provided from **Operational Programme Environment**, which is the main source of funding for environmental protection from EU funds, and the **Rural Development Programme**, which aims, among other things, at restoration, conservation and improvement of natural ecosystems dependent on agriculture.

The total allocation of Operational Programme Environment 2014–2020 amounts to almost EUR 3.2 bil. (CZK 81.6 bil.) of total eligible expenditure. From the start of the programming period till 31.12.2017, the Operational Programme Environment Managing Authority (Ministry of Environment) announced 93 calls, of which 45 new calls were announced in 2017 with an allocation of EUR 1.1 bil. (CZK 28.5 bil.) of total eligible expenditure. In the already closed calls, a total of 6,715 grant applications were registered from the beginning of the programming period until the end of 2017. Following a subsequent recommendation of the selection committee, a grant was approved for 3,252 projects amounting to EUR 1.4 bil. (CZK 35.9 bil.) of total eligible expenditure, of which the grant beneficiaries spent about EUR 0.3 bil. (CZK 7.7 bil.) from the beginning of the programming period. Operational Programme Environment also provides funding for boiler subsidies, as of 31.12.2017 the selection committee recommended financing for projects worth EUR 0.5 bil. (CZK 12.8 bil. of total eligible expenditure), individuals have replaced about 24 thous. solid fuel boilers so far.

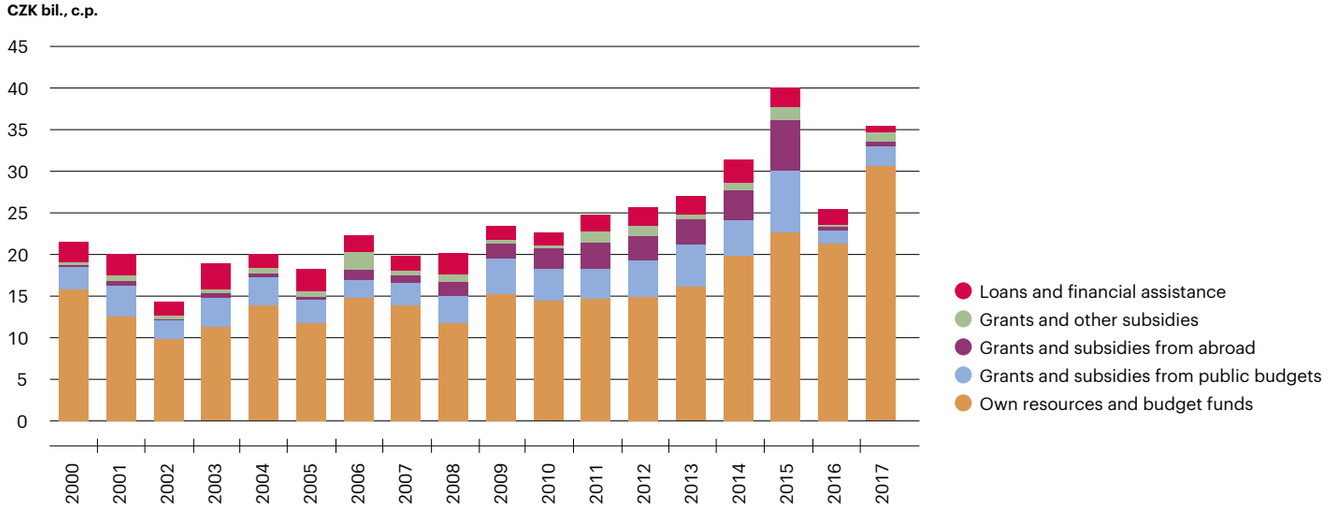
Rural Development Programme 2014–2020 also implemented support that contributes to improving the environment and include mainly the agri-environment-climate measures, organic farming, forest-environmental and climate services and forest conservation, payments under Natura 2000 payments for less favoured areas. In 2017, Rural Development Programme 2014–2020 paid CZK 6.9 bil. towards those measures.

An alternative view of environmental protection financing is offered by a statistical survey carried out by Czech Statistical Office, which focuses on **investments and non-investment costs of environmental protection** expended both by the public and the business (private) sector. In 2017, investments and non-investment costs of environmental protection amounted to CZK 96.7 bil. and in comparison with 2016 rose by CZK 14.1 bil., i.e. 17.1%. The reason for the year-on-year growth was particularly the significant increase in the volume of investments by CZK 9.9 bil. (i.e. by 39.0%) to the total of CZK 35.4 bil. That growth, however, meant a partial return to the level attained before 2016 when the investments significantly declined mainly due to the absence of funds in the form of grants and subsidies provided from public budgets and from abroad, especially in connection with the definitive closure of the programming period of Operational Programme Environment 2007–2013. Although the implementation of the follow-up Operational Programme Environment 2014–2020 started in 2016, it consisted mainly in the gradual launching of calls, designing projects and administration of grant applications, while the spending of subsidies started only in 2017. In 2017, the investing entities also significantly increased the volume of investments financed from own resources and budget (by CZK 9.2 bil., Chart 20).

[37] *The manager and the paying unit of the New Green Savings Programme is Ministry of Environment, and the State Environmental Fund of the Czech Republic is responsible for certain administrative tasks, in particular the selection and appraisal of applications. By the end of 2017, the individual calls under the programme received a total of 30,062 aid applications and 17,034 applications were already disbursed at approx. CZK 3 bil.*

Chart 20

Investments in environmental protection in the Czech Republic by source of financing [CZK bil., current prices], 2000–2017



Source: Czech Statistical Office

In terms of **investments**, more than 75% was represented by expenditure on integrated equipment (i.e. to prevent pollution) which prevailed over expenditure on terminal equipment (i.e. to remove generated pollution). The investment focus of programmes is, with the exception of the protection of biodiversity and landscape, analogous to the above-mentioned priority areas of public funds – the most capital expenditure was in 2017 spent traditionally on air and climate protection, on wastewater management (investments in reconstruction of sewerage systems and wastewater treatment plants and in building new ones) and waste management (investments in collection and transport, or recovery and disposal of municipal waste). In terms of the **economic activity sectors** of the investing entities (CZ-NACE), the highest share in the total investments in 2017 was spent by the processing industry (43.6% of total investments), followed by the public administration, defence and compulsory social security (25.1% of total investments), and the energy sector, i.e. production and distribution of electricity, gas, heat and conditioned air (13.3% of total investments). A significant share in the total investments is reached also by the water supply, including activities related to waste water, waste and remediation (11.9% of total investments).

The **non-investment costs**, or current expenditure, show a long-term upward trend. That was confirmed also in 2017 when those expenses grew year-on-year by CZK 4.2 bil. (i.e. by 7.3%) to CZK 61.3 bil., and apart from investments they accounted for a substantial part of the expenditure on environmental protection monitored by Czech Statistical Office. The largest volume of non-investment costs was spent on consumption of materials and energy and on wages.

Within an **international comparison of environmental financing**, it is possible to compare mainly investments that have long been above average in the Czech Republic compared to the EU28 average, both in the public and above all the **industrial sector**. While investments in that sector in some new Member States in 2015[38] moved around or well above 0.4% of GDP in current prices (e.g. Romania, Slovakia or the Czech Republic), many old Member States did not reach even 0.1% of GDP at current prices (Cyprus, Austria, Germany, France etc.). The reason for the increased investments in the Czech Republic and other new Member States is especially the need to meet stricter conditions and requirements of the relevant European legislation, the investment level is, especially in recent years, supported by the possibility of using EU funds or other foreign subsidy programmes.

Detailed data sources

https://issar.cenia.cz/

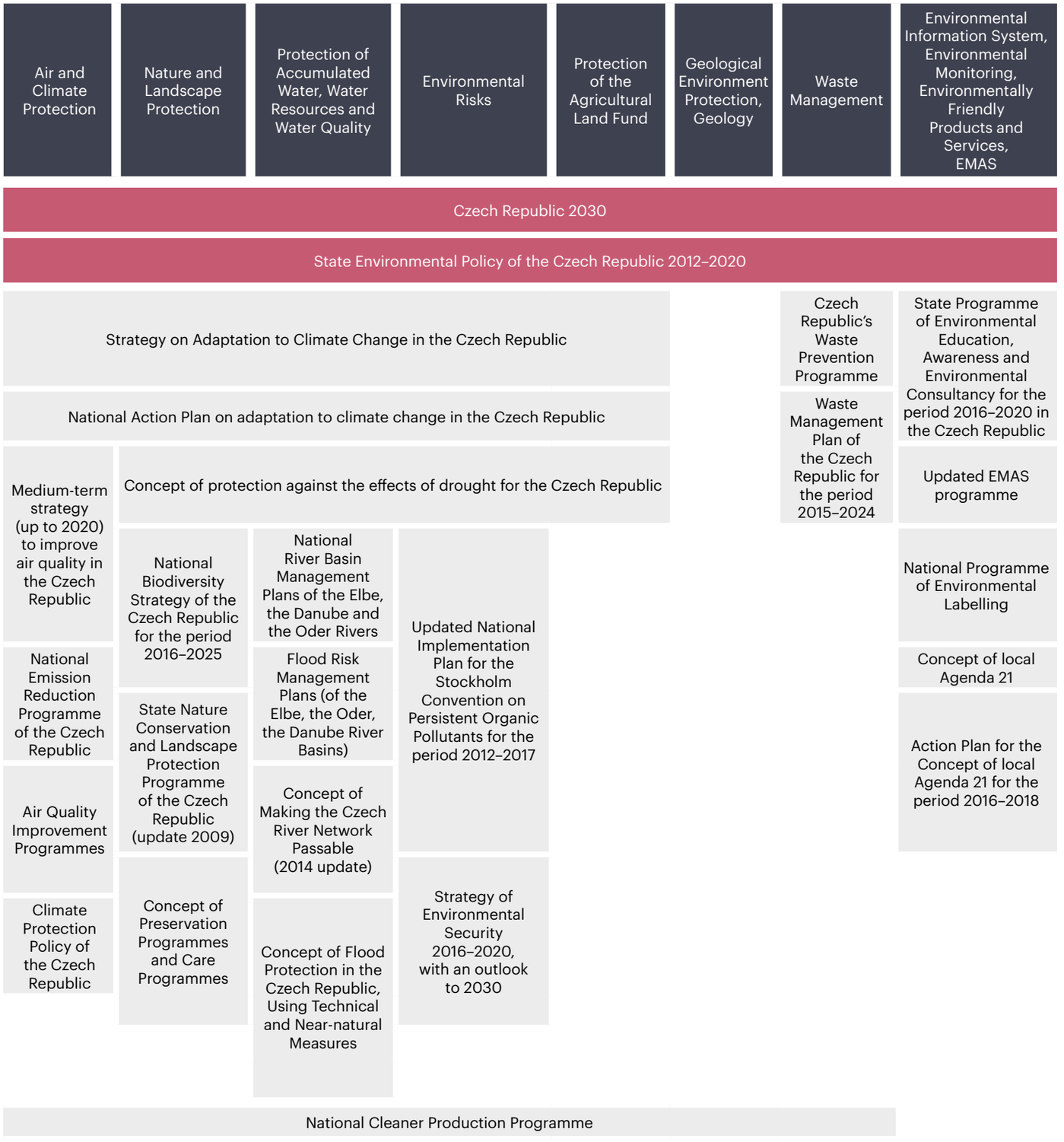
[38] *Data for 2016 and 2017 are not, due to the methodology of their processing, available at the time of publication.*

Strategies and policies in the environmental sector

As part of its strategic work, the Ministry of the Environment continuously monitors the progress in implementation of various strategic materials (Figure 11). For the years 2017/2018, it has evaluated the implementation of measures of the National Emission Reduction Programme of the Czech Republic and a set of indicators of vulnerability of the Czech Republic to the effects of climate change for the National Action Plan on climate change adaptation.

Figure 11

Map of the strategic documents of the Ministry of the Environment, 2017



Source: CENIA, adjusted according to the output of the project "Streamlining the activities of the TA CR in the area of R&D&I and support of strengthening the expertise of public administration organisations in R&D&I; key activity 1: output of the Strategic Map of Ministries, the Strategic Map of Ministry of the Environment

Evaluation of priority measures arising from the National Emission Reduction Programme of the Czech Republic

The main document which, at the national level, defines a roadmap for improving air quality in the Czech Republic until 2020 with an outlook till 2030, is the National Emission Reduction Programme of the Czech Republic (NERP). Its main objective is to achieve, based on an analysis of the development to date of air quality and emission indicators, the strategic objective together with the specific objectives and priorities. The strategic objective should be achieved through priority additional measures at national level, which arise from the scenario of NERP-WAM. There are a total of 12 economic measures and 11 technical and organizational measures. The implementation of the individual priority measures should reduce emissions of all the different pollutants, for which limit values or national emission ceilings and national exposure reduction targets are defined. The individual priority measures and their implementation within the set deadline are the responsibility of the individual expert supervisors.

In the Environment Report for 2017, the following measures of National Emission Reduction Programme of the Czech Republic were evaluated as completed:

> AA8 – Support for the purchase of environmentally friendly passenger vehicles
> AA9 – Raising the maximum limit of the fee for permission to enter selected locations and city parts by motor vehicles
> AA11 – Rationalization of the charging for roads with regard to the impact of traffic on air quality in the area concerned
> AB22 – Improving the functioning of the system of periodic technical inspections of vehicles
> DB9 – Speeding up the entry into force and any additional tightening of the parameters for the efficiency and emissions of heaters contained in the implementing regulation to Directive 2009/125/EC on eco-design

For the following measures, this evaluation stated the rationale for different implementation or complete abandonment of the measure.

> **CB7** **Reducing the ammonia emissions from mineral fertilisers application**
Conclusion: will be fulfilled through amendment to Decree No. 377/2013 Coll.

> **AB25** **Authorization for municipalities to issue ordinances regulating the transport of bulk (loose) materials by trucks**
Conclusion: can not be met on the basis of the ruling of the Constitutional Court

For the other measures, the manner of their implementation in 2016 is set out:

Economic priority measures

> **AA3** **Support for speeding up the renewal of the fleet of passenger cars**
Since 2009, Act No. 383/2008 Coll., which amended the Waste Act, introduced a charge on registration of a vehicle with the categories EURO 0 to EURO 2. An extension of the charge to category EURO 3 was contained in the proposal for a new law "on end-of-life products", which was to replace some parts of the Waste Act. In the inter-ministerial comments procedure on the draft law, the extension of the charge was dropped. The charging for older vehicles was also covered in an analysis prepared for priority measure AA8. Currently, the issue of charging for older vehicles is addressed in the "Analysis of charging for vehicles in the Czech Republic", drawn up by the Ministry of Transport.

Responsible body: Ministry of the Environment
Deadline: 01. 01. 2017
Conclusion: not achieved ☹

> **AA5** **Stimulating the use of alternative drives in road freight transport through reduced rates of the road tax**
The aim of the measure is to introduce a lower road tax for trucks using CNG/LNG, electricity and hydrogen. Currently, zero road tax applies only to passenger vehicles, but trucks are beginning to appear too.

National Action Plan for Clean Mobility addresses this issue in measures S14 (Modification of schemes and rates of road tax for vehicles using CNG/LNG and electric drive above 12 t and the concurrent introduction of tax breaks for vehicles using LNG and hydrogen – responsibility of the MF CR, the original deadline 2017) and S28 (Analysis of charging for vehicles in the Czech Republic – responsibility of Ministry of Transport, the original

deadline 2017). Measure S14 has not been implemented because MF CR is waiting for the results of the "Analysis of charging for vehicles in the Czech Republic", which is currently being carried out by the Ministry of Transport with a new deadline at the end of 2019.

Responsible body: MF CR
Deadline: based on the NAP of Clean Mobility
Conclusion: Implementation of the measure will depend on the results of the "Analysis of charging for vehicles in the Czech Republic", which should be completed by the end of 2019 ☹

> **AA6** **Supporting the purchase of vehicles with alternative drives for public passenger transport**

Call 20 of the Integrated Regional Operational Programme (Low-emission and zero-emission vehicles), which was launched in 2016, met with an enormous interest from applicants. Following the enormous interest, the allocation for that call was doubled in 2017. The total allocation of the call is about CZK 2.8 bil. By the end of 2017, 26 projects were supported and a total of 287 low-emission and zero-emission vehicles were purchased for public transport, of which 146 CNG buses, 65 electric bus, 48 trolleybuses and 28 trams.

Support for the acquisition of low-emission and zero-emission vehicles is further included in calls 50 Sustainable transport (ITI), 51 Sustainable transport (ITDP) and 53 Sustainable transport (CLLD). In those cases, acquisition of vehicles is supported only if it complies with the relevant integrated development strategy. The integrated instruments have around CZK 3 bil. to support low-emission and zero-emission vehicles. Currently, 26 approved projects are registered in the amount of CZK 2 bil., which include the purchase of 259 low-emission and zero-emission vehicles, of that 184 CNG buses, 61 trolleybuses, 9 electric buses and 5 trams.

Responsible body: Ministry of Regional Development
Deadline: continuously until 31. 12. 2023
Conclusion: implemented continuously ☺

> **AA7** **Supporting the construction of refuelling/recharging infrastructure for alternative drives in transport**

The concept of the subsidy programme of the Ministry of Transport under the Operational Programme Transport (OPT) "Supporting the infrastructure for alternative fuels" was prepared in the second half of 2015. The programme allocation is CZK 1.2 bil. It includes 5 sub-programmes, which are aimed at supporting the development of both fast charging and conventional charging stations and also at supporting the construction of refuelling stations for CNG, LNG and hydrogen. On 11 August 2017, the European Commission approved the "State aid scheme for introducing publicly accessible charging and refuelling stations for vehicles running on alternative fuels in the Czech Republic". The first call under subprogram 1a (support for fast charging stations) was launched in November 2017.

Responsible body: Ministry of Transport/Ministry of Regional Development/Ministry of Transport
Deadline: continuously until 31. 12. 2023
Conclusion: implemented continuously ☺

> **AA10** **Supporting the introduction of low emission zones**

In 2017, using a grant from the National Programme Environment (call 2/2016), feasibility studies were drawn up for low-emission zones in the cities of Brno, Ostrava and Písek. In Ostrava, based on that study, the City Council rejected the introduction of low-emission zones, in Brno their functioning is conditioned by the existence of bypass roads (full completion of the great ring road), in Písek, the introduction of low-emission zones is still to be decided.

In 2017, another call of the National Programme Environment was announced, again providing funds for feasibility studies on low-emission zones and newly also for feasibility studies on regulatory orders (containing a list of traffic measures applied during smog situations), and for drawing up sustainable urban mobility plans. That call received 6 applications on drawing up sustainable urban mobility plans, one application on a feasibility study of the regulatory order and one application on a feasibility study of low-emission zones. Sustainable mobility plans are comprehensive policy documents in the field of sustainable transport, which include (according to the conditions laid down by the Ministry of the Environment in the call) also evaluation of the need or feasibility of low-emission zones in the city.

Responsible body: Ministry of the Environment
Deadline: continuously
Conclusion: implemented continuously

> **BA1/CA1 Support for priority implementation of measures to reduce emissions from stationary in the sectors of energy, industry and agriculture**

In the programming period 2014–2020, support for the reduction of emissions from industrial sources is provided under Priority Axis 2 Improving air quality in human settlements, specific objective 2.2 of the Operational Programme Environment. The supported activities under specific objective 2.2 are the replacement and reconstruction of existing stationary sources of pollution, acquisition of technologies and changes in technological procedures to reduce pollutant emissions or to reduce the level of air pollution. The allocation for that specific objective is set at about CZK 3.6 bil. The call under specific objective 2.2 was announced in 2015. The call supported all activities and types of projects. The allocation for the approved projects was set at about CZK 2.5 bil. The call supported projects requiring EU grant at around CZK 2.6 bil. In 2017, call 89 was announced under that specific objective with an allocation of CZK 0.5 bil. The call did not support measures on stationary sources emitting volatile organic compounds. That call received projects demanding grants of more than CZK 4.8 bil.

The Ministry of Agriculture contributes to the implementation of this measure under the Rural Development Programme 2014–2020, where projects focused on the acquisition of technologies helping to reduce NH_3 emissions into the atmosphere as part of Operation 4.1.1 (Investment in agricultural enterprises) are favoured in the preferential criteria.

Responsible body: Ministry of the Environment/ Ministry of Transport/Ministry of Agriculture
Deadline: continuously until 31. 12. 2023
Conclusion: implemented continuously

> **BA2 Support for the implementation of measures to reduce energy consumption and increase energy efficiency**

Under specific objective 5.1 Improving the energy performance of public buildings and increasing the use of RES, 3 calls have been completed so far (calls 19, 39 and 70). Overall, 1,343 applications have been approved from all calls, of which 633 applications from call 70. The estimated energy savings from all projects with an issued legal act amounts to 502,231 GJ. On 01.03.2018, call 100 was announced for specific objective 5.1 with the receipt of applications until 31.01.2019. Under specific objective 5.2 Achieving high energy standards in new public buildings, it is possible to submit applications in the ongoing call 61 until 31.10.2019. 9 applications have been submitted so far. Two projects are already under implementation and another two projects were recommended for approval by the Steering Committee. Currently, negotiations are underway with the European Commission about detaching a separate specific objective 5.3 Improving energy performance and increasing the use of renewable energy sources in buildings of central government institutions in connection with the reallocation of funds from the Integrated Regional Operational Programme (IROP).

Specific objective 2.5 of IROP "Improving energy performance in the housing sector" supports the implementation of energy saving measures in apartment blocks outside the City of Prague. The IROP SO 2.5 had, according to NAPEE-III (National Action Plan for Energy Efficiency) an allocation to finance energy saving measures at CZK 16.9 bil., after reallocation of CZK 3 bil. to other areas under the operational programme, the remaining allocation is CZK 13.9 bil. In 2017, 608 projects were approved with a total subsidy of CZK 1.25 bil. and savings of 0.4 PJ. The number of approved applications increased more than 5 times against 2016 and the volume of approved subsidies approximately quadrupled. Specific subsidy for energy savings increased slightly, but remaining well below the level predicted in NAPEE-III.

Under specific objectives 3.2 and 3.5 of OP Enterprise and Innovation for Competitiveness, 237 projects were approved in the area of energy savings in 2017, with grant of CZK 2.6 bil. and the total effect of 2.2 PJ. In other programs (Panel, Effect and OP Prague Growth Pole), 392 projects were supported in the field of energy savings with a grant of CZK 1.1 bil. and achieved effect of 0.4 PJ.

By the end of 2017, the individual calls under the New Green Savings programme received a total of 30,062 aid applications and 17,034 applications were already disbursed at approx. CZK 3 bil.

Responsible body: Ministry of the Environment/Ministry of Transport/Ministry of Agriculture
Deadline: continuously until 31. 12. 2023
Conclusion: implemented continuously ☺

> **BA3** **Reducing the proportion of solid fossil fuels in combustion stationary sources outside the EU ETS**

The Ministry of Finance in cooperation with the Ministry of the Environment and the Ministry of Industry and Trade has prepared a document "Analysis of the options and impacts of taking into account environmental elements in the rates of excise duty and energy taxes in the Czech Republic", which was submitted to the Government in December 2016. In its Resolution No. 6/2017, the Government took note of it and ordered the Ministry of Finance in cooperation with the Ministry of the Environment and the Ministry of Industry and Trade to supplement it with additional impact analyses and, by 31 December 2018, to submit recommendations to the Government on the possible reflection of environmental elements in the rates of excise and energy taxes in the Czech Republic. In 2017 and 2018, several meetings of the ministries involved were held and the analysis is updated continually, based on outputs from those meetings and based on the results of negotiations on the approach to reducing emissions in the EU-ETS and non-EU-ETS sectors, with detailed estimates of environmental impacts so that the above recommendation can be submitted to the Government by the end of 2018.

Responsible body: MF CR
Deadline: 31. 12. 2016 and 2018
Conclusion: partially implemented ☺

> **DA1** **Supporting the speeding up of the replacement of heat sources in the sector of local household heating**

The replacements of solid fuel boilers are supported through boiler subsidies (OPE Priority Axis 2, Specific Objective 2.1), divided into 3 main calls with a total allocation of around CZK 9 bil. The first two calls have already taken place or are underway, the third is expected to open in early 2019. The replacement of 80–100 thous. old solid fuel boilers is expected. Under the first call, which was extended due to an increase in the allocation with a call only for sources using renewable energy, around 29 thous. applications for a boiler replacement have been approved (of which about 24 thous. applications have been disbursed). Under the second call, 8 thous. applications for a boiler replacement subsidy were approved as at the end of 2017 (185 applications disbursed), the aim is to replace up to 35 thous. boilers.

Responsible body: Ministry of the Environment
Deadline: continuously
Conclusion: implemented continuously ☺

Technical/technical-organizational priority measures

> **AB1** **Construction of the backbone network of capacity roads**
> **AB2** **Priority construction of bypasses of towns and villages**

The implementation of the measure is demonstrated by the following lengths of capacity roads on the backbone network that were put in operation in the given year.

- Year 2017: 37.8 km of motorways and 50.02 km of class I roads (27.76 km of bypasses on class I roads).

Responsible body: Ministry of Transport/Ministry of Regional Development
Deadline: AB1 31. 12. 2023 – 31. 12. 2030 / AB2 31. 12. 2020
Conclusion: implemented continuously ☺

> **AB21** **Replacement of the car fleet of the public administration with alternatively powered vehicles**

The obligation to purchase alternative fuel vehicles by public administration is contained in the Government Resolution on the National Emission Reduction Programme. For stronger legal enforcement of the purchase of alternative drive vehicles, an amendment was proposed in 2017 to Government Order No. 173/2016 Coll., on setting binding terms of reference for public contracts on the purchase of road vehicles, according to which every public contracting authority would have to include in every public contract a requirement to purchase min. 25% of alternative drive vehicles. However, after an inter-ministerial comments procedure, it was decided to withdraw it and that the issue will be addressed as part of the transposition of the revised European Parliament and Council Directive 2009/33/EC on the promotion of clean and energy efficient vehicles, which is currently being discussed in the EU bodies.

The National Programme Environment finances the support for the purchase of vehicles with alternative drive systems by municipalities and regions and organizations funded by them. Two calls have already been announced with a total allocation of CZK 200 mil. Under those calls, support was provided for 430 electric vehicles (BEV), 127 CNG vehicles, 9 plug-in hybrid electric vehicles (PHEV), and 8 hybrid electric vehicles (HEV).

Responsible body: All central government bodies, their contributory organizations and enterprises with Government equity participation
Deadline: 31. 12. 2020 and 31. 12. 2030
Conclusion: implemented continuously only through Government Resolution 😐

> **AB23** **Shifting the freight transport performance from roads to railways**

At the beginning of 2017, the Czech Government approved the Concept of Freight Transport for the Period 2017–2023 with an Outlook till 2030 as a strategic document for the sector of freight transport. The aim of the document is to create an environment where the logistics and freight transport can provide the necessary level of service to ensure the competitiveness of the economy and at the same time to economically use the existing resources. One of the means to reduce the negative societal effects of freight traffic is a uniform distribution of the transport work among the different modes of transport.

The Operational Programme Transport announced a call in 2016 under specific objective 1.3 – Modernization and construction of combined transport transhipment terminals. Another round of that call was announced in 2017.

Responsible body: Ministry of Transport
Deadline: 30. 06. 2016, 31. 12. 2023, 31. 12. 2030
Conclusion: partially implemented 🙂

> **AB24** **Setting the conditions of operation of construction machines**

Based on the requirements of members of working groups to support the implementation of measures established in air quality improvement programmes, the Methodological Guideline was expanded to cover other sources of dust during construction activities, with regard to the application of a measure under the Air Quality Improvement Programme called "Reducing dust from construction activities." The original idea of the Methodological Guideline was substantially expanded, which significantly complicated the preparation of the Methodological Guideline.

The draft Methodological Guideline drawn up by the Ministry of the Environment was consulted in mid-2017 with the Ministry of Transport and the Ministry of Regional Development. As the expanded Methodological Guideline significantly overreaches to issues under the responsibility of the above-mentioned ministries, it is necessary to find a balanced compromise that will, however, require a lot of time.

Responsible body: Ministry of the Environment
Deadline: 01. 01. 2017
Conclusion: not achieved within deadline, completion is expected by the end of 2018 ☹

> **CB1** **Reducing the ammonia emissions from fertiliser applications to arable land and from livestock production beyond the minimum requirements of Good Agricultural Practice**

Under call 8 of SO 2.2 of the Operational Programme Environment, support was provided to a total of 27 projects for the acquisition of technologies to reduce emissions of NH_3 from livestock farming. In the total amount of CZK 36,730,000 from EU funds. Call 89 received 20 projects to support the acquisition of technologies to reduce emissions of NH_3 from livestock farming in a total amount of CZK 37,745,670 from EU funds.

Responsible body: Ministry of the Environment
Deadline: continuously until 31. 12. 2023
Conclusion: implemented continuously 🙂

> **DB10** **Restrictions on the availability of combustion stationary sources with the rated thermal input lower than 300 kW designated for coal combustion**

The Ministry of the Environment will submit within a specified deadline an analysis that will evaluate the options of reducing the consumption of lignite in stationary combustion sources with a rated thermal output of less than 300 kW, based on experience of other EU countries with the introduction of additional restrictions on products,

which are regulated by European Parliament and Council Directive 2009/125/EC, or other legal ways will be sought to achieve the set goal of the measure, i.e. to prevent the installation of new boilers designed to burn lignite after 2025.

Responsible body: Ministry of the Environment
Deadline: 31. 12. 2018, 01. 01. 2025
Conclusion: under preparation 😐

- **Conclusion:** Out of 23 additional priority measures, 6 have been implemented successfully so far. Another 13 priority measures were implemented partially or are implemented continuously by the deadline specified in the National Emission Reduction Programme (subsidy schemes, roads under construction etc.), and only 4 priority measures were not or could not be implemented at all.

National Action Plan for Adaptation to Climate Change

In 2017, the Czech Republic adopted the National Action Plan for Adaptation to Climate Change (NAP Adaptation) which is an implementing document for the Strategy on Adaptation to Climate Change in the Czech Republic. The NAP Adaptation includes a set of 98 indicators of vulnerability, which was evaluated in 2017 for the baseline year 2014[39].

[39] *Publication available for download from https://www.mzp.cz/cz/hodnoceni_zranitelnosti_cr.*

Figure 12

Synthesis of vulnerability of the Czech Republic to the effects of climate change

The vulnerability of the Czech Republic to the effects of climate change was assessed as very high. Of the 98 evaluated indicators, only 9 were assessed as purely positive, while 32 indicators had a negative evaluation (Figure 12).

One of the most important elements of the vulnerability of the Czech Republic is found to be water management in the Czech landscape that is not sufficiently capable of retaining water, which on the one hand contributes to the very high vulnerability to drought and on the other hand to floods. Poor management of water in the landscape and in settlements is augmented by changing precipitation and temperature patterns that have an impact on other areas – population, forestry, agriculture, urban environment, energy and other.

The Strategic Framework Czech Republic 2030

The Czech Republic adopted in 2017 a document called the Strategic Framework Czech Republic 2030. It is a strategic framework defining the direction for the development of the Czech Republic and the society in the coming decades. Its achievement through follow-up (sectoral, ministerial, regional) strategies should increase the quality of life in the Czech Republic and steer the country towards a development that will be sustainable in social, economic and environmental terms.

The Strategic Framework Czech Republic 2030 replaces the Strategic Framework for Sustainable Development and is a contribution of the Czech Republic to the global Sustainable Development Goals adopted by the United Nations in 2015.

The Strategic Framework Czech Republic 2030 formulates its goals in six key areas (Figure 13): People and society, Economic model, Resilient ecosystems, Municipalities and regions, Global development and Good governance. The material takes into account the external context of development of the Czech Republic and deals with the global megatrends and their impact on the strategic objectives for the development of the country.

The implementation plan of the Strategic Framework Czech Republic 2030, which develops 27 strategic and 97 specific objectives down to the level of measures and recommendations, was approved by the Government on 17 October 2018.

Figure 13

Key areas of the Strategic Framework Czech Republic 2030

Source: Office of the Government

List of abbreviations

AOT40 Accumulated Ozone exposure over a Threshold of 40 ppb
BaP 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} potassium dichromate digestion to chemical oxygen demand
CZK Czech crowns
CZ-NACE Classification of Economic Activities (Nomenclature général des Activities Economiques dans les Communautés Européennes)
DDD dichlorodiphenyldichloroethane
DDE dichlorodiphenyldichloroethylene
DDT dichlorodiphenyltrichloroethane
DMC Domestic Material Consumption
ETBE Ethyl tert-butyl ether
EU European Union
EU28 EU28 Member States
EUR EURO
FAME Fatty Acid Methyl Esters
FSC Forest Stewardship Council
GDP gross domestic product
GHG greenhouse gases
HCB hexachlorbenzene
HCH hexachlorcyklohexane
LPG Liquified Petroleum Gas
LULUCF Land Use, Land Use Change and Forestry
PAH polycyclic aromatic hydrocarbons
PCB polychlorinated biphenyls
PEFC Programme for the Endorsement of Forest Certification Schemes
PES primary energy sources
pkm passenger-kilometres
ppb parts per billion
PPS Purchasing Power Standard
RES renewable energy sources
SHARES Short Assessment of Renewable Energy Sources
tkm tonne-kilometres
USLE Universal Soil Loss Equation
VOC Volatile Organic Compounds
WWTP Wastewater Treatment Plant

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