2009

REPORT
ON THE ENVIRONMENT OF THE CZECH REPUBLIC

cenia

Ministry of the Environment
of the Czech Republic

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of CENIA, Czech Environmental Information Agency

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Czech Office for Surveying, Mapping and Cadastre
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The enclosed CD contains these other publications:
Report on the Environment of the Czech Republic in 2008
Report on the Environment of the Czech Republic in 2009
Statistical Yearbook of the Environment of the Czech Republic 2009
Statistical Yearbook of the Environment of the Czech Republic 2010
Current news from the environment – water

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Introduction

Pursuant to Act No. 123/1998 Coll., on the right to environmental information, as amended, and Government Resolution of 17 August 1994 No. 446/1994, the Report on the Environment of the Czech Republic (hereinafter the Report) is annually submitted for approval to the Government of the Czech Republic and subsequently submitted for consideration to the Chamber of Deputies and the Senate of the Parliament of the Czech Republic.

The Report is a comprehensive document assessing the state of the environment of the Czech Republic, including its context. Since the 2005 edition, the compilation of the Report has been entrusted to CENIA, the Czech Environmental Information Agency.

The 2009 Report was discussed and approved by the Government on 3 November 2010, after which it was conveyed to both chambers of the Parliament of the Czech Republic. The Report is published in electronic form at http://www.mzp.cz and http://www.cenia.cz and also distributed in printed form.

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** change since 2003*

Methodology

The Report on the Environment (hereinafter referred to as the Report) is a basic environmental reporting document of the Czech Republic. The methodology of the Report did not change much between 1994 and 2008, and therefore it was published in a similar form, only with slight changes. As the need and demand for information and expert support for the political processes of the environmental sector have grown, the methodology of the Report has been modified in 2009 in order to better reflect the requirements of those who use it and to provide conclusions relevant to policy-making.
The year to year dynamics of environmental changes do not call for an annual detailed analytical document on the environment and therefore the present approved system of national environmental reporting is founded on two basic pillars: the annual indicator-based Report on the Environment and a report entitled „The Environment of the Czech Republic – State and Outlooks by the year 2020," published every five years.
An accompanying document of the indicator-based Report is the „The Environment of the Czech Republic – State and Outlooks by the year 2020,"published every five years in relation to The State and Outlook Environmental Report of the European Environment Agency. The first issue is planned for 2011. The fact that the document is published every five years allows for the use of a more comprehensive cross-section assessment of development and trends and represents the outlook of individual indicators subject to assessment.
The Report is standardly based on authorized data obtained from monitoring systems administered by organizations both from within and outside the environmental sector. Data for international comparison is provided by Eurostat, the European Environment Agency (EEA) and the Organization for Economic Cooperation and Development (OECD).

THE USE OF INDICATORS TO DESCRIBE THE STATE OF THE ENVIRONMENT

The methodical basis of the new Report are indicators, i.e. precisely methodically described indicators related to main environmental topics of the Czech Republic and objectives of the current State Environmental Policy of the Czech Republic for 2004–2010. Once a new State Environmental Policy of the Czech Republic has been prepared, the set of indicators should be harmonized so that new indicators are related to the new policy and can reflect annual fulfilment of the policy's objectives.
Environmental indicators are among the most widely used environmental assessment instruments. Based on data, they demonstrate the state, specifics and development of the environment and can indicate new topical environmental issues. An assessment that uses indicators is clear and user-friendly.
The new methodology based on indicators follows methodical trends applied in the EU and is in line with the gradual harmonizing process of reporting both at national and European levels.

ENVIRONMENTAL ASSESSMENT USING A SET OF KEY INDICATORS

The formation and development of key indicators stemmed from the necessity to identify a small range of politically relevant indicators that, together with other information, respond to selected priority policy issues and take current topics into consideration. The set is an effective tool used to process the Report on the Environment and assess the fulfilment of preset objectives and priorities of the State Environmental Policy of the Czech Republic.

The set of key indicators includes 39 indicators, selected using the following criteria:

- Relevance for current environmental issues;
- Relevance for the current implemented state environmental policy strategies and international commitments;
- The availability of quality and reliable data over a long period of time;
- The relationship to the sectoral concept and its environmental aspects;
- The "cross-section" nature of the indicator – the indicator covers as many causal links as possible, i.e. it was selected to represent both causes and consequences of other phenomena in the DPSIR chain;
- The link to indicators defined at the international level and detailed at the EU level.

In the future, the proposed set of indicators will not be static, but rather continuously modified to meet the needs of the applicable State Environmental Policy of the Czech Republic, the EEA set, environmental issues and the availability of underlying data sets. Compared to the 2008 Report, the current set of indicators has changed only in the Soil and Agriculture section where two indicators were added, namely indicator No. 25 – Soil use limits and No. 26 – Soil erosion. The structure of the Responsible forest management indicator was changed after a consultation with experts from the Forest Management Institute. Indicator No. 12, the State of animal and plant species of Community importance, and indicator No. 13, the State of natural habitat types of Community importance, cannot be updated as data is provided only once in six years.
Indicators included in the set of key indicators were developed by specialised work centres in the Czech Republic that have dealt with the issue for many years, or were adopted from internationally acknowledged sets (EEA CSI, Eurostat, OECD and others).

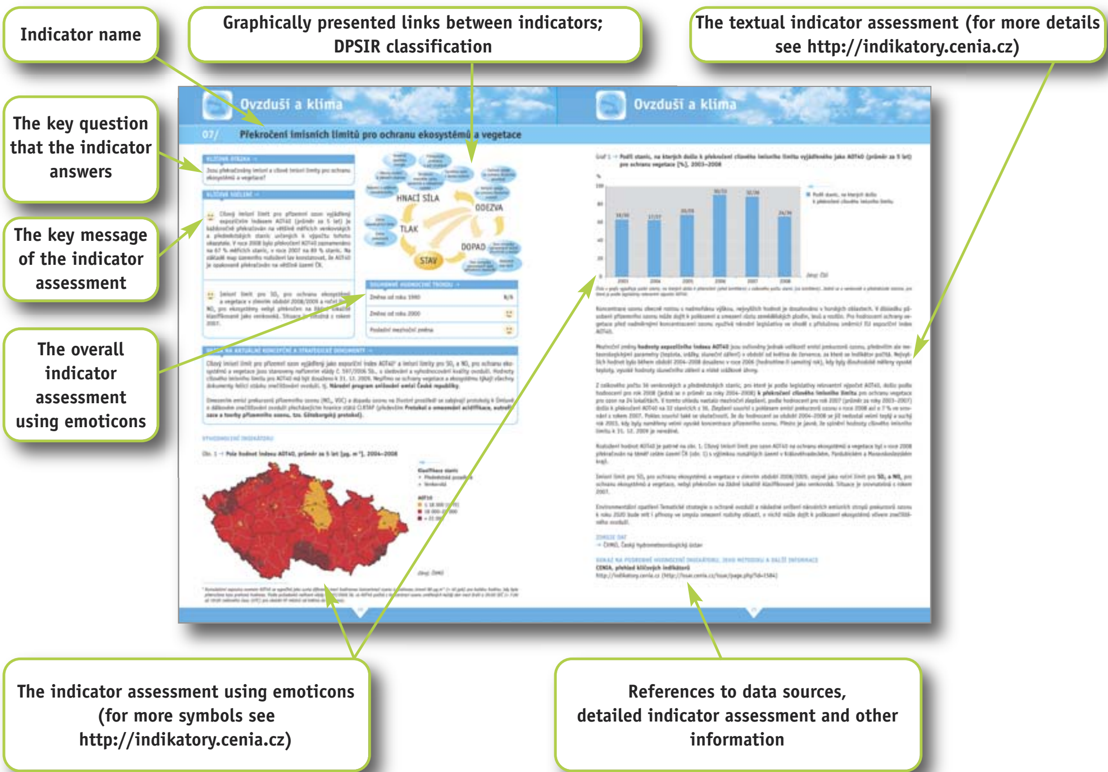
MESSAGES COMMUNICATED VIA INDICATORS

An indicator in the Report provides information across several hierarchical levels of detail. First, it provides comprehensible information – a key message, related (if currently possible) to a specific objective or another national or international obligation. The indicator assessment includes an assessment of the state and development as well as an assessment of international comparison. In indicators where verified data is available, the state of the environment is compared to other EU27 states. In some indicators, an international comparison beyond EU27 is included because of global importance of the topic (such as indicator No. 02 – Greenhouse gas emissions). Each indicator is assessed according to a unified template and simultaneously presented at http://indikatory.cenia.cz in a more detailed form that in the Report, together with methodology specifications and other meta data. The Report provides a link to the website for each indicator at the end of each chapter.

EMOTICON SYMBOL KEY

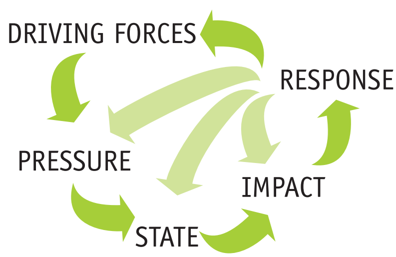
:-)	The trend is sustainable and is developing positively in line with the objectives we are striving to achieve.
:-/	The trend is neither negative, nor positive; it is stagnating.
:-(	The trend is developing negatively, is not in line with defined objectives we should strive to achieve.

INDICATOR ASSESSMENT STRUCTURE



RELATED INDICATORS

Indicators in the Report are arranged in thematic areas and their position within the internationally applied DPSIR model (Driving Forces, Pressure, State, Impact and Response) is specified. The DPSIR model shows mutual dependence between factors affecting the state of the environment and instruments used to regulate them. State indicators (S) include the state (quality) of individual environmental components (such as water, air, soil, etc.); pressure indicators (P) directly impact the state (such as emissions). The driving forces (D) are factors of pressure (such as the energy intensity of the economy, the structure of primary energy basis). Impact (I) means damage to the environment and human health and response (R) is implemented measures. Nevertheless, the classification of indicators may not be clear when taking into account the interpretation of individual dependences. Some indicators can be viewed as pressure, while from a different perspective they indicate the state. There is no definite classification.



Key messages of the Report

The state of the environment in the Czech Republic continues to be unsatisfactory **in terms of air quality**. However, areas with low air quality are not large, but rather limited to specific territories. These usually include industrial regions, areas with heavy road traffic and small settlements where environmental pressure comes mainly from household heating. In these heavily populated areas that include a part of the Moravia Silesia and Ústí nad Labem Region, Prague and some other locations around the Czech Republic, the low air quality poses a long term risk of impacting human health. **As far as water quality is concerned**, there are several remaining sections of watercourses that fall within the worst class V according to the basic classification of indicators. However, most assessed watercourses fall within classes I to III. The species composition of forests in the Czech Republic has been developing positively, showing an increase in more resistant deciduous trees; nevertheless, **the health state of forests** is unsatisfactory. The state of natural habitats and plant and animal species of Community importance is unsatisfactory. A significant amount of **agricultural land** is threatened by water erosion; wind erosion is also a major factor. The majority of agricultural land is also threatened with soil compaction and acidification.

The quality of the environment has not significantly improved even though **the overall pressures on the environment from the national economy's main industries decreased on the year to year basis in 2009**. Industrial production has decreased significantly and there has been a continuing decline in electricity generated from coal-burning power plants and a year to year decrease in the transportation capacities of railway and road transportation. Greenhouse gas emissions and emissions of most monitored pollutants declined in 2009. Surface water pollution has been decreasing, as has water consumption by industry and households. The proportion of the population connected to water management infrastructure has been increasing. With respect to the ongoing development of certain environmental components, the gradual decrease in environmental pressures may be seen later.

On the one hand, environmental pressure by the public energy sector and industrial production has been decreasing, while on the other hand, pressures by transportation and household consumption have been growing. Concerns about the impact of the global economic crisis have resulted in changed household behaviour, which is manifested in lower household budgets for some items. This has most likely affected the year-to-year increase in the number of households that use cheaper (solid) fuels for heating and the growing sales of briquettes, black coal and coke for residential use. This is a very unfavourable finding for air quality. In addition, based on the consumption of fuels it can be estimated that household expenses for passenger transportation have not been decreasing and the impact of transportation on the environment did not change in 2009.

Environmental burdens in the Czech Republic have been developing in close relationship to the nation's economic performance and their nature and structure are becoming more similar to that seen in other EU15 countries. **The specific burden of the environment per economic performance unit has been declining**, however, for historical reasons it remains higher that the EU27 and EU15 averages.

The current trends in the planning development of large cities, mainly Prague and Brno, are characterised by **suburbanisation**, i.e. the extending of cities' residential areas into their surroundings. In this respect, there have been changes in land use, an increase in developed areas and a subsequent link to a loss of biotopes of plant and animal species (biodiversity). Another negative consequence of the suburbanisation process includes increased transportation needs in relation to everyday commuting to work and the subsequent impact on the environment. In addition to environmental impacts, suburbanisation also causes social imbalance in settlements affected by this process.

As far as the long-term development since 2002 is concerned, **the state of the environment has stagnated** with relatively large year-to-year fluctuations. It has been proven that there is no direct correlation between the development of environmental pressures and the state of the environment affected by a number of external factors (i.e. those not caused by people), including temperature and precipitation. With respect to the uncertain development of socio-economic burdens and other factors, the current state of the environment is **rather unstable and will show significant ups and downs in the future**.

THE MAIN POSITIVE FINDINGS OF THE REPORT:

- On the year-to-year basis, greenhouse gas emissions dropped by 4.1% in 2008, i.e. by 27.5% since 1990. Compared to the total emissions decline in EU27, the decrease is almost double.

- After a period of increase between 2003 and 2007, material consumption in the Czech Republic in 2008 decreased by 1.6% on the year-to-year basis. Material intensity of the national economy, expressed as the indicator of total environmental burden related to the extraction and consumption of materials, has also been decreasing.

- The emissions of acidifying substances and secondary particles precursors (SO_2, NO_x, NH_3) dropped by almost 4% in 2009 compared to 2008; the emissions of ozone precursors (NO_x, VOC, CO, CH_4) dropped by 4%. The drop was caused mainly by NO_x and NH_3.

- Water abstraction for public water supply systems and industry has been declining with the consumption of water by household decreasing. The proportion of the population connected to public water supply systems and sewerage systems ending in waste water treatment plants has been increasing as has the number of waste water treatment plants.

- The amount of discharged pollution from point sources has decreased for main indicators such as BOD_5, COD_{Cr}, undissolved substances and $N_{inorg.}$. The quality of water in watercourses has been improving.

- The proportion of deciduous trees in the total forest area and in afforestation in the Czech Republic has been recently increasing only slightly, but steadily.

- The area of agricultural land under organic farming and the number of eco-farms has been growing. In 2009, the proportion of agricultural land under organic farming was 9.38% of the agricultural land fund and the number of eco-farms grew to 2 689.

- The consumption of mineral fertilizers and plant protection products that has been increasing since 2000 dropped by 38.5% for mineral fertilizers and by 11.4% for plant protection products on the year-to-year basis.

- The total waste generation has been decreasing since 2003 and dropped by 5.4% on the year-to-year basis.

- The total registered municipal waste generation in the Czech Republic per capita and year is the lowest in Europe.

- The use of packaging waste has been growing since 2003. Out of the total amount of generated packaging waste, 70% was used in recycling and 8% for energy purposes in 2009.

- Public expenditure on the environmental protection shows a growing trend; on the year-to-year comparison of 2008 and 2009, there was a visible increase in expenditure from central resources (by CZK 5.8 billion, i.e. 33%) and from regional budgets (by CZK 4.7 billion, i.e. 17%).

THE MAIN NEGATIVE FINDINGS OF THE REPORT:

- The area with low air quality, and hence the population exposed to overlimit concentrations of pollutants, have increased. This concerned 4.4% of the Czech Republic's area (in 2008, it was 3%). In 2009, 18% of population was exposed to the overlimit concentrations of PM_{10}; 36% of population was exposed to concentrations exceeding the target limit for benzo(a)pyren and 23% of population was exposed to concentrations exceeding the target limit for ground-level ozone. The limit value for NO_2 has been repeatedly exceeded in locations with heavy traffic.

- The quality of air in the Moravia Silesia Region is critical. The highest annual concentrations of both $PM_{2.5}$ and PM_{10} were measured in the Ostrava-Karviná region. The highest annual average concentration of benzo(a)pyren was measured, like in the past, in Ostrava-Bartovice (9.2 $ng.m^{-3}$). The target value was exceeded more than 9 times. The limit values for benzene and arsenic have been repeatedly exceeded in Ostrava.

- As far as total phosphorus is concerned, the discharge of pollution into surface water grew by 10.4% on the year-to-year basis (from 1.0 to 1.2 thousands of tonnes).

- 37% of animal and plant species of Community importance fall within the unsatisfactory category and 35% (and 36%) fall within the unfavourable category in terms of protection.

- Almost three quarters of natural habitats in the Czech Republic are assesses as unfavourable, 14% as less favourable and only 12% as favourable.

- The abundance of farmland bird species continues to decrease. The main cause for the decline is the intensification of agricultural and the loss of agricultural land.

- In spite of slowing down, the defoliation rate in the Czech Republic remains high. The proportion of older coniferous stands (over 59 years) was 75.5% for defoliation classes 2 to 4 (>25%) in 2009; in younger conifers (under 59 years) it was 28.4%; in older deciduous trees it was 41% and in younger deciduous trees 15.4%.

- There has been a constant increase in developed and other areas that represent significant destabilization elements in the landscape. Developed areas are usually created at the expense of agricultural land. Landscape fragmentation has been increasing.

- The number of households burning solid fuels, the sales of brown coal briquettes, coke and black coal for household consumption have increased on the year-to-year basis.

- 22% of agricultural land is threatened with water erosion and 8.5% with wind erosion in the Czech Republic; 40% of agricultural land is threatened with soil compaction.

- Hazardous waste generation increased by 7% between 2003 and 2009, even though the year-to-year comparison shows a decrease.

- Landfilling continued to be the most frequent waste disposal method in 2009 and accounted for 96% of total waste disposal.

- Air pollution with PM_{10} could cause premature deaths in elder and chronically sick people in 2009 and accounted for a 2% increase in the total death rate, similarly to previous years. Pollution with NO_2 is significant in locations with heavy traffic. Allergies diagnosed by physicians in children under 10 continue to grow.

THE DEVELOPMENT OF THE MAIN DRIVING FORCES OF THE ENVIRONMENTAL STATE:

- The industrial production in the Czech Republic decreased by 13.6% in 2009 in relation to the global recession
- Final energy consumption has been declining since 2007; there was a 7.8% year-to-year decrease in 2009.
- As far as different sectors are concerned, the highest energy consumption was registered in industry (39.8%), transportation (24.6%) and households (22.1%).
- The energy intensity of the national economy decreased by 1.8% in 2009.
- Electricity generation has shifted towards more environmentally friendly resources; electricity generation in steam power plants has decreased, while generation in nuclear power plants and from renewable sources has increased. The proportion of electricity generated from renewable energy sources in gross electricity consumption in the Czech Republic grew from 5.17% in 2008 to 6.79% in 2009. However, the Czech Republic has not reached the indicative target of 8% for 2010.
- Freight transport in the Czech Republic showed a significant 12.5% year-to-year decline in total transport capacities, registered both in railway and road transportation.
- The importance of railway for both passenger and freight transportation in the Czech Republic has been declining; on the other hand, road transportation has been growing in importance. In 2009, railway accounted only for 5.6% of total passenger transport capacity in the Czech Republic. An exception is public city and suburban transportation where the importance of railway has been increasing.
- Fuel consumption in transportation increased on the year-to-year basis in 2009 after stagnation in 2008; the increase was more significant in diesel (by 1.9%) than in petrol (by 0.9%).
- The number of passenger vehicles scrapped from the Central Vehicle Register significantly increased in 2009 which accelerated the vehicle fleet renewal. Approximately 259 000 vehicles were scrapped, i.e. the highest number since 1999. In spite of positive year-to-year changes, the passenger vehicle fleet remains very old; the proportion of vehicles over 10 years in the total fleet is about 60%, i.e. 2.63 billion vehicles.

The development of environmental pressure at the national level in the Czech Republic has contributed to lower global pressures and hence global environmental issues that include the loss of ecosystem services, climate change, use of natural resources and waste generation, changes in land use and a loss of biological diversity. The year-to-year decline in greenhouse gas emissions in the Czech Republic was the 5th largest in the EU27; the 27.5% decline in greenhouse gas emissions since 1990 is more than double compared to the entire EU27 (11.3%). There has been a decrease in the emission of air pollutants and consequently a decrease in transboundary environmental pollution. The Czech Republic is made up of a system of protected areas called Natura 2000 whose goal is to protect the animal and plant species and natural habitats that are the most precious from the Community perspective. Since 2005, the Czech Republic has been significantly decreasing both the material and energy intensity of its national economy as well as specific emissions of greenhouse gas emissions per capita and GDP unit. As far as these parameters are concerned, the Czech Republic is still behind the EU15, but the situation has been improving. The dynamics of the positive environmental pressure development (not the state, as explained in this Report) has been significantly higher in the Czech Republic compared to the EU27 average.

01/ Temperature and precipitation characteristics

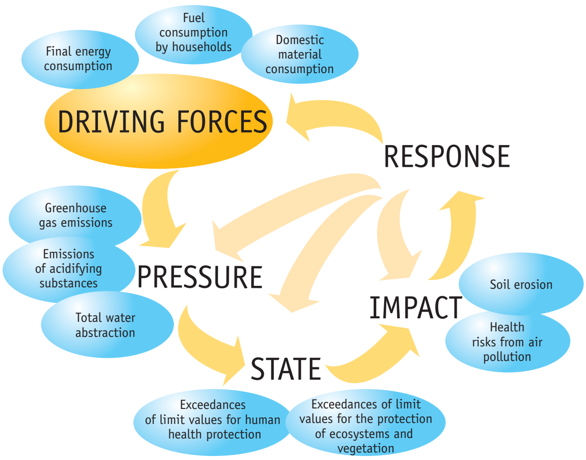
KEY QUESTION

What were the temperature and precipitation conditions in the Czech Republic in 2009?

KEY MESSAGE

In terms of temperature, 2009 was slightly above-average, and in terms of precipitation, it was an average year. The average annual temperature was 8.4 °C, i.e. 0.9 °C higher than the 1961–1990 mean; the annual precipitation was 744 mm, i.e. 110% of the long-term precipitation mean. Compared to the previous year, 2009 was 0.5 °C colder at the average and much richer in precipitation.

Throughout the year, temperatures fluctuated around the long-term average and precipitation was unevenly distributed. The beginning and the end of the vegetation period were warm and dry, there were torrential precipitation events in the summer and compared to previous years, the winter was colder. Torrential rains in June and July, accompanied by flash floods, caused damage to property and loss of life.

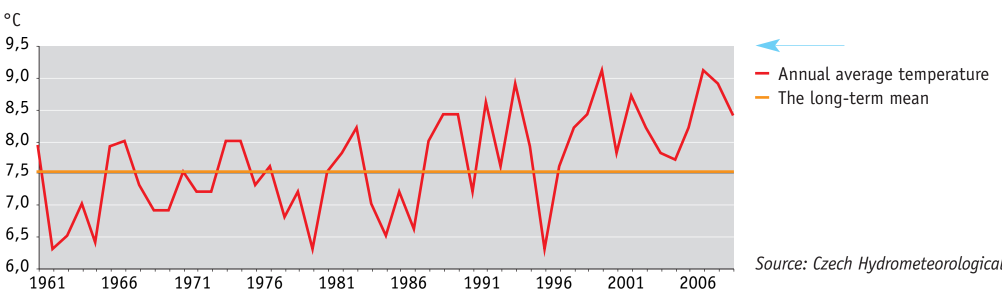


INDICATOR SIGNIFICANCE AND CONTEXT

Temperature and precipitation conditions and, more generally speaking, the state and dynamics of the atmosphere (i.e. the weather conditions), affect a number of natural and anthropogenic processes that influence the state of the environment. Air temperature and circulation conditions affect the intensity of air renewal and hence the air quality. High temperatures promote the formation of tropospheric ozone in summer and because of a higher evaporation rate, they decrease soil humidity, affect drainage, increase the eutrophication rate of still waters and, last but not least, can also result in fires. Weather conditions also affect some sectors of the national economy and thus the environmental burden caused by such sectors. The temperature affects energy consumed both for heating and air conditioning, thus affecting the air pollution related to energy generation. Temperature and precipitation conditions also significantly affect agriculture through water consumption for irrigation, fertilizers´ and agrochemicals´ consumption, the spreading of pests and total crop production. Other affected sectors include forestry and, to a minor extent, services. Extreme weather conditions, such as floods, long-term drought periods and strong winds, can cause extensive damage to the national economy. The air temperature also affects human health. Extremely high temperature, that tend to be more and more common in summer, are connected with health risks, such as an increased risk of infections and a higher stress, that can result, for instance, in serious traffic accidents.
Meteorological conditions thus affect the implementation of a wide range of strategies and the accomplishment of political objectives concerning air pollution, the quantity and quality of water resources, water management, the energy sector, agriculture and forestry, and human health protection.

INDICATOR ASSESSMENT

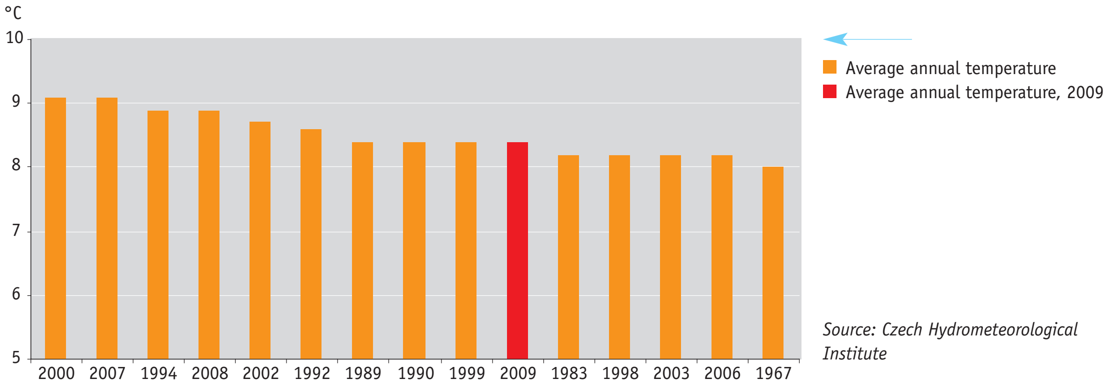
Chart 1 → **Annual average air temperature in the Czech Republic, areal averages[1] [°C], 1961–2009**



Source: Czech Hydrometeorological Institute

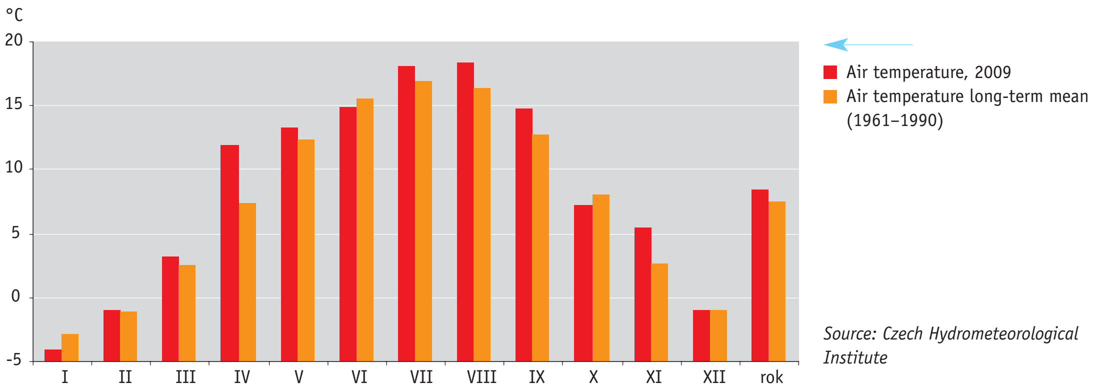
[1] *Areal averages for temperature and precipitation are used in order to smoothen the spatial differentiation of temperature and precipitation. They are calculated using a method of mathematical interpolation and, rather than a value for any particular location, they express the average value for the entire Czech Republic (corresponding to the median altitude), not a value for a specific area.*

Chart 2 → **The 15 warmest years in the Czech Republic since 1961 (annual areal average temperatures) [°C]**



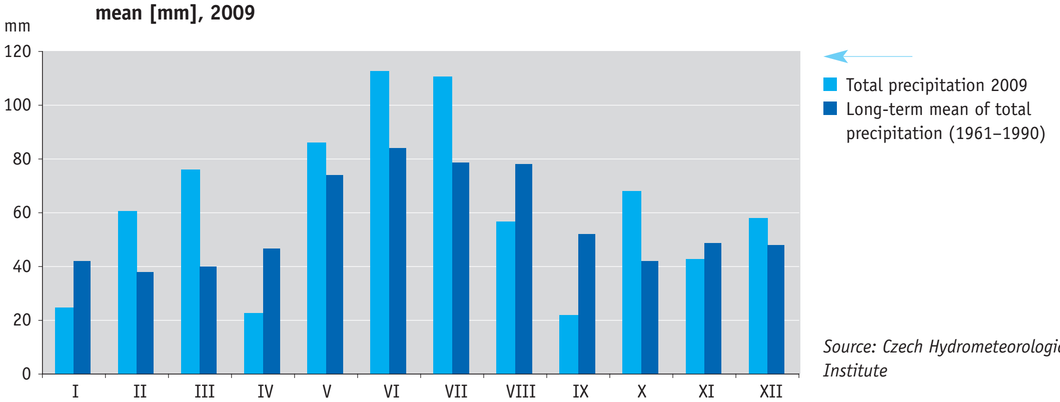
Source: Czech Hydrometeorological Institute

Chart 3 → **Monthly average air temperature in the Czech Republic (areal averages) compared to the 1961–1990 temperature mean [°C], 2009**



Source: Czech Hydrometeorological Institute

Chart 4 → **Monthly precipitation totals in the Czech Republic (areal averages) compared to the 1961–1990 precipitation mean [mm], 2009**



Source: Czech Hydrometeorological Institute

In terms of temperature, 2009 was a slightly above-average year in the Czech Republic with the annual average temperature of 8.4 °C being 0.9 °C higher than the long-term average for 1961–1990. In the list of the warmest years in the Czech Republic since 1961, 2009 shares the 7th to the 10th place with 1989, 1990 and 1999 (Chart 2). Compared to 2008, the temperature was 0.5 °C lower, especially thanks to a colder winter.

In terms of temperature changes, the value fluctuated around the long-term average for 1961–1990 (the temperature mean). Periods with temperatures markedly above the average were also accompanied by a lack of precipitation. After a colder winter, the beginning of spring was very warm; the summer was warm and featured torrential precipitation and both the beginning and the end of autumn were very warm and dry. The month of April was exceptionally warm and with a temperature deviation of +4.7 °C from the long-term mean it was the warmest April since 1961.

From the global perspective, 2009 was the 5th warmest year on the earth since the beginning of instrument temperature measurement in 1850 according to a WMO report o global climate; the global average annual temperature ranged between 14.4 and 14.5 °C. Based on temperature measurements carried continuously in Prague's Klementinum since 1775, the year 2009 was the 10th warmest year ever. The average temperature in Europe was above the standard throughout the year, below average temperatures were registered in Western and Central Europe, especially at the beginning of the year.

In terms of precipitation, 2009 was an average year with a total amount of 744 mm, i.e. 110% of the annual precipitation for 1961–1990 (the precipitation reference period, further referred to as the mean). Compared to the previous year, the year 2009 was richer in precipitation; the precipitation total in 2008 was at 92% of the long-term average. The distribution of precipitation throughout the year was uneven; drought periods and periods with excessive precipitation were alternating (Chart 4). The months of February, March and October were above-average in terms of precipitation; the months of January, April and September were dry to very dry.

After a dry January, the months of February and March were above-average in terms of precipitation; the precipitation total in March of 76 mm was at 191% of the mean. This was followed by a dry and warm April where the areal precipitation for the entire Czech Republic was 23 mm and reached only 49% of the mean; in the Liberec, Hradec Králové, South Moravia and Zlín Regions, the total precipitation was lower than 20% of the mean. Between May and July, most precipitation was in form of torrential rains. During the last ten days of June and at the beginning of July, there were storms all over the Czech Republic with intensive precipitation which resulted in flash floods. The worst affected regions were the north of Moravia and the south and north of Bohemia. At the end of June, the north of Moravia and Silesia and the Prachatice and Strakonice areas were flooded with precipitation over 100 mm during the last five days of the month. North Bohemia and the Děčín, Česká Lípa and Semily areas were affected by violent storms at the beginning of July. Total material damage caused by flash floods exceeded CZK 8 billion and 15 people died from drowning or as a result of insufficient help.

The months of August and September were below the average in terms of precipitation; the precipitation total reached only 42% of the long-term average for 1961–1990 and at the end of the month, a majority of the Czech Republic's area was affected by soil drought.

DATA SOURCES

➜ Czech Hydrometeorological Institute

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1594)

Information about climate on the Czech Hydrometeorological Institute's website
http://www.chmi.cz/meteo/ok/infklim.html

Czech Hydrometeorological Institute's Department of Climate Change
http://www.chmi.cz/cc

World Meteorological Organization
http://www.wmo.int

European Environment Agency
http://www.eea.europa.eu/themes/climate

02/ Greenhouse gas emissions

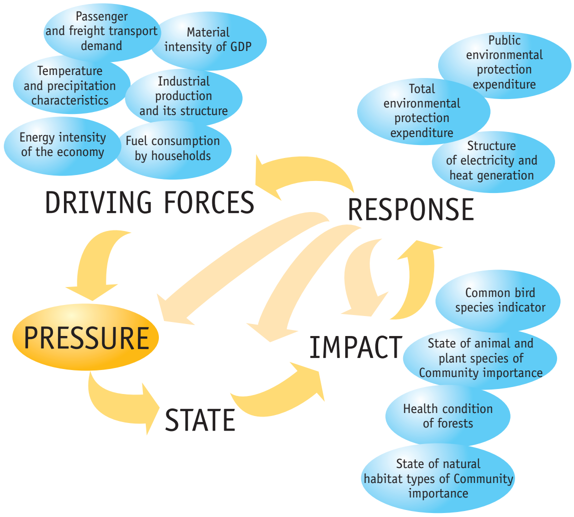
KEY QUESTION →

Are the national and international greenhouse gas emission targets of the Czech Republic being successfully met?

KEY MESSAGE →

After a period of slight increase at the beginning of the 21st century, greenhouse gas emissions in the Czech Republic have been significantly declining since 2007. The year-to-year decline in total greenhouse gas emissions by 4.1% in 2008[1] was the largest since 1998, with the largest decrease registered in the utilities sector and industry. A decline in emissions was most likely affected by the beginning of economic recession.
The Czech Republic will most likely comply with its current commitments under the Kyoto Protocol and new emission reduction commitments after 2012, when the first control period of the Kyoto Protocol ends, have not been defined. The trend of emissions in the Czech Republic is towards meeting the objectives formulated within the climate-energy package of EU and national strategic documents.

Due to relatively high energy demands of the national economy and its significant orientation on industrial production, specific greenhouse gas emissions remain above the average in the European context, even though the Czech Republic's position has been improving.
The share of mobile sources in total greenhouse gas emission in the Czech Republic has been growing (14.1% in 2008), even though in absolute figures, the emissions dropped on the year-on-year basis in 2008. In the years to come, further increases in this category's share in total emissions can be expected with respect to the state and the structure of greenhouse gas emissions by source in EU-27.



OVERALL ASSESSMENT →

Change since 1990	🙂
Change since 2000	🙂
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

„Protection of Earth's Climate System and the Prevention of the Long-range Transport of Air Pollution" is one of the priority areas of the State Environmental Policy of the Czech Republic. The priority objective in this area is the reduction of greenhouse gas emissions.

The Czech Republic is a signatory to the UN Framework Convention on Climate Change and the Kyoto Protocol. The Kyoto Protocol binds the Czech Republic to reduce aggregate greenhouse gas emissions in the 2008–2012 control period by 8% compared to the 1990 base year. An agreement concerning commitments for a period after the first control period has not been reached; however, the EU can be expected to accomplish its objective of collective emissions reduction.

A climate-energy package was adopted in December 2008 at the European Community level. The package introduces joint approaches and solutions in the area of climate protection, security of energy supplies and competitiveness of European economies. The package contains three directives and one decision[2] that are supposed to help meet the EU emission reduction target and reduce total greenhouse gas emissions by at least 20% by 2020 as compared to the 1990 reference year.

[1] *With respect to the data reporting methodology, the 2009 emission inventory data is not available as of the closing date of this publication. The results of the greenhouse gas inventory are regularly submitted to the Secretariat of the UN Framework Convention for the last processed year (here 2008) within 15 months from the end of the preceding year.*

[2] *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; Directive 2009/29/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community; Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide; Decision No. 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020.*

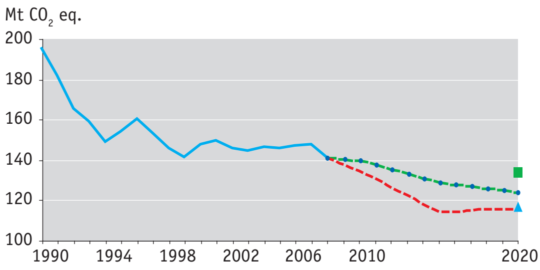
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Directive 2009/29/EC of the European Parliament and the Council of 23 April 2009 amending Directive 2003/87/EC regulates and expands the EU Emission Trading Scheme (EU ETS). The EU agreed to **reduce emissions in industries that fall under the EU ETS by 21% up to 2020 compared to 2005**. For the third trading period, that starts in 2013, the EU ETS counts on a gradual removal of free allocation of emission allowances to individual industrial enterprises and on introducing uniform rules for emission allowance auctions and/or free allocation of emission allowances based on the emission efficiency of production (benchmarking). In terms of emissions, the most important sector of energy will adopt 100% emission auction by 2013; however, some member states, including the Czech Republic, can allocate allowances free of charge also in this sector, provided criteria defined in Directive 2009/29/EC are met. The objective of reducing greenhouse gas emissions will be accomplished by introducing a single allowance ceiling for the EU that will be reduced by 1.74 % of allowances every year up to 2020.

Greenhouse gas emissions outside the EU ETS installations are regulated by Decision No. 406/2009/EC of the European Parliament and the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020. The Decision is supposed to ensure the reduction of greenhouse gas emissions in industries outside the EU ETS by 10% compared to the 2005 level. Commitments ranging from -20% to +20% have been set for individual member states. Under the Decision, the Czech Republic can increase its emissions by as much as 9%. The objectives both within and outside the EU ETS are related to the European objective of reducing emissions by 20% up to 2020; however, increasing the objective to 30% has been discussed. If a more ambitious objective is adopted, the above national commitments will change.

INDICATOR ASSESSMENT

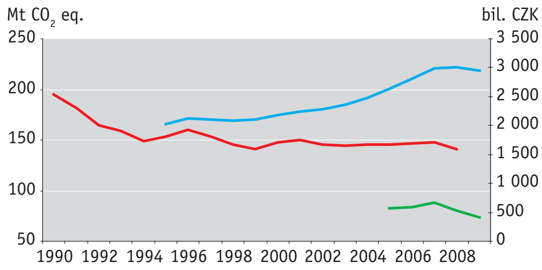
Chart 1 → **Development of greenhouse gas emissions (excluding LULUCF[3]) [Mt CO_2 eq.], 1990–2008, emissions projections for 2008–2020 and current reduction targets**



Source: Czech Hydrometeorological Institute, ENVIROS

- Aggregated emissions excl. LULUCF
- 30% reduction target
- 20% reduction target
- Scenario with adopted measures
- Scenario with additional measures

Chart 2 → **Development of greenhouse gas emissions (excluding LULUCF) [Mt CO_2 eq.], CO_2 emissions [Mt], reported within the emission trading, and GDP (right axis [billions of CZK, 2000 current prices]), 1990–2009**

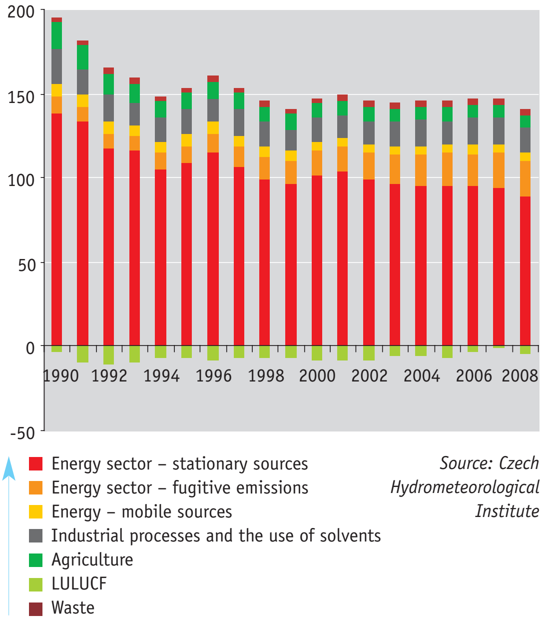


Source: Czech Hydrometeorological Institute, Ministry of the Environment of the Czech Republic, Czech Statistical Office

- GDP at 2000 constant prices (right axis)
- GHG emission excl. LULUCF (left axis)
- Emissions from EU ETS (left axis)

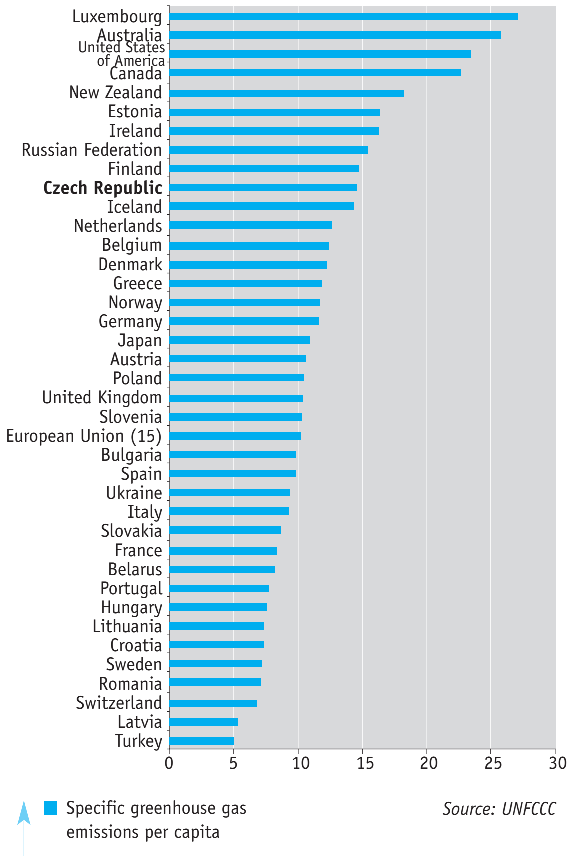
[3] *The charts represent, among other things, the results on national greenhouse gas emissions inventory where, in some cases, total national emissions are expressed including LULUCF emissions (LULUCF stands for land use, land-use change and forestry) in compliance with the UN Framework Convention on Climate Change, in other cases LULUCF is excluded, as required by the Kyoto Protocol. The use of emission values with/without LULUCF depends on the purpose of the presentation (to illustrate the impact of industrial activities on natural processes or the impact of natural processes on total emissions and their development) and the comparability of data to be displayed.*

Chart 3 → **Development of greenhouse gas emissions in the Czech Republic by sector [Mt CO_2 eq.], 1990–2008**



Source: Czech Hydrometeorological Institute

Chart 4 → **International comparison of specific greenhouse gas emissions per capita [t CO_2 eq. per capita], 2007**



Source: UNFCCC

Greenhouse gas emission (excluding LULUCF) in the Czech Republic significantly decreased in 2007 (Charts 1 and 2) after a period of slight increase and subsequent stagnation at the beginning of the 21st century. The 2008 year-on-year drop was 4.1% which is the largest year-to-year decline since 1998. Since 1990, the reference year for the Kyoto Protocol, emissions dropped by 27.5% to 141.4 Mt CO_2 eq. and compared to 2000, the emission drop was 4.1%. The annual decline thus compensated the increase over the seven years´ period.

In 2008, emission drops in LULUCF increased to 4.8 Mt CO_2 eq., the year-to-year decline in aggregated emissions including LULUCF was therefore by 6.9% higher (the highest since 1992). According to data from the ETS, the decreasing trend can be anticipated to continue in 2009.

The largest absolute decline in 2008 was registered in the energy sector – stationary sources (by 4.5 Mt CO_2 eq., i.e. by 4.8%) and in the industrial processes and the use of solvents sectors (by 1.2 Mt CO_2 eq., i.e. by 7.4%). After a period of continuous growth since 1994, emissions from mobile sources also decreased on the year-to-year basis by 0.5 Mt CO_2 eq. (2.4%), even though they still remain at more than a double of the 1990 value and their share in total emissions increased (to 14.1%). The development of emissions by sector is shown in Chart 3. The shares of individual greenhouse gases in total emissions have been relatively stable for a longer period of time, only the share of F gases has been slightly increasing.

The favourable trend in greenhouse gas emissions can be associated with economic recession and a subsequent decline in economic growth due to the global economic crisis and, last but not least, structural changes to the national economy. Energy generation in 2008 decreased by 5.3% on the year-to-year basis; in 2009 it was by 1.5%. As far as the energy generation structure is concerned, there has been a decline in energy generation by steam power plants that burn mainly brown coal (in 2008 by 9.2%, in 2009 by 4.9%) and an increase in nuclear energy generation in nuclear power plants and, in 2009, also in hydroelectric power plants.

Enterprises that belong to the EU ETS showed a sharp decline in produced greenhouse gas emissions in 2008 and 2009; in both cases, the decline was 8.2% in emissions reported in the EU ETS. While the largest decrease between 2007 and 2008 was registered in the public utilities sector (by 5.6 Mt CO_2 i.e. by 9.4%), 2009 brought more significant declines in iron, steel, coke, cement, glass and ceramics production, relatively about 20% on the year-on-year basis and by approximately 3.5 Mt CO_2 in total for all of the above industries. The share of emissions that belong to the EU ETS in total emissions reported in the national greenhouse gas inventory is about 67% and is very likely that the decline in total national emissions will also continue in 2009.

In spite of a favourable development, the Czech Republic still shows high specific greenhouse gas emissions per capita and GDP unit (the emission intensity) – see Chart 4. Specific emissions per capita were at 13.5 t CO_2 eq. in 2008 (excluding LULUCF) which means a decrease by 0.6 t CO_2 eq. compared to the previous year (the EU15 average is approximately at 10.1 t CO_2 eq. per capita). Specific emissions per GDP unit dropped to 46.9 kg CO_2 eq./ thousands of CZK at 2000 current prices, which means a decline by 38% compared to 1995 (time series of GDP data have been available since that year).This means the environmental burden per economic performance decreased (this is referred to as decoupling). Most years show a relative decoupling which means that during a period of economic growth emissions continued to grow even though more slowly than the economic performance.

Further greenhouse gas emissions development, with respect to a number of factors that affect it, is hard to predict. In addition to a successful implementation of national measures, economic performance, strategic priorities of energy and industry development, transportation development, mainly as far as the structure of transport capacities and fleet composition are concerned, and last but not least, the consumption behaviour of households will be important.

DATA SOURCES

- Czech Hydrometeorological Institute
- UN Framework Convention on Climate Change (UNFCCC)
- Czech Statistical Office
- Ministry of the Environment of the Czech Republic

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1508)

National Greenhouse Gases and Climate Change Inventory System (NIS)
http://www.chmi.cz/

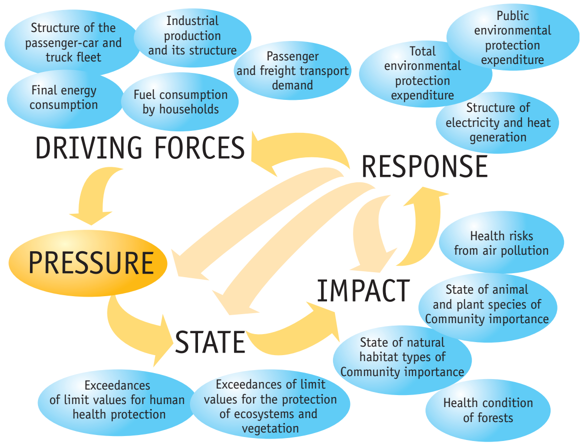
Czech Hydrometeorological Institute's Department of Climate Change
http://www.chmi.cz/cc

UN Framework Convention on Climate Change
http://www.unfccc.iorg

European Environment Agency
http://www.eea.europa.eu/themes/climate

EEA's Central Data Repository
http://cdr.eionet.europa.eu/cz

03/ Emissions of acidifying substances



KEY QUESTION

Have we succeeded in reducing air pollution with acidifying substances that adversely affect human health and ecosystems?

KEY MESSAGE

Emissions of acidifying substances into the air (SO_2, NO_x and NH_3) continue decreasing. The largest decline was reported in the 1990s; due to the economic crisis, a more significant decline has been registered over the last two years. The shares of individual substances in the total amount of acidifying substances have been evening out and SO_2 and NO_x account for almost identical shares (35.8% and 35.6%). The levels of emissions of acidifying substances are below the 2010 national emission ceilings, which are most likely to be met.

Compared to 2008 (15.99 kt per year), the emissions of acidifying substances dropped by approximately 3.6%. This year-to-year decrease most affected NH_3 and NO_x, by 1.8% and 1.5% respectively. This decrease in acidifying substances is a result of the decline in energy generating coal burning power plants, the decrease in industrial production and the continuing modernization of vehicular fleets.

OVERALL ASSESSMENT

Change since 1990

Change since 2000

Last year-to-year change

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

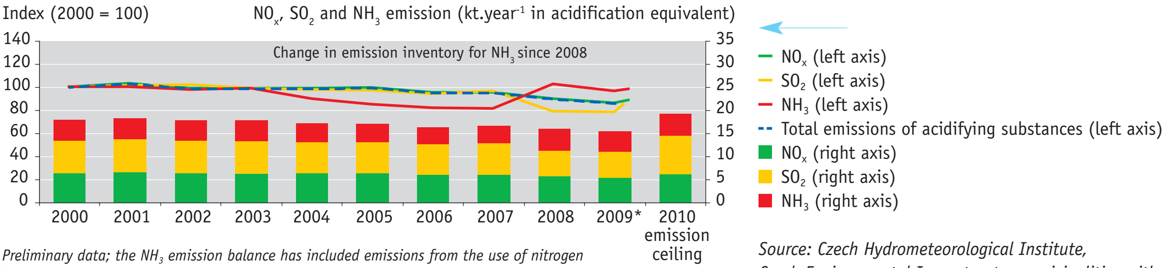
Requirements for reducing acidifying substances are addressed by the **National Emission Reduction Programme of the Czech Republic**. National emission ceilings for individual pollutants for 2010 were laid down by Directive 2001/81/EC of the European Parliament and of the Council on national emission ceilings for certain atmospheric pollutants, which is based – in part – on the relevant protocols of the CLRTAP Convention. The following emission ceilings are to be met by 2010: SO_2 (265 kt per year, i.e. 8.28 kt per year weighed by the acidification equivalent), NO_x (286 kt per year, i.e. 6.22 kt per year weighed by the acidification equivalent) and NH_3 (80 kt per year, i.e. 4.71 kt per year weighed by the acidification equivalent)[1].

An important international document is the **Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone to the Convention on Long-Range Transboundary Air Pollution (CLRTAP)**. In relation to acidification, the Protocol aims to control and reduce the emissions of sulphur, nitrogen and ammonia. These substances cause not only acidification, but also eutrophication and have adverse effects on human health. The Protocol's objectives are set as of 2010. The implementation of the Protocol is supposed to reduce the areas in Europe affected by excessive acidification by more than 80% (from 93 million hectares in 1990 to 15 million hectares in 2010).

The **State Environmental Policy of the Czech Republic** has committed to reduce transboundary air pollution and to achieve national emission ceilings within Priority Areas 4 "Protection of the Earth's Climate System and the Prevention of the Long-range Transport of Air Pollution".

INDICATOR ASSESSMENT

Chart 1 → **Total emissions of acidifying substances in the Czech Republic, 2000–2009* and the level of national emission ceilings for 2010 [index, 2000 = 100]; [kt.year^{-1} in acidification equivalent]**

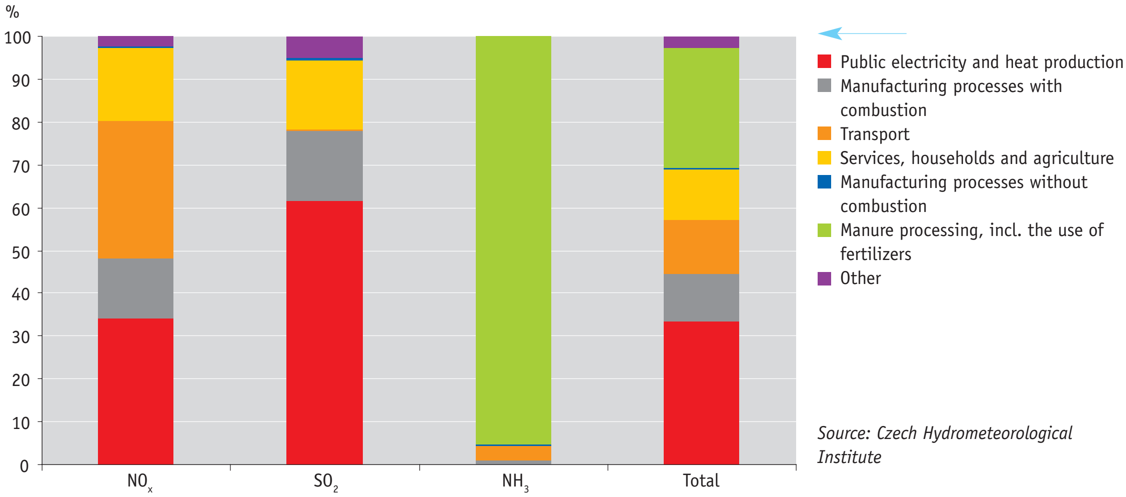


Preliminary data; the NH_3 emission balance has included emissions from the use of nitrogen fertilizers since 2008.

Source: Czech Hydrometeorological Institute, Czech Environmental Inspectorate, municipalities with expanded powers, Czech Statistical Office, Transport Research Centre, State Research Institute of Material Protection, Research Institute of Agricultural Engineering

[1] *The above data concerning emissions, presented both in the charts and the texts, is based on the acidifying equivalent. The acidifying equivalent factors are as follows for the below substances: for NO_x = 0.02174; for SO_2 = 0.03125 and for NH_3 = 0.05882. Total emissions equal to the sum of total annual emissions expressed in tonnes and mutiplied by their respective acidifying equivalent factors.*

Chart 2 ➜ **Sources of emissions of acidifying substances in the Czech Republic [%], 2008**



Source: Czech Hydrometeorological Institute

With respect to the data reporting methodology, the 2009 emission inventory data was not available as of the closing date of this publication.

Chart 3 ➜ **Emissions of acidifying substances across the EU-27 in 2008 (deviations [%] below or above the linear trend of emission reduction towards accomplishing national emission ceilings in 2010)**

Source: EEA

The following assessment is based on the NH_3 emission balance that has included emissions from the use of nitrogen fertilizers since 2008. That fact caused an increase in NH_3 emissions, the total emissions of acidifying substances and a drop in emissions over 1990–2008 and 2000–2008 compared to the 2008 Report assessment.

Between 1990 and 2009, there was a decrease in the emissions of acidifying substances[2] by more than 80% (from 78.97 to 15.41 kt per year weighed by the acidification equivalent). The decline slowed down at the beginning of the 21st century and the **production of emissions** decreased only slightly; over the last two years, the decline in emissions regained its speed as a result of the global recession (Chart 1). The decline in emissions between 2000 and 2009 was 14% from 18.02 to 15.41 kt per year of acidification equivalent (Chart 1). In the context of the relatively strong growth in economic activity that was accompanied by annual GDP growth figures since 2008, even the above trend can be viewed positively.

[2] Nitrogen oxides, sulphur dioxide and ammonia are substances that have the greatest impact on the acidification of the environment (soil and water ecosystems). Sulphur dioxide and nitrogen oxides contribute nearly equally to the emissions of acidifying substances (based on 2009 data), namely 35.8% and 35.6%. The remaining portion (28.6%) consists of NH_3.

Compared to 2008 (15.99 kt per year), the emissions of acidifying substances dropped by approximately 3.6%. The year-to-year decrease was mostly attributed to NH_3 and NO_x, by almost 1.8% and 1.5% respectively.
SO_2 emissions reached 5.48 kt weighted by the acidification equivalent in 2009 (in 2008, they were at 5.53 kt); the year-to-year decline was only slight and was mainly caused by a drop in large stationary sources. NO_x emissions were at 5.52 kt weighed by the acidification equivalent (in 2008, they were at 5.76 kt); however, the decrease in emissions was caused by large stationary sources. NH_3 emissions reached 4.41 kt of acidification equivalent in 2009 (in 2008, it was 4.70 kt);
The principal sources of the emissions of acidifying substances (based on 2008 data) are the public energy sector (more than 33% of the total emissions of acidifying substances, i.e. 5.37 kt per year weighed by the acidifying equivalent), manure processing (more than 28%, i.e. 4.52 kt per year) and transportation (more than 12%, i.e. 2.03 kt per year) – see Chart 2. Compared to 2000, there was no significant change in the structure of emission sources. The 2009 figures for the emissions of acidifying substances for the entire Czech Republic are below the ceilings set for 2010 (Charts 1 and 3).While some recommended values may have been slightly exceeded at the self-governing region level, it can be assumed that the recommended emission ceilings will be met as of 2010 there as well.
The development of the emissions of acidifying substances can be associated with the development of the economy and industrial production. The end of 2008 and all of 2009 can be classified as experiencing an economic slow-down or stagnation. A decline in the economic activity of emission intensive industries continued in 2009, but it was not as significant as in 2008. Energy generation in coal burning power plants dropped by 4.9% in 2009 (in the previous year it was by 8.2%). Similarly to 2008, industrial production that generates a large amount of emissions significantly decreased. In 2009, The Czech Republic's total industrial production dropped by 13.6% on a year-to-year basis because of the global economic crisis. The decrease in NO_x most likely resulted from a decline in the NO_x emissions from transportation. This is because vehicular fleets are being modernized and there is less fuel consumption.
In spite of all improvements concerning emissions in Europe, serious effects of air pollution remain. In light of these facts, the Sixth Environmental Protection Plan called for formulating a Thematic Strategy on Air Pollution (hereinafter referred to as the Strategy) with the aim of reaching „a quality of air that does not show risk to human health and the environment and does not have serious negative effects upon them". In relation to acidifying substances, the Strategy suggests stricter national ceilings for SO_2, NO_x and NH_3 emissions. Compared to 2000, the Thematic Strategy on Air Pollution envisages the following emissions reduction for the European Union by 2020: SO_2 reduced by 82%, NO_x by 60% and NH_3 by 27%. By achieving these objectives, the burden on water and forest ecosystems caused by acid atmospheric dispositions would decrease and European ecosystems would be protected from atmospheric effects caused by nutritious nitrogen.
The Strategy's implementation also envisages a review of the NECD directive. A draft reviewed directive is still under preparation. The reviewed directive sets 2020 national emission ceilings for acidifying substances and, naturally, also for VOCs and, in its latest version, for $PM_{2.5}$.

DATA SOURCES

- Czech Hydrometeorological Institute
- Czech Environmental Inspectorate
- Municipalities with expanded powers
- Czech Statistical Office
- Transport Research Centre
- State Research Institute of Material Protection
- Research Institute of Agricultural Engineering
- European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1522)

National Emissions Reduction Plan of the Czech Republic
http://www.mzp.cz/cz/narodni_program_snizovani_emisi_cr

Emission balance of the Czech Republic
http://www.chmi.cz/uoco/emise/embil/emise.html
http://issar.cenia.cz/issar/page.php?id=108

CLRTAP convention
http://www.mzp.cz/www/zamest.nsf/defc72941c223d62c12564b30064fdcc/7ea7a77d1457fc35c12565160028d316?OpenDocument

European Environment Agency, the international form of the indicator
http://themes.eea.europa.eu/IMS/ISpecs/ISpecification20081014122413/IAssessment1226069684950/view_content

04/ Emissions of ozone precursors

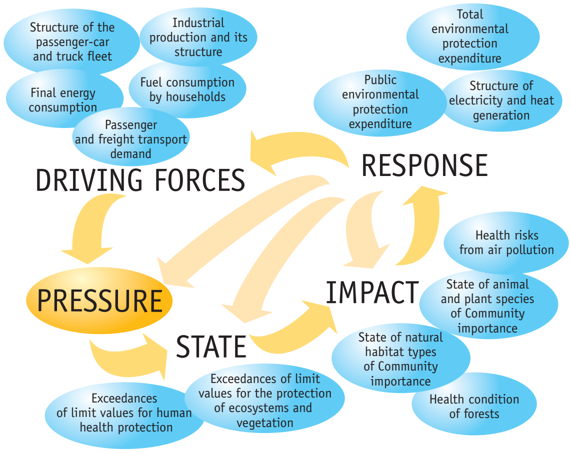
KEY QUESTION →

Have we succeeded in reducing the emissions of ground-level ozone precursors that adversely affects human health and vegetation?

KEY MESSAGE →

Between 1990 and 2009, the emissions of ground-level ozone precursors dropped by almost 58%. The decrease slowed down in 2000; a more significant decrease was registered over the last two years due to slower economic growth. The decline in emissions for 2000–2009 was almost 17%. The 2009 values of ground-level ozone precursors for which national emission ceilings have been set (VOC and NO_x) are all below the level established by the national emission ceiling.

In 2009, the emissions of precursors reached 528 kt per year weighted by the tropospheric ozone formation potential. Compared to 2008 (545 kt per year), there has been more than a 3% decline. The largest contribution to the decrease was by NO_x emissions, by 2.5%. CO accounts for a 0.5% decrease. The decrease in NO_x and CO emissions is related to the continuing decline in energy generation in coal burning power plants and the phasing out of industrial production.



OVERALL ASSESSMENT →

Change since 1990	☺
Change since 2000	☹
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

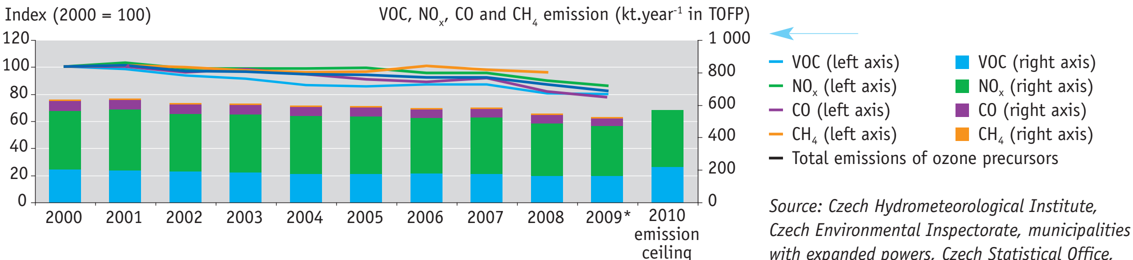
Reducing the emissions of ozone precursors (VOC, NO_x), i.e. substances from which ground-level ozone forms in the atmosphere, is addressed by the **National Emission Reduction Programme of the Czech Republic**. National emission ceilings for individual pollutants for 2010 were laid down by Directive 2001/81/EC of the European Parliament and of the Council on national emission ceilings for certain atmospheric pollutants, which is based – in part – on the relevant protocols to the **CLRTAP Convention**. As of 2010, the following emission ceilings are to be met: for NO_x 286 kt per year, i.e. 349 kt per year weighed the tropospheric ozone formation potential (TOFP) and for VOC 220 kt per year, i.e. 220 kt per year weighed by the TOFP[1].

In relation to air pollution caused by ground-level ozone, the objective of the **Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone** to the CLRTAP convention is to control and reduce the emissions of its precursors (NO_x and VOC) that are caused by anthropogenic activities. The adoption of the Protocol is supposed to reduce the number of days with high concentrations of ozone in Europe by one-half and subsequently reduce the effects of ground ozone on human health.

The **State Environmental Policy of the Czech Republic** seeks to reduce transboundary air pollution and to achieve national emission ceilings within Priority Areas 4 "Protection of Earth's Climate System and the Prevention of the Long-range Transport of Air Pollution".

INDICATOR ASSESSMENT

Chart 1 → **Total emissions of ozone precursors in the Czech Republic, 2000–2009*, and the level of national emission ceilings (for VOC and NO_x) for 2010 [index, 2000 = 100]; [kt per year weighted by the TOFP]**

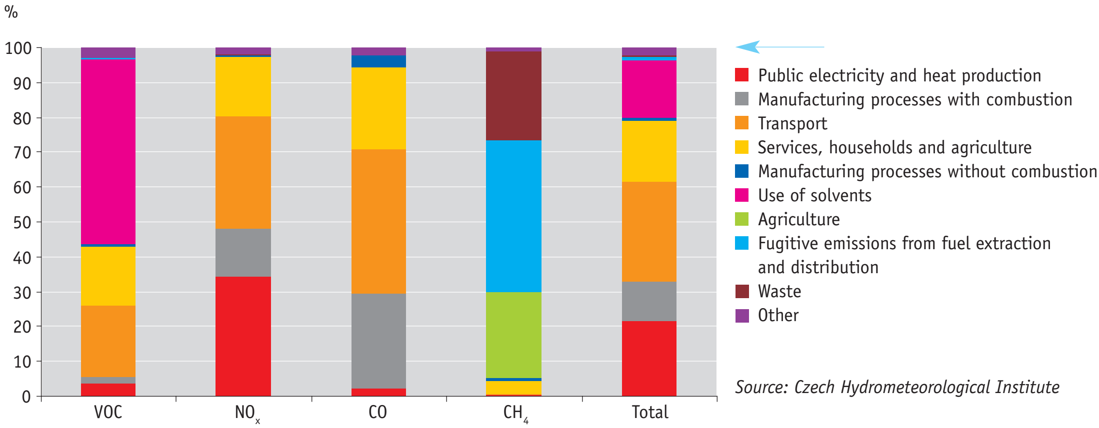


Preliminary data; data for CH_4 emissions in 2009 will be available in April 2011 because of the greenhouse gas emissions reporting scheme. To assess the trend, the CH_4 emissions value from 2008 was used.

Source: Czech Hydrometeorological Institute, Czech Environmental Inspectorate, municipalities with expanded powers, Czech Statistical Office, Transport Research Centre, State Research Institute of Material Protection, Research Institute of Agricultural Engineering

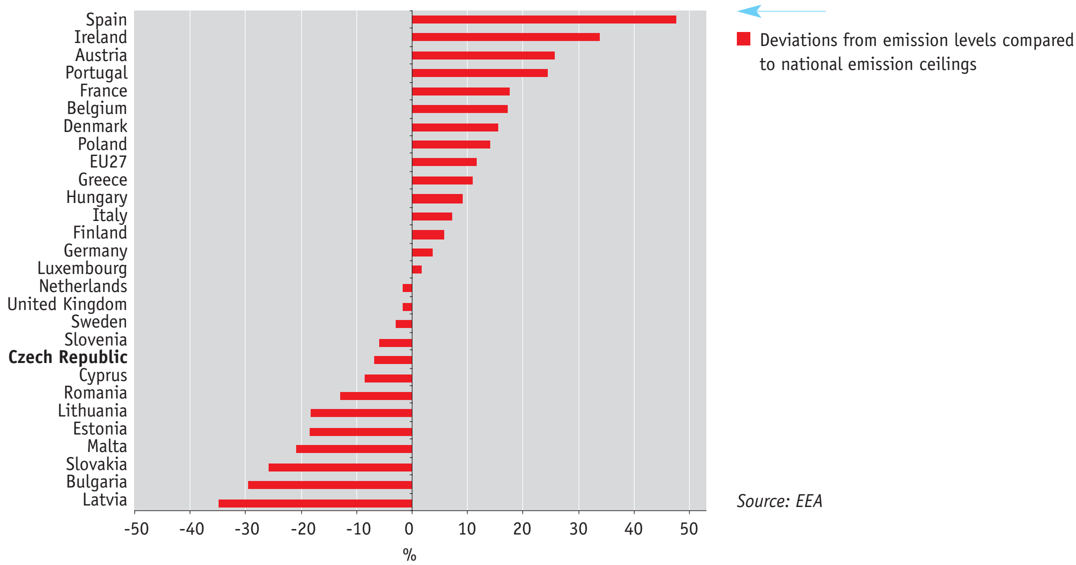
[1] All data on emissions, presented in the charts and texts, is based on emission values expressed as the tropospheric ozone formation potentials. The tropospheric ozone formation potential factors are as follows for the below substances: VOC = 1; NO_x = 1.22; CO = 0.11 and CH_4 = 0.014.

Chart 2 ➜ **Sources of emissions of ozone precursors in the Czech Republic [%], 2008**



With respect to the data reporting methodology, the 2009 emission inventory data was not available as of the closing date of this publication.

Chart 3 ➜ **Emissions (NO_x and VOC) across the EU-27 in 2008 (deviations [%] below or above the linear trend of emission reduction towards accomplishing national emission ceilings in 2010)**



Between 1990 and 2009[2] **the emissions of ground-level ozone precursors** were reduced by almost 58% (from 1 266 to 528 kt per year weighed by the TOFP). The decrease slowed down in 2000; a more significant decrease was registered over the last two years due to slower economic growth (Chart 1). The decline in emissions between 2000 and 2009 is almost 17%, i.e. from 634 kt to 528 kt weighed by the TOFP per year – see Chart 1.

In 2009, the emissions of precursors reached 528 kt per year weighed by the TOFP. Compared to 2008 (545 kt per year), there has been more than a 3% decline. The decrease was largely caused by NO_x emissions, by 2.5%. CO accounted for a 0.5% and VOC for a 0.3% decline.

NO_x emissions reached 309 kt weighed by the TOFP in 2009 (in 2008, they were 323 kt); the main cause of the year-to-year decrease was large stationary sources, followed by mobile sources. VOC emissions reached 164 kt in TOFP in 2009 (in 2008, it was

[2] Volatile organic compounds, nitrogen oxides, carbon oxide and methane belong among precursors of ground-ozone that is secondarily formed in the air. Adversal effects on both human health and vegetation were proved in ground-ozone. The main causes of ground-ozone formation were NO_x (59%) and VOC (31%). CO accounts for 9% and CH_4 for 1%. Compared to 2000, the situation has not significantly changed.

166 kt); the year-to-year drop in VOCs was mainly caused by a decrease in small sources. CO emissions reached 46 kt in TOFP 2009 (in 2008, they were at 49 kt); the year-to-year decline in CO was mainly caused by a drop in emissions from large stationary sources and mobile sources.

Based on data for 2008, it is safe to say that the **principal emission sources of ozone precursors** are transportation (29% of all emissions of ozone precursors, i.e. 159 kt weighed by the TOFP), and the public energy sector (22% of emissions of ozone precursors, i.e. 118 weighed by the TOFP). The third and the fourth largest sources include services, households and agriculture (17%) and the use of solvents (16%). Compared to 2000, the structure of sources has not changed much.

The 2009 values of precursors of ground-level ozone, for which **national emission ceilings** have been set (VOCs and NO_x), are below the level established by the national emission ceiling (Charts 1 and 3). While some recommended values may have been slightly exceeded at the self-governing region level, it can be assumed that the recommended emission ceilings will be met as of 2010 there as well.

The decrease in NO_x and CO emissions is related to the continuing decline in energy generation in coal burning power plants and the phasing out of industrial production (indicators Nos. 18 and 22). Energy generation in coal burning power plants was 4.9% lower in 2009 compared to 2008. Production in industries that generate large amounts of emissions has significantly dropped (such as the production of non-metallic and mineral products dropped by more than 20% and the production of metals and metallurgical products dropped by almost 30%). In relation to the decrease in CO emissions, a drop in coke production by almost 11% should be mentioned. The decline in VOC emissions is most likely related to a slump in the entrepreneurial sector (painting shops, etc.) and lower car production. In 2009, a decline in NO_x, VOC and CO emissions from individual car transportation was registered, most likely in relation to the continuing modernization of the vehicular fleet (indicators Nos 23 and 24).

The **Thematic Strategy on Air Pollution** (hereinafter referred to as the Strategy) notes that "air pollution and its effects on the health and quality of life of EU citizens are too significant for additional steps beyond those mandated by current legislation not to be taken". The Strategy proposes a significant reduction in emissions caused by air polluting substances. In relation to ground-level ozone, the Strategy proposes reducing VOC emissions by 51% and NO_x emissions by 60% by 2020 within EU member states as compared to 2000 levels.

A draft review directive is still under preparation. The review directive sets national emission ceilings as of 2020 for two ground-level ozone precursors (i.e. NO_x and VOC), and, naturally, also for SO_2, NH_3 and recently for $PM_{2.5}$. The Strategy's implementation also envisages a review of the NECD directive.

DATA SOURCES

- Czech Hydrometeorological Institute
- Czech Environmental Inspectorate
- Municipalities with expanded powers
- Czech Statistical Office
- Transport Research Centre
- State Research Institute of Material Protection
- Research Institute of Agricultural Engineering
- European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1524)

National Emissions Reduction Plan of the Czech Republic
http://www.mzp.cz/cz/narodni_program_snizovani_emisi_cr

Emission balance of the Czech Republic
http://www.chmi.cz/uoco/emise/embil/emise.html
http://issar.cenia.cz/issar/page.php?id=108

European Environment Agency, the international form of the indicator
http://www.eea.europa.eu/data-and-maps/indicators/emissions-of-ozone-precursors-version-1/emissions-of-ozone-precursors-version-1

05/ Emissions of primary particles and secondary particulate matter precursors

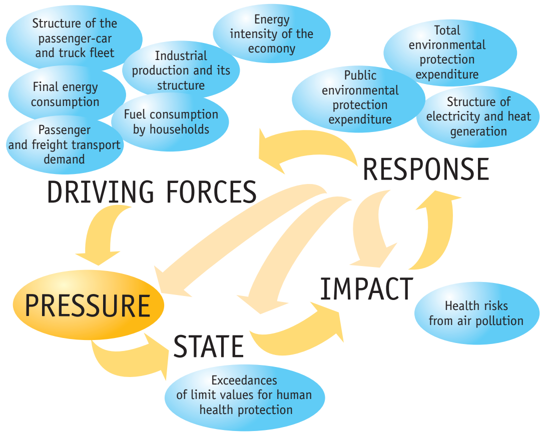
KEY QUESTION →

Have we succeeded in reducing air pollution caused by suspended particles that adversely affect human health?

KEY MESSAGE →

The precursors of secondary particles contribute 91% to the formation of particles (NO_x – 56%, SO_2 – 23%, NH_3 – 12%). The emissions of PM_{10} contribute the remaining 9%. Between 2000 and 2009, the emissions of precursors decreased by 15%. The values of total emissions of secondary particle precursors for 2009 are below the set ceiling.

Following a period of a moderate decline in emissions after 2000, more significant year-to-year declines in secondary particulate matters precursors were reported in 2008 and 2009 (3.6% in 2009). Primary particle emissions dropped by almost 7%. Total emissions of primary particles and secondary particles precursors decreased by almost 4% on a year-to-year basis.



OVERALL ASSESSMENT →

Change since 1990	
Change since 2000	
Last year-to-year change	

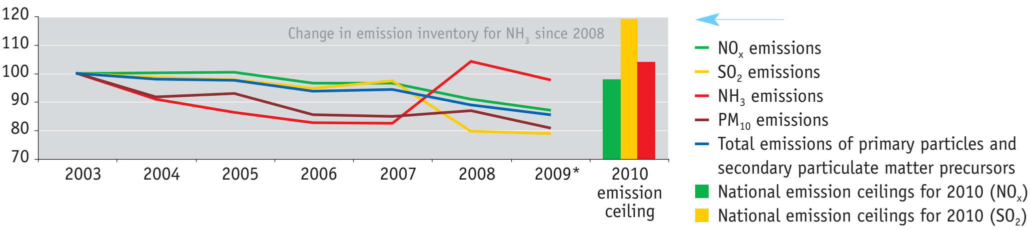
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The **National Emission Reduction Programme of the Czech Republic** addresses both air pollution with primary PM_{10} particles (i.e. that are emitted directly from the source), and the pollutants from which these particles may form in the atmosphere (secondary particulate matter precursors – NO_x, SO_2 and NH_3). National emission ceilings for individual pollutants for 2010 were laid down by Directive 2001/81/EC of the European Parliament and of the Council on national emission ceilings for certain atmospheric pollutants, which is based – in part – on the relevant protocols of **the CLRTAP**. The following emission ceilings are to be met by 2010: SO_2 (265 kt per year, i.e. 143 kt per year weighted by the particulate matter formation potential), NO_x (286 kt per year, i.e. 252 kt per year weighted by the particulate matter formation potential) and NH_3 (80 kt per year, i.e. 51 kt per year weighted by the particulate matter formation potential).[1]

The **State Environmental Policy of the Czech Republic** seeks to reduce transboundary air pollution and to achieve national emission ceilings within Priority Areas 4 „Protection of the Earth's Climate System and the Prevention of the Long-range Transport of Air Pollution".

INDICATOR ASSESSMENT

Chart 1 → **Development of emissions of primary particles and secondary particulate matter precursors in the Czech Republic, 2003–2009* and the national emission ceilings (for NO_x, SO_2 and NH_3) for 2010 [index, 2003 = 100]**

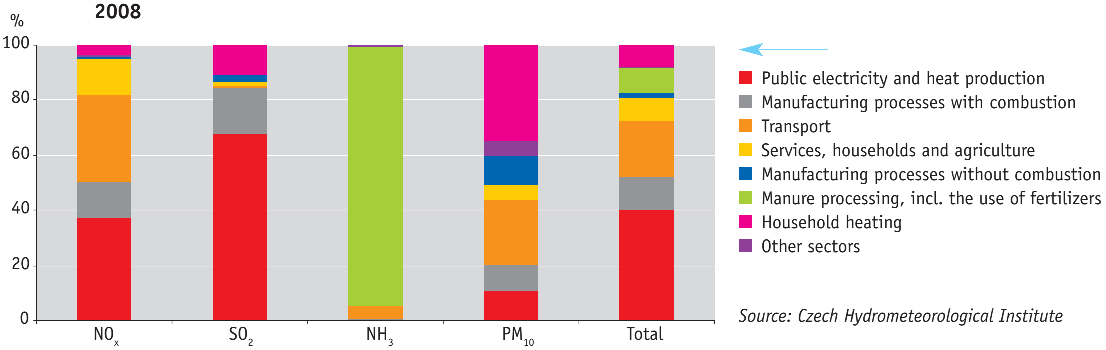


Preliminary data; the NH_3 emission balance has included emissions from the use of nitrogen fertilizers since 2008. The 2009 data for PM_{10} emissions was not available as of the closing date of the publication.

Source: Czech Hydrometeorological Institute, Czech Environmental Inspectorate, municipalities with expanded powers, Czech Statistical Office, Transport Research Centre, State Research Institute of Material Protection, Research Institute of Agricultural Engineering

[1] *All data, presented in the charts and the texts, is based on emissions expressed as the particulate matter formation potential. The particulate matters formation potential factors are as follows for the below substances: PM_{10} = 1; NO_x = 0.88; SO_2 = 0.54 and NH_3 = 0.64. The value of the indicators equals to the sum of total annual emissions of primary PM_{10} and secondary particulate matters precursors in tonnes, multiplied by their respective particulate matter potential factors.*

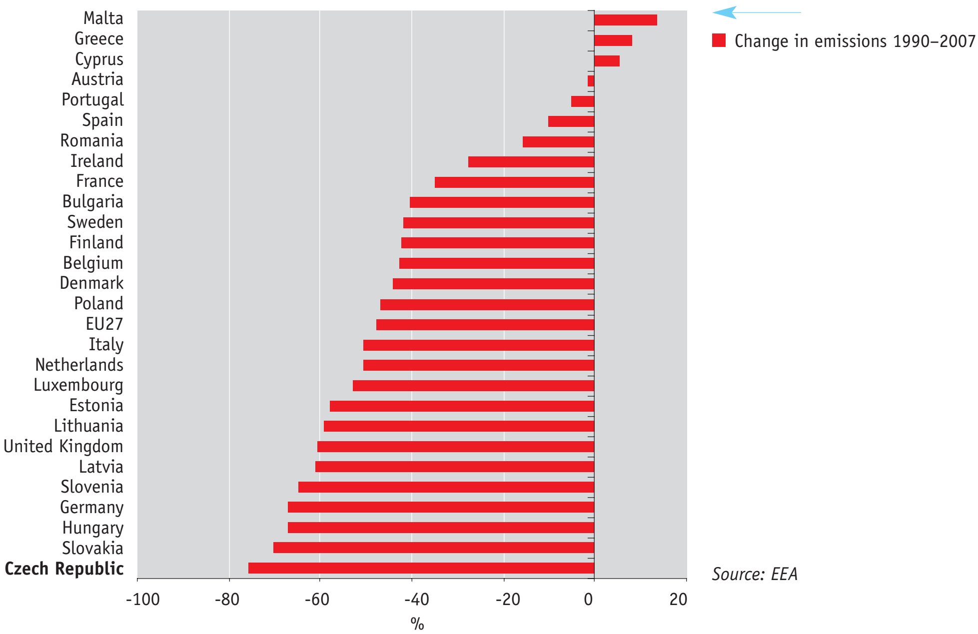
Chart 2 → **Emission sources of primary particles and secondary particulate matter precursors in the Czech Republic [%], 2008**



Source: Czech Hydrometeorological Institute

With respect to the data reporting methodology, the 2009 emission inventory data was not available as of the closing date of this publication.

Chart 3 → **Changes in the emission of primary particles and secondary particulate matter precursors in 2004 compared to 1990 emission levels in selected European countries [%]**



Source: EEA

The following assessment is based on an emission balance that has included NH_3 emissions from the use of nitrogen fertilizers since 2008. That fact caused an increase in NH_3 emissions, the total emissions of acidifying substances and a drop in emissions over 1990–2008 and 2000–2008 compared to the 2008 Report assessment.

Primary PM_{10} particles are emitted directly from the source. Precursors of secondary particles are pollutants from which these particles may form in the atmosphere (NO_x, SO_2 and NH_3).[2]

The **precursors of secondary particulate matters** contribute 91% to the formation of particles (NO_x – 56%, SO_2 – 23%, NH_3 – 12%). Between 2000 and 2009, their emissions dropped by 15% (from 431 to 366 kt per year weighted by the particulate matters formation potential). Following a period of minor decline in emissions after 2000, more significant year-to-year declines in secondary particulate matter precursors were reported in 2008 and 2009.

[2] *The source of primary particles means the actual burning in both stationary (the energy sectors and households) and mobile sources, road surface, tyre and pads grinding, and re-whirling. Secondary particulate matters are formed in the atmosphere from their gaseous precursors, i.e. SO_2, NO_x and NH_3 through a chemical reaction and a change from gaseous to liquid or solid state. The formation of secondary particles is also shortly referred to as the gas-particle conversion.*

In 2009, the emissions of precursors reached 366 kt per year weighted by the particulate matter formation potential. Compared to 2008, this was a 3.6% decline. This decline was mostly attributed to NO_x (2.6%).

The **emissions of PM_{10}** contribute the remaining 9%. The emissions of PM_{10} can only be assessed for 2003–2009. During that period, they declined by 19%; the year-to-year decline was 7%.

Total particulate emissions, i.e. the emission of primary particles and secondary particulate matter precursors, decreased by almost 15% (from 467 kt per year weighted by the particulate matter formation potential) between 2003 and 2009. The year-to-year decline in total emissions was 4%.

Based on 2007 data, the main source of primary particle emissions and secondary particulate matter precursors (Chart 2) are the public energy sector (40%), transportation (20%), and manufacturing processes involving combustion (13%).

The values for 2009 emissions of secondary particulate matter precursors are below the **national emissions ceilings** (Chart 1). While some recommended values may have slightly been exceeded at the self-governing region level, it can be assumed that the recommended emission ceilings will be met as of 2010 there as well.

The end of 2008 and all of 2009 can be classified as experiencing an economic slow-down or stagnation. One of the reasons for **the decrease in emissions** of primary particles PM_{10}, NO_x and SO_2 between 2007 and 2009 is decreased energy generation (indicator No. 22). Total energy generation in coal burning power plants in the Czech Republic decreased by 4.9% in 2009. Another reason for the emissions decrease is lower industrial production, including production in emission intensive industries (such as the production of non-metallic and mineral products, the production of metals and metallurgical products and wood processing). The reason for the decline in total emissions is lower NO_x emissions from transportation.

The **Thematic Strategy on Air Pollution** (hereinafter referred to as the Strategy) notes that air pollution and its effects on the health and the quality of life of EU citizens are too significant for additional steps not to be taken. In connection with secondary particulate matter precursors, it proposes stricter national emission ceilings and requires greater integration of air protection policies into other sectoral policies. Compared to 2000, the Thematic Strategy on Air Pollution envisages the following emission reductions for the European Union by 2020: SO_2 reduced by 82%, NO_x by 60% and NH_3 by 27%. In connection with primary particles, the Thematic Strategy points to the risks of both PM_{10} and fine $PM_{2.5}$ particles, which are more significant in terms of health.

A draft review directive is still under preparation. The review directive sets national emission ceilings for all secondary particulate matters precursors by 2020 (i.e. SO_2, NO_x and NH_3), as well as for VOCs. A new ceiling/percentage reduction for $PM_{2.5}$ emissions will be redefined. The Strategy's implementation also envisages a review of the NECD directive.

DATA SOURCES

- Czech Hydrometeorological Institute
- Czech Environmental Inspectorate
- Municipalities with extended powers
- Czech Statistical Office
- Transport Research Centre
- State Research Institute of Material Protection
- Research Institute of Agricultural Engineering
- European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

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http://www.mzp.cz/cz/narodni_program_snizovani_emisi_cr

Emission balance of the Czech Republic
http://www.chmi.cz/uoco/emise/embil/emise.html
http://issar.cenia.cz/issar/page.php?id=108

European Environment Agency, the international form of the indicator
http://www.eea.europa.eu/data-and-maps/indicators/emissions-of-primary-particles-and-1/emissions-of-primary-particles-and-1

06/ Exceedances of limit values for human health protection

KEY QUESTION

Are limit values and target values that have been set for pollutants in order to protect human health being observed?

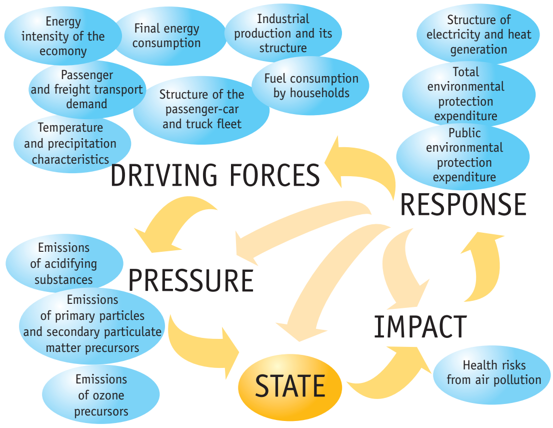
KEY MESSAGE

In the 1990s, there was a major drop in emissions of all basic pollutants and a subsequent drop in air pollution in the Czech Republic. In spite of the continuing drop in all emissions since 2000, concentrations of air pollutants remain the same.

In 2009, there was an obvious increase in air pollution with SO_2, PM_{10} and NO_2. Limit values for PM_{10} were exceeded at a greater number of measuring stations in 2009 than in 2008. Limit values for NO_2 have been repeatedly exceeded in heavy-traffic areas. Just like in 2008, there were a number of towns and municipalities that exceeded limit values for benzo(a)pyrene (BaP). Limit values for benzene and SO_2 and limit values for arsenic were locally exceeded.

Ground-level ozone concentrations decreased in 2009 compared to previous years. The size of area where the target value was not exceeded grew from 6.2% of the Czech Republic (in 2006–2008) to almost 53% (in 2007–2009).

The exceedance of the remaining limit values (for lead and carbon monoxide) and target values (for nickel) was not registered, as in previous years.



OVERALL ASSESSMENT

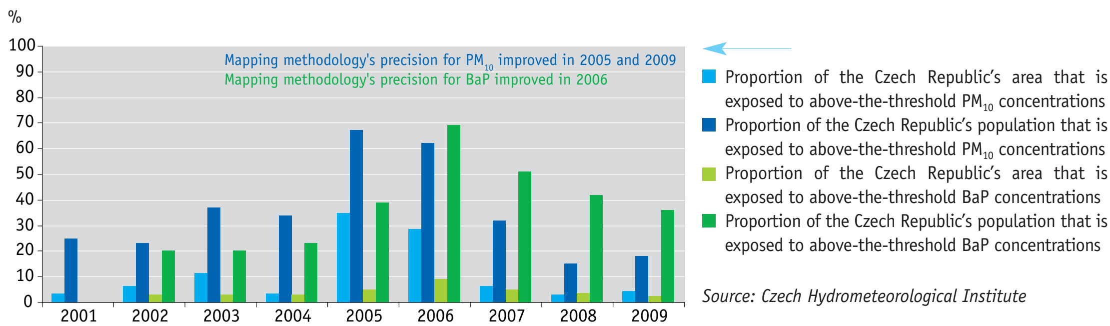
Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Priority area 3 „The Environment and the Quality of Life" within the **State Environmental Policy of the Czech Republic** aims to minimize the burden on the human population resulting from polluted air. The objective of the policy is to meet national and regional emission ceilings and improve air quality. The limit values set by EU directives have been fully transposed into **national legislation**. Currently, Government Regulation No. 597/2006 Coll. sets limit values for SO_2, PM_{10}, NO_2, Pb, CO and benzene. Target values have been set for ground-level ozone, cadmium, arsenic, nickel and benzo(a)pyrene. National emission ceilings are laid down by Directive 2001/81/EC that is based – in part – on the relevant protocols to the CLRTAP Convention.

INDICATOR ASSESSMENT

Chart 1 → **Percentage of the Czech Republic's area and population exposed to overlimit 24 hour concentrations of suspended particulate matters PM_{10} and overlimit annual concentrations of BaP [%], 2001–2009**

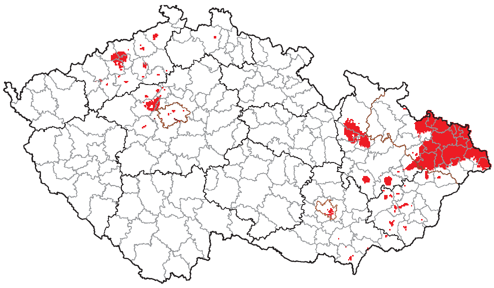


Source: Czech Hydrometeorological Institute

In 2005, the mapping methodology's precision was improved and, for the first time, a model that combined the SYMOS model, the European EMEP model and altitude data with concentrations measured at rural background stations was used to construct maps of PM_{10} concentration fields. In 2009, the methodology was again redefined by applying the CAM_X model. The SYMOS model includes emissions from primary sources. Secondary particles and re-suspended particles that are not included in emissions from primary sources are taken into account within the EMEP and CAM_X models.

Between 2002 and 2007, the benzo(a)pyrene mapping methodology was gradually refined. In addition to increasing the number of monitoring stations, the mapping methodology's precision was improved in 2006. In 2006, a number of towns and villages were subsequently included among those areas where the target value for BaP was exceeded.

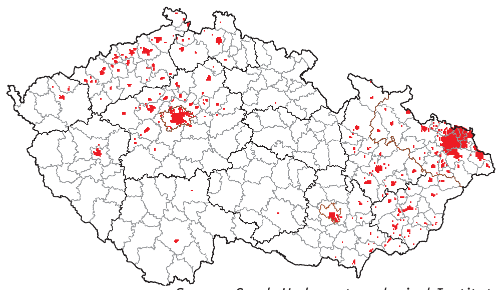
Figure 1 → **Map of the areas within the Czech Republic where health protection limit values were exceeded, 2009**



Source: Czech Hydrometeorological Institute

- Areas with exceeded LV (4.43% of the Czech Republic)
- Areas with exceeded LV+MT (0.01% of the Czech Republic)
- Regions
- Municipalities with extended competence

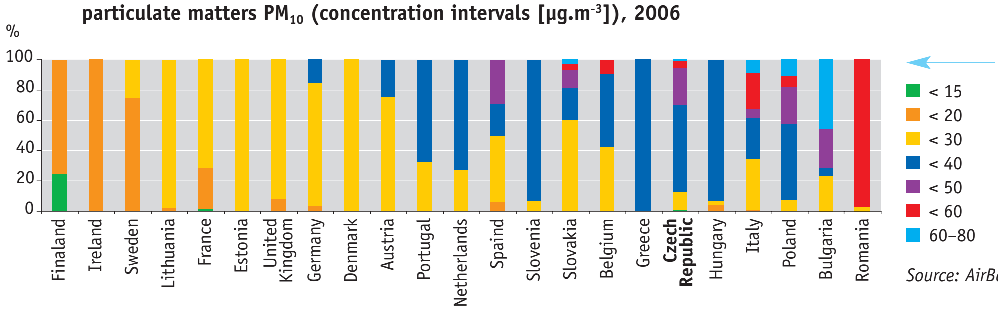
Figure 2 → **Map of the areas within the Czech Republic where health protection target values were exceeded (excluding ozone), 2009**



Source: Czech Hydrometeorological Institute

- Areas with exceeded TV (2.3% of the Czech Republic)
- Regions
- Municipalities with extended competence

Chart 2 → **Share of urban population [%] in selected states exposed to average annual concentrations of suspended particulate matters PM_{10} (concentration intervals [$\mu g.m^{-3}$]), 2006**



Source: AirBase, Eurostat

In the 1990s, there was a major drop in emissions of all basic pollutants and a subsequent drop in air pollution in the Czech Republic. In spite of the continuing drop in all emissions since 2000, concentrations of air pollutants remain the same. The EEA attributes that to a combination of factors (the dispersion conditions being affected by increasing temperatures and the long-range transport of pollution). Occasional fluctuations are mainly caused by dispersion conditions.

In 2009, an increase in air pollution with SO_2, PM_{10} and NO_2 roughly to the 2007 level was registered. An increase in the concentrations of the above pollutants in air was caused by less favourable weather and dispersion conditions, mainly in January, February and December 2009 compared to 2008. The main problem with respect to air quality in the Czech Republic is caused by the high concentration of **suspended particulate matters PM_{10}**. Air quality worsened between 9 and 16 January 2009 throughout the entire Czech Republic. The worst dispersion conditions were reported between 7 and 17 January 2009. The largest number of measuring stations where limit values were exceeded was in reported in the Ostrava, Prague, Central Bohemia and Ústí nad Labem regions. The situation in the Moravia Silesia region can be considered critical with respect to very high and more frequent concentrations.

In 2009, an increase in measured PM_{10} concentrations compared to the previous year was seen in most locations, namely because of the above weather and dispersion conditions. Limit values for 24 hour concentrations were exceeded in 4.4% of the area; 18% of Czech population was exposed to overlimit concentrations (Chart 1). The average concentration limit was exceeded in 0.54% of the Czech Republic (in 2008, it was in 0.44% of the area and in 2007, 0.7%). The limit value for annual concentrations of[1] suspended particulate matters $PM_{2.5}$ was exceeded in 10 out of 36 locations in 2009 (in 2008, it was 9 out of 35). The highest average annual $PM_{2.5}$ concentrations were reported, similarly to PM_{10}, in the Ostrava-Karviná region. The limit values were exceeded in 7 locations there. The remaining locations with overlimit $PM_{2.5}$ values were found in the Brno agglomeration (2 locations) and in Přerov.

According to an EEA[2] report, people in Benelux, Poland, the Czech Republic, Hungary, Italy and Spain are most affected by PM_{10}. The share of urban population in the Czech Republic exposed to overlimit concentrations is not negligible (Chart 2).

Ground-level ozone concentrations are influenced by weather in the warmer half of the year. Ground-level ozone concentrations decreased in 2009 compared to previous years. The size of area where the target value was not exceeded grew from 6.2% of the Czech Republic (in 2006–2008) to almost 53% (in 2007–2009). Approximately 23% of the population was exposed to ground-level ozone concentrations exceeding limit values for human health protection in the period of question between 2007 and 2009. Compared to the previous three year period, there was a decrease in the number of instances where 120 $\mu g.m^{-3}$ was exceeded in almost 88% of the locations between 2007 and

[1] Pursuant to Directive 2008/50/EC of the European Parliament that will be implemented into Czech legislation.
[2] EEA 2007. Air pollution in Europe 1990–2004. EEA Report No. 2/2007. Available at: http://www.eea.europa.eu/publications/eea_report_2007_2.

2009. When comparing the three year periods, weather conditions are crucial. This includes sunlight, temperature and precipitation from April to October, where ozone concentrations are usually higher.

The decline in ozone concentrations between 2007 and 2009 is most likely related to the slight decrease in maximum temperatures in the summer of 2009 (April-September) and to the decrease in limit values of NO_x (ozone precursors) when compared to 2006, which was not included into the 2007–2009 three year period. Limit values of VOCs (ozone precursors) were comparable. More significant differences in the average temperatures from April to September of the two years (2006 and 2009), when the highest ozone concentrations are typically measured, were not reported. Sunlight values for both years were also comparable.

Ground-level ozone concentrations usually grow with increasing altitude. This is confirmed by data measured in 2009 where the most exposed locations were found at higher altitudes. The least affected locations were heavy-traffic areas in cities where ozone is degraded through a chemical reaction with nitrogen oxide. It can be anticipated that ground-level ozone concentrations are below the limit values in other cities with heavy traffic where the decrease cannot be documented because measurements according to the current map methodology are not taken. Just like in 2008, a number of towns and municipalities exceeded **limit values for benzo(a)pyrene** (BaP). This concerns 2.31% of the Czech Republic in which approximately 36% inhabitants live (Chart 1). The annual average concentrations for 2009 were comparable to 2008. In 2009, BaP concentrations were monitored in 34 locations. The annual average concentrations exceeded the target limit l (1 $ng.m^{-3}$) in 21 of them. The highest annual average concentration was measured in Ostrava-Bartovice (9.2 $ng.m^{-3}$), similarly to previous years. The target value was exceeded by more than 9 times in that location.

Based on maps of the spatial distribution of the relevant air-pollution characteristics of air quality, **areas with impaired air quality** (Figure 1) were identified in 2009, i.e. such areas where the limit values for human health protection are exceeded for at least one pollutant (this is SO_2, CO, PM_{10}, Pb, NO_2 and benzene). In 2009, limit values were exceeded for PM_{10} (see above), NO_2 (locations with heavy traffic), SO_2 (Teplice) and benzene (in Ostrava). These areas were defined in 4.4% of the Czech Republic (in 2008, it was 3%).

Based on maps of the spatial distribution of relevant air-pollution characteristics, **areas where target values are exceeded** (Figure 2) for at least one pollutant apart from ozone (these include As, Cd, Ni and benzo(a)pyrene) were identified in 2.3% (in 2008 it was 3.7). Target values were exceeded in BaP (see above) and As. The target value for As is repeatedly exceeded in Ostrava and Kladno. The remaining limit values (Cd, Ni, Pb) were not exceeded in 2009. Much of the population of the Czech Republic lives in numerous small municipalities. Since the measuring stations are located in line with legislation, **information concerning air pollution in smaller settlements is missing**. The issue of small settlements is only mentioned in case studies[3] and as far as BaP is concerned, measurements are taken manually in rural locations but their number is too low. Alarming, however, is the fact that almost half of the Czech Republic's population (47% as of 31 December 2009) lives in even smaller settlements (up to 10 000 inhabitants). Increased to overlimit concentrations of pollutants were measured in smaller settlements. These are namely particulate matter, PAH and heavy metals. This means that air pollution in smaller settlements can be comparable to larger urban agglomerations. The worsened air quality in Czech rural areas is caused by the burning of solid fuels. People started to use solid fuels again because of their more competitive prices. This phenomenon is also supported by 2009 data in which sales of lignite briquettes, coke and black coal for households increased by 7.3% (indicator No. 20).

In May 2008, the European Parliament adopted **Directive 2008/50/EC** on ambient air quality and cleaner air for Europe, which unifies Directive 96/62/EC with the first three daughter directives and with Council Decision 97/101/EC establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States. Among other things, this directive newly sets limit values (the limit values for local concentrations, target values, the exposure concentration obligation, national exposure reduction targets) for $PM_{2.5}$. The directive will be transposed into Czech legislation through a new air protection act to come into force in 2011. In addition to transposing the requirements of Directive 2008/50/EC, the new **air protection act** is aimed at improving the effectiveness of existing instruments in order to significantly contribute to improving air quality in all regions of the Czech Republic. Air quality improvement and reducing impacts on human health and ecosystems are addressed by the Thematic Air Quality Strategy (see indicators Nos 3–5 and No. 35). At the national level, the issue of defining a specific cause of poor air quality and measures to improve it are addressed by the National Emissions Reduction Plan of the Czech Republic on which regional air quality improvement plans are based on.

DATA SOURCES

➜ Czech Hydrometeorological Institute

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators

http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1531)

Czech Hydrometeorological Institute, data and maps on air pollution

http://www.chmi.cz/uoco/isko/tab_roc/tab_roc.html
http://www.chmi.cz/uoco/isko/groc/groc.html
http://www.chmi.cz/uoco/isko/groc/groc.html

[3] *Kotlík B., Kazmarová H., Kvasničková S., Keder J. Kvalita ovzduší na českých vesnicích – stav v roce 2003 (The State of Air Quality in Czech Villages in 2003). Zpravodaj Ústředí Monitoringu a Centra hygieny životního prostředí (A Bulletin by the Monitoring Headquarters and the Centre of Environmental Health), 2005, No. 1: 4–6 (in Czech). Available at: http://www1.szu.cz/chzp/zpravodaj/documents/zprav0105.doc.*
Kotlík B., Kazmarová H., Morávek J., Keder J. Kvalita ovzduší na českých vesnicích – příčiny a zamyšlení nad možnými způsoby nápravy (Air Quality in Czech Villages – Causes and Deliberations over Possible Remedies). Ochrana ovzduší (Air Protection), 2006, No. 4: 5–8 (in Czech).

07/ Exceedances of limit values for the protection of ecosystems and vegetation

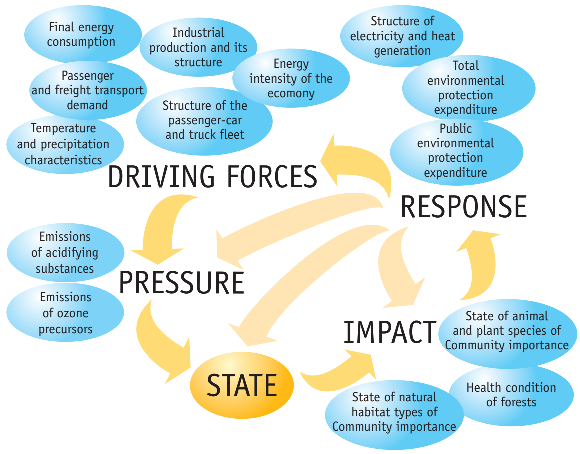
KEY QUESTION →

Have limit and target values for the protection of ecosystems and vegetation been exceeded?

KEY MESSAGE →

The target value for ground-level ozone – expressed as the AOT40 index (5-year average) has been regularly exceeded in more than 60% of rural and suburban measuring stations since 2003 that were chosen to determine this indicator. The year-to-year changes in the AOT40 index are affected by the amount of precursor emissions and, more importantly, by meteorological parameters. The highest values measured between 2005 and 2009 were reached in 2006 (if individual years are assessed) when long-term high temperatures, high sunlight levels and low precipitation were measured.

Compared to the previous assessment period of 2004–2008, there was a slight decline in the exposure index value to 75% in rural and suburban areas. However, out of the total number of 36 stations, the target value for ozone with respect to the protection of vegetation was exceeded in 22 of them (61%) based on the assessment for 2009 (the 2005–2009 average).



OVERALL ASSESSMENT →

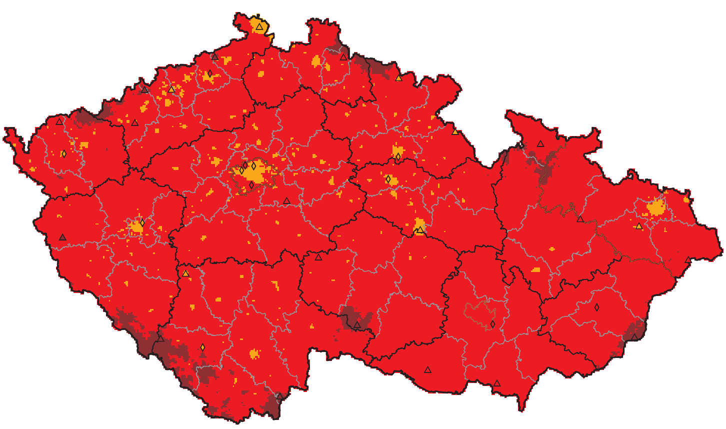
Change since 1990	N/A
Changesince 2000	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The target value – expressed as the AOT40[1] exposure index – and SO_2 and NO_x limit values for the protection of ecosystems and vegetation are set by Government Regulation No. 597/2006 Coll., on air quality monitoring and assessment. The level of the target value for AOT40 is to be achieved by 31 December 2009. Indirectly, the protection of ecosystems and vegetation is affected by all documents addressing the issue of air pollution, i.e. the **National Emission Reduction Programme** of the Czech Republic. Reducing the emissions of ground-level ozone precursors (NO_x, VOC) and the environmental impact of ozone is addresses by protocols to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) (in particular, the **Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone**).

INDICATOR ASSESSMENT

Figure 1 → **The fields of the AOT 40 index values, a five-year average [$\mu g.m^{-3}.h$], 2005–2009**



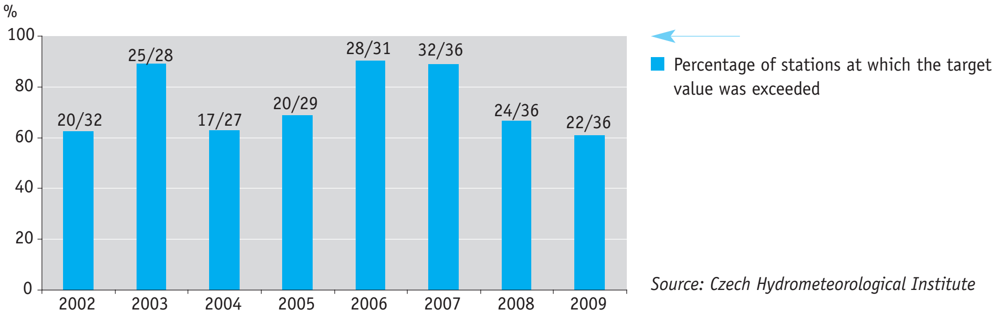
Clasification of stations
◊ Suburban background
△ Rural

AOT40
≤ 18 000 (≤ TV)
18 000–22 000
> 22 000

Source: Czech Hydrometeorological Institute

[1] *The cumulative exposure to AOT40 ozone is calculated as the sum of the differences between the hourly ozone concentration and the threshold level of 80 $\mu g.m^{-3}$ (= 40 ppb) for each hour in which this threshold value was exceeded. According to the requirements of Government Regulation 597/2006 Coll., AOT40 is calculated for a period of three months from May to July using ozone concentration measurements taken each day between 8:00 and 20:00 CET (= 7:00 to 19:00 UTC).*

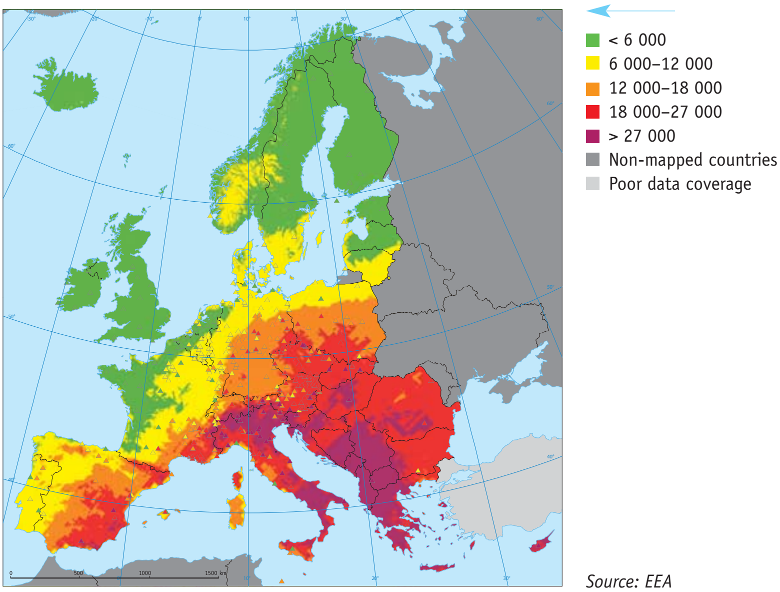
Chart 1 ➜ **Percentage of stations at which the target value – expressed as AOT40 (5-year average) – for the protection of vegetation was exceeded [%], 2004–2009**



Source: Czech Hydrometeorological Institute

The number in the Chart indicates the number of stations at which the target value has been exceeded (before the slash) out of the total number of stations (after the slash). These are rural and suburban stations for which AOT40 calculation is relevant under the legislation.

Figure 2 ➜ **Map of the exposure index AOT40 values [μg.m^{-3}.h], 2007**



Source: EEA

The calculation of the AOT40 index is based on ozone concentrations measured only in stations classified as rural stations and only for 2007 (May-July).

Generally, ozone concentrations increase with altitude, with the highest levels occurring in mountain areas. The action of ground-level ozone may result in damage to and reduced growth of agricultural crops, forests and plants. For the purposes of assessing the protection of vegetation against excessive ozone concentrations, national legislation uses the AOT40 exposure index – in compliance with the relevant EU directive.

Year-to-year **changes in the level of the AOT40** exposure index are affected by the volume of ozone precursor emissions, but more particularly by meteorological parameters (temperature, precipitation, solar radiation) in the period from May to July for which the indicator is calculated. The highest values measured between 2005 and 2009 were reached in 2006 (if individual years are assessed) when long-term high temperatures, high sunlight levels and low precipitation were measured.

Out of the total number of 36 rural and suburban stations, where the calculation of AOT40 is relevant pursuant to legislation, the target value of ozone for the protection of vegetation was exceeded in 22 locations (Chart 1) according to the 2009 assessment (an average for 2005–2009).

Compared to the previous assessment period of 2004–2008, there was a slight decline in the exposure index value to 75% in rural and suburban areas. The **meteorological characteristics** for 2004 (2004 was not included into the five years' assessment period) when compared to 2009 do not provide a clear explanation for the slight decrease. The above decrease in AOT40 might be related to a certain decline in preliminary ozone precursor emissions in 2009 due to the economic crisis. This is also documented by the fact that in 2009, the NO_2 limit values dropped between May and July (the period covered for the exposure index) in 72% locations compared to 2004. Taking into account the relatively complicated atmospheric chemical relationships, the termination of ozone, its dependence on both the absolute amount and relative presence of its precursors in air and on weather conditions, the reason for the slight decrease is hard to find.

The distribution of AOT40 levels is shown in Figure 1. In 2009, the **ozone AOT40 target value** for the protection of ecosystems and vegetation was exceeded in almost all of the Czech Republic (Figure 1) in spite of a slight decrease in the AOT40 values. As far as international comparison is concerned, the highest AOT40 values are found in Central and south Europe (Figure 2). The latest international comparison is available for 2007 when 36% of agricultural land in Europe was exposed to ozone concentrations exceeding the target value. Compared to 2005 and 2006, when 49% and 70% of agricultural land was exposed to ozone concentrations exceeding the target value, there has been an improvement.[2]

Neither the **SO_2** limit value for the protection of ecosystems and vegetation in the 2008/2009 winter period nor the annual SO_2 and **NO_x** limits for ecosystems and vegetation were exceeded at any rural site. The situation was comparable to previous years.

Environmental measures within the Thematic Strategy on air protection and the subsequent lowering of the national emission ceilings for ozone precursors for 2020 will also be beneficial in terms of reducing the size of the areas where damage to ecosystems due to air pollution may occur.

DATA SOURCES

- Czech Hydrometeorological Institute
- European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1584)

Czech Hydrometeorological Institute, data and maps on air pollution
http://www.chmi.cz/uoco/isko/tab_roc/tab_roc.html
http://www.chmi.cz/uoco/isko/groc/groc.html

EEA, the indicator related to the exposure of ecosystems to ozone
http://www.eea.europa.eu/data-and-maps/indicators/exposure-of-ecosystems-to-acidification-2/exposure-of-ecosystems-to-acidification

[2] *ETC/ACC, 2009: European air quality maps of ozone and PM_{10} for 2007 and their uncertainty analysis. ETC/ACC Technical Paper 2009/9. Dostupné z: http://air-climate.eionet.europa.eu/docs/ETCACC_TP_2009_9_spatialAQmaps_2007.pdf.*

08/ Total water abstraction

KEY QUESTION →

Is water in the Czech Republic being used efficiently with respect the availability of water sources in the future?

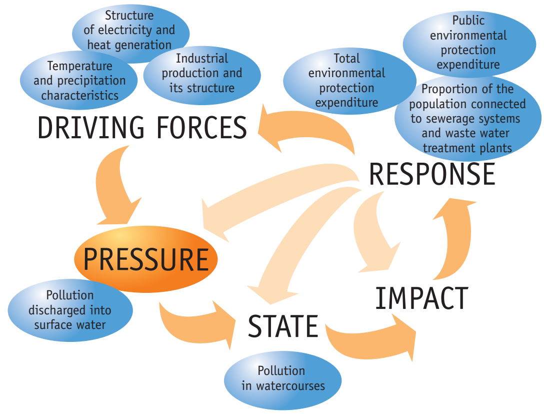
KEY MESSAGE →

After 2000, the trend of decreasing water abstraction for public water supply systems and industry continued, but was slower than in the 1990s.

The proportion of the population connected to water supply systems have been increasing and 93% population of the Czech Republic is supplied with drinking water. The consumption of water from public water supply systems has been decreasing.

Between 2000 and 2009, drinking water losses in the distribution system decreased from 25.2% to 19.3%, or from 9.7 to 4.7 m^3 per km of the distribution system per day.

Since 2002, the declining trend in the development of total water abstraction has slowed down and recently it has showed fluctuation or stagnation.



OVERALL ASSESSMENT →

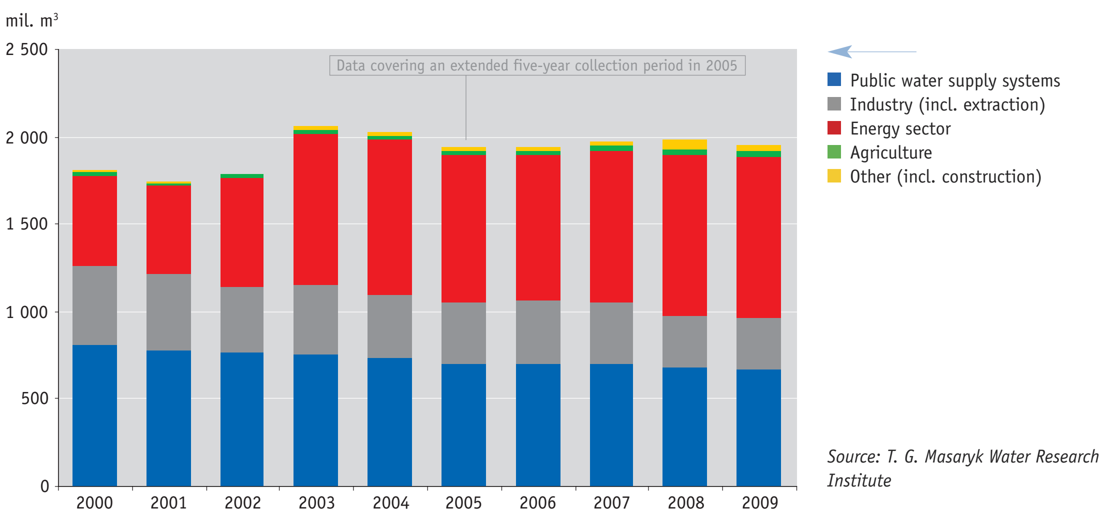
Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

Allowing for the sustainable use of water resources is one of the long-term objectives of the **State Environmental Policy of the Czech Republic**. This is connected with requirements to decrease total water abstraction per capita and in particular water abstraction for public water supply systems. Speeding up the renewal of failing and obsolete water supply networks is one of the framework objectives for water management services within the **Plan of Major River Basins of the Czech Republic.** The mid-term strategy of state policy concerning water supply and sewerage systems until 2015 is presented in the **Plan of Water Supply and Sewerage Systems Development of the Czech Republic**.

INDICATOR ASSESSMENT

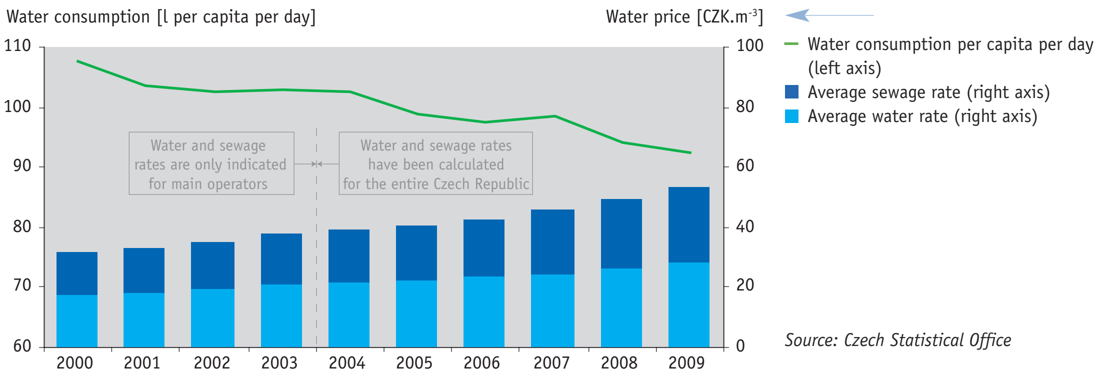
Chart 1 → **Water abstraction by individual sectors in the Czech Republic [million m^3], 2000–2009**



Source: T. G. Masaryk Water Research Institute

Water abstraction by users in excess of 6000 m^3 per year or 500 m^3 per month is kept on record – pursuant to Section 10 of Decree of the Ministry of Agriculture No. 431/2001 Coll.

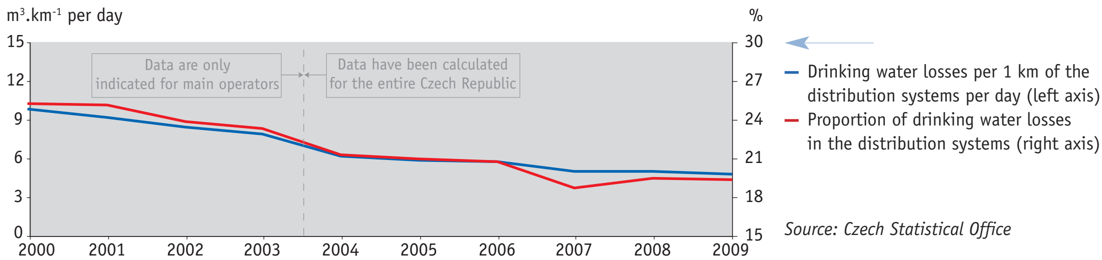
Chart 2 → **Water consumption by households in the Czech Republic [l per capita per day] and the price of water [CZK.m^{-3}], 2000–2009**



Source: Czech Statistical Office

Water consumption per capita per day indicates the amount of invoiced water per one inhabitant that is supplied with water from a public water supply system per one day. Up until 2003 (incl.), water and sewage rates are only indicated for main operators, since 2004 the figures have been calculated for the entire Czech Republic. Water and sewage rates are shown exclusive of VAT.

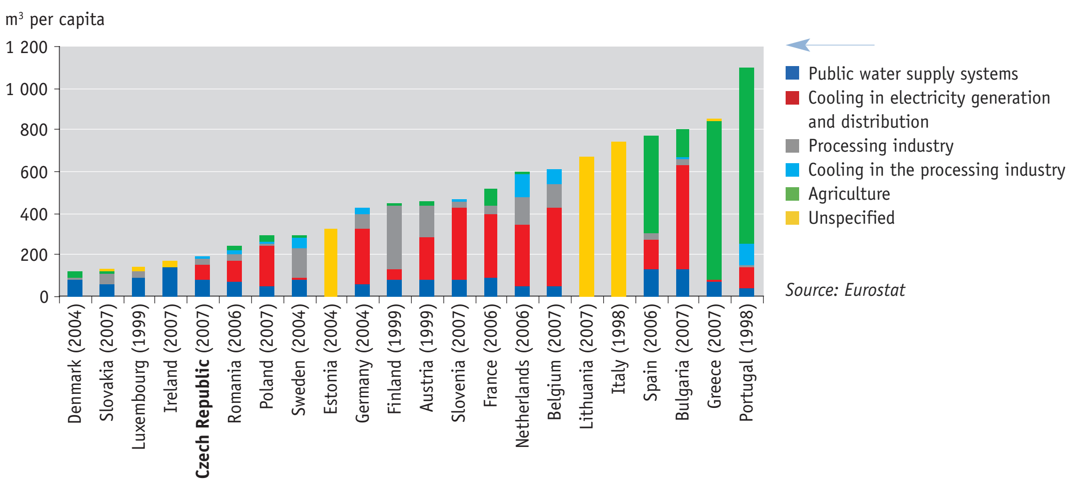
Chart 3 → **Water losses in distribution systems in the Czech Republic [m^3.km^{-1} per day, %], 2000–2009**



Source: Czech Statistical Office

Up until 2003 (incl.), data are only indicated for main operators, since 2004 the figures have been calculated for the entire Czech Republic.

Chart 4 → **International comparison of water abstraction [m^3 per capita]**



Source: Eurostat

The data relate to the most recent year for individual states (indicated in brackets in the Chart) in the Eurostat database.

Water abstraction interferes with water circulation in landscape. Influence on the environment is visible mainly during drought periods. Out of the total abstraction, 19.3% comes from underground water sources that are of a better quality and require less treatment. On the other hand, underground water is a more precious water source as the return time for underground water is

longer than in surface water. By abstraction, we are contributing to the decreasing of underground water sources which is also evident in relation to changes in the intensity and seasonality of precipitation and a low infiltration into soil.
The marked long-term reduction in **total water abstraction**, which occurred in the context of declining industrial production due to the restructuring of the national economy and a reduced demand for water due to technological changes in the period after 1990, peaked at the end of the 1990s. With the start of the next decade, the decline was replaced by fluctuating or stagnant trend of development (Chart 1). Individual sectors account for differing proportions of water abstraction (1 948.1 million m^3 in 2009). Most water is abstracted for the energy sector (47.2%), followed by public water supply (34.5%) and industry (14.9%). Water abstraction in agriculture is traditionally low (2%).
Throughout the 1990s, the decrease in **water abstraction for the energy sector** was mainly influenced by reduced production and the shutdown of some thermal power plants. The sharp increase in 2002 and 2003, which also significantly affected total water abstraction, was largely caused by the start of the Temelín nuclear power plant's operation and the resumption of abstraction for once-through cooling at the Mělník power plant. In the subsequent period, water abstraction for the energy sector more or less stagnated, yet it has grown slightly since 2006. As of 2009, the increase in water abstraction for the energy sector stopped. However, most of that abstraction is only used for once-through cooling of steam turbines, with the quality of the discharged cooling water remaining unchanged. On the other hand, such water increases the temperature of the receiving water bodies. Water abstraction for **agriculture** is influenced in particular by irrigation, the fluctuation in water abstraction is mainly due to the variability in rainfall and the temperature conditions during the vegetation period. Since 2005 there has been a slight annual increase in water abstraction for agriculture. In addition, the category entitled 'other', which also includes **construction**, displayed slightly lower water abstraction compared to 2008; from the long-term perspective, it has stagnated. With regards to **water abstraction for public and industrial water supply systems**, it can be concluded that the trend of declining water abstraction continued after 2000 – in the case of public abstraction, this was due to reduced drinking water consumption and reduced losses in distribution systems. In the case of industry, this was mainly due to the use of new technologies. However, the decline is more gradual than in the 1990s, especially the early 1990s. The year to year (2008/2009) decrease in water abstraction for industry was 2% and for public use both from underground and surface water sources by 1.3%. The development in water abstraction for public water supply systems is connected with the decreasing amount of water that is produced for public use.
In 2009, the actual amount of invoiced water was 505 million m^3, of which 65% was supplied to households. Despite that, the **number of supplied inhabitants** has been growing consistently over the long-term. In 2009, a total of 9.7 million inhabitants were supplied with drinking water, representing 92.8% of the Czech Republic's population. The decline in the amount of produced water is mainly due to reduced **drinking water losses** in distribution systems (Chart 3) and lower water consumption by households (Chart 2). Between 2000 and 2009, drinking water losses decreased from 25.2% to 19.3%, or from 9.7 to 4.7 m^3 per km of the distribution systems per day. After 2004, there has been a slight decrease in the trend of drinking water losses. From 2000 to 2009, **water consumption by households** (Chart 2) showed a slight decrease from 107.6 to 92.5 litres per capita per day. With respect to increasing **water rates** (Chart 2), the linear growth from recent years was continued with a year-to-year increase of 7.3%.
Compared to other European countries (Chart 4), the Czech Republic's total water abstraction per capita is below average, totalling 190 m^3 per capita per year. The situation is particularly problematic in southern European countries, i.e. not only due to extreme abstraction levels totalling as much as 700–1 100 m^3 per capita per year, but also due to a lack of water resources. In these areas, a large proportion of water is used for irrigation.

DATA SOURCES

- Czech Statistical Office
- T. G. Masaryk Water Research Institute (a public research institution)
- Ministry of Agriculture
- Podniky povodí, state enterprises
- European Environment Agency (EEA)
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1573)

European Environment Agency, international indicators (CSI 018)
http://themes.eea.europa.eu/IMS/CSI

Water Supply, Sewerage and Watercourses in 2009, The Czech Statistical Office tables
http://www.czso.cz/csu/2010edicniplan.nsf/engpubl/2003-10-year_2010

Report on the state of Water Management in the Czech Republic in 2009
http://eagri.cz/public/web/en/mze/water/publications/blue-report

09/ Pollution discharged into surface water

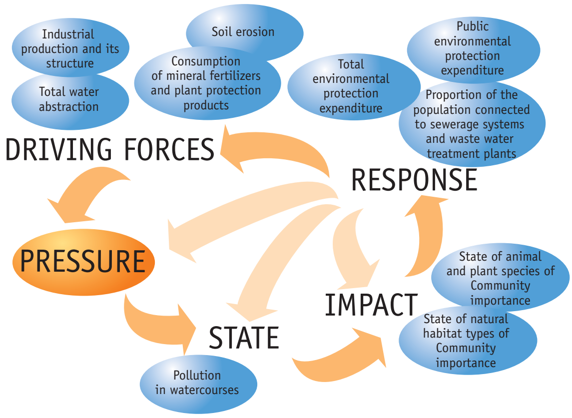
KEY QUESTION →

Have we succeeded in reducing the amount of pollution discharged by point sources that pollute surface water in the Czech Republic?

KEY MESSAGE →

Between 1993 and 2009, there was a significant decrease in pollution discharged by point sources in the Czech Republic. Weighed by basic indicators, it was by 93% in BOD_5, by 86% in COD_{Cr} and by 89% in undissolved substances. The most significant decrease in the amount of discharged pollution occurred in the 1990s, mainly due to the restructuring of the national economy and also due to the extensive construction and modernization of waste water treatment plants. The trend since 2003 has been gradually positive.

As far as discharged nutrients, there has also been a gradual decrease since 2003. Compared to 2008, the amount of discharged pollution decreased by 9.6% for $N_{inorg.}$ and increased by 10.4% in P_{total} on the year-to-year basis.



OVERALL ASSESSMENT →

Change since 1990	🙂
Change since 2000	🙂
Last year-to-year change	😐

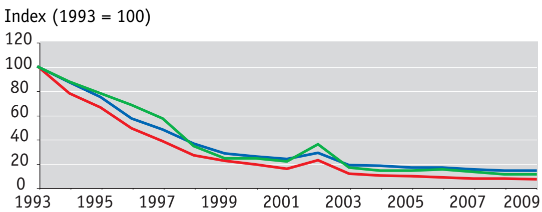
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

Reducing the amount of pollution discharged into water is the principal method for improving water quality. The requirements under **Water framework Directive 2000/60/EC** include the setting of emission limits for individual pollution indicators. Emphasis is also placed on minimizing the entry of nutrients and hazardous substances into the aquatic environment. Pollution reduction and prevention of further pollution with nitrates from agricultural sources is addressed by **Council Directive 91/676/EEC** concerning the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive). A system of measures that are obligatory in sensitive areas for a period of four years starting on 4 April 2008 is presented in the Second Action Plan adopted pursuant to Article 5 of the Nitrates Directive by Government Regulation No. 108/2008 Coll.

Likewise, **national strategic documents**, mainly the **State Environmental Policy of the Czech Republic**, highlight the need to reduce the entry of pollutants into water, mainly through promoting the construction and modernisation of waste water treatment plants in accordance with the requirements of Council Directive 91/271/EEC concerning urban waste-water treatment. Among other things, the **Plan of Major River Basins of the Czech Republic** stresses the need to introduce best available techniques into production processes and best available technologies into waste water disposal. Specific objective and measures to improve the quality of surface and underground water are set in River Basins Plans that were approved in December 2009 and will be updated every six years. The indicators and the values for the permissible pollution of waste water from point sources and the requirements for permitting discharge of waste water into surface water and into sewerage systems and sensitive areas are laid down by **Government Regulation** No. 61/2003 Coll. as amended by Government Regulation No. 229/2007 Coll. At the same time, the government regulation anchored within the Czech legal system the Czech Republic's decision from the EU accession treaties to define the entire territory of the Czech Republic as a sensitive area.

INDICATOR ASSESSMENT

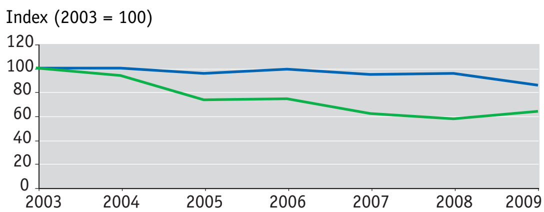
Chart 1 → **Discharged pollution in relative terms – the BOD_5, COD_{Cr} and undissolved substances indicators [index, 1993 = 100], 1993–2009**



— BOD_5
— COD_{Cr}
— Undissolved substances

Source: T. G. Masaryk Water Research Institute

Chart 2 → **Discharged pollution in relative terms – the $N_{inorg.}$ and P_{total} indicators [index, 2003 = 100], 2003–2009**



— $N_{inorg.}$
— P_{total}

Source: T. G. Masaryk Water Research Institute

The trend of the amount of pollution discharged by point sources into surface water is assessed using the amount discharged in five basic indicators and it expresses the discharged amount of a given pollutant that affects the quality of surface water. Organic pollution is expressed through the BOD_5, COD_{Cr} and undissolved substances indicators; nutrients are represented by $N_{inorg.}$ and P_{total}.

Between 1993 and 2009, the total level of **pollution discharged by point sources** decreased in the **BOD_5** indicator by 92.9% to 7 194 t in 2009, **COD_{Cr}** by 86% to 44 343 t in 2009 and **undissolved substances** by 89.1% to 13 420 t in 2009 (Chart 1). While in the first half of the 1990s the decline in the amount of pollution in waste water that was discharged into watercourses was mainly due to reduced production, the effects of extensive construction and technological modernisation of waste water treatment plants have been increasingly felt ever since the mid 1990s. Since 2003 (2002 was affected by catastrophic floods), the trend has been gradually positive. Compared to 2008, discharged pollution decreased for the BOD_5 indicator by 542 t (by 7.0%), for COD_{Cr} by 1 139 t (by 2.5%) and for undissolved substances by 475 t (by 3.4%) in 2009. The reduction occurred in almost all river basins, with the exception of the BOD_5 indicator in the Odra river basin, COD_{Cr} in the Morava and Odra river basins and undissolved substances in the Ohře and Odra river basins. The amount of pollution flowing into waste water treatment plants has shown little change that would be of statistical significance, with the production of the above pollutants being more or less stagnant since 2003. Given that major pollution sources already have newly-built or modernised waste water treatment plants, reducing the amount of discharged pollution is slower since it involves smaller sources.

A major problem for water receiving bodies is the discharge of nutrients – **nitrogen and phosphorus** that cause water eutrophication (phosphorus is a limiting factor). In the 1990s, nutrients also saw a significant reduction in the **amount of pollution discharged by point sources** (Chart 2). The reduction was mainly attributable to the fact that both biological nitrogen removal and biological and chemical phosphorus removal are specifically applied in waste water treatment technology within new and intensified waste water treatment plants. Since 2003, there has been a gradual decrease in the amount of discharged nutrients. In 2009, the amount of discharged pollution was 12 837 t for $N_{inorg.}$ and 1 156 t for P_{total}. Compared to 2008, the amount of discharged pollution for $N_{inorg.}$ dropped on the year-to-year basis by 1 356 t (by 9.6%), but it grew for P_{total} by 109 t (by 10.4%) on the year to year basis. This is most likely caused by the use of phosphorus in dishwasher detergents. In the previous years (since October 2006), the amount of discharged phosphorus from households was also partially reduced by placing laundry detergents with phosphorus concentrations lower than 0.5% on the market that was imposed by Decree No. 78/2006 Coll. in the Czech Republic. While a voluntary agreement on phosphate-free products (with phosphorus concentrations to 0.1%) has been in place since 2005, not all producers joined.

Significant pollution sources, particularly with regards to nitrates, pesticides and phosphorus, also include **non-point sources** – farming and sheet erosion in the landscape. The amount of these substances that gets into water is also affected by the dosing of fertilizers and the application of substances used for plant protection in agricultural production, as well as the conditions for the erosion of agricultural land.

Only a gradual reduction in pollution discharged by point sources can be expected **in the future**. This is because major pollution sources (industrial enterprises) and 76% of the Czech Republic's population has been connected to waste water treatment plants. The only issue that remains to be addressed is the conducting and treating of waste water in smaller municipalities where, compared to the population living in major towns, connection to a sewerage system with a waste water treatment plant is more demanding in terms of time and funds because of scattered housing development. Due to the requirement for tertiary-stage treatment in the construction of new waste water treatment plants and in the modernization of existing waste water treatment plants, a continued reduction in discharged nutrients can be expected. In addition, the completion of the modernization and intensification of the Central Waste Water Treatment Plant in Prague should also help to reduce the amount of discharged pollution.

DATA SOURCES

➜ T. G. Masaryk Water Research Institute (a public research institution)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1577)

European Environment Agency, international indicators (WEU 08, WEU 09)
http://www.eea.europa.eu/themes/water/indicators

Methodological guideline of the Ministry of the Environment's Department of Water Protection to Government Regulation No. 229/2007 Coll.

Report on the state of Water Management in the Czech Republic in 2009
http://eagri.cz/public/web/en/mze/water/publications/blue-report

10/ Pollution in watercourses

KEY QUESTION

Is the quality of water affecting both aquatic organisms and the use of water in watercourses improving?

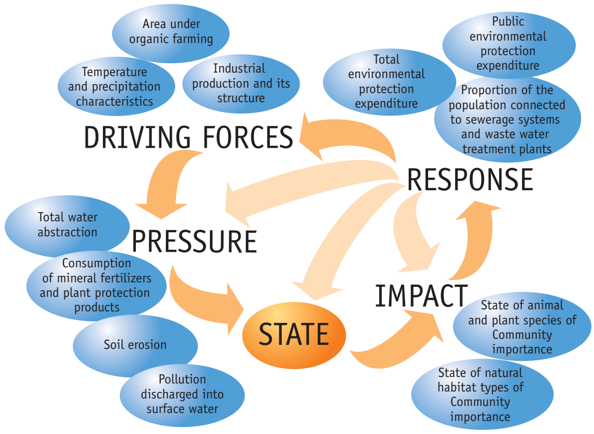
KEY MESSAGE

When assessing water quality based on CSN 75 7221, the gradual improvement of water quality in watercourses can be confirmed.

Between 1993 and 2008, or 1993 and 2009, the annual average concentrations of all selected pollution indicators (BOD_5, COD_{Cr}, $N\text{-}NO_3^-$, P_{total}, AOX, Cd, FCOLI and chlorophyll) in watercourses decreased. In addition, there was a reduction in the proportion of profiles at which limit values for indicators of permissible surface water pollution pursuant to Government Regulation No. 61/2003 Coll., as amended, had been exceeded; the limit values are to be achieved by the end of 2015.

During the first decade of the 21st century, the average concentrations of most of the above pollutants only showed a mild decrease or even stagnated.

Even though there has been a decrease in the proportion of profiles at which limit values for indicators of permissible surface water pollution are exceeded (with the exception of AOX), the limit values continue to be exceeded in a relatively large number of the profiles.



OVERALL ASSESSMENT

Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The basic requirements for improving water quality are based on **Water framework Directive 2000/60/EC** establishing a framework for the Community action in the field of water policy. One of the main objectives is to achieve a 'good status' of surface water bodies. This should be accomplished through selecting appropriate measures and quality objectives. Specific objective and measures to improve the quality of surface and underground water are set in River Basins Plans that were approved in December 2009 and will be updated every six years. A system of measures to reduce pollution with nitrates from agricultural sources that are obligatory in sensitive areas for a period of four years starting on 4 April 2008 is presented in the Second Action Plan adopted pursuant to Article 5 of Council Directive 91/676/EEC by Government Regulation No. 108/2008 Coll.

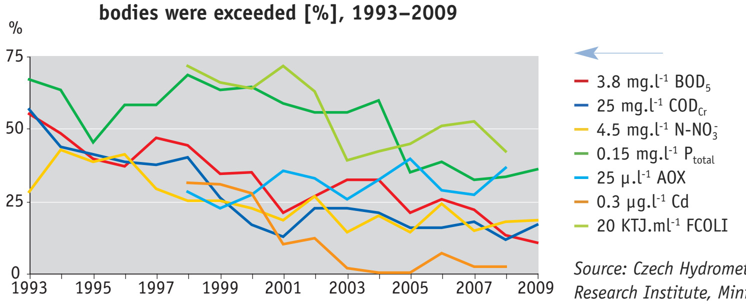
Under the current **national legislation**, limit values for indicators of permissible surface water pollution are laid down by Government Regulation No. 61/2003 Coll., on indicators and values of permissible surface water and waste water pollution, requirements concerning a permission to discharge waste water into surface water and sewerage systems and on sensitive areas, and are expressed as C90[1] The corresponding annual arithmetic averages for the general requirements for limit values are laid down by the methodological guideline of the Ministry of the Environment's Department of Water Protection to the above government regulation. Meeting the limit values is obligatory by the end of 2015.

An important instrument for water protection from priority hazardous substances is new **Directive 2008/105/EC of the European Parliament and of the Council** on environmental quality standards in the field of water policy. In 2009, **Commission Directive 2009/90/EC** laying down, pursuant to Water framework Directive 2000/60/EC, technical specifications for chemical analysis and monitoring of water status, was approved. Both directives are being transposed into the Czech body of laws.

[1] *A concentration level that is 90% likely not to be exceeded.*

INDICATOR ASSESSMENT

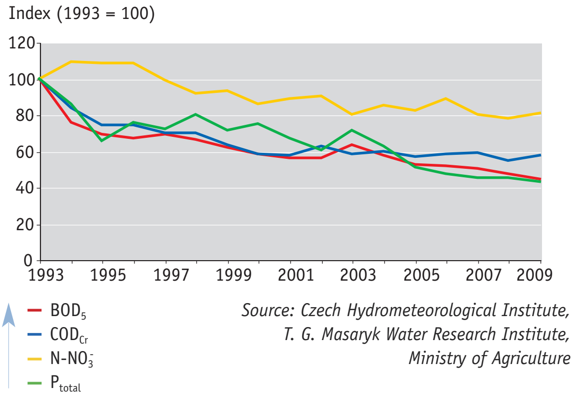
Chart 1 ➜ **Proportion of profiles at which limit values for indicators of permissible pollution of Czech surface water bodies were exceeded [%], 1993–2009**



Source: Czech Hydrometeorological Institute, T. G. Masaryk Water Research Institute, Ministry of Agriculture

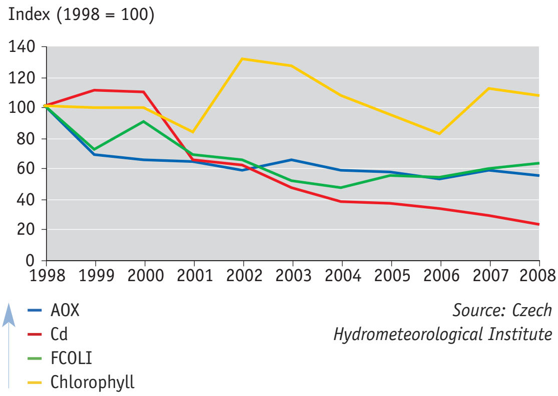
The percentage of profiles within the Eurowaternet network (73 stations) that exceeded the corresponding annual average general requirements for the limit values for indicators of permissible surface water pollution pursuant to the methodological guideline to Government Regulation No. 61/2003 Coll. as amended by Government Regulation No. 229/2007 Coll. The limit values for individual indicators are listed in the legend and were used retrospectively for all years that are shown in the Chart.
Data for the BOD_5, COD_{Cr}, $N\text{-}NO_3^-$ and P_{total} indicators for 2009, as provided in Charts 1 and 2, were calculated backwards from average concentrations for 2008–2009 and from individual profiles for 2008. Data for the AOX, Cd, FCOLI indicators and chlorophyll for 2009, provided in Charts 1 and 3, was not available as of the closing date of the report.

Chart 2 ➜ **Concentrations of the pollution indicators of Czech watercourses [index, 1993 = 100], 1993–2009**



Source: Czech Hydrometeorological Institute, T. G. Masaryk Water Research Institute, Ministry of Agriculture

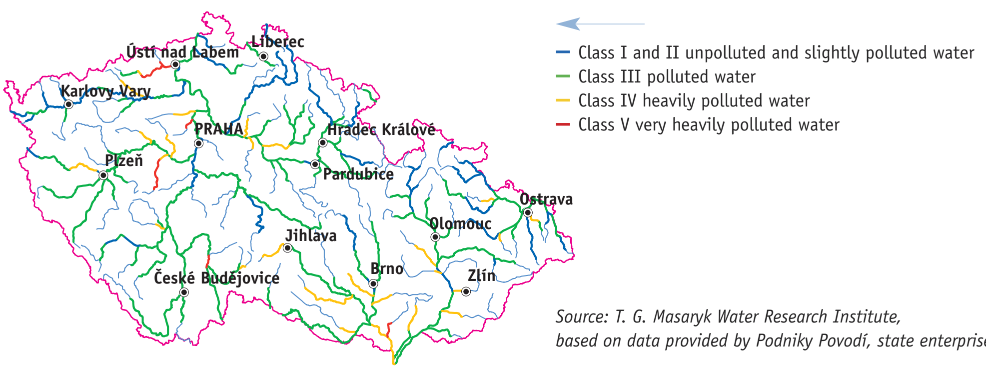
Chart 3 ➜ **Concentrations of the pollution indicators of Czech watercourses [index, 1998 = 100], 1998–2008**



Source: Czech Hydrometeorological Institute

The indices for individual indicators against the selected base year, provided in Charts 2 and 3, were calculated with arithmetic means for each year using annual average values for individual profiles within the Eurowaternet network (73 stations). The specific number of profiles with available data for individual indicators and years can be found in the ISSaR.

Figure 1 ➜ **Water quality in the watercourses in the Czech Republic, 2008–2009**



Source: T. G. Masaryk Water Research Institute, based on data provided by Podniky Povodí, state enterprises

The quality of watercourses is assessed using the concentrations of eight selected basic pollution indicators. Organic pollution is expressed using the BOD_5 and the COD_{Cr} indicators, nutrients are represented by $N\text{-}NO_3^-$ and P_{total}. Chlorophyll was chosen to represent biological indicators and cadmium (Cd) to represent heavy metals. Over the long term, the worst-classified substances include absorbable organically bound halogens (AOX) that are a general indicator and microbiological indicators represented by thermo-tolerant (faecal) coliform bacteria (FCOLI). In terms of reducing the amount of pollution discharged from point sources, relatively good progress has been made both in reducing the concentrations of and in preventing exceedances of the limit values for **organic pollutants and total phosphorus** (Charts 1 and 2: BOD_5, COD_{Cr}, P_{total}). In 2009, the average concentrations calculated for indicators that were measured at profiles within the Eurowaternet network in the Czech Republic equalled 2.68 $mg.l^{-1}$ for BOD_5, 19 $mg.l^{-1}$ for COD_{Cr} and 0.14 $mg.l^{-1}$ for P_{total}. The improvement of water quality was significantly affected by the restructuring of industry and industrial technologies, especially in the first half of the 1990s. Subsequently, the construction and the modernization of sewerage systems and both industrial and municipal waste water treatment plants helped to improve water quality. Regarding nutrient removal from waste water, the addition of tertiary-stage treatment is applied. The decline in phosphorus inputs was further supported by restrictions concerning the use phosphates in laundry detergents beginning from 2006. However, the slight year-to-year (2008/2009) increase in discharged pollution for the P_{total} indicator caused a slight increase in the profiles (to 36% in 2009) that exceeded the corresponding average standard for phosphorus pursuant to Government Regulation No. 61/2003 Coll. Since 1991, the use of phosphate fertilizers in agriculture has stagnated. **Nitrate** concentrations showed a gradual decline in the 1990s and have been more or less stagnant since 2000 (Chart 2: $N\text{-}NO_3^-$), 2.97 $mg.l^{-1}$ in 2009. There has been little success in reducing nitrate concentrations, largely due to surface pollution that is connected with the increasing application of nitrogen agricultural fertilizers. The stagnation in nitrogen discharges by point pollution sources also played a role. Of the above pollution indicators, the most pronounced positive trend was displayed by **cadmium** (Charts 1 and 3: Cd), a hazardous substance. In 2008, the above limit value for cadmium was only slightly exceeded at one profile and it can be assumed that it will not be exceeded in the future. In 2008, the average concentration was 0.07 $mg.l^{-1}$. Pollution from **AOX, FCOLI and chlorophyll** (Charts 1 and 3) has been developing rather unfavourably. While the average concentration of AOX has slightly decreased (to 24.7 $mg.l^{-1}$ in 2008) since 1998, the proportion of Eurowaternet profiles in the Czech Republic at which the annual average for the corresponding limit value pursuant to Government Regulation No. 61/2003 Coll. is exceeded has increased. With respect to the average concentrations of FCOLI, in 2004 there was a reversal of the trend from a gradual decline to a gradual increase. Despite a significant decrease relative to 1998, 42% of the Eurowaternet profiles in the Czech Republic still exceed the limit value for the average concentrations of the FCOLI indicator. Concentrations of chlorophyll in watercourses displayed a sharp increase between 2002 and 2007 and in spite of further decline, values from the late 1990s have not been reached.

When assessing water quality **based on CSN 75 7221** (Figure 1), the water quality improved rather than worsened in more sections of watercourses (in all cases by one class) between 2008–2009, as compared to 2007–2008, based on a comparison of maps. However, despite the gradual improvement in water quality, there are still portions of some watercourses that are classified as Class V according to the basic classification of indicators that were monitored in 1991. If we **compare the average concentrations** of the nitrates, the BOD_5 and the total phosphorus indicators from Eurowaternet stations in the Czech Republic and in Eastern European countries (one of which is the Czech Republic), the average concentrations of the above indicators are higher in the Czech Republic. However, average concentrations are also influenced by the specific conditions of watercourses, especially their flow rates. The declining trend is comparable. Generally, the best quality water is found in Northern Europe. Concentrations in the Czech Republic are similar to average concentrations in Western European countries.

DATA SOURCES

- ➜ Czech Hydrometeorological Institute
- ➜ T. G. Masaryk Water Research Institute (a public research institution)
- ➜ Ministry of Agriculture
- ➜ European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1579)

European Environment Agency, international indicators (CSI 019, CSI 020)
http://themes.eea.europa.eu/IMS/CSI

Methodological guideline of the Ministry of the Environment's Department of Water Protection
to Government Regulation No. 229/2007 Coll.

Report on the state of Water Management in the Czech Republic in 2009
http://eagri.cz/public/web/en/mze/water/publications/blue-report

Hydrological Yearbook of the Czech Republic 2009
http://www.chmi.cz

IS ARROW
http://hydro.chmi.cz/arrowdb_p/index.php

11/ Proportion of the population connected to sewerage systems and waste water treatment plants

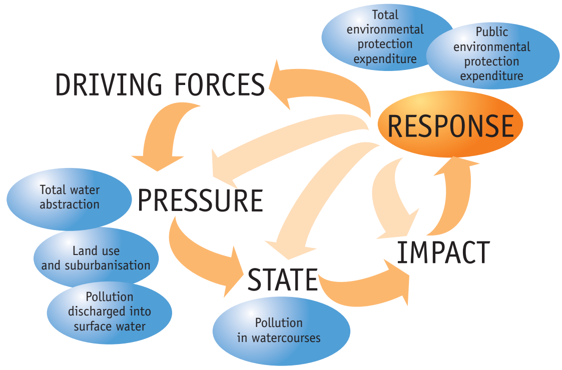
KEY QUESTION ➜

How much of the Czech Republic's population is connected to sewerage systems and waste water treatment plants?

KEY MESSAGE ➜

Development in the area of waste water management is documented by extensions to public sewerage systems (between 2000 and 2009 by 84%) which means the proportion of the population connected to sewerage systems increased from 75 to 81%, the number of waste water treatment plants grew (it has doubled since 2000) and consequently the proportion of the population connected to sewerage systems ending in waste water treatment plants grew (from 70 to 76% between 2000 and 2009).
Recently, attention has focused on the development of waste water treatment plants and sewerage systems in municipalities of 2 000 to 10 000 population equivalent.

In the category of greater than 2 000 population equivalent, 7 new municipal waste water treatment plants were completed and 30 were either modernized or extended.



OVERALL ASSESSMENT ➜

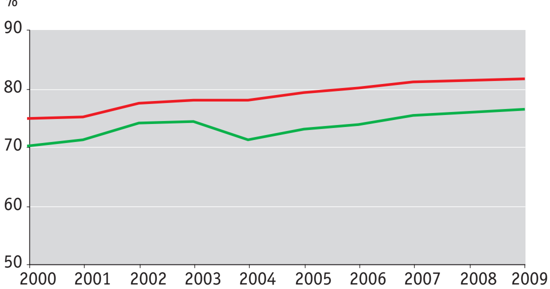
Change since 1990	☺
Change since 2000	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

Requirements for waste water treatment that follow from **Council Directive 91/271/EEC** concerning urban waste-water treatment and their fulfilment are important objectives set by the **State Environmental Policy of the Czech Republic**. The requirements include constructing missing water management infrastructure (particularly waste water treatment plants and sewerage systems), modernizing and improving the technology of waste water treatment in all agglomerations with a greater than 2 000 population equivalent within a transition period, i.e. by the end of 2010. For 54 selected agglomerations with a greater than 10 000 population equivalent, waste water treatment had to be ensured by the end of 2006. Furthermore, according to the State Environmental Policy of the Czech Republic, the desirable trend includes increasing the proportion of the population connected to public sewerage systems and increasing the proportion of the population connected to sewerage systems ending in waste water treatment plants. The mid-term strategy of state policy concerning water supply and sewerage systems until 2015 is presented in the **Plan of Water Supply and Sewerage Systems Development of the Czech Republic**.

INDICATOR ASSESSMENT

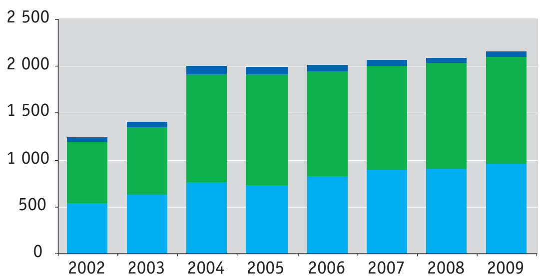
Chart 1 ➜ **Proportion of the population connected to sewerage systems and to sewerage systems ending in waste water treatment plants in the Czech Republic [%], 2000–2009**



— Proportion of the population connected to sewerage systems
— Proportion of the population connected to sewerage systems with wastewater treatment plants

Source: Czech Statistical Office

Chart 2 ➜ **Number of waste water treatment plants according to treatment stages in the Czech Republic, 2002–2009**

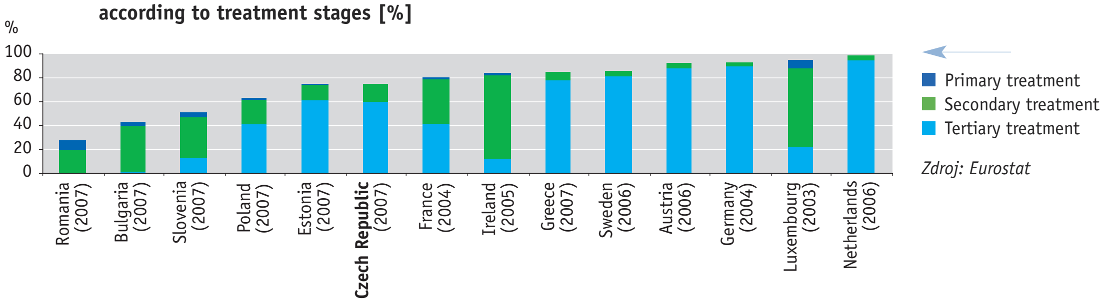


Primary treatment
Secondary treatment
Tertiary treatment

Source: Czech Statistical Office

Primary treatment = mechanical waste water treatment plants; secondary treatment = mechanical-biological waste water treatment plants without nitrogen or phosphorus removal; tertiary treatment = mechanical-biological waste water treatment plants with further nitrogen or phosphorus removal.

Chart 3 ➜ **International comparison of the proportion of the population connected to waste water treatment plants according to treatment stages [%]**



The data is related to the most recent year for individual states (indicated in brackets in the Chart) in the Eurostat database.

Waste water treatment reduces the amount of discharged pollution and is therefore an essential tool for improving surface water quality. Since 2000, the length of sewerage systems in the Czech Republic has almost doubled, thus increasing the proportion of the population connected to **public sewerage systems** from 74.8 to 81.3% in 2009 (Chart 1). By year-to-year comparison (2008/2009), sewerage systems were extended by 1 063 km to 30 767 km and the population connected to sewerage systems consequently increased by 0.8% to 8.5 million people in 2009. The extension of sewerage systems is more extensive than the increase in the connected population because both waste water treatment plants and sewerage systems have mostly already been built in larger cities and it is now necessary to gradually cover smaller municipalities in which the concentration of the population is lower. Even today, not all waste water that is discharged into sewerage systems is treated. Over the monitored period since 2000, the **proportion of waste water** that is discharged into sewerage systems and that is **treated** has stagnated at 94–96%. According to data from the Czech Statistical Office, 95.2% of the 496 million m^3 of waste water discharged into sewerage systems was treated in 2009 (in 1990, the proportion was only 75%).

Compared to 2008, the total **number of WWTPs** in the Czech Republic increased by 67 to 2 158 WWTPs, excluding domestic WWTPs (Chart 2). Due to the construction and the modernization of WWTPs, the number of WWTPs with nitrogen or phosphorus removal increased by 56, the number of WWTPs with basic mechanical-biological treatment by 15, while the number of only mechanical treatment plants decreased by 4. If we look at WWTPs with a **capacity greater than 2 000 population equivalent**, 7 new municipal WWTPs were completed and 30 municipal WWTPs and 2 industrial WWTPs were either modernized or extended in 2009. The number of agglomerations that can be considered resolved with respect to the requirements set by Council Directive 91/271/EEC concerning urban waste-water treatment increased by 73 in 2009. In 61 other agglomerations, the construction, modernization and/or intensification of a WWTP or the construction or completion of a sewerage system has started as of 31 January 2010. Measures are to be adopted in 146 agglomerations by the end of 2010. By the end of 2010, measures will most likely not be implemented in 46 agglomerations out of 649 that fall under the requirements of Council Directive 91/271/EEC. The Czech Republic has a very high average **WWTPs efficiency** (i.e. the ratio between the amount of pollution at the inflow and at the outflow) for BOD_5 and undissolved substances – with up to 97% of all pollution being removed. The efficiency for COD_{Cr} is about 94%, for total phosphorus 83% and for nitrogen compounds 71%. The values are similar to those in previous years, which is connected with the fact that the modernization of large WWTPs is virtually complete and the amount of pollution produced in individual agglomerations has stabilized.

The construction of new sewerage systems and WWTPs has translated into a continuing increase in the **proportion of the population connected to sewerage systems ending in WWTPs**. This figure reached 76.3% in 2009 (Chart 1) – this is consistent with the objectives set by the State Environmental Policy of the Czech Republic. By international comparison (Chart 3), countries of Northern and Western Europe are generally doing better.

DATA SOURCES

- Czech Statistical Office
- T. G. Masaryk Water Research Institute (a public research institution)
- European Environment Agency (EEA)
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1575)

European Environment Agency, international indicators (CSI 024)
http://themes.eea.europa.eu/IMS/CSI

Water Supply, Sewerage and Watercourses in 2009, The Czech Statistical Office tables
http://www.czso.cz/csu/2010edicniplan.nsf/engpubl/2003-10-year_2010

Report on the state of Water Management in the Czech Republic in 2009
http://eagri.cz/public/web/en/mze/water/publications/blue-report

12/ State of animal and plant species of Community importance

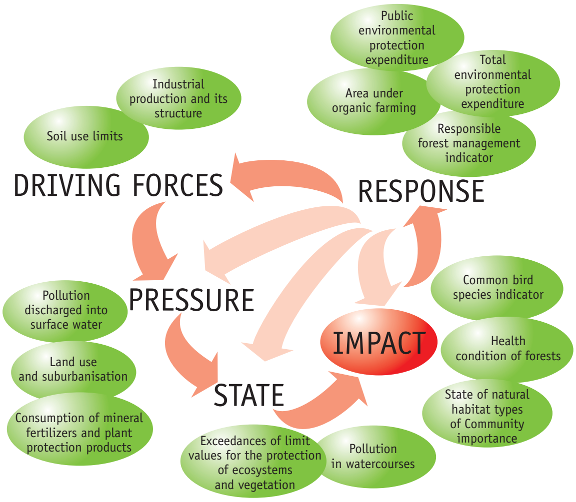
KEY QUESTION →

What is the state of animal and plant species of Community importance in the Czech Republic?

KEY MESSAGE →

The conservation status of 37% of animal and plant species of Community importance is assessed as unfavourable-inadequate and 35% (or 36%) as unfavourable-bad.

The selection of some species that are endangered at the European level points to the general condition of the Czech Republic's natural environment in relation to biodiversity – understood as species diversity. The general condition appears to be rather unfavourable.



OVERALL TREND ASSESSMENT →

An assessment of the status of animal and plant species of Community importance was made for the 2000-2006 period; the data for the 2007-2012 period will be available in 2013. For this reason, it is not possible to assess longer-term trends. This will only be possible (for all species that are important to the European Community) after 2013.

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The **Habitat Directive** (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) is crucial in this area. **Sites of Community Importance** (SCI) and **Special Protection Areas** (SPA) that together form the **Natura 2000** network were identified pursuant to the Directive.

The **EU Strategy for Sustainable Development** sets the objective of halting the loss of biodiversity and restoring natural habitats and natural systems by 2010.

The main political framework is the **Communication from the Commission: Halting the Loss of Biodiversity** by 2010 and Beyond, including the **Biodiversity Action Plan** (BAP) that was adopted by the European Commission in 2006 and whose specific measures apply to all member states. In 2008, the European Commission presented a mid-term assessment and, in 2010, the Commission will publish a comprehensive analysis, i.e. whether the EU has or has not halted the decline.

Adopted in 2002, the Sixth Environmental Action Programme of the European Community, "Our Future, Our Choice" defines the conservation of biological diversity as one of the four main areas to be addressed.

The 1992 **Convention on Biological Diversity** also addresses the issue of biodiversity loss. Its main objectives are the conservation of biological diversity, the sustainable use of the components of biological diversity and the fair and equitable sharing of the benefits arising from the utilization of genetic resources.

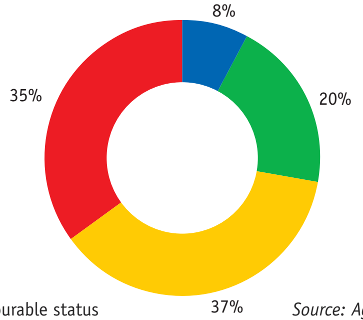
The indicator is also in accordance with the indicator that is defined at the Convention on Biological Diversity level – "The abundance and distribution of selected species" and that exists at the EU level from the SEBI 2010 project entitled "Species of Community Importance".

As part of priority area 1 "Nature protection, landscape and biodiversity conservation", the **State Environmental Policy of the Czech Republic** aims at halting the loss of biodiversity, developing the Natura 2000 system and functionally connecting it to the existing system of specially protected areas and managing biotopes for specially protected species of plants and animals.

The objective of the **National Biodiversity Strategy of the Czech Republic** is, in part, to assess the existing system of protected areas, ensure its optimisation and through monitoring and identify trends in the behaviour of ecosystems (especially at the national level).

INDICATOR ASSESSMENT

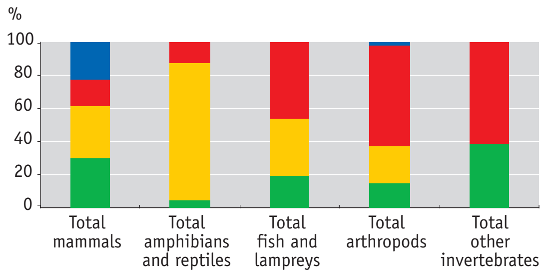
Chart 1 → **State of animal species of Community importance in the Czech Republic [%], 2000–2006**



Favourable status
Unfavourable-inadequate status
Unfavourable-bad status
Unknown status

Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

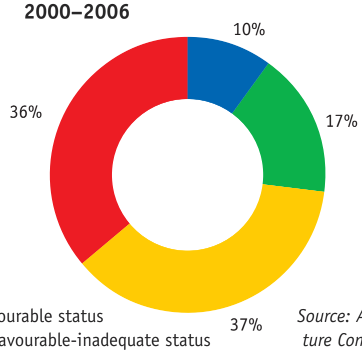
Chart 2 → **State of animal species of Community importance in the Czech Republic [%] according to taxonomic groups, 2000–2006**



Favourable status
Unfavourable-inadequate status
Unfavourable-bad status
Unknown status

Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

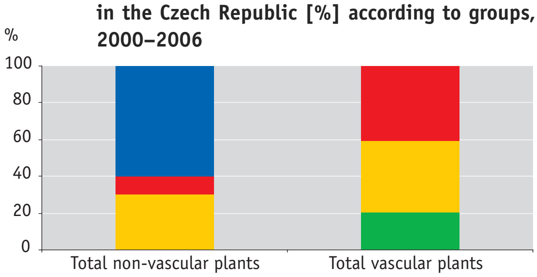
Chart 3 → **State of plant species that are important to the European Community in the Czech Republic [%], 2000–2006**



Favourable status
Unfavourable-inadequate status
Unfavourable-bad status
Unknown status

Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

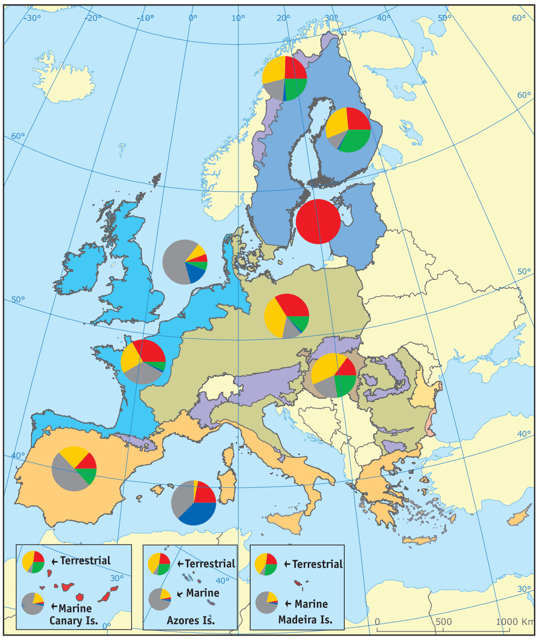
Chart 4 → **State of plant species of Community importance in the Czech Republic [%] according to groups, 2000–2006**



Favourable status
Unfavourable-inadequate status
Unfavourable-bad status
Unknown status

Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

Figure 1 → **Comparison of the overall state of species of Community importance in EU countries according to bio-geographical areas, 2000–2006**



Pie charts
Favourable
Less favourable
Unfavourable
Unknown
Not evaluated

Biogeographic regions
Alpine
Atlantic
The Black Sea
Boreal
Continental
Macaronesian
Mediterranean
Pannonian
Steppe

Source: ETC/BD and EK-DG Environment (adopted from the Agency for Nature Conservation and Landscape Protection of the Czech Republic)

Determining the overall status of each species requires looking at **four sub-parameter**s: area, population, habitat and likely development. If one of these parameters is assessed as unfavourable, the overall status of the species is also assessed as unfavourable.
The indicator reflects the **state of biodiversity** in the Czech Republic[1], with an ever increasing number of species being assessed as endangered – according to the criteria from the International Union for Conservation of Nature (IUCN). It mainly shows the relative proportions of the total assessment of species (defined by Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) within the above scale. The status of approximately one-third of the **animal species of Community importance** is assessed as unfavourable-bad and one-third as unfavourable-inadequate and their habitats are probably more or less disrupted. It is quite difficult to document any direct link to the type of habitat: the most endangered species include species found in natural watercourses (which have been adversely affected by regulations and changes in watercourse dynamics), species that are tied to old and decaying wood (which is much less abundant in Czech woods), and groups of species that are tied to a fine landscape mosaic (butterflies, amphibians and reptiles). In the Czech Republic, only 20% of all animal species of Community importance have a favourable conservation status. Similarly to animal species, the status of about one-third of the **plant species of Community importance** is assessed as unfavourable-bad and one-third as unfavourable-inadequate and their habitats are also likely to be more or less disrupted. Only 17% of all plant species of Community importance have a favourable conservation status.

Indicator assessment according to taxonomic groups
Analogically to the overall indicator, sub-indicators of animal species of Community importance have been defined for the taxonomic groups of monitored animals – mammals, amphibians and reptiles, fish and lampreys, arthropods and other invertebrates. Pursuant to the Habitat Directive, birds are not species of Community importance.
Within these groups, invertebrates groups have a considerably worse assessment – the unfavourable-bad status covers more than one-half of both arthropods and other invertebrate groups [species that are important to the European Community include molluscs and the European medical leech (*Hirudo medicinalis*)]. Arthropods (insects, crustaceans, and pseudoscorpion *Anthrenochernes stellae*) include a wide range of species that are tied to the above-mentioned types of endangered biotopes, ranging from structurally (age and species) rich forests and solitary trees, to heterogeneously managed non-forest habitats and largely unaltered aquatic habitats. This is mainly due to the different approach for selecting species classified as species of importance to the European Community. Among the much more numerous invertebrates, severely endangered species were primarily selected. By contrast, for vertebrates – whose species are less numerous – species have often been selected that are only endangered in some parts of Europe. The situation is also striking in the case of mammals, which have the highest proportion of favourable assessments – due to the inclusion of a greater number of species that are mainly endangered in Western (i.e. considerably more urbanized and fragmented) Europe.
Analogically to the overall indicator, sub-indicators of plant species of Community importance have been defined for groups of monitored plants – vascular and non-vascular. In the case of non-vascular plants (species of Community importance include lichens and bryophytes), the fact that the group has only been studied to a limited extent has the greatest effect (a high proportion of the "unknown" category), especially when compared to vascular plants that have a long history of research. By contrast, vascular plants show a one-third proportion of species with an unfavourable-bad status, in spite of the long-term care for and conservation of specially protected plant species and their habitats.
From the international perspective, the status of animal and plant species that are important to the European Community can be compared on several levels: at the interstate level, at the level of bio-geographical areas, and possibly at the European-wide level. The status of species of Community importance in the Czech Republic reflects the European-wide trend and shows average results at this level.
The strategic and political objective of the European Community is to maintain a favourable status of the components of the natural environment or, as the case may be, to either prevent further deterioration or effectuation improvement. Six-year intervals have been set for assessment monitoring – these intervals will allow for assessing possible trends and their direction.

DATA SOURCES

- Agency for Nature Conservation and Landscape Protection of the Czech Republic
- Assessment report on the conservation status of species of Community importance and natural habitat types in the Czech Republic pursuant to Article 17 of the Habitats Directive for the European Commission, June 2007
- ETC/BD, European Topic Centre on Biological Diversity
- EK-DG Environment

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1602)

Monitoring pursuant to the Habitats Directive 92/43/EEC and the Birds Directive 79/409/EEC
http://www.biomonitoring.cz

SEBI 2010 – Detailed indicators of nature conservation at the EU level – a description of the methodology
http://reports.eea.europa.eu/technical_report_2007_11/en

[1] Based on the state of plant and animal species of Community importance, the overall state of plant and animal species in the Czech Republic can be assessed even though the indicator only deals with species of Community importance. A similar assessment of the state of sites cannot be applied at the national level because this indicator does not exist.

13/ State of natural habitat types of Community importance

KEY QUESTION →

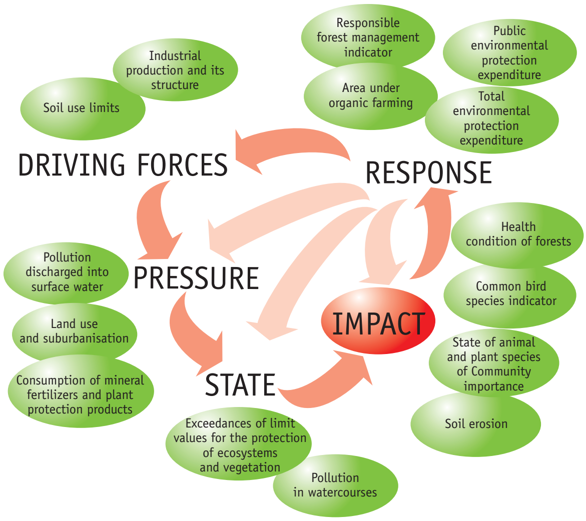
What is the state of natural habitat types of Community importance in the Czech Republic?

KEY MESSAGE →

The state of almost three-quarters of natural habitats in the Czech Republic is assessed as unfavourable, 14% as less favourable and only 12% of natural habitats are assessed as having a favourable conservation status.

The assessment is unfavourable for forests, grassland communities and small-scale habitats such as rocky habitats.

The condition of natural habitats in the Czech Republic is unsatisfactory. Despite the fact that this is a selection of natural habitat types at the European level, the result can be viewed as an indication of the overall condition of natural biotopes in the Czech Republic.



OVERALL TREND ASSESSMENT →

An assessment of the status of natural habitats was only made for the 2000-2006 period; the data for the 2007-2012 period will be available in 2013. For this reason, it is not possible to assess the trend. This will only be possible (for all natural habitat types that are important to the European Community) after 2013.

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The **Habitat Directive** (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) is crucial in this area. **Sites of Community importance** (SCI) and **Special Protection Areas** (SPA) that together form the **Natura 2000** network were identified pursuant to the Directive.

The **EU Strategy for Sustainable Development** (2001) set the objective of halting the loss of biodiversity and restoring natural habitats and natural systems by 2010.
The main political framework is the **Communication from the Commission: Halting the Loss of Biodiversity** by 2010 and Beyond, including the **Biodiversity Action Plan** (BAP) that was adopted in 2006 and whose specific measures apply to all member states. In 2008, the European Commission presented a mid-term assessment and, in 2010, the Commission will publish a comprehensive analysis, i.e. whether the EU has or has not halted the decline.

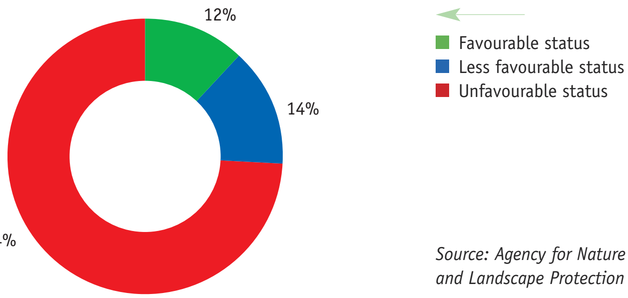
Adopted in 2002, the Sixth Environmental Action Programme of the European Community, "Our Future, Our Choice" defines the conservation of biological diversity as one of the four main areas to be addressed.
The 1992 **Convention on Biological Diversity** also addresses the issue of biodiversity loss. Its main objectives are the conservation of biological diversity, the sustainable use of the components of biological diversity and the fair and equitable sharing of the benefits arising from the utilization of genetic resources.

The indicator is also in accordance with the indicator that was defined at the Convention on Biological Diversity level – "Trends in the extent of selected biomes, ecosystems and habitats" and that exists at the EU level through the SEBI 2010 project (Streamlining European 2010 Biodiversity Indicators) entitled "Natural habitats of Community Importance".

As part of priority area 1 „Nature protection, landscape and biodiversity conservation", the **State Environmental Policy of the Czech Republic** aims at halting the loss of biodiversity, developing the Natura 2000 system and functionally connecting it to the existing system of specially protected areas and managing biotopes for specially protected species of plants and animals.
The objective of the **National Biodiversity Strategy of the Czech Republic** is, in part, to assess the existing system of protected areas, ensure its optimisation and through monitoring and identify trends in the behaviour of ecosystems (especially at the national level).

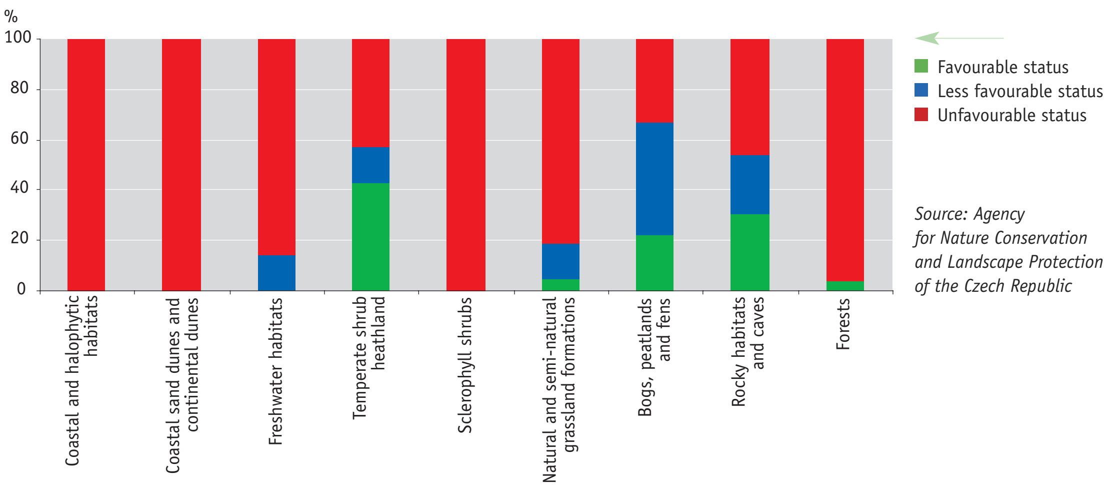
INDICATOR ASSESSMENT

Chart 1 ➔ **State of natural habitats in the Czech Republic [%], 2000–2006**



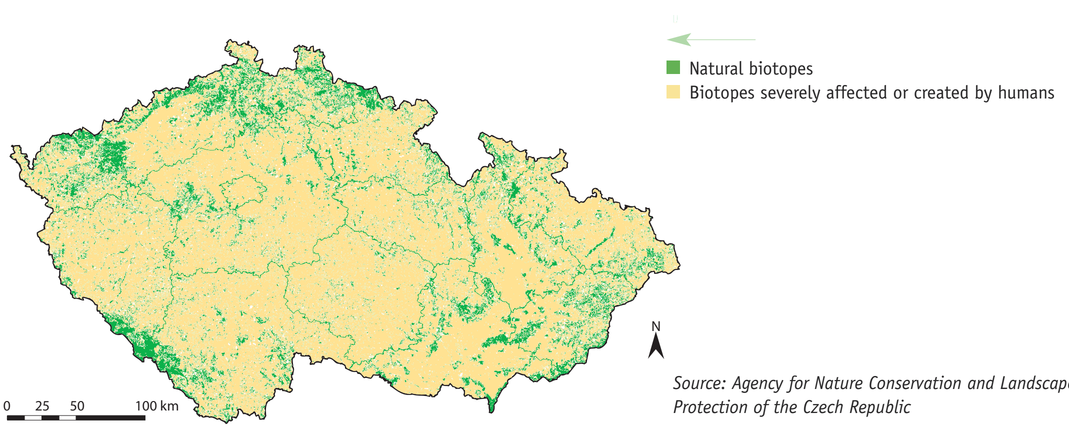
Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

Chart 2 ➔ **State of natural habitats in the Czech Republic according to individual formation groups [%], 2000–2006**



Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

Figure 1 ➔ **Distribution of natural biotopes and anthropogenically affected biotopes in the Czech Republic, 2000–2005**



Source: Agency for Nature Conservation and Landscape Protection of the Czech Republic

The map shows the distribution of all natural biotopes (both those that are and those that are not included in the Natura 2000 network) in the Czech Republic that were found during the first mapping of biotopes between 2000 and 2005.

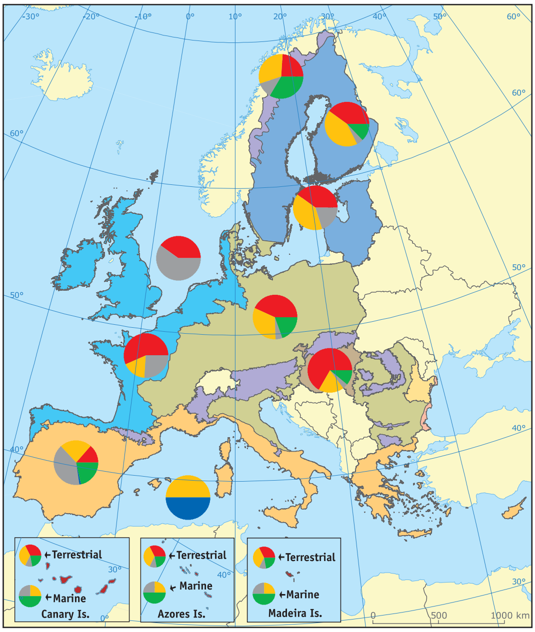


Figure 2 → **Comparison of the state of natural habitats of Community importance in EU countries according to bio-geographical areas, 2000–2006**

Pie charts
- Favourable
- Less favourable
- Unfavourable
- Unknown
- Not evaluated

Biogeographic regions
- Alpine
- Atlantic
- The Black Sea
- Boreal
- Continental
- Macaronesian
- Mediterranean
- Pannonian
- Steppe

Source: ETC/BD and EK-DG Environment (adopted from the Agency for Nature Conservation and Landscape Protection of the Czech Republic)

Based on the state of **natural habitat types of Community importance**, the overall state of natural biotopes in the Czech Republic can be assessed, even though the indicator only deals with sites of Community importance.[1]

Determining the overall status of each natural habitat type requires looking at **four sub-parameters**: current size, potential area, structure and function, and prospects for the future. If one of these parameters is assessed as unfavourable, the overall status of the species is also assessed as unfavourable.

Area, size and prospects for the future were mostly assessed as favourable and less favourable. However, the quality of structure and function is much worse since these mainly concern the biological value of the habitat and thus also its ability to resist external pressure.

95 natural habitat types were assessed – 11 have a favourable status, 13 have a less favourable status and 71 an unfavourable status. In the Czech Republic, the assessment is unfavourable for habitats that are not very large and for forests. On the contrary, the assessment was relatively the most favourable for heaths, rocky habitats, peatlands and fens.

From the international perspective, the status of natural habitats of Community importance can be compared on several levels: at the level of interstate comparisons, at the level of bio-geographical areas, and possibly at the European-wide level. The status of sites of Community importance in the Czech Republic reflects the European-wide trend and shows average results at this level.

The strategic and political objective of the European Community is to maintain a favourable status (as defined by the Habitats Directive – Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora) of the components of the natural environment or, as the case may be, to prevent worsening their status and ideally to improve it. Six-year intervals have been set for assessment monitoring – these intervals will allow for assessing possible trends and their direction.

DATA SOURCES

- Agency for Nature Conservation and Landscape Protection of the Czech Republic
- Assessment report on the conservation status of species of Community importance and natural habitat types in the Czech Republic pursuant to Article 17 of the Habitats Directive for the European Commission, June 2007
- ETC/BD, European Topic Centre on Biological Diversity
- EK-DG Environment

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1604)

Monitoring pursuant to the Habitats Directive 92/43/EEC and the Birds Directive 79/409/EEC
http://www.biomonitoring.cz

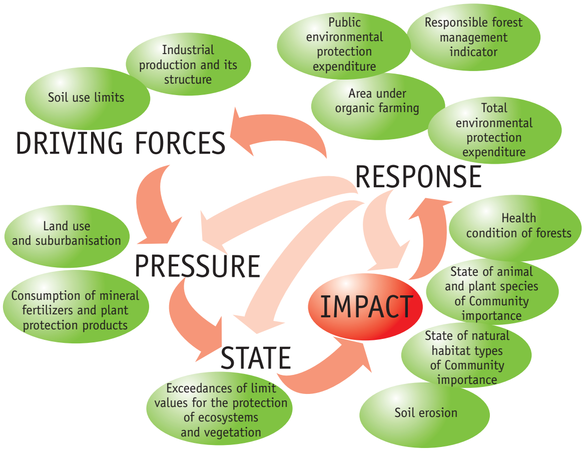
SEBI 2010 – Detailed indicators of nature conservation at the EU level – a description of the methodology
http://reports.eea.europa.eu/technical_report_2007_11/en

[1] *A similar assessment of the state of sites cannot be applied at the national level because this indicator does not exist.*

14/ Common bird species indicator

KEY QUESTION ➔

What progress has been made in stopping the decrease in the number of farmland bird species and woodland bird species?



KEY MESSAGE ➔

The abundance of woodland bird species has been stagnating, although it has been slightly decreasing over the last fifteen years.

The abundance of farmland bird species continues to decline. This shows that the state of landscape and biodiversity in the Czech Republic has been worsening.

OVERALL TREND ASSESSMENT ➔

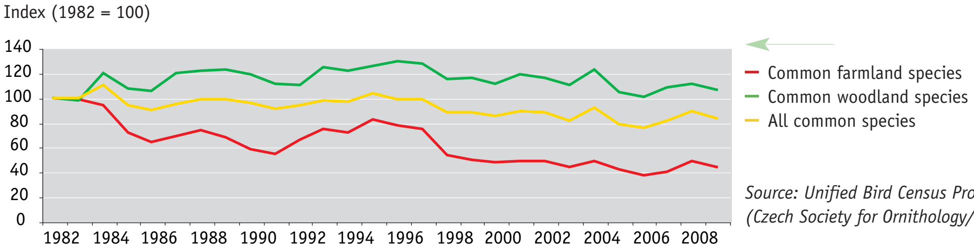
Change since 1990	☹
Change since 2000	☹
Last year-to-year change	☹

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➔

The **Bird Directive** (Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds) is crucial in this area. **Special Protection Areas** (SPA) and **Sites of Community Importance** (SCI) that together form the **Natura 2000** network were identified pursuant to the Directive.
The 1992 Convention on Biological Diversity also addresses the issue of biodiversity loss. Its main objectives are the conservation of biological diversity, the sustainable use of the components of biological diversity and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.
In 2006, the Commission adopted the **Biodiversity Action Plan** – in response to the need to halt the decline of biodiversity by 2010. The plan's specific measures apply to both the European Community and all member states.
As part of priority area 1 „Nature protection, landscape and biodiversity conservation", the **State Environmental Policy of the Czech Republic** aims at halting the loss of biodiversity, developing the Natura 2000 system and functionally connecting it to the existing system of specially protected areas and managing biotopes for specially protected species of plants and animals.
Other important strategic documents are the **Strategy of Biodiversity Protection of the Czech Republic** and the **State Programme of Nature Protection and Landscape Conservation of the Czech Republic**.

INDICATOR ASSESSMENT

Chart 1 ➔ **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], 1982–2009**



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

The main indicators of both the **condition and the development of biodiversity** include the abundance and the distribution of selected species. The main indicators defined in the Convention on Biological Diversity include population trends of selected taxonomic groups. Changes in the abundance of different species that make up the diversity of a monitored area may help to timely identify

possible negative factors threatening biodiversity. However, relevant data are not available for all constituents of biodiversity, meaning that indicators must be constructed based on data for well-studied groups. The best-studied taxa, for which relevant indicators of the development of their abundance and distribution within the Czech Republic can be constructed, include birds.
The common farmland bird species indicator and the common woodland bird species indicator are a subset of the overall indicator of the abundance of all common bird species.
Over the monitored period, the total value of the abundance of all common bird species declined. Also, the division of the indicator into groups according to the main types of environment shows the differences between these groups.
The abundance of **common farmland bird species** declined mostly during the first half of the 1980s. After 1989, the abundance started to stabilize and in the early 1990s, it started to grow.
Between 1994 and 1995, the index grew to 80% of the 1982 level. Subsequently, however, another decline occurred. According to a published scientific study (Reif, J. et al., 2008), the main cause of the decline of field birds was the intensification of agriculture. The reduction of agricultural land also affects the declining abundance of populations.
According to the Czech Society for Ornithology, the abundance of common farmland bird species in Europe has decreased by about one-half over the past 25 years. Some species that used to be common – such as the Eurasian tree sparrow (*Passer montanus*), the northern lapwing (*Vanellus vanellus*) and the skylark (*Alauda arvensis*) – are now on the list of rapidly declining species. The situation in the new EU member states, where the situation with respect to field birds has been better, is now also deteriorating (Voříšek, Pazderová, 2007). The abundance of **common forest bird species** has been more or less stable over the monitored period; only the representation within different groups continues to change. Species that typically live in coniferous forests are gradually being replaced by deciduous forests species. This is related to the growing area of deciduous forest compared to coniferous forests (Reif et al., 2008b). In spite of some favourable changes in the state of forests and farming methods, the abundance of forest bird species has started to slightly decline after increasing over the last 15 years.
Based on the assessment of population trends for common bird species, it is obvious that a decline in biodiversity in the Czech Republic is continuing and unless environmental measures are adopted across all sectors of human activities, this trend will most likely continue after 2010.

DATA SOURCES

➜ Unified Bird Census Programme (Czech Society for Ornithology/ORNIS of the Comenius Museum); (The provision of the indicator of farmland bird species is financed by the Technical Assistance measure of the Rural Development Programme of the Czech Republic for 2007–2013 in cooperation with the Ministry of Agriculture and the Czech Society for Ornithology.)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1600)

Czech Society for Ornithology
http://www.birdlife.cz

Unified Bird Census Programme
http://jpsp.birds.cz

BirdLife International
http://www.birdlife.org/index.html

European Bird Census Council, Pan-European Common Bird Monitoring Scheme
http://www.ebcc.info/pecbm.html

VERMOUZEK, Z. Indikátor ptáků zemědělské krajiny za rok 2008 (The farmland bird species indicator 2008). A study for the Ministry of Agriculture of the Czech Republic. The Czech Society for Ornithology, Prague, Přerov 2008. Unpubl., 21 pp. (in Czech).

REIF, J., VOŘÍŠEK, P., ŠŤASTNÝ, K., BEJČEK, V. & PETR, J. Agricultural intensification and farmland birds: new insights from a central European country. Ibis, 2008a. doi: 10.1111/j.1474-919x.2008.00829.x.

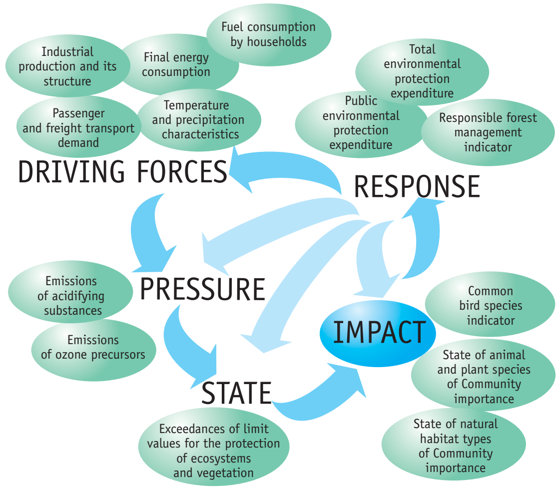
REIF, J., STORCH, D., VOLÍNEK, P., ŠŤASTNÝ, K. & BEJČEK, V. Bird habitat associations predict population trends in central European forest and farmland birds. Biodiversity Conservation, 2008b. doi: 10.1007/s10531-008-9430-4.

VOŘÍŠEK, P., PAZDEROVÁ, A. Z Evropy i nadále mizí ptáci zemědělské krajiny (The farmland bird species remain in disappearing from Europe). The Czech Society for Ornithology, 2007. Available from: http://www.birdlife.cz/index.php?ID=1609 (in Czech).

15/ Health condition of forests

KEY QUESTION →

What development has there been in the health condition of forest stands?



KEY MESSAGE →

Damage to forest stands expressed as the rate of defoliation (the loss of foliage) has not been progressing as fast as it used to. Over the past two years, the pace of the increase in defoliation rate has slowed down due to reduced air pollution.

Despite the slowdown in the pace of increase, the defoliation rate remains very high in the Czech Republic. The proportion of older conifers (over 59 years) that belong to defoliation classes 2 to 4 was 75.5% in 2009; in younger conifers (under 59 years) it was 28.4%; older and younger deciduous trees account for 41% and 15.4% respectively.

OVERALL TREND ASSESSMENT →

Change since 1990	N/A
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

One of the partial objectives of the environmental pillar of the **National Forestry Programme for the period until 2013** aims „To improve the health condition and protection of forests" by limiting clearings, supporting and implementing nature-friendly management methods and supporting a natural and nature-friendly renewal of the composition of tree species. Other partial objectives include „To reduce the impacts of global climate change and extreme meteorological phenomena", „To maintain and improve biodiversity in forests" and „Develop forest monitoring".

The objectives of the **State Environmental Policy of the Czech Republic** for forestry are as follows: promoting the continual increase in the proportion of amelioration and compacting tree species in forest renewal and afforestation, reducing damage to wetlands by logging, and reducing the drying out of these areas; conserving and utilizing the forest genetic fund; promoting the renewal of forest ecosystems in highly polluted areas; promoting the certification process within the framework of the PEFC system (Programme for the Endorsement of Forest Certification Schemes) and using sound forest management technologies.

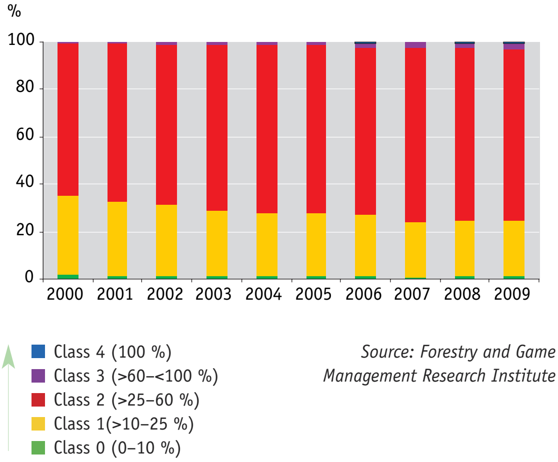
The Forest Ecosystems area of the **National Biodiversity Strategy of the Czech Republic** aims at specifying the current issues of forest ecosystem renewal in areas that were exposed to increased pollution in the past while using the results of research into and monitoring of the impacts of pollution on forest and forest soil to date. In addition, it is also necessary to prepare a strategy for further abating the impacts of adverse processes on biodiversity.

Another important document is the **State Programme of Nature Conservation and Landscape Protection of the Czech Republic** that defined 12 measures aimed at increasing biodiversity of forest stands towards a natural species composition, enhancing the structural diversity of forests, naturally renewing species that are genetically suitable and improving the non-production functions of forest ecosystems.

From the international perspective, the **ICP Forests programme** that is part of the CLRTAP convention is important. The programme focuses on assessing and monitoring the impact of air pollution on forests. Another document of international importance is the **FutMon** (Further Development and Implementation of an EU-level Forest Monitoring System) project that is being implemented under the **LIFE+** programme and aims to develop a long-term forest monitoring system.

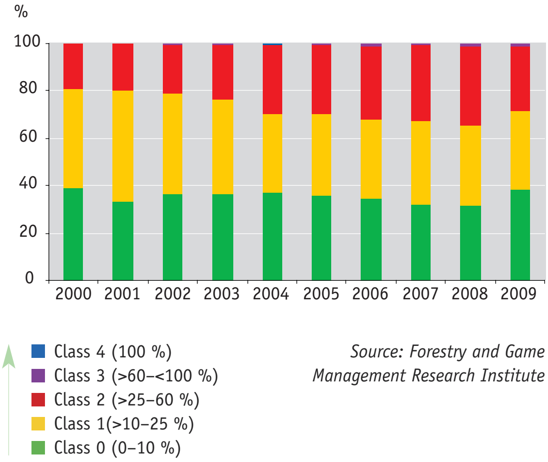
INDICATOR ASSESSMENT

Chart 1 → **Defoliation of older conifers (stands over 59 years of age) in the Czech Republic according to classes [%], 2000–2009**



Source: Forestry and Game Management Research Institute

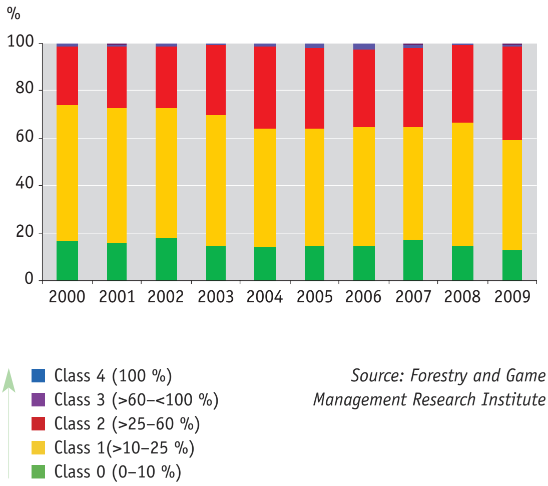
Chart 2 → **Defoliation of younger conifers (stands up to 59 years of age) in the Czech Republic according to classes [%], 2000–2009**



Source: Forestry and Game Management Research Institute

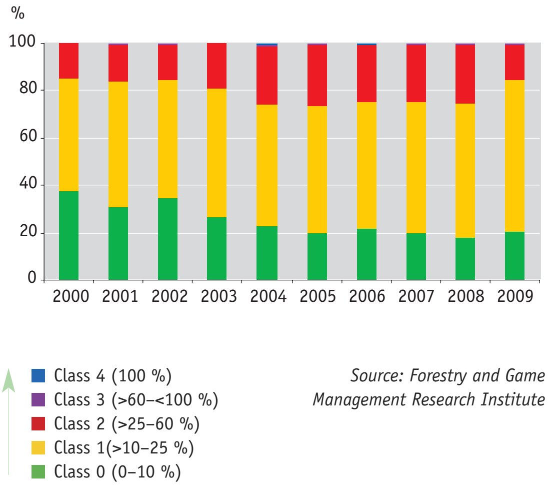
Defoliation levels are divided into five basic classes, of which the last three characterize significantly damaged trees: 0 – no defoliation (0–10%);1 – slight defoliation (>10–25 %); 2 – moderate defoliation (>25–60 %); 3 – severe defoliation (>60–<100 %); 4 – dead trees (100 %)

Chart 3 → **Defoliation of older deciduous tree (stands over 59 years of age) in the Czech Republic according to classes [%], 2000–2009**



Source: Forestry and Game Management Research Institute

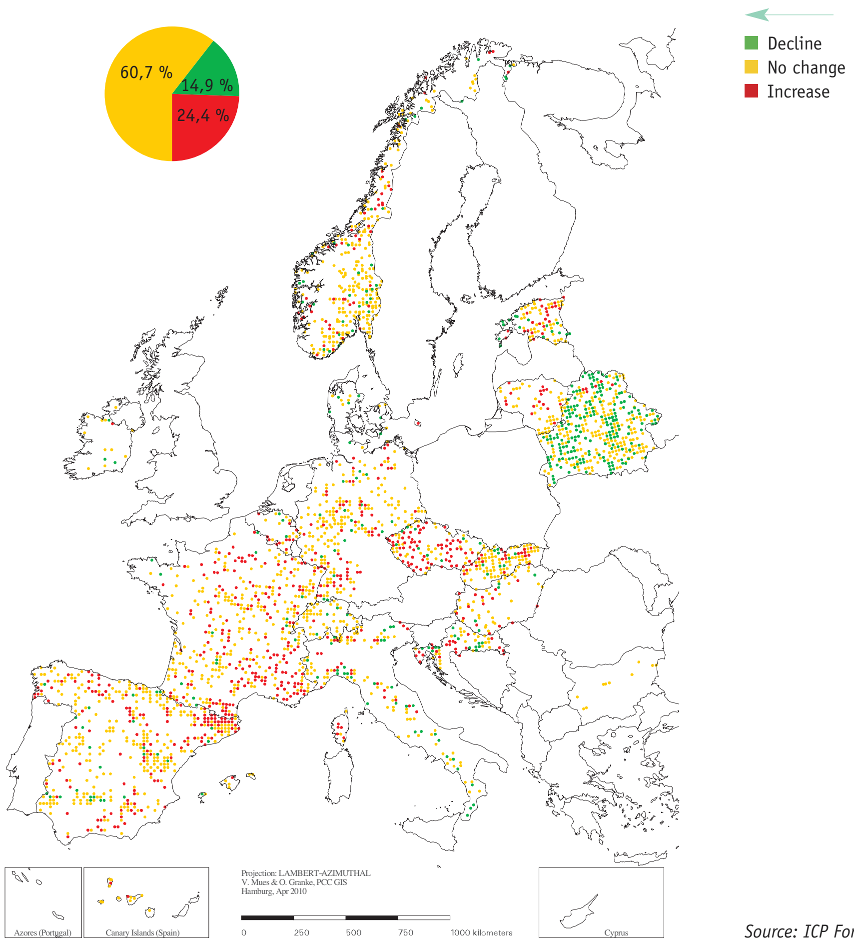
Chart 4 → **Defoliation of younger deciduous trees (stands up to 59 years of age) in the Czech Republic according to classes [%], 2000–2009**



Source: Forestry and Game Management Research Institute

Defoliation levels are divided into five basic classes, of which the last three characterize significantly damaged trees: 0 – no defoliation (0–10%);1 – slight defoliation (>10–25 %); 2 – moderate defoliation (>25–60 %); 3 – severe defoliation (>60–<100 %); 4 – dead trees (100 %)

Figure 1 ➜ **Average defoliation of all tree species [%], 1998–2009**



Source: ICP Forests

The indicator assesses the health conditions of both **older coniferous and deciduous stands (over 59 years)** and **younger coniferous and deciduous stands (under 59 years)**. The health condition of trees is identified by the **defoliation degree**, which is defined as a relative loss of assimilation in specific tree tops located within a stand compared to a healthy tree that is growing under the same conditions.

In **older conifers (over 59 years)**, defoliation has been increasing with the proportions of classes 2 to 4 growing (by 10.7% since 2000) at the expense of classes 0 and 1. In 2009, there was no significant change compared to 2008. Similarly, **younger conifers (under 59 years)** showed an increase in class 2 on the long-term basis (by 8.3% since 2000) at the expense of classes 0 and 1, which might have been caused by adverse abiotic factors and pests in weak forests affected by pollution. In comparing 2009 to 2008, there was a decline in class 2 (by 5.8%) and an increase in class 0 (by 6.8%). There were no major difference in basic older coniferous species as to the degree of defoliation; the proportion in classes 2 to 4 ranged from 70.4% in larch *(Larix decidua)* to 84.4% in pine *(Pinus sylvestris)*. Similarly, the greatest amount of defoliation in younger conifers was in pine *(Pinus sylvestris)* (69.4% in classes 2 to 4) and the lowest defoliation in fir (*Abies alba*) (50% in class 0 and 50% in class 1).

In **older deciduous trees (over 59 years)**, the degree of defoliation has been worsening with the percentage of stands in class 2 increasing (by 15.2% compared to 2000), at the expense of classes 0 and 1. Similarly, the degree of defoliation has been increasing in **younger stands (under 59 years)** on the long-term run. Unlike older stands, there has been a slight increase in class 1 (by 6.8%) and, to a smaller extent, in class 0 (by 2.8%) in 2009, at the expense of classes 2 and 3. The largest defoliation in basic tree species in older deciduous stands was reported in oak *(Quercus* sp.*)* (77% belonged to classes 2 to 4); on the other hand, the lowest defoliation was registered in beech *(Fagus sylvatica)* (86.2% in classes 0 and 1) and alder *(Alnus* sp.*)* (88.6% in classes 0 and 1). As far as basic younger deciduous trees species are concerned, the largest defoliation was registered in birch *(Betula pendula)* (39.5% of the stand falls into classes 2 to 4); on the other hand, the lowest defoliation was reported in beech *(Fagus sylvatica)* (40.7% in class 0 and 57.9% in class 1).

Older coniferous trees show a higher degree of defoliation that younger ones (the proportion of older conifers in class 2 was higher by 44.8% than in younger conifers in 2009). Similarly, older conifers show a higher degree of defoliation than older deciduous trees; on the other hand, younger conifers show a lower degree of defoliation than younger deciduous trees on the long-term basis.

Decreased pollution over the past two decades has undoubtedly improved the total dynamics of defoliation. Nevertheless, defoliation has been slightly increasing. This trend is usually manifested in both coniferous and deciduous trees by a decrease in class 1 and increase in class 2. Such a trend indicates a significant delay in the forests' response to positive environmental changes.

In the **international context**, the condition of Czech forests remains bad and is the worst in Europe – despite the significant reduction in emissions in the 1990s. In 2009, the Czech Republic had the most trees in EU27 countries in defoliation classes 2 to 4 (56.8%), followed by Cyprus (36.2%), Italy (35.8%), Slovenia (35.5%) and France (33.5%); Estonia, Denmark, Finland, Russia and Ukraine were below 10%.

Between 1998 and 2009, the **average defoliation in EU27 countries** visibly increased to 24.4% of the area (mostly in the Mediterranean and the Czech Republic), while it decreased only in 14.9% of the area. Between 1995 and 1999, it dropped from 26% to 21.2%, after 2000 it increased again and recently, it has begun to slightly decline and reached 19.2% in 2009.

The amount of the forest ecosystem that is identified by a higher stability, biodiversity and resistance to adverse environmental effects increases with age. A good health condition of forests is important with respect to the use of ecosystems by humans (**ecosystem services**). Ecosystem services in a healthy forest include product services (food, medicines, energy), regulation services (regulation of floods, drought, soil degradation and diseases), support services (soil formation, nutrient cycling) and cultural services (recreation, spiritual and other non-material values). The growing demand for ecosystem services results from the increasing disruption of the ecosystems' ability to provide them. If the objectives of the National Forestry Programme for the period until 2013 and the National Biodiversity Strategy of the Czech Republic are met, the vitality and resistance of forests will improve and forests will be better able to withstand adverse effects and will be able to provide services important both to humans and other ecosystems.

DATA SOURCES

- Forestry and Game Management Research Institute
- European Environment Agency (EEA)
- ICP Forests, International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1542)

Guide to Forestry
http://www.vulhm.cz/index.html?did=77&lang=cz

Forestry Research Reports
http://www.vulhm.cz/index.html?did=81&lang=cz

Reports on the Condition of Forests and Forest Management in the Czech Republic, the Ministry of Agriculture of the Czech Republic
http://www.uhul.cz/zelenazprava

ICP Forests
http://www.icp-forests.org/

16/ Responsible forest management indicator

KEY QUESTION

Has the development of forest management been positive from the environmental perspective?

KEY MESSAGE

In recent years, the proportion of deciduous trees in Czech Republic forests has been – very slowly but steadily – increasing.

The proportion of firs in afforestation has been rising over the long term.

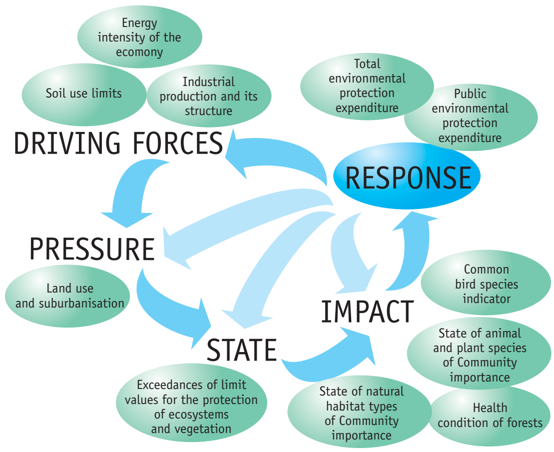
The area of natural renewal grew by 23.6% compared to last year.

Total forest stock has been increasing over the long term.

The proportion of firs in the total area of the Czech Republic's forests has stagnated.

The amount of Czech forest area certified pursuant to the PEFC and FSC rules peaked in 2006 and recently has declined to its current level 73%.

The percentage of forest area certified from the more environmentally demanding FSC system remains very low (2% of the total forest area).



OVERALL TREND ASSESSMENT

Change since 1990	☺
Change since 2000	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The „Responsible agriculture and forest management" priority of the **Strategic Framework for Sustainable Development in the Czech Republic** aims to maintain and improve biodiversity in forests while supporting nature-friendly management methods and enhancing non-production functions of forest eco-systems. The "Adaptation to climate change" priority aims at reducing the impact of the anticipated global climate change and extreme meteorological phenomena on forest ecosystems.

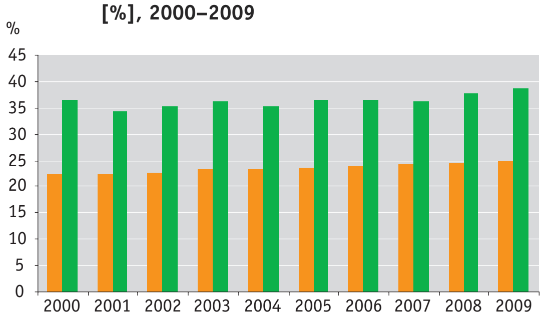
The objectives of the **State Environmental Policy of the Czech Republic** for forestry are as follows: promoting the continual increase in the proportion of amelioration and compacting tree species in forest renewal and afforestation, reducing damage to wetlands by logging, and reducing the drying out of these areas; conserving and utilizing the forest genetic fund; promoting the renewal of forest ecosystems in highly polluted areas; promoting the certification process within the framework of the PEFC system (Programme for the Endorsement of Forest Certification Schemes) and using sound forest management technologies;

Other important documents are the **State Programme of Nature Conservation and Landscape Protection of the Czech Republic** and the **National Biodiversity Strategy of the Czech Republic** that aim to increase biodiversity in forest stands towards a natural species composition, to increase structural diversity, naturally renew the species diversity in genetically suitable stands and to enhance the non-production functions of forest ecosystems.

One of the partial objectives of the **environmental pillar of the National Forestry Programme for the period until 2013** aims „To improve the health condition and protection of forests" by limiting clearings, supporting and implementing nature-friendly management and supporting the natural and nature-friendly renewal of tree species. Other partial objectives are „To maintain and improve biodiversity in forests" by supporting diverse management procedures and maintaining the pattern of stands with a high biological value within the landscape. In addition, the Programme aims „To achieve a balance between forests and game" by reducing excessive hoofed game stock in order to use more nature-friendly management forms and damage to forest stands.

INDICATOR ASSESSMENT

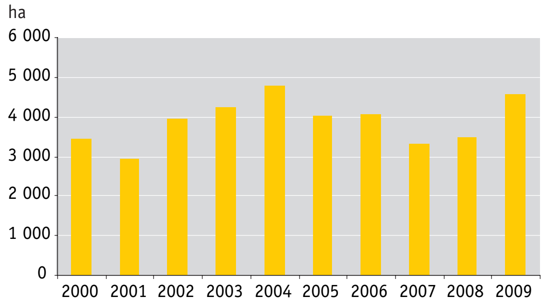
Chart 1 ➜ **Proportion of deciduous trees in the Czech Republic's total forest area and in afforestation [%], 2000–2009**



Proportion of deciduous trees in total forest area
Proportion of deciduous trees in afforestation

Source: Forest Management Institute, Czech Statistical Office

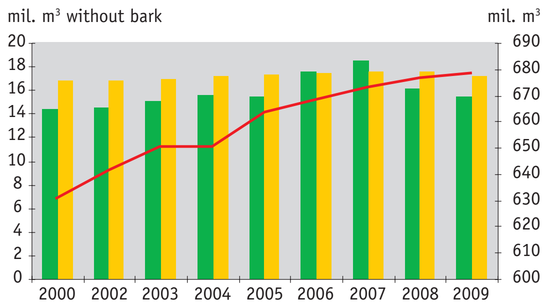
Chart 2 ➜ **Development of natural renewal areas the Czech Republic [ha], 2000–2009**



Natural renewal area

Source: Czech Statistical Office

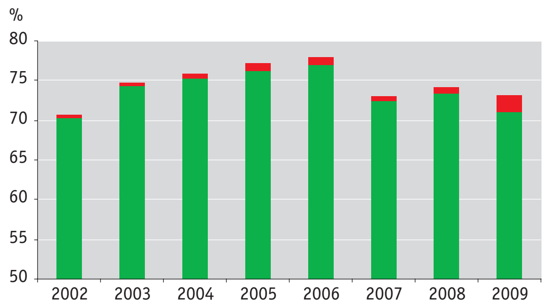
Chart 3 ➜ **Comparison of the total average growth and wood felling [millions m^3 without bark] with total stock in the Czech Republic [million m^3], 2000–2009**



Felling (left axis)
Growth (left axis)
Stock (right axis)

Source: Forest Management Institute, Czech Statistical Office

Chart 4 ➜ **Share of forest area certified pursuant to the PEFC and FSC principles in the total forest area of the Czech Republic [%], 2002–2009**



FSC
PEFC

Source: FSC and PEFC

Deciduous tree species have been increasingly used in forest renewal (such as beech, oak, maple and rowan trees) at the expense of coniferous trees (spruce and pine). This results in a favourable change in species composition towards a more natural (and stable) structure of forest stands. The state of more species-diverse young forests represents a certain issue because of browsing in locations with excessive hoofed game stock and as a result if unsuitable management. **The share of deciduous trees in the total forest area in the Czech Republic** has been growing very slowly. This is caused by a relatively long rotation. In 2009, they accounted for 24.8% of the total forest area. **The number of deciduous trees during afforestation** was long at a stable level of 35–36%, but has slightly grown over the last two years to 38.8% in 2009 (Chart 1).

An important part of a natural forest ecosystem is fir, a species important for maintaining forest stability. **The proportion of fir in the total forest area** has been stable (0.9%) since 1995 and **its share in afforestation** grew from 2% in 1995 to 6.3% in 2009.

The natural renewal of forests has almost tripled over the period in question (since 1995), which is a significant positive phenomenon from the forestry and environmental perspectives. Between 2004 and 2008, the share of natural renewal dropped in relation to the share of areas caused by random tree felling; however, it increased by 23.6% in 2009 compared to 2008 (Chart 2).

The total standing wood stocks have been increasing over the long term. In 2009, it reached 678 million m^3 (Chart 3). A main reason for the increase in total wood stocks is that certain age groups of trees in above-normal areas are maturing and the mean age of trees has been increasing. Other reasons include the increasing proportion of nitrogen oxides and carbon dioxide in the atmosphere, the growing average temperature and large amounts of wood left in the forest compared to previous years (Vašíček, J., 2007). Another reason is that **wood felling** has not exceeded **the total average growth** (Chart 3) over the long term. An exception was 2007 when maximum wood felling values were reported, namely due to the processing of wood mass damaged by hurricane Kyrill and the subsequent destruction caused by the bark beetle. During the period in question, wood felling was about 15 million m^3 without bark per year. Total average growth has been stable at about 17 million m^3 without bark during the period (since 2000).

A forest area certified pursuant to the PEFC (Programme for the Endorsement of Forest Certification schemes) and **FSC**[1] (Forest Stewardship Council), i.e. forests managed in a sustainable manner, reached its peak in 2006 and has been slightly decreasing over the last three years to the current 73% (1 876 505 ha) of the total forest area in the Czech Republic. Of the total number of issued certificates, most are PEFC (97.2%). For these certificates, a slight decrease was registered compared to last year (by 3.1%). On the other hand, the forest area certified pursuant to FSC (Chart 4) has increased 171.4% compared to 2008, (from 19 271 ha to 52 387 ha).

Forest management within the objectives of the State Environmental Policy has been developing positively. As long as the objectives of the Strategic Framework for Sustainable Development in the Czech Republic and the National Forestry Programme until 2013 are accomplished, the species and age structure of forests will also improve, the vitality and resistance of forests will increase and forests will better withstand any adverse conditions. This will go hand in hand with a better species and forest diversity.

DATA SOURCES

- Czech Statistical Office
- Forest Management Institute
- Programme for the Endorsement of Forest Certification schemes in the Czech Republic (PEFC)
- Forest Stewardship Council of the Czech Republic (FSC)
- VAŠÍČEK, J. Těžba dřeva v roce 2006 (Wood felling in 2006). Forest works. Volume 86, 2007. No. 8. http://lesprace.silvarium.cz/content/view/2017/111/ (in Czech).

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1596)

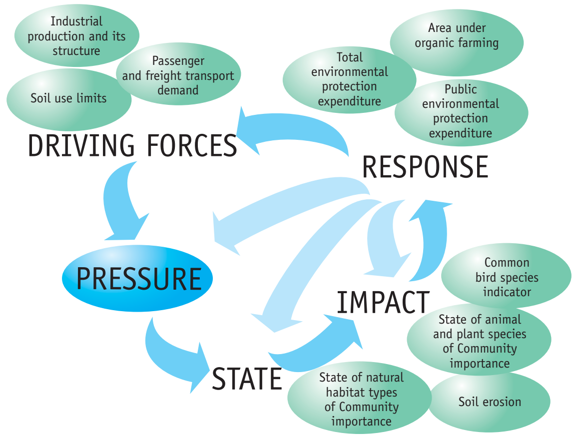
Forest Management Institute
http://www.uhul.cz

Programme for the Endorsement of Forest Certification schemes in the Czech Republic (PEFC)
http://www.pefc.cz

Forest Stewardship Council of the Czech Republic (FSC)
http://czechfsc.cz

[1] Forest certification under the PEFC and FSC systems is one of the forest management processes aimed at sustainable forest management in the Czech Republic that strives to maintain all forest functions in favour of the environment for people. Through the certificate, the forest owner declares a commitment to manage the forest pursuant to certain criteria. PEFC is a professional, voluntary and independent association of legal entities in the Czech Republic. FSC is an international certification carried out by several authorized companies, not by certification companies accredited only in the Czech Republic. FSC does not allow for regional forest certification. From the international perspective, the systems are equal.

17/ Land use and suburbanisation



KEY QUESTION →

Is the Czech Republic's land use satisfactory in terms of landscape ecology?

KEY MESSAGE →

Within agricultural land resources, there is a growing proportion of permanent grasslands at the expense of arable land. At the same time, the forested area has slightly increased.

Agricultural areas are used for development, built-up and other areas have increased considerably. There has been accelerating landscape urbanisation.

The degree of landscape fragmentation has increased, particularly due to the construction of linear transport structures.

Yet again, the Act on the Protection of Agricultural Land Resources failed to be amended in 2009 – its amendment would be a significant contribution towards protecting the landscape from development.

OVERALL TREND ASSESSMENT →

Change since 1990	N/A
Change since 2000	☹
Last year-to-year change	☹

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The Czech Republic's obligations stem from the **European Landscape Convention**. The main aim of the Convention is to provide for the protection of individual types of European landscape. Its importance lies in the fact that it promotes sustainable landscape conservation, management and planning and facilitates European cooperation in this area, mainly through formulating and implementing landscape policies at the national, regional and local levels.

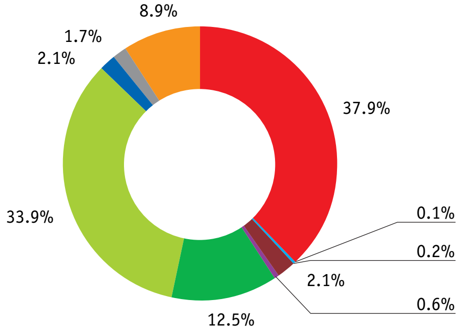
Another important strategic document is the **State Environmental Policy of the Czech Republic**. It aims for „environmentally friendly land use", i.e. it strives to minimise free-landscape disturbances, reclaim or otherwise use disturbed landscapes, remove ecological pressures, prevent landscape fragmentation and even reduce fragmentation through developing bio-corridors and ecological stability territories. With regard to economic activities that are most closely associated with land use (such as agriculture and forestry, mineral extraction, construction, transport and tourism), it is necessary to implement legislative, financial and educational measures to promote the most landscape friendly activities.

The **State Nature Conservation and Landscape Protection Programme of the Czech Republic** aims to maintain and enhance the ecological stability of the landscape with a mosaic of interconnected biologically functional elements and policies that are able to withstand negative external influences (including climate change), maintain and enhance the natural and aesthetic value of the landscape, ensure comprehensive sustainable land use – especially through limiting landscape development, maintaining landscape permeability and limiting further fragmentation with preferential use of space within residential zones or with ties to such zones – and ensure that adequate care is provided for an optimized system of Specially Protected Areas. It shall also ensure that TSES are defined as the irreplaceable basis of natural landscape infrastructure to guarantee the conservation of biological diversity and the functioning of natural processes essential to human life.

Another strategic document is the **Territorial Development Policy of the Czech Republic,** a land-use planning instrument whose priority is to protect and develop the natural, civilisational and cultural values of the territory in the public interest.

INDICATOR ASSESSMENT

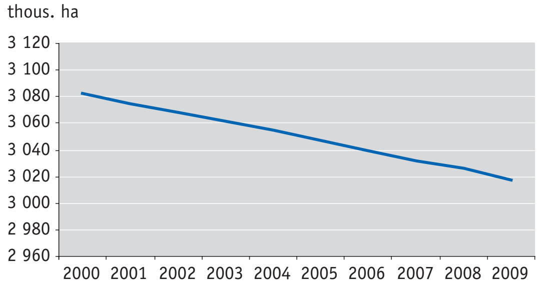
Chart 1 → **Land use in the Czech Republic [%], 2009**



- Arable land
- Hops fields
- Vineyards
- Gardens
- Fruit orchards
- Permanent grasslands
- Forests
- Bodies of water
- Developed areas and courtyards
- Other areas

Source: Czech Office for Surveying, Mapping and Cadastre

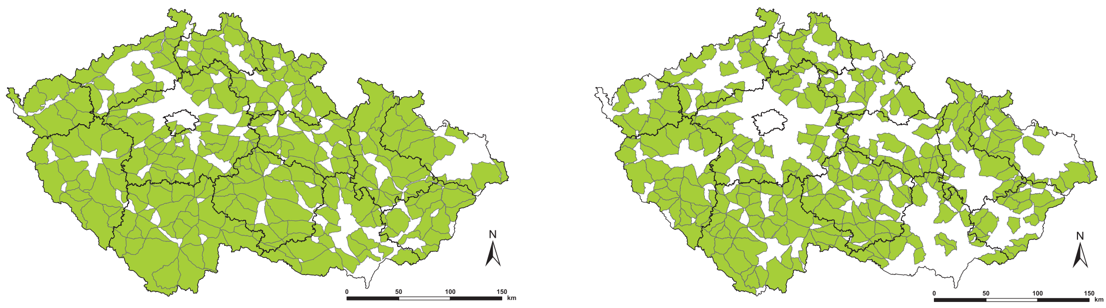
Chart 2 → **Area of arable land [thousands of ha], 2000–2009**



— Arable land

Source: Czech Office for Surveying, Mapping and Cadastre

Figure 1 → **Landscape fragmentation due to transport in the Czech Republic, 1980 and 2005**



Year 1980
- UAT polygons 1980
- Boundaries of self-governing regions

Source: Evernia

Year 2005
- UAT polygons 2005
- Boundaries of self-governing regions

Source: Evernia

The Czech Republic has a **high proportion of arable land** (34% of its total area, ranking 5th within the EU27) and a **high proportion of forest cover** (33.7% in 2009). In terms of land-use typology, most of the country is comprised of forest-agricultural and agricultural landscapes that are typical of Central Europe. The character of land use varies distinctly with altitude in the Czech Republic. In 2009, agricultural land resources totalled 4 239 thousand ha (i.e. 53.7% of the total area), non-agricultural land accounted for 3 648 thousand ha. Agricultural land is mainly comprised of arable land (70.1%) followed by permanent grasslands (23.2%) (Chart 1).
Land use trends in the Czech Republic are characterized by two types of changes. For remote and less attractive areas, we speak of the **„extensification"** of use, leading to the abandonment of arable land and increased areas of new permanent grasslands and forest land. On the other hand is **„intensified"** use that is typical of the main agricultural areas and urbanisation centres. This results in an increased proportion of arable land and, above all, an increase in developed and other areas. While the former process is viewed rather positively from the landscape-ecology perspective, the intensification of use in the latter case is clearly negative. The long-term trend

in the Czech Republic has been one of widening disparities amongst different regions based on their natural and socio-economic characteristics, which increases the intensity of both of the above-mentioned processes. Economically attractive areas (especially large cities and their surroundings) are experiencing very dynamic development while, on the other hand, remote areas that are less interesting in terms of agriculture, industry and recreation are losing both their value and population.

The dynamic development of significant economic, political and cultural centres in the Czech Republic is accompanied by population growth and, consequently, an increase in residential and commercially developed areas – not only within existing urban zones, but also in outer urban zones, especially around existing municipalities. The expansion of urban areas, known as **urban sprawl**, is characteristic of the current development in Prague and, to a lesser extent, in Brno and other major cities in the Czech Republic. Urban sprawl denotes the expansion of both the residential and commercial functions of a city (storage, production and retail facilities) and it typically swallows a city's existing surroundings into the municipality creating **„suburbia"** (urban residential areas adjacent to cities).

The above processes determine the principal long-term trends of land use in the Czech Republic. These include a considerable decrease in arable land, a slight decline in total agricultural land and a significant increase in developed areas and other parcels that are largely comprised of unbuilt urban areas and transport infrastructure. Within agricultural land resources, there has been a gradual increase in the proportion of permanent grasslands. Between 1993 and 2007, 33 000 ha of agricultural land was lost (i.e. a decrease of 0.8%). Arable land displayed the largest decrease (141 000 ha or 4.4%). On a year-to-year basis, the amount of arable land decreased by 8 734 hectares (0.3%) in 2009. This amounts to an arable land loss of about 24 ha each day. By contrast, developed and other areas displayed a year-to-year increase of 2 620 ha (0.3%) in 2009 (Chart 2). The increase since 2000 totalled 19 507 ha (2.4%). In 2009, built-up and other areas accounted for approximately 829 500 ha, which represents 10.5% of the Czech Republic's total area.

The proportion of developed areas is an important factor influencing runoff conditions, and thus the intensity of floods. While runoff from vegetated areas only represents about 5% of all stormwater, hard surfaces soak up almost no water at all. This leads to more than 90% of all stormwater that needs to run off. New development brings changes to the original terrain (new dumps, embankments etc.). At the same time, soil degradation occurs, e.g. due to worsened stormwater absorption and drainage, thereby reducing the replenishment of underground water.

Another negative process in the landscape is **landscape fragmentation** caused by linear transport structures and buildings. The construction of highways and speedways, adjustments to railway lines, the construction of new roads and new development around roads and streams have caused even more undesirable landscape fragmentation, leading to the extinction of many species' biotopes. Between 1980 and 2005, the proportion of non-fragmented landscape decreased from 81% to 64% of the Czech Republic's total area (Figure 1); future prognoses assume that the proportion of non-fragmented landscape will only be 53% in 2040.

Eurostat data suggest that, in comparison with neighbouring countries, the Czech Republic has the fastest decreasing proportion of agricultural land as measured by the country's total area. Between 2003 and 2007, the proportion fell by 2.6% in the Czech Republic. Germany and Austria experienced a much slower decrease, and in Poland the proportion of agricultural land as a function of its total area increased by 3.4%.

If agricultural land is not sufficiently protected and agricultural use of this land is not maximally supported, the proportion of developed and other areas will increase to the detriment of agricultural land. The Act on the Protection of Agricultural Land Resources needs to be amended so that the removal of land from agricultural land resources is only possible in exceptional cases and at a sufficient price. However, the amended act has not yet been approved by the Chamber of Deputies. Greater attention should be paid to the creation of territorial and zoning plans. Towns and villages should not change these plans under the pressure of investors and developers.

DATA SOURCES

- Czech Office for Surveying, Mapping and Cadastre
- Evernia, the Research Centre of Applied Ecology

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

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CORINE Land Cover 2006
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Czech Office for Surveying, Mapping and Cadastre
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Miko, L., Hošek, M., et al. Příroda a krajina České republiky (The Nature and the Landscape of the Czech Republic). The Report of the state in 2009. 1. edition. Prague: The Agency for Nature Conservation and Landscape Protection of the Czech Republic, 2009. 102 p. ISBN 978-80-87051-70-2 (in Czech).

18/ Industrial production and its structure

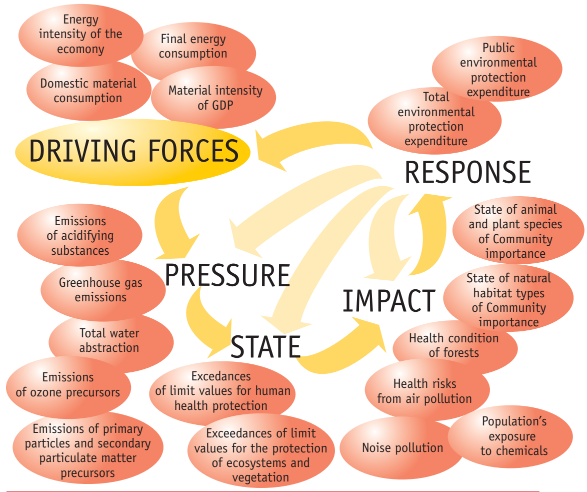
KEY QUESTION ➔

What is the impact of the development of industrial production and its structural changes on the environment?

KEY MESSAGES ➔

Between 2000 and 2008, there was a long-term upward trend in industrial production. However, industrial production was not associated with adverse environmental impacts, which is attributable to industrial restructuring and the "lightening" of production structure emphasizing products with lower energy and emission intensity.

Over the last year-to-year period (2008–2009) industrial output fell by 13.6% in connection with the global economic crisis. This situation has helped to decrease emissions, thus relieving environmental pressure from the industrial sector.



OVERALL TREND ASSESSMENT ➔

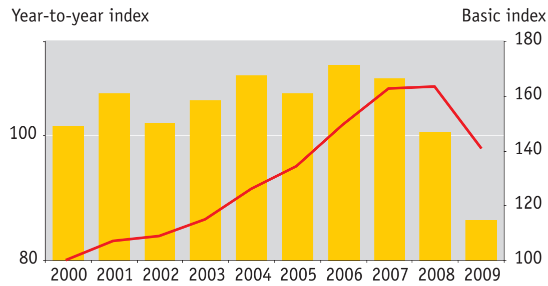
Change since 1990	🙂
Change since 2000	🙂
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➔

The State Environmental Policy of the Czech Republic has the following industrial objectives: to more thoroughly include environmental aspects in industrial policies; to orient industrial production on products with higher finality, a greater increase in the value of inputs and more favourable environmental effects; to support the widest possible introduction of best available techniques (BAT); to support programmes focused on the development of ecologically-minded mechanical engineering and on supporting ecological investments in air protection, the treatment and purification of waste water, the processing and disposal of waste and the introduction of "cleaner" technologies; to reduce pollution emissions into the air and water, not to pollute streams with industrial water and waste chemicals and to improve waste water treatment.

INDICATOR ASSESSMENT

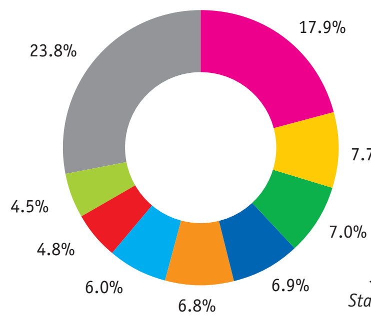
Chart 1 ➔ **An index of industrial production in the Czech Republic, 2000-2009**



Year-to-year index of industrial production (the same period in the previous year = 100)
Basic index of industrial production (2000 = 100)

Source: Czech Statistical Office

Chart 2 ➔ **Industrial production in the Czech Republic [%], 2009**

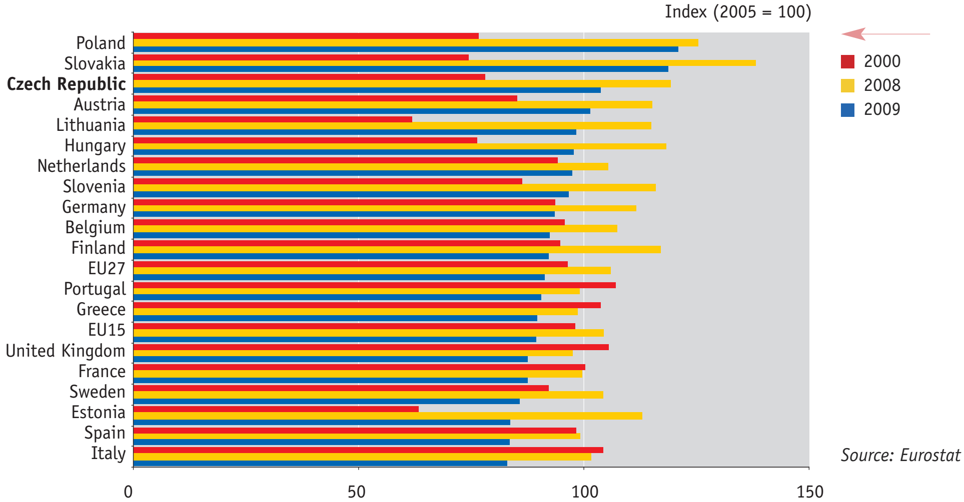


Source: Czech Statistical Office

- Manufacture of motor vehicles (except for motorcycles), trailers and semi-trailers
- Manufacture of computer, electronic and optical products
- Manufacture of fabricated metal products, except machinery and equipment
- Manufacture of machinery and equipment n.e.c.
- Manufacture of food products
- Manufacture of rubber and plastic products
- Manufacture of electrical equipment
- Manufacture of basic metals, metallurgical processing; casting
- Other

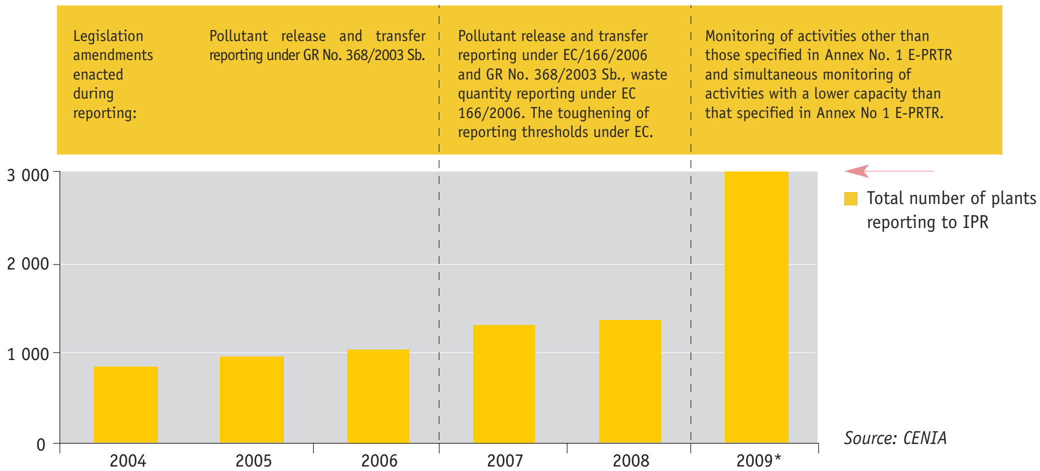
Industrial production as a result of income from the sales of products and services.

Chart 3 ➜ **Industrial production index [index 2005 = 100], an international comparison 2000, 2008 and 2009**



Total industrial production index (i.e. mining, processing and the energy sector, excluding water distribution). The index is recalculated according to the number of days worked.

Chart 4 ➜ **Number of facilities reporting to the Integrated Pollution Register in the Czech Republic, 2004-2009**



**Preliminary data.*

From 2000-2009, **industrial production in the Czech Republic** did not bring with it any increased adverse environmental impacts. Structural changes became apparent, especially through the "lightening" of production, i.e. an increase in the proportion of those sectors producing technologically more complex products with higher added value and lower energy and emission intensity (automotive, electronics, computer technology). In addition, virtually all sectors underwent technologically innovative development. Therefore, the objectives – especially those of the State Environmental Policy of the Czech Republic – have been successfully fulfilled.

Despite slight fluctuations, **industrial production** showed an upward trend between 2000 and 2007 (Chart 1) in contrast to the beginning of the 1990s when there was a lack of raw materials and energy intensive production. Stagnation and the beginning of a decline did not come until 2008 in connection with the global economic crisis. In 2009, industry – including manufacturing – showed the largest year-to-year negative change (decrease) since 2001.

Industrial production fell by 13.6% year-to-year in 2009. The year-to-year decline in industrial production was largely attributable to the production of machinery and equipment (a decrease of 27.2%) and the manufacture of metal structures and products (a decrease of 21.8%). The automotive industry was also significantly affected, i.e. a sector that exports about two-thirds of its production (a decrease of 10.2%). The global recession's impact on this major sector of Czech industry (it has a 17.9% share in industrial production, see Chart 2) was mitigated, in part, by scrapping bonuses abroad that benefited not only domestic car manufacturers, but also the producers of motor vehicle parts and accessories in related manufacturing industries (e.g. rubber and plastics industries). The manufacture of food products was the only sector to experience growth (an increase of 5.3%). However, the decline in industrial production has had a **positive effect on pollutant emissions**, thus relieving environmental pressure from industry. In 2008, after the economic crisis had started to show, industry experienced a year-to-year reduction in NO_x emissions of 0.44%, SO_2 emissions of 27.4%, CO emissions of 24.9% and VOC emissions of 7.96%. PM_{10} and $PM_{2.5}$ emissions were the only substances to display a year-to-year increase, by 17% and 6.9% respectively. Due to the processing methodology, emission figures for 2009 were not available at the time of finalizing this report. There is still relatively **high energy and material intensity** in industry, which impedes the rate at which environmental impacts are being reduced. Energy intensity indicators are affected by the large proportion of the metallurgical, chemical and refinery-petrochemical industries in total processing. However, they have nevertheless been gradually decreasing due to technological innovations and the development of other processing industry branches. Compared to the 1990s, energy intensity in the processing industry has decreased by approximately 20%. **By international comparison**, industrial production in the Czech Republic has been growing faster; at almost double the rate compared to the EU27 average (Chart 3). This comparison also clearly shows that the fall in industrial production in 2009 that occurred in connection with the global economic crisis was felt strongly in all EU countries.

The position of industry in the Czech economy is still extraordinary. In 2009, Czech industry generated 30.3% of GDP, while the EU27 average was about 18%. The proportion was even lower in the EU15 countries – 17.5%, especially due to the gradual dematerialisation of the economy. By international comparison, figures above 25% are only seen in four EU countries (Slovakia, Romania, the Czech Republic and Norway). An advanced way of controlling selected industrial and agricultural activities while achieving a high level of environmental protection as a whole is **Integrated Pollution Prevention and Control (IPPC)**. The measure aims to prevent pollution and, when this is not possible, reduce emission production. Lower environmental pressure is achieved through reducing produced emissions, especially through applying preventative measures rather than end-use technologies that remove already existing pollution. Integrated prevention gets past the principle of approaching the problem within individual components that often results in transferring pollution from one environmental component to another. An important tool for increasing the awareness of pollution releases and transfers in industrial and agricultural emissions discharged into the environment is the **Integrated Pollution Register (IPR)**. The register is maintained pursuant to Regulation of European Parliament and Council 2006/166/EC concerning the establishment of a European Pollutant Release and Transfer Register (the E-PRTR regulation), Act No. 25/2008 Coll., on the integrated pollution register and amending some acts, and Government Regulation No. 145/2008 Coll. on the list of pollutants and threshold values and the information required for reporting to the integrated pollution register. The total number of facilities that reported the required data in the IPR between 2004 and 2009 is shown in Chart 4. Between 2004 and 2009, the scope of reported data changed, mainly in connection with the adoption of the E-PRTR. For the reporting years 2004–2006, all operators (users of a registered substance) reported the same range of data on releases and transfers. For 2007–2008, it already mattered what activity was carried out at the facility and, at the same time, a new obligation was imposed on operators to report the quantities of waste transferred out of the facilities. From reporting year 2009, pollutant releases and transfers as well as waste quantity transfers shall be reported if they exceed threshold values specified for the given substances in the facilities specified by the E-PRTR as well as in facilities with other activities and for activities with a lower capacity than specified by the E-PRTR. This is the main reason behind the sharp increase in the number of operators that reported data for 2009 to the IPR in 2010.

Through operating the register, the Czech Republic also fulfils its obligations under the Protocol on Pollutant Release and Transfer Registers that entered into force for the Czech Republic on 10 November 2009 (108/2009 Coll. of international treaties). The protocol is the first international legally binding document on pollution release and transfer registers. Adhering to the protocol helps insure compliance with Article 5 of the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention). The Czech Republic's **future economic development** involves a large degree of uncertainty, as it will greatly depend on the intensity and sustainability of the recovery of its major trading partners. However, it is considered realistic to expect that the Czech economy will return to growth somewhere in the region of 1% in 2010.

DATA SOURCES

- Czech Statistical Office
- Ministry of Industry and Trade
- Czech Hydrometeorological Institute
- CENIA, Czech Environmental Information Agency
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1568)

Integrated Pollution Prevention and Control (IPPC)
http://www.ippc.cz/

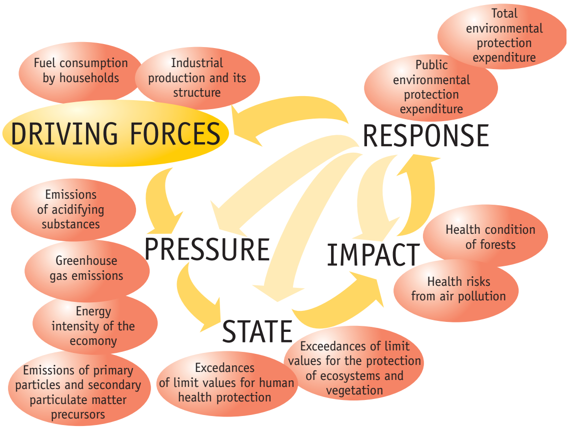
Integrated Pollution Register (IPR)
http://www.irz.cz

Overview of Czech industry
http://www.mpo.cz/dokument65939.html

19/ Final energy consumption

KEY QUESTION

Are energy consumption and subsequent potential environmental burdens decreasing in the Czech Republic?



KEY MESSAGES

Since 2007 there has been a continued decrease in final energy consumption; a decrease of 7.8% was recorded in 2009.

With regard to heat consumption, there has been a marked decline over the past 10 years. From 2000 to 2008, heat consumption fell by 22%.

By sectoral breakdown, the largest proportion of energy is consumed in industry (39.8%), transport (24.6%) and households (22.1%).

OVERALL TREND ASSESSMENT

Change since 1990

Change since 2000

Last year-to-year change

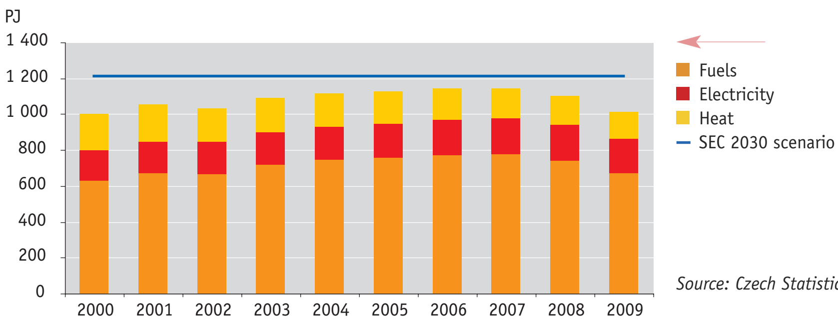
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The aim of the **State Environmental Policy of the Czech Republic** is to promulgate rational energy consumption and supply within sustainable development principles.

The **State Energy Policy (SEP)** aims to maximise heat savings in buildings within the commercial, state and municipal sectors, as well as with residential users (individual households); to maximise the efficiency of energy-consuming appliances and power distribution systems; and to reduce losses in distribution lines.

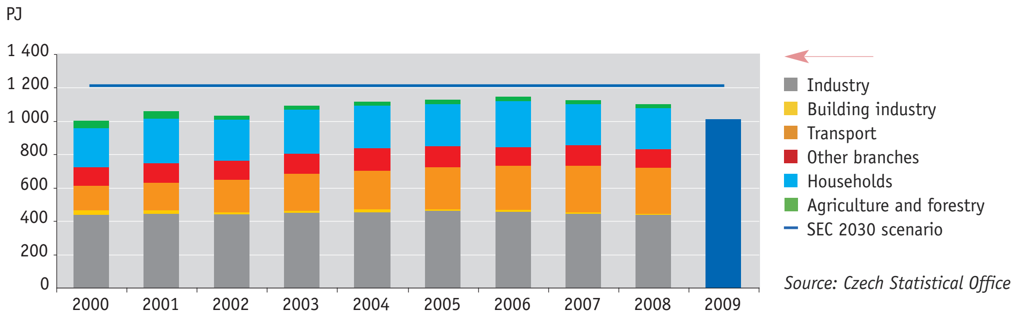
INDICATOR ASSESSMENT

Chart 1 → **Final energy consumption trends by resource in the Czech Republic [PJ], 2000–2009**



Source: Czech Statistical Office

Chart 2 ➜ **Final energy consumption trends by sector in the Czech Republic [PJ], 2000–2009**



Due to the processing methodology, figures for the sectoral breakdown of final energy consumption in 2009 were not available at the time of finalizing this report.

Chart 3 ➜ **Final energy consumption by sector, an international comparison [%], 2008**

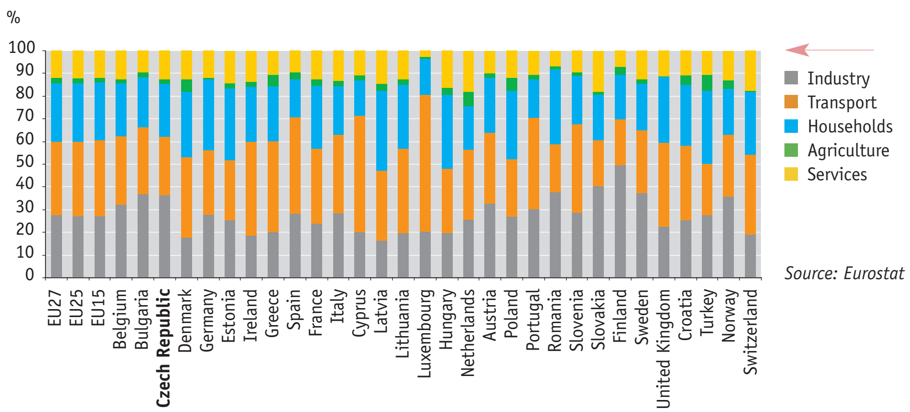
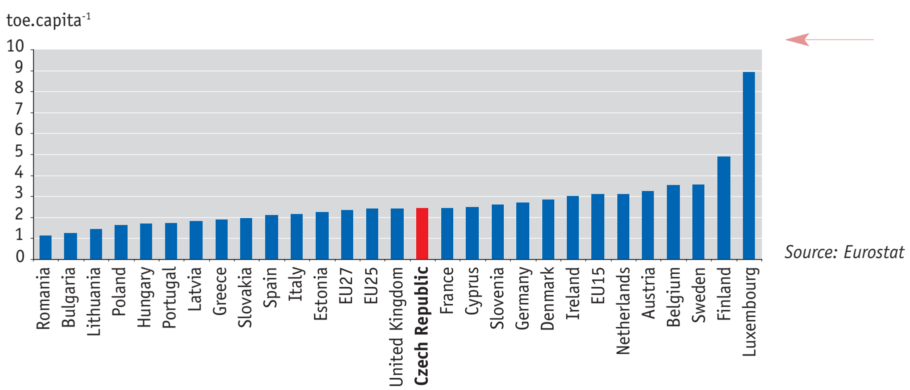


Chart 4 ➜ **Final energy consumption per capita, an international comparison [toe.capita^{-1}], 2008**



toe – Ton of Oil Equivalent, a unit corresponding to the energy obtained from 1 t of oil (41.868 GJ or 11.63 MWh).

Final energy consumption (Chart 1) had been increasing over the past decade up to 2006. However, the trend reversed in 2007 and there have been year-on-year decreases in total consumption ever since (0.36% in 2007, 3.6% in 2008 and 7.76% in 2009). For the first time during the monitored period (2000–2009), all forms of energy showed a year-to-year decrease in consumption. The consumption of fuels experienced the most significant decrease, by 9.5%, but electricity and heat consumption also declined – by 5.5% and 4.9% respectively.

By **sectoral breakdown** (Chart 2), the largest proportion of energy is consumed in **industry** (39.8%). While **final energy consumption** in this area showed year-to-year fluctuations, since 2006 there have been decreases each year (the 2007-2008 year-to-year decrease was 1.6%). Within the processing industry, the most energy intensive branches are the production of metals and metallurgical processing, the production of non-metallic mineral products and the chemical and petrochemical industries.

Up to 2006, the second largest consumer of energy had been **households**, where consumption had grown consistently in connection with the improvement of the population's standard of living. However, this sector displayed a noticeable decline in consumption over the past two years, namely by 9.7% in 2007 and 1.3% in 2008. This trend has been caused by the rising prices of electricity, heat and fuel and the consequent efforts by residents to achieve greater savings. Despite energy savings within the sector, the proportion of energy consumption by households in total energy consumption was 22.1% in 2008.

Since 2007, the amount of energy consumed in households was surpassed by the **transport** sector (24.6% of final energy consumption in 2008), where consumption increased at a rapid pace throughout the monitored period. From 2000 to 2007, energy consumption in transport increased by 86%. A decrease in energy consumption did not occur until the last year-to-year period (2007–2008), in which the transport sector showed a decline of 2.5%. However, this decline appears to be related to the incipient economic crisis that resulted in overall lower traffic volume.

By **international comparison** to both the EU15 and EU27 countries (Chart 4), the Czech Republic has average per-capita energy consumption (2.44 toe/capita compared to 3.11 and 2.35 toe/capita respectively). Regarding energy consumption distribution in national economy sectors, the Czech Republic's industry accounts for a greater proportion of energy consumption compared to the EU27 and EU15 averages and, despite a strong increase in the transport sector over the past few years, energy consumption in that sector is still below the European average (Chart 3).

With the application of the measures of the **State Energy Policy**, the energy economy will head towards a higher valuation of energy inputs, increased savings and better energy management. It is expected that electricity consumption will increase, yet at a gradually diminishing rate. Over the 2000–2030 period, the average year-to-year increase in electricity consumption will be 1.3%. The proportion of renewable energy sources in the domestic consumption of primary sources will increase to 15.7% by 2030.

DATA SOURCES

- Czech Statistical Office
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1557)

State Energy Policy of the Czech Republic
http://www.mpo.cz/dokument5903.html

20/ Fuel consumption by households

KEY QUESTION

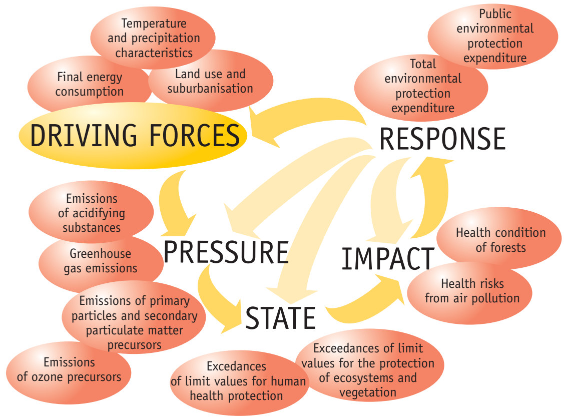
What progress has been made in reducing local heating units that have a negative impact on air quality and public health?

KEY MESSAGES

Household heating significantly contributes to air pollution. In 2008, 36.4% of total PM_{10} emissions was discharged from local heating units.

The largest proportion of households is heated using natural gas and district heating. The number of households that use these heating methods is gradually increasing. In addition, the amount of heat generated from solar collectors and heat pumps is increasing each year.

The number of households that burn solid fuels showed a year-to-year increase, the sales of brown coal briquettes, coke and black coal to households grew by an aggregate 7.3% in 2009.



OVERALL TREND ASSESSMENT

Change since 1990	positive
Change since 2000	positive
Last year-to-year change	negative

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

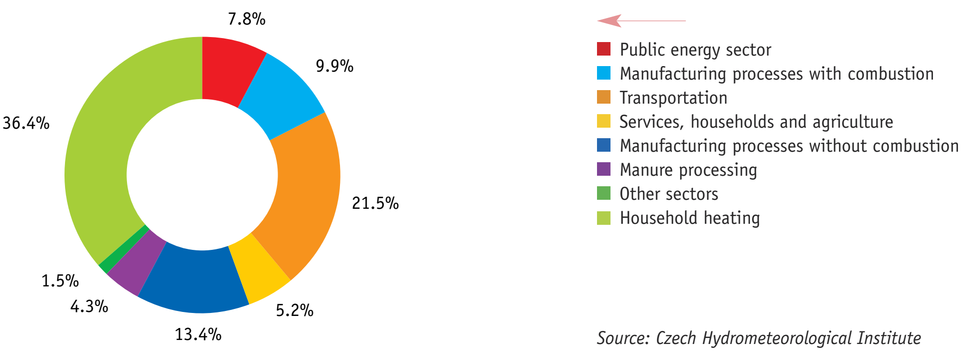
The **State Environmental Policy of the Czech Republic** aims to reduce coal-fired local heating units that severely pollute the ground layer of the atmosphere. In addition, undisciplined burning of municipal waste produces emissions of toxic pollutants.

The **State Energy Policy** aims to promote heat savings in buildings and to support heat generated from renewable energy sources.

The **ecological tax reform** encourages citizens to use cleaner fuels for heating. Since January 2008, an excise tax (about 10% for coal, about 1% for electricity for heating) has been imposed on fuels that produce greater amounts of harmful emissions. Conversely, cleaner fuels are exempt from taxes (biomass and other renewable sources, natural gas for household heating). Furthermore, wood briquettes and pellets are now subject to a reduced VAT rate, which means an additional price advantage.

INDICATOR ASSESSMENT

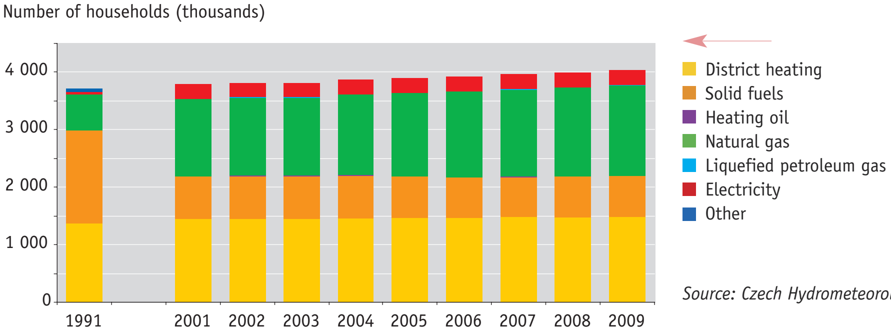
Chart 1 → **PM_{10} emissions from the different economic sectors in the Czech Republic [%], 2008**



Source: Czech Hydrometeorological Institute

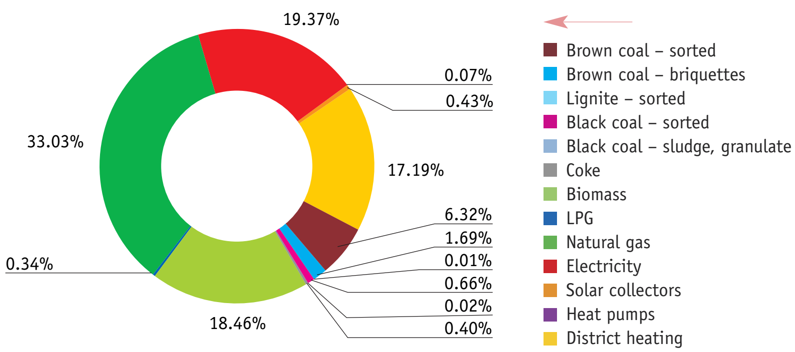
Due to the processing methodology, figures for 2009 were not available at the time of finalizing this report.

Chart 2 → **Household heating methods in the Czech Republic, 1991-2009**



Source: Czech Hydrometeorological Institute

Chart 3 → **Fuel and energy consumption by household (the proportion of energy contained in individual sources) in the Czech Republic [%], 2009**



Source: Ministry of Industry and Trade

The mix of household heating is closely linked to the air quality of the immediate environment in which we live. Local heating units significantly contribute to air pollution, especially if poor quality fuels (or even garbage) are used for heating. However, combustion technology also plays a major role. When a modern automatic brown-coal boiler is used, the amount of emissions may be lower than is the case for biomass combustion in an average boiler.

In 2008, 36.4% of total **PM_{10} emissions** originated from local heating units (Chart 1). Compared to 2007, total PM_{10} emissions from local heating units increased from 12.0 kt to 12.9 kt. This increase in emissions was primarily due to a power average temperature in winter season and increase of number of households using solid fuels for heating. In 2008, total PM_{10} emissions in the Czech Republic were 35.42 kt.

In the Czech Republic, **limit values** for particulates that are valid in all EU countries are regularly exceeded – not only locally, but also in larger areas. In 2009, 24-hour limit values for PM_{10} concentrations were exceeded in 4.4% of the Czech Republic, i.e. this represents areas that house 18% of the total population.The limit value for annual PM_{10} concentrations was exceeded in 0.54% of the Czech Republic, i.e. in areas that house 3.5% of the total population (the areas where the 24-hour and the annual limit values were exceeded overlap).

Since 1991, the **number of households** using solid fuels – especially coal – for heating has significantly declined; to a large extent, these fuels have been replaced by natural gas (Chart 2). Currently, natural gas and district heating (DH) are the most widely used household heat sources in the Czech Republic. Chart 2 shows “main heating”; also, it needs to be highlighted that the division of solid fuels into coal and wood is difficult to specify since these two fuels are, to a large extent, burned together and, from the user’s perspective, their actual mutual proportion largely depends on their price. Households usually use multiple types of fuels for heating – the most common combinations include gas/wood and coal/wood, in rural areas. Another typical combination is gas with electricity/coal/wood.

In 2009, the total **amount of energy** that was delivered to households (100% in Chart 3) within the different sources was about 273 000 TJ, which is 0.25% less than in 2008.

The number of households that burn **solid fuels** showed a year-to-year increase. The sales of brown coal briquettes, coke and black coal to households grew by an aggregate 7.3% in 2009. In addition, there has been a decrease in biomass consumption by 1.5%.

The consumption of brown coal **briquettes** has increased due to imports of good-quality and reasonably-priced German **briquettes**. Increased supply of **coke** to households was caused by a short-term price drop and sales difficulties in the industrial market. Generally reduced logging resulted in a decreased biomass supply, while the supply **of biomass pellets and briquettes** has grown steadily.

The amount of heat generated using **solar collectors** and **heat pumps** keeps increasing; the year-to-year increase for both systems was 30%, same as last year. Solar collectors are more often used for producing hot water and for preheating water for heating. However, the use of both systems is still quite limited. In 2009, heat pumps generated 1 172 TJ and solar collectors 199 TJ, which corresponds to 4.3 and 0.73 ‰, respectively, of the total amount of heat for households in the Czech Republic.

A **new Decree** No. 13/2009 Coll. to Act No. 86/2002 Coll., on air protection, came into force that sets fuel quality requirements for stationary sources in terms of air protection. The decree also applies to fuels (both solid and liquid) that are intended for combustion in small stationary sources. In particular, it tightens the limit for the maximum allowable sulphur content in fuels and the requirements for their minimum calorific value.

An amendment to Act No. 86/2002 Coll. on air protection is currently **under preparation** – in addition to transposing the requirements of Directive 2008/50/EC, the amended act is aimed at improving the effectiveness of existing instruments in order to significantly contribute to improving air quality in all regions of the Czech Republic. As an important step within the amended act, the application of emission ceilings will be expanded (to include more than the current extra large combustion sources of air pollution) **possibilities for toughening emission limits** and technical requirements for emission sources due to increased air pollution levels will be strengthened, and **an individual approach to sources will be introduced** – again, with regard to local air pollution levels.

In 2009, the **Green Savings** national subsidy programme was announced. It supports reducing energy requirements for heating in buildings, thus reducing the amount of emissions produced by local sources for household heating.

DATA SOURCES

- Czech Hydrometeorological Institute
- Ministry of Industry and Trade

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1566)

State Energy Policy of the Czech Republic
http://www.mpo.cz/dokument5903.html

Act No. 86/2002 Coll., on air protection

Act No. 261/2007 Coll., on the stabilization of public budgets (the Ecological Tax Reform)

Decree No. 13/2009 Coll., on the setting of fuel quality requirements for stationary sources in terms of air protection

21/ Energy intensity of the economy

KEY QUESTION →

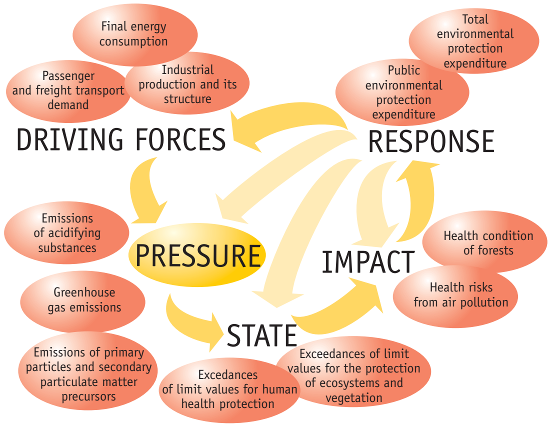
Are the efforts in reducing energy intensity of the Czech economy successful?

KEY MESSAGES →

The energy intensity of Czech GDP is still high compared to the EU average, although it has been steadily declining since 2004. The energy intensity of the economy showed a 1.8% year-to-year decrease.

High energy intensity is seen in the transportation, industry and agriculture sectors.

Primary energy sources consumption fell by 6.9% year-to-year, with a particularly significant decrease in the consumption of solid fuels.



OVERALL TREND ASSESSMENT →

Change since 1990	
Change since 2000	
Last year-to-year change	

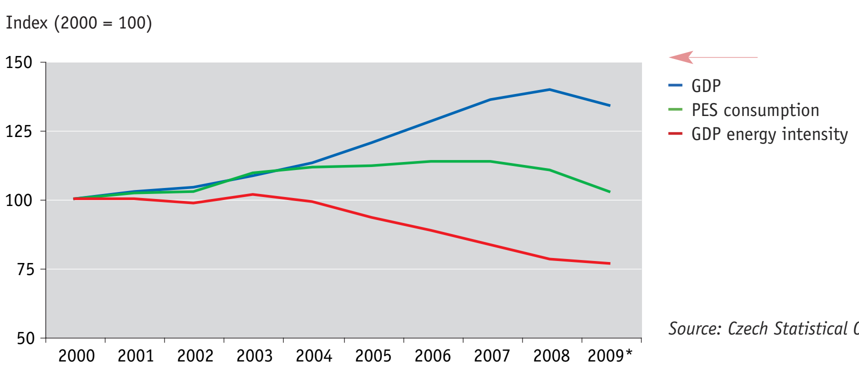
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The **State Environmental Policy of the Czech Republic** aims to reduce energy intensity (energy consumption per GDP unit) in pursuance of the objectives of the State Energy Policy. Another goal is to reduce the energy intensity of the national economy by developing regional energy policies, performing energy audits and engaging in activities directed at reducing energy losses during energy transfer.

The long-term objectives of the State Energy Policy (SEP) include accelerating then stabilising the decrease in the energy intensity of GDP at an annual rate of 3.0–3.5% (indicative objective); accelerating then stabilising the decrease in the energy intensity of GDP at an annual rate of 1.4–2.4% (indicative objective).

INDICATOR ASSESSMENT

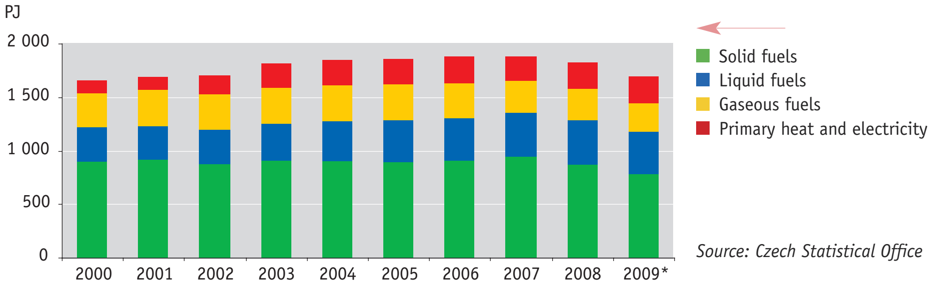
Chart 1 → **Energy intensity of Czech Republic's GDP [index, 2000 = 100], 2000–2009**



Source: Czech Statistical Office

**Data for 2009 are preliminary.*

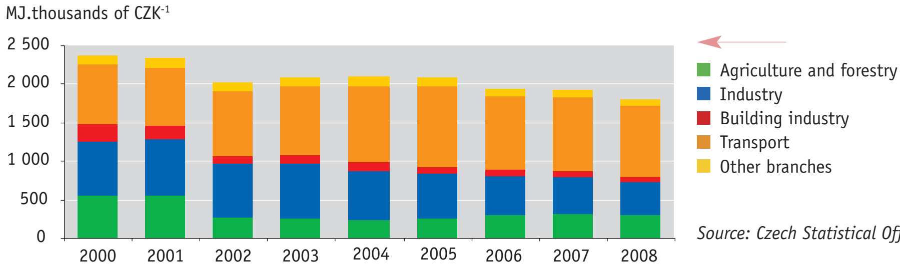
Chart 2 → **PES consumption trends in the Czech Republic [PJ], 2000-2009**



Source: Czech Statistical Office

*Preliminary data.

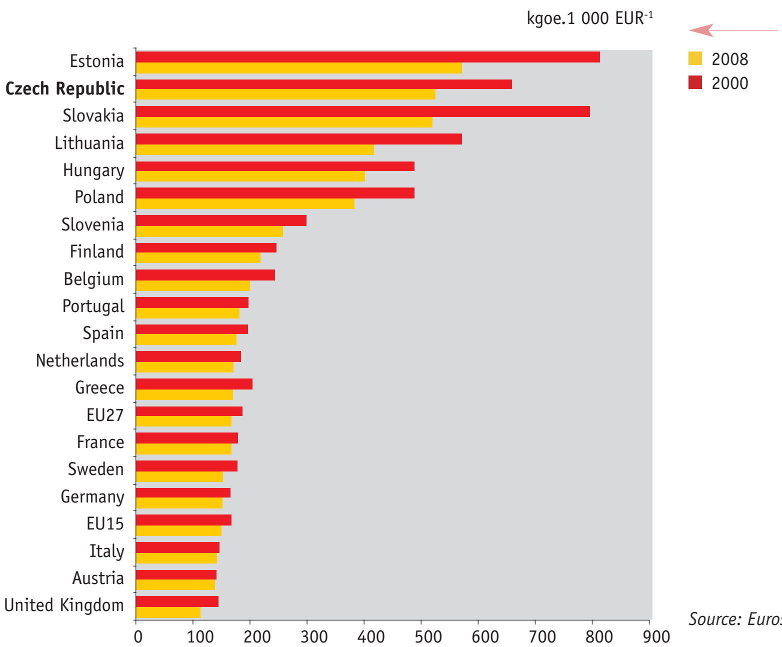
Chart 3 → **Energy intensity trends by sector, expressed as the quotient of total energy consumption in the sector and gross added value in the sector in the Czech Republic [MJ.thousands of CZK^{-1}], 2000–2008**



Source: Czech Statistical Office

Due to the processing methodology, figures for 2009 were not available at the time of finalizing this report.

Chart 4 → **Energy intensity of the economy, an international comparison [kgoe.1 000 EUR^{-1}], 2000, 2008**



Source: Eurostat

kgoe – Kilogram of Oil Equivalent, a unit corresponding to the energy obtained from 1 kg of oil (41.868 MJ or 11.63 kWh).

The year-to-year rate of **energy intensity decline** was very unstable and greatly fluctuated between 2000 and 2003. However, since 2004, the situation has considerably improved and energy intensity has been rapidly decreasing (Chart 1). In addition to economic growth, this fact has also been caused by the implementation of the State Energy Policy that was adopted in March 2004. Domestic energy consumption per GDP unit has been continuously decreasing since 2004.

In recent years, the **year-to-year decline** in the energy intensity of the Czech Republic's GDP was greater than 5%. In 2008, energy intensity decreased by 6.4%, which was the most pronounced decline within the monitored period since 1997.

However, both primary energy sources (PES) consumption and GDP declined in 2009 due to the financial and economic crisis, which also significantly impacted the economy's energy intensity. Thus, although PES consumption decreased by a considerable 6.9%, the economy's energy intensity decreased by only 1.8%.

Increasing energy **efficiency** is no doubt the most significant way to reduce energy demand, pollutant emissions into the environment and the growth of import energy dependence, and to increase the competitive strength of the energy sector and the economy as a whole.

The **consumption of primary energy sources** (PES) in the Czech Republic (Chart 2) has been continuously growing on a year-to-year basis since 2000, by 0.5 – 6.6%. The trend reversed in 2007 and PES consumption started to decline (by 0.1% in 2007 and 3.0% in 2008). In 2009, the year-to-year decline in PES consumption was considerable (6.9%).

Within **the PES structure**, there has been a considerable reduction in the consumption of **solid fuels**: between 2007 and 2009, their consumption decreased by 9.9% on a year-to-year basis, reducing their proportion in total PES consumption to 46.2%. The consumption of other fuels also decreased (liquid fuels by 5.5% and gaseous fuels by 6.2%), with the exception of primary electricity, which remained the same as the 2008 level.

In proportion to the amount of GDP generated, the Czech Republic has been consuming more primary energy and electricity sources than objectively required (the value of consumed energy translates little into added value). Despite these achievements, the **energy and electricity intensity of Czech GDP** remains **high compared to the EU average** (Chart 4).

High energy intensity (Chart 3) is seen in the transport, industry and agriculture sectors. However, in the last year-to-year reporting period (2007–2008), energy intensity decreased in all sectors, including transport – i.e. a sector that had previously only experienced yearly increases (with the exception of 2006).

In line with EU practices, the Czech Republic has already implemented standard systemic measures conditioning the **growth in economic efficiency** (adjusting energy prices, incentive measures towards energy savings). For example, the Operational Programme Enterprise and Innovation (OPEI), Operational Programme Environment (OP E) and the Green Savings programme are some of these measures.

With the application of the **State Energy Policy** measures, energy **management will head towards** a high valuation of energy inputs. The energy intensity of GDP will decrease from 1.212 $MJ.CZK^{-1}$ to 0.454 $MJ.CZK^{-1}$, i.e. to 37%.

The **valuation** of energy consumed for GDP will increase along with savings, and energy management will improve. The combination of both factors will contribute to positive **trends in the energy intensity of GDP** and a fast convergence with levels found in other EU countries.

For the period until 2030, the **average decline in the energy intensity of GDP** is projected at 3.22%. The average annual rate of decline in the **electricity intensity of GDP** is projected at 2.35%, while **import energy intensity** is expected to increase to 57.8% by 2030.

DATA SOURCES

➜ Czech Statistical Office
➜ Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

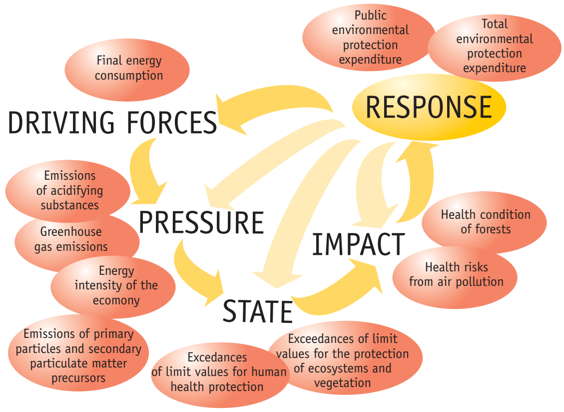
CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1534)

State Energy Policy of the Czech Republic
http://www.mpo.cz/dokument5903.html

22/ Structure of electricity and heat generation

KEY QUESTION

What is the mix of energy sources and what is the proportion of renewable sources that do not pollute the air with emissions of pollutants and greenhouse gases?



KEY MESSAGES

In 2009, 82 250 GWh of electricity was produced in the Czech Republic, which is 1.5% less than in 2008. Steam power plants, mainly lignite-fired, accounted for the largest share of generated electricity (63%); the second largest electricity producer was nuclear power plants (33%).

Electricity generation from renewable sources is increasing. The proportion of electricity from renewable energy sources in the Czech Republic's gross electricity consumption increased significantly from 5.17% in 2008 to 6.79% in 2009.

While total heat generation is declining each year, heat generation from renewable sources is significantly increasing.

OVERALL TREND ASSESSMENT

Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

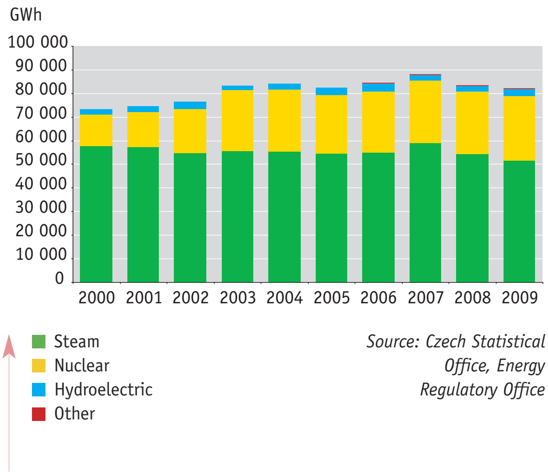
The EU Energy Policy has defined the maximum use of renewable energy sources as one of its key issues.

The **State Environmental Policy of the Czech Republic** aims for the maximum replacement of non-renewable sources with renewable sources. In the Accession Treaty that was signed in Athens in March 2003, the Czech Republic committed to achieving a minimum proportion of 8% of electricity from renewable sources in the Czech Republic's gross electricity consumption by 2010.

In connection with the adoption of new **European Directive** 28/2009/EC **on the promotion of the use of energy from renewable sources**, the common European objective to achieve a 20% proportion of energy from RES in final energy consumption by 2020 was distributed among the EU member states. The Czech Republic's objective was set at a 13% proportion of energy from RES in final energy consumption by 2020.

The **State Energy Policy of the Czech Republic** aims to prevent exceeding the threshold levels for energy import dependence (indicative targets):
– a maximum of 45% in 2010
– a maximum of 50% in 2020
– a maximum of 60% in 2030.

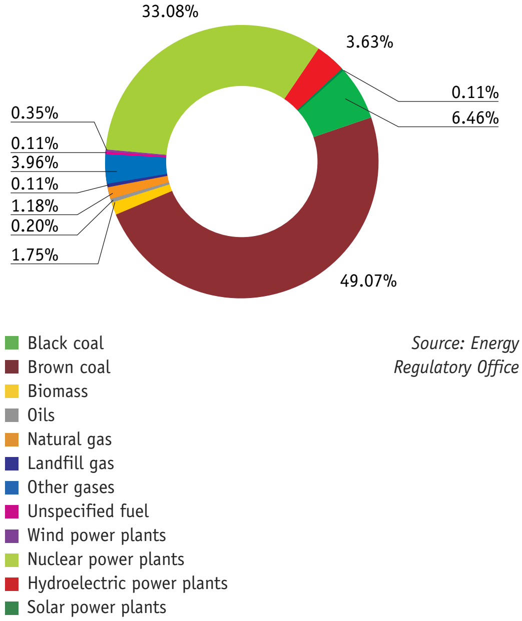
Chart 1 → **Electricity generation by power plant type in the Czech Republic [GWh], 2000–2009**



Source: Czech Statistical Office, Energy Regulatory Office

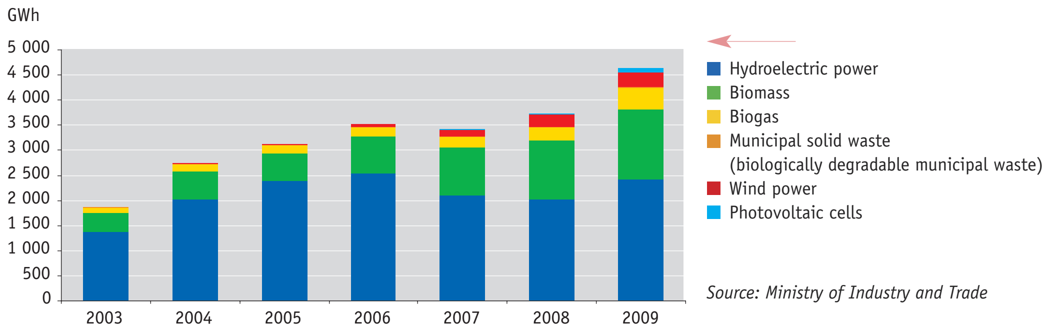
The Steam category includes steam, gas-steam, gas and combustion power plants. The Other category includes wind, solar, geothermal and other alternative power plants.

Chart 2 → **Electricity generation by fuel type [%], 2009**



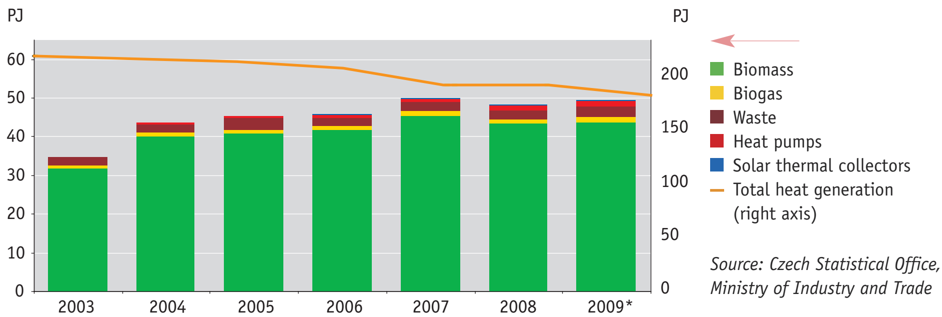
Source: Energy Regulatory Office

Chart 3 → **Electricity generation from renewable energy sources in the Czech Republic [GWh], 2003–2009**



Source: Ministry of Industry and Trade

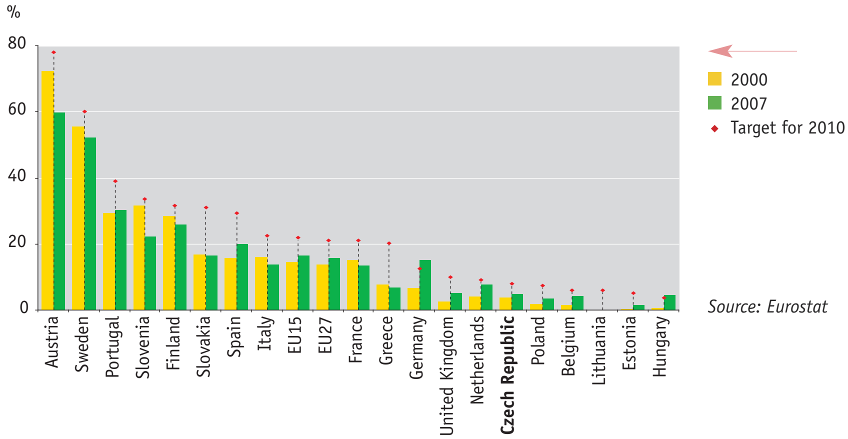
Chart 4 → **Heat generation from renewable energy sources, total heat generation in the Czech Republic [PJ], 2003-2009**



Source: Czech Statistical Office, Ministry of Industry and Trade

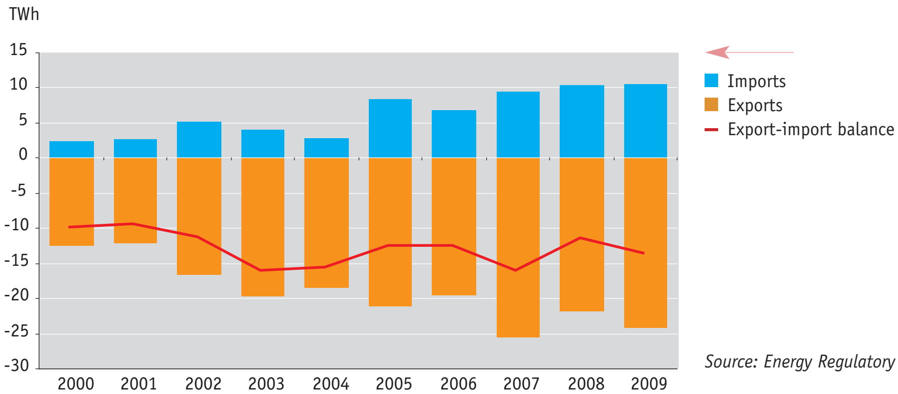
**Data for 2009 are preliminary.*

Chart 5 ➜ **Proportion of RES in gross electricity consumption [%], an international comparison, 2000, 2007**



Source: Eurostat

Chart 6 ➜ **Electricity imports and exports from the Czech Republic [TWh], 2000–2009**



Source: Energy Regulatory Office

Over the 2000–2007 period (except in 2005), **total electricity generation** grew year-to-year by 1–7%. However, there was a reversal in the trend in the past two years and total electricity generation is now decreasing – by 5.3% in 2008 and by 1.5% in 2009. The reduction in electricity generation took place in coal-fired power plants, with other energy sources experiencing an increase in production. In 2009, the largest increases occurred in nuclear and hydroelectric plants in which electricity generation grew by 656.8 and 606.4 GWh respectively (Chart 2).

In the Czech Republic, **steam power plants** (mainly lignite-fired) still account for the largest proportion in **electricity generation** (62.8%). In 2009, 51 683 GWh of electricity was generated by steam power plants.

Nuclear power plants are second (the Dukovany and the Temelín nuclear power plants). With a total production of 27 208 GWh, they contributed 33% of the electricity generated in 2009.

Each year, electricity generation from **renewable sources** (RES) is increasing in importance (Chart 3). In 2008, 4 634 GWh of electricity was obtained from RES, which corresponds to 5.7% of the total amount of electricity generated in the Czech Republic (in 2008, the proportion was 4.5%).

The proportion of electricity generated from RES in gross electricity consumption in the Czech Republic showed a significant year-to-year increase from 5.17% in 2008 to 6.79% in 2009. However, this is still short of 8%, the indicative target for 2010.

By international comparison, the Czech Republic is among the EU countries with the lowest proportion of RES in total electricity consumption (Chart 5). The problem is the limited RES potential that is available in the Czech Republic – the potential for hydroelectric plants is not as great as in Norway or Austria and the potential for wind power plants is not as great as those in Germany. However, the potential for biomass use is comparable to other European countries.

The mix and the proportion of the different **renewable sources** are rather uneven (Chart 3). Electricity generation in hydroelectric plants accounts for the highest proportion (52.4% of RES), followed by electricity generation from biomass (29.7%). Other sources remain relatively underused; they mainly include energy generation from biogas (9.5%), wind power (6.2%), photovoltaic cells (1.92%) and the incineration of municipal solid waste (0.24%).

Thanks to high subsidies and low purchase prices, **solar energy** is experiencing a boom, with electricity generation from photovoltaic cells soaring from 13 GWh to 89 GWh year-to-year (Chart 3). Distribution companies are obligated to buy electricity from these sources at a favourable state-guaranteed price. However, subsidies for energy generation from renewable sources have resulted in the risk of electricity becoming more expensive and – according to distributors – the rapid development of photovoltaics also threatens the stability of the electrical grid. The Energy Regulatory Office is therefore preparing a reduction in electricity purchase prices from 2011 to which photovoltaic power plants will need to adapt.

In 2009, electricity **exports a**mounted to 22 230 GWh (Chart 6), i.e. 27% of all production. In the same year, however, 8 586 GWh of electricity was imported. The balance of exports and imports is thus 13 644 GWh, which represents 16.6% of the total amount of electricity generated in the Czech Republic (82 250 GWh).

Total heat production in the Czech Republic (Chart 4) is declining every year. Between 2003 and 2009, it dropped by 16.7% and in 2009 it showed a year-to-year decrease of 4.7%. In the Czech Republic, solid biomass contributes the highest proportion (88.4%) to **heat energy** generation from RES, while the proportions of other RES in heat generation are considerably lower. The principal factor in estimating heat generation from RES is the consumption of biomass by households.

Energy security includes everything the state must do in order to prevent threats to the steady supply of energy into the national economy. Its interruption may lead to enormous economic losses and, in the worst case scenario, a loss of life.

The Czech Republic is nearly **self-sufficient** only in electricity generation from coal since this raw material is mined domestically. In addition, the Czech Republic exports both coal and electricity. At the same time, however, the Czech Republic is **dependent** on oil and gas supplies and it also imports nuclear fuel for its nuclear power plants. More than two-thirds of oil and gas and all nuclear fuel are bought from Russia.

An increased proportion of energy from renewable sources leads to diversification in the fuel mix that is used, which helps to improve the security of the energy supply. **Using energy from renewable sources** is now generally more expensive than using hydrocarbons, but the gap is narrowing, especially when the costs associated with climate change are taken into account.

According to the **long-term projections presented in the State Energy Policy of the Czech Republic**, the Czech Republic's imports of energy sources will increasingly exceed exports. At the end of the period (2030), energy imports will be dominated by nuclear fuel (35%) followed by natural gas (34%), liquid fuels (14.5%), and black coal and coke (9% of all imports of energy sources). The Czech Republic will be fully dependent on natural gas, oil and nuclear fuel, and highly dependent on black coal (55%). The Czech Republic's dependence on energy imports will nearly double (from 40% to 60%).

DATA SOURCES

- Czech Statistical Office
- Ministry of Industry and Trade
- Energy Regulatory Office
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

CENIA, a list of key indicators
http://issar.cenia.cz/issar/page.php?id=1560

State Environmental Policy of the Czech Republic
http://www.mzp.cz/cz/statni_politika_zivotniho_prostredi

State Energy Policy of the Czech Republic
http://www.mpo.cz/dokument5903.html

23/ Passenger and freight transport demand

KEY QUESTION

What are the trends in the Czech Republic's transport characteristics and the subsequent environmental pressures from transport?

KEY MESSAGES

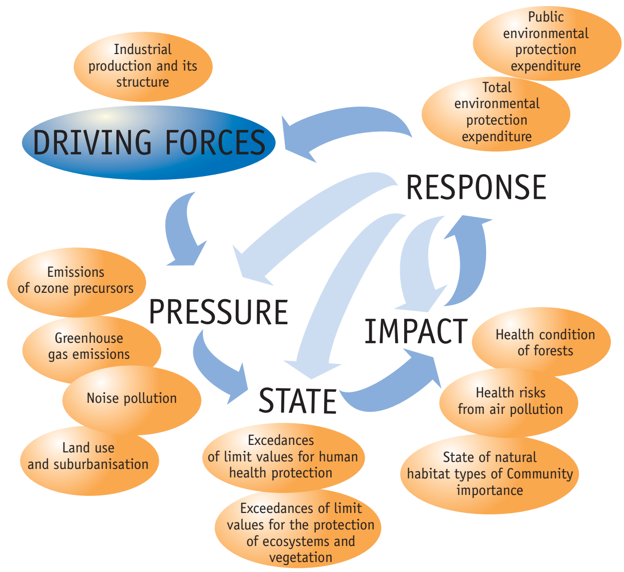
After previous increases, total passenger transport demand in the Czech Republic stagnated in 2009. In 2009, total freight transport demand showed a significant year-to-year decline of 12.6%; the drop occurred in both rail and road transport.

The significance of rail for passenger and freight transport has decreased in the Czech Republic. In 2009, the rail system only accounted for 5.6% of total passenger transport in the Czech Republic, transporting 12.5 million fewer passengers than the previous year. It accounted for 21.2% of freight transport. This is contrary to the objectives of both the Transport Policy of the Czech Republic and the State Environmental Policy of the Czech Republic. Urban and suburban public transport is an exception; it shows a clear increase in the significance of rail.

Following a slight decrease in 2008, fuel consumption in the transport sector increased in 2009. This was more markedly true in the case of diesel (1.9%) than petrol (0.9%). As a result, there has been a continuing growth in greenhouse gas emissions from transport, as well as particulate matter emissions, which are mainly produced by combustion in diesel engines.

Alternative fuels and drives play a minimum role in transport in the Czech Republic. However, the consumption of biofuels (bioethanol and biodiesel) has increased as a result of the mandatory increased biofuel content in petrol and diesel.

NO_x, VOC and CO emissions from transport have declined, mainly due to the decrease in these emissions from individual passenger transport. With transport being a major producer of these pollutants, the decreased production of these pollutants could help improve air quality in areas with heavy traffic.



OVERALL ASSESSMENT

Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

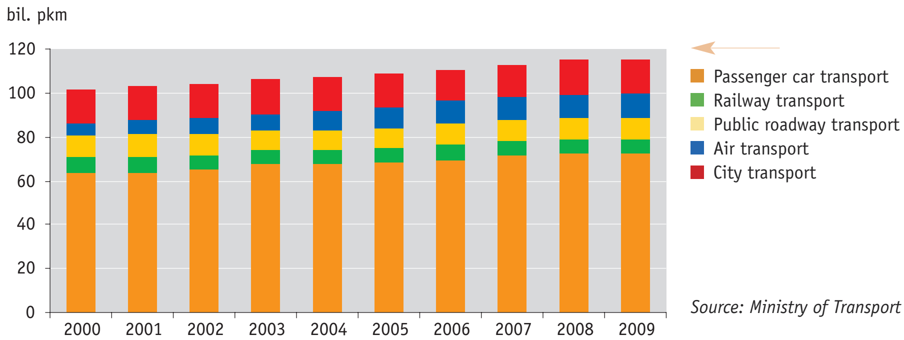
The transport-related priorities of the current **State Environmental Policy of the Czech Republic** for 2004–2010 include shifting the passenger and freight transport structure in favour of environmentally friendly modes, reducing the impact of road transport on the environment, reducing landscape fragmentation due to transport infrastructure, reducing the consumption of non-renewable energy sources in transport and minimizing the impacts of transport on human health and ecosystems in terms of air pollution and noise from transport.

The **Transport Policy of the Czech Republic for 2007–2013** is based on a global objective that was developed through four cross-cutting and five specific priorities that are directly related to the transport sector. The global objective of the Policy is „...to create conditions for ensuring quality transport with a focus on its economic, social and environmental impacts within the scope of sustainable development principles, and to lay realistic foundations to initiate changes in the proportions among individual transport modes". The thematic priorities address achieving a suitable modal split, ensuring a quality transport infrastructure, improving transport safety and promoting transport development in regions. One of the cross-cutting priorities is „Limiting the environmental and public health impacts of transport in line with sustainable development principles".

The proposed measures to implement this priority should focus on reducing air pollution caused by transport, strengthening state supervision in the area of state technical inspection of vehicles, minimizing the impact of transport on ecosystems and human health in terms of noise and emissions from transport. The objectives are not quantified either in the applicable State Environmental Policy of the Czech Republic or in the Transport Policy of the Czech Republic.

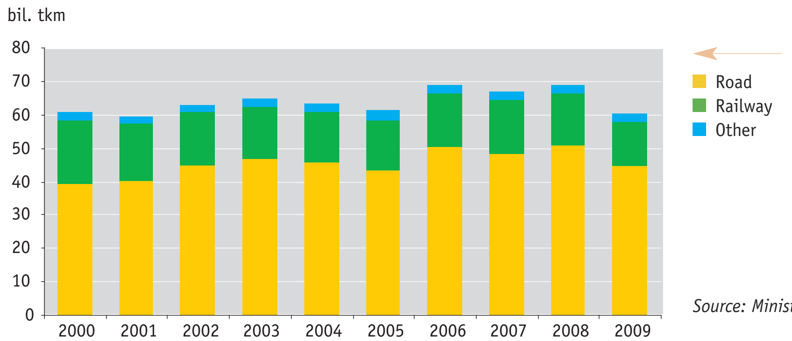
INDICATOR ASSESSMENT

Chart 1 ➜ **Development of passenger transport demand and structure in the Czech Republic [billions of pkm], 2000–2009**



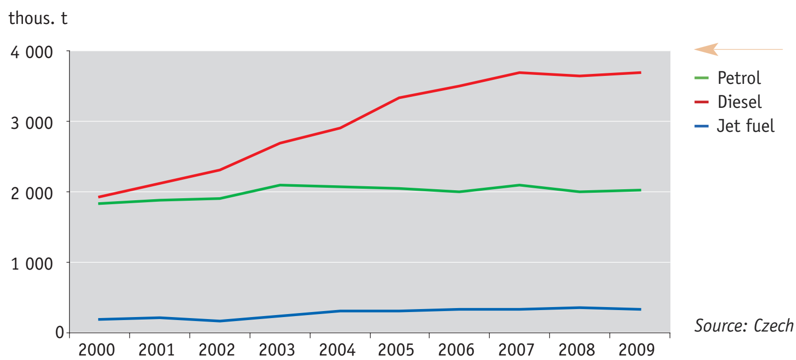
Source: Ministry of Transport of the Czech Republic

Chart 2 ➜ **Development of freight transport demand and structure in the Czech Republic [billions of tkm], 2000–2009**



Source: Ministry of Transport of the Czech Republic

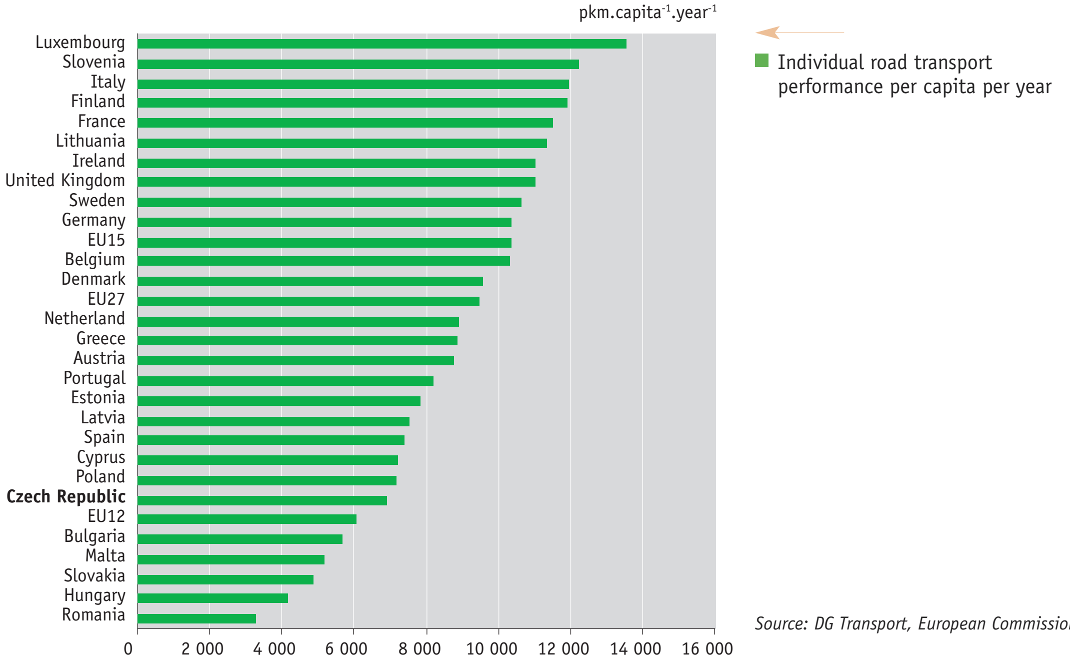
Chart 3 ➜ **Fuel consumption in the transportation in the Czech Republic* [thous. t], 2000–2009**



Source: Czech Statistical Office

* *The consumption of petrol and diesel fuels is indicated including their biofuel content, which increased from 54 to 91 thousand tonnes for petrol and from 85 to 159 thousand tonnes for diesel in 2009.*

Chart 4 ➜ **Volumes of passenger car transportation per capita, an international comparison [pkm.capita^{-1}.year^{-1}], 2008**



Source: DG Transport, European Commission

Following a period of moderate growth after 2000, total **passenger transport** demand stagnated at 115.2 billion pkm in the Czech Republic in 2009 (an increase of 14.3% compared to 2000). Throughout this period, the trend in transport demand reflected the growth of individual road transport and air transport. In year-on-year figures, individual road transport (passenger car transport) demand stagnated (at 72.3 billion pkm) in 2009. Since 2000, it has increased by 14.4%. Air transport demand continued to show solid growth from previous years, with an increase of 5.4% to 11.3 billion pkm. Since 2000, air transport demand has nearly doubled.

In terms of transport demand, the Czech passenger transport structure is **dominated by road transport** (71% of total passenger transport) and, in turn, passenger transport is dominated by individual (passenger car) **road transport** (62.4% of total transport). The proportion of public passenger transport in total passenger transport was 37.2%. The modal split of passenger transport has not changed significantly since 2000.

Within **public passenger transport**, rail transport **declined** by 4.5% (0.3 billion pkm) in 2009, with railways transporting 12.5 million fewer people than the previous year. In 2009, the rail system only accounted for 5.6% of total passenger transport, the lowest figure since 1990. Public road transport demand slightly increased by 1.6% to 9.5 billion pkm while, at the same time, the number of transported passengers decreased by 9 million. The concurrent increase in transport demand and decrease in the number of transported passengers indicates that the average travel distance for regular bus transport has increased and that the share of long-distance transport has increased at the expense of regional transport.

Despite considerable year-to-year fluctuations, the **trend in public urban transport** demand has **stagnated** since 2000. In 2009, public urban transport transported a total of about 2.26 billion passengers with a transport demand totalling 15.56 billion pkm. This represents 13.5% of total passenger transport in the Czech Republic. The fact that the proportion of public urban transport in total passenger transport within cities has not been declining is a positive finding.

Even though **rail passenger transport** accounts for a declining share of passenger transport in the Czech Republic, the significance of rail in urban and suburban transport is increasing. In 2009, the number of passengers that were transported by the S lines within the Prague Integrated Transport system increased (year-to-year) by 8.1% to 86 400 passengers each 24-hour period during the work week. Compared to 2005, this represents an increase of 13.6%. Since 2000, the total number of passengers with Prague Integrated Transport tickets or documents that were transported by rail increased by 76.7% to 17.75 million passengers per year, i.e. the figure almost doubled over a period of less than a decade. This was partly due to the expansion of the Prague Integrated Transport system.

In the Czech Republic, **freight transport** showed a significant decline of 12.6% in 2009; with the drop occurring in both rail and road transport (Chart 2). This is probably the result of the global economic recession and the decline in industrial production in

this period. The proportion of road freight transport in total freight transport reached 74.7% in 2009 (increase of 0.9 percentage points), which is the highest figure since 1990.
From the international perspective, specific individual transport demand per capita is lower in the Czech Republic (6 915 pkm/capita in 2008) than in the EU15 countries (the EU15 average is about 10 400 pkm/capita), but above average compared to the new EU12 member states (the EU12 average is 6 060 pkm/capita) – see Chart 4. The dominance of passenger car individual transport within passenger transport is even greater in Western European countries than in the Czech Republic, ranging from 80 to 90%, while in Eastern Europe this mean of transportation accounts for less than 70% of total passenger transport. Transport parameters in the Czech Republic thus closely converge with transport characteristics of Western European countries, including the accompanying negative aspects.
Transport in the Czech Republic produces **higher specific emissions of greenhouse gases and particulate matter per unit of transport volume** compared to the average for EEA member countries, i.e. it is more emission intensive. Preliminary data for 2009 put specific greenhouse gas emissions per transport demand unit at 136.5 g/pkm for passenger car transport and 127.3 g/tkm for freight road transport. The average for all EEA member countries is 114 g/pkm for passenger transport and 111 g/tkm for freight transport. This is probably the result of the fleet composition.
Despite a decrease in freight transport, **fuel consumption in the transport sector** increased in 2009. Diesel fuel consumption increased more markedly (1.9%) than petrol consumption (0.9%) – see Chart 3. Since 2000, the gradual growth in fuel consumption in the transport sector was only interrupted in 2008. The increased diesel fuel consumption can be attributed to the increase in the share of diesel vehicles in the passenger car fleet. However, traction energy consumption by electrical transport modes decreased by 3% in 2009.
While **greenhouse gas emissions from transport** continue to grow moderately in the Czech Republic, the rate has slowed down considerably after 2007 compared to the beginning of the 21st century. Following a decline in 2008, particulate matter (PM) emissions from transport increased by about 1% (year-on-year) to 6 448 tonnes in 2009. This was mainly due to a 5.8% increase in emissions from passenger car transport. If we examine the longer-term trend in PM emissions from transport, emissions grew significantly over the 2000–2005 period and have stagnated since 2006. The dynamics of PM emissions have reflected the increased number of diesel-powered passenger vehicles that produce much more dust particles than petrol cars. **NO_x, VOC and CO emissions** from traffic have declined. A significant decrease has been observed in passenger car transport. With transport being a major producer of these pollutants, the reduced production of these pollutants could help improve air quality in cities.
Future trends in environmental pressures from transport will depend on the development of the Czech Republic's transport system in terms of the modal split of transport volumes within both passenger and freight transport and the composition of the road vehicle fleet. Total freight transport is likely to follow the trend that is closely linked to the overall economic performance of the country. Taking into account the above evaluation, total pressures from transport are projected to slowly increase. However, measures that are adopted to ensure the strategic and environmentally-friendly development of transport in the Czech Republic will have a significant effect.

DATA SOURCES

- Transport Research Centre, a public research institution
- Ministry of Transport of the Czech Republic
- Technical Administration of Roads of the Capital City of Prague

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND FURTHER INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1587)

Transport Yearbooks of the Czech Republic
http://www.sydos.cz/cs/rocenky.htm

Transport Research Centre Publications
http://www.cdv.cz/publikace

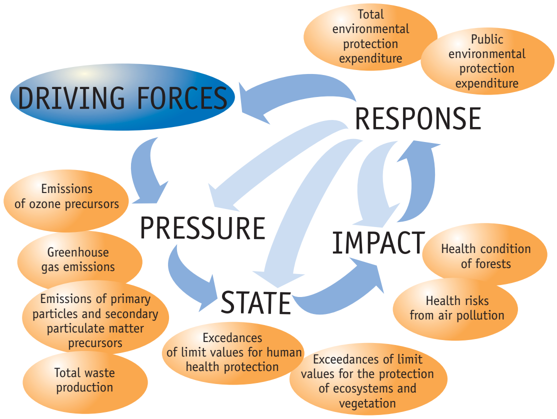
Ministry of Transport of the Czech Republic
http://www.mdcr.cz

Yearbook of Transportation Prague 2007
http://www.rd2007.xf.cz/rd2007.pdf

24/ Structure of passenger-car and truck fleet

KEY QUESTION

Has there been improvement in the parameters of the road vehicle fleet and, in turn, a reduction in environmental pressure?



KEY MESSAGES

Within the structure of the passenger car and light commercial vehicle fleet, the proportion of the most emission-intensive vehicles that do not meet any EURO emission standard decreased by about 5 percentage points to 21.9% of the Czech Republic's total fleet in 2009. At the same time, the proportion of vehicles meeting the EURO 3 and higher emission standards increases.
In 2009, considerably more vehicles were scrapped from the Central Vehicle Register, thus accelerating the renewal of the fleet. Approximately 259 thousand vehicles were permanently scrapped, more than any time since 1999.

In the Czech Republic, car ownership rate reached 423 vehicles per 1 000 inhabitants in 2009 and although it is below the EU27 average, the figure is one of the highest among the EU12 new member states.
Since 2000, the proportion of diesel passenger cars in the Czech Republic's passenger-car fleet has been growing and it reached about one quarter of the total fleet size in 2009. The proportion of alternative fuels and tractions in the fleet has stagnated and remains very low.

Despite the positive year-to-year changes, the passenger-car fleet remains very old, with vehicles over 10 years of age accounting for about 60% (i.e. 2.63 million vehicles) of the total fleet size.

OVERALL ASSESSMENT

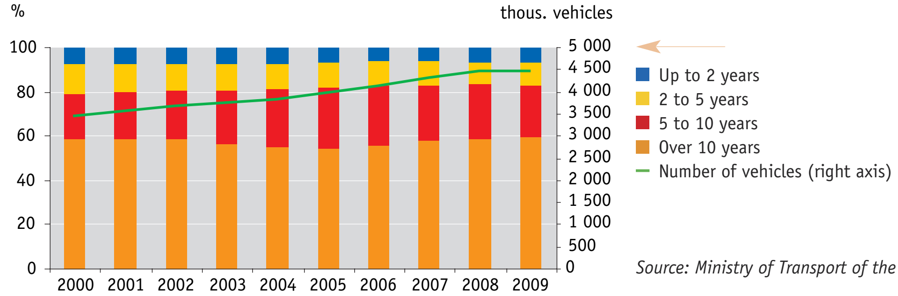
Change since 1990	😐
Change since 2000	😐
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The priorities of the current **State Environmental Policy of the Czech Republic** for 2004–2010 relating to the vehicle fleet include reducing the consumption of non-renewable energy sources in the transport sector and minimizing the impacts of transport on human health and ecosystems in terms of air pollution and noise from transport. The policy aims to promote the use of alternative fuels (especially in urban public transport) including the construction of the distribution network, so that their proportion is at least 20% in 2020.
The **Transport Policy of the Czech Republic for 2007–2013** is based on a global objective that is developed through four cross-cutting and five specific priorities that are directly related to the transport sector. The global objective of the Policy is: „...to create conditions for ensuring quality transport with focus on its economic, social and environmental impacts within the scope of sustainable development principles, and to lay realistic foundations to initiate changes in the proportions among individual transport modes". The thematic priorities address for example achieving a suitable modal split, providing quality transport infrastructure, improving transport safety and promoting transport development in regions. One of the cross-cutting priorities is „Limiting the environmental and public health impacts of transport in line with sustainable development principles".
At the EU level, the main legislative measure for reducing emissions from new cars are the **European emission standards**, or the EURO standards, which the Czech Republic as an EU member state must meet. This is a set of rules and requirements that define limits for pollutants in exhaust gases from all new automobiles that are produced in EU member states within the effective period of the given EURO standard. The objective is to gradually reduce the amount of nitrogen oxides (NO_x), hydrocarbons (HC), carbon monoxide (CO) and particulate matter (PM) in vehicle emissions. The EURO 5 standard has been in effect since 1 September 2009 and EURO 6 is currently in preparation.
Under the current agreement of the European Commission, Council and Parliament, **CO_2 emissions** from new vehicles are to be gradually reduced by 18% by 2015, i.e. from the current average of 160 g/km to 120 g/km. This target should be met by 65% of vehicles by 2012, and by all produced vehicles by 2015.

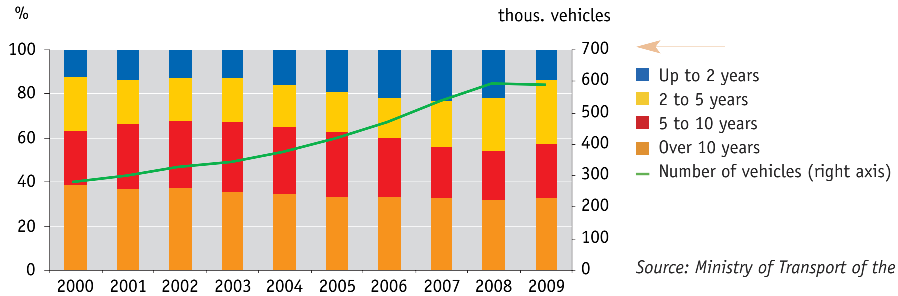
INDICATOR ASSESSMENT

Chart 1 **Structure of passenger-car fleet according to age [%] and the number of vehicles in the Czech Republic, 2000–2009**



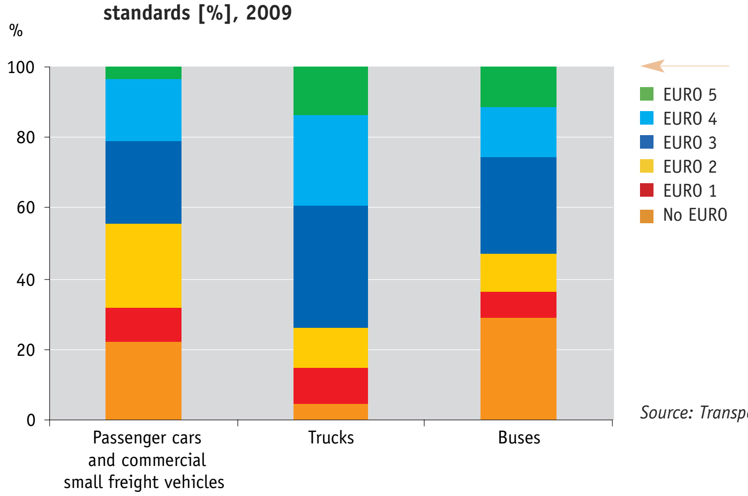
Source: Ministry of Transport of the Czech Republic

Chart 2 **Structure of good's-carrying vehicles according to age [%] and the number of vehicles in the Czech Republic, 2000–2009**



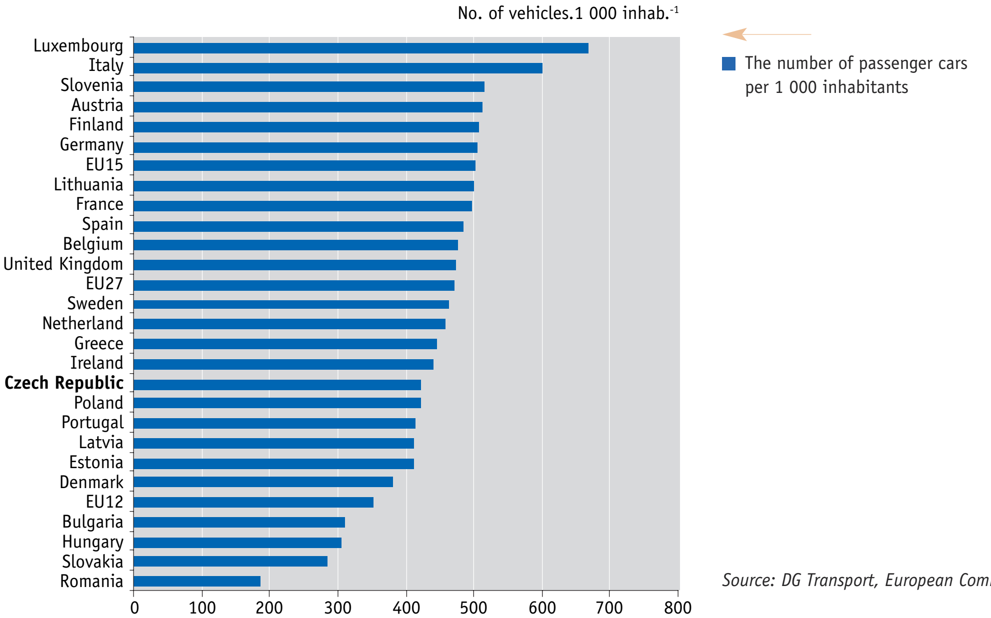
Source: Ministry of Transport of the Czech Republic

Chart 3 **Structure of the road vehicle's fleet in the Czech Republic according to the compliance with EURO emission standards [%], 2009**



Source: Transport Research Centre

Chart 4 → **Passenger car ownership rate, an international comparison [number of vehicles.1 000 inh.$^{-1}$], 2008**



Source: DG Transport, European Commission

The long-term **increase in the number of registered cars and trucks** slowed down considerably in the Czech Republic in 2009. The number of registered passenger cars increased by 0.3% to 4.44 million vehicles, the number of registered good's carrying road vehicles (including the N1 category – light commercial vehicles) decreased by 0.2% to 587.5 thousand vehicles. Since 2000 the number of registered passenger cars has increased by about 29%, and it has almost doubled compared to 1990. The number of registered buses has stagnated, which is also true of small bikes since 2005. However, motorcycles show an upward trend, their number in the register has increased by nearly 100,000 since 2005. In 2009, **car ownership rate in the Czech Republic** reached a level of 422 passenger cars per 1 000 inhabitants, meaning that roughly every other inhabitant of the Czech Republic owns a car. The highest number has been identified in Prague, namely 547 cars per 1 000 inhabitants.

The existing **very poor environmental parameters of the fleet** of passenger cars and light commercial vehicles (N1)[1] **improved significantly in 2009**. The proportion of vehicles failing to meet any EURO emission standard (i.e. vehicles manufactured before 1993) fell by about 5 percentage points to 21.9% (about 1 million) of total registered vehicles. This was largely attributable to a **faster renewal of the fleet**. About 259 thousand vehicles (5.84% of the total fleet size) were permanently scrapped from the Register, which is the highest figure since 1999; the 2008 figure was 176 thousand vehicles. This is likely to have been caused by the introduction of an environmental tax on the registration of vehicles that meet the EURO 3 or a lower emission standard and the effect of the permanent scrapping of older uninsured (and usually unused) vehicles from the Register. In the case of trucks, only about 4.6% of registered vehicles do not meet any EURO emission standard.

Despite the positive trend, the age structure of the passenger-car fleet remains largely unchanged (Chart 1), the car fleet is still very old. The main problem and a major threat in terms of the future trend in the vehicle fleet's emission intensity is the very high and non-decreasing proportion of vehicles older than 10 years that account for about 60% of the total fleet size (2.63 million

[1] Statistics on the age structure of vehicles that are published in the Transport Yearbooks by the Ministry of Transport of the Czech Republic place the N1 category among trucks. The Transport Research Centre's statistics on the fleet mix according to the different EURO emission standards include the N1 category among passenger cars.

vehicles). The truck fleet (including light commercial vehicles) is newer and both its age structure and renewal are more dynamic, in part due to its comparatively smaller size.

In the context of the EU27, the Czech Republic's level of passenger car ownership rate is below average (470 vehicles per 1 000 inhabitants in the EU27 compared to 423 in the Czech Republic). However, it is one of the highest among the EU12 countries (the EU12 average is 352 vehicles per 1 000 inhabitants). **The proportion of new cars** registered in 2008 (latest available data) in the total fleet size was 3.8% (167.7 thousand vehicles) in the Czech Republic. Compared with the EU27 and especially the EU15, the proportion is significantly lower (6.1% and 6.7% respectively). However, the number of new vehicles sold in the Czech Republic is greater than in the EU12 countries (2.1% of new registrations). Conversely, the proportion of the passenger-car category of over 10 years of age is one of the highest, the EU27 average is 30%.

In terms of vehicle fleet composition by traction type, the proportion of **diesel passenger cars** in the total number of registered passenger cars has increased considerably. While in 2000 diesel cars accounted for about one tenth of the fleet (383 thousand vehicles), in 2009 it was about one quarter (1 102 thousand vehicles). Since 2005 the number of registered petrol vehicles has stagnated. The number of vehicles using alternative fuels and tractions has stagnated, with electric cars being the only ones to show an increase, and the total number of these vehicles is low (700 in 2009, an increase of 500 vehicles). Number of LPG- and CNG vehicles reached about 142 thousand and 1.7 thousand respectively. Altogether, alternatively powered vehicles account for approximately 0.2% of the road vehicle fleet.

Future trends in the Czech Republic's vehicle fleet will depend, in addition to economic performance that is closely linked to the car market, on measures to support the scrapping of old vehicles from the Register and restrictions on imports of older cars from abroad. Assuming the continued growth in passenger transport performance, the composition of the passenger-car and truck fleet is essential for any future trends in the environmental impacts of transport.

DATA SOURCES

- Transport Research Centre, a public research institution
- Ministry of Transport of the Czech Republic
- Technical Administration of Roads of the Capital City of Prague
- Central Vehicle Register

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Automotive Industry Association
http://www.autosap.cz

Transport Research Centre Publications
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http://www.mdcr.cz

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25/ Soil use limits

KEY QUESTION ➜

What factors threaten the quality of agricultural land?

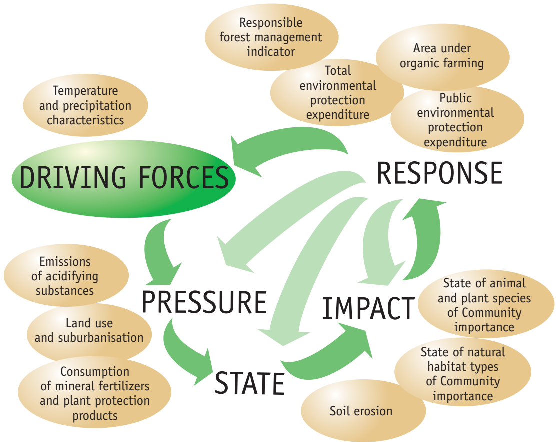
KEY MESSAGES ➜

In terms of the different classes of protection, the Czech Republic's agricultural land resources include both the most valuable top-quality soils and soils with poor productivity.

40% of agricultural land is at risk of degradation through compaction; the area of land that is vulnerable to acidification is also considerable.

In terms of agricultural land productivity scoring, the Czech Republic's agricultural land is mostly of rather poor quality.

The degradation of the physical and chemical properties of land adversely affects the productive and non-productive functions of land. Characteristically, the different types of land degradation condition the occurrence of other types of degradation.



OVERALL ASSESSMENT ➜

Soil use limits indicator includes soil quality indicators that are driving forces especially towards indicators in the areas of biodiversity, forests and the landscape and soil and agriculture. Given the structure of this indicator, its status remains unchanged over the long term.

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

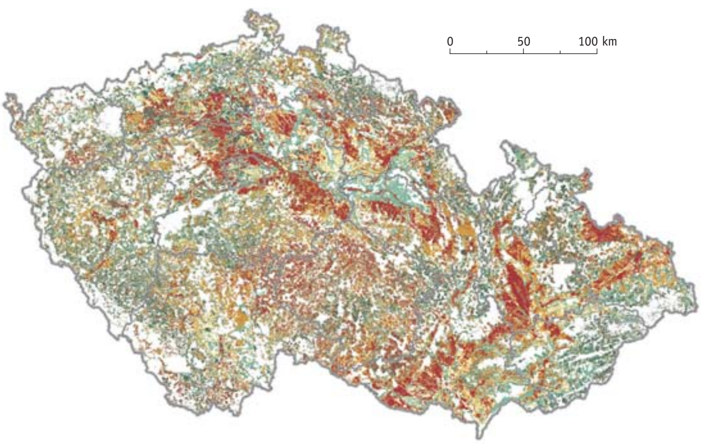
One of the partial objectives of the **State Environmental Policy of the Czech Republic** in the „Sustainable use of natural resources, material flows and waste management" priority area is to prepare and implement the national soil conservation programme.

The protection of agricultural land is addressed by **Act No. 334/1992 Coll.**, on the protection of agricultural land resources, **Decree No. 13/1994** that regulates some details of the protection of agricultural land resources, **Government Regulation No. 75/2007 Coll.**, on the conditions of the provision of payments for natural conditions disadvantages in mountain areas, in otherwise disadvantaged areas, and in Natura 2000 areas, **Government Regulation No. 79/2007 Coll.** on agro-environmental conditions, **Government Regulation No. 239/2007 Coll.**, on laying down the conditions for granting subsidies for agricultural land afforestation and **Government Decree No. 479/2009 Coll.**, on determining the consequences of violating aid conditionality.

Measures to improve the quality of agricultural land resources are partly addressed by the **Good Agricultural and Environmental Conditions (GAEC) standards**, as specified by Government Regulation No. 479/2009 Coll., on determining the consequences of violating aid conditionality.

INDICATOR ASSESSMENT

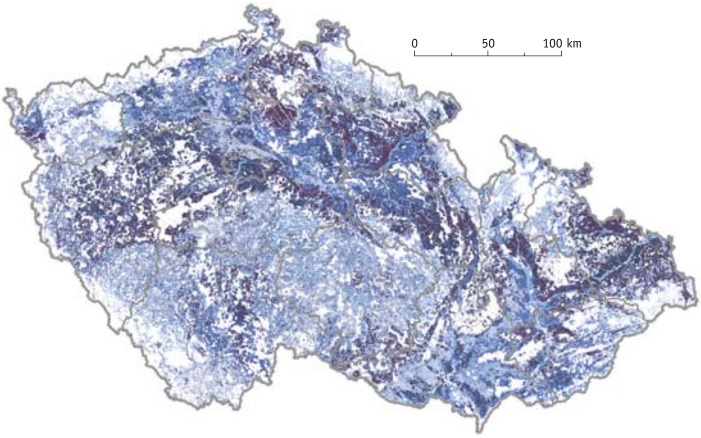
Figure 1 ➜ **Classes of protection of agricultural land resources, 2009**



- The most valuable soils
- Soils with above-average production capacity
- Soils with average production capacity
- Soils with below-average production capacity
- Soils with poor production capacity
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

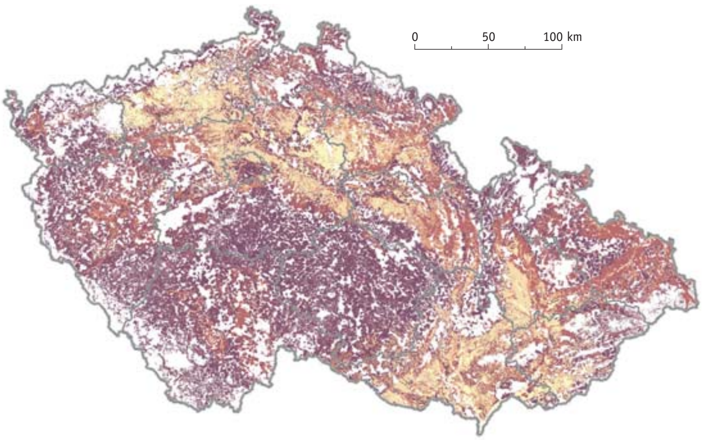
Figure 2 ➜ **Potential vulnerability of lower layers of soil to compaction, 2009**



- Negligible
- Low
- Medium-low
- Medium-high
- High
- Not evaluated
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

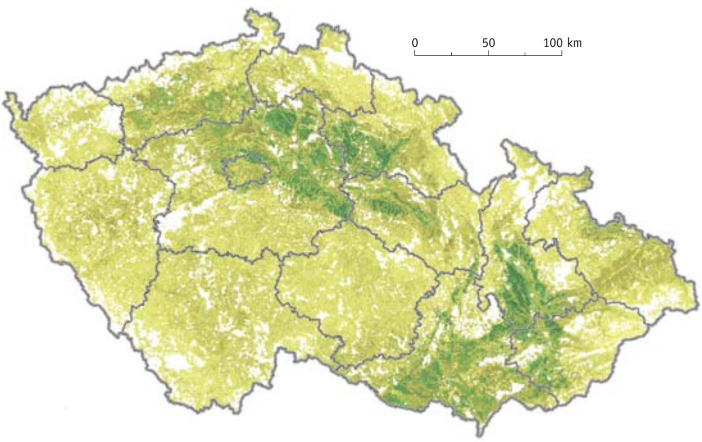
Figure 3 ➜ **Potential soil vulnerability to acidification, 2009**



- Negligible
- Low
- Medium-low
- Medium-high
- High
- Not evaluated
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

Figure 4 ➜ **Agricultural land productivity scoring, 2009**



- Insignificant productivity
- Low-significance productivity
- Very low productivity
- Low productivity
- Medium-low productivity
- Medium productivity
- Standard productivity
- Medium-high productivity
- High productivity
- High productivity with stabilised yields
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

Classes of protection of agricultural land resources

Agricultural land resources consist of plots that are cultivated for agricultural purposes and plots that have been and will again be cultivated for agricultural purposes but are currently lying fallow. Agricultural land resources is possible to describe by evaluated soil-ecological units (BPEJ)[1] .The classes of protection of agricultural land are defined as follows:

Class I protection of agricultural land resources – the most highly valued soils in the particular climatic regions, mainly on level or only gently sloping parcels, which may only be removed from agricultural land resources in exceptional cases and mostly for purposes connected with the restoration of the ecological stability of the landscape or for linear structures of fundamental importance.

Class II protection of agricultural land resources – agricultural soils with above-average production capacity in the particular climatic regions. With regard to the protection of agricultural land resources, these are highly protected soils that may only be removed from agricultural land resources on certain conditions and, in the land-use planning context, may only be used for building purposes subject to certain conditions.

Class III protection of agricultural land resources – in the particular climatic regions this mainly concerns soils with an average production capacity that, in the land-use planning context, may be assigned for building and other non-agricultural purposes.

Class IV protection of agricultural land resources – in the context of the particular climatic regions, these are mainly soils with a below-average production capacity that only have limited protection and may be used for building and other non-agricultural purposes.

Class V protection of agricultural land resources – covers the remaining evaluated soil-ecological units that represent soils with a very low production capacity such as shallow soils, soils that are hydromorphic, high coarse fragment soils and soils at serious risk of erosion. Most of these soils are dispensable from an agricultural point of view. A more effective use other than farming may also be permitted. These are mainly soils with a low level of protection, i.e. with the exception of defined protection zones and protected areas.

The Czech Republic has been mapped based on this characteristic; the most highly valued soils are mainly found in the Polabí area and the areas of the Moravian depressions (Figure 1).

Potential vulnerability of the lower layers of soil to compaction

Soil compaction belongs to the most serious manifestation of soil degradation. The degradation of the physical properties of soil and the resulting compaction of subsoil and crusting on the soil surface negatively affect the production and non-production function of soil. Such degradation reduces infiltration, accelerates surface runoff and increases erosion, reduces the water retention capacity and the available water capacity of soil, reduces the effective depth of the soil profile and suppresses biological activity through worsening air, water and thermal regime of soil.

In the Czech Republic, 40% of agricultural land is at risk of degradation due to compaction, i.e. about 1.75 million ha, of which only 30% (about 0.5 million ha) is at risk of „genetic compaction" that results from the natural properties of soils, and more than 70% (approximately 1.25 million ha) is at risk of technogenic compaction that results from a number of anthropogenic causes. In terms of compaction, the condition of the Czech Republic's soils currently appears to be stagnating or steadily deteriorating. Subsoil of agricultural soils is both the most damaged and at the greatest risk, which is associated with the still spreading use of more efficient and thus heavier farm machinery, and also with the minimisation of cultivation work that is often performed under inadequate soil moisture conditions. Soils that are at risk of compaction are most commonly found in the northern and western parts of the Czech Republic (Figure 2).

The main causes of technogenic compaction include the movement of heavy agricultural and forestry machinery under unsuitable high-humidity conditions, changed hydrothermic conditions due to high irrigation, the growing of monocultures with the same depth of tillage and no representation of perennial forage crops in crop rotation, high dosage of some mineral fertilizers (especially potassium) that negatively affect soil structure, and others. This reduces stormwater infiltration into soil and retention, accelerates runoff, increases the risk of floods and flooding, accelerates erosion, reduces the transformation and reclamation capacity of land and, in turn, reduces the sanitation effectiveness of soil and increases the mobility of hazardous substances due to acidification that is associated with soil compaction. Genetic compaction results from the formation of clayed illuvial or gleyic horizons and is thus typical of soils with higher clay content, soils with heavier particle composition, while technogenic compaction can affect soils of any particle size composition, i.e. light soils as well. Heavier soils usually suffer from a combination of both forms of compaction.

[1] *An evaluated soil-ecological unit (BPEJ) is a five-digit numeric code that is associated with agricultural parcels. It expresses the main soil and climatic conditions that affect the productive capacity of agricultural land and its economic evaluation. The legal instrument that lays down the characteristics of evaluated soil-ecological units and the procedure for managing and updating them is Ministry of Agriculture Decree No. 327/1998 Coll., as amended.*

Potential vulnerability of soil to acidification

Thus far, soil acidification has been a gradual process that occurs over large parts of the agricultural land resources (except for highly calcareous soils). In recent years, almost all soils in the Czech Republic have shown a slight decrease in pH, i.e. a mild acidification that is currently taking place. The process of soil acidification is a natural phenomenon especially in mountainous areas; it results from the formation of organic acids that occurs in forest soils during the decomposition of organic substances, especially litter and surface humus. However, this natural process is greatly amplified by the effects of anthropogenic activities, such as wet and dry atmospheric acid deposition, inappropriate forest management, the insufficient application of lime fertilizers, the removal of Ca and Mg from soil by crops (a large proportion of cereals with no perennial forage crops), the use of inappropriate agricultural machinery, as well as other anthropogenic activities affecting soil. The rate of acidification is determined by the initial buffering capacity of soil, the intensity of acid inputs and the water regime type. In terms of the climatic factors, it is water that plays the most significant role – soil vulnerability to acidification is greater under harsher climatic conditions with a percolative soil-water regime in acidic matrices with a lack of bases.

Soil degradation through acidification results in particular in reduced humus quality with a predominance of fulvic acids, the slower release of mineral nitrogen from humus, the petrification of phosphorus in soil into compounds from which phosphorus is not available to plants, the increased mobility of toxic elements, reduced resistance to the disintegration of structural units resulting in a greater vulnerability to compaction and erosion, the release of potassium into the soil solution and the subsequent risk potassium being washed away, an increased risk of pathogenic organism and plant disease development, which reduces yields. The distribution of soils that are potentially affected by acidification is shown in Figure 3, the most vulnerable soils are most commonly found in western and southern Bohemia and in the Vysočina region.

Agricultural land productivity scoring

The evaluation of agricultural land resources through a scoring method is based on integrating available information on agricultural areas. The data output stems from Government Regulation 241/2004 Coll., on the conditions for implementing assistance to less favoured areas and areas with environmental restrictions. The basic indicator includes the characteristics of an evaluated soil-ecological units (BPEJ) including their ecological and economic information.

The information underlying the scoring method, as it is currently designed, is soil productivity that is determined based on the gross annual rent effect (HRRE) for evaluated soil-ecological units (BPEJ) that is calculated using the cost-revenue method. Soil productivity is expressed using a score within a range from 6 to 100 points. The lower value was set at 6 points in order to ensure a high enough score even after all deductions that may apply to a plot. The lowest value of 6 points corresponds to grasslands in cool and humid climatic regions with an average annual temperature below 5 °C, in deep ravines with very steep slopes over 30%, where land is unsuitable for agricultural production and should be afforested. The highest value of 100 points is awarded to chernozem on loess that is moderately heavy, deeper than 60 cm, has a favourable water regime and that is situated in a warm and moderately humid climatic region with an average annual temperature of 8–9 °C, on perfectly levelled terrain with no possibility of surface water erosion. These soils are suitable for growing intensive commercial crops, sugar beet and vegetables. The evaluation of agricultural land according to these criteria is shown in Figure 4; the highest quality soils are mainly found in the Polabí area and the areas of the Moravian depressions.

Characteristically, the different types of soil degradation condition the occurrence of other types of degradation – e.g. soil structure disintegration and the subsequent soil compaction are often preceded by soil acidification and loss of organic matter. The proposed **Soil Framework Directive** might improve the situation somewhat, as it aims to establish an EU-wide framework for protecting soils and for preserving their ecological, economic, social and cultural functions. To that end, the directive lays down measures to prevent soil degradation processes, whether they occur naturally or as a result of various human activities. In addition to preventive measures that will be included as the central element of the draft directive, it will also include cleaning up contaminated areas, reducing and eliminating risk and restoring soil functions that have been degraded due to erosion, loss of organic matter, compaction, salinisation and landslides.

DATA SOURCES

➜ Research Institute for Soil and Water Conservation, a public research institution

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators

http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1700)

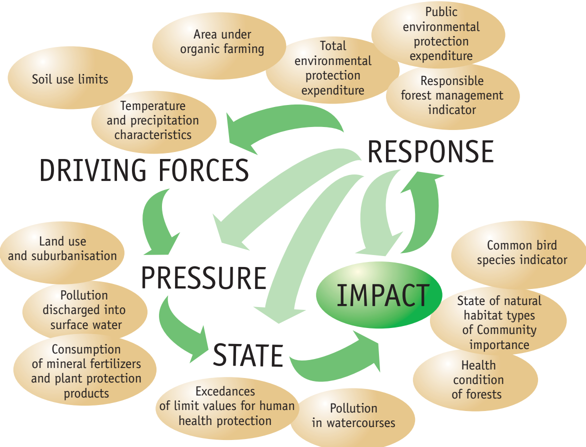
Research Institute for Soil and Water Conservation

http://www.vumop.cz

26/ Soil erosion

KEY QUESTION

What is the proportion of agricultural land that is at risk of erosion?



KEY MESSAGES

Within the Czech Republic, 22% of agricultural land is threatened by water erosion and 8.5% by wind erosion.

The vast majority of land that is at risk of erosion is not subject to any systematic protection that would reduce soil loss to permissible limits, let alone to a level that would prevent a further reduction in the thickness of the soil profile and the impacts the ongoing process of water erosion has on water quality.

OVERALL ASSESSMENT

Change since 1990	☹
Change since 2000	☹
Last year-to-year change	☺

Changes since 1990 and 2000 are only indicated on the basis of expert estimates.

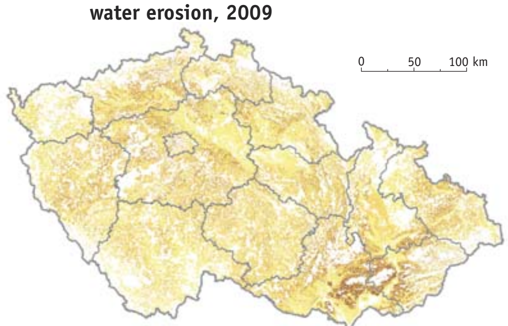
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The Agriculture and Forest Management sectoral policy within the **State Environmental Policy of the Czech Republic** includes a measure to expand programmes for parcels that are at risk of water and wind erosion and for greater water retention in the landscape in pursuance of a greater ecological stability of the landscape. The protection of agricultural land is addressed by **Act No. 334/1992 Coll.**, on the protection of agricultural land resources and **Decree No. 13/1994** that regulates some details of the protection of agricultural land resources.

Council Regulation (EC) No. 73/2009 of 19 January 2009 establishes both common rules for direct support schemes for farmers under the common agricultural policy and certain support schemes for farmers. The issue of erosion control measures is partly addressed by the **Good Agricultural and Environmental Conditions (GAEC) standards**, as specified by Government Regulation No. 479/2009 Coll., on determining the consequences of violating aid conditionality.

INDICATOR ASSESSMENT

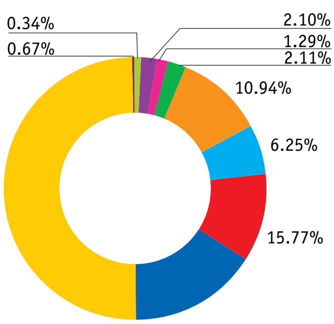
Figure 1 → **Potential vulnerability of agricultural land to water erosion, 2009**



- No risk
- Vulnerable
- Low risk
- Medium risk
- High risk
- Extreme risk
- Not evaluated
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

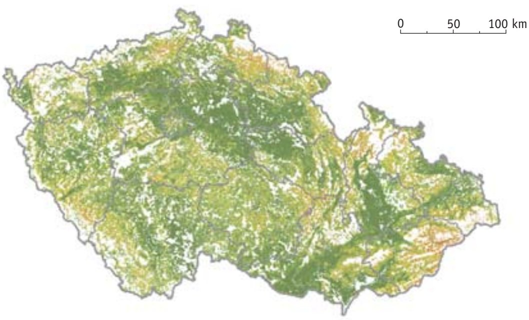
Chart 1 → **Potential vulnerability of agricultural land to water erosion expressed as the long-term average soil wash-off (G) in the Czech Republic [%], 2009**



- 30.1 and above
- 20.1–30.0
- 12.1–20.0
- 10.1–12.0
- 8.1–10.0
- 4.1–8.0
- 3.1–4.0
- 2.1–3.0
- 1.1–2.0
- 0.1 and less

Source: Research Institute for Soil and Water Conservation

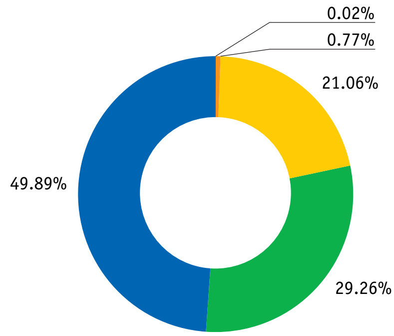
Figure 2 ➜ **Maximum allowable value of the protective effect of vegetation factor (C_p), 2009**



- Up to 0.005 (permanent grasslands)
- 0.005–0.02 (clover, alfalfa)
- 0.02–0.05 (no wide-row crops)
- 0.05–0.15 (no wide-row crops)
- 0.15–0.2 (no wide-row crops)
- 0.2–0.3 (with soil conservation technologies)
- 0.3–0.4 (with soil conservation technologies)
- 0.4–0.6 (with soil conservation technologies)
- Over 0.6 (no limitations)
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

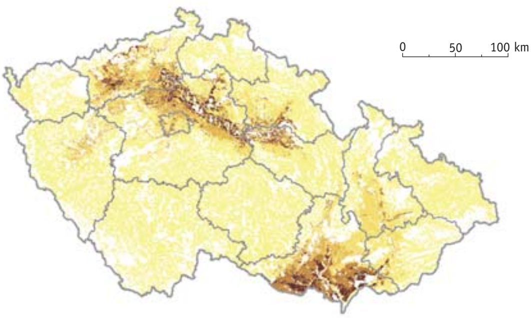
Chart 2 ➜ **Vulnerability of agricultural land to water erosion expressed as the maximum allowable values of the protective effect of vegetation factor (C_p) in the Czech Republic [%], 2009**



- Extreme risk (C_p up to 0.005)
- High risk (C_p 0.005–0.02)
- Medium risk (C_p 0.02–0.2)
- Low risk (C_p 0.2–0.6)
- No risk (C_p greater than 0.6)

Source: Research Institute for Soil and Water Conservation

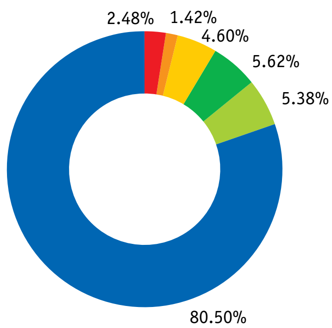
Figure 3 ➜ **Potential vulnerability of agricultural land to wind erosion, 2009**



- No risk
- Vulnerable
- Low risk
- Medium risk
- High risk
- Extreme risk
- Boundaries of self-governing regions

Source: Research Institute for Soil and Water Conservation

Chart 3 ➜ **Potential vulnerability of agricultural land to wind erosion in the Czech Republic, 2009**



- Extreme risk
- High risk
- Medium risk
- Low risk
- Vulnerable
- No risk

Source: Research Institute for Soil and Water Conservation

Potential vulnerability of agricultural land to water erosion

Water erosion is a serious problem in the Czech Republic, not only in terms of agriculture but also in terms of environmental protection. Determining areas that are prone to water erosion has established a very effective tool for implementing some erosion -control measures more effectively. Further, determining areas that are at risk of erosion (while taking into account other characteristics of a given area) may also help in evaluating agricultural land and providing subsidies for farming under less favourable conditions. It also makes it possible to better meet obligations arising from legal provisions and regulations.

According to the new methodology of the Research Institute for Soil and Water Conservation for determining the vulnerability to erosion based on the maximum allowable value of the protective effect of vegetation factor (C_p), about 22% of the Czech Republic's agricultural land is potentially threatened by water erosion (Figure 1, Chart 1).

The potential vulnerability of agricultural land to water erosion is determined using the Universal Soil Loss Equation (USLE) that calculates the long-term average annual soil loss ($t.ha.year^{-1}$). The inputs into the equation include the following factors: the rainfall erosivity factor, the soil erodibility factor, the length of the slope factor, the gradient of the slope factor, the protective effect of vegetation cover factor and the erosion-control measure effectiveness factor. The key identifier for assessing the degree to which an area is potentially threatened by water erosion is the maximum allowable value of the protective effect of vegetation factor (C_P)[1] (Figure 2, Chart 2). C_P does not examine the potential degree of risk, it is used directly as an erosion-control tool (i.e. it indicates both where land is at risk and how to protect it effectively). This value should not be exceeded in a given place and if it is, it should be reduced through erosion-control measures. An important indicator that helps (along with other criteria) to assess the degree of erosion risk to parcels is the maximum allowable soil loss[2], which is defined as the maximum soil loss at which it is possible to permanently and economically maintain soil fertility.

Potential vulnerability of agricultural land to wind erosion

While determining the potential vulnerability of agricultural land to wind erosion is as relevant as in the case of water erosion, the methodology is somewhat more complicated. The Research Institute for Soil and Water Conservation determines potential vulnerability using a method that is based on the institute's pedological database. The underlying information includes the evaluated soil-ecological units (BPEJ, see the footnote on page 88). Data on climatic regions and data on major soil units were also used. A climatic region is characterized by the daily temperature sum above 10 °C, an average moisture certainty during the growing season, the probability of dry growing seasons, average annual temperatures and total annual rainfall. The main soil unit is mainly determined by the genetic soil type, the matrix, the texture, the coarse fragment content, and the degree of hydromorphism. By evaluating these two factors, the characterized codes of evaluated soil-ecological units (BPEJ) were used to express the potential vulnerability of soils to wind erosion in the different cadastres.

At present, approximately 8.5% of the Czech Republic's agricultural land is at risk of wind erosion (extremely vulnerable soils, highly vulnerable soils and vulnerable soils) (Figure 3, Chart 3). Wind erosion now also occurs in places where it was previously unknown or harmless. Anthropogenic influences have significantly affected its distribution both in terms of area and magnitude. Given the current farming trends, it can be assumed that the risk of wind erosion will increase in the future.

The numerical values relating to erosion vulnerability are difficult to compare with previous years because the methodology for determining soil vulnerability to water erosion has changed due to improvements in data accuracy and some new findings. The issues of water and wind erosion are of growing relevance in the Czech Republic. Since most natural phenomena do not change abruptly, but rather gradually, the year-to-year changes in erosion trends are minimal. However, in the longer term the situation deteriorates. Rather than identifying changes in the rate of erosion in the entire country over one year, changes can be observed in smaller areas that struggle with mud deposits at the slightest rainfall. These events are usually associated with improper farming in parcels that are situated above municipalities and from which soil is regularly transported to the municipality where it contaminates houses, gardens, ponds etc. In addition to enormous losses of soil value (the most valuable is topsoil that is also

[1] *The maximum allowable values of the protective effect of vegetation factor (C_P) are divided into 9 categories. The first group, which is also at the greatest risk of erosion, includes areas with a C_P of up to 0.005. To prevent this value from being exceeded, it is recommended to transfer these areas into the permanent grassland category. The second group includes areas with a value of up to 0.02, for which a definitive measure is also recommended in order to reduce the risk of erosion, in this case growing perennial forage crops, for example clover and alfalfa. For other categories, no specific recommendations are provided in order to prevent the limit values from being exceeded. This is mainly because of the varied natural conditions, especially climatic conditions, existing in the different parcels that are placed in the same category.*

[2] *The maximum allowable soil loss is expressed as the value of erosive wash that should not be exceeded in parcels with a given depth. In parcels with shallow soil, the allowable soil loss should not exceed 1 $t.ha.year^{-1}$ (they should be grassed); in parcels with medium-depth soil the allowable soil loss should not exceed 4 $t.ha.year^{-1}$; and in parcels with deep soils this is 10 $t.ha.year^{-1}$.*

the first to be washed off), there are also soaring costs for remedying damage that is caused by erosion and for restoring damaged property, both municipal (roads etc.) and private (various entities and individuals). The number of these extreme events that are recorded by the Research Institute for Soil and Water Conservation increases.

Among other things, the increasing rate of erosion is also influenced by the increasing intensity of extreme weather events (especially the greater magnitude of torrential rains), but also inappropriate methods of farming agricultural land (e.g. maize growing on slopes etc.), that lead to soil degradation (i.e. the deterioration of soil properties, and thus a reduced soil resistance to erosion). Pedogenesis (or soil evolution) is a process lasting several decades, yet the current intensity of soil losses due to erosion, which has been considerably accelerated by negative human influences, is a much faster process. Accelerated agricultural soil erosion poses a serious threat to the production and non-production functions of soils and causes multi-million damage in the inner urban zones of towns and municipalities due to surface runoff and soil wash-off, especially from agricultural land. Also notable are the frequent damages that are caused by wind erosion. Soil erosion deprives agricultural land of its most fertile component – the topsoil, deteriorates the physical and chemical properties of soil, reduces the thickness of the soil profile, increases the grittiness, reduces the content of humus and nutrients, damages crops and cultures, makes it difficult for machinery to operate on the land and causes loss of seeds and seedlings, fertilizers and plant protection products. Transported soil particles and the substances bound to them pollute water sources, fill storage tank areas, reduce the flow capacity of streams, cause surface water turbidity, deteriorate the environment for aquatic organisms, increase costs for water treatment and sediment extraction; high flood flow rates damage buildings, roads, watercourse channels etc. In the case of wind erosion, the negative effects include in particular damage to germinating plants, air pollution, damage due to wind-borne topsoil etc.

The negative effects of water and wind erosion are mitigated through **erosion control measures**, such as ensuring the harmless collection of surface water from river basins, reducing surface runoff and capturing soil that is being washed off, retaining water in the landscape, protecting roads and municipalities' inner urban zones from the effects of soil erosion and reducing the speed and the harmful effects of wind. Erosion control measures are divided into organizational (appropriate distribution of crops, strip cropping and designing vegetation belts between parcels); agrotechnical and vegetation-related (cultivation for soil protection) and technical (ditches, furrows, terraces, erosion control reservoirs etc.).

At present, the issue of erosion is partly addressed by **the Good Agricultural and Environmental Conditions (GAEC) standards**, namely standard no 1 (measures to protect soil on sloping land above 7°) and standard no 2 (the principles for growing certain crops on land highly vulnerable to erosion), especially in terms of the method of farming agricultural land that is rather alarming in the Czech Republic.

The proposed **Soil Framework Directive** might improve the situation somewhat, as it aims to establish an EU-wide framework for protecting soils and for preserving their ecological, economic, social and cultural functions. To that end, the directive lays down measures to prevent soil degradation processes, whether they occur naturally or as a result of various human activities. In addition to preventive measures that will be included as the central element of the draft directive, it will also include cleaning up contaminated areas, reducing and eliminating risk and restoring soil functions that have been degraded due to erosion, loss of organic matter, compaction, salinisation and landslides.

DATA SOURCES

- Research Institute for Soil and Water Conservation, a public research institution
- Ministry of Agriculture of the Czech Republic
- JANEČEK, M. et al. Ochrana zemědělské půdy před erozí (Erosion control measures of agricultural land fund), Prague: Research Institute for Soil and Water Conservation, 2007, 76 p. ISBN 978-80-254-0973-2 (in Czech).

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1700)

Research Institute for Soil and Water Conservation
http://www.vumop.cz

27/ Consumption of mineral fertilizers and plant protection products

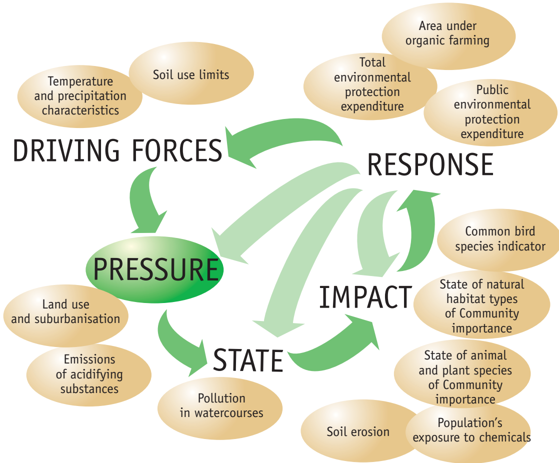
KEY QUESTION ➜

Is the amount of agrochemicals used in agricultural activities decreasing?

KEY MESSAGES ➜

After a period of steady growth starting in 2000, the consumption of mineral fertilizers declined significantly in 2009, compared with the previous year it dropped by 38.5%. In 2009, the use of plant protection products decreased by 11.4% compared to the previous year.

From the environmental perspective, a further reduction in the consumption of agrochemicals is positive because of the negative impacts they have on soils and water.



OVERALL ASSESSMENT ➜

Change since 1990	🙂
Change since 2000	🙁
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

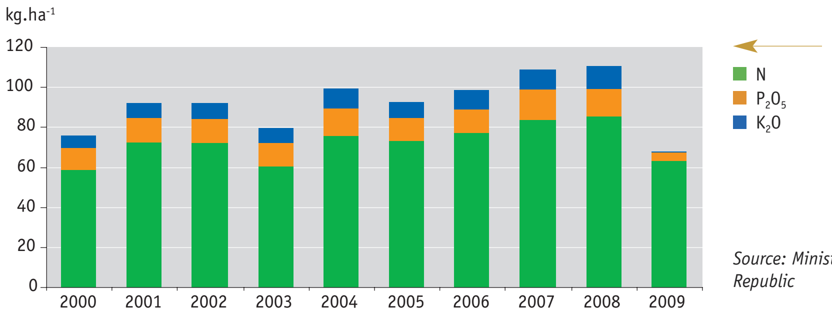
Priority area „The Environment and the Quality of Life" within the **State Environmental Policy of the Czech Republic** sets the partial objective to implement environmental aspects of agricultural management through Good Agricultural Practice. The Sustainable Use of Natural Resources, Material Flows and Waste Management priority area includes the partial objective to protect soil against contamination by hazardous substances. The Agriculture and Forest Management sectoral policy includes the measure to limit the use of hazardous pesticide and biocide products and replace them by less hazardous products.

Through Decision No. 1600/2002/EC laying down the Sixth Community Environment Action Programme, the European Parliament and the Council state that the use of plant protection products in agriculture affects human health and the environment and needs to be further reduced. Therefore, a package of three legal regulations has been prepared that includes **Regulation (EC) No. 1107/2009 of the European Parliament and of the Council** of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC, **Directive 2009/128/EC of the European Parliament and of the Council** of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides, and a **draft regulation of the European Parliament and of the Council concerning statistics on plant protection products**. The above regulations introduce much stricter criteria for plant protection products registration and, at the same time, regulate the use of the products and the assessment of their impacts on human and animal health and on the environment.

Another important document in this area is **Regulation (EC) No. 2003/2003 of the European Parliament and of the Council** relating to fertilisers.

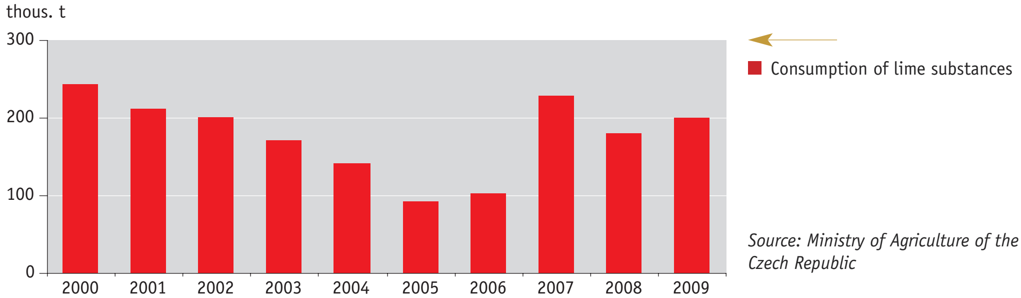
INDICATOR ASSESSMENT

Chart 1 ➜ **Trends in consumption of mineral fertilizers in the Czech Republic [$kg.ha^{-1}$], 2000–2009**



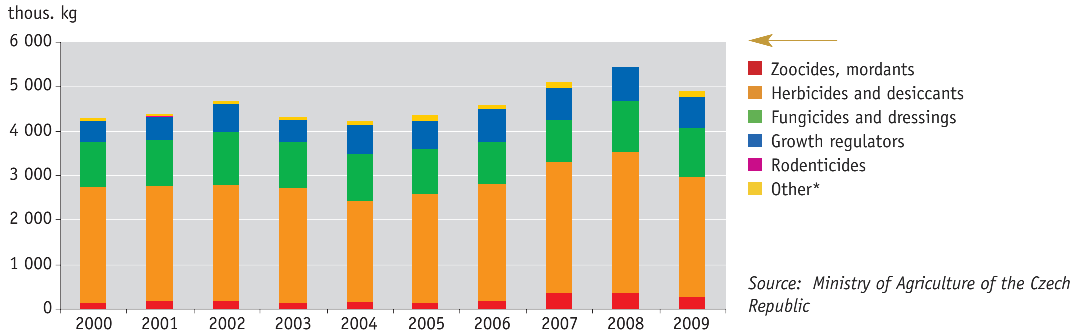
Source: Ministry of Agriculture of the Czech Republic

Chart 2 ➜ **Trends in consumption of lime substances in the Czech Republic [thousands of tonnes], 2000–2009**



Source: Ministry of Agriculture of the Czech Republic

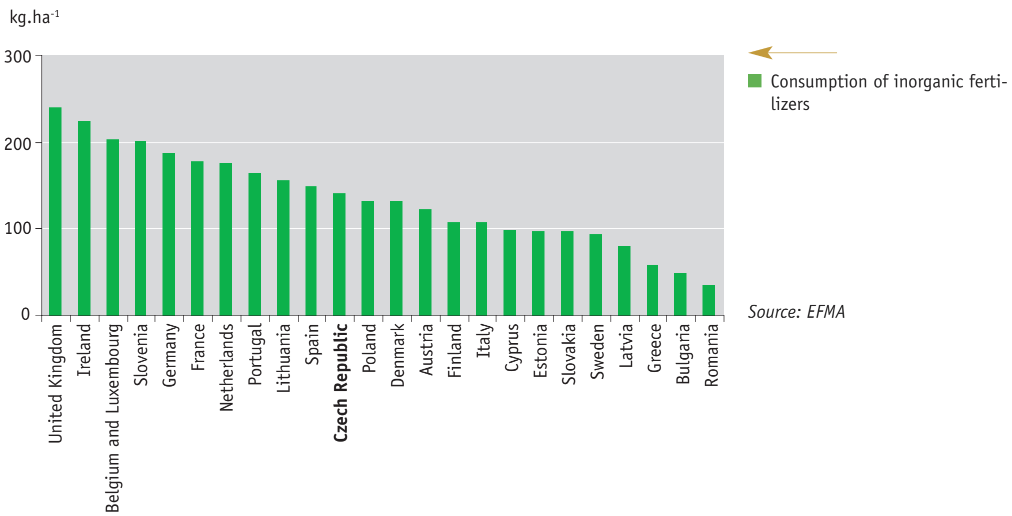
Chart 3 ➜ **Trends in consumption of plant protection products in the Czech Republic [kg of active ingredient], 2000–2009**



Source: Ministry of Agriculture of the Czech Republic

**Other – auxiliary ingredients, repellents, mineral oils etc.*

Chart 4 ➜ **Consumption of mineral fertilizers in Europe [kg.ha^{-1}], 2006**



Source: EFMA

Consumption of mineral fertilizers that contribute to water and soil contamination declined sharply after 1990. From 2000 to 2008 it increased, reaching 46% of the consumption in 2000. In terms of the different categories, the consumption of phosphate and potash fertilizers was constant, while the consumption of nitrogen fertilizers increased. In 2009, the total consumption of mineral fertilizers declined sharply by 38.5% compared to 2008. The sharp decline in mineral fertilizer consumption is being attributed to two reasons, namely high prices, especially of phosphate and potash fertilizers, and – by contrast – low strike prices of agricultural products in general.

In 2009, total mineral fertilizer consumption was 68 kg of pure nutrients per 1 ha of agricultural land, with all categories showing significant decreases in consumption. The pure-nutrient consumption in the different categories was 63.4 $kg.ha^{-1}$ for nitrogen fertilizers (as the content of N – nitrogen), 4.3 $kg.ha^{-1}$ for phosphate fertilizers (as the content of P_2O_5 – phosphorus oxide) and 0.3 $kg.ha^{-1}$ for potash fertilizers (as the content of K_2O – potassium oxide). The trends in the consumption of mineral fertilizers are shown in Chart 1.

In 2009, the **consumption of lime substances** totalled 200 thousand t, displaying an 11% increase compared with the previous year. Following a steady decline in lime substance consumption starting in the mid 1990s, their consumption has increased significantly since 2007 (Chart 2). This increase is probably due to the better financial circumstances of farmers and an increased awareness. Given the decline in the use of lime substances, the proportion of agricultural land with increased acidity grew over the recent years. Emissions of acidifying substances (indicator 3) are another reason underlying the negative reduction in soil pH.

Compared to other European countries, the Czech Republic has average mineral fertilizer consumption levels (Chart 4). Fertilizer consumption depends – above all – on climatic conditions and the intensity of agricultural activities in the different countries, as well as on the financial strength of farming entities.

In 2009, **consumption of plant protection products** showed a decrease of approximately 5 to 11% compared with 2007 and 2008. If we compare consumption of products over a longer time period, we can conclude that during the period 2000–2009 (with the exception of 2007 and 2008) it fluctuated in the region of 4 200 to 4 800 thousand kg of active ingredients per year. In 2009, a total of 4 885 thousand kg of active ingredients contained in plant protection products was applied to treat field crops, specialty crops (fruit, vines, vegetables and hops) and within the „other" category (ornamental plants and trees, forest trees, storage of plant products etc.). Consumption trends are shown in Chart 3. Consumption of plant protection products is influenced by the actual incidence of harmful organisms in a given year. The incidence of harmful organisms is affected by the weather conditions during the year, especially air temperature and precipitation.

A positive trend in consumption of agrochemicals is the decrease in consumption of mineral fertilizers and plant protection products in 2009. Consumption of plant protection products is expected to decrease due to the adoption of the new legislative package of legal regulations that introduces stricter criteria for registering plant protection products and regulates their use.

While mineral fertilizers and plant protection products increase yields in agricultural production, they are also a source of soil contamination and – due to surface runoff – they contribute to polluting both surface water and groundwater. In the case of nitrogen fertilizers, they also contribute to 'anthropogenic eutrophication'. Intensive agricultural activity can lead to reduced biodiversity of soil microorganisms and a decline in the populations of bird species that are adversely affected by soil pollution due to nitrogen, as nitrogen accumulates in the food chain and may result in the weakening of eggshells and egg damage. Agrochemicals enter into food through the food chain.

DATA SOURCES

- ➜ Ministry of Agriculture of the Czech Republic
- ➜ State Phytosanitary Administration
- ➜ European Fertilizer Manufacturers Association (EFMA)
- ➜ Primack, R. B., Kindlmann, P., Jersáková, J. Biologické principy ochrany přírody (Biological principles in nature conservation). Prague: Portál, 2001, 349 p. (in Czech).

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

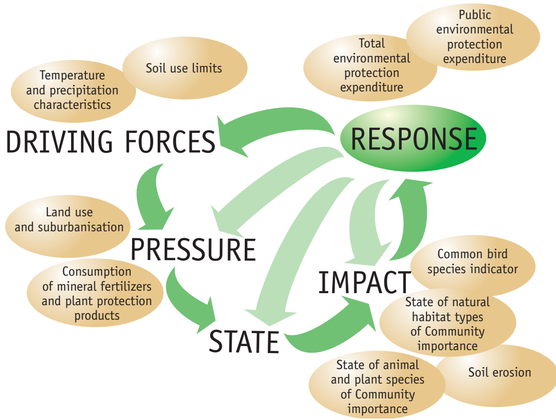
CENIA, a list of key indicators

http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1608)

28/ Area under organic farming

KEY QUESTION ➔

Is the proportion of agricultural land under organic farming increasing?



KEY MESSAGES ➔

The proportion of agricultural land under organic farming and the number of both organic farms and organic food producers increases.

In 2009, the proportion of agricultural land under organic farming in the total area of agricultural land resources reached 9.38% and the number of organic farms rose to 2 689. The target set by the State Environmental Policy of the Czech Republic is likely to be accomplished.

OVERALL ASSESSMENT ➔

Change since 1990

Change since 2000

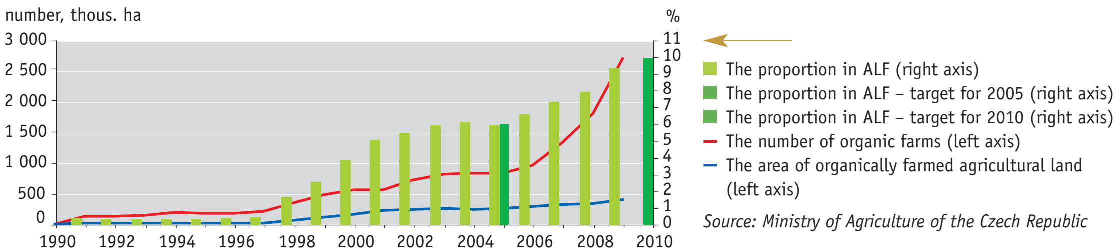
Last year-to-year change

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➔

Priority area „The Environment and the Quality of Life" within the **State Environmental Policy of the Czech Republic** sets the partial objective to implement environmental aspects of agricultural management through Good Agricultural Practice. The Agriculture and Forest Management sectoral policy includes the measure to create the conditions for the development of multi-functional agriculture over the largest area possible and to promote environmentally sound farming methods in an attempt to increase the proportion of organically farmed agricultural land to at least 6% by 2005 and at least 10% by 2010, above all in specially protected areas and protected areas of natural accumulation of water.
Priority axis 4 entitled „Landscape, ecosystems and biodiversity" within the **Strategic Framework for Sustainable Development in the Czech Republic** includes the objective of „promoting sound and close-to-nature farming methods and developing the non-production functions of farming". The rules of organic farming and organic food production are regulated by national and European legislation – **Act No. 242/2000 Coll.**, on organic farming and amending Act No. 369/1992 Coll., on administrative fees, as amended, **Council Regulation (EC) No. 834/2007** on organic production and labelling of organic products, and **Commission Regulation (EC) No. 889/2008** of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No. 834/2007. Since 2007, **Council Regulation (EC) No. 1698/2005** on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) allows the Czech Republic to receive funds for supporting rural development from the EAFRD. **The Action Plan of the Czech Republic for the Development of Organic Farming by 2010** supports in particular those areas of organic farming that are insufficiently developed, for example research and education for farmers, the domestic market with organic farming products, public awareness etc. In addition, one of the objectives is to achieve an approximately 10% share of agricultural land under organic farming in the total area of agricultural land by 2010.

INDICATOR ASSESSMENT

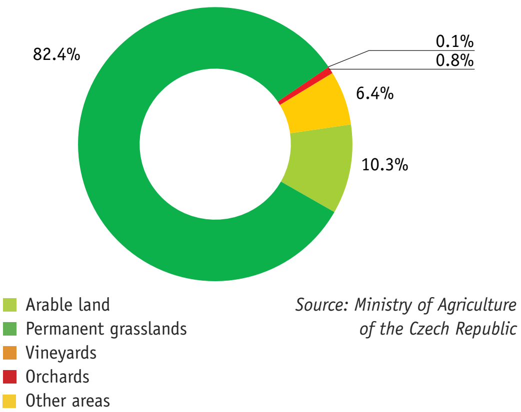
Chart 1 ➔ **Organic farming trends in the Czech Republic [number, thousands of ha, %], 1990–2009**



Source: Ministry of Agriculture of the Czech Republic

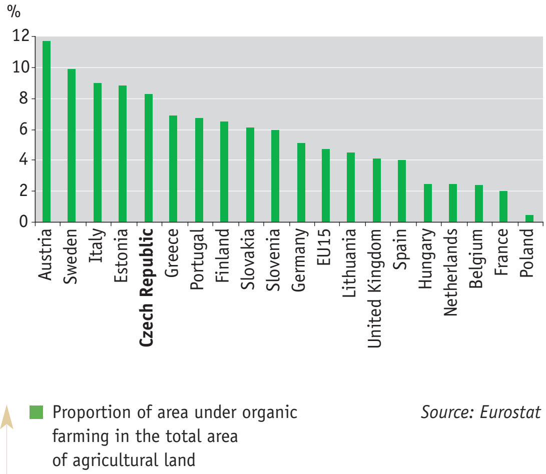
ALR – Agricultural land resources

Chart 2 ➜ **Structure of land resources in organic farming in the Czech Republic [%], 2009**



Source: Ministry of Agriculture of the Czech Republic

Chart 3 ➜ **Proportion of area under organic farming in the total area of agricultural land in Europe [%], 2007**



Source: Eurostat

Despite the high proportion of permanent grasslands in total organically farmed agricultural land, permanent grasslands play an irreplaceable role, as they affect the quantity and the quality of groundwater and surface water, serve as a reliable erosion -control and flood-control measure and help significantly in protecting biodiversity. Expanding, restoring and maintaining grass communities in the landscape represents one of the possible solutions to agricultural overproduction and – at the same time – land conservation.

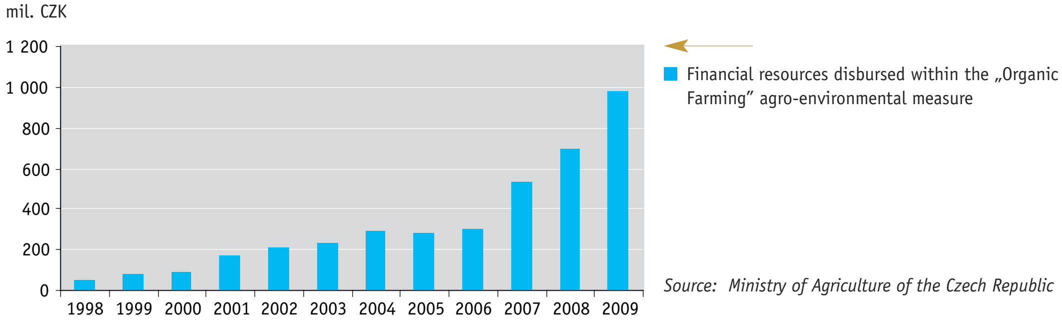
Table 1 ➜ **Amount of organic farming subsidies per unit of area [CZK.ha^{-1}], 2004–2009**

Culture	2004–2006 (HRDP*) [CZK.ha^{-1}]	2007–2009 (RDP**) [CZK.ha^{-1}]
Arable land	3 520	4 086
Permanent grasslands	1 100	1 872
Vegetables and special herbs on arable land	11 050	14 869
Permanent cultures (orchards, vineyards)	12 235	22 383

** The Horizontal Rural Development Plan (HRDP).*
*** The Rural Development Programme (RDP)*

Source: Ministry of Agriculture of the Czech Republic

Chart 4 ➜ **Financial resources disbursed within the „Organic Farming" agro-environmental measure [CZK million], 1998–2009**



Source: Ministry of Agriculture of the Czech Republic

Over the long-term, the importance of **organic farming** in the Czech Republic has been growing. In 2009, there was a further increase in the number of both organic farmers and producers of organic food. By the end of 2009, there were 2 689 farmers that were farming according to set principles of organic farming and 501 entities were producing organic food. Throughout 2009, the number of organic farmers increased by almost 50% and the number of organic food producers by 22%. The area under organic farming increased by nearly 60 thousand ha (i.e. 18%) and reached 398 407 ha, representing 9.38% of the total area of agricultural land resources (Chart 1). Environmentally sound farming methods that are supported by the agricultural policy were applied on more than 25% of agricultural land.

According to projections by the Ministry of Agriculture of the Czech Republic, the objective of the **State Environmental Policy of the Czech Republic** (i.e. to increase the proportion of area under organic farming to at least 6% by 2005 and to at least 10% by 2010) will be achieved. The target for 2005 had already been accomplished in 2003.

In 2009, the area under organic farming increased in almost every category, with the exception of „other areas". The area of arable land under organic farming increased by 28% to 44 906 ha, yet it only reached 1.5% of total arable land. The area of permanent grasslands under organic farming increased by 18% to 329 232 ha, reaching 33.5% of the total area of permanent grasslands. The area of organically managed orchards grew by 32% to 3 678 ha, accounting for 8% of the total area of orchards. The area of vineyards under organic farming increased by 58% and reached 645 ha, i.e. 3.3% of the total area of vineyards. In 2009, organic farming for the first time included the 'hop fields' category totalling 8 ha. The structure of land resources in organic farming is shown in Chart 2. Cattle breeding without commercial milk production accounts for the largest proportion of organic farming.

In the EU27, the area of agricultural land under organic farming reached 7.8 million ha in 2008, which is 7% more than in the previous year. In 2007, the area of organically farmed agricultural land in the EU27 represented 4.1% of total agricultural land. **Compared to other European countries**, the proportion of organically farmed land is above average in the Czech Republic (Chart 3).

The significant growth of organic farming is mainly due to the resumption of **state subsidies**. In 2009, traditional support for organic farmers (subsidies per area that was included in the transition period or in organic farming) was paid from the Rural Development Programme 2007–2013 (RDP), where organic farming is part of the 'agro-environmental' measure under Axis II of the RDP. The tools were also targeted at defined areas (Protected Landscape Areas and National Parks, Natura 2000, Areas vulnerable to nitrogen). The amount of subsidies differs according to the different cultures. Since 2007, organic farming is also supported through a considerable point bonus in evaluating investment projects within Axes I and III of the Rural Development Programme. The measures within Axis I in which organic farmers received point bonuses included the „Modernisation of agricultural holdings" and the „Setting up of young farmers". In Axis III these were the „Encouragement of tourism activities" (agrotourism) and the „Diversification into non-agricultural activities" measures. Organic farmers thus had a much greater chance of their projects being approved and financed. The amount of organic farming subsidies per unit of area and the financial resources disbursed within the „Organic Farming" agro-environmental measure are shown in Table 1 and Chart 4.

In addition, each year the Ministry of Agriculture of the Czech Republic financially supports the education of organic farmers and organic food producers; educational activities are mainly provided by non-governmental organisations. Greater awareness and better availability of information is another reason behind the increased number of organic farmers and organic food producers.

In order to promote organic farming, the European Commission adopted the **European Action Plan for Organic Food and Farming** in 2004. The Czech Republic adopted its national action plan for organic farming in advance of the European Action Plan, took an active part in drafting the European Action Plan, and has been successful in meeting the targets of both plans.

Organic farming is positively reflected in the sustainability of soil quality, into which organic matter is supplied. Organically farmed land is not burdened by chemicals or compaction, which improves the quality of produced food. Areas in which organic farming is performed have a positive effect on the landscape function and character and contribute to biodiversity conservation and sustainable rural development.

DATA SOURCES

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Organic Farming Year Book 2006, 2007, 2008, 2009
http://eagri.cz/public/eagri/zivotni-prostredi/ekologicke-zemedelstvi/publikace-a-dokumenty/

The Summary to the Report on the Condition of Agriculture in the Czech Republic in 2009
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29/ Domestic material consumption

KEY QUESTION

Is the environmental pressure associated with material consumption decreasing in the Czech Republic?

KEY MESSAGES

Following a period of growth between 2003 and 2007, domestic material consumption (DMC) showed a decrease of 1.6% in 2008[1].
Within the domestic material consumption structure, there is continued substitution of solid fossil fuels for liquid and gaseous fuels.

Domestic material consumption was 7.5% higher in 2008 than in 2000, this trend can be attributed to the Czech Republic's significant economic growth, especially between 2003 and 2007.
Throughout the period there was an increase in the share of imports in domestic material consumption up to 34.6%. The material dependence of the Czech economy on imports thus increased.
The proportion of renewable resources in domestic material consumption has declined, reaching 11.5% in 2008. It was the lowest figure since 1990.

OVERALL ASSESSMENT

Change since 1990	🙂
Change since 2000	🙁
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Reducing both the consumption of materials and the material intensity of the economy are among the priorities of the State Environmental Policy of the Czech Republic. Priority area 2 The Sustainable Use of Natural Resources, Material Flows and Waste Management, includes priority objectives 2.2 Protection of Non-renewable Natural Resources and 2.4 Reduction of the Energy and Material Intensity of Production and Increased Material and Energy Use of Waste.

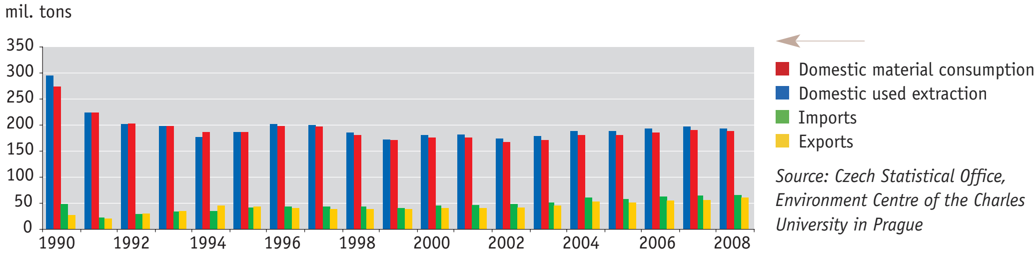
In January 2010, the government approved the **Strategic Framework for Sustainable Development in the Czech Republic** that has replaced the Sustainable Development Strategy of the Czech Republic (Resolution No. 37 from government meeting of 11 January 2010). Under priority axis 2 „The Economy and Innovation", the document sets specific objectives for the energy and material efficiency of the economy. These include in particular „...achieving a sustainable relationship between the economic efficiency of material consumption and the environmental impacts of material flows" (priority 2.2, objective 4), which is supposed to „...improve the Czech Republic's position in an international comparison of the material intensity of production, and its competitiveness". Furthermore, the document aims to minimize the Czech Republic's dependence on foreign energy sources, especially sources from high-risk areas (priority 2.2, objective 1). The objectives should be achieved inter alia through encouraging innovation, environmentally friendly technologies and measures to promote sustainable consumption at household level. Other strategic documents such as the State Environmental Policy of the Czech Republic, the Raw Material Policy in the Field of Mineral Materials and Their Resources, the State Energy Policy of the Czech Republic, the Economic Growth Strategy of the Czech Republic underline the need to reduce material consumption and maintain a certain level of raw-material and material self-sufficiency.

At the international level, specific numerical targets have been adopted for example in Japan, Germany and Italy. The need to reduce material consumption and the environmental impacts associated with such consumption has been highlighted by the EU Sustainable Development Strategy, the EU Thematic Strategy on the Sustainable Use of Natural Resources and the Recommendation of the OECD Council on material flows and resource productivity. However, no international standards have yet been set for this area.

[1] *Due to the data collection and reporting procedures used by the Czech Statistical Office, data for material flow indicators for 2009 are not available at the time of finalizing this publication. These data will be published in the publication entitled „Material Flow Accounts in the Czech Republic in 2003–2009" probably in February 2011 and will be evaluated in the Report for 2010.*

INDICATOR ASSESSMENT

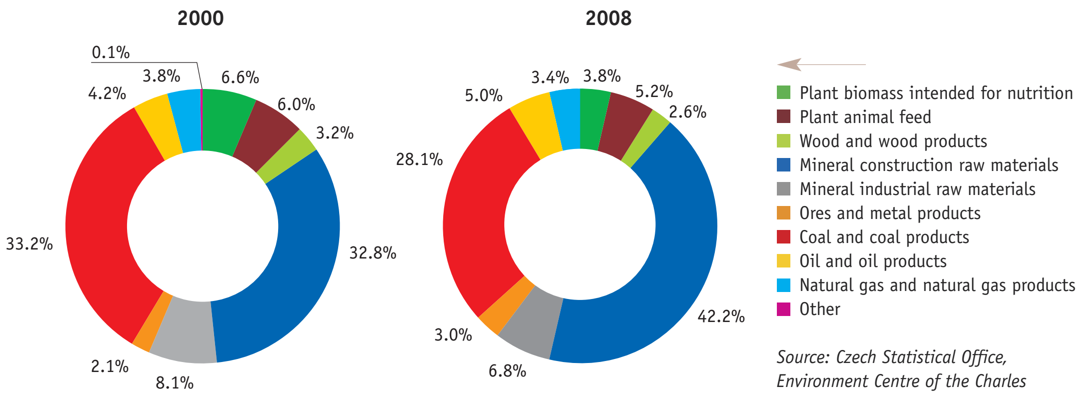
Chart 1 → **Development of domestic material consumption and its components in the Czech Republic [millions of t], 1990–2008**



Source: Czech Statistical Office, Environment Centre of the Charles University in Prague

Domestic material consumption (DMC) is calculated as 'Used Domestic Extraction', i.e. materials that enter the economic system from the domestic environment, plus imports minus exports. The level of used domestic extraction is in direct proportion to the burden and the impacts that are associated with extracting raw materials and growing biomass.

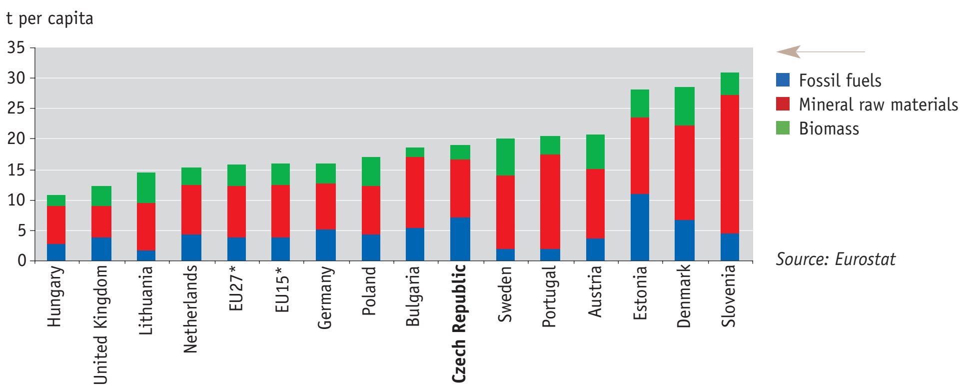
Chart 2 → **Material consumption structures in the Czech Republic by material groups [%], 2000 and 2008**



Source: Czech Statistical Office, Environment Centre of the Charles University in Prague

The „Other" category includes animal biomass intended for nutrition, other biomass and other fossil

Chart 3 → **International comparison of domestic material consumption by material group [tonnes per capita], 2007**



Source: Eurostat

** Eurostat estimate for 2005.*

In 2008, the Czech Republic's domestic material consumption fell by 1.7% to 193.4 million tonnes, following a five-year period of growth between 2003 and 2007 (Chart 1). The trend in domestic material consumption thus followed the development of the economy in this period, especially in terms of material-intensive industries such as construction, the manufacture of machinery and equipment and the manufacture of motor vehicles. In the last monitored year of 2008, the signs of the economic crisis had already begun to show, as it had translated both into the development of the gross domestic product (GDP) and into lower material consumption.

In the long term, the trends in domestic material consumption can be divided into two main phases: a downward trend between 1990 and 2002, with domestic material consumption falling from 295.7 million tonnes to 173.5 million tonnes (a drop of 41%), and the subsequent growth period between 2002 and 2007, with domestic material consumption reaching a level of 196.7 million tonnes (an increase of 13.4%), and finally a slight decline in 2008. Despite the upward trend starting in 2002, the level of material consumption in 2008 corresponded to 65% of the 1990 figure and the environmental pressures associated with material consumption still remain significantly lower than in the early 1990s. By decreasing its domestic material consumption, the Czech Republic contributes to reducing global environmental pressures.

Mineral construction raw materials make up the largest proportion within the domestic material consumption structure (Chart 2). The absolute figures for this category indicate that it significantly contributed to the increase in domestic material consumption between 2002 and 2007. In this period, it increased by a significant 39.3% from 59.1 million tonnes to 82.3 million tonnes. In 2008, there was only a marginal decline of 0,7 million tonnes (0.9%). The increase in this category is attributable to a significant growth in construction output in the Czech Republic. **The second most important category within domestic material consumption is coal and coal products**; its volume remained unchanged in 2002–2007 at approximately 56.8 million tonnes. In 2008, this category decreased by 4.2% to 54.3 million tonnes. By contrast, the category of **oil and oil products increased** by 24.4% from 7.8 million tonnes in 2002 to 9.7 million tonnes in 2008. The consumption of natural gas and natural gas products fluctuated over that period with no significant trend, largely due to the temperature conditions during the heating seasons.

Trends in fossil fuel consumption indicate the gradual (and desirable) substitution of liquid and gaseous fuels for solid fuels. While in the 1990s this substitution occurred due to the decline in coal consumption, after 2002 it has reflected the increased oil product consumption in the transport sector in combination with stagnating coal and natural gas consumption. Total fossil fuel consumption does not decline any more, which poses a risk to the environment, for example in terms greenhouse gas emissions.

As regards renewable resources, it is plant and animal feed followed by plant biomass for food and wood and wood products that account for the largest proportion in domestic material consumption. The consumption of these material groups is connected with the overall proportion of the consumption of renewable resources in domestic material consumption. This proportion decreased from 15.2% in 2002 to 11.5% in 2008, with the latest reporting year showing a decrease of 1 percentage point. The largest decrease in consumption occurred in plant biomass for food (a drop by 28.4% from 10.2 million tonnes to 7.3 million tonnes) and wood and wood products (by 16.7% from 6 million tonnes to 5 million tons). Given that the consumption of renewable resources is usually associated with less environmental impact than the consumption of non-renewable resources, the trend between 2002 and 2008 should be regarded as negative. From the perspective of the entire time series, the proportion in 2008 is the lowest compared to any other reporting year: for example the 1991 figure was 17.8%.

Between 1991 and 2008, the proportion of imports in domestic material consumption (i.e. the material dependence on imports) increased significantly from 9.8% in 1991 to 34.6%; the increase between 2002 and 2008 was 7 percentage points and in 2008 alone it was 2.1 percentage points. In the case of fossil fuels, the proportion of imports in their consumption increased from 14.2% in 1991 to 37.8% in 2008. Between 2002 and 2008 it increased by 8 percentage points, with the latest reporting year showing an increase of 2.5 percentage points. This significant increase was mainly due to the growing oil and natural gas consumption, as the vast majority of these fuels is imported. High foreign dependence that is associated with the supply of fossil fuels is strategically unfavourable for the Czech Republic.

The Czech Republic's per-capita domestic material consumption is about 16% higher than the EU15 average and 17% higher than the EU27 average (Chart 3). In this respect, it is interesting that the accession of new countries to the EU resulted in a slight reduction in the average domestic material consumption. The comparatively high level of domestic material consumption in the Czech Republic is due to the second highest per-capita fossil fuel consumption of all compared countries and the average raw material consumption. Conversely, biomass consumption in the Czech Republic is the third lowest after Bulgaria and Hungary. The high fossil fuel consumption can be attributed to the large proportion of solid fuels in the primary energy basis (51% in 2007, 47% in 2008) and the persistent relatively high energy intensity that results, among other things, from the substantial proportion of industry in the Czech economy.

Since material consumption largely depends on economic performance and the GDP trend, it can be assumed that, due to the economic crisis, the domestic material consumption indicator stagnated or further declined in 2009. A similar pattern is likely to be observed in other European countries as well, which means that – by international comparison – the Czech Republic's position is not expected to significantly change. Given that domestic material consumption is considered an indicator of the overall environmental pressure, the objective is to ensure that it follows a downward trend even after economic growth has been resumed. This can be achieved mainly through changing the structure of the economy towards less material-intensive industries and services, promoting technological innovation in production and reducing the currently high proportion of coal in primary energy consumption in favour of liquid and especially gaseous fuels.

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- Eurostat, The Statistical Office of the European Union

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30/ Material intensity of GDP

KEY QUESTION →

Is the material intensity of GDP generation decreasing in the Czech Republic?

KEY MESSAGES →

Between 2005 and 2008[1], the material intensity of GDP declined rather sharply in the Czech Republic; the trend in the environmental burden due to material consumption became decoupled from the trend in economic performance.

Over the 1995–2008 period, material intensity showed a slight gradual decline.

The decoupling of the curve of the environmental burden associated with material consumption from the economic performance curve was only relative in most years within the monitored period, i.e. material consumption also increased in the periods of economic growth, albeit at a lower rate. This is due to the persistent great importance of material-intensive industrial sectors to the Czech Republic's GDP.

OVERALL ASSESSMENT →

Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

Priority area 2 'The Sustainable Use of Natural Resources, Material Flows and Waste Management' within the **State Environmental Policy of the Czech Republic** aims at (priority objective 2.2) reducing the energy and material intensity of production and increase the use of waste for material and energy recovery.

Increasing material and energy efficiency and achieving the Czech Republic's independence of foreign energy sources is among the priorities of the **Strategic Framework for Sustainable Development in the Czech Republic** that was approved by the government in January 2010 and replaced the Sustainable Development Strategy of the Czech Republic. The strategy is to be implemented through encouraging innovation, environmentally friendly technologies and measures to promote sustainable consumption at household level. Other strategic documents such as the State Environmental Policy of the Czech Republic, the Raw Material Policy in the Field of Mineral Materials and Their Resources, the State Energy Policy of the Czech Republic, the Economic Growth Strategy of the Czech Republic underline the need to reduce material consumption and maintain a certain level of raw-material and material self-sufficiency.
The need to improve efficiency in transforming materials into economic output and to reduce the environmental burden per unit of economic output has been highlighted by the EU Sustainable Development Strategy, the EU Thematic Strategy on the Sustainable Use of Natural Resources and the Recommendation of the OECD Council on material flows and resource productivity. However, no international standards have yet been adopted for this area.

In the Czech Republic, the EU Environmental Technology Action Plan (ETAP) is implemented through the **updated Programme of Support for Environmental Technologies in the Czech Republic** that was adopted through Government Resolution No 938 of 20 July 2009. The updated programme includes a performance monitoring system and a mechanism for updating it, which provides a framework for situation reports that are prepared and submitted to the Government every year (by 30 June of the following year). A comprehensive update is to be carried out once every four years.

[1] *Due to the data collection and reporting procedures used by the Czech Statistical Office, data for material flow indicators for 2009 are not available at the time of finalizing this publication. These data will be published in the publication entitled „Material Flow Accounts in the Czech Republic in 2003–2009" probably in February 2011 and will be evaluated in the Report for 2010.*

INDICATOR ASSESSMENT

Chart 1 ➜ **Material intensity of GDP, domestic material consumption and the GDP in the Czech Republic [index, 1995 = 100], 1995–2008**

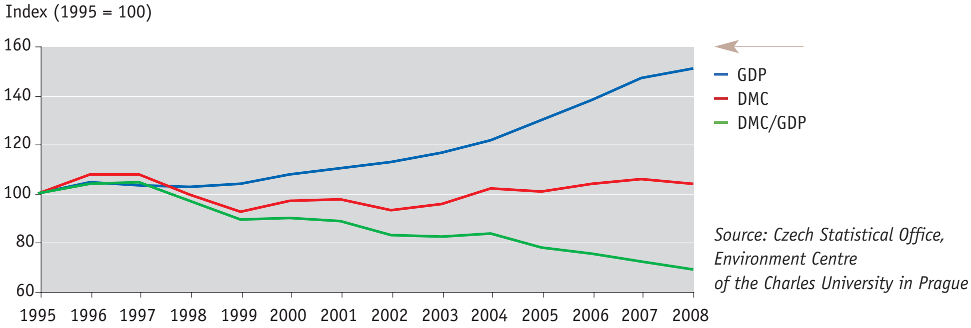
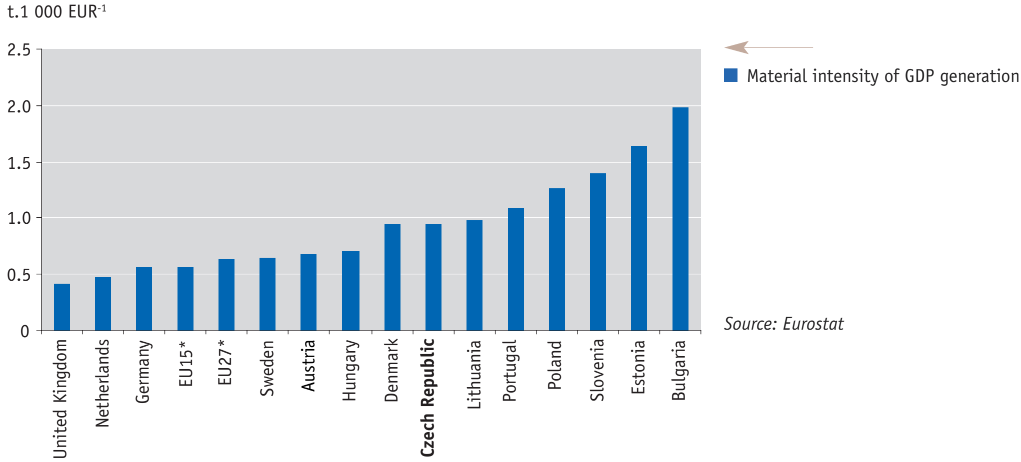


Chart 2 ➜ **International comparison of material intensity of GDP generation [tonnes per thousand EUR], 2007**



** Eurostat estimate for 2005; GDP conversion based on the purchasing power parity (PPP).*

The material intensity of the Czech economy has been declining since 1997, most markedly in the period since 2004 (Chart 1, DMC/GDP – the green line). Decreasing material intensity is a positive trend that indicates an increased efficiency of the transformation of input material flows into economic output and also a decreased environmental impact per unit of GDP. Between 2003 and 2007, the decline was driven by solid economic growth (Chart 1, GDP – the blue line) that was greater than the growth of domestic material consumption (Chart 1, DMC – the red line). In the latest reporting year of 2008, the rate of economic growth slowed down and, at the same time, there was a slight decrease in domestic material consumption. This resulted in decreasing of material intensity, similarly to the previous two years. The fact that the strong economic growth between 2003 and 2007 was associated with an increase in domestic material consumption was, among other things, based on material-intensive industries such as construction, the manufacture of machinery and equipment and the manufacture of motor vehicles.

The above trend is referred to as 'decoupling', i.e. the separation of the environmental impact curve expressed as material consumption (Chart 1 – the red line) from the economic performance curve expressed as GDP (Chart 1 – the blue line). Between 1995 and 1997 there was no decoupling at all. Between 1998 and 2003 direct material consumption was below the 1995 level, i.e. we could see absolute decoupling. In the subsequent years, decoupling was only relative, except in 2008 when there was a small economic growth and a decrease in direct material consumption, i.e. the decoupling of the curves was absolute. The aim is to achieve absolute decoupling, because the burden on the environment is determined by the total (absolute) quantity of materials consumed.

The Czech Republic's material intensity is almost twice as high as the EU15 average, its level is also significantly higher compared with the EU27 average (Chart 2). Higher material intensity than the Czech Republic's is found in some other new EU countries, notably Poland, Slovenia, Estonia and Bulgaria. The only EU15 country with a higher material intensity than the Czech Republic was Portugal. The unfavourable position of the new EU countries results from the fact that while their direct material consumption per capita is often comparable to the EU15 countries, their GDP per capita is considerably lower.

Since material consumption largely depends on economic performance and the trend in GDP, it can be assumed that, due to the financial and economic crisis, the direct material consumption indicator stagnated or further declined in 2009 as well. While it is very difficult to estimate whether the GDP indicator will decline more or less than domestic material consumption, material intensity can generally be expected to stagnate or moderately grow in the following years. Material intensity will be positively affected by the gradual introduction of BAT (Best Available Techniques) in facilities that are covered by Act No. 76/2002 Coll., on integrated prevention. Techniques are understood as both technologies and methods in which a facility is built, operated, maintained and put out of operation.

DATA SOURCES

➜ Czech Statistical Office
➜ Environment Centre of the Charles University in Prague
➜ Eurostat, The Statistical Office of the European Union

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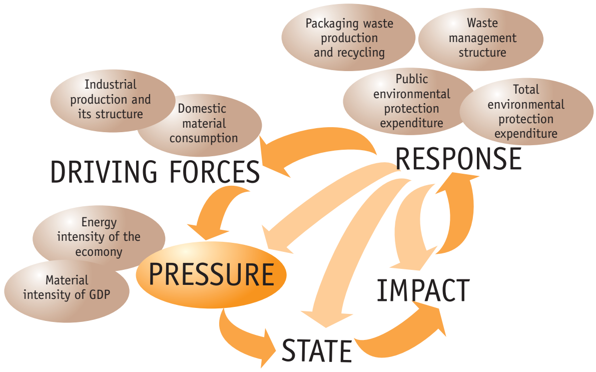
31/ Total waste production



KEY QUESTION ➜

What progress has been made in reducing total waste production?

KEY MESSAGES ➜

☺ Between 2003 and 2009, total waste production decreased by 20%.

☹ Between 2003 and 2009, hazardous waste production increased by 7%.

OVERALL ASSESSMENT ➜

Change since 1990	N/A
Change since 2003	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

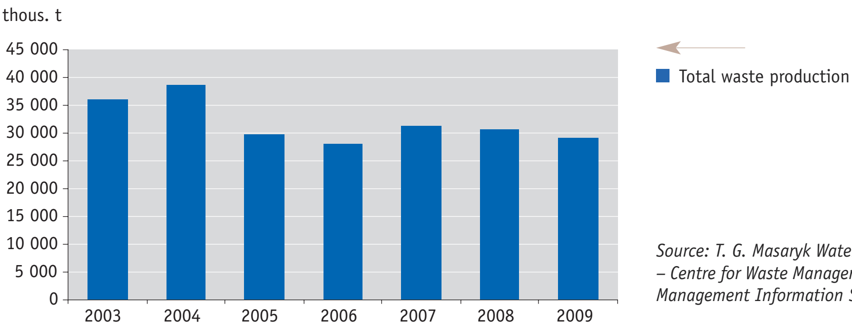
Priority area 2 „The Sustainable Use of Natural Resources, Material Flows and Waste Management" within the **State Environmental Policy of the Czech Republic** aims to reduce the material intensity of production and thus reduce waste production. In this respect, it is – among other things – the introduction of best available techniques (BAT), i.e. not only in manufacturing but also in the field of waste management, that serves as an important instrument. Attention is paid to the category of hazardous waste. The following objectives have been set: preventing the creation and the specific production of hazardous waste, reducing the hazardous properties of waste, substituting hazardous substances and materials, creating the technical capacities for hazardous waste management, eliminating waste polychlorinated biphenyls (PCBs) by 2010 and ensuring the Czech Republic's active participation in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Communication No. 100/1994 Coll.).

One of the key strategic objectives of **Government Regulation No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic** is to reduce specific waste production independently of the level of economic growth. The main measures to promote the strategic objective include:

- ➜ initiating and supporting, through all available means, changes in production procedures towards low-waste and zero-waste technologies and, should waste be produced, a higher level of recovery thereof;
- ➜ assuming that this is technically and economically feasible, replacing harmful materials and components used as raw materials with less harmful materials and components;
- ➜ minimizing the volume and the weight of products while retaining their functional properties.

INDICATOR ASSESSMENT

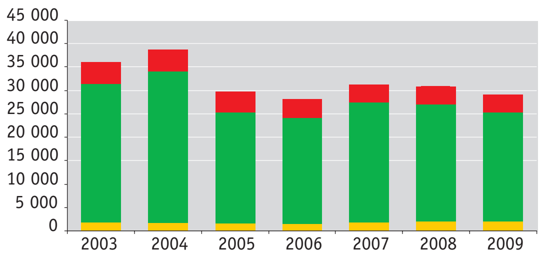
Chart 1 ➜ **Total waste production in the Czech Republic [thousands of tonnes], 2003–2009**



Source: T. G. Masaryk Water Research Institute – Centre for Waste Management, CENIA (Waste Management Information System)

The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary.

Chart 2 → **Total waste production by category (hazardous, non-hazardous and municipal) in the Czech Republic [thousands of tonnes], 2003–2009**

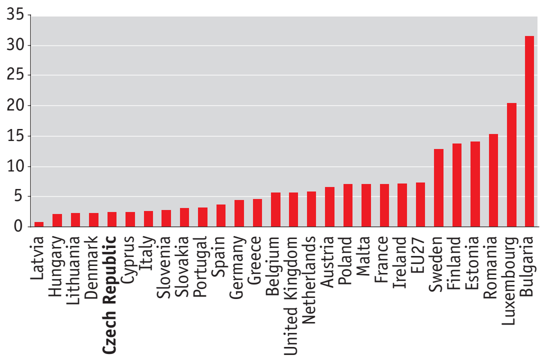


Source: T. G. Masaryk Water Research Institute – Centre for Waste Management, CENIA (Waste Management Information System)

- Total municipal waste
- Non-hazardous waste, excluding municipal waste
- Hazardous waste

The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary; sludges are in a saturated state.

Chart 3 → **Total waste production per capita, an international comparison [t.capita^{-1}], 2006**



- Total waste production per capita

Source: Eurostat

The underlying data are sent to Eurostat by the Czech Statistical Office; the discrepancies between data of the Czech Statistical Office and the Waste Management Information System are due to different data collection and processing methodologies.

Total registered waste production[1] (hereinafter „total waste production") decreased by 20% between 2003 and 2009 (Chart 1). Over the monitored period, the lowest value was recorded in 2006 when a total of 28 million tonnes of waste was produced. In 2009, total waste production decreased by 5.4% year to year. The decrease in total waste production between 2003 and 2009 is attributable to structural changes in industry and production, the development of industrial and waste processing technologies that increase production efficiency and, last but not least, the economic impact of the rising prices of primary raw materials.

Non-hazardous waste production (including municipal waste) decreased by a total of 21% between 2003 and 2009 (Chart 2). The lowest level of non-hazardous waste production was recorded in 2006. Between 2008 and 2009, non-hazardous waste production decreased by 5%. In 2009, the proportion of non-hazardous waste in total waste production reached 93%.

Between 2003 and 2009, **hazardous waste production** increased by a total of 7%. In 2009, reported hazardous waste production decreased by about 6% compared to 2008.

By comparison to per-capita waste production in other EU member states (Chart 3), the Czech Republic has the fifth lowest total per-capita production, namely 2.4 tonnes in 2006. In 2006, the largest amount of waste per capita was produced in Bulgaria (31.4 tonnes), the smallest amount in Latvia (0.8 tonnes). On average, 7.3 tonnes of waste per capita is produced in the EU27**.**

DATA SOURCES

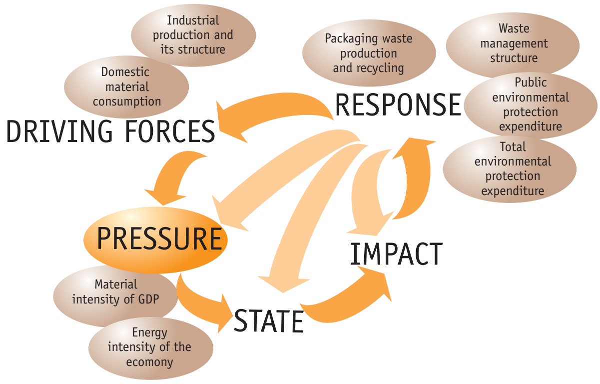
→ T. G. Masaryk Water Research Institute – Centre for Waste Management
→ CENIA, Czech Environmental Information Agency (ISOH – Waste Management Information System)
→ Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1610)

[1] The reason why the registered disposal volume is higher than the registered production volume lies in the inclusion of below-the-threshold producers (i.e. waste producers that did not exceed the limits set by section 39 of Act No. 185/2001 Coll., on waste, and thus have no reporting obligation and are not included in registered production, yet they are included in registered disposal, because final waste disposal facilities are always obligated to report waste). Given the growing difference between the registered and actual waste production, in 2009 the processing of final data that are collected under the Act on Waste will for the first time probably include recalculating the total amount of produced waste.

32/ Municipal waste production and management



KEY QUESTION

Is the proportion of landfilled municipal waste decreasing?

KEY MESSAGES

Between 2003 and 2009, the proportion of municipal waste that is used for material recovery increased by 15 percentage points. The Czech Republic's total registered municipal waste production (hereinafter „total municipal waste production") per capita per year is among the lowest in Europe.

In 2009, almost 91% of all municipal waste was landfilled. Landfilling thus remains the most common method in municipal waste management.

OVERALL ASSESSMENT

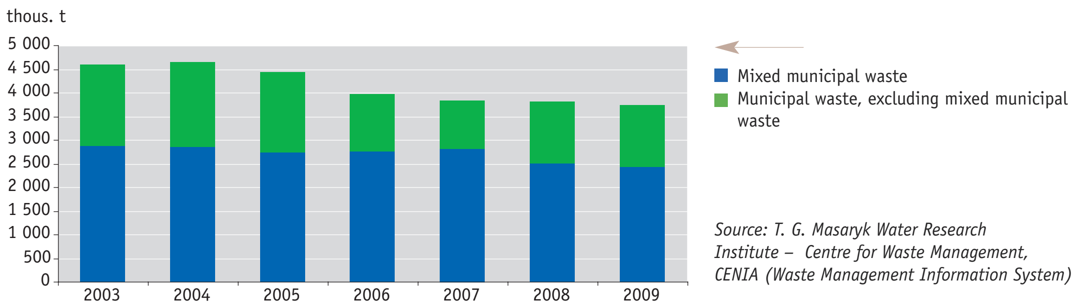
Change since 1990	N/A
Change since 2003	🙂
Last year-to-year change	🙁

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The most important documents are the **State Environmental Policy of the Czech Republic for 2004–2010** and **Government Regulation No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic** (hereinafter the Plan). Under priority area 2 "The Sustainable Use of Natural Resources, Material Flows and Waste Management", the State Environmental Policy of the Czech Republic refers to the Plan that defines the key strategic objectives that include reducing specific waste production independently of the level of economic growth; achieving the maximum utilization of waste as a substitute for primary natural resources; and minimizing the adverse effects on human health and the environment in waste management.
The specific objectives set by the Plan include increasing the proportion of municipal waste used for material recovery to 50% by 2010 compared to 2000 and reducing the proportion of landfilled biodegradable municipal waste (BMW) so that the proportion of the weight of this component in the total amount of biodegradable municipal waste that was produced in 1995 is no more than 75% by 2010, 50% by 2013 and eventually 35% by 2020.

INDICATOR ASSESSMENT

Chart 1 → **Total municipal waste production in the Czech Republic [thousands of tonnes], 2003–2009**



Source: T. G. Masaryk Water Research Institute – Centre for Waste Management, CENIA (Waste Management Information System)

The data indicated for 2009 are preliminary.

[1] *The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set". Municipal waste includes all waste that is produced in a municipality by natural persons and is listed as municipal waste in an implementing legal regulation, with the exception of waste produced by legal persons or natural persons that are authorised for business activities (Act No. 185/2001 Coll.). Mixed municipal waste is waste that remains once the usable components have been separated from municipal waste.*

Table 1 ➜ **Municipal waste management mix relative to total municipal waste production [%], 2003–2009**

Type of treatment [%]	2003	2004	2005	2006	2007	2008	2009
Proportion of municipal waste used for energy recovery (R1)	4.8	8.7	9.4	9.5	9.7	8.5	8.5
Proportion of municipal waste used for material recovery (R2-R12, N1, N2, N8, N10, N11, N12, N13, N15)	10.9	11.8	15.5	20.0	21.0	24.1	26.1
Proportion of municipal waste disposed in landfills (D1, D5, D12)	63.3	64.4	69.3	81.0	86.2	89.9	91.1
Proportion of municipal waste disposed in incinerators (D10)	4.8	0.05	0.04	0.05	0.07	0.05	0.04

Source: T. G. Masaryk Water Research Institute – Centre for Waste Management, CENIA (Waste Management Information System)

The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary. A detailed description of the treatment codes is given in Table 2.

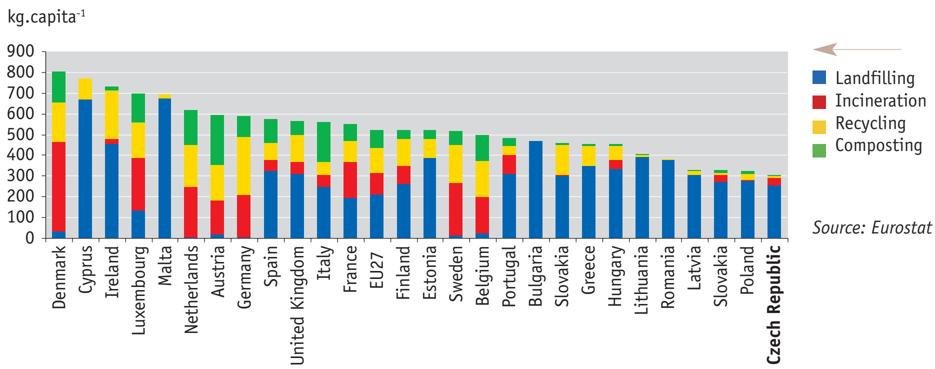
The reason why the registered waste management volume is greater than the registered production volume lies in the inclusion of below-the-threshold producers (i.e. waste producers that did not exceed the limits set by section 39 of Act No. 185/2001 Coll., on waste, and thus have no reporting obligation and are not included in registered production, yet they are included in registered management, because final waste management facilities are obligated to report waste in any case). Given the growing difference between the registered and actual waste production, in 2009 the processing of final data that are collected under the Act on Waste will for the first time probably include recalculating the total amount of produced waste.

Table 2 ➜ **Selected waste management methods**

Management code	Management method
Use of waste for energy recovery	
R1	Use of waste as a fuel and for energy generation
Use of waste for material recovery	
R2	Solvent reclamation/regeneration
R3	Recycling/reclamation of organic substances
R4	Recycling/reclamation of metals
R5	Recycling/reclamation of other inorganic materials
R6	Regeneration of acids or bases
R7	Recovery of substances used for pollution abatement
R8	Recovery of components from catalysts
R9	Used oil re-refining or other reuses of previously used oil
R10	Land treatment resulting in benefit to agriculture or ecological improvement
R11	Uses of wastes obtained from any of the operations numbered R1 to R10
R12	Exchange of wastes for submission to any of the operations numbered R1 to R11
N1	Use of wastes for reclamation, landscaping etc.
N2	Transfer of sludge from WWTP for use on agricultural land
N8	Transfer of parts and waste for reuse
N10	Sale of waste as a raw material (secondary raw material)
N11	Use of waste for landfill reclamation
N12	Depositing waste as technological material to secure landfills
N13	Composting
N15	Tyre retreading
Waste disposal in landfills	
D1	Deposit into or onto land (landfilling)
D3	Deep injection
D4	Surface impoundment
D5	Specially engineered landfill
D12	Permanent storage
Waste disposal in incinerators	
D10	Incineration on land

Source: Regulation No. 383/2001 Coll. on waste management details

Chart 2 ➜ **Municipal waste management methods in the EU [kg.capita^{-1}], 2008**



The underlying data are sent to Eurostat by the Czech Statistical Office.

In 2009, **total municipal waste production** amounted to 3.74 million tonnes (Chart 1). In per-capita terms of the Czech republic, this was about 356 kg of municipal waste in 2009. Over the 2003–2009 monitored period, total municipal waste production followed a downward trend with year-to-year fluctuations of 4–10% either way.

Over the monitored period, the total production of residual, i.e. unsorted waste originating mostly from households and small businesses that typically produce waste in non-manufacturing activity – '**mixed municipal waste**' followed the same trend as total municipal waste production. In 2009, about 232 kg of mixed municipal waste per capita was produced in the Czech Republic.

The different methods of waste management (treatment) are identified using codes that are defined by Act No. 185/2001 Coll., on waste, and Decree No. 383/2001 Coll., on the details of waste management, as amended (Table 1). According to the Mathematical Expression of Calculating the „Waste Management Indicator Set" methodology, which defines the procedure for calculating the various indicators in waste management, the methods of municipal waste management can be divided in particular into:
- the use of municipal waste for material (recovery, recycling, waste pre-processing and others)
- the use of municipal waste for energy (using waste in a manner similar to fuels and in other ways to generate energy)
- the disposal of municipal waste in landfills (landfilling)
- the disposal of municipal waste in incinerators (incineration on land)

The different municipal waste management codes are described in detail in Table 2.

Landfilling remains the most common method of municipal waste management. In 2003, a total of 63.3% of municipal waste was disposed in landfills. In 2009, the proportion of landfilled municipal waste was 91.1%. By contrast, the proportion of incinerated municipal waste decreased from 0.05% in 2008 to 0.04% in 2009. The largest positive change occurred in material utilization, with a proportion totalling 26.1% in 2009 (according to preliminary data).

In each member state, the issue of municipal waste is dealt with differently and even the definitions of municipal waste are different. **By international comparison** with other EU countries, the Czech Republic is doing well and production is very low (Chart 2). Apart from the above-mentioned differences in definitions, lower municipal waste production is closely related to the population's purchasing power, consumer behaviour and the frequency of consumer goods replacement. The declining production of mixed municipal waste is caused by a consistently growing level of the sorting of separable municipal waste components (plastics, paper, glass etc.).

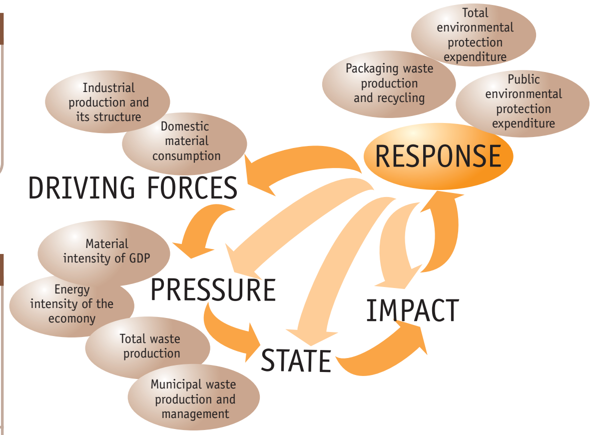
DATA SOURCES
- T. G. Masaryk Water Research Institute – Centre for Waste Management
- CENIA, Czech Environmental Information Agency (ISOH – Waste Management Information System)
- Eurostat, Statistical Office of the European Union
- Regulation No. 383/2001 Coll. of 17 October 2001 on waste management details

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION
CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1612)

33/ Waste management structure

KEY QUESTION ➜

Is the proportion of waste utilization increasing compared to waste disposal?



KEY MESSAGES ➜

In 2009, the proportion of waste utilization in waste management increased by 2 percentage points compared to 2003.

The proportion of waste disposal has been declining over the long term.

In 2009, depositing into or onto land (landfilling) was still the most common method of waste disposal, accounting for 96% of the total waste disposal.

OVERALL ASSESSMENT ➜

Change since 1990	N/A
Change since 2003	☺
Last year-to-year change	☺

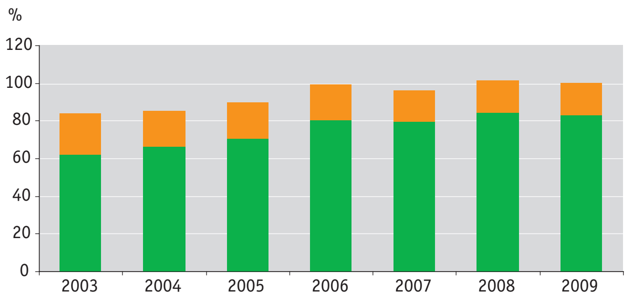
REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

The most important documents are the State Environmental Policy of the Czech Republic for 2004–2010 and **Government Regulation No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic** (hereinafter the Plan). Under priority area 2 „The Sustainable Use of Natural Resources, Material Flows and Waste Management", the State Environmental Policy of the Czech Republic refers to the Plan, which defines the key strategic objectives that include achieving the maximum utilization of waste as a substitute for primary natural resources.

The main measures to promote the strategic objective include initiating and supporting changes in production procedures towards low-waste and zero-waste technologies and, should waste be produced, a higher level of recovery thereof; assuming that this is technically and economically feasible, replacing harmful materials and components used as raw materials with less harmful materials and components; and finally, minimizing the volume and the weight of products while retaining their functional properties.

INDICATOR ASSESSMENT

Chart 1 ➜ **Proportions of waste management methods in total waste production in the Czech Republic [%], 2003–2009**

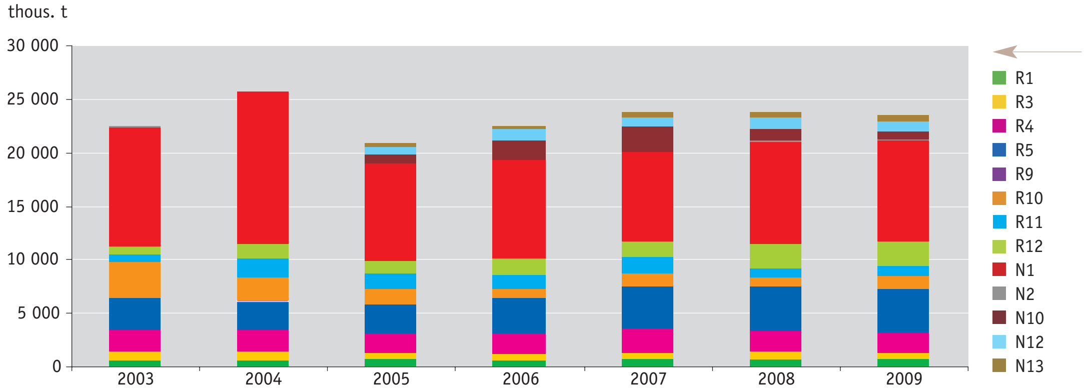


Utilization as a proportion of total waste production (R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, N1, N2, N8, N10, N11, N12, N13, N15)
Disposal as a proportion of total waste production (D1, D5, D12, D3, D4, D10)

Source: CENIA (Waste Management Information System)

The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary. A detailed description of the management codes is given in Table 2 on page 110.)
The reason why the registered management volume is greater than the registered production volume lies in the inclusion of below-the-threshold producers (i.e. waste producers that did not exceed the limits set by section 39 of Act No. 185/2001 Coll., on waste, and thus have no reporting obligation and are not included in registered production, yet they are included in registered management, because final waste management facilities are obligated to report waste in any case). Given the growing difference between the registered and actual waste production, in 2009 the processing of final data that are collected under the Act on Waste will for the first time probably include recalculating the total amount of produced waste.

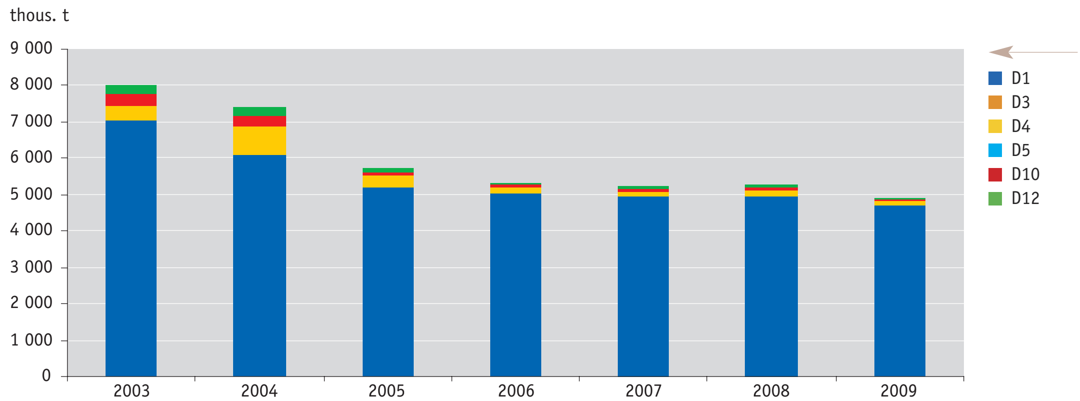
Chart 2 ➜ **Waste recovery mix in the Czech Republic [thousands of tonnes], 2003–2009**



Source: CENIA (Waste Management Information System)

The chart only shows the most common waste recovery methods (codes according to Decree No. 383/2001 Coll., on the details of waste management, as amended – N13, N12, N10, N1, N2, R12, R11, R10, R9, R5, R4, R3, R1).
The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary.
A detailed description of the management codes is given in Table 2 on page 110.

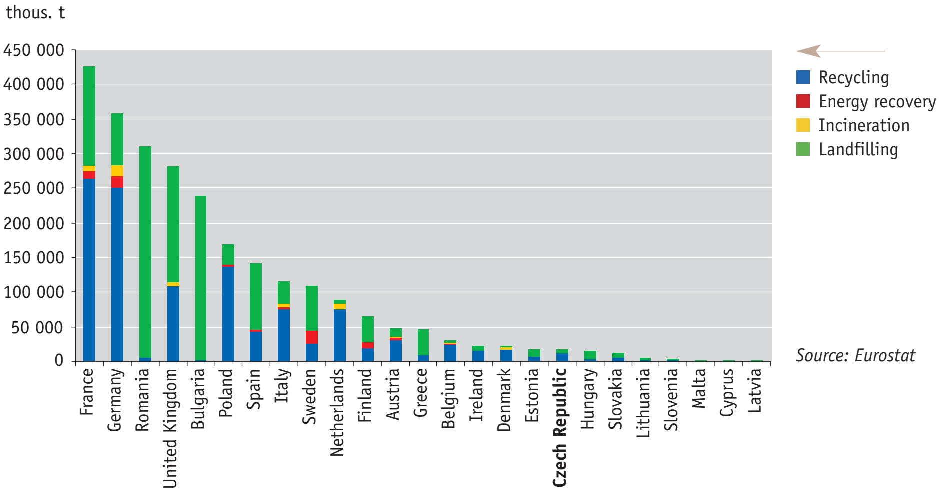
Chart 3 ➜ **Waste disposal mix in the Czech Republic [thousands of tonnes], 2003–2009**



Source: CENIA (Waste Management Information System)

The chart only shows the most common waste disposal methods (codes according to Decree No. 383/2001 Coll., on the details of waste management, as amended – D12, D10, D5, D4, D1 and D3).
The data were determined according to the methodology applicable for a given year – according to the Mathematical Expression of Calculating the „Waste Management Indicator Set"; the data indicated for 2009 are preliminary.
A detailed description of the management codes is given in Table 2 on page 110.

Chart 4 ➜ **Waste management mix in the EU [thousands of tonnes], 2006**



Source: Eurostat

The underlying data are sent to Eurostat by the Czech Statistical Office; the discrepancies between data of the Czech Statistical Office and the Waste Management Information System are due to different data collection and processing methodologies.

The different methods of waste management are identified using codes that are defined by Act No. 185/2001 Coll., on waste, and Decree No. 383/2001 Coll., on the details of waste management, as amended. In terms of the Mathematical Expression of Calculating the „Waste Management Indicator Set", waste management can be divided into waste utilization (recovery, recycling, waste pre-processing and others) and waste disposal (landfilling) – Chart 1. The different waste management codes are described in detail in Table 2 on page 110.

Due to emerging technologies that improve waste management efficiency in the manufacturing sector and in waste management, the trend in waste management between 2003 and 2009 was headed towards a consistent increase in the proportion of waste recovery, compared to disposal. Despite that, disposal through landfilling remains the most common method of waste management (Chart 1).

Between 2003 and 2009, the proportion of **utilization in total waste production** increased by 21 percentage points compared to 2003 (see Chart 1). In 2009, 3% of total waste recovery was reported under code R1 (Use of waste as a fuel and for energy generation), use for material recovery accounted for 97% (Chart 2).

Between 2003 and 2009, the proportion of **disposed waste in total waste production** steadily declined (Chart 1). Over that period, the proportion of disposed waste decreased by 5 percentage points. The waste disposal sector is still dominated by the 'D1 – Landfilling' code (Chart 3). In 2009, 96% of the total amount of disposed waste was landfilled. Only 1% of waste was incinerated on land – code D10 (Chart 3).

In the vast majority of EU27 member states, the most common waste management methods include waste disposal in landfills. The states that landfill more than 98% of waste include Romania and Bulgaria, while countries like Denmark, Belgium or the Netherlands landfill up to 20% of waste. Waste recovery through recycling is of increasing importance in most EU member states.

DATA SOURCES

- ➜ T. G. Masaryk Water Research Institute – Centre for Waste Management
- ➜ CENIA, Czech Environmental Information Agency (ISOH – Waste Management Information System)
- ➜ Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators

http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1614)

34/ Packaging waste production and recycling

KEY QUESTION

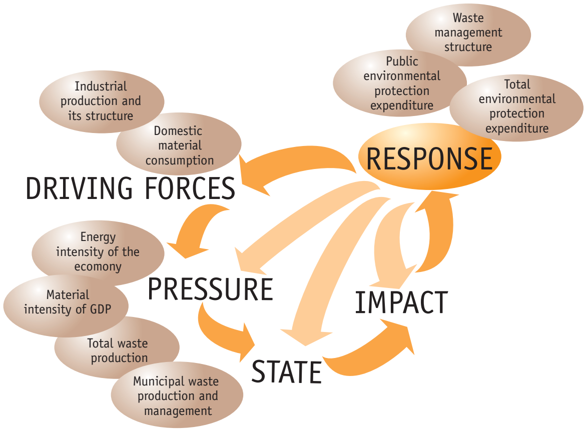
Is the proportion of packaging waste utilization increasing?

KEY MESSAGES

In 2009, 70% of the total amount of produced packaging waste was recycled and 8% was used for energy recovery.

The utilization of registered packaging waste has been increasing since 2003. In 2009, 71% of produced packaging waste was utilized within the system of the authorized packaging company, EKO-KOM, a.s.

In 2009, the amount of produced packaging increased by 25% compared to 2003.
However, produced packaging waste decreased by more than 6% compared to 2008.



OVERALL ASSESSMENT

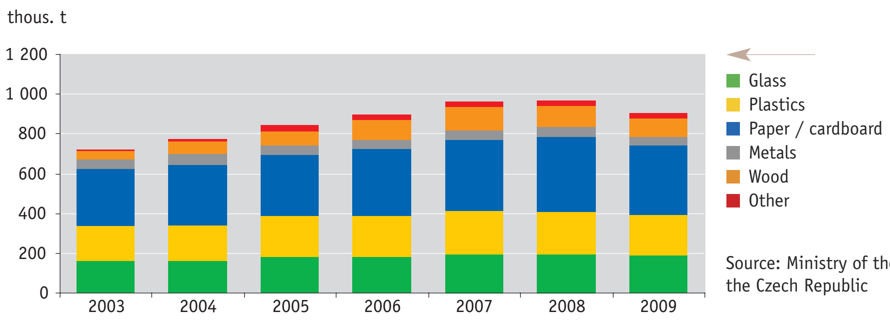
Change since 1990	N/A
Change since 2003	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

The most important documents are the State Environmental Policy of the Czech Republic for 2004–2010 and Government Regulation No. 197/2003 Coll., on the Waste Management Plan of the Czech Republic (hereinafter the Plan). Under priority area 2 „The Sustainable Use of Natural Resources, Material Flows and Waste Management", the State Environmental Policy of the Czech Republic refers to the Plan, which defines the key strategic objectives that include reducing specific waste production independently of the level of economic growth; achieving the maximum utilization of waste as a substitute for primary natural resources; and minimizing the adverse effects on human health and the environment in waste management.

INDICATOR ASSESSMENT

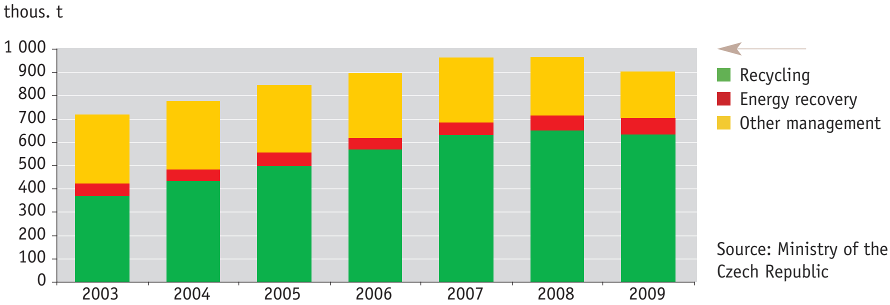
Chart 1 → **Packaging waste produced in the Czech Republic, the packaging waste composition mix [thousands of tonnes], 2003–2009**



Source: Ministry of the Environment of the Czech Republic

Produced packaging waste corresponds to the quantity of disposable packaging that is put on the market and the quantity of waste resulting from reusable packaging. The data indicated for 2009 are preliminary.

Chart 2 ➜ **Utilization of packaging waste in the Czech Republic [thousands of tonnes], 2003–2009**



Source: Ministry of the Environment of the Czech Republic

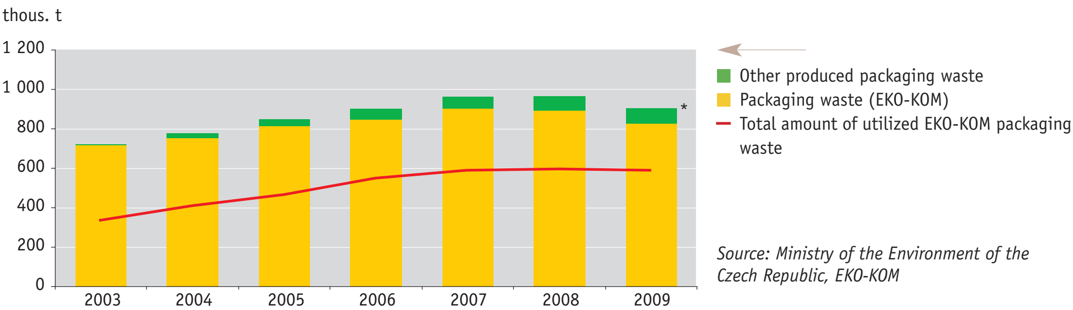
The data indicated for 2009 are preliminary.

Table 1 ➜ **Number of entities that are obligated to utilize packaging waste or to provide takeback and that participate in the EKO-KOM system, and the number of municipalities that participate in the EKO-KOM system, 2003–2009**

Year	Number of clients participating in the EKO-KOM system	Number of municipalities participating in the EKO-KOM system
2003	20 754	4 358
2004	21 164	4 932
2005	21 502	5 337
2006	20 946	5 481
2007	20 798	5 668
2008	20 822	5 791
2009	20 573	5 861

Source: Ministry of the Environment of the Czech Republic, EKO-KOM

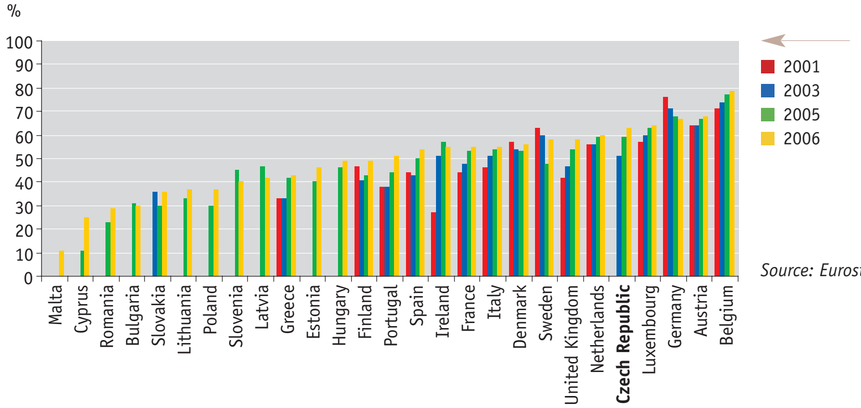
Chart 3 ➜ **Utilization of packaging waste in proportion to the total amount of produced packaging waste in the Czech Republic within the EKO-KOM system [thousands of tonnes], 2003–2009**



Source: Ministry of the Environment of the Czech Republic, EKO-KOM

*The data indicated for 2009 are preliminary; *the figure is an estimate.*

Chart 4 ➜ **Recycling rate of packaging waste, a comparison with other EU member states [%], 2001–2006**



Source: Eurostat

The amount of packaging produced in 2009 was 25% higher compared to 2003 (Chart 1). Compared to 2008, produced packaging waste decreased by more than 6%. In terms of composition, paper/cardboard packaging and plastic packaging accounted for the largest portion of packaging waste between 2003 and 2009 (Chart 1). The predominant method of waste utilization is recycling. A total of 903 770 tonnes of packaging waste was produced in 2009, of which 70% was recycled and 7.6% was used for energy recovery (Chart 2). In the same year, paper/cardboard packaging totalled 348 286 tonnes and was 94% recycled, while plastic packaging totalled 204 879 tonnes, of which 19% was used for energy recovery, thus accounting for the largest proportion of packaging waste used for energy recovery.

Due to the global economic crisis, in the last few months of 2008 and the first three quarters of 2009 there was a significant decline in industrial production and a dramatic fall in the prices of usable raw materials, i.e. waste (especially metals, paper and plastics). This situation led to significant problems in the recycling industry, to which the authorized packaging company (EKO-KOM, a.s.) responded by introducing a system of subsidies to support the position of sorted waste on the market. The last quarter of 2009 then brought a partial recovery in the demand for secondary raw materials and also an increase in their purchase prices. Despite these adverse effects, no significant decline was identified in the reported statistical figures in 2009.

Entities that place packaging or packaged products on the market or into circulation are obligated under Act No. 477/2001 Coll., on packaging, to use packaging waste. This obligation can be met through the authorized packaging company (EKO-KOM). Between 2003 and 2006 the number of entities participating in the EKO-KOM system increased each year; from 2007 to 2009 the number of participating entities fluctuated, because some companies went out of business or merged. In 2009, the authorized packaging company had a total of 20 573 clients. Also, the number of municipalities participating in the EKO-KOM system has been increasing every year since 2003. In 2009, there were a total of 5 861 participating municipalities (Table 1). A total of 827 795 tonnes of produced packaging waste was registered within the EKO-KOM system in 2009, which accounts for 92% of the total amount of produced packaging waste. Between 2003 and 2009, the proportion of packaging waste registered in the EKO-KOM system averaged about 90%. The utilization of packaging waste has been consistently increasing since 2003. Within the EKO-KOM system, 71% of produced packaging waste was utilized in 2009 (Chart 3).

By international comparison, it was Belgium that showed the largest percentage of recycled packaging waste in 2006, namely 79%. In 2006, the Czech Republic recycled 63% of packaging waste and had the fifth highest recycling rate of packaging waste in the EU27 (Chart 4).

DATA SOURCES

- ➜ CENIA, Czech Environmental Information Agency
- ➜ Eurostat, Statistical Office of the European Union
- ➜ EKO-KOM, authorized packaging company
- ➜ Ministry of the Environment of the Czech Republic

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1616)

EKO-KOM, an authorized packaging company
http://www.ekokom.cz/

35/ Health risks from air pollution

KEY QUESTION

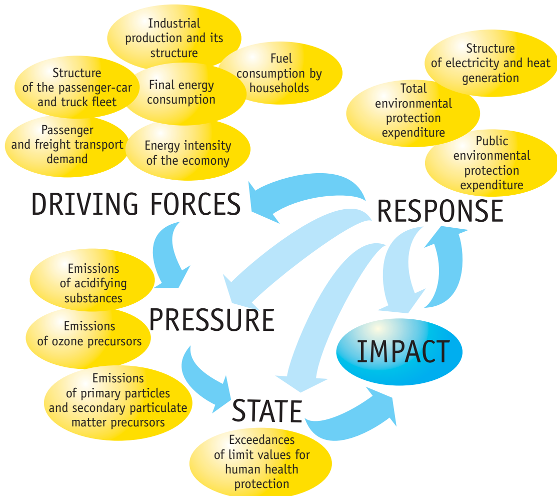
What progress has been made in mitigating health risks arising from air pollution?

KEY MESSAGES

In 2009, the criteria for exceeding the annual limit value that is set for the PM_{10} fraction were met for 11% (in 2008 for 14%) of the monitored cities' population. Similarly to previous years, overall mortality was 2% higher (especially in elderly and chronically ill people) as a result of premature deaths due to air pollution with PM_{10} in 2009.

Exposure to nitrogen dioxide NO_2 is significant in areas that are heavily burdened with traffic. In recent years, residents of the monitored cities are not exposed to above-the-threshold concentrations of NO_2 (except for some portions of Prague). However, year-to-year values indicate a shift towards higher levels of exposure.

The incidence of allergic diseases in children diagnosed by physicians showed an upward trend over the past decade.



OVERALL ASSESSMENT

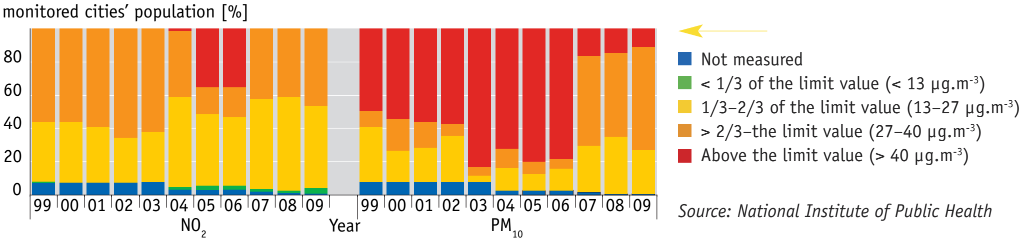
Change since 1990	N/A
Change since 2000	☺
Last year-to-year change	☺

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Priority area 3 „The Environment and the Quality of Life" of the **State Environmental Policy of the Czech Republic for 2004–2010** aims to improve air quality, among other things. In pursuance of human health protection, it is necessary to continue reducing the burden of air pollution on the human population. The public needs to have broad access to information relating to the environment and human health.
The **Sixth Environment Action Programme of the EU** called for the preparation of a strategy on air pollution in Europe in order to achieve such air quality that does not result in any significant adverse impacts and risks to human health and the environment.
Objective 10 of the long-term programme for improving public health in the Czech Republic – **Health for All in the 21st Century**, which was approved through a government resolution in 2002, calls for „…reducing public exposure to health risks that are associated with water, air and soil pollution…," and „…systematically monitoring and evaluating air quality and health indicators".
In 2004, at the Fourth Ministerial Conference on Environment and Health in Budapest, the ministers adopted the Children's Environment and Health Action Plan for Europe **(CEHAPE)**. The plan includes four regional objectives to reduce children's burden of environmentally attributable disease.

INDICATOR ASSESSMENT

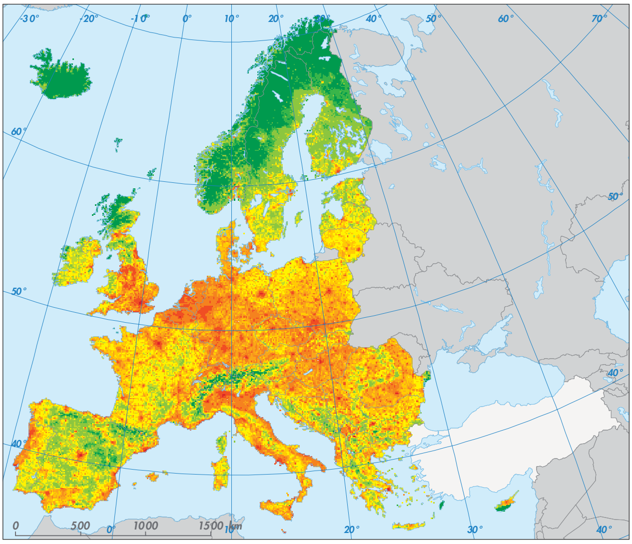
Chart 1 → **Time trend in the estimated proportion of the population [%] living in the different intervals of suspended particle concentrations (PM_{10} and nitrogen dioxide) in cities in the Czech Republic (3.38 million people included), 1999–2009**



Source: National Institute of Public Health

The annual limit value for NO_2 is 40 µg.m^{-3}.
The annual limit value for PM_{10} is 40 µg.m^{-3}. The criterion of the 36th highest 24-hour concentration was also included in evaluating exceedances of the annual limit value for PM_{10} suspended particles.
The method that is used for presenting the long-term trends in selected substances (PM_{10} and NO_2) is based on annual mean values calculated for each of the 26 Czech cities with a population over 15 thousand that are included in the Environmental Health Monitoring System in the Czech Republic. The way it is designed, the indicator is roughly indicative in nature; this is because the value used is the average obtained from measuring stations in the different cities. The problem lies in the uneven coverage – the locations that are measured in the different cities have different proportions of air pollution sources (traffic, local heating, industry, long-range transport etc.). Therefore, the average annual concentration (in the case of 11 cities this is the only available chart) characterizes the mean value for a given city with a generally unquantifiable level of uncertainty. In most cities (20) that are included in the Monitoring System, there are only 1–2 measuring stations, in 5 cities with populations over 100 000 there are 3–7, and Prague is the only city with a larger number of stations (22).

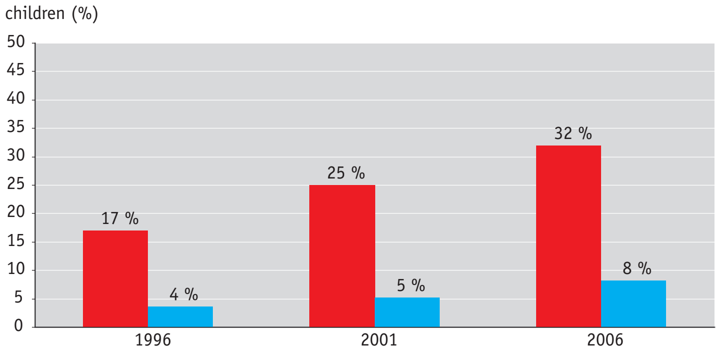
Figure 1 → **Estimated years of life lost (YOLL) attributed to long-term $PM_{2.5}$ exposure, 2005**



Years of life lost (x 1 000)
- 0–0.5
- 0.5–1
- 1–5
- 5–10
- 10–25
- 25–50
- 50–100
- 100–500
- 500–5 000
- > 5 000
- Poor data coverage
- Outside data coverage

Source: EEA, ETC Air and Climate Change

Chart 2 → **Trend in the prevalence of allergic diseases in children in the Czech Republic [%], 1996, 2001, 2006**



Source: National Institute of Public Health

Due to the reporting methodology, data for 2009 are not available at the time of finalizing this report.

The fundamental non-point source of PM_{10} and $PM_{2.5}$ suspended particles and carbon dioxide NO_2 in towns and municipalities is transport, which has been confirmed by measurement results from monitored towns and municipalities under continuing favourable climatic conditions from 2007 to 2009. In the case of polycyclic aromatic hydrocarbons (PAHs) it is the combined effect of two major emission sources, namely household heating and transport.

Exposure to nitrogen dioxide NO_2 is significant in areas that are heavily burdened with traffic. The observed values indicate that in heavily-trafficked portions of cities (over 10 000 vehicles per 24 hours) the population can be expected to suffer from reduced lung function, an increased incidence of respiratory disease and an increased incidence of asthma and allergies. In an urban environment with no direct impact of transport, NO_2 is not a source of health risks. Compared to 2008, the estimated proportion of the monitored cities' population that was exposed to annual average concentrations of nitrogen dioxide in ambient air between 27 $\mu g.m^{-3}$ and 40 $\mu g.m^{-3}$ slightly increased (from 41% to 46.5% of the population) and, by contrast, the proportion of the population exposed to annual average concentrations up to 27 $\mu g.m^{-3}$ declined (from 57% to 52.5% of the population). Except for some portions of Prague, the monitored cities' population was not exposed to above-the-threshold NO_2 concentrations.

Depending on the degree of the burden and the length of exposure, **the presence of PM_{10} in the air** contributes to a number of health problems (e.g. generally increased morbidity and mortality rates (including in infants), an increased incidence of cough and breathing difficulty, reduced lung function, the incidence of the symptoms of chronic bronchitis and probably lung cancer). No safe threshold concentration has been set for the effects of PM_{10} in the air.

The distribution of the monitored cities' population in the different exposure intervals is significantly influenced by the Prague agglomeration. In Prague, at least one criterion for exceeding thePM_{10} limit value was met at 7 out of 20 stations. However, the overall mean value for Prague (27.6 $\mu g.m^{-3}$) did not exceed the annual limit value. The proportion of the population with a lower exposure up to an annual average of 27 $\mu g.m^{-3}$ decreased (from 35% in 2008 to 26.5% in 2009), while the proportion of the monitored cities' population that was exposed to annual concentrations between 27 and 40 $\mu g.m^{-3}$ increased (from 51% in 2008 to 62% in 2009). In 2009, the criteria for exceeding the annual limit value that is set for the PM_{10} fraction were met for 11% (in 2008 for 14%) of the monitored cities' population.

In terms of the European population, it is estimated that exposure to suspended particles reduces life expectancy by an average of 8.6 months and causes about 500 thousand premature deaths a year. According to an EEA report[1], the greatest exposure to PM_{10} is among the urban population in the Benelux countries, Poland, the Czech Republic, Hungary, Italy and Spain. The proportion of the Czech Republic's urban population that is exposed to above-the-threshold concentrations is negligible (indicator 6). Based on the mean values for PM_{10} concentrations in selected Czech towns and municipalities, it can be estimated that air pollution with this pollutant in the urban environment is likely to have increased the overall mortality rate by an average of 2% in 2009 (2% in 2008, 2.4% in 2007) through premature deaths, mostly in elderly and chronically ill people. Similarly, it can be estimated that approximately 750 patients with acute heart problems and 1 200 patients with acute respiratory problems were admitted to hospitals due to air pollution with PM_{10} particles. Although the PM_{10} fraction has significant negative health effects, it has been proven that **fine particles ($PM_{2.5}$) pose a greater health risk** than larger-diameter particles. Therefore, in addition to reducing exposure to PM_{10}, it is also necessary to reduce the risks that are associated with exposure to $PM_{2.5}$ (Figure 1). The new Directive 2008/50/EC on ambient air quality and cleaner air for Europe includes concentration limits for the $PM_{2.5}$ fraction of fine suspended particles and specific targets for reducing the population's exposure to $PM_{2.5}$. Alongside fine suspended particles, PAHs are ambient air pollutants that pose the greatest health risk. The calculations of the theoretical increase in the likelihood of cancer due to lifetime exposure to measured concentrations of benzo(a)pyrene in cities, this pollutant may have theoretically contributed approximately two cases per 10 000 inhabitants in 2009 (a risk of 2.18×10^{-4}). Epidemiological studies indicate that, in addition to causing DNA damage with subsequent carcinogenic effects, **exposure to PAHs** may even affect and damage the individual before birth through the transplacental transfer from the mother's blood to the foetus.

Poor air quality tends to be associated with the increased **incidence of allergies and asthma**. According to estimates, 20% of the world's population suffers from allergic diseases; in the 1990s asthma became one of the most common chronic diseases. Recent studies have documented the link between exposure to PM_{10} and ground-level ozone and asthma exacerbations[2]. Other studies indicate a relationship between air pollution with PAHs and the development of environmentally induced asthma. In the Czech Republic, the incidence of asthma in children is estimated at 5-15% depending on the age of children and the methodologies used by the studies. According to repeated studies on the prevalence of allergic diseases that were conducted as part of the the Environmental Health Monitoring System in the Czech Republic in children aged 5, 9, 13 and 17 in 1996, 2001 and 2006, the incidence of allergic diseases in children diagnosed by physicians showed an upward trend over the decade (Chart 2).

DATA SOURCES

- National Institute of Public Health, Environmental Health Monitoring System in the Czech Republic
- AirBase, European Air Quality Database
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz

National Institute of Public Health, the Health Monitoring System in the Czech Republic, Subsystem I – The health effects and the risks of air pollution
http://www.szu.cz/publikace/subsystem–i

National Institute of Public Health, health and environmental indicators
http://www.szu.cz/tema/zivotni-prostredi/expozice-obyvatel-suspendovanym-casticim-ve-venkovnim-1
http://www.szu.cz/tema/zivotni-prostredi/vyskyt-astmatu-a-alergii-u-deti-1

[1] *EEA 2007. Air pollution in Europe 1990–2004. EEA Report No. 2/2007. Available at: http://www.eea.europa.eu/publications/eea_report_2007_2.*

[2] *An episode of the worsening of a previously stable asthmatic condition that is associated with the typical symptoms of breathlessness, coughing, wheezing, chest tightness, or a combination of these symptoms.*

36/ Population's exposure to chemicals

KEY QUESTION

Is the population's exposure to selected chemicals decreasing?

KEY MESSAGES

Since 2000, blood lead concentrations in the Czech Republic's adult and child populations have shown a downward trend. One of the key reasons is the ban on the use of leaded petrol.

Blood mercury level in the Czech Republic's adult and child populations do not exceed values that are associated with adverse health effects.

A significant long-term downward trend in the concentrations of DDT and other organochlorine pesticides (that were used from the 1950s to 1970s) has been evidenced in the breast milk of Czech mothers.

Since no safe blood lead level can be currently set for the child population, a further gradual reduction in environmental lead concentrations is a necessary precautionary measure.

OVERALL ASSESSMENT

Change since 1990	
Change since 2000	
Last year-to-year change	

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Priority area 3 „The Environment and the Quality of Life" within the **State Environmental Policy of the Czech Republic** aims to minimize the exposure of the human population to toxic metals and organic pollutants.

Priority axis 1 „Society, People and Health" of the **Strategic Framework for Sustainable Development in the Czech Republic** makes „Reducing the health risks associated with negative environmental factors and food safety" one of its objectives.

Health 21, a key programme for protecting and promoting public health that was adopted by the government in 2002, obligates individual ministries to take measures to promote one of its objectives, namely to reduce public exposure to health risks that are associated with water, air and soil pollution by microbial, chemical and other substances.

The **Strategic Approach to International Chemical Management** constitutes a political framework for the safe management of chemicals throughout their life cycle so that by 2020, chemicals will be produced and used in ways that lead to the minimization of significant adverse effects on human health and the environment.

The **Stockholm Convention on Persistent Organic Pollutants (POPs)** is a global treaty aimed at protecting human health and the environment from the harmful impacts of persistent organic pollutants. At the national level, the implementation of the Stockholm Convention takes place according to the National Implementation Plan that was acknowledged by the Government on 7 December 2005 through Resolution No. 1572.

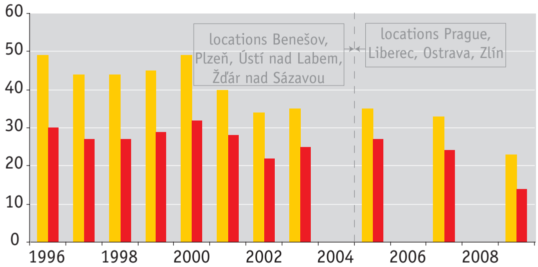
The **Protocol on Heavy Metals** to the **Convention on Long Range Transboundary Air Pollution State** (CLRTAP) obligates the contracting parties to apply measures to reduce air emissions of heavy metals, especially cadmium, lead and mercury.

Reducing pollution by persistent organic pollutants is addressed by the **Protocol on Persistent Organic Pollutants** to CLRTAP.

INDICATOR ASSESSMENT

Chart 1 → **Blood lead levels in adults in the Czech Republic [μg.l-1 of blood], 1996–2009**

μg.l-1 of blood (median)

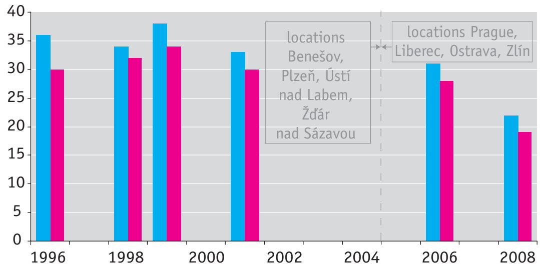


Men
Women

Source: National Institute of Public Health

Chart 2 → **Blood lead levels in children (aged 8–10) in the Czech Republic [μg.l-1 of blood], 1996–2008**

μg.l-1 of blood (median)

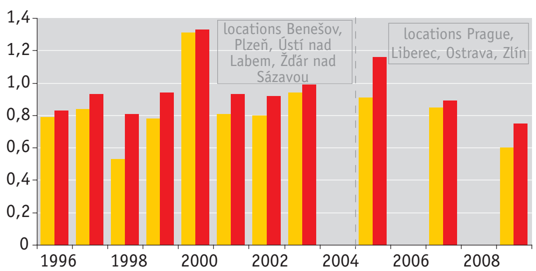


Boys
Girls

Source: National Institute of Public Health

Chart 3 → **Blood mercury levels in adults in the Czech Republic [μg.l-1 of blood], 1996–2009**

μg.l-1 of blood (median)

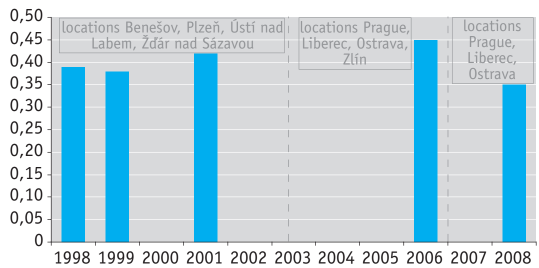


Men
Women

Source: National Institute of Public HealthChildren

Chart 4 → **Blood mercury levels in children in the Czech Republic [μg.l-1 of blood], 1998-2008**

μg.l-1 of blood (median)



Children

Source: National Institute of Public HealthChildren

Blood lead level

Lead is one of the best-known toxic heavy metals. At higher exposures, the health effects of lead include anaemia and adverse effects on the nervous system, kidney function and immunity. Blood lead levels are a reliable indicator of both current and recent exposure to environmental lead.

Blood lead levels in the adult population have gradually declined over the years. In 2009, mean (median) blood levels of 23 μg.l-1 were found in men and of 14 μg.l-1 in women, both of which are significantly lower compared to the levels that were recorded at the beginning of the monitoring in 1996 (Chart 1). The degree I limit value for blood lead level in women of childbearing age (18–35 years) that had been set by the German Commission on Biological Monitoring at 100 μg.l-1 was exceeded in 1 case. The degree I limit value for the remaining adult population, namely 150 μg.l-1, was exceeded in two people, both men. The medically significant limits for lead are currently being reviewed.

In the latest monitoring year (2008), the mean value (median) of recorded individual blood lead level values in the child population in individual monitoring cities ranged from 16 to 29 μg.l-1. The downward trend in blood lead levels in children, which had been observed since 2001, thus continued. To a certain degree, blood lead level data corresponded to the trend in the lead concentrations in urban air that were measured within the Environmental Health Monitoring System in the Czech Republic. Within the monitoring, the originally set maximum permissible level of 100 μg.l-1 was not exceeded in any of the monitored children.

Blood mercury level

Mercury is a toxic heavy metal. It is widely present in the environment and it accumulates in living organisms and is subsequently transferred through the food chain. One of the most serious negative effects on organisms is damage to the nervous system. Of the possible sources of mercury exposure, the intake of toxic methylmercury from the consumption of fish and fish products is currently

considered the most significant; the inhalation of vapours and the swallowing of small particles of mercury from amalgam dental fillings are less significant in terms of health.
Detected **blood mercury levels** do not indicate an increased exposure of the Czech population to this element, the levels show a slight decline compared to previous years. The degree I limit value for blood mercury level in adults of 5 $\mu g.l^{-1}$ that is significant with respect to health was exceeded in 0.7% of all persons (2 cases) in 2009. The result is similar to the previous monitoring year (2007), in which the limit value was exceeded in 2 people. Women generally show higher mercury levels. Risk groups include in particular pregnant women and women of childbearing age (there is a risk of neurotoxicity to the foetus). In 2009, the limit value of 3.4 $\mu g.l^{-1}$ that had been set for women of childbearing age was exceeded in 3 out of 159 women up to 40 years of age, i.e. it decreased by 0.5% compared with the previous monitoring year (2007). The insignificant increase in mercury level that had been observed in several previous years (until 2007) was related to dietary exposure (i.e. a rise in seafood consumption).
Lead and mercury concentrations in the biological material of Czech adult and child populations are consistent with the typical values observed in other European countries.

PCB and OCP levels in breast milk
Polychlorinated biphenyls (PCBs) and DDT-, HCB- and HCH-type organochlorine pesticides (OCPs) are persistent organic pollutants (POPs). While the production of PCBs began in the 1920s, their industrial use spread mainly in the 1950s. Due to the wide use of these substances and their persistence, their concentration in the environment has increased, which is especially significant in the food chain. Producing PCBs was banned in the second half of the 1970s (in the Czech Republic in 1984) and their use became regulated. Since the 1970s, DDT-, HCB- and HCH-type organochlorine pesticides have not been used in the Czech Republic.
The results of the monitoring of PCB levels in breast milk confirm the predominance of highly chlorinated PCB congeners 138, 153 and 180. In the areas that have been monitored since 2005, the level of the PCB 153 indicator congener shows a downward trend, including the Uherské Hradiště area, where higher values were measured in recent years due to old burdens.
In the 1990s, the **level of OCPs** (that were used in the 1950s to 1970s) in breast milk continually declined. After the turn of the millennium, the concentrations of total DDT fluctuated between 250 and 400 $\mu g.kg^{-1}$ of fat; since 2005 they have been declining. The decline in HCB levels has been continual.
The main exposure pathway of a large portion of POPs is food and products of daily consumption. The negative health effects of POP exposure include for example reproductive, nervous and immune system disorders, and carcinogenicity.
Repeated studies coordinated by the World Health Organization that have been monitoring the levels of selected POPs in breast milk in a number of European countries have shown that there are significant differences between countries. The level of dioxins in breast milk in a sample of Czech women was among the lower ones. By contrast, the detected PCB level was (along with Slovakia) high compared to other countries, which can to some extent be explained by a delay of about 10 years in banning PCB production and use compared to Western countries.
The European Environment and Health Action Plan that is being implemented for the 2004–2010 period considers biological monitoring a significant part of preventive activities. The EU seeks to harmonize biological monitoring procedures in EU countries so that the outcomes are comparable, representative and focused on current issues. The EU 7th Framework Programme supports scientific and technical programmes.
The efforts to restrict the movement of persistent pollutants in the environment are also linked to the implementation of the EU's new chemicals policy called REACH[1], which represents a new system of chemical management that ensures that – no later than 2020 – only chemicals with known properties will be used and only in a way that does not damage the environment or human health.

DATA SOURCES
➜ National Institute of Public Health

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION
CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1664)

Health and environmental indicators of the National Institute of Public Health
http://www.szu.cz/tema/zivotni-prostredi/chemicke-latky-a-fyzikalni-faktory

National Institute of Public Health, Environmental Health Monitoring System in the Czech Republic. Summary Report, 2009
http://www.szu.cz/publikace/monitoring-zdravi-a-zivotniho-prostredi

[1] Regulation (EC) No. 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93 and Commission Regulation (EC) No. 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC („REACH").

37/ Noise pollution

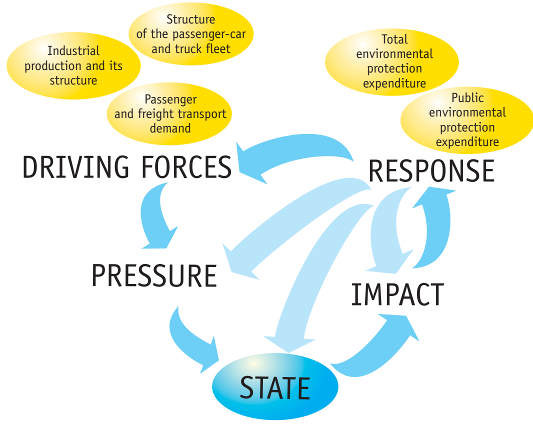
KEY QUESTION

Is the Czech population exposed to excessive noise that adversely affects human health?

KEY MESSAGES

In 2007, the preparation of strategic noise maps for road, rail and air transport and for agglomerations with more than 250 000 inhabitants showed that within the monitored areas of the Czech Republic that were defined as part of round 1 of mapping, 245 385 people were exposed to above-the-threshold daily values and 314 396 people to nightly values as defined by Decree No. 523/2006 Coll.

Road transport was clearly identified as the principal source of noise. Due to increasing road traffic, noise – as a factor that adversely affects human health – is becoming a significant environmental problem.



OVERALL ASSESSMENT

Longer-term and year-to-year changes in the issue cannot currently be characterized. Only the first evaluation is available; comparisons and trends will not be available until the completion of Round II of strategic noise mapping in 2012.

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS

Priority area 3 „The Environment and the Quality of Life" within the **State Environmental Policy of the Czech Republic** sets priority objective 3.3 entitled „Protection of the Environment and Humans against Noise". The partial objectives and measures include protecting quiet areas in the landscape and reducing the burden on the population in settlements from exposure to transport noise and noise from industrial activities. Sanitary noise limits are laid down by Government Regulation No. 148/2006 Coll., on health protection from the adverse effects of noise and vibrations. Limit values for noise indicators for the purposes of strategic noise mapping in the Czech Republic are defined by Decree No. 523/2006 Coll., on noise mapping.
In 2002, **Directive 2002/49/EC of the European Parliament and of the Council related to the assessment and management of environmental noise (END)** was adopted, which was implemented into Czech legislation in 2006, namely through an amendment to Act No. 258/2000 Coll., on public health protection, and Decree No. 523/2006 Coll., on noise mapping. The directive aims to determine the exposure to environmental noise through noise mapping and by assessment methods common to the member states. Furthermore, the directive also regulates the public disclosure of information about noise and its effects and the adoption of action plans by the member states, based upon noise-mapping results, with a view to preventing and reducing environmental noise. In 2010, the Ministry of Health of the Czech Republic is preparing an amendment to the two above-mentioned laws, including a new government regulation to replace the existing Government Regulation No. 148/2006 Coll., on health protection from the adverse effects of noise and vibrations. The amendments will also take into account the Czech Republic's experience from the preparation of strategic noise maps and action plans.

INDICATOR ASSESSMENT

Table 1 → **Limit values for noise indicators in the Czech Republic [dB] pursuant to Decree No. 523/2006 Coll., on noise mapping**

Noise source	L_{den} [dB]	L_n [dB]
Road transport	70	60
Rail transport	70	65
Air transport	60	50
Integrated facilities	50	40

Source: Institute of Public Health Ostrava, Ministry of Health of the Czech Republic

L_{den} – The limit value (L_{den} for day-evening-night) that characterizes the overall annoyance over an entire
L_n – The limit value for night hours (23:00 – 07:00, L_n for night) that characterizes sleep disturbances

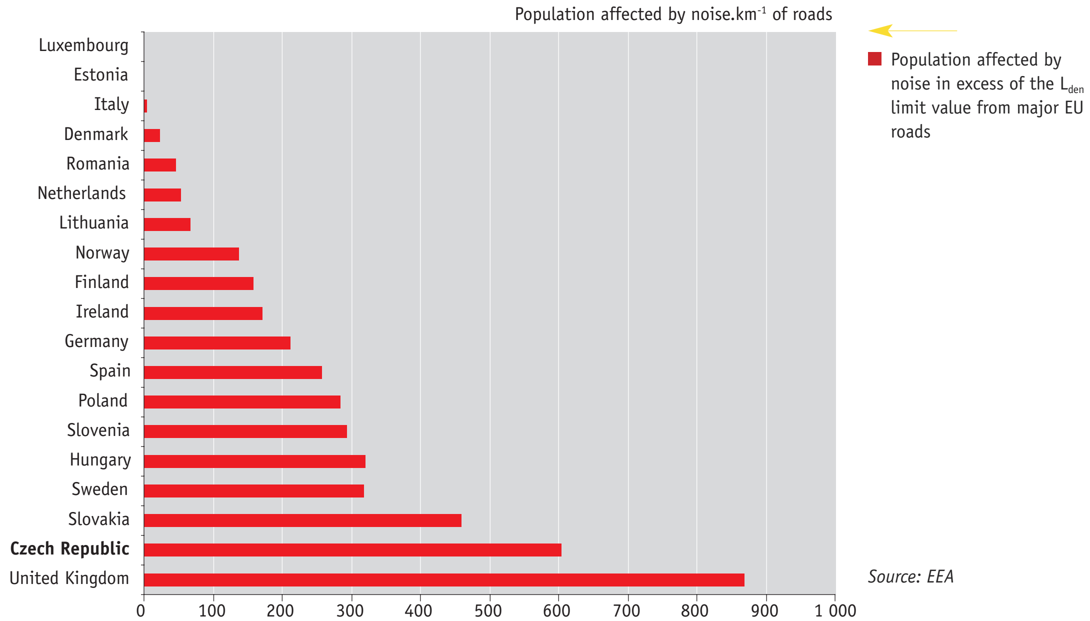
Table 2 ➜ **The Czech Republic's population affected by noise, 2007**

The number of exposed people and buildings				
L_{den} [dB]	Number			
	People	Residential buildings	Educational facilities	Hospitals
55–59	629 273	94 944	261	114
60–64	406 623	56 277	200	51
65–69	324 155	47 326	103	45
70–75	193 437	23 977	60	11
over 75	51 948	5 250	12	6
Total	**1 605 436**	**227 774**	**636**	**227**

The number of exposed people and buildings				
L_n [dB]	Number			
	People	Residential buildings	Educational facilities	Hospitals
45–49	780 127	128 027	377	152
50–54	512 267	73 177	189	73
55–59	381 070	53 690	126	38
60–64	236 612	33 681	81	29
65–69	66 757	7 759	20	6
over 70	11 027	1 050	3	1
Total	**1 987 860**	**297 384**	**796**	**299**

Source: National Reference Laboratory

Chart 1 ➜ **Population affected by noise in excess of the L_{den} limit value from major EU roads, 2007 (preliminary results)**



Source: EEA

Noise came to the fore in the 1970s, when many people in Europe were diagnosed with noise-related conditions – the noise originated not only from transport, but also from other sources. The situation improved after the adoption of technical measures (insulation, noise barriers etc.) **The issue of noise** was then pushed aside by other environmental problems. Given the increasing intensity of road transport, which has been clearly identified as the main source of noise, this human health-affecting factor can no longer be ignored.

The negative impacts of noise on humans lie in the effects of acoustic discomfort, impacts on human activities – for example speech, sleep, learning etc., and impacts on organs, both auditory and extra-auditory. Annoyance along with sleep disturbance is also a source of stress, which is one of the factors that co-act in the development of 'civilization' diseases. Effects on the cardiovascular system are associated with long-term (lifetime) exposure to an equivalent acoustic pressure level L_{Aeq} greater than 65–70 dB, especially in terms of co-acting in the development of ischemic heart disease and hypertension. Negative effects of excessive noise on the central nervous and immune systems have also been described. In addition, the health impact of noise may increase when combined with other factors, such as air pollution. This problem can be particularly acute in cities and agglomerations.

The above findings, which are clearly summarized in Table 2, are based on strategic noise maps that were prepared for the Ministry of Health of the Czech Republic in 2007. Mapping includes the following areas: road transport (for roads with a traffic volume greater than 6 million vehicles per year), rail transport (railway lines with a traffic volume greater than 60 000 trains per year), air transportation (for airports with more than 50 000 aircraft arrivals and departures per year) and agglomerations with more than 250 000 inhabitants. The Czech Republic submits the **results** of strategic **noise mapping** to the Commission as part of its regular reporting requirements.

On the basis of strategic noise maps that were created within round I, the Ministry of Transport of the Czech Republic and regional authorities have prepared **Action Plans**. The plans define the long-term strategy for protection against noise and detail the implementation of noise abatement measures for the following 5 years. They also include evaluating measures relating to transport infrastructure that were primarily aimed at the transport safety and efficiency. With a few exceptions, noise was not the primary criterion for the proposed measures. However, wherever there are changes in roads, the issues of noise and reducing residents' exposure have to be addressed.

According to an EEA[1] study on the environmental impacts of transport that was published in 2009, more than one-half of the population living in agglomerations with more than 250 000 inhabitants within the EU27 (67 million, i.e. 55%) are exposed to excess noise (more than 55 dB) from road transport. Fewer residents of these agglomerations, yet still a significant portion, are exposed to noise from rail and air transport (5.6 million and 3.2 million respectively). Road transport is also the major source of noise at night. More than 48 million inhabitants of the EU27 are exposed to noise exceeding 50 dB[2] at night.

The first preliminary results of strategic noise mapping in Europe are shown in Chart 1. In the period until 30 June 2012, round II of strategic noise mapping will take place, covering 7 agglomerations with more than 100 000 inhabitants and a total area of 2 000 thousand km^2 (round I: 3 agglomerations, ca 950 km^2), ca 4 000 major roads (round I: ca 1 400 km) with more than 3 million vehicles per year and 2 000 km of major railway lines (round I: ca 1 400 km) with more than 30 000 trains per year. Strategic noise maps for round II should be completed in 2012. Subsequently, action plans will be prepared for these areas as well. It can be concluded that the objective of END (using assessment methods that are common to all member states) has not been fully accomplished in round I of strategic mapping and a uniform methodology needs to be established. **Noise abatement measures**, as well as the start of work on round II of strategic noise mapping, are seriously threatened by the current economic crisis.

Through DG JRC (the CNOSSOS-EU project – Common Noise Assessment Methods in the EU), the European Commission has prepared a draft **common calculation method** for preparing strategic noise maps; round II can therefore be expected to provide outcomes on the population's exposure that are truly comparable among the different member states.

It is expected that an **amended END Directive** (2002/49/EC) will be adopted in 2011, reflecting the experience to date with preparing maps and action plans. An important part of the amendment is supposed to be the inclusion of approaches for evaluating the health risks of noise exposure. These are both 'subjective criteria' – noise annoyance and sleep disturbance, and 'objective criteria', i.e. the population attributable risk of some diseases, especially cardiovascular disease.

[1] EEA, 2009: Transport at a crossroads. TERM 2008: indicators tracking transport and environment in the European Union. Available from http://www.eea.europa.eu/publications/transport-at-a-crossroads.

[2] Health risks from exposure to noise exist even below the 'sanitary noise limits' that are laid down by legislation. Relationships for noise annoyance due to traffic are defined from a value of L_{den} = 45 dB and for sleep disturbance from a value of L_n = 40 dB.

DATA SOURCES

- National Reference Laboratory for Noise Measurement and Assessment in Municipal Environment at the Institute of Public Health Ostrava
- Institute of Public Health Ostrava
- Ministry of Health of the Czech Republic
- Ministry of Transport of the Czech Republic
- European Environment Agency (EEA)

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://indikatory.cenia.cz (http://issar.cenia.cz/issar/page.php?id=1666)

National Reference Laboratory for Noise Measurement and Assessment in Municipal Environment
http://www.nrl.cz

Strategic noise maps
http://geoportal.cenia.cz/mapmaker/cenia/portal

Browser of strategic noise map results – NOISE (Noise Observation and Information Service for Europe)
http://noise.eionet.europa.eu

EEA Report No. 3/2009 [online]. Available from
http://www.eea.europa.eu/publications/transport-at-a-crossroads

Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0049:CS:HTML

38/ Total environmental protection expenditure

KEY QUESTION →

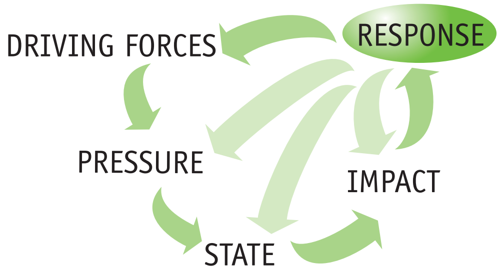
What is the amount of financial resources spent on environmental protection?

KEY MESSAGES →

It can be concluded that that overall statistically monitored expenditure (i.e. the sum of investments in environmental protection plus non-investment costs) showed an upward trend between 2003 and 2008. However, the trend was halted by the drastic decline in non-capital costs in 2009, with total environmental protection expenditure remaining at the same level in 2009 as in 2008.

In 2009, total environmental protection expenditure amounted to CZK 72.3 billion, in 2008 almost CZK 72 billion, i.e. there was only a slight year-to-year increase. In current prices, the proportion in GDP was close to 2% in 2009. Although the largest decline occurred in non-investment costs in waste management (a decline of approximately CZK 3 billion), the area of waste totalling CZK 32 billion remained by far the largest financial item within non-investment costs. By contrast, investments in environmental protection increased by CZK 3 billion (i.e. by almost 16% compared to 2008) and the biggest jump occurred in the area of water protection.

Generally it can be concluded that waste water management, waste management, and air quality and climate protection remained the priority areas within environmental protection.



The financing of environmental protection through investment and non-investment costs is a response (R) to the development and the state (S) of the environment thus far, namely of its individual components, aiming to maintain and improve the state. In addition, financial resources are spent on reducing the negative pressures (P) on the environment, which mainly arise from the activities of economic sectors, and by extension, on reducing the subsequent impacts on ecosystems and human health (I).

OVERALL ASSESSMENT INVESTMENT EXPENDITURE →	
Change since 1990	☺
Change since 2000	☺
Last year-to-year change	☺

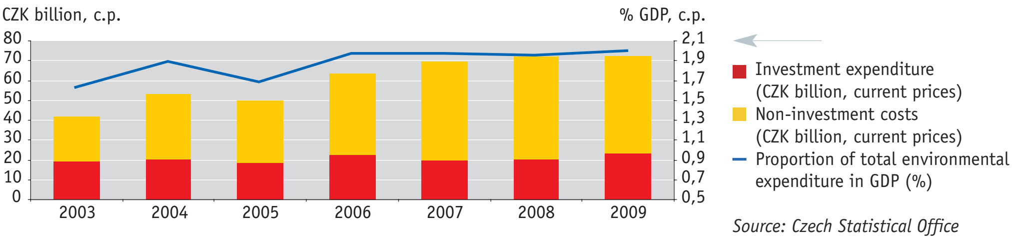
OVERALL ASSESSMENT NON-INVESTMENT EXPENDITURE →	
Change since 1990	N/A
Change since 2003	☺
Last year-to-year change	☹

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS →

The objectives stemming from the State Environmental Policy of the Czech Republic for 2004–2010 relate to investments within the priority areas of environmental protection – especially the promotion of investment in the use of thermal energy from renewable sources, the promotion of environmental investments in environmentally-sound machinery, air quality protection, waste water processing and treatment, waste processing and disposal, and the introduction of „cleaner" technologies in industry. The State Environmental Policy also declares unequivocal support for the reinvestment of financial resources obtained from tax collection and transport fees in the development and application of modern environmentally sound transport technologies.
The **Strategic Framework for Sustainable Development in the Czech Republic** was approved in January 2010. The following objectives have been set in pursuance of priority axis 2 „Economy and Innovation": supporting the dynamics of the national economy and improving competitiveness (in industry and business, agriculture, services); ensuring national energy security and improving the energy and raw-material intensity of the economy; and promoting human resource development, supporting education, research and development.

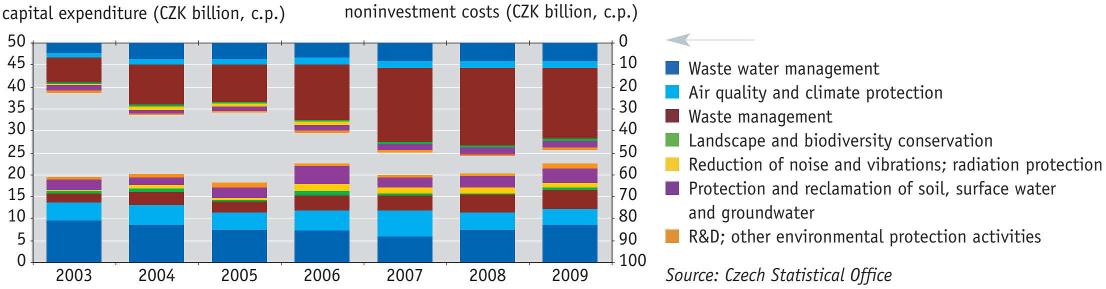
INDICATOR ASSESSMENT

Chart 1 → **Total environmental protection expenditure in the Czech Republic [CZK billion, % of GDP, current prices], 2003–2009**



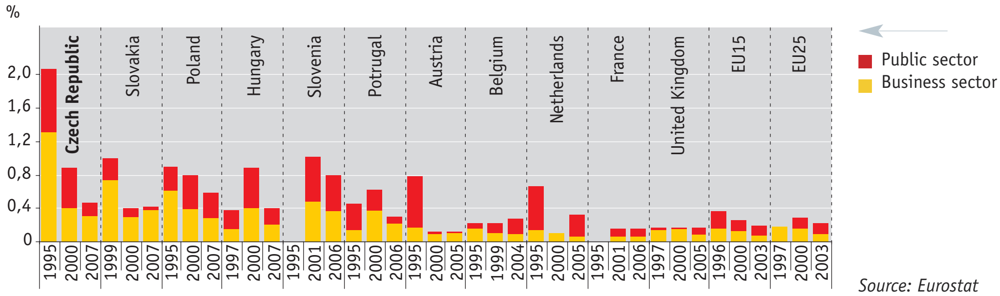
Source: Czech Statistical Office

Chart 2 → **Investments and non-investment expenditure for environmental protection according to programming orientation in the Czech Republic [CZK billion, current prices], 2003–2009**



Source: Czech Statistical Office

Chart 3 → **Proportion of investment expenditure on environmental protection by the business and the public sectors in GDP, an international comparison [% of GDP], 1995, 2000, 2008 (i.e. the closest years available)**



Source: Eurostat

In the case of Slovenia, France, and the EU25, data for some years were partly or fully unavailable.

Total environmental protection expenditure

The total statistically monitored environmental protection expenditure represents the sum of investments in environmental protection and non-investment costs for environmental protection. Investments include all expenditure for tangible fixed assets, i.e. expenditure that relates to environmental protection activities whose main objective is to reduce the negative effects resulting from entrepreneurial activity. Non-investment costs are current or operating expenditure, especially payroll costs, payments for material consumption, energy, repairs and maintenance etc. Data allowing for the quantification of non-investment costs have been recorded since 2003.

In 2009, total environmental protection expenditure amounted to more than CZK 72 billion, which indicates almost no change compared to the previous year. This was due to the opposite trends in investments (a year-to-year increase of CZK 3.2 billion) and non-investment costs (a year-to-year decrease of CZK 2.7 billion). Since 2003 non-investment costs have accounted for the larger portion of total expenditure. Until 2008 non-investment costs showed steady growth and, given the stagnation of investments at approximately CZK 20 billion, they led to an increase in total expenditure on environmental protection, whose proportion in GDP has been stable at a level of approximately 2% of GDP (Chart 1) due to the development of the economy.

Investment in environmental protection

Until 2000, most resources were spent on air quality protection; since 2000 there has been a shift in priorities, with the largest amount of investment going into waste water management and waste management.

In 2009, investment in environmental protection totalled CZK 23.5 billion, representing a 0.65% proportion in GDP in current prices. Compared to 2008, investment increased by more than CZK 3 billion, i.e. by about 15.8%. In the above period, most investment went to end-of-pipe equipment rather than equipment in which an integrated approach to environmental protection is applied. However, there was a slight increase in investment in that area in 2009, partly because it became possible for polluters to obtain subsidies under the Operational Programme Environment (OP E, axis 5).

Within the **programming orientation**, most funding was invested in waste water management (CZK 8.6 billion), waste management (CZK 4.3 billion) and air quality and climate protection (CZK 3.6 billion) in 2009, similarly to preceding years. Compared to 2008, investment in air quality and climate protection decreased the most (by CZK 200 million), while investment in waste water management showed the biggest growth (of about CZK 1 billion), see Chart 2.

In terms of **the economic sectors** of the investing entities, the largest proportion of total investment took place in the area of water supply and activities relating to waste water, waste and remediation (approximately 38% of total investment), followed by public administration, defence and compulsory social security (22%), and electricity, gas and heat production and distribution (14%). The processing industry, which had contributed a large portion of total investment in previous years, invested nearly 13% of the total investment in environmental protection in 2009.

In 2009, the trend of a higher proportion of investment coming from the **business sector** continued. Based on economic principles, this is the application of the „polluter pays" principle, where it the main responsibility for protecting the environment needs to be transferred onto private entities, thus reducing public sector involvement. In 2009, businesses invested more than CZK 16 billion and the **public sector (both central and regional)** approximately CZK 7 billion.

Non-investment costs for environmental protection

Non-investment costs for environmental protection have been monitored by the Czech Statistical Office since 2003. In 2009, they reached CZK 48.7 billion, i.e. 1.34% of GDP. Compared to 2008, these costs decreased by CZK 2.7 billion, i.e. by about 5.2%. These costs constitute a significant portion of total environmental protection expenditure (more than 60% in the 2003–2009 period). The largest amount of non-investment costs was spent on material and energy consumption and payroll.

In terms of **programming orientation**, most of these resources were invested in waste management (CZK 32.1 billion) and waste water management (CZK 8.2 billion) in 2009, similarly to preceding years. However, costs in the area of waste management significantly decreased compared with 2008, namely by CZK 3 billion (Chart 2). This happened mainly due to the increased waste thresholds for waste production and management reporting which, in turn, considerably reduced the administrative burden on businesses.

As for the **sectors of economic activity** in 2009, the largest proportion of non-investment costs for environmental protection took place – as in the case of investments – in the area of water supply and activities relating to waste water, waste and remediation (49%), followed by the processing industry (21%) and public administration and defence, compulsory social security (18%).

An international comparison

The Czech Republic, along with other post-communist countries, spent considerably more on environmental protection than the EU average (Chart 3). This was mainly due to the much worse condition of the environment that had to be addressed through increased investment, and the need to meet EU requirements in connection with EU accession (especially investment in water protection).

DATA SOURCES

- Czech Statistical Office
- Eurostat, Statistical Office of the European Union

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION

CENIA, a list of key indicators
http://issar.cenia.cz/issar/page.php?id=1543

Indicators on Environmental Protection Expenditure, the Czech Statistical Office
http://www.czso.cz/csu/2009edicniplan.nsf/p/2005-09

39/ Public environmental protection expenditure

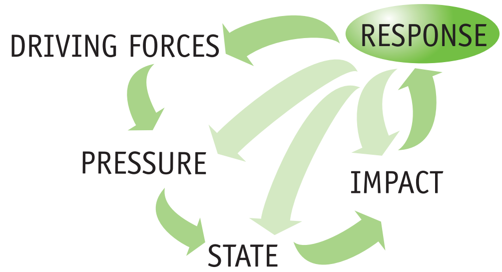
KEY QUESTION ➜

What is the mix and the volume of expended financial resources from central sources and local budgets within public support for environmental protection?

KEY MESSAGES ➜

Despite some fluctuations in the amount of public environmental protection expenditure (i.e. expenditure from central sources and local budgets) we can conclude that the expenditure has been following an upward trend, especially after the Czech Republic's accession to the EU. In 2004, the Czech Republic was involved in the financing of environmental protection through the EU funds. Also important is the growing role of local budgets, i.e. regions and municipalities, in financing environmental protection. In 2009, public environmental protection expenditure from regional budgets totalled CZK 31.7 billion (0.87% of GDP), expenditure from central sources amounted to CZK 23.2 billion (0.59% of GDP). In recent years, most support from public resources has been provided in the area of water protection, followed by biodiversity and landscape protection and waste management.

By year-to-year comparison of 2008 and 2009, it is clear that there was a significant increase in expenditure on environmental protection from both central sources (an increase of CZK 5.8 billion) and local budgets (CZK 4.7 billion). This trend should be viewed positively, since it reflects the growing need for and importance of environmental protection.



The financing of environmental protection through the state budget, the state fund and local budgets is a response (R) to the development and the state (S) of the environment thus far, namely of its individual components, aiming to maintain and improve the state. In addition, financial resources are spent on reducing the negative pressures (P) on the environment, which mainly arise from the activities of economic sectors, and by extension, on reducing the subsequent impacts on ecosystems and human health (I).

OVERALL ASSESSMENT ➜

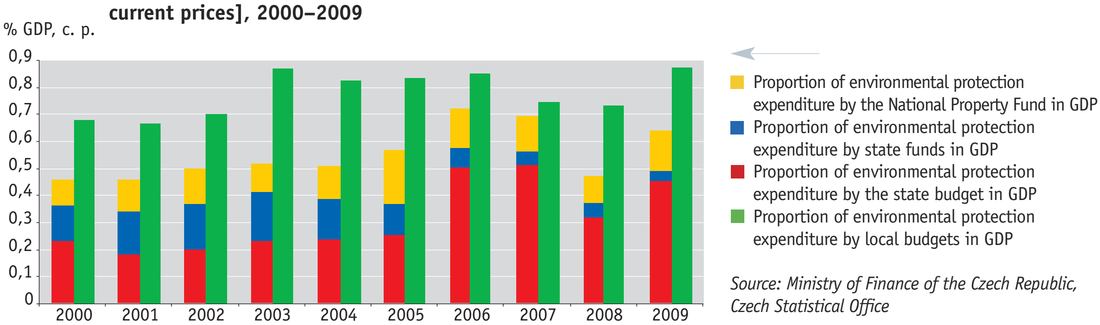
Change since 1990	🙂
Change since 2000	🙂
Last year-to-year change	🙂

REFERENCES TO CURRENT CONCEPTUAL AND STRATEGIC DOCUMENTS ➜

In the area of public environmental protection expenditure, the **State Environmental Policy of the Czech Republic** places special emphasis on expending resources from public budgets on priority areas while retaining economic effectiveness. In the environmental area, the subsidy policy from both the state budget and the State Environmental Fund of the Czech Republic primarily focuses on compliance with obligations that follow from negotiations with the EU and from the priority objectives of the State Environmental Policy of the Czech Republic. **The Strategic Framework for Sustainable Development in the Czech Republic** was approved in January 2010, replacing the Sustainable Development Strategy of the Czech Republic. The following objectives have been set as part of public support in pursuance of priority axis 2 „Economy and Innovation": supporting the dynamics of the national economy and improving competitiveness (in industry and business, agriculture, services); ensuring national energy security and improving the energy and raw-material intensity of the economy; and promoting human resource development, supporting education, research and development.

INDICATOR ASSESSMENT

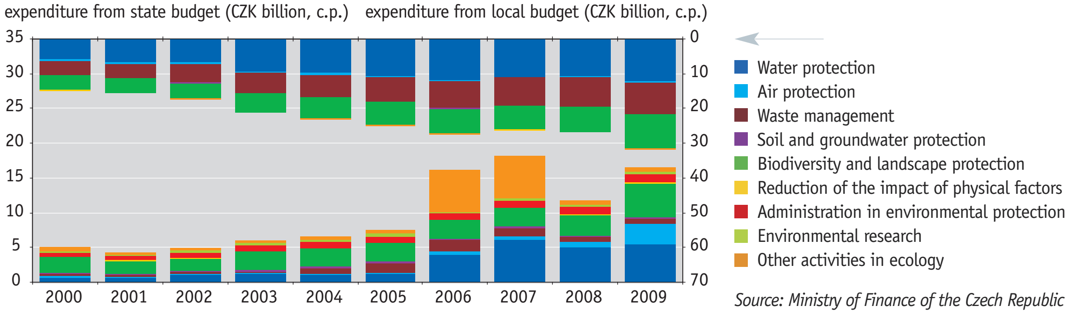
Chart 1 ➜ **Proportion of public environmental protection expenditure in GDP in the Czech Republic by source type [% GDP, current prices], 2000–2009**



Source: Ministry of Finance of the Czech Republic, Czech Statistical Office

The National Property Fund of the Czech Republic was abolished as of 1 January 2006. Both its competences and the resources spent on the rehabilitation of old ecological burdens are now administered by the Ministry of Finance of the Czech Republic. The marked increase in state budget expenditure between 2005 and 2006 resulted from the involvement of funding by European funds.A part of public environmental expenditure by local budgets is a duplication of expenditure from central sources.

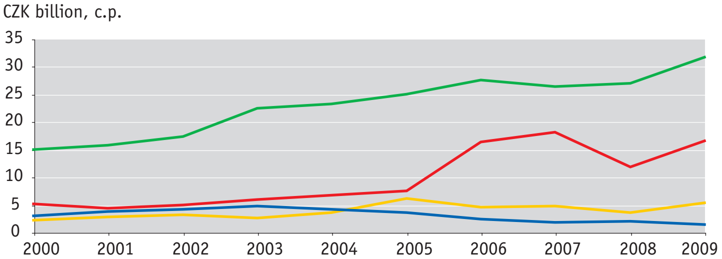
Chart 2 → **Public environmental protection expenditure from the state budget and local budgets in the Czech Republic by programming orientation [CZK billion, current prices], 2000–2009**



Source: Ministry of Finance of the Czech Republic

The marked increase in state budget expenditure between 2005 and 2006 resulted from the involvement of funding by European funds. A part of public environmental expenditure by local budgets is a duplication of expenditure from central sources.

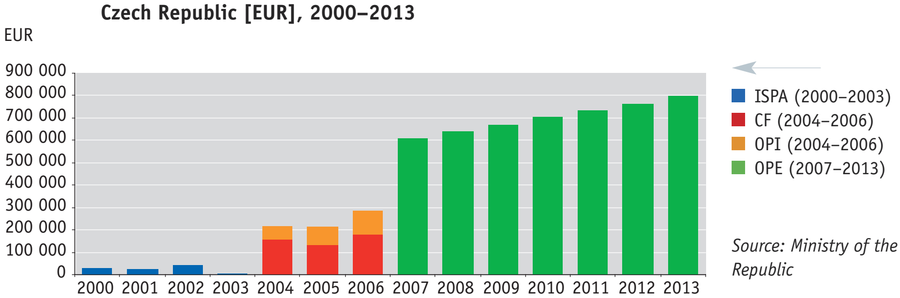
Chart 3 → **Public environmental protection expenditure in the Czech Republic by source type [CZK billion, current prices], 2000–2009**



Source: Ministry of Finance of the Czech Republic

The National Property Fund of the Czech Republic was abolished as of 1 January 2006. Both its competences and the resources spent on the rehabilitation of old ecological burdens are now administered by the Ministry of Finance of the Czech Republic. The marked increase in state budget expenditure between 2005 and 2006 resulted from the involvement of funding from European funds.A part of public environmental expenditure by local budgets is a duplication of expenditure from central sources.

Chart 4 → **Estimated allocation of financial resources from EU funds for projects in the area of the environment in the Czech Republic [EUR], 2000–2013**



Source: Ministry of the Environment of the Czech Republic

Public environmental protection expenditure is comprised of environmental protection expenditure from **central sources** and **local budgets** and it quantifies the implementation of the need to protect the environment at both the central and regional levels. As regards public environmental protection expenditure in relation to the overall performance of the economy, the **proportion of the expenditure in GDP** showed a moderate upward trend between 2000 and 2009. Given the comparatively solid economic growth over the 2000–2008 period, this is a positive finding – public support for environmental protection grew in proportion to the growth of the economy. In the case of public expenditure from central sources, the proportion was cca 0.64% of GDP in 2009 (+0.17 percentage points compared to 2008). In the case of expenditure by local budgets, the proportion was 0.87% of GDP (+0.17 percentage points; Chart 1). It should be noted that despite the crisis that pervaded the Czech economy in 2009, environmental protection and its support from public budgets lost none of its importance.

Public expenditure from central sources

The state budget is the most significant central source of public funding – especially in terms of the amount of financial resources – that provides subsidies, repayable financial assistance (interest-free loans) and guarantees for commercial loans. Also important **are transfers of resources from the state budget to both local budgets and state funds for environmental protection**. A significant

increase in expenditure from the state budget was seen in 2006 and 2007, when financial resources from EU funds became involved in the budget chapters that are intended for financing environmental protection in the Czech Republic. In 2008, these resources were transferred directly to the newly prepared environmental protection programmes, which resulted in a year-to-year decline in expenditure from this source of 35%. However, in 2009 there was another **significant year-to-year increase**, namely of about CZK 4.7 billion to a total of CZK 16.5 billion (+40% compared to 2008). This amount also includes transfers to local budgets and state funds totalling CZK 295.4 million. Compared with 2000, when the state budget expenditure totalled CZK 5.04 billion, the amount of expended financial resources more than tripled by 2009. This truly dramatic increase is mainly attributable to the involvement of the EU; since 2004, the EU has been helping the Czech Republic to finance environmental protection projects, with resources for co-financing these projects being provided by the state budget. The highest annual increase in expended financial resources occurred in the area of biodiversity and landscape protection, which corresponds to the overall trend from the previous years. This area showed a year-to-year increase of approximately CZK 1.9 billion to a total of CZK 4.87 billion (+65.5%). Significant year-to-year increases could also be seen in air protection (+CZK 1.9 billion, i.e. +211%) to a total of CZK 2.8 billion and water protection (+CZK 0.6 billion, i.e. +12%) to a total of CZK 5.6 billion.
In terms of **programming orientation**, the areas that have received the most support over the **long-term** include the already-mentioned water protection, biodiversity and landscape protection, and waste management. In recent years, support for air protection has also been increasing again (Chart 2). Other public central sources of environmental expenditure include – as part of monitoring the expenditure from state funds – the **State Environmental Fund of the Czech Republic** and the now-defunct **National Property Fund**, whose remaining competences and resources are now administered by the Ministry of Finance outside the state budget. In 2009, the expenditure by the State Environmental Fund of the Czech Republic amounted to approximately CZK 1.32 billion – it has declined over the past five years, especially due to the decrease in income from laws pertaining to individual environmental components, i.e. depending on the improving condition of the environment, a delay in the drawing of resources from the Operational Programme Environment, and the allocation of most resources of the State Environmental Fund of the Czech Republic for co-financing EU programmes. Support from the State Environmental Fund of the Czech Republic in the form of loans, subsidies and partial payments of interest is directed mainly to the areas of water protection, biodiversity and landscape protection, air protection, and waste management. In 2009, CZK 5.4 billion was expended from the resources of the National Property Fund that are administered by the Ministry of Finance, namely in the form of contractual guarantees for the removal of old environmental damage. Compared to 2008 this figure increased by CZK 1.8 billion (+50%; Chart 3).

Public expenditure from local budgets
Public sources of environmental protection expenditure also include **local budgets** that have displayed a steadily increasing trend. In 2009, they totalled CZK 31.7 billion, after a year-to-year increase of CZK 4.7 billion (+17% compared to 2008). They had increased more than twofold compared to 2000, when they had totalled approximately CZK 14.9 billion. Local budgets are thus the most significant public source of funding for environmental protection projects in the Czech Republic, which is in line with the solidarity principle (Chart 3). At the municipality and self-governing region levels, expenditures are implemented continually based on the competence of municipalities and self-governing regions – however, they partly consist of subsidies from central sources. The largest year-to-year increase occurred in water protection (+CZK 1.3 billion, i.e. +12%) to CZK 12.1 billion, biodiversity and landscape protection (+CZK 2.6 billion, i.e. +36%) to CZK 9.7 billion, and waste management (+CZK 0.7 billion, i.e. +8%) to CZK 9.2 billion. As in the case of expenditure from the state budget, local budgets also showed a relatively significant increase in expenditure on air protection, namely of CZK 0.2 billion (i.e. 96%) to a total of CZK 0.46 billion (Chart 2).

Financing by EU and foreign sources
Since 2004, both the EU and other foreign sources have also played an important role in financing environmental protection. The financial amount that was promised to the Czech Republic for the 2004–2013 period by EU and foreign sources is nearly EUR 5.7 billion and CHF 30 million, most of which is intended for the Operational Programme Environment. The main sources for financing environmental protection are the Operational Programme Infrastructure (OPI, 2004–2006), the Cohesion Fund (2004–2010), the Norwegian and the EEA Financial Mechanisms (2004–2009), the Swiss-Czech Cooperation Programme (2007–2011) and the Operational Programme Environment (2007–2013) that is the largest in terms of subsidies and that is thematically linked to the OPI (Chart 4). Furthermore, the role of SEA, IPPC and land-use planning needs to be strengthened. These areas offer promising prospects for the use financial resources from the EC. It is obvious that in the future, the absolute amount of financial resources for environmental protection will need to be increased. However, it is important to reduce their dependence on the proportion in GDP, i.e. the EU aims to achieve a greater involvement of private entities, thus reducing the amount of public environmental protection expenditure year by year.

DATA SOURCES
➜ Czech Statistical Office
➜ Ministry of Finance of the Czech Republic
➜ Ministry of the Environment of the Czech Republic

LINKS TO A COMPREHENSIVE ASSESSMENT OF THE INDICATOR, THE METHODOLOGY AND ADDITIONAL INFORMATION
CENIA, a list of key indicators
http://issar.cenia.cz/issar/page.php?id=1548

Ministry of Finance of the Czech Republic – Guarantees for the removal of old environmental damage and the revitalization of the landscape
http://www.mfcr.cz/cps/rde/xchg/mfcr/xsl/fnm_smluvni_garance_50187.html

List of abbreviations

ALR	agricultural land resources
AOT40	accumulated ozone exposure over a threshold of 40 parts per billion
AOX	adsorbable organohalogens
BaP	benzo(a)pyrene
BAT	Best Available Techniques
BMW	biodegradable municipal waste
BPEJ	evaluated soil-ecological unit
BOD_5	biochemical oxygen demand over five days
CEHAPE	Children's Environment and Health Action Plan for Europe
CENIA	Czech Environmental Information Agency
CLC	CORINE Land Cover
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CNG	compressed natural gas
COD_{Cr}	chemical oxygen demand by chromium
Coll.	Czech collection of laws
c.p.	current prices
CSN	Czech state standard
CZK	Czech crown
DDT	dichlorodiphenyltrichloroethane
DG JRC	Directorate General Joint Research Centre
DH	district heating
DMC	domestic material consumption
EAFRD	European Agricultural Fund for Rural Development
EC	European Communities
EEA	European Environment Agency
EEC	European Economic Community
EFMA	European Fertilizer Manufacturers Association
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
END	Environmental Noise Directive
E-PRTR	European Pollutant Release and Transfer Register
EU	European Union
EU ETS	European Union Emission Trading System
EUR	Euro
Eurostat	Statistical Office of the European Union
FCOLI	thermo-tolerant (faecal) coliform bacteria
FSC	Forest Stewardship Council
GAEC	Good Agricultural and Environmental Conditions standards
GDP	Gross Domestic Product
HCB	hexachlorobenzene
HCH	hexachlorocyclohexane
HRDP	Horizontal Rural Development Plan
ICP Forests	International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests
IPPC	Integrated Pollution Prevention and Control
IPR	Integrated Pollution Register
ISSaR	Information System for Statistics and Reporting
IUCN	International Union for the Conservation of Nature
LPG	liquefied petroleum gas
LV	limit value
LULUCF	Land Use, Land Use Change and Forestry
MT	margin of tolerance
NECD	National Emission Ceiling Directive
NIS	National Inventory System
N/A	data not available
OCPs	organochlorine pesticides
PAH	polycyclic aromatic hydrocarbons

PCB	polychlorinated biphenyls
PEFC	Programme for the Endorsement of Forest Certification Schemes
PES	primary energy sources
PM	particulate matter
POPs	persistent organic pollutants
RDP	Rural Development Programme
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RES	renewable energy sources
SCI	Sites of Community Importance
SEBI	Streamlining European Biodiversity Indicators
SEP	State Energy Policy
SPA	Special Protection Areas
TSES	Territorial System of Ecological Stability
TV	target value
UAT	Unfragmented Areas by Traffic
UN	United Nations
UNFCC	United Nations Framework Convention on Climate Change
USLE	Universal Soil Loss Equation
VAT	value added tax
VOC	volatile organic compounds
WHO	World Health Organization
WMIS	Waste Management Information System
WMO	World Meteorological Organization
WWTP	waste water treatment plant

Glossary of terms

Acidification. The process whereby the substance's pH decreases, resulting in increased acidity. It primarily affects air and secondarily affects water and soil. Acidification is caused by the emission of acidifying substances (i.e. sulphur oxides, nitrogen oxides and ammonia) into the air.

AOT40. This is the target value for ground-level ozone levels from the perspective of ecosystem and vegetation protection. This refers to the accumulated exposure over a threshold of 40 ppb ozone. The AOT40 cumulative exposure to ozone is calculated as the sum of the differences between the hourly ozone concentration and a threshold level of 40 ppb (= 80 µg/m^3) for each hour in which the threshold value was exceeded. According to the requirements of Government Regulation No. 597/2006 Coll., AOT40 is calculated over a three-month period from May to July from ozone concentration measurements taken each day between 8:00 and 20:00 CET.

AOX. These are absorbable organically bound halogens. The summary indicator AOX is expressed as chlorides, expressed as the equivalent weight of chlorine, bromine and iodine contained in organic compounds (e.g. trichloromethane, chlorobenzene, chlorophenols etc.) that, under certain conditions, adsorb onto activated carbon. The main source of these substances is the chemical industry. While generally poorly degradable and water-soluble, these compounds are soluble in fats and oils, and thus easily accumulate in fatty tissues.

BAT. Special Protection Areas. BAT means the most effective and advanced stage in the development of technologies, practices and methods of operation which indicate the practical suitability of particular techniques designed to prevent, or when not possible, to reduce emissions and their impact on the environment.

Biomass. As a general concept, biomass includes all organic material that is involved in the energy and element cycles within the biosphere. This especially includes plant and animal substances. For the purposes of the energy sector, biomass includes plant material that can be utilised for energy (e.g. wood, straw etc.) and biological waste. The energy that is accumulated in biomass originates from the Sun, similar to fossil fuels.

BMW. Biodegradable municipal waste is the biologically degradable component of municipal waste that undergoes anaerobic or aerobic decomposition, such as food and garden waste, as well as paper and cardboard.

BOD_5. This represents the five-day biochemical oxygen demand. BOD_5 is the amount of oxygen that is consumed by microorganisms during the biochemical oxidation of organic substances over five days under aerobic conditions at 20 °C. This is therefore an indirect indicator of the amount of biodegradable organic pollution in water.

BPEJ. The evaluated soil-ecological unit (BPEJ) is a five-digit numeric code associated with agricultural land. It expresses the main soil and climatic conditions that affect the productive capacity of agricultural land and its economic value.

Climatic conditions (climate). This is the long-term weather trend that is determined by the energy balance, atmospheric circulation, the character of the active surface, and human activities. Climate is an important component of the natural conditions of any specific location. It affects the character of the landscape and whether it can be used for anthropogenic activities. It is geographically contingent and reflects the latitude, altitude and the degree of ocean influence.

CO_2 eq. This carbon dioxide emission equivalent measures aggregating greenhouse gas emissions. It expresses a unit of any greenhouse gas recalculated to CO_2 radiation efficiency that is taken as 1; other gases have higher coefficients.

COD_{Cr}. Chemical oxygen demand determined by the dichromate method. COD_{Cr} is the amount of oxygen that is consumed for oxidizing organic substances in water through an oxidizing agent – potassium dichromate under standard conditions (two hours of boiling in a 50% acid with a catalyst). It is therefore an indirect indicator of the amount of all organic pollution in water.

DDT. Dichlorodiphenyltrichloroethane – see OCP.

Decoupling. The separation of the economic growth curve from the environmental pressure curve. Decoupling reduces the specific environmental pressure per unit of economic output. It can be either absolute (economic output increases while pressure decreases) or relative (economic output increases while pressure also increases, yet at a slower rate).

Dependence on foreign countries for materials. It expresses the proportion of imports in domestic material consumption. It is usually evaluated for certain groups of materials (e.g. oil) for which it indicates whether and to what degree the country's economy is dependent on the imports of that material.

DH. District heating. In a DH heating system, heat is generated at a single centralised source and subsequently distributed via grids to multiple buildings. DH is also known as teleheating.

Domestic material consumption. This term covers all materials entering the economy. It is calculated as the sum of all direct material input (domestic extraction, including extraction-related indirect material flows) and imports less exports.

Emissions. The discharge or release of one or more pollutants into the environment. These substances may originate from natural sources or human activity.

Equivalent noise level. Equivalent noise level A is the average energy of the instantaneous levels of acoustic pressure A and is expressed in dB. The equivalent noise level is thus a constant noise level that has approximately the same effect on the human body as time-varying noise.

Eutrophication. The enrichment of water with nutrients, especially nitrogen and phosphorus. Eutrophication is a natural process where the main nutrient sources are nutrients washed from soil and the decomposition of dead organisms. Excessive eutrophication is caused by human activities. Nutrient sources include fertilizer use, sewerage discharge etc. Excessive eutrophication leads to the overgrowth of algae in water and subsequently to the lack of oxygen in water. Soil eutrophication distorts its original communities.

Exacerbation. The worsening of a previously stable asthmatic condition that typically is associated with breathlessness, coughing, wheezing, chest tightness, or any combination of these symptoms.

Greenhouse gases. Gases that are naturally present in the atmosphere or produced by humans; they have the ability to absorb long-wave radiation that is emitted by the Earth's surface, thus influencing the climate's energy balance The action of greenhouse gases results, in part, in an increased daily average temperature near the Earth's surface. The most important greenhouse gas is water vapour, which accounts for 60–70% of the total greenhouse effect in mid-latitudes (excluding the effect of clouds). The most important greenhouse gas that is affected by humans is carbon dioxide.

Hazardous waste. Waste exhibiting one or more hazardous characteristics that are listed in Annex 2 to Act No. 185/2001 Coll., such as explosiveness, flammability, irritability, toxicity, and others.

HCB. Hexachlorobenzene – see OCP.

HCH. Hexachlorocyclohexane – see OCP.

Investment in environmental protection (= investment expenditure). Investment expenditure on environmental protection includes all expenditures for acquiring tangible fixed assets that are spent by reporting units in order to acquire fixed assets (through purchasing or through their own activities), along with the total value of tangible fixed assets that are acquired free of charge, transferred under applicable legislation, or reassigned from private use to business use.

Lime fertilizers. Calcium for the production of lime fertilizers is obtained from lime and magnesian-lime rocks that naturally formed from calcium that had been released from magnetic minerals. Another source of calcium fertilizers is waste materials from industry – lime sludge, cement dust, phenol lime etc., and natural lime fertilizers of local importance. Lime is used as fertilizer either directly (possibly after mechanical processing), as a fertilizer produced through a chemical process (calcining, burnt-lime slaking etc.).

Local concentration of pollution. A pollutant that is present in the air and comes into contact and affects the recipient (humans, plants, animals, materials). It results from the physical and chemical transformation of emissions.

LULUCF. The category that covers the emission and removal of greenhouse gases resulting from land use and forestry activities. This category is usually negative for countries with high forest cover and low levels of logging, and positive for countries with low forest cover or where there are rapid changes in the landscape towards the cultural landscape.

Material intensity of GDP. The amount of materials that a given economy needs to produce a unit of economic output. High material intensity indicates that the economy causes high potential pressure on the environment and vice versa. The pressure results not only from the extraction of materials, but also from waste flows, e.g. emissions and waste.

Meteorological conditions. The weather trend over several days, months, or even longer periods selected with regard to the influence on certain economic activities (e.g. the energy sector) and the state of environment (air quality). The term should not be confused with climatic conditions (climate).

Mineral fertilizers (inorganic, industrial, chemical fertilizers). Fertilizers containing specific inorganic nutrients that are obtained through extraction and/or physical and/or chemical industrial processes.

Mixed municipal waste. Waste that remains after the separation of usable components and hazardous components from municipal waste; sometimes also called "residual" waste.

Motorization. The number of registered passenger cars in proportion to the population. It is expressed as the number of vehicles per 1 000 inhabitants.

Municipal waste. This is all waste that is produced in a municipality by natural persons and that is listed as municipal waste in an implementing legal regulation, with the exception of waste produced by legal persons or natural persons that is authorised for business activities.

Natura 2000. A system of protected areas that are formed in all EU member states based on common principles. The system aims to protect animal and plant species and habitat types that are – from the European perspective – the most valuable, endangered, rare or limited in their prevalence to a particular region (endemic).

Non-investment expenditure in environmental protection. Non-investment costs for environmental protection, also referred to as current or operating expenditures, include payroll costs, payments for material and energy consumption, repairs and maintenance etc. and payments for services whose main purpose is preventing, reducing, treating or disposing of pollution and pollutants etc. that are generated by the production process of a given business.

OCPs. A group of substances known as organochlorine pesticides that includes DDT, HCH (hexachlorocyclohexane) and HCB (hexachlorobenzene) derivatives and others. These are persistent lipophilic substances that were once used as pesticides.

Other waste. Waste that is not included in the list of hazardous waste in Decree No. 381/2001 Coll. and does not show any hazardous characteristics listed in Annex 2 to the Act on Waste.

Outer urban zone. The outer area of a municipality, usually outside its administrative boundaries, that forms a transition zone between the municipality (or the 'inner urban zone') and open landscape.

PCBs. Polychlorinated biphenyls is the collective term for 209 chemically related compounds (congeners) that differ in the number and position of chlorine atoms bound to the biphenyl molecule.

Pentad. The five-day period that is used in the detailed analysis of meteorological data, most commonly for precipitation. The first pentad occurs from 1 to 5 January, the last one from 27 to 31 December; there are 73 pentads in a year, some of which are part of two consecutive months.

PES. Primary energy sources. PES is the sum of domestic and imported energy sources expressed through energy units. Primary energy sources are a key indicator of the energy balance.

POPs. Persistent organic pollutants are substances that remain in the environment for long periods of time. They accumulate in the fatty tissues of animals and enter humans through the food chain. Even at very low doses, they can cause reproductive disorders, affect the hormonal and immune functions and increase the risk of cancer.

Population equivalent. Population equivalent is a number that expresses the size of a municipality as a pollution source through converting pollution from facilities and other pollution sources to the amount of population that would be needed to produce the same amount of pollution. A population equivalent of one corresponds to the pollution production of 60 g of BOD_5 per day.

Prevalence. The number of people within the monitored population that suffer from a given disease. It is usually indicated as a percentage as of a certain date.

Regional temperatures and precipitation. The values of meteorological components related to a given territory that represent the mean value of the given parameter in that area.

RES. Renewable energy sources. These sources are called "renewable" because they constantly replenish themselves thanks to solar radiation and other processes. From the perspective of human existence, direct solar radiation and some of its indirect forms are "inexhaustible" energy sources. RES includes wind energy, solar energy, geothermal energy, water energy, soil energy, air energy, biomass energy, landfill gas energy, sludge gas energy, and biogas energy.

SCI. Sites of Community importance are protected areas that have been identified in order to ensure the protection of habitats of Community importance and species of Community importance. They are created pursuant to Directive 92/43/EEC and, along with Special Protection Areas, constitute the Natura 2000 network.

SPA. Special Protection Areas are protected areas that have been indentified in order to ensure bird conservation. They are created pursuant to Directive 79/409/EEC and, along with Sites of Community importance, constitute the Natura 2000 network.

State Energy Policy. The State Energy Policy defines the Czech Republic's goals and priorities for the energy sector and describes the specific implementation tools available within the country's energy policy. The State Energy Policy is an essential component of the Czech Republic's economic policy.

Suspended particles. Solid or liquid particles that remain air-borne for a long period of time due to their negligible stalling speed. Particles in the air rare a significant risk factor for human health.

Traffic performance. The sum of all distances travelled by all vehicles within a monitored category for a certain period of time, regardless of their payload ratio. It is measured in vehicle-kilometres (vkm).

Transport performance. The number of passengers or the volume (possibly weight) of goods transported over a distance of 1 kilometre. It is measured in 'passenger-kilometres' (pkm) and 'tonne-kilometres' (tkm).

Transport volume. The number of passengers that were transported by a given mode of transportation during the monitored period (usually a day or a year).

TSES. A territorial system of ecological stability is an interconnected set of natural and altered, yet near-natural ecosystems that maintain a natural balance. A distinction is made between local, regional and supra-regional systems of ecological stability.

UAT. Unfragmented Areas by Traffic. This is a method used to determining 'areas that are unfragmented by traffic'; the method assumes a traffic intensity greater than 1 000 vehicles/24 h and an area greater than 100 km^2.

Vehicle fleet. All vehicles within a monitored category that are registered in the Central Vehicle Register as of a given date.

Waste. Any movable that a person disposes of, or that a person intends to or is obligated to dispose of and that belongs to any of the waste groups specified by Annex 1 to Act No. 185/2001 Coll.

Weather. A term referring to the state of the atmosphere above a certain point on the earth's surface at a specific time. Weather is described using a set of meteorological parameters (temperature, pressure, precipitation, wind direction and wind speed etc.), including the vertical profiles of these parameters, and meteorological phenomena (usually non-quantifiable – icing, fog, thunderstorms, hail etc.).