

3 ENVIRONMENT

Methodological notes

The **environment** shall mean everything that creates natural conditions for the existence of organisms, including human beings, and forms a prerequisite for their further evolution. It comprises especially the air, water, rocks, soil, organisms, ecosystems, and energy.

Waste management refers to activities focused on preventing waste generation, treatment (recovery and disposal) of waste, and the after-care of permanent disposal sites, as well as the supervision of such operations.

Water management refers to all activities aimed at the use, development, and protection of water sources and protection against harmful effects of waters.

Environmental protection expenditure includes costs of the acquisition of tangible fixed assets for environmental protection and non-investment costs for environmental protection. The data are collected by means of an annual statistical questionnaire of the CZSO. The data on tangible fixed assets are the sum of expenditure/costs, which reporting units spent on the tangible fixed assets acquisition (by a purchase or own activities) along with the total value of tangible fixed assets acquired for free or by a transfer according to relevant legislation or by the reclassification from the private use to business one. The non-investment costs include wages and salaries, payments for rents, energy and other material, and payments for services the principal purpose of which is environmental protection.

Notes on Tables

Table 3-1 Land use balance

All agricultural and non-agricultural land is measured by summing up crop areas recorded in the real estate cadastre kept by bodies of the Czech Office for Surveying, Mapping and Cadastre as at 31 December of the reference year.

Agricultural land includes arable land, hop gardens, vineyards, gardens, orchards, and permanent grassland.

Non-agricultural land includes forest land, surface water bodies, as well as built-up areas and other areas.

All the data on land are measured as crop areas of agricultural holdings and non-agricultural enterprises, or of private owners, not differentiated by type of the land management and land size.

Tables 3-2 to 3-5 Specially protected areas and Natura 2000 network

The Act No 114/1992 Sb, on Nature Conservation and Landscape Protection, as subsequently amended, distinguishes six categories of **specially protected areas**. National parks and protected landscape areas, which are referred to as **large-size specially protected areas**, and national nature reserves, nature reserves, national nature monuments, and nature monuments, which are referred to as **small-size specially protected areas**.

Natura 2000 is a network of protected areas (sites) designated by all EU Member States in their territories under unified principles. Establishment of Natura 2000 network is assigned by two most important legal regulations of the EU for nature protection – Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. Requirements of both the directives have been implemented in the national legislation by means of the Act No 114/1992 Sb. In the territory of the Czech Republic, Natura 2000 comprises of delimited **Birds Directive sites** (special protection areas, SPAs; in Czech “ptačí oblast”) and of declared **Habitats Directive sites** (sites of Community importance, SCIs; in Czech “evropsky významná lokalita”).

On 1 March 2017, methodology of the calculation of total land areas of protected areas changed. Since then, land areas of all protected areas have been calculated using borders of the respective protected areas. The figures written in respective decrees to the Act on Nature Conservation and Landscape Protection, which the protected areas were established by, are not applied anymore.

The data given in the tables were taken from the Nature Conservation Agency of the Czech Republic.

Tables 3-6 to 3-11 Emissions from air pollution sources and specific emissions of main air pollutants

Main air pollutants monitored, which are generated, first of all, in the combustion of solid and liquid fuels and are released into the air, are particulate matter (e.g. PM_{10} , fly ash), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and hydrocarbons (C_xH_y). From 2002 onwards, the reporting of hydrocarbon (C_xH_y) emissions has been replaced by the reporting of volatile organic compounds (VOCs), which also cover emissions from the use of solvents, paints, and varnishes, e.g. for outdoor maintenance and in households.

Amounts of mentioned pollutants released into the air are listed in the Register of Emissions and Stationary Sources (Registr emisí a stacionárních zdrojů – REZZO). From 2013 onwards, in connection with changes to the categorization of sources pursuant to the Annex 2 to the Air Protection Act, REZZO sources have been newly categorized as follows:

- **REZZO 1, REZZO 2** categories include stationary installations for fuel combustion with the total heat output over 0.3 MW, incineration plants, other sources (technological combustion processes, industrial productions, etc.). REZZO 1 – reported emissions, REZZO 2 – emissions calculated from reported fuel consumption and emission factors;
- **REZZO 3** category includes stationary installations for fuel combustion with the total heat output up to 0.3 MW, technological processes that are not listed (use of dissolving agents in households, etc., construction works, agricultural activities);
- **REZZO 4** category includes road, railway, water, and air passenger transport and freight transport; as for road transport it further includes abrasion of breaks and tires, abrasion of the road surface, evaporation from fuelling systems of petrol-fuelled vehicles, operation of non-road mobile machinery and mechanisms for landscape and forest maintenance, etc.;
- **REZZO 3, REZZO 4** categories – emissions calculated from data on activities obtained, for example, from the Population and Housing Census, production and energy statistics, traffic census and the Registry of motor vehicles, etc., and emission factors.

More detailed information can be found on http://portal.chmi.cz/files/portal/docs/uoco/oez/emisnibilance_CZ.html (partly in Czech).

Specific emissions shall mean pollutant emissions per unit of time per unit of area.

Tables 3-12 and 3-13 Immissions in selected localities and at background stations

Background stations are stations located in areas of lower population density, at a substantial distance from urban and industrial areas and unaffected by emissions from local pollution sources. They must not be located on locations where ground-level inversion conditions occur and on mountains summits as well.

The **immission limit** is the maximum permissible airborne mass concentration of a pollutant. Permissible annual average concentrations are set for sulphur dioxide at 50 µg/m³ and for PM₁₀ at 40 µg/m³.

Measurement methods:

- sulphur dioxide (SO₂) is measured by colorimetry, coulometry, and based on the UV fluorescence method;
- PM₁₀ is a respirable fraction of suspended particulate matter with the aerodynamic average of 50% of particulates smaller than 10 µm, also called thoracic fraction; it is measured by radiometry;
- nitrogen oxides (NO_x) are measured by colorimetry and chemical luminescence;
- precipitation acidity (pH) is measured by pH-metry.

Precipitation acidity is read on the scale from 14 to 1, where pH value of 14 means extremely alkaline, 7 neutral, and 1 extremely acidic environment.

Table 3-14 Emissions of carbon dioxide and other greenhouse gases

At present, the climate change is considered to be one of the most serious global problems. The climate system is influenced by a number of anthropogenic activities and the prevailing role is assigned to emissions of greenhouse gases (GHGs), which reinforce the greenhouse effect. The following are considered to be the main anthropogenic greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), partly (hydrofluorocarbons - HFCs) and completely (perfluorocarbons - PFCs) fluorinated hydrocarbons, sulphur hexafluoride (SF₆), and nitrogen trifluoride (NF₃) that are collectively known as fluorinated greenhouse gases and also abbreviated as F-gases.

CO₂ emissions originate mainly from fossil fuels combustion, carbonate decomposition in the production of cement, lime, and glass, in desulphurisation processes, and also in metallurgical and chemical production processes. The CO₂ emissions and sequestration occur in the sector of the land use, land-use change, and forestry (LULUCF); in the overall balance of the LULUCF sector, emissions have been prevailing since 2018. Anthropogenic methane emissions in the Czech Republic have their origin mainly in mining, processing, and distribution of fuels. This type of sources is called fugitive sources. Other significant methane emission sources are as follows: animal and livestock rearing and breeding, anaerobic decomposition of biological waste in their land filling, and wastewater treatment. The largest amount of nitrous oxide emissions in the Czech Republic comes from agricultural activities, especially due to denitrification of nitrogen supplied to the soil in the form of artificial fertilisers or organic materials. Production of nitric acid is another important source of the emissions. Since fluorinated greenhouse gases are not produced in the Czech Republic, all the emissions come from their use mostly in cooling industry, and in a lesser extent from their use as blowing agents in manufacturing of foam insulation materials, propellants of some aerosol products, fillings of extinguishers, and insulating medium in heavy current electric equipment.

Greenhouse gases emissions are monitored within the United Nations Framework Convention on Climate Change, including the Kyoto Protocol thereto, and on the basis of the Regulation (EU) No 525/2013 of the European Parliament and of the Council on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC. This regulation has been replaced since 2020 by the Regulation (EU) 2018/1999 of the European Parliament and of the Council on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013

of the European Parliament and of the Council. However, the European Commission is planning to prepare corresponding platforms for reporting as of 2023 and therefore it still requires the Member States to report emission inventory pursuant to the Regulation No 525/2013. Nevertheless, it has to be mentioned that the new regulation will have no major impact on amounts of emissions and on the system of reporting and therefore one does not have to be afraid of any changes. Amounts of emissions are determined according to the required methodology of Intergovernmental Panel on Climate Change (IPCC) called the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and amendments. Due to constant development of the methodology and strict implementation of quality assurance and quality control (QA/QC) procedures, retroactive recalculations are performed from time to time and therefore minor changes may occur in respective years compared to the previously reported data.

Currently, emissions from international transport are included neither in the commitments of the UN Framework Convention on Climate Change nor in the Kyoto Protocol. Therefore, they are not involved in the total national emissions and are reported as a separate item.

Emissions in the table are expressed as a CO₂ equivalent.

Table 3-15 Ground-level ozone concentrations

The maximum ground-level ozone concentration refers to the maximum 8-hour average ozone concentration measured between 9 a.m. and 5 p.m.

The ground-level ozone concentrations are measured by the UV absorbance method.

Data given in the Tables 3-6 to 3-15 were provided by the Czech Hydrometeorological Institute.

Table 3-16 Total ozone amounts in the atmosphere

The ozone concentration is measured by a Dobson spectrophotometer. The principle consists in the determination of wavelength-selective absorption (proportional to the ozone amount) of solar radiation passing through the atmosphere. All the measurements are given in Dobson units (DU) on the BP scale.

The data in the table were provided by the Solar and Ozone Observatory in the city of Hradec Králové, a workplace of the Czech Hydrometeorological Institute.

Tables 3-17 to 3-22 Waste generation and management

Waste means any substance or object which the holder discards or intends or is required to discard.

A **hazardous waste** is defined as a waste that displays one or more of the hazardous properties listed in the Commission Regulation (EU) No 1357/2014 of 18 December 2014 replacing Annex III to Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives.

Waste **generation** represents the volume of own waste, including secondary waste generation (waste from waste processing). It does not include the volume of waste take from a warehouse (storage), imports of wastes or waste taken over from another entity (with the exception of waste from citizens).

Waste management means the collection, transport, recovery and disposal of waste, including the supervision of such operations and the after-care of disposal sites, and including actions taken as a dealer or broker.

Waste treatment, according to the Regulation (EC) No 2150/2002 of the European Parliament and of the Council on waste statistics, as subsequently amended, are subdivided into groups as follows:

- **waste recovery** – operations given in the Annex II to the aforementioned Regulation;
- **waste disposal** – operations given in the Annex II to the aforementioned Regulation.

Waste treatment does not include the volume of secondary waste, preparatory operations, export of waste, balance in storage or transfer to another person. Conversely, in addition to own production, waste treated involves the import of waste or the balance in storage from the previous period. **For these reasons, the volume of waste generated is not equal to the volume of waste that is treated.**

Municipal waste means:

- mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, bio-waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture;
- mixed waste and separately collected waste from other sources, where such waste is similar in nature and composition to waste from households.

Municipal waste does not include waste from production, agriculture, forestry, fishing, septic tanks and sewage network and treatment, including sewage sludge, end-of-life vehicles or construction and demolition waste.

This definition is without prejudice to the allocation of responsibilities for waste management between public and private actors. Waste from households and waste similar in nature and composition to waste from households will be included in municipal waste regardless of the waste collector.

Municipal waste includes waste from:

- households;
- retail trade, small businesses, office buildings and institutions (such as schools, hospitals, government buildings);
- businesses provided that it is similar in nature and composition to household waste and it is not originating from production;
- waste from selected municipal services, i.e. waste from park and garden maintenance, waste from street cleaning services (e.g. street sweeping, waste from cleaning of markets), provided that it is managed as waste.

EWC-STAT (European Waste Classification for Statistics) is a classification (waste statistical nomenclature) in the Regulation (EC) No 2150/2002. Unlike the classification used in the List of Waste (LoW), EWC-STAT is not origin-oriented (it does not distinguish who generated the waste); it is purely a substance oriented waste statistical nomenclature.

The regional breakdown is made **according to the registered office of the establishments** (local units), not according to the registered office of the enterprise.

Data presented in the Tables 3-17 to 3-22 are based on data from the Integrated Environmental Reporting System (administrative system of waste records in Czech abbreviated as ISPOP) and from the annual statistical survey Odp 5-01.

Table 3-23 Pollutants discharged into watercourses and accidents on water sources

Quantities of pollutants discharged into watercourses are given in tonnes per year, separately for respective pollutants defined as follows:

- **insoluble matter (IM)** – substances determined by the water filtration and drying of the filter residue to constant weight at 105 °C;
- **dissolved inorganic salts** – substances, which remain in the filtrate of a water sample after its evaporation, drying, and calcination (at 600 °C) to constant weight;
- **biochemical oxygen demand (BOD₅)** – the amount of oxygen consumed by the aerobic biochemical decomposition of organic matter contained in water for five days under standard conditions;
- **chemical oxygen demand (COD_{Cr})** – the oxygen consumption determined by the dichromate method.

The data on water source accidents were provided by the Czech Environmental Inspectorate.

Table 3-24 Watercourses and surface water abstraction under administration of state-owned enterprises of Povodí

The decisive part of watercourses is under the administration of water management organisations, which are state-owned enterprises called Povodí s. p. (Catchment, s.o.e.).

The **length of watercourses** (in km) includes canalised, partially canalised, and non-canalised natural watercourses; the length of drainage, irrigation, and feeding channels is not included.

From 2011 onwards, the **length of watercourses** has been affected by the transformation of the Zemědělská vodohospodářská správa (Agricultural Water Management Administration), in which mostly companies of Povodí s. p. were delegated to do the water management of small watercourses.

From 2013 onwards, the length of watercourses has been reported according to the Central Registry of Watercourses; concurrently, their classification is revised.

Therefore, results may not be comparable in full to those of previous years.

Tables 3-25 to 3-30 Water supply systems, sewerage systems, and wastewater treatment plants (WWTPs) for public needs; sludge generation in WWTPs

The domain of water supply systems and sewerage systems involves water management activities related to the management and operation of water supply and sewerage systems, i.e. production and distribution of drinking water in a sufficient amount and of good quality and wastewater collection and treatment.

Public water supply systems and sewerage systems are water supply and sewerage systems established and operated in the public interest.

In 2021, data on the numbers and percentages of population supplied with water from public water supply systems and population permanently living in houses connected to public sewerage systems are influenced by results of the 2021 Population and Housing Census and are not fully comparable to those of previous years.

From 2014 onwards, the **volume of water invoiced to households** has been influenced by a change of the Decree No 428/2001 Sb, implementing the Act No 274/2001 Sb, on Water Mains and Sewerage Systems, as subsequently amended. The Decree specifies the term of water invoiced to households and related to that sewerage wastewater.

Water produced includes both invoiced and non-invoiced water supply. The sum of these two items may differ from the water production figures by the amount of water received from or supplied to other organisations.

Wastewater treatment plants (WWTPs) are premises and equipment (facilities) serving for wastewater treatment and having the mechanical, biological, and/or other stage of treatment. Equipment for wastewater pre-treatment (rakes, sand traps, oil traps, grit traps, etc.), cesspools, sumps, and simple facilities with a mechanical function, which are not regularly observed and operated, are not considered to be wastewater treatment plants.

The **capacity of WWTPs** is given as the designed capacity in m³/day. A higher capacity than the designed one is given when implemented intensification measures have been approved by the water management authority.

The data listed in the Tables 3-23 to 3-30 have been obtained from the processing of the CZSO's questionnaires filled in by watercourse management organisations and operators of water supply and sewerage systems. Data on water supply and sewerage systems have been obtained from a regular survey among major operators and a sample of municipalities. Then they are grossed up to Regions and the whole Czech Republic.

Tables 3-31 to 3-36 Investments, non-investment expenditure, and economic benefits from environmental protection activities

Environmental protection is divided into nine areas as follows:

Protection of ambient air and climate includes modifications to technological processes to prevent pollution (air pollution control, protection of climate and the ozone layer); removal of waste gases and vented air; removal of solid and gaseous emissions; air quality monitoring systems, etc.

Wastewater management includes modifications to technological processes to prevent pollution; construction of wastewater treatment plants; construction of sewerage systems connected to wastewater treatment plants; cooling water management; water quality monitoring systems, etc.

Waste management includes modifications to technological processes to prevent waste generation; facilities and equipment for waste collection, transport, sorting, and treatment; construction of incineration plants, recycling plants, controlled landfills, and composting plants; remediation of old landfills; waste monitoring systems, etc.

Protection of biodiversity and landscapes includes protection and rehabilitation of habitats and species; protection of natural and nature-close types of landscape; protection and renewal of components of ecological stability; revitalization of hydrological network; costs of solutions to duties resulting from the Act No 44/1988 Sb, on the Protection and Utilisation of Mineral Resources (the Mining Act), as subsequently amended, etc.

Protection and remediation of soil, groundwater and surface water involves prevention of pollutants' deposition into soil including subsequent infiltration into water; prevention of soil contamination and degradation by chemical effects and subsequent soil remediation; protection of soil against erosion, slope slides and other degradation caused by physical phenomena, including costs of solutions of landslide issues; costs of geological survey tasks aimed at protection of soil, groundwater and surface water, etc.

Noise and vibration abatement (excluding workplace protection) includes prevention of noise and vibration through technology and design modifications and application of noise and vibration control systems in transport by road, rail, and air and in industry; measuring equipment, etc.

Protection against radiation includes radon control measures; geological work connected with the issue of locating deep nuclear waste depositories; measuring equipment; transport and handling of highly radioactive waste, etc.

Research and development include R&D activities dealing with air pollution control and protection of climate and the ozone layer; water pollution control; waste management; soil and groundwater protection; noise and vibration abatement; biodiversity conservation and landscape protection; radiological protection; other environmental research and development, etc.

Other environmental protection activities involve acquisition of long-term tangible fixed assets to prevent floods, environmental protection education, training and instructing, etc.

Data given in the tables come from annual questionnaires of the CZSO.

Table 3-37 Environmental expenditure of selected central government institutions

Environmental expenditure from central government budgets consists of expenses of the State Environmental Fund (without administrative expenses of the Fund office) and of the State Agricultural Intervention Fund, from which environmental protection activities are co-financed.

Table 3-38 Income and expenditure of the State Environmental Fund of the Czech Republic

The income of the State Environmental Fund of the Czech Republic (SEF CR) consists of various payments and charges plus resources from the National Programme of Air Pollution Control. Expenditure of the SEF CR includes grants and loans.

From 2009 onwards, the Fund has been receiving income from the Green Savings programme (the Czech Green Investment Scheme, GIS), from the sale of emission permits (also called carbon credits). These are earmarked funds for implementation of measures leading to energy savings and utilisation of renewable energy sources in family houses and multi-dwelling buildings.

Data in the Tables 3-37 and 3-38 were provided by the State Environmental Fund and the Ministry of Finance.

Table 3-39 Selected material flow indicators

Most environmental problems are directly or indirectly connected with the material flows through the economy. The compilation of macroeconomic material flow accounts objective is to quantify total material intensity of the economy. This intensity can be expressed as material inputs into the economy, material consumption, or as total waste flows from the economy back to the environment.

Direct material input (DMI) measures the input of materials used by the economy, i.e. all materials, which are of economic value and are used in the production and consumption activities. DMI equals domestic (used) extraction (extracted raw materials and grown biomass) plus imports.

Domestic material consumption (DMC) measures the total amount of materials directly used by the economy. DMC is calculated as DMI minus exports.

Furthermore, economic performance indicators can be related to the input or output material flow indicators. For example, GDP per DMI or DMC unit indicate direct **material productivity** of the economy. Conversely, input indicators related to GDP give **material intensity** of the economy.

The material flow indicators of the Czech Republic were subdivided into the following categories:

- biomass (raw materials, intermediates, semi-finished products, and products of biomass);
- fossil fuels (raw materials, intermediates, semi-finished products, and products of fossil fuels);
- metal ores (raw materials, intermediates, semi-finished products, and products of metal ores);
- non-metallic minerals (raw materials, intermediates, semi-finished products, and products of industrial and construction minerals);
- other (other products not elsewhere classified and wastes).

* * *

Further information can be found on the website of the Czech Statistical Office at:

– www.czso.cz/csu/czso/environment_zem

or on websites of other institutions at:

– www.cenia.cz – Czech Environmental Information Agency (Czech only)

– www.chmi.cz/?l=en – Czech Hydrometeorological Institute

– www.mzp.cz/en/ – Ministry of the Environment

– www.nature.cz/web/en – Nature Conservation Agency of the Czech Republic