3. ENVIRONMENT

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

***Waste management** refers to activities focused on preventing waste generation, managing waste, and subsequent care for localities of the permanent waste deposition, as well as to checking of these activities.*

***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 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 fixed assets are the sum of costs which reporting units spent on the fixed assets acquisition (by a purchase or own activities) along with the total value of 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, whose principal purpose 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.

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

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

All the data on land are measured as crop areas of agricultural holdings and non-agricultural enterprises, or of private owners, while there is differentiation made concerning the land size and the type of the land management.

*Tables **3**-2 to **3**-5. **Protected areas***

*The Act on nature conservation and landscape protection distinguishes 6 categories of **specially protected areas**:*

*– national parks and protected landscape areas which are referred to as **large-size protected areas**, and*

*– national nature reserves, nature reserves, national nature monuments, and nature monuments which are referred to as **small-size protected areas**.*

The data given in Tables were taken from the Agency for Nature Conservation and Landscape Protection, Prague.

*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 (as for instance flying ash), sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), and hydrocarbons (C_xH_y). Since 2002 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 for outdoor maintenance and in households, for instance.

In the course of 2006 recalculations of emissions from the heating of households for the period 2000–2006 were completed. The modifications to the methodology resulted in decreased total heat necessary and thus also in a decrease in fuel consumption and emissions by approximately 15–20%; and in the case of technical pollutants emissions dropped by about 40%. In the methodology for the determination of automotive fuel consumption and emissions from mobile pollution sources a new redistribution of the diesel fuel consumption in between means of transport and other mobile pollution sources. Data on automotive fuel consumption for the whole period of 2000–2006, provided by the CZSO, were used for the update of the balance of emissions from transport, from operation of agricultural and forestry machinery, and from other off-road vehicles (e.g. construction machinery).

Amounts of pollutants released into the air are listed in the Air Pollution Sources and Emissions Register (Registr emisí a zdrojů znečišťování ovzduší – REZZO). *The register is, depending on the type of sources and their thermal output, subdivided as follows:*

– ***REZZO 1*** *includes technology sets having a stationary fuel-fired installation with heat output over 5 MW and equipment of especially important technology processes. Installations of this group are classified as extremely large and large pollution sources;*

– ***REZZO 2*** *includes technology sets having a stationary fuel-fired installation with heat output from 0.2 to 5 MW, equipment of important technology processes, and coal open pits and quarries and similar areas, where there is a potential of spontaneous fire, gob fire, release, or entrainment or fly away of pollutants. Installations of this group are classified as medium sized pollution sources;*

– ***REZZO 3*** *includes technology sets having a stationary fuel-fired installation with heat output lower than 0.2 MW; installations of technology processes not falling into the category of the large and medium sized pollution sources; areas where works carried out can cause air pollution; storage sites of fuel, raw materials, products, waste and captured pollutants emissions; and other constructions, facilities, and activities causing significant air pollution. Installations of this group are classified as small pollution sources;*

– ***REZZO 4*** *includes mobile equipment with internal combustion engines or other ones, which pollute the air, as, namely, road motor vehicles, railway vehicles, boats, vessels, and aircraft. The group members are classified as mobile air pollution sources. Since 1995 the balance has include transport emissions of solid particulates and sulphur dioxide.*

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

*Tables **3**-12 and **3**-13.* ***Immissions on selected locations and 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/m^3 and for PM_{10} at 40 µg/m^3, respectively.*

***Measurement methods**:*

– *sulphur dioxide (SO_2) is can be measured by colorimetry, coulometry, and UV fluorescence;*

– *PM_{10} (respirable fraction of suspended particulate matter with the aerodynamic average of 50% of particulates smaller than 10 µm) is measured by radiometry;*

– *nitrogen oxides (NO_x) can be measured by colorimetry and chemical luminescence; and*

– *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, respectively.*

*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 main anthropogenic greenhouse gases are considered to be carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), partly (HFCs) and completely (PFCs) fluorinated hydrocarbons, and sulphur hexafluoride (SF_6), (collectively known as fluorinated greenhouse gases and abbreviated also as F-gases).

CO_2 emissions originate mainly from fossil fuels combustion, carbonate decomposition in the production of cement, lime, and glass, in desulphurization processes, and also in metallurgical and chemical production processes. The CO_2 emissions and sequestration occur in the sector of the land use, land-use change, and forestry (LULUCF); in overall balance of the LULUCF sector the sequestration has prevailed so far. 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 fertilizers or organic materials. The nitric acid production is another important source thereof. Because fluorinated greenhouse gases are not produced in the Czech Republic all their 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, insulating media in heavy current electric equipment, and in the thermal insulation of windows.

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 Decision No. 280/2004/EC of the European Parliament and of the Council. Amounts of emissions are determined according to the required IPCC (Intergovernmental Panel on Climate Change) methodology. Because the methodology is under constant development and strict implementation of control mechanisms QA/QC are being introduced retroactive recalculations are performed from time to time and therefore minor changes may occur in respective years compared to the previously reported data.

At the moment emissions from international transport are neither included in the commitments of the UN Framework Convention on Climate Change nor in the Kyoto Protocol. They are therefore not involved in the total national emissions and are reported as a separate item.

Emissions in the Table are expressed in the CO_2 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 09.00 and 17.00 o'clock.

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

*Data given in 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 the 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 Hradec Králové, *a workplace of the Czech Hydrometeorological Institute.*

*Tables **3**-17 to **3**-20.* ***Waste generation***

Waste *is any movable thing a person disposes of or intends/is under duty to dispose of, which is classified to any group of waste enlisted in the Act on Waste.*

Hazardous waste *is waste enlisted in the List of Hazardous Waste and any other waste exhibiting one or more hazardous properties.*

Waste management *refers to purchase, collection, concentration, sorting, transport, storage, treatment, recovery, and disposal of waste. Operations of waste management are subdivided into the following groups.*

Recovery operations (R codes) are as follows:

- *R 1 – Use principally as a fuel or other means to generate energy*
- *R 2 – Solvent reclamation/regeneration*
- *R 3 – Recycling/reclamation of organic substances which are not used as solvents (including biological transformation processes except composting)*
- *R 4 – Recycling/reclamation of metals and metal compounds*
- *R 5 – Recycling/reclamation of other inorganic materials*
- *R 6 – Regeneration of acids or bases*
- *R 7 – Recovery of components used for pollution abatement*
- *R 8 – Recovery of components from catalysts*
- *R 9 – Oil re-refining or other reuses of oil*
- *R 10 – Land treatment resulting in benefit to agriculture or ecological improvement*
- *R 11 – Use of wastes obtained from any of the operations numbered R1 to R10*
- *R 12 – Exchange of wastes for submission to any of the operations numbered R1 to R11*
- *R 13 – Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)*

Disposal operations (D codes) are as follows:

- *D1 – Deposit into or onto land (e.g. landfill, etc.)*
- *D2 – Land treatment (e.g. biodegradation of liquid or sludgy discards in soils, etc.)*
- *D3 – Deep injection (e.g. injection of pumpable discards into wells, salt domes or naturally occurring repositories, etc.)*
- *D4 – Surface impoundment (e.g. placement of liquid or sludgy discards into pits, ponds or lagoons, etc.)*
- *D5 – Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.)*
- *D6 – Release into a water body except seas/oceans*
- *D7 – Release into seas/oceans including sea-bed insertion*
- *D8 – Biological treatment not specified elsewhere in this table which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D12*
- *D9 – Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D8 and D10 to D12 (e.g. evaporation, drying, calcination, etc.)*
- *D10 – Incineration on land*
- *D11 – Incineration at sea*
- *D12 – Permanent storage (e.g. emplacement of containers in a mine, etc.)*
- *D13 – Blending or mixing prior to submission to any of the operations numbered D1 to D12*
- *D14 – Repackaging prior to submission to any of the operations numbered D1 to D13*
- *D15 – Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)*

National legislation expands the listed operations of waste management by other waste management operations (N codes) as follows:

- *N1 – Use of waste for landscaping, etc., except for the use of sludge pursuant to the Decree No. 328/2001 Sb.*
- *N2 – Transfer of waste water treatment sludge for the use on agricultural land*
- *N3 – Transfer of waste to other authorized persons (except transport agents)*
- *N5 – Warehouse balance residuum as at 31 December*
- *N7 – Waste exports to the EU Member States*
- *N8 – Transfer (of parts and/or waste) for the re-use*

N9 – Processing of car wrecks
N10 – Sale of waste as a raw material
N11 – Use of waste for the landfill reclamation
N12 – Utilisation of waste as technology material securing landfills
N13 – Composting
N14 – Biological decontamination
N15 – Retreading of tyres
N17 – Waste exports to the non-EU states
N18 – Processing of electrical waste

***Municipal waste** shall mean all waste generated on the municipality territory by activities of natural persons, which is classified to Group 20 of the List of Waste, except for waste produced by legal or natural persons holding a business licence. In this publication municipal waste also includes **commercial waste,** which composition is similar to municipal waste and which is generated in non-production activities of legal or natural persons holding a business licence (e.g. small entrepreneurs, authorities, and offices).*

*The **standard waste collection** shall mean the collection of mixed waste from dustbins, containers, or in bags.*

*The **bulky waste collection** shall mean the collection of waste, which due to its dimensions cannot fit dustbins, containers, or bags.*

*Table **3**-21. **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)** is substances determined by the water filtration and drying of the filter residue to constant weight at 105° C;*

– ***dissolved inorganic salts** are 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 (BOD_5)** is the amount of oxygen consumed by the aerobic biochemical decomposition of organic matter contained in water for 5 days under standard conditions;*

– ***chemical oxygen demand (COD_{Cr})** is the oxygen consumption determined by the dichromate method.*

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

*Table **3**-22. **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 organizations – government-owned enterprises called Povodí *(Catchment).*

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

*Table **3**-23. **Water management works***

Data on water management works are monitored at five-year interval only and include data from enterprise of Povodí s. p. *(Catchment, soe),* Lesy České republiky, s. p. *(Forests of the Czech Republic, soe),* Magistrát hl. m. Prahy *(Prague City Hall) – Department of Environmental Protection, and the Agricultural Water Management Administration.*

*Tables **3**-24 to **3**-29.* ***Water supply systems and sewerage systems, and waste water treatment plants (WWTPs) for public needs; sludge production in WWTPs***

The industry of water supply systems and sewerage systems involves water management activities related to the operation and management of water supply and sewerage systems, i.e. the production and distribution of good quality drinking water and waste water collection and treatment.

***Water supply systems and sewerage systems for public needs** are water supply and sewerage systems established and operated in the public interest.*

***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 organizations.*

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

*The **capacity of WWTPs** is given as the design capacity in m^3/day. Higher capacity than the design capacity is given where implemented intensification measures have been approved by the water management authority.*

*The data listed in Tables **3**-22 to **3**-29 have been obtained from the processing of the CZSO questionnaires filled in by watercourse management organizations and operators of water supply and sewerage systems. Information on water supply and sewerage systems has been collected from major operators and, at present, a sample survey is also conducted to collect data from small operators and the data obtained are grossed up to regions and the whole the Czech Republic.*

*Tables **3**-30 to **3**-35.* ***Investments, non-investment expenditure, and economic benefits from environmental protection activities***

Environmental protection is divided into 9 areas:

***Protection of ambient air and climate** includes modifications to technology 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 technology processes to prevent pollution; construction of waste water treatment plants; construction of sewerage systems connected to waste water treatment plants; cooling water management; water quality monitoring systems, etc.*

***Waste management** includes modifications to technology 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 semi-natural types of landscape; protection and renewal of environmental stability elements; revitalization of hydrological network; costs of solutions to duties resulting from the Act on the Protection and Use of Mineral Resources (the Mining Act), 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 protection at workplace) includes prevention of noise and vibration through technology modifications, design 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 tangible fixed assets to prevent floods, environmental protection education, and training, etc.*

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

*Table **3**-36.* ***Environmental expenditure from central government budgets***

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 activities for environmental protection are co-financed.

*Table **3**-37.* ***Income and expenditure of the State Environmental Fund of the CR (SEF CR)***

The income of the SEF CR consists of various payments and charges plus resources from the National Programme of Air Pollution Control (NPAPC), while SEF's expenditure includes grants and loans.

Since 2009 the Fund has been receiving income from The Green Savings programme (GIS) – income 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 Tables **3**-36 and **3**-37 were provided by the State Environmental Fund, the National Property Fund, and the Ministry of Finance of the CR.*

*Table **3**-38.* ***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 economic system. This intensity can be expressed as material inputs into the economic system, material consumption, or as total waste flows from the economic system back to the environment.

Direct material input (DMI) *measures the input of materials used in 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 in the economy, excluding hidden flows. 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-ferrous minerals (raw materials, intermediates, semi-finished products, and products of minerals for industrial and construction production);

– *others (other products not elsewhere classified and wastes).*

* * *

Further data can be found on the webpages of the Czech Statistical Office at:

– http://www.czso.cz/eng/redakce.nsf/i/environment_zem

or on websites of other institutions at:

– http://www.cenia.cz/ – *Czech Environmental Information Agency*

– http://www.chmi.cz/portal/dt – *Czech Hydrometeorological Institute*

– http://www.mzp.cz/en/ – *Ministry of the Environment of the CR*

– http://www.ochranaprirody.cz/wps/portal/en/ – *Agency for Nature Conservation and Landscape Protection of the CR*