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Preface

	Natural resources, resource use	Pressures	State	Responses
Water	Water resources, water abstraction	Water pollution Water abstraction	Water quality	Waste water treatment
Air	Carbon dioxide sequestration	Air pollution	Ambient air quality Weather	
Land	Land use Organic farming Mineral resources	Use of fertilisers Use of manure Use of pesticides	Nutrient balance Areas exposed to drought Floods, inland inundation	Organic farming
Wildlife	Forest area Afforestation, living stock Game management Logging	Logging	Population trends of farmland birds Health condition of forests	Nature conservation Afforestation, living stock
Waste, material flow	Material flow	Generated waste Material flow	Material flow	Waste treatment
Energy	Energy production Balance of electricity Energy consumption	Energy consumption		Renewable resources
Environment protection expenditures				Environment protection investments Current environment protection expenditures Environmental industry Environmental taxes

Studies describing the state, protection and renewal of and pressure on the environment and databases serving as the basis for the studies are nowadays in high demand. As a result of intensive methodological developments, also urged for and co-ordinated at international level, clear and widely-used environmental indicators help facilitate the interpretation of environmental trends.

This publication is based on the data content of the volume titled "Environmental report", published three times to date, and is the updated version of the last publication, issued in 2012.

The current publication discusses the status of environmental elements, and it presents statistical data on water, air, land and the living world, as well as the available information on wastes and energy, considerably affecting the state and resources of our environment. Major data on environmental protection expenditures and environmental taxes are summarised, too.

The publication presents the indicators both by themes and the groupings of the PSR (pressures-state-responses) model developed by the OECD. The model is based on a relationship in which human activities generate pressure on the environment and alter the quality of environmental elements and the quantity of natural resources. These changes in the state of the environment and their negative effects induce social responses. The chapters are displayed in the matrix on page 6.

The publication contains environmental information based on the data of the Hungarian Central Statistical Office (HCSO) or composed with the contribution of HCSO. These are completed by the data of other institutions, which were transmitted to HCSO to be used for other data or in other statistical publications, and are disclosed here to provide a more comprehensive picture.

The primary aim of our publication is to summarise the available information and to exhibit that with the help of figures and maps. Background information and supplementary tables are available for users in the HCSO database, the publication contains their access path.

The comparable structure of the different chapters help follow up information: the latest available data relevant to the particular area are followed in case of each indicator by time series, then regional data, and each chapter ends with international data.

To facilitate search between the different chapters and tables referred to, we ensured direct access to them in the publication.

Air

Land

Wildlife

Water

Water is the cradle of life on Earth, it covers seven-tenths of our planet's surface, but merely 2.5% of this enormous volume is fresh water. As a consequence of the excess and at the same time wasteful use of water as well as the extreme weather conditions caused by climatic change, the lack of water causes an increasing problem in several regions on our planet. Pure drinking water is estimated to be unavailable or only partly available for nearly 1 billion people.

The EU Water Framework Directive prescribes the protection of eco-systems related to waters, the amelioration of their state, the encouragement of sustainable water use based on the long-term protection of usable water resources, the amelioration of the quality of surface and groundwater by lowering the emissions of pollutants, and the reduction of the impact of floods and droughts.

The implementation of the objectives included in the framework directive is to ensure the "good state" of waters until 2015, which means at the same time cleanliness of water, the as-natural-as-possible state of water-related habitats, and sufficient volume of water. To achieve a good ecological state requires the harmonisation between measures serving this target and flood and inland inundation protection as well as ideas on settlement development.

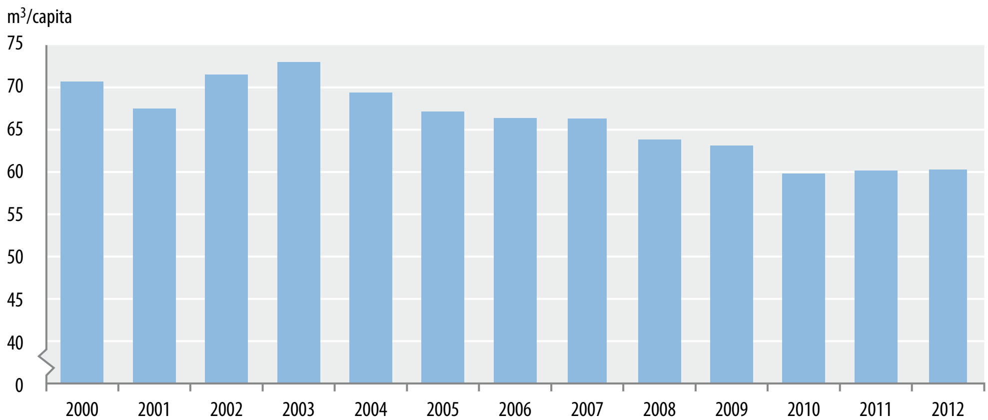
1.1 Water resources, water abstraction

Water resources are natural resources available to different degrees in space and time, maybe even within the borders of one country. Water management is subject to state supervision, as well as legal and economic regulations all over the world. The value of water and the importance of tasks are determined by the availability of water resources, and the rank of priority of use is set up by water quality. A large proportion of surface waters in Hungary is taking its source abroad, which requires international co-operation in water management. The quality and availability of water bodies depend considerably on population density in the examined area, on the concentration of industrial activities there, and on the intensity of agricultural farming.

Due to the favourable geological circumstances Hungary has an outstanding position in Europe in terms of its thermal and medicinal water endowments.

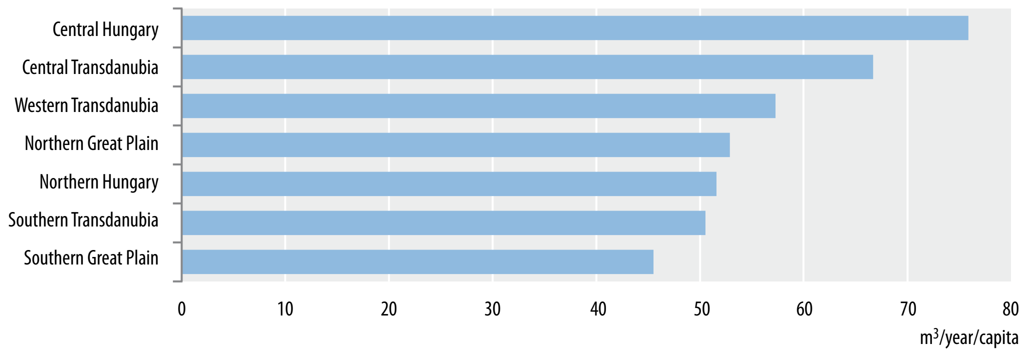
The protection of water quality and availability are key tasks, which are implemented by EU member states according to the objectives defined in the frame of Environmental Action Programmes (at present the Seventh) and the Water Framework Directive. Key objectives are e.g. water saving and the prevention of water pollution. Important activities to achieve these include waste water treatment and remediation, the collection of as high proportions of waste water – released after consumption of drinking water – as possible and its treatment in line with the relevant standards, and then its discharge into surface waters by following strict control procedures.

Figure 1.1.1 Water abstraction by public water supply per capita



The indicator of annual water abstraction by public water supply per capita contains the volume of water from fresh surface and groundwater resources. The main areas of use are drinking water supply as well as – in profitable cases – water uses for industrial, irrigation and cooling water supply purposes. The annual water consumption of households from public water supply decreased gradually between 2000 and 2012 in Hungary (by some 10%), principally because of high water prices and the also significant sewerage charges in areas connected to the sewage system, and water supply from own wells, spreading as an impact of these. The main reasons for large regional disparities were different water abstraction technologies and dwellings' different access to public water supply facilities (e.g. dwellings only with water supply, without waste water collection and treatment).

Figure 1.1.2 Water abstraction by public water supply per capita by regions, 2012



More than one-third of the water abstracted by public water supply was produced in Central Hungary in 2012, while the share of each of the other six regions was 8–13%.

Figure 1.1.3 Distribution of water abstraction by public water supply by regions, 2012

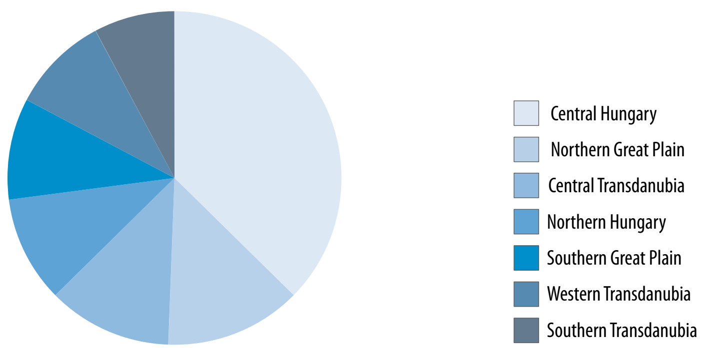
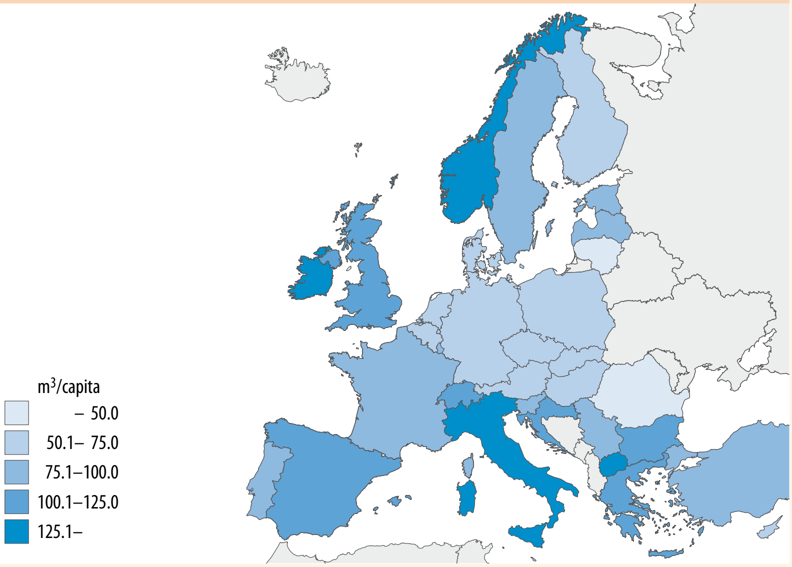


Figure 1.1.4 Water abstraction by public water supply in certain countries in Europe, 2011

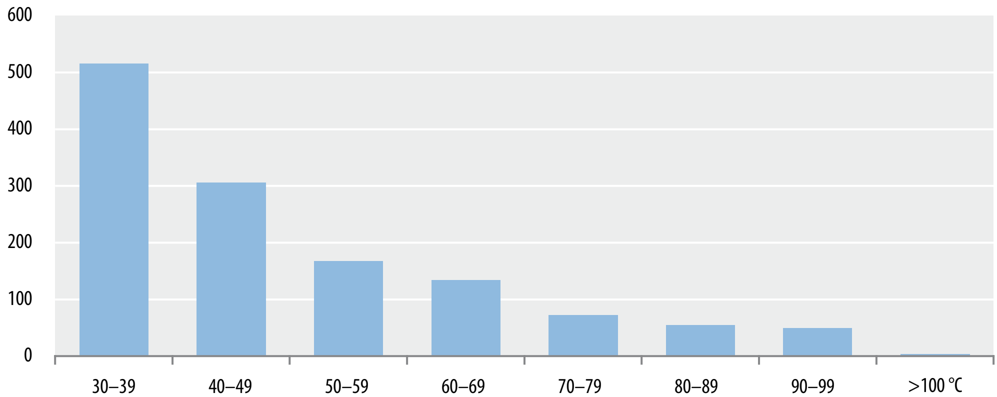
Notes: Countries with data referring to other than 2011: Hungary (2012); Denmark, France, Germany, Latvia, the Netherlands, Slovakia, Spain, Sweden, Turkey (2010); Belgium, Macedonia, Portugal (2009); Austria, Italy (2008); Ireland (2007).



Source: Eurostat, HCSO.

Compared to EU member states, Hungary's indicator for the per capita volume of water abstracted by public water supply (60 m^3/capita in 2012) falls in the second lowest quintile, which can be considered as desirable from the point of view of environment protection, and indicates water saving. Generally the values of the indicator are lower in new member states than in old ones. The main reasons for the differences are for example different water abstraction technologies, dwellings' different access to public water facilities, different climatic circumstances, the ownership of public water supply facilities (state/private), the price of water etc.

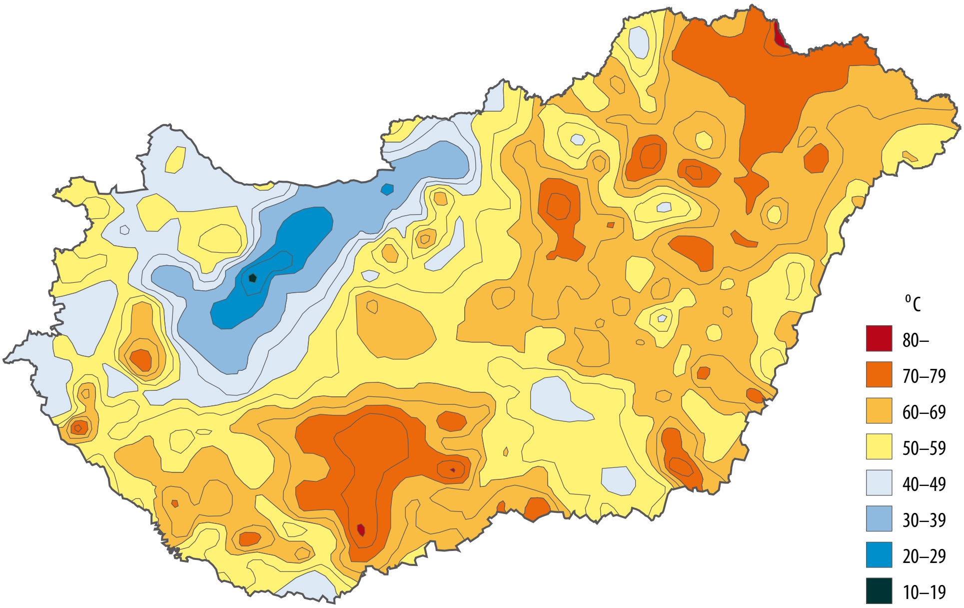
Figure 1.1.5 Number of thermal wells in Hungary by temperature at outflow, 2010



Source: Environmental Protection and Water Management Research Institute.

Thermal waters (in case of which the temperature of outflowing water exceeds 30°C) are principally used for bathing, energetic and drinking water supply purposes in Hungary. The largest and the most dense thermal water abstraction areas are situated in the Great Plain.

Figure 1.1.6 **Temperature at a depth of 1000 m**



Source: Dövényi, P., Horváth, F. and D. Drahos, 2002: Hungary. In: Hurter, S. and R. Haenel (eds.) Atlas of Geothermal Resources in Europe. Publication No. 17811 of the European Commission, Office for Official Publications of the European Communities, L-2985 Luxembourg, pp. 36–38.

The value of the geothermal gradient is 5°C/100 m in Hungary, which is one and a half times as high as the global average. Consequently, the temperature of our groundwaters can also be high.

Tables (Stadat):

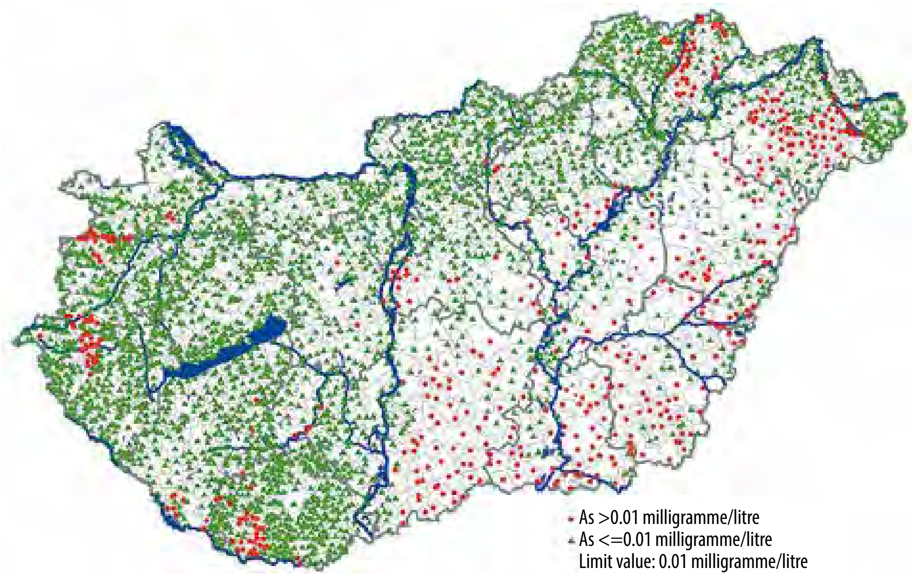
5.4.1 Subsurface water production by types of water

5.4.2 Public water abstraction and supply

1.2 Water quality

Water quality is the physical, chemical and ecological characteristics of water. Accordingly, no single indicator or methodology exists which would be suitable to describe water quality. For this reason, the determination of water quality is actually only meaningful from the aspect of certain well-defined goals. Thus, one can determine the drinking-water-consumption, industrial (cooling water), agricultural (irrigation), touristic (bathing) or ecological quality of surface and groundwaters.

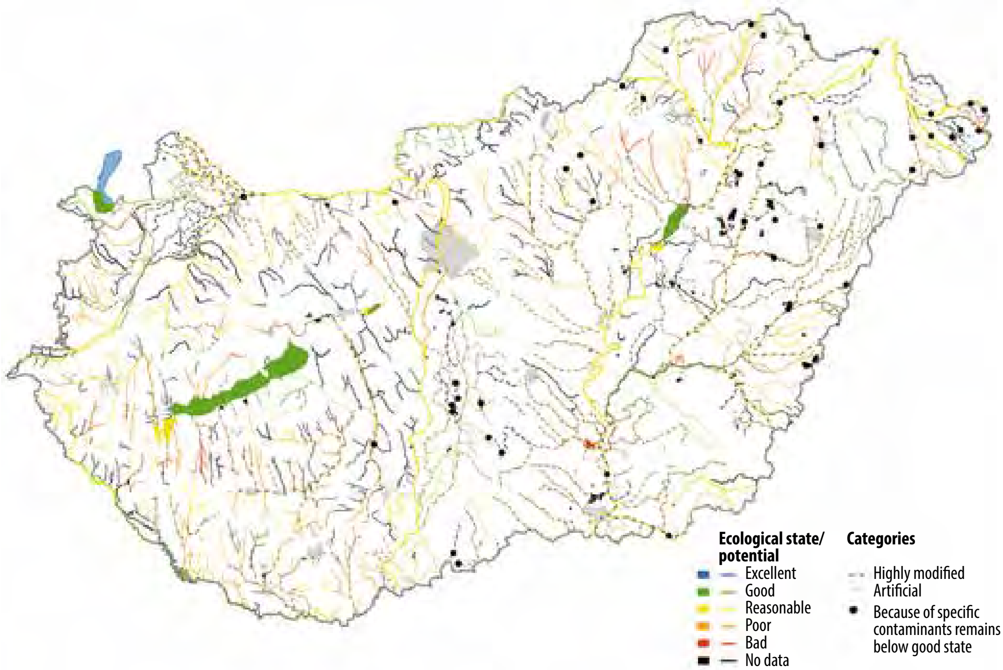
Figure 1.2.1 Arsenic content of drinking water from public water supply, 2007



Source: National Institute of Environmental Health, 2007.

Inorganic arsenic is a potent human carcinogen and toxicant. It may get into the human organism mainly via drinking water and food. The arsenic content of drinking water is in excess of 10 microgrammes/litre in numerous settlements in Hungary, it is frequent principally in Southern Great Plain, mainly in artesian waters. The arsenic content of waters is of natural origin, according to the characteristics of deep aquifers. Although Hungary invests lot of money to reduce arsenic levels in the water, the strict European threshold value (10 microgrammes/litre) is still not reached in many settlements.

Figure 1.2.2 **Ecological assessment of surface water bodies, 2010**



Source: National Institute for Environment (NeKI), Hungarian River Basin Management Plan, 2010.

The Water Framework Directive of the EU requires the ecological assessment of all surface water bodies. One of the main aims of the directive is to reach good ecological status and potential of surface waters by 2015.

According to the ecological assessment of surface water bodies in Hungary in 2010:

– 9% of surface water-courses were in good or excellent status compared to the total length of surface water-courses, and

– 65% of surface lakes and reservoirs reached good or excellent status compared to the total surface of surface lakes and reservoirs.

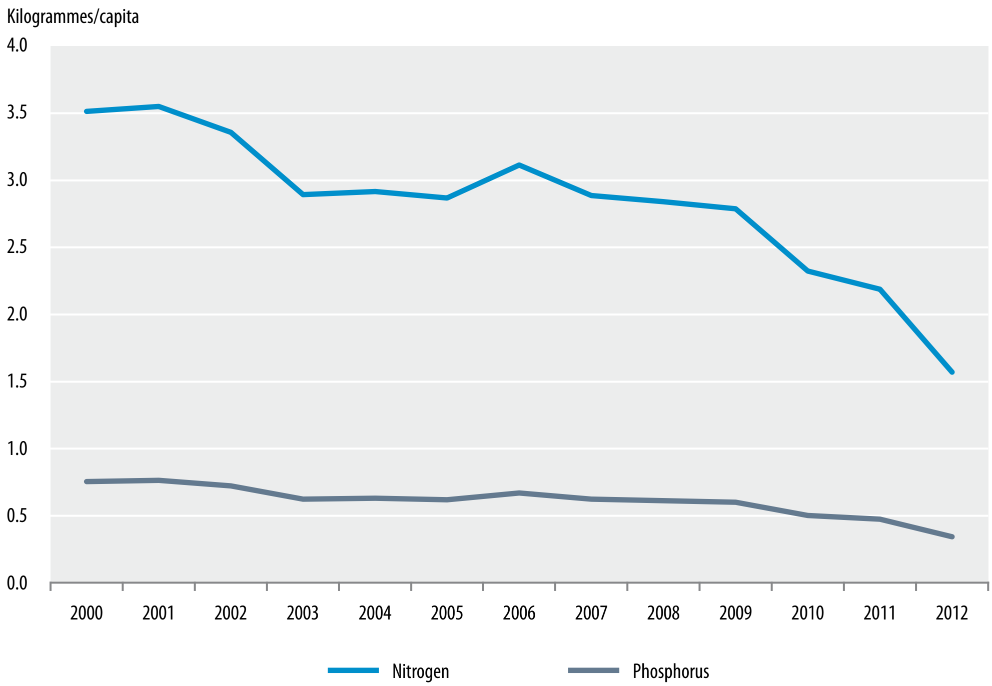
Table (Stadat):
5.4.4 Main surface water quality parameters of Hungarian rivers

1.3 Water pollution

Water pollution occurs when the original and natural quality of surface and groundwaters is changed. As an effect of water pollutions the physical, chemical and biological characteristics of contaminated waters alter so that they become partially or fully unsuitable for drinking water supply, industrial, agricultural and other use as well as for natural biomes. Water pollution can be of natural origin but is mainly caused by human activities.

The quantities of annual average nitrogen, phosphorus and five-day biochemical oxygen demand (BOD_5) emissions discharged from households after waste water treatment can be estimated from the basic data of statistical surveys. Data on emissions from agriculture and industry are incomplete and not full-scope.

Figure 1.3.1 **Estimated annual nitrogen and phosphorus emissions from households after waste water treatment**

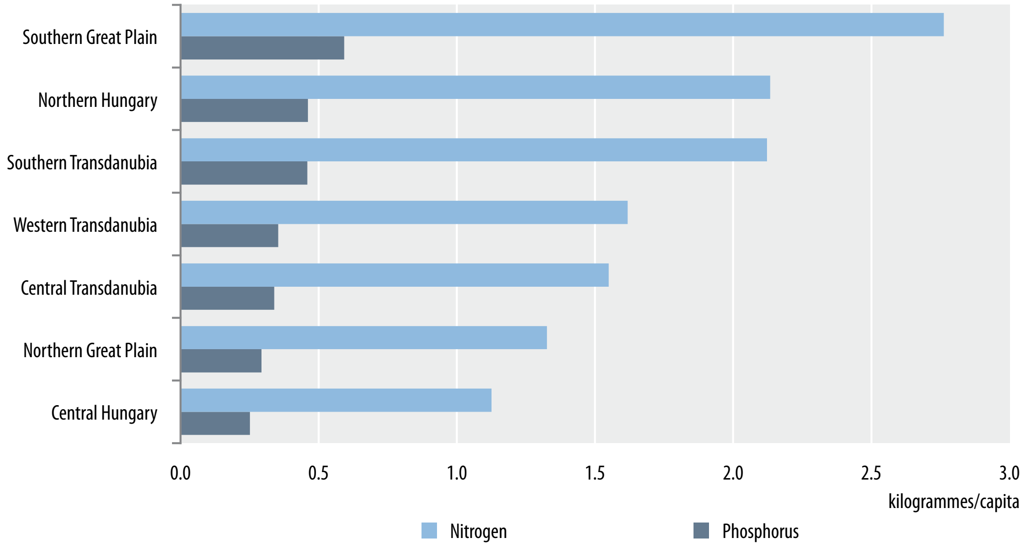


The time series of the indicator show the annual average emissions of nitrogen and phosphorus into surface waters after waste water treatment for 2000–2012.

Data on emissions are calculated from estimated data on population connected to treatment plants, by means of the following specific annual emission factors:

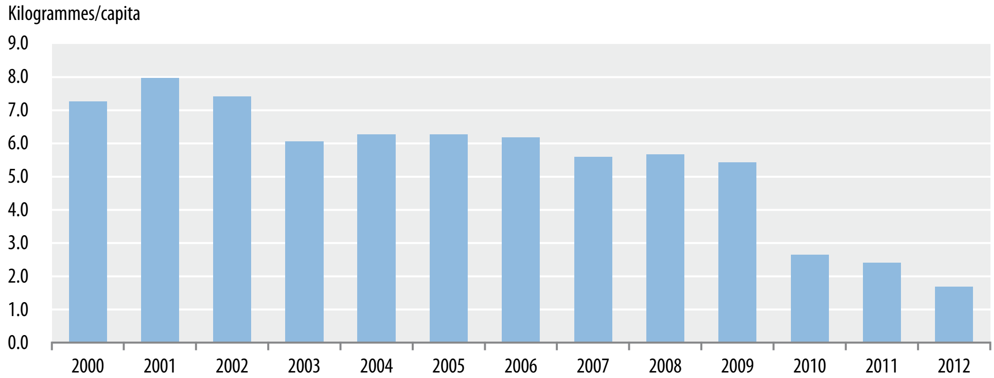
– nitrogen emission factor: 4.4 kilogrammes of N/inhabitant,
– phosphorus emission factor: 1 kilogramme of P/inhabitant.

Figure 1.3.2 **Estimated annual nitrogen and phosphorus emissions from households after waste water treatment, by regions, 2012**



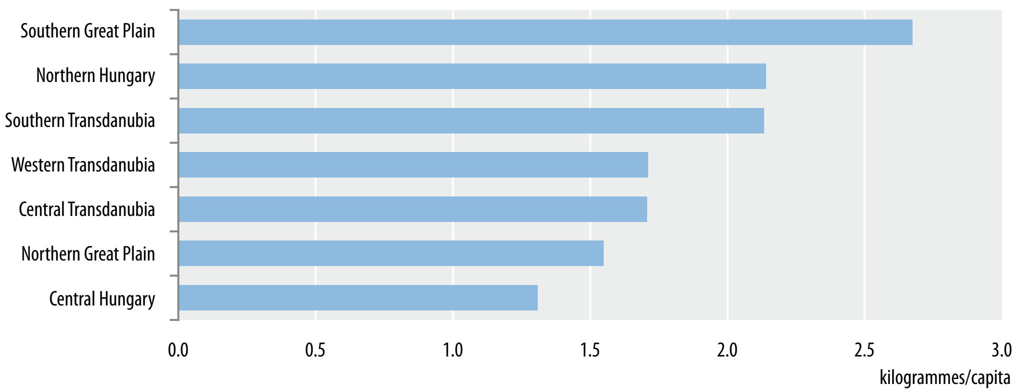
When comparing regional indicators, annual per capita nitrogen and phosphorus emissions from households after waste water treatment are the highest in Southern Great Plain and Northern Hungary, and the lowest in Northern Great Plain and Central Hungary. The reason for the spatial disparities is that the estimated proportion of households connected to waste water treatment plants with advanced (tertiary) treatment technology is significant in Northern Great Plain (55%) and the highest in Central Hungary (76%).

Figure 1.3.3 Estimated annual BOD_5 emissions from households after waste water treatment



The indicator shows the biochemical oxygen demand (BOD_5) of municipal waste water from households after treatment in kilogrammes/capita units per year, which well describes the efficiency of treatment plants. Due to the lack of direct statistical data from measurements, it can be defined by estimations based on average technical data. Technical data refer to the potential efficiency that can be reached during municipal waste water treatment; actual efficiencies may differ from the calculated values in the reference years. Therefore, the data published refer to potential BOD_5 emissions from households after treatment. The factor of emissions used for estimations is 60 grammes/capita/day, taking into account the levels of treatment. Efficiency values of the levels of treatment: 30% for mechanical treatment only, 85% when applying biological treatment in addition and 95% after tertiary treatment.

Figure 1.3.4 Estimated annual BOD_5 emissions from households after waste water treatment, by regions, 2012



When comparing regions, annual per capita BOD_5 emissions from households after waste water treatment are the highest in Southern Great Plain and Northern Hungary and the lowest in Northern Great Plain and Central Hungary. The reason for the spatial disparities is that the estimated proportion of households connected to waste water treatment plants with advanced (tertiary) treatment technology is significant in Northern Great Plain and Central Hungary.

1.4 Waste water treatment

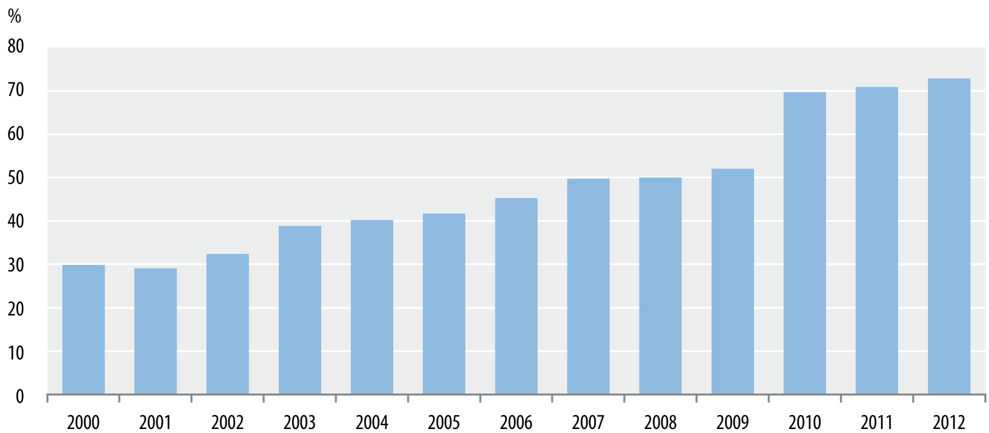
Waste water treatment aims at removing contaminants from waste water to as high an extent as possible. The residuals in water after proper waste water treatment are degraded by the self-purification capacity of receiver natural waters, so water can be further utilised and the original natural status of water quality is not substantially damaged.

The development of waste water treatment substantiates the improvement of the quality of water ecosystems and affects economic activities related to water ecosystems, such as fisheries. Developments have favourable impacts on public health as well.

The mode of sewage treatment is highly dependent on the characteristic and the origin of waste water. As a result, domestic, municipal, industrial, agricultural etc. sewage treatment can be distinguished.

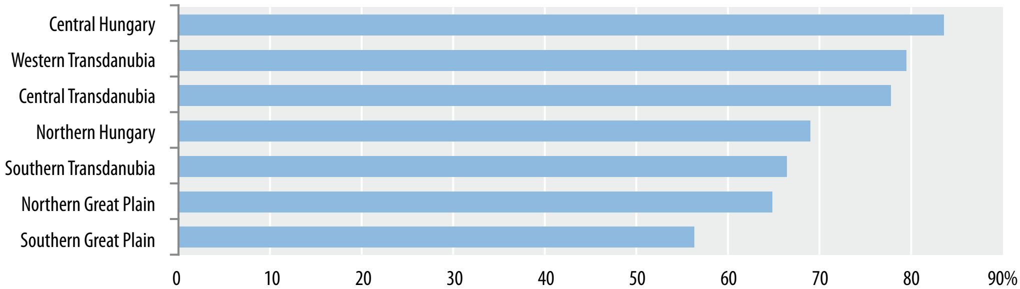
The estimated proportion of the population connected to waste water treatment plants with at least secondary (biological) treatment technologies well indicates the results achieved by a particular region or country in urban waste water treatment, in line with the objectives of European legislation.

Figure 1.4.1 **Estimated proportion of population connected to waste water treatment plants with at least secondary (biological) treatment technologies**



A positive impact of the implementation of the EU Urban Waste Water Treatment Directive is that the estimated proportion of the population connected to waste water treatment plants with at least secondary (biological) treatment technologies was nearly 73% in 2012, which was primarily due to the implementation of a new central waste water treatment plant in Budapest in 2010.

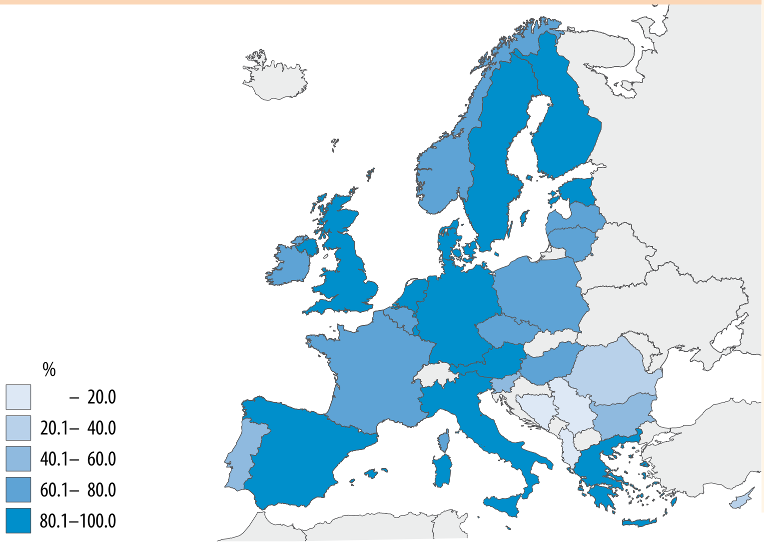
Figure 1.4.2 **Estimated proportion of population connected to waste water treatment plants with at least secondary (biological) treatment technologies, by regions, 2012**



When comparing regions it can be stated that the estimated proportion of the population connected to waste water treatment plants with at least secondary (biological) treatment technologies is the highest in Central Hungary and Western Transdanubia and the lowest in Southern Great Plain.

Figure 1.4.3 **Estimated proportion of population connected to waste water treatment plants with at least secondary (biological) treatment technologies, in certain countries in Europe, 2011**

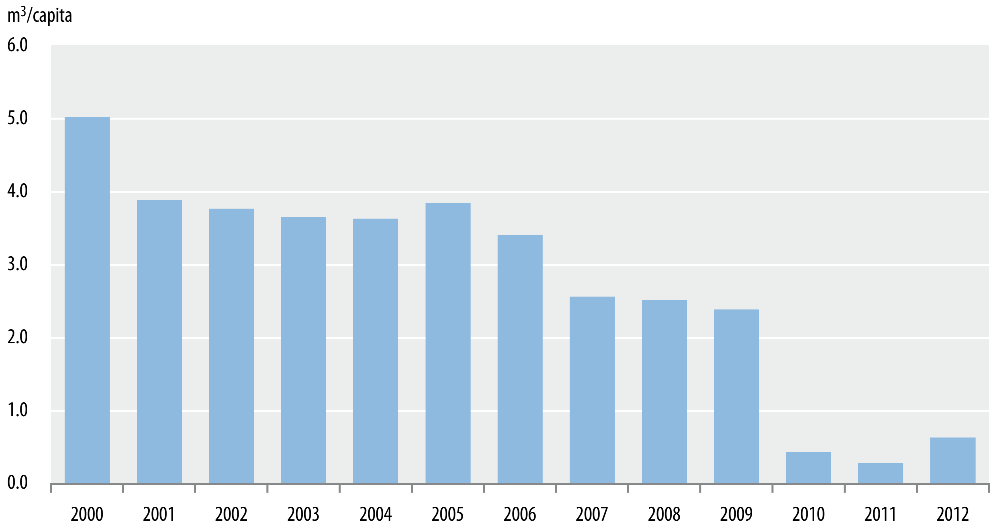
Notes: Countries with data referring to other than 2011: Hungary (2012); Austria, Denmark, Germany, the Netherlands, Spain, Sweden, the United Kingdom (2010); Belgium, Portugal (2009); Latvia (2007); Cyprus, Italy (2005); France (2004).



Source: Eurostat.

According to the EU-level assessment of the estimated proportion of the population connected to waste water treatment plants with at least secondary (biological) treatment technologies it can be stated that the indicator of Hungary falls in the second quintile from the top (~73%). Generally this estimated proportion is lower in the new member states than in the old ones. The possible reasons for regional disparities: dwellings' access to public water facilities differing by regions, different waste water collection and treatment technologies, population density, different climatic circumstances, ownership of public water facilities etc.

Figure 1.4.4 **Volume of non-treated municipal waste water connected to public sewerage**



The indicator expresses the temporal development in the volume of non-treated municipal waste water burdening surface waters. Non-treated municipal waste water is the main pollutant of surface waters; it mainly causes eutrophication problems in fresh waters. With the implementation of municipal waste water treatment plants a significant reduction could be reached in 2000–2012 in the quantity of non-treated municipal waste water connected to public sewerage.

When comparing regions the discharge of non-treated municipal waste water connected to public sewerage is the highest in Southern Great Plain and Central Hungary and the lowest in Western Transdanubia and Northern Hungary.

1.4.1 Municipal liquid waste

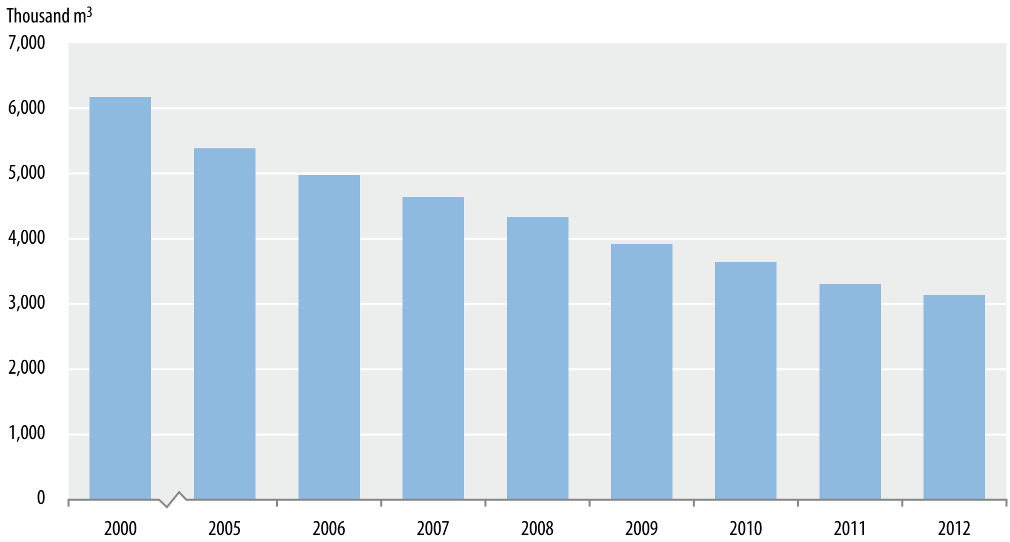
Municipal liquid waste is waste water that is not connected to sewerage network and/or sewerage treatment plants, which – as defined in the relevant legislation – comes from:

– emptying waste water storage facilities and other local infrastructure replacing public utilities, belonging to buildings suitable for human residence,

– sewerage and drainage networks beyond public service, and

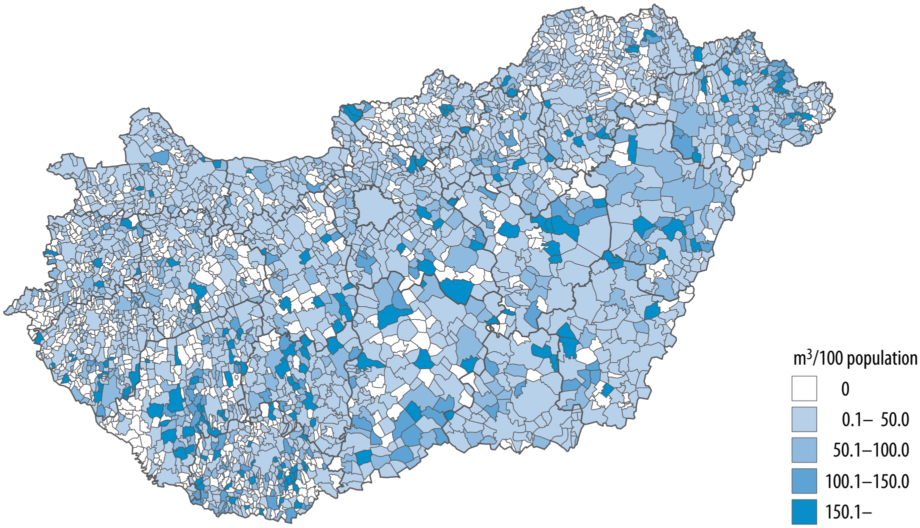
– economic but not production or technological activities.

Figure 1.4.5 Volume of municipal liquid waste



The volume of municipal liquid waste has continually decreased since 2005 along with the expansion of the sewerage network.

Figure 1.4.6 **Volume of municipal liquid waste per hundred population, 2012**

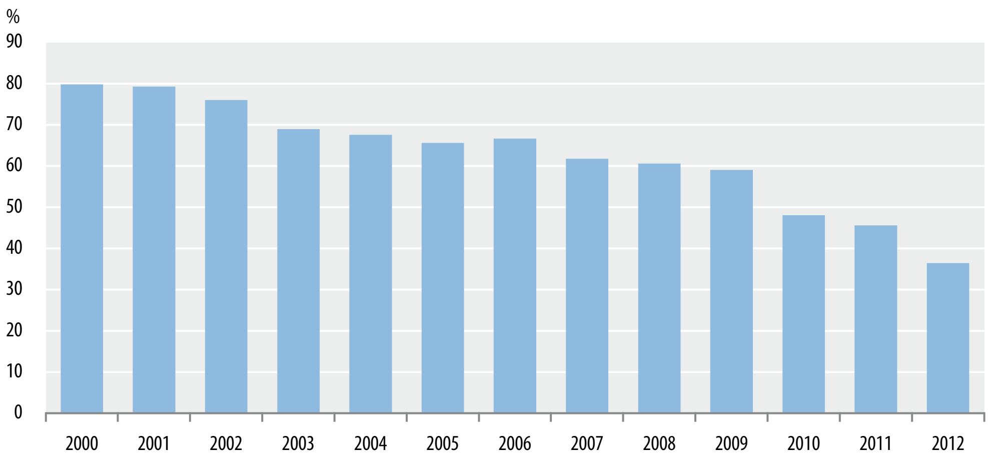


The volume of municipal liquid waste per hundred population depicts the areas less equipped with sewerage system.

1.4.2 Municipal waste water treatment index

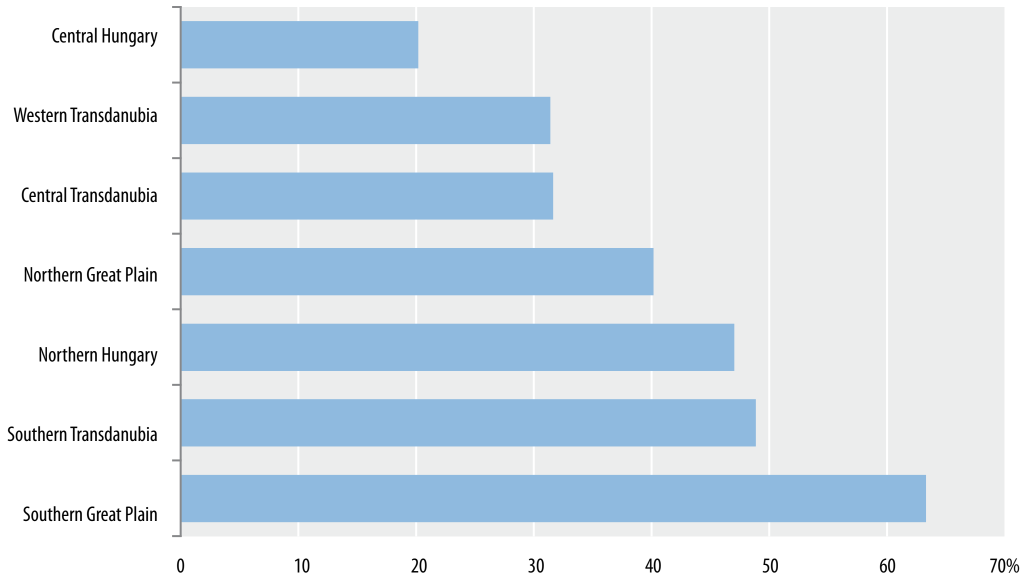
The municipal waste water treatment index expresses the development of municipal sewage treatment based on treatment efficiency.

Figure 1.4.7 **Municipal waste water treatment index**



To describe the effectiveness of the levels of municipal waste water treatment the coefficients published by Eurostat were applied in the data series: weights of 1.00 for non-treated waste water, 0.86 for waste water treated by primary (mechanical) treatment only, 0.49 for waste water treated by additional secondary (biological) treatment and 0.00 for waste water treated by additional tertiary (chemical) treatment. The municipal waste water treatment index is 100% if there is no waste water treatment and 0% if all municipal waste water is treated by tertiary waste water treatment. The value of the index fell by over 43 percentage points in Hungary in 2000–2012, which resulted from the starting of the operation of waste water treatment plants with enhanced effectiveness (applying at least biological treatment).

Figure 1.4.8 Municipal waste water treatment index by regions, 2012



When comparing regions, the situation of municipal waste water treatment is the most favourable in Central Hungary as well as Western Transdanubia and Central Transdanubia. Due to the completion of huge investments into waste water collection and treatment in Budapest the value of the index decreased significantly in Central Hungary and consequently at national level, too. The index is the highest in Southern Transdanubia and Southern Great Plain. The reason for the spatial disparities is that the estimated proportion of the population connected to waste water treatment plants with at least biological treatment technologies is high in Central Transdanubia, Western Transdanubia and Central Hungary (around 80% each).

Table (Stadat):
5.4.3 Municipal waste water discharge and treatment

Air

The quality of life on Earth is basically determined by the purity of air. Pollutants threaten human health directly, damage vegetation and destroy our environment. One of today's major environmental tasks is to curb air pollution, one of the underlying causes of climate change, and its adverse effects. A basic link in these processes is to connect air pollution to specific industries or economic branches.

Temperature rises continuously on our planet, which is affected by human activities.

Greenhouse gas emissions causing climate change are a global phenomenon, to control their quantity requires international co-operation. To reduce greenhouse gas (GHG) emissions a framework convention on climate change was adopted at a UN conference held in Rio de Janeiro in 1992. This applies to the three most important greenhouse gases, namely to carbon dioxide, methane and nitrous oxide. The sustainable development strategy of the European Union and the Europe 2020 strategy aim at a 20% reduction of GHG emissions in the EU on average compared to 1990.

Acidification causes damage mainly to still waters, forests and soil.

Ozone is an extremely reactive gas, it causes several health problems, damages the eco-system and agricultural produce.

The higher attention on particulate matters with a diameter of less than 10 micrometres results from their harmful effect on health. The inhalation of these materials plays a role in the formation of many serious cardiovascular and respiratory diseases (e.g. lung cancer).

2.1 Air pollution

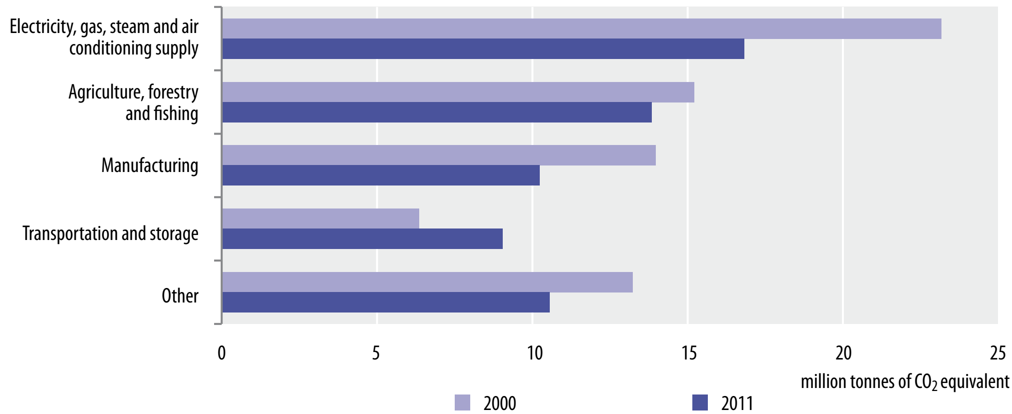
The requirements of environmental satellite accounts on air are summarised in AEA (Air Emissions Accounts) methodology. Based on data collected and calculated according to international methodology some emissions decreased in 2000–2011: these were the emissions of carbon dioxide (CO_2) (without carbon dioxide from biomass), nitrous oxide (N_2O), methane (CH_4), perfluorocarbon (PFC), sulphur dioxide (SO_2), ammonia (NH_3), non-methane volatile organic compounds (NMVOC), carbon monoxide (CO) and particulate matter with a diameter of less than 10 micrometres (PM_{10}). The reason for this is that the observed emissions fell in the 1990s rather because of shrinking industrial production and the significant change in the structure of the economy, while the introduction and broader use of developed technologies became dominant in the latter decade. Global crisis had an impact on decreases in certain air pollutants and greenhouse gases, too, in recent years.

Air Emissions Accounts indicate the net flow of the gases and particulate matter that originate from economic activities and are emitted to the environment. When compiling the Air Emissions Accounts in 2013, two approaches were applied. On the one hand, energy economic statistics of the national economy were the starting point, (pyrogenous) air emissions coming from the consumption of fossil fuels were classified by industries/economic branches, and then technological emissions were accounted using emission factors described in international standards. On the other hand, emissions in line with the NACE Rev.2 classification were calculated using the codes of the emissions inventories compiled by the Hungarian Meteorological Service (CRF is the classification of GHG applied in emissions inventories; NFR is the classification of air pollutants other than GHG applied in emissions inventories), and so Air Emissions Accounts were compiled directly.

2.1.1 Greenhouse gas emissions by industries

The total GHG emissions of the Hungarian economy (carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride emissions) decreased in 2005–2011. 12.9 million tonnes stemmed from household consumption, while 60.5 million tonnes from productive industries from the total of 73.4 million tonnes of CO_2 equivalent in 2011. The most polluting industry from the point

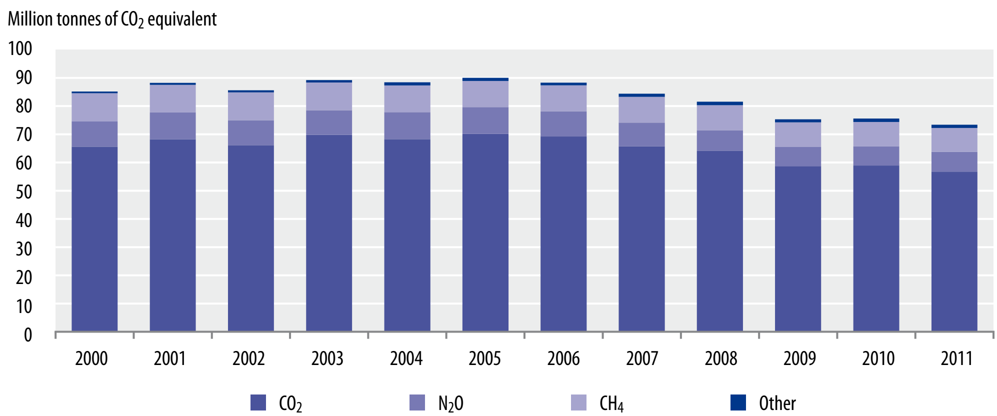
Figure 2.1.1 Quantity and structure of greenhouse gas emissions of Hungarian economy



of view of GHGs is electricity, gas, steam and air conditioning supply (28% of the emissions of the national economy), but the size and proportion of the burden it causes decreases. Agriculture, forestry and fishing accounts for 23%, while manufacturing for 17% of emissions of the national economy. The share of transportation and storage was 8.8% in the national economy's emissions in 2000, which grew to 15% by 2011.

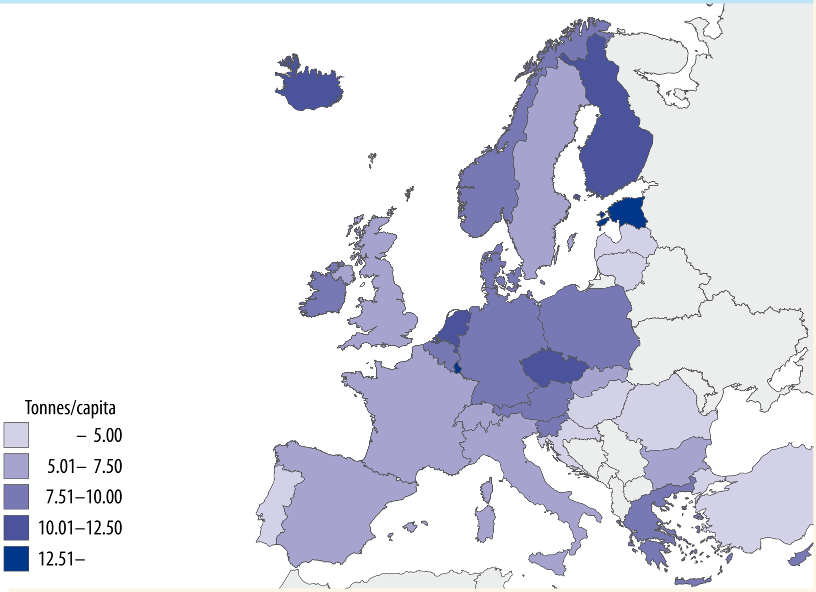
81–84% of greenhouse gas emissions to the atmosphere stemmed directly from economic activities, the rest came from household consumption in Hungary between 2000 and 2011. The emissions of the national economy were reduced in the examined period, while the emissions of households went up between 2000 and 2005, and decreased after.

Figure 2.1.2 Distribution of greenhouse gas emissions of Hungarian economy and households by components



Carbon dioxide is the most important greenhouse gas, its emissions decreased less dynamically in 2011 compared to 2000 than those of nitrous oxide and methane. In 2005, the volume of carbon dioxide emissions increased in Hungary compared to 2000, but it has significantly fallen since the middle of the decade. In respect of carbon dioxide emissions the most polluting industries are electricity, gas, steam and air conditioning supply (its share of the national economy was 35% in 2011), manufacturing (22%) and transportation and storage (20%). In case of nitrous oxide 87% of the national economy's emissions originate from agriculture (fertilisers), as for methane, the most polluting industry is water supply, sewerage, waste management and remediation activities (its share was 38%).

Figure 2.1.3 **Gross CO_2 emissions per capita in countries of Europe, 2011**



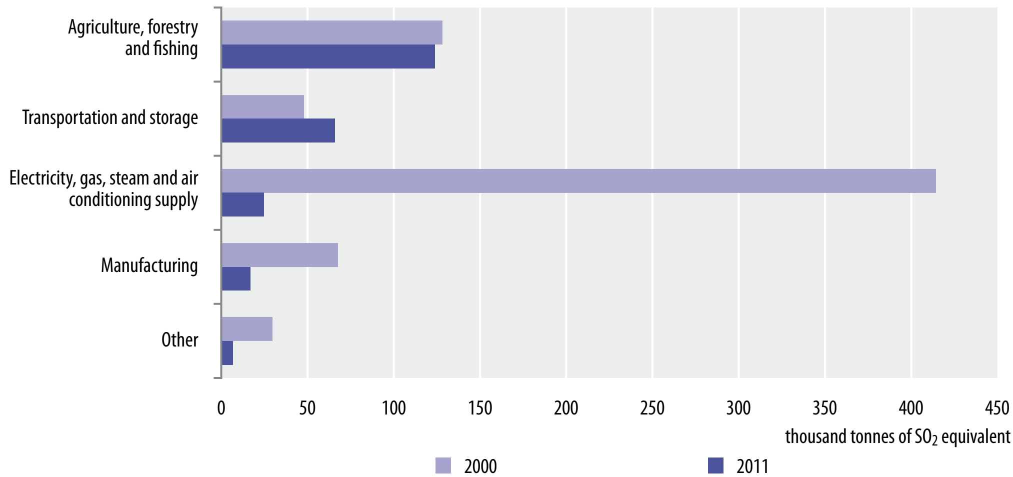
Source:
European Environment Agency.

Gross carbon dioxide emissions per capita were the highest in Luxembourg, Estonia and the Czech Republic and the lowest in Latvia and Romania.

2.1.2 Emissions of acidifying gases by industries

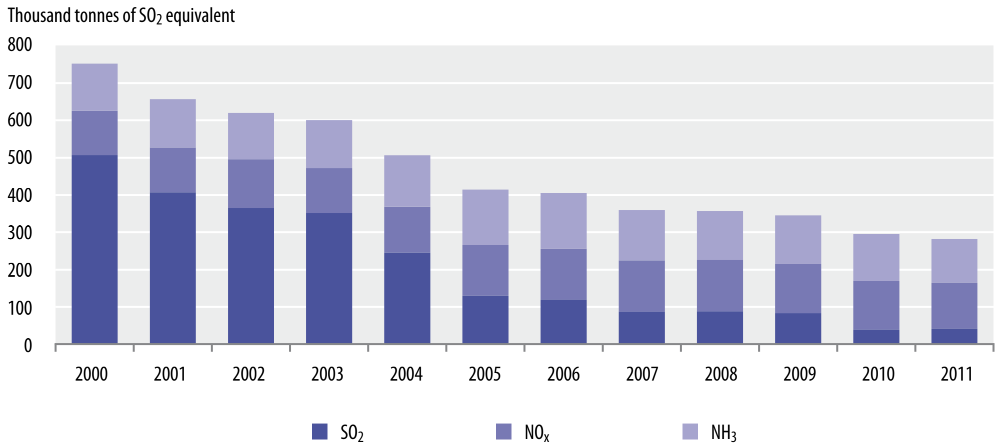
Sulphur dioxide (SO_2), nitrogen oxides (NO_X) and ammonia (NH_3) are acidifying gases. The SO_2 equivalent of the above-mentioned gases as a whole sank dramatically, from 688 thousand tonnes in 2000 to

Figure 2.1.4 **Quantity and structure of aggregated acidifying gas emissions of Hungarian economy**



239 thousand tonnes in 2011 in the emissions of the Hungarian national economy. The reason for this change was the technological changes in electricity, gas, steam and air conditioning supply (from 415 thousand tonnes of SO_2 equivalent in 2000 to 25 thousand tonnes in 2011).

Figure 2.1.5 **Distribution of acidifying gas emissions of Hungarian economy and households by components**



The proportions of the components of acidifying gases also changed considerably. Sulphur dioxide emissions were down to 8.3% of the starting value (of 2000) in the period, and the economy's ammonia and nitrogen oxides emissions became dominant in the acidification of the environment. The primary reason for the improvement was decreasing emissions in electricity, gas, steam and air conditioning supply, which were 387 thousand tonnes of sulphur dioxide in 2000 compared with 12 thousand tonnes in 2011. The most significant emitter of ammonia is agriculture (98% of emissions from the national economy in 2011), while transportation and storage account for nearly two-thirds (65%) of nitrogen oxides emissions of the national economy.

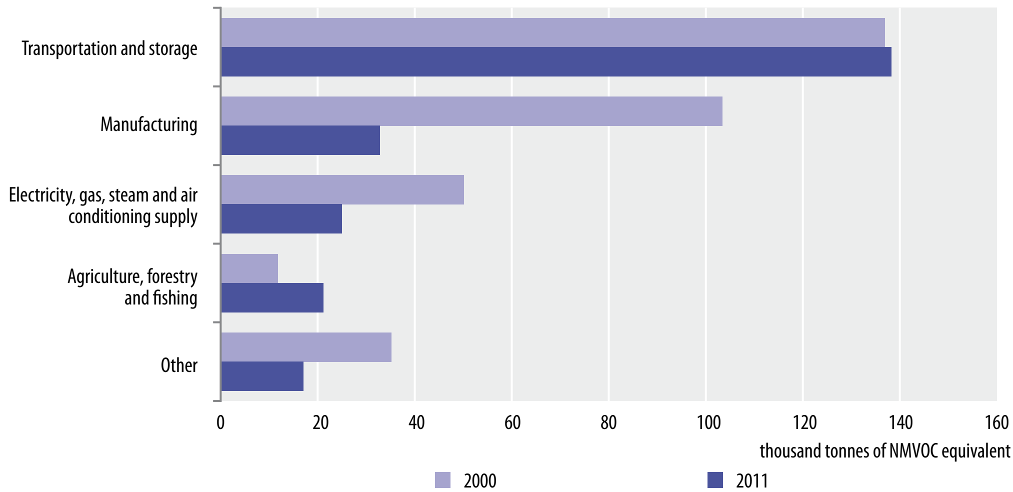
The share of households in the total emissions of acidifying gases in Hungary nearly doubled over the examined twelve years, and their proportion of total acidifying gases emissions was already 15% in 2011.

2.1.3 Emissions of ozone precursors by industries

High ozone concentration occurring near ground level might have an adverse effect on living and lifeless environment. Ozone is a secondary pollutant, i.e. it is not emitted directly to the atmosphere but is generated through the photochemical reactions of different atmospheric trace materials (precursors).[1] Its presence in the atmosphere is particular too: its concentration might occur further away from the place of emission of precursors. The value of ozone concentration, consequently, is determined by the quantity of materials engaged in ozone formation, diffusion processes and deposition together.

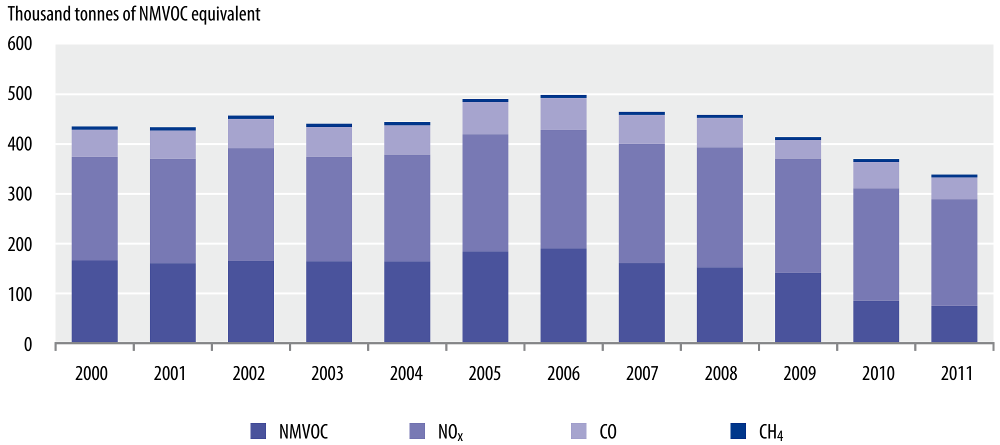
1 The definition of ozone precursors comprises non-methane volatile organic compounds (NMVOC), carbon monoxide, nitrogen oxides and methane together.

Figure 2.1.6 Quantity and structure of ozone precursors emissions of Hungarian economy



The emissions of ozone precursors in the national economy decreased by 31% between 2000 and 2011, from 337 thousand tonnes of NMVOC equivalent to 234 thousand tonnes of NMVOC equivalent. The most polluting industry is transportation and storage, the share of which was 59% in the national economy's emissions in 2011.

Figure 2.1.7 Distribution of ozone precursor gas emissions of Hungarian economy and households by components

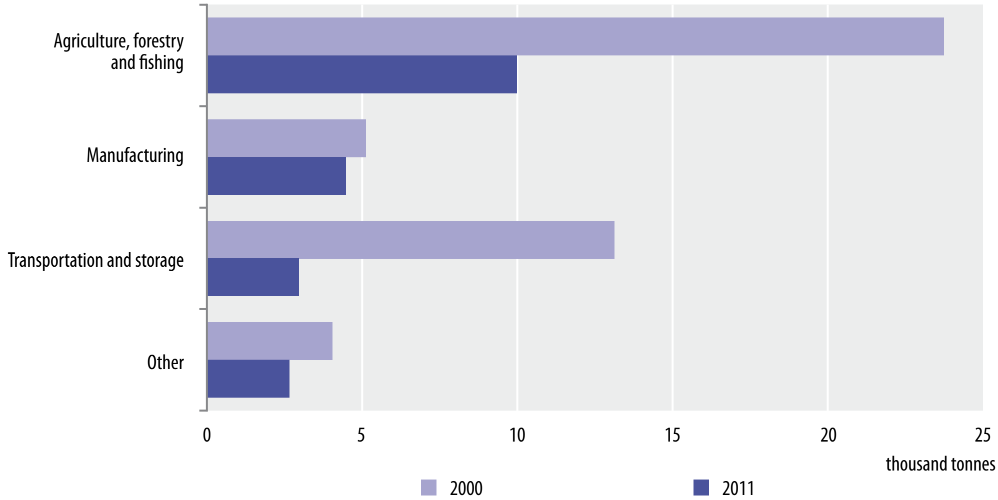


Among ozone precursors, nitrogen oxides and non-methane volatile organic compounds are dominant. Transportation and storage accounted for 65% of the nitrogen oxides emissions of the national economy, and households for 44% of the total emissions of non-methane volatile organic compounds in 2011. The emissions of the economy did not reach even 70% of total emissions, i.e. the ozone precursors emissions of households are very significant.

2.1.4 Particulate matter emissions by industries

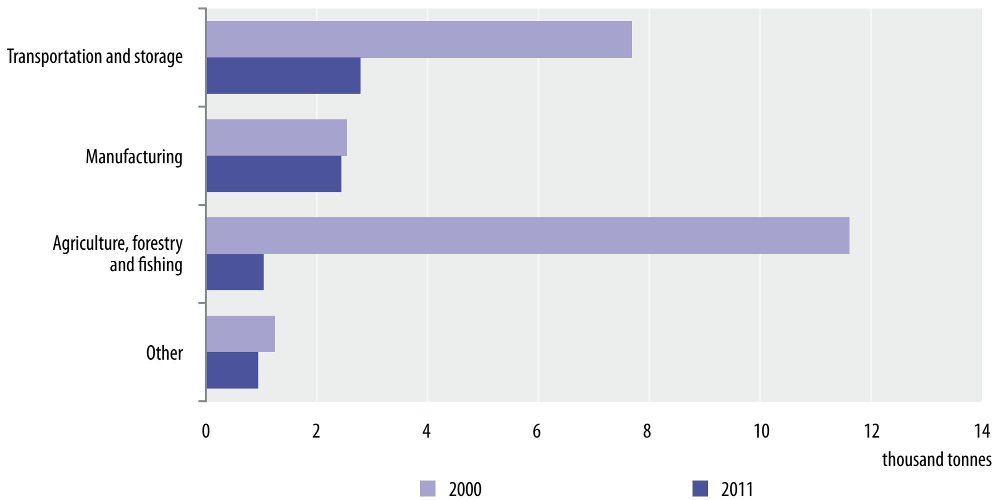
Particulate matter is emitted into the air of towns mainly by diesel vehicles and industrial, household and other combustion. Increasing attention is focused on particulate matter with a diameter of less than 10 micrometres because of their harmful effect on health. The inhalation of these materials can play a role in the formation of many cardiovascular and respiratory diseases (e.g. lung cancer). In line with EU expectations two pollutants are examined in respect of particulate matter: particulate matter with a diameter of 10 micrometres or less (PM_{10}) and particulate matter with a diameter of 2.5 micrometres or less ($PM_{2.5}$).

Figure 2.1.8 **Quantity and structure of Hungarian economy's emissions of particulate matter with a diameter of less than 10 micrometres (PM_{10})**



The national economy's emissions of particulate matter with a diameter of less than 10 micrometres (PM_{10}) dropped to less than half, from 46 thousand tonnes to 20 thousand tonnes in the examined period. Agriculture accounts for nearly the half of emissions in the national economy. More than the half (56%) of total emissions is emitted to the environment by households.

Figure 2.1.9 **Quantity and structure of Hungarian economy's emissions of particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$)**



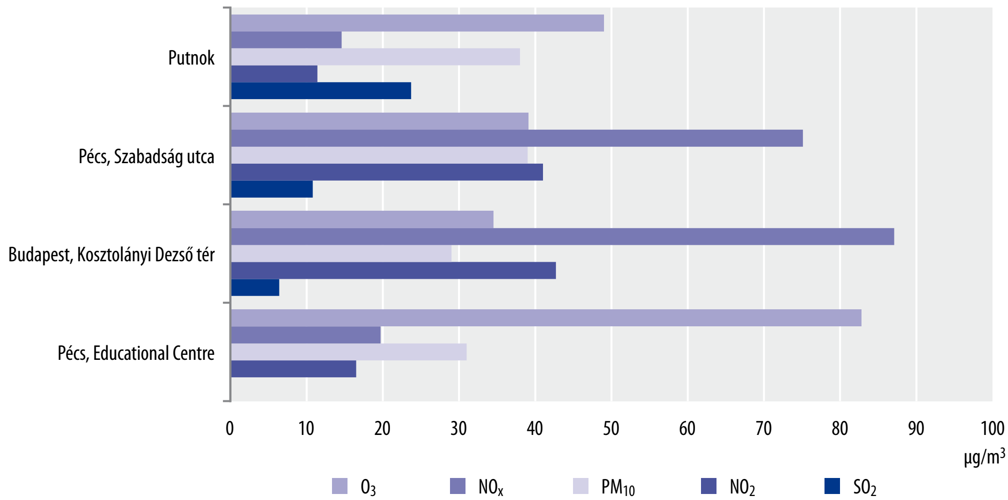
The national economy's emissions of particulate matter with a diameter of less than 2.5 micrometres ($PM_{2.5}$) declined to less than one-third, from 23 thousand tonnes to 7.2 thousand tonnes in the examined period. The national economy's industries polluting the most the environment with particulate matter with a diameter of less than 2.5 micrometres are transportation and storage (39%) and manufacturing (34%). More than three-fourths (77%) of total emissions come from households.

Tables (Stadat):

2.2 Ambient air quality

Air quality and air pollutant concentrations in Hungary can be assessed based on the data of the Hungarian Air Quality Network (HAQN). HAQN is made up of two parts: manual and automatic monitoring networks. The data of the automatic monitoring network are presented, where the concentrations of pollutants of special significance (SO_2, NO_2, NO_X, O_3, CO etc.) and the meteorological parameters necessary for assessment (wind velocity, wind direction, temperature, air humidity) are continuously measured.

Figure 2.2.1 **Average values of air pollution concentrations in certain settlements, 2012**



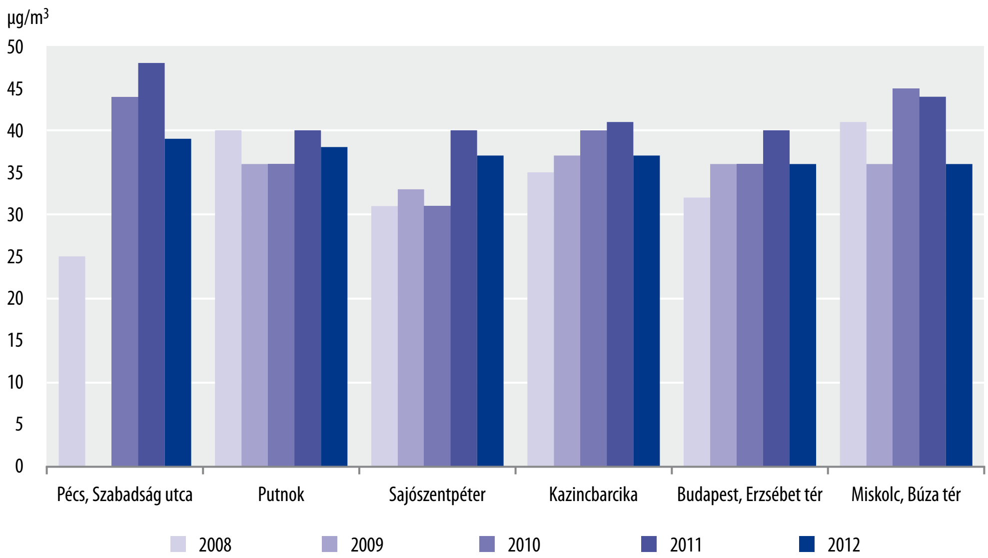
Source: Hungarian Meteorological Service, Climate and Atmospheric Environment Department, Air Quality Reference Centre.

The measuring station at Kosztolányi Dezső tér is outstanding in Budapest in respect of the examined pollutants, the highest annual average values of nitrogen oxides and nitrogen dioxide pollution were measured there. The highest annual average sulphur dioxide pollution in the country was observed in Putnok, and there was registered the second highest immission of particulate matter (PM_{10}).

The concentration of sulphur dioxide pollution during the year exceeded the limit value for health as a percentage of all 1-hour data (without subtracting the tolerated number of exceedences) only at the measuring station in Putnok. This concentration was below the annual limit value at all the examined measuring stations in 2012, the highest were measured in Putnok, Dunaújváros and Sajószentpéter. The concentration of nitrogen dioxide exceeded the annual limit value only at Kosztolányi Dezső tér in Budapest, while the exceedences of the hourly limit value were the most frequent at Komló. The highest annual concentrations of nitrogen oxides pollution were recorded at Kosztolányi Dezső tér in Budapest, in Hajnal utca in Debrecen, in Szabadság utca in Pécs and at Búza tér in Miskolc. With a few exceptions the concentration of ozone pollution surpassed the long-term target value[2] at nearly every station in the summer period. Exceedences of daily limit values for particulate matter (PM_{10}) pollutants occurred at every station in the past year. No exceedences of annual limit values for this latter pollutant were recorded.

2 Long-term target value: 120 microgrammes/m^3, which is the maximum of measured daily 8 hours moving average concentrations.

Figure 2.2.2 Average concentration of particulate matter in certain settlements



Source: Hungarian Meteorological Service, Climate and Atmospheric Environment Department, Air Quality Reference Centre.

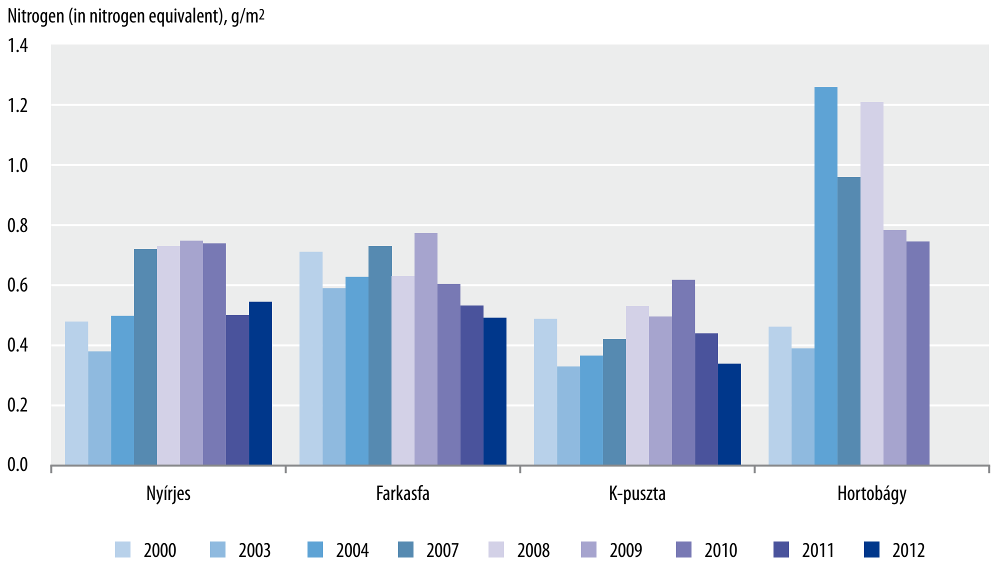
The highest annual average immissions of air pollutant concentrations of particulate matter with a diameter of less than 10 micrometres (PM_{10}) occurred at the measuring stations in Szabadság utca in Pécs, in Putnok, in Sajószentpéter and in Kazincbarcika in 2012. The number of exceedences of the 24-hour limit value as a percentage of all 24-hour data were above 20% in Sajószentpéter, Putnok, Kazincbarcika, Pécs (Szabadság utca) and Miskolc (Búza tér).

Tables (Stadat):

2.2.1 Background concentration

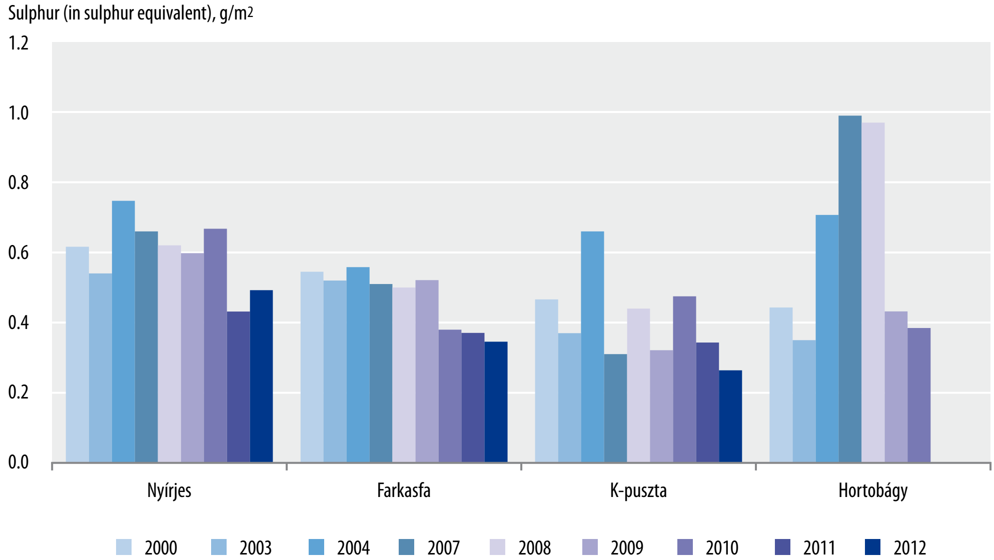
At present the Hungarian Meteorological Service operates the K-puszta, Nyírjes and Farkasfa monitoring stations measuring background concentration. Sampling was suspended at the Farkasfa station in 2005–2006. Monitoring is no more carried out at the Hortobágy station from 1 January 2011.

Figure 2.2.3 Wet deposition of nitrogen



Source: Hungarian Meteorological Service.

Figure 2.2.4 **Wet deposition of sulphur**



Source: Hungarian Meteorological Service.

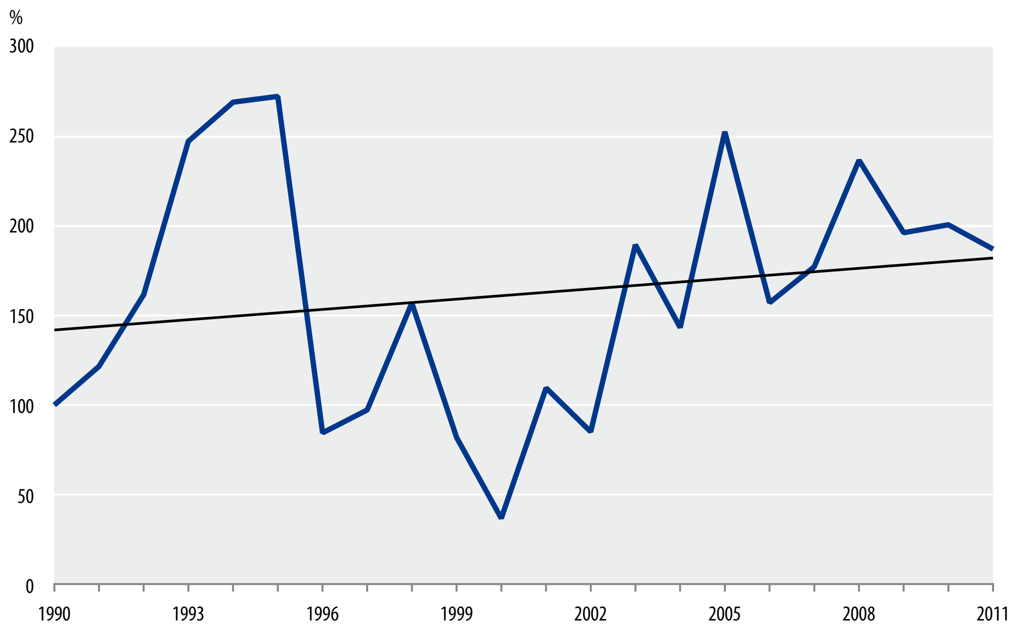
In a process of deposition chemical components are transferred from the atmosphere to the surface of Earth. Its two types are wet and dry deposition. In wet deposition compounds leave the atmosphere and deposit on Earth's surface through precipitation. The changes of wet deposition mainly depend on the emissions of pollutants to the atmosphere (emissions from power plants or industrial activities) and conditions of precipitation.

Tables (Stadat):
5.3.31 Trends of regional background concentrations of some air pollutants
5.3.32 Wet deposition of sulphur and nitrogen

2.3 Carbon dioxide sequestration

The indicator contains the net quantity of carbon dioxide sequestrated by anthropogenic activities in land use, land use change and forestry. The rate of carbon sequestration changes primarily in parallel with the size of forest cover.

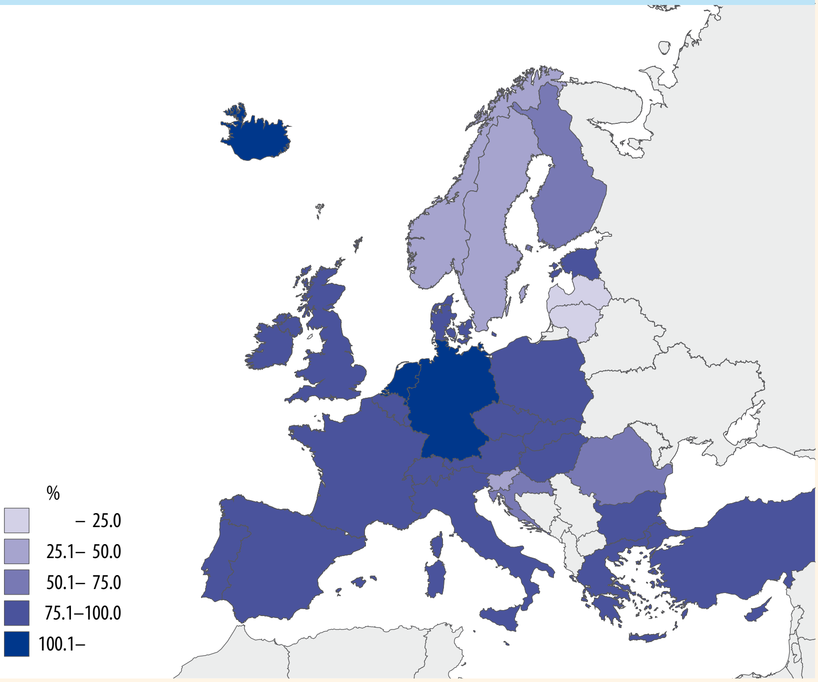
Figure 2.3.1 **Rate of net carbon dioxide sequestration** 1990=100%



Source: Hungarian Meteorological Service.

The quantity of carbon dioxide sequestrated by land use offsets 6% of all carbon dioxide emissions (5.7% of all GHG emissions) in Hungary. The indicator fluctuated during the past twenty years.

Figure 2.3.2 **Ratio of net to gross CO_2 emissions in countries of Europe, 2011**



Source:
European Environment Agency.

The ratio of net to gross carbon dioxide emissions was the highest in Iceland, the Netherlands and Germany and the lowest in Latvia, Lithuania and Sweden. The indicator was negative only in Latvia. It means that the ratio of carbon dioxide quantities sequestrated by forests and land use to anthropogenic emissions was the highest in the latter countries.

The indicator is higher than 100% if the sequestration of the land use, land use change and forestry sector (LULUCF) is lower than its emissions.

The indicator is lower than 100% if the sequestration of LULUCF is higher than its emissions.

The indicator is lower than 0% (i.e. is negative) if the sequestration of LULUCF as a whole is higher than total emissions (including also the emissions of the land use and forestry sector).

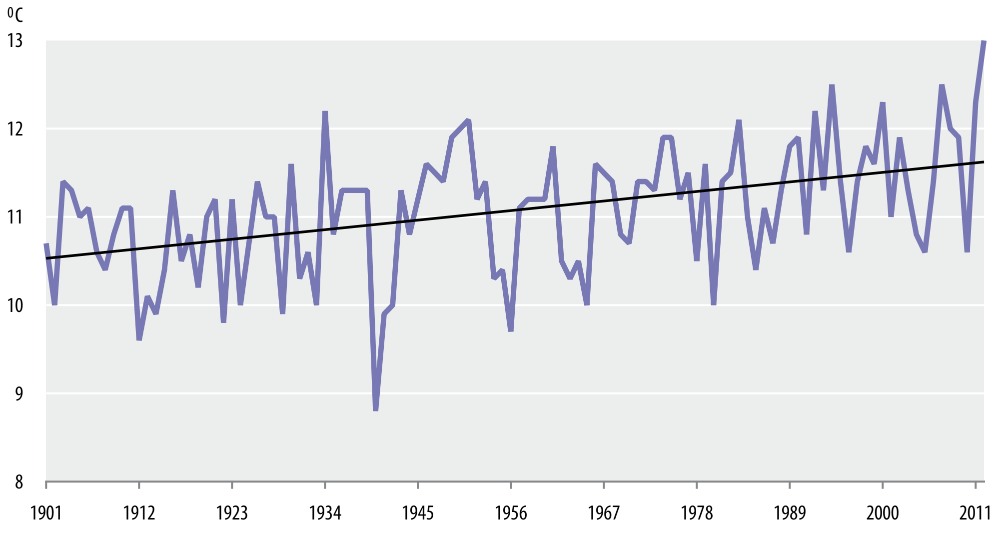
2.4 Weather

Hungary, as a geographical area with continental climate, is free from extreme climatic conditions: its climate is fairly steady, which stems from the small difference between the data of latitude of the area as well as the negligible differences in altitude.

The annual mean surface temperature is the average of the monthly mean surface temperatures of the twelve months.

The quantity of precipitation is measured by the height (millimetres) that rainwater (or melted snow) would reach if it did not evaporate or seep.

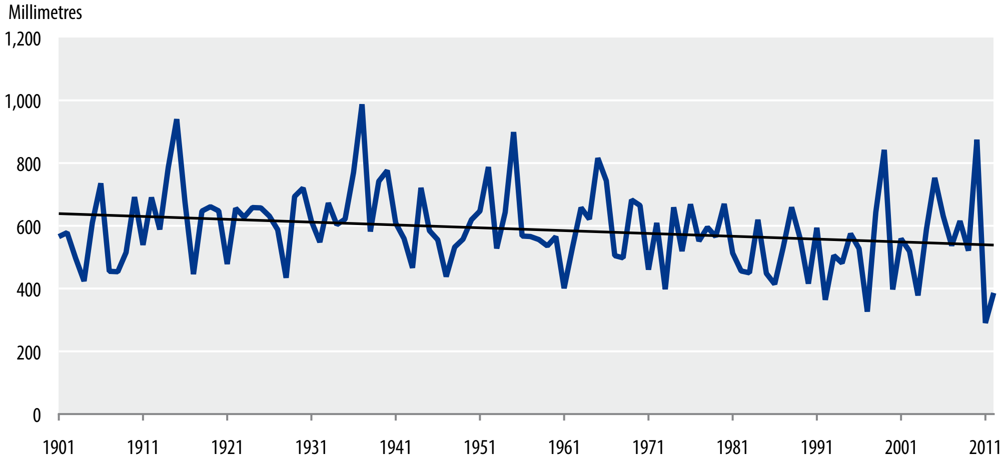
Figure 2.4.1 **Annual mean temperatures in Budapest**



Source: Hungarian Meteorological Service.

The figures indicate marked warming and precipitation decline in the area of Budapest for the period between 1901 and 2012. Though the weather changed year by year over the 112-year-long time span, the temperature trended upwards. According to the linear trend fitted to the series of annual mean temperatures in Budapest, warming reached 1°C in the examined century, mainly as a consequence of increasing urbanisation effects.

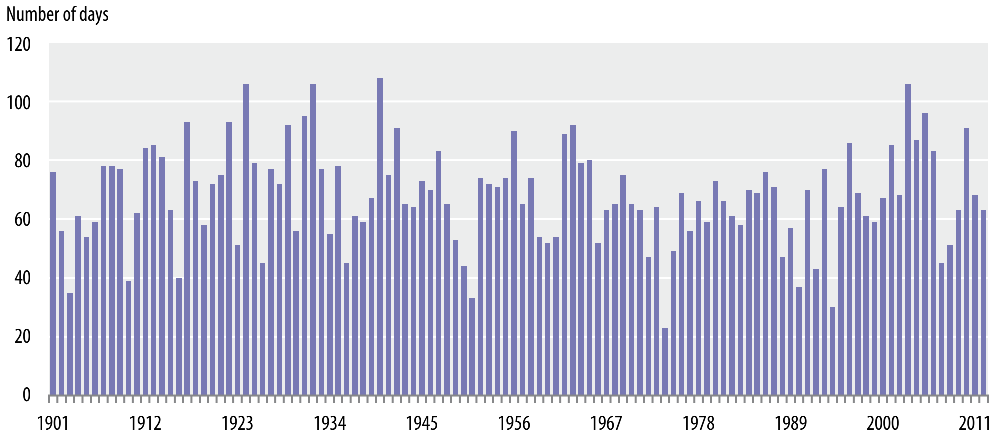
Figure 2.4.2 Quantity of precipitation in Budapest



Source: Hungarian Meteorological Service.

The most precipitation is recorded for May and June and the least for January and February. The quantity of precipitation fluctuates year by year. Years with the most precipitation may see three times as much precipitation as the driest years. The varying annual sum of precipitation follows a downward trend. An annual average 0.9 mm less precipitation is recorded year by year for Budapest.

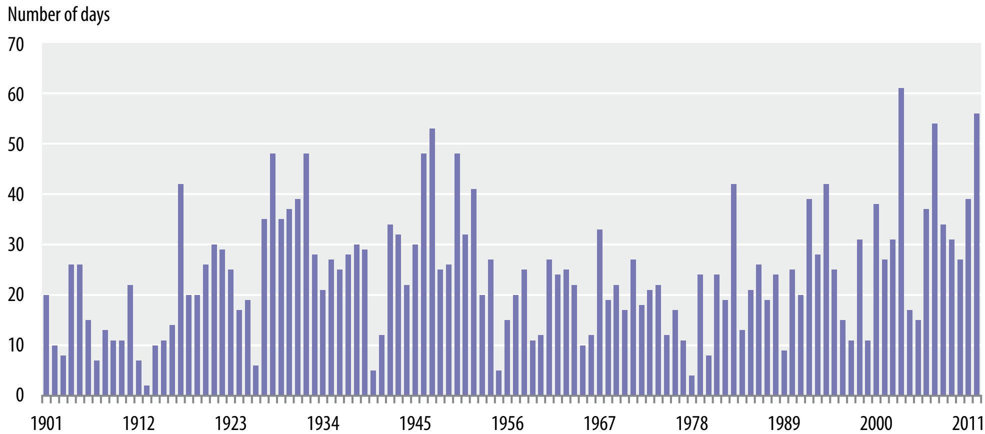
Figure 2.4.3 Number of cold days in Budapest*



* Cold days are the days when the daily minimum temperature is below 0 °C.

Source: Hungarian Meteorological Service.

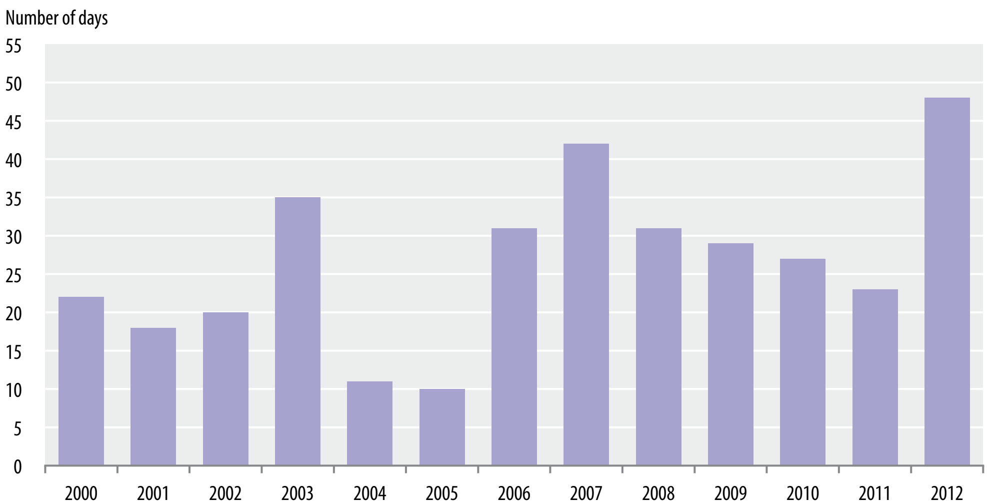
Figure 2.4.4 **Number of hot days in Budapest***



* Hot days are the days when the daily maximum temperature reaches 30 °C. In a heat wave at least three consecutive days are hot days.

Source: Hungarian Meteorological Service.

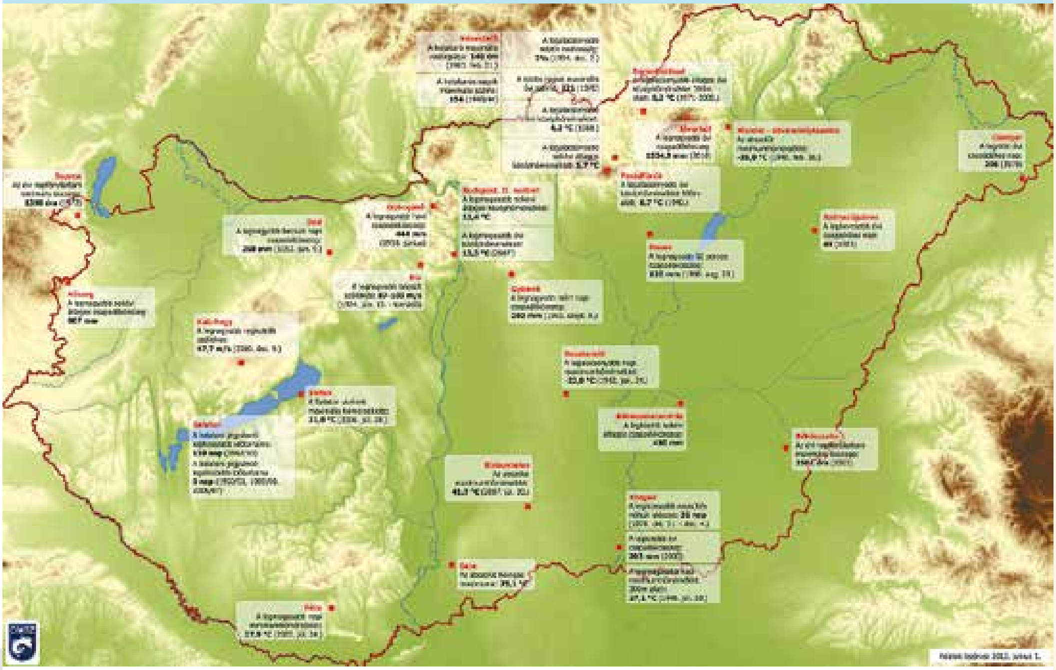
Figure 2.4.5 **Sum of days from heat waves in Budapest**



Source: Hungarian Meteorological Service.

Information from average mean surface temperature data is completed with the assessment of temperature extremes (hot and cold days) and time range (heat waves).

Figure 2.4.6 **Weather records in Hungary as of 1 June 2013**



Source: Hungarian Meteorological Service.

The lowest temperature (–35°C) was measured in 1940, while the highest (41.9°C) in 2007 in Hungary between 1901 and 2012, furthermore, the largest quantity of annual precipitation (996 millimetres) was recorded in 2010 and the lowest (420 millimetres) in 2011. The year 2007 was hotter than the average, the highest temperatures in Szombathely, Szeged, Miskolc, Kecskemét and Budapest were measured then, while the negative records of the years 1929 (Budapest, Kecskemét, Miskolc, Szombathely) and 1942 (Debrecen, Szeged, Pécs, Siófok) still survive in numerous settlements.

One can conclude that the number of cold days decreased, while those of hot days and heat waves grew in parallel with the temperature rise during the examined 112 years, though there were years, too, differing significantly from these conclusions.

Tables (Stadat):
5.10.3 Extreme weather values
5.10.4 Main data of the meteorological observation stations

Land

The ecological and human exploitation of soil makes it one of the most important environmental elements. A significant part of Hungary (57%) is agricultural area, therefore it is an important task from the point of view of land use to evaluate the effects of agriculture on environment.

Agriculture, on the one hand, created and maintained a multitude of valuable semi-natural habitats, thus helping the conservation of the living world. On the other hand, by applying inadequate agricultural cultivation methods it pollutes the soil, surface and groundwaters and the air, and can have harmful effects on environment also because of the fragmentation of habitats. Toxic agents directly or indirectly threaten the eco-systems of the soil and of other environmental elements, principally groundwater, reduce biodiversity and alter the distribution of species.

The EU's thematic strategy on soil protection contains measures that aim at protecting the soil and preserving its ability through which it can perform its ecological, economic, social and cultural functions. The strategy requires to ensure the protection and the sustainable use of soil, to prevent further soil erosion, by restoring the functions of soil and the quality of eroded soil.

The chapter is also devoted to Hungary's mineral resources, which make part of the natural resources and the national wealth of our country.

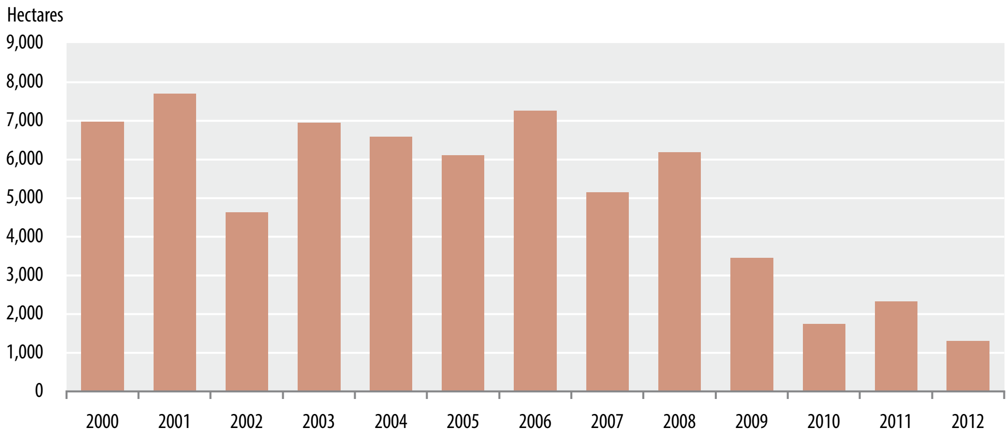
3.1 Land use

In Hungary the largest land area is utilised by agriculture. The changes of land use, also observed nowadays, have an effect on environment and landscape, since these alterations (e.g. permanent withdrawal of areas from agricultural production) lead to irreversible results most of the time and cause in general the expansion of built-up areas.

Figure 3.1.1 **Distribution of land area by land use categories, 2012**

Agricultural areas are the largest land use category in Hungary, although their size decreases continuously. Agricultural areas were 5,338 thousand hectares in 2012, 57% of the area of the country. Besides, the proportions of forests and uncultivated land areas were significant too (21% each).

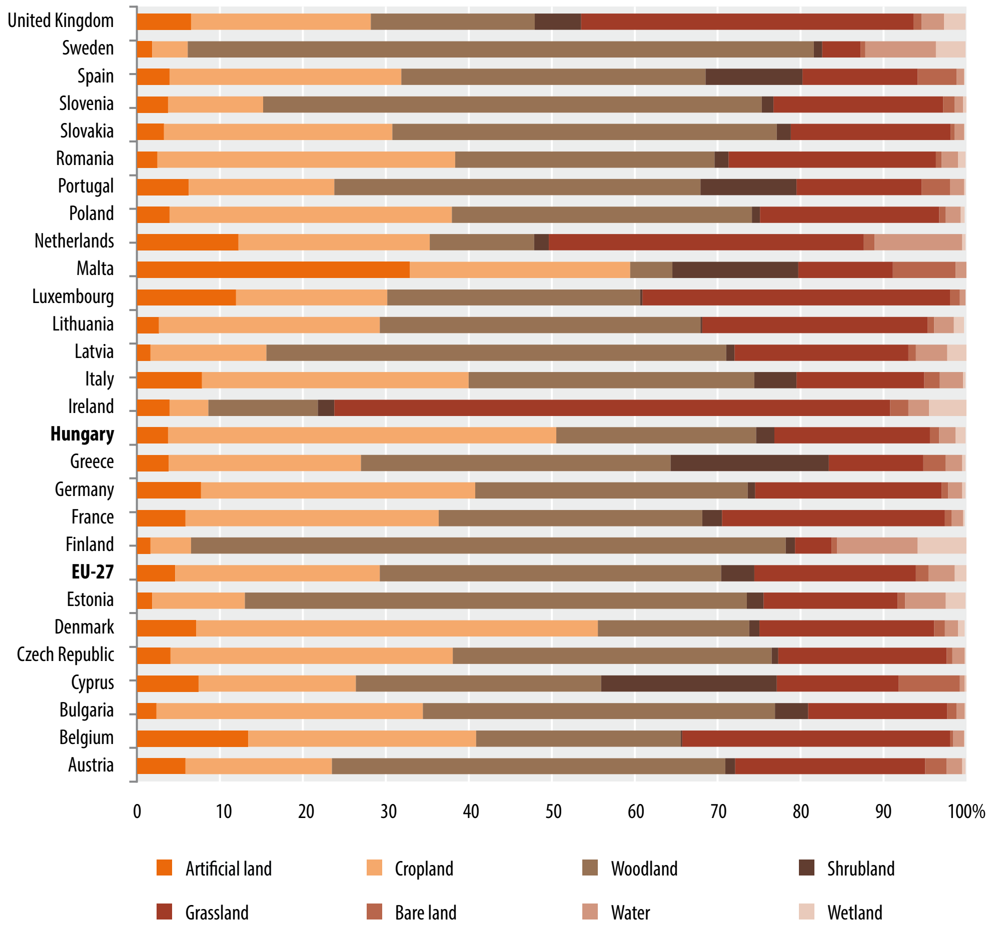
Figure 3.1.2 **Size of areas permitted to be withdrawn permanently from agricultural production**



Source: Ministry of Rural Development.

Between 2000 and 2008 relatively large areas were permitted to be withdrawn permanently from agricultural production, mainly for industrial/mining purposes, to be re-classified as built-up areas and for roads/railways construction purposes. From 2009 this trend decreases, 1,301 hectares were granted permission in 2012.

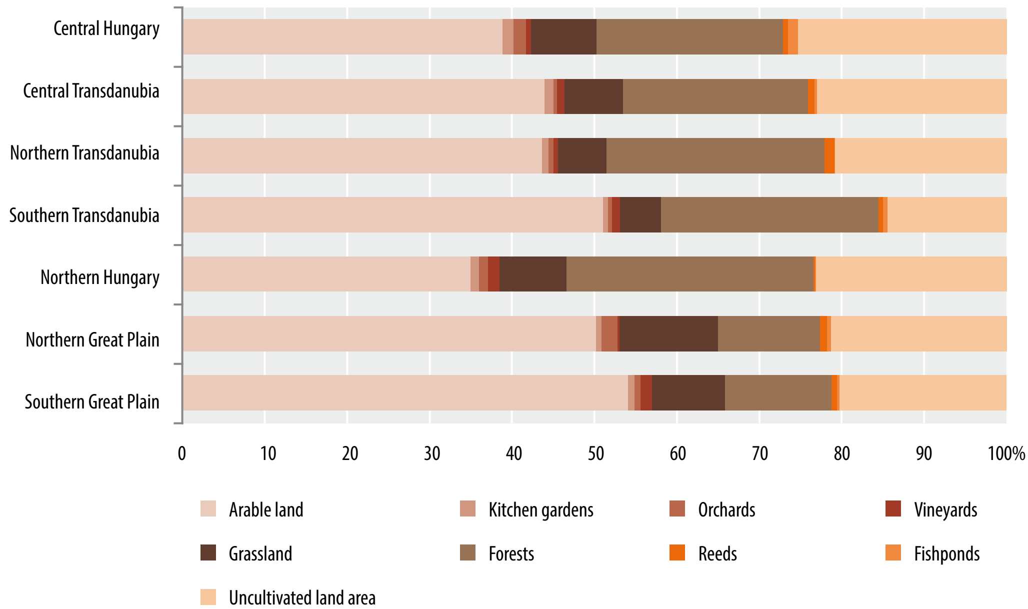
Figure 3.1.3 LUCAS land use data, 2012



Source: Eurostat.

The LUCAS (Land Use/Cover Area frame Statistical Survey) survey of land use and land cover was conducted in 27 countries of the European Union in 2012. According to the results 24.7% of the area of the EU is cropland, 19.5% is grassland, 41.2% is woodland and 4.6% of the area is artificial land.

Figure 3.1.4 **Regional distribution of land use methods, 2012**



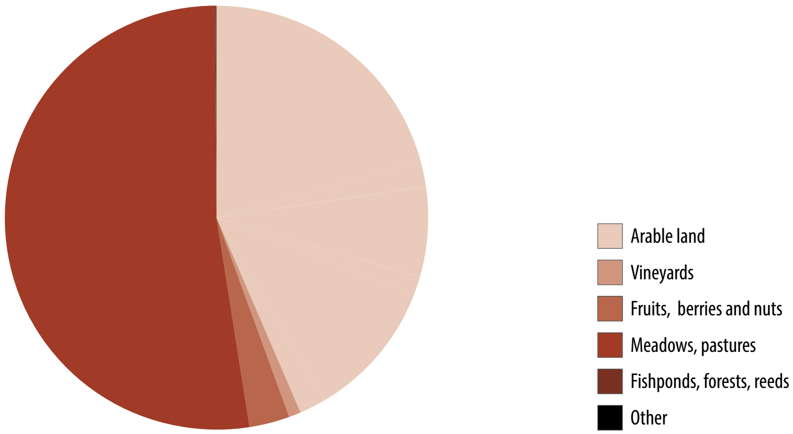
No less than the half of the area is occupied by arable land in Southern Transdanubia, Northern Great Plain and Southern Great Plain. The proportion of forests is above the national average in five regions: Central Hungary, Central Transdanubia, Western Transdanubia, Southern Transdanubia and Northern Hungary. The proportion of uncultivated land area is relatively high in Central Hungary, Central Transdanubia and Northern Hungary.

Table (Stadat):
4.1.4 Use of land area by land use categories and by legal forms, 31 May

3.2 Organic farming

Organic farming is a production method laid down in legislation in the EU, it lays high emphasis on the protection of environment, within which soil as well as surface and groundwater reserves, on the promotion of biodiversity and on food safety.

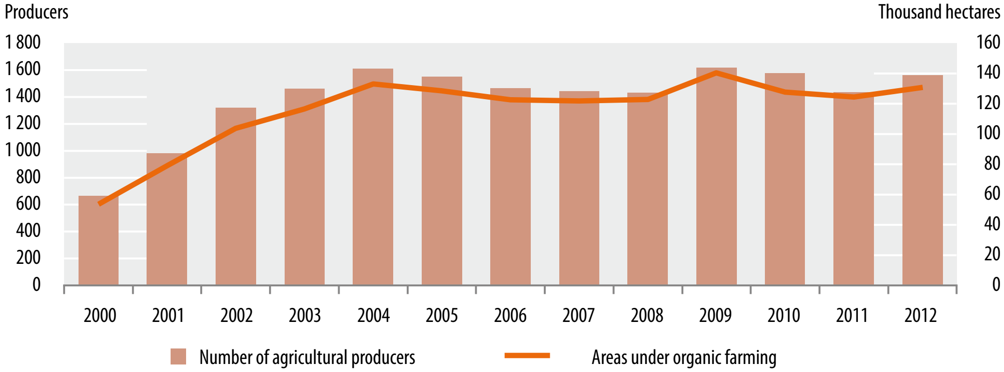
Figure 3.2.1 **Share of areas under organic farming, 2012**



The size of areas under organic farming was more than 130 thousand hectares in Hungary in 2012, the half of which was meadows and pastures, and green fodder was produced on another 11%. The proportion of the area of cereals was 21%.

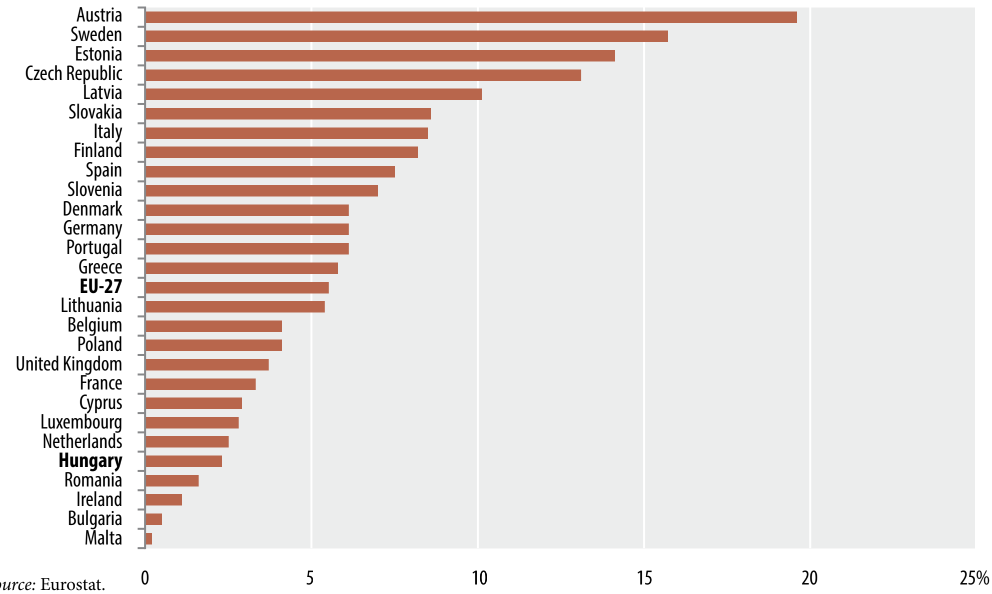
The potential growth of organic areas in the future is determined by the size of areas under conversion, since organic products can only be grown in areas that already went through a conversion period of 2–3 years. 19% of areas under organic farming were under conversion, and 81% were already fully converted in 2012.

Figure 3.2.2 Areas under organic farming and number of producers engaged



Areas under organic farming have grown by nearly 144% in Hungary since 2000, though the growth trend was slightly broken in 2004, since the agri-environmental programme, started then, did not cover the support of organic farming. Organic producers can apply again for support within the framework of the agri-environmental programme started from 2009. This may have helped the size of areas under organic farming increase again in 2009 and reach 140 thousand hectares. Although the size of areas under organic farming temporarily decreased from 2009, it grew again, by 5% in 2012 compared to the previous year.

Figure 3.2.3 Areas under organic farming as a proportion of agricultural area, 2011



Source: Eurostat.

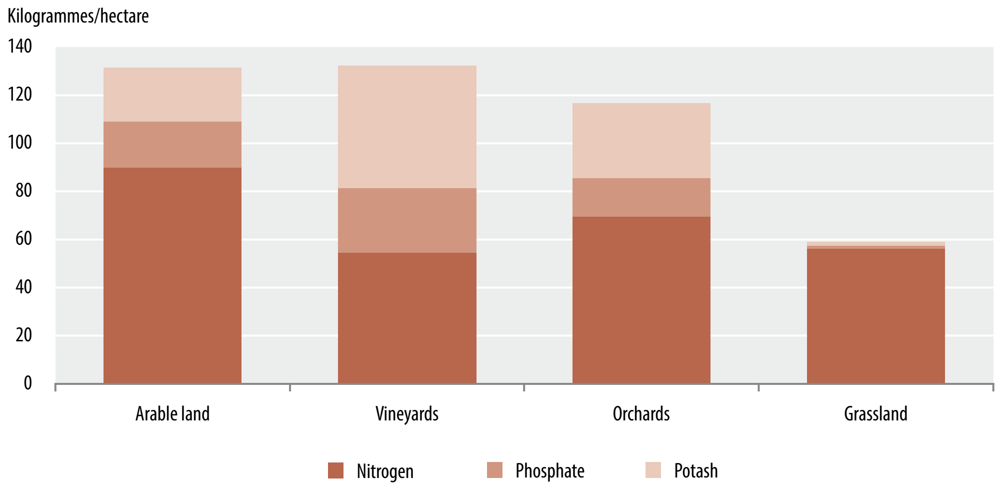
The proportion of areas under organic farming was 2.3% of agricultural area in Hungary in 2011, which was lower than the EU average of 5.5%. The proportion of areas under organic farming was the highest, 20% in Austria, but it was above 10% in Sweden, Estonia, the Czech Republic and Latvia too.

Table (Stadat):
4.1.6 Organic farming

3.3 Use of fertilisers

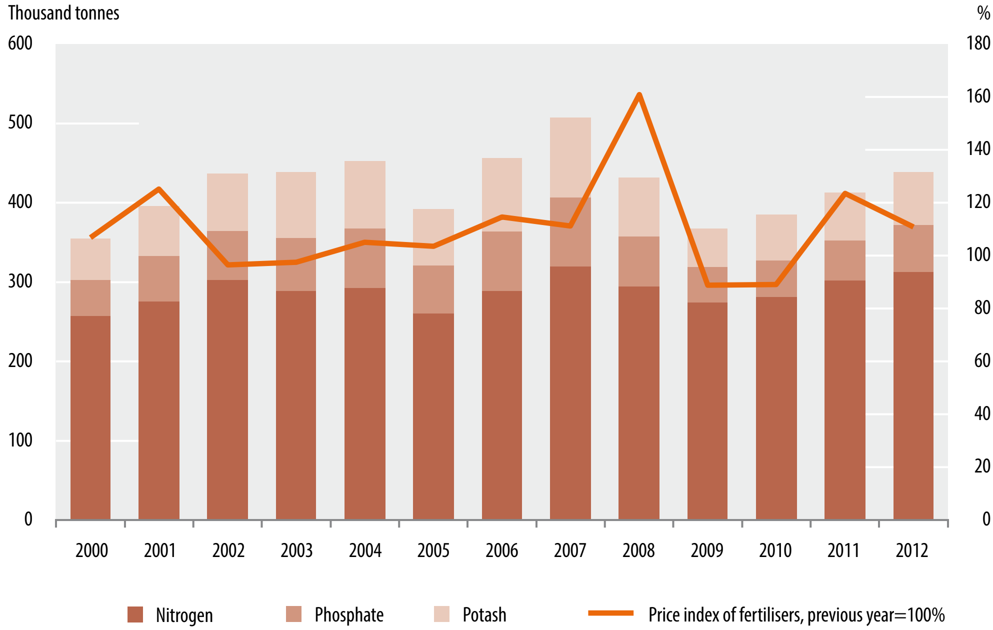
Nitrogen in fertilisers oxidised into nitrate causes acidification of the soil and, leaching into deeper layers of the soil, enhances the levels of nitrate in groundwater. It leads to eutrophication in surface waters and can cause poisoning in drinking water. In addition, the production of nitrogen fertilisers entails large emissions of greenhouse gases to the atmosphere.

Figure 3.3.1 Use of fertilisers by land use categories, 2012



Fertilised areas covered 2.9 million hectares in Hungary in 2012. The proportion of fertilised areas was the highest in case of arable land areas (67%) out of the major land use categories. Farmers used fertilisers on 35% of the area of orchards.

Figure 3.3.2 Quantity of nutrients in sold fertilisers and price index of fertilisers

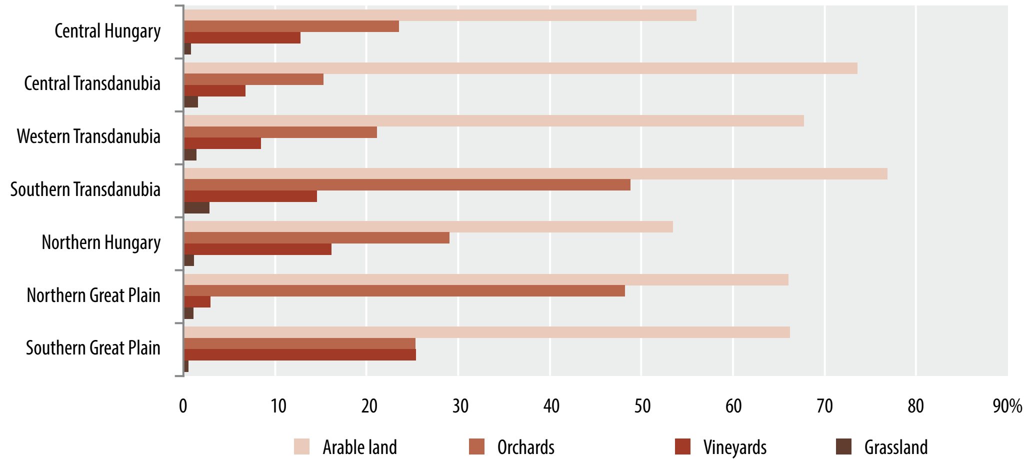


Source: Research Institute of Agricultural Economics, Hungarian Central Statistical Office.

The quantity of sold fertilisers grew almost continuously in Hungary until 2007, then it dropped markedly in the subsequent two years (by 28%). Though it has increased again since 2009, the sold quantity still did not reach the level of 2007. Nitrogen fertilisation has a predominance in Hungary, farmers principally reduce phosphate and potash application in case they have financial difficulties. The share of nitrogen in the total quantity of nutrients was 71% in 2012.

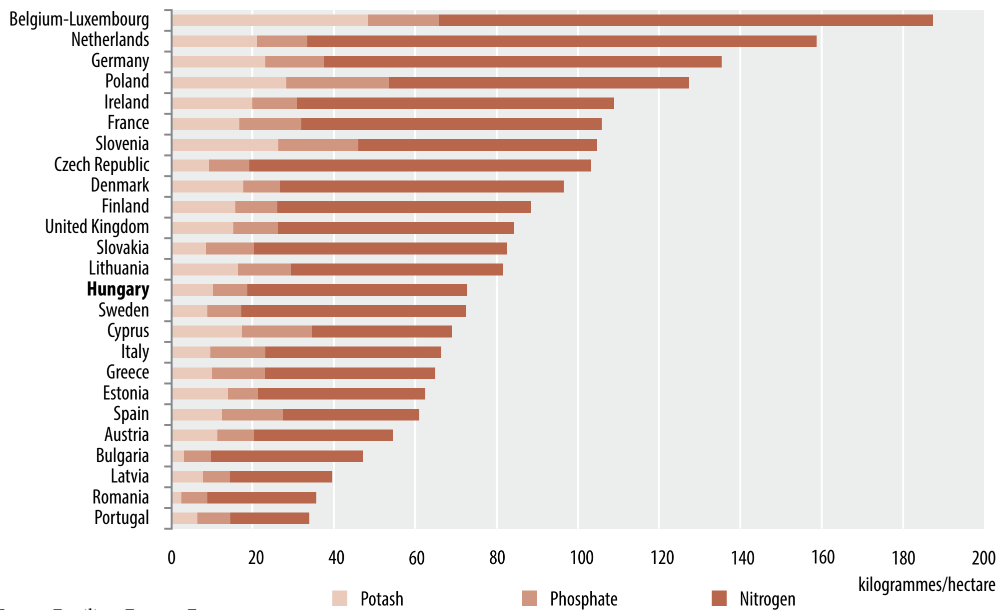
The purchase price index of fertilisers was fluctuating in the examined period. After a 61% price rise in 2008 the purchase price of fertilisers declined in 2009 and 2010 compared to the previous year, one of the reasons for which was probably a drop in the quantity sold. The average purchase price of fertilisers was 11% higher in 2012 than in the previous year.

Figure 3.3.3 Share of fertilised areas by regions, 2012



The proportion of fertilised arable land areas was the highest in the regions of Transdanubia, ranging from 68% to 77%. The proportion of fertilised orchards was the highest in Southern Transdanubia and Northern Great Plain, 49% and 48% respectively. Vineyards were fertilised to the highest extent (25%) in Southern Great Plain in 2012.

Figure 3.3.4 Nutrients per hectare of agricultural area, 2011



Source: Fertilizer Europe, Eurostat.

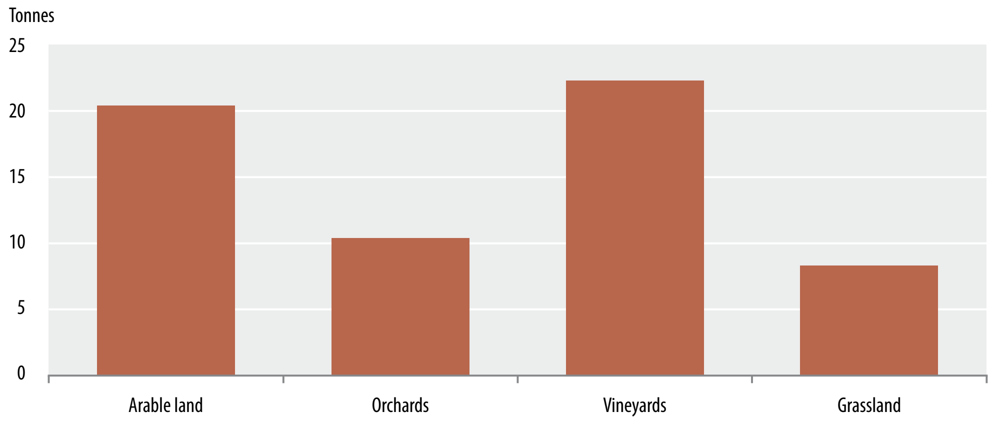
According to the estimation of the European organisation of fertiliser producers (Fertilizers Europe) for 2011, the quantity of nutrients per hectare of agricultural area was the highest in Belgium and Luxembourg: 187 kilogrammes/hectare. Among new Member States, producers in Poland, Slovenia, the Czech Republic, Slovakia and Lithuania use more fertilisers than farmers in Hungary.

Table (Stadat):
4.1.7 Quantity of sold fertilizers

3.4 Use of manure

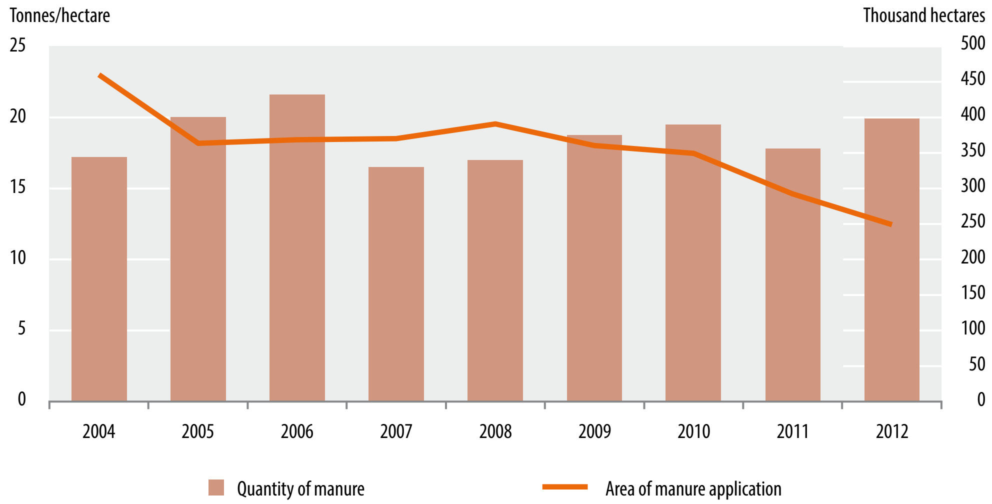
Manure comprises solid and liquid manure. Solid manure, unlike fertilisers, improves not only the fertility of soils but also their structure. If stored and incorporated into the soil appropriately, greenhouse gas emissions can be reduced. To protect water resources, the quantity of nitrogen in manure applied annually on agricultural areas cannot exceed 170 kilogrammes per hectare in nitrate vulnerable zones.

Figure 3.4.1 Quantity of manure per hectare of area of manure application, 2012



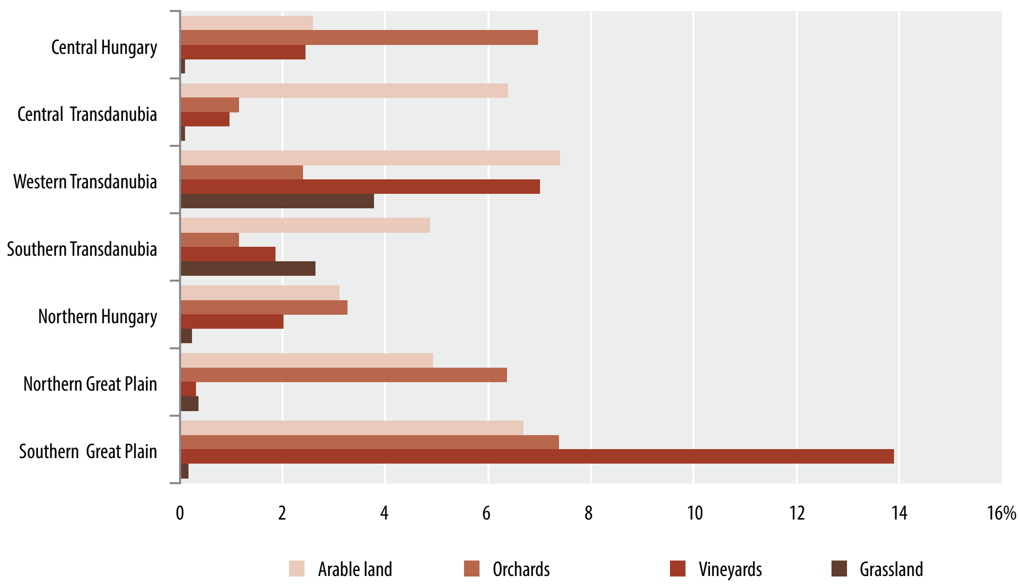
The quantity of manure per hectare of area of manure application was the highest in vineyards, 22 tonnes/hectare, compared with 20 tonnes/hectare on arable land areas, while the use was the half of that in orchards in 2012.

Figure 3.4.2 **Area of manure application and quantity of manure applied**



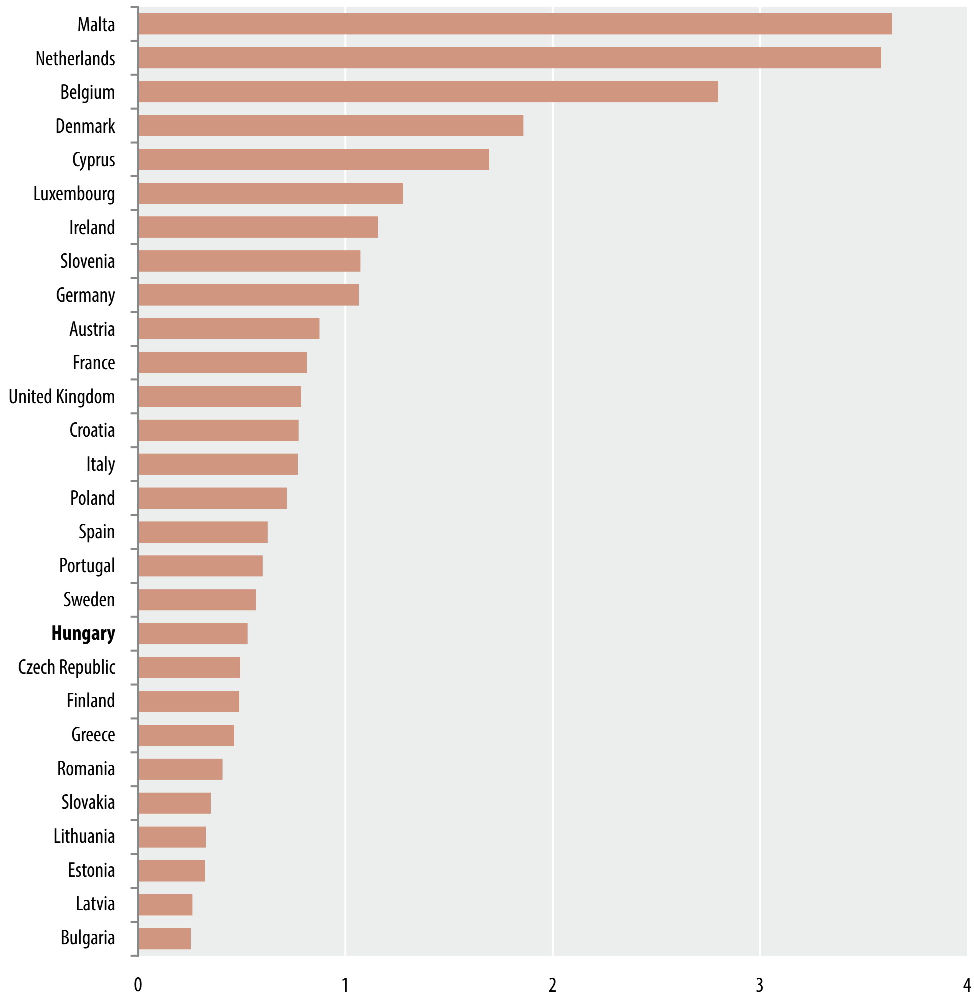
The size of areas of manure application has decreased since 2004, in parallel with which the total quantity of applied manure has been reduced, too, by 37% between 2004 and 2012. Nonetheless, the quantity applied per hectare has grown almost continuously since 2007.

Figure 3.4.3 **Regional proportions of areas of manure application by land use categories, 2012**



The proportion of areas of manure application was the highest in Western Transdanubia in the land use categories of arable land and grassland, and in Southern Great Plain in the land use categories of orchards and vineyards, which may be consistent in case of Southern Great Plain with the highest number of livestock in this region.

Figure 3.4.4 Livestock per hectare of agricultural area, 2010



Source: Eurostat.

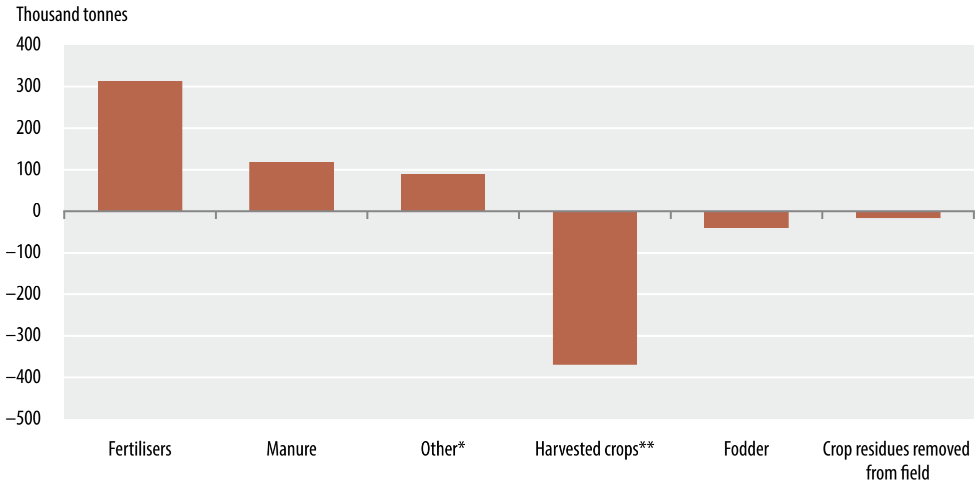
The quantity of manure used is consistent with the livestock of a particular country. The most livestock units per hectare of agricultural area were recorded in Malta, the Netherlands and Belgium in 2010.

3.5 Nutrient balance

Nutrient balances provide a picture of changes in the nutrient element status of soil as well as the circle of mineral substances important for crops. If the balance of any nutrient is permanently and significantly positive, then the risks of nutrient leaching and the consequent water contamination are high. And where this balance is negative for a longer period of time, there the sustainability of the agricultural practice applied is questionable.

Nutrient intake adapted to soil type and status is especially important because an excess of nitrogen leaching into still waters causes eutrophication. In addition, the application of inorganic and organic fertilisers can result in nitrogen dioxide and ammonia emissions into the atmosphere.

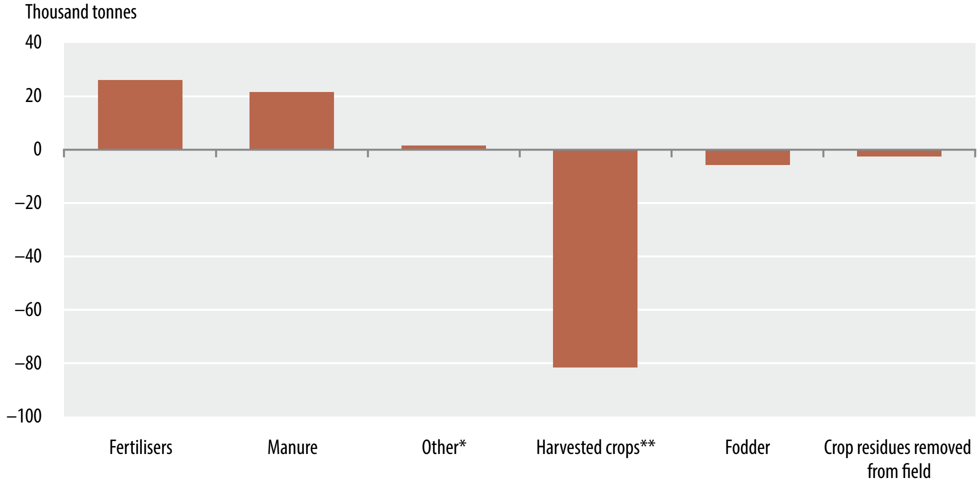
Figure 3.5.1 Components of nitrogen balance, 2012



* *Other input:* nitrogen fixation, wet deposition of nitrogen, and nitrogen quantity in seeds input.

** *Nitrogen output of harvested crops:* not including fodder.

Figure 3.5.2 **Components of phosphorus balance, 2012**

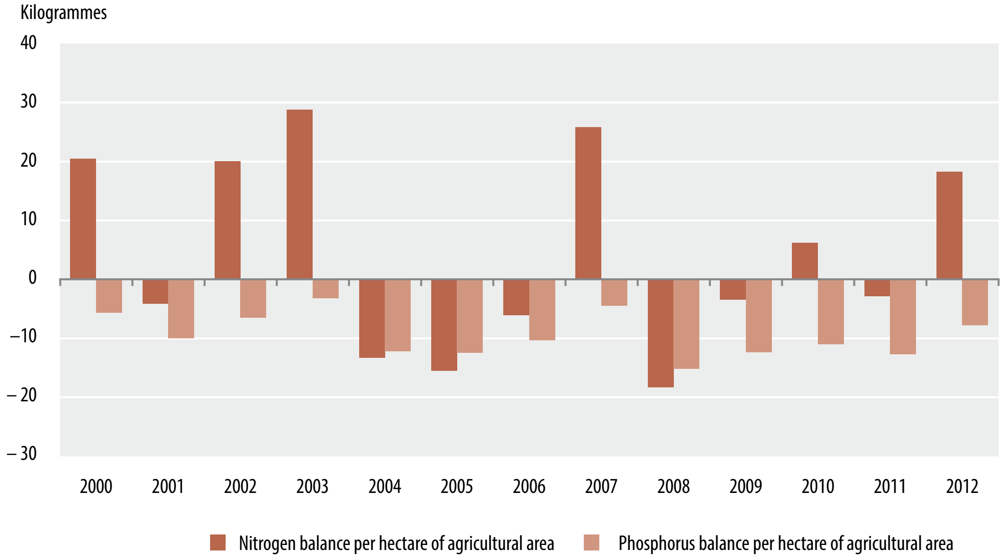


** *Other input:* phosphorus quantity in seeds input.

** *Phosphorus output of harvested crops:* not including fodder.

Nutrient balances are the difference between nutrient input by fertilisation and other ways and nutrient output by crop yields. The dominant component of the input side of the balance is the nutrient content of fertilisers. The output side is dominated by crop yields, which depends to a great extent on weather conditions in a particular year.

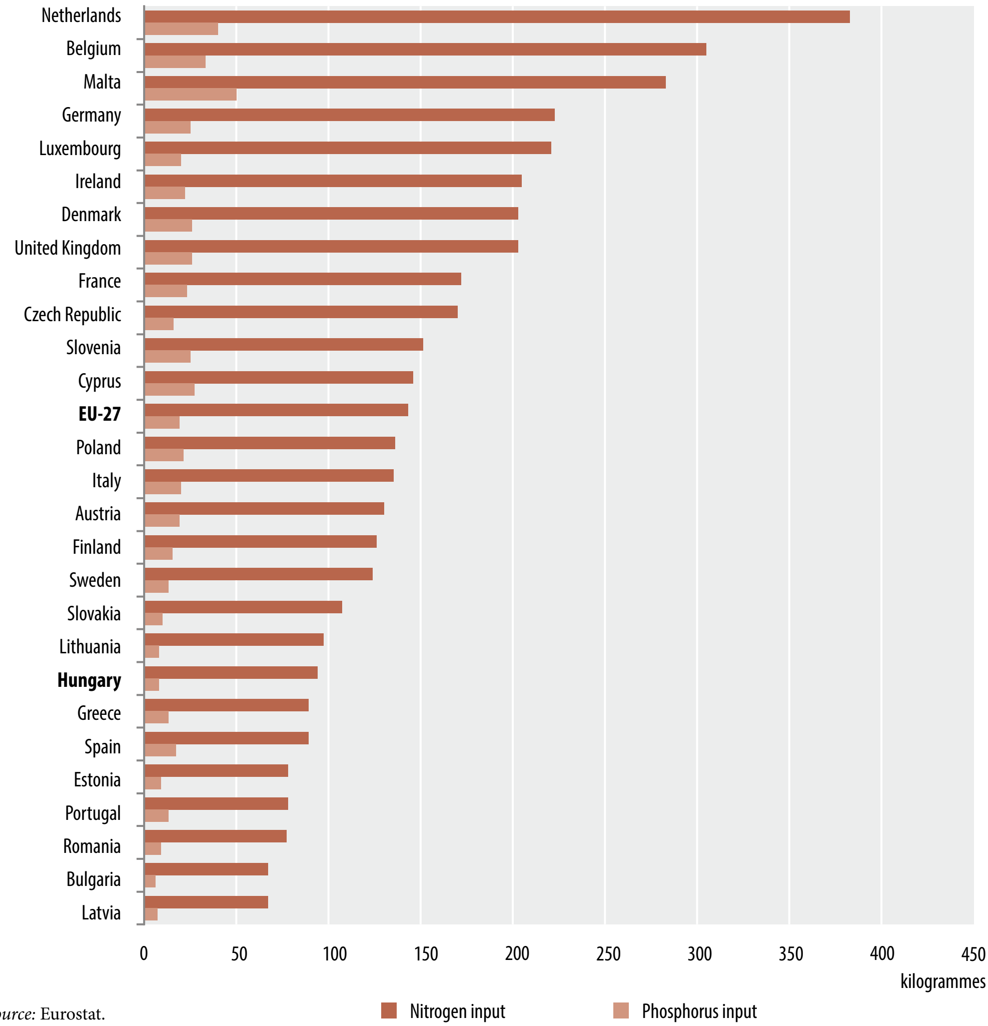
Figure 3.5.3 **Nutrient balance per hectare of agricultural area**



According to the data calculated in line with Eurostat/OECD methodology, the quantity of input was nearly permanent in Hungary between 2000 and 2012. Nitrogen balances fluctuated mainly depending on output from the field by crop yields.

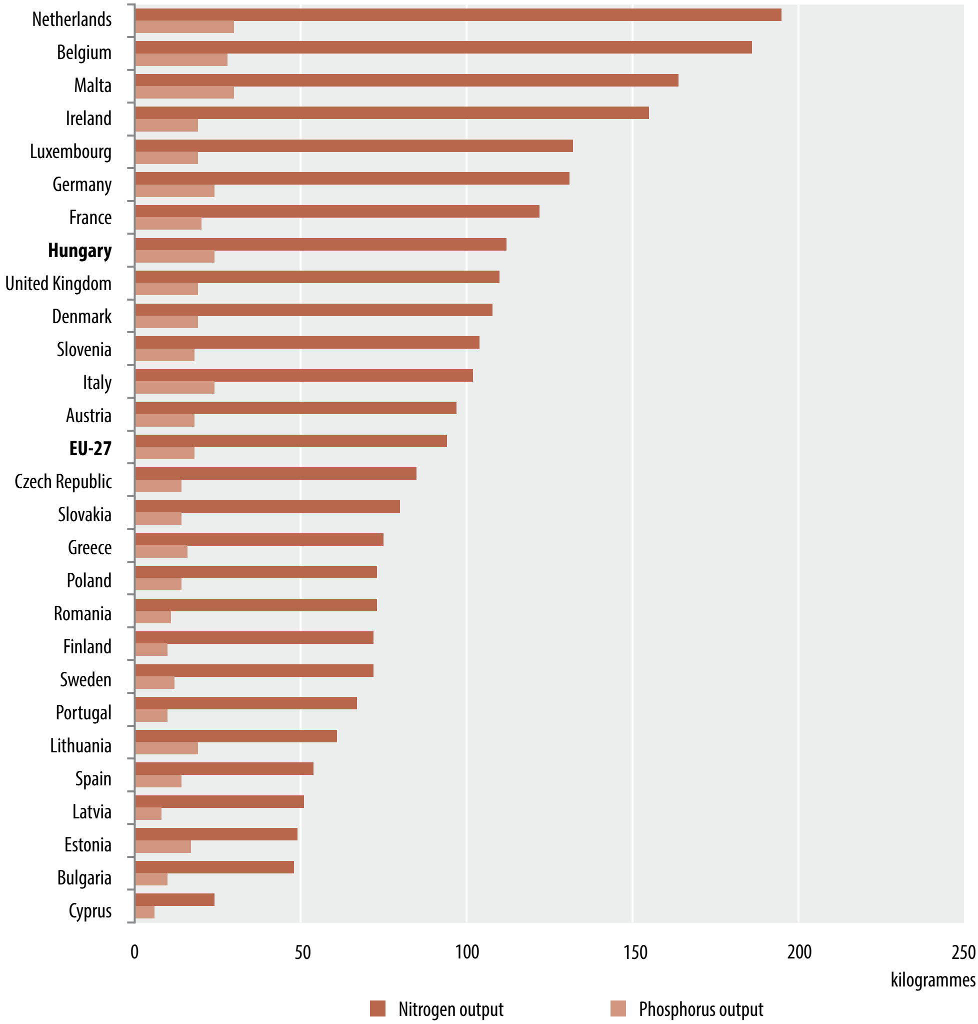
As opposed to nitrogen phosphorus is less mobile, the excessive amounts that remained in the soil accumulate year by year, increasing the soluble and total phosphorus content of the soil. However, the phosphorus balances of soils have been negative each year in Hungary since 2000, which may already risk the sustainability of agricultural production.

Figure 3.5.4 Nutrient input per hectare of agricultural area, 2008



Source: Eurostat.

Figure 3.5.5 Nutrient output per hectare of agricultural area, 2008



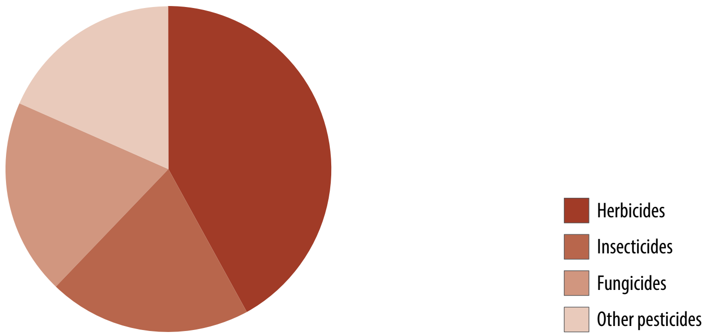
Source: Eurostat.

The quantity of nutrient input in Hungary is lower than the EU average, while the nutrient output by crop yields exceeds that. As a consequence, the balance in Hungary is much less favourable compared to the other Member States.

3.6 Use of pesticides

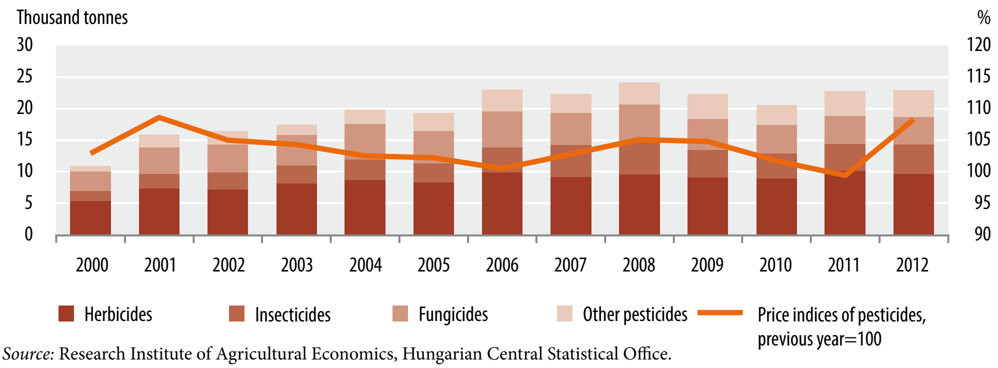
The inappropriate use of pesticides has environmental and health risks. To reduce these risks and to elaborate the relevant EU strategy for the sustainable use of plant protection products were one of the highlighted domains in the EU's sixth environmental action programme that lasted until 2012. As statistical data collection in Hungary covers at present only sales by enterprises producing and distributing pesticides, sales data are considered as consumption.

Figure 3.6.1 Distribution of sold quantity of pesticides, 2012



42% of the quantity of pesticides sold to agricultural producers was herbicides in 2012.

Figure 3.6.2 Sold quantity and price indices of pesticides



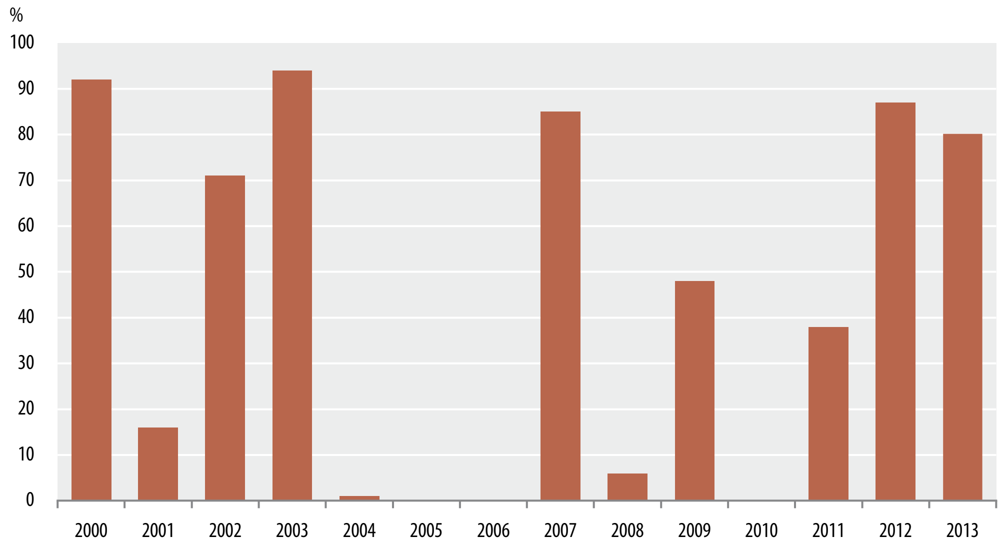
Source: Research Institute of Agricultural Economics, Hungarian Central Statistical Office.

According to the data of the Research Institute of Agricultural Economics the sales of pesticides, following a peak in 2008, decreased by 15% between 2008 and 2010, and grew again in the subsequent two years. The quantity of sold pesticides was nearly 23 thousand tonnes in 2012, 110% higher than the quantity in 2000. The price of pesticides rose almost continuously between 2000 and 2012, a minimal decrease occurred only in 2011.

3.7 Areas exposed to drought

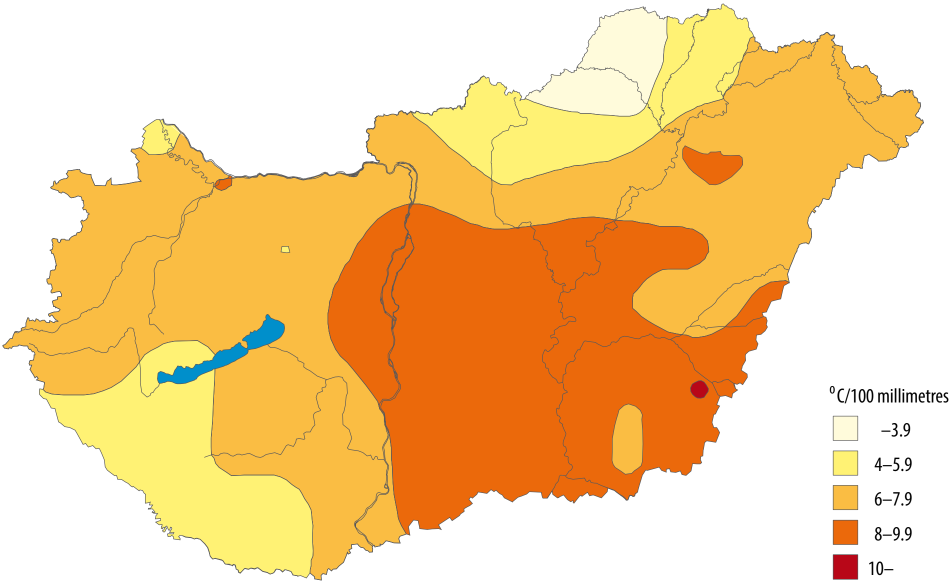
The size of areas exposed to drought is determined by the Pálfai drought index (PDI). This is the quotient of the mean temperature in the period between April and August and the weighted precipitation amount in the period between October and August. The index takes into account the number of hot days, the length of period poor in precipitation, the depth of groundwater and agricultural plants' water demand, changing over time.

Figure 3.7.1 **Proportion of areas exposed to drought in Hungary**



Source: General Directorate of Water Management.

Figure 3.7.2 **Spatial distribution of drought index (PDI) values for 2013**



Source: General Directorate of Water Management.

Drought-free areas are those where the PDI is < 6°C/100mm, and extreme drought is recorded where the PDI is > 12°C/100mm.

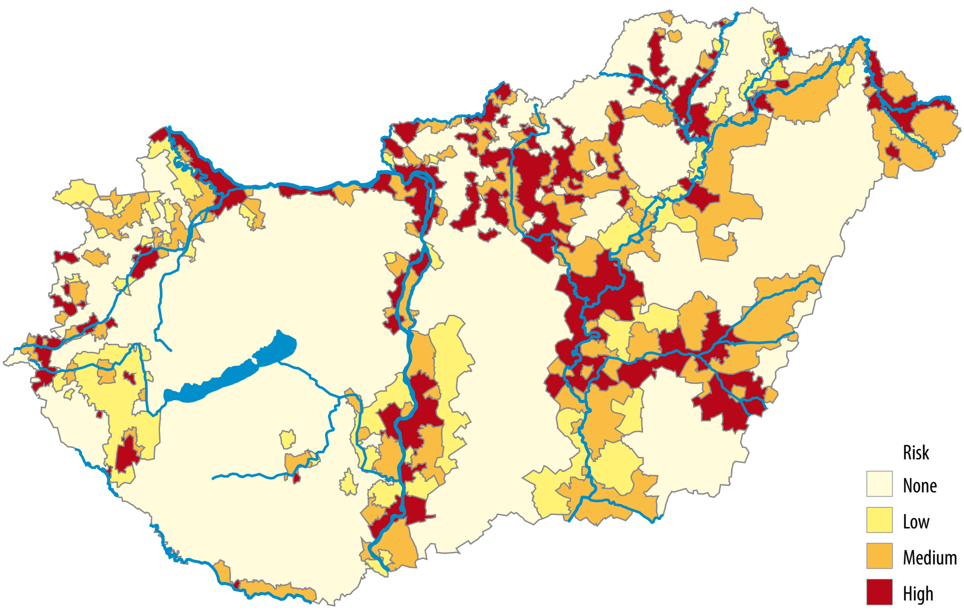
Table (Stadat):
5.6.1 Area exposed to drought

3.8 Floods, inland inundation

Due to its geographical location, relief and climate, Hungary is considered as an area highly exposed to floods and inland inundation in the Carpathian Basin.

The temporal and spatial distribution of our water resources is exceptionally extreme. In general there are two flood waves on the rivers of Hungary each year, floods in early spring are caused by snowmelt, while flood waves in early summer are caused by the maximum amount of precipitation at the beginning of summer (green floods).

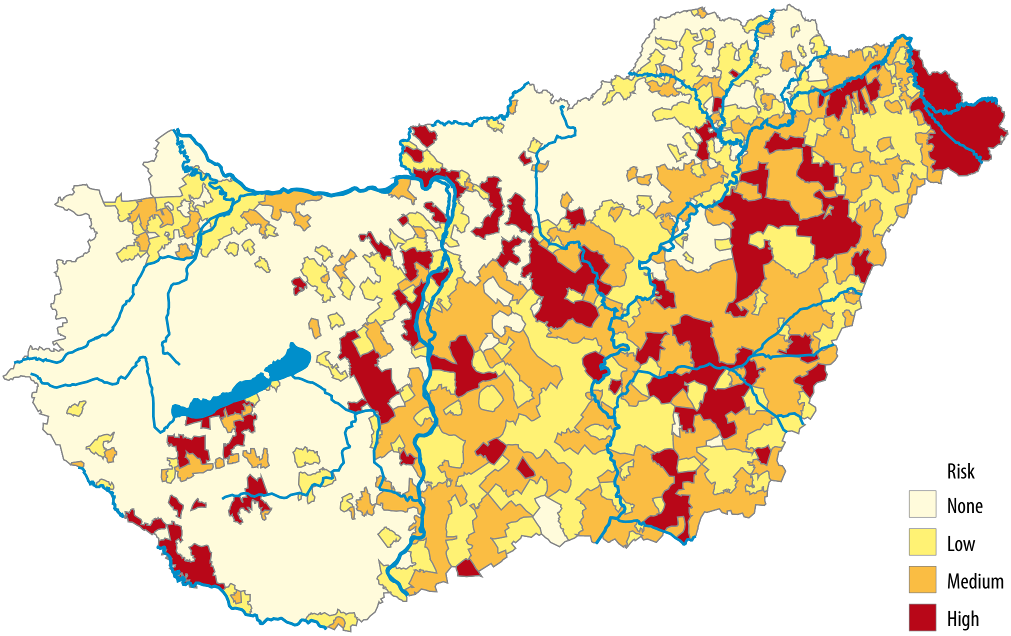
Figure 3.8.1 Flood risk classification of settlements in Hungary, 2011



Source: National Disaster Risk Assessment, Ministry of Interior, National Disaster Management Chief Directorate, 2011.

Nearly the half of Hungary is plain area (44,500 km^2), with endorheic lowlands covering large areas. More than 20,000 km^2 of area are threatened by floods, of which 5,610 km^2 lie on the river basin of the Danube and 15,641 km^2 on the river basin of the Tisza.

Figure 3.8.2 **Inland inundation risk classification of settlements in Hungary, 2011**



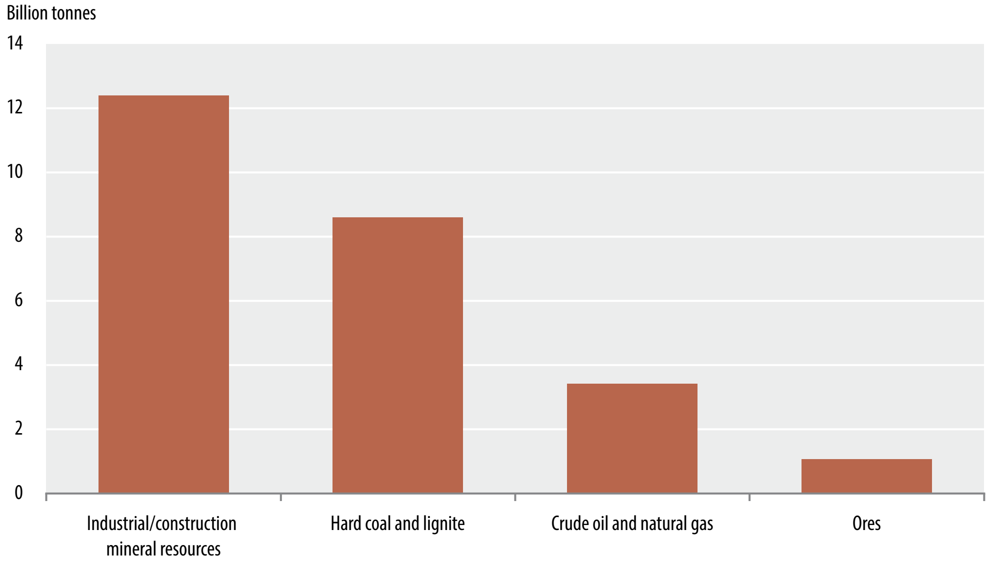
Source: National Disaster Risk Assessment, Ministry of Interior, National Disaster Management Chief Directorate, 2011.

Around 60% of plain areas in Hungary are exposed periodically to inland inundation year by year.

3.9 Mineral resources

The aggregation of domestic mineral resources, their regular registration in the form of a balance and their preliminary economic evaluation by occurrences, mineral resources, main groups of mineral resources and areas as of 1 January are carried out by the Hungarian Office for Mining and Geology. The mineral resources of the country in their natural form are owned by the state. These resources are a part of the natural resources and the national wealth of Hungary, their registration has been carried out by the Office and its legal predecessors since 1953. The registration of domestic mineral reserves in the form of a balance is based on the compulsory data supply of mining enterprises and the decrees of mining authorities.

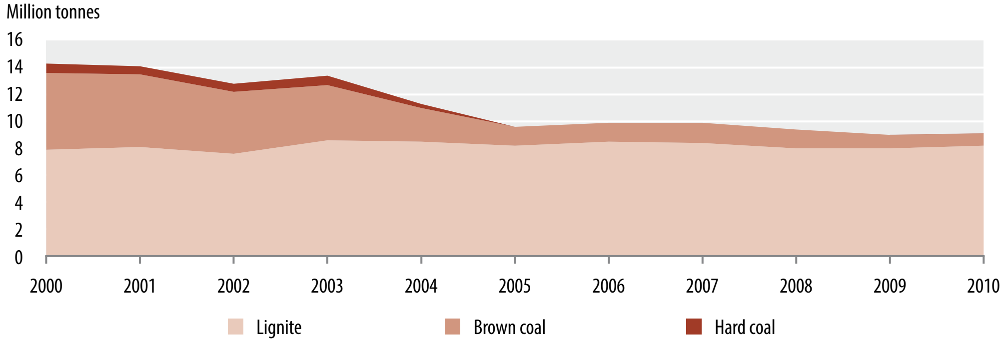
Figure 3.9.1 **Exploitable mineral reserves on 1 January 2011**



Source: Hungarian Office for Mining and Geology.

The National Mineral Inventory contained the data of 37.5 billion tonnes of geological and 24.4 billion tonnes of exploitable reserves in more than 3,700 known deposits on 1 January 2011.

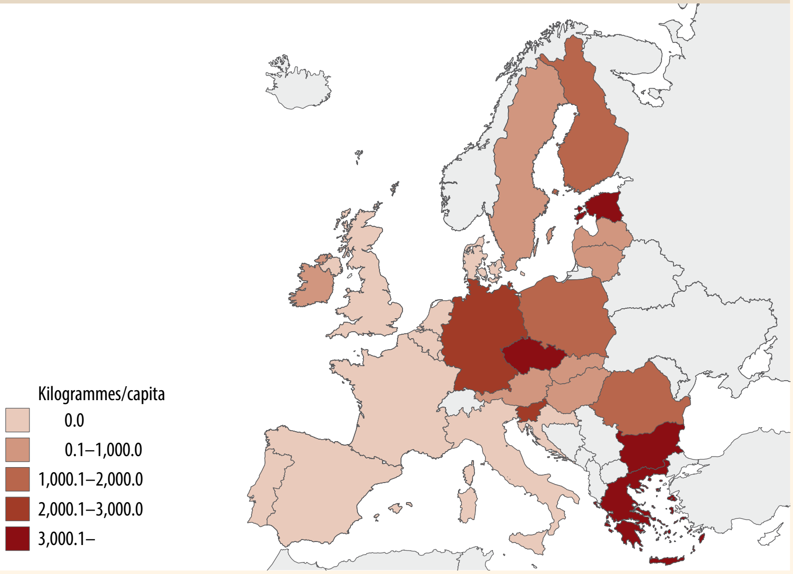
Figure 3.9.2 Coal extraction in Hungary



Source: Hungarian Office for Mining and Geology.

Coal mining was dominant in the energy supply of Hungary until the end of the 1960s. Annual coal extraction reached its maximum in 1964, with 34.5 million tonnes. This was followed by short stagnation and a decrease. The extraction of hard coal came to an end in 2005, and the total extraction of brown coal and lignite hardly exceeded 9 million tonnes in 2010.

Figure 3.9.3 Lignite extraction in Europe, 2011



Source: Eurostat.

Table (Stadat):
5.10.1 Exploitable reserve, 1 January

Wildlife

The goal of nature conservation is to protect biodiversity. In Hungary, numerous animal, plant, mushroom and lichen species are protected by the law. National parks, nature conservation areas, landscape protection areas as well as forest and biosphere reserves are to ensure the integrated and multi-level protection of complete natural habitats.

One of the requirements of joining the EU was the designation and proclamation of Natura 2000 territories in Hungary. Natura 2000 is an ecological network designed to protect wild animal and plant species and natural habitats across Europe.

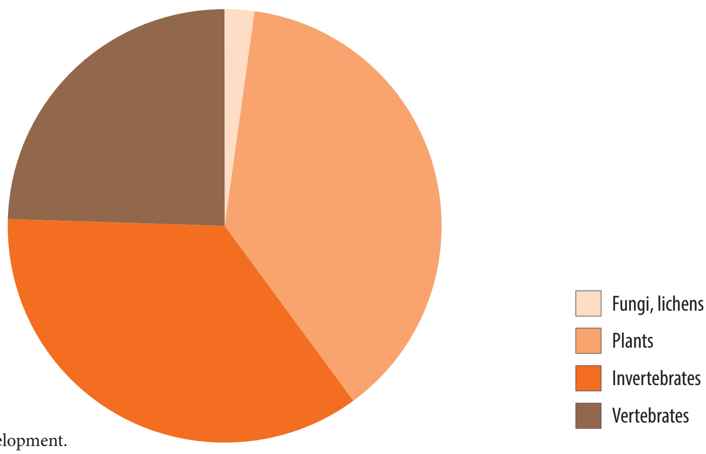
Around one-fifth (2,056 thousand ha) of Hungary is covered by forests. Our forestry sector is strictly regulated to ensure the sustainable management of forests taking into account the purposes of logging, the preservation of biodiversity as well as the tourism and recreation related social functions.

There are 6 species of big game and 26 species of small game that can be hunted in Hungary. However, only five of the big game species (red deer, fallow deer, roe deer, mouflon, wild boar) as well as hare, pheasant and to a lesser degree partridge have value with respect to hunting. Game management is to sustain the balance between the increasing game population and the decreasing area of habitat.

4.1 Nature conservation

The legal protection of wildlife can be reached in two ways. First, certain species of animals and plants are under protection. Second, they fall under protection as part of protected natural areas, such as national parks, nature conservation areas, landscape protection regions and natural monuments.

Figure 4.1.1 Natural values protected without area, 2012



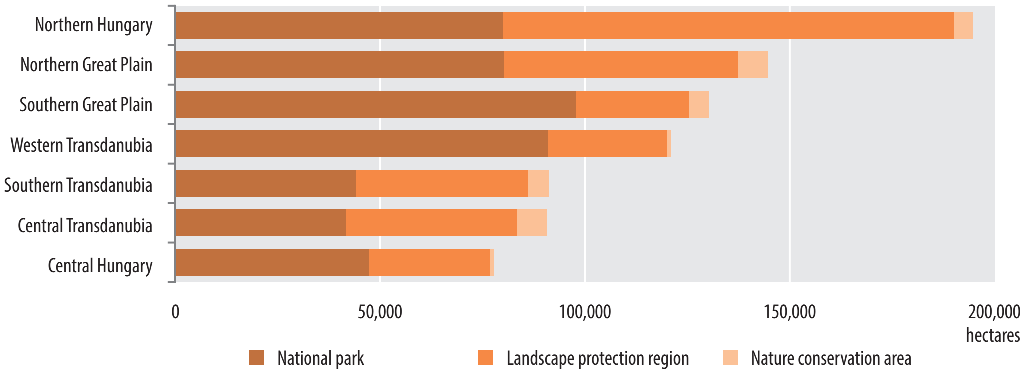
Source: Ministry of Rural Development.

Nearly three thousand plant species live in Hungary, the number of plant associations is approximately 400. Endangered habitats are frequently home to valuable plant associations, so an integrated approach is needed. Of 733 protected plant species, 87 are highly protected. Since 2000, the number of protected and highly protected plant species has risen by approximately 86% and more than two-thirds respectively.

The overwhelming majority, i.e. 40,000 species of the more than 43,000 animal species living in Hungary are arthropods. Of vertebrates living in Hungary, 83 species are fish, 18 amphibian, 15 reptilian, 373 bird and 83 mammal species.

In line with the international practice, most of the mammal species are protected by a separate law. Of 1,168 protected vertebrate species, 186 are strictly protected.

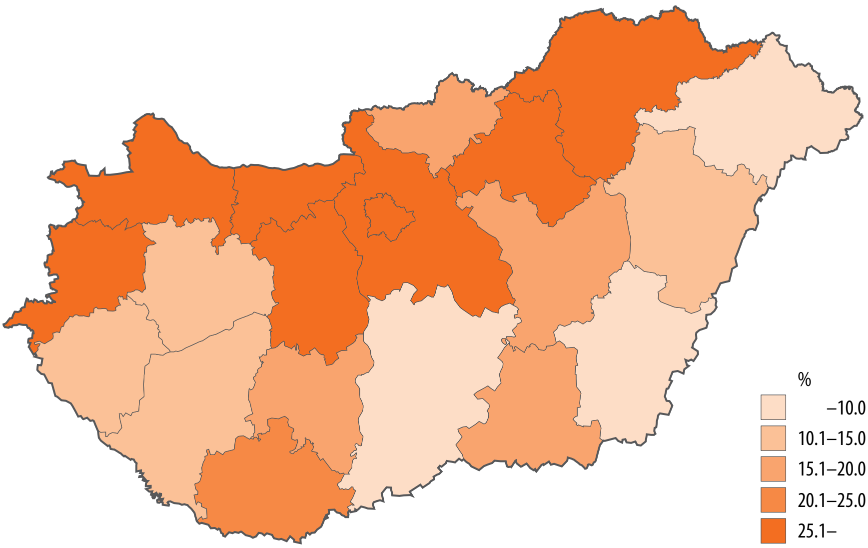
Figure 4.1.2 Protected areas of national significance by regions, 2012



Source: Ministry of Rural Development.

Since 2000, the size of the protected areas of national importance has increased by 34 thousand hectares to 850.7 thousand hectares. Nearly 57% of these protected areas are national parks. The number of national parks, as the most comprehensive protected areas, rose to 10 due to the establishment of the Őrség National Park. Their area underwent a significant, more than three-fold rise from a total of 159.1 thousand hectares to 484.9 thousand hectares.

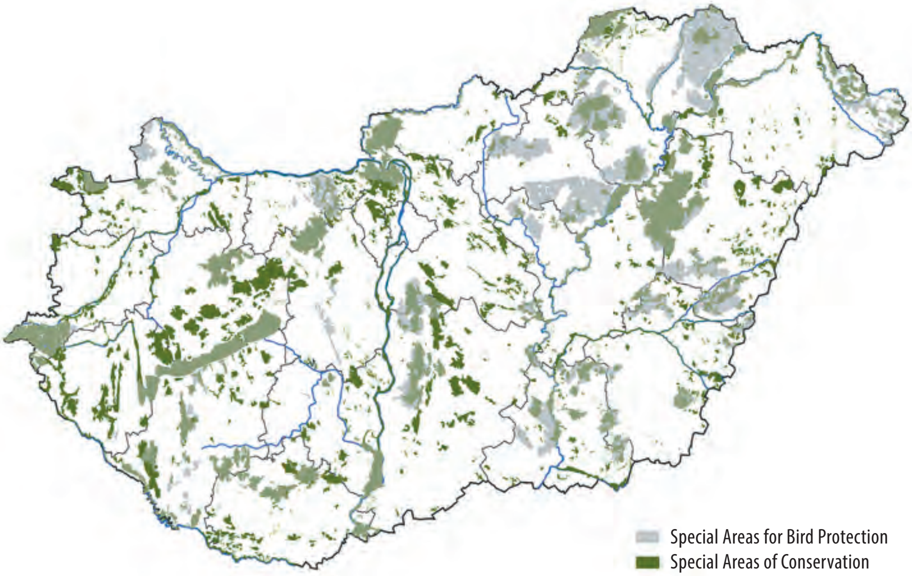
Figure 4.1.3 The ratio of protected forests to all forested areas, 2012



Source: National Food Chain Safety Office, Hungarian Forest Management.

In Hungary, there was more than 422 thousand hectares of protected forests in 2012, which made up more than 21% of the total forest area. The proportion of protected forests is higher in the northern parts of Hungary.

Figure 4.1.4 **Natura 2000 protected areas**



Source: Ministry of Rural Development.

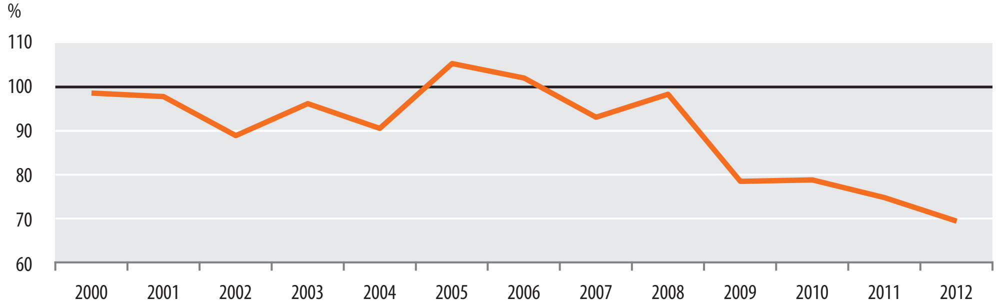
Natura 2000 areas were designated for the protection of biodiversity and the restoration or the maintenance of the natural state of the concerned areas. The network comprises Special Areas for Bird Protection (classified under the Birds Directive) and Special Areas of Conservation (classified under the Habitats Directive). 105 different species of animals, 36 different species of plants and 46 different types of habitats were identified in the designated Natura 2000 areas. 55 Special Areas for Bird Protection are to ensure the protection of bird species of European significance living in our country as well as that of migrating birds. The number of Special Areas of Conservation is 467. Natura 2000 areas total some 1,950 thousand hectares, 39% of which is already protected.

Tables (Stadat):
5.2.2 Protected natural areas
5.2.3 Natural values protected

4.2 Population trends of farmland birds

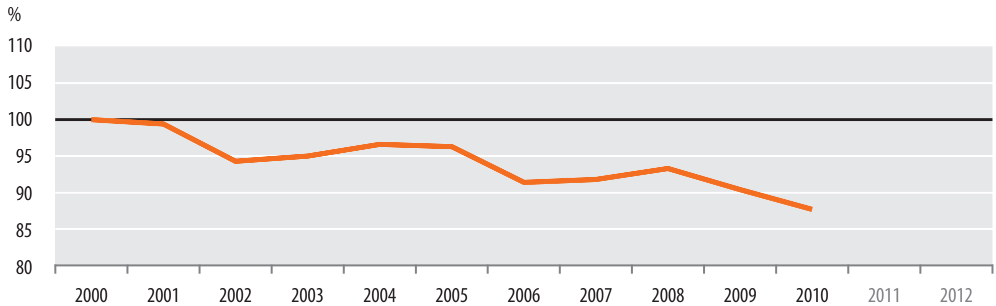
In Hungary, the monitoring of farmland birds has been carried out by BirdLife Hungary since 1999 involving almost a thousand volunteer counters. The survey covers 2% of the country's area in every year. This indicator is an aggregated index based on the results of the monitoring programme on farmland species dependent on agricultural land for nesting or feeding. It reflects the state of habitats in agricultural areas and the sustainability of farming practices.

Figure 4.2.1 **Change in the population of farmland birds** (1999=100%)



Source: BirdLife Hungary (MME).

Figure 4.2.2 **Change in the population of farmland birds in the EU-27** (EU-27, 2000=100%)



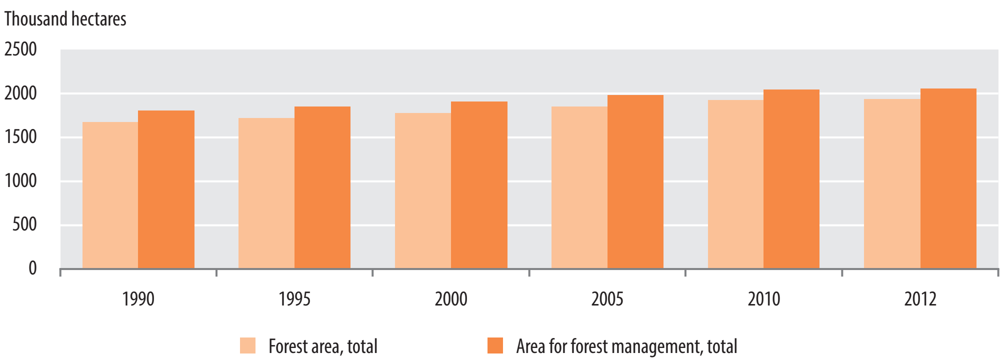
Source: Eurostat.

The index calculated for the EU-27 and rebased to 2000 shows a declining tendency similar to the domestic processes at a slower rate.

4.3 Forest area

Forestry areas account for 22% of Hungary, of which nearly 21% is covered by 'real' forests.

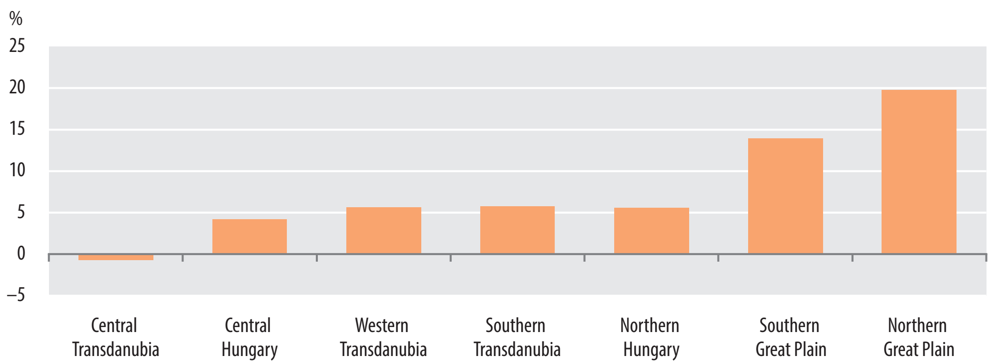
Figure 4.3.1 Total forest area



Source: National Food Chain Safety Office, Hungarian Forest Management.

Owing to more intense afforestation and tree planting, the forest area has grown by more than 13 thousand hectares each year since 2000. As a result of this, the area under forest management is now above 2 million hectares.

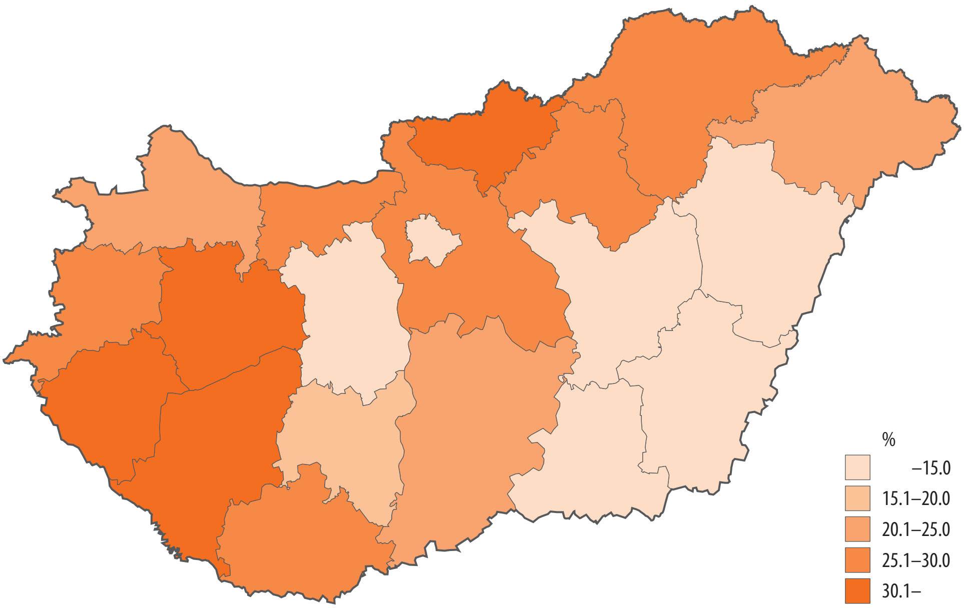
Figure 4.3.2 Change in forest area, 2012 (2000=100%)



Source: National Food Chain Safety Office, Hungarian Forest Management.

Since 2000, the most intensive afforestation has taken place in the two regions of the Great Plain. However, the share of forests in these regions continued to be lower than the national average.

Figure 4.3.3 **Proportion of woodlands in Hungary (forest cover), 2012**

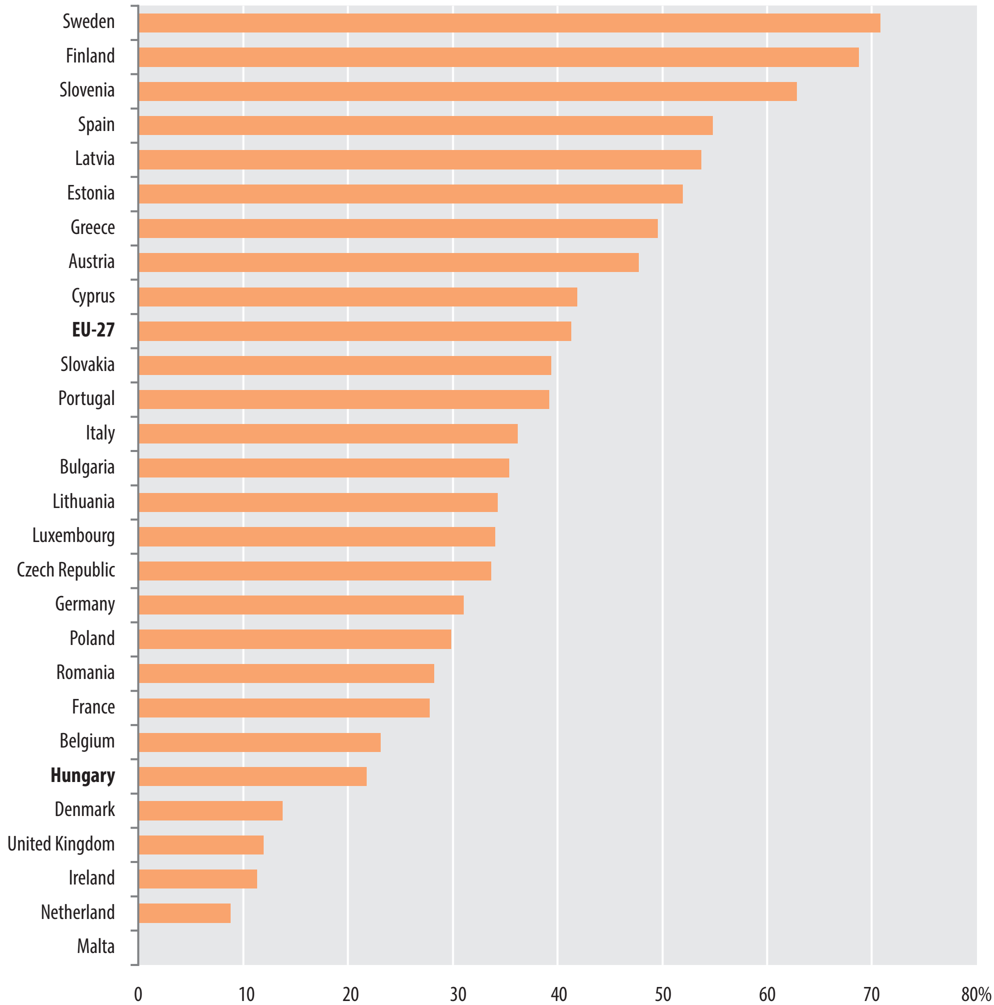


Sources: National Food Chain Safety Office, Hungarian Forest Management.

Our medium-high mountains are densely forested due to their climate (400 metres plus altitude, more than 600 millimetres precipitation per year). Target values (25%) are reached everywhere, with the exception of regions of the Great Plain.

The area under forest management grew by 3.5 million hectares (a 2% increase) in the EU-27 between 2000 and 2010. In Hungary, the rise in the proportion of forested areas was 7 percentage points higher than the EU average. In this respect, Hungary was ranked fourth after Ireland, Bulgaria and Latvia.

Figure 4.3.4 Proportion of woodlands in the EU member states, 2010



Source: Eurostat.

Tables (Stadat):

5.1.1 Distribution of forest area by primary goals, 1 January

5.1.2 Distribution of stocked forest area by tree species and age group

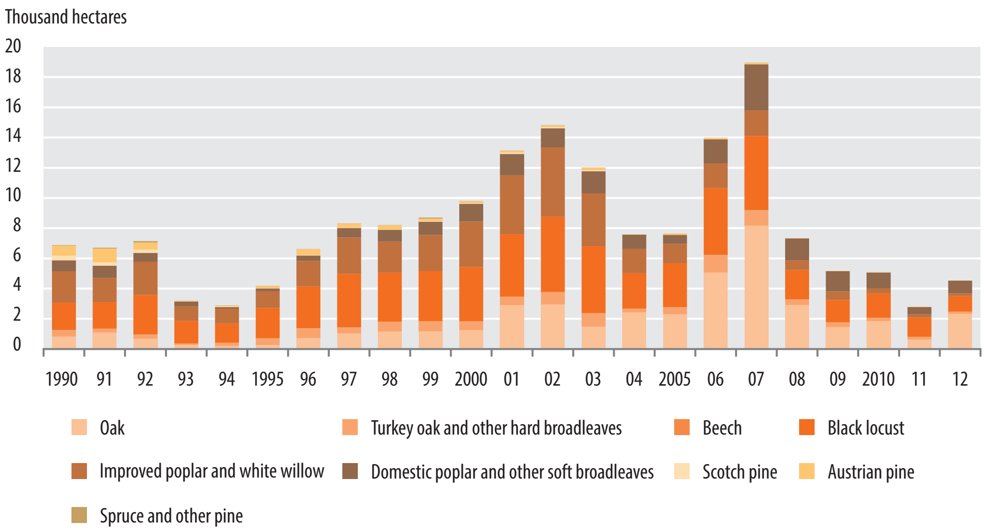
4.4 Afforestation, living stock

Since 2000, woodlands have increased by nearly 8%, i.e. by around 113 thousand hectares of new forests. Forest coverage is on the rise in Hungary, though it is still low in an international comparison (EU: 35 %). The National Forest Program sets out a forest coverage target of over 25% by 2015.

Forests account for 45% of all natural habitats in Hungary, within which the forest coverage is quite low compared with the EU average since the major part of the land areas are used by the agriculture.

A relatively high proportion of our forests are non-indigenous tree plantations. 57% of the total forest area is made up of indigenous and 43% of introduced or cloned tree species.

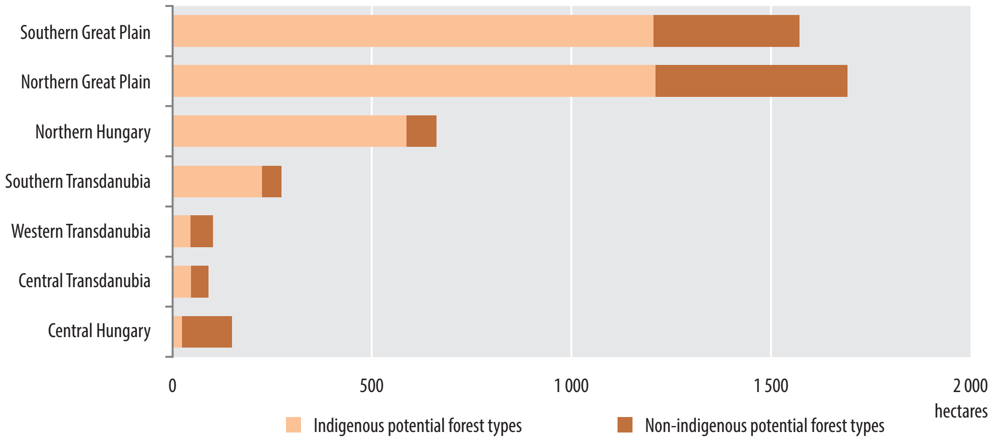
Figure 4.4.1 First planting of afforestation by tree species



Source: National Food Chain Safety Office, Hungarian Forest Management.

Forests with indigenous trees like beech, oak, lime, ash or elm trees ensure better conditions for the native (animal and plant) species. The planting of near-natural forests with indigenous tree species is preferred by the forestry law.

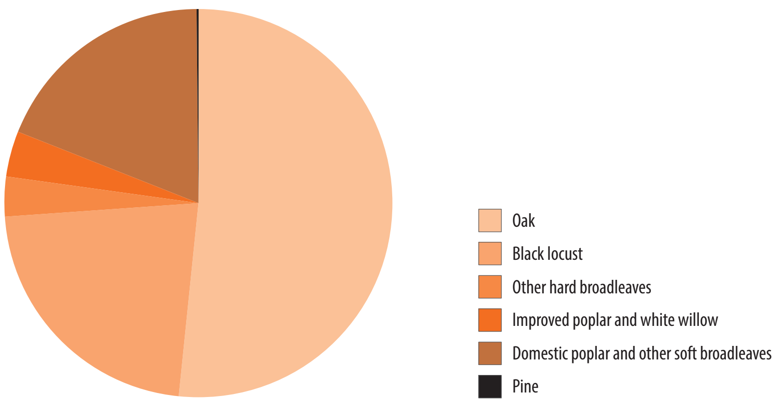
Figure 4.4.2 **First planting of afforestation by region, 2012**



Source: National Food Chain Safety Office, Hungarian Forest Management.

In 2012, the greatest initial forest plantings (area planted in the given estate in year 1) were in the regions of Northern and Southern Great Plain putting an emphasis on the planting of native trees.

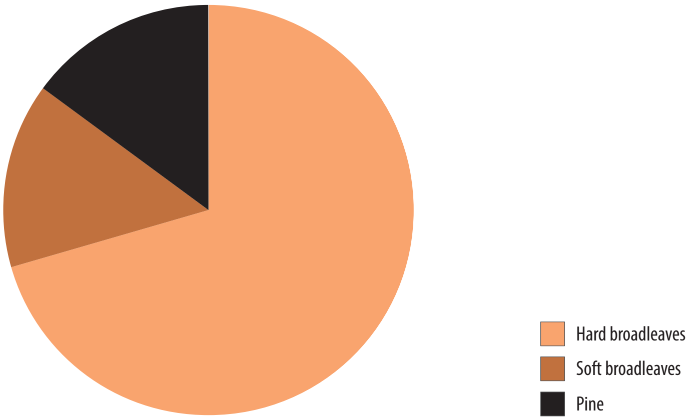
Figure 4.4.3 **First planting of afforestation by species, 2012**



Source: National Food Chain Safety Office, Hungarian Forest Management.

Though the planting of non-indigenous black locust trees is still widespread, the combined share of oak and other indigenous species is higher.

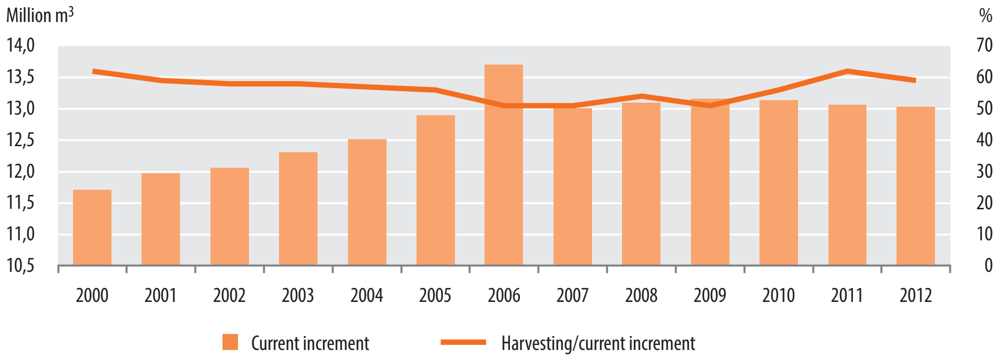
Figure 4.4.4 Living stock, 2012



Source: National Food Chain Safety Office, Hungarian Forest Management.

The living stock was 366 million m³ in 2012, of which hard broadleaved species accounted for two-thirds.

Figure 4.4.5 Current increment and the rate of logging



Source: National Food Chain Safety Office, Hungarian Forest Management.

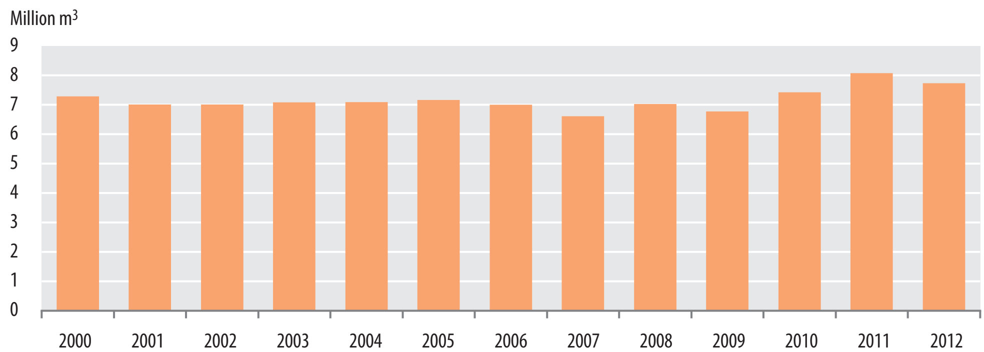
Current increment exceeded logging, resulting in an increase of 41 million m³ in the living stock from 2000 to 2012. The growing stock increased by around 0.5%–1.5% a year.

Table (Stadat):
5.1.4 Afforestation, plantations, regenerations

4.5 Logging

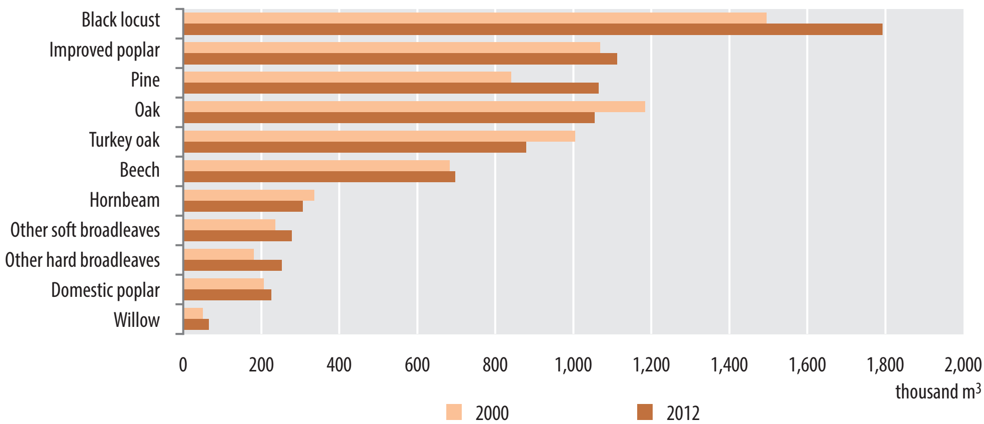
One of the purposes of the forest law is to ensure sustainable forest management through the preservation of biodiversity, productivity and regeneration capacity in forests and wooded areas. Forest management plans are to ensure sustainable management and logging.

Figure 4.5.1 Changes in logging



Source: National Food Chain Safety Office, Hungarian Forest Management.

Figure 4.5.2 Changes in logging by groups of tree species



Source: National Food Chain Safety Office, Hungarian Forest Management.

One of the factors of the sustainable development of forests is a rise in both growing stock and logging. The monitored period saw a sustained increase in increment and a varying wood production of between 6.6 million and 8.1 million m^3 from 2000.

Of tree species, black locust trees with shorter maturity as well as not properly acclimatised pine trees were harvested at the highest rate.

Table (Stadat):
5.1.3 Logging by tree species

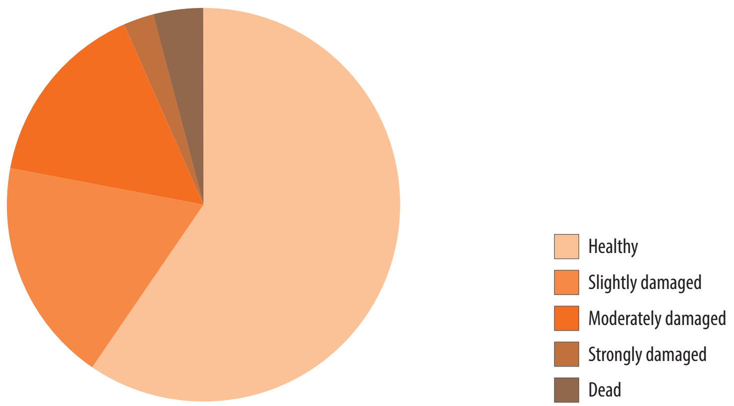
4.6 Health condition of forests

When elaborating its forest management strategy, the EU, in addition to formulating guidelines for sustainable forest management and stimulating forest regeneration, put a great emphasis on enhancing the efficiency of phytosanitary monitoring and stimulating the research of forest protection methods.

Examining the last decade, it can be stated that forest health has not changed significantly. However, there have been small fluctuations. Monitoring data suggest that the state of our forests is similar to the EU average.

Based on foliage symptoms, the proportion of symptom-free trees (no perceptible defoliation) rose from nearly 40% in 2000 to 60% nowadays. The proportion of endangered trees (slight defoliation) fell

Figure 4.6.1 Health condition of forests based on defoliation, 2012



Source: National Food Chain Safety Office, Hungarian Forest Management.

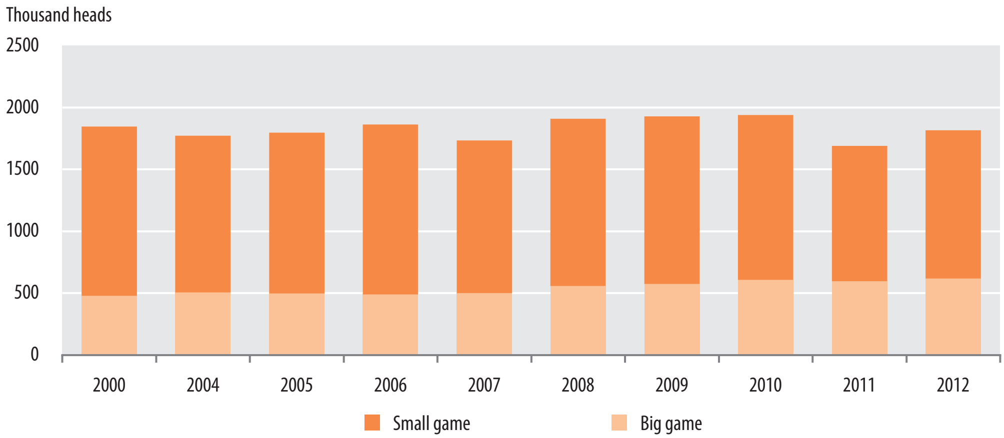
from 40% in 2000 to 18%. There was no change in the proportion of the moderately (15%) and seriously damaged (3%) trees. As opposed to this, the proportion of dead trees rose by 1.7 percentage points to 4%.

Table (Stadat):
5.1.5 Health condition of the forests

4.7 Game management

Summary reports are made on the state of the game population and game management in the National Game Management Database based on game management statistics. The establishment and operation of the database is regulated by the act on wildlife protection and management as well as hunting. The main goal of game management is to maintain the balance between the growing game population and the shrinking habitat.

Figure 4.7.1 Changes in the game population



Source: National Game Management Database, Institute for Wildlife Conservation.

Increasing game damages made it necessary to reduce the deer population. Deer herds also appeared in those parts of the Great Plain, where forests appropriate for them have been planted over the past decades.

The number of wild-boars has gone up because the forest cover has increased over the past ten years and wild-boars adapt well to land-use changes. Consequently, a reasonable reduction of the wild-boar population is needed to ensure the sustainability of agriculture and forest management.

The fallow-deer population is estimated at more than 33 thousand heads. Its quality is excellent even in a European comparison.

The population of huntable indigenous species, i.e. deer (97 thousand heads), wild-boar (110 thousand heads) and roe-deer (366 thousand heads) also increased.

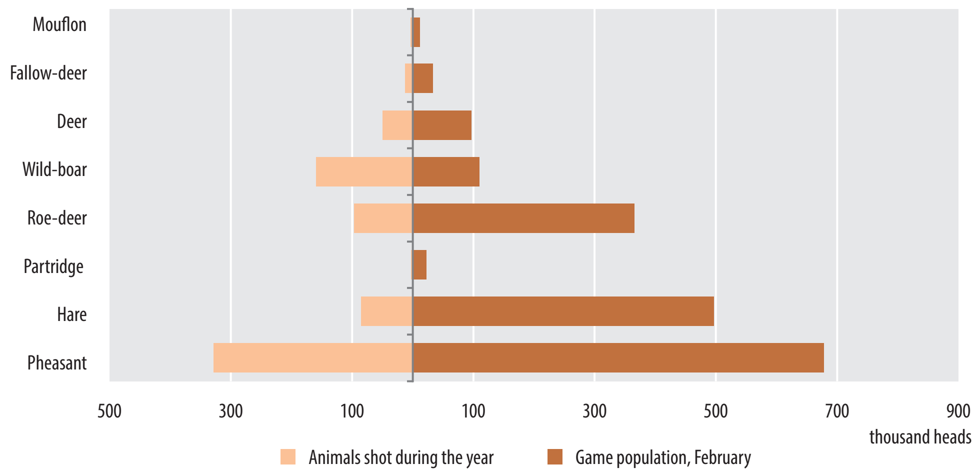
The protection of the roe-deer population of 366 thousand heads is a priority task taking into account the permanent disturbation resulting from the fragmentation of the post-privatisation forest areas.

There are measures to decrease the mouflon population intentionally introduced in the 1970s and 1980s: an increase was seen in the number of shoots, reducing the damage caused in protected areas. The mouflon population was estimated at nearly 12 thousand heads in 2012.

Of the three most abundant small game species (partridge, pheasant, hare) in Hungary, fluctuation was seen in the wildfowl population and an increase in the hare population during the last decade.

A decrease was recorded in the area of forests of high game carrying capacity and an increase in that of forests with less favourable endowments.

Figure 4.7.2 Game management



Source: National Game Management Database, Institute for Wildlife Conservation.

Table (Stadat):
5.2.1 Game farming

Waste, material flow

Along with a rise in consumption and production more and more wastes are generated. The increasing volume of not properly treated waste pollutes the elements of the environment (water, air and soil) and, as its certain constituting parts are assimilated by plant and animal organisms, it exerts a detrimental influence on the health of human beings through the food chain.

The primary purpose of the European Union is to reduce the generation of hazardous waste and to enhance waste recycling. Waste reduction measures and better resource use are to implement these goals.

For the related functions, waste management laws set out technical requirements, financial incentives and sanctions, waste management related producer and consumer liabilities and the tasks of official licensing and inspection.

The Waste Information System (WIS) is a database on waste management. The WIS database, being in operation since 2004 and receiving around 25 000 data entries a year, is based on the European Waste Catalogue (EWC). Information on waste generation and treatment can be accessed by EWC codes.

The summary data of material flow accounts, which are to measure the material use of the national economy, are also included by this chapter.

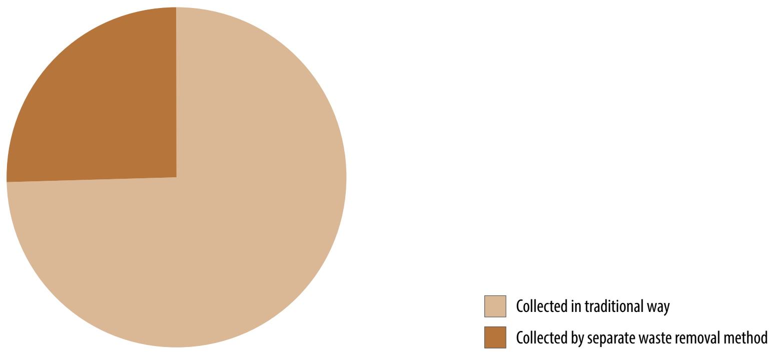
5.1 Generated waste

Waste generation, with direct or indirect environmental risks, is an inevitable concomitant of the production and consumption processes.

Wastes, based on the source of generation, are classed as either distribution and consumption related municipal waste or goods and services related production waste. The latter one, based on pollution risks, differentiates between hazardous and non-hazardous wastes.

5.1.1 Municipal solid waste

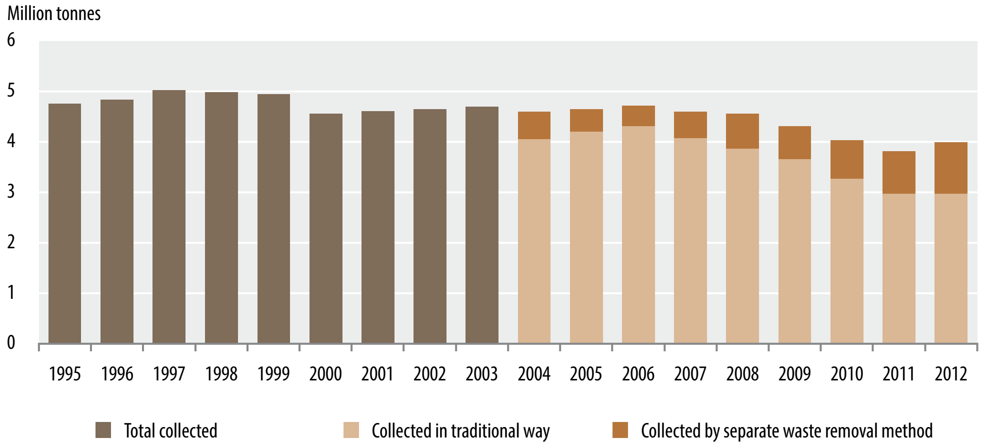
Figure 5.1.1 Generated municipal solid waste by mode of collection, 2012



Source: Ministry of Rural Development (MoRD), Waste Information System.

Selective waste collection is one of the basic prerequisites to enhance recycling. Concerning pre-recycling and the recycling of (quasi-)household waste of glass, metal, plastic and paper generated by households and other units a recycling target value of 50% was determined for 2020 in the areas subject to the waste management decree of the European Union.

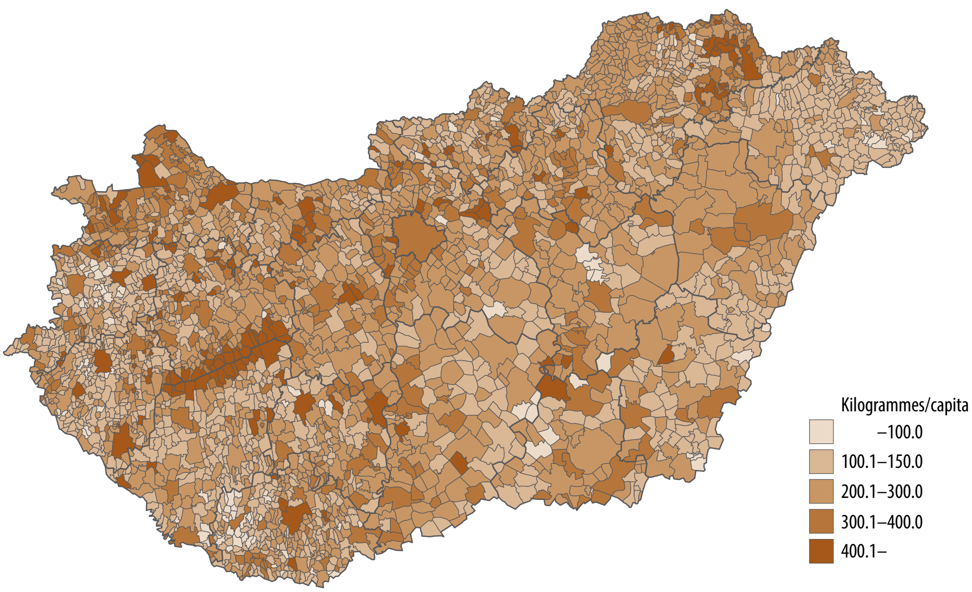
Figure 5.1.2 Changes in the volume of municipal solid waste in Hungary



Source: HCSO, MoRD, Waste Information System.

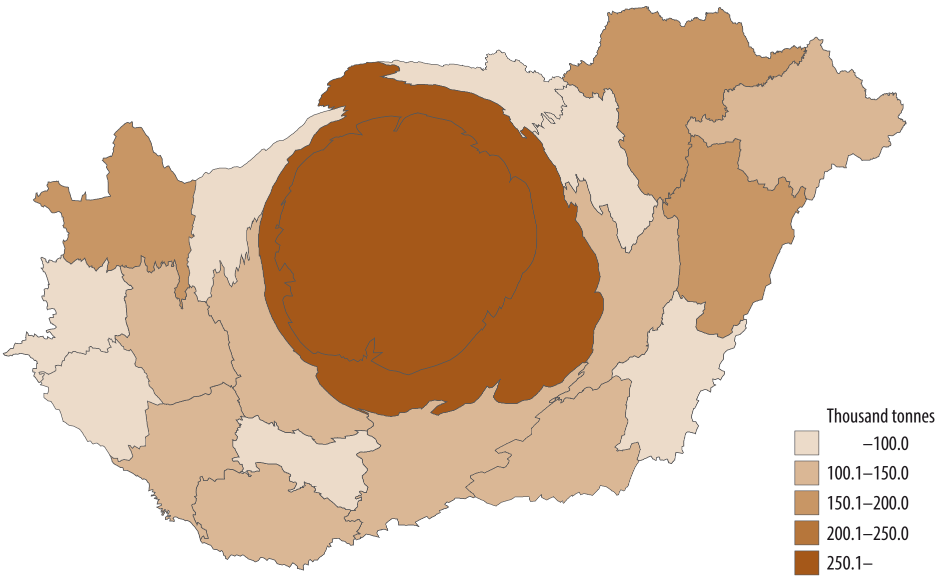
The annual volume of solid waste fell in Hungary between 2006 and 2011, while there was a rise in selective waste collection (except for 2009). The volume of municipal solid waste increased again in 2012.

Figure 5.1.3 Per capita volume of municipal solid waste removed as part of public services in 2012



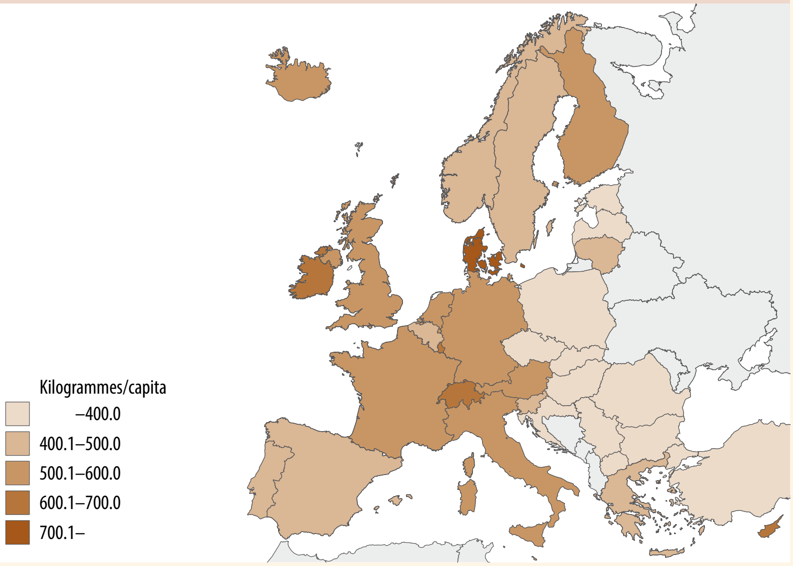
In Hungary, the per capita volume of municipal solid waste removed through public services was the highest in the settlements surrounding Lake Balaton as well as in some settlements with significant tourism.

Figure 5.1.4 Volume of the generated municipal solid waste displayed on a population proportional topological map, 2012



Traditional mapping is not appropriate to display the outstanding role of the small area of the capital city. Topological maps make a specific territorial compensation possible, as their social indicator is in proportion with not the area of the observed units, but the volume of the indicator to be mapped. It distorts the shape of the territorial units preserving the original neighbourhood relations. If we display the volume of the generated municipal solid waste on a population proportional topological map, Budapest and Pest County will be represented as outliers.

Figure 5.1.5 Per capita volume of municipal solid waste generated in some European countries, 2011



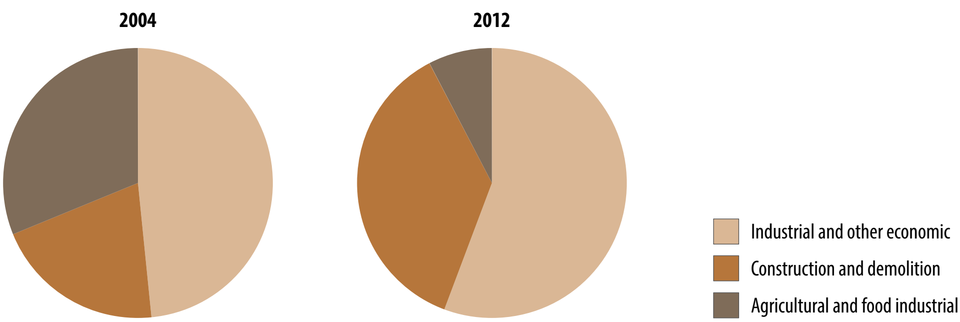
Source: Eurostat.

The different structure of consumption in the newly accessed states – i.e. the CEE countries – was one of the reasons behind the regional differences of this indicator.

Table (Stadat):
5.5.2. Amount of waste types according to waste generation

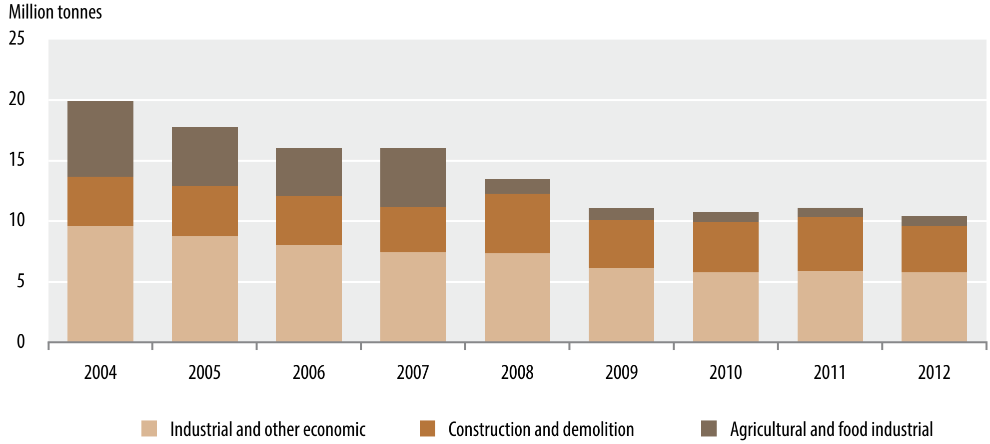
5.1.2 Other non-hazardous waste

Figure 5.1.6 Distribution of other non-hazardous waste generated



Source: MoRD, Waste Information System.

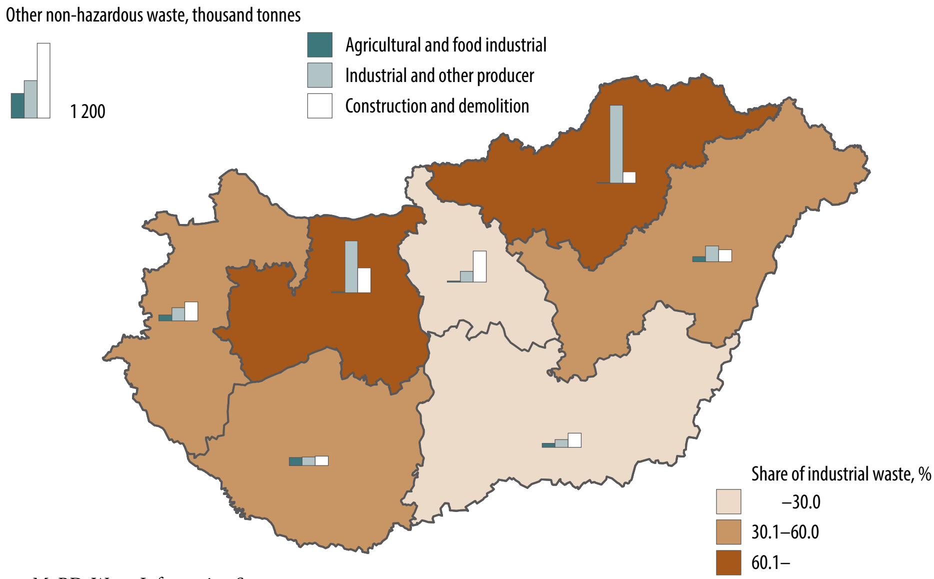
Figure 5.1.7 **Changes in the volume of other non-hazardous waste generated**



Source: HCSO, MoRD, Waste Information System.

Since 2008, the group of agricultural and food industrial wastes has included only the volume of manure as well as animal and plant by-products declared explicitly as waste resulting in a significant fall in the post-2007 period.

Figure 5.1.8 **Volume of other generated non-hazardous waste and the proportion of industrial waste by region, 2012**



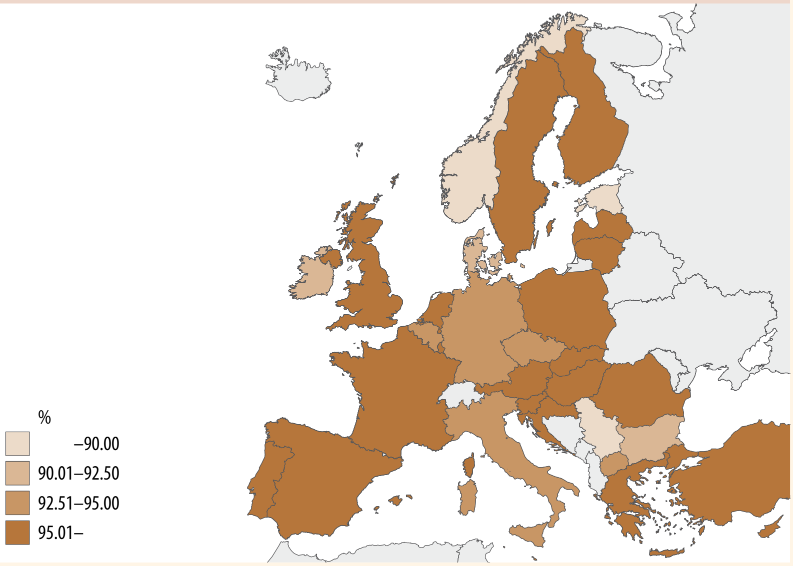
Source: MoRD, Waste Information System.

This period, with the exception of 2011, saw an ongoing fall in the volume of industrial waste as a result of a decline in the output of the great waste producing sectors (e.g. mining, metallurgy), a rise in the proportion of less material intensive producing sectors and an improvement in production technologies.

Changes in the output volume of construction-demolition waste are mainly influenced by the volume of construction investments.

The Budapest-based major construction projects (e.g. underground 4) resulted in a rise in the volume of construction and mainly demolition wastes in Central Hungary.

Figure 5.1.9 **Ratio of generated non-hazardous waste to total generated waste in the countries of Europe, 2011**



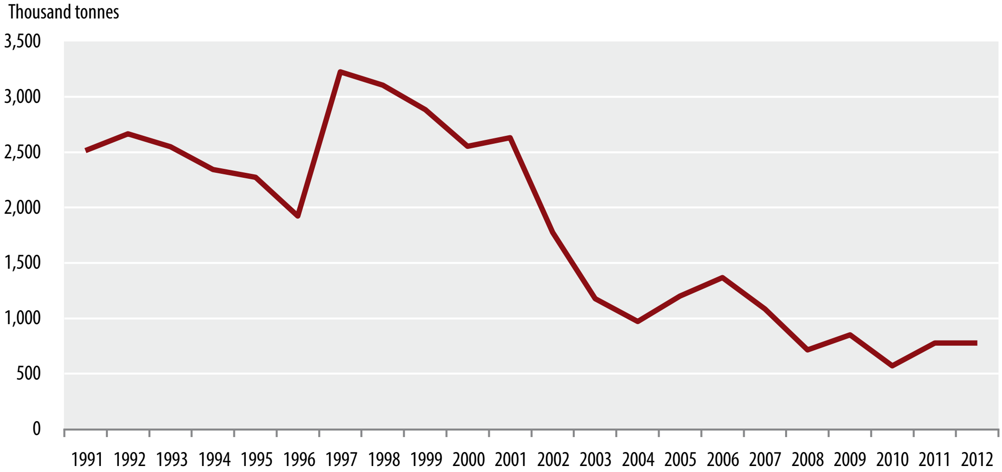
Source: Eurostat.

Non-hazardous wastes account for over 95% of the total output of waste in most EU countries.

5.1.3 Hazardous waste

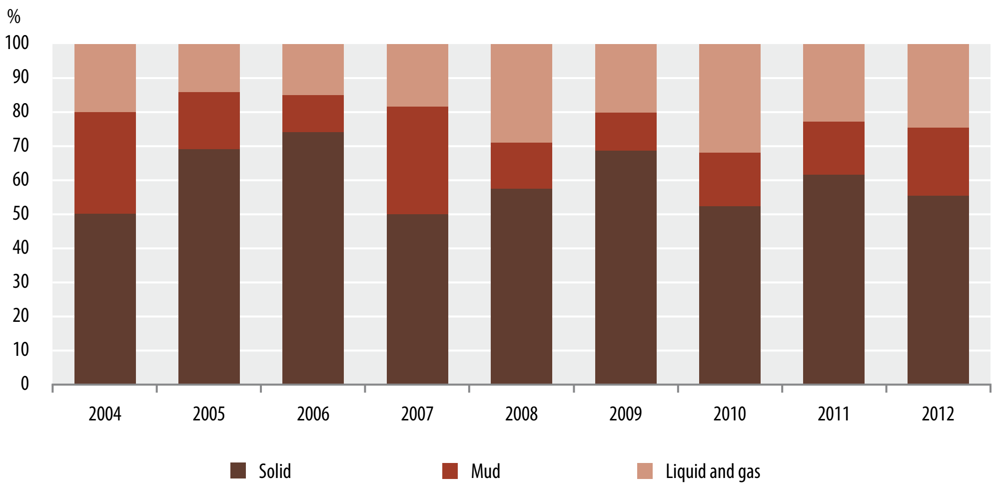
The slag of certain power plants in Hungary was reclassified as hazardous waste resulting in a sharp rise in the volume of hazardous waste in 1997. The declining tendency of the last decade mainly resulted from an output decline and methodological changes. The European Waste Catalogue, which was introduced in 2002, reclassified several types of waste (e.g. animal and health care waste) as non-hazardous ones. There were interruptions in certain years (in 2005 and 2006), when the remediation of contaminated soil was classified as hazardous waste.

Figure 5.1.10 Changes in the volume of hazardous waste



Source: HCSO, MoRD, Waste Information System.

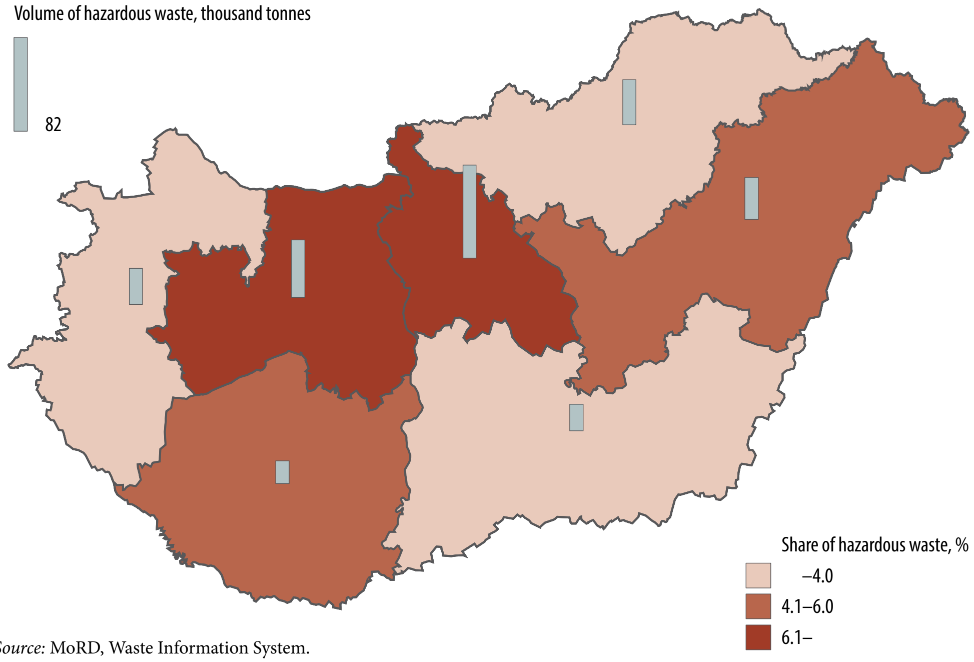
Figure 5.1.11 Distribution of hazardous waste by physical state



Source: MoRD, Waste Information System.

There were fluctuations in the physical state based distribution of hazardous wastes during the observed period; however the proportion of the solid hazardous wastes was the highest in each year.

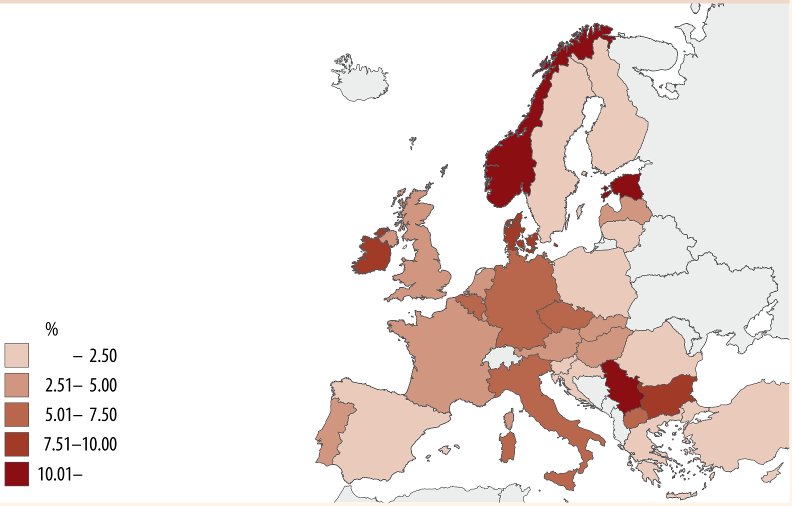
Figure 5.1.12 Volume of hazardous waste generated and their ratio to total waste generation, 2012



Source: MoRD, Waste Information System.

Because of mining and the chemical industry, the proportion of hazardous waste is above average in certain regions.

Figure 5.1.13 Ratio of hazardous waste to all wastes generated in some countries of Europe, 2010



Source: Eurostat.

The ratio of hazardous waste to the total waste output was the highest in Estonia, Serbia and Norway. The reasons were different in each country. In Estonia, the branch of electricity, gas, steam and air conditioning supply played the main role in the output of hazardous waste. In Serbia, the branch of mining and quarrying was the main source and a significant volume of remediation wastes classified as hazardous ones was generated in Norway.

Table (Stadat):
5.5.1. Amounts of hazardous waste by solidity

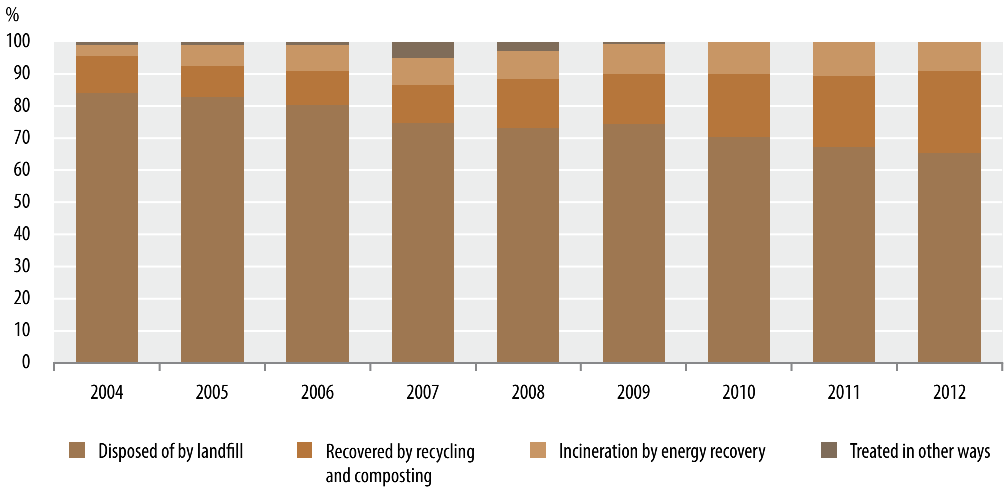
5.2 Waste treatment

Waste management is a complex environmental issue: the recycling of valuable waste materials as well as the environment-friendly disposal of waste is a more and more expensive task.

If we want to rank waste management methods, then, from the point of view of environmental protection, recycling is the most important treatment mode, since recycling is concerned with the repeated use of waste materials in production and services. Incineration is the heat treatment of waste implemented in an incineration or a co-incineration plant. Landfilling is waste disposal implemented in line with legal and technical requirements in force.

5.2.1 *Municipal solid waste*

Figure 5.2.1 Municipal solid waste by mode of treatment



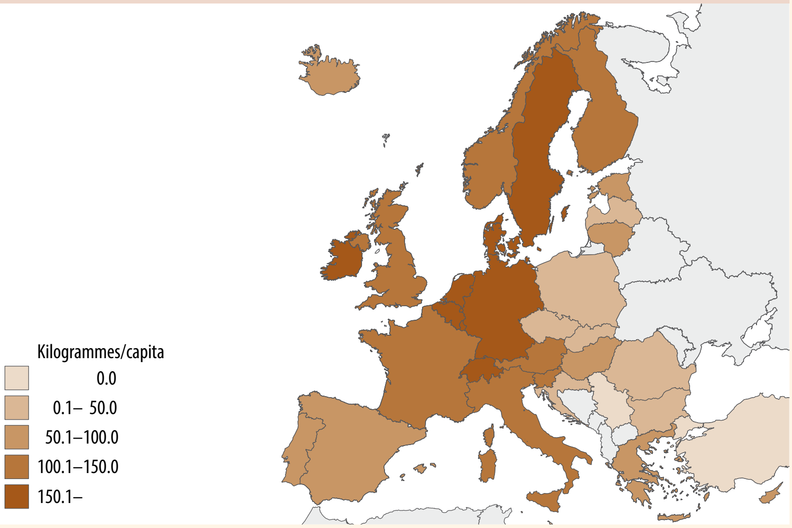
Source: MoRD, Waste Information System.

Landfill, the least environment-friendly treatment mode, is still the most common treatment and disposal method of municipal solid waste, mainly for being not as expensive as recycling or incineration. The disadvantages of landfill are the leaching of nutrients, heavy metals and other toxic compounds, the emissions of greenhouse gases, and the loss of valuable land space. Landfill is harmful to air, soil and water, and is detrimental for human beings, the flora and fauna.

The trends of the recycling of municipal solid waste are positive, since its proportion has increased since 2005. From the point of view of environmental protection, recycling is the most important treatment mode since it reduces environment pollution through the extraction of useful materials from waste.

The proportion of incineration has remained almost unchanged since 2006. Incineration is a more environment friendly treatment method than landfill because it makes possible to recover energy and reduce waste volumes. On the other hand, it may lead to the emission of toxic gases such as dioxins, to the production of ashes, and to water pollution from gas cleaning.

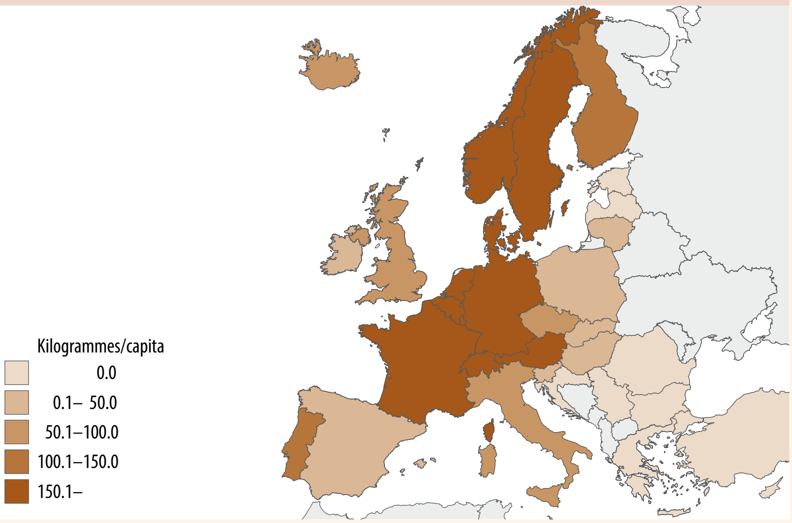
Figure 5.2.2 Per capita volume of recycled municipal solid waste in some countries of Europe, 2011



Source: Eurostat.

The volume of recycled municipal waste per capita is lower in the East-Central-European countries. This mode of waste treatment is much more widespread in Western and Northern Europe.

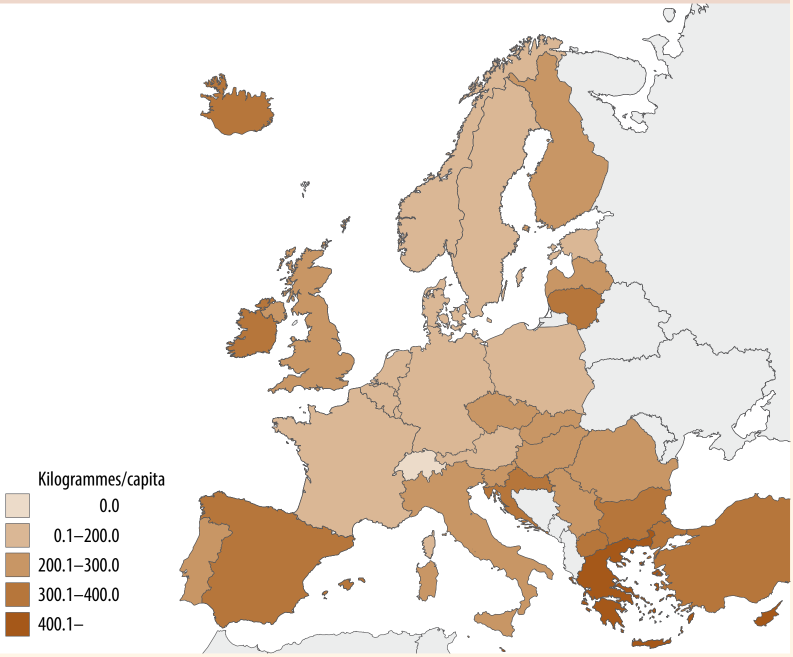
Figure 5.2.3 Per capita volume of incinerated municipal solid waste in some countries of Europe, 2011



Source: Eurostat.

There is no incineration in Cyprus, Estonia, Latvia, Croatia, Serbia, Greece, Romania, Bulgaria and Turkey. In contrast, it is quite widespread in the more developed countries of Europe.

Figure 5.2.4 Per capita volume of landfilled municipal solid waste in some countries of Europe, 2011



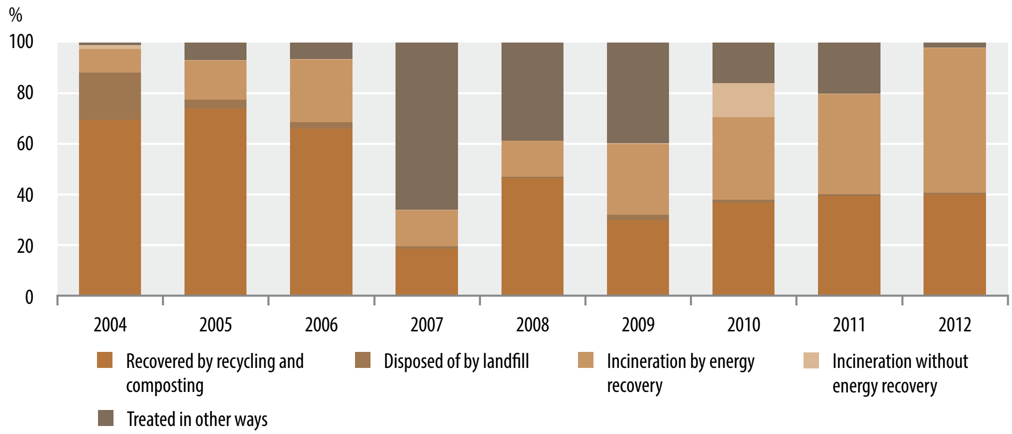
Source: Eurostat.

Landfill still plays the most important role in the Central and Eastern European countries, while the volume of landfilled waste is reduced by recycling and incineration in the Western European countries.

Table (Stadat):
5.5.2 Amount of waste types according to waste generation

5.2.2 Other non-hazardous waste

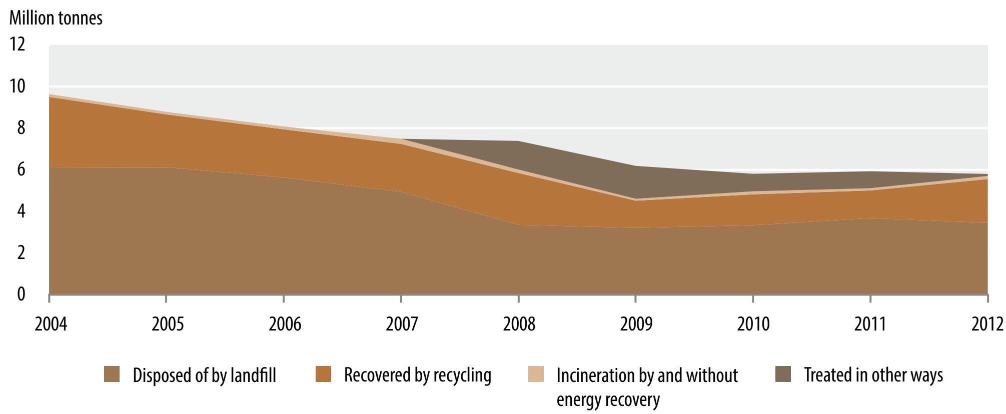
Figure 5.2.5 Distribution of agricultural and food industrial waste by treatment



Source: MoRD, Waste Information System.

The decrease in the proportion of the recycling of agricultural and food industrial waste is due to a methodological change, since only the volume of manure and animal or plant by-products, effectively qualified as waste, have been classified as waste since 2008. The rules of the treatment of animal by-products effectively qualified as waste became stricter, reducing the potential recycling of this type of waste.

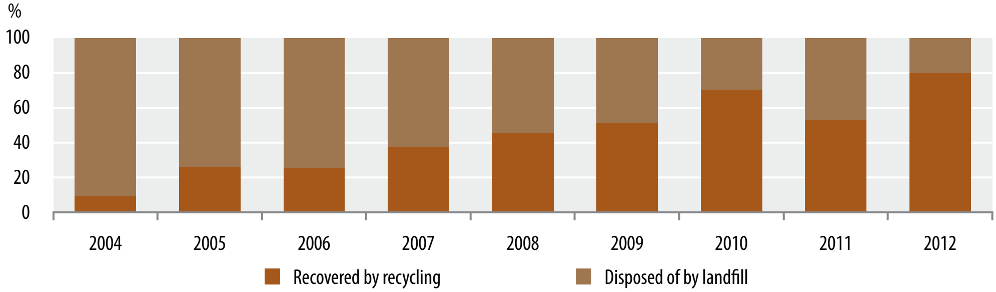
Figure 5.2.6 Treatment of industrial and other economic waste



Source: MoRD, Waste Information System.

Landfill accounts for the highest proportion of the treatment of industrial and other economic waste. In 2012, favourable processes started as there was a significant rise in the proportion of recycled waste.

Figure 5.2.7 Distribution of construction and demolition waste by treatment

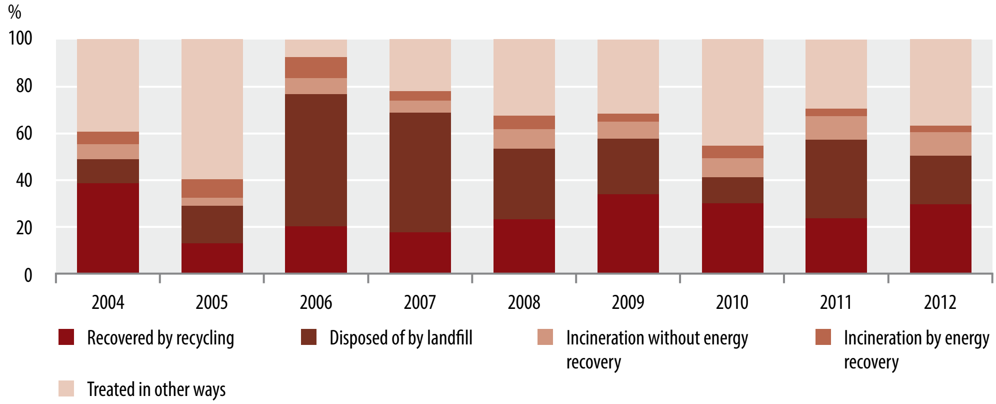


Source: MoRD, Waste Information System.

The proportion of disposed construction and demolition waste keeps decreasing.

5.2.3 Hazardous waste

Figure 5.2.8 Distribution of hazardous waste by treatment



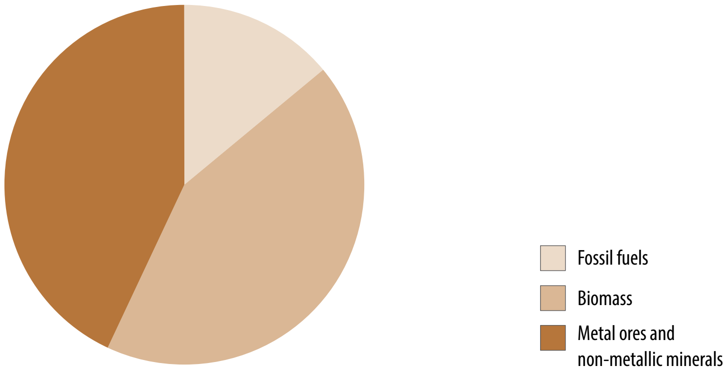
Source: MoRD, Waste Information System.

Other methods of hazardous waste treatment cover the pre-treatment of hazardous waste (which can result in non-hazardous waste, the final treatment of pre-treated waste can be recovery or disposal) and biological treatment.

5.3 Material flow

Material flow accounts (MFA), because of their scale-like structure, are applicable to describe the relationship between the economy and the environment. The input side of the MFA comprises those material flows that enter the economy from the side of environment in a given time period: natural resources used in the economy, such as domestically extracted fossil fuels and minerals, biomass and imported raw materials as well as products. The most important MFA input indicators (direct material input, domestic material consumption, physical trade balance) are available in Hungary for the period of 2000–2011.

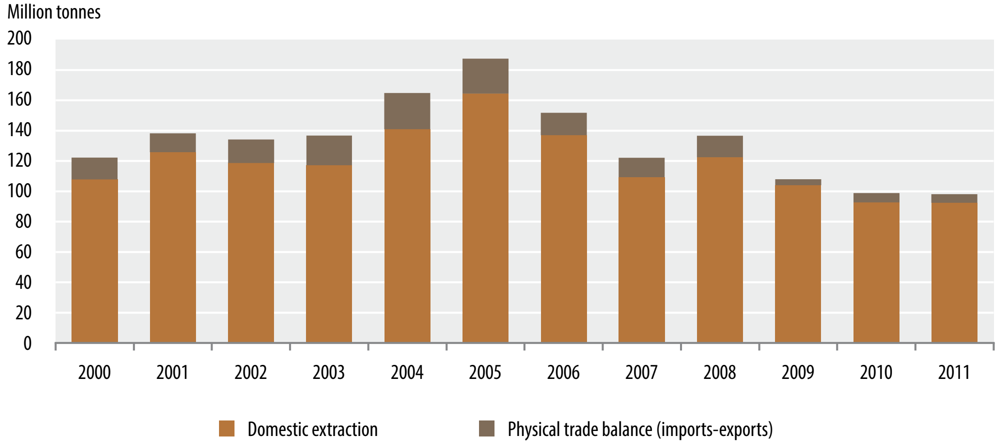
Figure 5.3.1 Components of domestic extraction in 2011



The calculation methods of the indicators are as follows:
Domestic extraction = biomass + metal ores + minerals + fossil fuels
Direct material input = domestic extraction + imports
Domestic material consumption = domestic extraction + imports – exports
Physical trade balance = imports – exports

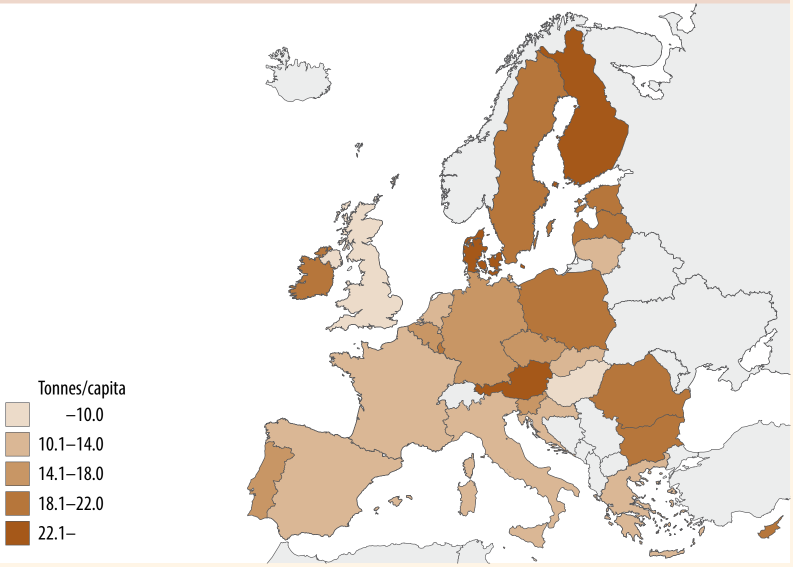
The volume of domestic production continued to rise at the beginning of the observed period. The high of 2005 resulted from a rise in motorway construction related gravel, sand and clay extraction. However, clay extraction started to fall after 2005 hitting a low in 2011

Figure 5.3.2 Components of domestic material consumption, 2000–2011



at only 93 million tonnes due to a significant reduction in the balance of physical external trade, i.e. in the volume of imported raw materials and products.

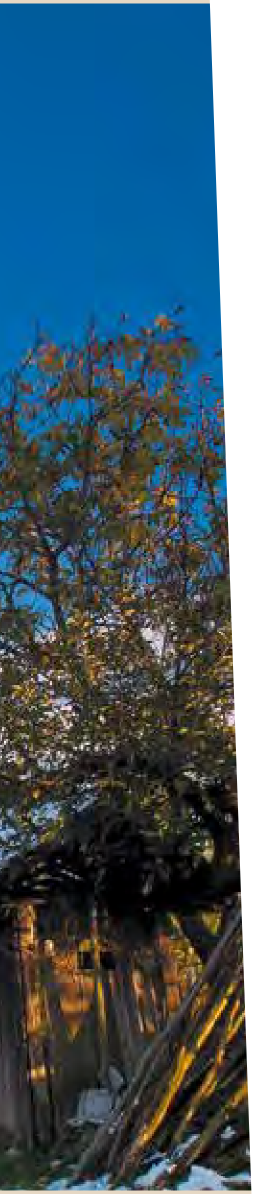
Figure 5.3.3 Domestic material consumption in EU countries, 2009



Source: Eurostat.

Table (Stadat):
5.10.2 Material flows

Energy



Both energy-producing industrial activities and energy consumption result in environmental pressures. The extraction and burning of fossil fuels, such as crude oil, natural gas and coal, increase the atmospheric concentration of greenhouse gases (CO_2, N_2O, CH_4) contributing to global warming. Gases released by burning (SO_2, NO_2, CO) contain substances harmful to human health. The technologies of energy production and transformation pollute water resources and the soil. The treatment of hazardous waste generated in nuclear power stations also results in environmental pressures.

The purpose of the energy policy of the European Union is to generate environment friendly and relatively cheap energy with high operational standards. It prescribes more sustainable operation, on the one hand, through better energy efficiency and, on the other hand, through the enhanced use of renewable energy resources as well as it emphasizes the exploitation of local energy resources. It envisages a significant fall in the consumption and imports of fossil energy in the long run.

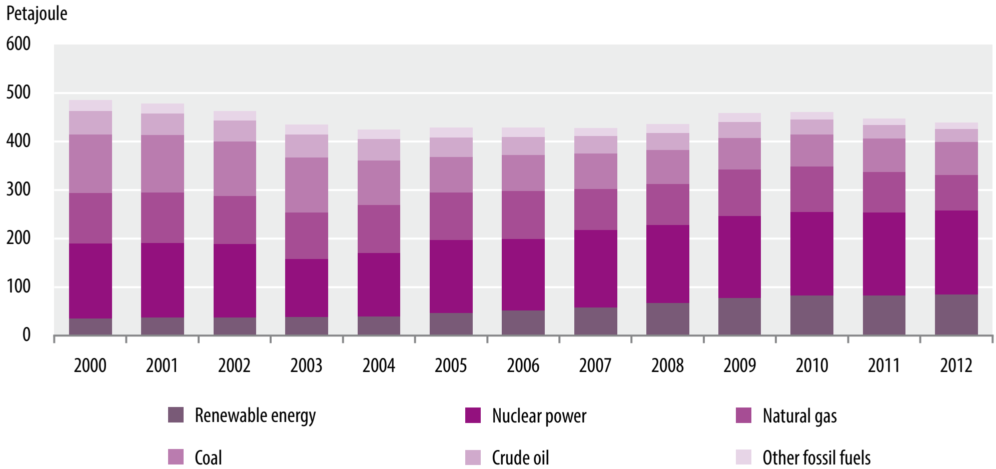
Concerning the ratio of renewable energy to gross national energy consumption, the European Union set a target of 13% for Hungary by 2020. However, the Renewable Energy Utilization Action Plan of Hungary set a target value of 14.65%.

6.1 Energy production

Reserves of traditional fossil fuels (hydrocarbons and coal) in Hungary were largely depleted during the past decades. The domestic production of natural gas, crude oil and coal fell by nearly 30%, around 43% and nearly 50% respectively in calorific value between 2000 and 2012. Nowadays only lignite and brown coal are mined in Hungary as the mining of black coal came to an end in 2005. Natural gas makes up nearly one-third of our energy supply. Its production in 2010 was 2.9 billion m^3, which covered around one-fourth of all domestic consumption.

A fall in the extraction of fossil fuels is offset by the rising share of nuclear electricity generation and renewable energy. The production of hydro- and wind power electricity as well as firewood and other renewable energy accounting for 19% of total domestic energy output has increased by a factor of more than 2.5 since 2000.

Figure 6.1.1 **Production of primary energy carriers in calorific value**



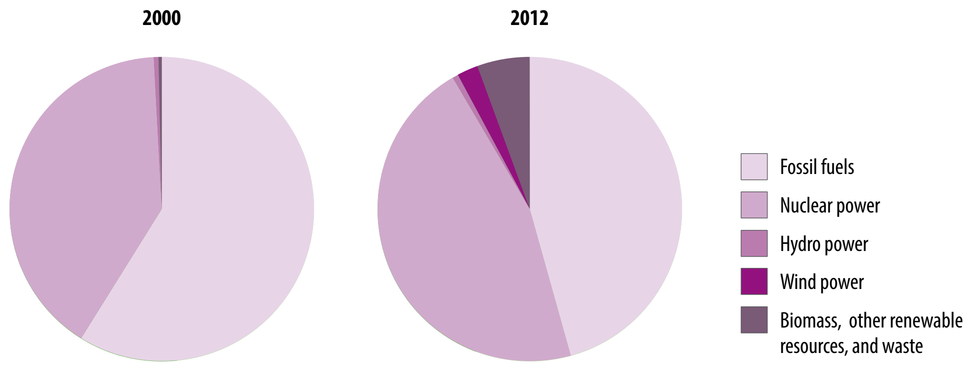
Source: Until 2010, National Environmental Protection and Energy Center Non-Profit Ltd.; since 2011 Hungarian Energy and Public Utility Regulatory Authority.

Table (Stadat):
5.7.2 Primary energy production in calorific values

6.2 Balance of electricity

The national balance of electricity details the actual state of the electricity production in Hungary. On the supply side, the balance includes the annual amount of electricity production, its composition by sources, the capacities of power stations involved in energy production as well as the volume of imports. On the distribution side, it takes into account domestic consumption, the self-consumption of plants, network losses and exports.

Figure 6.2.1 Distribution of gross electricity production by sources



Source: National Environmental Protection and Energy Center Non-Profit Ltd.

Source: Hungarian Energy and Public Utility Regulatory Authority.

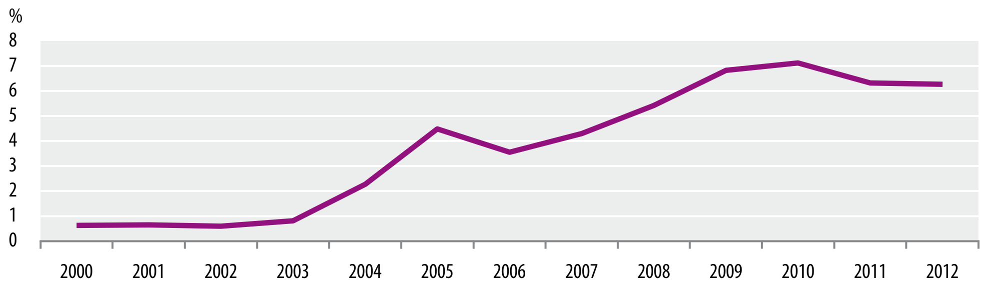
In the last 12 years, the gross domestic electricity output fell by 2% along with a 14% rise in domestic consumption. Renewable energy gained ground at the expense of fossil and atomic energy in the electricity production reaching a proportion of 6.3% in 2012. There was a significant rearrangement in the field of renewable energy production: hydro power (70%) and waste incineration (20%) were replaced by biomass as the most significant source of renewable energy. The observed period saw a ten-fold rise in the generation of renewable based electricity.

Table (Stadat):
3.8.2 Electricity balance

6.3 Renewable resources

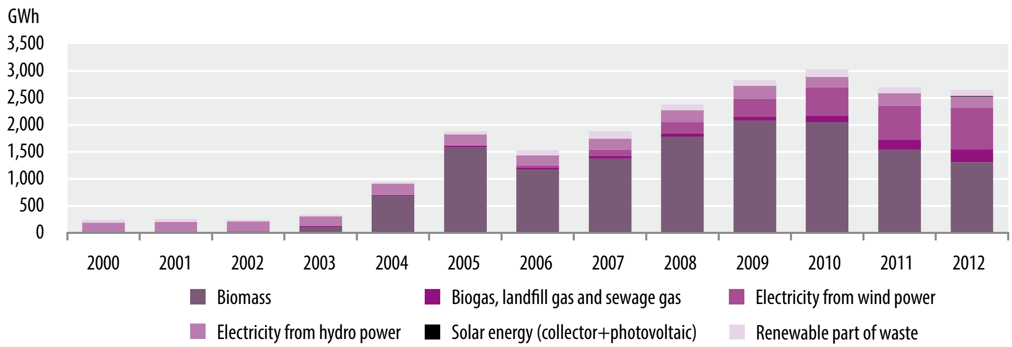
It is characteristic of the renewable energy resources that - in line with the principle of sustainable development – they are replaced naturally. The production of solar, hydro, geothermal and biomass energy makes it possible to generate a similar volume from the same type of energy in a given estate, therefore these energy resources are also renewable ones. The use of solar, wind, hydro and geothermal energy involves neither fuel consumption nor air pollution.

Figure 6.3.1 The ratio of electricity generated from renewables and waste to total electricity consumption



Source: Until 2007, National Environmental Protection and Energy Centre Non-Profit Ltd.; since 2008 Hungarian Energy and Public Utility Regulatory Authority.

Figure 6.3.2 Volume of electricity generated from renewable resources and waste

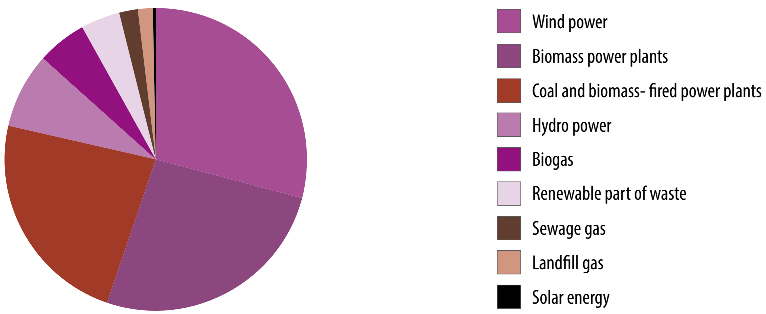


Source: Until 2007, National Environmental Protection and Energy Center Non-Profit Ltd.; since 2008 Hungarian Energy and Public Utility Regulatory Authority.

Since 2003, there has been a rise in the production of renewable electricity as a result of the introduction of a mandatory takeover system, which was one form of operational subsidies. In the framework of this, electricity producers complying with certain requirements are authorized to sell their energy output at an official price higher than the prevailing market price. Due to the high purchase price, the proportion of 'green' electricity rose from 1% in 2000 to 4.5% (2005). This growth was mainly generated by power plants converted from coal to biomass (at Pécs, Ajka, Kazincbarcika) and mixed (at Tiszapalkonya, Mátra) burning. As a result of the compulsory takeover, Hungary outperformed the target of 3.6% set to comply with the renewable energy related production requirements of the Union.

After the setback (2006) resulting from the limitation of the volume of electricity taken over, the proportion of 'green' energy dynamically increased then fell to 6.3% in the last two years.

Figure 6.3.3 **Composition of electricity generated from renewable resources, 2012**



Source: Hungarian Energy and Public Utility Regulatory Authority.

The major part of the electricity output of renewable energy based power plants comes from biomass burning, in the pre-2009 years it stood at a proportion of over 70%. Though the last two years saw a significant fall of 36% in the volume of biomass burning based 'green' electricity, it still has a decisive share of around 50% in the renewable sources of electricity production (in 2012). This decline resulted, on the one hand, from the exclusion of two mixed burning power plants (Bakony and Mátra power plants), from the system of mandatory takeover and, on the other hand, from the production stoppage of the biomass power plants of Szakoly and Borsod.

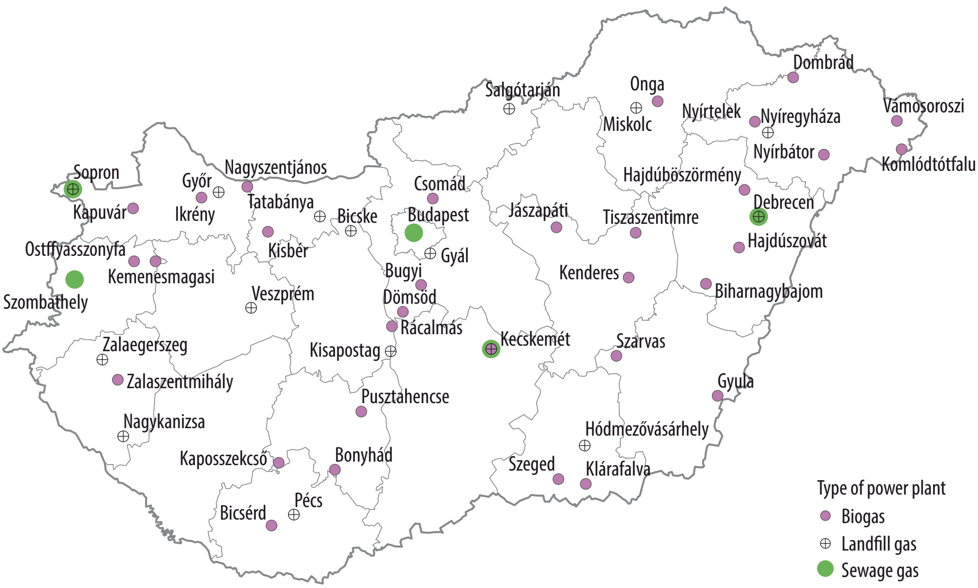
In 2012, according to the register of Hungarian Energy and Public Utility Regulatory Authority, three mixed and five biomass burning power plants operated in Hungary.

Biomass can come from by-products generated in agriculture and silviculture or waste from animal husbandry, food industry as well as municipal and industrial waste. Biomass is mainly used for heat production, but electricity is also generated from it.

Concerning the generation of 'green' electricity, in terms of proportion, biomass energy was ranked first and wind energy second. Since 2007, there has been a sharp rise in the generated volume of wind energy reaching an electricity output of 771 GWh in 2012. The proportion of wind energy rose from 5.8% to 29% during the past six years.

In 2012, wind and biomass energy accounted for the major part (55%) of the renewable electricity generation, but mixed burning still had a very significant share (23%).

Figure 6.3.4 **Biogas, landfill gas and sewage gas power plants in Hungary, 2012**



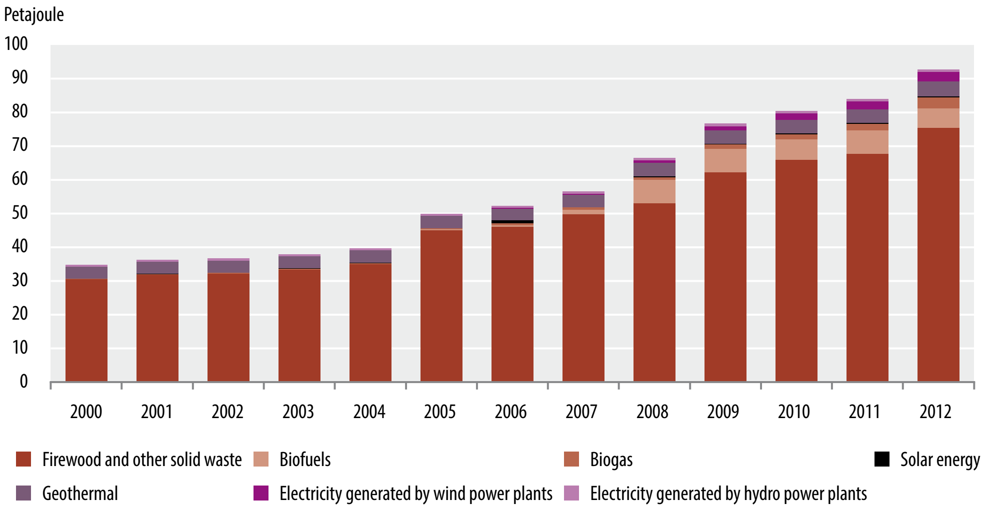
Source: Hungarian Energy and Public Utility Regulatory Authority.

There was a spectacular growth in the use of biogas (34 power plants), landfill gas (16 power plants) and sewage gas (7 power plants) reaching a four-fold rise in electricity generation between 2008 and 2012. The share of it in 'green' electricity was 9% in 2012. In 2012, three new biogas power plants (Tiszaszentimre, Zalaszentmihály, Onga) and two new landfill gas power plants (Nagykanizsa, Zalaegerszeg) were put into operation.

The electricity output of waste burning doubled between 2000 and 2012 hitting all-time highs in 2007 and 2010 at figures of over 140 GWh.

After 2011, the decline mainly resulted from a fall in the output of energy recovery from waste incineration at the Mátra Power Plant and the waste incineration plant of TechCon in Polgár. In 2012, a total of four waste incineration based power plants were in operation (in addition to the previously mentioned ones, the Budapest Waste Recycling Works and the Dunaharaszti based New Energy Ltd.). Communal waste accounted for around half of the renewables based electricity generation.

Figure 6.3.5 **Energy generated from renewable resources in calorific value by source of energy**



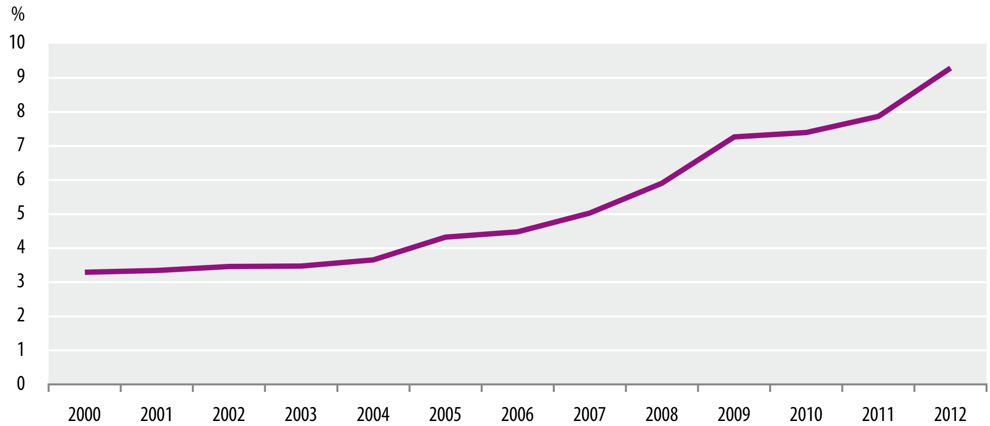
Source: Until 2010, National Environmental Protection and Energy Center Non-Profit Ltd.; since 2011 Hungarian Energy and Public Utility Regulatory Authority.

Remark: Firewood and other solid waste category includes communal waste as well. 2012 data are preliminary data.

According to the data of the Hungarian Energy and Public Utility Regulatory Authority, 22 hydro power plants were in operation in Hungary in 2012. There was hardly any change in the absolute volume of their electricity output during the previous period, only 2010 saw a considerable decline as a result of flood protection measures. Since 2003, the significance of hydro power has lost ground and it declined to only 8% of the domestic generation of green electricity in 2012.

One of the strategic objectives of the energy policy of the European Union is that renewable energy should reach a target value of 20% in the EU energy consumption by 2020. According to EU Directive 2009/28/EC, Hungary has to reach a target value of 13% concerning the ratio of renewable energy resources to the total gross final energy consumption. However, Hungary set a higher target value of 14.65% by 2020 in its Renewable Energy Utilization Action Plan.

Figure 6.3.6 **Share of renewable resources in total energy consumption**

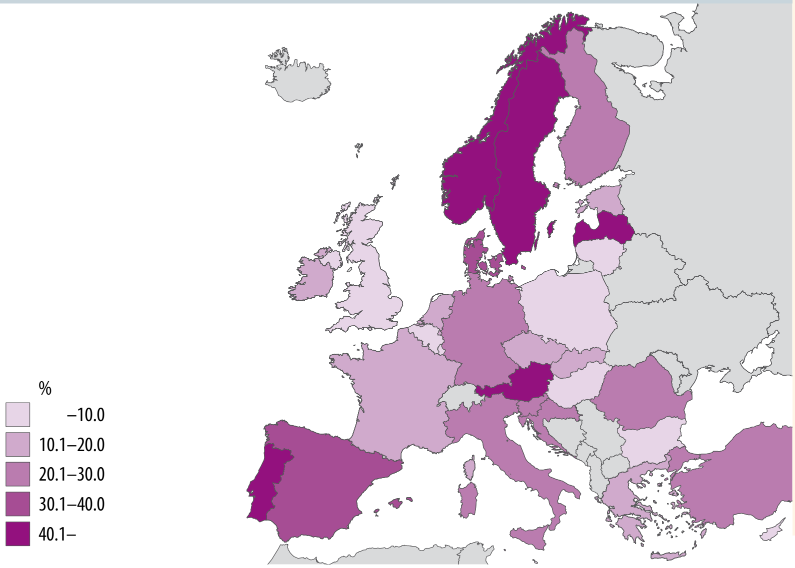


Source: Until 2010, National Environmental Protection and Energy Center Non-Profit Ltd; since 2011 Hungarian Energy and Public Utility Regulatory Authority.

In 2012, renewables accounted for around 9% of all energy consumption in Hungary reaching around three fifths of the target value.

Firewood and the other solid energy carriers play an increasing role in renewable energy production. In the last five years, the volume of biofuel based energy rose from 1200 TJ to nearly 6000 TJ, i.e. a proportion of 6% in 2012.

Figure 6.3.7 **Share of renewable electricity production in some European countries, 2011**



Source: Eurostat.

In the EU-27, the share of renewable energy resources in electricity production grew from 14.2% to 21.7% between 2004 and 2011. In the production of 'green' electricity, Austria was ranked first (with a proportion of 66.1%), and Sweden second (59.6%).

Figure 6.3.8 Wind plants in Hungary, 2012

Source: Hungarian Energy and Public Utility Regulatory Authority.

According to the 2012 data of the Hungarian Energy and Public Utility Regulatory Authority a total of 47 wind power plants worked in Hungary with an installed performance capacity of 329 MW. Most of them were in the north-western part of the country, in Komárom-Esztergom and Győr-Moson-Sopron counties. In Hungary, the first wind plant integrated into the electricity supply network was set up in the village of Kulcs in 2001.

In 2012, the electricity output of the wind power plants accounted for nearly one-third (29%) of the 'green' electricity production. The takeover price of wind electricity is two times higher than that of the average price of electricity generated by domestic power plants.

Tables (Stadat):

5.7.3 Share of renewable resources from electricity production

5.7.4 Production of energy from renewable energy resources

6.4 Energy consumption

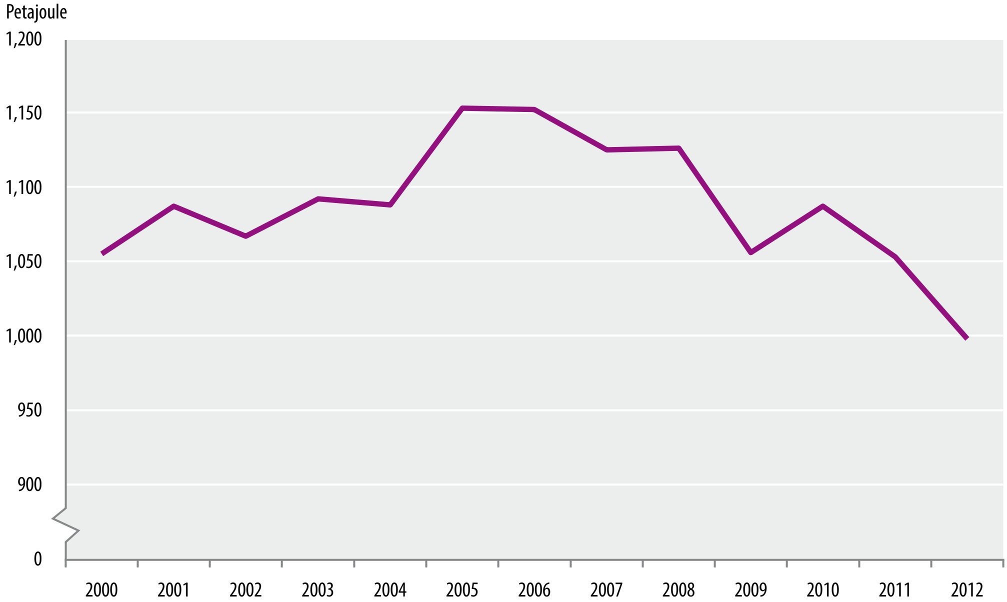
Energy consumption is the sum of final energy consumption and energy transformation losses, decreased with the amount of utilized waste energy. Fuels are accounted for in calorific value, while heat and electricity by the calorific value of fuels necessary for their generation.

Primary energy consumption is about the annual energy consumption of the national economy. First of all it includes the volume of the annually consumed coal, oil, natural gas and atomic energy, but it also takes into account, in a predetermined manner, electricity imports and renewable energy.

Final (direct) energy consumption is the annual energy consumption of consumers. Direct energy consumption contains the sum of ultimate energy, non-energy and material-like consumption, excluding consumption aimed at energy transformation into other energy source. Final energy consumption is lower than primary energy consumption because of the losses relating to energy transformation and transport.

The quantity of energy supplied to final customers is the sum of the energy consumption of industry, transport, households, trade, services, agriculture, etc. The consumption of industry covers all industrial sectors, with the exception of energy production. The quantity of fuels transformed in electricity-generating power plants and that of fuels transformed to blast furnace gas are excluded from industrial use, but the transformation sector includes them. The energy use of transportation includes the energy consumption of rail, road, air and inland water transport.

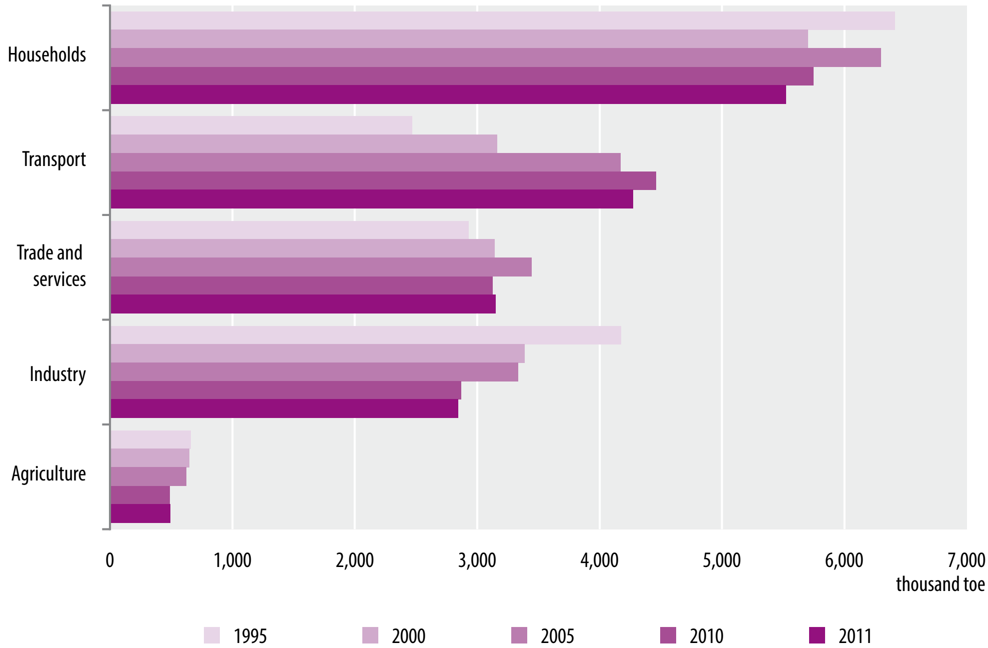
Figure 6.4.1 Use of primary energy



Source: Until 2010, National Environmental Protection and Energy Centre Non-profit Ltd.; since 2011 Hungarian Energy and Public Utility Regulatory Authority.

Primary energy consumption grew between 2000 and 2008 then decreased by 6.3% in 2009 as a result of the economic crisis. Later it continued to decline, with the exception of 2010 to 998 PJ.

Figure 6.4.2 Final energy consumption by sectors

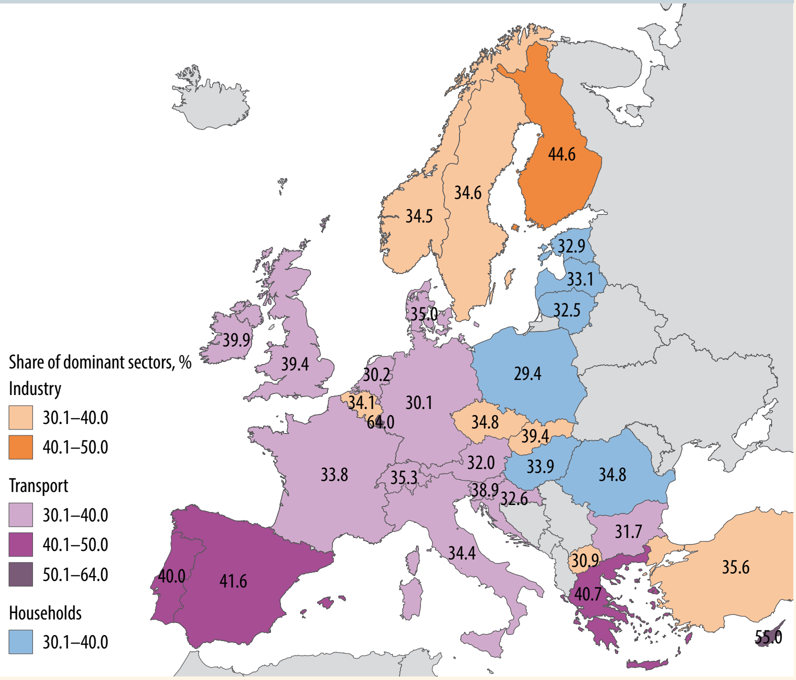


Source: National Environmental Protection and Energy Center Non-Profit Ltd., Eurostat (2011 data).

Previous years saw a fluctuation in domestic final energy consumption. In 2011, households (34%) and the transport sector (26%) played the most important role in final energy use. Trade and services, industry as well as agriculture accounted for 19, 18 and 3% respectively.

Within final energy consumption gaseous and liquid hydrocarbons have a dominant role.

Figure 6.4.3 **Share of dominant sectors in final energy consumption in some European countries, 2011**



Source: Eurostat.

In 2011, the transport sector accounted for a third of the EU-27 final energy consumption. Its share is particularly significant in Luxembourg (64%), Malta (60%) and Cyprus (55%).

The energy consumption of the industrial sector decreased by 13%, i.e. its share fell from 29% to 26% over 10 years. The rate of industrial energy consumption is dominant in Slovakia, the Czech Republic and the Scandinavian countries, especially in Finland (44.6%). In the observed year, the proportion of energy consumption by households and services was 25% and 13% respectively in the EU-27.

The Member States with the highest share of household consumption included Romania, Latvia and Estonia.

Table (Stadat):
5.7.1 Final energy consumption

Environment protection expenditures

Many people think that the natural environment is quite resilient despite the fast depletion of the limitedly available non-renewable natural resources. It is a high priority to stop this negative process and to preserve the natural environment for the future generations. Different levels of the government (EU, national, regional and local), business stakeholders, non-governmental bodies and the population should cooperate to meet this huge challenge.

The purpose of environment protection is to maintain the smooth operation of ecological systems, to preserve environmental assets and to ensure the sustainable use of natural resources, which are essential to the life conditions of present and future generations.

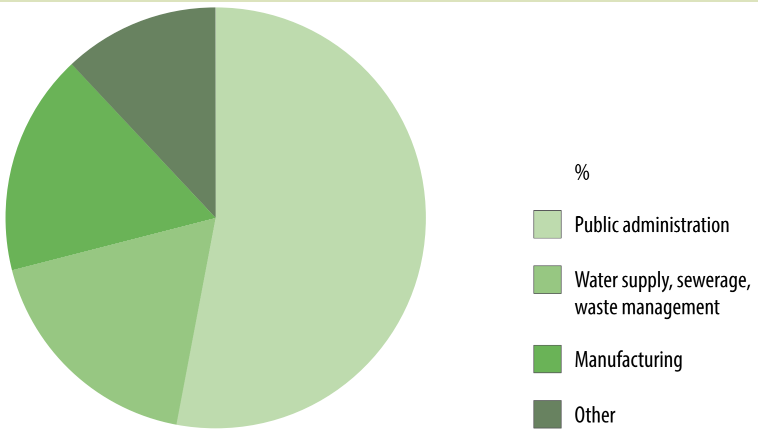
Environmental tasks may be classified as preventive and reactive interventions. Preventive measures are to prevent environment pollution and degradation, while reactive measures are about environmental remediation and rehabilitation. Changes in the money spent on environmental investments, current environmental expenditures as well as in the indicators on environmental industry and environmental taxes are a good starting point to characterize the actual state of environment as well as the dedication for environment protection in a given country.

7.1 Environment protection investments

The main purpose of environment protection investments is to prevent, minimize and eliminate the pollution or any other degradation of the environment. These investments were made to directly manage some environmental issues.

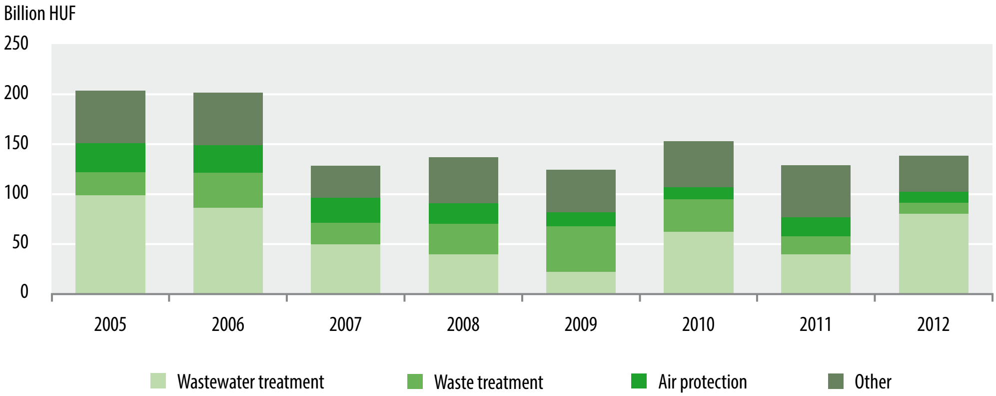
Direct environmental investments (end-of-pipe investments) are such additional investments, which have no or only a minimal effect on the production process and are fundamentally about minimizing, managing and monitoring pollution and environment protection events. Integrated investments are investments where a production process or installation is adapted or changed so that it generates less emissions or pollutants than it would in the absence of the technology. Usually the purpose of these investments is prevention.

Figure 7.1.1 End-of-pipe environmental protection investments by economic branches, 2012



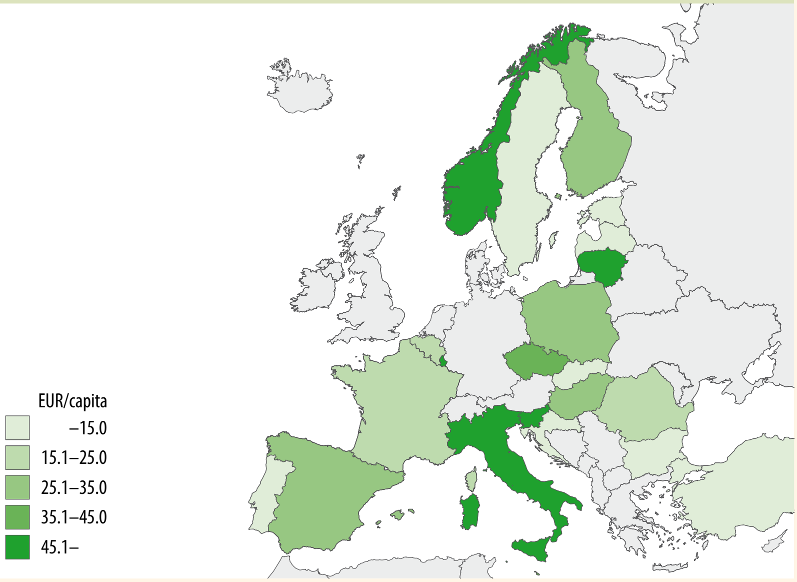
The value of end-of-pipe environmental protection investments was as high as HUF 119 billion in 2012, in which the share of public administration as an economic branch was HUF 63 billion. 91%, i.e. HUF 57 billion of total end-of-pipe environmental protection investments of the public administration were in wastewater treatment.

Figure 7.1.2 **Environmental protection investments by environmental domains**



In 2012, investments related to municipal sewage projects played a significant role in the growth of the sewage treatment related environmental protection investments of the national economy.

Figure 7.1.3 **Environmental protection investments per capita in public administration in some European countries, 2010**



Source: Eurostat.

In 2010, the per capita value of the public administration related environmental investments was the highest in Luxembourg at EUR 162/capita and the lowest in Croatia (at EUR 5.3/capita).

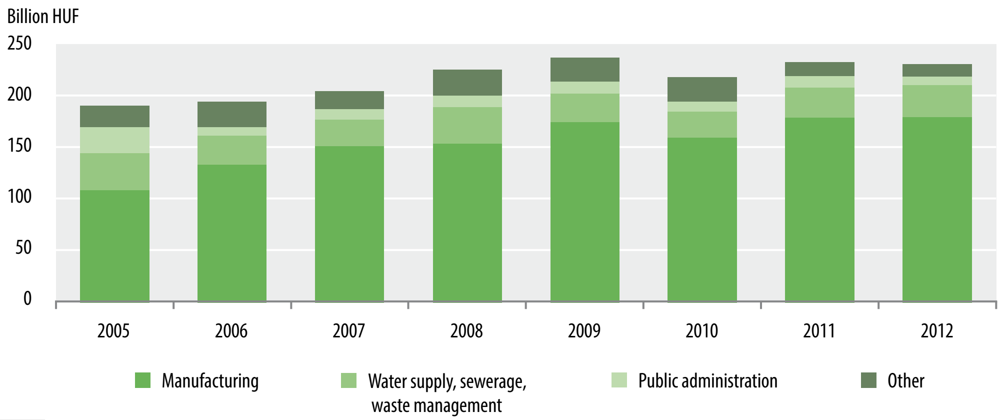
7.2 Current environment protection expenditures

Current internal environmental expenditures are to operate environment protection equipment. They may be classified – similarly to the environmental investments – by area of environment protection.

Figure 7.2.1 Current internal environment protection expenditures by environmental domains, 2012

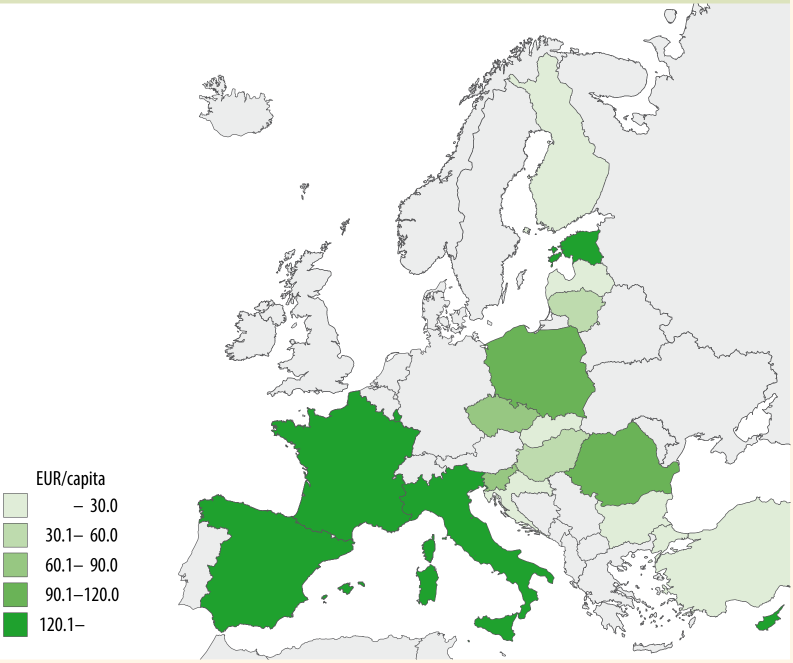
In 2012, sewage, waste management as well as ground and subsurface water protection accounted for 47%, 40% and 5% respectively of all internal environment protection expenditures.

Figure 7.2.2 Current internal environment protection expenditures by economic branches



In 2012, current internal environment protection expenditures accounted for HUF 231 billion in the national economy, 78% of which was paid out by organizations being in the branch of water supply, sewerage, waste management and remediation activities.

Figure 7.2.3 **Current internal environment protection expenditures in the branches of sewerage and waste management in some countries of Europe, 2010**



Source: Eurostat.

In 2012, the per capita current internal environment protection expenditures in the branch of sewerage and waste treatment were the highest in France (EUR 342 per capita) and the lowest in Turkey (EUR 9.3 per capita).

Tables (Stadat):

5.9.1 Environmental protection investments by purpose

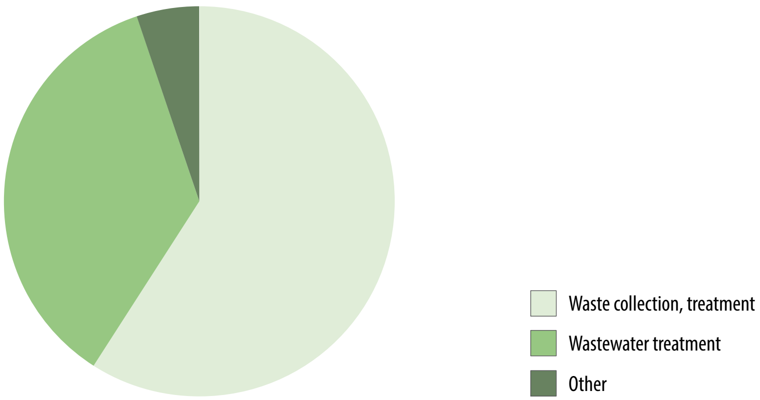
5.9.2 Environmental protection investments by branch of industry

5.9.3 Internal current environmental expenditures

7.3 Environmental industry

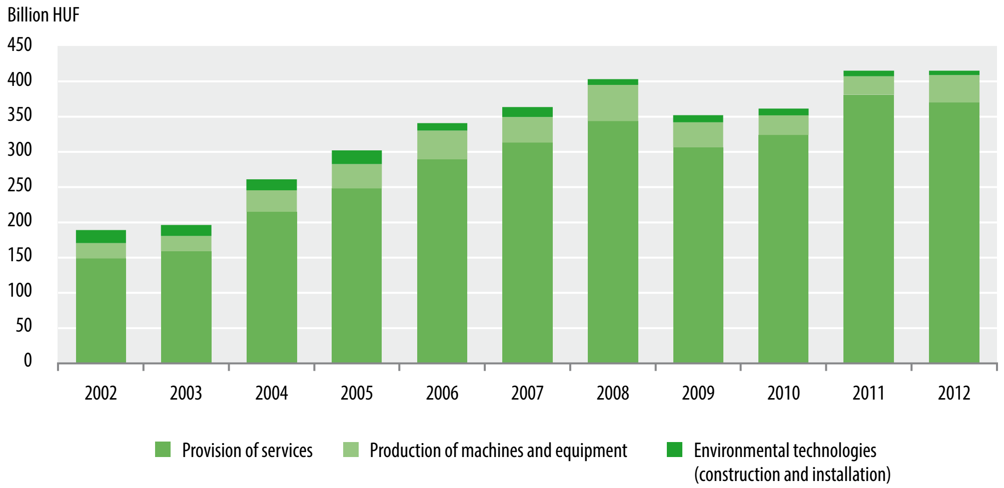
The industry of environment protection goods and services includes the production of all machines, equipment and products, which are to measure, prevent, limit, minimize or reverse the process of water, air and soil contamination as well as to contribute to the reduction of waste production and noise pollution and to facilitate landscape and nature protection.

Figure 7.3.1 Net environmental industrial sales for end-of-pipe pollution abatement purposes by environmental domains, 2012



In 2012, businesses dealing with waste collection, treatment and disposal accounted for 59% of all net sales (HUF 415 billion) of the environment protection industry of direct pollution reduction. Those dealing with sewerage and wastewater had a share of 36%.

Figure 7.3.2 **Net revenues from sales of end-of-pipe pollution abatement at current prices**



In 2012, end-of-pipe pollution abetment services accounted for 89% of all revenues of the environmental industry, this figure was 78% in 2002.

Table (Stadat):
5.8.1 Value of environment industrial sales

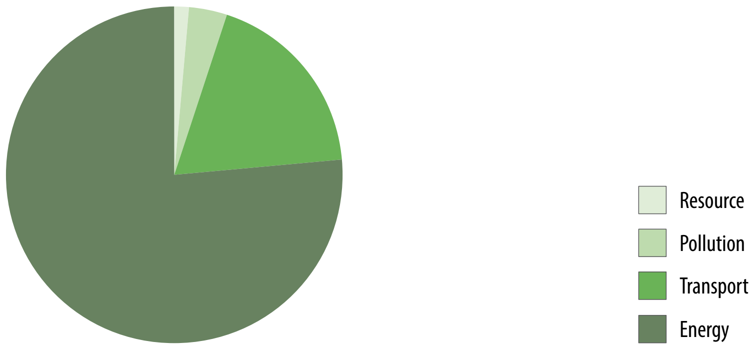
7.4 Environmental taxes

In line with the definitions of OECD and Eurostat, environmental taxes are such types of taxes, whose tax base is such a physical unit, which exerts a proven negative impact on the environment. The OECD classification governs the classification of the environmental taxes in most European countries (and in Hungary as well). According to this, environmental taxes can be classified as follows:

– energy taxes (including the carbon dioxide tax as well),
– transport taxes,
– pollution taxes,
– resource taxes.

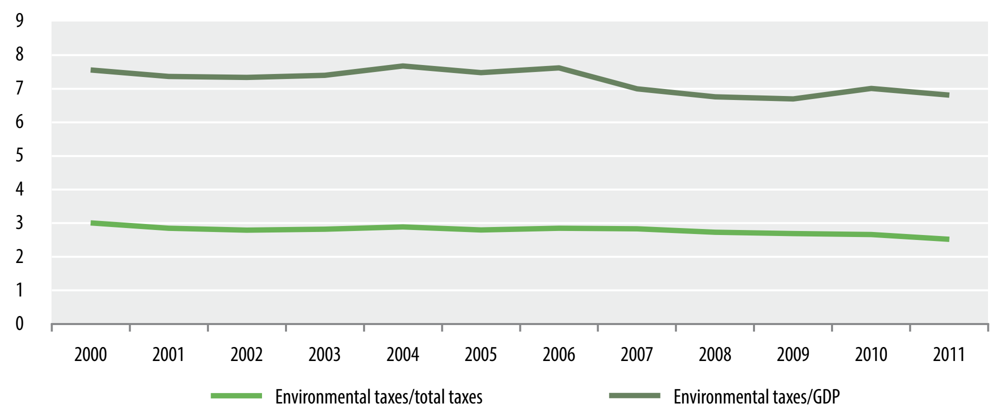
The bases of energy taxes are different energy products, for example fuels used in power plants and during road and air transport. That is the reason why gasoline tax is labelled as energy tax and not as transport tax. Among the different transport taxes motor vehicle tax is the most common in Hungary. The tax base of the third category, i.e. pollution taxes is air and water pollution, solid waste generation and noise emission. Resource taxes must be paid after the use of different natural resources. In Hungary, the water resource fee can be classified as a resource tax.

Figure 7.4.1 Environmental taxes, 2011



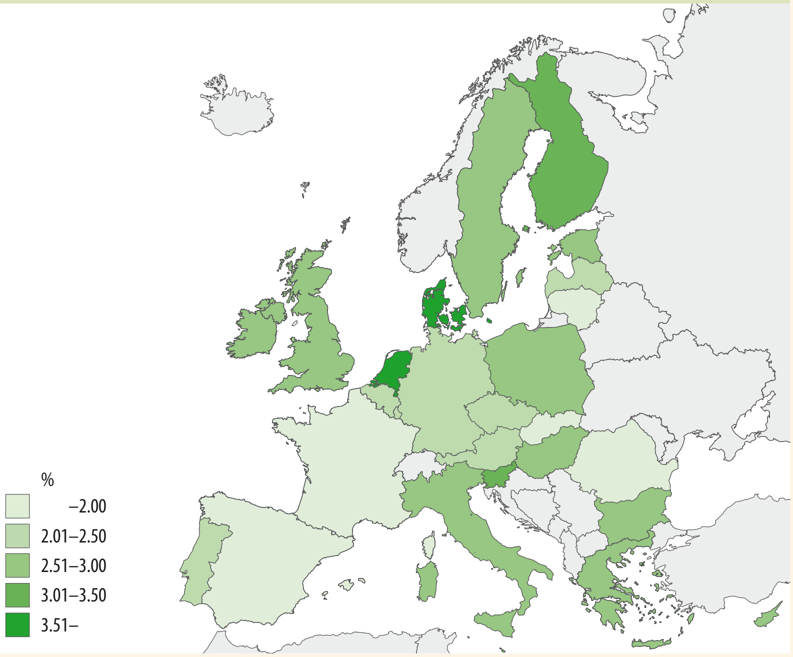
In Hungary, similarly to the member states of the European Union, energy taxes account for the most significant proportion standing at 89% in 2000 and at 77% in 2011. Of energy taxes, excise taxes on automotive petrol and diesel play an outstanding role providing tax incomes of HUF 504 billion in 2011, i.e. they accounted for 72% of all receipts from environmental taxes. This proportion was 86% in 2000.

Figure 7.4.2 Environmental taxes in percentage of GDP and of total taxes (including the social security contributions)



Since 2000, the ratio of environmental taxes to GDP as well as to the total income from taxes and social contributions has steadily decreased at a slow rate.

Figure 7.4.3 Environmental taxes in percentage of GDP in some European countries, 2011



Source: Eurostat.

In 2011, among the EU member states, the ratio of environmental taxes to GDP was the highest in Denmark at slightly higher than 4%.

Table (Stadat):
5.9.4 Environmental taxes