STATE OF THE ENVIRONMENT REPORT OF THE SLOVAK REPUBLIC 2021

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC

SLOVAK ENVIRONMENT AGENCY

FOREWORD

Dear readers,

we bring you a regular assessment **State of the Environment Report of the Slovak Republic**, which aims to inform you about the quality of the environment in our country, its development in the short and long term, as well as about the expected direction of implementation of the objectives adopted by the **Strategy of the Environmental Policy of the Slovak Republic until 2030 "Greener Slovakia".**

This report is one of the most important tools for fulfilling the right to environmental information guaranteed by the **Constitution of the Slovak Republic** and for shaping the environmental awareness of our society. It is published annually in accordance with Act No. 17/1992 Coll. on the Environment and Act No. 205/2004 Coll. on the collection, storage and dissemination of information on the environment and on amending and supplementing certain acts.

Our quality of life depends directly on a favourable and safe environment. We all need enough clean drinking water, clean air, healthy nature around us, enough natural resources to meet the basic needs of life. Unfortunately, such conditions are not commonplace even today. We are increasingly confronted with the negative effects of climate change and the fear that its impacts on our society will continue to grow on a global scale.

The Slovak Republic, as part of international organisations, takes an active approach to solving current environmental problems. It has supported the adoption of flagship documents, including one at the global level **"Transforming Our World: the 2030 Agenda for Sustainable Development"**, which sets out a general framework for the countries of the world to eradicate poverty and achieve sustainable development by 2030.

The European Union has transformed the 2030 Agenda through the **European Green Deal** (the Deal). Its primary objective is to make Europe the first climate-neutral continent by 2050, with a stronger decoupling of economic growth from resource consumption. The targets include a significant reduction in greenhouse gas emissions and an overall reduction in environmental pollution. It is also essential to increase efforts to influence consumer behaviour to favour products that are environmentally friendly, recyclable, reusable and with long-life, thus reducing material consumption.

EU Action Plan: "Towards zero pollution for air, water and soil", adopted in 2021, is a document that defines measures to achieve a state where air, water and soil pollution falls to levels that are no longer considered harmful to health and natural ecosystems and respects the limits of our planet's ability to cope, resulting in a toxic-free environment.

The Agreement is followed up by the eighth **General Environment Action Programme of the European Union by 2030 (8th EAP)**, adopted in 2022. This EAP aims to accelerate the green transformation in a fair and inclusive way, in line with the long-term 2050 goal of "Living well within the limits of our planet". The development of economic activities should be carried out in a manner consistent with the protection and enhancement of the environment by halting and reversing the loss of biodiversity, preventing environmental degradation, and protecting health and well-being from negative environmental risks and impacts.

The Slovak Republic is fully aware of the necessity of transformational change in the economy. In 2021, the Government of the Slovak Republic adopted the **Vision and Strategy for the Development of Slovakia to 2030—a Long-Term Strategy for the Sustainable Development of the Slovak Republic—Slovakia 2030**. In line with this strategy, the transformation of the economy into a sustainable one, the competitiveness of which is based on the innovative and efficient use of resources and which generates good wages and prosperity, should be achieved.

We are living in complex times marked by the COVID-19 pandemic, which has had a profoundly negative impact on the functioning of society and the lives of individuals. The response to this situation was the adoption of the **Recovery and Resilience Plan for the Slovak Republic.** In terms of supporting economic development, it is built on Slovakia's global vision as an innovative economy that is the engine of sustainable economic growth and a guarantee of successful management of green and digital transformation.

It is expected that the implementation of the above-mentioned documents will be directed towards the improvement of Slovakia's environment, towards the promotion of positive developments in the areas where we are currently achieving this status, but mainly towards the solution of the identified problems that we are facing.

On behalf of the team of authors, as well as all cooperating entities, we would like to express our conviction that the presented **State of the Environment Report of the Slovak Republic in 2021** will be an inspiring source of information for you, which will help you to get an overview of the environment in Slovakia, as well as of the main challenges that we face in the future.

Team of authors

BASIC INFORMATION ABOUT THE SLOVAK REPUBLIC

Table 001 | The SR in selected figures (2021)

FOUNDATION OF THE INDEPENDENT SR	**1 JANUARY 1993**	
CHARACTERISTICS (2021)		
AREA	49 034 $km^{2:}$	
LAND TYPES	Agricultural land	48.4 %
	Forests	41.4 %
	Water bodies	1.9 %
	Built-up areas	4.9 %
	Other areas	3.4 %
HEIGHT ABOVE SEA LEVEL	94.3 m (Klin nad Bodrogom) /2 655 m (Gerlach Peak)	
POPULATION (AS OF 31 DECEMBER 2021)		
TOTAL POPULATION	5 434 712, of which 48.9 % men and 51.1 % women	
LIVE BIRTHS	56 565	
DEATHS	73 461	
NATURAL INCREASE / DECREASE	-16 896	
INCREASE THROUGH IMMIGRATION	2 338	
TOTAL INCREASE	-14 558	
LIFE EXPECTANCY AT BIRTH (YEARS)	men	71.16
	women	78.13
AVERAGE AGE (YEARS)	men	39.8
	women	42.9
POPULATION DENSITY	111 inhabitants/km^2	
GROSS DOMESTIC PRODUCT AT CURRENT PRICES	EUR 98.52 Billion	
INFLATION	3.2 %	
REGISTERED UNEMPLOYMENT RATE	6.8 %	

Source: SEA

Table 002 | Assessment of selected indexes

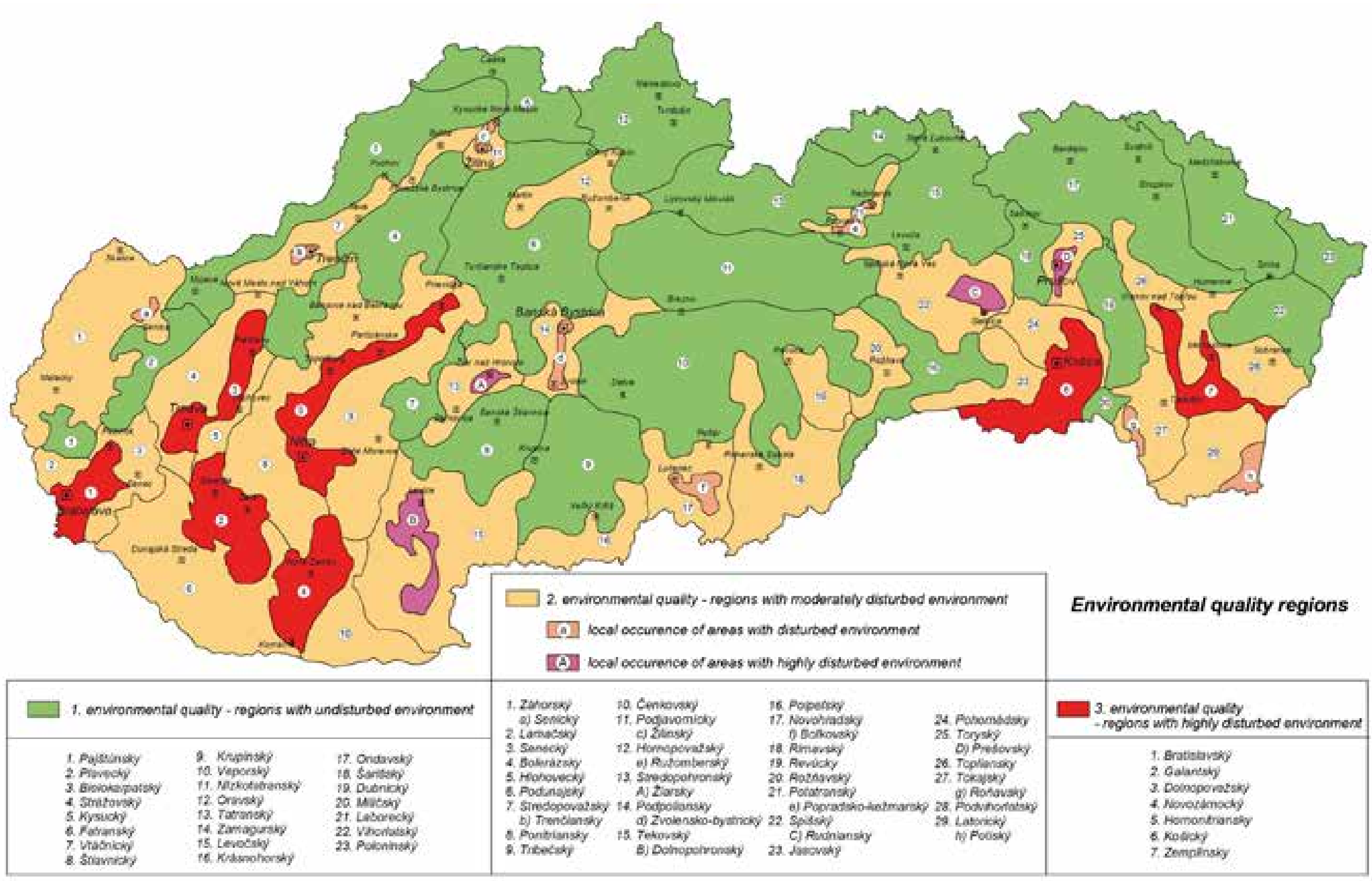
ENVIRONMENTAL PERFORMANCE INDEX (EPI), Yale 2022	60 % (18th of 180 assessed countries)
GINI INDEX, WORLD BANK 2019	23.2 %
HUMAN DEVELOPMENT INDEX, UNDP 2021	0.848 (45th of 191 assessed countries)

Source: SEA

The territory of the SR is split into 3 levels of environmental quality (EQ). Regions 1st EQ covering primarily a high-quality environment – 23 regions. Regions 2nd EQ representing territories, the so-called transitional type, which are heterogeneous from the environmental point of view – 29 regions and regions 3rd EQ represent territories with accumulated environmental issues – 7 regions.

There have been slight changes compared to the previous environmental regionalization issued in 2016. The most significant positive changes are the loss of the area of the 3rd level of EQ by approximately 1.1% of the territory, which represents approximately 541 km², and the increase of the areas of the 1st and 2nd level, which include high-quality territories and territories of a transitional type suitable for human habitation.

Map 001 | Environment quality regions



Source: SEA

SUMMARY ASSESSMENT OF THE ENVIRONMENTAL SITUATION IN THE SLOVAK REPUBLIC

Evaluation of the changes in individual indicators

Icon	Explanation of the assessment
	Positive development, improvement trends prevail. A positive assessment may also occur in the case of a slight deterioration that does not affect the already achieved satisfactory state.
	Variable, ambiguous trend, trend without significant changes in both positive and unfavourable directions.
	Unfavourable development, worsening trends prevail.

Evaluation of the state of individual indicators

Icon	Explanation of the assessment
	Satisfactory state. Positive state, compliance with limit values and objectives, or only minimal deviations from them.
	A state that cannot clearly be rated as satisfactory or unsatisfactory. This is, for example, because no objectives or limits are set for its evaluation, or its evaluation is not clear.
	Unsatisfactory state. Largely exceeding limit values, failure to meet the set objectives, or a possibility of not meeting the objectives set for future periods.

Evaluation of the forecast for meeting the objectives of the 2030 Environmental Strategy (ES)

Icon	Explanation of the forecast evaluation for meeting the 2030 EC objectives
	**Positive development.** Maintaining the trend in the development of the indicator, supported by the consistent implementation of the measures taken, signals the assumption of meeting the planned objectives.
	A state that cannot be clearly assigned as a positive or unfavourable development. The trend in development is only slightly positive, or ambiguous in the longer term. However, the implementation of the measures taken can lead to the achievement of the planned objectives.
	**Unfavourable development.** The trend in the development of the indicator signals a threat to the achievement of the planned objectives. It is questionable whether the results achieved by the further planned implementation of the measures taken will be sufficient to meet the objectives.

Sustainable use and effective protection of natural resources

Enough clean water for everyone

Surface water quality and status of surface water bodies (more detailed evaluation from p. 17)		
Change since 2007		The proportion of water bodies in a very good and good ecological status/potential in the third evaluation period (2013-2018) compared to the first (2007-2008) and second (2009-2013) evaluation periods decreased to 41.30% (1st evaluation period - 63.7%, 2nd evaluation period – 56.2%). The proportion of water bodies in a good chemical status in the third evaluation period decreased to 71.21% compared to 95% in the first and 97.5% in the second evaluation period. The reason for the decrease is mainly the gradual increase in the level of reliability of the assessment of the status of water bodies related to the tightening of legislation at the European and national level. This is about increasing the number of monitored water bodies, increasing the number of monitored water quality indicators that were not monitored in previous periods, as well as tightening the limit values.
Last year-on-year change		There was a slight year-on-year decrease in the number of monitoring sites (367 compared to 381) and an increase in the number of monitoring sites where surface water quality requirements were not met.
State (2021)		The limit values were exceeded in individual groups of indicators, as well in priority substances and some other substances evaluated for compliance with the environmental quality standard at several monitoring sites (322 out of a total of 367).
Forecast of meeting the Envirostrategy 2030 objectives		26% of surface water bodies were at risk of not achieving a good ecological status/potential by 2027, and 2.2% of bodies were at risk of not achieving a good chemical status. Meeting the objective of the 2030 Envirostrategy to ensure the achievement of a good state of all surface water bodies by 2030 will require considerable effort, especially in the implementation of measures to improve the ecological status of water bodies.

Groundwater quality and the status of groundwater bodies (more detailed evaluation from p. 18)		
Change since 2007		In the evaluation of the chemical status of groundwater bodies in the third evaluation period (2013-2018), compared to the first period (2007-2008), there was an increase of 23 groundwater bodies in a good chemical status, and 21 groundwater bodies compared to the second period (2009-2013), thus 80.19% of groundwater bodies reached a good chemical status in the third evaluation period. In the evaluation of the quantitative status of groundwater bodies, there was a decrease in the third evaluation period (2013-2018) compared to the first evaluation period (2007-2008), and an increase in the proportion of bodies in a good quantitative status to 90.88 % compared to the second evaluation period (2009-2013) (1st evaluation period - 93.33%, 2nd evaluation period - 70.59%).

Groundwater quality and the status of groundwater bodies (more detailed evaluation from p. 18)	
Last year-on-year change	In 2021, the percentage of unsatisfactory groundwater quality analyses was 45.85%, which is a slight deterioration compared to 2020 (41.36% in 2020).
State (2021)	In the majority of the monitoring objects of the groundwater monitoring network, the drinking water quality limit value was exceeded in at least one indicator.
Forecast of meeting the Envirostrategy 2030 objectives	20 groundwater bodies were classified as being at risk of not achieving a good quantitative status by 2027, and 18 groundwater bodies were classified as being at risk of not achieving a good chemical status by 2027. Meeting the objective - achieving a good state of all groundwater bodies by 2030 is not clear.
Drinking water quality (more detailed evaluation from p. 21)	
Change since 2005	The quality of drinking water distributed by public water supplies was very high quality over the long priod of time. The number of inhabitants connected to public water supplies increased by 4.8 percentage points compared to 2005 and 2021.
Last year-on-year change	The share of drinking water analyses complying with hygienic limits did not change year-on-year (it reached 99.72% in 2020). The number of inhabitants connected to public water supplies increased by 0.34 percentage points.
State (2021)	99.74% of drinking water analyses met the hygienic limits. 90.15% of the Slovak population was supplied with water from public water supply systems.
Forecast of meeting the Envirostrategy 2030 objectives	The quality of drinking water was at a high level for a long time, and the percentage of the population connected to public water supplies is growing slightly. It is realistic to assume that the objective of providing sufficient clean water for all will be met.
Wastewater and connection to the public sewerage (more detailed evaluation from p. 21)	
Change since 2005	The decrease in the volume of discharged wastewater in 2021 compared to 2005 was almost 28%, and there was also a decrease in the total discharged pollution. The number of inhabitants connected to public sewerage system increased by 13.92 percentage points compared to the mentioned years.
Last year-on-year change	The production of wastewater, as well as the share of its treatment, were at the same level as last year. The number of inhabitants connected to public sewerage system increased by 0.93 percentage points.
State (2021)	The level of population connection to public sewerage system is 70.62%.
Forecast of meeting the Envirostrategy 2030 objectives	The share of discharged and treated wastewater from agglomerations of more than 2 000 EI is gradually increasing, although it is still below the required level. In particular, the meeting of objectives in agglomerations below 2 000 EI remains at a low level. Strategic documents and associated financial mechanisms are being adopted to support measures to increase the proportion of wastewater discharged and treated. However, these measures are financially demanding, and their implementation will be largely influenced by the availability of financial resources.

Effective protection of nature and landscape

Conservation status of species and habitats of European importance (more detailed evaluation from p. 30)	
Change since 2005	Compared to the 1st (2004-2006) and 2nd (2007-2012) reporting period, in the 3rd reporting period (2013-2018), there was a more significant improvement in knowledge, but in reality, their conservation status is more or less the same (i.e., still unfavourable - insufficient measures).
Last year-on-year change	The conservation status of species and habitats of European importance did not change significantly from year to year, according to the continuous monitoring records (KIMS).
State (2021)	The conservation status of species and habitats of European importance is largely unfavourable, 74.9% of species and 60.4% of habitats of European importance are in an unfavourable status.
Forecast of meeting the Envirostrategy 2030 objectives	Meeting the objective of stopping the loss of biodiversity, or a significant and measurable improvement in the conservation status of species and habitats of European importance is quite distant, with a not very positive trend.

Protected areas (more detailed evaluation from p. 32)	
Change since 2005	The proportion of small-size protected areas (SSPA) (including their protective zones) increased slightly from 2.24% in 2005 to 3.15% in 2021. The development of the European Natura 2000 system started.
Last year-on-year change	The area of the national system of protected areas (PA) increased slightly year-on-year. Proposals to add 97 sites to the national list of Sites of Community importance (SCI) covering more than 10,000 ha were discussed and prepared. Other management programs of Special Protection Areas (SPA) were prepared and processed. 76 new nature reserves with an area of 6,462 ha were declared as Primary forests of Slovakia. The National Council of the Slovak Republic (NC SR) approved the reform of national parks.
State (2021)	Despite the high proportion of the protected area, many shortcomings can be observed within the national system (in the field of its representativeness, quality, definition of the target conservation status, implementation of management programs for the SSPA. The European Natura 2000 system has already been largely completed, but the process of declaring SCI and preparing management programs is too slow.
Forecast of meeting the Envirostrategy 2030 objectives	The objectives regarding the completion of the national part of the Natura 2000 PA system, as well as the completion and approval of the remaining management programs of protected areas, are gradually being met.

Sustainable land management

Acceptable soil nutrients (more detailed evaluation from p. 41)		
Change since2006	☹	There has been an increase of 5.5 and 0.8 percentage points in the proportion of agricultural soils with low phosphorus and potassium stocks, respectively.
Last year-on-year change	-	The amount of acceptable nutrients is monitored in 6-year cycles.
State (last completed cycle 2012 – 2017)	😐	Almost 47.7% of agricultural soils have a low phosphorus stock, and on the contrary, 51.5% of soils have a good potassium stock and 84.2% a good magnesium stock.
Forecast of meeting the Envirostrategy 2030 objectives	☹	The proportion of agricultural soils with a low phosphorus stock and potassium stock is constantly growing, which indicates that the meeting the 2030 objective - to prevent the loss of nutrients in the soil is still at risk.
Pesticide use in agricultural production (more detailed evaluation from p. 42)		
Change since 2005	☹	Since 2005, pesticide use has increased by 42%.
Last year-on-year change	☺	Year-on-year pesticide use decreased by 8.2%.
State (2021)	😐	4 979.6 tons of pesticides were applied to agricultural soils.
Forecast of meeting the Envirostrategy 2030 objectives	😐	The longer-term trend in pesticide use in agriculture is ambiguous, indicating a lack of progress towards the objective of reducing pesticide use in agriculture and ensuring a continuous decrease.
Application of treated sewage sludge and bottom sediments to the soil (more detailed evaluation from p. 43)		
Change since 2005	☹	There was a 3.9% decrease in the amount in the amount of sludge dry matter used for compost production.
Last year-on-year change	☺	Year-on-year, the amount of sludge processed into compost increased by 5.2%.
State (2021)	😐	During the production of compost, 27 769 tons of sewage sludge dry matter were used.
Forecast of meeting the Envirostrategy 2030 objectives	😐	The assumption of meeting the objective for the year 2030 – to make greater use of fertilization with processed and environmentally sound sewage sludge is still ambiguous.
Area of agricultural land in the system of organic agricultural production (more detailed evaluation from p. 44)		
Change since 2005	☺	Since 2005, the area of agricultural land in the organic agricultural system increased from 4.4% of the total area of agricultural land in 2005 to 13.57% in 2021.
Last year-on-year change	☺	Compared to 2020, there was an increase in land in the organic agricultural production system by 1.5 percentage points.
State (2021)	☺	The area of agricultural land in the organic agricultural system represents 13.57% of the total area of agricultural land.
Forecast of meeting the Envirostrategy 2030 objectives	☺	The area of agricultural land with organic agricultural production accounted for 13.57% of the total area of agricultural land, thus the Envirostrategy 2030 objective to increase the proportion of cultivated land in the system of organic agricultural production to at least 13.5% of the total area of agricultural land was achieved.

Fulfilling the functions of forests

Tree species composition and natural regeneration of forest stands (more detailed evaluation from p. 49)		
Change since 2005	🙂	The development in the tree species composition of the forests is favourable (an increase in proportion share of broadleaved trees from 59% to the current 64.2%). The development in the share of natural regeneration of forest stands in the total regeneration is also favourable (an increase from 33.9% to 41%).
Last year-on-year change	🙂	There was a further improvement in the tree species composition of forests, as well as a slight increase in the proportion of natural regeneration of forest stands (by 1.2 p.p.).
State (2021)	🙂	A generally favourable and diverse species structure prevails in the forests of the Slovak Republic. The proportion of natural regeneration is close to the level of comparable advanced forestry countries.
Forecast of meeting the Envirostrategy 2030 objectives	🙂	The objective of encouraging an increase in diversity and giving priority to the cultivation and planting of native tree species is continuously being met.

Timber felling and use of forest resources (more detailed evaluation from p. 51)		
Change since 2005	😐	The volume of timber felling fluctuated, mainly with regard to the occurrence of wind calamities, while in the long-term trend both the planned and actual timber felling in Slovakia increased (as a reflection of the age representation of trees). However, incidental felling accounted for more than half (negatively) of the harvest volume between 2005 and 2021 (55% on average). The share of timber felling in the total current increase (use of forest resources) decreased from 88% (2005) to 63.8% (2021); the management is still sustainable.
Last year-on-year change	🙂	There was a slight increase in timber felling (by 1.7%), while the planned felling was not exceeded. The share of timber felling in the total current increase (TCI) increased year-on-year (by 1.1 p.p.).
State (2021)	🙂	The total timber felling does not exceed the planned felling, and the proportion of incidental felling fell below 40%. The use of forest resources can be assessed as sustainable.
Forecast of meeting the Envirostrategy 2030 objectives	😐	Felling is below the TCI, but the structure of felling and its control is still not satisfactory, indicating a lack of progress towards the objective of ensuring sustainable timber felling.

Forests health (more detailed evaluation from p. 52)		
Change since 2005	☹	Since 2005, there were significant fluctuations in the health condition of the forests, indicated by the defoliation of tree species, which are probably related to the current climatic conditions (especially drought). However, the development of forest damage is increasing (with a culmination in 2014, when the share of tree damage in degrees 2-4 was up to 49.1%), which is mainly due to the deterioration of the state of broadleaved trees.
Last year-on-year change	🙂	There was an improvement in the health condition of the forests between years (from 40.4% of damaged trees in degrees 2-4 in 2020 to 37.9% in 2021).
State (2021)	☹	The health condition of the Slovakia's forests can still be considered unfavourable, and it remains worse than the European average.
Forecast of meeting the Envirostrategy 2030 objectives	-	The 2030 Strategy of the Environmental Policy does not explicitly define the objectives for this indicator, but its state affects the sustainable management of forests, including their diversity.

The rational use of the rock environment

Mineral mining and its impact on the environment (more detailed evaluation from p. 59)		
Change since 2005		For most of the mined raw materials, the mining volume did not reach the level of 2005 (a decrease in lignite mining by 57%, magnesite by 50%, or by 92%), which is positive in terms of the use of natural resources and the environmental impact associated with mining.
Last year-on-year change		There was an increase in the mining of raw materials on the surface by 18.2% and underground by 4.4%.
State (2021)		Despite the year-on-year increase, the share of mineral raw materials mining in their reserves does not indicate an issue with their depletion. Reducing the volume of mining, including the implementation of the Mining Waste Management Act, was directly reflected in the reduction of the negative impact of mining on the environment. Due to the escalating negative consequences of climate change (torrential rains, induced instability of the subsoil, etc.), closed and abandoned repositories of waste from the mining industry require increased attention.
Forecast of meeting the Envirostrategy 2030 objectives		The trend in mineral mining and the implementation of measures in the field of mining waste management indicate the assumption of meeting the 2030 objective - to minimize the impact of mineral mining on the environment.

Contaminated sites (more detailed evaluation from p. 62)		
Last year-on-year change		In 2021, work continued on the survey of locations of probable contaminated sites. Locations where pollution was documented were reclassified as contaminated sites. Their number increased by 21 compared to 2020. However, this is a confirmation of pollution that occurred before 2007 (pollution after that year is assessed by the regime of environmental damage in the sense of Act No. 359/2007 Coll. on the Prevention and Remediation of Environmental Damage and on the Change and amendments to some laws).
State (2021)		331 confirmed contaminated sites were recorded, of which 148 have a high priority of solution. Of these, 34 locations underwent remediation in 2021, decontamination was completed at a total of eight locations.
Forecast of meeting the Envirostrategy 2030 objectives		The objective of eliminating the contaminated sites with the highest priority of solution is at risk due to the complexity of the process of solving contaminated sites, as well as limited financial resources.

Climate change and air protection

Climate change preventions and reduction of its impacts

Greenhouse gas emissions (more detailed evaluation from p. 63)		
Change since 2005		The amount of greenhouse gas emissions decreased by 27.3% since 2005, which is a positive trend.
Last year-on-year change		The greenhouse gas emissions decreased by 7% year-on-year compared to 2019 and 2020, and in the short term show a relatively stable development.
State (2021)		The Slovak Republic fulfils the obligations arising from the relevant international conventions regarding greenhouse gas emissions in the atmosphere.
Forecast of meeting the Envirostrategy 2030 objectives		The objective of reducing greenhouse as emissions in ETS sectors by 43% and in non-ETS sectors by 20% by 2030 compared to 2005 will probably be achieved, according to the current trend, with the implementation of the measures taken.

Average annual temperature (more detailed evaluation from p. 63)	
Change since 2005	The average annual temperature increased significantly since 2005, at the same time the negative manifestations of climate change were significantly manifested (significant weather variability, above-average annual temperature, extreme local precipitation).
Last year-on-year change	An increase in the average annual temperature was also recorded year-on-year.
State (2021)	The year 2021 was unusually warm.

Protection against floods consequences

Protection against floods consequences (more detailed evaluation from p. 69)	
Change since 2005	The total expenses and damage caused by floods decreased by 41.3% compared to 2005 and 2021. The number of people affected by floods by 2021 amounted to more than 80 thousand, 7 people died.
Last year-on-year change	Despite the year-on-year increase in the amount of damage caused by floods by EUR 2.85 mil. and expenses related to flood rescue works by EUR 1.35 mil., the number of inhabitants affected by floods decreased by 85 people. The expenses for rescue works decreased by EUR 0.34 mil. The number of days with a declared degree of flood activity increased by 3 (122 days in 2021 compared to 119 days in 2020).
State (2021)	The total expenses and damages caused by floods were EUR 16.98 mil., of which damages reached the value of EUR 8.83 mil., one person died. The number of days with a declared level of flood activity exceeded the long-term average by 13 days (122 days in 2021 compared to an average of 109 days for the period 2007-2021).
Forecast of meeting the Envirostrategy 2030 objectives	Due to the implementation of anti-flood measures in the long term, expenses for flood and rescue works as well as damages caused by floods decreased, even though a slight increase was recorded in the last two years. Floods associated with torrential rains are particularly problematic. It is necessary to consistently apply the measures taken, as well as to take additional measures in accordance with the new flood risk management plans being prepared.

Solution to droughts and water scarcities

Drought in the country (more detailed evaluation from p. 72)	
Change since 2005	The results of drought monitoring based on the PDSI (Palmer Drought Severity Index) and SPEI (Precipitation and Evapotranspiration Index) indices show that dry conditions occur more frequently and last longer. Extremely dry conditions have already occurred in the north of Slovakia.
Last year-on-year change	Inter-annual change refers only to temporal and regional differences in the manifestations of drought. Dry to extremely dry conditions were recorded in the country in both of the last monitored years.
State (2021)	The most pronounced drought in 2021 was mainly in the months of June and July and then in the month of October.
Forecast of meeting the Envirostrategy 2030 objectives	As one of the main causes of the increase in dry conditions in the country is the increasing trend of potential evaporation from the soil caused by the increased air temperature; it is assumed that the implementation of measures aimed at increasing the water retention capacity of the soil, reducing water erosion and retaining water in the country will contribute to the achievement of the 2030 objective - mitigation of the effects of drought on the country, but it will not be possible to completely eliminate it. ccording to the current trend, with the implementation of the measures taken.

Water use from the point of view of preserving water resources (more detailed evaluation from p. 77)		
Change since 2005	☺	Compared to 2005 and 2021, surface water withdrawals decreased by 54.3% and underground water withdrawals by 8.4%. The water exploitation index plus (WEI+) reached a value of 0.39%.
Last year-on-year change	☺	There was a slight increase in groundwater withdrawals by 2.78% and surface water withdrawals by 1.1%.
State (2021)	☺	The percentage of total withdrawals from outflow from the territory of the Slovak Republic reached 5.18%, and the proportion of used underground water from the total documented usable amounts of underground water reached 13.8%.
Forecast of meeting the Envirostrategy 2030 objectives	☺	The effective use of water resources will depend on the development of the amount of surface and groundwater withdrawals and on the development of the amount of available water resources. The Slovak Republic has relatively sufficient water resources at the present. Implementing measures to adapt to climate change, retaining water in the landscape and reducing water demands by making production processes more efficient will further create the conditions to maintain this status.

Clean air

Emissions of pollutants (more detailed evaluation from p. 80)		
Change since 2005	☺	From 2005 to 2020, the emissions of pollutants decreased. The SO_2 emissions decreased by 84.5%, NO_x by 47.2%, CO by 49.2%, PM_{10} by 46.7%, $PM_{2.5}$ by 51.7%, NH_3 by 36.5% and NMVOC by 18.1%.
Last year-on-year change	☺	The year-on-year emissions of most monitored pollutants decreased - SO_2 emissions decreased by 15.2%, NO_x by 4.8%, CO by 1.3%, $PM_{2.5}$ by 1.3%, NH_3 by 3.2% and NMVOC by 11.5%. The exception was PM_{10}, there was only a very slight increase of 0.5%.
State (2020)	☺	The Slovak Republic fulfils the obligations resulting from the relevant international obligations relating to the emissions of pollutants.
Forecast of meeting the Envirostrategy 2030 objectives	☺	The current trend of reducing the emissions of pollutants, supported by the implementation of adopted strategic documents, indicates that the Slovak Republic is meeting the set objectives, or in the case of some polluting substances, they are already fulfilled.

Air quality (more detailed evaluation from p. 86)		
Change since 2005	☺	A positive trend was recorded in the development of air quality, despite its slightly fluctuating course.
Last year-on-year change	☹	Compared to the previous year, there was an increase in the number of exceeding limit and target values.
State (2021)	☹	The permissible values were exceeded, in connection with the protection of human health are still recorded for PM_{10} (3), $PM_{2.5}$ (3), BaP (9) and ground-level ozone (2), and the permissible values for ground-level ozone for the protection of vegetation and forests were exceeded too.
Forecast of meeting the Envirostrategy 2030 objectives	☹	Despite the positive trend in the development of the emissions of pollutants and the assumption of meeting the set objectives for their reduction, the objective that air pollution does not have significant adverse effects on human health and the environment will probably not be met.

Green economy

Towards the circular economy

Resource productivity (more detailed evaluation from p. 94)		
Change since 2005		Since 2005, resource productivity has increased by 78.4%.
Last year-on-year change		Compared to the previous year, resource productivity decreased by 1%.
State (2020)		Despite the recorded longer-term growth, resource productivity remains low compared to other EU countries.
Circular material use rate (more detailed evaluation from p. 94)		
Change since 2010		Since 2010, the circular material use rate increased by more than 5 percentage points.
Last year-on-year change		The circular material use rate increased significantly year-on-year — in 2020 it reached 10.5%.
State (2020)		The circular material use rate remains below the EU average (11.8% in 2020).
Forecast of meeting the objectives		In order to achieve the non-binding 2030 objective set by the EU (to double the circular material use rate compared to 2020), the Slovak Republic needs to achieve an increase of 100% (10.5 percentage points) in 10 years, which could be achieved if the year-on-year growth recorded between 2019 and 2020 is maintained. Due to the long-term stagnation between 2010 and 2019, progress needs to be evaluated annually.
Eco-Innovation Index (more detailed evaluation from p. 95)		
Change since 2012		Since 2012, the Slovak Republic fell from 19th to 21st place in the ranking (out of a total of 27 EU member states).
Last year-on-year change		The Slovak Republic remained in the 21st place (out of a total of 27 EU member states).
State (2021)		The Slovak Republic is placed, for a long period of time, in the lower ranks and is included among the so-called catching-up countries.
Municipal waste management (more detailed evaluation from p. 97)		
Change since 2005		There was a significant decrease in the amount of municipal waste deposited in the landfill (by almost 39 percentage points). The municipal waste recycling rate increased significantly (by approximately 50 percentage points).
Last year-on-year change		The share of landfilled municipal waste decreased by 4.4 percentage points year-on-year. The municipal waste recycling rate increased by 3.5 percentage points.
State (2021)		There is still a high proportion of municipal waste disposed of by landfilling (40.1%). The recycling rate of municipal waste reached 50.1% in 2020.
Forecast of meeting the Envirostrategy 2030 objectives		The objective in the field of municipal waste is to reduce the rate of its landfilling to less than 25% of the total amount of municipal waste by 2035. To meet the objective, it is necessary to speed up the diversion of municipal waste from landfills. Another objective in this area is to increase the recycling rate of municipal waste, including its preparation for reuse, to 60% by 2030. To meet this objective, municipal waste recycling rate needs to continue to increase.

Packaging waste (more detailed evaluation from p. 101)		
Change since 2005	🙂	The recycling rate of packaging waste has been increasing since 2005. While in 2005 the recycling rate for the monitored packaging waste was 45.21%, in 2020 it was 70.8%.
Last year-on-year change	🙂	The recycling rate of all packaging waste increased year-on-year from 67.55% to 70.8%.
State (2020)	🙂	The minimum set recycling goals until 2025 are already being met for all packaging waste at the present.
Green public procurement (GPP) (more detailed evaluation from p. 105)		
Change since 2007	😐	The trend of GPP application was fluctuating since 2007, with an unfavourable development in the longer term despite an increase in recent years.
Last year-on-year change	😐	A decrease was recorded in the share of the number of GPP contracts in the total number (a decrease of 9.6 percentage points), but in the case of the proportion of GPP contracts linked to the value of the contracts, there was an increase of 6.25 percentage points.
State (2021)	☹️	The level of GPP is still low, the evaluation was based on a survey in which less than a fifth of the public institutions concerned participated. In 2021, the level of the proportion of GPP orders in the total number was 5.14% and the proportion of GPP contracts in the total value of contracts was 17.7%.
Forecast of meeting the Envirostrategy 2030 objectives	☹️	The 2030 objective is that Slovakia will provide at least 70% of the total value of public procurement and at least 70% of the total number of contracts in public procurement through green public procurement. To meet this objective, it is necessary for Slovakia to significantly increase the proportion of GPP from the total value of public procurement, otherwise there is a risk that Slovakia will not meet the set objective.

Economic and clean energy

Energy efficiency expressed in the form of primary energy consumption (PEC) (more detailed evaluation from p. 111)		
Change since 2005	🙂	Since 2005, there was a 12.8% decrease in primary energy consumption.
Last year-on-year change	🙂	Year-on-year, there was a significant 5.1% decrease in primary energy consumption.
State (2020)	🙂	The national objective of energy efficiency for 2020 in the primary energy consumption, not to exceed the level of 16.2 Mtoe, was met.
Forecast of meeting the Envirostrategy 2030 objectives	🙂	Meeting the 30.3% objective for energy efficiency (in the form of a 30.32% reduction in PEC) is conditional on the consistent implementation of all measures taken in the Integrated National Energy and Climate Plan for 2021 – 2030.
Energy efficiency expressed in the form of final energy consumption (FEC) (more detailed evaluation from p. 111)		
Change since 2005	🙂	There was a 10.3% decrease in the final energy consumption.
Last year-on-year change	🙂	The impact of the COVID-19 pandemic was reflected in a significant 7.1% year-on-year decrease in the final energy consumption.
State (2020)	😐	The original objective of energy efficiency for 2020 in the final energy consumption, when the FEC should not exceed the level of 10.38 Mtoe, was met. The revised objective (9.243 Mtoe) could not be met.
Forecast of meeting the Envirostrategy 2030 objectives	🙂	Meeting the 30.3% objective for energy efficiency (in the form of a 30.32% reduction in FEC) is conditional on the consistent implementation of all measures taken in the Integrated National Energy and Climate Plan for 2021 – 2030.

Renewable energy sources (RES) (more detailed evaluation from p. 112)	
Change since 2005	There was an increase in the proportion of RES in the gross final energy consumption from 6.4% in 2005 to 17.3% in 2020.
Last year-on-year change	There was a minimal year-on-year increase in the proportion of RES (an increase of 0.4 percentage point).
State (2020)	The Slovak Republic met its binding objective for the proportion of energy from RES in 2020 (14%).
Forecast of meeting the Envirostrategy 2030 objectives	Meeting the 19.2% objective for increasing the proportion of RES will be conditional on the consistent implementation of all measures taken in the Integrated National Energy and Climate Plan for 2021 – 2030. The priority will be the use of RES, especially in transport and for the production of heat and cold.

Greenhouse gas emissions from energy (more detailed evaluation from p. 113)	
Change since 2005	Between 2005 and 2020, the greenhouse gas emissions from the energy decreased by 38.5%.
Last year-on-year change	In 2020, the positive trend of decreasing the greenhouse gas emissions from the energy continued (decrease of 6.3%).
State (2020)	The greenhouse gas emissions from the energy in 2020 were one of the lowest since 1990.
Forecast of meeting the Envirostrategy 2030 objectives	A decrease in the greenhouse gas emissions from the energy, assuming the adoption and application of targeted policies, measures and investments, should lead to a decrease in total greenhouse gas emissions in the SR and thereby contribute to the achievement of EU objectives for reducing the greenhouse gas emissions.

Economic instruments for a better environment

Environmental expenditures for businesses and municipalities (more detailed evaluation from p. 114)	
Change since 2005	The expenditures of companies and municipalities for environmental protection increased by 60.6% from 2005 to 2021.
Last year-on-year change	There was a year-on-year increase in the costs of businesses and municipalities for environmental protection by 16.2%.
State (2021)	In 2021, the businesses and municipalities changed their development in the area of environmental protection expenditures and, unlike the previous year, they increased year-on-year.
Forecast of meeting the Envirostrategy 2030 objectives	The 2030 Environmental Strategy does not explicitly define the objectives for this indicator. However, it mentions the possibility of expanding environmental taxes in individual areas. On their basis, the selected measures will be applied in such a way as to increase their total proportion. Envirostrategy 2030 also recommends considering the introduction of a fiscally neutral environmental tax reform, including a comprehensive tax deduction reform. The tax burden should be shifted to environmentally harmful activities.

Taxes with an environmental aspect (more detailed evaluation from p. 125)	
Change since 2005	Since 2005, there was an increase in the total financial volume of taxes with an environmental aspect by 152.1%.
Last year-on-year change	Year-on-year, there was an increase in the total financial volume of taxes with an environmental aspect by 8.7%.
State (2021)	The amount of environmental taxes, calculated as a share of GDP, reached 2.41% in 2021 and is roughly at the level of the average within the EU countries.

SUSTAINABLE USE AND EFFECTIVE PROTECTION OF NATURAL RESOURCES

1 ENOUGH CLEAN WATER FOR EVERYONE

KEY QUESTIONS AND KEY FINDINGS

Are the requirements for surface water quality being met?

As part of the basic monitoring and operational monitoring, as well as the monitoring of protected areas, several exceeded values of the established pollution limits were recorded in 2021.

Very good (high) and good ecological status/potential of surface water bodies was recorded in 41.3% of the total number of water bodies, which represents a length of 6 351.01 km. A good chemical status reached 71.2% of the total number of water bodies, which represents a length of 10 596.3 km.

Are the requirements for the quality of groundwater being met?

As part of the basic monitoring and operational monitoring, in 2021, the specified groundwater pollution limits were exceeded. The most frequently unsatisfactory indicators were Mn and Fe_{total}, which points to the persistent unfavourable state of oxidation-reduction conditions.

85 groundwater bodies (80.2%) were in a good chemical status, representing an area of 53 207 km^2.

What is the quality of drinking water?

The quality of drinking water was at a high level for a long period of time. In 2021, the proportion of drinking water analyses complying with the limits reached 99.74%, while in 2006 it was 99.44%.

The number of inhabitants supplied through the public water supply in 2021 reached 90.15%, while in 2005 it was 85.4% of the inhabitants. Compared to 2020, there was a minimal increase.

Is surface water pollution reduced by sewage discharges?

In 2021, waste water production was at the level of 2020 and decreased by 28% compared to 2005. In 2021, the amount of pollution characterized by COD_{Cr} and N_{total} parameters increased. There was a decrease in the BOD_5 indicator. Insoluble substances, P_{total} and NES_{uv} were approximately at the same level as in the previous year.

The proportion of inhabitants connected to public sewerage system is increasing, but only very slowly. In 2005, 56.7% were connected to public sewage, in 2020 - 69.69%, and in 2021 the level of connection reached 70.62%, which is an increase of 0.93 percentage points compared to the previous year. The connection of inhabitants to domestic sewage treatment plants or cleaning by methods close to nature was not evaluated.

What is the quality of the waters intended for bathing?

In 2021, the classification of bathing waters in the sense of Directive 2006/7/EC on the management of bathing water, which repealing Directive 76/160/EEC, which is incorporated into the national legislation, was performed in 29 natural sites out of a total of 32 locations declared as waters intended for bathing. 16 bathing water sites were classified as sites with excellent bathing water quality, 10 sites had good bathing water quality, 2 sites had sufficient water quality, and one site had unsatisfactory bathing water quality. Two sites were not classified due to their reconstruction and one site could not be classified due to the unavailability of data from 4 consecutive bathing seasons.

SURFACE WATER QUALITY AND THE STATUS OF SURFACE WATER BODIES

Qualitative indicators of surface water were monitored in 2021 according to the approved Addendum to the Framework Water Monitoring Program of Slovakia for the period 2016-2021, for 2021. A total of 450 sites were monitored in the basic and operational mode.

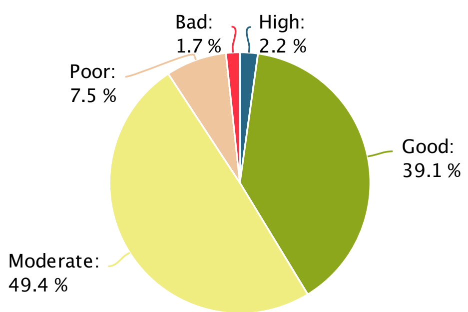
The results of the monitoring were evaluated according to the **Government Regulation of the Slovak Republic No. 269/2010 Coll., which sets up the requirements on a good water status**, as amended (GR SR No. 269/2010 Coll.). For priority substances and some other substances, compliance with the environmental quality standard (EQS) was assessed according to **Government Regulation of the Slovak Republic No. 167/2015 Coll. on environmental quality standards** in the field of water policy (GR SR No. 167/2015 Coll.).

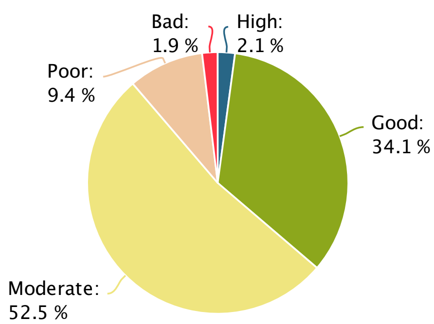
In 2021, the requirements for surface water quality were listed in Annex No. 1 GR SR No. 269/2010 Coll., fulfilled in all evaluated locations in the following general indicators (Part A): Mg, Mn, Fe, Se, V, free ammonia, phenol index, anionic surfactants (PAL-A), chlorobenzene (CB), dichlorobenzenes (DCB), 2-monochlorophenol (CP), 2,4,6-trichlorophenol (2,4,6-TCP), and for radioactivity indicators (part D): total volume activity of alpha and beta ($a_{V,ca}$ $a_{V,cb}$), tritium (^{3}H), strontium (^{90}Sr), cesium (^{137}Cs). The highest limit values in general indicators (Part A) were exceeded in the nitrogen nitrite indicator in all sub-basins. The requirements for surface water quality, listed in Annex No. 1 GR SR No. 269/2010 Coll. and Annex No. 1 GR SR No. 167/2015 Coll. for the group of non-synthetic substances (Part B), they were not met in the indicators: As, Zn, Cr, and Pb, and for the group of synthetic substances (part C) in the indicators: total cyanides, PCBs and its congeners (8, 28, 52, 101). The annual average EQS (according to Annex No. 1 GR SR No. 167/2015 Coll.) from the group of substances of polycyclic aromatic hydrocarbons - PAU was exceeded for fluoranthene and potentially exceeded benzo(a)pyrene, maximum permissible concentration (MPC) - EQS was exceeded in the indicators: fluoranthene, benzo(b)fluoranthene and benzo(g,h,i) perylene. For the indicator octylphenol ((4-(1,1',3,3'-tetramethylbutyl) phenol)) the annual average (AA) - EQS was exceeded. Of the pesticide substances, the AA - EQS was potentially exceeded for atrazine and chlorpyrifos, and the potential exceeded values of both the AA - EQS and the MPC - EQS were in the indicator heptachlor and endosulfan. From the group of hydrobiological and microbiological indicators (Part E), the requirements were not met in the following indicators: saprobic index of bioseston, abundance of phytoplankton, chlorophyll-a, coliform bacteria, thermotolerant coliform bacteria, intestinal enterococci and culturable microorganisms at 22°C.

The evaluation of the status of surface water bodies is performed by evaluating their ecological status or potential, and by evaluating the chemical status. The latest current evaluation of the status of surface water bodies is processed for the needs of the Water Plan of Slovakia - 2nd update, which covers 1 351 surface water bodies and is based on the reference period 2013-2018.

A very good and good ecological status/potential was recorded in 41.3% of the total number of water bodies with a length of 6 351.01 km, which is 36.23% of the total length of water bodies. 49.4% of water bodies were in an average ecological status, 7.55% were in a bad status and 1.70% were in a very bad status.

Chart 001 | Ecological status/potential of surface water bodies evaluated within the third cycle of river basin management plans (Proportion of number) and (Proportion of lengths)

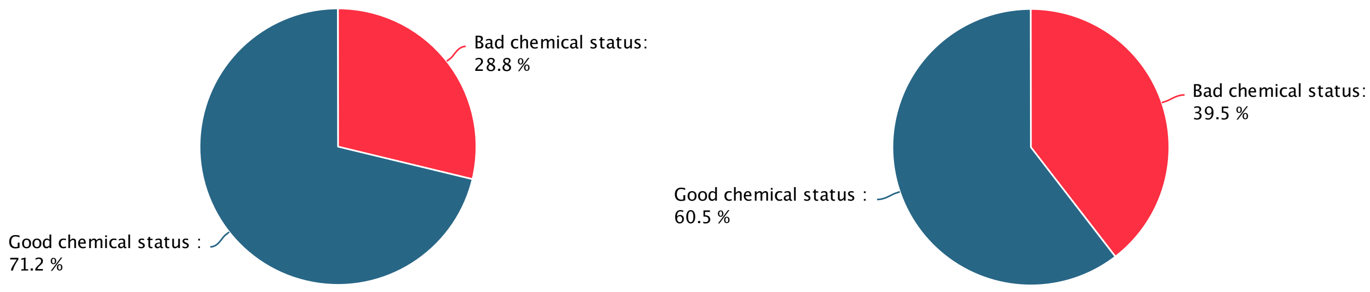




Source: MoE SR

A good chemical status was achieved by 962 surface water bodies (71.21% of the total) in a length of 10 596.3 km (60.45% of the total length of surface water bodies). 389 water bodies (28.79%) with a length of 6 932.1 km (39.55%) did not achieve a good chemical status.

Chart 002 | Chemical status of surface water bodies evaluated within the third cycle of river basin management plans (Proportion of number) and (Proportion of lengths)



Source: MoE SR

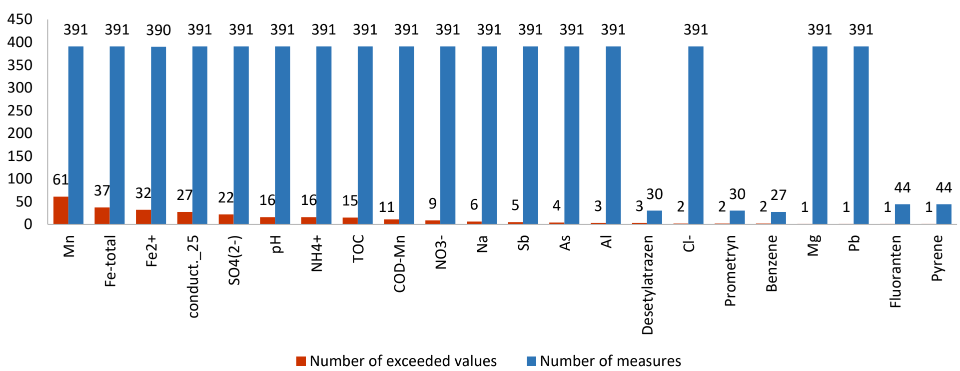
GROUNDWATER QUALITY AND THE STATUS OF GROUNDWATER BODIES

Monitoring of the chemical state of underground water was divided into:

- basic monitoring,
- operationl monitoring.

In 2021, the underground water quality was monitored in 176 basic monitoring objects. These are objects of the SHMI state monitoring network or springs that are not affected by point sources of pollution. The results of laboratory analyses were evaluated according to the Decree of the Ministry of Health of the Slovak Republic No. 247/2017 Coll., which establishes details on drinking water quality, drinking water quality control, monitoring program and risk management in drinking water supply.

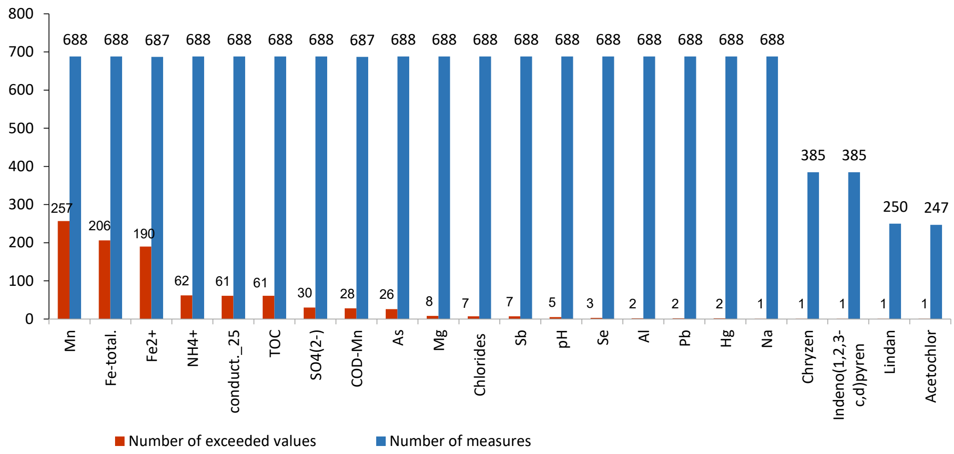
Chart 003 | Frequency of exceeded selected groundwater quality indicator in basic monitored objects according to Decree of the MoH SR No. 247/2017 Coll. (2021)



Source: SHMI

The operational monitoring was performed in all underground water bodies that were evaluated as risky from the point of view of not achieving a good chemical state. In 2021, as part of the operational monitoring, 220 objects were monitored, where possible penetration of pollution into underground water from a potential source of pollution or a group of them is assumed to be captured.

Chart 004 | Frequency of exceeded selected groundwater quality indicator in operational monitored objects according to Decree of the MoH SR No. 247/2017 Coll. (2021)

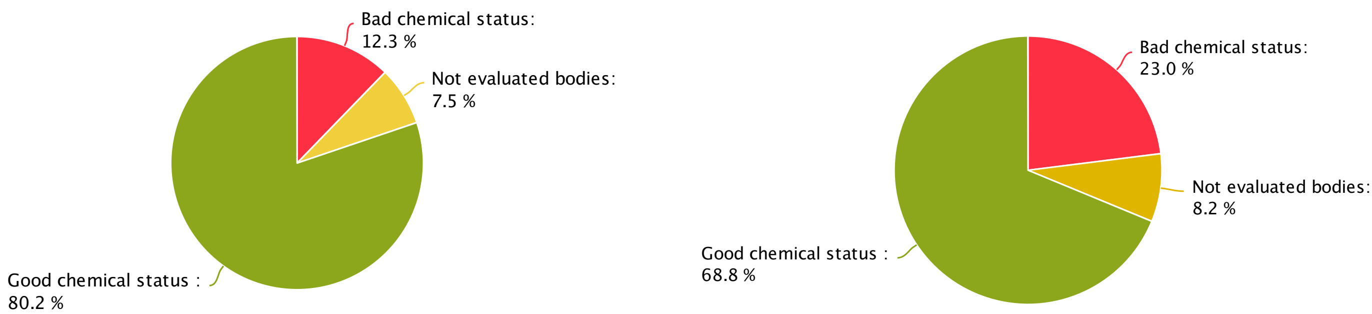


Source: SHMI

The evaluation of the state of groundwater bodies is ensured by the evaluation of their chemical status and quantitative status. The latest current evaluation of the status of groundwater bodies is processed for the needs of the Water Plan of Slovakia - 2nd update, which covers 106 groundwater bodies and is based on the reference period 2013-2018.

Out of the total number of 106 groundwater bodies, 85 bodies (80.19%) achieved a good chemical status, 13 bodies (12.26%) had a bad chemical status, and the remaining 8 bodies (7.55%) were not evaluated due to lack of data (all bodies that had not been evaluated were formations in geothermal structures). In terms of the area of water bodies, a good chemical status was indicated on water bodies with an area of 53 207 km² (68.78% of the total area of 106 groundwater bodies), bad on bodies with an area of 17 819 km² (23.03%) and on the remaining in the area of water bodies (6 335 km², 8.19%), the chemical status was not evaluated.

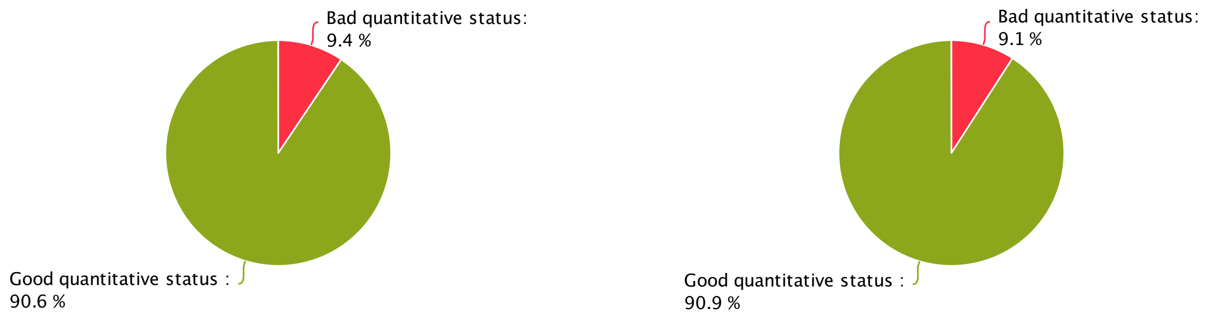
Chart 005 | Chemical status of groundwater bodies evaluated within the third cycle of river basin management plans (Proportion of number) and (Proportion of area)



Source: MoE SR

Out of the total number of 106 groundwater bodies, 96 bodies (90.57%) achieved a good quantitative status, and 10 groundwater bodies (9.43%) achieved a bad quantitative status. In terms of the area of water bodies, a good quantitative status was indicated on water bodies with an area of 70 308 km² (90.88% of the total area of 106 groundwater bodies) and bad on bodies with an area of 7 054 km² (9.12%).

Chart 006 | Quantitative status of groundwater bodies evaluated within the third cycle of river basin management plans (Proportion of number) and (Proportion of area)



Source: MoE SR

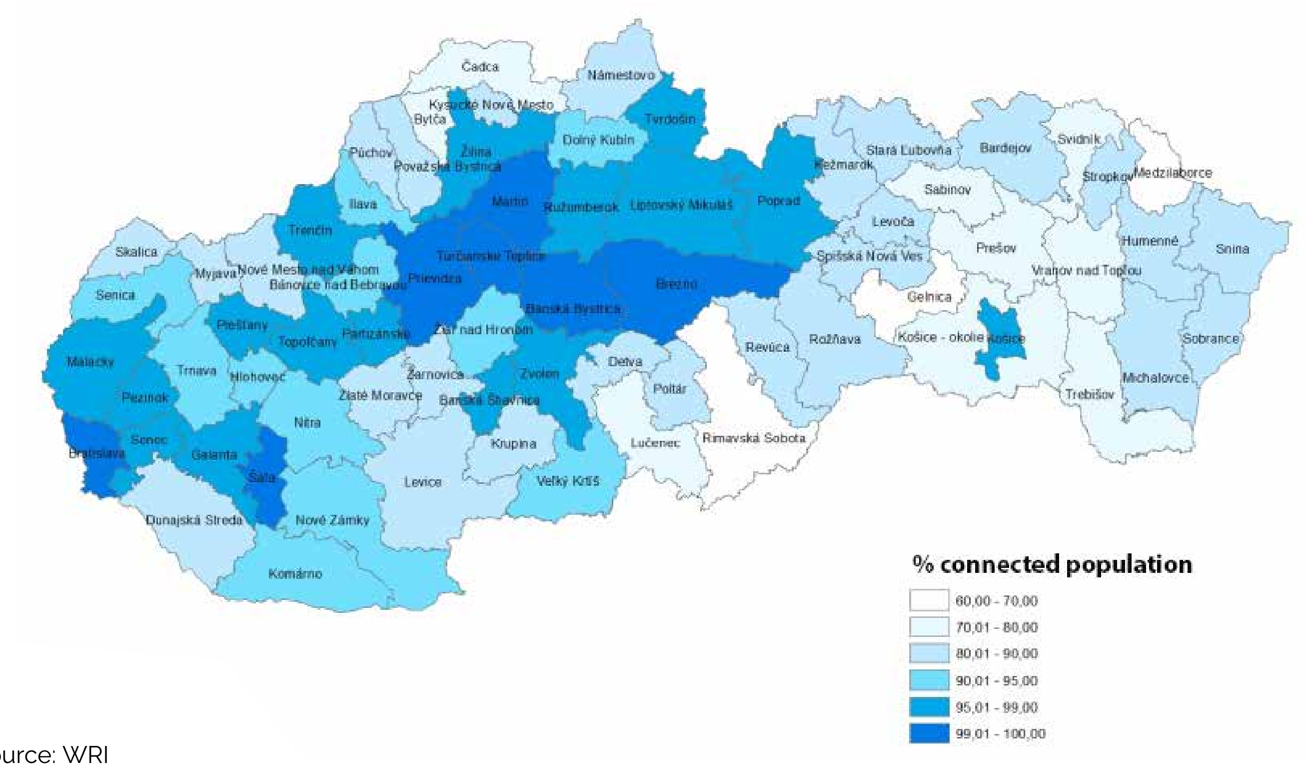
SUPPLYING THE POPULATION WITH DRINKING WATER

Supplying the population with water from public water supply systems

The number of inhabitants supplied with water from public water supplies in 2021 reached 4 912 940, which represented 90.15% of the total number of inhabitants of the Slovak Republic. In 2021, there were 2 443 separate municipalities that were supplied with water from public water supplies, and their proportion of the total number of municipalities was 84.53%.

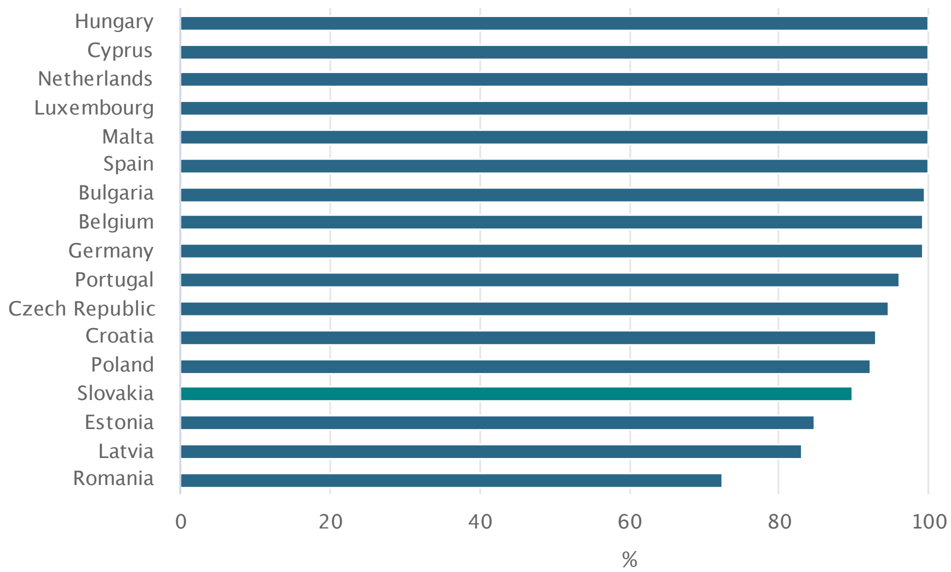
The **amount of drinking water produced** in 2021 reached 296 mil. m^3, which represents an increase of 4 mil. m^3 compared to 2020. Of the total water produced in water management facilities, in 2021 **water losses** in the pipe network represented 25.3%. The **specific water consumption** in households decreased slightly to the value of 80.73 l.inhabitant^{-1}.day^{-1}.

Map 002 | Share of inhabitants supplied from the public water supply systems in individual districts of the Slovak Republic (2021)



Source: WRI

Chart 007 | International comparison of population connected to the public water supply system (2020)



Source: Eurostat

DRINKING WATER QUALITY

Drinking water quality control and its health safety is determined through a set of water quality indicators, representing the physical, chemical, biological and microbiological properties of water. Indicators of the quality of drinking water are defined by the **Decree of the Ministry of Health of the Slovak Republic No. 247/2017 Coll., which sets up the details on drinking water quality, drinking water quality control, monitoring program and risk management in the supply of drinking water**, as amended (Decree MoH SR No. 97/2018 Coll.) and by **Decree of the Ministry of Health of the Slovak Republic No. 100/2018 Coll. on limiting the exposure of the population to drinking water**, **natural mineral water and spring water**. In addition to the complete analysis of drinking water, a minimal analysis is performed to check and obtain regular information about the stability of the water source and the effectiveness of water treatment, especially disinfection, about the biological quality and sensory properties of drinking water - i.e., testing of 26 indicators of water quality and free chlorine, or chlorine dioxide.

In 2021, 18 113 drinking water samples were analysed in operational laboratories of water companies, in which 524 008 analyses were made for individual drinking water indicators. In 2021, the proportion of drinking water analyses **complying with hygienic limits** reached a value of **99.74%.** The proportion of samples **meeting the drinking water quality requirements in all indicators** reached a value of **95.34%**. The free chlorine indicator is not included in these proportions.

The disinfection of drinking water is primarily carried out using the chemical process of chlorination. Decree of the MoH SR No. 247/2017 Coll. determines a limit value of 0.3 mg/l for the content of free chlorine in drinking water. If water is disinfected using chlorine, the minimum value of free chlorine in the distribution network need not be 0.05 mg/l. The percentage of analyses that did not comply with Decree MoH SR No. 247/2017 Coll. due their exceeding the 0.3 mg/l value was 1.08% in 2021. The requirement of Decree MoH SR No. 247/2017 Coll. for the minimum content of free chlorine (0.05 mg/l) was not complied with by 12.07% of drinking water samples.

WASTE WATER AND CONNECTION TO THE PUBLIC SEWERAGE

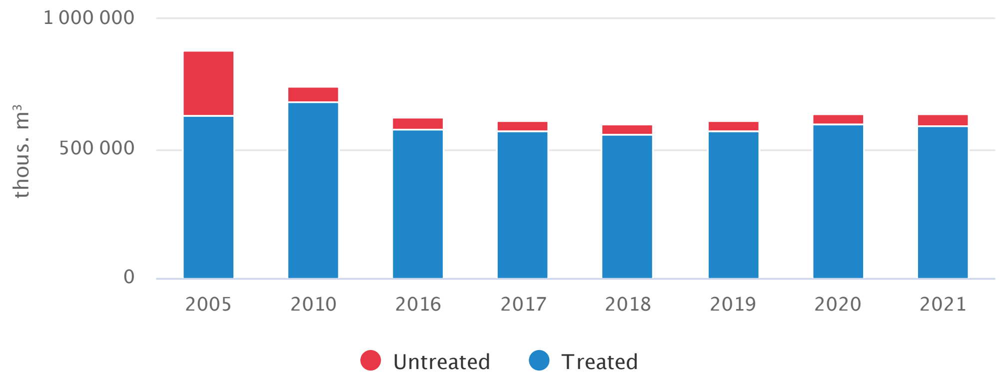
Wastewater production

In 2021, the total amount of **waste water** discharged into surface waters was 634 851 486 m^3, which was at the level of 2020, and this is a decrease of 28% compared to 2005.

Compared to the previous year, there was an increase in indicators of waste water pollution - chemical oxygen consumption by dichromate (COD_{Cr}) by 817 t. $year^{-1}$ and total nitrogen (N_{total}) by 133 t. year^{-1}. A decrease of 186 t. year^{-1} was recorded in the indicator biochemical oxygen consumption (BOD_5). Total phosphorus (P_{total}), insoluble substances (IS) and non-polar extractables NPE_{uv} were approximately at 2020 levels.

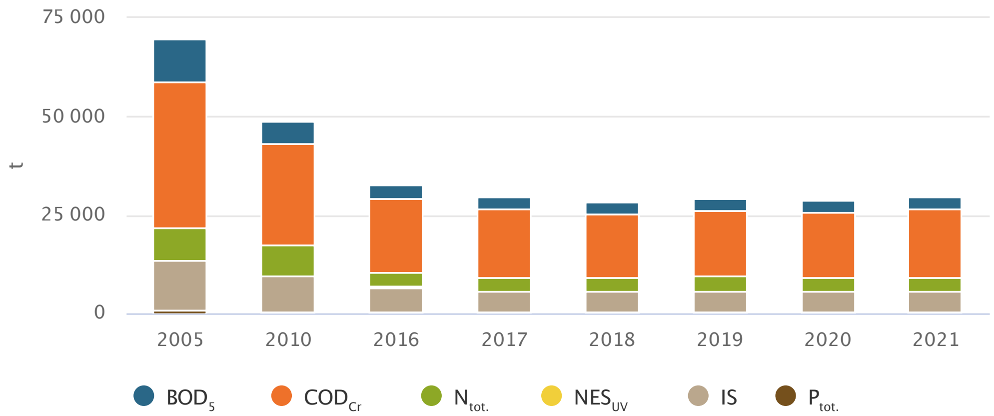
The **share of discharged treated** waste water to the **total amount of waste water** discharged into streams in 2021 was 93.30%.

Chart 008 | Trend in discharges of treated and untreated waste waters into watercourses



Source: SHMI

Chart 009 | Polution of waste water discharged into surface water



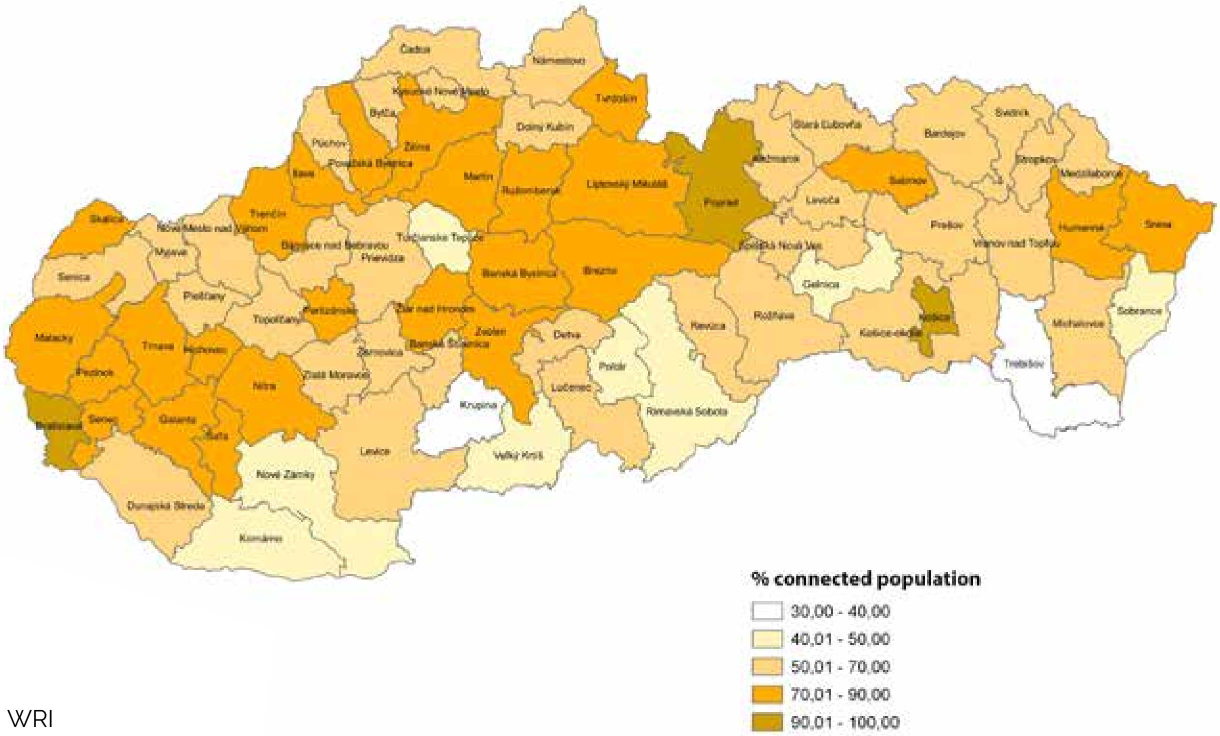
Source: SHMI

Drainage of wastewater

The **number of inhabitants** living in houses **connected to public sewerage** system in 2021 reached 3 848 272, which represents 70.62% of the total population. 1 155 municipalities (39.97% of the total number of municipalities in the Slovak Republic) had built public sewage.

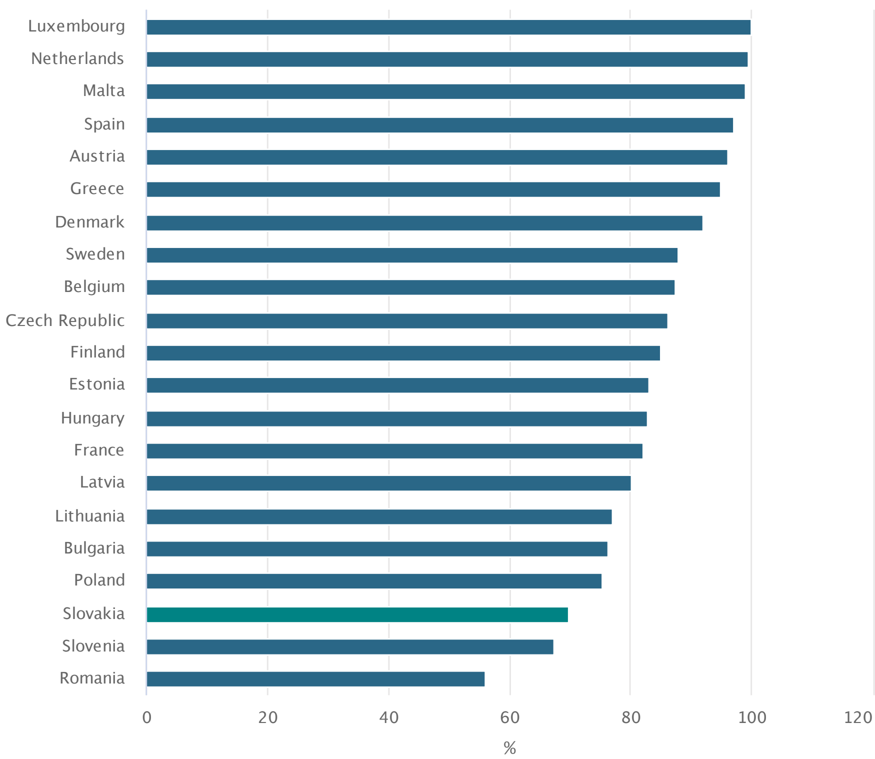
One of the goals of **Envirostrategy 2030** is to increase the proportion of wastewater treatment and achieve a 100% share of wastewater removal and treatment in agglomerations with more than 2 000 equivalent inhabitants (EI). For agglomerations with less than 2 000 equivalent inhabitants, the objective is a 50% share of wastewater removal and treatment.

Map 003 | Share of population connected to public sewerage system in individual districts of the Slovak Republic (2021)



Source: WRI

Chart 010 | International comparison of population connected to the public sewage system (2020)



Source: Eurostat

In 2021, approximately 449 mil. m³ of waste water was discharged into streams through public sewerage systems (managed by water companies, municipal authorities and other entities), a decrease of 11 mil. m³ compared to the previous year, and the amount of treated waste water discharged into public sewerage systems reached 446 mil. m³.

Table 003 | Water discharged by the public sewerage system in 2021

Water discharged by the public sewerage	Sewage	Industrial and other	Precipitation	Separate	Total
	(thous. m³)				
Treated	127 392	85 340	50 682	181 752	445 909
Untreated	374	306	876	1 842	3 439
Total	**127 766**	**85 646**	**51 558**	**183 594**	**449 348**

Surce: WRI

Sewerage sludge is a necessary by-product of the waste water treatment process. In 2021, the total production of sludge from municipal wastewater treatment plants was 54 764 tons of sludge dry matter, while 50 064 tons of sludge dry matter was reused (91.38%).

Table 004 | Sludge generated in wastewater treatment plants (t)

Year	Sludge quantity (tonnes of dry matter)							
	Total	Recovered				Disposed of		Temporarily stored
		application on agricultural land	application on forest land	composting and other recovery	energy recovery	incinerated	stored	
2005	56 360	5 870	0	33 250	0	0	8 530	8 710
2010	54 760	923	0	47 140	0	0	16	6 681
2021	54 764	0	0	37 289	12 753	0	456	4 266

Surce: WRI

BATHING WATER QUALITY

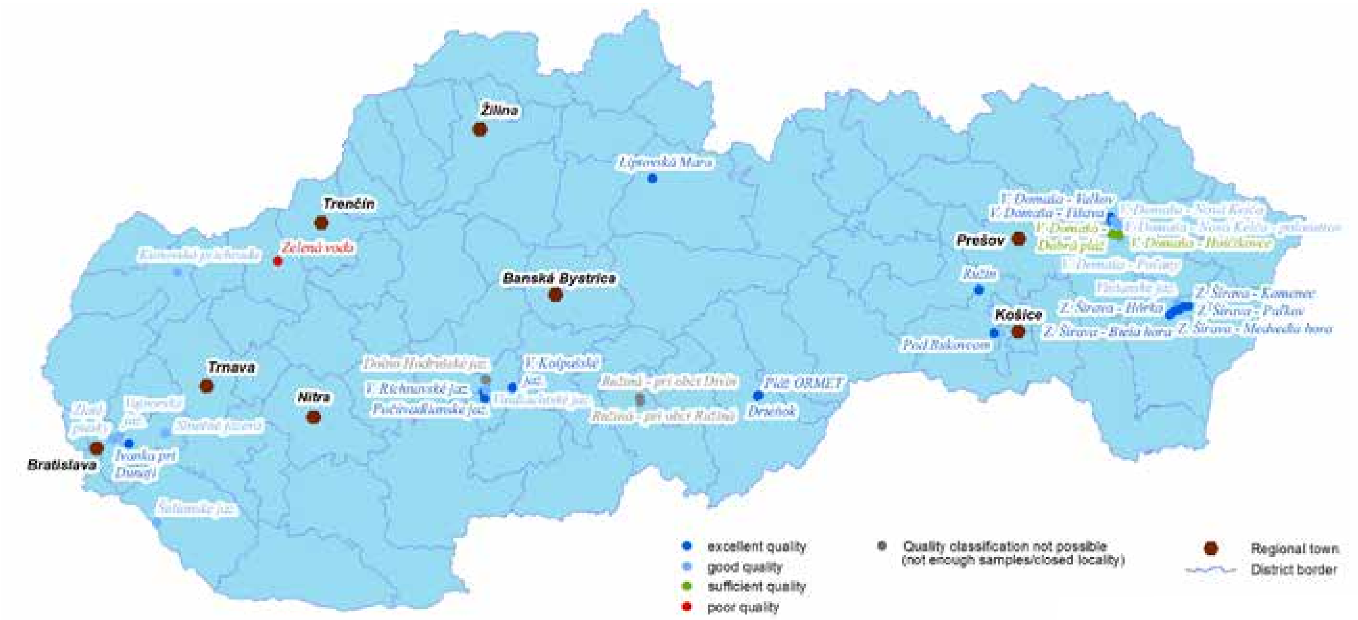
The 2021 bathing season was largely affected by the anti-epidemic measures issued due to the ongoing COVID-19 pandemic. In natural water bodies and artificial swimming pools, the hygienic situation was monitored by public health authorities in accordance with **Act No. 355/2007 Coll. on the protection, support and development of public health and on the amendment and supplements to certain acts, as later amended, as well as by Decree of the Ministry of Health of the Slovak Republic No. 308/2012 Coll. on the requirements for water quality, water quality control and the requirements for operation, equipment of operating areas, premises and facilities at the natural swimming pool and artificial swimming pool, and by the Decree of Ministry of Health of the Slovak Republic No. 309/2012 Coll. on requirements for bathing water.**

During the 2021 season, more than 80 natural water bodies were monitored with varying frequency. Organized recreation took place at 9 locations, i.e., these water bodies were operated as natural swimming pools. 477 water samples were taken from which 4 155 water quality indicators were examined. The limit value (LV) of the determined indicators was exceeded in 30.61% of the total number of samples, and in 5.39% of the total number of indicators.

Within the scope of natural sites in the Slovak Republic. In the 2021 bathing season, 31 locations were included in the list of bathing waters. 16 bathing water sites were classified by the European Commission as sites with excellent quality of bathing water, 10 sites had good quality of bathing water, 2 sites had sufficient water quality and one site had insufficient quality of bathing water. Due to the reconstruction and release of water from water reservoirs, it was not possible to classify 2 sites in 2021 - *Ružiná - near the villages of Divín* and *Ružiná - near the village of Ružiná,* and due to the unavailability of data from 4 consecutive bathing seasons, it was not possible to classify Dolno Hodrušské jazero.

During the 2021 bathing season, no diseases or health complications that would be related to swimming in a natural swimming pool were recorded.

Map 004 | Bathing water quality in the season of 2021



Source: PHA SR, EC, SEA

2 EFFECTIVE PROTECTION OF NATURE AND LANDSCAPE

KEY QUESTIONS AND KEY FINDINGS

What is the conservation status of species and habitats of European importance?

The conservation status of species and habitats of European importance in Slovakia shows a deterioration for 2013-2018 (according to the 3rd evaluation report for the European Commission), but this is a consequence of improved knowledge, so in fact their conservation status is more or less the same as in the previous evaluation periods. 75% of species and 60.4% of habitats of European importance were in unfavourable condition (unsuitable or bad).

What is the state of individual plant and animal species and development in preventing its deterioration?

The threat of lower plants in the Slovak Republic is currently 11.7% and the threat of higher plants is 14.6%, while 22.1% of higher plants occurring in the Slovak republic are protected. Among animals, 24.2% of vertebrates and 6.5% of invertebrates are in threat, while over 3% of species are protected in total. In 2021, rescue programs for 8 animal species and management programs for 3 animal species were implemented.

What is the state and development of territorial protection in the Slovak Republic?

Currently, there are a total of 1,183 small-size protected areas and 23 large-size protected areas of the national system, while the total area of protected areas classified by protection levels (2nd - 5th) is 1,148,958 ha (without mutual overlaps), which is 23.4% of the area of the Slovak Republic.
In 2021, 76 new nature reserves with a total area of 6,462.42 ha were created for the Primary forests of Slovakia.

At the end of 2021, the National Council of the Slovak Republic approved the reform of national parks, thereby taking the first step in the transition to unified management of state-owned lands located in national parks. A draft material was prepared for the negotiations of the Government of the Slovak Republic for the addition of 97 sites to the national list of Sites of Community Importance (within the European system of protected areas – Natura 2000) on an area of more than 10,000 ha.
Expert proposals for 9 management programs for Special Protection Areas were processed too.

Was there progress in the evaluation of ecosystem services?

In 2021, Regulation (EU) No. 691/2011 of the European Parliament and of the Council on environmental accounts was amended to add new modules to this regulation, including ecosystem accounts.
The Carpathian Ecosystem Services Toolkit (CEST) was developed within the Interreg CENTRAL EUROPE project "Central parks", which provides practical steps for developing and using ecosystem services in decision-making processes and policies in many areas.

BIODIVERSITY

Monitoring of species and habitats

As part of the monitoring of habitats and species of European importance, **2,237 field visits** to permanent monitoring sites were performed, while the data were recorded and approved through the Comprehensive Information and Monitoring System (KIMS), published at the portal www biomonitoring sk.

As part of the **preparation of the monitoring of birds of European importance**, complex monitoring methodologies were developed **for more than 200 bird species**. A draft was prepared to establish more than 5,000 permanent monitoring sites (PMS).

Species protection

Endangerment of species

In Slovakia, according to the current red lists, **1,047 species of lower plants are currently threatened** (in the categories CR - critically endangered, EN - endangered and VU - vulnerable, according to IUCN), while almost half of bryophytes and almost a quarter of lichens are threatened. **527 species of higher plants** are threatened.

According to the **current red lists of animals, 1,636 invertebrates and 100 vertebrate taxa are threatened** in Slovakia (in categories CR, EN and VU, according to IUCN).

Among **the most threatened invertebrates** are cockroaches (44.4%), mayflies (34.2%), dragonflies (33.3%) and also molluscs and spiders (up to 30%). Of the **vertebrates**, lampreys (100%) and amphibians with reptiles (over 40%) are the most threatened.

Trade in endangered species

In 2021, **the MoE SR granted**, as the **head of the Executive of the Slovak Republic, 2,574 exemptions** from the prohibition of commercial activities under **the Convention on International Trade in Endangered Species of Wild Fauna and Flora** (CITES Convention) in accordance with Article 8, par. 3 of Council Regulation (EC) No. 338/97 on the protection of species of wild fauna and flora by regulating trade therein, three approvals for the relocation of live animals according to Article 9 of the Council Regulation and 164 permits for import/export/re-export in accordance with Articles 4 and 5 of the Council Regulation.

The **scientific body** of the Slovak Republic is **the State Nature Conservancy of the Slovak Republic** (SNC SR), and employees of the individual offices of the SNC SR were called to 14 death cases in connection with the supervision of the handing over of dead animals of selected species of felines for disposal or further processing.

Protection of species

In the sense of **the Decree of the MoE SR No. 170/2021 Coll., implementing Act No. 543/2002 Coll. on the nature and landscape protection**, as later amended (hereinafter referred to as the "Nature and Landscape Protection Act"), **1,153 species and subspecies of plants** occurring in the Slovak Republic are protected, including 798 species of higher (vascular) plants, 222 species of bryophytes, 44 species of lichens and 89 species of higher fungi occurring in the Slovak Republic.

The number of **protected animals occurring in the Slovak Republic is 965 taxa**, of which 486 are vertebrate taxa (including the entire taxonomic group of birds, as all species of naturally occurring birds in the territory of the Slovak Republic are protected).

Care for protected and endangered species

In 2021, no rescue programs of higher plant species were processed or implemented.

Table 005 | Rescue programs (RP) and management programs (MP) for animal species

Type of program	Implementation in 2021 (species)
Rescue programs	RP of Colias myrmidone RP of Parnassius apollo for the years 2017-2021 RP of Emys orbicularis for the years 2017-2021 RP of Falco vespertinus for the years 2018-2022 RP of Tetrao urogallus for the years 2018-2022 RP of Tetrao tetrix for the years 2018-2022 Common RP of Botaurus stellaris and Aythya nyroca for the years 2019-2023
Management programs	MP for Canis lupus in Slovakia MP for Lynx lynx in Slovakia MP for Ursus arctos in Slovakia

Source: SNC SR, MoE SR

Within **20 breeding** and **7 rehabilitation stations, 1,838 individuals** of injured or otherwise handicapped animals were rehabilitated in 2021 (**birds – 1,550** individuals, **mammals – 278** individuals, **others – 10** individuals). **975 individuals** were released back into the wild (including 784 birds, 182 mammals and 9 others).

From the point of view of saving animals **in situ**, in 2021 the nature and landscape protection organizations organized transfers of 100 individuals of **ground squirrels** within the project LIFE Syseľ.

In 2021, within the framework of the organizational units of SNC SR, **143 nests** of 8 species of raptors (eastern imperial eagle, golden eagle, lesser spotted eagle, peregrine falcon, saker falcon, Eurasian eagle-owl, white-tailed eagle, red kite) were guarded and **171 young were successfully hatched** in them.

SNC SR ensures the **installation of foil barriers** on problematic road sections during the spring migration of amphibians and the subsequent **transfer of amphibians**, mainly frogs, across the body of the road. In total, 90,478 amphibians **were transferred** in 2021, while 15,100 m of barriers for amphibians **were installed**, of which 9,120 m were outside the protected areas.

Invasive species

In 2021, in accordance with Article 13 of the Regulation No. 1143/2014 of the European Parliament and the Council (EU) on the prevention and management of the introduction and spread of invasive alien species, a comprehensive analysis of the penetration routes of invasive alien species of concern to the EU and at the same time as species of concern to the Slovak Republic was prepared. As a follow-up to the analysis, an **action plan was developed to solve the problem of penetration routes of unintentional introduction and unintentional spread of invasive alien species in the territory of the Slovak Republic and in the territory of the EU through the territory of the Slovak Republic**. This action plan is intended to identify problem areas through which invasive alien species may enter the territory, and thereby support better protection against their introduction.

Invasive plant species

The **trend** of invasive alien plant species **continues to worsen**. This is mainly related to the relatively large occurrence of these species on land with unknown or unsettled ownership, on which regular care is not provided (e.g., mowing, grazing), but also to the insufficiently effective enforcement of legislation governing the prevention and management of the introduction and spread of invasive alien species. Populations of invasive alien plant species are expanding, as activities to eliminate them are insufficient and, above all, are not performed comprehensively and systematically.

The **list** of invasive alien plant species **of concern to the Slovak Republic (the so-called national list)** is given in Annex No. 1 of the **Regulation of the Government of the Slovak Republic No. 449/2019 Coll.**, which issues a list of invasive alien species of concern to the Slovak Republic and includes **three species** and **one genus** of herbs and **three species of trees**:

- low ragweed (*Ambrosia artemisiifolia*)
- Canadian goldenrod (*Solidago canadensis*)
- giant goldenrod (*Solidago gigantea*)
- buckwheat (*Fallopia sp.; syn. Reynoutria*)
- desert false indigo (*Amorpha fruticosa*)
- matrimony vine (*Lycium barbarum*)
- ash-leaved maple (*Negundo aceroides*)

The **list** of invasive alien plant species of **concern to the Union (the so-called EU list)** is set out in Commission Implementing Regulation (EU) No. 2016/1141. The list includes 36 species of invasive alien plants, of which only 5 species were confirmed to occur in Slovakia:

- common milkweed (*Asclepias syriaca*)
- giant hogweed (*Heracleum mantegazzianum*)
- western waterweed (*Elodea nuttalii*)
- Himalayan balsam (*Impatiens glandulifera*)
- tree of heaven (*Ailanthus altissima*)

In **2021, 565 sites were mapped**, within which data were recorded for **36 species** of invasive alien plants and plants with a potentially invasive character. **The most frequently reported species** in the protected areas (PA) were Asclepias syriaca, Ambrosia artemisiifolia, Fallopia sp., Impatiens glandulifera, Solidago canadensis, Solidago gigantea, Conyza canadensis, Robinia pseudoacacia, Stenactis annua, Helianthus tuberosus and Impatiens parviflora.

In **2021,** the removal of alien and invasive alien plant species was performed at 46 sites **in the PA** on an area of 6.57 ha (which followed on from the measures implemented in the previous years as well). It concerned **19 species** of alien and invasive alien plant species: Ailanthus altissima, Ambrosia artemisifolia, Asclepias syriaca, Aster novi-belgii, Fallopia sp., Fraxinus americana, Fraxinus ornus, Heracleum mantegazzianum, Impatiens glandulifera, Lycium barbarum, Negundo aceroides, Pinus nigra, Pteridium aquilinum, Robinia pseudoacacia, Solidago sp., Stenactis annua.

Outside the PA, 8 species of alien and invasive alien plant species were removed (Abutilon theophrastii, Ambrosia artemisifolia, Bunias orientalis, Fallopia japonica, Heracleum mantegazzianum, Iva xanthiifolia, Stenactis annua, Solidago canadensis) at 16 sites on an area of 1.9 ha.

Invasive animal species

The list of invasive alien species of animals of concern to the Slovak Republic (the so-called national list) is given in Annex No. 2 of Government Regulation No. 449/2019 Coll. and includes ten species (two species of molluscs, six species of fish, one species of reptiles, one species of mammals):

Mollusca – molluscs

- Iberian slime (*Arion lusitanicus*)
- Chinese pond mussel (*Sinanodonta woodiana*)

Pisces – fish

- black bullhead (*Ameiurus melas*)
- three-spined stickleback (*Gasterosteus aculeatus*)
- racer goby (*Neogobius gymnotrachelus*)
- monkey goby (*Neogobius fluviatilis*)
- bighead goby (*Neogobius kessleri*)
- round goby (*Neogobius melanostomus*)

Reptilia – reptiles

- painted turtle (*Chrysemys picta*)

Mammalia – mammals

- American mink (*Mustela vison*)

The **list** of invasive alien animal species of **concern to the Union (the so-called EU list)** is set out in Commission Implementing Regulation (EU) No. 2016/1141. The list includes **30 species** of invasive alien animals, of which **15 species** were confirmed to occur in Slovakia: Myocastor coypus, Orconectes limosus, Oxyura jamaicensis, Pacifastacus leniusculus, Procambarus clarkii, Perccottus glenii, Pseudorasbora parva, Procyon lotor, Trachemys scripta, Nyctereutes procyonoides, Ondatra zibethicus, Lepomis gibbosus, Procambarus fallax f. virginalis, Alopochen aegyptiacus, Corvus splendens.

Habitats

The **practical care** of habitats was aimed at replacing the missing traditional management of grasslands and consisted mainly in the elimination of encroached trees, mowing of biomass and its removal from the sites. These measures were performed **on 170 sites** with **a total area of 290.69 ha in the PA** and on **25 gene pool areas with a total area of 12.62 ha.**

Summary of the conservation status of species and habitats of European importance and the conservation status of birds

The subject of monitoring in Slovakia is 150 species of animals, 50 species of plants and 66 types of habitats of European importance within two biogeographical regions - Alpine and Pannonian. The third report on the conservation status of species and habitats of European importance (for the years 2013-2018) for Slovakia was submitted to the European Commission in 2019.

Chart 011 | Comparison of conservation status of spieces of European importance

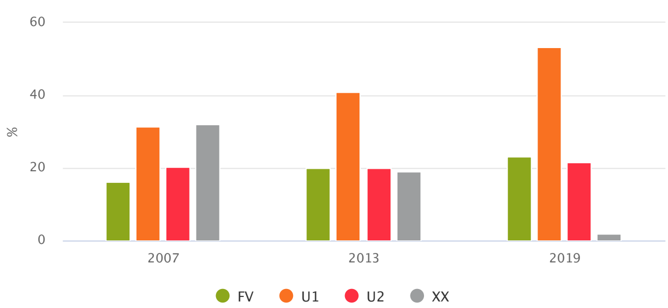
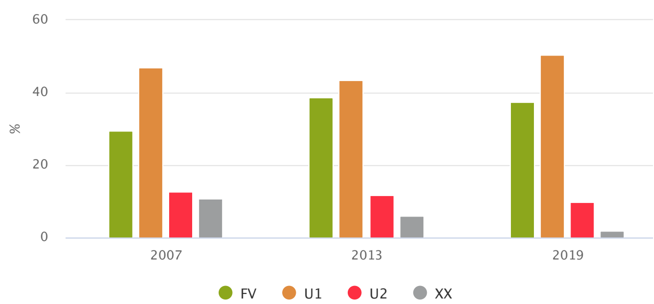


Chart 012 | Comparison of conservation status of habitats of European importance



Note: FV – Favourable, U1 – Unfavourable - unsatisfactory, U2 – Unfavourable - bad, XX – Unknown
Source: SNC SR (reporting)

An overall assessment of the status of species and habitats of European importance was published in the document: Černecký, J., Čuláková, J., Ďuricová, V., Saxa, A., Andráš, P., Ulrych, L., Šuvada, R., Galvánková, J., Lešová, A., Havranová, I. 2020. Správa o stave biotopov a druhov európskeho významu za obdobie rokov 2013 – 2018 v Slovenskej republike. Banská Bystrica: ŠOP SR, 109 pp, ISBN 978-80-8184-076-0.

Similarly, in 2019, **the second report on the conservation status of birds in Slovakia** was submitted to the EC in accordance with Article 12 of the Birds Directive. A total of **223 bird species were evaluated.**

In terms of the status of individual bird species, the **species tied to agrarian land** in particular are in **unsatisfactory conservation status**; many species are also in the group tied to wetland habitats or forest habitats, e.g., western capercaillie (Tetrao urogallus). Another group that is in a bad status as a whole are the raptors.

The overall assessment of the conservation status of birds in Slovakia was published in the document: Černecký, J., Lešo, P., Ridzoň, J., Krištín, A., Karaska, D., Darolová, A., Fulín, M., Chavko, J., Bohuš, M., Krajniak, D., Ďuricová, V., Lešová, A., Čuláková, J., Saxa, A., Durkošová, J., Andráš, P. 2020. Stav ochrany vtáctva na Slovensku v rokoch 2013 – 2018. Banská Bystrica: ŠOP SR, 105 strán. ISBN: 978-80-8184-084-5.

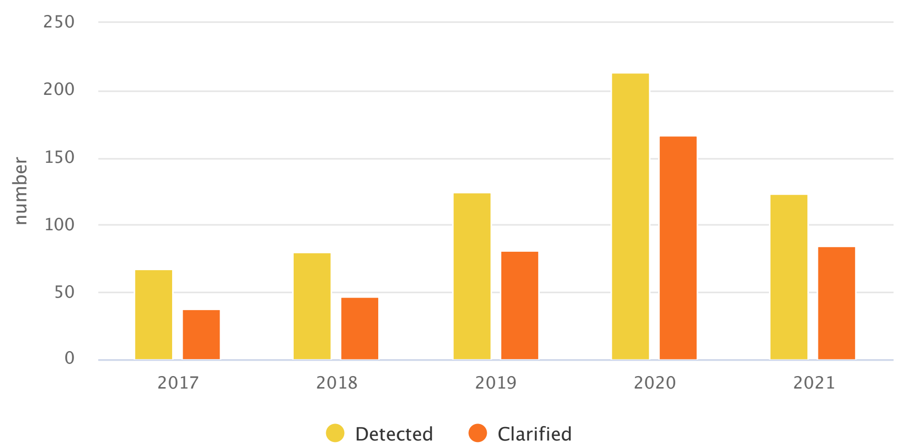
In 2021, the **exemption reporting** requirements were met. The exemption report in accordance with the Birds Directive, Article 9 (for 2020) and the exemption report in accordance with the Habitats Directive, Article 16 (for 2019-2020) were prepared and submitted to the EC.

Environmental crime - protection of plants and animals

In terms of the number of detected crimes in the framework of environmental crime, the most significant decrease in the number of cases is in poaching and violations of the protection of plants and animals. In both cases, it is **an issue of the so-called latency** - i.e., a significant number of cases remain unreported or are hidden.

In 2021, in the field of plant and animal protection, the criminal police detected **123 cases** of environmental crime (in accordance with §305 of Act No. 300/2005, the Criminal Code), **with 85 cases (69.11%) being resolved**. Compared to the previous year, the number of solved cases decreased by 3.8 percentage points.

Chart 013 | Detected and clarified criminal acts in the field of plant and animal protection



Note. The data in the graph also includes additional clarifield cases
Source: MoI SR

Implementation of law and conceptual activities in the area of biodiversity protection

Protection of biological diversity

In 2021, the MoE SR started preparing a new national strategy and action plan for biodiversity 2021-2030. It followed the implementation of the Action Plan for the implementation of measures resulting from the Updated National Biodiversity Strategy until 2020, with a link to the EU Biodiversity Strategy for 2030 and the proposal for a new Global Biodiversity Framework after 2020 according to the Convention on Biological Diversity.

Protection of wetlands

In 2021, the National Report for the Slovak Republic for COP14 (14th session of the Conference of the Contracting Parties to the Ramsar Convention) and the evaluation of the implementation of the Action Plan for Wetlands for the years 2019-2021 were prepared. Out of 65 measures, 43 or are continuously implemented, 15 measures were partially implemented, and 7 measures were not implemented. The preparation of a new action plan until 2024 also started, which, together with the evaluation, was processed as a material for government negotiations (with a submission deadline of 2022).

Among the implemented activities in the protection of wetlands, there were the following:

- preparation of new measures for the protection and management of wetlands within the Strategic Plan of the Common Agricultural Policy for the years 2023-2027,
- preparation, negotiation and approval of management programs of wetland PA,
- preparation of the Water Policy Concept of the Slovak Republic until 2030 with a view to 2050,
- preparation of the Water Plan of Slovakia,
- and other important documents and plans.

The preparation and implementation of projects for crossing barriers on water courses and revitalizing water courses and wetlands was ensured. Attention was also paid to the monitoring, mapping and care of native wetland species, mapping and removal of invasive species of plants and animals, management of wetland habitats, as well as monitoring of the hydrological regime and chemistry of cave waters.

Protected trees

As of 2021, **the system of protected trees (PT)** consisted of **429 PT** and their groups, including tree stands - protected objects (by eight less than the previous year), which represented **1,200 individual trees** (by 45 less) within **63 taxa** (of which 31 were native and 32 were non-native).

In 2021, **25 PT** and their groups (78 individuals) were **treated**. The SNC SR from its own budget, the owners of the land on which the trees grow, the municipalities on whose territory the trees grow, and resources from the Environmental Fund within the Nature Protection Program participated in the financing.

Territorial protection

National system of protected areas

On November 3, 2021, the Government of the Slovak Republic approved a regulation **declaring 76 new nature reserves** (NR) with a total area of **6,462.42 ha as the Primary forests of Slovakia**. This step means a commitment and an obligation to preserve the most valuable forests for future generations, so that the forests can be truly protected.
Thanks to the approval of NR Primary forests of Slovakia, almost another 2,500 ha of primeval forests and almost 4,000 ha of forests (which make up the rest of the nature reserves) will be protected, while approximately one third of the area of primeval forests in Slovakia is made up of the habitats of the ruffed grouse. Most of these locations are currently part of protected landscape areas, national parks (NP) and protective zones.

On 14 December **2021, the National Council of the Slovak Republic approved the reform of national parks in Slovakia**. The objective of the reform is the development of NP and a higher level of quality of life for inhabitants in the affected regions. The approved amendment **will ensure the legal subjectivity for NP and the transfer of state-owned land** management to the department of environment, which will be implemented only **after the zoning** of NP. As of 1 April 2022, the management of state-owned lands will be transferred to the management of the NP only in the territory of TANAP, PIENAP and NP Slovenský raj. As of this date, the management of state-owned lands in the 4th and 5th protection level also comes under NP. The transfer of territory management in the 3rd and lower protection level to state ownership is conditional on zoning.

Area of protected sites

The total area of specially protected parts of nature and landscape in the Slovak Republic **classified by protection levels** (2nd - 5th) **in 2021** amounted to **1,148,958 ha** (taking into account the mutual overlap of these territories), which represents **23.43%** of the territory of the Slovak Republic and an increase of 1,376 ha compared to the previous year.

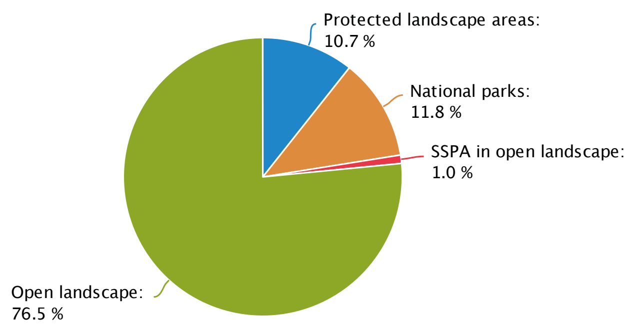
In addition to the above mentioned, protected areas (PA) of the national system in the territory of the Slovak Republic were declared, which are **not classified by protection levels - protective zones of 22 caves** (15 national natural monuments and 7 natural monuments) with a total area of **3,683 ha**. However, part of them **overlaps** with other PA of the national system.

As part of the national system of PA, there are also **municipal protected areas** in the territory of the Slovak Republic, in which the **protection levels do not apply**, but the protection conditions set by the municipalities that declare them as municipal protected areas. At the present, there are **11** municipal protected areas with a total area of **584 ha**.

In 2021, the national system of PA of Slovakia consisted of:

- 9 national parks,
- 14 protected landscape areas and
- 1,183 small-size protected areas (SSPA, i.e., +94 areas compared to the previous year).

Chart 014 | Share of protectes areas according to selected categories (2021)



Source: SNC SR

Table 006 | An overview of protected areas according to types and levels of protection

Protection level*	Category	Area (ha)	% of SR territory
1. level	„open landscape" (outside the territory of PA national system)	3 754 541.9673	76.57
2. level	PLA**, PZ of NP**, natural park, PS, PLE, D-zones	740 555.4751	15.10
3. level	NP**, natural park, PS, PLE, declared PZ of SSPA, PZ of SSPA by law, C-zones	286 134.3139	5.84
4. level	NNR, NR, NNM, NM, PS, PLE, declared PZ of SSPA, B-zones	27 942.3392	0.57
5. level	NNR, NR, NNM, NM, PS, PLE, A-zones	94 325.9045	1.92
2. – 5. level	**Protected areas of national system classified with protection level**	**1 148 958.0327**	**23.43**

* *The territories that do not have a protection level are not listed (cave protective zones and general protected areas)*
** *The area outside the SSPA which are found in them*

Source: SNC SR

State of the protected areas

The state of the SSPA included in the 2nd - 5th protection levels is evaluated **in 3 categories** of danger, while **1.5%** of these 1,172 areas (excluding municipal PA) were **degraded, 37.1%** were **in danger and 61.4%** were in an **optimal state.**

European system of protected areas – Natura 2000

The Natura 2000 system **covers** approximately **a third of the territory of Slovakia** and consists of two types of territories:

- Sites of Community importance **(SCI)** - 642 territories with an area of 615,287 ha and
- Special Protection Areas **(SPA)** - 41 territories with an area of 1,309,977 ha (according to GIS).

After deducting the mutual overlap, it is approximately 1,463 thousand ha.

Chart 015 | Overview of the mutual overlap of Natura 2000 system territories

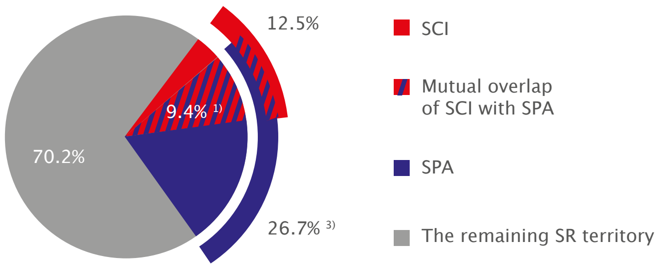
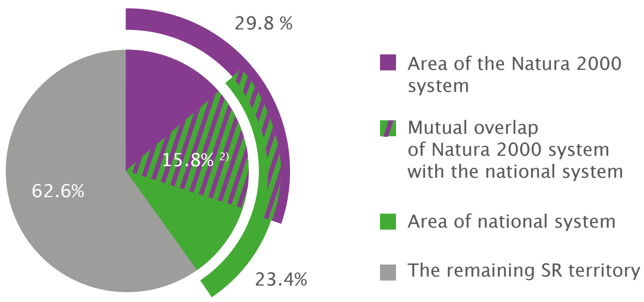


Chart 016 | Overview of the overlap of the territories of the Natura 2000 system with the national system of protected areas



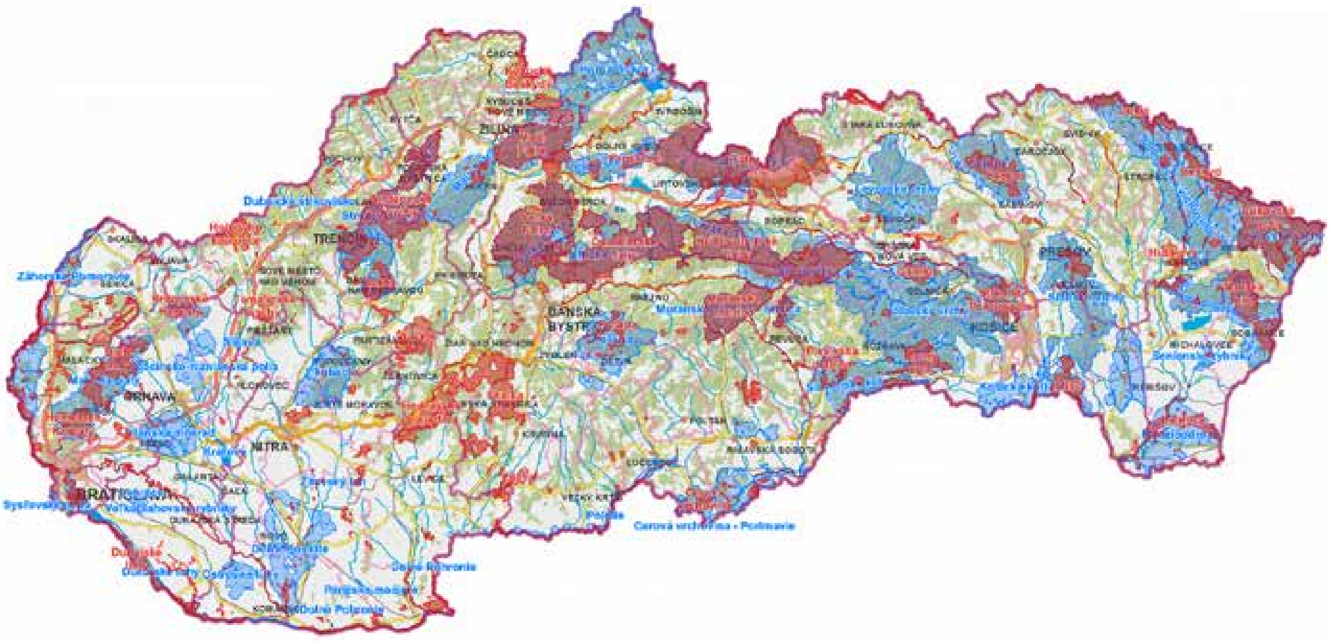
[1] mutual overlap of SCI and SPA represents 31.6% of their common area
[2] the overlap between the national PA system and the Natura 2000 system represents 42.3% of their total area
[3] the area of SPA according to GIS is 1,309,977 ha (26.7%), according to the decrees (in which there are several erroneous data), however, their area is 1,284,806 ha (26.2%)

Source: SNC SR

Sites of Community importance

- In 2021, the MoE SR, the SNC SR and the district authorities ensured the **negotiations of the 2nd phase of proposals to supplement the national list of SCI** with the owners, administrators, and tenants of the affected lands (25 negotiations took place).
- After evaluating the results of the negotiations, **a draft material was prepared for the negotiations of the Government of the Slovak Republic**, consisting of 97 sites on an area of more than 10,000 ha. These sites were defined in terms of EC requirements for the adequacy of the national list of SCI. 79 sites were defined for the protection of grass habitats (of which 4 sites are also for the ground squirrel), 9 sites are defined for the protection of fish, or lamprey, 5 sites for the protection of oak forests, 2 sites for the protection of 2 species of invertebrates, 1 site for the protection of aquatic habitats and floodplain forests and 1 site for the protection of salt marshes.
- The process of **updating and specifying the boundaries of the SCI** continued according to the pre-established rules for the preparation of the consolidated text of the national list of SCI, which will contain the SCI approved by the government since 2004.

Map 005 | European system of protected areas – Natura 2000

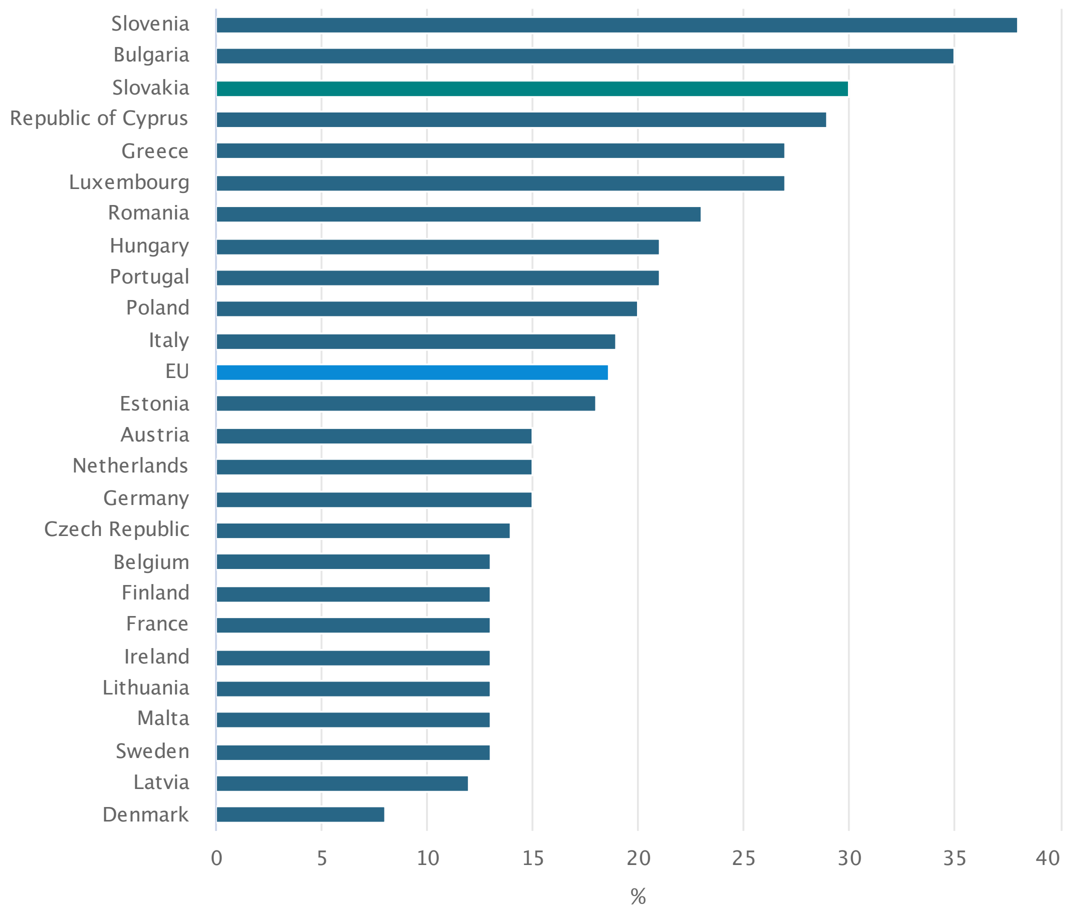


Note: red - SCI, blue - SPA
Source: SNC SR

Special Protection Areas

- **All 41 SPA locations were declared** (by generally binding legal regulations), and they cover **26.7%** of the Slovak Republic.
- The SNC SR, in cooperation with the MoE SR, **finalized** expert proposals for **management programs (MP)** for SPA, while at various stages of processing, or of approval was **9 MP** for SPA. In connection with new Decree No. 170/2021 Coll., **their outline was simplified** and, according to the requirements of the EC, the protection objectives for the **objects of protection** of the concerned SPA were **supplemented**.
- In 2021, the SNC SR and the MoE SR developed **an expert draft of the MP** on the **Senianske rybníky SPA**, and the expert MP proposal for the **Medzibodrožie SPA** was also finalized. The SNC SR **processed** the MP proposals for the Tatra SPA, the Volovské vrchy SPA, the Malá Fatra SPA and the Veľká Fatra SPA.
- The **activities and measures** defined in them **are being implemented** on an ongoing basis within the framework of the already approved MP for SPA.
- **In 2021, out of a total of 41 SPA, 20 of them had MP approved by the government.**

Chart 017 | International comparison of the share of Natura 2000 sites in the total SR area



Source: EC (Natura 2000 Barometer, EU-27)

Territories of international importance

Most of the territories of international importance are also part of the national system of PA. If this is not the case, according to §28b, par. 3 of the Act on Nature and Landscape Protection, they should be declared a protected area.

Areas with the European Diploma of the Council of Europe for protected areas

- NNR Dobročský prales (1998),
- NP Poloniny (1998).

Both protected areas received this prestigious international award again in 2018 for another ten-year period.

Biosphere reserves

(within the UN Man and Biosphere Programme - MaB)

- Biosphere Reserve (BR) Poľana (1990),
- BR Slovenský kras (1977),
- BR Východné Karpaty (1998; trilateral BR: Poland/Slovakia/Ukraine),
- BR Tatry (1992; bilateral BR: Poland/Slovakia).

Ramsar sites

(within the framework of the Convention on Wetlands of International Importance especially as Waterfowl Habitat, the so-called Ramsar Convention)

Table 007 | Overview of Ramsar sites in Slovakia

Ramsar site name (RS)	Area (ha)	District	Registration date
1. Paríž Marshes	184,0	Nové Zámky	2.7.1990
2. Šúr	1 136,60	Pezinok	2.7.1990
3. Senné Fishponds	425,0	Michalovce	2.7.1990
4. Danube Flood Plains	14 488,0	Bratislava II, V, Senec, D. Streda, Komárno	26.5.1993
5. Morava Flood Plains (Trilateral Transboundary RS Floodplains of the Morava-Dyje-Danube Confluence : Austria - Czech Republic - Slovakia)	5 380,0	Bratislava IV, Malacky, Senica, Skalica	26.5.1993
6. Latorica	4 404,7	Michalovce, Trebišov	26.5.1993
7. Rudava River Valley	560,0	Malacky, Senica	17.2.1998
8. Turiec Wetlands	750,0	Martin, Turčianske Teplice	17.2.1998
9. Poiplie (Transboundary RS Ipoly Valley - Poiplie : Hungary - Slovakia)	410,9	Levice, Veľký Krtíš	17.2.1998
10. Wetlands of Orava Basin	9 287,0	Námestovo, Tvrdošín	17.2.1998
11. Orava River and its Tributaries	865,0	Dolný Kubín, Tvrdošín	17.2.1998
12. Domica (Transboundary RS Baradla - Domica Cave System : Hungary - Slovakia)	622,0	Rožňava	2.2.2001
13. Tisza River (Transboundary RS Upper Tisza Valley : Hungary - Slovakia)	734,6	Trebišov	4.12.2004
14. Caves of the Demänová Valley	1 448,0	Liptovský Mikuláš	17.11.2006
Total	**40 695,8**	**0.8% of SR territory**	

Source: SNC SR

Protection of the caves

In 2021, **two new cave protective zones** (PZ) were declared, and in the case of one PZ, its area was **expanded. Four new cave hatches were built**, and one damaged cave hatch was repaired. Four sites were **cleaned** of municipal and biological waste. **Inspections of inaccessible caves** aimed at identifying damage to caves and their closures took place throughout Slovakia during the year.

As of 2021, **7,723 caves were registered** in the Slovak Republic, which are also natural monuments according to the Act on Nature and Landscape Protection. Of these, **44 of the most significant** were included among the **national natural monuments. 19 caves were made accessible,** of which the SNC SR - Administration of Slovak Caves **operated 13 caves**. The number of **caves freely accessible to the public** was **45**, and the total number of **caves with a declared protective zone** was 22.

3 SUSTAINABLE LAND MANAGEMENT

KEY QUESTIONS AND KEY FINDINGS

What is the state and trend in land use?

In 2021, the total area of the Slovak Republic was 4,903,391 ha, of which the proportion of agricultural land was 48.4%, forest land 41.4% and non-agricultural and non-forest land 10.2%. Between 2005 and 2021, the area of agricultural land decreased by 2.4% (-59,416 ha) to the current 2 373 563 ha. An increase was recorded in the area of water surfaces by 2.2% (+2 024 ha) and forest land by 1.2% (+23 275 ha), while the largest percentage increase compared to 2005 occurred in built-up areas and courtyards by 6.2 % (+13 913 ha). The area of agricultural land is constantly decreasing, mainly in favour of built-up areas and courtyards.

Is soil quality deteriorating?

The development of soil contamination with hazardous substances after 1990 was very gradual, without significant changes. Almost 99% of the agricultural land fund is hygienically satisfactory. The remaining part of the contaminated soil is mainly tied to the areas of industrial activity and the areas of influence of the so-called geochemical anomalies - mountain and foothill areas.

A direct indicator of the state of soil acidification is the value of the soil reaction, which affects the course of most chemical reactions in the soil. A comparison of the results of the monitoring cycle (2006 – 2011) of agrochemical soil testing and the most recently completed cycle (2012 – 2017) showed an increase in the representation of agricultural soils with an acidic soil reaction by 0.5 percentage points and an alkaline soil reaction by 2.9 percentage points. On the contrary, there was a decrease in the proportion of agricultural soils with slightly acidic and neutral soil reaction, by 1.7 percentage points for both. The partial values processed for the years 2018 – 2021 show that there was an increase in the representation of agricultural soils with a slightly acidic soil reaction. Almost 47.7% of agricultural soils have a low phosphorus stock, and on the contrary, 51.5% of soils have a good potassium stock and 84.2% a good magnesium stock. In 2021, 303 747 ha of agricultural land in the Slovak Republic was threatened by current water erosion of varying intensity (erodibility categories from moderate to extreme).

As a result of maintaining the profitability of agricultural production, the use of powerful mechanization is becoming standard, which exerts considerable pressure on the physical sate of soils and leads to their compaction. Compaction resistance increases from heavy to light soils. In terms of the entire monitoring period (1993 – 2018), a predominantly negative trend was recorded in the development of topsoil compaction in the monitored soil types (except for clay cambaceous soils on volcanics, sandy-clay fluvial soils) and, on the contrary, a predominantly positive trend in the subsoil for sandy-clay soils (except for clay fluvial soils) and clayey-loamy cambaceous soils).

Soil salinization processes are not very widespread in our conditions. They are applied in warm areas with a predominant evaporative soil regime, on flat elements of the relief with a high level of strongly mineralized underground water.

What is the state and direction of agriculture in relation to soil and water conservation?

With the changes after 1989 in the agricultural sector, in particular the reduction of intensification, there was a significant decrease in the industrial fertilizers used in agriculture. In the period 1990 – 2021, the use of nitrogen fertilizers decreased by 21.4%, the use of phosphorous fertilizers by 75.6% and potassium fertilizers by 85%. In 2021, the total usage of industrial fertilizers was 100.7 kg of pure nutrients (p.n.) per hectare of agricultural land, which was 2.7 kg p.n./ha less than in the previous year. Between 2005 and 2021, the use of industrial fertilizers increased by 55.2%. During the period of intensive agriculture, high doses of pesticides were applied in the past. While in 1980 the use of pesticides was 19 016 t, by 1993 it was reduced to 3 904.5 t, which represented a decrease of 79.5%. From 1993 to the present, the use of pesticides has been more or less increasing, and in 2021, 4 979.6 tons were applied in agriculture. Compared to the years 2005 – 2021, there was an increase in the consumption of fungicides, herbicides, as well as insecticides, while the total usage of pesticides increased by 42% during the given period.

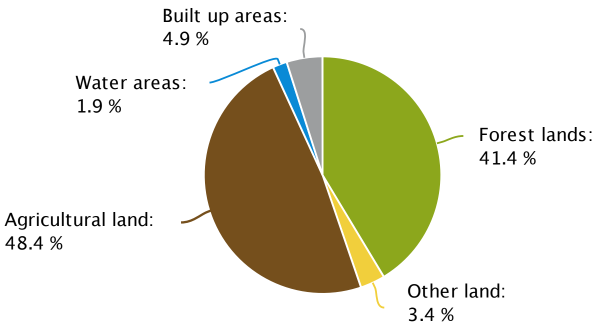
In 2005, the proportion of land with organic agricultural production was approximately only 4.4%, and with the exception of the two years 2012 and 2013, it was constantly increasing. In 2021, the area of agricultural land in the system of organic agricultural production reached a proportion of 13.57% of the total area of agricultural land, thus the goal of Envirostrategy 2030 to increase the proportion of cultivated land in the system of organic agricultural production to at least 13.5% of the total area of agricultural land was already achieved in the given year.

SOIL

Soil balance

The total area of the Slovak Republic is 4 903 391 ha. In 2021, the area of agricultural land was 2 373 563 ha, forest land 2 028 509 ha, and non-agricultural and non-forest land 501 319 ha.

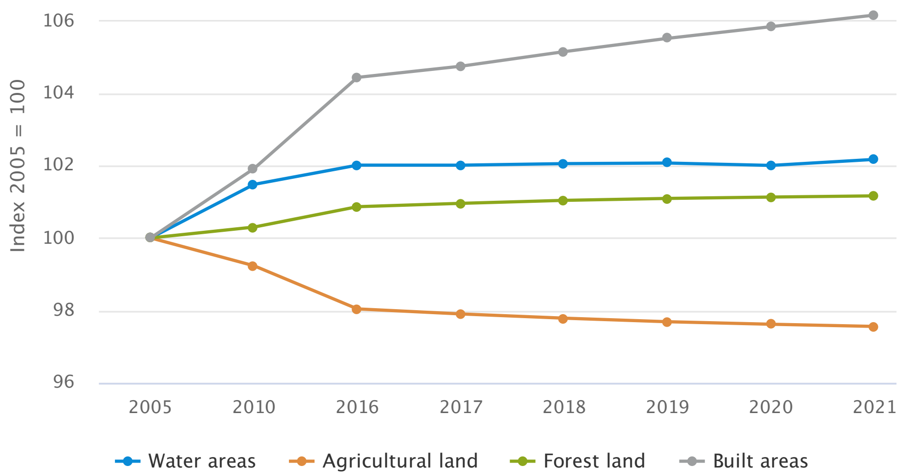
Chart 018 | Share of individual types of land in total Slovak territory (2021)



Source: GCCA SR

Anthropogenic pressure to use land for purposes other than fulfilling its primary production and environmental functions is causing its gradual decrease. The development of the land fund in the SR was marked by a further decrease of agricultural and arable land in 2021.

Chart 019 | Trend in land use changes



Source: GCCA SR

Soil quality

Soil contamination by hazardous substances

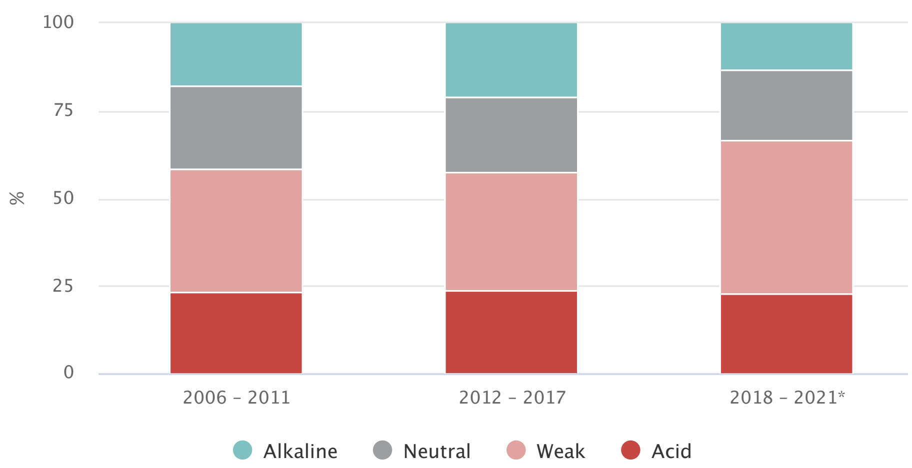
In terms of soil contamination, the main risk elements (Cd, Pb, Cu, Zn, Ni, As) were monitored in 2021, which recorded above-limit values in the previous monitoring cycle. Selected localities were analysed, in which contamination by at least one contaminant was determined after the evaluation of the 4th sampling cycle (sampling year 2007). In the evaluated groups of soils in 2021 (kambizem on flysch (permanent grassland, arable land), kambizem on acid substrates (permanent grassland, arable land), kambizem on carbonate substrates (permanent grassland, arable land) at monitored contaminated sites, based on the observations, compared to the sampling years of 2007 and 2018, recorded a positive trend in the development of the total content of As, Cd and Zn and a negative trend in the case of the total content of Ni, and, in comparison of the sampling years 2013 and 2018, a positive trend in the development of the total content of As, Zn and a negative trend in the case of the total content of Co, Ni.

The latest hygienic survey of agricultural soils in the vicinity of the former aluminium plant in Žiar nad Hronom shows that the area of soil contaminated with fluorine is slightly decreasing, as is the concentration of fluorine in the soil, which confirms the improved emission situation in the region. However, the process of reducing the concentration of the monitored and evaluated element in the soil is very slow. The average value of water-soluble fluorine in the soils located opposite the former aluminium plant is still relatively high and even currently exceeds 3 times the valid hygienic limit in soils (5 $mg.kg^{-1}$).

Soil acidification

The optimal value of soil reaction is one of the key aspects in soil evaluation. In recent decades, anthropogenic factors have significantly contributed to the changes in the soil response. The use of physiologically acidic fertilizers as well as acidic atmospheric pollutants contributed to increased acidification of soils. The results of agrochemical testing of soils during the cycles (2006 – 2011) and the last completed cycle (2012 – 2017) showed an increase in the representation of agricultural soils with acidic (+0.5 percentage points) and alkaline (+2.9 percentage points) soil reaction. On the contrary, there was a decrease in the representation of agricultural soils with slightly acidic (-1.7 percentage points) and neutral (-1.7 percentage points) soil reaction.

Chart 020 | Trend in soil reaction in agricultural land based on the results of agrochemical soil testing



*Note: * Partial values - statistically processed for years 2018 - 2021*
Source: CCTIA

In soils with a soil reaction value in the slightly acidic and acidic range, the solubility of most of the risk elements in the soil increases, which are then taken up by plants, which can lead to the penetration of heavy metals and aluminium into the food chain. The level of active aluminium in agricultural soils of the Slovak Republic is significantly lower in arable soils compared to grasslands. However, high maximum values were also measured in arable soils, which directly correlate with a lower value of the soil reaction.

Salinization and sodification

Weak – initial salinization (salt content 0.10 – 0.15%) was recorded primarily in the surface horizons of the locations of Iža, Zemná, Gabčíkovo, Zlatná na Ostrove and Malé Raškovce, medium salinization (salt content 0.15 – 0.35%) was present at the Komárno-Hadovce location and extreme salinization at the Kamenín and Žiar nad Hronom locations.
The content of exchangeable sodium in the absorption complex in the range of 5 – 10%, indicating weak sodification, was found at the Zemné location in the sub-horizontal horizons. At the Zlatná na Ostrove, Komárno-Hadovce, Malé Raškovce, Kamenín and Žiar nad Hronom locations, the content of exchangeable sodium was in the interval 10 – 20%, which characterizes salt-rich soil. The values of soil reaction (pH) as an indicator of soil sodification confirm a strongly alkaline reaction (pH>8.4) at the Kamenín and Žiar nad Hronom locations.

Organic carbon in soil

The average value of soil organic carbon (SOC) in kambizem, as well as all subtypes of kambizem in the upper soil layer (0 – 0.1 m) is significantly influenced by the method of use. The average value of SOC in permanent grasslands (3.8%) is significantly higher than in arable land (2.0%). Significantly higher inputs of organic carbon in permanent grasslands stabilize the amount of SOC in contrast to arable land, where inputs of organic carbon, due to the withdrawal of biomass of the main product, are significantly lower. Of the individual kambizem subtypes, kambizem on carbonate substrates (4.4%) have the highest average SOC value, especially on permanent grasslands, and the lowest average SOC value was found on permanent grasslands - pseudogley kambizem on flysch (3.4%). On arable land, the average values of SOC in the upper soil layer on kambizem - pseudogley and on carbonate substrates are identical (2.1%), a slightly lower average value of SOC was found in kambizem on acid substrates (1.8%).

In the deeper soil horizon (0.35 – 0.45 m), the average SOC values of kambizem soils and individual subtypes are slightly higher on permanent grasslands than on arable land, but the difference in SOC concentrations between arable lands and permanent grasslands is not as significant as in the upper layer soil (SOC/permanent grasslands – 1.0%, SOC/arable lands – 1.1%). In the deeper soil profile, the highest average SOC value for both arable lands (1.5%) and permanent grasslands (2.0%) was found in kambizem on carbonate substrates and the lowest in kambizem in acidic substrates (SOC/permanent grasslands – 0.9%, SOC/arable lands – 0.8%).

During the entire monitoring period (1993 – 2018), the SOC values in kambizem had a rather fluctuating character, but no statistically significant difference was detected between the last two samplings.

Acceptable soil nutrients

During the cycles (2006 – 2011) and the last completed cycle (2012 – 2017), there was an unfavourable development of an increase in the representation of agricultural lands with a low supply of two accessible nutrients, namely phosphorus and potassium.

Soil erosion

In 2021 in the Slovak Republic, 15.9% of the total area of agricultural land registered in the LPIS land register, which represents 303,747 ha, was threatened by current water erosion of varying intensity (erodibility categories from moderate to extreme).

Soil compaction

Kambizem covering the largest part of our territory and formed on various substrates belong to soils with a different representation of the soil skeleton, which weathers internally. With its content up to 20% and small fractions, it can have a favourable effect on the aeration of these soils. According to the results of the last 6th monitoring cycle (sampling year 2018), their physical state in terms of compaction limits slightly deteriorated in the direction from lighter to heavier soils. According to the average values of the physical properties of the soil, only the subsoil of moderately heavy kambizem on acidic substrates and variegated shale and heavy kambizem on flysch were compacted. Slightly more favourable conditions were recorded for clay soil types. In the case of the development of compaction on the monitored soil types, there was a slight improvement in the physical condition in the last 6th monitoring cycle (sampling year 2018) compared to the previous 5th cycle (sampling year 2013) in the subsoil, while mainly a slight deterioration in the topsoil. Fin terms of the entire monitoring period (1993 – 2018), a more pronounced negative trend was recorded within the topsoil of kambizem on flysch and clay kambizem on acidic substrates, a more permanent positive trend in the case of subsoil of the monitored kambizem.

AGRICULTURE

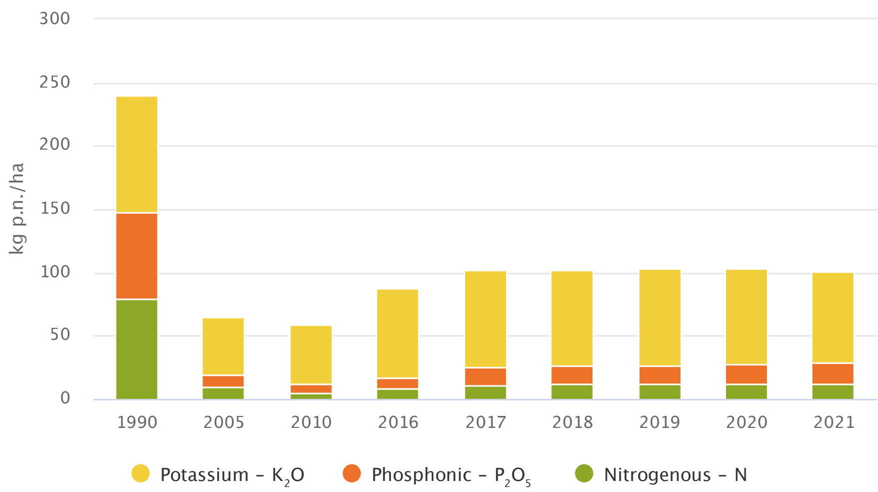
Structure of agricultural land

In 2021, the total area of agricultural land in the Slovak Republic was 2 373 563 ha. The largest part of this area was arable land 59.18% and permanent grasslands 35.78%. On the contrary, the least represented were hop farms 0.02%, fruit orchards 0.74%, vineyards 1.1% and gardens 3.18%. In 2005, the area of arable land per inhabitant was 0.265 ha, and in 2021 it was 0.258 ha.

Consumption of industrial fertilisers and pesticides

In 2021, the usage of industrial fertilizers amounted to 100.7 kg of pure nutrients (p.n.) per hectare of agricultural land. With the changes after 1989, there was a significant decrease in the industrial fertilizers used in the agricultural sector. Since 2005, however, the use of industrial fertilizers has had a fluctuating nature with a tendency to increase again.

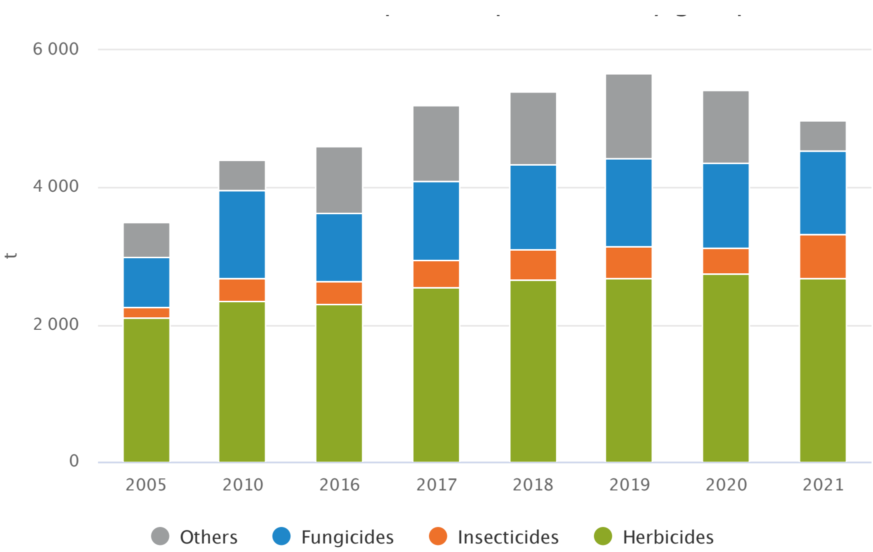
Chart 021 | Trend in the consumption of industrial fertilisers converted to N, P_2O_5 and K_2O



Source: CCTIA

In 2021, a total of 4 979.6 tons of plant protection preparations were applied, of which approximately 2 670.1 tons were herbicides, 1 203.2 tons fungicides, 660.5 tons insecticides and 445.8 tons other preparations.

Chart 022 | Trend in the consumption of pesticides by group

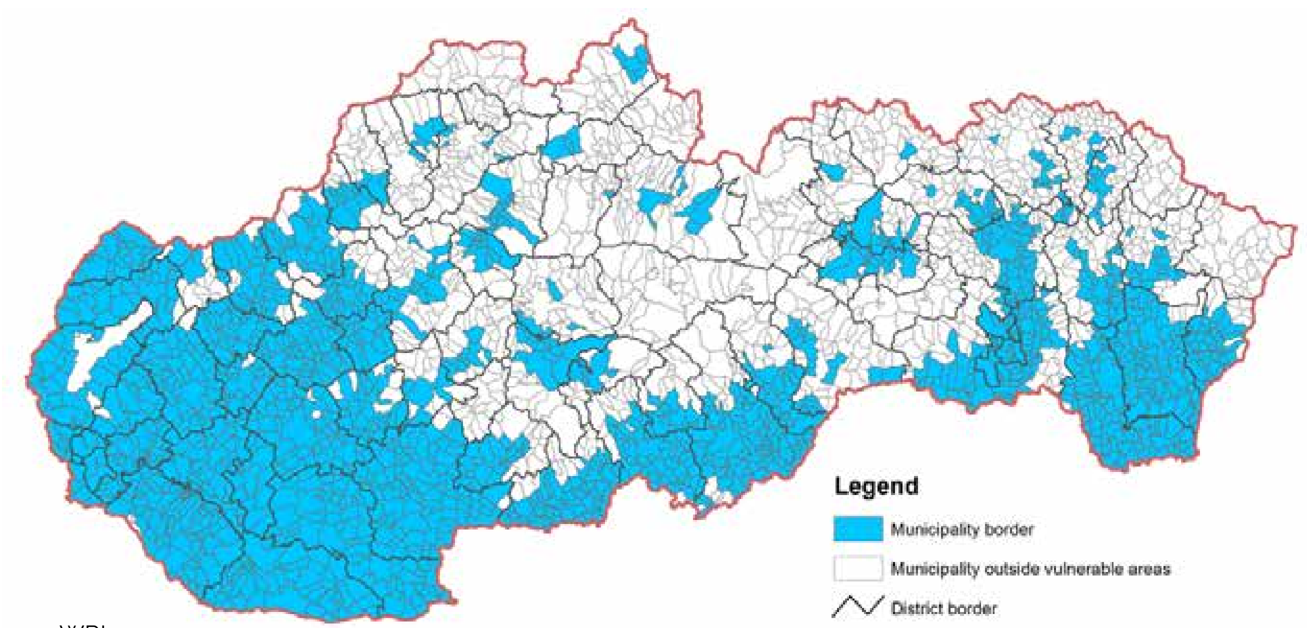


Source: SO SR

Vulnerable areas

In the territory of the Slovak Republic, vulnerable areas are defined by Regulation No. 174/2017 Coll. od the Government of the Slovak Republic, establishing sensitive and vulnerable areas. The list of vulnerable areas that was valid in 2021 contained 1 344 municipal cadastral areas, and the area of agricultural land in vulnerable areas was 11 891.47 km², which accounted for 61.6% of the area of utilized agricultural land.

Map 006 | Vulnerable areas of the Slovak Republic



Source: WRI

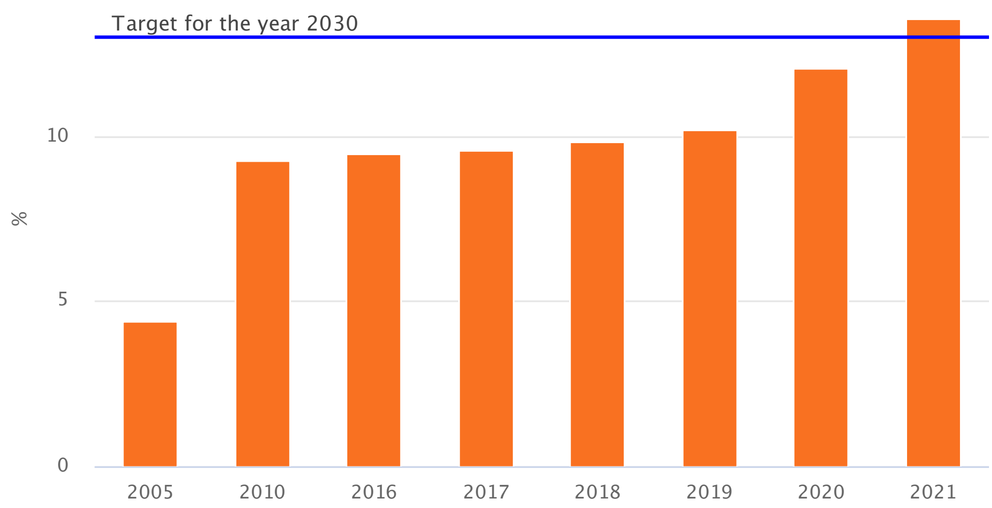
Application of sewage sludge and bottom sediments to the soil

In 2021, the total production of sludge in the Slovak Republic was 54 764 tons of dry matter, of which 37 289 tons (68.1%) were used in soil processes. Sewage sludge was not applied directly to agricultural land.

Organic agricultural production

Organic agricultural production in 2021 represented 13.57% of the total area of agricultural land. In the system of ecological agricultural production, a total of 872 entities were registered, managing an area of 249 723 ha of agricultural land. One of the main objectives of Envirostrategy 2030 for the area of sustainable land management, to increase the share of cultivated land in the system of organic agricultural production to at least 13.5% of the total area of agricultural land by 2030, was already achieved in 2021.

Chart 023 | Trend in the share of organic agricultural production land to total agricultural land



Source: CCTIA

Production of biomass and renewable energy from agriculture

In 2021, 76 facilities for the production of biogas from agriculture were in operation with a total biogas production of 2 59.4 thousand m³.

Table 008 | Total annual production of agricultural biomass suitable for heat production in Slovakia (2021)

Crop	Area (ha)	Biomass yield (tons/ha)	Biomass production (tons/year)
Thicken cereals together	555 842	5,3	2 938 215
Corn	191 479	12,9	2 464 004
Sunflower	53 545	5,1	271 440
Oil-seed rape	146 557	6,0	881 742
Orchards	6 271	1,5	9 407
Vineyards	7 727	1,5	11 591
Natural seeding from permanent grasslands	153 660	1,0	153 660
Total	**1 115 081**	**6,0**	**6 730 059**

Source: NAFC – RIPP

4

PRODUCTION OF FOREST ENVIRONMENTAL SERVICES

KEY QUESTIONS AND KEY FINDINGS

What is the state and development of forest resources?

With a forest cover of 41.3%, the Slovak Republic is one of the most forested countries in Europe. The area of forest land (FL), as well as of forest crop land, has been increasing slightly over the long term according to data from both the forest care programs and the land register.

The growing stock in the forests of Slovakia has been increasing for a long period of time. At the present, due to the age composition of forests in the Slovak Republic, growing stocks are historically the highest, but their volume is already peaking.

There is a gradual increase in carbon stocks in forest ecosystems, which is a consequence of the expansion of the forested area and, in particular, of the increase in hectare stocks of wood mass.

The forest resources utilisation (the share of timber felling in its increment) can still be assessed as sustainable, since timber felling is lower than its annual total current increment. In the long term, however, this share has grown considerably, but it has fallen more significantly in the last three years.

In the forests of the Slovak Republic, a generally suitable tree composition prevails, i.e., a favourable and varied species structure. A positive thing is the gradual reduction of the area representation of conifers compared to broadleaved ones.

The share of natural regeneration of forest stands in their overall regeneration from a long-term and medium-term point of view shows a growing trend, it also increased slightly year-on-year.

Is the state of forests improving?

Abiotic harmful agents with the dominant effect of wind (in which irregular fluctuations in damage can be noted over the long term) are largely involved in the damage to forests, while they have recorded a significant decrease year-on-year. Among the biotic harmful agents, the most significant group are bark beetles (especially the spruce bark beetle), which, from a long-term perspective, have seen a gradual increase in occurrence and harmful effects. However, in the last three years, they have been declining again. Of the anthropogenic factors, immission damage is the most significant, but it has significantly decreased since 2002. Timber theft also accounts for a high proportion of anthropogenic damage to forests.

The forest health in Slovakia, characterized by degrees of defoliation, can still be considered unfavourable, while it remains worse than the pan-European average. In 2021, the condition of broadleaved trees and trees improved slightly again, while conifers, on the other hand, deteriorated. Within individual tree species, a slightly improving trend of defoliation development has been recorded for a long period of time in the case of fir, it is stabilized in the case of spruce and worsening in the case of pine, oak, beech and hornbeam. Kysuce, Orava and the Spiš-Tatra regions remain the areas with the worst health condition of forests in Slovakia for a long period of time, which is related to the massive decay of spruce forest stands.

How are the functions of forests distributed and used?

Forests, by their very nature, fulfil both productive (economic) and non-productive (public utility) functions or services at the same time. The most represented category of forests according to their function are production forests (PdF), followed by protection forests (PtF) and the least represented are special-purpose forests (SPF). Since 2000, there has been a renewed increase in the area of PdF at the expense of SPF. The area of PtF has been stabilized for a long period of time.

Timber felling in the forests of the Slovak Republic has had a long-term growing trend, which resulted mainly from the large scale of incidental felling due to the action of harmful agents, but also from the gradual shift of the currently over-represented age stages to the age of extreme maturity. Since 2018, there has been a decrease in timber felling, although it has increased slightly year-on-year, but it was the second lowest volume of felling (after 2020) since 2005. After a long-term undesirable trend in their growth, the spring stocks of wild game decreased slightly (mainly deer, roe deer and wild boar).

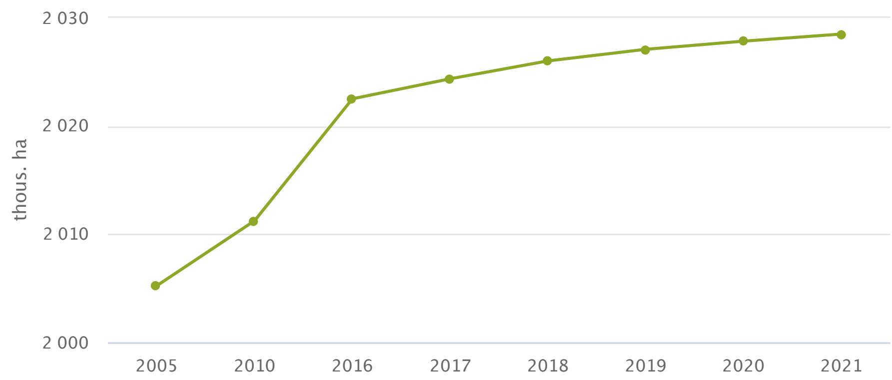
FORESTRY

Preservation of forest resources

Forest area

The **forest cover** of the Slovak Republic has been growing slightly for a long period of time and in 2021 it was approx. **41.3%.** The **area of forest land** (FL), according to the Land register, reached **2,028,509 ha** (with an annual increase of 657 ha).

Chart 024 | Trend in the area of forest land

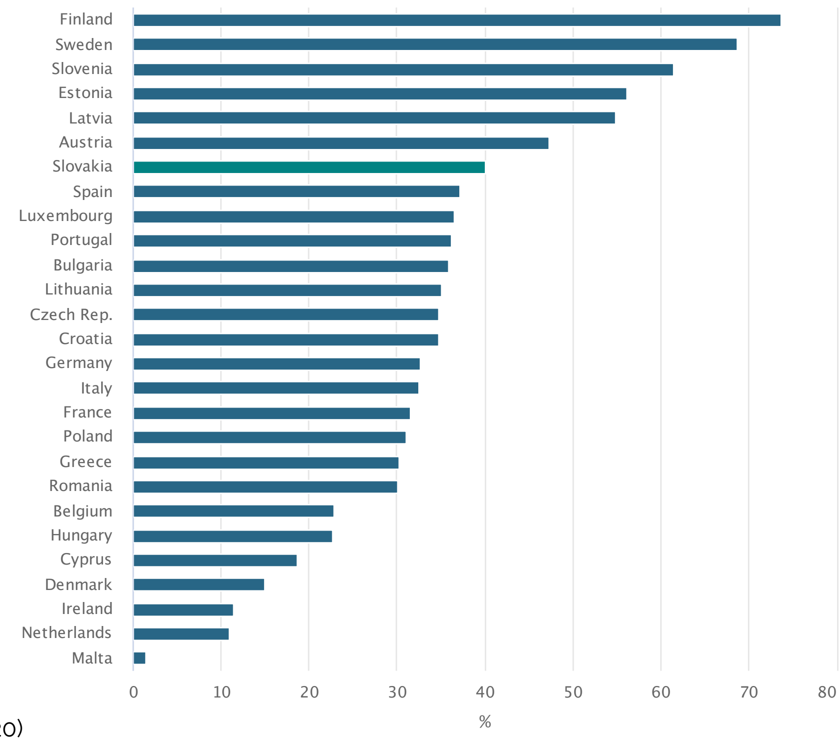


Source: GCCA SR

In addition to the FL, forest tree species also occur on agricultural and other land (the so-called **white plots**). According to the results of the second cycle of the National Forest Inventory and Monitoring of the Slovak Republic 2015-2016 (NIML 2), the area of such lands reaches **288±39 thousand ha**, which represents a significant proportion of the forest area, and after taking it into account, the actual forest cover of Slovakia is 45.7±0.9%.

According to the **State of Europe's Forests 2020 report** (FOREST EUROPE 2020), the forest cover of Slovakia is lower (40.1%) due to a different calculation (it is calculated from the area of forest stands without dwarf pine). According to the mentioned report, **the Slovak Republic is the 13th most forested country** among 43 European states, with a higher forest cover than the European average (34.8%), or EU-28 (38.3%).

Chart 025 | International comparision of the forest coverage of the EU states (2020)



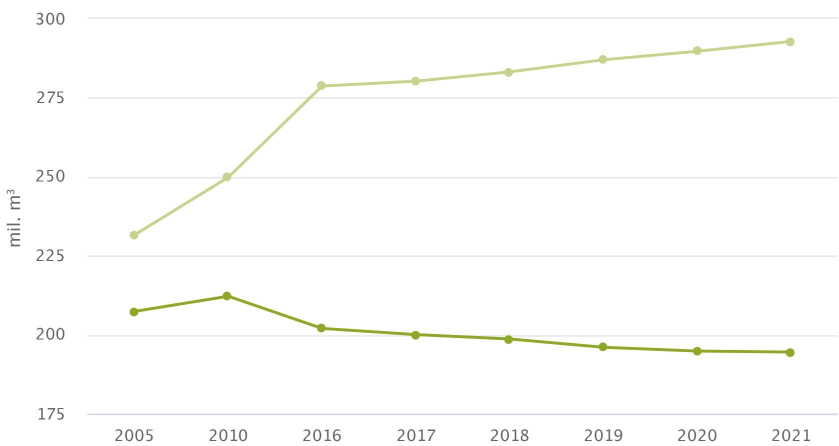
Source: FAO (GFRA 2020)

Growing stock

In the case of **growing stock** in forests, the trend of their increase continues and **in 2021** they reached **487.3 mil. m³** of timber inside bark, which is 2.8 mil. m³ more than the previous year. The stock of coniferous wood has been **decreasing** since 2010 (due to frequent damage, especially of spruce forests), on the contrary, the trend of increasing the broadleaved stock continued. In addition, according to the findings of NIML 2, there is a growing stock of 46±7 mil. m³ in non-forest land (white plots). The **average stock** of timber per hectare was **250 m³.**

At the present, the Slovak Republic has historically the highest growing stock for at least the last century, which results from the current age structure of the forests. However, due to the gradual change in the age structure, the total volume of growing stock is currently culminating.

Chart 026| Trend in growing stock in Slovak forests

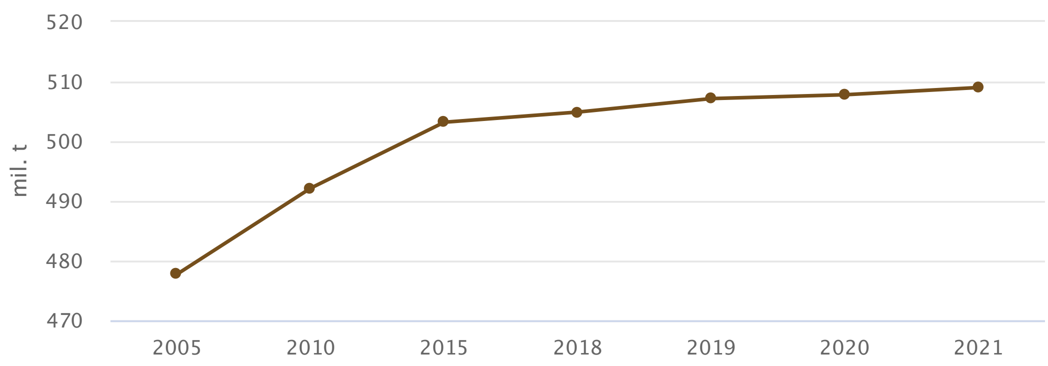


Source: NFC

Carbon stock

The carbon stock in forest ecosystems, above-ground and below-ground biomass is related to growing stock in forests and the area of forest land, while in 2021 it amounted to 509 mil. tons.

Chart 027 | Trend in carbon stock in forest ecosystems



Note: In addition to living and dead biomass, the carbon stock also includes soil carbon, wich represents a stock of around 271 mehatons (million tons).
Source: NFC

Age structure

The current age structure of forests is uneven, with a higher representation of older (mainly mature) forest stands over 70 years old and young forest stands under 20 years old, which results in cyclical changes in the provision of some forest ecosystem services.

The increase in the proportion of young forest stands is related to the high extent of forest regeneration due to the current increased harvesting possibilities, as well as the action of harmful factors (restoration of damaged forest stands).

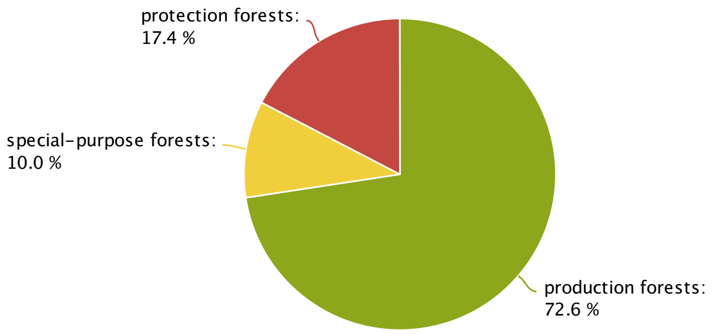
Ownership structure

The **state** organizations of forest management **own 40.4%** of the forest crop land (789,572 ha), but they **managed up to 51.2%** of the forest crop land (999,191 ha). The remaining area of forest crop land was managed by non-state entities of forest management, which own and manage private, community, church, municipal and agricultural cooperative forests.

Categorization of forests according to their functions

From the point of view of predominant functions, forests are divided into relevant categories, with the most represented category being **production** forests, followed by **protection** forests, and the least represented are **special-purpose** forests. Most production forests are multifunctional forests that, in addition to production, fulfil other associated ecological and social functions.

Chart 028 | Share of forest categories in forested land (2021)



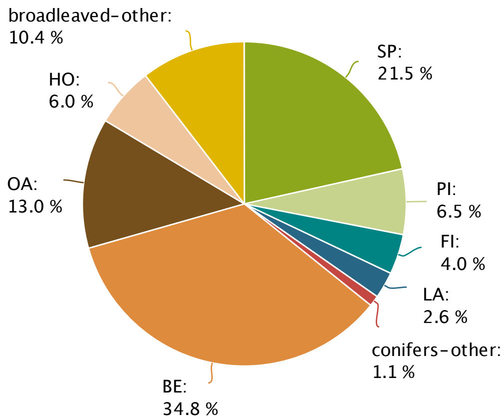
Source: NFC

Improving biological diversity in forest ecosystems

Forest composition

As of 2021, the increase in the favourable proportion of **broadleaved trees (64.2%)** compared to **conifers (35.8%)** continued. Compared to 2020, the proportion of broadleaved trees increased by another 0.3%, while the decrease in the proportion of conifers is recorded especially in the case of spruce. Beech (34.8%), spruce (21.5%), oak (13%) and pine (6.5%) have the **highest representation** among trees.

Chart 029 | Share of tree species representation in forests of the SR (2021)



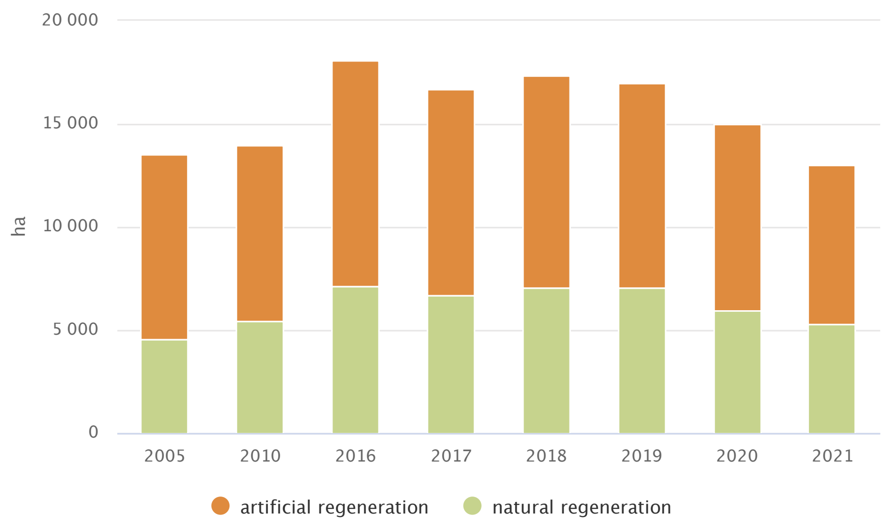
Poznámka: SP – spure, PI – pine, Fi – fir, LA – larch, BE – beech, OA – oak, HO – hornbeam
Source: NFC

In the forests of the Slovak Republic, on an area of 57.1 thousand ha (approx. 2.9%), there are also **introduced tree species**, but their area does not increase in the long term. There are mainly 12 species (that is, with a representation higher than 0.1%), of which the white acacia is the most represented (34.75 thousand ha) and the Douglas fir (1.12 thousand ha) should be considered the most promising.

Forest regeneration

For the promotion of sustainable forest management, increasing the proportion of **natural forest regeneration** is currently of particular importance. The **total** extent of **forest regeneration** decreased by 2,018 ha compared to the previous year to the current **12,980 ha**. **Natural regeneration** also decreased compared to 2020, but its **proportion of total forest regeneration** increased by 1.2 percentage points, representing **41%.**

Chart 030 | Trend in forest regeneration



Source: NFC

Dead wood

Dead wood is also an important component of forest ecosystems, which should be left in forests to the extent necessary to support biodiversity. According to the results of NIML 2, there are **87.0±5.7 mil. m³** of dead wood (standing logs, stumps, lying thick and thin wood), which is an average of **45.2±2.8 m³** per ha; on non-forest land it is another 6.8±1.8 mil. m³. The volume of dead wood in Slovakia is significantly higher than the average of European countries.

Close-to-nature forest management

Close-to-nature forest management (CNFM) is a spectrum of cultivation practices aimed at forming a differentiated structure of natural forest ecosystems while at the same time optimally using their economic, ecological and environmental potential. These procedures use the natural processes of forest ecosystems, their regenerative capacity, individual tree growth in height and thickness, self-reduction and shape variability of forest trees.

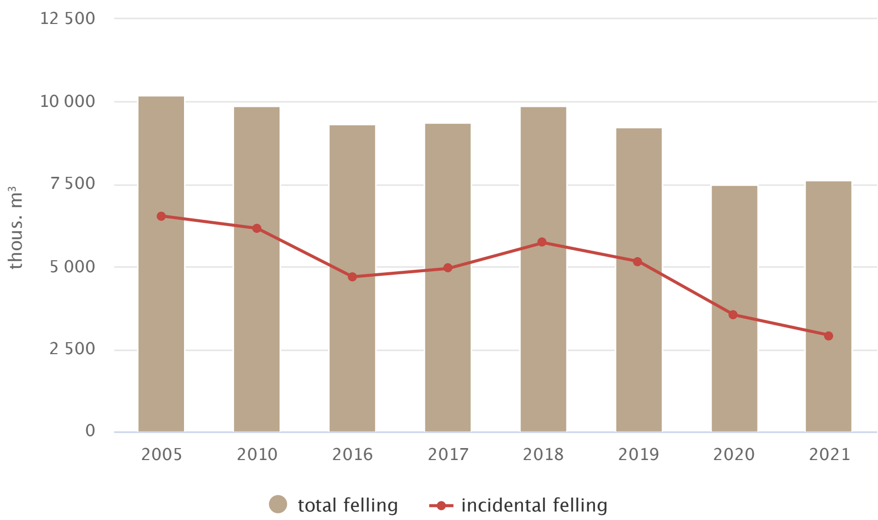
The **total area of stands** that meet the conditions of **CNFM** was 64,991.67 ha in 2020 and **112,394.06 ha in 2021** (year-on-year increase of 72.9%).

Production functions of forests

Timber felling

One of the goals of Envirostrategy 2030 is **to ensure sustainable timber felling**. In 2021, **timber felling increased slightly** compared to the previous year (by 1.7%) and reached **7,641 thousand m³**, while the bearing capacity (planned) felling **was not exceeded**. The share of **incidental felling** in total timber felling **decreased** by 8.9%, to **38.2%** compared to the previous year.

Chart 031 | Trend in total and incidental felling



Source: NFC

Forest resources utilisation

The intensity of forest resources utilisation (the share of timber felling in its increment) was **63.8%** (increase compared to 2020 by 1.1 percentage points). Since 1993, this proportion has grown considerably, while since 2004 it has not fallen below the value of 60%. It is mainly related to the implementation of excessive random felling caused by calamities.

Forest certification

In Slovakia, two certification schemes are used for forest certification:

- Certification according to the Program for the Endorsement of Forest Certification Schemes PEFC (PEFC Slovakia Association)
- Certification according to the FSC scheme (FSC Slovakia Association).

By 2021, 1,226.41 thousand ha were certified according to the **PEFC scheme** and according to **FSC** 322.96 thousand ha of forests. Due to the fact that 253.75 thousand ha are covered by double PEFC and FSC certification, in 2021 **the total area** of certified forests in the Slovak Republic was **1,295.62 ha of forests**, i.e., **66.2%** of the total area of forest crop land. **274 certificates** of participation in forest certification were issued, of which 257 according to PEFC and 17 according to FSC.

Harmful agents and the forest health

Abiotic harmful agents

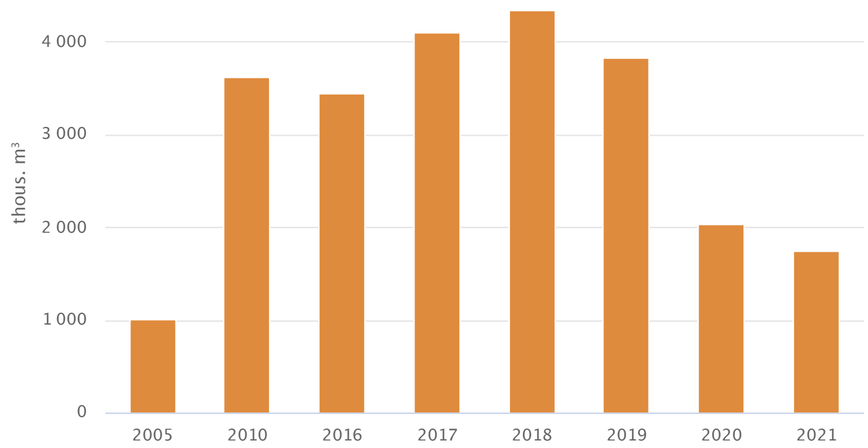
As a result of the harmful effects of wind, snow, frost, drought and other abiotic factors, **1,233,919 m³** of timber were **damaged** in 2021 (by 411.3 thousand m³ less than in 2020), of which 193,629 m³ was the unprocessed volume of the previous year. The **proportion of wind** on abiotic harmful agents was up to **80.3%. 91.2%** of the timber was processed.

Biotic harmful agents

In 2021, **1.77 million m³** of timber in forest stands were damaged by **biotic** harmful agents in forests. In 2021, the volume of calamitous matter caused by **bark beetles and wood borers** increased by **1,632,456 m³** (together with the rest from the previous year, 1,750,869 m³ of timber was damaged). Of this, 93.4% was **processed**. Compared to the previous year, this damage **decreased by approx. 14%**, while the most significant harmful factor was again the **spruce beetle**.

Other harmful agents include phytopathogenic microorganisms (with a damage volume of 146,793 m³ of timber in 2021), fungal diseases, leaf-eating and mammalian insects, and game animals.

Chart 032 | Trend in forest damage by bark-beetles and woodworms



Source: NFC

Anthropogenic harmful agents

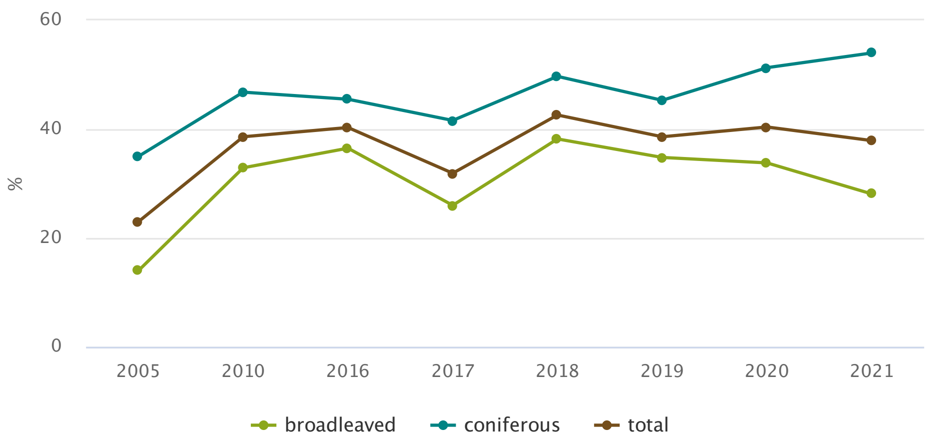
In 2021, **17,749 m³** of timber was **damaged** by anthropogenic harmful agents, of which 1,435 m³ was the unprocessed volume from the previous year (in total, this represents a year-on-year **increase of 39%**). The largest share was attributed to **immissions** (up to 47.1%), and a high proportion was also recorded by timber theft (39.6%).

In 2021, **101 forest fires** were recorded in the Slovak Republic (120 less than in 2020) on an area of **159 ha.** The direct calculated damage was EUR 206 thousand.

Forest health

A basic element of the assessment of forest trees health is the visual assessment of the state of tree crowns, specifically the loss of assimilation organs (defoliation). Such an assessment is performed annually on 107 permanent level I monitoring areas throughout Slovakia with Partial Monitoring System Forests, using an international 5-class scale (degrees of defoliation 0-4). The proportion of trees in **2-4** damage degrees is decisive, that is, with **defoliation higher than 25%** (moderately to severely defoliated and dead trees; trees with lower defoliation are considered healthy).

Chart 033 | Trend in trees defoliation - coniferous, broadleaved and total



Note: 2 - moderately defoliated (= defoliated: 26 - 60%); 3 - highly defoliated (61 - 99%); 4 - dying and dead trees (100%)
Source: NFC

The proportion of **conifers** in 2-4 defoliation degrees in 2021 was **54.0%**. This is **the highest value since defoliation assessment began**. Compared to 2005, when the value of this indicator was the lowest, it was 15.6% more. Since then, the proportion of conifers in 2-4 defoliation degrees **has continuously increased**.

The share of **broadleaved** trees in the indicated defoliation degrees in 2021 was **28.1%**. Despite the fact that they are generally better able to withstand adverse factors, even in their case there is a long-term **increase in average defoliation**, especially a permanent decrease in the proportion of trees with 0-10% defoliation.

The **trend** in the defoliation of both coniferous and broadleaved trees shows **significant changes**, which, especially in the last 15 years or so, have been probably related to the current **climatic conditions** (especially drought).

Of the conifers, defoliation has **a long-term decreasing** tendency for **fir** (in 2021 it was 23.2%), it is stabilized for **spruce** (30.7%) and since around 2000 it has significantly **worsened** for **pine** (36% in 2021). With all the most represented **broadleaved trees** (oak, beech and hornbeam), defoliation has a **long-term tendency to increase**. **The most damaged** broadleaved tree is **oak** (28.1% in 2021).

Related activities and sectors of forest management

Use of timber for energy purposes

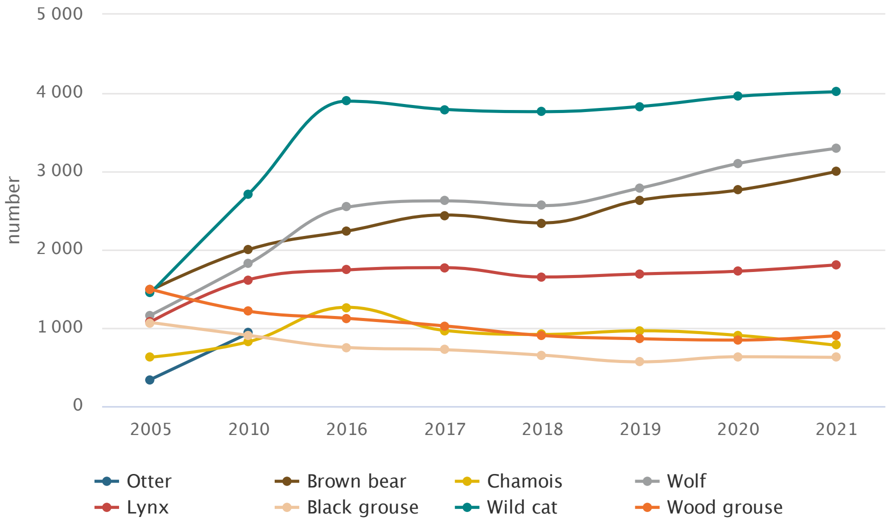
In 2021, **the forest management sector** delivered **1.345 mil. tons of fuel wood biomass** in the form of fuelwood and wood chips (about 25 thousand tons less than the previous year).

Hunting

In 2021, **1,884 hunting grounds** were recognized in the Slovak Republic for wild game. **The total area** of the hunting area has increased compared to the previous year and is **4,454,966 ha.**

After a long-term **undesirable trend** of increasing the **spring stock** (SS) of wild game, there has been a slight decrease since 2020. Among **small game**, a **decrease** in SS was recorded in pheasant, partridge, hazel hen and wild duck, and among **rare species** only in **red grouse**. The number of **large predators** increased.

Chart 034 | Trend in spring stock of rare game species



Source: NFC

In 2021, **damage caused by wild game** was recorded in forestry and agriculture in the amount of **EUR 2,116,413,** which represents an increase compared to 2020 by EUR 369.2 thousand. Approximately 9.2% of damages were **paid**. The **damage** caused by **large predators** (bears, wolves, lynx) was calculated at **EUR 2,539,712**, of which only about 14.5% was paid. Compared to 2020, this is an increase in damages by EUR 423.3 thousand. The **greatest damage** was caused by **wolves** (74.9%). In 2021, **53 brown bear attacks** on humans were recorded.

Environmental crime - poaching

In 2021, in the field of poaching, the criminal police detected 222 cases of environmental crime (in accordance with §310 of Act No. 300/2005, the Criminal Code), with 116 cases (52.3%) being resolved. Compared to the previous year, the number of solved cases decreased by 4.8 percentage points.

5 THE RATIONAL USE OF THE ROCK ENVIRONMENT

KEY QUESTIONS AND KEY FINDINGS

What geological hazards most threaten the natural environment and ultimately human beings?

Slope deformations are among the most significant geological hazards. 21 190 slope deformations with an area of 257.5 thousand ha were registered in the SR, which represents 5.25% of the territory of the SR. Landslides had the largest representation within slope deformations (19 104). In 2021, 14 new or reactivated slope deformations, which were dominantly caused by climatic conditions in combination with inappropriate anthropogenic activities, were inspected and registered in the database of the Landslides and other slope deformations information system. Currently, the MoE SR registers more than 100 emergency landslides that threaten people's lives, property and the environment.

What is the state of the potential and use of geothermal energy?

In 2021, the total heat and energy potential of geothermal energy was estimated at 7 153 MWt with a production period of 40 years and 3 358 MWt with a production period of 100 years. In 2021, geothermal energy was used from 96 geothermal sources at 60 locations. In 2021, the heat output of the used geothermal resources was 207.78 MWt.

What is the trend in the development of minerals mining and the effects of mining on the environment?

In 2021, compared to the previous year, there was a slight increase in the mining of raw materials both on the surface and underground. However, comparing the years 2005 and 2021, there was a decrease in brown coal mining by 57%, magnesite by 50%, and ores by up to 92%. In terms of use of natural resources and environmental impacts associated with mining, this long-term development can be evaluated positively. In 2021, 102 mining waste storage facilities were in operation, of which 82 were dumps and 20 decanting plants. There are 338 closed and abandoned mining waste storage facilities registered in the territory of the Slovak Republic, of which 28 are risky. The Program for the Prevention and Management of Risks Arising from Abandoned and Closed Mining Waste Repositories (2021 – 2027) was adopted.

Is there a reduction of the risk associated with the existence of contaminated sites?

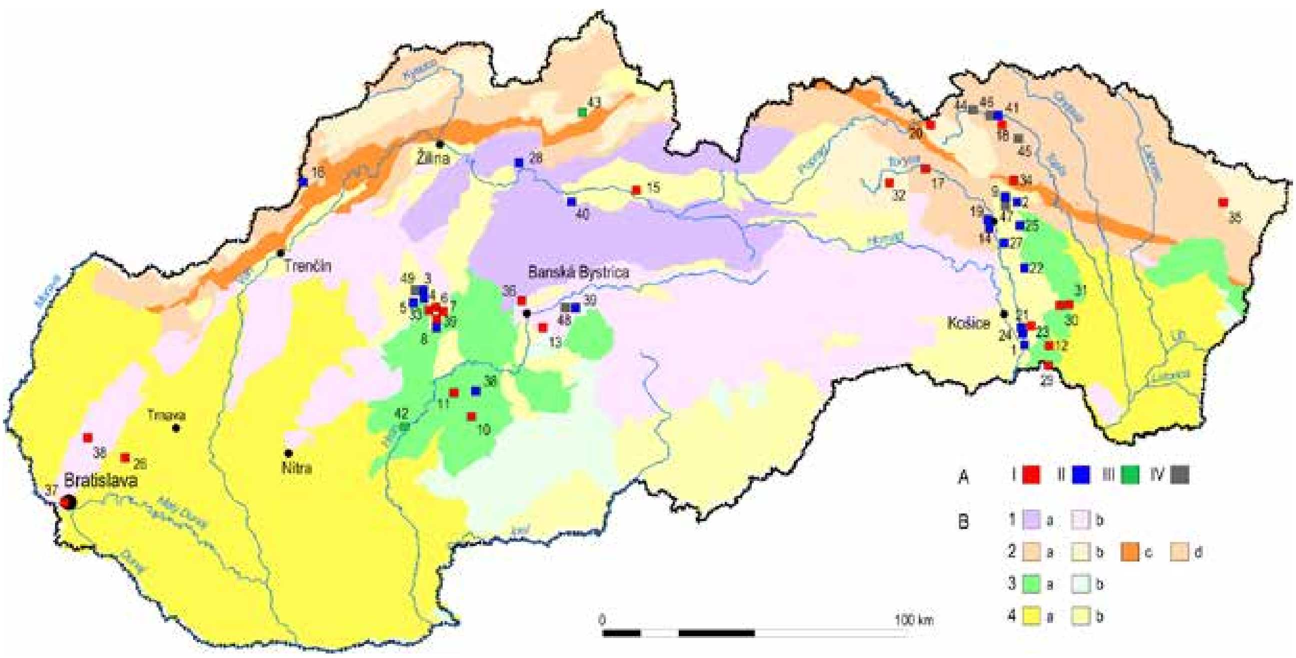
As of 2021, 877 probable contaminated sites (A), 331 confirmed (B) and 818 already remedied contaminated sites (C) were registered in the respective registers of the Information System of Contaminated sites, there were 112 sites in Part A and 112 sites in the Part C of the register, 115 sites in Part B and 115 sites in Part C of the register at the same time. In terms of the riskiness of the confirmed contaminated sites, 148 were included in the category with the highest solution priority. In order to eliminate/minimize the risk related to health and the environment, remedial works were performed at 34 locations in 2021, while remedial works will continue on most of them. The pace of remediation works is negatively influenced by complex ownership relationships, unsettled plots, the localization of the contaminated sites themselves, complex public procurement processes as well as problems with determining the person responsible for the solution. All this has a negative impact on the ability to withdraw the financial resources allocated to this area.

GEOLOGICAL FACTORS OF THE ENVIRONMENT

Landslides and other slope deformations

In 2021, three basic types of slope movements were monitored – sliding (12 sites), creeping (4 sites) and indications of the activation of rapid movements (4 sites).

Map 007 | Distribution of monitored locations of slope deformations in the territory of the SR



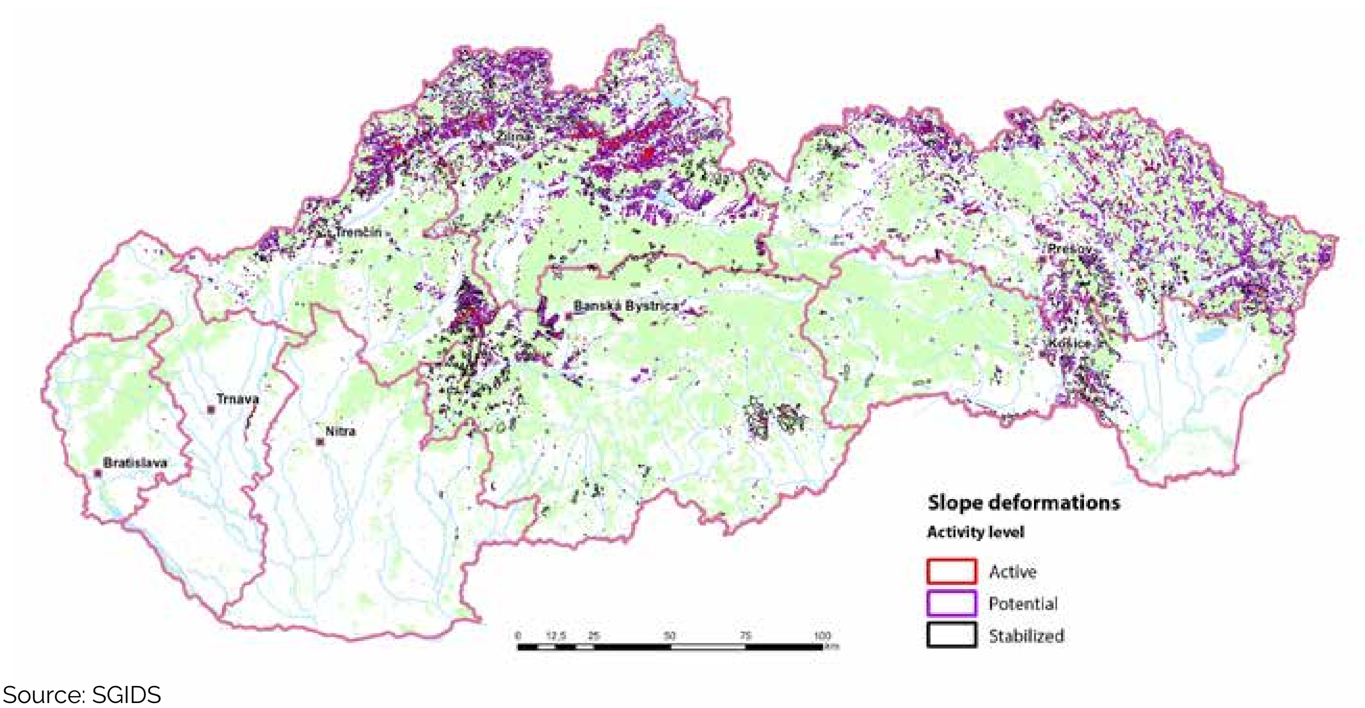
A – division of sites according to solved geological tasks: I – Partial monitoring system Geological factors, II – Monitoring of landslide deformations, III – Engineering geological survey of slope deformations – 1st stage (project sustainability), IV – Engineering geological survey of slope deformations – 2nd stage (project sustainability); B – regional engineering geological division of the Slovak Carpathians (Hrašna and Klukanová, 2002 in Atlas krajiny SR, 2002): 1 – region of core mountains: a – region of high core mountains, b – region of central mountains, 2 – region of Carpathian flysch: a – region of flysch highlands, subregion of outer flysch Carpathians, b – region of flysch mountains, subregion of outer flysch Carpathians, c – region of flysch uplands, subregion of the klippen belt, d – region of flysch uplands, subregion of inner Carpathian flysch, 3 – region of Neogene volcanics: a – region of volcanic mountains, b – region of volcanic uplands, 4 – region of Neogene tectonic depressions: a – region of Inner Carpathian lowlands, b – the area of inland basins; locations: 1. Nižná Myšľa, 2. Kapušany, 3. Veľká Čausa, 4. Prievidza-Hradec, 5. Prievidza-V. Lehôtka, 6. Handlová-Morovnianske Housing Estate, 7. Handlová-Kunešovská Road, 8. Handlová – 1960, 9. Fintice, 10. Svätý Anton, 11. Hodruša-Hámre, 12. Slanec-TP, 13. Dolná Mičiná, 14. Prešov-Pod Wilec Hôrkou, 15. Okoličné, 16. Červený Kameň, 17. Ďačov, 18. Bardejovská Zábava, 19. Prešov-Horárska ul., 20. Čirč, 21. Vyšná Hutka, 22. Varhaňovce, 23. Vyšný Čaj, 24. Nižná Hutka, 25. Ruská Nová Ves, 26. Šenkvice, 27. Petrovany, 28. Kraľovany, 29. Veľká Izra, 30. Sokoľ, 31. Košický Klečenov, 32. Jaskyňa p. Spišskou, 33. Handlová-Baňa, 34. Demjata, 35. Bratislava-Železná st., 36. Pezinská Baba, 37. Handlová-Stabilization embankment, 38. Podhorie, 39. Ľubietová-above the playground, 40. Liptovská Štiavnica, 41. Bardejov-Orthodox church, 42 – Orovnica, 43 – Babín, 44 – Sveržov, 45 – Vyšná Voľa, 46 – Bardejov-Orthodox church (the western part), 47 – Fintice (the southern part), 48 – Ľubietová-above the playground (the northern part), 49 – Veľká Čausa (landslide above PD)
Source: SGIDS

In 2021, 14 new or reactivated slope deformations, which were dominantly caused by climatic conditions in combination with inappropriate anthropogenic activities, were inspected and registered in the database of the Landslides and other slope deformations information system. Currently, the MoE SR registers more than 100 emergency landslides that threaten people's lives, property and the environment. A new Landslide Risk Prevention and Management Program (2021 – 2029) was adopted.

In total, 5.25% of the territory of the Slovak Republic is damaged by slope deformations. Agricultural and forest land are damaged in approximately the same proportion (50.6% and 46.7%), and the proportion of damage of other used areas is 2.7%. However, some areas of agricultural land damaged by slope deformations have ceased to be used for agriculture due to the difficult conditions for cultivation and are currently overgrown or are overgrown with wild grass, scrub, or up to the forest cover. In the case of agricultural land, 2.66% of the total area of agricultural land has been damaged, in the case of forest land it is 2.45%.

In terms of the assessment of the degree of activity, the largest number of slope deformations is a potential 63%. 24.9% are stabilized and 11.6% are active. Other slope deformations (0.5%) are combined.

Map 008 | Expansion of slope deformations in the territory of the SR



Source: SGIDS

Tectonic and seismic activity of the territory

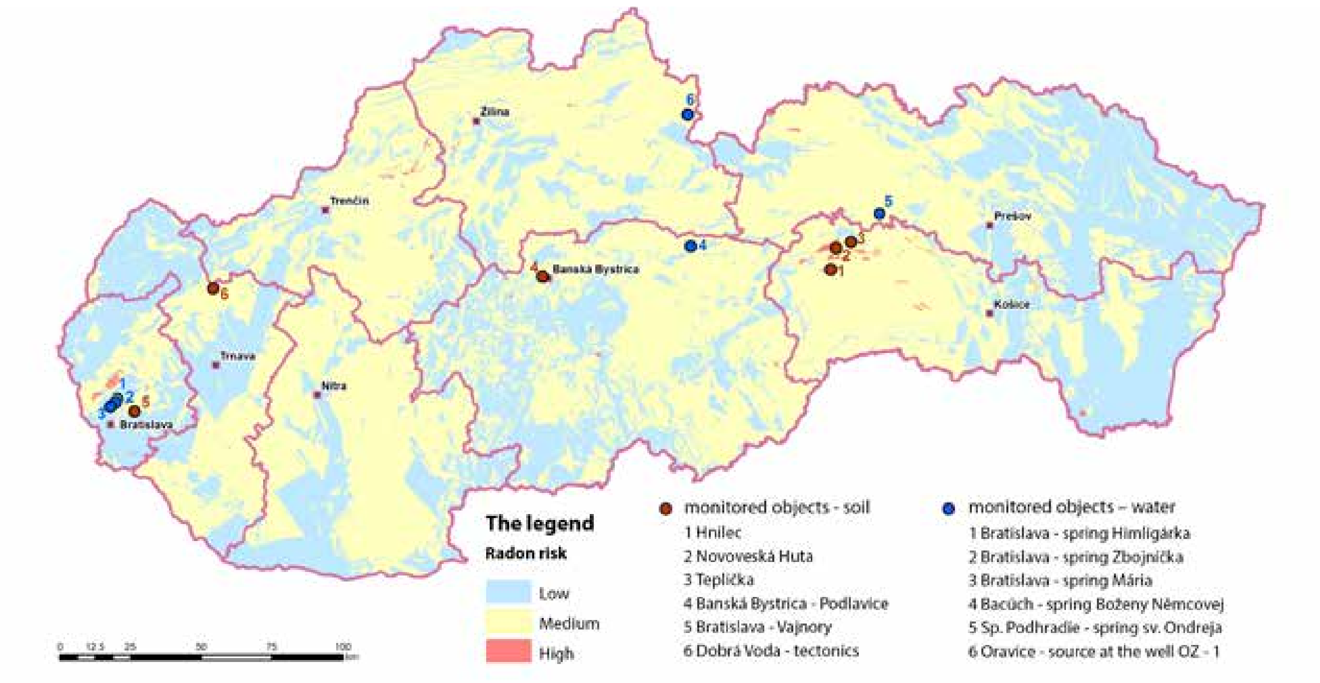
Movements of the surface of the territory of the Slovak Republic measured in 2021 at depth-stabilized geodetic points (Modra-Piesok, Banská Bystrica and Gánovce) do not represent a significant change in their overall steady and stable nature of movement.

Seismic phenomena - in 2021, 10 656 teleseismic, regional or local seismic phenomena were interpreted from the records of the National Network of 13 seismic stations (Institute of Earth Sciences, SAS).

Monitoring the volumetric activity of radon in geological environment

The measurements of volumetric radon activity (VRA) is focused on three categories: radon in soil air at reference areas with increased radon risk, radon in soil air above tectonic zones and radon in underground water.

Map 009 | Overview of monitored locations of volume activity of radon in geological environment



Source: SGIDS

Stability of rock massifs under historical buildings

In 2021, 7 castle cliffs were monitored (Trenčiansky, Pajštúnsky, Uhrovský, Plavecký, Oravský, Spišský and Strečniansky castles) including faults in construction objects.

The stability of the monitored blocks was generally confirmed at the Oravský and Strečniansky castles. In 2021, at the Spiš castle, significant movements were demonstrated only in the case of Perúnová skala and in the western part of courtyard II (TM-wall). The long-term trend (since 1980 or 1992) of tilting the Perúnova skala block towards the NE continued. In 2021, the displacement increments ranged from 0.019 to 0.456 mm. The Tm-wall device again confirmed the expansion of the lower part of the crack under the perimeter wall by 0.332 mm, which, since 199,7 has reached a total value of 8.423 mm and is already visible to the naked eye. In the monitoring cycle of 2021, changes in the width of the discontinuities in the measured profiles were observed at the investigated discontinuities of Uhrovský, Pajštúnský, Plavecký and Trenčiansky castles, ranging from their narrowing by 0.226 mm to their widening by 0.544 mm.

Monitoring of river sediments

The aim of the monitoring subsystem of river sediments is to identify temporal changes and spatial differences in the contents of selected indicators of chemical composition in the active river sediments of the main water courses of Slovakia, both due to the influence of primary (geogenic) and anthropogenic factors. In 2021, the analysed association of chemical composition indicators in 42 samples represented trace elements (As, Ba, Cd, Cr, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Sr, V, Zn, Zr) and determinations of organic C_{10}-C_{40} indicators, PAH (polycyclic aromatic hydrocarbons), PCB (polychlorinated biphenyls), organochlorine pesticides and TOC (total organic carbon).

Long-term polluted water courses include the river Nitra (sampling points Chalmová, Lužianky, Nitriansky Hrádok), Štiavnica (estuary), Hron (sampling points Kalná nad Hronom, Kamenica), Hornád (sampling point Krompachy) and Hnilec (sampling point tributary to the Ružín reservoir). The polluted water courses Štiavnica, Hron, Hornád and Hnilec represent geogenic-anthropogenic contamination linked to the Banská Štiavnica or Spiš-Gemer ore regions. Anomalous concentrations of some metals (Zn, Pb, As, Sb) testify to the significant contaminated sites of the given areas, which persists even after the decline of mining in Slovakia. The contents of Hg and as in the river Nitra (sampling points Chalmová, Lužianky) originating from industrial activity in the upper Ponitrie are also significant.

From the detected contents of organic substances, persistent elevated concentrations of PCB in the river sediments of Laborec (site Lastomír) appear to be significant. High concentrations of PAH were repeatedly detected in the river sediments of Kysuca (site Považský Chlmec), Latorica (site Leleš), Uh (Pinkovce), Turiec (Vrútky).

MINING AND ENVIRONMENT

Balance sheet of mineral deposits

Geological reserves of reserved and non-reserved mineral deposits in the SR amounted to almost 22.5 billion tons in 2021. Both geological reserves and mining are significantly dominated by non-ore raw materials, including construction materials.

Table 009 | Reserves of deposits of reserved minerals in SR (as of 31.12.2021)

Mineral	Reserves (M.t)	Reserves (%)
Mineral fuels	1 107 045	74.46
Metals	1 341 588	6.92
Non-ore raw materials	14 426 309	5.71
Construction materials	2 500 496	12.91
Total	**19 375 438**	**100**

Source: SGIDS

Table 010 | Reserves of deposits of non-reserved minerals in SR (as of 31.12.2021)

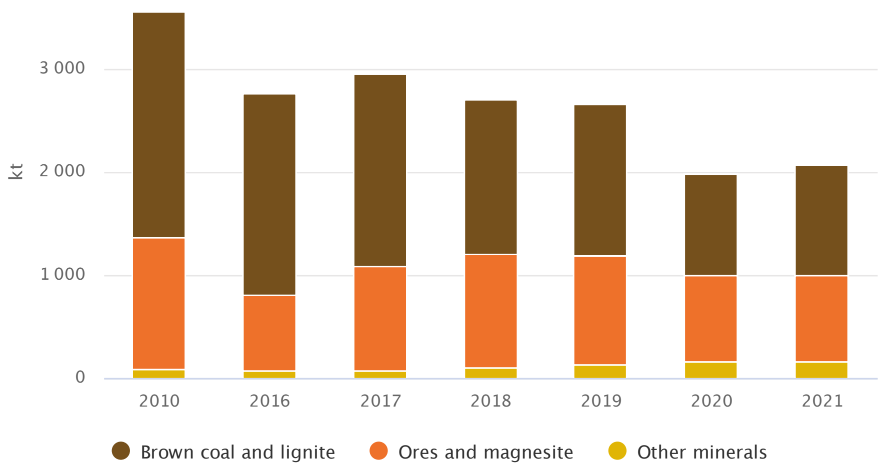
Mineral	Reserves (M.t)	Reserves (%)
Other minerals	77 530	2.55
Crushed stone	2 184 946	71.84
Gravel sands	551 119	18.12
Brick clays	227 882	7.49
Total	**3 041 477**	**100**

Source: SGIDS

Trend in mineral mining

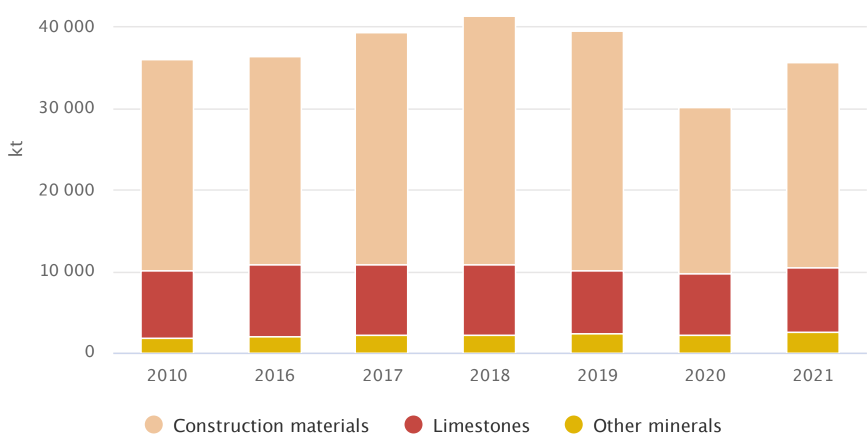
In 2021, 843 underground and surface mineral deposits were registered in the Slovak Republic. Of economic importance are mainly deposits of energy raw materials (lignite, oil, natural gas), ores (Au, Ag, Zn), magnesite, building materials (building stone, gravel and sands, brick making raw materials), limestone (production of cement, lime and other special purposes), as well as other raw materials (bentonite, perlite, talc and others). 2 080.01 kt of solid useful minerals, 6.13 kt of oil and gasoline and 70 647 thousand m^3 of natural gas were extracted from the underground. 35 705.96 kt of raw materials were mined on the surface.

Chart 035 | Trend in underground mining



Source: MMO SR

Chart 036 | Trend in surface mining



Source: MMO SR

Management of waste from mining industry

In the territory of the SR, 102 mining waste storage facilities were in operation, of which 82 were dumps and 20 decanting plants. 3 decanting plants were included in category A with a stricter mode of operation due to a possible higher environmental risk. Other storage facilities were classified as category B with a less strict mode of operation. In 51 cases, operators needed storage stability monitoring, and in 25 cases water monitoring was necessary.
At the same time, 338 closed and abandoned mining waste storage facilities were registered, of which 28 storage facilities were classified as risky, 33 as potentially risky and 277 as non-risky.

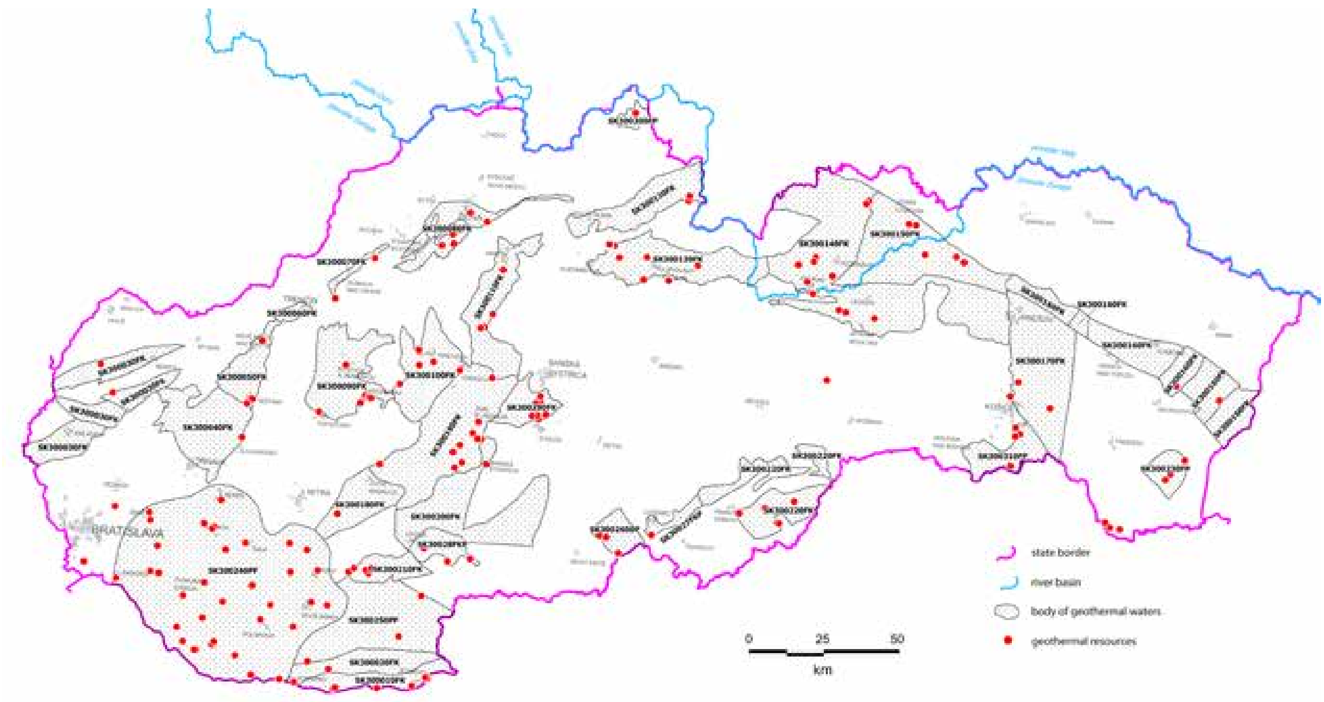
GEOTHERMAL ENERGY

In 2021, 31 geothermal bodies of underground water were defined in the territory of the SR. The total heat and energy potential of geothermal energy in defined bodies of geothermal water is calculated at 7 153 MWt with a production period of 40 years and 3 358 MWt with a production period of 100 years.

In the formations in question, 269 geothermal sources were documented in 2021, which verified 3,084 $l.s^{-1}$ of water with temperatures from 18 to 129˚C at the mouths of the sources. Geothermal waters were detected by boreholes 56 to 3 616 m deep. The productivity of the wells was in the range from 1.50 $l.s^{-1}$ to 100 $l.s^{-1}$. Na-HCO_3, Ca-Mg-HCO_3-SO_4 and Na-Cl type waters are predominant, with mineralization from 0.4 to 90.0 $g.l^{-1}$.

In 2021, geothermal energy in Slovakia was used from 96 geothermal sources at 60 sites, while 33 of the mentioned number of geothermal sources were healing water sources. Of the verified quantities of geothermal water in Slovakia (3 084 $l.s^{-1}$), an average of 422.72 $l.s^{-1}$ was withdrawn in 2021. Geothermal waters in Slovakia are mainly used for recreation, spas and heating.

Map 010 | Geothermal formations of underground waters of the Slovak Republic with sources of geothermal waters



Source: SGIDS

CONTAMINATED SITES

Contaminated sites (CS) represent territories polluted by contamination from industrial, military, mining, transport and agricultural activities, but also from improper waste management. Data collection and provision of information on CS is ensured through the Information System of Contaminated sites (IS CS).

Part of the IS CS is the Register of Contaminated Sites (RCS), which consists of Part A containing evidence of probable contaminated sites, Part B containing evidence of contaminated sites and Part C containing evidence of rehabilitated and reclaimed sites. At the end of 2021, 1 799 sites were registered in the IS CS (2 026 registration sheets, as some sites are included in two parts of the register). 877 sites were included in Part A, 331 sites in Part B and 818 sites in Part C. There were 112 sites in the register of Part A and at the same time in Part C, there were 115 sites in the register of Part B and at the same time in Part C.

In 2021, remediation was completed at eight locations, while subsequent monitoring was performed on them. Five locations were remediated within the EQ OP projects and three sites were remediated (financed) from private sources. Out of the five remediations performed within the EQ OP projects, four sites were depots (Prievidza - locomotive depot - reservoirs, Kraľovany - locomotive depot, Cargo a.s., Štúrovo - locomotive depot (Cargo), Komárno - locomotive depot, Cargo a.s.) and one waste dump (Zlaté Klasy). Of the three rehabilitated sites from private sources, the remediated site was Bratislava - Ružinov - incinerator - slag dump in front of the building. Another site was Hlohovec - Šulekovo - SMW landfill. The third remediation is the remediation of part of the location Bratislava - Staré Mesto - Apollo - the wider area of the former refinery, specifically "Remediation of the contaminated site of Eurovea II Bratislava".

The Report on the implementation of the State Program for the remediation of contaminated sites (2016 – 2021) (SP RCS) was submitted to the Government of the Slovak Republic for discussion. Based on the results of the fulfilment of the established priorities and goals of the SP RCS, it can be concluded that the tasks set for the period 2016 – 2021 were partially fulfilled. The main reason for unrealized plans was complicated ownership relations, unsettled land, or facts such as the location of the site in relation to protected areas, the vulnerability of the area, etc. The complexity of public procurement due to its severity and procedural procedures, the long-lasting approval of geological task projects due to their review, the delayed submission of geological task projects by geological work contractors and the pandemic situation, which caused the slowdown, postponement or suspension of some works, were also a problem. Due to the stated reasons for the delay in the implementation of geological works, it was not and is not possible to complete all the works by the end of the EQ OP, i.e., by the end of 2023.

The strategic document SP RCS (2016 – 2021) created the basis for planning other objectives and contributed to the acquisition of experience that will help effectively solve the issue of CS in the following period. As a follow-up to the SP RCS (2016 – 2021), the SP RCS materials for 2022 to 2027 was prepared in 2021, which contain lists of the most risky CS sites in the Slovak Republic proposed for geological exploration, monitoring or remediation. The expected costs associated with solving the most risky sites are estimated at almost EUR 1 billion. In terms of setting up the necessary financial flows, the new Operational Programme Slovakia is expected to draw EUR 239 million, and the realistic forecast of the EQ OP is estimated at around EUR 120 mil. In order to meet the objective of solving the most risky sites, it will be necessary to find additional financial resources.

CLIMATE CHANGE AND AIR PROTECTION

6

CLIMATE CHANGE PREVENTIONS AND REDUCTION OF ITS IMPACTS

KEY QUESTIONS AND KEY FINDINGS

What is the trend of greenhouse gas emissions in SR?
Greenhouse gas emissions decreased in the longer term (in the period 1990-2020) by almost 50%. The year-on-year (2019-2020) greenhouse gas emissions decreased by 7%.
Greenhouse gas emissions in the sectors covered by the European Emissions Trading Scheme (EU ETS) decreased by 28% in the period 2005-2020 and decreased by 8.7% year-on-year.
Greenhouse gas emissions in sectors that are not included under the EU ETS decreased by 18.4% in the period 2005-2020 and decreased by 6% year-on-year.
For the first time since 2008, the percentage of emissions produced in the ETS sectors was lower than the percentage of emissions produced outside the ETS sectors.

What is the observable development of temperatures in the SR and the impact of climate change?
The year 2021 ended as a temperature normal in the entire territory of the Slovak Republic compared to the values from the period 1991-2020 with deviations of -0.7˚C to +0.2˚C. Based on the territorial average of the SR (8.8˚C), the year 2021 ended as the 19th warmest since at least 1931 with a deviation of +1.0˚C from the average in 1961-1990, or +0.4˚C in 1981-2010, or -0.1˚C in 1991-2020. The highest average annual air temperature was recorded in Bratislava at the airport at 11.4˚C, the lowest at Lomnický štít -2.9˚C. The other three warmest years (in terms of annual air temperature) were 2014 (10.2˚C), 2019 (10.1˚C) and 2018 (10.1˚C). The assessment of the impacts of climate change mainly includes the chapters Solving drought and water shortage and Protection against the consequences of floods.

Which strategic and conceptual documents covering activities for preventing climate change and mitigating its impacts does the Slovak Republic have?
In connection with the Climate Change Adaptation Strategy of the SR, the National Action Plan for the implementation of the Climate Change Adaptation Strategy of the SR was approved in 2021, which identifies 45 specific measures and 169 tasks within them. A cross-cutting document concerning all sectors of the economy in the area of preventing climate change is the Low Carbon Development Strategy of the SR until 2030 with an outlook until 2050, adopted in 2020.

TREND OF GREENHOUSE GAS EMISSIONS

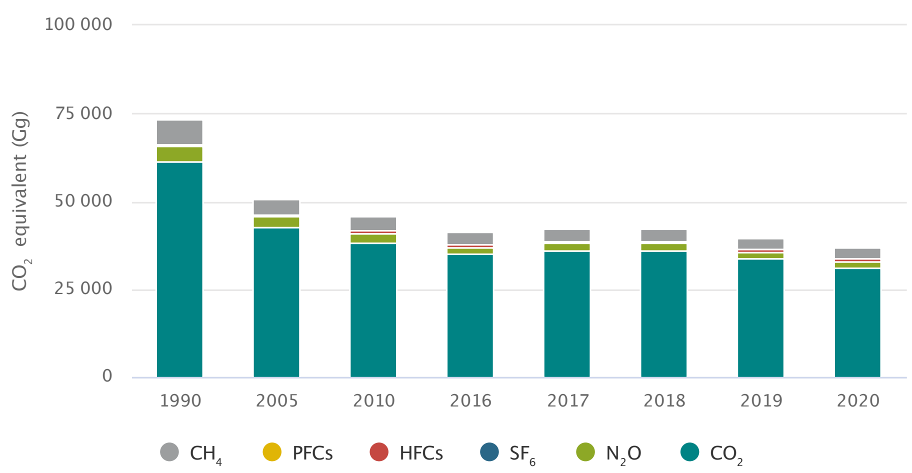
The basic source of data on trends in greenhouse gas emissions is the National Inventory Report of the SR for the year 2022, which lists 2020 as the last evaluated year.
The total anthropogenic greenhouse gas emissions for 2020 amounted to 37,002,706 tons of CO_2 equivalents, not including the removals from the LULUCF sector and not including the indirect emissions from industrial solvents and agriculture. Total greenhouse gas emissions, including captures from the Land use - Land use change and forestry (LULUCF) sector, fell to 28 256,168 tons of CO_2 equivalents. As a percentage, this is a 14% decrease compared to 2019 and almost a 55% decrease compared to the 1990 baseline year. In 2020, it was possible to maintain the so-called decoupling, i.e., slower growth of greenhouse gas emissions compared to the dynamics of GDP growth. This positive development is mainly the result of the restructuring and rebuilding of industry and energy, as well as the introduction of measures aimed at saving and efficient use of energy.

Table 011 | Aggregated anthropogenic emissions of greenhouse gases in CO_2 equivalents (thousand tons)

	1990	2005	2010	2016	2017	2018	2019	2020
Total (without LULUCF)	**73 374,79**	**50 495,10**	**45 624,02**	**41 126,85**	**42 215,29**	**42 081,77**	**39 776,35**	**37 002,71**
Total (with LULUCF)	**63 232,47**	**44 265,31**	**38 972,81**	**33 896,15**	**35 093,23**	**36 890,91**	**33 605,57**	**28 256,17**

Emissions determined as at 13. 4. 2022
NO = Does not occur
Source: SHMI

Chart 037 | Trend of greenhouse gas emissions



Note: Emissions excluding the captures in LULUCF sector (Land Use Land-use change and forestry)
Emissions determined as at 13. 4. 2022
Source: SHMI

Greenhouse gas emissions in 2020 have been at their lowest level since 1990. They decreased mainly in the energy and industrial processes and product use (IPPU) sectors, within the EU ETS and non-ETS sectors in all categories, especially in industrial production, mineral mining, chemical industry and metal industry.

The **energy sector (including transport)** contributed the most to total greenhouse gas emissions in 2020, with a proportion of 66.5%. In this sector, transport has a significant proportion of the greenhouse gas budget with a 19.1% proportion of total emissions. In 2020, emissions from transport decreased by more than 13% compared to the previous year 2019.

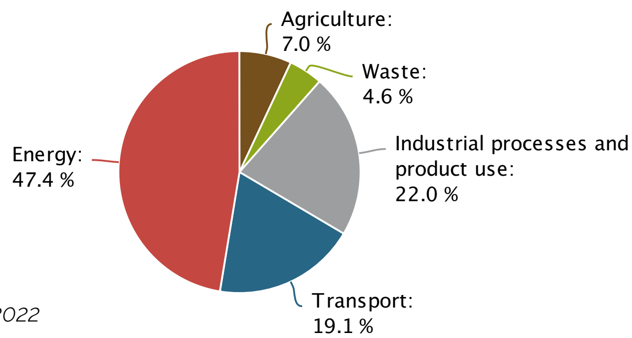
The second important sector in 2020 was the **IPPU sector** with a 22% proportion in total greenhouse gas emissions, producing mainly technological emissions from the processing of mineral raw materials, chemical production and steel and iron production. Reducing emissions from technological processes is very expensive and there are specific technical limits, so emissions have not changed as much since the reference year as for other categories. Their level mainly affects the volume of production in industrial processes. The most increasing emissions in the IPPU sector are HFC and SF_6 emissions due to industrial demand and use of these substances in the construction, building insulation, electrical and/or automotive industries.

In 2020, the proportion of the **agriculture sector** in total greenhouse gas emissions was 7%, and the emission trend has been relatively stable since 1999. The most significant reduction in emissions from agriculture was achieved in the early 1990s due to a reduction in livestock farming together with a reduction in fertilizer use.

The **waste sector** accounted for 4.55% of total greenhouse gas emissions in 2020. Using a more accurate methodology for assessing methane emissions from solid waste disposal in landfills, there has been a continuous increase in emissions of more than 100% over the base year of 1990. A similar trend is expected to remain in the coming years, although the increase should not be as significant as it has been so far. The volume of emissions from landfills depends to a large extent on the used methodology for evaluating landfills and on the extent of implementation of energy recovery of landfill gases by landfill operators.

The proportion of individual sectors in total greenhouse gas emissions did not change significantly compared to the base year of 1990. Despite this, there has been a noticeable increase in transport emissions in the trend since 1990 and a decrease in the share of stationary sources of pollution in the energy sector. The burning of fossil fuels, which make up about 76% of total CO_2 emissions in the Slovak Republic (without LULUCF), represent the most significant anthropogenic source of CO_2 emissions.

Chart 038 | Share of individual sectors in GHG emissions (2020)

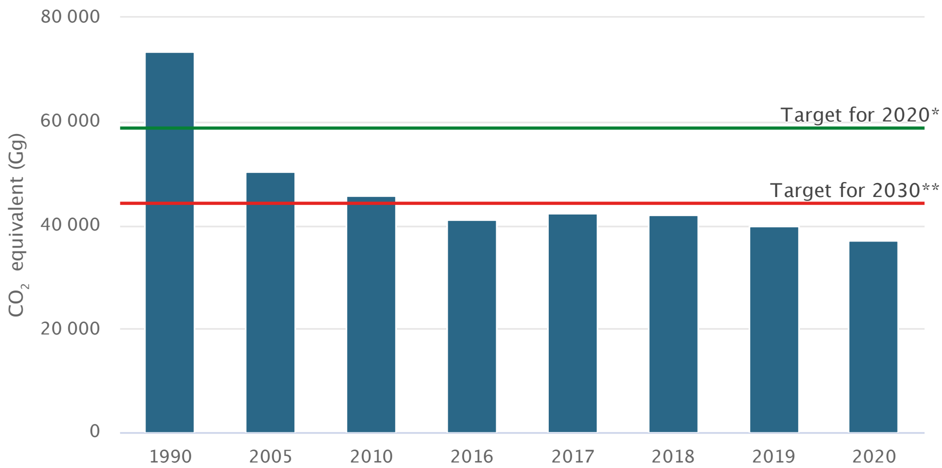


Note: Emissions determined as at 13. 4. 2022
Source: SHMI

The United Nations Framework Convention on Climate Change (UNFCCC), its Kyoto Protocol and the Paris Agreement are the basic international legal instruments in dealing with the issue of climate change. Slovakia successfully ended the first binding period of the Kyoto Protocol by meeting the objective of reducing greenhouse gas emissions in 2012 by 8% compared to the base year of 1990. Another objective was to reduce emissions by 20% by 2020 compared to 1990. Slovakia met this objective. The Paris Agreement, aimed at limiting the increase in global temperature, set the objective of **achieving carbon neutrality by 2050**, which means achieving a balance between greenhouse gas emissions and their capture. In 2019, the **European Green Deal** was added to the above-mentioned international instruments, which presented the EU's actions and defined its procedures for achieving climate neutrality in 2050. With it, the European Commission adopted a set of proposals to reduce net greenhouse gas emissions by at least 55% by 2030 compared to the 1990 levels, by adapting policies in the fields of climate, energy, transport and taxation. In 2021, Regulation of the European Parliament and Council No. 2021/1119 was adopted, which establishes the framework for achieving climate neutrality, the so-called European legislation in the field of climate.

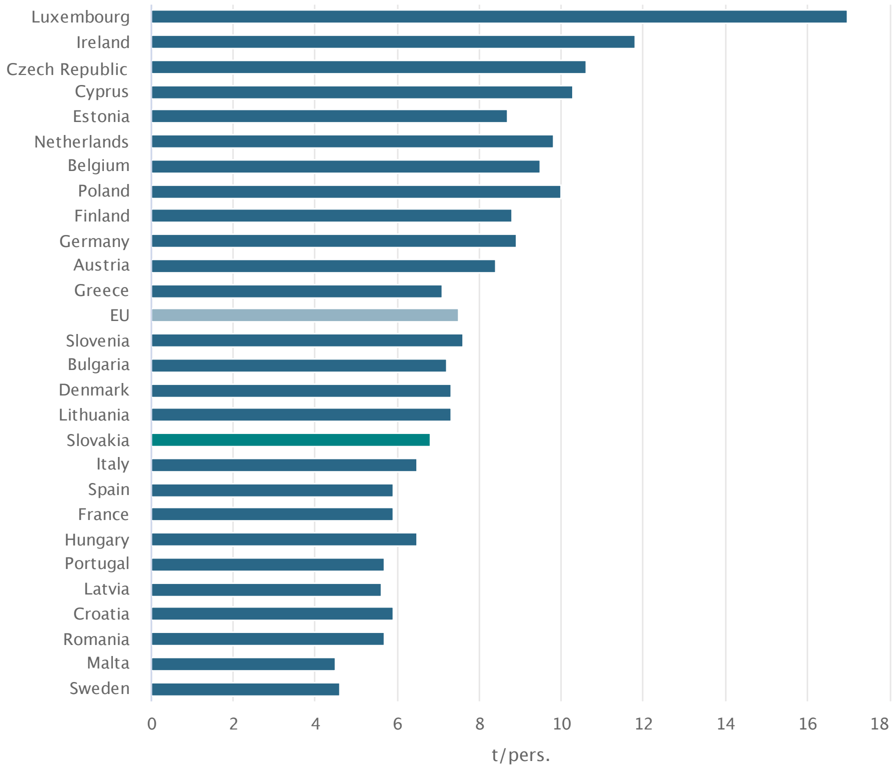
The most important documents in the Slovak Republic, in addition to the adoption of Envirostrategy 2030, which defines the objectives of reducing greenhouse gas emissions in the Slovak Republic until 2030, also include the Low-Carbon Development Strategy of the Slovak Republic until 2030 with a view to 2050 (NUS), approved in 2020 by the Government of the Slovak Republic. It did not set more stringent objectives for greenhouse gas emission reduction, but only confirmed the more stringent objectives adopted in Envirostrategy 2030.

Chart 039 | Trend of greenhouse gas emissions in connection with fulfilment of obligations



Note: Emissions determined as at 13. 4. 2022
Source: SHMI

Chart 040 | International comparison of greenhouse gas emissions (CO_2 equivalent) per capita in 2020

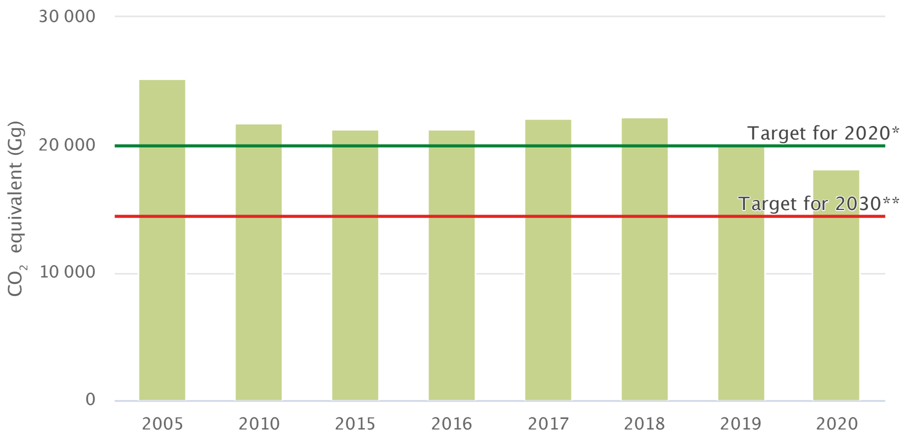


Source: Eurostat

Greenhouse gas emissions covered by the European Emissions Trading Scheme (EU ETS)

The EU ETS is the key tool of the EU for reducing greenhouse gas emissions from large installations in the energy and industrial sectors, as well as in the aviation sector. The EU ETS covers around 45% of the greenhouse gas emissions of the EU. In 2020, the objective is for emissions from these sectors to be 21% lower across the EU than in 2005. The EU ETS is based on Directive No. 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading, which was amended by Directive No. 2009/29/EC to improve and extend the Community scheme for greenhouse gas emission allowance trading. The national goal of the Slovak Republic by 2030 is to reduce emissions in operations under the ETS by 43% compared to the 2005 baseline year. Between 2005 and 2020, the greenhouse gas emissions in the ETS sectors decreased by 28%.

Chart 041 | Trend of greenhouse gas emissions in ETS sectors

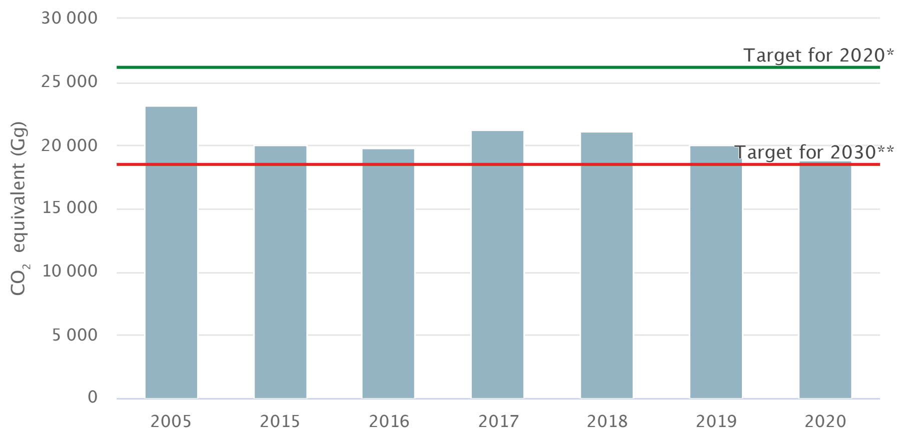


*Note: Emissions determined as at 15.4.2022 *Target set by Directive 2003/87/ES on establishing a scheme for greenhouse gas emission allowance trading ** National target of the SR (Envirostrategy 2030, Low-carbon Strategy)*
Source: SHMI

Greenhouse gas emissions not covered by the European Emissions Trading Scheme (EU ETS)

Sectors not covered by the EU ETS (buildings, non-ETS industry, transport, agriculture and waste) are regulated in the EU by Decision No. 406/2009/EC of the European Parliament and the Council on joint efforts (ESD - Effort Sharing Decision), which redistributes the efforts of member states to reduce greenhouse gas emissions by -10% by 2020 compared to 2005. A target of +13% has been set for Slovakia by 2020, which corresponds to a specific amount of annually allocated emission quotas (the so-called AEA units). In 2020, Slovakia managed to reduce these emissions by 18.4% compared to 2005. In its objectives for the Slovak Republic, **Envirostrategy 2030** established that by 2030, compared to 2005, **greenhouse gas emissions in sectors not covered by the EU ETS will be reduced by 20%.**

Chart 042 | Trend of GHG emissions in non-ETS sectors



*Note: Emissions determined as at 13. 4. 2022 *Target according to Decision of the European Parlament and of the Council no. 406/2009/EC on the Joint Effort (ECK) ** National target of the SR (Envirostrategy 2030, Low-carbon Strategy)*
Source: SHMI

ADAPTATION TO ADVERSE EFFECTS OF CLIMATE CHANGE

Adaptation to climate change

The basic strategic document in this area is the **Adaptation Strategy of the Slovak Republic to Climate Change - Update** (Adaptation Strategy) approved by Resolution of the Government of the Slovak Republic No. 478/2018. The main objective of the updated Adaptation Strategy is to increase the resilience and improve the preparedness of the Slovak Republic to face the adverse effects of climate change, to establish an institutional framework and a coordination mechanism to ensure the effective implementation of adaptation measures at all levels and in all areas. The strategy links scenarios and possible effects of climate change with proposals for appropriate adaptation measures, while the key areas and sectors in terms of adaptation to the adverse effects of climate change are considered to be: rock environment and geology, soil environment, natural environment and biodiversity, water regime in the country and water economy, residential environment, population health, agriculture, forestry, transport, tourism, industry, energy and other areas of business and the area of risk management.

In 2021, the EU Council approved the EU Strategy on Climate Change Adaptation. It outlines a long-term vision, on the basis of which the EU is to become a society that is resistant to climate change and fully adapted to its inevitable effects by 2050. The strategy is based on the 2013 adaptation strategy and is one of the key measures set out in the European Green Deal. Since the adoption of the first strategy, all member states have implemented their national adaptation strategies or plans.

In 2021, the **National action plan for the implementation of the Climate Change Adaptation Strategy of the Slovak Republic** (NAP) was approved. Its structure is based on the main objective which is based on the implementation of strategic priorities. In order to achieve the objective, five cross-cutting measures are identified, which are aimed at improving the implementation framework, supporting science and research in the field of adaptation to climate change, creating an effective crisis management system and managing extreme events such as floods and fires, supporting green infrastructure, as well as to promote education and awareness. The NAP is built on seven specific areas: protection, management and use of water, sustainable agriculture, adapted forestry, natural environment and biodiversity, health and healthy population, residential environment and technical, economic and social measures. All seven areas have their specific objective, and each of them has defined its basic principles and specific measures that define the tasks in the given segment. In total, 45 specific measures and 169 tasks were identified within them for the period of validity of the NAP until 2027. These measures and related tasks are based on the NAS.

PROTECTION AGAINST FLOODS CONSEQUENCES

KEY QUESTIONS AND KEY FINDINGS

Are the negative impacts of floods on the life and health of people, their property and the environment reduced?

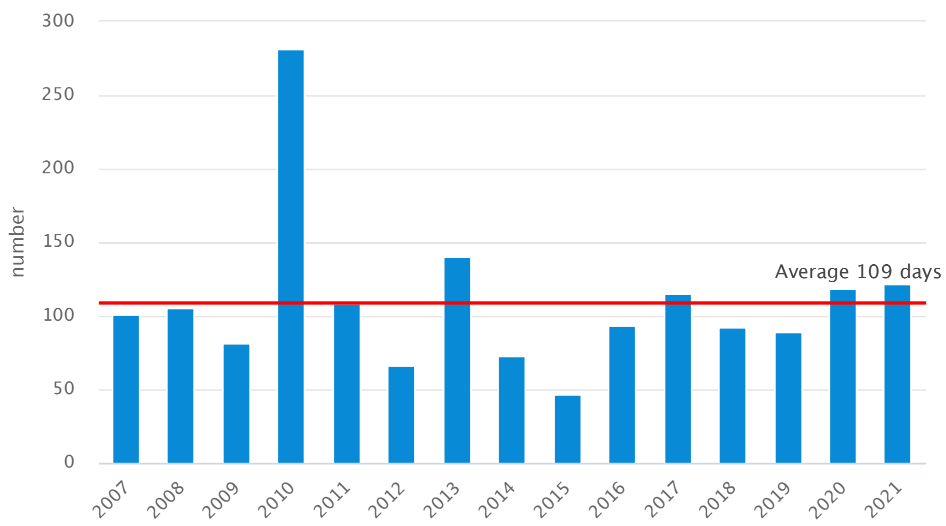
In the period of 2005-2021, the total expenses and damages caused by floods were calculated at the value of EUR 869.82 mil., while the lowest damages were caused in 2019 and floods with the highest number of days of flood activity were recorded in 2010 and 2013. The total expenses and damage caused by floods increased by EUR 3.12 million year-on-year. Preventive anti-flood measures implemented by the administrator of important water courses in 2021 eliminated potential flood damage in the amount of EUR 2.30 mil.

In the years 2005-2021, more than 83 528 inhabitants were affected by floods and seven people died (1 person in 2006, 2 in 2017, 3 in 2019 and 1 in 2021).

FLOOD SITUATION AND ITS CONSEQUENCES

In 2021, 122 days with the occurrence of level 1st to 3rd flood activity (SPA) were recorded, ranking this year as the third year with the highest number of SPA days, behind 2010 (282 days) and 2013 (140 days). A total of 1 514 hydrological warnings were announced, of which 1 050 were warnings of the first degree, 416 warnings of the second degree and 48 warnings of the third degree. According to the type of imminent flood, out of the mentioned total number of warnings, 893 hydrological warnings were announced for torrential floods, 486 hydrological warnings for floods from rain, the remaining hydrological warnings were floods from permanent rain, melting snow and rain.

Chart 043 | Trend in the number of days with the level of flood activity reached for the period 2007-2021



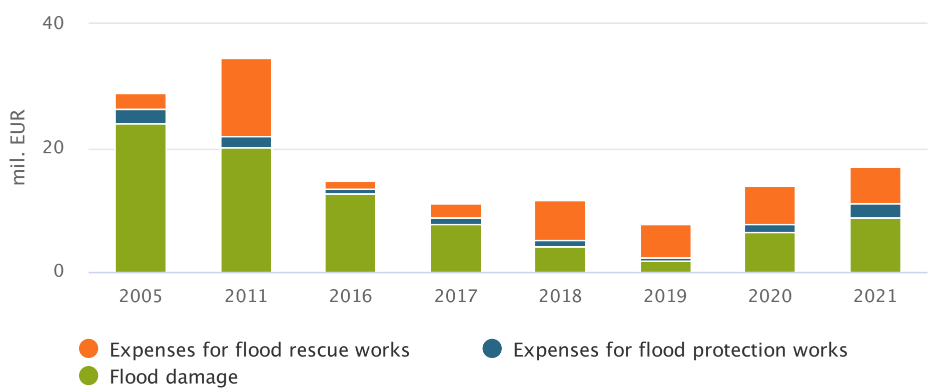
Source: SHMI

In total, 237 municipalities and cities were affected by floods in 2021, while 1 613 residential buildings, 482 non-residential buildings, 1 895.44 ha of agricultural land, 810.10 ha of forest land and 1 456.69 ha of urban areas of municipalities and cities were flooded. As a result of the floods, 216 residents were affected, one person died.

The **total expenses and damages** caused by floods in 2021 were amounted to EUR 16.98 mil., of which expenses for flood protection works were calculated at EUR 5.92 mil., expenses for flood rescue works to EUR 2.23 mil. and flood damage to EUR 8.83 mil.

Flood damage to state property amounted to EUR 1.64 mil., EUR 0.69 mil. to the property of inhabitants, EUR 3.64 mil. to municipal property, EUR 0.75 mil. to the property of legal entities and natural persons of entrepreneurs. Higher territorial governing units recorded damages in the amount of EUR 2.11 mil.

Chart 044 | Total expenses and damages caused by floods



Source: MoE SR

FLOOD RISK MANAGEMENT

In the Slovak Republic, the measures for protection against floods, obligations in the assessment and management of flood risks as well as planning and management of protection against floods are stipulated by **Act No. 7/2010 Coll.** on flood protection. This act transposes **Directive No. 2007/60/EC** of the European Parliament and the Council on the assessment and management of flood risks, the aim of which is to reduce the adverse effects of floods on human health, environment, cultural heritage and economic activity.

The planning process of flood risk management consists of a **preliminary flood risk assessment**, the processing of **flood threat maps** and **flood risk maps** (the so-called flood maps), the processing of **flood risk management plans** and the subsequent implementation of appropriate measures. The first flood risk management plans for sub-basins of the Slovak Republic were adopted in 2015 and are valid for the period 2016-2021.

In 2018, as part of the update of the preliminary flood risk assessment, the following were identified:

- 144 geographical areas in which there is a potentially significant flood risk,
- 34 geographical areas in which there is a potentially significant flood risk and in which it can be assumed that its occurrence is likely,
- 17 geographical areas in which it can be assumed that the occurrence of a potentially significant flood risk is likely.

In 2021, works continued on the preparation of an update of flood maps and works on the preparation of an update of flood risk management plans for the second planning cycle, which will be valid for the period 2022-2027.

PREVENTIVE FLOOD CONTROL MEASURES AND MEASURES TO ENSURE THE LONGITUDINAL CONTINUITY OF RIVERS AND BIOTOPES

The **preventive flood measures** involved the preparation and implementation of constructions, the most important of which were:

- in the stage of preventive measures for flood protection: structures on the Slatina water course and on the Hron water course in the city of Zvolen, on the Ladomírka water course in the city of Svidník, on the Bodva water course in Moldava nad Bodvou, municipal program plan in the city of Podolínec, on the Slaná water course in the city of Tornaľa, on the Rimava water course in the village of Rimavské Brezovo, on the Slatina water course in the village of Zvolenská Slatina, on the Varínka water course in the village of Varín and a polder in the village of Čechy;
- in the stage of flood protection construction works: constructions on the lower section of Malý Dunaj, in the city of Banská Bystrica on the Hron water course, on the Kysuca water course in the village of Makov;
- included in permanent operation: the Vitanová - Oravica constructions, the adjustment of the water course in the inner village and the reconstruction of the hut on the Hornád water course in the city of Krompachy.

The measures **to ensure the longitudinal continuity of rivers and biotopes** included the preparation and implementation of constructions, crossing barriers, the most important of which were:

- in the stage of project property-legal and investment preparation: measures on Myjava, Cirocha, Poprad, Revúca, Turiec, Brezovský potok and Bodva water courses;
- in the stage of implementation of construction works: measures on the Hornád water course in the city of Spišská Nová Ves.

SOLUTION TO DROUGHTS AND WATER SCARCITIES

KEY QUESTIONS AND KEY FINDINGS

Which areas of SR are most at risk of drought and what is the current situation?

The drought in 2021 in the SR mainly affected northern and central Slovakia, namely in the first two summer months - June and July. During the summer, the extreme drought also spread to the Orava, Kysuce and Horné Považie regions. The largest area was affected by extreme drought on 11 July, namely 3.5% of the total area of Slovakia. During this period, the soil moisture deficit rose to the lowest value of -80 to -100 mm in Orava, in the rest of Slovakia the deficit was at most -60 mm. During the autumn, drought was particularly pronounced in south-eastern Slovakia. At the end of October, extreme drought affected up to 2% of the territory of Slovakia, while locally the relative saturation in the entire soil profile was below the 10% limit. At the same time, the soil moisture deficit was up to -80 mm.

What is the trend in the use of surface water and groundwater?

After 2005, the withdrawals of surface water decreased significantly and since 2010 they have recorded minimal year-on-year fluctuations. In 2021, consumption decreased by 54.3% compared to 2005 and increased slightly by 1.1% year-on-year (2020-2021).

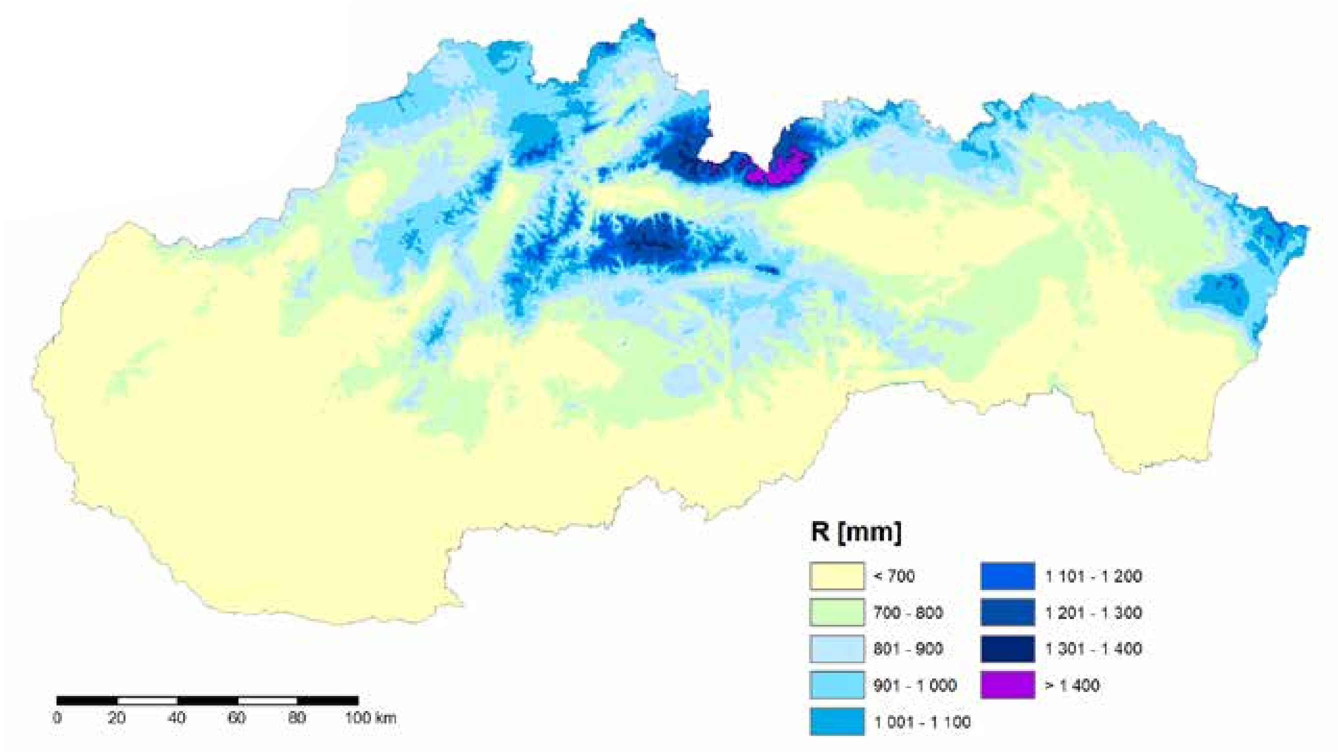
There was a decrease in the groundwater withdrawals after 2005, with a renewed increase since 2016. In 2021 the withdrawal of groundwater increased by 2.78% compared to the previous year and decreased by 8.38% compared to 2005.

Drought assessment

Assessment of meteorological drought in 2021

The total precipitation for the year 2021 in Hurbanovo reached 80% of the long-term average 1901-2000 (LTA) and 78% 1991-2020 LTA, in Košice 102% 1991-2020 LTA, in Poprad 100% 1991-2020 LTA, in Oravská Lesná 87% 1991-2020 LTA and in the whole SR approximately 761 mm, which is 100% LTA. The beginning of 2021 was in the range of moderately to very wet conditions at most stations, which occurred mainly in February, only in the east of the territory already in January. In the central part of central Slovakia, extremely wet conditions also occurred for a short period of time in February. In January, they were also recorded in north-eastern Slovakia and Východoslovenská nížina. Normal conditions were recorded only in the extreme southwest and the central part of Podunajská nížina, as well as in Orava and Kysuce.

Map 011 | Annual total atmospheric precipitation (2021)



Source: SHMI

During the spring of 2021, there was one comprehensive dry period in almost the entire territory of the country. At most stations, it lasted from the end of February to the beginning of May. At some stations (Trenčín, Bratislava - airport, Topoľčany and Mochovce) it lasted until mid-May. In Záhorie, it even started at the end of January. It mostly reached the intensity of moderate drought, but at the stations of the Podunajská nížina and in the vicinity of Žiar nad Hronom and Banská Štiavnica, it reached an interval for very dry conditions. In the vicinity of Žihárec and Nitra, short-term and extreme drought was recorded. In the east of Slovakia, this spring dry period was less intense and lasted shorter (only until mid-April). There was no drought at all in Kysuce, Orava and two stations in the Prešov Region.

After a short break in the range of normal humidity conditions, a second dry period was observed during the summer, which was more intense compared to the spring period. A large part of the monitored stations recorded it from mid-June to the first decade of August, or until the end of July. They were mainly located in western and north-eastern Slovakia. At almost all of these stations, extreme drought was observed for a longer period of time, not only occasionally. In the vicinity of Hurbanovo, this dry episode lasted until the beginning of October. Although the drought decreased in the region at the beginning of August, it did not end and increased again in September. In the south of central Slovakia, under the Tatras and in Zamagurie, the duration of the summer dry period was shorter, only until mid-July. On the contrary, an even longer duration was observed in Spiš and Východoslovenská nížina. At the Švedlár station, the dry period starting in mid-July lasted almost until Christmas, with a few significant decreases. At the remaining stations of the mentioned regions, it was not only mitigated, but also interrupted by short periods with normal conditions, but given the total duration of the individual dry periods, we can speak of their cumulative effect.

Dry conditions during the autumn also appeared in other parts of Slovakia. Due to the length and intensity of the wet period that separated it from the summer dry episode, we talk about a separate period there. It started in mid-October and lasted until the end of the first decade of December. It is interesting that it was more intense in the area of Horná Nitra, Kysuce, Orava and Žilina than in the south-western part of the country. It did not occur at all in the south of central Slovakia.

It is interesting to evaluate the maximum duration of dry periods in 2021 at individual stations. In four cases (Kuchyňa, Oravská Lesná, Milhostov and Podolínec) the duration was longer than 80 days. Except for Kuchyňa in Záhorie, with a drought at the end of winter and during spring (27 January - 24 April); it was the autumn dry season. At only 25 stations (including the ones already mentioned), the longest dry period lasted for more than 50 days. Only five of them occurred in summer, the rest occurred equally in spring and autumn.

Table 012 | Monthly incidence of drought at selected meteorological stations (2021)

Station	january	february	march	april	may	june	july	august	september	october	november	december
Bratislava - letisko	none	none	significant	extreme	none	extreme	extreme	none	none	moderate	moderate	none
Piešťany	none	none	moderate	výrazné	none	extreme	extreme	none	none	extreme	significant	none
Nitra	none	none	significant	extreme	none	extreme	extreme	none	none	moderate	moderate	none
Hurbanovo	none	none	significant	extreme	none	extreme	extreme	none	moderate	moderate	significant	none
Topoľčany	none	none	significant	extreme	none	extreme	extreme	none	none	significant	significant	none
Banská Bystrica	none	none	moderate	significant	none	significant	significant	none	none	moderate	none	none
Boľkovce	none	none	moderate	significant	none	extreme	extreme	none	none	none	none	none
Prievidza	none	none	moderate	significant	none	extreme	extreme	none	none	moderate	significant	none
Žilina	none	none	moderate	moderate	none	extreme	extreme	none	none	moderate	significant	none
Oravská Lesná	none	none	none	none	none	extreme	extreme	none	none	significant	significant	none
Poprad	none	none	significant	none	none	extreme	significant	none	none	moderate	moderate	none
Švedlár	none	none	moderate	none	none	extreme	extreme	significant	moderate	moderate	moderate	none
Prešov	none	none	moderate	none	none	extreme	extreme	none	none	significant	moderate	none
Košice	none	none	significant	none	none	extreme	significant	none	none	moderate	moderate	none
Michalovce	none	none	significant	moderate	none	extreme	extreme	none	none	significant	significant	none
Somotor	none	none	significant	moderate	none	extreme	extreme	none	none	significant	significant	none
Tisinec	none	none	none	none	none	extreme	extreme	none	none	significant	significant	none

Source: SHMI

Assessment of soil drought in 2021

The drought in the winter of 2020/21 peaked at the turn of the second and third decade of December. Severe to exceptional drought affected north-western Slovakia and the northern part of central Slovakia. The extreme dryness was mainly in the surface layer in Kysuce, Orava, Považie, Turiec and Horná Nitra. Together, they affected approximately 6% of the total area. Due to the fact that it is the winter season, the relative saturation was locally at least 60-70%, in most areas the saturation was 70-90%, or higher than 90%. In this period, the soil moisture deficit was up to -40 mm, and this was rare in Orava, Kysuce and Považie. In the surface layer, there was a deficit of soil moisture in almost the entire territory of Slovakia. At the end of December, the situation improved. In January and February, the entire territory of Slovakia was without risk of drought almost all the time. The relative saturation during these months was higher than 70% in almost the entire territory, only locally in Spiš and Záhorie the saturation was in the interval of 60-70% for a short period of time.

Drought reappeared at the turn of March and April and occurred mainly in the surface layer, affecting mainly the area of Záhorie, Malé Karpaty, Pohronie and the mountains on the border of central and western Slovakia. The situation worsened in the first half of April. On 11 April 2021, there was significant drought in the entire soil profile in the area of the Vtáčnik, Pohronský Inovec, Slovenské rudohorie mountains, but also locally in the Turčianska kotlina and Rajecká dolina. In the surface layer, significant drought affected an even larger area, approximately 3% of the total territory, and was found, in addition to the already mentioned areas, also in Záhorie and in the Malé Karpaty region. In this period, the relative saturation in Záhorie in the surface layer was lower than 10%. The soil moisture deficit was at most -40 mm isolated in central and western Slovakia. From the middle of April, the situation gradually improved, and during May, most of Slovakia was already without a risk of drought.

The situation gradually worsened again in June, and on 20 June, there was already significant to extreme drought in places, especially in the northern half of Slovakia and in Slovenské rudohorie. In the following weeks, the situation in most of Slovakia stabilized or slowly improved, but in July, the extreme drought continued to spread in the area of Orava, Kysece and Horné Považie. The largest area was affected by extreme drought on 11 July, namely 3.5% of the total area of Slovakia (Fig. 3). In the second half of July, the situation also improved in the north of central Slovakia, and the drought gradually receded. In August, there were only rare beginnings of drought in the south-western and south-eastern parts of Slovakia. At the end of August, it remained slightly dry locally in the vicinity of Komárno and Nové Zámky. The soil moisture deficit decreased in the summer to the lowest value of -80 to -100 mm, on 11 July in Orava. In the rest of Slovakia, the deficit was at most -60 mm. Relative saturation reached values below 10% in Záhorie, in the south and south-west of Podunajská nížina and locally also in Východoslovenská nížina. While in July and August the saturation gradually increased in a large part of Slovakia, at the end of the summer the saturation was still below 10% in the vicinity of Hurbanovo. Saturation in the range of 10-20% was present in approximately 1/10 of the area on this date.

In September, significant drought occurred sporadically in south-eastern Slovakia. Relative saturation remained in the lower soil layer 40-100 cm below the 10% limit even locally in the south of Podunajská nížina and Východoslovenská nížina, as well as in Hont. Drought in south-eastern Slovakia became more pronounced during October and by the end of this month there was already extreme drought in a relatively large part of Dolný Zemplín (in total affecting 2% of Slovakia), while locally the relative saturation in the whole soil profile was below the threshold of 10%. At the same time, the soil moisture deficit was up to -80 mm. In November, the saturation of the soil in south-eastern Slovakia gradually increased, but drought appeared to a lesser extent in Orava, the south of Podunajská nížina and the adjacent part of central Slovakia. The level of intensity in these areas was exceptionally at the level of severe drought. In December, the situation improved, and there was incipient drought only rarely in Podunajská nížina and the south of central Slovakia.

Hydrological drought

The assessment of hydrological drought in surface waters was accessible online since 2016 at the SHMI website as part of the Hydrological Drought Monitoring. It is based on the comparison of current operational data of average monthly flows with long-term average monthly flows (Qma) for the reference period and on the evaluation of average daily flows based on the corresponding M-day for the reference period. Starting in 2021, the SHMI website regularly evaluates individual past months in terms of drought in surface and underground waters, as well as in terms of flood situations.

The assessment of average monthly flows for individual calendar months introduces the aspect of seasonality into the analyses, which is important for differentiating individual natural outflow phases, i.e., the distribution of outflow in the year. In our conditions, spring is a typical period of increased outflow. According to different altitudes (and related air temperatures, the amount of snow deposits and the time of their melting), such an increased water level is typical for the months of March to May, on average for Slovakia, April is the wettest month. The period of the smallest flows is mainly the summer-autumn period; in mountainous areas, the winter period is also added, when water from precipitation is captured in the form of snow and ice, or even freezing of streams may occur.

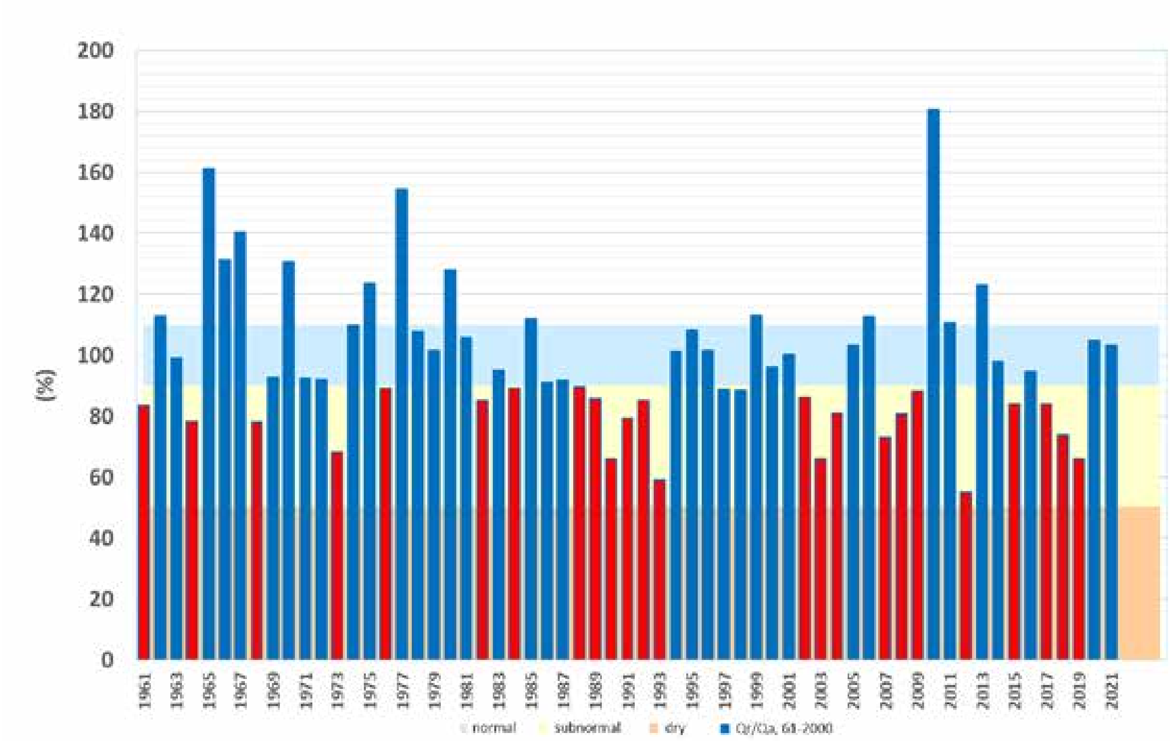
Due to the influence of climate change, certain changes in the above-mentioned distribution of outflow were observed in the last decades. This mainly concerns the earlier melting of the snow already in the winter months, which affects the increase in the outflow in these months and, conversely, the decrease in the outflow in the usually watery spring months. The most significant changes are the increase in flows in January and the decrease in flows in April. Although the spring months on average still remain months with increased outflow, part of the outflow is moving to earlier months. This is negatively reflected in the insufficient spring replenishment of water reserves in the basins, including water seepage into the soil and underground water. In later unfavourable climatic conditions, this situation may represent an increased risk of drought in surface water courses in the summer and autumn months.

On the basis of the overall assessment of surface waters in the Slovak Republic processed by analysing the observed hydrological data in 42 representative and unaffected water measuring stations of the state hydrological network of surface waters of SHMI for the period 1961-2020 compared to the representative period 1961-2000, there is a decrease in water content.

The M-day flow represents the average daily flow reached or exceeded after M days in the selected period. This means that, for example, the 355-day flow (Q_{355d}) is a value that in a given flow profile should be less on average only 10 days a year (365 days minus 355), for the remaining days of the year it should either be equal to this value or higher. The values corresponding to Q_{355d}, Q_{364d} are considered to be values close to the minimum (dry season).

The year 2021 was normal in terms of precipitation (100% of the long-term normal). The amount of precipitation and its distribution in the year was also reflected in the annual outflow amount from the territory of the Slovak Republic, which was also close to the long-term average (99%). In the sub-basins in Slovakia, the values of the rout flow quantity ranged from 78 to 117% of normal, the outflow quantities in the Morava, Nitra, Slaná, Bodva, Hornád and Bodrog basins represented more than 100% of the long-term average, in the other basins it was between 78 and 98 %.

Chart 045 | Trend of the average annual water level of surface water courses



Source: SHMI

The minimum average monthly flows were recorded mainly in July and in the period from September to December. Their values ranged from 4% (on the Morava tributaries) to 166% (in the Malý Dunaj basin) of the corresponding long-term average monthly flow.

The minimum average daily flows in Slovakia in 2021 were similar to the minimum monthly flows, especially in July and in the period from September to December. Only sporadically at some gauging stations they fell below Q_{364d}.

In the Malý Dunaj basin, such small values of average daily flows occurred in two stations (Svätý Jur - Šúrsky kanál, Vajnory - Račiansky potok) and in the Váh basin at six stations (Blatnica - Gaderský potok, Necpaly - Necpalský potok, Pivovarský potok - Martin, Bystrica – Riečnica, Váh – Hlohovec and Váh - Šaľa). In the Hron basin, a flow smaller than Q_{364d} was recorded on Bystrianka in Bystrá and Tále, on Hutná in Ľubietová, on Slatina in Hriňová nad VN and in Zvolen, on Hron in Banská Bystrica, Zvolen and Veľké Kozmálovce.

Balance of water resources

In 2021, the annual inflow to the territory of the Slovak Republic was 60 787 mil. m^3, which is 271 million more than in 2020. The outflow from the territory of the Slovak Republic decreased by 441 mil. m^3 compared to the previous year, the decrease in annual outflow amounted to 122 mil. m^3.

As of 1st January 2021, the total water reserve in storage tanks represented 918.6 mil. m^3, which represented 79% of the usable volume of water in storage tanks. As of 1st January 2022, the total usable volume of the evaluated storage tanks compared to the status on 1st January 2021 decreased to 745.9 mil. m^3, which represents 64% of the usable volume of water.

BALANCE OF WATER RESOURCES

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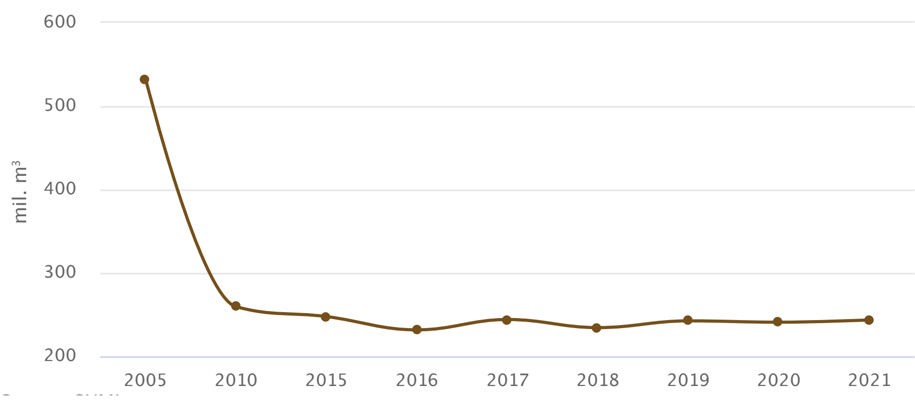
WATER USE IN TERMS OF PRESERVING WATER RESOURCES

The Water Exploitation Index Plus (WEI+) expresses the ratio of water requirements and renewable water resources for a certain area. In Slovakia, the value of WEI+ reached 0.39% in 2017, which is below the level of 20%, which is generally considered an indicator of water scarcity.

In 2021, total surface water withdrawals increased by 1.1% compared to the previous year. The increase in withdrawals for industry amounted to 2.1%, withdrawals of surface water for water supply systems decreased by 7.3%. Surface water withdrawals for irrigation increased minimally and reached a value of 14.99 mil. m³, which was at the level of 2020.

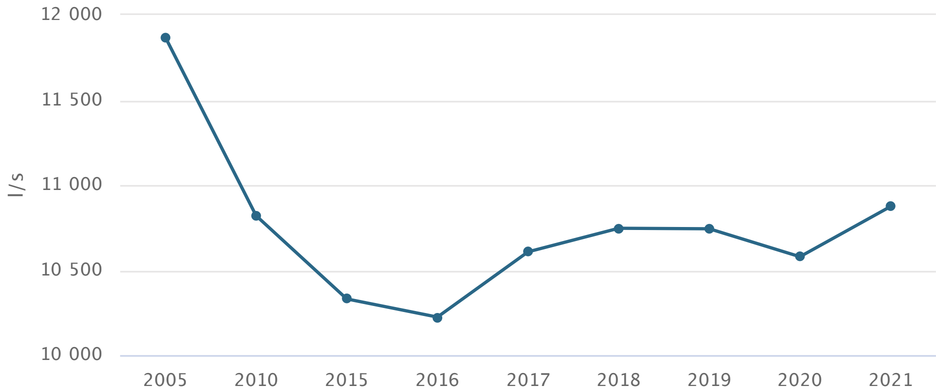
Chart 046 | Trend in surface water withdrawals



Source: SHMI

In 2021, an average of 10 873.80 l.s⁻¹ of groundwater was used in Slovakia, which represented 13.85% of the documented exploitable amount. In 2021, groundwater withdrawals increased by 2.79% compared to 2020.

Chart 047 | Trend in the use of groundwater



Source: SHMI

In the year-on-year comparison (2020-2021), there was an increase in groundwater withdrawals according to the purpose of use in five categories; on the contrary, a decrease in withdrawals was recorded in the areas of crop production and irrigation by 9.85 $l.s^{-1}$ and social purposes by 7.72 $l.s^{-1}$. Groundwater withdrawals increased the most in the public water supply category by 211.96 $l.s^{-1}$, the increase also occurred in the category of other use by 62.53 $l.s^{-1}$ and food industry by 20.13 $l.s^{-1}$, the categories other industry and agriculture and livestock production recorded a minimal increase.

9

CLEAN AIR

KEY QUESTIONS AND KEY FINDINGS

What is the trend in the generation of pollutants in the Slovak Republic?

Emissions of basic pollutants (SO_2, NO_X, non-methane volatile organic compounds (NMVOC), CO and ammonia) decreased in the period 2005-2020. The decrease was also recorded in the comparison of 2019 and 2020.

Emissions of solid dust particles also decreased in the long term, but in a year-on-year comparison, PM_{10} emissions increased very slightly.

In the case of heavy metals (Cd, Hg, Pb), a downward trend in their emissions was recorded in the long term, but also in the short term compared to 2019, when Hg, Pb emissions decreased and Cd emissions remained at approximately the same level.

Emissions of persistent organic pollutants (POPs) also decreased between 2005 and 2020. A year-on-year decrease was also recorded in a similar way.

Does the Slovak Republic fulfil the obligations resulting from international obligations in air protection?

The Slovak Republic fulfils the reduction obligations resulting from EU legislation and international documents in air protection without shortcomings. For most substances, their emissions are currently below the binding values defined for the period 2020-2029.

Are the limit values for air pollutants intended to protect human health being met?

In 2021, the limit values for the protection of human health for 24-hour concentrations of PM_{10} at 3 monitoring stations were exceeded, and at 3 stations the average annual values for $PM_{2.5}$ were exceeded too. The health target value for BaP at 9 monitoring stations was exceeded. At 2 monitoring stations, the permitted values of ground-level ozone concentration for the protection of human health were exceeded. Limit values were observed for other pollutants.

Are the limit values for air pollutants intended to protect vegetation and forests being met?

The limit values of pollutants in the air determined for the protection of vegetation (SO_2, NO_X) were not exceeded. At 4 monitoring stations, the permitted values of ground-level ozone concentration for the protection of vegetation and forests were exceeded.

What is the trend in the status of the ozone layer and the intensity of solar radiation over the territory of the Slovak Republic?

The total atmospheric ozone was below the long-term average of -1.7%, the total amount of daily doses of ultraviolet erythematic radiation increased slightly in Bratislava compared to 2020 and decreased slightly in Gánovce.

Does the Slovak Republic comply with international obligations to protect the Earth's ozone layer?

The Slovak Republic fulfils its obligations arising from international documents in the protection of the ozone layer.

What is the trend in the impact of transport on the air?

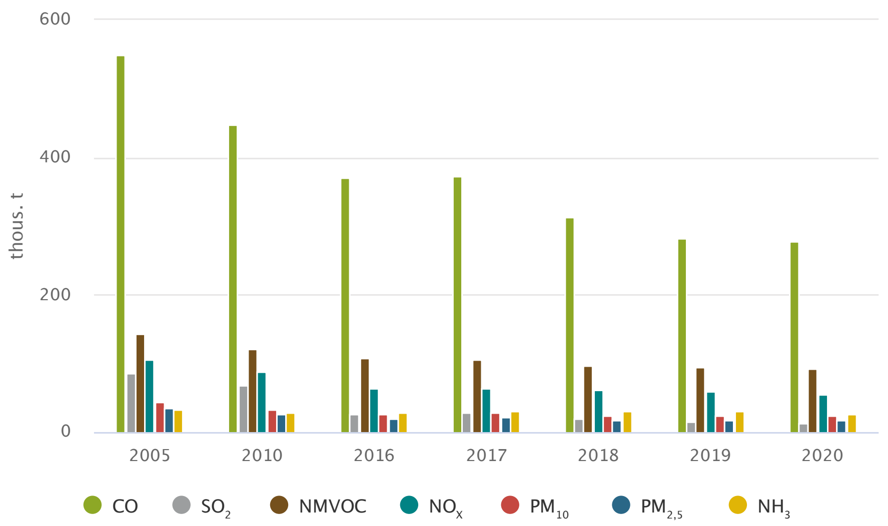
In the period 2005-2020, the emissions of basic pollutants from transport decreased. A permanent decrease since 2010 was recorded in CO, NO_X, PM_{10} and $PM_{2.5}$ emissions. SO_2 emissions also showed a fluctuating trend in the years 2005-2017 and has had a slightly increasing trend since 2018, although they slightly decreased in 2020.

Trend in emissions of selected pollutants

The evaluation of the emission situation is processed on the basis of emission inventories resulting from the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and thus according to the NFR categorization of sources (NFR - Nomenclature for Reporting).

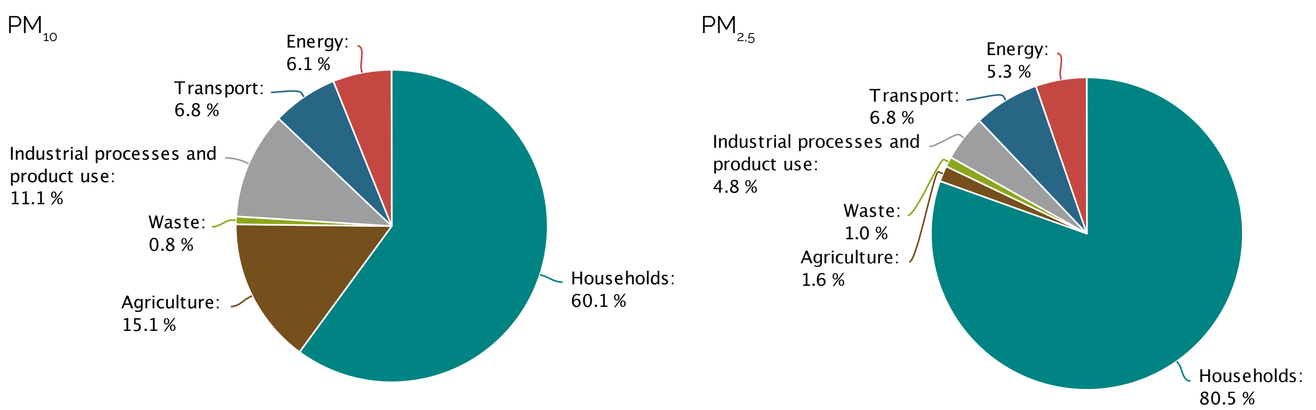
A comparison of the years 2005-2020 revealed **a decrease in the emissions of basic pollutants.** In the year-on-year comparison (2019-2020), there was a decrease in the emissions of all monitored pollutants, except for the PM_{10} emissions, which, however, increased only very slightly. This positive trend was recorded as a result of legislative and technological progress and a change in the fuel base. Changes in the structure and volume of industrial production also had an impact on the development.

Chart 048 | Emissions of selected air pollutants and particular matter



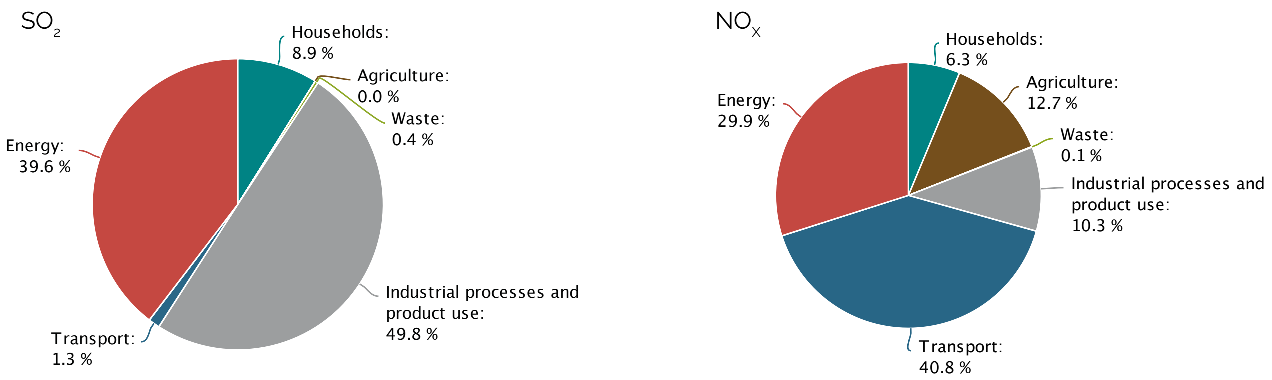
Source: SHMI

Chart 049 | Contribution of different sectors for emissions of PM_{10} and $PM_{2,5}$ (2020)



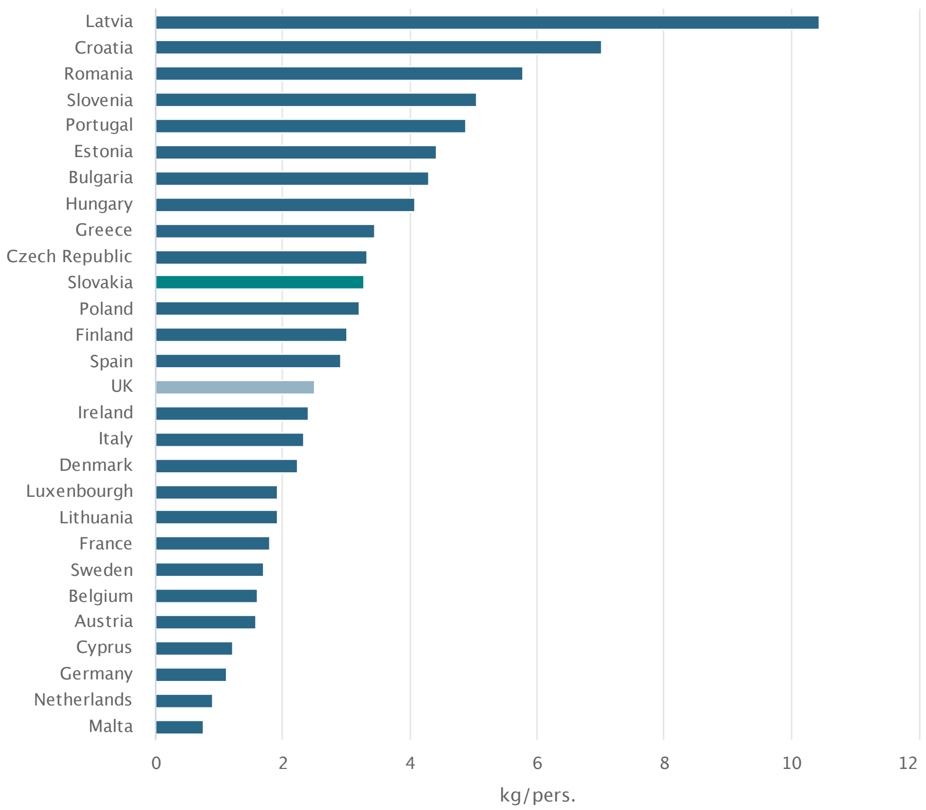
Source: SHMI

Chart 050 | Contribution of different sectors for emissions of SO_2 and NO_X (2020)



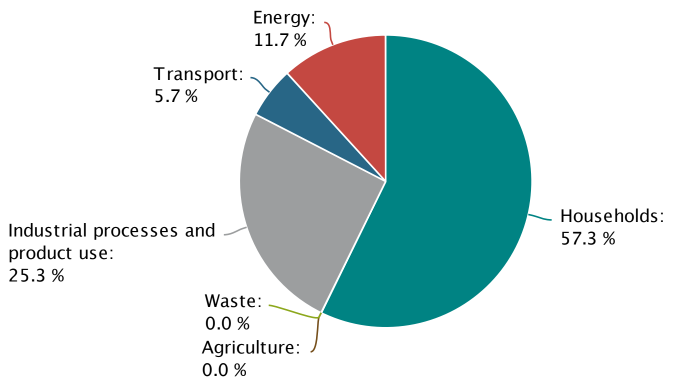
Source: SHMI

Chart 051 | International comparison of $PM_{2.5}$ emissions (2019)



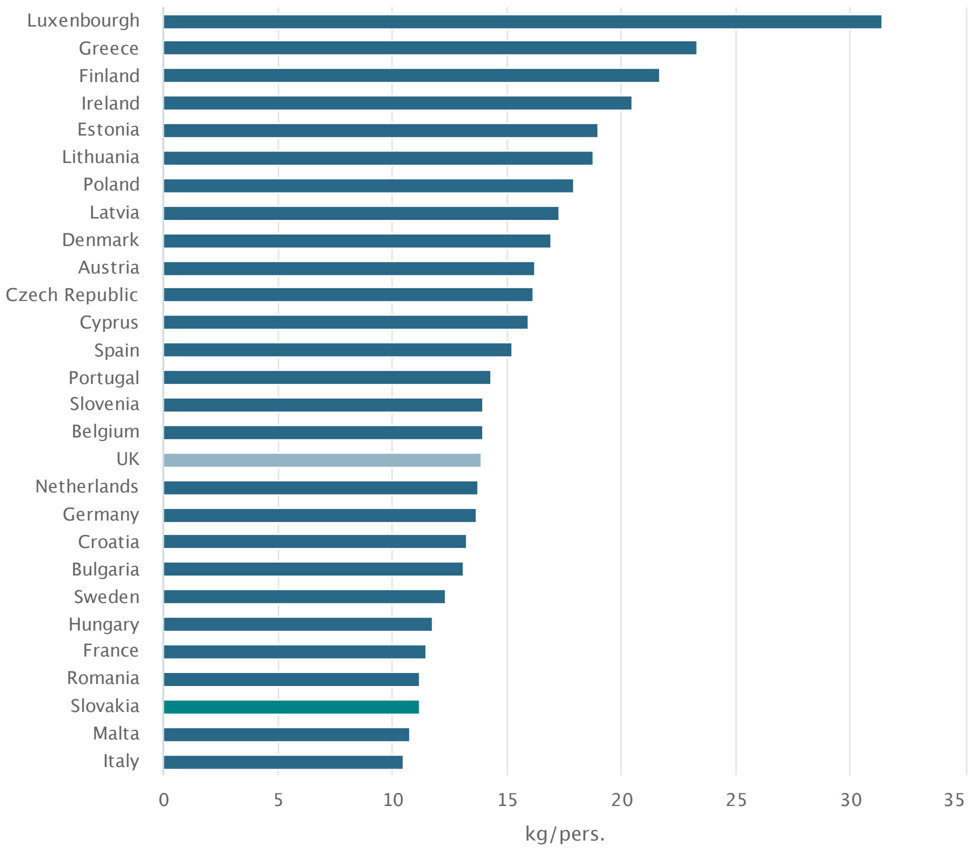
Source: Eurostat

Chart 052 | Contribution of different sectors for emissions of CO (2020)



Source: SHMI

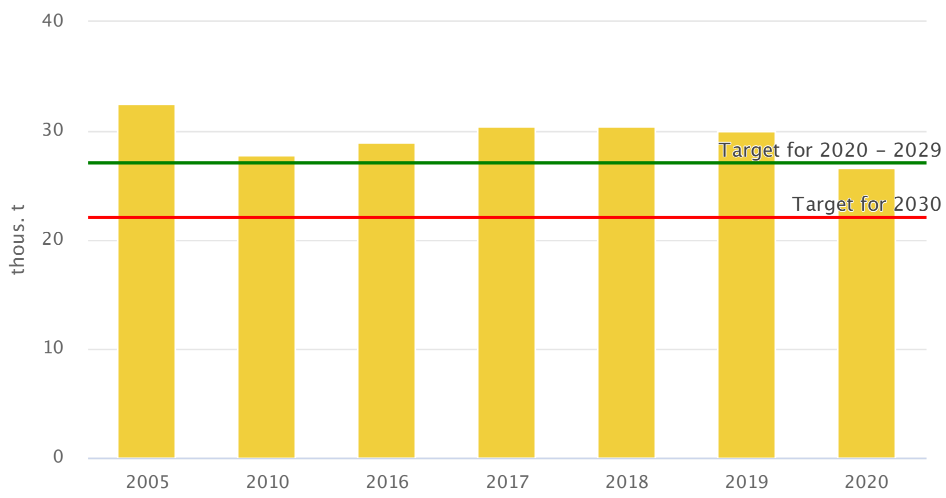
Chart 053 | International comparison of NO_x emissions (2019)



Source: Eurostat

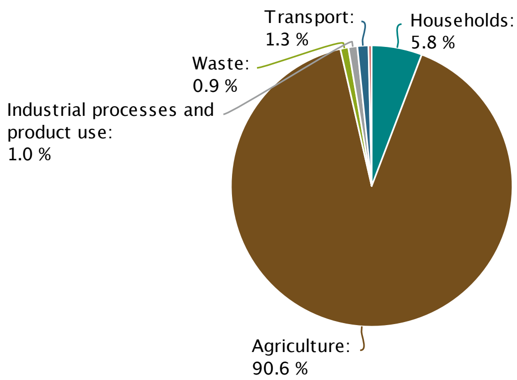
Ammonia (NH_3) emissions reached the amount of 26,594 tons in 2020. Compared to 2019, there was a 13% decrease. In terms of longer-term trend, ammonia emissions **decreased by 31.5%** in 2020 compared to 2005.

Chart 054 | Trend of NH_3 emissions in terms of meeting national targets



Note: National obligations to reduce emissions according to the NEC directive for Slovakia
Source: SHMI

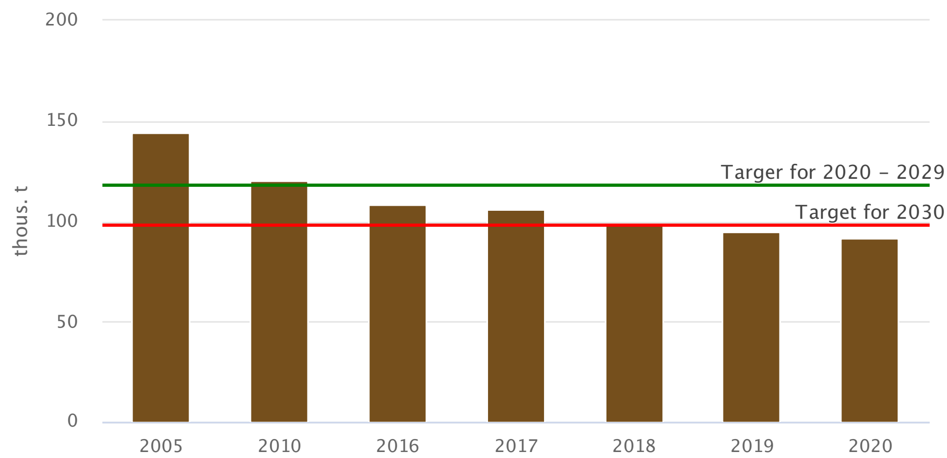
Chart 055 | Contribution of different sectors for emissions of NH_3 (2020)



Source: SHMI

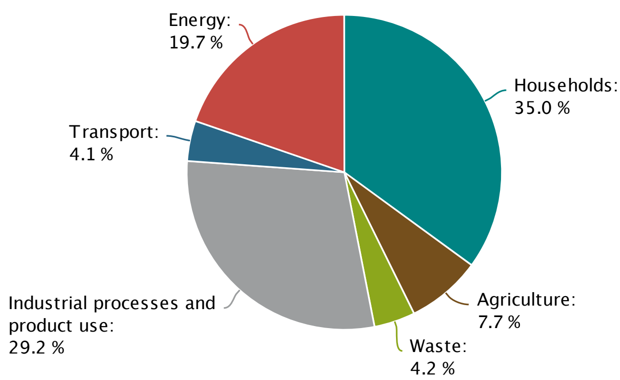
In the long-term time horizon of 2005-2020, there was a **36.5%** decrease in the **emissions of non-methane volatile organic compounds** (NMVOC). In the last years, the trend of NMVOC emissions was slightly decreasing. This development was mainly caused by the decrease in the consumption of coating substances, the introduction of low-solvent types of coatings, the introduction of measures in the oil processing sector, the gasification of combustion equipment, the change of the car fleet in favour of vehicles equipped with a controlled catalyst. The adoption of new stricter legislation aimed at limiting emissions of volatile organic compounds also had a positive impact.

Chart 056 | Trend of NMVOC emissions in terms of meeting national targets



Note: National obligations to reduce emissions according to the NEC directive for Slovakia
Source: SHMI

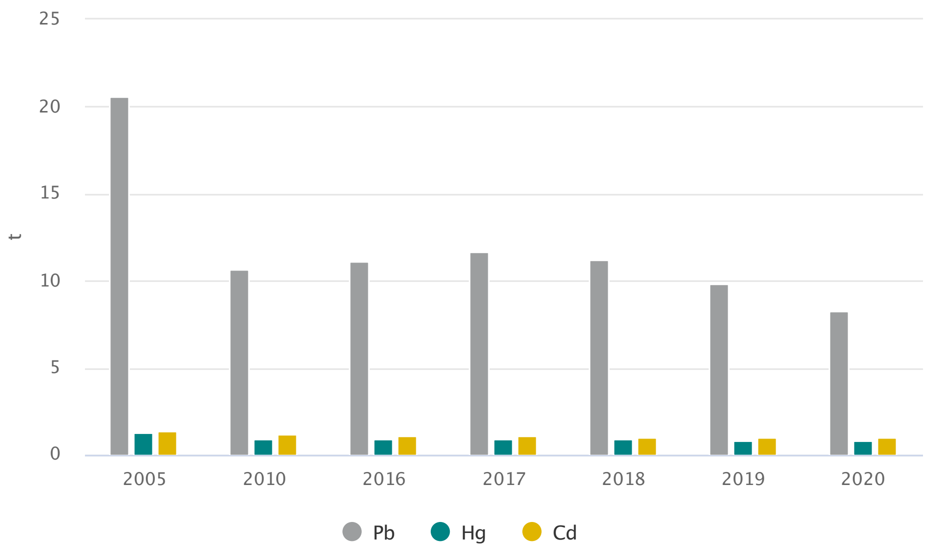
Chart 057 | Contribution of different sectors for emissions of NMVOC (2020)



Source: SHMI

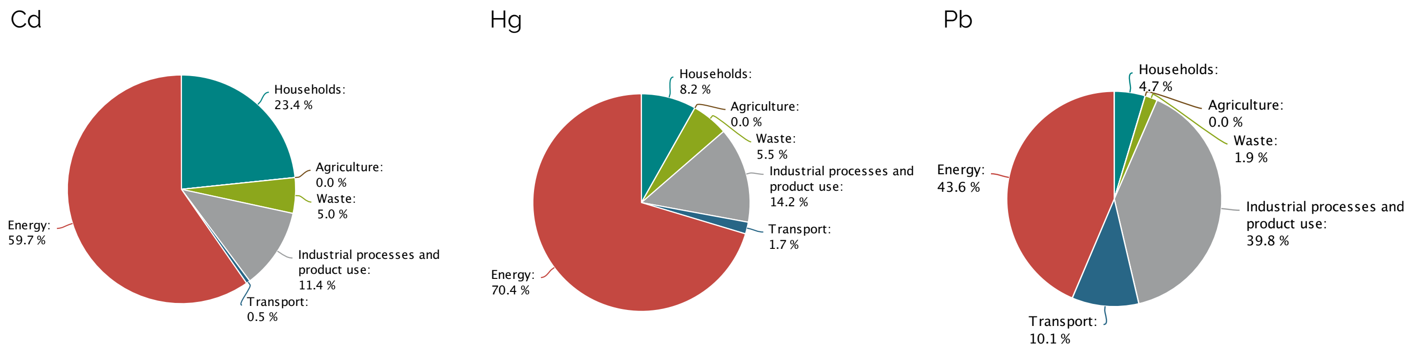
When comparing the years 2005 and 2020, there was a **59.9% decrease in Pb, 34.6% Hg and 27.9% Cd emissions**. In 2020, compared to 2019, there was a slight decrease in the case of Hg and Pb emissions, and Cd emissions remained at the same level. In addition to the tightening of the relevant legislation, the above-mentioned development was also influenced by the shut-down of outdated production, the decline in industrial production and the transition to the use of unleaded gasoline. Industry mainly contributes to heavy metal emissions, in the case of cadmium it is the production of copper, and in the case of lead and cadmium it is the production of iron and steel.

Chart 058 | Trend of heavy metals emission (Cd, Hg, Pb)



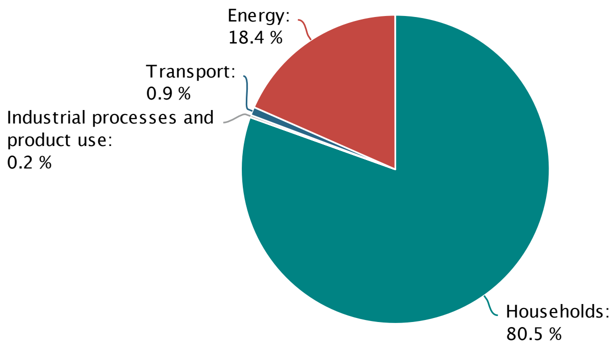
Source: SHMI

Chart 059 | Contribution of different sectors for emissions Cd, Hg, Pb (2020)



Source: SHMI

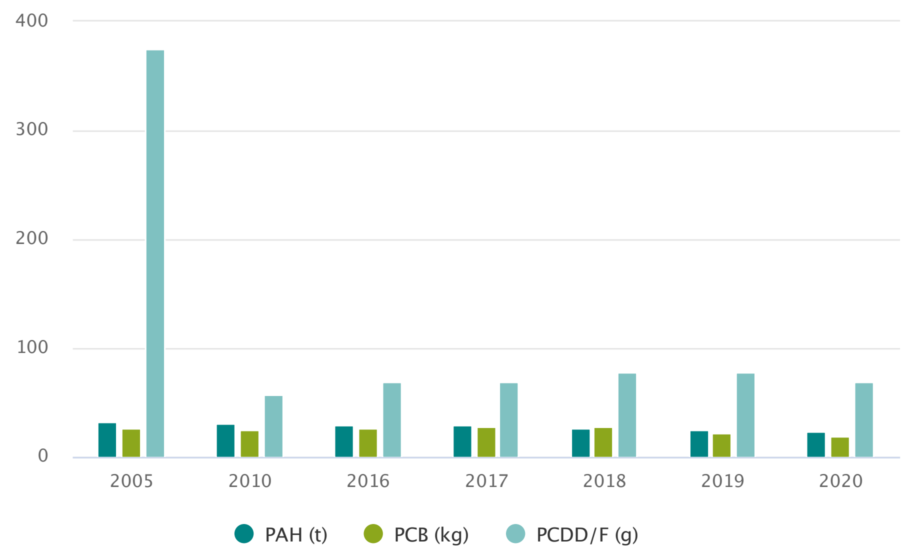
Chart 060 | Contribution of different sectors for emissions of benzo(a)pyrene (2020)



Source: SHMI

Emissions of persistent organic substances (POPs) were decreasing for a long time since 2005, but at the same time there was a year-on-year decrease. The most important sources of these emissions include iron and steel production, waste incineration, but also the burning of solid fuels in households.

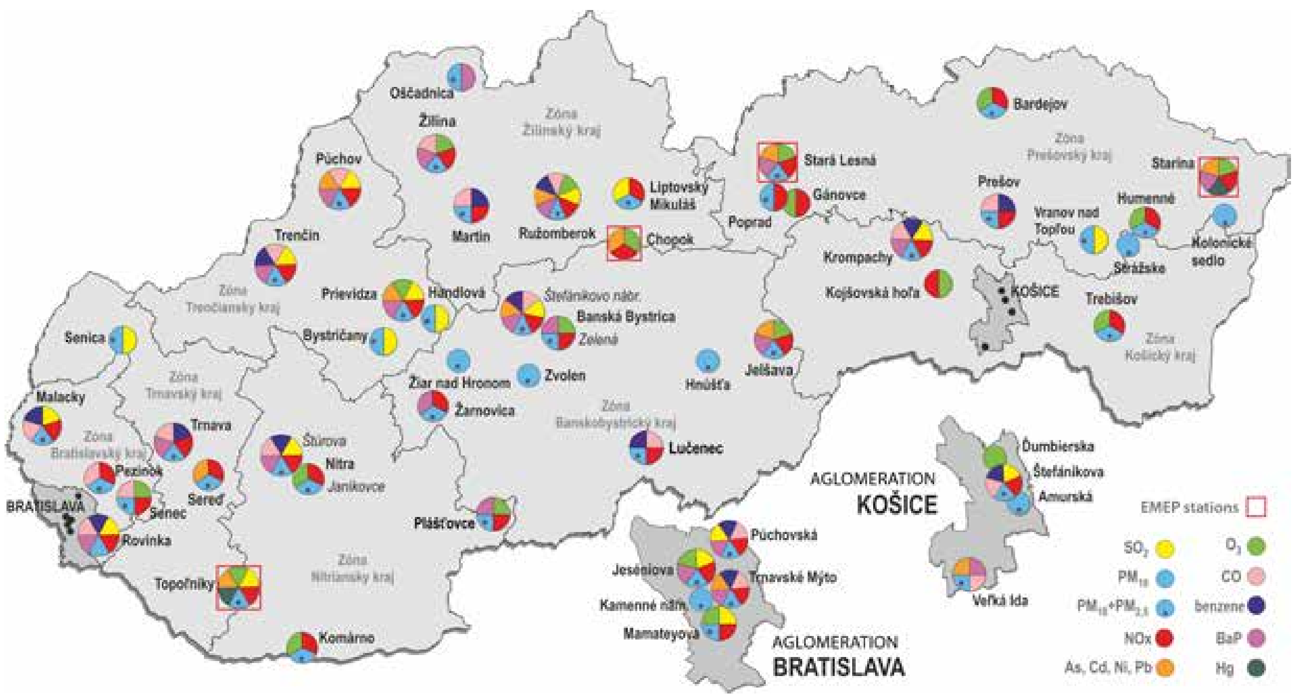
Chart 061 | Trend of persistent organic pollutants (POPs)



Source: SHMI

AIR QUALITY

Map 012 | National air quality monitoring network (2021)



Source: SHMI

Sulphur dioxide

In 2021, the limit value for average hourly and daily SO_2 values was not exceeded in any agglomeration or zone. At the same time, this year at the monitoring stations in the Slovak Republic, there was no case of exceeding the warning threshold. The measured concentrations have been below the limit value for a long period of time.

Nitrogen oxide

In 2021, the annual limit value for NO_2 was not exceeded at any monitoring station. Also, the limit value for the protection of human health for hourly concentrations of this pollutant was not exceeded. In 2020, there was no case of exceeding the warning threshold for NO_2.

PM_{10}

In 2021, the limit value for the average annual concentration of PM_{10} was not exceeded at any monitoring station. The limit value for the protection of human health for 24-hour concentrations was exceeded at three AMS: Jelšava - Jesenského, Banská Bystrica - Štefánikovo nábrežie, Veľká Ida - Letná.

$PM_{2.5}$

As of 1 January in 2020, a stricter limit value of 20 μg.m^{-3} was applied for $PM_{2.5}$. In 2021, this limit value was exceeded at three AMS - Jelšava - Jesenského, Banská Bystrica - Štefánikovo nábrežie, Martin - Jesenského. The health consequences of air pollution depend on both the size and composition of the particles and are more severe the smaller the particles. The European and, after the implementation, also the Slovak legislation therefore shifts the focus of attention to $PM_{2.5}$.

One of the indicators that should characterize the burden of the population with increased concentrations of $PM_{2.5}$ is the average exposure index (AEI), which is defined for a given year as the continuous mean value of the concentration averaged over all sampling points in the last three years. According to Annex No. 4 to the Decree of the MoE SR No. 244/2016 Coll. on air quality, the AEI value is used to prove the achievement of the national objective of reducing exposure, which was 18 μg.m^{-3} for 2020 (as an average for 2018, 2019 and 2020). The Slovak Republic also met the national objective of reducing exposure to $PM_{2.5}$ particles in 2021. The average exposure indicator in 2021 was 15.7 μg.m^{-3}.

Carbon monoxide

The limit value for CO was not exceeded in 2021 at any of the monitoring stations in Slovakia, and the level of air pollution by this pollutant for the previous period of 2012-2021 was below the lower limit for evaluating the level of outdoor air pollution.

Benzene

The highest level of benzene was measured in 2021 at the station Krompachy, SNP. However, the average annual concentration values were significantly below the limit value of 5 μg.m^{-3}.

Pb, As, Ni, Cd

Neither the limit nor the target value was exceeded in 2021. The average annual concentrations of heavy metals measured at the NMSKO stations were usually only a fraction of the limit, or target value.

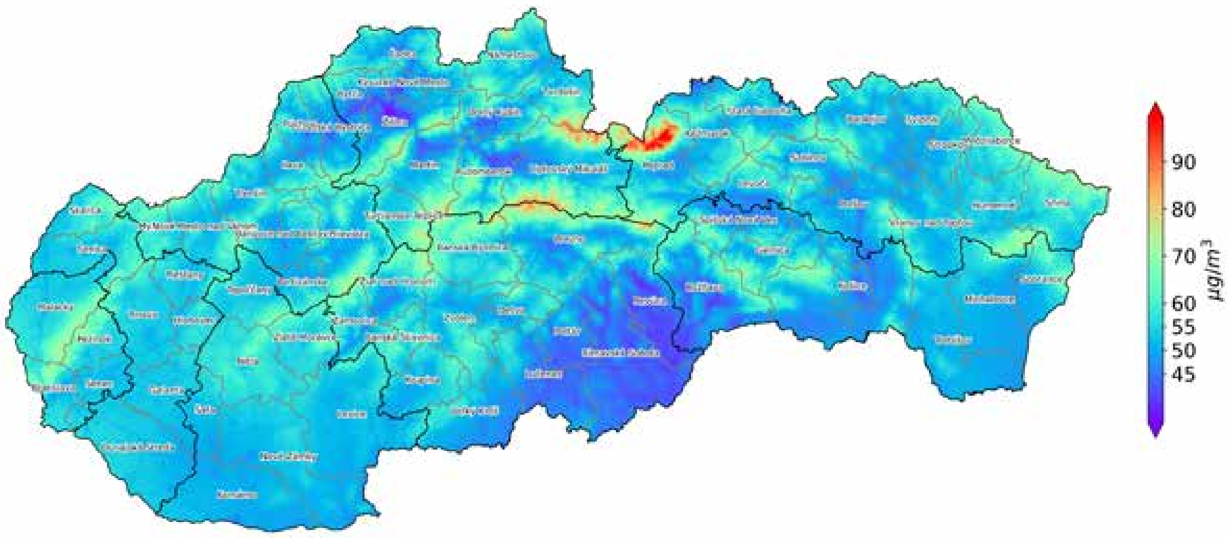
BaP

The target value for BaP was exceeded at most monitoring stations monitoring this pollutant. Therefore, it is necessary to pay extra attention to this pollutant. The target value (1 ng.m^{-3}) was exceeded at the stations Veľká Ida - Letná, Banská Bystrica - Štefánikovo nábr., Banská Bystrica - Zelená; Žilina - Obežná, Jelšava - Jesenského, Krompachy - SNP and Prievidza - Malonecpalská, Ružomberok - Riadok, Žarnovica - Dolná. At the monitoring stations Trenčín - Hasičská, Plášťovce, Púchov - 1.mája, high concentrations of BaP were also measured, but the number of measurements at them was not sufficient, therefore the annual average for this station is not evaluated.

Ground-level ozone

The average **annual concentrations of ground-level ozone** in Slovakia in 2021 ranged from 35 to 89 µg.m^{-3}. The Chopok station had the highest average annual concentrations of ground-level ozone in 2021 (89 µg.m^{-3}).

Map 013 | Average annual concentrations (µg.m^{-3}) of ground-level ozone (2021)

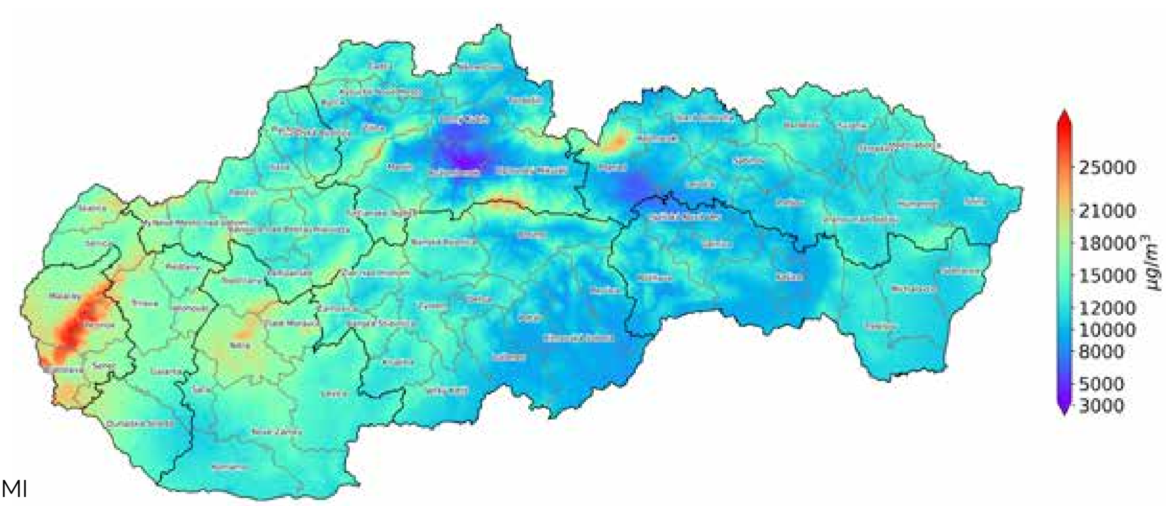


Source: SHMI

The target value of the concentration of ground-level ozone for the protection of human health is 120 µg.m^{-3} (greatest daily 8-hour value) according to the Decree of the MoE SR No. 244/2016 Coll. on air quality. This value must not be exceeded on more than 25 days a year, on average over three years.

The target value of the exposure **index for vegetation protection AOT40** is 18 000 µg.m^{-3}.h. This value refers to concentrations that are calculated as an average over a period of five years. The average for 2017-2021 was exceeded at the Bratislava - Jeséniova, Bratislava- Mamateyova, Nitra - Janíkovce and Chopok stations. Exceeding the permitted concentrations of ground-level ozone to protect vegetation and forests has a negative effect on vegetation, especially through defoliation.

Map 014 | Average values of AOT40 (µg.m^{-3}.h) for a period of five years (2017-2021) for vegetation protection



Source: SHMI

TRANSPORT

The transport sector has a significant negative impact on the environment and human health, and is responsible for greenhouse gas emissions, air pollution, and noise and habitat fragmentation. The extent of the production of pollutant emissions in road transport is mainly determined by individual car transport and road freight transport, which is closely related to the growth of fuel consumption. However, increasing the energy efficiency of new vehicles through technological improvements will not eliminate the dependence of the transport sector on fossil fuels and its impact on the environment.

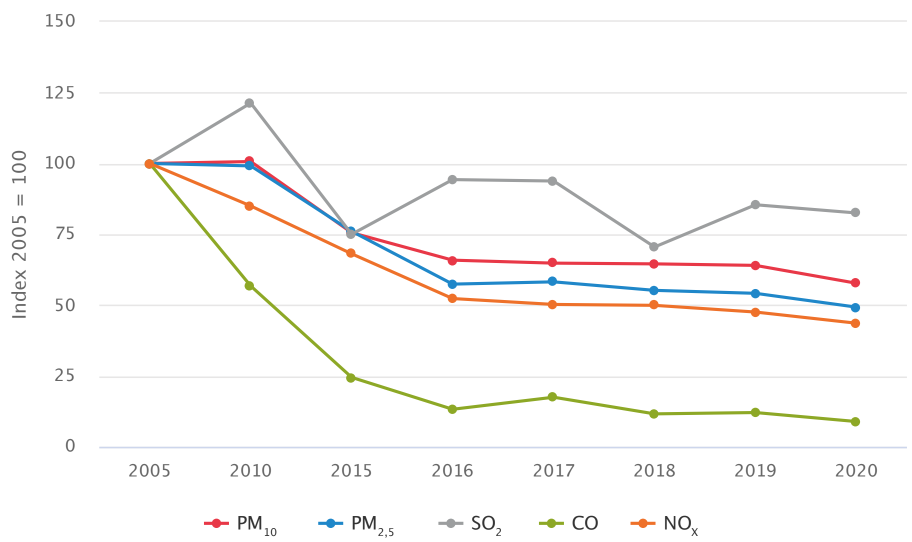
Impact of transport on the environment

In the Slovak Republic, an inventory of the production of emissions of selected pollutants is prepared regularly on an annual basis, which also includes an **annual inventory of the operation of road, rail, water and air transport.** The CORINAIR methodology, whose special program product COPERT is intended for the inventory of the annual production of emissions from the operation of road transport, is used to determine the amount of production of pollutants from transport.

In the total emissions of balanced pollutants for 2020, the 5.7% share of transport in CO emissions, 40.8% share of NO_x, 4.1% share of NMVOC and 1.3% share of SO_2 emissions is significant. The proportion of emissions of $PM_{2.5}$ and PM_{10} solid particles was 6.8%.

There was a more significant decrease in CO emissions by 91.1% of the main pollutants in transport in the observed period of 2005-2020. Despite the fluctuating trend, NO_x emissions also decreased by 56.4%, $PM_{2.5}$ emissions by 50.7%, PM_{10} emissions by 42.3% and SO_2 emissions by 17.5% in the monitored period.

Chart 062 | Trend in emissions of the main pollutants from transport

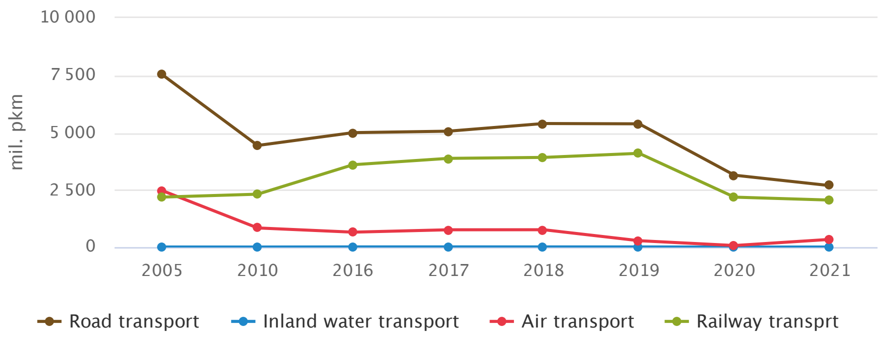


Source: SHMI

Transport of passengers and goods

The coronavirus (COVID-19) pandemic continued in 2021, affecting passenger transport more than freight transport. The **number of transported passengers** year-on-year (2020-2021) decreased by 7% and **transport performance** decreased by 10.1%, compared to 2019 (pre-pandemic year), the decrease in passenger transportation was 35.2% and the performance was 48.2%. The share of individual modes of transport in the performance passenger transport (without individual transport) is as follows: urban public transport - 57%, road public transport - 25%, rail transport - 17%, air and water transport - 1%.

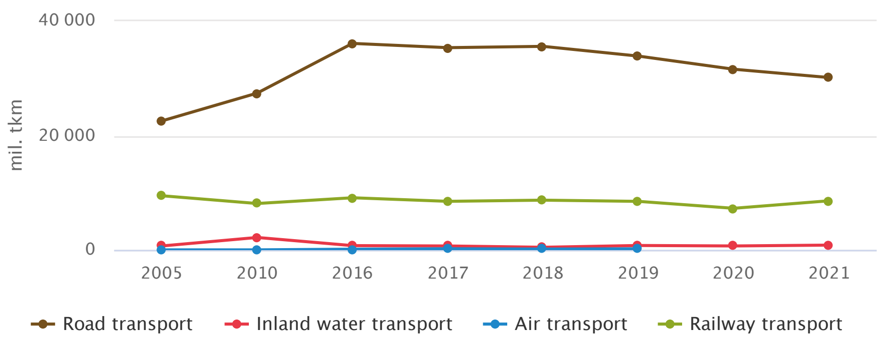
Chart 063 | Trend in transport performances in passenger transport by mode of transport



Source: SO SR

The decrease in the transport of goods in the year-on-year comparison (2020-2021) was 7.4% and the transport performance was 0.7%. Compared to 2019, the transport of goods decreased by 17.3% and the performance by 7.1%. Road transport has the largest share of freight transport performance (approx. 76%), followed by rail transport (22%) and inland water transport represents only 2%; no goods were transported by air transport.

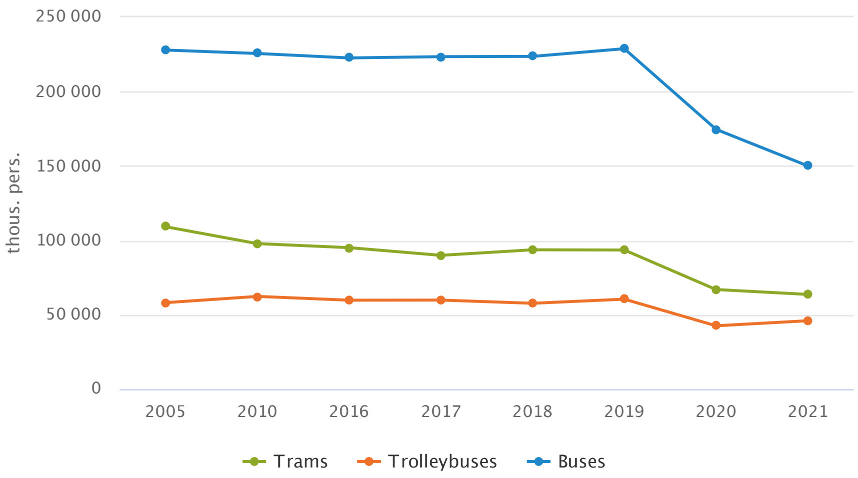
Chart 064 | Trend in transport performances in freight transport by mode of transport



Source: SO SR

Urban public transport (UPT) is provided by transport companies in Bratislava, Košice, Banská Bystrica, Prešov and Žilina. In other cities of the Slovak Republic, transport is provided without the ownership participation of the city, usually by the Slovak Automobile Transport (SAD) companies or private companies, and part of the transport operated in this way is recorded as public transport. Due to the COVID-19 pandemic and related measures, there was also a drop in mobility in public transport, which was reflected in a decrease in the number of people transported by public transport buses, trams and trolleybuses. In 2021, the year-on-year decrease was 8.6%, and compared to 2019, it was at the level of 32%.

Chart 065 | Trend in the numbers of passengers transported by urban public transport



Source: SO SR

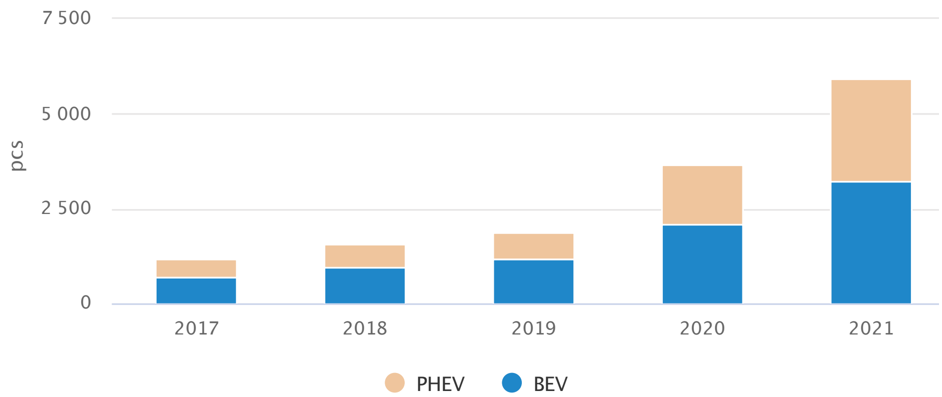
Renewal of the vehicle fleet

In 2021, 3 436 018 motorized and non-motorized vehicles were registered in all categories, which represented an increase of 86 224 compared to 2020. The average age of cars in the Slovak Republic is 13.8 years, while in the entire EU it is 11.8 years. In 2021, the number of new registered passenger cars was 75 308, and 55 178 were removed from the register. Bus public transport vehicles still show a low level of fleet renewal. In 2021, 344 new vehicles were registered, yet the average age of registered coaches, buses and trolleybuses in Slovakia is 11.3 years, while the EU average is 12.8 years. The rolling stock of regional railway transport is renewed with subsidies from European funds, but the vehicles cover only part of the traffic and Železničná spoločnost Slovensko, a.s. (ZSSK) is not able to guarantee transport by modern low-floor vehicles on most lines. In 2021, ZSSK had 692 rolling stock in its fleet with an average operating age of 21.2 years, and 885 passenger railway carriages with an average age of 22 years.

Electromobility

In 2021, the sales of low-emission vehicles increased slightly year-on-year, while two cars running on hydrogen were also sold. 17 419 electrified vehicles were registered, which represented 23% of the total number of new registered passenger cars. 1 104 battery electric vehicles (BEV) and 1 167 additional plug-in hybrid vehicles (PHEV) were sold, and the total number of electric vehicles (BEV and PHEV) increased to 5 963 in 2021. The average number of BEV and PHEV registrations in the EU in 2021 was 18.9%, while in the Slovak Republic it was only 3%.

Chart 066 | Trend in the total number of electric cars (BEV a PHEV)



Source: MoI SR

GREEN ECONOMY

10

TOWARDS THE CIRCULAR ECONOMY

KEY QUESTIONS AND KEY FINDINGS

What is the trend in resource productivity?
The productivity of resources in the Slovak economy in 2020 reached a value of 1.32 EUR/kg. Compared to 2005, it increased by 78.4%, but despite this growth, the SR significantly lags behind the average resource productivity in the EU.

Is there a reduction in waste production?
In the longer term (comparing 2005 — 2021), there was an increase in the amount of waste produced. In 2021, compared to 2020, there was a slight, 1% decrease in its quantity.

The trend of long-term and year-on-year increase in the amount of municipal waste (MW) continued. In 2021, the Slovak Republic produced 509 kg of municipal waste per inhabitant - the Slovak republic is thus gradually catching up with the average of the EU countries in the production of MW per inhabitant. However, the amount of mixed waste produced decreased by 4.8% year-on-year.

Is the share of landfilled waste decreasing?
The share of landfilling of MW decreased year-on-year, but still remains at a relatively high level - 40.1% of MW was disposed of by landfilling in 2021. In the case of waste as a whole (municipal waste, non-hazardous waste, hazardous waste), in 2021 the landfill rate was 20.3%, while in 2020 it was 23.5%.

Does the Slovak Republic meet the objectives resulting from EU regulations, or the national objectives?
Even in 2021, the increase in the recycling rate of municipal waste continued - in 2021 it reached 50.1%. For the following years, the objectives are set to increase preparation for reuse and recycling of municipal waste to at least 55% by 2025, at least 60% by 2030 and at least 65% by 2035. The objective of increasing the rate of municipal waste recycling, including its preparation for reuse, to 60% by 2030 is also set in Envirostrategy 2030. Also, in the case of municipal waste disposed of by landfilling, an improvement was recorded between years 2020—2021 — a year-on-year decrease of 4.4 percentage points. However, the objective of reducing municipal waste landfill rate to less than 10% by 2035 is still relatively distant. However, in the case of the national objective set in Envirostrategy 2030, an objective of 25% is set in this area. There was a year-on-year increase in the rate of sorted municipal waste collection (from 34.8% in 2020 to 38.7% in 2021). The objectives by 2025 - to increase the rate of sorted collection of municipal waste to 60% and the rate of preparation for reuse and recycling of municipal waste to 55% set in the Waste Management Programme of the Slovak Republic for the years 2021—2025 was not met yet.

In 2021, 9.04 kg of waste from electrical and electronic equipment per inhabitant was collected from households. In 2021, the Slovak Republic met the objective of electrical and electronic waste collection, and in 2021 it also met the limits of the rate of recovery and the rate of recycling of individual categories of electrical and electronic waste.

For the reuse of parts of old vehicles and recycling of old vehicles, the Slovak Republic achieved a share of 95.38%, thus meeting the required limit. The reuse and recovery rate of old vehicles reached 97.09% in 2021.

There was a year-on-year decrease of less than 1% in the production of packaging waste. With the exception of metals, the recycling rate for all monitored materials increased year-on-year, and the minimum recycling targets set for individual materials until 2025 are already being met.

In 2021, 953.5 tons of used portable batteries and accumulators were collected, which corresponds to a collection rate of 47.3%. The Slovak Republic thus met the limit set by the relevant EC directive.

MATERIAL INTENSITY OF THE ECONOMY

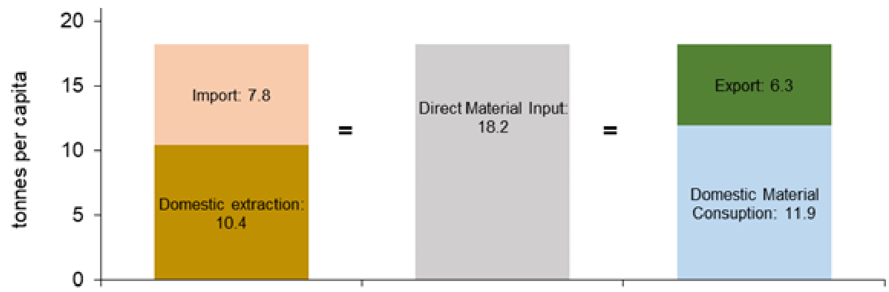
Material flows

The account of material flows quantifies the overall demands of the economic system for materials. This account monitors the exchange of material flows between the national economy and the environment - extraction of materials on the input side and waste flows, emissions on the output side and flows between the national economy and other economies - foreign trade (imports and exports).

Domestic extraction (mineral raw materials and biomass) plus imports represent a **direct material input** to the economy. The total amount of materials directly used within the national economy is monitored by **domestic material consumption**, which is calculated as direct material input minus exports.

In 2020, domestic mining for the Slovak Republic was 10.4 tons per inhabitant, while the average value within the EU was 11.8 tons per inhabitant. The imports of goods amounted to 7.8 tons per inhabitant. Direct material input (DMI) was therefore 18.2 tons per inhabitant in Slovakia in 2020 (the average value within the EU states was 15.2 tons per inhabitant). Domestic material consumption (DMC) was 11.9 tons per inhabitant (the average value within the EU states was 13.6 tons per inhabitant).

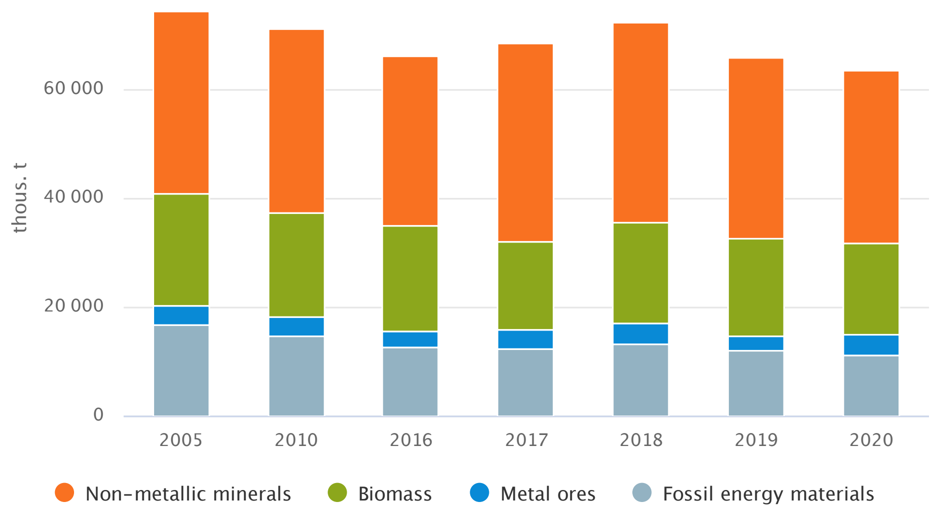
Chart 067 | Amount of materials available and their use (2020)



Source: Eurostat

DMC in the SR reached a value of 64 775 thousand tons in 2020, and the largest part (51.2%) consisted of non-metallic mineral raw materials, followed by biomass with 27.2%, energy raw materials (16.7%) and metallic minerals (4.9%). Compared to the previous year, it decreased by 3.3% and compared to 2005, it decreased by approx. 14%.

Chart 068 | Trend in domestic material consumption

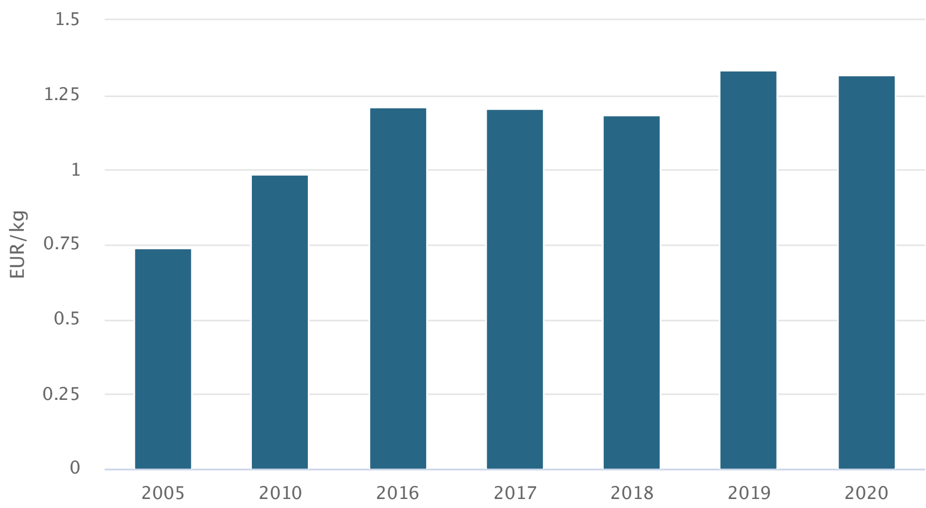


Source: Eurostat

Resource productivity

In 2020, the productivity of resources (GDP/DMC) in the Slovak economy was 1.32 EUR/kg. Compared to 2005, when its value was 0.74 EUR/kg, it increased by 78.4%. Compared to the previous year, it decreased by 1%. Despite the long-term growth of the SR, it lags significantly behind the average productivity of resources in the EU countries, which reached a value of 2.1 EUR/kg in 2020.

Chart 069 | Trend in resource productivity

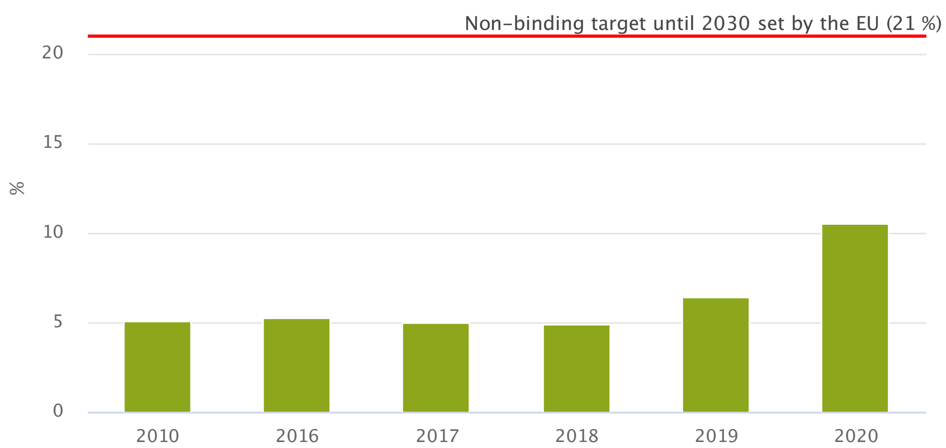


Note: Resource productivity (measured as GDP at constant prices 2015 to DMC)
Source: Eurostat

Circular material use rate

Whether recycled material is returned back to the economy is evaluated by the indicator circular material use rate. In a simplified way, it can be said that with the increasing rate of use of recycled materials, the need for extraction of primary raw materials decreases, which also reduces the possible negative effects of extraction on the environment. Between 2010 and 2019, the circular material use rate increased only slightly. A more significant increase was recorded between the years 2019—2020, when the circular material use rate increased by 4.1 percentage points.

Chart 070 | Trend in circular material use rate

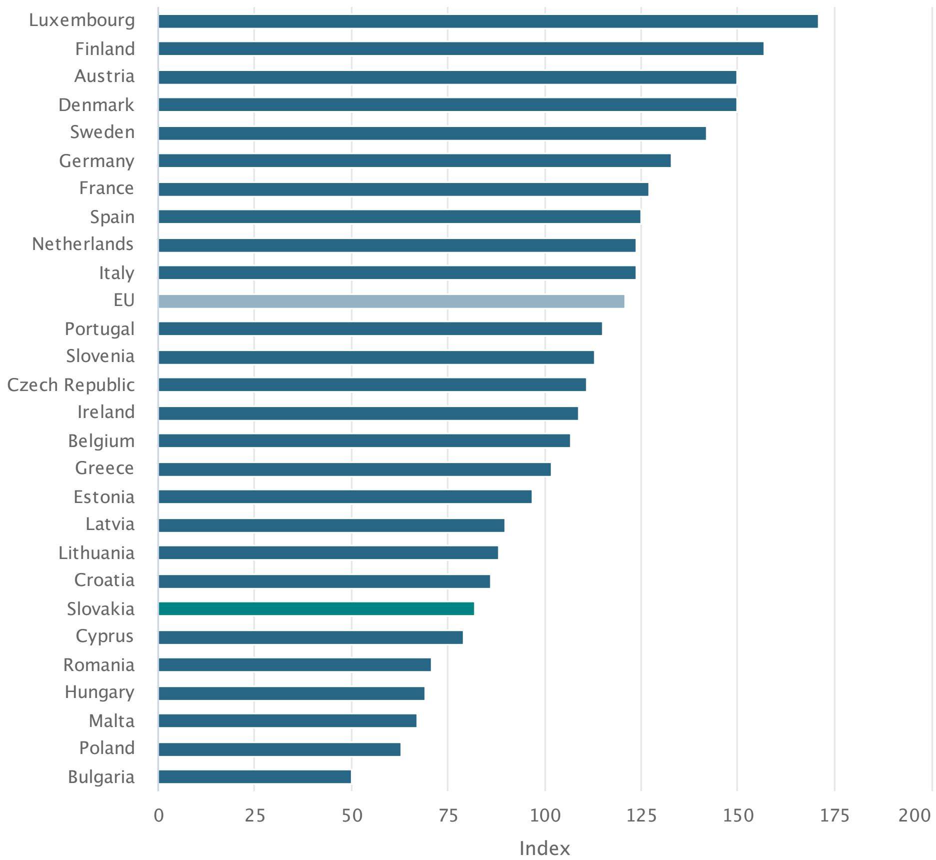


Note: Data for 2017 and 2019 are Eurostat estimates
Source: Eurostat

Eco-Innovation

Eco-innovations, or ecological innovations, are evaluated through the Eco-Innovation Index indicator. In 2021, the Slovak Republic was ranked 21st out of a total of 27 places.

Chart 071 | Eco-Innovation Index — international comparison (2021)



Source: European Commission

WASTE

Generation and management of waste

Waste generation and management

The main objective of waste management in the Slovak Republic until 2025 is **to divert waste from disposal by landfilling**, especially for municipal waste. It is still necessary to enforce compliance with the hierarchy of waste management with an emphasis on waste prevention, preparation for reuse and recycling. The promotion of waste prevention, along with reuse and preparation for reuse through the implementation of the measures of the Waste Prevention Programme of the Slovak Republic for the years 2019—2025, are an inseparable key part of the long-term efforts of the Slovak Republic to reduce the amount of waste generated in the territory of the Slovak Republic. The big challenge of waste management in the Slovak Republic is to stop the increase in the generation of waste and, above all, to reduce the high proportion of waste disposed of by landfilling.

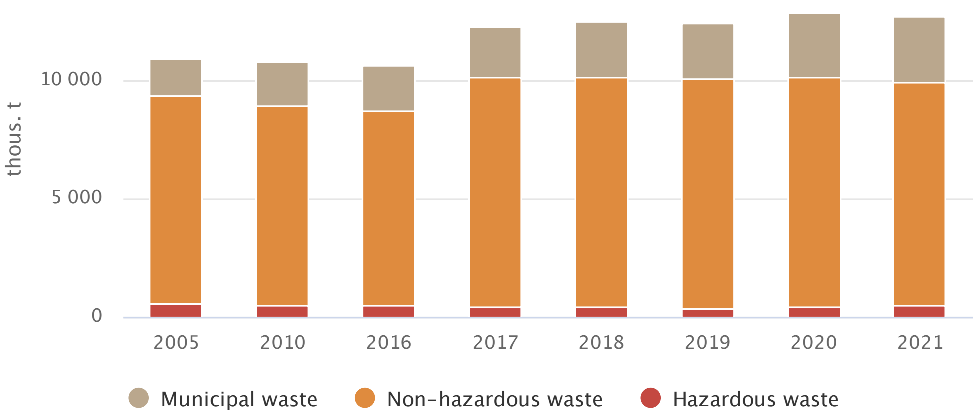
In 2021, a total of **12,710,723 tons** of waste was generated in Slovakia. Compared to 2020, this is a year-on-year decrease in total waste generation by 1%. There was a year-on-year decrease for non-hazardous waste. In the case of both hazardous waste and municipal waste, there was a year-on-year increase. *Note: Data for 2020 have been revised due to a change in methodology as well as a retrospective revision of the data provided (they do not match the originally published data).*

Table 013 | Waste generation balance (2021) (thousand tons)

Waste category	Quantity
Hazardous waste (HW)	474
Non-hazardous waste (NHW)	9 470
Municipal waste (MW)	2 767
Total	**12 711**

Note: Both categories of waste are represented in municipal waste (non-hazardous waste and hazardous waste); its separation is necessary due to the special nature of waste and the regime that applies to MW.
Source: MoE SR

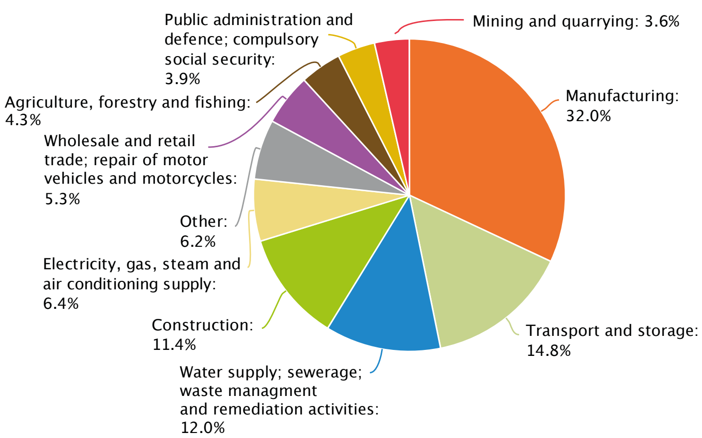
Chart 072 | Trend in waste generation



Note: Both categories of waste are represented in municipal waste (non-hazardous waste and hazardous waste); its separation is necessary due to the special nature of waste and the regime that applies to MW.
Source: MoE SR, SO SR

According to the SK NACE classification of economic activities, the largest waste producer is manufacturing (mainly non-hazardous waste), which accounts for 32% of the total waste production, followed by transport and storage with 14.8%.

Chart 073 | Generation of waste according to Slovak Statistical Classification of Economic Activities (2021)



Source: MoE SR, SO SR

The dominant recovery activity is material recovery with a 44.95% proportion of the total amount of generated waste. The high share of waste landfilling - up to 20.3% of the total amount of generated waste, as well as a relatively significant proportion (26.23%) of waste in the category of "other management" is still a problem. "Other management", with an increase since 2016, currently includes the following activities: waste collection (temporary storage of waste prior to further management), transfer of waste for household use, collection, acceptance/transfer to a dealer, acceptance/transfer to a broker, temporary storage of excavated soil, temporary storage of waste at a municipal waste transfer station. The negative side of such waste management is the deterioration of the possibility of a more accurate evaluation in the way of waste management in the given evaluated year.

Table 014 | Waste management including MW (2021)

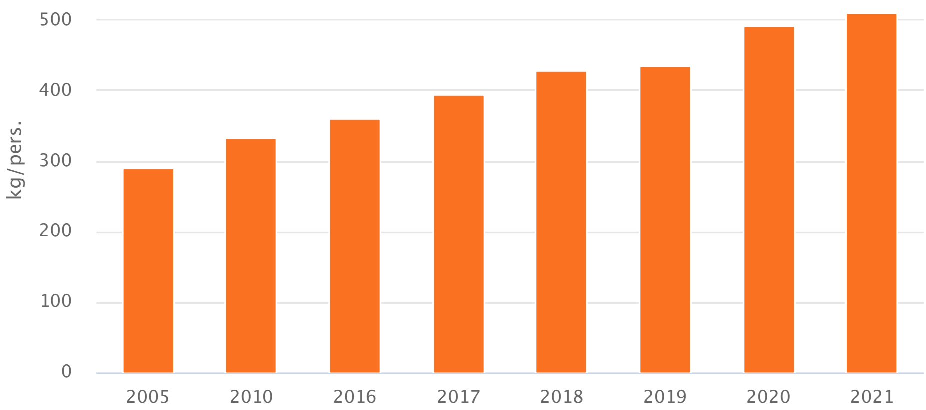
Management method	(tonnes)	(%)
Landfilling	2 580 477	20,3
Incineration without energy recovery	18 239	0,14
Other disposal	216 281	1,7
Incineration with energy recovery	647 667	5,1
Material recovery (recycling)	5 712 678	44,95
Other recovery	200 938	1,58
Other management	3 334 445	26,23
Total (after rounding)	**12 710 723**	**100**

Source: MoE SR

Municipal waste

In 2021, **2,766,927 tons** of municipal waste were generated in the Slovak Republic, which represents **509 kg of municipal waste per inhabitant**. Compared to 2020, this represents an increase of 17 kg MW per inhabitant. Municipal waste production increased by 77.6% since 2005. There was a 3% year-on-year increase in municipal waste production. On the other hand, thanks to the increase in the rate of sorted municipal waste collection, there was a decrease in the amount of mixed municipal waste - from 1,144,886 tons to 1,089,587 tons. The production of mixed municipal waste decreased by 4.8% year-on-year.

Chart 074 | Trend in the amount of municipal waste per inhabitant

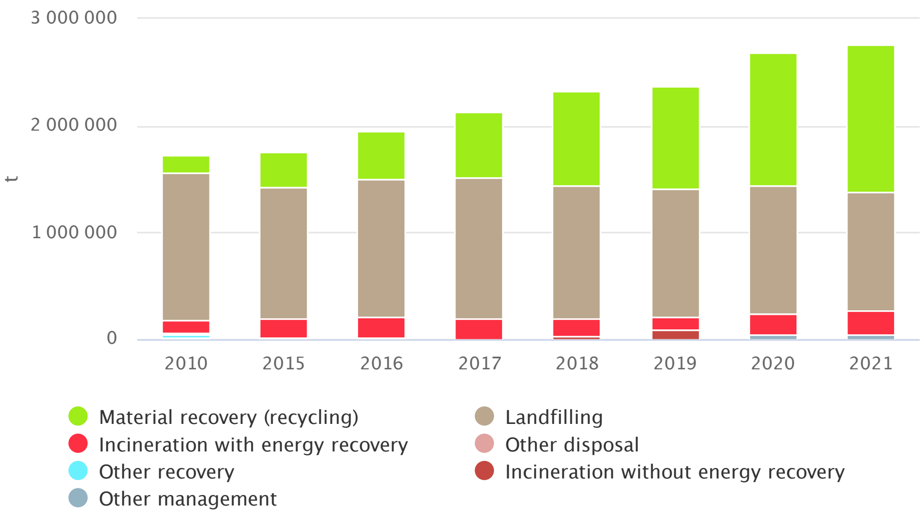


Note: Change in methodology from 2020 (the original figure for 2020 was 446 kg MW per inhabitant).
Source: SO SR

The proportion of landfilled municipal waste was 40.1% of the total disposal, which represents a year-on-year decrease of 4.4 percentage points. The objective in the field of municipal waste is **to reduce the rate of its landfilling to 10% of the total amount of municipal waste by 2035** (an objective of 25% is set in this area in Envirostrategy 2030).

In 2021, the municipal waste recycling rate reached the level of 50.1%. For the following years, the objectives are set **to increase preparation for reuse and recycling of municipal waste to at least 55%** by 2025, at least 60% by 2030 and at least 65% by 2035. The objective of increasing the rate of municipal waste recycling, including its preparation for reuse, to 60% by 2030 is also set in Envirostrategy 2030.

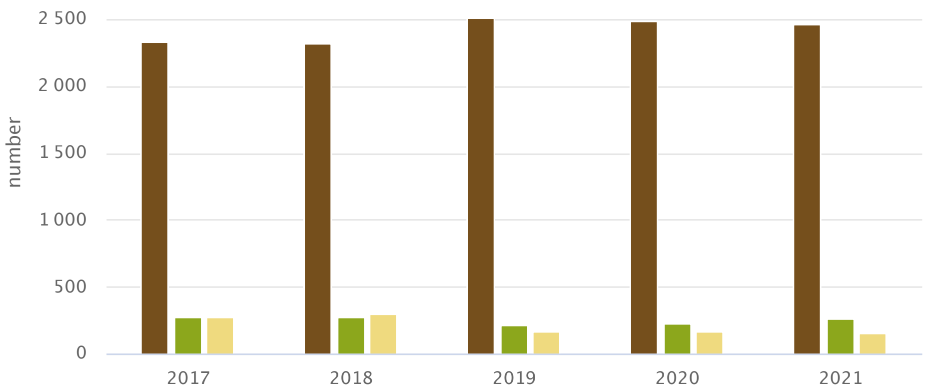
Chart 075 | Trend in the amount of municipal waste according to the method of disposal



Source: MoE SR

The local fee for the collection of municipal waste from households can be set by municipalities as a flat rate, according to the amount of waste produced, or by a combination of them. In 2021, **only 9.2% of municipalities established unit based pricing** (so-called Pay-As-You-Throw scheme) collection of municipal waste and **only 5.4% introduced a combined method**.

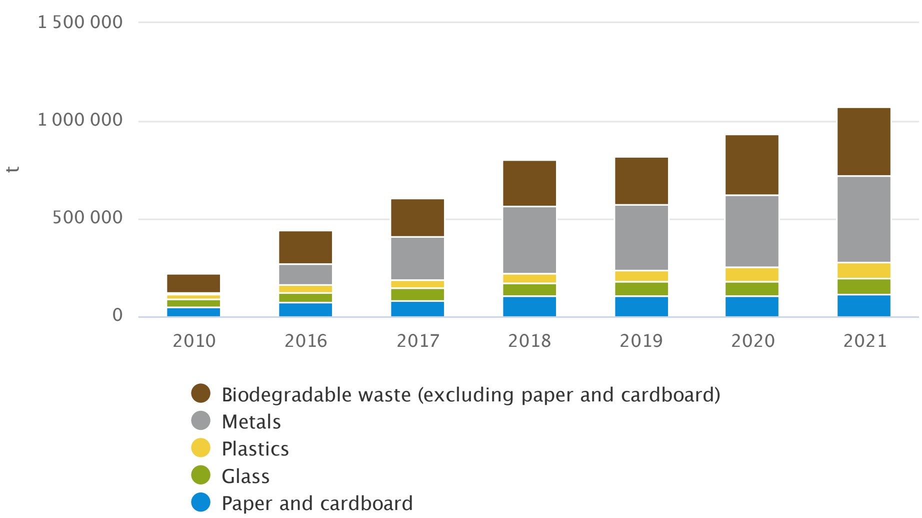
Chart 076 | Trend in the method of determining the fee for the collection of municipal waste from households



Source: SO SR

Long-term monitoring of sorted waste collection shows an **increasing trend in the amount of sorted waste components**, however, in terms of Slovakia's commitments in the field of preparation for reuse and recycling of waste, it will be necessary to intensify the sorted waste collection significantly. There was a **year-on-year increase in the rate of sorted municipal waste collection** (from 34.8% in 2020 to 38.7% in 2021). **The objective** for the sorted collection of municipal waste set in the Waste Management Programme of the Slovak Republic for the years 2021-2025 **(to increase the rate of sorted collection of municipal waste to 60% by 2025) was not met yet**.

Chart 077 | Trend in sorted collection of selected components of municipal waste



Source: MoE SR, SO SR

Similarly, as with other sorted components of MW, it will be necessary to significantly intensify the efficiency of the sorted collection of municipal bio-waste to achieve the objectives in the area of reducing the amount of biodegradable waste disposed of by landfilling.

Table 015 | Sorted biodegradable municipal waste (excluding paper and cardboard) (2021) (t)

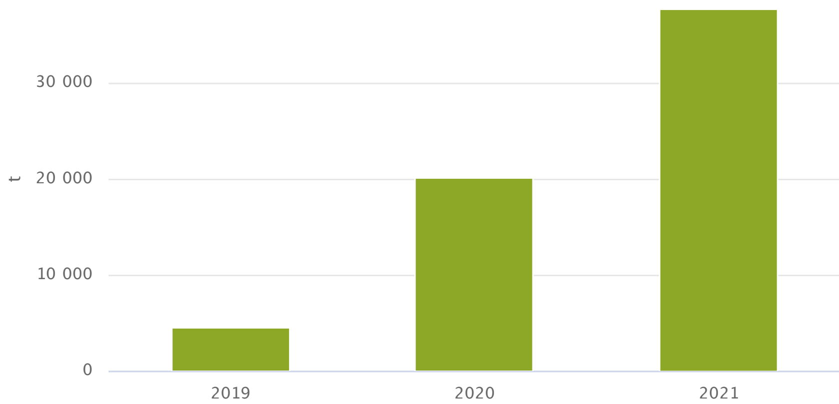
Waste code	Waste	Amount of biodegradable waste
20 01 08	**Biodegradable kitchen and canteen waste**	35 917
20 01 25	**Edible oil and fat**	1 758
20 01 38	**Wood other than that mentioned in 20 01 37 (20 01 37 - wood containing dangerous substances)**	43 668
20 02 01	**Biodegradable waste**	350 112
20 03 02	**Waste from markets**	501

Source: MoE SR

Food waste

Food waste includes waste codes 20 01 08 (biodegradable kitchen and canteen waste) and 20 01 25 (edible oil and fat). In 2021, 37,675.05 tons of food waste was produced, of which less than 5% was edible oils and fats, the rest was biodegradable kitchen and canteen waste. Due to the gradual cancellation of exceptions from the obligation to introduce and ensure the implementation of sorted collection of municipal waste for biodegradable kitchen waste, there was a significant year-on-year (2020 — 2021) increase in the production of food waste. In the following years, the generation of this waste is expected to increase, as from 1 January 2023 the obligation of sorted collection will no longer apply only to that part of the municipality that proves that 100% of households compost their own biodegradable waste.

Chart 078 | Trend in food waste generation

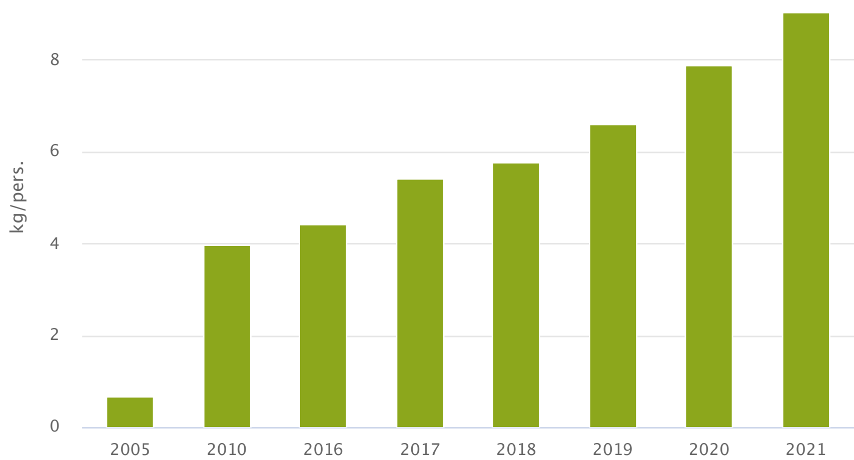


Note: Waste codes 20 01 08 (biodegradable kichen and canteen waste) and 20 01 25 (edible oil and fat) are included.
Source: MoE SR

Waste from electrical and electronic equipment

The manufacturers of electrical equipment are obliged to fulfil the limits of collection, recovery, recycling and reuse of electrical waste. In terms of meeting the objectives set out in Directive No. 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE), the MoE SR is monitoring and evaluating the fulfilment of the collection objective since 2016, as the minimum weight proportion of collection from the average weight of electrical equipment placed on the market in the Slovak Republic in the previous three years.

Chart 079 | Trend in the amount of WEEE collected from households



Source: MoE SR

In 2021, **49,181 tons of electrical waste was collected from households**, which represents an annual increase of more than 6,000 tons. In 2021, 9.04 kg of electrical waste was collected per inhabitant, which represents a year-on-year increase of 1.14 kg. The objectives for recovery and recycling of electrical and electronic waste were met for all individual categories of electrical and electronic waste. In terms of total e-waste collection, the Slovak Republic met the target only narrowly — based on the amount of electrical and electronic equipment placed on the market in 2020, 2019 and 2018, the Slovak Republic achieved a 65.01% share of electrical and electronic waste collection.

Old vehicles

In 2021, 40,124 old vehicles were processed in the territory of the Slovak Republic, which represents a decrease of 24.8% compared to 2020.

Table 016 | Total reuse of parts of old vehicles, recovery of waste from the processing and recycling of old vehicles, the number of processed old vehicles and the total weight of processed old vehicles (2021)

Reuse (t)	Total recycling (t)	Total recovery (t)	Total reuse and recycling	Limit for reuse of old vehicle parts and recycling of old vehicles	Total reuse and recovery	Limit for reuse of old vehicle parts and recovery of waste from the treatment of old vehicles
773,93	39 501,46	40 221,32	**95,38%** (40 275,39 t)	**85%**	**97,09%** (40 995,25 t)	**95%**
Number of processed old vehicles (pieces)					40 124	
Total weight of processed old vehicles (t)					42 225,63	

Source: MoE SR

Waste tyres

The management of waste tires has long been **dominated by material recovery**. In 2021, the level of their material recovery reached 89.48%, and energy recovery represented 4.2%. Landfilling of waste tyres is prohibited under the Waste Act. *(Note: except for tires that are used as a construction material in the construction of a landfill, bicycle tires and tires with an outer diameter greater than 1,400 mm).* The objective by 31 December 2025 for waste tyres set in the WMP SR for the years 2021-2025 is to achieve a recycling rate of at least 75% and energy recovery rate of a maximum of 24% of the total weight of tires placed on the market. The possibility of other management of waste tires is set at a maximum of 1%.

Packaging and packaging waste

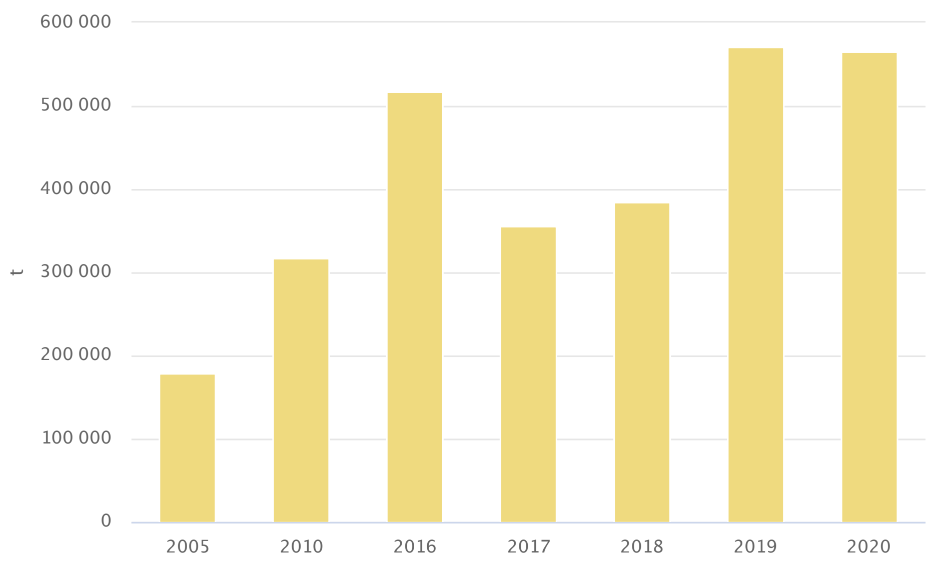
The total amount of packaging waste is increasing in the long term. However, a year-on-year decrease by less than 1% in the generation of packaging waste was recorded. The recycling rate grown from 45.21% in 2005 to 70.8% in 2020, meeting the objective of recycling at least 65% of the weight of all packaging waste by 2025. In the case of individual types of packaging, **the minimum recycling targets until 2025 are already being met**.

Table 017 | Generation and management of packaging waste (2020)

Material	Amount (t)	Recycling (%)	Minimum recycling target by 2025 (%)	Recycling, energy recovery and other recovery together (%)
Glass	97 057,01	74,41	70	74,41
Plastic	128 224	56,29	50	69,12
Paper	240 175,04	82,09	75	82,21
Metals	39 140,76	71,13	70 - ferrous metals, 50 - aluminium	71,13
Wood	60 084,11	61,44	25	63,47
Other	1 258,24	2,55	-	2,55
Total	**565 939,16**	**70,8**		**74,06**

Source: MoE SR

Chart 080 | Trend in generation of packaging waste

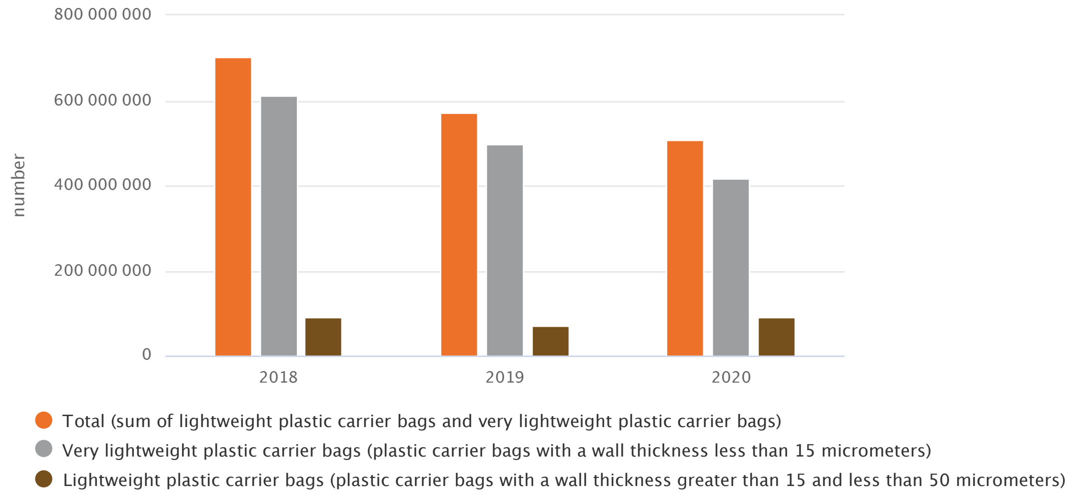


Source: MoE SR

Plastic bags

In 2020, more than 500 million pieces of lightweight plastic carrier bags and very lightweight plastic carrier bags were placed on the Slovak market. Compared to 2018, this was a decrease of almost 28%. **In 2018, almost 129 pieces of lightweight plastic carrier bags and very lightweight plastic carrier bags were placed on the market per capita, while in 2020 it was only 93 pieces**. This decrease is probably caused by a legislative change effective from 1 January 2018, when mandatory charging for lightweight plastic carrier bags was introduced, including the obligation of sellers to provide alternative types of bags - e.g. paper or textile ones.

Chart 081 | Trend in the number of plastic bags placed on the market

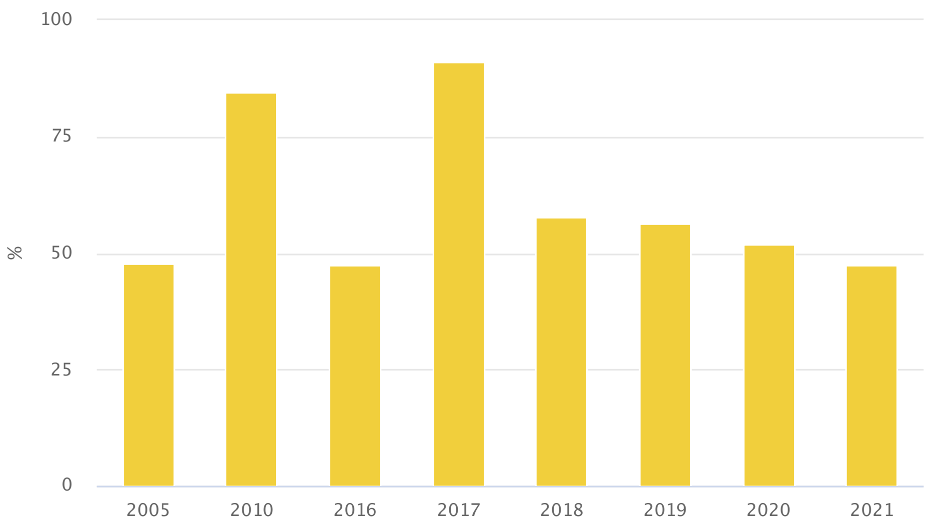


Source: MoE SR

Used batteries and accumulators

In 2021, 953.5 tons of used portable batteries and accumulators were collected, which represents a collection rate of 47.3% (the collection rate is calculated based on batteries and accumulators placed on the market in 2021, 2020 and 2019). The objective — to achieve a 45% rate of the collection of portable batteries and accumulators in 2021 was thus achieved.

Chart 082 | Trend in the collection rate of used batteries and accumulators



Source: MoE SR

Table 018 | Recycling efficiency for used batteries and accumulators

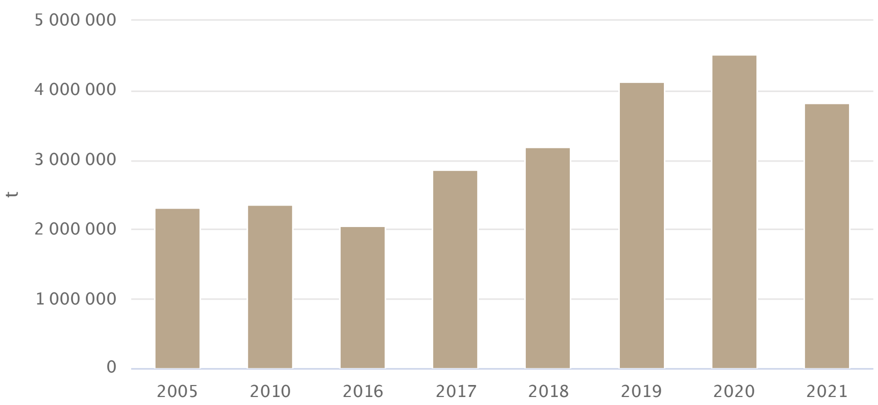
Type	2012 (%)	2013 (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)	2021 (%)	Target (%)
Lead	97	93	87	92	90,5	90,51	91,4	91,2	91,3	90,8	90
Ni-Cd	97	83	76	80	80,9	78,98	77,18	77,58	75,65	75,35	75
Other	97	89	64	61	65,3	67,38	66	68,3	66,8	60,9	60

Source: MoE SR

Construction and demolition waste

The total amount of construction waste and demolition waste is increasing in the long term — in the period 2005 — 2021, an increase in their generation by almost 65% was recorded. However, there was a year-on-year decrease of 15.5%.

Chart 083 | Trend in generation of construction and demolition waste



Note: The following waste codes are included: 17 01 01, 17 01 02, 17 01 03, 17 01 06, 17 01 07, 17 05 03, 17 05 04, 17 05 05, 17 05 06, 17 05 07, 17 05 08, 17 06 01, 17 06 03, 17 06 04, 17 06 05, 17 08 01, 17 08 02, 17 09 01, 17 09 02, 17 09 03, 17 09 04, 20 03 08.
Source: MoE SR

Cross-border shipments of waste - imports, exports and transit of waste

In 2021, the MoE SR issued 179 decisions on the transboundary shipment of waste, which permitted transboundary movement of waste in accordance with Regulation No. 1013/2006/EC of the European Parliament and the Council on shipment of waste. In 2021, 26 more decisions were issued compared to the previous year. However, the number of decisions to import waste decreased year-on-year (from 88 to 73). There was an increase (from 29 to 63) in the transit/tacit consents category.

Table 019 | Cross-border shipments of waste — overview by category of transport (2021)

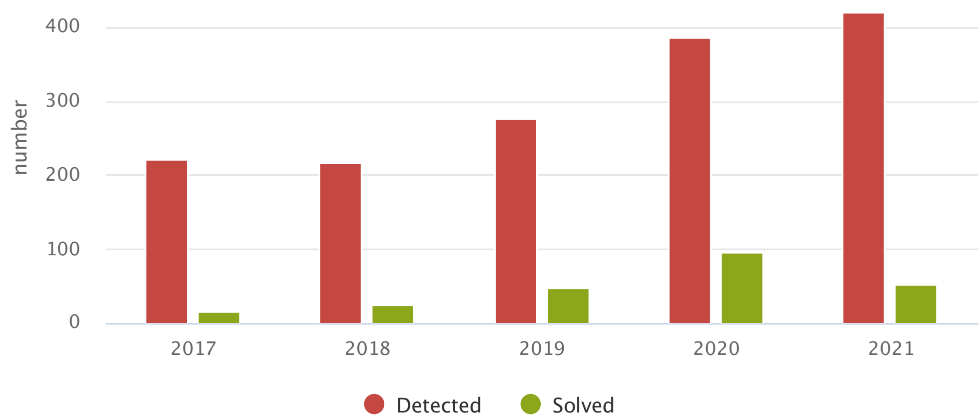
Category of transport	Number
Import	73
Export	43
Transit/tacit consents	63
Total	**179**

Source: MoE SR

ENVIRONMENTAL CRIME — UNAUTHORIZED WASTE MANAGEMENT

In 2021, the criminal police units detected 421 cases of environmental crime in the area of unauthorized waste management (over 9% more than in 2020), with 53 cases (12.6%) solved. Clearance rate (ratio of clarified cases) decreased by 0.7 percentage points compared to 2020 but increased by more than 5 percentage points compared to 2017.

Chart 084 | Detected and solved criminal acts in the field of unauthorized waste management



Note: The data for the year 2020 also includes additionally clarified cases
Source: MoI SR

GREEN PUBLIC PROCUREMENT

Green public procurement (GPP) represents a special form of public procurement in which public authorities integrate environmental requirements into public procurement procedures to acquire goods, services or construction works with a reduced negative impact on the environment throughout the entire life cycle.

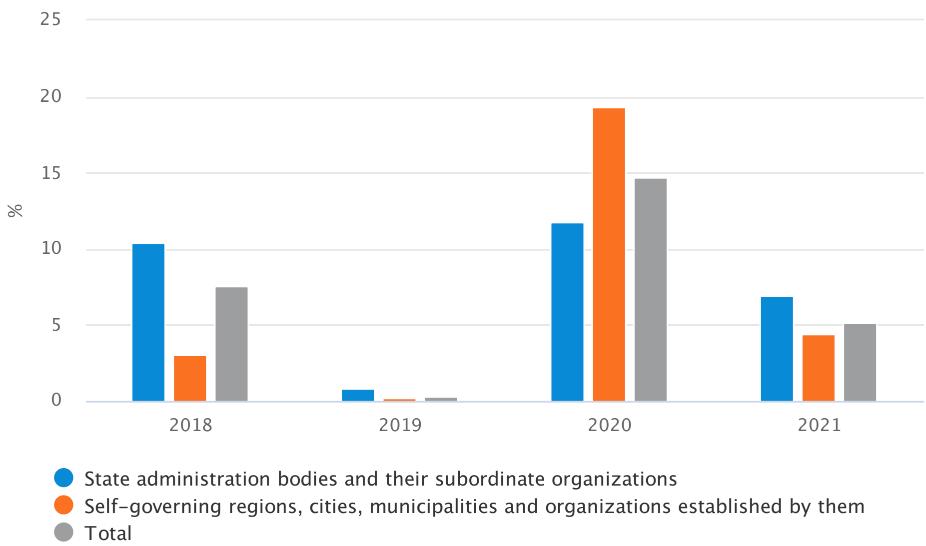
Through the Strategy of the Environmental Policy of the Slovak Republic until 2030 (Envirostrategy 2030), the Slovak Republic has committed itself to securing at least **70% of the total value of public procurement** and at least **70% of the total amount of contracts in public procurement** through green public procurement.

Tracking the progress of the GPP is done through annual monitoring, which assesses the level of GPP implementation based on two quantitative indicators, namely:

- Level 1 indicator: percentage proportion of GPP from the total public procurement **in relation to the number of contracts** per calendar year;
- Level 2 indicator: percentage proportion of GPP from total public procurement **in relation to the value of contracts (in EUR, excluding VAT)** per calendar year.

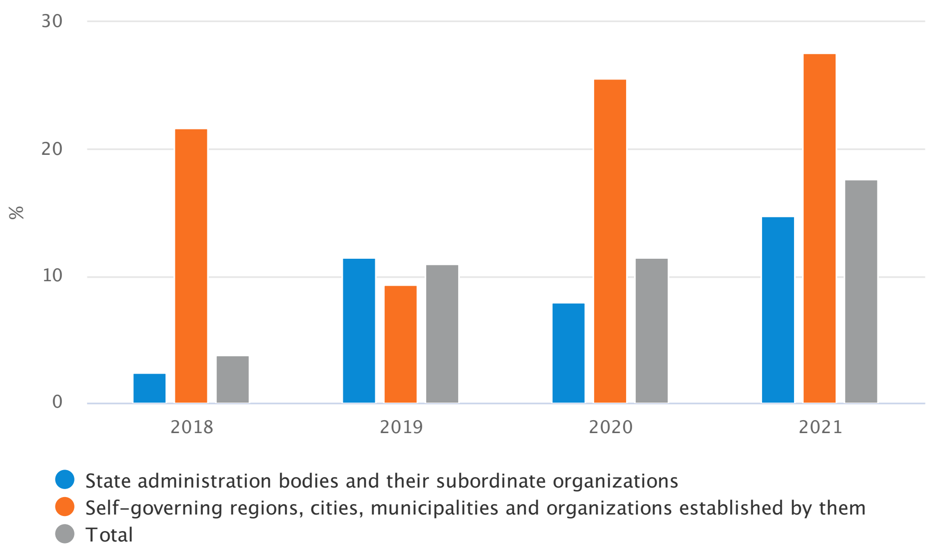
For the year 2021, as part of monitoring of the level of GPP application in the Slovak Republic, the total numbers and values of **over-limit contracts, under-limit contracts and low-value contracts** were monitored, broken down into goods, services and construction works. 4,270 public institutions (state administration bodies and their subordinate organizations, self-governing regions and organizations established by them, cities and municipalities) were addressed, of which 827 subjects (17.5%) participated in the questionnaire survey. In 2021, the level of Indicator 1 was 5.14% and the level of Indicator 2 was 17.7%.

Chart 085 | Values of indicator 1 of the level of GPP application in the Slovak Republic within the years 2018-2021, broken down into state administration bodies and their subordinate organizations and self-governing regions, cities, municipalities and organizations established by them



Source: SEA

Chart 086 | Values of indicator 2 of the level of GPP application in the Slovak Republic within the years 2018-2021, broken down into state administration bodies and their subordinate organizations and self-governing regions, cities, municipalities and organizations established by them



Source: SEA

Based on the evaluation of the GPP application, the ambitious objective set in Envirostrategy 2030 **has not been achieved yet**.

ENVIRONMENTAL LABELLING OF PRODUCTS

Table 020 | Overview of the total number of products with the right to use the national environmental label Environmentally suitable product (ESP)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of products	148	147	146	117	130	105	105	49	43	43	60	44	44

Source: SEA

Table 021 | Products that had the right to use the "Environmentally suitable product (ESP)" label in 2021

Brand holder	Product name
Johan ENVIRO s. r. o. Bratislava	Universal absorption materials from non-woven fabric; Hydrophobic absorption materials from non-woven fabric: E1000, E1000 EKO BG, E348U, E348U EKO, E1500, E1500 EKO BG, E1500S, E1500S EKO BG, EM36, EM36 EKO, GL 150, GL 150 EKO Hydrophobic absorption materials from non-woven fabric: E150M, E150M EKO, E150SM, E150SM EKO, E100M, E100M EKO, E810, E810 EKO, E10P, E10P EKO, E348P, E348P EKO, E25, E25 EKO, Spagettex, Spagettex EKO
CRH (Slovakia), a.s. Rohožník, Turňa nad Bodvou plant (from 1 October 2021 under the name Danucem Slovensko, a.s.)	Cements: CEM I 52,5 R, CEM I 42,5 R, CEM II/A-S 42,5 R, CEM II/A-S 42,5 N, CEM II/B-S 42,5 N, CEM III/A 32,5 R, CEM III/B 32,5 N - LH/SR , CEM III/A 32,5 N, EXTRACEM, MULTICEM+ PLUS, FLEXICEM
Maccaferri Manufacturing Europe s. r. o. Senica	Gabions, Reno Mattresses, Terramesh system, Green Terramesh, Terramesh Mineral

Source: SEA

The valid register of products with the ESP label is available at: https://www.sazp.sk/app/cmsFile.php?disposition=i&ID=1297

With the accession of the Slovak Republic to the EU in 2004, applicants had the opportunity to obtain a European environmental label for their products - the EU Ecolabel. In Europe, 83,590 products in 20 different product groups were awarded the EU Ecolabel (as of September 2021).

So far, a total of 131 products have been awarded the EU Ecolabel in Slovakia. **The trend in the number of awarded products has been decreasing in the Slovak Republic since 2016.**

Table 022 | Overview of the total number of products with the right to use the EU Ecolabel

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of products	1	5	5	3	3	9	9	131	129	8	8	6	5	5

Source: SEA

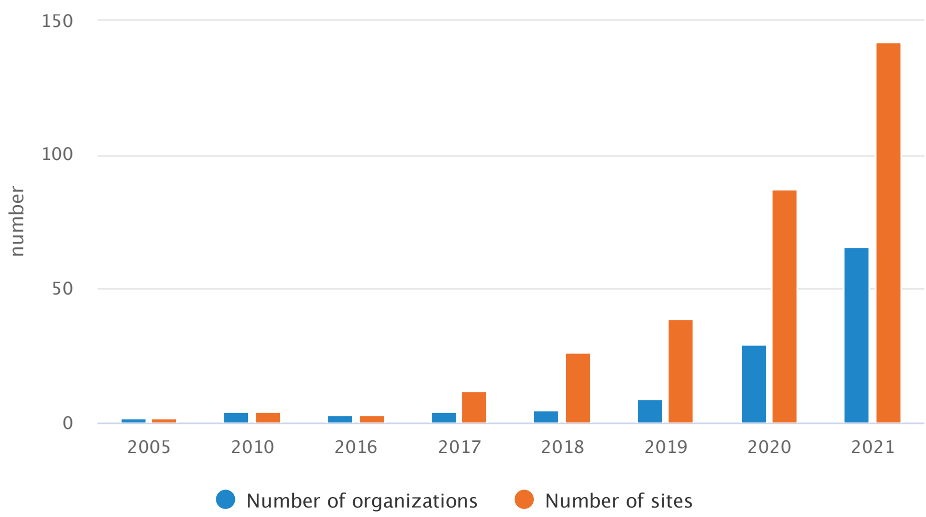
Table 023 | Products that had right to use the EU Ecolabel (products assessed and awarded in the Slovak Republic) in 2021

Brand holder	Product name
SLOVENSKÁ GRAFIA, a. s. Bratislava	Printed paper products: 1. Advertising materials and newsletters 2. Periodicals 3. Catalogues 4. Leaflets 5. Brochures

Source: SEA

THE ECO-MANAGEMENT AND AUDIT SCHEME (EMAS)

Chart 087 | Number of registered organizations and their sites in the EMAS



Source: SEA

The current register of organizations registered in EMAS with their registered sites in the Slovak Republic is available at: http://www.emas.sk/register-emas-v-sr

11 ECONOMIC AND CLEAN ENERGY

KEY QUESTIONS AND KEY FINDINGS

Are the adopted objectives in the area of reducing energy intensity and increasing energy efficiency successful?

Despite the significant decrease in the energy intensity (EI) of the Slovak economy in the period 2005 – 2020, the Slovak Republic belongs to the EU countries with a high EI.

The energy efficiency objectives for 2020, according to which energy savings are manifested as a reduction of primary energy consumption (PEC) and final energy consumption (FEC), were partially met. While the PEC 2020 objective of not exceeding the value of 16.2 Mtoe as well as the original objective for FEC of not exceeding the value of 10.38 Mtoe were met, the revised goal for FEC with a target value of 9.243 Mtoe was not met despite the implemented measures in this area. 2020 was characterized by a significant year-on-year decrease in PEC, as well as FEC as a result of the impact of the COVID-19 epidemic. For a long time, the largest consumer of energy in the SR is the industry sector (approx. 1/3).

What is the development of renewable energy sources with regard to the adopted objectives?

In the 2005 – 2020 period, the share of energy from renewable energy sources (RES) in the SR will increase from 6.4% in 2005 to 17.3% in 2020. Thus, the Slovak Republic met the objective of 14% share of RES in 2020. This was mainly due to the year-on-year increase in 2018 and 2019, when the share of RES increased by 5 percentage points compared to the previous year, which was the result of more accurate statistics in the area of biomass and heat pumps use. Among RES, hydropower (electricity production) and biomass (heat and cold production) dominated. In the transport sector, biodiesel was dominant.

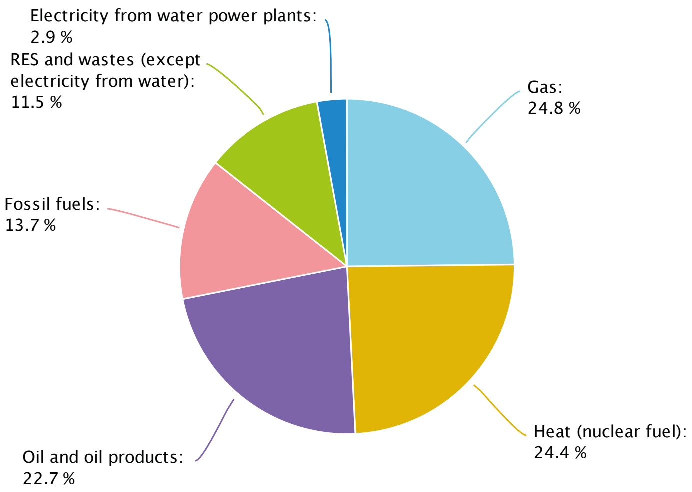
What is the development of greenhouse gas emissions from the energy industry?

In 2020, greenhouse gas emissions from the energy sector decreased by more than half compared to 1990 (excluding the LULUCF sector). A significant year-on-year decrease in emissions in 2020 compared to 2019, which was mainly affected by the COVID-19 epidemic, contributed to this to a large extent. The downward trend was also achieved in the mid-term comparison between 2005 and 2020. Most emissions came from the combustion and transformation of fossil fuels. The proportion of emissions from stationary sources decreased, the burning of fossil fuels in households is still a problem. Despite the significant decrease, the energy sector accounted for almost half of total greenhouse gas emissions in 2020.

ENERGY SOURCES BALANCE / ENERGY SECURITY

In terms of natural conditions, the SR is poor in primary energy sources (PES) and imports almost 90% of them. Gross inland energy consumption (GIEC), which expresses the consumption of primary energy sources, recorded a decrease of 14.1% in the period 2005 – 2020 with slight fluctuations and GIEC reached 689.372 TJ in 2020. The structure of the primary energy sources used in 2020 showed a balanced share of individual energy sources in gross inland consumption (the so-called energy mix).

Chart 088 | Energy mix (2020)

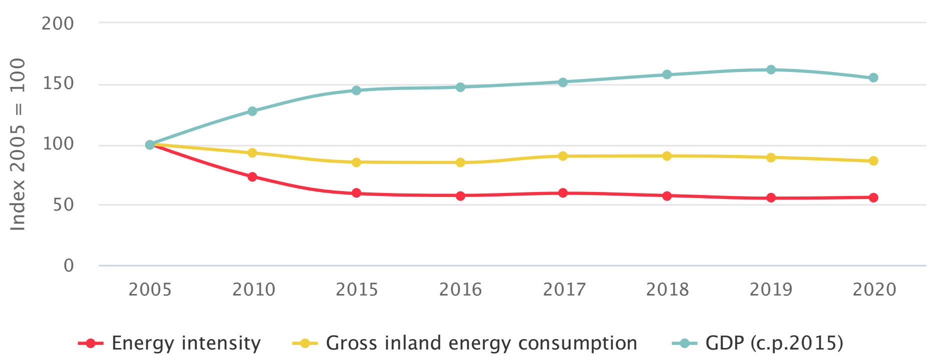


Source: SO SR

ENERGY INTENSITY AND ENERGY EFFICIENCY

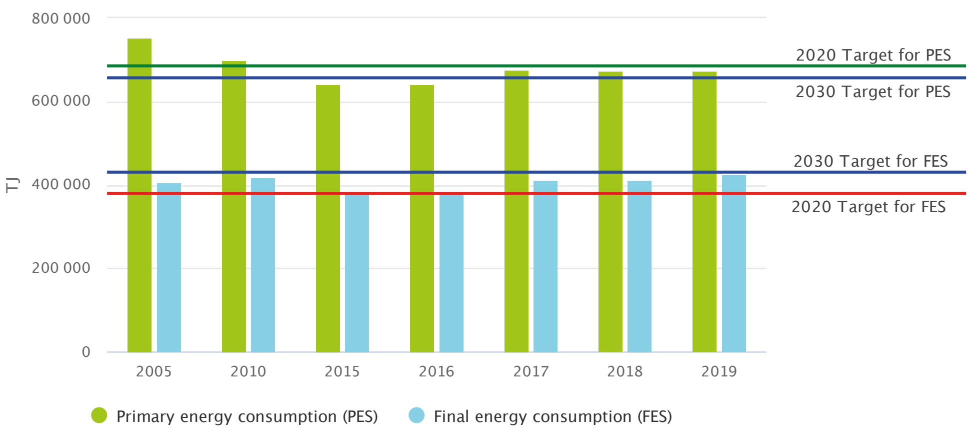
Reducing the energy intensity (EI) of the Slovak economy, defined as the ratio of gross inland energy consumption to GDP, is one of the long-term goals of the Slovak energy policy. Between 2005 and 2020 the energy intensity of the SR fell by 44.1%. Despite the favourable trend, the SR had the eighth highest EI among the EU 27 countries in 2020.

Chart 089 | Trend in energy intensity, gross inland energy consumption and GDP at constant prices 2015



Source: SO SR

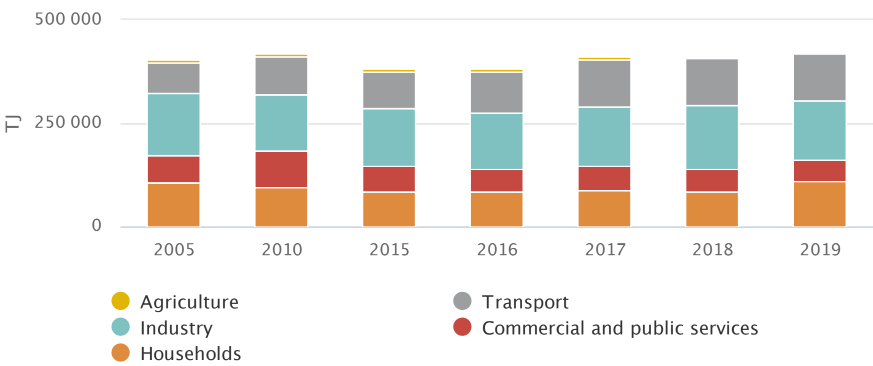
Chart 090 | Trend in primary energy consumption and final energy consumption



Source: SO SR

The industrial sector has long been **the largest consumer of energy** in the Slovak Republic. The development of final energy consumption in 2020 was marked by the COVID-19 epidemic, which significantly affected the year-on-year trend in sectors. Among the fuels in FEC, fossil fuels prevailed.

Chart 091 | Trend in final energy consumption in sectors of the economy

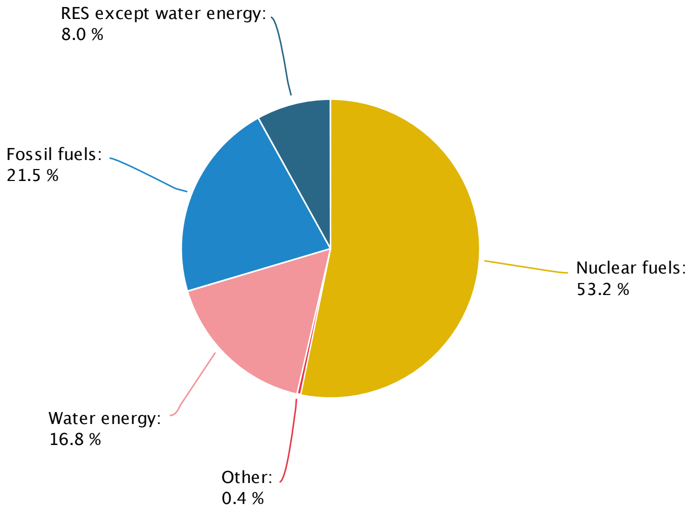


Source: SO SR

ENERGY SUSTAINABILITY

The 2005 – 2020 period is characterized by a downward trend in electricity production (7.3%). In terms of electricity production sources used, the Slovak Republic is one of the leaders in low-carbon electricity production, as the share of carbon-free electricity production was almost 80% in 2020.

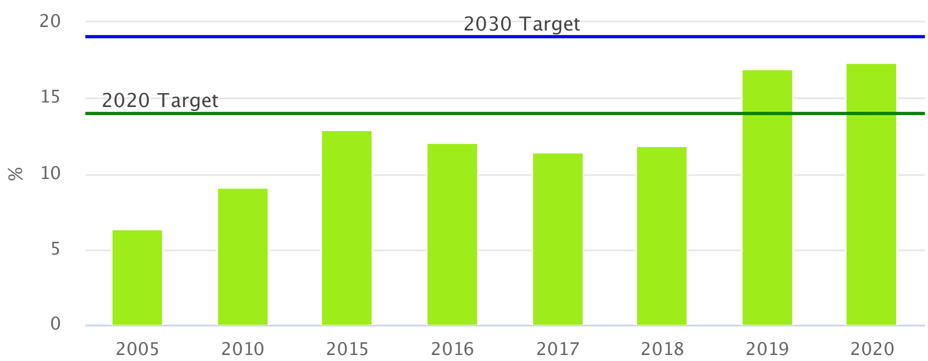
Chart 092 | Electricity generation by source (2020)



Source: SEPS, a. s.

One of the objectives of Envirostrategy 2030 is the development of environmentally friendly renewable energy sources. In this area, the SR adopted **a national objective of achieving a 14% proportion of renewable energy sources** in gross final energy consumption **by 2020** and subsequently increasing this proportion to **19.2% by 2030**.

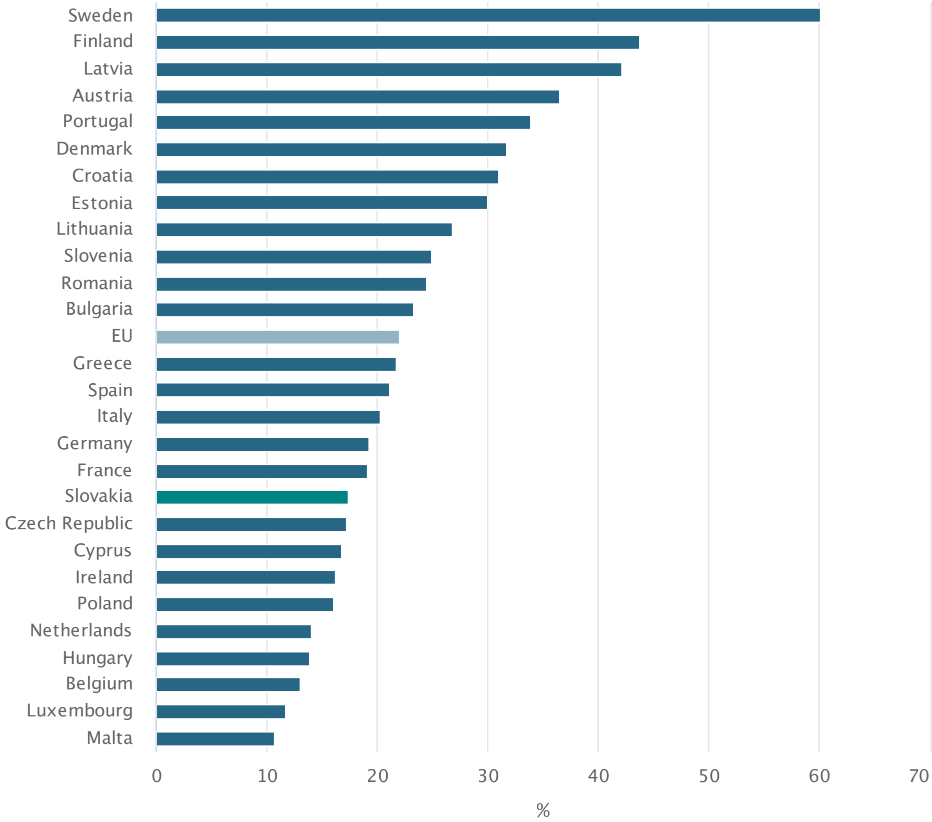
Chart 093 | Trend in the share of energy from renewables from the perspective of meeting the national targets



Soure: Eurostat

In the **2005 – 2020** period, **the total share of energy produced from RES** increased to **17.3%**. The Slovak Republic thus met the objective of 14% share of RES in final energy consumption in 2020. In particular, the year-on-year increase in 2019, when the share of RES increased by 5 percentage points compared to the previous year 2018, reflecting refined statistics on biomass use and the start of data reporting for heat pumps, contributed to the fulfilment of the commitment. This was manifested by a significant increase in **the share of RES in the heat and cold production sector**, in 2020 the proportion in the sector reached **19.4%**. In 2020, **23.1%** of **the produced electricity came from RES** (as defined in Article 5(1)(a) and Article 5, par. 3 of Directive No. 2009/28/EC on the promotion of the use of energy from RES). **The proportion of RES in transport** reached **9.3%.**

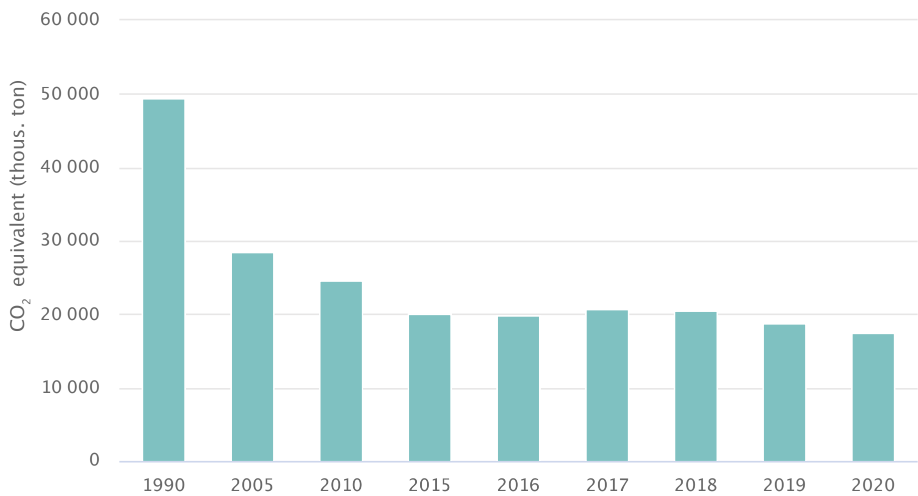
Chart 094 | International comparison of the share in energy from renewables (2020)



Source: Eurostat

Despite a significant decrease in **greenhouse gas emissions from the energy sector** compared to 1990, this sector remains one of the largest producers. **In 2020** the energy sector generated 17 539.31 kt of CO_2 equivalent greenhouse gas emissions, or **47.4% of total emissions generated in the SR**. Overall, the greenhouse gas emissions from the energy sector decreased by 64.5% by 2020 compared to the 1990 baseline.

Chart 095 | Trend in greenhouse gas emissions from the energy sector



Note: Emissions determined as of 15 April 2022
Source: SHMI

12

ECONOMIC INSTRUMENTS FOR A BETTER ENVIRONMENT

KEY QUESTIONS AND KEY FINDINGS

What is the development of environmental protection expenditures?

The national expenditure on environmental protection is monitored for the three institutional sectors and for the national economy as a whole. They amounted to EUR 770 mil. (46.1%) for public administration in 2019, EUR 630 mil. (37.7%) for the corporate sector and EUR 271 mil. (16.2%) for the household sector. Total national expenses for environmental protection amounted to EUR 1,671 mil., which represented an increase of 8.8% compared to 2018.

The expenditures of businesses and municipalities for environmental protection had a fluctuating trend in year-on-year comparisons. The expenditures in 2021 increased by 60.6% compared to 2005 and by 16.2% compared to the previous year.

The largest percentage of environmental protection expenditures of enterprises and municipalities was in the field of waste management (70.9% in 2021), and the second highest proportion was spent on wastewater management (13.8% in 2021).

What is the proportion of taxes with an environmental aspect on GDP in the Slovak Republic?

The proportion of taxes with an environmental aspect on GDP reached 2.41% in 2021.

NATIONAL EXPENDITURE ON ENVIRONMENTAL PROTECTION

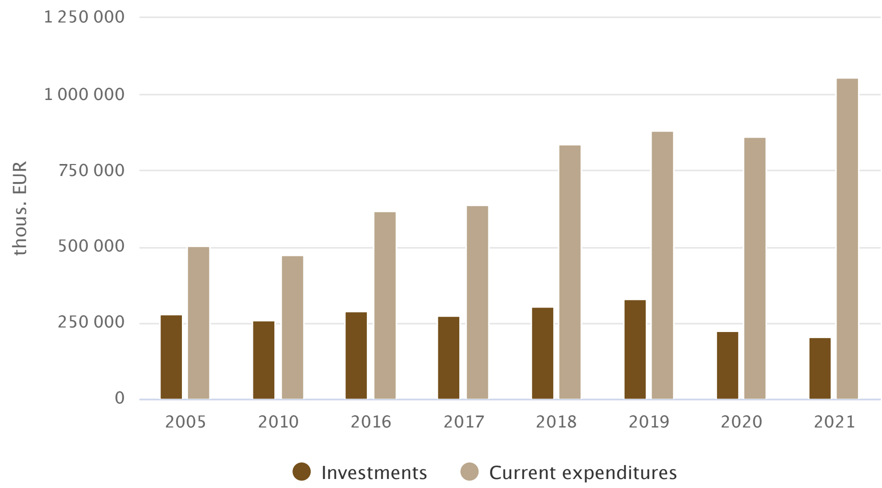
In 2019, the total expenses for environmental protection reached the amount of **EUR 1,671 mil.** Compared to 2008, they increased by 33.1%. Compared to the previous year, they increased by 8.8%.

ENVIRONMENTAL EXPENDITURES AND INCOMES FOR BUSINESSES AND MUNICIPALITIES

The financial indicators of environmental protection are systematically monitored in the Slovak Republic by the Statistical Office of the Slovak Republic (SO SR) for businesses with 20 or more employees and for municipalities.

The expenditures of businesses and municipalities for the environmental protection had a fluctuating trend. In 2021, they reached the amount of **EUR 1,257,012 thousand** (including: investments **EUR 203,328 thousand**, current expenditures **EUR 1,053,684 thousand**). Compared to 2005, they increased by 60.6% and compared to the previous year, they increased by 16.2%. In 2021, incomes from the environmental protection of reached **EUR 1,329,125 thousand** and increased by 28.8% compared to the previous year.

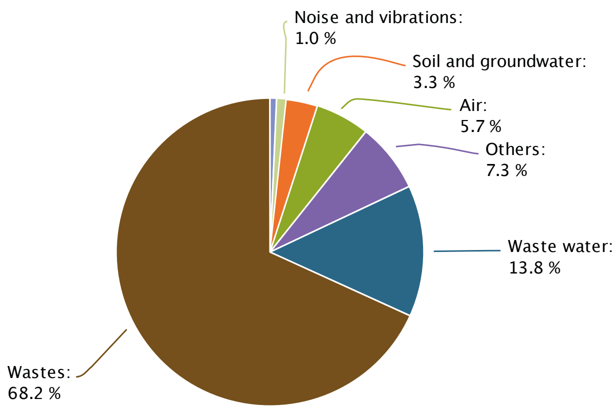
Chart 096 | Development of expenditures of enterprises and municipalities for environmental protection



Source: SO SR

The expenditures of environmental protection of **businesses and municipalities** in the area of **soil and groundwater protection** in 2021 reached **EUR 32,402 thousand**, increased by 3.1% compared to 2005 and decreased by 32.2% compared to the previous year. The expenditures of environmental protection in the area of **waste management** in 2021 reached **EUR 891,014 thousand** and increased by 227.3% compared to 2005. The costs increased by 24.1% compared to the previous year. The expenditures of environmental protection in the area of **wastewater management** in 2021 reached **EUR 173,623 thousand** and increased by 27.9% compared to 2005. The expenditures decreased by 10.2% compared to the previous year. The expenditures of environmental protection in the **other areas** in 2021 reached **EUR 72,422 thousand** and in comparison, with 2005 they decreased by 31.4%. The expenditures increased by 41.1% compared to the previous year.

Chart 097 | Development of the share of proportion of environmental protection expenditures of business by area



Source: SO SR

The proportion of businesses expenditures for environmental protection in GDP had a fluctuating trend in the evaluated period. In 2005, the proportion was 1.3% of GDP, and in 2021 it decreased to 0.96% of GDP. In 2021, compared to the previous year, the proportion increased by 0.08 percentage points.

The proportion of municipal expenditures for environmental protection in GDP has a fairly constant trend in the evaluated period. In 2005, it was 0.25% of GDP and in 2021 it increased to 0.3% of GDP. In 2021, the proportion increased by 0.01 percentage points compared to the previous year.

Chart 098 | Development of the proportion of the expenditures of businesses and municipalities for the environmental protection in GDP (%)

Source: SO SR

FINANCING IN THE FIELD OF ENVIRONMENTAL CARE

National resources

Environmental fund

The fees for trading emission quotas in the amount of EUR 275,888,555 and were among the most significant incomes of the Environmental Fund from fees in 2021. The highest amount for environmental pollution came from waste disposal fees, EUR 31,625,248. In the use of natural resources, the highest amount came from fees for the withdrawal of underground water and amounted to EUR 10,520,702.

In 2021, the Environmental Fund provided 217 subsidies in the total amount of EUR 25,569,107.67. The highest subsidies went to the area of water protection and use, EUR 15,260,516.93 (59.7%), to the area of waste management and circular economy development, EUR 6,823,609.52 (26.7%), and to air protection, EUR 2,996,899.19 (11.7%).

Operating programs

Environmental quality operational program (2014-2020)

The EQ OP is a program document of the Slovak Republic for drawing aid from EU structural funds and the Cohesion Fund in the program period 2014-2020 in the area of sustainable and efficient use of natural resources, ensuring environmental protection, active adaptation to climate change and support for an energy-efficient low-carbon economy.

The total draw-down of funds from the state budget within the EQ OP program as of 31 December 2021 amounted to EUR 167,961,777, which represents 51.5% of the spent funds from the total allocated amount set aside from the state budget. European Union resources were used to finance the following projects as of 31 December 2021, EUR 1,415,251,588 were drawn down, representing 49.9% of the total allocated amount from European Union resources.

Rural development program (2014-2020)

In relation to the environment, the rural development program is focused, in two areas, on addressing the restoration, preservation and strengthening of ecosystems related to agriculture and forestry and on promoting the efficient use of resources and supporting the transition to a low-carbon economy.

The total draw-down of funds from the state budget within the framework of the Rural development program as of 31 December 2021 amounted to EUR 220,291,744, which represents 68.9% of the spent funds from the total allocated amount from the state budget. European Union resources were used to finance the following projects as of 31 December 2021, EUR 660,875,234 were drawn down, representing 68.9% of the total allocated amount from European Union resources.

Fisheries operational program (2014-2020)

Within the framework of environmental protection, the fisheries operational programme finances aquaculture that is environmentally sustainable, resource efficient, innovative, competitive and knowledge-based.

The total withdrawal of funds from the state budget within the framework of the fisheries program as of 31 December 2021 amounted to EUR 274,367, which represents 14.7% of the spent funds from the total allocated amount from the state budget. European Union resources were used 2021 spent EUR 823,102, which represents a 14.7% proportion of spent funds from the total allocated amount from European Union resources.

Integrated regional operational program (2014-2020) (IROP)

One of the priorities of IROP, which is related to environmental protection, is the safe and ecological transport in regions focused on low-carbon transport systems or the development of urban mobility in the form of support for cycle transport. Another related priority is a priority aimed at improving the quality of life in regions with an emphasis on the environment.

The total draw-down of funds from the state budget within the IROP program as of 31 December 2021 amounted to EUR 69,298,23, which represents 56.8% of the spent funds from the total allocated amount from the state budget. European Union resources were used to finance the following projects as of 31 December 2021, EUR 351,217,446 were drawn down, representing 48.7% of the total allocated amount from European Union resources.

Programs of interregional cooperation

Interreg Europe (2014-2020)

The interregional cooperation program builds on the positive experience gained within the INTERREG IIIC Community Initiative in the Slovak Republic. In order to make the best use of the funds, four topics were selected, which, in two cases, are devoted to environmental protection. The topics are focused on low-carbon economy and efficient use of resources.

The total draw-down of funds from the state budget within the Interreg Europe program as of 31 December 2021 amounted to EUR 197,509.80, which represents 67.9% of the spent funds from the total allocated amount from the state budget. European Union resources were used to finance the following projects as of 31 December 2021, EUR 1,119,220.40 were drawn down, representing 67.9% of the total allocated amount from European Union resources.

EU programs

Horizont 2020

It focuses on three main areas - excellent science, industry leadership and societal challenges. In the area of societal challenges, seven areas were identified where targeted investments in research and innovation can be beneficial for the citizens. In relation to the environment, four areas are relevant.

LIFE (2014 – 2020)

In 2021, the European Commission concluded a Grant Agreement with coordinating beneficiaries within two Slovak LIFE projects and within two foreign LIFE projects with the participation of entities from the Slovak Republic. The mentioned projects were successful in the last call of the program announced in 2020. In December 2021, the MoE SR issued a decision on the approval of the request for the provision of funds for the co-financing of the integrated LIFE project to improve the condition of the territories of the NATURA 2000 system in the Slovak Republic in the amount of the state budget of more than EUR 1 mil. for the recipient of the Ministry of the Environment of the Slovak Republic, in the amount of EUR 2.5 mil. for the recipient State Nature Protection of the Slovak Republic, in the amount of EUR 772 thousand for the recipient WWF Slovakia, in the amount of EUR 549 thousand for the recipient National Forestry Centre, in the amount of EUR 508 thousand for the recipient DAPHNE – Institute of Applied Ecology, in the amount of EUR 925 thousand for the recipient Slovak Watermanagement enterprise, s.e. in the amount of EUR 194 thousand for the recipient Comenius University in Bratislava, Faculty of Natural Sciences. During the 10 years of implementation, EUR 16.6 million will be spent on the project, of which EUR 9.9 million from EU resources from the LIFE program.

Other selected financial mechanisms

EEA and Norway grants

The Ministry of Environment of the Slovak Republic, as the program administrator (PA) for Mitigation and adaptation to climate change (abbreviated name of the program SK-Climate), together with donor program partners from Norway, actively participates in meeting the program objective, which is to contribute to the mitigation of climate change and the reduction of vulnerability to climate change. The objective of the program is fulfilled through two program outputs. The implementation of the program is supported by the Financial Mechanism of the European Economic Area (FM EEA) and the Norwegian Financial Mechanism (NFM) up to 85%. The state budget of the Slovak Republic contributes 15% to the financing.

The draw-down of Total Authorized Expenditure (TAE), as of 31 December 2021, is EUR 222,626 from the EEA and NFM grants and EUR 43,529 from the Slovak state budget, i.e., EUR 266,155 TAE.

SELECTED ECONOMIC INSTRUMENTS OF ENVIRONMENTAL POLICY

In the conditions of the Slovak Republic, the focal form of economic instruments of environmental policy is payments/fees for pollution and the use of natural resources. Individual types of these economic instruments are defined in the relevant legal regulations, including the method of their calculation and their recipient.

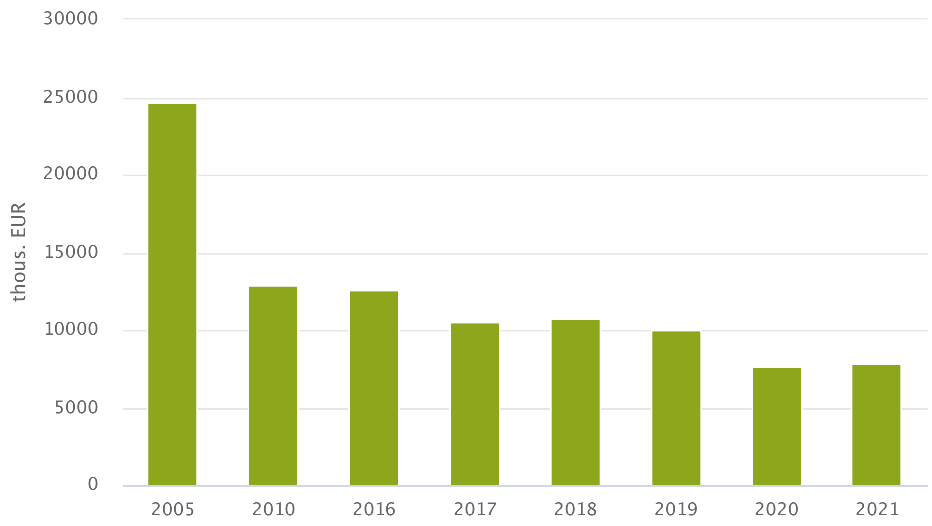
Environmentally harmful subsidies

In the Slovak Republic, most of the identified environmentally harmful subsidies are directed to the areas of energy and transport policy. All environmentally harmful subsidies in the Slovak Republic are to be phased out by the end of 2030, as stated in the objectives of Envirostrategy 2030. In 2019, the total subsidies for fossil fuels in the Slovak Republic reached the value of EUR 400 mil., which represents 0.44% of GDP. The Slovak Republic is among the member states that allocates more than the EU average to fossil fuel subsidies as a percentage of GDP.

Fees for air pollution

The fees for air pollution from large and medium sources of pollution have a decreasing nature in the long term and in 2021 they reached EUR 7,801.67 thousand.

Chart 099 | Development of fees for air pollution from large and medium sources

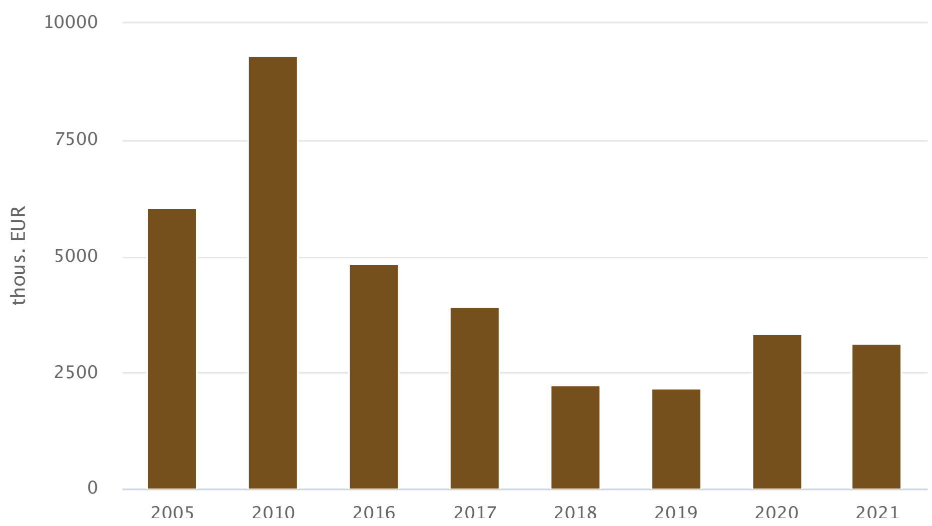


Source: Environmental Fund

Fees for discharge of wastewater into surface waters

The fees for discharging wastewater into surface waters in 2021 reached EUR 3,127.84 thousand.

Chart 100 | Development of fees for discharge of wastewater into surface waters

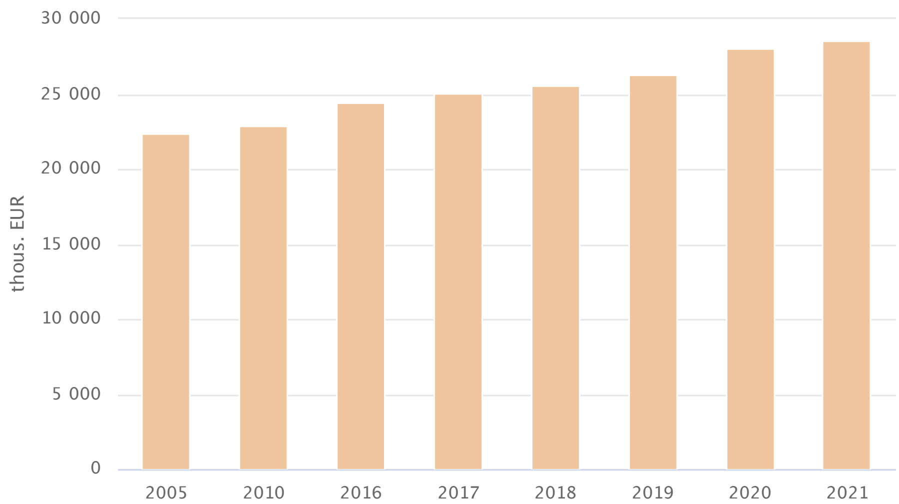


Source: Environmental Fund

Payments for the withdrawal of surface water from watercourses

The payments for the withdrawal of surface water from watercourses have a growing trend and in 2021 they reached **EUR 28,531 thousand.**

Chart 101 | Development of payments for the withdrawal of surface water from watercourses

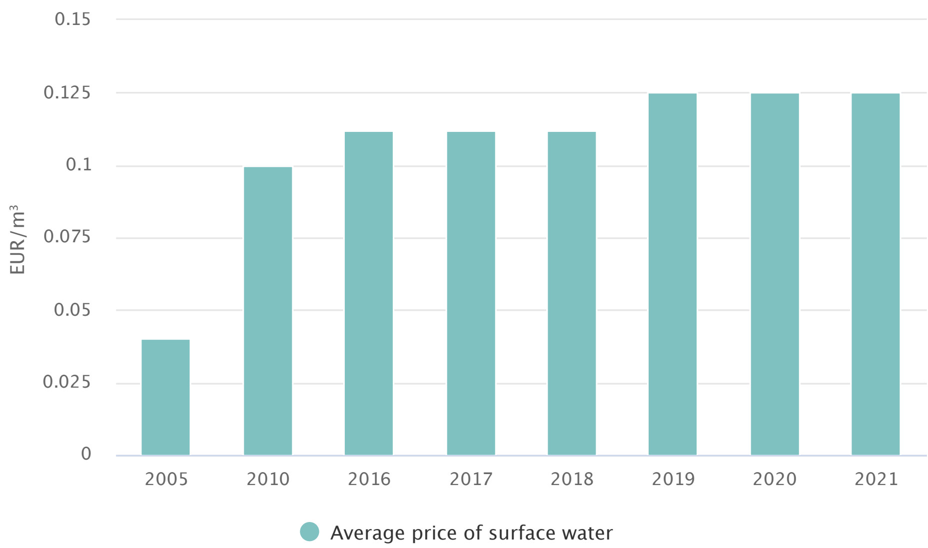


Source: WRI

Average price of surface water

The average price of surface water had a slightly increasing trend since 2010 and in 2021 it reached the level of **0.125 EUR/m³.**

Chart 102 | Development of the average price of surface water

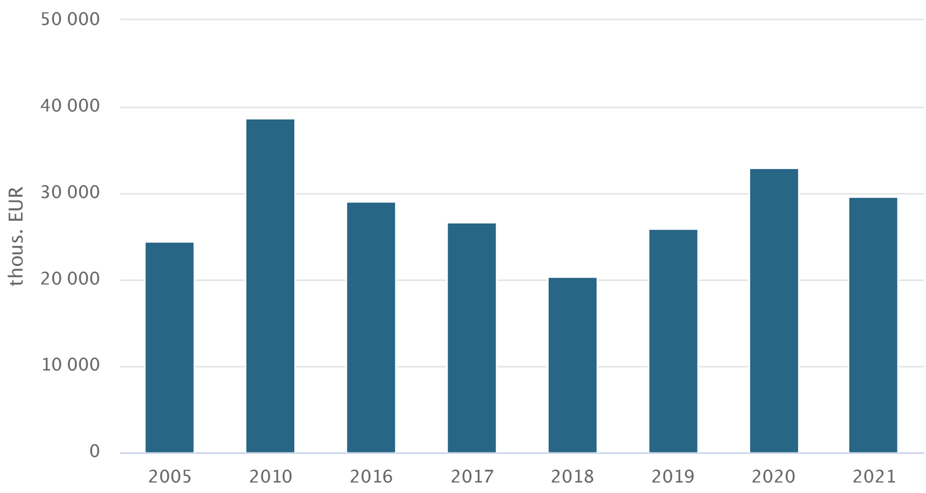


Source: WRI

Payments for the use of the hydro-power potential of water courses at water structures in the management of the water courses administrator

These payments have a fluctuating trend and reached **EUR 29,603 thousand in 2021**.

Chart 103 | Development of payments for the use of the hydro-power potential of water courses at water structures in the management of the water courses administrator

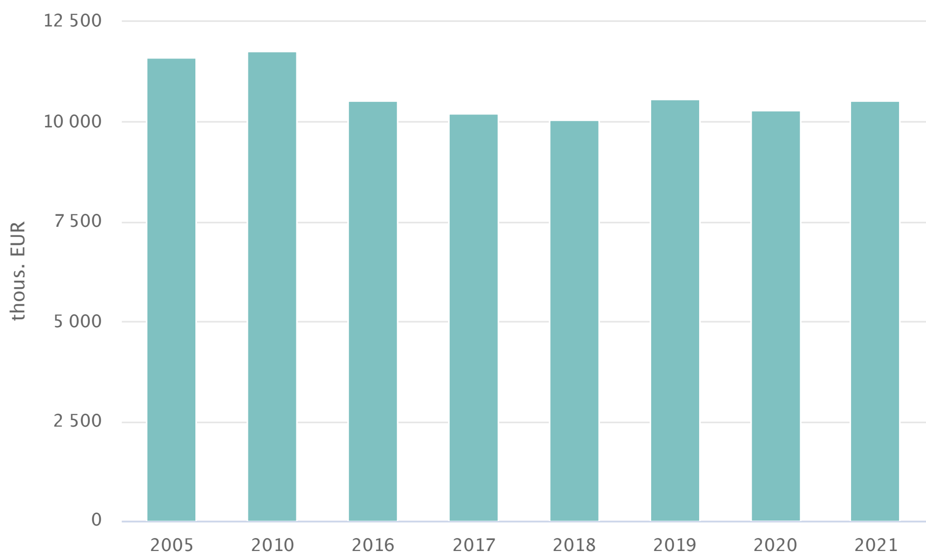


Source: SWME

Fees for withdrawal of underground water

The fees for the withdrawal of underground water have a slightly fluctuating trend and in 2021 they reached **EUR 10,520.7 thousand.**

Chart 104 | Development of fees for withdrawals of underground water



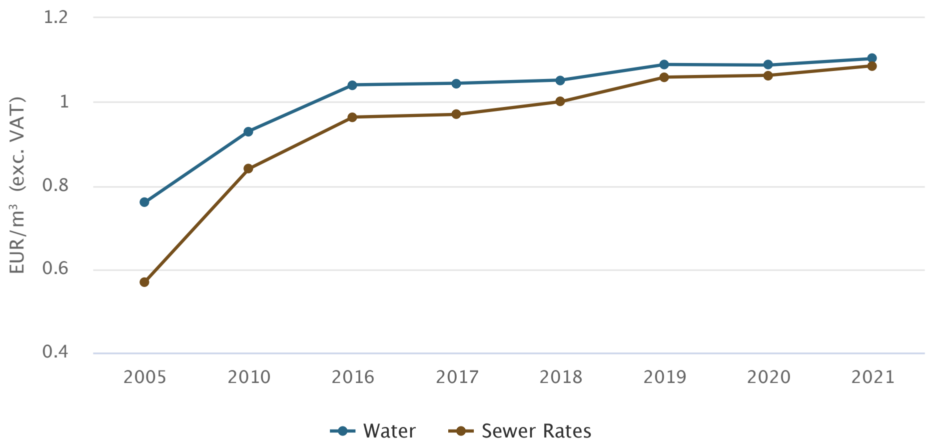
Source: Environmental Fund

The price for the supply of drinking water through a public water supply system and for the removal and treatment of wastewater

The average price for the supply of drinking water (water charges) by public water supply had an upward trend in 2021 and reached EUR 1.1032 per 1 m³ (excluding VAT).

The average price for the removal and treatment of wastewater through public sewerage systems (sewage) has a growing trend and in 2021 it reached EUR 1.086 per 1 m³ (excluding VAT).

Chart 105 | Development of the average price for the production, distribution and supply of drinking water by public water supply and for the removal and purification of wastewater through public sewerage systems

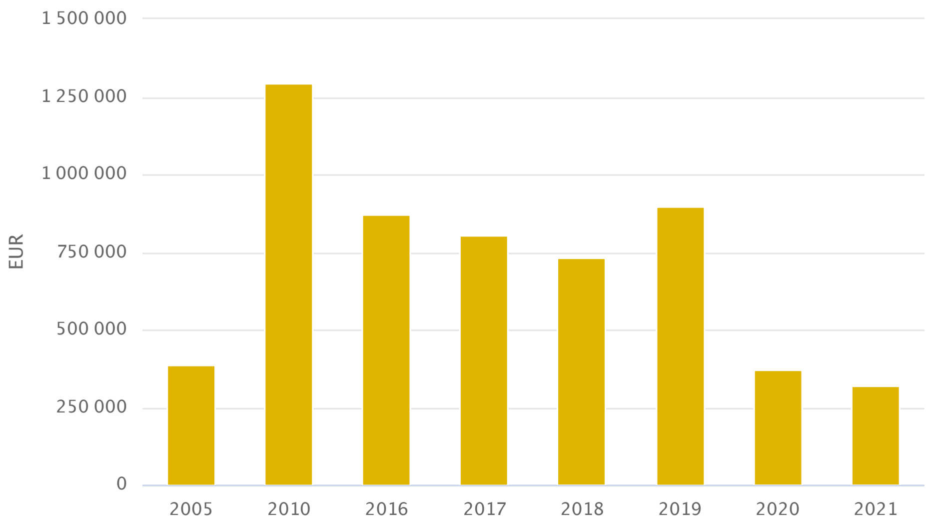


Source: RONI

Payments for exploration areas

In 2021, the Environmental Fund's income from payments for exploration areas reached **EUR 320,544.**

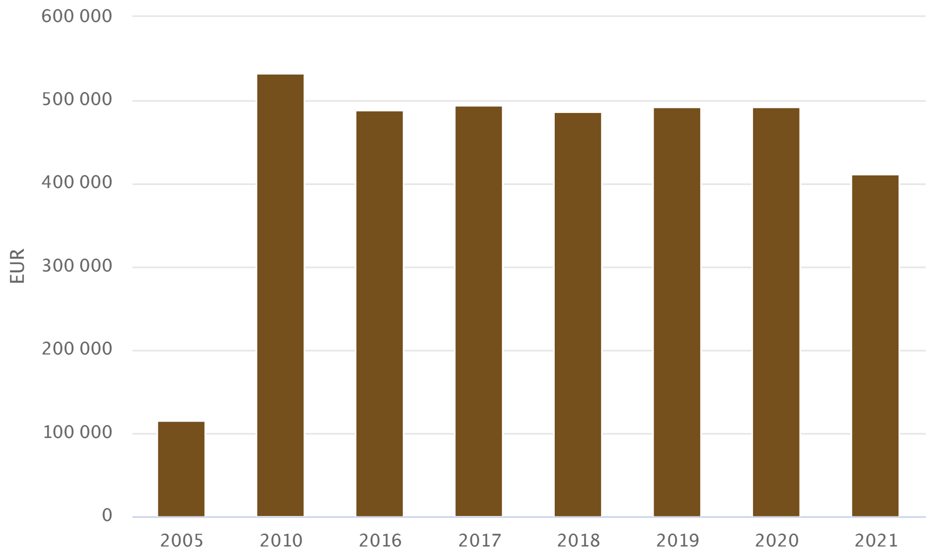
Chart 106 | Development of the Environmental Fund's income from payments for exploration areas



Source: Environmental Fund

In 2021, the amount of payments for mining space reached EUR 410,941.72.

Chart 107 | Development of payments for mining space

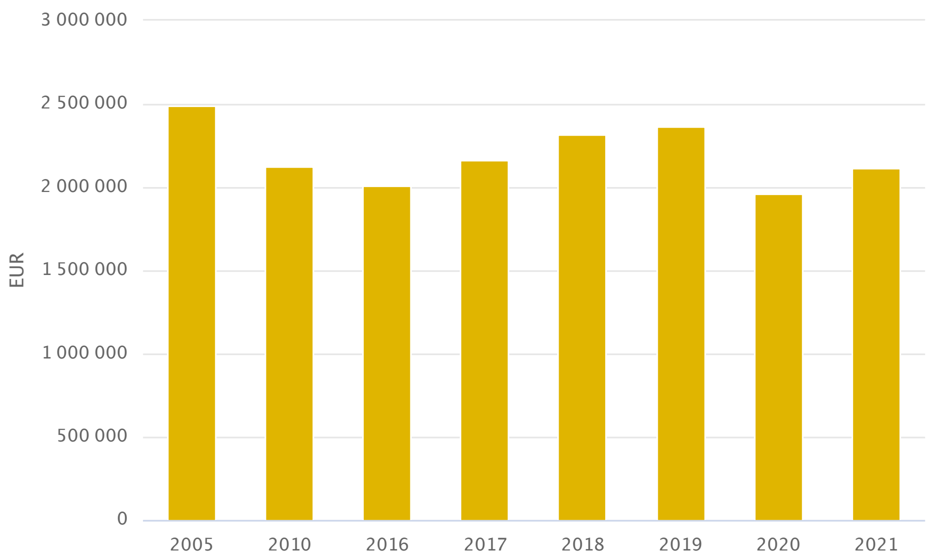


Source: MMO SR

Payments for mined minerals

The payments for mined minerals, which are the income of the Environmental Fund, have a fluctuating trend. In 2021, the payments for mined minerals reached the amount of EUR 2,116,264.

Chart 108 | Development of payments for mined minerals

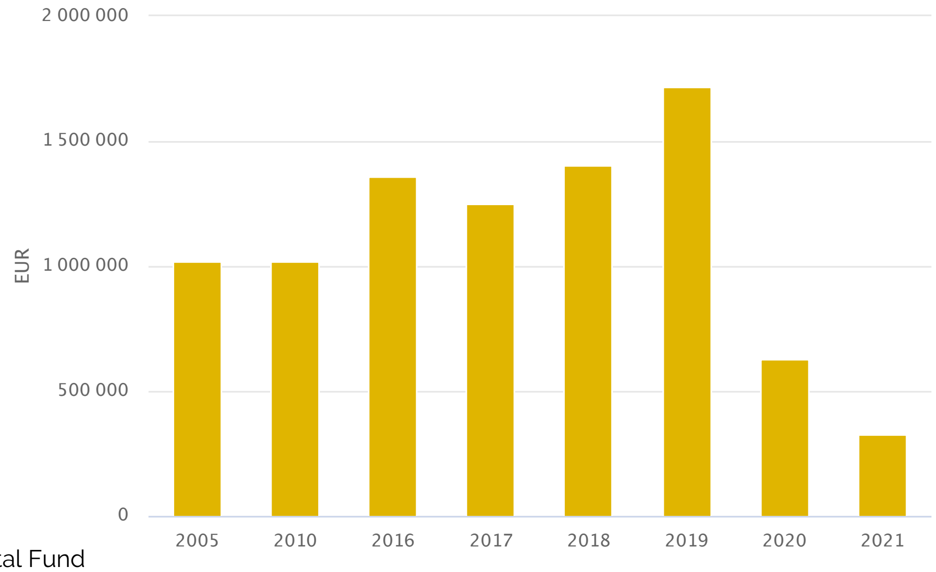


Source: Environmental Fund

Payments for storage of gases and liquids

The payments for the storage of gases and liquids have a fluctuating trend. In 2021, the amount of payments for the storage of gas and liquid reached EUR 323,816.

Chart 109 | Development of payments for storage of gases and liquids



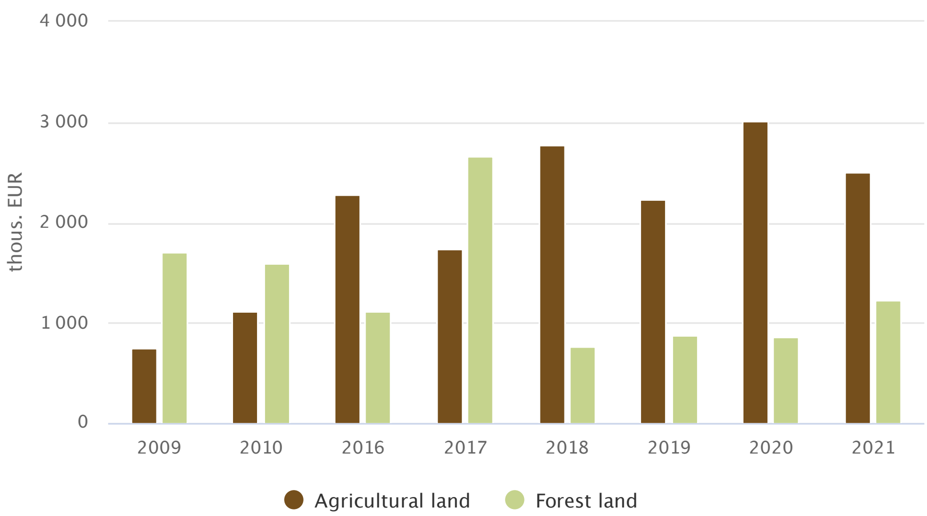
Source: Environmental Fund

Fees for the removal of agricultural land and for the removal of forest land

In 2021, the fees for the removal of agricultural land amounted to EUR 2,501,000.

In 2021, the fees for the removal of forest land amounted to EUR 1,220,000. In 2009, they decreased by 28.2%.

Chart 110 | Development of fees for the removal of agricultural land and for the removal of forest land

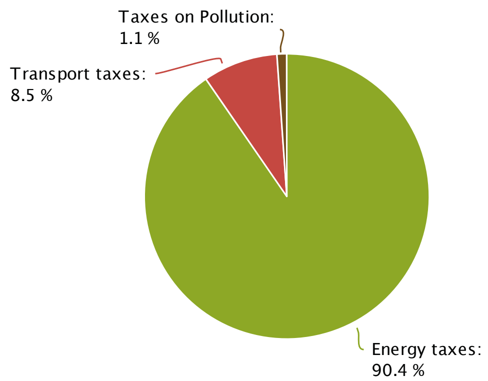


Source: MoARD SR

Taxes with an environmental aspect

According to the EP and Council regulation No. 691/2011 on European environmental economic accounts, taxes with an environmental aspect relate to taxes on **energy, transport and pollution.**

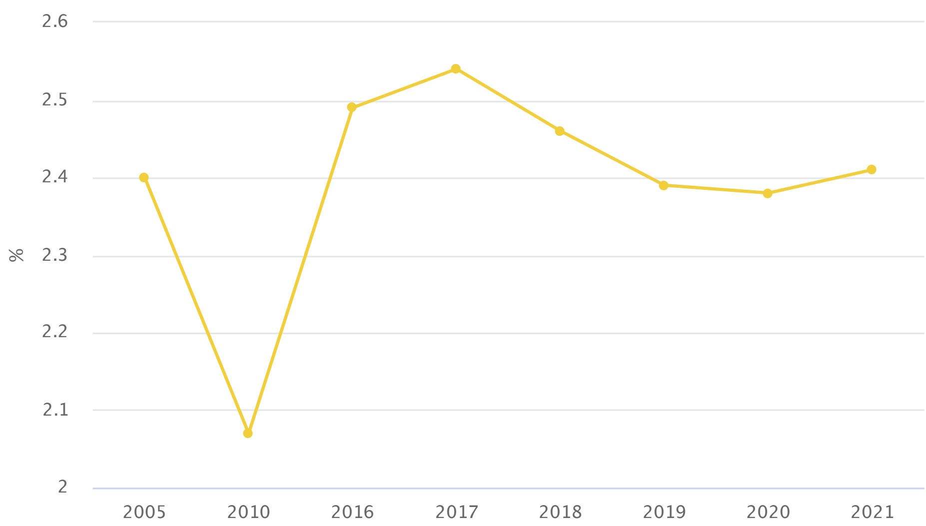
Chart 111 | Development in the share of taxes with an environmental aspect



Source: SO SR

The proportion of taxes with an environmental aspect in the GDP of the Slovak Republic in the last observed year 2021, the proportion of taxes with an environmental aspect in the GDP of the Slovak Republic reached the level of **2.41%**, which represents an increase of **0.03 percentage points** compared to the previous year.

Chart 112 | Development of the proportion of taxes with an environmental aspect in GDP



Source: SO SR

13

ENVIRONMENTAL EDUCATION AND LEARNING FOR PEOPLE OF ALL AGES

STRATEGIC DOCUMENTS

The policy for the area of environmental education, training and awareness in the Slovak Republic is based on several strategic documents adopted at the national and international level. The most comprehensive international document is **Agenda 2030 for Sustainable Development** (Agenda 2030) approved by the UN General Assembly.

Envirostrategy 2030 also includes the field of environmental education, namely the streamlining of the system of formal and informal environmental education, as well as education and training for sustainable development. The priority objective of Envirostrategy 2030 in this area is to guide the population towards responsible consumption and nature protection, as well as improving environmental awareness through cultural and natural heritage and tourism.

The Departmental Concept of Environmental Education, Training and Awareness until 2025 (DC EETA) remains an important starting document, the main objective of which is to create a comprehensive system of environmental education, training and awareness in the environmental sector. The meeting of the main objective of the concept is realized through five sub-goals, their measures and activities, which are intended to lead the identified target groups to a comprehensive understanding of the mutual relations between people and care for the environment.

ENVIRONMENTAL EDUCATION IN FORMAL EDUCATION

Formal environmental education in the Slovak Republic is concentrated in school-type facilities and is coordinated by the Ministry of Education, Science, Research and Sport of the Slovak Republic (MESRS SR). Since 2015, it has been part of the objectives, performance and content standards of the innovative state education program (ISEP), in which it is defined as a cross-cutting topic falling under the relevant educational areas at the relevant levels (from pre-primary education - ISCED 0 to upper secondary education - ISCED 3). On the basis of the ISEP, it is possible to implement environmental education as part of the curriculum of teaching subjects, through separate projects, seminars, teaching blocks or as a separate teaching subject from optional lessons.

In 2021, the MESRS SR started work on the curricular reform of basic education, which will also affect the field of environmental education. Topics related to environmental education will thus be a mandatory part of education. Environmental topics will be included in the educational areas of Man and Society and Man and Nature, that is, more precisely, the subjects of geography, civics, chemistry and biology.

The MESRS SR also provides support for environmental education with the help of the development project Enviroprojekt aimed at financing school, regional or national environmental education projects at primary and secondary schools. In 2021, 396 projects applied for support from Enviroprojekt with a request of EUR 749 204 for their implementation. From the submitted projects, the MESRS SR selected 27 projects in the total amount of EUR 50 000.

Several natural science faculties of Slovak universities participate in the preparation of workers for environmental education in the form of combined teaching study programs. The possibility to study ecology teaching in combination is made possible by the Constantine the Philosopher University in Nitra and the University of Prešov in Prešov. The study program - teaching environmental studies in combination is offered by the Faculty of Natural Sciences of the Comenius University in Bratislava.

In 2021, however, a discussion study entitled "What do they teach you at that school" was published, which is a joint publication of the Institute of Environmental Policy of the MoE SR and the Institute of Educational Policy of the MESRS SR. The study was devoted to the analysis and state of introduction of environmental education (EE) as a cross-cutting topic in the teaching process. The following findings result from it:

- When introducing EE into the teaching process, there is a lack of an interdisciplinary approach, which is necessary for a better understanding of complex economic, social and environmental contexts.
- The government should adopt a comprehensive strategy that will guarantee the improvement of environmental education in formal education.
- Evaluating the effectiveness of educational policy and setting measures should be done on the basis of new data obtained through extensive research.
- The education system must focus more on leading students to think critically and analyse complex problems.
- Fundamental changes must also occur in the university training of future teachers, the expansion of further education options is also necessary, as well as a motivational environment for environmental education coordinators.

The implementation of formal environmental education was negatively affected by the COVID-19 pandemic, which again limited the educational process in 2021.

ENVIRONMENTAL EDUCATION IN NON-FORMAL EDUCATION

In the Slovak Republic, the informal environmental education, training and awareness (EETA) is implemented by state and non-governmental organizations.

The working group for the creation of a functional EETA system in the Slovak Republic, coordinated by the Slovak Environmental Agency (SAA) and consisting of the representatives of state, non-profit organizations and municipalities, continued in 2021 to develop a certification system for EETA providers in the Slovak Republic. Specifically, it defined the entry conditions and quality criteria for the following areas: Management, EETA employees, EETA offer, Organization operation.

As part of the mentioned working group, work continued on the internet portal of environmental education - **EWOBOX** (www.ewobox.sk). New filtering tools were created for better orientation of users in the content of the portal, promotion and expansion of the portal's user base was ensured.

Several non-governmental organizations specializing in environmental education operate in the Slovak Republic. Some organizations with this focus are covered by **the Špirála association** - a nationwide network of organizations dedicated to environmental education and training. The condition of membership is the provision of educational programs with an environmental theme and the fulfilment of the criteria of the environmental educational program. Members of this association are, for example, CEA - Centre for Environmental Activities, Centre for Environmental and Ethical Education ŽIVICA, DAPHNE - Institute of Applied Ecology, SOSNA - Centre for Sustainable Alternatives, etc.

The departmental organizations of the MoE SR also participated significantly in the informal EETA, in accordance with the Environmental Strategy 2030 and the Departmental Concept of Environmental Education, Training and Awareness (DC EETA) until 2025. One of the goals of the DC EETA is the implementation and further development of existing successful activities focused on EETA. In 2021, activities were again implemented to a limited extent due to the situation with the spread of the COVID-19 disease and the resulting restrictions. The departmental organizations of the MoE SR tried to adapt to the given situation by using various interactive methods. As part of their educational activities, they implemented, for example, actions and events on the occasion of important environmental days, online discussions for all categories of schools, exhibitions, professional conferences and seminars for various target groups. Last but not least, the departmental organizations of the MoE SR devoted to editing, publishing and promotional activities, issuing various types of informational, educational and promotional materials in the form of leaflets, posters, anthologies, periodicals, professional and popular publications, methodical manuals, films and interactive CD carriers intended for various target groups.

The Environmental Fund also financially supports informal educational activities. Under the E-1 challenge: Environmental education, training and awareness were supported in the form of subsidies and co-financing by the beneficiaries of the subsidy. Two projects focused on the repair of nature trails, the promotion of the territory of the Muránska Planina National Park, the innovation of the exhibition of Mining in Slovakia and environmental education; budget costs reached the amount of EUR 204 376.

ABBREVIATIONS AND CONTENT

AEA	Annual emission allocations
AEI	Average Exposure Index
AMS	Automated Monitoring Stations
AOT40	Accumulated Dose Over a Threshold of 40
AEA	Annual emission allocations
BaP	Benzo(a)pyrene
BEV	Batery Electric Vehicle
BR	Biosphere Reserve
BOD	Biochemical Oxygen Demand
CAP	Common Agricultural Policy
CCTIA	Central Control and Testing Institute in Agriculture
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
CLRTAP	Convention on Long Range Transboundary Air Pollution
CMI	Crop Moisture Index
CNMF	Close-to-nature forest management
COD	Chemical Oxygen Demand
COP	Conference of the Contracting Parties
CR	Critically endangered taxon
p.n.	pure nutrients
DMC	Domestic Material Consuption
DMI	Direct Material Input
EDS	Effort Sharing Decision
EC	European Commission
EI	Energy intensity
EI	Equivalent Inhabitants
EMAS	Eco-Management and Audit Scheme
EMEP	Environment Monitoring and Evaluation Programme
EN	Endangered taxon
EP	European Parliament
EQ	Environmental quality
ES	Educational sites
ESP	Environmentally suitable product
ET	Educational trails
ESD	Effort Sharing Decision
EU	European Union
EU ETS	European Union - Emission Trading System
Eurostat	Statistical Office of the European Communities
EQS	Environmental Quality Standards
FAO	Food and Agriculture Organization of the United Nations
FEC	Final energy consumption
FL	Forest land
FSC	Forest Stewardship Council
FV	Favourable (conservation status)
GCCA SR	Geodesy, Cartography and Cadastre Authority of the Slovak Republic
GFRA	Global Forest Resources Assessment
GIS	Geographic Information System
GPP	Green Public Procurement
GDP	Gross domestic product
GIEC	Gross inland energy consumption
HW	Hazardous waste
IC	Information center
IUCN	The International Union for Conservation of Nature
KIMS	Comprehensive Information and Monitoring System
kg	kilogram
LPIS	Land Parcel Identification System
LULUCF	Land use-Land use change and forestry
MAES	Mapping and Assessment of Ecosystems Services
ME SR	Ministry of Economy of the Slovak Republic

MESRS SR	Ministry of Education, Science, Research and Sport of the Slovak Republic
MMO SR	Main Mining Office of the Slovak Republic
MoE SR	Ministry of Environment of the Slovak Republic
MoH SR	Ministry of Health of the Slovak Republic
MoI SR	Ministry of Interior of the Slovak Republic
MP	Management program
MW	Municipal waste
NAP	National action plan for the implementation of the Climate Change Adaptation Strategy
NAS	National Adaptation Strategy
NFC	National Forest Centre
NIML 2	The second cycle of the National Forest Inventory and Monitoring
NAQMN	National air quality monitoring network
NHW	Non-hazardous waste
NM	Nature Monument
NMVOC	Non-Methane Volatile Organic Compounds
NNM	National Nature Monument
NNR	National Nature Reserve
No	Number
NP	National Park
NAFC - RIPP	National Agricultural and Food Centre – Research Institute of Plant Production
NR	Nature Reserve
PA	Protected area
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCDD/ PCDF	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-p-furans
PdF	Production forests
PEC	Primary energy consumption
PEFC	Program for the Endorsement of Forest Certification Schemes
Pers	Person
PP	Percentage point
PHA	Public Health Authority
PHEV	Plug-in Hybrid Electric Vehicle
PLA	Protected Landscape Areas
PLE	Protected Landscape Element
PM10 (2,5)	Particulate Matter10 (2,5)
PMS	Partial Monitoring System / Permanent monitoring sites
POPs	Persistent Organic Compounds
PS	Protected Site
PT	Protected Trees
PtF	Protection forests
PZ	Protective zone
RDP	Rural Development Program
RES	Renewable energy sources
RONI	Regulatory Office for Network Industries
RP	Rescue program
RS	Ramsar site
SCI	Sites of Community importance
SEA	Slovak Environment Agency
c.p.	Constant price
SGIDS	Slovak Geological Institute of Dionýz Štúr
SHMI	Slovak Hydrometeorological Institute
SK NACE	New Classification of Economic Activities
SNC SR	State Nature Conservancy of the Slovak Republic
SO SR	Statistical Office of the Slovak Republic
SOC	Soil organic carbon
SPA	Special Protection Areas
SPEI	Standardized Precipitation Evapotranspiration Index
SPF	Special-purpose forests
SPI	Standardized Precipitation Index
SR	Slovak Republic
SSPA	Small-size Protected Areas
SWME	Slovak Water Management Enterprise
t	tonne
TCI	Total current increase
U1	Unfavourable - unsatisfactory (conservation status)
U2	Unfavourable - bad (conservation status)
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

VAT	Value-added tax
VU	Vulnerable taxon
WEEE	Waste from Electrical and Electronic Equipment
WH	World Heritage (UNESCO)
WMP SR	Waste Management Programme of the Slovak Republic
WRI	Water Research Institute
WWTP	Waste Water Treatment Plant
XX	Unknown (conservation status)

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State Nature Conservancy of the Slovak Republic
Statistical Office of the Slovak Republic
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