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National Inventory Document 2025

SLOVAK REPUBLIC

Submission under the Regulation (EU) 2018/1999

Bratislava
January 2025

PREFACE

TITLE OF REPORT	NATIONAL GREENHOUSE GAS INVENTORY REPORT 1990 – 2023 UNDER THE REGULATION (EU) 2018/1999
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In 2025, the Slovak Republic is submitting report to the European Commission under the Article 26 (3) of the Regulation (EU) 2018/1999 and the Chapter III and Articles 8-24 of the Commission Implementing Regulation (EU) 2020/1208. The whole package of the National Inventory Document 2025 of the Slovak Republic comprises:

1. SVK NID 2025 – Preliminary sectoral chapters of Slovakia's National Greenhouse Gas Emission Inventory Document prepared using the MPG under ETF;
2. SVK_GHG_1990-2023 – SVK-CRT-2025-V0.1 (2025) generated using the ETF software according to the decision 18/CMA.1 (Annex 1), accompanied by the json file;
3. Tabular format specified in Articles 10-15, 17, 19-24 to the 2020/1208 Regulation, including LULUCF accounting tables.

The Slovakia Inventory Document as well as CRT tables can be downloaded from the following address: http://oeab.shmu.sk. GHG emissions are also published in publication Životné prostredie v SR (Chapter 1.3 Air, page 19) prepared by the Statistical Office of the Slovak Republic.

This version of the annual GHG emissions inventory is the first submission of the National Inventory in 2025 of the Slovak Republic to the European Union under the Energy Governance.

Submission is uploaded via the EIONET Central Data Repository tool of the EEA.

Major changes and corrections included in this SVK NID 2025 are connected with the implementation of the IPCC 2019 Refinement and are focused on following issues:

- General: Harmonization of indirect emissions of the NOx, CO, NMVOC, SO_2 and NH_3 in line with the CLRTAP and NECD submissions reported in March 15, 2024 in all sectors (**Chapter ES.5**).
- Energy: Road transport was recalculated due to the COPERT model update. In addition, based on the new statistical input in households, biomass consumption in the 1.A.4.b was recalculated.
- Fugitive Emissions: This subcategory was recalculated based on the changes in EF and corrections.
- IPPU: No major recalculations needed in this sector except of correction of the EF and addition new vehicle categories due to the COPERT model update in 2.D.3.
- Agriculture: Several recalculations were occurred, as addition emissions from rabbits.
- LULUCF: No major recalculations needed in this sector except of corrections of calculation errors.
- Waste: Several recalculations in all categories connected with the implementation of the IPCC 2019 Refinement and the changes in activity data and methodologies.

More information on recalculations made in the GHG inventory preparation can be found in the sectoral chapters of this Report and the **Chapter 10**.

EXECUTIVE SUMMARY

ES.1. Background Information on Greenhouse Gas Inventories and Climate Change

Climate change is a key environmental, economic and social challenge globally and in Europe. On the one hand, most economic activities are contributing to climate change by emitting greenhouse gases or affecting carbon sinks (e.g. through land use change); on the other hand, all ecosystems, many economic activities as well as human health and well-being are sensitive to climate change.

Because the impact of the climate change differs in various regions of the world, its socio-economic and environmental impact always requires an active solution. Necessary political measures have to steam from detailed analysis of the current greenhouse gas (GHG) emissions in every sector, emission projections and impact assessment of adopted or planned policy measures. Such detailed analyses are good starting points for any policy reflected in national communication of a party prepared according to rules of the United Nations Framework Convention on Climate Change (UNFCCC).

Climate change, caused by increasing anthropogenic emissions of greenhouse gases, represents one of the most serious environmental threats for humankind. Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are the most important anthropogenic greenhouse gases with increasing concentration in atmosphere. The GHGs inventory includes also halogenated hydrocarbons (PFCs, HFCs) and SF_6, which are not controlled by the Montreal Protocol.

According to the WMO it is officially confirmed that 2024 is the warmest year on record, by a huge margin. The annual average global temperature approached 1.5° Celsius above pre-industrial levels – symbolic because the Paris Agreement on climate change aims to limit the long-term temperature increase (averaged over decades rather than an individual year like 2024) to no more than 1.5° Celsius above pre-industrial levels. Six leading international datasets used for monitoring global temperatures and consolidated by WMO show that the annual average global temperature was 1.45 ± 0.12 °C above pre-industrial levels (1850-1900) in 2024. Global temperatures in every month between June and December set new monthly records. July and August were the two hottest months on record. Long-term monitoring of global temperatures is just one indicator of climate and how it is changing. Other key indicators include atmospheric greenhouse gas concentrations, ocean heat and acidification, sea level, sea ice extent and glacier mass balance.

WMO's provisional State of the Global Climate in 2024 report, published on 30 November, showed that records were broken across the board. WMO will issue its final State of the Global Climate 2024 report in March 2025. This will include details on socio-economic impacts on food security, displacement and health.

The Paris Agreement seeks to hold the increase in the global average temperature to well below 2°C above pre-industrial levels while pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. The Intergovernmental Panel on Climate Change says that climate-related risks for natural and human systems are higher for global warming of 1.5°C than at present, but lower than at 2°C. A study by WMO and the UK's Met Office last year predicted that there is a 66% likelihood that the annual average near-surface global temperature between 2023 and 2027 will be more than 1.5°C above pre-industrial levels for at least one year. This does not mean that we will permanently exceed the 1.5°C level specified in the Paris Agreement which refers to long-term warming over many years. The chance

of temporarily exceeding 1.5°C has risen steadily since 2015, when it was close to zero. For the years between 2017 and 2021, there was a 10% chance of exceedance.[1]

The European Climate Law writes into law the goal set out in the European Green Deal for Europe's economy and society to become climate-neutral by 2050. The law also sets the intermediate target of reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. Climate neutrality means achieving net zero greenhouse gas emissions for EU countries as a whole, mainly by cutting emissions, investing in green technologies and protecting the natural environment. The law aims to ensure that all EU policies contribute to this goal and that all sectors of the economy and society play their part. The Climate Law includes measures to keep track of progress and adjust our actions accordingly, based on existing systems such as the governance process for Member States' integrated national energy and climate plans, regular reports by the European Environment Agency, and the latest scientific evidence on climate change and its impacts. Slovakia is a part of these actions and agreed the climate neutrality until 2050 among the first countries in the EU (end of 2019).

During the year 2020, many countries were going through the worst economic contraction since the 1930s due to COVID-19 pandemic. Some economists believe it will be essentially V-shaped: first a steep fall, then a steep return to normal. In May 2020, the EU Commission proposed stimulus packages called "sustainable recovery" mostly address to investments into the buildings, transport, power and industry sectors. Aim of this plan is not only reduce emissions, but also create new jobs, make innovations and build circular economy.

On 14 July 2021, the European Commission adopted a series of legislative proposals setting out how it intends to achieve climate neutrality in the EU by 2050, including the intermediate target. The package proposes to revise several pieces of EU climate legislation, including the ETS directive, Effort Sharing Regulation, transport and land use legislation, setting out in real terms the ways in which the Commission intends to reach EU climate targets under the European Green Deal.

From 2021, the fourth EU ETS trading period has gone operational. Main change is the increase of linear reduction factor from 1.74% per annum to 2.2% per annum, which should bring at least 43% reduction within the EU ETS sectors by 2030. To achieve the ambitious reductions, several low carbon-funding mechanisms were introduced, in particular Innovation Fund (to support demonstration of innovative renewable energy and low-carbon innovation in industry, as well as carbon capture, use and storage) and a Modernisation Fund (to contribute to modernising the energy systems of 10 EU Member States with lower GDP).

ES.2. Summary of National Emission and Removal Trends

The GHG emissions presented in the National Inventory Document 2025 were updated and recalculated using the last updated methods based on the IPCC 2019 Refinement to the IPCC 2006 Guidelines for National Greenhouse Gas Inventories, national conditions and data published by the Statistical Office of the Slovak Republic.

In 2024, UNFCCC review did not take place and all previous recommendation were implemented. ESR review took place in 2024 resulted with no recommendation.

Total GHG emissions were 36 094.23 Gg of CO_2 eq. in 2023 (without LULUCF and with indirect emissions). This represents a reduction by 50.9% against the base year 1990. In comparison with 2022, the emissions decreased by 2%. The decrease in total emissions of 2023 compared to 2022 was due to decrease in the Energy and IPPU sectors.

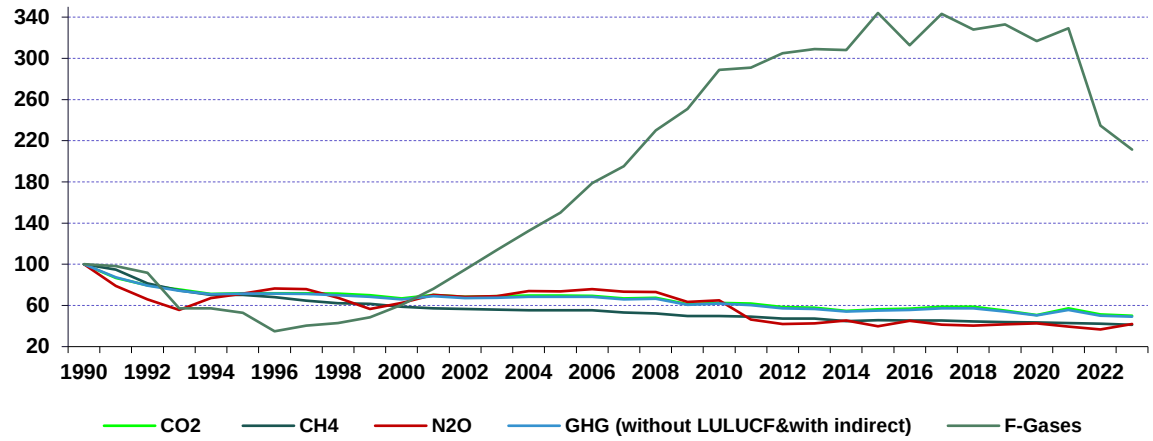
[1] https://wmo.int/media/news/wmo-confirms-2023-smashes-global-temperature-record

The 2025 submission includes indirect CO_2 emissions in the solvents category (IPPU). This means, that indirect emissions were 41.08 Gg of CO_2 eq. in 2023. Indirect CO_2 emissions were estimated and reported for the time series 1990 – 2023.

The major changes in the 2025 national inventory of GHG emissions are caused by recalculations in the Fugitive Emissions, Agriculture and Waste sectors for the particular years or whole time series.

The emissions with LULUCF and with indirect emissions decreased in 2023 compared to 2022 by 3.5%. During period 1991 – 2023, the total greenhouse gas emissions in the Slovak Republic did not exceed the level of 1990. ***Tables ES.2*** and ***ES.3*** show the aggregated GHG emissions expressed in CO_2 equivalents and according to the gases in the period 1990 – 2023. ***Figure ES.1*** shows trend in the gases without LULUCF. The emissions of F-gases are the only emissions from consumption HFCs, PFCs and SF_6 in industry with the increasing trend since 1990 (despite decrease of PFCs gases from aluminium production).

Figure ES.1: *GHG emission trends compared with the base year (%) in the Slovak Republic*



GHG emissions in % to base years without LULUCF and indirect emissions; emissions are determined as of January 2025

Slovakia decreased its emissions by around 21% between 2010 and 2023. The latest available GHG emission projections have demonstrated emissions decrease as an evidence of the successful implementation of the policies and measures and their effect on the improvement in energy intensity and industrial production efficiency. These projections are in line with the Low-Carbon Strategy of Slovak Republic (approved in February 2020 by the Government). New drivers and parameters reflecting the actual pandemic situation were projected. Actually, during the year 2024, a new emissions projection among the National Energy and Climate Plan are prepared and were published in the First Biennial Transparency Report.

Reduction of emissions in Slovakia in past years was conjunction of different impacts starting from impressive industrial and technological restructuring connected with the fuel switching of fossil fuels from coal and oil to the natural gas (air pollution legislation since 1991 was the main driving force), economy restructuring towards the less energy intensive production (mostly in recent years) and also by temporary changes in production intensity (driven by global and EU markets). Transport (mostly the road transport), with continuously increasing emissions is an important exception. The continuous pressure is being made in formulating the effective strategy and policy to achieve further reduction of emissions in this sector, too. For example, combination of regulatory and economic instruments (toll pay for freight vehicles based on their environmental characteristics in a combination with fuel and emission standards for new cars). The car tax system and the level of fuel taxation, which is close to the EU average, contribute to limit the increase of greenhouse gas emissions in the transport.

In Slovakia, the structural changes in the manufacturing industry towards less energy intensive industries, such as machinery and automotive industry, can explain why after 2009 the energy consumption did not pick up the same pace as prior to that year when led to a significant decrease in primary energy intensity (the GDP grew twice as fast as primary energy consumption). Therefore, the trend observed particularly in primary energy consumption is mainly due to other factors although some energy efficiency improvements did take place particularly during the period after the year 2012. The policy package still needs various improvements across the sectors including the sectoral mitigation targets particularly in transport, buildings, agriculture and waste.

Although this optimistic trend recognised in previous years, it is visible since last 3 years, that the improvement of several indicators such as GHG per capita or GHG/GDP started slowed down and reached minimum level. GHG emissions level reached minimum in 2014 and trend is stabilised, fluctuated with increases in transport, households, waste and some industrial categories in the latest year, however, the year 2019 is the second lowest emissions' year since the base year (**Chapter 2**). Covid-19 pandemic situation occurred in 2020 in conjunction with the industrial changes in iron and steel production, transformation of electricity and heat production sectors and changes in fuels combustion caused by increasing prices led to the dramatically high decrease of the total emissions in 2020. However, despite this optimistic development, the emission trend in 2021 increased back to the pre-pandemic level. Further reduction of emissions in 2023 was caused by the energy prices policy and due to economic reasons, several important industrial plants reduced or closed the operation. More information are in energy and IPPU sectoral chapters.

ES.3. Overview of Source and Sink Category

The emissions without LULUCF in 2023 and with indirect emissions are lower than in 2022 due to the essential decrease in Energy and IPPU sectors, mostly in energy and manufacturing industry, mineral production, chemical industry and metal industry.

The Energy sector (including transport) with the share of 69% was the main contributor to total GHG emissions in 2023. Transport with 21% share on total emissions contributes significantly to the GHG budget. In 2023, the transport in total emissions has decreased by more than 0.55% in comparison with previous year 2022. In addition to fuel combustion in stationary sources of pollution, also the pollution from small sources of residential heating systems and fugitive methane emissions from transport, processing and distribution of oil and natural gas contribute significantly to the total GHG emissions.

The Industrial Processes and Product Use sector was the second important sector in 2023 with its 20% share in total GHG emissions, producing mainly technological emissions from processing mineral products, chemical production and steel and iron production. The reduction of emissions from technological processes is very costly and there exist specific technical limits, therefore the emissions have not been changed since the reference year as significantly as for other categories. Mostly the production volume in industrial processes influences their level. The most growing emissions within the IPPU sector are HFCs and SF_6 emissions as result of industrial demand and use of these substances in construction, insulation of building, electro-technical and/or automobile industry.

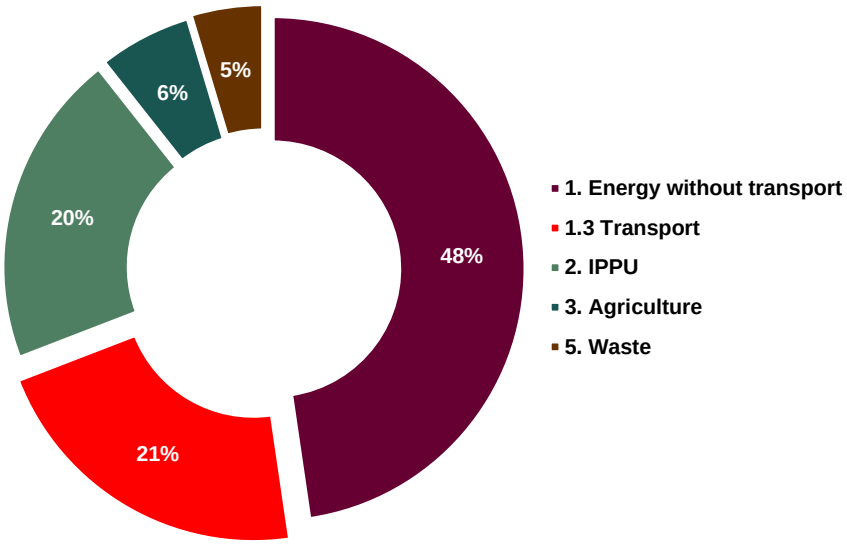
In 2023, the share of the Agriculture sector on total GHG emissions was 6% and the trend in emissions is slightly decreasing since 1999. The most significant reduction of emissions from agriculture was achieved at the beginning of nineties as result of reduction in breeding livestock number together with restricted use of fertilizers.

The Waste sector contributed by 5% to total GHG emissions in 2023. Using of more exact methodology for the evaluation of methane emissions from solid waste disposal on sites and included also older layer into calculation resulted in continual increase of emissions by more than 100% compared to the base year 1990. Similar trend is expected to remain in future years, although the increase should not be so

substantial as before. Volume of emissions from landfills depends, largely, on applied methodology to evaluate landfills and on the scale of implementation energy recovery of landfill gases by landfill operators.

The shares of individual sectors in total GHG emissions have not been changed significantly compared to the base year 1990. Nevertheless, increase in transport emissions in trend since 1990 and decreased share of stationary sources of pollution in the Energy sector are noticeable. Combustion of fossil fuels, which account for about 75% of the total CO_2 emissions in the Slovak Republic (without LULUCF), represent the most important anthropogenic source of CO_2 emissions (***Figure ES.2***, ***Table ES.3***).

Figure ES.2: *GHG emissions share by the sectors (%) in the Slovak Republic in 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

Table ES.1: *Summary of the GHG emissions according to the gases and the sectors in 2023 and 2022*

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2023					
	Gg of CO_2 equivalents					
	CO_2	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**
1. Energy	23 972.41	27.95	0.65	NO	NO	NO
2. Industrial Processes	6 718.99	0.57	0.40	437.89	0.01	14.70
3. Agriculture	72.47	40.66	3.59	NO	NO	NO
4. LULUCF	-7 525.91	0.54	0.10	NO	NO	NO
5. Waste	2.38	52.58	0.74	NO	NO	NO
Memo Items - International Transport	*169.66*	*0.00*	*0.00*	*NO*	*NO*	*NO*
Total (excluding LULUCF)	30 766.25	3 409.16	1 425.16	437.89	0.01	14.70
Total (including LULUCF)	23 240.33	3 424.30	1 452.20	437.89	0.01	14.70

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2022					
	Gg of CO_2 equivalents					
	CO_2	**CH_4**	**N_2O**	**HFCs**	**PFCs**	**SF_6**
1. Energy	24 609.40	28.26	0.71	NO	NO	NO
2. Industrial Processes	6 915.91	0.54	0.42	480.86	5.91	15.38
3. Agriculture	60.84	40.93	2.83	NO	NO	NO
4. LULUCF	-7 316.72	1.64	0.17	NO	NO	NO
5. Waste	3.31	54.90	0.76	NO	NO	NO
Memo Items - International Transport	*148.02*	*0.00*	*0.00*	*NO*	*NO*	*NO*
Total (excluding LULUCF)	31 589.46	3 489.80	1 250.69	672.37	14.23	17.44
Total (including LULUCF)	24 272.74	3 535.65	1 294.89	672.37	14.23	17.44

Table ES.2: *Summary of the GHG emissions according to the gases in 1990 – 2023*

GREENHOUSE GAS EMISSIONS	Base year 1990	1991	1992	1993	1994	1995	1996	1997
	Gg of CO_2 equivalents							
CO_2 emissions excluding net CO_2 from LULUCF	61 528.54	53 333.93	48 930.98	46 394.33	43 803.52	44 194.17	44 075.52	44 147.08
CO_2 emissions including net CO_2 from LULUCF	52 505.31	43 499.03	38 463.07	36 120.97	34 124.52	35 073.46	35 046.20	35 340.74
CH_4 emissions excluding CH_4 from LULUCF	8 274.60	7 854.81	6 747.22	6 160.39	5 802.15	5 800.84	5 633.69	5 353.15
CH_4 emissions including CH_4 from LULUCF	8 287.04	7 865.11	6 761.53	6 187.20	5 809.38	5 809.49	5 645.73	5 362.51
N_2O emissions excluding N_2O from LULUCF	3 409.06	2 696.29	2 246.25	1 892.73	2 292.56	2 437.89	2 608.64	2 583.99
N_2O emissions including N_2O from LULUCF	3 527.32	2 806.30	2 355.62	2 005.92	2 390.82	2 522.92	2 689.68	2 656.22
HFCs	NO	NO	NO	NO	0.20	12.38	26.31	38.33
PFCs	213.92	210.43	195.83	122.51	104.11	90.15	36.89	36.48
SF_6	NO	NO	NO	NO	NO	NO	NO	NO
Total (excluding LULUCF)	**73 426.19**	**64 095.50**	**58 120.32**	**54 570.06**	**52 020.71**	**52 545.90**	**52 392.55**	**52 170.85**
Total (including LULUCF)	**64 533.66**	**54 380.91**	**47 776.10**	**44 436.69**	**42 447.19**	**43 518.86**	**43 456.30**	**43 446.10**
Total (excluding LULUCF, including indirect emissions)	***73 513.96***	***64 182.03***	***58 205.74***	***54 654.31***	***52 103.88***	***52 627.98***	***52 473.52***	***52 250.69***
Total (including LULUCF, including indirect emissions)	***64 621.43***	***54 467.43***	***47 861.53***	***44 520.95***	***42 530.36***	***43 600.94***	***43 537.28***	***43 525.93***

GREENHOUSE GAS EMISSIONS	1998	1999	2000	2001	2002	2003	2004	2005
	Gg of CO_2 equivalents							
CO_2 emissions excluding net CO_2 from LULUCF	5 165.44	5 144.29	4 879.71	4 752.08	4 704.46	4 672.62	4 598.59	4 612.40
CO_2 emissions including net CO_2 from LULUCF	2 301.11	1 932.49	2 128.75	2 393.42	2 335.34	2 350.59	2 517.40	2 506.26
CH_4 emissions excluding CH_4 from LULUCF	2 367.29	2 022.17	2 192.54	2 443.26	2 385.76	2 408.97	2 559.94	2 552.47
CH_4 emissions including CH_4 from LULUCF	50.73	71.82	98.20	130.29	167.96	201.17	240.28	277.09
N_2O emissions excluding N_2O from LULUCF	28.34	19.03	17.83	18.84	19.87	26.55	27.00	27.48
N_2O emissions including N_2O from LULUCF	NO	NO	NO	NO	NO	NO	NO	NO
HFCs	13.04	13.03	13.44	13.74	15.23	15.52	15.91	16.89
PFCs	5 165.44	5 144.29	4 879.71	4 752.08	4 704.46	4 672.62	4 598.59	4 612.40
SF_6	2 301.11	1 932.49	2 128.75	2 393.42	2 335.34	2 350.59	2 517.40	2 506.26

GREENHOUSE GAS EMISSIONS	1998	1999	2000	2001	2002	2003	2004	2005
	Gg of CO_2 equivalents							
Total (excluding LULUCF)	**51 426.99**	**50 208.66**	**48 294.63**	**50 567.01**	**49 253.00**	**49 579.73**	**50 239.82**	**50 267.95**
Total (including LULUCF)	**41 635.34**	**41 257.31**	**39 373.71**	**42 324.55**	**40 532.10**	**41 433.97**	**42 086.24**	**46 003.68**
Total (excluding LULUCF, including indirect emissions)	***51 505.69***	***50 285.46***	***48 360.07***	***50 632.52***	***49 324.77***	***49 647.72***	***50 315.50***	***50 334.88***
Total (including LULUCF, including indirect emissions)	***41 714.05***	***41 334.11***	***39 439.16***	***42 390.06***	***40 603.86***	***41 501.96***	***42 161.92***	***46 070.61***

GREENHOUSE GAS EMISSIONS	2006	2007	2008	2009	2010	2011	2012	2013
	Gg of CO_2 equivalents							
CO_2 emissions excluding net CO_2 from LULUCF	42 639.35	41 031.85	41 425.30	37 681.13	38 464.35	38 045.11	35 961.41	35 621.71
CO_2 emissions including net CO_2 from LULUCF	35 224.70	34 047.68	35 554.50	32 026.41	33 704.86	32 916.83	29 694.28	28 636.37
CH_4 emissions excluding CH_4 from LULUCF	4 590.27	4 388.64	4 319.39	4 119.42	4 124.91	4 059.11	3 912.02	3 896.44
CH_4 emissions including CH_4 from LULUCF	4 608.88	4 419.27	4 338.60	4 147.77	4 147.35	4 086.05	3 963.57	3 913.52
N_2O emissions excluding N_2O from LULUCF	2 581.15	2 498.89	2 488.64	2 165.83	2 209.54	1 579.58	1 433.78	1 453.36
N_2O emissions including N_2O from LULUCF	2 619.13	2 541.17	2 522.27	2 203.43	2 242.94	1 615.27	1 482.83	1 484.89
HFCs	323.94	368.16	431.50	492.20	569.22	576.43	602.07	620.99
PFCs	40.96	31.39	41.43	24.50	28.27	24.63	28.62	17.02
SF_6	17.22	17.93	19.43	20.11	20.23	21.44	21.90	22.99
Total (excluding LULUCF)	**50 192.89**	**48 336.86**	**48 725.69**	**44 503.19**	**45 416.53**	**44 306.30**	**41 959.80**	**41 632.50**
Total (including LULUCF)	**42 834.83**	**41 425.60**	**42 907.73**	**38 914.42**	**40 712.87**	**39 240.65**	**35 793.28**	**34 695.77**
Total (excluding LULUCF, including indirect emissions)	***50 264.46***	***48 393.82***	***48 788.39***	***44 562.02***	***45 465.73***	***44 363.91***	***42 006.28***	***41 678.92***
Total (including LULUCF, including indirect emissions)	***42 906.40***	***41 482.56***	***42 970.43***	***38 973.25***	***40 762.07***	***39 298.26***	***35 839.76***	***34 742.18***

GREENHOUSE GAS EMISSIONS	2014	2015	2016	2017	2018	2019	2020	2021
	Gg of CO_2 equivalents							
CO_2 emissions excluding net CO_2 from LULUCF	33 708.17	34 527.85	34 977.55	36 183.94	36 184.07	33 853.19	31 176.16	35 251.32
CO_2 emissions including net CO_2 from LULUCF	28 891.15	29 224.94	29 603.59	30 914.67	31 888.48	28 788.22	23 932.38	27 988.06
CH_4 emissions excluding CH_4 from LULUCF	3 708.41	3 771.15	3 759.07	3 758.44	3 685.24	3 618.35	3 599.31	3 561.74
CH_4 emissions including CH_4 from LULUCF	3 733.75	3 799.60	3 782.59	3 784.57	3 711.03	3 648.57	3 626.64	3 581.54
N_2O emissions excluding N_2O from LULUCF	1 550.85	1 352.16	1 536.56	1 412.13	1 372.36	1 418.79	1 447.42	1 350.67
N_2O emissions including N_2O from LULUCF	1 587.36	1 391.96	1 573.77	1 450.45	1 410.10	1 458.37	1 484.06	1 381.84
HFCs	626.14	704.84	647.95	710.19	675.62	688.69	646.65	672.37
PFCs	18.27	16.53	15.17	16.75	16.14	14.28	13.22	14.23
SF_6	14.60	14.75	6.00	7.30	9.68	9.14	17.73	17.44
Total (excluding LULUCF)	**39 626.44**	**40 387.28**	**40 942.31**	**42 088.75**	**41 943.11**	**39 602.44**	**36 900.49**	**40 867.77**
Total (including LULUCF)	**34 871.28**	**35 152.61**	**35 629.06**	**36 883.93**	**37 711.05**	**34 607.26**	**29 720.69**	**33 655.47**
Total (excluding LULUCF, including indirect emissions)	***39 675.98***	***40 443.62***	***40 994.83***	***42 136.24***	***41 996.22***	***39 647.74***	***36 946.37***	***40 911.44***
Total (including LULUCF, including indirect emissions)	***34 920.82***	***35 208.96***	***35 681.58***	***36 931.41***	***37 764.16***	***34 652.56***	***29 766.56***	***33 699.13***

Total aggregated GHG emissions, emissions are determined as of January 2025, indirect emissions are reported in the 2025 submission.

Table ES.3: *Summary of the GHG emissions according to the sectors in 1990 – 2023*

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year (1990)	1991	1992	1993	1994	1995	1996	1997
	Gg of CO_2 equivalents							
1. Energy	56 942.20	50 508.06	45 728.77	41 790.47	39 225.31	38 827.39	38 411.81	38 222.80
2. Industrial Processes	9 427.67	7 225.07	6 844.38	7 886.83	8 171.05	9 028.62	9 405.44	9 445.58
4. Agriculture	5 871.65	5 162.80	4 352.34	3 693.97	3 502.75	3 565.43	3 447.60	3 350.16
5. Land Use, Land-Use Change and Forestry	-8 892.53	-9 714.59	-10 344.22	-10 133.37	-9 573.52	-9 027.04	-8 936.24	-8 724.76
6. Waste	1 184.66	1 199.57	1 194.83	1 198.79	1 121.60	1 124.46	1 127.69	1 152.32

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1998	1999	2000	2001	2002	2003	2004	2005
	Gg of CO_2 equivalents							
1. Energy	37 699.24	36 973.08	36 086.69	38 036.04	35 702.20	36 617.90	36 156.63	36 675.25
2. Industrial Processes	9 555.64	9 171.96	8 191.62	8 381.92	9 315.95	8 872.47	10 099.17	9 585.07
4. Agriculture	2 993.56	2 866.53	2 786.96	2 893.35	2 889.66	2 722.95	2 573.55	2 601.52
5. Land Use, Land-Use Change and Forestry	-9 791.65	-8 951.35	-8 920.91	-8 242.46	-8 720.91	-8 145.76	-8 153.58	-4 264.26
6. Waste	1 178.55	1 197.10	1 229.36	1 255.69	1 345.20	1 366.42	1 410.47	1 406.11

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2006	2007	2008	2009	2010	2011	2012	2013
	Gg of CO_2 equivalents							
1. Energy	35 920.33	34 258.97	34 678.74	32 106.57	32 409.48	31 856.75	29 591.58	29 413.83
2. Industrial Processes	10 412.72	10 245.83	10 129.73	8 631.05	8 998.01	8 626.83	8 550.70	8 270.40
4. Agriculture	2 376.88	2 413.75	2 464.21	2 268.64	2 463.68	2 227.17	2 197.86	2 310.13
5. Land Use, Land-Use Change and Forestry	-7 358.06	-6 911.26	-5 817.96	-5 588.77	-4 703.66	-5 065.65	-6 166.52	-6 936.73
6. Waste	1 482.95	1 418.32	1 453.02	1 496.93	1 545.35	1 595.55	1 619.65	1 638.14

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	2014	2015	2016	2017	2018	2019	2020	2021
	Gg of CO_2 equivalents							
1. Energy	27 076.55	27 781.52	28 034.09	28 987.41	28 826.42	27 317.54	25 107.26	27 836.04
2. Industrial Processes	8 503.52	8 690.97	8 889.20	9 175.89	9 202.30	8 358.27	7 807.24	9 226.34
4. Agriculture	2 417.46	2 179.17	2 345.89	2 215.82	2 185.95	2 215.10	2 226.23	2 076.08
5. Land Use, Land-Use Change and Forestry	-4 755.17	-5 234.66	-5 313.25	-5 204.83	-4 232.06	-4 995.18	-7 179.80	-7 212.31
6. Waste	1 628.92	1 735.61	1 673.14	1 709.64	1 728.43	1 711.52	1 759.76	1 729.32

Total aggregated GHG emissions, emissions are determined as of January 2025, indirect emissions are reported in the 2025 submission.

ES.5. Indirect Emissions and Precursors of Greenhouse Gases

The Slovak Republic is providing here the estimate of CO, NOx, SO_2 and NMVOC emissions for the years 1990 – 2022 originally submitted under the NECD and the CLRTAP on February 15, 2024. The estimation for the year 2023 is not available, yet. The latest (March 2024) data is included in CRT tables 1990 – 2022 generated using the ETF software, accompanied by the json file. According to the new rules for the reporting of the air pollutants recalling the Article 8(1) and the Annex I of the NECD, annual emission reporting requirements as referred to in the first subparagraph of the Article 8(1) for the years after the year 2017 was set for the emissions inventory in February, 15 and for the informative inventory reports (IIR) or emissions data resubmission in March, 15, respectively. Among others for example:

- In the Energy sector, emissions of NOx, NMVOC, SOx and CO in the categories 1.A.3.d.i.i and 1.A.4.b.i changed based on update of the activity data for fuel consumption.
- In the IPPU sector, emissions for historical years 1990 – 1999 from the category 2.H.2, changed as a result of the activity data update which resulted in recalculations of emissions of NMVOC.
- In the Agriculture sector, in categories 3.B.3, 3.B.1, 3.B.4 and 3.D.a.2.a emissions of NOx changed as a result of implementation of the IPCC 2019 Refinement and implementation of the 2023 EMEP/EEA Guidebook. In category 3.B.1, NMVOC emissions changed based on EU recommendation. In the category 3.B.4.h, NOx and NMVOC emissions changed due to implementation of a new methodology based on tier 1 method available in the 2023 EMEP/EEA Guidebook.
- In the Waste sector, emissions of NMVOC in the categories 5.A and 5.B.2 were recalculated due to an addition of the new activity data to the calculation based on the change in the EMEP/EEA GB version 2023.

These changes are resulted to the methodological changes in the NECD inventory and are reflected in the March 15, 2024 NECD submission and consequently provided in the GHG inventory submission 2024. According to the analyses, there are no larger inconsistencies (+/-5%) in the reporting under NECD (or CLRTAP) (submitted on 15/03/2024) and the GHG inventory (submitted on 15/01/2025). Due to differences in methodology, small inconsistencies occurred in the emissions from forest fires that are not included in the NECD inventory and emissions of NOx in manure management are not included directly in the GHG inventory (indirect N_2O emissions are calculated based on NOx emissions in the category 3.B.2 – Manure Management). More information can be found in **Chapter 10.1**.

Table ES.4: *Summary of the indirect GHG emissions according to the gases and the sectors in 2022*

EMISSIONS	TOTAL	ENERGY	INDUSTRY	AGRICULTURE	LULUCF	WASTE
	Gg					
NOx	53.79	42.35	5.27	4.74	1.05	0.39
CO	337.05	216.98	70.11	NO	37.28	12.67
NMVOC	88.54	54.75	25.60	6.74	0.89	0.56
SO_2	13.24	8.47	4.70	NO	0.05	0.01

Emissions of main pollutants are available in public databases:

- ŠÚ SR in the STATdat database.
- SHMÚ website – Air Emission Accounts data for the years 2008 – 2022 are available as the aggregates in format of separate PDF files for particular gases.

CHAPTER 1. INTRODUCTION

1.1. Background Information on Greenhouse Gas Inventories and Climate Change

1.1.1. Climate Change

The greenhouse effect of the atmosphere is similar to the effect that may be observed in greenhouses, however the function of glass in the atmosphere is taken over by the "greenhouse gases" (international abbreviation GHGs). Short wave solar radiation is transmitted freely through the greenhouse gases, falling to the earth's surface and heating it. Long wave (infrared) radiation, emitted by the earth's surface, is caught by these gases in the major way and partly reemitted towards the earth's surface. Because of this effect, the average temperature of the surface atmosphere is 33°C warmer than it would be without the greenhouse gases. Finally, this enables the life on our planet.

The most important greenhouse gas in the atmosphere is water vapour (H_2O), which is responsible for approximately two thirds of the total greenhouse effect. Its content in the atmosphere is not directly affected by human activity, in principle it is determined by the natural water cycle, expressed in a very simple way, as the difference between evaporation and precipitation. Carbon dioxide (CO_2) contributes to the greenhouse effect by 30%, methane (CH_4), nitrous oxide (N_2O) and ozone (O_3); all three together contribute by 3%. The group of synthetic (artificial) substances – chlorofluorocarbons (CFCs), their substitutes, hydrofluorocarbons (HCFCs, HFCs) and others such as fluorocarbons (PFCs) and SF_6, also belong to the greenhouse gases. There are other photochemical active gases as well, such as carbon monoxide (CO), oxides of nitrogen (NO_x) and non-methane organic compounds (NM VOC), which do not belong to the greenhouse gases, but contribute indirectly to the greenhouse effect of the atmosphere. They are registered together as the precursors of ozone in the atmosphere, as they influence the formation and disintegration of ozone in the atmosphere.

Despite setbacks from COVID-19, global greenhouse gas emissions increased in 2021. In 2021, greenhouse gas concentrations reached new highs, with globally averaged surface mole fractions for carbon dioxide (CO_2) at 415.7 ± 0.2 parts per million (ppm), methane (CH_4) at 1908 ± 2 parts per billion (ppb) and nitrous oxide (N2O) at 334.5 ± 0.1 ppb, respectively, 149%, 262% and 124% of pre-industrial (1 750) levels.

Carbon dioxide (CO_2) is a long-lived greenhouse gas that accumulates in the atmosphere. When CO_2 sources and sinks are in net balance, concentrations of CO_2 will have a small variability. That was the case over the 14 000 years that preceded the industrial era, which started around 1 750 AD. Emissions from burning fossil fuels and changing land uses have led to an increase in CO_2 in the atmosphere from the pre-industrial level of 280 parts per million (ppm) to current levels that are over 410 ppm (this means 410 CO_2 molecules per million of air molecules or 0.041% of all air molecules).

Methane (CH_4) is the second most important long-lived greenhouse gas and contributes about 17% of radiative forcing. Approximately 40% of methane is emitted into the atmosphere by natural sources (e.g., wetlands and termites), and about 60% comes from human activities like cattle breeding, rice agriculture, fossil fuel exploitation, landfills and biomass burning.

Nitrous Oxide (N_2O) is emitted into the atmosphere from both natural (about 60%) and anthropogenic sources (approximately 40%), including oceans, soil, biomass burning, fertilizer use, and various industrial processes. Nitrous oxide also plays an important role in the destruction of the stratospheric ozone layer, which protects us from the harmful ultraviolet rays of the sun. It accounts for about 6% of radiative forcing by long-lived greenhouse gases.

According to the global climatologic classifications, the Slovak Republic is located in the mild climate zone with mean monthly precipitation totals equally distributed over the whole year. The Atlantic Ocean affects more the western part of the country and the continental influence is more typical for the eastern part. The Mediterranean climate influences mainly the south of the central part of Slovakia by higher precipitation totals in autumn. A regular rotation of spring, summer, autumn and winter seasons is typical for the country. However, the overall increase of GHGs emissions concentration caused significant climatic changes in the temperature, water regime and extreme weather events in Slovakia.

Detail climatic measurements at several meteorological stations and more than 200 precipitation gauges since 1881 has enabled us to prepare the study on climate change and variability for the period of 1881 – 2023. It is also possible to separate natural causes of climate changes from those induced by enhanced atmospheric greenhouse effect (using global and regional climatic analyses).

Information on climate changes in Slovakia can be found in the First Biennial Transparency Report of Slovakia to the UNFCCC published in December 2024.

1.1.2. Greenhouse Gas Inventories

This National Inventory Document (NID) of Slovakia for the submission to the EU, the UNFCCC and to the Kyoto Protocol includes data of the anthropogenic emissions by sources and removals by sinks of all greenhouse gases (GHGs) not controlled by the Montreal Protocol, i.e. carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulphur hexafluoride (SF_6). Emissions of nitrogen trifluoride (NF_3) did not occurred in Slovakia and appropriate notation key was used in inventory.

Indirect CO_2 and N_2O emissions resulting from atmospheric oxidation of NH_3, CH_4 and NMVOC emissions from non-biogenic sources are also included in the inventory in the sectoral tables (IPPU and Agriculture). The indirect CO_2 emissions have been evaluated and included in the IPPU sector consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (the IPCC 2006 GL) since the base year. Indirect N_2O emissions resulting from a deposition of nitrogen due to emissions of nitrogen oxides (NOx) and ammonia (NH_3) are estimated and indirect N_2O emissions from agricultural sources are included in the national total emissions consistent with the UNFCCC reporting guidelines in the Annex to Decision 24/CP.19 (UNFCCC 2013).

The SVK NID 2025 includes also estimates of so-called indirect greenhouse gases and precursors (carbon monoxide (CO), nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOCs) and sulphur dioxide (SO_2 meaning sulphur oxides and other sulphur emissions calculated as SO_2). Indirect greenhouse gases and sulphur dioxide do not have a direct warming effect, but influence on the formation or destruction of direct greenhouse gases, such as tropospheric ozone. These gases are not included in Annex A of the Kyoto Protocol, but are included in consistent way in the GHG inventory submission since the year 1990 (**Chapter ES.5**). The emissions and removals estimates are presented by gas and by category and refer to the latest inventory year unless otherwise specified. Full time series of the emissions and removals from 1990 to latest inventory year are included CRT tables, which are part of the inventory submission. In the NID, the data is presented for a limited set of years consistent with the UNFCCC reporting guidelines.

The structure of this NID follows the UNFCCC Reporting Guidelines. According to the emissions inventory submitted in January, 2025, the Slovak Republic total anthropogenic emissions of greenhouse gasses expressed as CO_2 equivalent decreased by more than 51% without LULUCF and with indirect emissions, compared to the base year 1990. This achievement is the result of impacts of several processes and factors, mainly:

- Recovery and investments after the Covid-19 pandemic impacts on transport, industry and services.
- Higher share of services on the GDP.

- Technological restructuring and change in structure of industries.
- Higher share of gaseous fuels on consumption of primary energy resources.
- Gradual decrease in energy consumption for certain energy intensive sectors.
- Impact of air protection legislation, which regulates directly or indirectly generation of greenhouse gas emissions.
- Global energy crises started in 2022 and increasing of fuel prices due to Ukraine war.
- Increase of energy efficiency and share of the renewable energy sources on final consumption.
- Phased-out one of three furnaces in the US Steel company (iron and steel producer) in June 2019 mostly caused decrease of EU ETS emissions in comparison with the ESD emissions (non-EU ETS). Re-introduction of the phased-out furnace took place in beginning of 2021, so the increase of emissions can be found in 2021 inventory. In 2022 and 2023, further decrease in emissions of EU ETS occurred due to high fuel prices, several operators phased-out or reduced production. This, along with other factors, caused the changes in the share of allocated emissions in the EU ETS and the ESD/ESR; in the EU ETS (48.75%) and the ESD/ESRR (51.25%) (***Table 1.1***).
- Implementation of strict policies and measures in climate change and international agreements up to 2030 focused mostly on the EU ETS categories.
- Less intensive winter seasons, lower fuel consumption for heating.
- Higher share of biomass in the residential heating sector.

In May 2004, the Slovak Republic joined the European Union. Relevant European legislation has brought additional positive direct and indirect effects to the reduction of GHG emissions, mainly in the Energy sector. The introduction of emission trading system will allow the implementation of further reduction measures in all installations included in the EU ETS.

Table 1.1: *Total GHG emissions in the EU ETS and ESD/ESR for the years 2019 – 2023*

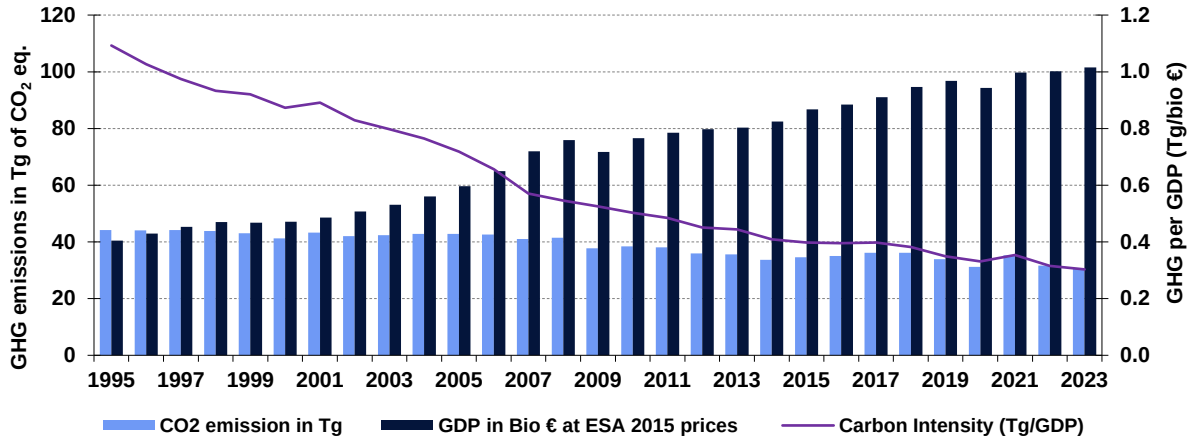
YEAR	2023	2022	2021	2020	2019
	Gg of CO_2 equivalents				
Total greenhouse gas emissions without LULUCF and with indirect emissions	36 094.23	36 871.61	40 911.44	36 946.37	39 647.74
Total verified EU ETS emissions	16 994.18	17 418.25	20 898.87	18 170.00	19 903.84
CO_2 emissions from 1.A.3.A civil aviation	1.56	1.48	1.29	0.88	1.83
Total verified ESD/ESR emissions	19 098.50	19 451.88	20 011.28	18 775.49	19 742.07

Table 1.2 and ***Figure 1.1*** show the most significant trend indicator of GDP and GHG emissions decoupling which was achieved in Slovakia in past years. In addition, development in the last inventory year (2023) is an evidence of continuation of decoupling process started in the 1997 and continuing after economic crises in 2009. With the recovery of economy, carbon emissions did not follow GDP growth. This is a signal of total reconstruction of Slovak economy and industry. It is also expected, that similar trend will continue in the future, while there are planned investments in energy saving and efficiency and step by step building a carbon neutral economy.

Table 1.2: *Decrease of carbon intensity per GDP in the Slovak Republic in 2008 – 2023*

YEAR	2008	2009	2010	2011	2012	2013	2014	2015
CO_2 emission *in Tg*	41.43	37.68	38.46	38.05	35.96	35.62	33.71	34.53
GDP *in Bio €* at ESA 2015 prices	75.85	71.68	76.54	78.51	79.74	80.30	82.47	86.74
Carbon Intensity *in Tg/GDP*	0.55	0.53	0.50	0.48	0.45	0.44	0.41	0.40
YEAR	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
CO_2 emission *in Tg*	34.98	36.18	36.18	33.85	31.18	35.25	31.59	30.77
GDP *in Bio €* at ESA 2015 prices	88.43	90.97	94.67	96.82	94.32	99.72	100.17	101.55
Carbon Intensity *in Tg/GDP*	0.40	0.40	0.38	0.35	0.33	0.35	0.32	0.30

Figure 1.1: *Comparison of CO_2 emissions per GDP (carbon intensity) in 1995 – 2023*



The Slovak Statistical Office, Dpt. of National Accounts. Within the revision of annual national accounts (base year 2015).

1.1.3. International Agreements

International agreements under the UN:

United Nations Framework Convention on Climate Change (UNFCCC):

- Adopted on May 9, 1992 in New York
- Adopted by the Slovak Republic on May 19, 1993
- Ratified by the Slovak Republic on August 25, 1994
- Entry into force for the Slovak Republic on November 23, 1994

The aim of the Convention is to stabilize the atmospheric concentrations of greenhouse gases to a safe level that enables adapting of ecosystems and to prevent the dangerous consequences of the impact of anthropogenic activity.

Commitments:

- The level of emissions in 2020 must not exceed the level of 1990
- Prepare and annually submit greenhouse gas inventories
- Prepare and implement national mitigation programs
- Support sustainable management and cooperate in maintaining and increasing the number of captures of greenhouse gas emissions
- Take into account climate change in the appropriate extent within the relevant social, economic and environmental measures and actions

Kyoto Protocol (KP)

- Adopted on 11 December 1997 in Kyoto
- Adopted by the Slovak Republic on February 26, 1999

- Entered into force for the Slovak Republic on February 16, 2005
- Amendment to KP adopted on December 8, 2012 in Doha, Qatar

In a response to the significant increase in GHG emissions since 1992, legally binding agreement known as the Kyoto Protocol was adopted. Developed countries, listed in Annex I to the Convention, should reduce six GHGs emissions (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) individually or together by 5.2% on average compared to the year 1990 during the first commitment period 2008 – 2012. The Kyoto Protocol also defined instruments for achieving the maximum reduction potential - such as joint fulfilment of obligations or emissions trading. Slovakia is committed to reducing emissions by 8%. Doha Amendment was negotiated to define a second binding (reduction) period (2013-2020) with the aim of reducing developed countries' emissions by 20% compared to the base year (mostly 1990, but negotiated separately for each side). Slovakia fulfilled the reduction targets for the first and the second commitment periods with a large difference in positive way. Currently, the GHG emissions without the LULUCF and without indirect emissions are almost 50% of the 1990 level.

The obligation to provide the supplementary information report with our GHG inventory as required under article 7 paragraph 1 of the Kyoto Protocol is no longer applicable. Indeed, the end of the compliance review following the True-up period report of the second commitment period of the Kyoto protocol marked the end of the associated reporting obligations. True-up period report and review report for the second commitment period of the Kyoto Protocol for Slovakia can be find here https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review/reporting-and-review-under-the-kyoto-protocol/second-commitment-period/reporting-and-review-process-for-the-true-up-period-of-the-second-commitment-period-of-the-kyoto.

Paris Agreement (PA)

- Adopted on 12 December 2015 in Paris
- Adopted by the Slovak Republic on April 22, 2016
- Ratified by the Slovak Republic on September 28, 2016
- Entered into force for the Slovak Republic on November 4, 2016

The Paris Agreement central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. Monitoring, reporting and reducing emissions, including adaptation to climate change, is mandatory for all countries, not just those listed in Annex 1 to the Convention. Emissions reduction action plans, defined as nationally determined contributions (NDCs), set targets for reducing greenhouse gas emissions by 2025 or 2030, along with adaptation to the climate change. Countries should review and tighten their NDCs every 5 years to achieve carbon neutrality by 2050.

International agreements under the EU:

The European Union (EU) considers climate change as one of the four environmental priorities. On November 28, 2018, the European Commission presented its Long-Term Strategy for a prosperous, modern, competitive and climate-neutral economy by 2050. The Low-Carbon Development Strategy of the Slovak Republic until 2030 with a View to 2050 was adopted by the Government of the Slovak Republic by the Resolution No 104/2020. The European Commission launched the European Climate Pact in December 2020, an EU-wide initiative inviting people, communities and organisations to participate in climate action and build a greener Europe. As part of the European Green Deal, the Climate Pact offers a space for everyone to share information, debate and act on the climate crisis, and to be part of an ever-growing European climate movement. The Commission’s proposal to cut greenhouse gas emissions by at least 55% by 2030 and 90% by 2040 sets Europe on a responsible path to become climate neutral by 2050.

The Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action

The Regulation (EU) 2018/1999 together with Commission implementing Regulation EU) 2020/1208 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) 2018/1999 integrated rules to ensure planning, monitoring and reporting of progress towards its 2030 climate and energy targets and its international commitments under the Paris Agreement have been adopted. The Regulation established a governance mechanism for the implementation of strategies and measures designed to meet the objectives and targets of the Energy Union and the EU's long-term greenhouse gas emission commitments under the Paris Agreement, in particular the EU's ambition to achieve climate neutrality by 2030. Slovakia submitted the 2021 – 2030 draft plans under the Regulation on the Governance by the end of 2018 and final plans by the end of 2019. The Commission has assessed these both at EU and Member State level. The update of the national energy and climate plans is expected by the end of June 2023 in a draft form and by 30 June 2024 in a final form to reflect an increased ambition.

1.2. Description of the National Inventory Arrangements

1.2.1. Institutional, Legal and Procedurals Arrangements

The Ministry of Environment of the Slovak Republic (MŽP SR) is responsible for development and implementation of national environmental policy including climate change and air protection objectives. It has the responsibility to develop strategies and further instruments of implementation, such as acts, regulatory measures, economic and market based instruments for cost efficient fulfilment of adopted goals. All ministries and other relevant bodies annotate both, the conceptual documents as well as legislative proposals. Following the commenting process, the proposed acts are negotiated in the Legislative Council of the Government, approved by the Government, and finally by the Slovak Parliament. The Ministry of Environment of the Slovak Republic is the main body to ensure conditions fulfilment and to monitor progress of the Slovak Republic for meeting all commitments and obligations of climate change and adaptation policy.

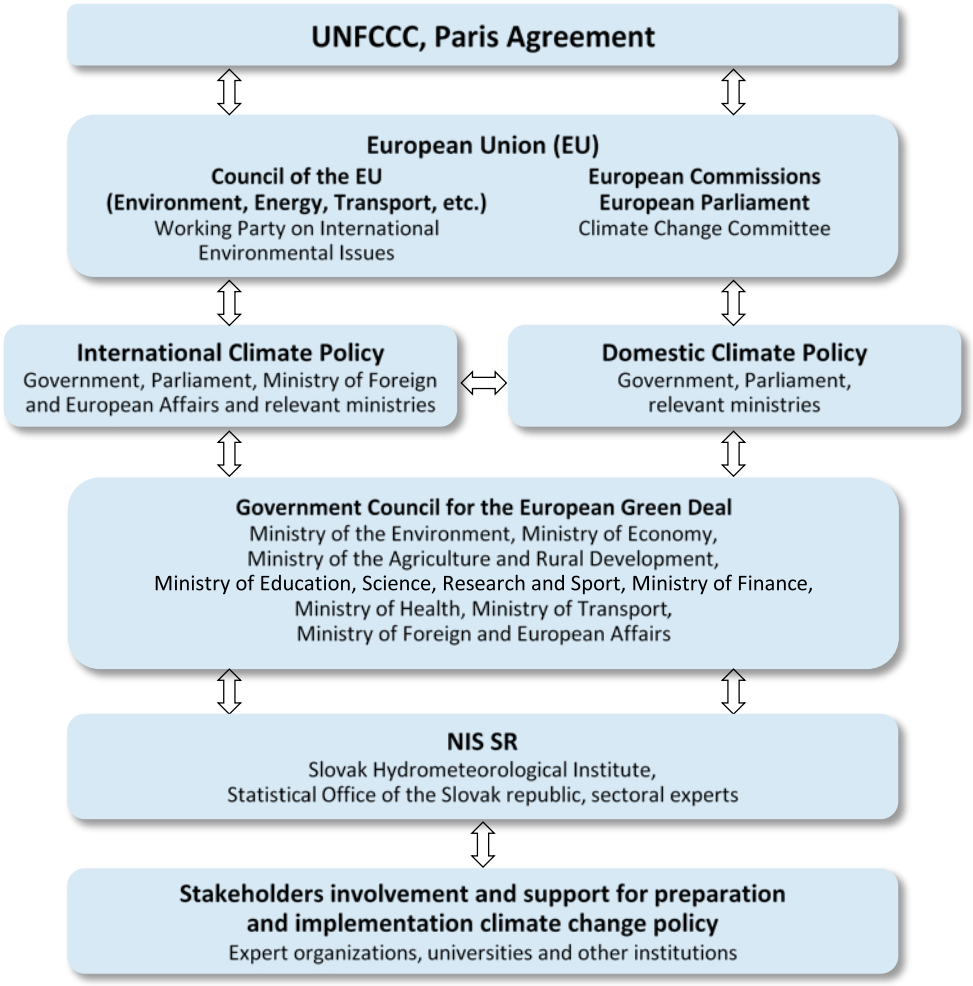
According to the Governmental Resolution No 821/2011 Coll. from 19th December 2011, minister of the Environment established the inter-ministerial High-Level Committee on Coordination of Climate Change Policy (HLC CoCCP) by Decision No 1/2012-8.1 from the January, 13th 2012. This Committee was created at the state secretary level and replaced previous coordinating body, i.e. the HLC CoCCP established in August 2008. Committee was chaired by the State Secretary of MŽP SR; other members were the state secretaries of the Ministry of Economy, Ministry of Agriculture and Rural Development, Ministry of Transport and Construction, Ministry of Education, Science, Research and Sport, Ministry of Health, Ministry of Finance, Ministry of Foreign Affairs and the Head of the Regulatory Office for the Network Industries. ***Figure 1.2*** provides in depth overview diagram showing the institutional arrangements concerning climate policy and its implementation.

Main objective of the HLC CoCCP was an effective coordination at developing and implementation of mitigation and adaptation policies and selection of appropriate measures to fulfil international obligations. An important output of its activities was also "Report on the Current State of Fulfilment of the International Climate Change Policy Commitments of the Slovak Republic" ("Správa o priebežnom stave plnenia prijatých medzinárodných záväzkov SR v oblasti politiky zmeny klímy"), regularly submitted to the Government, with aim to inform it on the basis of a detailed analysis of current progress on this issue. The first was in June 2012 and the latest was approved by the government in April 2024. This type of report will be published irregularly after 2019.

The role of HLC CoCCP has been replaced by Council of the Government of the Slovak Republic for the European Green Deal (CG EGD) which first session took place in April 20, 2021. CG EGD serves

as expert, advisory, coordinating and initiative body of the Government of the Slovak Republic for matters relating to the European Green Deal as vision for achieving the sustainable development goals (i.e. national priorities for the implementation of the Agenda 2030 for sustainable development) and the transition to a carbon-neutral economy by 2050 and the related implementation of key policies and measures aimed at achieving climate and environmental goals and the continuing transformation of the economic, environmental, energy and social system of the Slovak Republic, including transformation of industry, agriculture, transport, tourism, manufacturing, non-productive, consumer and social areas. The CG EGD is chaired by minister for the Environment; other members are relevant ministers and representatives of state bodies and National Council of the Slovak Republic, local government authorities, self-government representatives and representatives of academy.

Figure 1.2: *Institutional arrangements in climate change policy and its implementation*



The Ad-hoc Expert Group for preparing of the Adaptation Strategy of the Slovak Republic on Adverse Impacts of Climate Change and Ad-hoc Expert Group for preparing Low-Carbon Strategy of the SR were created under the HLC CoCCP in 2012. These expert groups include experts from other relevant ministries, academic, university positions, and other expert institutions. The Government Resolution No 148/2014 adopted the National Adaptation Strategy in March 26, 2014. The updated strategy has undergone the process of strategic environmental assessment under Act No 24/2006 Coll. On Environmental Impact Assessment. Strategy for the Adaptation of the Slovak Republic to Climate Change was updated and approved on October 17, 2018 by Government Resolution No 478/2018. The Climate Change Adaptation National Action Plan was supposed to be submitted to the Government by December 31, 2020. However, Government of the Slovak Republic prolonged submission by the end of August 2021. This Action Plan was approved on August 31, 2021 by Government Resolution No

476/2021.The preparation of the Climate Change Adaptation National Action Plan, which began in 2018, was under the auspices of the MŽP SR in cooperation with the Institute for forecasting of the Slovak Academy of Sciences. Based on qualitative and quantitative analyses, adaptation measures were prioritized in the Action Plan. The short-term measures for the period 2021 – 2023 and the medium-term for the period 2024 – 2027 were identified. The Action Plan contributes to a better reflection of adaptation measures in the 7 sectors – water protection, water management and water use, sustainable agriculture, adapted forestry, the natural environment and biodiversity, health and healthy population, adapted residential environment and technical, economic and social measures. Each of these 7 sectors has its specific goal, each of which has defined its basic principles and specific measures that define the tasks in a given sector. A total of 45 specific measures were identified and within them 169 tasks for the period of validity of the Action Plan until 2027. These measures and the related tasks are based on the updated National Adaptation Strategy. This Action Plan has undergone the process of strategic environmental assessment under Act No 24/2006 Coll. On Environmental Impact Assessment.

According to Government Resolution No 478/2018 – the first Information on the progress made in implementing adaptation measures on national level in the Slovak Republic shall be submitted to Government by 28. February 2023. This Information was approved by the Government Resolution No 110/2023. Following the Government Resolution No 476/2021 considering National Action Plan on Adaptation – the Information on short-term targets progress (of NAP) to the Government will be reported by 30. June 2024. The next planned revision of the National Adaptation Strategy taking into account new scientific knowledge on climate change is planned in 2025. According to Government Resolution No 478/2018 the next National Adaptation Strategy shall be submitted to the Government by 31. December 2025. National Adaptation Strategies, Action Plan, Government Resolutions and other data relevant to adaptation to climate change in Slovak Republic are available (in Slovak language) on the MŽP SR website.

On the EU level, according to the Regulation on the Governance of the Energy Union and Climate Action by 15 March 2021, and every two years thereafter, Member States shall report to the Commission information on their national climate change adaptation planning and strategies, outlining their implemented and planned actions to facilitate adaptation to climate change, including the information specified in Part 1 of Annex VIII and in accordance with the reporting requirements agreed upon under the UNFCCC and the Paris Agreement.

The Low-Carbon Development Strategy of the Slovak Republic until 2030 with a View to 2050 (LCDS), adopted in March 2020, aims to identify measures, including additional measures, to achieve climate neutrality in the Slovak Republic by 2050. The aim of the LCDS is to outline options for a comprehensive long-term (30-year) strategic roadmap for moving to a low-carbon economy, which will be completed by achieving climate neutrality by 2050. The LCDS identifies key policies and measures that will lead to achieving the headline target of the Paris Agreement – keeping the increase in global temperature this century to well below 2°C and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. The LCDS aims to select and analyse cost-effective measures in terms of the scope of emission reductions and the economic and social impact. The measures envisaged in the near future, detailed, and modelled in the strategy under the WEM and WAM scenarios raised the fact that climate neutrality in Slovakia cannot be achieved by 2050 with them. Therefore, the strategy also includes additional measures (called NEUTRAL) which should move Slovakia closer to its goal by 2050. Whether this happens will be analysed in detail in the near future as part of the updating process. The implementation of the measures will require the active involvement of the relevant sectors, the interconnection and consolidation of the individual sectoral and crosscutting policies, and society-wide engagement. Consistent horizontal implementation of measures that are in harmony with the objective of achieving climate neutrality by the middle of this century and in line with this strategy is to be ensured by the Council of the Government of the Slovak Republic for the European Green Deal, the adoption of which is expected together with this Strategy.

Consistent horizontal implementation of measures in line with the objectives of climate neutrality by 2050 and in line with the LCDS is to be ensured by the Council of the Government of the Slovak Republic for the European Green Deal and Low-Carbon Transformation, adopted by the Government Resolution No 699 of November 4, 2020.

Thanks to the new approved environmental policy Greener Slovakia – Strategy of the Environmental Policy of the Slovak Republic until 2030 (the Envirostrategy 2030), Slovakia determined a way of how to face the biggest environmental challenges and address the most serious environmental problems. The Slovak Government approved the Envirostrategy 2030 on February 27, 2019.

Articles 4 and 12 of the UNFCCC require the Parties to the UNFCCC to develop, periodically update, publish, and make available to the Conference of the Parties their national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled under the Montreal Protocol. Moreover, the commitments require estimation of emissions and removals as a part of ensure that Parties are in compliance with emission limits, that they have a national system for estimation of sources and sinks of greenhouse gases, that they submit an inventory annually, and that they formulate national programs to improve the quality of emission factors, activity data, or methods. The obligation of the Slovak Republic to create and maintain the National Inventory System of the Slovak Republic (NS SR) which enables continual monitoring of greenhouse gases emissions is given by Article 5, paragraph 1 of the Kyoto Protocol.

Setting up the NS SR of emissions in compliance with the Kyoto Protocol requirements was framed with functions which it should fulfil according to the decision 19/CMP.1. The basic characteristics of the NS SR are as follows:

- To ensure linkages and co-operation among involved institutions, bodies and individuals to perform all activities for monitoring and estimation of GHG emissions from all sectors/categories according to the UNFCCC guidelines and relevant decisions and according to the approved IPCC methodologies. To enable using of all relevant data from national and international databases for preparing and improving GHG emission inventory.
- To define role and competencies of all involved stakeholders including the role of National Focal Point to the UNFCCC.
- To define and regularly implement quality assurance and quality control (QA/QC) process in two lines; both internally and externally by appropriate body.
- To ensure ongoing process of development capacities; financial, technical and expert sources in relation to QA/QC but also in relation to new tasks rising from the international process.

The National Inventory System of the Slovak Republic was established and officially announced by Decision of the Ministry of Environment of the Slovak Republic on 1st January 2007 in the official bulletin: Vestnik, Ministry of Environment, XV, 3, 2007. In agreement with paragraph 30(f) of Annex to Decision 19/CMP.1, which gives the definitions of all qualitative parameters for the NS SR, the description of quality assurance and quality control plan according to Article 5, paragraph 1 is also required. The revised report of the NS SR dated on November 2008 was focused on the changes in the institutional arrangement, quality assurance/quality control plan and planned improvements. The regular update of the NS SR with all qualitative and quantitative indicators is provided in the NIRs and NIDs and was provided in the Eight National Communication of the SR on Climate Change, published in February 2023 and in the Fifth Biennial Report in 2023.

The first Biennial Transparency Report under the Paris Agreement was submitted in December 2024 and can be find here: https://unfccc.int/first-biennial-transparency-reports.

The role of responsible ministries in the national system

The MŽP SR is responsible for implementation of national environmental policy including climate change and air protection. It serves also as the National Focal Point to the UNFCCC.

District and regional environmental offices are decision-making bodies according to Act No 525/2003 Coll. These are located at eight regional and 46 district administration offices. The four inspectorates of the Slovak Environmental Inspection carry out inspection and enforcement activities. According to the Act No 146/2023 Coll. on Air Protection, competencies and decision-making process concerning large, medium and small pollution sources are given to regional and district levels and municipalities.

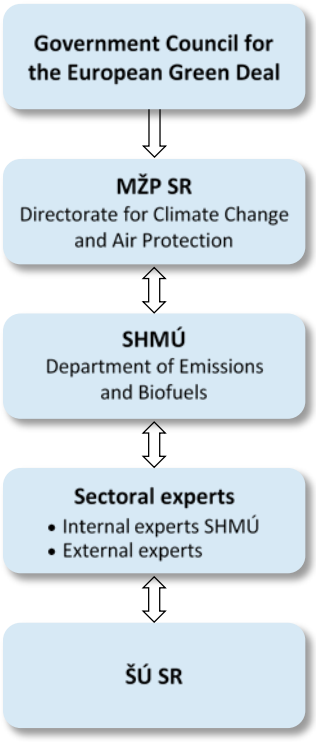
Act No 414/2012 Coll. on Emission Trading as amended is the legal instrument directly oriented towards the control of GHG emissions. According to this Act, competencies with respect to emission allowance trading are given to the MŽP SR and the regional and district environmental offices.

Slovak Hydrometeorological Institute as the single national entity

The Slovak Hydrometeorological Institute (SHMÚ) www.shmu.sk is authorised by the MŽP SR to provide environmental services, including annual GHG inventories according to the approved statute. The range of services, competencies, time schedule and financial budget are updated and agreed annually. All details of the SHMÚ activities are described in the Plan of Main Tasks. The plan, commented by all stakeholders, is published after approval at the website of the SHMÚ. Deadline for the approval of this plan by the ministry is 31st December each year. In 2024, organisational changes occurred and the structure of SHMÚ was updated. Presented changes have no impact on the NS SR. Establishment of the Department of Emissions and Biofuels (OEaB) was based on organisational changes provided in January 2017. The OEaB has two main tasks: emission inventories and projections (GHG, NECD, and CRLTAP) and National System of Biofuels. The OEaB is also responsible for developing and maintaining the National Emission Information System (the NEIS) – the database of stationary sources to monitor the development of SO_2, NO_x, CO emissions at regional level and to fulfil reporting commitments under the national regulations and EU Directives. The NEIS software product is constructed as a multi-module system, corresponding fully to the requirements of current legislation. The NEIS database contains also some technical information about the sources like fuel consumption and use for the estimation of the sectoral approach. The Single National Entity is a part of the OEaB with the defined structure and overall responsibility for compilation and finalization of the inventory reports and their submission to the UNFCCC Secretariat and the European Commission according to the announcement. The SNE was officially appointed by the Decision of the Director General of the SHMÚ No 16/2011 in August 2011 and amended by the Decision of the Director General of the SHMÚ No 8/2012 in September 2012. The SNE coordinates the NS SR.

On ***Figure 1.3*** is visible a structure of the NS SR, where the Committee on CCP is intergovernmental body responsible for implementation of climate change policy on cross-ministerial level and composition of the SNE with updated list of internal and external experts within NS SR is presented in the ***Table 1.3***

Figure 1.3: *Structure and responsibilities of the NS SR*



Responsibilities of expert organisations

Contracts with the external institutions and the sectoral experts are fully in a competence of the SNE after previous approval by the MŽP SR. The SNE is fulfilling inventory tasks fully in line with approved annual the Plan of Main Tasks and with financial resources allocated by the MŽP SR. To specify main objectives for given year, kick-off workshop with participation of the MŽP SR, SHMÚ and external co-operating bodies and experts is organised regularly, usually at the beginning of February each year. This workshop is also an official forum for closing and summing up outcomes from the previous year and preparing the activities, including the QA/QC plan and responsibilities for the current year. The main institutions involved in the compilation of the GHG inventory are:

- Ministry of Environment of the Slovak Republic;
- Slovak Hydrometeorological Institute;
- Statistical Office of the Slovak Republic;
- Slovak Technical University, Faculty of Chemical Engineering
- National Forest Centre – Ministry of Agriculture and Rural Development;
- Research Institute on Soil Protection Bratislava - Ministry of Agriculture and Rural Development.

Supporting institutions, founded by the Ministry of Environment to perform specific tasks linked to inventory activities, play an important role. These include the Slovak Hydrometeorological Institute, the Water Research Institute and the Slovak Environmental Agency. There are also other relevant subjects for data providing, which are listed in sectoral chapters (***Table 1.3***).

Table 1.3: *List of the sectoral experts in the NS SR*

INTERNAL EXPERTS - SHMÚ		
INSTITUTION	**NAME**	**RESPONSIBILITY**
Dept. of Emissions and Biofuels	Ms. Janka Szemesová	NIS coordinator
Dept. of Emissions and Biofuels	Ms. Alexandra Nadžadyová	Data manager of quality, Biofuels expert
Dept. of Emissions and Biofuels	Mr. Ján Horváth	Deputy of NS coordinator and Energy expert
Dept. of Emissions and Biofuels	Mr. Marcel Zemko Mr. Jozef Orečný Mr. Roman Mach	Emission projections experts, Buildings sector emissions
Dept. of Emissions and Biofuels	Ms. Michaela Câmpian Ms. Petra Kršáková	Other pollutant experts
Dept. of Emissions and Biofuels	Ms. Patrícia Navrátilová	Deputy of NIS coordinator and Agricultural expert
Dept. of Emissions and Biofuels	Ms. Monika Jalšovská	NEIS expert
Dept. of Emissions and Biofuels	Mr. Roman Mach	Uncertainty analyses, QA activity
Dept. of Water Quality	Ms. Lea Mrafková	GHG inventory in wastewater sector
Dept. of Climate Service	Mr. Peter Kajaba	Climatological data

EXTERNAL INSTITUTIONS/EXPERTS		
INSTITUTION	**NAME**	**RESPONSIBILITY**
Astraia	Mr. Ján Judák	Reference approach and fugitive emissions preparations
Ecosys Slovakia – company for environmental services in energy	Mr. Jiří Balajka	Consultations in energy and emission projections
National Forest Centre Zvolen	Mr. Ivan Barka Mr. Tibor Priwitzer Mr. Pavel Pavlenda	GHG inventory in Forest Land and KP LULUCF
Animal Production Research Centre	Ms. Zuzana Palkovičová Mr. Ondrej Pastierik Mr. Miroslav Záhradník	GHG inventory in agriculture – animal production
Research Institute on Soil Protection Bratislava National Agricultural and Food Institute	Mr. Michal Sviček Mr. Pavol Bezák Ms. Kristína Buchová	Data provider in agriculture sector – soils, LULUCF Cropland and fertilizers
Central Control and Testing Institute in Agriculture	Mr. Štefan Gáborík Ms. Maggioni-Brázová Ildikó	Data provider in the Agricultural sector – soil nutrition
Faculty of Chemical Technology of the Slovak Technical University Bratislava	Mr. Vladimir Danielik Mr. Juraj Labovský	GHG inventory in industrial processes and solvent use sectors and energy – sectoral approach Consultation in fuel balance Consultation for EU ETS
Faculty of Chemical Technology of the Slovak Technical University Bratislava	Mr. Igor Bodík	GHG inventory in waste – wastewater
Independent Expert	Mr. Marek Hrabčák	GHG inventory in waste – SWDS
Statistical Office of the Slovak Republic – Department of Cross-sectoral Statistics	Ms. Maria Lexová	Statistical data provider

EXTERNAL INSTITUTIONS/EXPERTS		
INSTITUTION	**NAME**	**RESPONSIBILITY**
Slovak Association for Cooling and Air Conditioning Technology		F-gases data provider
SPIRIT Information Systems – IT services, NEIS databases provider	Mr. Jozef Skákala	NEIS provider, consultation on the NACE classification of sources
ICZ Slovakia a.s.	Ms. Eva Vicenová	National Registry focal point
Ministry of Economy	Mr. Jozef Olexa	Data provider for renewables
Grassland and Mountain Agriculture Research Institute	Mr. Štefan Pollák	GHG inventory in Grassland

1.2.2. National Registry of the Slovak Republic

Slovakia operates its national registry in a consolidated manner with the EU Member States who are also Parties to Kyoto Protocol plus Iceland, Liechtenstein and Norway. The consolidated platform which implements the national registries in a consolidated manner (including national registry of Slovakia) is called Consolidated System of EU registries (CSEUR). The Slovak National Emission Registry was successfully connected to the International Transaction Log (ITL) with other EU countries in October 2008 and it has been fully operational since. More information related to the national registry is provided in **Chapter 12**. Changes in the national registry are reported in **Chapter 14** of this report.

Table 1.4: *Organization designated as registry system administrator of the Slovak Republic*

NAME OF THE INSTITUTION:	**ICZ SLOVAKIA A.S.**
Postal address:	Soblahovská 2050, 911 01 Trenčín, Slovakia
Phone & Fax number:	Phone: +421 32 6563 730, Fax: +421 32 6563 754
E-mail:	emisie@icz.sk
Web site address:	emisie.icz.sk
Contact person:	Eva Vicenová
Position:	Emission Registry Administrator
E-mail address:	eva.vicenova@icz.sk

1.2.3. Inventory Planning, Preparation and Management

The preparation of emission inventories within the NS SR for GHG emissions is decentralized according to the definition of Article 5.1 of the KP. The individual sectors are fully under the responsibilities of the external institutions and sectoral experts, who are authorized to evaluate the emission inventory within the delegated sectors. The preparation of the inventory includes three stages – inventory planning, preparation and management.

During the inventory planning are set up roles and responsibilities, specifying processes and resources according to internal and external QA/QC plans. These plans are updated and evaluated annually by the quality manager of the NS SR and approved by the MŽP SR. The inventory preparation process starts with the collection of activity data, emission factors and all relevant information needed for estimation of emissions, followed by choice of methods, data processing and then archiving.

For the inventory management, reliable data management to fulfil the data collecting and reporting requirements is necessary. The inventory management includes a control system for documents and data and for their archives.

1.2.4. Quality Assurance/Quality Control and Plans

This section presents the quality management and inventory process. Category – specific QA/QC details with improvements and recommendations are discussed in the relevant sectoral chapters of this NID.

Quality management

The Slovak Hydrometeorological Institute has built and introduced the quality management system (QMS) according to the requirements of EN ISO 9001:2008 standard of conformity. In the frame of introduction of the QMS for the SHMÚ as a global standard, the certification itself proceeds according to the partial processes inside of the SHMÚ structure. The process of Emission Inventories was the subject of internal and external audits during the March 2010 by the certification body ACERT, accredited by Slovak National Accreditation Service. The quality manager has completed several trainings regarding the QMS. The recertification process is taking place every two years.

The objective of the NS SRis to produce high-quality GHG inventories. In the context of GHG inventories, a high quality provides, that both the structures of the national system (i.e. all institutional, legal and procedural arrangements) for GHG emissions and removals and the inventory submissions (i.e. outputs, products) comply with the requirements, principles and elements arising from the UNFCCC in line with the MRV principles. The IPCC Guidelines for the GHG emissions inventory 2016 were fully implemented. The IPCC Guidelines Refinements 2019 were considered for possible utilisation in inventory where the methodology was missing in previous Guidelines. The starting point for accomplishing a high-quality GHG inventory is consideration of the expectations and requirements directed at the inventory. The quality requirements set for the annual inventories – transparency, consistency, comparability, completeness, accuracy, timeliness and continuous improvement – are fulfilled by implementing the QA/QC process consistently. ***Figure 1.4*** shows a model for the timeline steps provided in inventory process, QA/QC and verification procedures.

The SHMÚ implemented a policy of continuous training process for internal and external experts. Experts are trained during workshops of the NS SR, which are held two times per year. The minutes of the workshop and all relevant documents are available to the sectoral experts of the NS SR. The latest meeting was held on June 27-28, 2024[2] and the other ways of communication within the NS SR are via e-mail, phone call, visits and meetings.

The sectoral experts apply the QA/QC methodology according to the Quality Manual, collect data from providers and process emission inventory for a given sector – they provide partial reports with information on quality and reliability of data on activities and emissions. The quality manual including e.g. guidelines, QA/QC plans, templates and checklists is available to all experts of the NS SR via the Internet. The set of templates and checklists consists these documents:

- ✓ QA/QC Plan (external, internal)
- ✓ Matrix of Responsibility
- ✓ General QC
- ✓ Source Category-specific QC
- ✓ Quality Assurance
- ✓ Archive Document
- ✓ Improvement plan
- ✓ Recommendation list

[2] In the framework of the project EMISIE for the implementation of the IPCC 2019 Refinement

All documents after filling out by experts are approved by responsible person of inventory system and then are archived. The data manager has the overall responsibility for documentation, formal contact with the sector experts and approval activities, taking over the sectoral reports and archiving them.

Figure 1.4: *PDCA cycle (Plan, Do, Check, Act)*

Inventory planning (PLAN)

The inventory planning stage includes the setting of quality objectives and elaboration of the QA/QC plans for the coming inventory preparation, compilation and reporting work. The setting of quality objectives is based on the inventory principles. The quality objectives regarding all calculation sectors for inventory submissions are the following:

- ✓ Timeliness
- ✓ Completeness
- ✓ Consistency
- ✓ Comparability
- ✓ Accuracy
- ✓ Transparency
- ✓ Improvement

The quality objectives and the planned QC and QA activities regarding to all sectors are set in QA/QC plans (internal and external). In these documents, deadlines and responsibilities are descripted

(included in **Annex 4** in ***Tables A4.1*** and ***A4.2***). These plans updates and evaluates the quality manager of the NS SR and following are approving by the MŽP SR.

Quality control procedures (DO)

The experts perform the general and category-specific QC procedures during inventory preparation, calculation and compilation.

General quality control includes routine checks of correctness, completeness of data, identification of errors, deficiencies and documentation and archiving of the inventory material. The sectoral experts must adopt adequate procedures for development and modification of the spreadsheets to minimise emission calculation errors. Checks ensure compliance with the established procedures as well as allow detecting the remaining errors. Parameters, emission units and conversion factors used for the calculations must be clearly singled out and specified.

Category-specific QC includes reviews of the source categories, activity data and emission factors focusing on key categories and on categories where significant methodological changes or data revision have taken place. Experts fill QC forms during the compilation of inventory; results from QC activities are documented and archived.

Quality assurance (CHECK)

Quality assurance is performed after application QC checks concerning the finalised inventory. QA procedures include reviews and audits to assess the quality of inventory and the inventory preparation and reporting process, determine the conformity of the procedures taken and to identify areas where improvements could be made. These procedures ongoing on different levels, including basic reviews of the draft reports, general public review, external peer review, internal audit, EU and UNFCCC reviews.

With uploading to the SHMÚ website, printing and distribution of the final inventory document feedback from public is appreciated. The sectoral experts and the members of inventory team are participating in various seminars, meetings, conferences and sector-specific workshops during the year. The activities of inventory members and results of national inventory of GHG emissions are reported there. A broader range of researchers and practitioners in non-government organizations, industry and academia, trade associations as well as the public have the opportunity to contribute to the final documents. Comments received during these processes are reviewed and, as appropriate, incorporated into the reports or reflected in the inventory estimates.

Independent experts from the MŽP SR and the sectoral experts not directly involved into inventory cycle (except of above-mentioned activities) now perform QA. Each sector has a different reviewer:

GENERAL PART	Ms. Miroslava Dančová Mr. Mário Gnida Ms. Lenka Zetochová	MŽP SR SHMÚ
ENERGY	Mr. Mário Gnida Ms. Katarína Nanášiová	MŽP SR Institute of Environmental Policy
TRANSPORT	Mr. Leoš Pelikán Ms. Zuzana Kačmárová	Centrum of Transport Research in Brno, Czech Republic[3]
IPPU	Mr. Jozef Škultéty	MŽP SR
AFOLU	Ms. Lenka Malatinská Ms. Hana Fratričová Ms. Kristína Buchová	MŽP SR MPaRV SR

[3] In the framework of the Agreement on Mutual Cooperation signed in 2023

		VÚPOP[4]
WASTE	Ms. Zuzana Jonáček Mr. Michal Patassi	SHMÚ MŽP SR

When checking the data quality of each sector, the NS SR coordinator, quality manager of the NS SR, data manager of the NS SR and other stakeholders must conduct the following general activities:

Checking: Check whether the data in the sectoral reports (calculations and documents) for each sector conform both to the general and specific procedures.

Documentation: Write down all verification results filling out a checklist, including conclusions and irregularities that have to be corrected. Such documentation helps to identify potential ways to improve the inventory as well as store evidence of the material that was checked and of the time when the check was performed.

Follow-up of corrective actions: All corrective actions necessary for documenting the activities carried out and the results achieved must be taken. If such check does not provide a clear clue concerning the steps to be taken, the quality control, bilateral discussion between expert and the NS SR coordinator will take place.

Data transference: All checked documents (including the final questionnaire and all annexes) shall be put into the project file and copies shall be forwarded to all the NS SR experts. Since the data quality supervision procedures must be observed all the time, it is not mandatory to conduct all checks annually during the inventory preparation. Certain activities, such as verification of the electronic data quality or project documentation for checking whether all documents have been provided, must be carried out every year or at least at set intervals. Some checks may be conducted only once (however, comprehensively) and then only from time to time.

Part of the QA procedures is bilateral cooperation with Czech Republic. The first meeting took place in July 2013 and since then is repeated every year. Team of GHG inventory experts from the SHMÚ and the Czech Hydrometeorological Institute (CHMI) met to exchange information and experience relating to the preparation of GHG inventory. In the last meeting, the experts from Slovakia, Czech Republic, Poland, Hungary and Austria attended. This last meeting with the Czech Hydrometeorological Institute (NIS CZ) took place in June 2024 in Bratislava (Slovakia) and the next meeting is scheduled for May 2025. Meeting includes expert discussion on sectoral level for sectors energy, IPPU, agriculture and waste. Separate meeting for LULUCF was held on national level on June 19, 2024.

In addition to the activities regarding the regional knowledge transferring in emissions inventories, the QA procedures focusing on introducing changes and improvements on national level are organised regularly. National experts, not directly involved in the NS SR, are invited to provide comments and discuss methodological issues.

Verification activities

Independent verification procedure was introduced since the inter-ministerial High Level Committee on Coordination of Climate Change Policy was established. The members of the Committee nominated experts involved in the verification and approval process for the selected parts of the emission inventory. The stakeholders (experts) are responsible for the official and legislative agreement of the presented results and ensure harmonisation within several international reporting.

[4] Institute for Soil Protection

Verification refers to the collection of activities and procedures that can be followed during the planning and development, or after the completion of an inventory, that can help to establish its reliability for the intended applications of that inventory. The used parameters and factors, the consistency of data is checked regularly. Completeness checks are undertaken, new and previous estimates are compared every time. The sector expert for uncertainty checks data entry into the database many times. If possible, activity data from different data sources are compared and thus verified. Comprehensive consistency checks between national energy statistics and IEA time series. Checking the results of the EU's internal review for the EU-28 (since 1. 2. 2020 EU-27), and analyse its relevance for Slovakia.

Confidential information is provided to the NS SR experts based on the bilateral agreements but cannot be reported on individual level (only aggregated) in emissions inventory.

Inventory improvement (ACT)

The main aim of the QA/QC process is continuous improvement of the quality of inventory. The outcomes and experiences from the annual reviews are the main sources for the preparation of recommendation lists and improvement plans based on this recommendation lists.

The recommendation lists and improvement plans are updated annually after the regular UNFCCC and/or EU compliance reviews take place. As the Slovakia is one of the Member States of the European Union, the separate review regime is undertaken under the EU Effort Sharing Regulation (ESR) in spring every year. These outcomes and recommendations are included in the improvement plan, too. Detailed recommendation lists and improvement plans are prepared by the sectors and delivered to the sectoral experts for consideration and prioritisation of planned activities for the next inventory cycle. These plans are including in **Annex 4**. According to the latest annual review on GHG emissions inventories 2022 (final ARR delivered on 4th April 2023), several ERT recommendations focused on general part of the inventory were implemented. These are connected with the key category analysis (G.5 and G.6) and uncertainty improvements (G.3), and CPR calculation and verification (G.7).

Prioritisation process is based on recommendations raised during the previous UNFCCC reviews. Prioritisation for improvements is given to those categories of the GHG emissions inventory, where higher uncertainty is a result of the assessment. The latest examples can be found in categories of swine in agriculture or in 1.B.2 of fugitive methane emissions. The underlying assumptions used for estimating uncertainties applied on EF and AD are mostly based on the default values provided in the IPCC 2006 GL and/or expert judgment. The prioritisations are performing on annual basis also by quantitative assessment of uncertainty assessment (UA) for the base year and the latest inventory year. This approach is a part of the annual QA/QC system since 2017 submission. According to the previously identified outcomes made for tabular comparison of the key categories and tier method used, it was recognised, that the tier 1 approach (fugitive emissions of methane, direct soil emissions) was used several key categories. These categories are selected as the high priority of important to move to higher tier method. During the last years, the prioritisation of the Improvement Plan was focused on the Energy sector and the harmonisation of different data sources for energy balance and implementation of the higher tiers for fugitive emissions based on the IPCC 2019 Refinement. The methodological tiers for significant categories (bases on the UA results) are continuously improving, also for example in the Agricultural sector (change methodology from tier 1 up to tier 2 for enteric fermentation and manure management in swine and in direct soil emissions). In the Waste sector, the high priority in this inventory was put on distribution of the sewage sludge and implementation of the QA/QC activities. The improvement of the uncertainties in the LULUCF sector finished in 2022 and are fully implemented in 2024 submission (**Chapter 6**).

1.2.5. Changes in the National Inventory Arrangements

During the preparation cycle of the GHG emissions inventory submitted in 2025, no significant changes in the arrangement or structure of the NS SR occurred. The NS SR is operational, functioning and

fulfilling all main tasks and obligation in the line with the approved plans. NS SR is continuing in the process of strengthening capacity among the national system in line with the improvement and prioritization plans. The uncertainties calculations were previously based on external cooperation, now (since the year 2021), an internal expert is responsible for all sectors across inventory. In addition, a new expert was involved in the cropland category to strengthen new calculations on land-based matrix and new expert was involved into agricultural team. During previous years, the several new institutions were involved in the inventory, aiming to focus on QA activities, new internal (SHMÚ) expert on emission projections and emissions estimation in household sector.

1.2.6. Inventory Preparation, and Data Collection, Processing and Storage and Archiving

The compilation of the emission inventory starts with the collection of activity data. A comprehensive description of the inventory preparation for GHG emissions is described in methodologies for the individual sectors. The methodologies are updated annually within the improvement plan and recommendation list and they are archived after formal approval at the web page of the NS SR and by the sectoral experts and the NS SR coordinator. The most important source of activity data is the Statistical Office of the Slovak Republic and the sectoral statistics of the relevant ministries. The NEIS database is also important reference source of data on fuels and other characteristics of stationary air pollution sources. The OEaB of the SHMÚ operates the NEIS. Other important sources are listed in ***Table 1.5*** below and full catalogue of activity data is listed in the NIS description.

Table 1.5: *List of important information sources for inventory preparation*

SECTOR	SOURCE OF INPUT DATA
ENERGY	Energy Statistics of the SR, NEIS, www.spp.sk, www.transpetrol.sk, EU ETS Reports, Reports of the EU ETS verifiers
INDUSTRIAL PROCESSES AND PRODUCT USE	Association of cement and lime producers, Association of refrigeration and air conditioning engineers, Association of paper producers; EU ETS Reports, Reports of the EU ETS verifiers, Association for coating and adhesives, solvent distributors, Research Institute for Crude Oil
AGRICULTURE	Green Report of the Ministry of Agriculture of the SR - Agriculture, Institute for Fertilisers Research, List of Livestock to the 31. 12. 2022, Crop yields data for crops and vegetables in 2022
LULUCF	Green Report of the Ministry of Agriculture of the SR - Forest, Cadastral Office
WASTE	Population (mid-year), Statistical Yearbook of Slovakia Table 3-3; Real Wage Index, Statistical Yearbook of Slovakia Table 1; Municipal Waste, industrial waste landfilled, Waste in the Slovak Republic in 2022; Database of disposal sites; Municipal Waste, industrial waste composted, industrial waste incinerated Waste in the Slovak Republic in 2019; Incinerators, Enviroportal; Generated, discharged BOD, COD, N, Environment in the SR (selected indicators in 2013 – 2022); Protein Consumption, Statistical Yearbook of Slovakia Table 5-8, State of Environment report 2022; Sludge, database of wastewater treatment plants, SHMÚ.

Collected input data are compared and checked with the international statistics (Eurostat, IAE, FAO and others). In some cases, the collected input data are compared with the results from models (e.g. in road transport it is COPERT model, model for the Waste sector, etc.).

Archiving of inventory documents and database is in the competence of the quality and data managers of the NS SR. Archiving of database is in the competence of the NS SR coordinator. Documents and emission inventories are archived at three levels. Official documents, methodologies and reports are archived and stored at the web page of the NS SR. The archiving is controlled by rules for archiving systems in organizations at the SHMÚ level. The documents needed for the quality management systems are archived in electronic form at the webpage of the SHMÚ (intranet). Documents required

signature are printed and archived according to the archiving regulation of the Institute. Printed documents are archived in central archive of the SHMÚ and at the OEaB.

An archive system allows information to be easily reproduced, allows safeguards against data and information loss, and allows reproducibility of the estimates. The archive system includes relevant data sources and spreadsheets, reproduce the inventory and review all decisions about assumptions and methodologies. The archiving system checklist contains these archiving activities: documenting methods used, including those used to estimate uncertainty and data sources for each category; expert comments; revisions, changes in data inputs or methods and recalculation, also reason and source of changes; documenting the used software for calculation of emission. Each new inventory cycle benefits from effective data and documents management during development of the previous inventory.

Archived information includes all emission factors and activity data at the most detailed level, and documentation of how these factors and data have been generated and aggregated for the preparation of the inventory. This information also includes internal documentation on QA/QC procedures, external and internal reviews, documentation of annual key categories and key category identification, and planned inventory improvements and recommendations. All information on archiving is recorded in Archiving System. In addition, internal document about good practise in archiving were prepared. In this document, the exact way of archiving, procedures and steps is descripted.

1.2.7. Brief General Description of Methodologies and Data Sources Used

The methodologies used for the preparation of greenhouse gas inventory in the Slovak Republic are consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006 GL). In line with the Quality Improvement Plans of the NS SR , methodologies and parameters have been implemented fully in accordance with the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories by the end of 2023 and therefore, this submission is fully in line with the IPCC 2019 Refinement. Detailed descriptions of used methodologies can be found as the sector specific ones in the following chapters of this Report. Regarding the tier approaches used in the NS SR, the detailed information can be found in CRT tables and sectoral chapters. The increasing tier of methodologies is one of the priorities mostly for key categories. This is also included in the improvement plan. In the view of provided recalculations, the higher tier method was implemented in the Agriculture, IPPU and Energy sectors.

Additional sources of activity data for the major sectors are as follows:

Energy:
The Statistical Office of the Slovak Republic:

- *Energ. P 2-01:* Yearly company statement on energy process of fuel enrichment.
- *Energ. P 3-01:* Yearly company statement on the consumption of fuels, electricity and heat for production of selected commodities.
- *Energ. P 4-01:* Yearly company statement on the production of heat and electricity.
- *Energ. P 5-01:* Yearly company statement of retail trade in solid fuels.
- *Energ. P 6-01:* Yearly company statement on sources and distribution of fuels.
- *Energ. P 1-01:* Yearly company statement of manufacture branches.

Transport:
Road transportation:

- *SLOVNAFT a. s. Bratislava*: Production and selling of gasoline and diesel fuel.
- *The Ministry of Economy of the Slovak republic:* Fuel sales of gasoline, diesel and biofuels.
- *SAPPO – Slovak association of petrochemical industry:* Gasoline, diesel and LPG selling data.

- *Slovak Gas Trading Company SPP Inc.:* Selling of compressed natural gas at gas stations.
- *SAD, a. s. Zvolen; ARRIVA Slovakia; DP Košice, a.s. Košice; DPB a.s. Bratislava; SAD Prievidza, a.s.:* CNG consumption data from bus transportation companies.
- *Presidium of the Police Force of the Slovak Republic, the Department of Documents and Registration of the Presidium:* Numbers of road vehicles for each year.
- *Ministry of Transport and Construction of the Slovak Republic:* Cumulative mileage data, odometers data.
- *Slovak Technical Control Stations:* Information on mileages.

Railways:

- *Železničná spoločnosť Slovensko, a. s.:* Fuel consumption data and selected operation capacity of combustion engine driven locomotives in personnel railway transport.
- *Železničná spoločnosť Cargo Slovakia, a. s.:* Fuel consumption data and selected operation capacity of combustion engine driven locomotives in railway freight service.
- *CER Slovakia a.* s.: Fuel consumption data and selected operation capacity of combustion engine driven locomotives in railway freight service.

Navigation:

- *Slovak navigation and harbours Inc. Bratislava & Norwardia*: Diesel oil selling data from custom storage to navigation companies in Slovak harbours.
- *Small companies from lakes and dams:* Fuel consumption data during the season.

Aviation:

- *EUROCONTROL:* Fuel consumption, LTO cycles and emissions.

IPPU:

- *Operators:* Manufacturers, importers, exporters and service, assembling organizations reported over by refrigerant.

Agriculture:

- *The Research Institute for Animal Production Nitra:* Expert guaranty of emission inventory
- *The Statistical Office of the Slovak Republic:* Number of the livestock, sowing areas, harvested areas, harvested yield.
- *The Breeding Services:* Detailed dividing of cattle and sheep
- *The Research Institute for Animal Production:* Animal production data.
- *The Central Controlling and Testing Institute in Agriculture:* Synthetic and organic fertilizers (sewage sludge, compost) applied to the soils, liming and urea application on soils, liming and urea application on the soil, pH of soils.

Waste:

- *COHEM SAŽP (Waste Management Centre of the Slovak Environmental Agency):* Industrial solid waste data.
- *ÚRSO – Regulatory Office for Network Industries:* Data on methane recovered from SWDSs.
- *ACE (the Association of Experts on Waste Water Treatment):* Data on sewage sludge management.
- *Duslo a. s.:* Data on ISW incineration.
- Websites of several companies and institutions are also used for the inventory: *OLO, KOSIT, Slovnaft, Duslo, NsP Prievidza, Fecupral, Ecorec.*

1.2.8. Brief Description of Key Categories

Key categories were assessed by Approach 1 by the level of emissions in years 1990 and 2023 and the trend in emissions for the year 2023 with and without LULUCF categories and those key categories have been chosen, whose cumulative contribution is less than 95%. The identification includes all reported greenhouse gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 and all IPCC source categories with LULUCF categories (in absolute values) performed with the detailed categorization. The detailed key categories were assessed and are listed in **Annex 1** of this Report.

In 2023, the Slovak Republic determined using the Approach 1 by the level assessment, 27 key categories with LULUCF and 24 key categories without LULUCF. In 2023, the Slovak Republic determined using the Approach 2 by the level assessment, 22 key categories with LULUCF and 31 key categories without LULUCF.

In 2023, the Slovak Republic determined using the Approach 1 by the trend assessment, 34 key categories with LULUCF and 29 key categories without LULUCF. In 2023, the Slovak Republic determined using the Approach 2 by the trend assessment, 29 key categories with LULUCF and 36 key categories without LULUCF.

List of key categories is almost identical for the base year 1990 and for the latest inventory year. The most important key categories are fuel combustion in energy sector for CO_2, road transport, forest land, direct N_2O emissions from agricultural soil or methane emissions from SWDS.

1.2.9. General Uncertainty Evaluation

The uncertainty assessment by the Approach 1 is enclosed in **Annex 3** to this report. Quantification of emissions uncertainty by level and trend assessment was calculated by using Approach 1 method published in the IPCC 2006 GL. The Approach 1 with the LULUCF estimated the 11.61% level uncertainty and the 6.11% trend uncertainty in 2023. Approach 1 without LULUCF estimated the 2.73% level uncertainty and the 1.15% trend uncertainty in 2023. According to the previous recommendations, Slovakia is using hybrid combination of Approaches 1 and 2 in this submission for calculation of total uncertainty of the inventory (**Annex 3**). Uncertainty analyses performed by the Approach 1 in transport was carried out using Table 3.2 for uncertainty calculation and country specific uncertainties for activity data and emission factors were inserted into calculation table.

The Slovak Republic provided also Approach 2 for uncertainty analyses according to Chapter 3 of the IPCC 2006 GL for the complete Energy and Waste sectors for the year 2015 (latest results). The methodology and results were published and described in previous SVK NIR 2018. Based on the latest Improvement Plan (**Chapter 1.2**), Monte Carlo calculation in the IPPU sector was updated in this submission and the results can be found in the **Chapter 4.2.1** of this Report. Approach 2 in the Agriculture sector is provided in this submission. Uncertainty evaluation is based on Monte Carlo method. Results and methodology are descripted in the **Annex A.5.1** of this Report. Approach 2 in the LULUCF uncertainty analyses was updated in this submission, too. Uncertainty evaluation is based on Monte Carlo method. Results and methodology are descripted in the **Annex A.6.2** of this Report.

1.2.10. Completeness

Assessment of completeness is one of the elements of quality control procedure in the inventory preparation on the general and sectoral level. The completeness of the emission inventory is improving from year to year and the updates are regularly reported in the NIDs. The completeness checks for ensuring time series consistency is performed and the estimation is completed in recent inventory submission (2024). The improvements were performed in the previous inventory submissions such as estimation of GHG emissions for the agriculture and transport.

The list of categories reported by the notation keys is provided in CRT table 9. Whole overview of notation keys with detailed explanation is provided in ***Table A2.1*** with information on notation keys used

for each sector was prepared. More information can be found in **Annex 2** of this Report. Information is divided to the sectors and categories. Several categories are reported as not occurring (NO) due to the not existence of the emission source or the source is out of threshold and measurement range. If the methodology does not exist in the IPCC Guidelines, the notation key not applicable (NA) was used. Several NE key categories have been reported in 2025 submission for 1990 – 2023.

Three reasons for not estimated (NE) categories are:

- no methodology is available;
- potential emissions/removals will under the threshold level of emissions in comparison to GHG emissions total;
- insufficient activity data (mostly for indirect GHG emissions like CO, SO_2 or NMVOC).

Table 1.6: *List of NEs in the 2025 submission*

GAS	SECTOR	CATEGORY	DESCRIPTION
CO_2	Energy	1.B Fugitive emissions from fuels > Oil and natural gas and other emissions from energy production > Oil > Refining/storage	Change of notation according to FCCC/ARR 2019 recommendation E.38; emissions are not estimated because the 2006 IPCC guidelines do not include methodologies to estimate these emissions.
CH_4	Energy	1.B Fugitive emissions from fuels > Oil and natural gas and other emissions from energy production > Oil > Distribution of oil products	Change of notation according to FCCC/ARR 2019 recommendation E.38; emissions are not estimated because the 2006 IPCC guidelines do not include methodologies to estimate these emissions.
CH_4	IPPU	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.b Pig Iron	Used methodology does not allow to distinguish the emissions
CH_4	IPPU	2.C Metal Industry/2.C.1 Iron and Steel Production/2.C.1.e Pellet	Used methodology does not allow to distinguish the emissions
CH_4	IPPU	2.D Non-energy Products from Fuels and Solvent Use/2.D.1 Lubricant Use	No methodology is provided neither in the IPCC 2006 GL not in IPCC 2019 Refinement.
CH_4	IPPU	2.D Non-energy Products from Fuels and Solvent Use/2.D.2 Paraffin wax use	No methodology is provided neither in the IPCC 2006 GL not in IPCC 2019 Refinement.
N_2O	IPPU	2.D Non-energy Products from Fuels and Solvent Use/2.D.1 Lubricant Use	No methodology is provided neither in the IPCC 2006 GL not in IPCC 2019 Refinement.
N_2O	IPPU	2.D Non-energy Products from Fuels and Solvent Use/2.D.2 Paraffin Wax Use	No methodology is provided neither in the IPCC 2006 GL not in IPCC 2019 Refinement.
CO_2	Agriculture	General	Indirect CO_2 emissions are not estimated in agriculture due to a lack of available methodology on atmospheric oxidation.
N_2O	Agriculture	General	Part of the indirect emissions of N_2O are included in the sectoral tables for manure management and agricultural soils indirect emissions from other than agricultural sources are not estimated.
N_2O	Agriculture	3.D Agricultural Soils/3.D.1 Direct N2O Emissions From Managed Soils/3.D.1.6 Cultivation of Organic Soils	The emissions are under the threshold of significance. See NID Chapter Agriculture.

Categories included elsewhere (IE) are listed also in CRT table 9 with the explanations of reallocation.

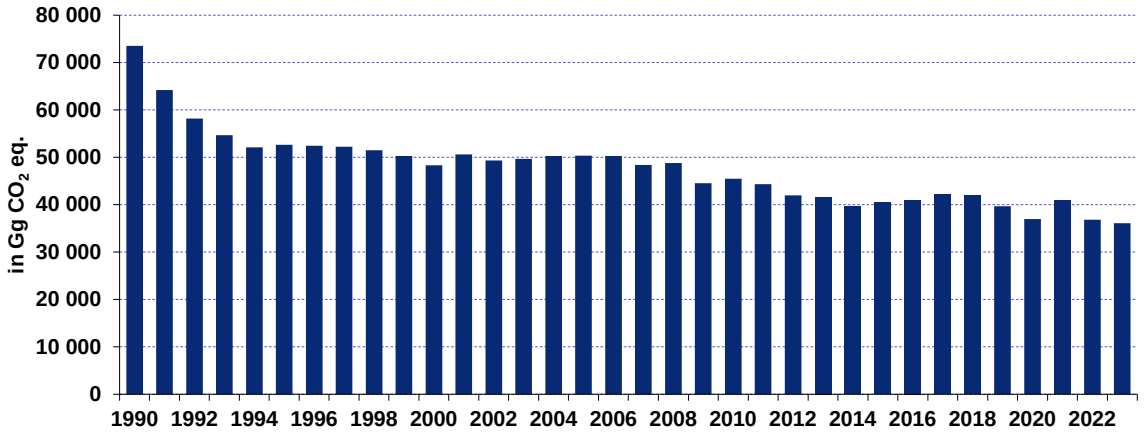
Both direct and indirect GHGs as well as precursor gases are covered by the inventory of the Slovak Republic. The geographic coverage is complete; the whole territory of the Slovak Republic is covered by the inventory.

CHAPTER 2. TRENDS IN GREENHOUSE GAS EMISSIONS

2.1. Description and Interpretation of Emission Trends for Aggregated GHG Emissions

The GHG emissions presented in the National Inventory Document 2025 were updated and converted by using the newest available methods, national conditions and data published by the Statistical Office of the Slovak Republic and other official statistical authorities. The improvements for the categories included in the Improvement Plan and prioritisation according to Recommendation Lists were implemented in previous submission. Total GHG emissions were 36 094.23 Gg CO_2 eq. in 2023 (without LULUCF and with indirect emissions). This represents a reduction by more 51% in comparison with the reference (base) year 1990. In comparison with 2022, the emissions decreased by 2%. Total GHG emissions in the Slovak Republic decreased in 2023 in comparison with the previous year by almost 800 kt, which was affected by the decrease in the Energy and IPPU sectors (mostly in the EU ETS sources) because of decreasing of industrial production in Slovakia. Total GHG emissions excluding the LULUCF sector have been decreasing continually from the base year and more stable trend in the recent years, dropped significantly in the years 2019 and 2020 due to special circumstances connected with the COVID-19 and other important changes made in Slovak economy. Then during the year 2021, emissions increased due to recovery of economy and afterwards due to Ukraine war, emissions decreased in 2022 affected by the increasing prices for fossil fuel. Significant changes in methodologies and emission factors are implemented in the frame of trying to keep consistency with the European Emission Trading System (EU ETS). ***Table 2.1*** shows the aggregated GHG emissions. In the period 1990 – 2023, the total greenhouse gas emissions in the Slovak Republic did not exceed the level of the base year 1990. ***Figure 2.1*** shows trends in the gases without LULUCF in relative expression.

Figure 2.1: *The aggregated GHG emission trends*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

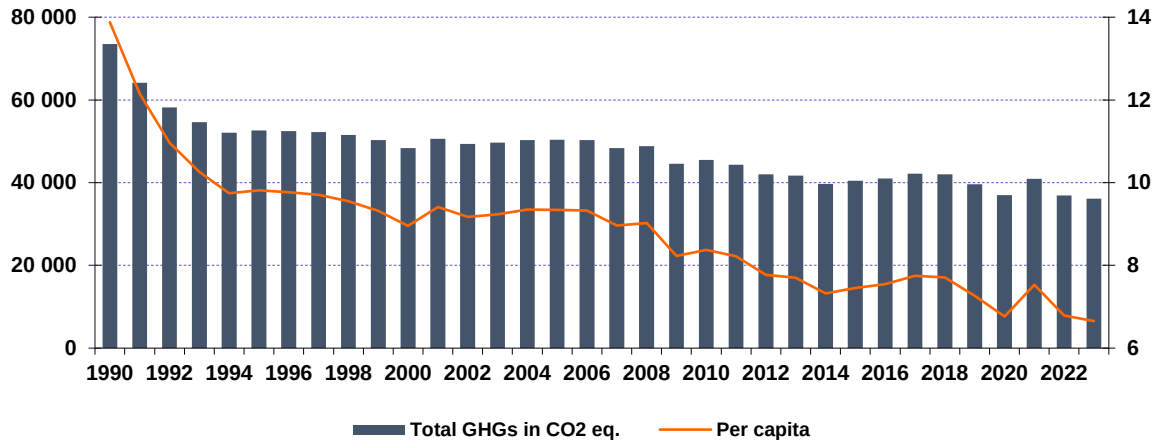
This important reduction of emissions has resulted above all from the strong although temporary decrease in economy activities, followed by restructuring of economy joined with implementing new and more effective technologies, reducing the share of the intensive energy industry and increasing share of services in GDP generation. Transport (mostly the road transport), with increasing emissions is an important exception.

Total anthropogenic greenhouse gas emissions by gases in the years 1990 – 2023 are depicted in ***Table ES.2*** in this Report.

Beside the basic macroeconomic indicators as GDP, GDP per capita, foreign and domestic trade development, inflation, employment, there are also mentioned the data on the amount of investment in environmental protection and activities in the area of science and research, without specifying their orientation. The economic crisis that began in 2008 has brought a significant weakening of the external demand, causing a decreasing dynamic of the Slovak export, manufacturing, labour market and total domestic demand. The debt crisis in the Eurozone that broke out in 2012 again caused a decline in external demand. Emission situation in Slovakia can be considered and evaluated separately. While the EU ETS sources/sectors is going to further reduction of their emissions, the emissions in the non-EU ETS sources (ESR sectors/sources) is mostly stabilised or negative. Regulations included in the EU ETS push sources via economical instruments (Modernisation Fond) into larger investments and reduction of CO_2 emissions. In addition, the Slovak economy introduced changes in energy industry and steel production (phase-out of the furnace in the U.S. Steel company) what have positive effect on emissions in the EU ETS part of inventory. On the other hand, non-EU ETS sources representing agriculture, small industry, transport, waste and other small sources have not effective mitigation measures in place and the sectors policies are not targeting emissions reduction in a sufficient way. Therefore, the Ministry of Environment prepared the new Climate Change legislation, what introduces the sectoral targets with the shared responsibility among the ministries and the private sectors.

The indicators can assess the current economic and emission situation in Slovakia. While the indicator of carbon intensity can be changed much more rapidly in the situation of a high economic growth, GHG per capita is a different case where you can get very impressive results even without any measures, just by higher population growth rate. However, this is not the case of the Slovak Republic right now. It will take much longer time to change numerator by the impact of new technologies implementation namely in combination with high dynamic of development in the energy intensive industries. However, the indicator reached the lowest level in 2020. This was caused by combination of above mentioned measures and special situation with COVID-19, Ukraine war and fuel prices policy in the last few years.

Figure 2.2: *Total GHG emissions in Gg of CO_2 eq. per capita in 1990 – 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025.

2.2. Description and Interpretation of Emission Trends by Gas

Population of the Slovak Republic as of December 31, 2023 was 5 424 687 and has slightly decreasing. Average residential density is 110.7 inhabitants per km². The population is concentrated in towns in lowlands and the main basins. Mountain areas are randomly populated. Unemployment rate in the Slovak Republic was 5.6% at the end of 2023 (according to the national statistics), what is lower than the previous years. The capital Bratislava is the largest city in the Slovak Republic with the number of inhabitants 475 500.

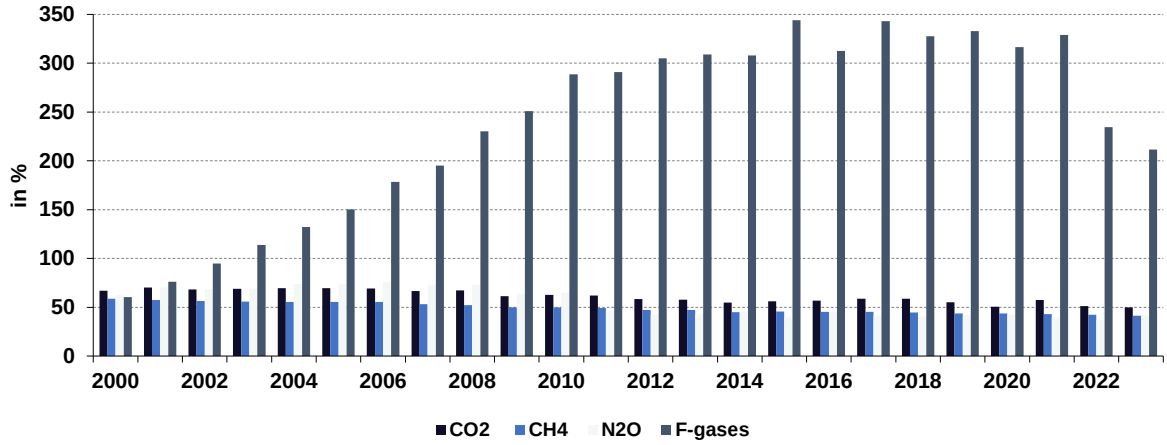
Total anthropogenic emissions of carbon dioxide excluding LULUCF and including indirect emissions have decreased by more than 50% in 2022 compared to the base year (1990). Nowadays the amount is 30 807.32 Gg of CO_2 without LULUCF and with indirect emissions. Compared to the previous inventory year 2022, emissions decreased by more than 2%. The reason for the decrease in CO_2 emissions in 2023 is caused by decreasing of CO_2 emissions in almost all energy and industry categories.. Mainly in energy industry, manufacturing industry and in metal industry. In 2023, CO_2 emissions including the LULUCF and including indirect emissions significantly decreased compared to the previous year and decreased by 55% compared to the base year.

Total anthropogenic emissions of methane without LULUCF and with indirect emissions decreased compared to the base year (1990) by more than 58% and currently the emissions are 3 409.16 Gg of CO_2 eq. In absolute value, CH_4 emissions were 121.76 Gg without LULUCF. Methane emissions from the LULUCF sector are 0.54 Gg of CH_4 caused by forest fires. These emissions, however negligible, are decreasing due to lower number of forest fires in Slovakia. Trend of methane emissions is affected by the implementation of new waste legislation and measures in fugitive emissions and agriculture. Compared to the previous inventory year 2022, the amount of emission is decreased by more than 2%, mostly due to declining emissions in energy and IPPU sectors.

Total anthropogenic emissions of N_2O without LULUCF decreased compared to the base year (1990) by more than 58% and currently the emissions are 1 425.16 Gg of CO_2 eq. Emissions of N_2O in absolute value were 5.38 Gg without LULUCF. Emissions of N_2O from the LULUCF sector are 0.10 Gg. Compared to the previous inventory year 2022, the emission increased by almost 14%, the increased was caused by Agricultural soils.

Total anthropogenic emissions of F-gases 452.60 Gg, from it 437.89 Gg of HFCs, 0.01 Gg of PFCs and 14.70 Gg of SF_6 in CO_2 eq. Emissions of HFCs decreased since 1995 due to the decrease in consumption and the replacement of PFCs and HFCs substances. Since that time, first decrease had occurred in the 2016 inventory year and repeated in 2018 and significant decrease continue in 2023. Decrease occurred in all F-gases and this is effect of implemented legislation of the EU in line with F-gases regulation (**Chapter 4**). Emissions' trend of PFCs has been decreasing and emissions of SF_6 has been slightly decreasing due to the decreasing consumption in industry. Decrease of F-gases emissions beginning in 2016 was caused by the biannual interval of servicing equipment. Despite this facts, emission of F-gases decreased compared to previous year 2022.

Figure 2.3: *Emission trends by gas for the years 2000 – 2023 relative to the 1990 level (relative in %)*

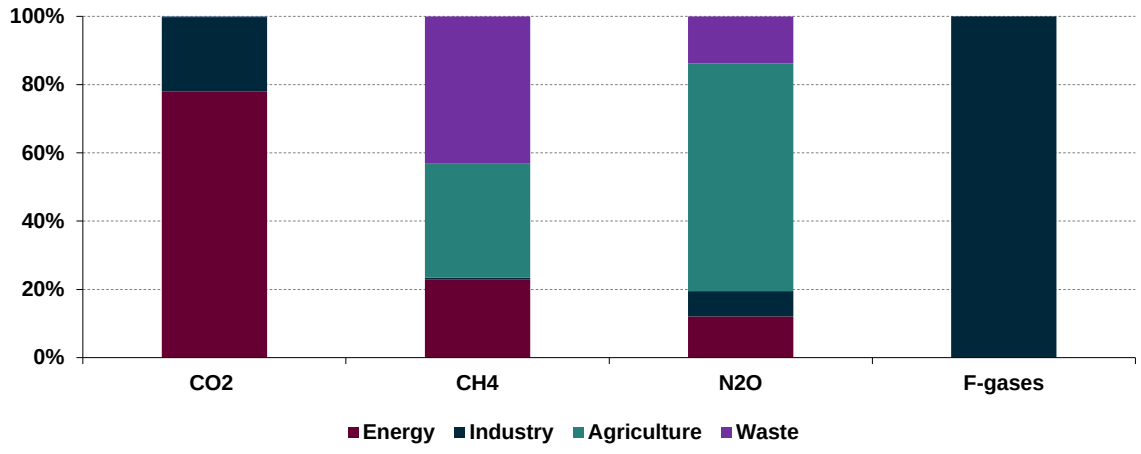


Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

2.3. Description and Interpretation of Emission Trends by Category

The major share of CO_2 emissions comes from the Energy sector (fuel combustion, transport) with the 77.9% share from the total carbon dioxide emissions in 2023 inventory, 21.8% of CO_2 is produced in the IPPU sector and negligible amount is produced in the Agriculture (0.2%) and the Waste (0.01%) sectors. The energy related CO_2 emissions from waste incineration are included in the Energy sector. The 43.2% of CH_4 emissions is produced in the Waste sector (SWDS), 23% of methane emissions is produced in the Energy sector and 33.4% in the Agriculture sector. Almost 66.7% of N_2O emissions is produced in the Agriculture sector (nitrogen from soils), 7.4% in the IPPU sector (nitric acid production), 13.8% in the Waste sector and 12.1% in the Energy sector. F-gases are produced exclusively in the IPPU.

Figure 2.4: *Emission trends by gas in the sectors in 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

Aggregated GHG emissions from the Energy sector based on the sectoral approach (combustion) data in 2023 were estimated to be 24 927.43Gg of CO_2 eq. including transport emissions (7 735.54Gg of CO_2 eq.), which represent the decrease by 56% compared to the base year and decrease compare to

previous year by 2.6%. Transport decreased by 0.55% compared to 2022 and in comparison with the base year increased by more than 13%.

Total emissions from the IPPU sector were 7 292.59 Gg of CO_2 eq. in 2023, which was decreased by more than 22% compared to the base year and the decreased by 3% compared to the previous year. This sector covers also emissions from solvents use and indirect CO_2 emissions from solvents NMVOC emissions.

Emissions from the Agriculture sector were estimated to be 2 161.34 Gg of CO_2 eq. It is almost 63% decrease in comparison with the base year and the increase compared to the previous year was more than 10%. The Agriculture sector is the sector with the most significant decrease compared to the base year 1990, because of the decreasing trend in cattle numbers and fertilisers use.

Emissions from the Waste sector were estimated to be 1 671.86 Gg of CO_2 eq. The decrease is more than 4% compared to the previous inventory year and the time series are stable for last years. Compared to the base year, the increase was more than 41%, because of increased methane emissions from solid waste disposal sites. The emissions from waste incineration with energy use are included into the Energy sector, categories 1.A.1.a, 1.A.2.f and 1.A.2.c.

Structural changes in the Energy sector and the implementation of economic instruments have played an important role in achieving the status, when the trend of GHG emissions does not copy the fast GDP growth. In this context, the most important measure seems to be the adoption of the national legislation on air quality, which was approved in 1991 and it has initiated the positive trend in the reduction of the emissions of basic air pollutants and indirectly GHG emissions. At the same time, the consumption of primary energy resources as well as total energy has decreased.

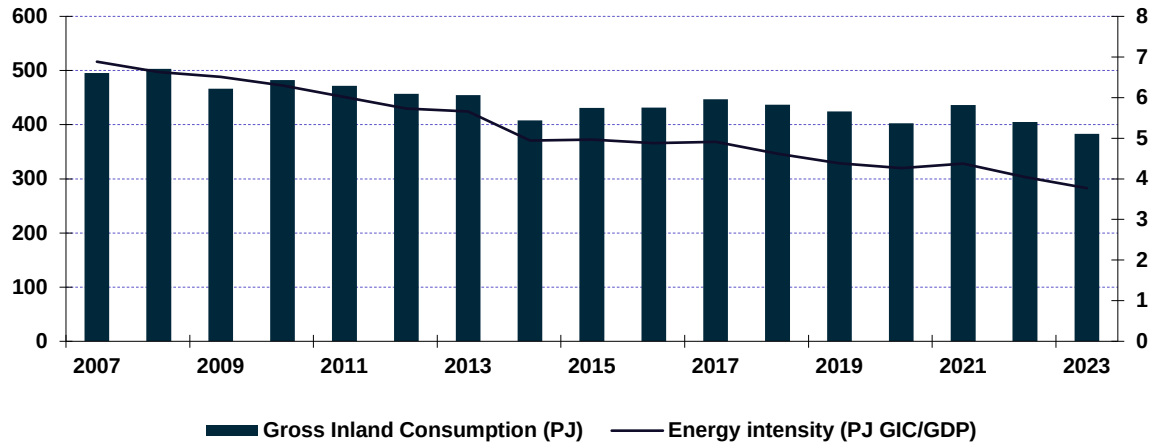
Total anthropogenic greenhouse gas emissions by the sectors in the years 1990 – 2023 are depicted in ***Table ES.2*** in this Report.

According to the Joint Research Centre of the European Commission, the highest reduction in the energy intensity values during the 15-years period from 2000 to 2014 was found in the Slovak Republic, which has undergone a growth rate of 82.5%.[5] This positive development is the result of the successful restructuring of industry, the introduction of energy-efficient production processes in industry and effective energy-saving measures in household by superseding home appliances with more efficient variants (due to several support programmes focused on households). Energy intensity in 2023 decrease in comparison with the previous year, due to decrease of the GDP caused by the economic reasons and lower total inland energy consumption. The latest year development estimated the long-term trend in energy intensity per GDP and final decarbonisation of economy.

Transport is a significant source of emissions in the Energy sector, with 28% share in total FEC (Final Energy Consumption) in the Slovak Republic. The proportion of transport is growing each year and the adopted policies and measures have no positive impact on increasing trend of emissions from transport. Emission balances in road transport are modelled according to method COPERT 5 version. GHG emissions from non-road transport are balanced by the use of EMEP/EEA 2023 methodology according to individual transport types (air, water and rail). The share of rail and water transports is decreasing from year to year, while the share of air transport increased rapidly in previous years, especially due to the increasing activity of low cost airlines, but the trend is stabilised recently. Slovak transport policy started to support railways and other alternative mode of transport (public, car sharing, etc.), but the effect of investments will be visible later.

[5] Joint Research Centre: Energy Consumption and Energy Efficiency Trends in the EU-28 2000-2014 2016, p. 19.

Figure 2.5: *The trend of energy intensity (right y axis) in the period 2007 – 2023 (estimated by the revised statistical approach NACErev.2)*



Fugitive methane emissions from the extraction (only 0.4% share in total FEC) and distribution of fossil fuels were important, as the Slovak Republic is an important transit country regarding the transport of oil and natural gas from the third countries (East Europe, Asia) to Europe. Raw materials are transported through high-pressure pipelines and distribution network and they are pumped in pipeline compressors. During previous years, massive investments were introduced into transmission network to reduce fugitive emissions and losses. Further improvements were implemented by the specific distribution companies of oil and natural gas to the pipeline system (exploration, transit, distribution, etc.) in line with the international requirements. Side effect of these changes caused reducing fugitive emissions in this sector. New data and methodological approach for fugitive emissions from natural gas transmission was implemented into previous and current submissions.

The IPPU sector includes all GHG emissions generated from technological processes producing raw materials and products with the 28% share in total FEC in the Slovak Republic. Within the preparation of the GHG emission balance in the Slovak Republic, consistent emphasis is put on the analysis of individual technological processes and distinction between the emissions from fuel combustion in heat and energy production and the emissions from technological processes and production. Most important emission sources are balanced separately, emission and oxidation factors are re-evaluated, as well as other parameters entering the balancing equations and the results are compared with the verified emissions in the Slovak National Registry for CO_2 emissions. Fundamental emissions inventory in solvents is based on the balance of non-methane volatile organic compounds (NMVOC) according to EMEP/EEA 2023 methodology. Emissions are recalculated according to the stoichiometric coefficients to CO_2 emissions. Indirect emissions of CO_2 are estimated since the base year and allocated in the IPPU sector according to the IPCC 2006 GL.

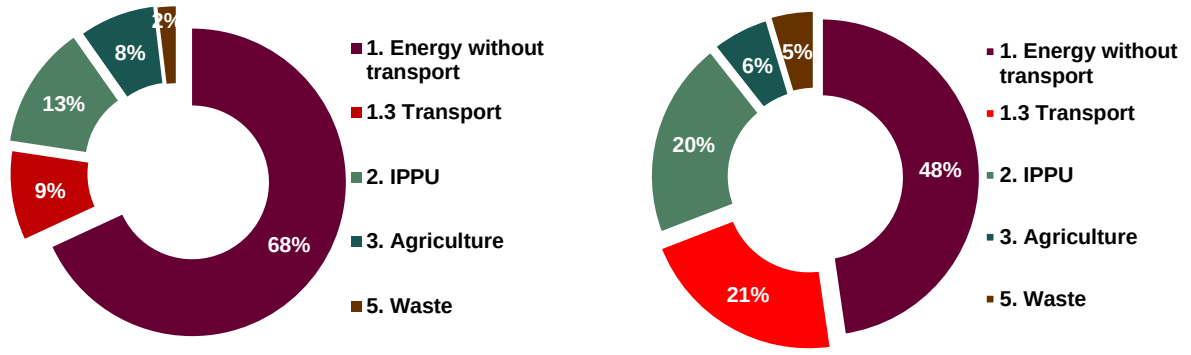
The Agriculture sector with more than 1% share in total FEC in the Slovak Republic is the main source of methane and N_2O emissions in the GHG emissions balance in the Slovak Republic. The emissions balance is compiled annually based on the sectoral statistics and in recent years based on a new regionalisation of agricultural areas of the Slovak Republic. The Ministry of Agriculture of the Slovak Republic issues annual statistics “Green Report”, part agriculture and food industry on a yearly basis. In recent year, the increasing trend of services and other (non-industrial) activities on GDP is visible. This has positive impact on the emissions. Slovakia is also providing to the EUROSTAT national accounts inventory of GHGs and pollutants according to the NACE rev.2 classification of economic activities. However, the methodology is different from the GHG inventory preparation, emissions trend shows interlinkages with the shift of GDP share of the economic sectors on total GDP of Slovakia.

The area of forest in the Slovak Republic covers approximately 40% of the territory and wood harvesting is historically an important economic activity. Since 1990, sinks from the LULUCF sector have remained at the level of 8-10% of total GHG emissions, but in the recent years, sinks increased on 15% level of the total GHG emissions. Historically stable trend was disrupted in 2004 by a wind calamity in the High Tatras, which resulted in increased harvest of wood damaged by the calamity and pests and consequently in the decrease in total sinks to the half of former volumes. The lower harvest and better management of forest caused increasing of sinks in the last years.

Several significant changes and re-evaluations of the applied methods have been carried out in the Waste sector, followed by recalculations in all categories of waste treatment. Methane emissions from solid waste disposal sites (SWDS) have the largest share on total emissions. Waste balance methodology has been revised and tier 2 approach FOD (First Order Decay) methodology has been used for the recalculations of the time series since 1950. The trend of methane emissions has been stabilised depending on the adopted legislation in municipal waste landfills, lower production of waste and higher share of recycling. A more detailed description of the methodology as well as with the Monte Carlo uncertainty analysis is described in the references.[6] The disaggregation of emissions from municipal waste incineration into two groups, i.e. waste incineration with and without energy utilisation, was another important change with respect to the quality improvement of the emission inventory. The emissions from waste incineration with energy utilisation were reported under the Energy sector, sub-category 1.A.1.a (other fuels). The emissions from waste incineration without energy utilisation are reported within the Waste sector, but are negligible in the present year. The comparison of the 2023 sectors share with the base year is shown on following ***Figure 2.6***. The significant decrease is visible in the Energy and Agricultural sectors (without transport) and increase in the Waste and IPPU sectors and transport. Emissions from international aviation and shipping are excluded from the national totals and therefore not presented here.

International bunker emissions of the inventory are the sum of the aviation bunker and maritime bunker emissions. These emissions are reported as memo items; but excluded from national totals. Emissions of greenhouse gases from international aviation increased constantly between 1992 and 2008. Between 2009 and 2014, international bunker emissions decreased, partly reflecting the economic recession. Total GHG emissions from international transport represents 170.97 Gg of CO_2 equivalents in 2023, after dramatically decrease, practically stopping of air transport caused by Covid-19 pandemic situation in 2020-2021, emissions increase in 2023. Emissions from international aviation have more than 95% share.

Figure 2.6: *The share of the individual sectors in total GHG emissions in 2023 (left) and 1990 (right)*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

[6] Szemesová, J.; Gera, M.: Emission estimation of solid waste disposal sites according to the uncertainty analysis methodology, Bioclimatology and Natural Hazards, ISBN 978-80-228-17-60.

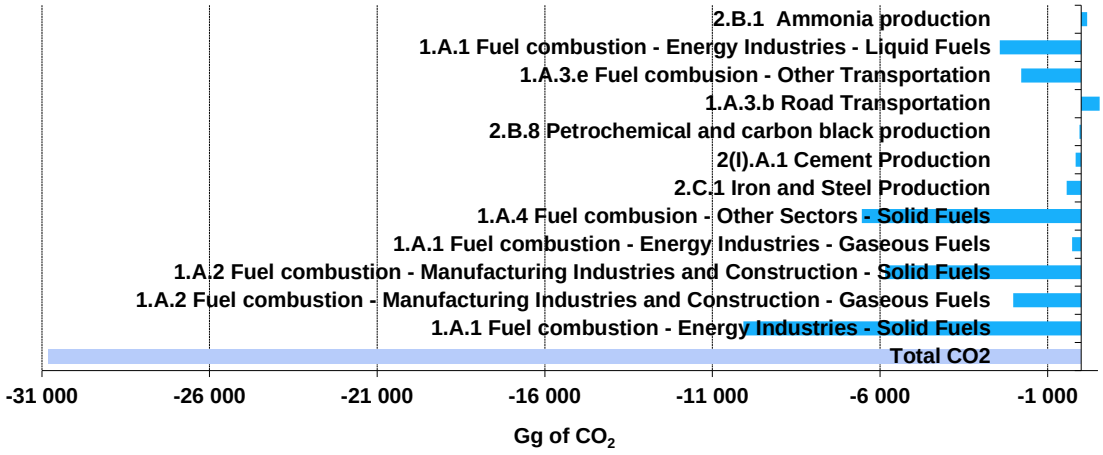
2.3.1. Change in Emissions from Key Categories

Key categories are defined as the sources or removals of emissions that have a significant impact on the inventory as a whole, in terms of the absolute level of emissions, the trend, or both. The Slovak Republic prepared key categories analysis for 2023 and 1990 emission sources in line with the IPCC 2006 GL by using Approach 1. The quantitative analyses include combined uncertainty (on emission factors and activity data) and recognized key categories by level assessment with and without the LULUCF sector (**Chapter 1.2.12** and **Annex 1** of this Report).

CO_2 emissions from the category 1.A.3.b - Road Transportation are the largest key source remains accounting for 24% of total CO_2 emissions without LULUCF in 2023. Between 1990 and 2023, CO_2 emissions in road transportation increased by 3.04 Mt of CO_2, which is 67% increase due to an increase in fossil fuel consumption (liquid) in this key category (***Figure 2.7***). Since 1990, the large increase in road transportation related CO_2 emissions was recognized. ***Figure 2.7*** shows that, solid fuels from the category 1.A.1 - Energy Industries, solid fuels is the key category without LULUCF (8.8%) with the largest decrease (78%; 10 Mt of CO_2) is between 1990 and 2023. The main explanatory factors of emissions decrease are in improvements in energy efficiency and (fossil) fuel switching from coal to gas. CO_2 emissions from the category 1.A.2 - Manufactured Industry, solid fuels in the Energy sector are the third largest key source in the Slovak Republic, accounting for 10.1% of total GHG emissions in 2023. Between 1990 and 2023, emissions from this category showed the decrease by 65%.

CO_2 emissions from fuels in the category 2.C.1 - Iron and Steel Production are the largest key category without LULUCF in the IPPU sector, accounting for 11.8% of total CO_2 emissions in 2023. Emissions decreased by 10% in the comparison with the base year. A shift from solid and liquid fuels to mainly natural gas took place and an increase of biomass and other fuels has been recorded.

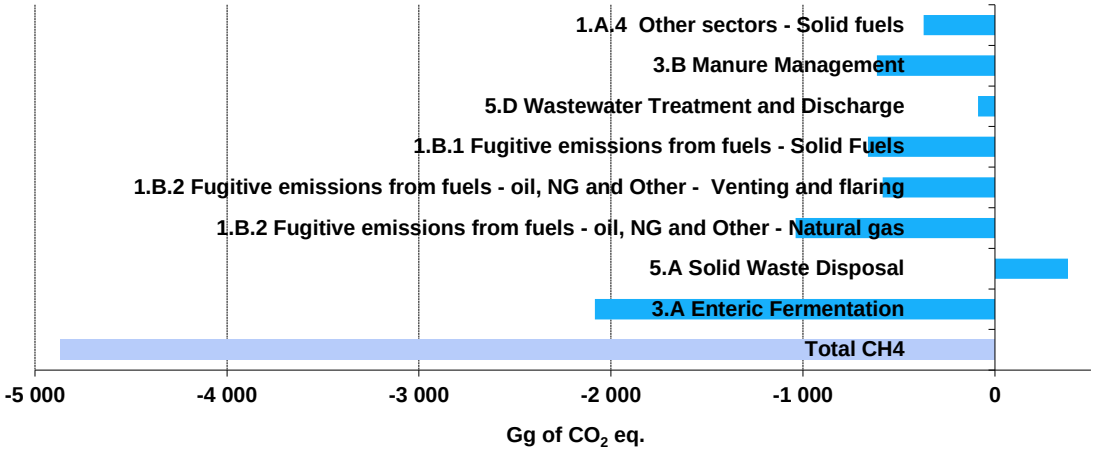
Figure 2.7: *Absolute change of CO_2 emissions by large key categories 1990 to 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

Methane emissions account for almost 9% of total GHG emissions in 2023 and decreased by almost 59% since 1990 to 121.76 Gg CH_4 without LULUCF in 2023. The three largest key sources (5.A - Solid Waste Disposal at 34%, 3.A - Enteric Fermentation at 30% and 1.B.2 Fugitive emissions from fuels - oil, NG and Other - Natural gasat 10% of total CH_4 emissions in 2023) account for more than 74% of CH_4 emissions in 2023. ***Figure 2.8*** shows that the main reasons for declining CH_4 emissions were reductions in enteric fermentation mainly caused by the decreased of animal numbers and use reductions in fugitive emissions and coal mining. ***Figure 2.8*** shows significant decrease in the categories 3.A and 3.B and increase in 5.A caused by the change of IPCC methodology used for solid waste disposal sites which considers time layer since 1960. Slight increase occurred also in the category 5.B - Biological Treatment of Solid Waste, due to changing in waste management praxis in Slovakia.

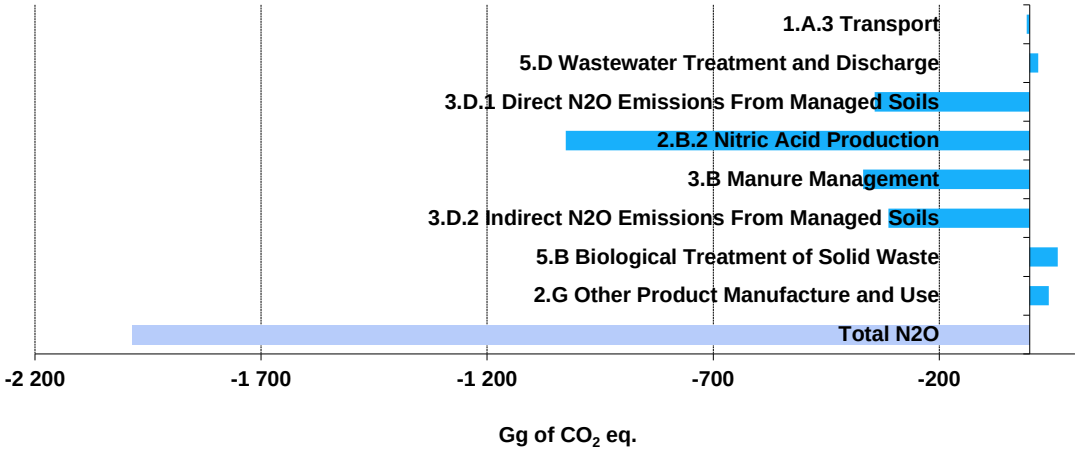
Figure 2.8: *Absolute change of CH_4 emissions by large key categories 1990 to 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

N_2O emissions are responsible for 4% of total GHG emissions and decreased by 58% to 5.38 Gg of N_2O without LULUCF in 2023 (***Figure 2.9***). The three largest key sources causing this trend in agriculture are 3.D.1 - Direct N_2O Emissions from Managed Soils 32%, 3.D.2 - Indirect N_2O Emissions from Managed Soils at 21% and 3.B - Manure Management at 14% of total N_2O emissions in 2023. The main reason for large N_2O emission cuts were reduction measures in the nitric acid production and decreasing agricultural activities (***Figure 2.9***). N_2O emissions increased in biological treatment of waste and other products manufactured categories. This increase was caused by increase of operationalise and production.

Figure 2.9: *Absolute change of N_2O emissions by large key categories 1990 to 2023*



Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

Fluorinated gas emissions account for 1.3% of total GHG emissions. In 2023, emissions were 452.6 Gg CO_2 eq., which was 111% above 1990 levels. The largest key source is 2.F.1 - Refrigeration and Air Conditioning and accounts for 96% of fluorinated gas emissions in 2023. HFC emissions from the consumption of halocarbons showed large increases between 1990 and 2023. The main reason for this is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs (mainly in refrigeration, air conditioning, foam production and as aerosol propellants). On the other hand, PFC emissions decreased substantially since the base year. The decrease has started in 1996 and peaked in 1999 and 2001.

2.3.2. Main Reasons for Emission Changes in 2021 – 2023

Total GHG emissions in the Slovak Republic decreased by 2% in 2023 in comparison with the previous year, which was affected by the decrease in the Energy and IPPU sectors. This decrease demonstrates the economic and industrial impact of the energy prices policy, restrictions against the import of fossil fuels and raw materials from Russian Federation and development of electricity prices for industry. Several industrial subjects phased-out or reduced production or transformed. There were several significant changes in methodologies and emission factors implemented in the latest submission, particularly in fugitive emissions, agriculture and waste sectors. More changes were connected with the implementation of the 2019 IPCC Refinement.

The main reason for emission changes in 2021 – 2023 were as follows:

- CO_2 emissions decrease in the Energy sector - category 1.A.1 – Energy Industry (0.35 Tg of CO_2) caused by decrease energy and heat production.
- CO_2 emissions decrease in the Energy sector - category 1.A.4 – Other Sectors (0.3 Tg of CO_2) caused by decrease industrial production of heavy metals and chemistry.
- CO_2 emissions decrease in the Energy sector - category 1.A.3 – Transport (0.04 Tg of CO_2) caused by increasing road transportation, mainly diesel-driven cars and transit.
- CO_2 emissions decrease in the IPPU sector – category 2.C – Iron and Steel Production (0.2 Tg of CO_2).

In addition, methane emissions decreased in the Energy sector - category 1.A.4 – Other Sectors (0.2 Tg of CH_4) and N_2O emissions increased in the Energy sector - category 1.A.4 – Other Sector (0.5 Tg of N_2O).

2.3.3. Key Drivers Affecting Emission Trends in LULUCF

The increasing trend of removals in forest land-use category is evident in the Slovak Republic since 1970. The increasing trend of removals cropland land-use category was recorded at the same time. Grassland areas decreased from 1980 to beginning of 1990 and since this year, decreasing trend of removals was recorded up to 2005. Since 2005, moderately downward trend has been taking place. Settlements land-use category has continual increasing trend during the whole period. This situation is mostly caused by development of transport infrastructure, industrial areas, municipal development and raising the standards and infrastructure in country and is very often connected with decreasing of the cropland and other land categories. Wetland represents 1.9% (94 kha) of the Slovak territory and it is considered constant, not involving any land use conversions. The LULUCF sector with net removals -7 843.72 Gg of CO_2 eq. in 2023 is very important sector and comprises from several key categories.

The major share from the LULUCF sector in 2023 represents removals in CO_2 with the contributions of the categories provided in the ***Table 2.1***. N_2O emissions from the disturbance associated with the land-use conversion to Cropland, Grassland, Settlements and Other Land were reported in this submission. In addition, removals from the harvested wood products were estimated in this submission. The emissions of other pollutants originate from forest fires and controlled burning of forest. The estimated amount of NOx emissions was 1.05 Gg and the estimated amount of CO emissions was 37.28 Gg in 2023 (***Table 2.1***).

Table 2.1: *Summary of total emissions and removals according to the categories in 2023*

CATEGORY	Net CO_2		CH_4	N_2O	NO_x	CO	NMVOC	SO_2
	Gg		*Gg*		*Gg*			
4. LULUCF	NO	-7 525.91	0.54	0.10	0.35	12.31	NO,NE,NA	0.01
A. Forest Land	NO	-7 009.5	0.54	0.03	0.35	12.31	NE,NA	NO
B. Cropland	NO	-654.30	NO	0.03	NO	NO	NO	NO
C. Grassland	NO	-27.85	NO	0.00	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	90.50	76.94	NO	0.02	NO	NO	NO	NO
F. Other Land	76.66	88.78	NO	0.02	NO	NO	NO	NO
G. HWP	NO	-108.19	NO	NO	NO	NO	NO	NO
H. Other	NO	NO	NO	NO	NO	NO	NO	0.01

Aggregated GHG emissions without LULUCF and indirect emissions; emissions are determined as of January 2025

2.3.4. Description and Interpretation of Emission Trends for Indirect GHG and SO_2

Information can be found in **Chapter ES.5** of this Report.

Table: *List of recalculations in January 15, 2025 submission (version 1) against September 15, 2024 submission (version 2) with short explanation*

RECALCULATED CATEGORY (SUBMISSION 2024 v2 VERSUS SUBMISSION 2025 v1)		YEARS	GHG AFFECTED	EXPLANATION
1. ENERGY SECTOR				
1.A.3.b	Road transport	2013-2022	CO_2, CH_4, N_2O	Recalculation is based on an update of the model to a newer version. The update involves correction of several emission factors, parameters, calculations, and adding new vehicle categories.
1.A.4.b	Households - Biomass	2021-2022	CO_2, CH_4, N_2O	Biomass consumption was recalculated due to new statistical inputs on households
1.B.1.b	Charcoal production	2022	CH_4	The recalculation is based on correction of calculation.
1.B.1.a	Coal mining and handling	1990-2022	CO_2, CH_4	The recalculations is a result of change of emission factors from underground mining. Slovakia switched from CIAB to IPCC emission factors. Also the calculation of emissions from abandoned mines was corrected.
1.B.2.c	Venting and flaring	1990-2022	N_2O	Correction of calculation resulted in recalculation of emissions.
1.B.2.b	Gas post-meter	1990-2022	CO_2, CH_4	Reconstruction of time-series for appliances based on gas distribution resulted in recalculation of emissions.
2. INDUSTRIAL PROCESSES AND PRODUCT USE SECTOR				
2.D.3.d	Urea Catalytic Converters	2013-2022	CO_2	Software update of the COPERT model resulted in the corrections to several emission factors, and the addition of new vehicle categories.
3. AGRICULTURE				
3.B.1.b	Non-dairy cattle	1990-2022	N_2O	Fixed inconsistency for the activity data in the share of pasture on total AWMS for the animal subcategory (heifers) of Non-dairy cattle. No impact on trend and marginal impact on level of emissions.
3.B.3.a	Breeding swine Market swine	1990-2022	N_2O	Update of the method for the calculation of nitrogen excretion rate for the swine categories.
3.B.4.h.i	Rabbits	1990-2022	CH_4, N_2O	Addition of new emissions source from rabbits.
3.D.1.b	Organic N fertilizers	1990-2022	N_2O	Recalculation based on the recommendation during the review on identified irregularities between nitrogen volatilized as NH_3 and NOx. It will have impact in the 3.D.1.b Organic N fertilizers and 3.D.2 Indirect N_2O emissions from managed soils categories.
3.D.1.b.iii	Other organic fertilizers	1990-2022	N_2O	Recalculation based on the implementation of updated data on the N content in different types of fertilizers included in the category 3.D.1.b.iii Other organic fertilizers. The issue has been identified during QA process in cooperation with Central Controlling and Testing Institute in Agriculture.
3.D.2	Indirect N_2O emissions from managed soils	1990-2022	N_2O	Recalculation based on the recommendation during the review on identified irregularities between nitrogen volatilized as NH_3 and NOx. It

RECALCULATED CATEGORY (SUBMISSION 2024 v2 VERSUS SUBMISSION 2025 v1)		YEARS	GHG AFFECTED	EXPLANATION
				will have impact in the 3.D.1.b Organic N fertilizers and 3.D.2 Indirect N_2O emissions from managed soils categories
4. LULUCF				
4(III)	Direct & indirect N_2O emissions from N mineralization/immobilization	1991-2022	N_2O	Calculation error (incorrected formula used) of indirect N_2O emissions from N mineralization/immobilization.
4.G	Harvested Wood Products	2021-2022	CO_2	Correction of input data.
5. WASTE				
5.A	Solid Waste Disposal – 5.A.1.a Anaerobic	2011-2022	CH_4	Recalculation based on revision MSW composition (% share of paper + garden + food) based on consideration of recycling share.
5.A	Solid Waste Disposal – 5.A.1.a Anaerobic	2022	CH_4	Recovery disposal gas was wrongly reported by the external organisation for 2022 (ÚRSO), data was corrected and lowered.
5.A	Solid Waste Disposal – 5.A.1.a Anaerobic	2010-2019	CH_4	Activity data for waste disposal was updated by the Statistical Office of the Slovak Republic, minor changes.
5.A	Solid Waste Disposal – 5.A.1.a Anaerobic	2000-2022	CH_4	Activity data for waste disposal was updated according real data from the disposal companies, approved by MŽP SR, minor changes 5-10%.
5.B.2.b	Composting of the Municipal Waste - 5.B.2.b. Other waste	2001-2022	CH_4	This recalculation is connected with the correction of activity data of digestion in 2001 – 2022. The revision of new data is connected with data refinement provided by the NEIS.
5.C	Waste Incineration without Energy Use: 5.C.1.1.b (biogenic) and 5.C.1.2.b (non-biogenic)	1990-2022	CO_2, CH_4, N_2O	Emissions of CO_2, CH_4 and N_2O were recalculated for all-time series 1990 – 2022 due inclusion of the waste incinerated in the clinical waste incinerators These recalculations increased biogenic as well as non-biogenic GHG emissions in equivalents.
5.D.1	Domestic Wastewater	1990-2022	CH_4	Recalculations of methane emissions based on the implementation of different MCFs used for methane emission in individual retention tanks - cesspools. Explained different methane production in septic tanks and cesspools.
5.F	5.F.1 –Long-term C Storage in WDS	1990-2022	CO_2	Recalculations are connected with recalculations in 5.A category for SWDS and parameters.
5.F	5.F.2 – Annual Change in Total Long-term C Storage 5.F.3 - Annual Change in Total Long-term C Storage in HWP Waste	2000-2022	CO_2	Recalculations are connected with recalculations in 5.A category for SWDS and parameters.